FINAL

Faro Mine Remediation Project Comprehensive Design Road Map Report

Prepared for

Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada

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Acronyms and Abbreviations

%	percent
<	less than
>	greater than
≤	less than or equal to
°	degree
°C	degree Celsius
1-D	one-dimensional
2-D	two-dimensional
3-D	three-dimensional
AACE	AACE International
AAM	Assessment and Abandoned Mines
AANDC	Aboriginal Affairs and Northern Development Canada
ABA	acid base accounting
AEP	annual exceedance probability
AMP	adaptive management plan
AP	acid potential
ARD	acid rock drainage
Associated	Associated Engineering
AT	Aerial Triangulation
BCL	Brodie Consulting Limited
BGC	BGC Engineering Inc.
Borrow Report	Borrow Baseline Design Criteria Report
C&M	care and maintenance
CAD	computer-aided design
Canada	Government of Canada
CCME	Canadian Council for Ministers of the Environment
CDRM	Comprehensive Design Road Map
CDRMR	Comprehensive Design Road Map Report
CH2M	CH2M HILL Canada Limited
CGVD28 HT	Canadian Geodetic Vertical Datum of 1928 Height Transformation
Challenger	Challenger Geomatics Ltd.
cm	centimetre(s)
cm/s	centimetre(s) per second
COC	contaminant of concern

CPT	cone penetration test
CSM	conceptual site model
CSQC	Canadian Sediment Quality Guidelines
CSRS	Canadian Spatial Reference System
CVD	Cross Valley Dam
DBR	Design Basis Report
DES	Denison Environmental Services
DI-leach	de-ionized leaching
DMP	Data Management Plan
DQE	data quality evaluation
DTM	Digital Terrain Model
DVIHU	Down Valley Interim Hydraulic Upgrades
EBA	EBA Engineering Consultants Limited
EcoCSM	ecological conceptual site model
EDD	electronic data deliverable
EDI	Environmental Dynamics Inc.
ELR	Ecological Logistics & Research Ltd.
EQuiS	Environmental Quality Information System
ETA	Emergency Tailings Area
FAA	Fisheries Act Authorization
FCD	Faro Creek Diversion
FMC	Faro Mine Complex
FMRP	Faro Mine Remediation Project
FPET	Faro Project Execution Team
FY	fiscal year
g	gravitational constant
GAI	geochemical abundance index
Gaps Report	Gaps Assessment Report
GCM	global climate model
GIS	geographic information system
GLL	Gartner Lee Limited
Golder	Golder Associates
GPR	ground-penetrating radar
H:V	horizontal to vertical
ha	hectare(s)
HAZMAT	hazardous materials
HDPE	high-density polyethylene

HDS	high-density sludge
HEC-HMS	Hydrologic Engineering Center–Hydrologic Modeling System (U.S. Army Corps of Engineers)
HEC–RAS	Hydrologic Engineering Center–River Analysis System (U.S. Army Corps of Engineers)
HHCSM	human health conceptual site model
hp	horsepower
ICAP	Integrated Comprehensive Abandonment Plan
ID	Intermediate Dam
IEG	Integral Ecology Group
INAC	Indigenous and Northern Affairs Canada
IPRP	Independent Peer Review Panel
IWPP	Interim Works Project Proposal
IWTS	interim water treatment system
KCB	Klohn Crippen Berger
KCC	Klohn Crippen Consultants
kg	kilogram(s)
km	kilometre(s)
km^2	square kilometre(s)
L	litre(s)
L/min	litre(s) per minute
L/s	litre(s) per second
LGSPC	Low-grade Stockpile “C”
LiDAR	Light Detection and Ranging
m	metre(s)
ML/d	megalitre(s) per day
m/day	metre(s) per day
m/m	metre(s) per metre
m/s	metre(s) per second
m^2	square metre(s)
m^3	cubic metre(s)
m^3/day	cubic metre(s) per day
m^3/sec	cubic metre per second
mbgs	metre(s) below ground surface
MCE	maximum credible earthquake
MEND	Mine Environment Neutral Drainage
mg/L	milligram(s) per litre
MGSP	medium grade ore stock pile

MIW	mining-influenced water
mm	millimetre(s)
MSA	Master Services Agreement
MTP	Medium Term Plan
N	north
NAD	North America Datum
NF	nanofiltration
NFRC	North Fork Rose Creek
NFRC Project	North Fork Rose Creek Realignment Project
NFRD	North Fork Rock Drain
NORM	Normally Occurring Radioactive Materials
NP	neutralizing potential
NWID	North Wall Interceptor Ditch
NWL	Northwest Lower Dump
O&M	operations and maintenance
ODS	ozone-depleting substances
OXSP	Oxide Fines Stockpile
PCB	polychlorinated biphenyl
PDT	Project Design Team
PHC	petroleum hydrocarbons
PMF	probable maximum flood
$PM_{2.5}$	particulate matter 2.5 micrometres or less in diameter
PM_{10}	particulate matter 10 micrometres or less in diameter
QAPP	quality assurance project plan
QM	Quantum Murray
RCAA	Rose Creek Alluvial Aquifer
RCD	Rose Creek Diversion
RCTA	Rose Creek Tailings Area
RGC	Robertson GeoConsultants Inc.
RLT	Regulatory Leadership Team
RMSE	root-mean-square-error
RO	reverse osmosis
RPP	Remediation Project Proposal
RQD	rock quality designation
RTK-GPS	real time kinematic global positioning system
RU	remediation unit
RZD	Ramp Zone Dump

SFRC	South Fork Rose Creek
SIS	seepage interception system
SPT	standard penetration test
SRK	SRK Consulting Engineers and Scientists
SWM	stormwater management
TA	task authorization
TAR	task authorization request
TDS	total dissolved solid
TEES	Tlicho Engineering and Environmental Services
Tera	Tera Consultants
tpy	tonne(s) per year
TSP	total suspended particulates
TSS	total suspended solid
UGC	Upper Guardhouse Creek
USEPA	U.S. Environmental Protection Agency
USgpm	US gallon(s) per minute
V:H	vertical to horizontal
VC	valued component
VCD	Vangorda Creek Diversion
VE	value engineering
VWS	Veolia Water Systems
VWT	Veolia Water Technologies
W	west
WRD	waste rock dump
WTP	water treatment plant
WVID	West Valley Interceptor Ditch
YESAA	*Yukon Environmental and Socio-economic Assessment Act*
YESAB	Yukon Environmental and Socio-economic Assessment Board
YG	Government of Yukon

SECTION 1

Introduction

1.1 Purpose

This Comprehensive Design Road Map Report (CDRMR) for the Faro Mine Complex (FMC) has been prepared in accordance with the scope requirements of Task Authorization Request (TAR) 020-2016-010 under Master Services Agreement (MSA) C00010250 (Project Design Team for Faro Mine Remediation) between CH2M HILL Canada Limited (CH2M) and the Government of Yukon (YG).

The purpose of this report is to document the work completed by CH2M and its subcontractors during the period of performance of the MSA, from September 2011 through August 2016, and to provide a resource for continued development of the Faro Mine Remediation Project (FMRP), planned to be implemented under one or more separate contracts. The CDRMR provides summary descriptions of all project remediation elements and current status and a complete listing of reports and technical memorandum prepared by CH2M under the MSA.

1.1.1 Background

CH2M was contracted by YG in September 2011 to provide the necessary engineering and regulatory support for preparation of a Yukon Environmental and Socio-economic Assessment Act (YESAA) Project Proposal (known as the Remediation Project Proposal [RPP]) for submittal to the Yukon Environmental and Socio-economic Assessment Board (YESAB). The intent of the MSA was to support the FMRP co-proponents (YG and the Government of Canada [Canada], as represented by Indigenous and Northern Affairs Canada [INAC]) in the remediation and closure planning of the FMC (Figure 1-1). (INAC was known until late 2015 as Aboriginal Affairs and Northern Development Canada [AANDC].)

Work completed under the MSA included the following:

- Evaluation of existing data and identifying data gaps, conducting field investigations to address the data gaps
- Preparation of conceptual designs and alternative analyses for the Rose Creek Tailings Area (RCTA), the Faro Mine Area, and the North Fork Rose Creek (NFRC)
- Design of a permanent high-density sludge (HDS) water treatment plant
- Design and construction of an Interim Water Treatment System (IWTS)

The work has included seep and groundwater sampling, development of groundwater, surface water, and geochemical models; assisting YG and INAC in preparation of a Medium Term Plan (MTP), assisting YG in preparation of an Interim Works Project Proposal (IWPP); and beginning work on the RPP.

Over the duration of the MSA, the FMRP objectives have changed to address changing site conditions and to accommodate changes in project governance and funding. Figure 1-2 illustrates the major activities undertaken by CH2M, as well as the major associated project milestones.

In September 2015, YG and INAC directed CH2M to discontinue the preparation of a site-wide Design Basis Report (DBR). The DBR was intended to provide sufficient design development for use in preparing the RPP. Instead, CH2M was directed to prepare a comprehensive report that summarizes the closure and remediation planning work conducted by CH2M and its subcontractors under the current contract duration (September 2011 through August 2016). The scope, format, and level of detail of this report, the CDRMR, was further discussed with YG and INAC during a November 23, 2015, scoping meeting that informed preparation of TAR 020-2015-010, dated January 18, 2016.

1.1.2 Report Objectives and Scope

The CDRMR provides a summary road map of the closure planning and design work completed to date by CH2M and their subcontractors for select portions of the FMC (see Section 1.1.3).

The road map terminology was adopted by YG, INAC, and CH2M to illustrate the role of the CDRMR to document work conducted by CH2M and other consultants, roughly in a chronological manner, that conveys the evolving scope of work and to refer to existing key documents, where applicable, that summarize the work in greater detail. The CDRMR does not reiterate in detail work already documented in prior reports.

As an additional way to convey the breadth of the work conducted by CH2M and its team of subcontractors and to assist future engineers and scientists that may work on the FMC project, CH2M has compiled its complete bibliography of technical deliverables submitted to YG during the period of performance of the MSA, and includes this summary in Appendix L, Bibliography of CH2M and Team Deliverables. Note that contract administration deliverables (such as TARs) are not included in Appendix L.

The CDRMR documents the work conducted to advance knowledge of the existing site conditions, particularly with respect to groundwater, surface water, geochemical and geotechnical conditions, closure alternatives. It also describes progress made on FMRP design projects, including the Faro Water Treatment Plant (WTP), Faro IWTS, Vangorda Creek Diversion (VCD), Down Valley Interim Hydraulic Upgrades (DVIHU), and Cross Valley Dam (CVD) Seepage Interception System (SIS).

The CDRMR also includes a summary of work performed to meet the regulatory objectives of the IWPP and the RPP.

1.1.3 Report Limitations

As directed by YG and INAC, this CDRMR does not include the following:

- Work associated with the investigation, studies, and design of the NFRC Realignment Project. This work is documented in CH2M's NFRC DBR (March 2016b). Key portions of the NFRC DBR are referenced in this CDRMR, as appropriate.
- Closure and planning work conducted by CH2M related to the Vangorda/Grum Area of the FMC (with the exception of the VCD design, interpretation of annual seep and waste dump monitoring programs, and investigations of borrow sites located within the Vangorda/Grum Area).

1.1.4 Report Organization

This report is organized as follows:

- Section 1 - Introduction
- Section 2 – Site-wide Conditions (includes model development and modelling results at both site-wide and remediation unit [RU] -specific levels)
- Section 3 – Water Treatment
- Sections 4 through 9 – Sections for each RU of the Faro Mine Area and RCTA (with references to Section 2 for applicable topics)
- Section 10 – Vangorda Creek Diversion
- Section 11 – Regulatory Overview and Status
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- Appendix H - CH2M's Responses to Comments on Faro Mine Modelling Deliverables
- Appendix I – Permanent WTP Siting Cost Benefit Analysis
- Appendix J – Seismic Stability Analyses of Selected Dams for the Faro Mine Remediation Project
- Appendix K – Water Management Strategy Presentation Materials
- Appendix L - Bibliography of CH2M and Team Subcontractor References

Section 1 provides a brief overview of the CDRMR, provides context for the chronological sequence of work conducted, identifies shifts in project focus based on changing site conditions, and also describes environmental planning and management documents prepared at a site-wide basis.

Section 2 and the appendices document field investigations, analyses, and designs applicable to current site-wide conditions and features.

Other report sections summarize work conducted within smaller site planning areas, referred to as RUs. Because the somewhat artificial RU demarcations were not established until late 2014 and have been modified since, prior (and subsequent) work does not always clearly fall within a designated RU boundary. To reduce repetition and to facilitate a clear chronological understanding of the work conducted, work completed specific to key technical disciplines or work products (e.g., such as groundwater modelling) is presented in a single report section or appendix instead of dividing the discussions across multiple RUs.

1.2 Project Context and Sequence

This subsection describes the general context and sequence of CH2M's work on the FMRP since September 2011, including the following:

- Engineering and regulatory approvals support to prepare an RPP
- Engineering design in support of Interim Works projects included as part of the 2014 – 2017 MTP
- Environmental and socio-economic baseline data collection and effects assessment and preparation of an IWPP
- Design, construction, and commissioning of the IWTS
- Preparation of the conceptual design, AACE International (AACE) Class 4 Cost Estimate, and DBR for the NFRC Realignment Project
- Multi-disciplinary field investigations in support of the various designs and environmental assessments

1.2.1 RPP and YESAA Level of Design Requirements

As stated in Section 1.1.1, CH2M's initial scope of work was to provide the necessary engineering and regulatory approvals support for the preparation of a YESAA Project Proposal (the RPP) for YESAB. Under its initial contract with YG, the goal was to submit a draft RPP to YESAB by fall 2014.

A governing assumption regarding this target schedule was that the RPP would remain substantially consistent with the alternatives and design concepts presented in the Draft 4A Closure Plan (SRK, March 2010a) and that preparation of the RPP would require development of a 60 percent level of design for the remediation. Following review of the Draft 4A Closure Plan, existing data, and other reports, CH2M prepared a Gaps Assessment Report (Gaps Report) (CH2M, February 2012c and February 2012d). The Gaps Report presents an assessment of data gaps and recommended field investigations to support the preparation of a 60 percent level of design and to conduct an effects assessment in evaluation of the proposed design. Cost estimates were developed and submitted to YG and AANDC (CH2M, December 2011a) providing an estimate of costs for completing all work elements (field investigations, engineering, environmental, regulatory, model development, and project management) associated with preparation and submittal of the RPP. This estimate was based on preparation of a 60 percent level of design and included both the Faro Mine Area, the RCTA, and the Vangorda/Grum Area.

During the data gap review meetings held in January 2012, YG and INAC determined that sufficient funding would not be available to complete the required field work, engineering, regulatory analyses, and preparation of the RPP by the fall of 2014 and that the schedule would need to be extended to accommodate available funding. At that time, it was anticipated that funding would be spread between Fiscal Year (FY) 2013, FY2014, and FY2015.

In early 2013, YG requested that CH2M conduct an analysis of YESAA to determine the appropriate level of design and the associated field investigations necessary for preparation and submittal of a RPP. Neither YESAA nor YESAB define the level of design required to support a RPP. Under YESAA, proponents are obliged to provide sufficient information to describe the adversity and significance of potential environmental and socio-economic effects of their proposed projects. Based on the conclusions of the required level of design assessment, YG requested that CH2M also update its 2012 evaluation of data gaps, specifically focusing on the information needs for the YESAA RPP.

In response to this request, CH2M conducted two workshops. The first YESAA workshop took place in Whitehorse on March 5 and 6, 2013, and was attended by YG representatives. The purpose of the first workshop was to address the following:

- Develop a common understanding of methods and approaches that will be used to predict environmental and socio-economic effects for the FMRP to fulfill YESAA's requirements.
- For each project component in the remediation plan, determine what level of design and detail was needed to ensure that valued components (VCs) are adequately defined and addressed by the RPP.
- For each participant to leave the workshop with a common understanding of how the design and effects assessment will interface.

The second YESAA workshop took place in Vancouver, British Columbia, from July 9 to 11, 2013. The purpose of the second workshop was to do the following:

- Define the level of engineering design (i.e., percent design) required to support the YESAA RPP for the FMRP.
- Identify baseline and engineering data gaps that require further data gathering to provide sufficient information to complete a YESAA RPP for the FMRP.

These workshops resulted in preparation the *YESAA Level of Design and Gaps Analysis Updates* report (CH2M, March 2014p) detailing the information and design requirements for defining the physical closure design elements (i.e., covers, SISs, diversions, dams, and fish habitat); requirements for management closure design elements (i.e., surface water and groundwater management, contaminated water management, integrated closure surface plans, and adaptive management plans [AMPs]) and integration of the physical and management elements through use of modelling and socio-economic effects prediction.

The closure elements included dams, pits and ponds, diversions, fish habitat compensation, site infrastructure, construction management, covers, landscape design, contaminated water management, seepage and groundwater collection systems, and surface water management. The report concluded that a level of design averaging about 30 percent, and that addressed identified value components, would address YESAA requirement for submission of the RPP. The level of design would be more detailed for higher risk components, such as dams, than for lower risk components, such as roadways.

The report also provided an update to the Gaps Report, based on the field work completed to date and revision based on the change in the required level of design from 60 percent to 30 percent.

1.2.2 Faro Mill Water Treatment Plant Shutdown

Because of continuing concerns regarding the performance and safety of the Faro Mill WTP, YG requested that CH2M assess the plant's ability to provide effective water treatment on an ongoing basis. The treatment plant equipment is spread throughout the length of the old Mill Building, which is in poor physical condition and contains appreciable lead dust, asbestos-containing materials, and other chemical hazards. At the time of the evaluation, the WTP had been in service 5 years longer than its planned operational life. Continued deterioration of the WTP posed a significant human health and safety risk to the Care and Maintenance (C&M) operations staff.

CH2M concluded that, because of significant operability constraints and major issues associated with operator health and safety, the existing Faro Mill WTP should be replaced as soon as practical (CH2M, March 2012p). The building structure and equipment was in poor operational condition, with severe corrosion of critical components at a high risk of failure. The WTP thickeners and clarifiers were in poor condition and missing critical equipment components (the launder in the thickener was no longer functional). The clarifier was found to leak at a rate of 33 litres per minute (L/min), and the thickener at a rate of 71 L/min. Failure of some of these components could not be readily repaired, potentially rendering the existing WTP inoperable. Following receipt of this assessment, on April 5, 2012, YG directed CH2M to initiate the design of the replacement WTP. Because of budgetary constraints, this resulted in the postponement of the RPP preparation and submission to YESAB.

In spring 2013, the existing Faro Mill WTP was closed to all personnel because of health and safety risks. The closure of the Mill Building essentially ceased all water treatment operations on the Faro portion of the site necessitating storage of all contaminated water in Faro Pit. With timelines for a new replacement WTP beginning operation in late 2016, YG determined, based on site water balance projections, that the FMRP would require interim water treatment to prevent uncontrolled release from the site. CH2M provided YG with alternatives and ultimately supported the decision to construct a 378 litres per second (L/s) (6,000 U.S. gallons per minute [USgpm]) ACTIFLO® lime neutralization IWTS. This system was selected because of its reduced footprint and modular construction.

During the IWTS design and procurement process, INAC and YG decided to defer the remaining cost for the design and construction of the replacement WTP design and construction in favour of extending the design life of the IWTS. Section 3 of this report provides summaries of the replacement WTP design process and IWTS design, construction, startup, and operations.

1.2.3 Medium Term Plan

Faced with both significant costs to replace the WTP and the conflicts with the planned project direction for adhering to the YESAA process before implementing closure works, the Faro Project Execution Team (FPET) brought their concerns to INAC in early 2012. As a result of these concerns, INAC requested that the FPET develop an MTP of approximately 5 years' duration to gain Faro Management Board endorsement on the scope of the project and establish a multi-year funding agreement required to enter into the WTP replacement activities and complete the RPP.

The MTP was intended as a multi-year planning document for operational needs and funding approvals. It contained all the work plans to be executed during the 5-year planning period. The MTP was to be reconciled on an annual basis. The MTP's primary milestone was the submission of the overarching RPP to YESAB in May 2017, but also added early remediation activities required to address deteriorating site conditions. These activities included the following:

- Replacement of the Faro Mill WTP
- Hydraulic upgrades to structures in the Rose Creek Valley (DVIHU)
- Enabling works for interception of groundwater in the Rose Creek Valley Alluvial Aquifer (CVD SIS)
- Replacement of the VCD

The first draft of the MTP was submitted to INAC on December 14, 2012, and contained the medium-term basis for project governance, C&M, preparation of the RPP, early remediation actions, other fixed costs (i.e., project management), and committed works.

In early 2013, during review of the initial draft of the MTP, it was decided by YG and INAC to develop an IWPP for submission to the YESAA Designated Office to permit the early remediation activities (subsequently renamed to interim works, but excluding the VCD, which was considered a final closure element) as well as ongoing site C&M. The interim works were to last up to 10 years, until such time that YG and INAC had completed the design, assessment and permitting, and procurement for the final remediation plan. The interim works had two main purposes: (1) to control and mitigate the effects of the existing FMC on human health and safety and the environment and (2) to compile sufficient site and environmental information to support design, assessment, and permitting for the final remediation plan.

CH2M initiated the design of the VCD, DVIHU and CVD SIS work packages in early 2013, along with ongoing efforts to advance the RPP and IWPP. On March 5, 2014, CH2M was notified by YG that INAC would be removing funding for the Vangorda/Grum Area of the FMC from the scope of the MTP. On March 12, 2014 CH2M met with YG and INAC to receive further instruction and to discuss management of this change against the baselined MTP scope of work. As a result of this determination, CH2M ceased efforts for the majority of data collection pertaining to the RPP for the Vangorda/Grum Area and the design of the VCD. The design definition report for the VCD was completed and submitted on March 31, 2014 (CH2M, March 2014g).

CH2M provided assistance to INAC in finalization of the MTP. Draft 4 was submitted to INAC on November 15, 2013, and included the changes in scope (addition of the IWPP and IWTS and removal of the replacement WTP) and schedule (removal of year 1). CH2M subsequently completed the 90 percent+ design for the replacement WTP in March 2014. The revised MTP was finalized and signed off by the Management Board on March 23, 2014 (YG, March 2014).

In summer 2014, CH2M completed the preparation of the IWPP for submission to YESAB. No additional effort to support the IWPP through a YESAA adequacy review or water licensing was undertaken because of the Management Board's decision not to submit the IWPP for YESAB review.

1.2.4 North Fork Rose Creek

In winter 2013, routine surface water monitoring identified increasing zinc concentrations in the NFRD. A field investigation conducted by Robertson GeoConsultants Inc. (RGC) (RCG, March 2015a) indicated that contaminated seepage, potentially originating from the Intermediate Sulfide Cell, was discharging within the North Fork Rock Drain (NFRD). Over the course of 2014 and early 2015, YG constructed a seepage collection system to attempt to intercept the contaminated seep before it mixed with the NFRC. This approach was not successful in capturing the bulk of the contamination. YG and INAC decided in February 2015 to initiate the design for realignment of the NFRC.

At that time, YG and INAC determined that the remainder of CH2M's work scoped within the MTP, with the exception of the upgrades to the Rose Creek Diversion (RCD) component of the DVIHU package,

would be stopped to allow for a focus on the NFRC realignment project. This direction from YG and INAC also included stopping work on the RPP and CVD SIS design. At that time, CH2M was still contracted to advance the design of the FMRP closure plan with the objective of preparing a site-wide DBR. As described in Section 1.1.1, on September 25, 2015, CH2M was directed to cease advancement of the site-wide design and document the work performed in the current CDRMR. CH2M prepared and submitted the draft conceptual design for the NFRC realignment project, AACE Class 4 cost estimate, and DBR in March and April 2016 (CH2M, March 2016b and April 2016l).

1.2.5 Site History and Initial Closure Planning

The FMC is located in south-central Yukon Territory, 15 kilometres (km) north of the Town of Faro and almost 200 km northeast of Whitehorse. The FMC is in the traditional territory of the Kaska Nation and upstream from the traditional territory of the Selkirk First Nation (FMRP, 2010).

The mine opened officially in 1969, and by the mid-1970s was the largest lead and zinc mine in Canada. For a brief period, it was the largest operating open-pit lead and zinc mine in the world. The lead and zinc concentrates produced at the FMC included economic quantities of silver and gold. The lead and zinc concentrates were shipped to international smelters via Skagway, Alaska (YG, February 2010).

In 1988, a second mining area called the Vangorda Plateau was developed, about 10 km east of the Faro Pit. The Vangorda and the Grum deposits went into production in 1990, with the ore transported to the Faro Mine Area for processing.

The Integrated Comprehensive Abandonment Plan (ICAP) (RGC, November 1996) was prepared for the Anvil Range Mining Corporation as a requirement by the water licences issued by the Yukon Territory Water Board. The ICAP provides a detailed history of the development of the Faro and Vangorda Plateau mines, summarizes available data to describe baseline site conditions, and proposes closure plans for both the mine areas, including recommendations for post-closure water management and treatment, post-closure monitoring and maintenance, and estimated costs.

Mining continued intermittently until 1998, when the last operator, Anvil Range Mining Corporation, sought protection under the Companies' Creditors Arrangement Act and was placed into receivership. All mining operations stopped. Under the Companies' Creditors Arrangement Act, C&M work was performed at the site by the court-appointed interim receiver, Deloitte and Touche. This work included treating the water flowing from the site so that it met acceptable standards. It also included regular inspection and maintenance of all structures on the site. In 2003, YG and Canada acknowledged that the FMC would not reopen, and initiated a process to develop an overall site closure and remediation plan. Since that time, YG and INAC have shared responsibility for managing the FMC. When the Yukon Northern Affairs Devolution Transfer Agreement took effect (April 1, 2003), YG assumed administration and control of public lands, including abandoned mine sites. As per the Devolution Transfer Agreement, Canada remained responsible for unfunded liabilities related to Type II sites (i.e., mine sites identified in the transfer agreement as having potentially unfunded environmental liabilities, which includes the FMC) (YG and AANDC, 2013a). In March 2009, YG and INAC assumed more direct responsibility for daily FMC operations, taking over when the interim receiver concluded its responsibilities. At that time, YG agreed to direct and lead FMC site operations. On February 28, 2009, at the same time as the Ontario Superior Court discharged Deloitte and Touche Inc. from its responsibilities as interim receiver and YG assumed responsibility for day-to-day management of the FMC, the site water licence expired. Since then, YG has conducted its activities at the FMC under the authority of a Minister's Determination granted in accordance with Subsection 37(1) of the *Waters Act*. This subsection provides the Minister with authority to take "any reasonable measures to prevent, counteract, mitigate, or remedy any resulting adverse effect on persons, property, or the environment" if the effects may arise from an abandoned site.

In January 2003, when the federal and territorial governments acknowledged that the FMC would not reopen and that a permanent, long-term closure plan would be needed, the two governments then entered into a joint agreement with the Ross River Dena Council (on behalf of the Kaska Nation) and Selkirk First Nation to provide strategic direction on the overall closure planning and remediation process (FMRP, 2010).The first stage in this process was to develop a set of overarching closure objectives for the FMC. The Canada, YG, Selkirk First Nation, and Ross River Dena Council took a collaborative approach to developing the closure objectives for the FMC. The following overarching objectives define the desired results of a closure plan and guide the entire planning and remediation process (per YG, July 2006):

- Protect human health and safety:
  - Ensure that the health and safety of people using the land and water are protected, both around the mine site and downstream including the Pelly River.
- Protect, and to the extent practicable, restore the environment, including land, air, water, fish, and wildlife:
  - Prevent, reduce, or mitigate environmental degradation.
  - Ensure that the environment (surface water, groundwater, land, and air) and its fish and wildlife are protected, both around the mine site and downstream including the Pelly River.
  - Monitor the air, water, land and the terrestrial and aquatic biota in the affected areas as long as required during and after remediation, involving First Nations people in the monitoring.
- Return the mine site to an acceptable state of use that reflects pre-mining land use where practicable:
  - Restore the mine site to maximize the re-establishment of traditional land uses, including the use of hunting and trapping trails that existed before mining.
  - Use traditional knowledge in the planning process, and give traditional knowledge the same weight as scientific knowledge.
  - Protect the culture and traditional pursuits of the affected First Nations.
  - Ensure the continued traditional use of aquatic and terrestrial resources, both around the mine site and downstream including the Pelly River.
  - Restore the productivity of the aquatic habitats.
- Maximize local and Yukon socio-economic benefits:
  - Maximize economic and social benefits to the Kaska and Selkirk First Nations in the implementation of the closure plan.
  - Provide economic opportunities for the First Nation residents, local residents, and Yukoners in general.
- Manage long-term site risk in a cost-effective manner:
  - Maintain short-term C&M, addressing immediate issues and identifying early actions to minimize risks while the Final Closure Plan is developed.
  - The Closure Plan activities and undertakings should be phased and integrated and should be designed to minimize long-term risk.

From 2003 through 2009, more than 100 technical studies and assessments were performed to characterize the potential environmental issues at the FMC. In addition, a large number of technical workshops were conducted with consultants, different levels of government, communities, and regulatory agencies to gather input regarding different closure approaches (FMRP, 2010).

Beginning in early 2005 and under the direction of YG and INAC, SRK led the development of example closure alternatives for the FMC that were to represent the range of options that prior studies and closure planning had shown to be technically reasonable. Work on the example alternatives continued through mid-2006. Between September 2006 and March 2007, the sample alternatives were reviewed by an Independent Peer Review Panel (IPRP) composed of leading mining experts from a range of technical areas of expertise. The review included an extensive period for feedback and discussion of specific issues and topics with governments and stakeholders. Based on the recommendations of the IPRP and the results of community and government consultations, the twelve sample closure alternatives were refined into five final closure options (three for the Faro Mine Area and two for the Vangorda/Grum Area) in the *Options for Closure of the Faro Mine Complex* (SRK, February 2008). These options were subject to a second independent technical review before entering into a formal evaluation process that measured each option's performance against the five overarching project objectives.

Guided by a team of experts in multiple accounts-decision analyses, a group comprising community members, technical consultants, and federal, territorial, and First Nations governments spent more than 1 year evaluating the short list of the closure options against the project objectives to determine the merits of each option (Faro Closure Core Assessment Team, February 2008). In 2009, the findings of the evaluation process were presented and the federal, territorial, and First Nations governments agreed on a preferred option that would form the overall basis of the FMC's long-term closure and remediation plan (YG, December 2012). This plan emphasizes the need to stabilize contaminants, rather than remove them from the FMC. Key features include upgrading dams so that tailings remain in place, re-sloping waste rock, installing engineered soil covers over approximately 390 million tonnes of tailings and waste rock, upgrading stream diversions, and installing state-of the-art water collection and treatment systems.

Since consensus was reached on a long-term closure and remediation plan, additional engineering tasks and investigations have taken place; these have served to refine the scope of the major site components and to understand the potential changes to site conditions over time. Following earlier versions, in 2010, SRK Consulting Engineers and Scientists (SRK) submitted a draft *Faro Mine Complex – Final Closure & Remediation Plan: Project Proposal* (SRK, March 2010a) to YG and Canada.

In general, the closure and remediation plan is to avoid unacceptable risks to public and worker health and safety, while meeting appropriate environmental standards and guidelines and achieve the following broad actions (CH2M, March 2016b):

- Reslope and cover waste rock and cover tailings
- Revegetate soil covers and other areas
- Divert clean water around the site
- Provide long-term collection and treatment of contaminated water
- Provide long-term management of water treatment sludge
- Provide long-term storage of water in pits
- Establish long-term maintenance of remaining site facilities (diversions, covers, water collection systems, water treatment systems, and dams)
- Institute long-term monitoring of environmental conditions (water, animals, plants, and climate)

1.3 Site Description

Many prior documents provide detailed descriptions of the FMC. For the purposes of this CDRMR, only a brief description of the FMC will be provided as context for the remaining sections of this report. For a detailed site description, refer to the IWPP (YG, November 2014a) or the ICAP (RGC, November 1996).

Major project features located within the Faro Mine Area and RCTA are shown on Figures 1-3 and 1-4, respectively; The Vangorda/Grum Area is shown on Figure 1-5. The Faro Mine Area and the Vangorda/Grum Area are connected by the Haul Road.

1.3.1 Faro Mine Area

The Faro Mine Area includes the following components:

- The Faro Pit (nominally 1,600 metres [m] long, 975 m wide, 345 m deep, is partially filled with water and contains approximately 15 million tonnes of subaqueous tailings)
- Approximately 30 waste dumps (as a remediation unit, referred to as the Waste Rock Dump [WRD] RU) (totalling approximately 260 million tonnes of waste materials that cover approximately 335 hectares)
- Closed ore processing and handling facilities (Mill Building Area structures)
- The Emergency Tailings Area (ETA)
- Adjacent freshwater creeks and diversions

The area includes contaminated water management facilities, including the S-Wells and ETA SIS, and contaminated water pumping, conveyance, and treatment facilities. A second pit (Zone II Pit), southeast of Faro Pit and within the waste dump area, was filled with waste rock during mining. Dewatering the Zone II Pit prevents contaminated water from accumulating within the pit and discharging into the NFRC.

Much of the waste material at the FMC is acid-generating, where oxidation of sulphide minerals releases sulphuric acid that mobilizes metal contaminants. Waste rock and pit walls at the Faro Mine Area continue to oxidize and release contaminants. Although sulphide cells (or the areas previously document as such), low/medium-grade ore stockpiles, and oxide fines stockpiles contain the most consistent highly mineralized wastes, the waste rock at the Faro Mine Area is generally poorly segregated with both acid generating and non-acid generating rock.

The waste rock releases acid rock drainage (ARD) -containing dissolved metals into groundwater, seeps, and surface water streams and creeks. This contamination poses a direct threat to benthic and fishery communities that live in the creeks within and downstream of the FMC. Other concerns that need to be addressed include contamination of air and land by lead dust, and direct contact of humans and wildlife with the metal-rich waste materials.

The Faro Pit serves as a contaminated water storage reservoir, providing storage capacity to support seasonal water treatment volumes and to reduce site water management risks. The Faro Pit has a storage capacity of approximately 43 million cubic metres (m^3) up to elevation 1,153 m, the suspected but unconfirmed approximate elevation of fractured bedrock within the rim of the pit on the side towards the Zone II Pit. As of January 18, 2016, the water surface elevation at the Faro Pit was 1,151.8 m (TEES, January 2016).

Before mine development, a number of streams and creeks flowed through the Faro Mine Area. Mine development required establishing diversions to re-route fresh water around the site and prevent surface water contamination. Throughout the FMC, clean surface water continues to be managed using various fresh water conveyance diversions and facilities to minimize the amount of clean water that enters the impacted areas of the site and subsequently requires management and treatment. The following fresh water diversions in the Faro Mine Area are illustrated on Figures 1-3 and 1-4:

- The Faro Creek Diversion (FCD) conveys Faro Creek along the northeastern side of the Faro Pit and into the NFRC. Faro Creek collects natural flows from a catchment north of the Faro Pit. The creek originally flowed across the footprint of the Faro Pit and into Rose Creek via a channel in the area now occupied by the ETA.

- The NFRC currently conveys the combined flows of FCD and the NFRC through the Haul Road Rock Drain and joins with the South Fork Rose Creek (SFRC), which then transitions into the RCD. The RCD conveys flow around the RCTA and eventually joins Rose Creek downstream of the FMC. The NFRC is referenced in the CDRMR because it is a major creek within the Faro Mine Area but detailed descriptions of the creek, its current conditions, and prior studies are not included. These items are described in great detail in the NFRC DBR (CH2M, March 2016b).
- The West Valley Interceptor Ditch (WVID) collects natural runoff from the hillsides northwest of the Faro Pit and conveys it into the upper end of the FCD.
- The North Wall Interceptor Ditch (NWID) conveys the flows from Upper Guardhouse Creek (UGC) (a natural channel northwest of the Faro Pit) and intercepts natural runoff from the north side of the Rose Creek Valley. The NWID flows into Rose Creek downstream of the CVD. Effluent discharge from the CVD Pond enters that NWID before the ditch joins Rose Creek.
- Lower Guardhouse Creek conveys contaminated stormwater and runoff from the waste dumps (e.g., Lower and Upper Parking Lot dump) and the Mill Building area and transmits this flow to the RCTA.

1.3.2 Rose Creek Tailings Area

The RCTA (Figure 1-4) covers an area of over 200 hectares in the original valley of Rose Creek, just downstream of the confluence of the NFRC and SFRC. The RCTA is composed of four dams – the Original, Secondary, Intermediate, and Cross Valley dams – and the RCD. The Original, Secondary, and Intermediate dams retain a total of 55 million tonnes of tailings in the Rose Creek Valley. The CVD retains a pond that was used for final polishing of treated water. Sludge cells on the Original Impoundment provide dewatering and storage for water treatment sludge.

Contaminated surface water accumulates in the Intermediate Dam (ID) Pond. Site operations include collecting and treating this water at the newly constructed IWTS. The RCD conveys clean water in Rose Creek around the RCTA.

Contaminants from the acid-generating RCTA are migrating into the Rose Creek Alluvial Aquifer (RCAA), which flows beneath the tailings. While concentrations of some contaminants are increasing in groundwater downgradient of the RCTA, none have reached levels that are ecologically significant enough to warrant collection and treatment.

Because of the contaminant loading associated with the tailings, the physical stability of the structures in the RCTA is critical to protect the downstream environment.

1.3.3 Vangorda/Grum Area

The Vangorda/Grum Area (Figure 1-4) includes the Vangorda Pit (nominally 1,150 m long, 375 m wide, and 150 m deep), the Grum Pit (nominally 1,000 m long, 625 m wide, and 200 m deep), the Vangorda Waste Dump, the Grum Waste Dump, the Grum Overburden Dump, the Grum Ore Transfer Pad, the VCD (which conveys clean water around the Vangorda Pit), the Vangorda WTP, and the Little Creek Dam. There are no tailings stored at the Vangorda/Grum Area because all ore was processed in facilities at the Faro Mine Area.

CH2M's work in the Vangorda/Grum Area focused primarily on alternative analysis and design for a replacement channel to the VCD and investigations of potential borrow sites located within the Vangorda/Grum Area. Sections 2 and 10 of this report summarize CH2M's work associated with the site-wide borrow and the VCD, respectively.

1.4 Remediation Units Designation

To facilitate the analysis of potential remedial actions at appropriate spatial scales, a site is often subdivided into smaller areas based on location and similar characteristics. For the Faro Mine Area and RCTA, these smaller areas are referred to as RUs. The remainder of this report is generally organized with respect to these RUs.

For the designation of RUs, CH2M chose to organize the site around a basic site-wide remediation objective of managing contaminant sources within the Faro Mine Area as needed to keep clean perimeter surface water sources from becoming contaminated by mining-impacted waters. The boundaries of some of the RUs have been adjusted based on comments received from the IPRP (IPRP, September 2015). As shown on Figure 1-6, the Faro Mine Area RUs consist of the following:

- Perimeter units (freshwater diversions, subdivided into West, East, and South) (Perimeter RU)
- Faro Pit (Faro Pit RU)
- Waste dumps (WRD RU)
- Mill Building Area and ETA (includes Lower Guardhouse Creek) (Mill Building Area and ETA RU)
- RCTA (RCTA RU)
- CVD and ID and associated pond (Dams and CVD Pond RU)

1.5 Environmental Management Planning

This section describes environmental management and planning documents prepared by YG and CH2M.

The success of any mine closure that must be actively managed in perpetuity relies on a commitment to environmental management that includes a comprehensive water management strategy, a robust monitoring program, and an adaptive management program that can quickly and cost effectively guide mitigation responses to the evolving site changes and variable contamination migration. Consistent with typical mine closure plans, the closure approaches evaluated by CH2M for the FMC focus on remediation measures that slow the production of acid rock drainage (e.g., covers for acid generating waste) and contain contaminant migration by relying on the interception and collection of contaminants before they are released to the environment.

Documents and strategies prepared by YG and CH2M that describe environmental management, monitoring, adaptive management, and water management strategies are described in the following subsections. As noted below, some of these documents were prepared specifically for the IWPP which was focused on a specific 10-year timeframe. However, the concepts and strategies described in these documents are applicable to a longer timeframe of site management.

1.5.1 Environmental Management

Appendix 5A, Environmental Management Plan (YG, November 2014b), to the IWPP was developed so that appropriate environmental management practices are carried out during the Interim Works phase. The Environmental Management Plan is a framework document that outlines the key elements of monitoring and mitigation plans. These plans describe which measures should be applied to avoid or minimize adverse environmental effects and risk to human health and safety. It was envisioned that the Environmental Management Plan would be refined, as required, to reflect site modifications, changes in environmental conditions or new management protocols arising from unforeseen events, implementation of adaptive management measures, or changes in contractual arrangements. The Environmental Management Plan currently contains the following plans:

- Sediment and Erosion Control Plan
- Emergency Response Plan

- Spill Contingency Plan
- Tailings and Water Management Structures Plan
- Emergency Response and Preparedness Plan
- Operations, Maintenance, and Surveillance Manual
- Waste Management Plan
- Wildlife and Habitat Management Plan
- Heritage Resources Management Plan
- Occupational Health and Safety Plan
- Dust Management Plan

1.5.2 Environmental Monitoring, Surveillance, and Reporting

CH2M developed a plan to monitor conditions at the FMC and the receiving environment (Appendix 5E to the IWPP, *Environmental Monitoring, Surveillance, and Reporting Plan* [CH2M, November 2014d]) to address increasing site risks associated with contamination migration and instability of certain FMC water- and tailings-retaining structures. This plan summarizes a comprehensive monitoring and adaptive management program whose objective was to identify environmental risks and hazards, such that these could be prevented or minimized. The Environmental Monitoring, Surveillance and Reporting Plan provided data and site characterization information to assist in risk assessment and adaptive management activities.

The Environmental Monitoring, Surveillance and Reporting Plan defines the monitoring objectives, monitoring design, and reporting to support the Interim Works. The plan outlines the anticipated environmental monitoring and reporting requirements for the Interim Works related to water quality, meteorology, aquatic environment, wildlife, and vegetation. The primary objectives of the environmental monitoring plan include the following:

- Confirmation Monitoring – Confirmation monitoring is performed to confirm the response of the receiving environment from the actions and operations carried out as part of the Interim Works. Monitoring of reference areas not impacted by mine site operations is also included in this category because it provides data critical for evaluating any potential changes in the receiving environment as a result of the Interim Works.
- Performance Monitoring – Performance monitoring evaluates operational system performance and effectiveness. The monitoring data collected in these areas will support the evaluation of system effectiveness as well as support the design of potential improvements to system operations. Performance monitoring also includes, where applicable, compliance monitoring to determine whether the site operations are meeting conditions set out in the Water License.
- Adaptive Management Monitoring – Adaptive management monitoring is performed to understand how environmental conditions in a particular area are changing, and whether a response is needed to address these changes to be protective of human health and the environment.

1.5.3 Adaptive Management Plan

In addition to water and site facilities being actively managed, the FMC contains waters and facilities that represent potential environmental risks but do not necessarily require immediate intervention. For these situations, the Interim Works included an AMP (Appendix 5G, Adaptive Management Plan Framework [CH2M, November 2014f]) whose objective was to identify, characterize, and provide appropriate responses to these risks.

The AMP takes the Precautionary Principle Approach: it provides a mechanism to identify potential environmental risks as they emerge, and to allow for a management response before an environmental effect occurs. To be effective, the AMP is linked to a monitoring program designed to indicate changes

well before a management intervention is necessary. This assures the necessary data for the assessment of environmental conditions is being collected for evaluation against predetermined triggers or thresholds.

The AMP includes the following key components:

- Proactive monitoring to detect changing conditions in areas of expected uncertainty within a timeframe that allows for effective response
- Clear triggers that will ensure timely implementation of effective responses
- Appropriate measures to address unacceptable conditions and performance

The AMP framework also describes eight discrete events that represent anticipated environmental conditions that may deteriorate over the 10-year period of the Interim Works to the point that they require a management response. These events specifically focus on areas where deteriorating water quality conditions may affect receiving environments. The AMP should be updated, as required, if additional events/situations develop that require ongoing monitoring and potential responses.

The following eight events included in the AMP framework, as well as conceptual AMPs for each of these proposed individual events, include the following:

1. Degraded groundwater quality in the RCAA
2. Degraded water quality in NFRC below S-Wells SIS
3. Degraded water quality in NFRC below NFRD
4. Degraded water quality in NFRC above NFRD
5. Degraded water quality in seepage from the Northwest WRD
6. Degraded water quality in Rose Creek downstream of mine site facilities
7. Degraded water quality below the Grum/V15 Collection System
8. Degraded water quality in Vangorda Creek downstream of mine site facilities

1.5.4 Water Management Strategies Principles

Closure designs that include effective water management strategies are critical for managing both clean and dirty (contaminated) site waters before, during, and after closure. As part of closure planning, CH2M proposes the following site-wide management water strategies:

- Keep clean water clean to the extent practicable.
- Reduce contaminant loading to the extent practicable.
- Collect impacted seeps and other sources of contamination to the extent practicable and cost effective.
- Provide water treatment to treat impacted water.
- Manage stormwater (mine impacted and clean water)
- Apply appropriate monitoring to track and respond to high risk areas.
- Apply adaptive management, long-term care, and maintenance.

In a series of IPRP workshops conducted in September and November 2014 and February and June 2015, CH2M presented an evolving water management strategy that described management approaches for both clean and contaminated surface water, stormwater, groundwater, and contaminated seepage during timeframes of before, during, and after implementing various closure actions. Based on these workshops and feedback provided by the IPRP, CH2M prepared detailed tabular summaries of the proposed draft water management strategy concepts and submitted these informally to YG in April 2015. The water management strategy PowerPoint presentation from the June 2015 IPRP Faro site meeting and the tabular summaries are included in Appendix K. A formal report that describes the water management strategy had not yet been prepared at the time that YG and INAC redirected the work that would be conducted in the remaining time of CH2M's MSA contract.

SECTION 2

Site-wide Conditions

2.1 Introduction

This section identifies and briefly discusses the work conducted by CH2M since 2011 to develop a more in-depth understanding of site-wide conditions from an environmental and physical viewpoint.

This section describes the following:

- Development of an initial conceptual site model (CSM) based on site information available when CH2M began its work for YG in 2011
- Preparation and status of data gaps assessment reports to support data gathering necessary to prepare the RPP
- Summaries of site-wide model development to evaluate water flow through the site and to predict contaminant transport and trends
- Overview of site-wide conditions based on previous data and data gathered by CH2M
- Status of site mapping and data management activities

2.2 Initial Conceptual Site Model Development

One of the first activities CH2M performed after coming under contract to YG was to review existing background information and develop a CSM for the FMC (CH2M, August 2012a). For this project, the CSM is defined as a consolidated representation of site information relevant to contaminant sources, release mechanisms, and pathways for transport and exposure. The CSM focuses on hydrologic, hydrogeologic, and geochemical processes that drive water and contaminant movement at the site, the physical and chemical properties of the subsurface environment, and the rates and volumes of water movement through the physical system.

The 2012 CSM supported the development of the project's integrated groundwater, surface water, and geochemical water quality models for the FMRP (see Section 2.5). The predictive models were then used to evaluate the effectiveness of remediation alternatives and used for design.

The CSM supports decision making related to identifying data gaps and uncertainties and managing remedial actions. The CSM was developed to help identify additional data needs and to help focus, and streamline, the collection of new data.

The CSM is a living body of information that must evolve as knowledge of the FMC's controlling parameters and processes evolves. The CSM and AMPs, in conjunction with the computer models, provide a means to assess why contaminant concentration changes occur and how these changes may affect site management decisions.

The 2012 CSM was intended to evolve as the project progresses and more information is learned about the site through additional field investigation, data interpretation, and modelling efforts. While the report itself has not been updated, elements of the CSM have been updated based on further data gathering (see Section 2.6).

2.3 2013 Data Gaps Assessment and Current Status

Another of the first activities CH2M conducted after coming under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this

review, CH2M recommended the necessary field investigations to support preparation of a YESAA Project Proposal. These recommendations were summarized in tabular form in the Gaps Report (CH2M, February 2012c) and Revised Gaps Report (CH2M, March 2014o). For this CDRMR, CH2M compared and augmented the tables included in the Revised Gaps Report by adding columns to describe and document whether specific gaps identified in the Revised Gaps Report were addressed during the conduct of CH2M's contract for closure planning work at the FMRP. This process of comparing and documenting whether data gaps have been addressed is often referred to as the gaps crosswalk comparison. The updated Gaps Assessment tables documenting this crosswalk process are included in Appendix B. Tables are included for both engineering gaps and regulatory gaps.

Subsequent sections of this CDRMR will refer to the Appendix B tables, as applicable, and identify key remaining gaps for the particular section topic.

2.4 Field Investigations and Analytical Testing Programs

Developing an RPP and designing remediation and closure elements for a site as large and complex as the FMC requires extensive site investigation and analytical testing programs. Many prior site investigations and data gathering programs were conducted before CH2M was contracted as the Project Design Team (PDT). Many of these prior works are cited in this report as applicable.

A summary of field investigation and analytical testing programs conducted by CH2M beginning from FY2012 through FY2016 is included in Tables C-1 through C-5 of Appendix C. The tables show the applicable geographic site area, program objectives, summary of completed fieldwork scope, and applicable document citations (for example, the Field Sampling Plan or Data Report) for each program. Table C-1 shows supporting documents for the field investigation such as standard operating procedures prepared in 2012 and submitted to YG.

2.5 Site-wide Modelling

This section describes the approach used to develop surface water, groundwater, geochemical, and water quality (GoldSim) models for the FMRP.

2.5.1 Groundwater Model

This section describes the ongoing development and application of groundwater modelling tools at the FMC to support the quantification of water budgets in various areas of the site, and to support the design of two major efforts; the CVD SIS and the NFRC Diversion. The short-term groundwater flow modelling objectives include the following:

- Help inform the CVD SIS design and the NFRC Diversion design
- Help test and inform the CSM components related to groundwater flow
- Gain insight into the locations and nature of groundwater/surface water interaction
- Help inform the development of the RCAA subsurface reactive transport model beneath the RCTA (see Section 4.5)
- Reduce conceptual errors associated with how the GoldSim model handles groundwater flow and forecasts SIS effectiveness
- Help inform the AMP as it relates to anticipated groundwater flow conditions

To the extent the groundwater flow models are periodically updated and used, groundwater flow modelling could include the following longer-term objectives:

- Enhance the utility of the groundwater flow models by incorporating newly collected field data to further evaluate groundwater flow conditions in support of the FMRP
- Evaluate potential alternative designs and configurations of future SISs
- Evaluate the performance of SISs to assess the opportunity to enhance remedial effectiveness
- Provide a basis for additional enhancements to the GoldSim model to improve its predictive capabilities by reducing uncertainties associated with groundwater flow conditions at locations of interest
- Help inform subsequent phases of the Faro WTP design, AMP, and other components of the FMRP, as needed

The following sections describe the chronology of groundwater modelling related activities conducted from FY2012 through FY2015 to support the FMRP. These activities are summarized in Table 2-1.

Table 2-1. Chronology of Main Groundwater Modelling Activities
Faro Mine Remediation Project

Date(s)	Activity
October 2011 - August 2012	Developed a conceptual model for the Faro Mine and Vangorda/Grum areas to support the development of numerical groundwater flow models for these areas
April - August 2012	Developed Water Modelling Work Plan describing proposed activities associated with developing site-wide groundwater flow models for the site
FY2012	Developed initial site-wide steady-state groundwater flow model and used model to obtain groundwater budgets for the FMC including stream-aquifer interaction
January - March 2013	Prepared the Fiscal Year 2012 Water Modelling Analysis Report that documented the construction and calibration of the initial site-wide groundwater flow model for the FMC
FY2013	Refined and recalibrated the site-wide groundwater flow model of the FMC based on the results of drilling, aquifer testing, and geophysical testing in the CVD area, as well as a RCD seepage study along the RCTA conducted in 2013. Refined model to include development and integration of refined water budgets for the CVD Pond and the ID Pond into the model. Used model to evaluate four alternative design options for the CVD SIS; the options included conventional extraction wells with and without low permeability cut-off walls, and a shallow trench with cut-off walls.
January - February 2014	Prepared the CVD SIS Phase 2 – Groundwater Modelling technical memorandum, dated February 14, 2014. Incorporated information into the 2014 CVD SIS design basis report
FY2014	Refined model grid in the vicinity of the CVD primarily to address IPRP comments regarding the potential for aquifer heterogeneity to compromise the effectiveness of a CVD SIS. Reconfigured the groundwater flow model to incorporate alternative CVD SIS designs centered around groundwater extraction trenches with passive relief wells instead of convention extraction well based systems. Evaluated six CVD SIS alternatives using the groundwater flow model; three based on conventional extraction wells technologies and three based on extraction trench/passive well systems
January - March 2015	Updated the CVD SIS Phase 2 – Groundwater Modelling technical memorandum, dated March 2015. Incorporated information into the 2015 CVD SIS design basis report
FY2015	Reconfigured FMC groundwater flow model to use the recently released MODFLOW-USG platform to allow for greater flexibility and efficiency in developing refined sub-areas of the model grid in areas of interest; this allows for relatively efficient refinement of the model grid resolution in the future to perform more detailed analysis of various design elements (such as dams, cut-off walls, and SISs). Refined model input assumptions (stratigraphy, bedrock topography, aquifer properties, and stream-aquifer interaction) in the NFRC area based on drilling, aquifer testing, packer testing, and geophysical surveys performed in the NFRC drainage. Converted steady-state flow model to a fully transient model

Table 2-1. Chronology of Main Groundwater Modelling Activities
Faro Mine Remediation Project

Date(s)	Activity
	containing one-month stress periods over an 8-year (2008-2015) calibration period. Fully calibrated model and documented such in the Fiscal Year 2015 Groundwater Model Development Report
September - March 2015	Used the newly developed transient and steady-state versions of the FMC groundwater flow models to support NFRC Diversion design. Used model results to estimate groundwater fluxes into various design elements (such as seepage collector drains and seepage collection ponds) under conditions that would exist assuming various design alternatives
December 2015 - March 2016	Documented groundwater modelling analyses to support the NFRC Diversion design in the NFRC Groundwater Modeling Report and the 2016 NFRC DBR

2.5.1.1 Fiscal Year 2012 Groundwater Modelling Activities

Efforts during this initial year of groundwater modelling activities at the FMC focused on developing a CSM of the Faro Mine and Vangorda/Grum areas to support the development of subsequent numerical groundwater flow models. The product of this effort was documented in the CSM (CH2M, August 2012a). A groundwater modelling work plan was also prepared to provide for review and comment from project stakeholders before the initiation of model development activities (CH2M, August 2012j). The majority of the remaining work conducted within this fiscal year was the development and calibration of an initial groundwater flow model of the FMC using the MODHMS modelling platform. This model was developed using readily available information in the following areas:

- Topography
- Pit bathymetry
- Hydrology
- Geological and hydrological properties
- Areal groundwater recharge rates

The model construction process resulted in a model grid covering 262 square kilometres (km^2), with six layers. Because of the size of the model domain, two separate steady-state models were developed: one with finer grid resolution in the CVD area and one with finer grid resolution in the NFRC area. Two models were required to provide adequate resolution to support project design needs while maintaining reasonable model simulation times. The resulting numerical groundwater flow models were then calibrated to average groundwater levels measured in 205 monitoring wells across the FMC. The complete documentation of the construction and calibration of the 2012 groundwater flow modelling effort is presented in the *Fiscal Year 2012 Water Modeling Analysis Report* (CH2M, March 2013o).

2.5.1.2 Fiscal Year 2013 Groundwater Modelling Activities

The groundwater flow modelling efforts in FY2013 focused on design activities associated with the CVD SIS. To support these design activities, the following two separate field activities were conducted:

- Long-term aquifer testing program at the CVD
- Seepage study along the RCD

The results of the long-term aquifer testing program were used to refine the conceptual and numerical models regarding the aquifer properties within the RCAA in the vicinity of the CVD. This area was initially selected for construction of the CVD SIS, and improved estimates of RCAA and underlying bedrock aquifer properties were necessary to support the design effort. The results and analysis of the aquifer testing program are documented in the *Analysis of 2012 Site-wide Field Data Report* (CH2M, March 2013e).

The CSM development analysis conducted in 2012 indicated that one of the most significant uncertainties in the water budget of the RCTA and CVD areas was the spatial distribution and magnitude of leakage from the RCD into the RCAA. To further define these leakage rates, a seepage investigation consisting of monitoring well installation, stream stage gage installation, and aquifer testing, was performed at 12 locations along the RCD. The results of these field efforts are documented in the *2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report* (CH2M, February 2014q).

The steady-state groundwater flow models of the site were refined and re-calibrated using the information obtained from these two studies. Model layer refinements were conducted based on improved resolution of stratigraphy (alluvial nature and thickness, weathered bedrock thickness, and competent bedrock surface) in both the RCD and CVD areas. Assumed aquifer properties were also refined in these areas based on the results and interpretation of the aquifer test data collected in 2012 (CVD area) and 2013 (RCD area). The refined CVD model was then used to evaluate eight options for construction of a CVD SIS. All of these design options contained nine extraction wells installed across the Rose Creek Valley just downstream of the CVD along with the installation of various low permeability cut-off walls constructed to bedrock both across the Rose Creek Valley downstream of the extraction well fence as well as along various lengths of the RCD. The results of the model re-calibration and application to the CVD SIS design are included in the *2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report* (CH2M, February 2014q).

2.5.1.3 Fiscal Year 2014 Groundwater Modelling Activities

The groundwater modelling activities in FY2014 continued to focus primarily in the CVD area, to support continued design efforts for the CVD SIS. The activities conducted in the first half of the year centered on responding to comments received from the IPRP in meetings conducted in February 2014. The IPRP was concerned that the current version of the model did not contain adequate spatial resolution to reliably evaluate the effectiveness of the SIS given the potential for significant heterogeneity in the aquifer sediments within the RCAA near the CVD. To address these concerns, the steady-state CVD groundwater flow model grid was refined from the original 10-m by 10-m grid spacing to a 1.25-m by 1.25-m grid spacing in the vicinity of the CVD. The assumed aquifer properties were further refined to introduce significant hypothetical aquifer heterogeneity into the model representing high-permeability gravel channels and low-permeability till layers that may exist within the RCAA. Hydraulic conductivities for the gravel channels was assumed to be 300 metres per day (m/day), and the hydraulic conductivity of the till units were assumed to be 1 m/day. Simulations performed assuming a highly heterogeneous aquifer suggest that high-permeability gravel channels between the SIS wells could compromise the effectiveness of the SIS. However, this condition could be addressed by operating the SIS at slightly higher flow rates (on the order of a 10 percent increase in operating flow rate).

Groundwater modelling efforts in the latter half of 2014 were performed to evaluate the potential effectiveness of constructing an SIS using a trench-based collection system in conjunction with passive extraction wells fully penetrating the RCAA. The following three general design approaches were evaluated during this effort:

1. A system of conventional extraction wells constructed across Rose Creek Valley connected to a common header pipe for conveyance to the water treatment plant
2. A trench-based system consisting of a series of passive extraction wells constructed across Rose Creek Valley that connect to a permeable collection trench
3. A trench-based system consisting of a series of passive extraction wells constructed across Rose Creek Valley that connect to a piped collection system

Eight alternatives were defined based around these three general approaches, and further evaluated using the refined groundwater model. Implementability and constructability concerns, as well as

effectiveness and longevity concerns, were also discussed for each of these three design approaches. The results of these analyses are documented in the *Cross Valley Dam Seepage Interception System Alternative Analysis Report* (CH2M, March 2015gg).

2.5.1.4 Fiscal Year 2015 Groundwater Modelling Activities

The groundwater modelling activities in FY2015 shifted to focus on the NFRC area as the top priority of the program shifted to the design of the NFRC Diversion Project. The primary activities conducted during this period included the following:

- Converting the two steady-state versions of the FMC models (CVD and NFRC) into a single version of the model using the MODFLOW-USG platform
- Refining the model in the NFRC area based on field investigation activities conducted during the 2014 and 2015 field seasons
- Developing a transient version of the refined groundwater flow model
- Applying both steady-state and transient versions of the refined model to support the NFRC Diversion design analysis

The groundwater flow model of the FMC was re-configured to use the recently released MODFLOW-USG platform, to allow for greater future flexibility and efficiency in developing refined sub-areas of the model grid in areas of interest. This allows for relatively efficient refinement of the model grid resolution to perform more detailed analysis of various design elements (such as dams, cut-off walls, and SISs). MODFLOW-USG allows for adding nodes and layers within selected areas of the model without changing any of the surrounding model construction or parameterization. Using this approach, it was also practical to combine the two previous versions of the model that provided high resolution in the CVD and NFRC areas into a single model of the site that provides adequate resolution throughout the model domain.

Once the model was ported over to use the MODFLOW-USG platform, the assumptions of model stratigraphy and aquifer properties in the NFRC area were also refined based on drilling, aquifer testing, packer testing, and geophysical surveys performed in the NFRC drainage during the 2014 and 2015 field seasons. These data provided for more accurate depictions of the aquifer thickness, bedrock topography, and aquifer properties in areas of the NFRC drainage where few data were available before 2014.

The final model enhancement performed in 2015 was to develop a fully transient version of the groundwater flow model. This model was calibrated to an 8-year period that extended from 2008 through 2015, with monthly stress periods. This effort required the further refinement of all model boundary conditions into temporal series reflecting monthly values over the 8-year period. Calibration targets for the model (transient groundwater levels and well/drain flows) were now also defined monthly over the 8-year calibration period and reflect the seasonality observed at the site. Complete documentation of the model conversion, refinement, and calibration is provided in the Fiscal Year 2015 Groundwater Model Development Report (CH2M, April 2016c).

Once the model was converted to MODFLOW-USG, refined, and recalibrated to both steady-state and transient conditions, both the steady-state and transient versions of the model were used, as necessary, to support the development of the NFRC Diversion design. During this process, the steady-state and transient models were used to develop transient baseline estimates of the components of the groundwater budgets in the NFRC area. These values primarily consisted of both average (steady-state) and seasonal (transient) estimates of the magnitude of stream-aquifer interaction along the NFRC. Once these baseline values were defined, the model was modified to reflect the conditions that would exist with the NFRC Diversion design in place. The design versions of the model then provided estimates of groundwater seepage rates to the NFRC channel as well as inflow rates to groundwater interception

drains, and also provided estimates of groundwater inflow and outflow from seepage collection ponds associated with the design. A complete documentation of the application of the steady-state and transient models to support the NFRC Diversion design is provided in Appendix D of the NFRC Diversion DBR (CH2M, March 2016b).

2.5.2 Surface Water Model

This section describes the development, evolution, and use of surface water modelling and analysis tools at the FMC to support assessment of natural and modified conveyance elements as well as design of water management features.

The following sections describe the chronology of surface water modelling and analysis activities that were conducted from FY2012 through FY2015 to support the FMRP. These activities are summarized in Table 2-2.

Table 2-2. Chronology of Main Surface Water Modelling Activities
Faro Mine Remediation Project

Date(s)	Activity
October 2011 – August 2012	Developed a conceptual model for the Faro Mine Area/RCTA and Vangorda/Grum Area to support the development of a numerical surface water model for these areas.
August 2012 – March 2013	Developed continuous HEC-HMS model of the FMC, including both Vangorda/Grum and Rose Creek catchments. Conducted initial flow and meteorological data compilation and review.
April 2013 – March 2014	Completed a regional frequency analysis to develop peak flow estimates for conceptual design of the VCD. Compiled a HEC-RAS hydraulic model of the conceptual VCD. Hydrologic and hydraulic analyses were also completed to establish a basis for the DVIHU design. This included estimates of peak flow rates, assessment of the conveyance capacity of the NFRD, and compilation of 1-dimensional (1-D) and 2-dimensional (2-D) models of the Down Valley area.
April 2014 – March 2015	Developed a Hydrology Baseline Report to document available flow and meteorological data at the FMC as well as issues related to collection and processing of such data. This information was further detailed in the 2014 Hydrology Field Program Report. The 2014 Hydrology Baseline Report and 2014 Hydrology Field Program Reports provide detailed descriptions of the hydrological conditions at the FMC through 2014 and assesses the information and data used to characterize surface water flow regimes in natural channels and stream diversions. This report also includes details regarding development of Intensity-Duration-Frequency curves for the FMC.
April 2015 – March 2016	The surface water modelling activities in FY2015 were focused primarily on conceptual design of the NFRC Realigned channel as well as the NFRC Seepage Collection Pond. This included refinement of peak flow and runoff volume estimates using a regional analysis methodology as well as development of a 1-D, steady-state HEC-RAS hydraulic model of the NFRC Realigned Channel. A 1-D HEC-RAS model of the proposed NFRC Seepage Collection Pond Dam downstream to the tailings area was developed to support dam-break analyses.

Notes:

HEC-HMS = Hydrologic Engineering Center–Hydrologic Modeling System (U.S. Army Corps of Engineers)

HEC–RAS = Hydrologic Engineering Center–River Analysis System (U.S. Army Corps of Engineers)

2.5.2.1 Fiscal Year 2012 Surface Water Modelling Activities

A CSM was developed of the FMC to support subsequent numerical surface water modelling tools. This effort was documented in the CSM Report (CH2M, August 2012a). This included review of previous work related to hydrology and hydraulics at the FMC, as well as an initial review of available flow and meteorological data collected at the site as well as in the local area.

A water modelling work plan was also developed to describe a proposed approach for integrating surface water, groundwater and geochemical water quality models for the FMC. This modelling was initially intended to support the following:

- Basis of the design for the proposed WTP at the FMC
- Design of SISs and surface water conveyance structures
- Development of AMPs
- Aid for risk management across the FMC

The main objective of the current surface water flow modelling effort was to develop a calibrated tool that could be used to simulate precipitation-runoff processes from the FMC on a continuous, multiyear simulation basis. The focus of this model was to simulate the timing and magnitude of runoff events throughout the year, ranging from low-flow (i.e., base flow) conditions to peak flow conditions that occur during the spring freshet.

Building on the CSM Report (CH2M, August 2012a), a surface water flow model was developed to define precipitation-runoff processes throughout the FMC. Existing physical site characteristics, meteorological data, and surface water flow monitoring data were used to perform an initial calibration based on available flow data.

The complete documentation of the construction and calibration of the 2012 surface water modelling effort is presented in the *Fiscal Year 2012 Water Modelling Analysis Report, Faro Mine Remediation Project* (CH2M, March 2013s).

2.5.2.2 Fiscal Year 2013 Surface Water Modelling Activities

Surface water analyses for FY2013 were related to Phase 1 of the VCD work package, which was the design definition phase. This included development and review of various design concepts, criteria development, option selection, and preferred option concept development. Refer to Section 10 of this CDRMR for a description of the VCD project design.

A review of previous peak instantaneous flow estimates was completed. An updated regional frequency analysis was undertaken to develop estimates of peak flow rates for a range of return period events based on updated flow data collected in the Yukon and Eastern Alaska.

A 1-D hydraulic model was also compiled to assess the VCD channel. This included consideration of various alignment and headworks configurations.

The complete documentation of the hydrologic and hydraulic analyses to support the VCD design definition phase is presented in the *Task Authorization 018(A) Vangorda Diversion Design Definition, Faro Mine Remediation Project* (CH2M, March 2014d).

Hydrologic and hydraulic analyses were also completed to establish a basis for the DVIHU design. This included estimates of peak flow rates, assessment of the conveyance capacity of the NFRD, and compilation of 1-D and 2-D models of the Down Valley area. The complete documentation of the DVIHU is presented in the *Down Valley Interim Hydraulic Upgrades Phase 2 – Basis of Design Repor*t (CH2M, March 2014l).

2.5.2.3 Fiscal Year 2014 Surface Water Modelling Activities

Highlighted in Appendix 6C of the IWPP Hydrology Baseline Report (CH2M, November 2014j) was a summary of available flow and meteorological data at the FMC as well as issues related to collection and processing of such data. Given the importance of flow and meteorological data to development and calibration of surface water hydrology modelling tools, additional effort was undertaken in FY2014 to supplement the historical record at the site.

The *2014 Hydrology Field Program Report, Faro Mine Remediation Project* (CH2M, February 2015a) provides an update to the November 2014 Hydrology Baseline Report to reflect the existing hydrological conditions in the Rose Creek watershed at the FMC through 2014. This document does not include updated information for the Vangorda Creek watershed at the FMC. The 2014 Hydrology Baseline Report provides detailed descriptions of the hydrological conditions at the FMC through 2014 and assesses the information and data used to characterize surface water flow regimes in natural channels and stream diversions.

The baseline hydrology-related data consist primarily of stream flow data and meteorological data collected over various intervals as part of FMC monitoring programs or other regional or federal data collection programs. This document summarizes hydrology-related data collected onsite since 2011 that were not included in the analysis in the Hydrology Baseline Report (CH2M, November 2014j).

This report summarizes additional supporting data sets that were collected as part of the FMC site characterization efforts, consisting of physical data related to watershed and subwatershed catchments at the FMC; it also incorporates available information from ongoing hydrological studies, specifically the FCD design. Many of the historical data included in the 2014 Hydrology Baseline Report were collected and reviewed as part of previous studies at the FMC, to determine the requirements for managing surface water and directing other site activities. This report does not describe previous studies or surface water management activities at the FMC where there has been no change since the Hydrology Baseline Report.

This report also discusses the analysis methods used to characterize hydrology at the FMC and describes the hydrological and meteorological conditions at the FMC, based on available data and the results of previous and ongoing studies. Analysis methods and results for data made available since the 2014 Hydrology Baseline report are described in this document.

Lastly, the 2014 Hydrology Field Program Report (CH2M, February 2015a) includes details related to development of intensity-duration-frequency curves for the FMC.

2.5.2.4 Fiscal Year 2015 Surface Water Modelling Activities

The surface water modelling activities in FY2015 were focused primarily on conceptual design of the NFRC Realigned channel as well as the NFRC Seepage Collection Pond. This included refinement of peak flow and runoff volume estimates using a regional analysis methodology as well as development of a 1-D, steady-state HEC-RAS hydraulic model of the NFRC Realigned Channel. A 1-D HEC-RAS model of the proposed NFRC Seepage Collection Pond Dam downstream to the tailings area was developed to support dam-break analyses.

The complete documentation of the hydrologic and hydraulic analyses completed to support the NFRC Realignment Channel and seepage collection systems is presented in the NFRC Hydrology/Hydraulics Report (CH2M, March 2016i).

Collection and processing of updated flow and meteorological data was also conducted as presented in the 2015 Surface Water Data Processing Report (CH2M, March 2015ii).

2.5.2.5 Surface Water Modelling Activity Summary

The initial goal of the HEC-HMS model work in FY2012 was to develop a baseline hydrology tool in which available meteorological data, flow records, catchment discretization, and related parameterization could be incorporated. The modelling platform was selected based on the then-current understanding of data availability and the initial objective of completing a calibration of rainfall-runoff from the Rose Creek and Vangorda catchments. The HEC-HMS model was considered an appropriately complex model at the time given the understanding of the hydrological system, including available input and calibration data.

The objective of the FY2012 modelling efforts was to simulate rainfall-runoff responses from large, undisturbed catchments tributary to the main FMC conveyance features. This would allow for initial characterization of seasonal variations in flow for more frequent return period events. This would also form a baseline tool that could be further developed based on subsequent collaboration with the hydrogeological and geochemical modelling teams and by incorporating updated meteorological, flow and physical data. It was recognized at the time that the tool was not as appropriate for modelling attenuation impacts from impacted landforms including WRD or for simulating baseflow conditions in which groundwater-surface water interaction is the dominant process.

Flow and meteorological data compilation was completed in parallel with model development during FY2012. From this work, various issues related to processing of this data and associated operations and maintenance of the equipment resulted in concerns with the quality of the data and suitability for model calibration. In addition, two key data gaps were identified: (1) a lack of understanding of meteorological and physical conditions in the upper reaches of catchments tributary to the FMC and (2) unknown impacts of WRD and related disturbed landforms on infiltration and subsequent sub-surface flow of water.

The focus of hydrological analyses subsequent to FY2012 was on development of estimates of peak instantaneous flow and runoff volumes in FMC diversion features that convey runoff from the larger, undisturbed tributary catchments. It was determined that regional analyses incorporating data from a variety of catchments and over a number of years was more appropriate for estimation of peak flow rate and runoff volume in diversion channels around the FMC for larger, less-frequent events (i.e., 1-in-10-year to 1-in-1,000-year). The FMC Design Flood Manual (Appendix B to CH2M, March 2016b) includes details related to the development and application of the updated regional frequency analyses prepared for the FMC. These data were used for conveyance design as well as conceptual design of proposed attenuation facilities. Numerous recommendations have been made regarding meteorological and hydrological data collection at the site as well as related compilation and processing with the intention of incorporating improved data sets into subsequent modelling efforts.

2.5.3 Geochemistry Models

This section describes the development, evolution, and use of geochemical models for the FMC. Two geochemical software packages are referred to in this section, both released and maintained by the U.S. Geological Survey: PHREEQC (Parkhurst and Appelo, 2013) and PHAST (Parkhurst et al., 2010).

PHREEQC is an application for simulating chemical reactions and transport processes in surface water and groundwater. For the FMC, it was used to (1) provide chemically balanced, thermodynamically correct water chemistry for the GoldSim model, (2) provide a kinetic model of each waste dump's seepage evolution that simulates chemical evolution continuously over time, and (3) provide a mixing model for each subcatchment surrounding the waste rock/pit lake area that simulates groundwater evolution over time.

PHAST is a combination of PHREEQC and a three-dimensional (3-D) groundwater flow model that is used to model reactive transport through an aquifer. This software was applied to the RCAA beneath the tailings facility, ID Pond and CVD Pond, and downgradient areas.

The work performed with these model codes is chronologically documented in the following sections, and is summarized in Table 2-3.

Table 2-3. Chronology of Main Geochemical Modelling Activities
Faro Mine Remediation Project

Date(s)	Activity
December 2011 – April 2012	Evaluated the existing water quality modelling approach for the site, and planned geochemical model development to improve accuracy of existing model
May 2012 – March 2013	Developed PHREEQC models of current WRD seepage assignments, based on GoldSim v1, to provide geochemical constraints and ion balance. Entered these balanced analyses in mixing models for Faro Pit lake and X23 nodes of GoldSim v1 models and adjust parameters to match currently observed data. See Figure 2-2 for X23 location. Developed first version of RCTA transport model using the PHAST code. Calibrated transport model to data at several monitoring points in RCTA.
April 2013 – March 2014	Developed PHREEQC kinetic models of WRD seepage evolution. Reviewed ABA data and identify data gaps. Assessed calculation method of NP and applied this and ABA data to WRD seepage model development. Used WRD seepage model output to construct revised mixing models for GoldSim v2 nodes; calibrated to X23 node in particular. Updated RCTA transport model to more closely reflect groundwater flow model properties; used X23 mixing model for future input to transport model.
October 2014 – July 2015	Began second version of the WRD kinetic seepage model to convert from a batch-style model to a one-dimensional vertical transport model ("column model"). Retained outside geochemical modelling expert for development of this phase. Provided long-term estimates of water quality at ID and CVD for water treatment assessment. Per YG, halted geochemical work in July 2015 pending resolution of concerns on modelling approach.
October 2015 – March 2016	Applied batch-style version of the site-wide geochemical WRD model to the NFRC project. Recalculated sulphide cell regression model for specific NFRC use and calibrated five groundwater mixing models to observed groundwater data along NFRC using input from the site-wide groundwater flow model. Produced mixing model of planned seepage collection pond to aid in design planning.

Notes:

ABA = acid-base accounting

NP = neutralization potential

2.5.3.1 Background and Initial Modelling Objectives

As of 2011, the site-wide model consisted of a series of interconnected spreadsheets that combined surface water, groundwater, WRD seepage, and water quality mixing models. The GoldSim software was used to collect and organize these models into a cohesive single model, known herein as GoldSim v1 (Gomm, April 2010). The FMC geochemical model development originated as a response to IPRP comments on the Closure Plan (SRK, March 2010a) calling for transport modelling to be incorporated into the site-wide model along with an accounting of chemical reactions occurring during transport.

Initial inspection of the GoldSim v1 model and its predecessors in late 2011 and early 2012 showed that some of the assumed WRD seepage chemistry and resulting mixtures (including pit lake water and other sub-catchment drainage) did not reflect observed groundwater chemistry, and further did not adhere to basic geochemical processes.

The initial objectives for 2012 were to (1) apply PHREEQC to account for these reactions in the seepage and mixture waters present in GoldSim v1 and (2) develop a geochemical transport model with the PHAST code for the Rose Creek Aquifer beneath the RCTA.

2.5.3.2 CH2M Work Associated with Geochemical Model Development

Fiscal Year 2012

Work performed in 2012 began with using PHREEQC to chemically balance seepage waters assigned to WRDs in GoldSim v1. Although the water chemistry data were based on actual seep data, they

represented long-term averages of each parameter and therefore not an actual chemistry analysis. For data with significant chemical variability, this often results in unbalanced cation-anion equivalence and unrealistic water chemistry. An example of the latter condition was that some of the assigned waters had an elevated iron concentration with high alkalinity and neutral pH, a combination that does not occur due the precipitation of either iron oxyhydroxides or iron carbonate under such conditions.

PHREEQC was used to balance GoldSim WRD water chemistries and bring them into equilibrium with known mineral phases in the environment at the WRD base. The next step was to mix these waters in the same proportions as estimated in GoldSim for Faro Pit lake and for the X23 catchment, with mineral phases and gas equilibria applied to these mixing reactions. The boundary areas for these catchments are shown on Figure 2-1. The objective was to preserve the basic GoldSim approach to seepage generation and mixing, but to apply geochemical constraints to maintain geochemical integrity and to prepare these waters for incorporation into transport modelling. Mixing models were constructed as batch models, where multiple waters were mixed assuming static conditions.

In the Faro Pit lake mixing model, GoldSim had assumed a diluted water chemistry for inflow from the upper Faro Creek valley. In reality, seepage data from the northern pit wall reveals that background water entering the pit lake is affected by mineralized zones. Therefore, three seep locations along the northern wall of the Faro Pit (A30, SRK-FD40, and CH-FP-30) that contribute the largest volume of water to the Faro Pit lake from the northern wall were selected as representative of these background water quality conditions. The upper portion of pit lake water was calibrated to the observed 2012 data for pit lake water. Mineral phases, including calcium carbonate (calcite) and aluminum and iron hydroxides, were allowed to precipitate if they became saturated, and a small amount of calcite, representing alkalinity source in deeper lake water, was allowed to dissolve. The resulting mixture showed an improved fit to the observed data compared to the previous GoldSim results (CH2M, March 2013s).

The X23 mixing model was completed in two parts. The first was similar to that done for the pit lake model, with GoldSim mixing fractions used to combine multiple waste dump seeps under equilibrium with key mineral phases. Adsorption reactions of trace metals to mineral phases was added to account for these reactions occurring in the aquifer matrix. The resulting mixture agreed reasonably well with the X23 seepage monitoring data, but not with the true ETA inflow to the downgradient Rose Creek Aquifer (CH2M, March 2013s). A second mixing model was constructed to account for the mixing reactions occurring between X23 and FCS-4, which produced a more acceptable fit to FCS-4 data and pointed out the shortcomings of the GoldSim mixing assumptions for ETA outwash (CH2M, March 2013a). This was considered important, as the FCS-4 water chemistry provided an important input to the RCTA groundwater transport model.

The RCTA model was constructed using the PHAST code, and accounted for groundwater fate and transport in the Rose Creek Aquifer between monitoring stations X2 and X14 (Figure 2-2). This initial version accounted for the adsorption and precipitation reactions described above for the X23 mixing model, with initial conditions set for 2002 data from representative wells throughout the domain, as shown on Figure 2-2. The groundwater hydraulic parameters were based on average values used in the site-wide groundwater flow model being developed at the time. Groundwater fluxes entering the domain at its boundaries were assigned constant chemistries based on data from wells or surface waters adjacent to the boundaries. The ETA inflow was based initially on the X23 and FCS-4 data and GoldSim future predictions. Seepage flux and water quality through the tailings into the groundwater was assigned on the basis of estimates from previous reports (SRK, January 2005), with the ability to dilute or concentrate the water quality in each of the 11 tailings infiltration zones. The model was calibrated to data from the representative wells for the period 2002 through 2012. The model enabled a spatial distribution of future water quality simulation in the RCTA that was not previously provided. Results showed a much-improved fit to observed groundwater data in the ID and CVD areas (CH2M, March 2013s) compared to GoldSim v1.

Fiscal Year 2013

The summary reports for the previous year (CH2M, March 2013s; CH2M, 2013a) called for a re-evaluation of the GoldSim WRD seepage water quality simulations and a refinement of the RCTA transport model parameters to more closely match those of the site-wide groundwater flow model. To fulfill these objectives in 2013, the following series of tasks was developed:

- Develop a more accurate model of seepage water quality
- Identify seeps that reflect a single waste dump seepage quality that can be used to calibrate a new seepage model
- Assess the previous methods used in estimating acid potential (AP), NP, and other ABA assignments for waste dump samples
- Build a PHREEQC seepage model for each waste dump that accounts for governing geochemical reactions and kinetic processes
- Work closely with the groundwater flow modelling team to improve the RCTA model with parameters and boundary conditions taken directly from the flow model as it is developed

Seep flow and water quality data from the Faro Pit and surrounding waste dumps were examined, along with available compositional and ABA data for the waste dumps themselves. Most of the seeps represent a combination of two or more waste dump seepages, dilution with regional groundwater flow, or both. These were not usable as calibration targets for a seepage model, as the goal was to form waste-dump-specific kinetic seepage models. Only three seeps were regarded with certainty of being representative of a single waste dump: SRK-FD19 for the Northwest Lower Dump (NWL), SRK-FD14 for the Ramp Zone Dump (RZD), and SRK-FD37 for the medium grade ore stock pile (MGSP). These represented future acid-generating, neutral, and presently acid-generating waste dumps, respectively, so the range of conditions was fortunate. The work is documented in a technical memorandum (CH2M, August 2013d).

Concurrent with the work described above, the ABA properties from previous and newly collected samples were evaluated for accuracy and completeness. The purposes of the work were to (1) describe the new ABA data added to the previous dataset, (2) identify potential issues affecting the data interpretation, and (3) provide a preliminary assessment of the ABA properties of the WRDs employed in the GoldSim model. The work revealed that multiple methodologies used in previous work to determine ABA characteristics and the lack of locational information indicated substantial limitations of the dataset to be effectively incorporated into the improvements to the GoldSim model (CH2M, August 2013b). Analysis of the sensitivity of NP and AP calculations to the predicted future water quality calculations in the GoldSim model led to the conclusion that a more mechanistic geochemical approach to the waste dump seepage model was necessary to produce a more reliable model of future water quality (CH2M, October 2013f).

The PHREEQC kinetic model for a given waste dump consists of four kinetic algorithms: pyrite dissolution, calcite dissolution, carbon dioxide gas diffusion, and oxygen gas diffusion. Each of these algorithms has a set of parameters that may be adjusted during calibration to fit observed data. The starting time for each dump was assigned as the year it was completed. The waste dump seep models for the NWL and RZD seeps were calibrated to provide a reasonable match to observed data between 2002 and 2013. Calibration was not possible for the MGSP model because of this seep's very high ionic strength chemistry. In place of the PHREEQC calibration for this waste dump, the stockpile model was calibrated by running a polynomial regression equation through the SRK-FD37 seep sulphate data. The remaining elements in the seep water were calculated from their equivalent ratios to that of sulphate in the observed data. This was a similar method to that used to calculate seepage through the RCTA tailings in previous work (SRK, January 2005) and for the PHAST RCTA transport model (CH2M, March 2013s).

Following calibration of the NWL and RZD seepage models, a relationship was established between the model parameters and the properties of each of these waste dumps that contributed to those model parameter values. These properties were composition (sulphide content, calc-silicate content, zinc content) and ABA properties (GoldSim AP depletion rate), which were measured or estimated for all WRDs in the Faro Mine Area. The relationships between model parameters and waste dump properties for the NWL and RZD were then applied to all remaining dumps. All waste dump models were run into the future to verify that the chemical solutions correlated well with the observed waste dump properties (i.e., those with higher AP produce more acid and those with higher NP stay neutral) and parameter adjustments were made to ensure that no numerical errors occurred. While ore stockpiles were modelled separately using the regression relationship developed for SRK-FD37 seep, as described above, the sulphide cells were modelled with the kinetic model assuming these cells were comprised of 80 percent sulphides and 20 percent calc-silicate, based on descriptions in previous reports (RGC, November 1996). This work is described in more detail in the summary report (CH2M, March 2014bb).

Once a seepage model for each waste dump was complete, the seepages were mixed, along with background water if applicable, in proportions dictated by GoldSim v2 to create water quality output for each catchment shown on Figure 2-1. The subsurface drainage points for these catchments, termed "nodes" in GoldSim v2, provide water quality and loading estimates for the drainage areas surrounding the WRDs. The model output for the X23 node compared favorably to observed data from the X23 and FCS-4 monitoring stations (CH2M, March 2014bb), and was used as input to the updated RCTA PHAST model (CH2M, March 2014y).

The RCTA transport model was updated to more closely reflect the groundwater flow model. The original version incorporated approximate averages for groundwater hydraulic parameters and flow boundary conditions, based on the 2012 flow model. In 2013, the flow model underwent a significant evolution, and the RCTA transport model reflected those changes. Instead of approximate boundary flux averages applied over broad stretches of the model boundary, the revised transport model assigned flux rates from the revised groundwater model to each boundary cell. Representative water quality was assigned along the boundaries using observed data from nearby monitoring wells. As previously described, the WRD mixing model output for the X23 node was assigned as the time-dependent water quality input along the boundary interface with the ETA. The complex interactions between surface water and groundwater, accounted for in the flow model, were beyond the capability of the PHAST code used in the transport model. A more general set of infiltration rates were used to replace those from the 2012 version. The tailings water quality assignment system remained consistent with the 2012 version, though the settings were changed during recalibration. The model remained a single layer, representing the upper portion of the Rose Creek Aquifer. The updated model showed improvement in matching observed data compared to the previous year's model, as shown for sulphate data on Figure 2-3. Details of this work are provided in the summary report (CH2M, March 2014y).

Fiscal Year 2014 and 2015

The waste dump seepage model package was developed as a batch kinetic reaction model in the interest of simplicity and computational efficiency. In reality, the actual process is of rainfall or runoff moving vertically downward through a waste dump, dissolving minerals as it makes its way to the bottom. The objective in 2014 was to improve the 2013 seepage model so that the high-strength ore stockpile seepage could be modelled with a kinetic model instead of the regression method, and that the kinetic models of some of the other waste dumps could have a broader range of parameters that better reflected their composition.

The modelling team concluded that a 1-D vertical transport model would be a more accurate method of modelling the seepage. The vertical transport model was constructed in PHREEQC as follows: water representing background conditions is introduced to the top of each waste dump and then is transported incrementally through multiple model cells along a vertical flowpath. Mineral phases are

equilibrated in each cell along this flowpath to the base of the waste dump. The transport model evolved via calibration to a dual-domain model, in which the kinetic mineral dissolution and gas diffusion reactions were modelled in a less-mobile domain of the waste dump and the resulting fluid was allowed to diffuse and mix into the more-mobile phase during transport, emerging from the bottom cell as simulated seepage. Additional mineral phases were modeled kinetically in the vertical transport model, including key silicates present in the waste rock (e.g., tremolite, biotite, diopside, and plagioclase). This more accurately accounted for observed increases in magnesium and dissolved silica over time, the latter of which accounted for improved simulation of pH buffering in the leachate.

This phase of work was progressing through model calibration when geochemical modelling work was suspended by YG in June 2015. A list of comments was submitted by the IPRP in July 2015, and CH2M submitted responses to these comments in August 2015. No further communication has transpired on this subject, and site-wide geochemical modelling has not progressed further.

Beginning in late October 2015, the previously calibrated batch-style waste dump model was used to support the NFRC design work (CH2M, March 2016b). The model was altered specifically for the NFRC area to (1) more closely model the specific sulphide cells in the NFRC drainage area, (2) calibrate to observed groundwater in selected monitoring zones along the NFRC, and (3) expand to model the mixture of waste dump seepage and background water in the planned Seepage Collection Pond immediately south of the NFRD. Calibration and future water quality modelling used predicted mixing fractions from the site-wide groundwater flow model.

2.5.3.3 Outstanding Issues and Recommendations

The WRD leaching and mixing models are currently being used to assist in the NFRC collection ditch and seepage collection pond design. The 2013 model package has been partially updated for the NFRC project area by (1) replacing GoldSim v2 seepage mixing fractions with those suggested by the updated groundwater flow model and (2) calibrating to observed groundwater data in five monitoring areas in the NFRC project area.

Other recommended geochemical modelling activities that were included in the FY2015-16 scope of work, but which were subsequently cancelled by YG, consisted of (1) completing calibration of the 1-D transport model of waste dump seepage evolution, (2) refining the mixing model for all catchments using the groundwater flow model, (3) updating the RCTA transport model with hydraulic and geochemical data and advances made in other models, and (4) integrating the geochemical model package into the latest version of GoldSim.

2.5.4 Water Quality Modelling (GoldSim)

2.5.4.1 Introduction

This section describes the development, evolution, and use of GoldSim models for the FMC. GoldSim is a dynamic, probabilistic simulation software developed and licensed by GoldSim Technology Group (http://www.goldsim.com/). The GoldSim software is used to model complex systems for decision and risk analysis. While a licensed copy of GoldSim is required to develop models, GoldSim Player is available for free download to view, navigate, and run existing GoldSim models.

2.5.4.2 Background – Status of Water Modelling at the FMC in 2011

In 2009, SRK combined separate spreadsheet models for tailings and waste rock dumps at the FMC into a single Microsoft Excel model for the site. The initial version of a site-wide water quality model for the FMC was developed in GoldSim from this consolidated Excel model (GEEC, April 2010; SRK, March 2010). This site-wide model will be referred to herein as GoldSim Version 1 (v1).

2.5.4.3 CH2M Work Associated with GoldSim Model Development

The main activities associated with GoldSim model development and usage are identified in Table 2-4 and discussed briefly in the following paragraphs.

Table 2-4. Chronology of Main GoldSim Modelling Activities
Faro Mine Remediation Project

Date(s)	Activity
June – August 2012	Documented the water modelling approach for the site, and planned model development, for the surface water, groundwater, geochemical, GoldSim models.
August – November 2012	Used GoldSim water quality model to assess influent flows and concentrations to support WTP design.
March 2013	Performed ongoing revisions and refinements to GoldSim model v1 during FY2012, resulting in GoldSim model v2.
June – October 2013	Used GoldSim water quality model to evaluate existing Faro WTP sizing and Rose Creek water quality, and to perform sensitivity analysis on geochemical parameter assignments and calculations retained from GoldSim v1.
August – November 2013	Developed GoldSim Water Management Tool, a simplified and streamlined model focussing on water storage, conveyance, and treatment facilities. Constructed interactive GoldSim dashboard for use in evaluating risk assessment and management options.
September – October 2013	Assessed water management in Faro, Vangorda, and Grum pits, and in the CVD Pond and ID Pond, to support target water elevation decisions.
June 2013 – January 2014	Developed Interim Works Project Proposal model. Updated representation of the Vangorda/Grum infrastructure, flows, and water quality in GoldSim v2. Refined water balance in the RCTA, including CVD and ID ponds. Updated water quality input.
December 2013 – March 2014	Evaluated and revised geochemical engine in GoldSim model by replacing v1 geochemistry approach with look-up tables derived from PHREEQC modelling studies, resulting in GoldSim model v3.
November 2015 – February 2016	Incorporated NFRC diversion and Seepage Collection Pond into the Water Management Tool version of the GoldSim model.

Water Modelling Work Plan (CH2M, August 2012a). This report describes the proposed approach for developing surface water, groundwater, and geochemical models for the FMC. Aspects of these models will then be integrated into the site-wide water quality GoldSim model. This report also presents proposed efforts for improving the original GoldSim model v1.

Interim Water Modelling Analysis in Support of Faro WTP Design (CH2M, August 2012b). This technical memorandum provided preliminary predictions of water quantity and quality collected for treatment under three scenarios to support initial planning for WTP design. These results were also used to help identify water qualities to be used in HDS water treatment pilot testing. The following three scenarios were modelled:

- Baseline Scenario. This scenario includes the assumptions inherent in the previously developed GoldSim model v1 (SRK, 2004; SRK, 2006a; GEEC, 2010). As previously discussed, this scenario does not include outflows from the ID Pond or active treatment of Grum Pit water.
- Scenario 1. This scenario includes the assumptions inherent in the Baseline Scenario, with the following exceptions: (1) implementation of ID Pond water collection and treatment starts in Calendar Year 2012 and continues until the CVD SIS begins operating in Calendar Year 2025, (2) Vangorda and Grum water collection flows are conveyed to the Vangorda Pit and a new, high-

density sludge Vangorda WTP, and (3) the Faro and Vangorda WTPs operate separately (i.e., there are two WTPs, one on each side of the FMC).

- Scenario 2. This scenario includes the assumptions inherent in Scenario 1, except that all collected waters are conveyed to the Faro Pit and replacement Faro WTP. The existing Vangorda WTP is assumed to no longer operate (i.e., a single WTP located in the Faro Mine Area treats water collected across the entire FMC).

WTP Influent Characterization/Plant Capacity Phasing (CH2M, November 2012). This technical memorandum presents a variety of WTP design information, including revised projections of WTP influent flows and constituent concentrations generated using a revised version of the GoldSim model (09262012 version). Two WTP and single WTP scenarios were modeled (Scenarios 1 and 2, respectively) as were two cases for each scenario:

- Case A – used the fixed annual precipitation rate of 357 millimetres (mm) per year and the associated mean annual runoff values used within the original model (GoldSim v1)
- Case B – used the annual precipitation recorded at the Faro Airport in 1991 (highest precipitation year for the period of record, 1978-2011), adjusted upward by 25 percent to represent an assumed maximum precipitation.

This analysis led to a recommended design maximum flow capacity for a single WTP treating all FMC water (assuming seasonal treatment during 5 months of the year) of 44 megalitres per day (ML/d) (8,100 USgpm), based on the following:

- Existing Faro Mine Area treatment needs of 23 ML/d (4,300 USgpm)
- Projected future CVD SIS flow of 15 ML/d (2,800 USgpm)
- Projected future Grum/Vangorda Area treatment needs of 5.6 ML/d (1,000 USgpm)

FY2012 Site-wide Water Quality Modelling Report (CH2M, March 2013b). This report describes and documents refinements made to GoldSim model v1 and identifies near- and long-term modelling objectives. The principal refinements included in the revised version, referred to as v2, were as follows:

- Incorporating a more-accurate representation of the RCTA.
- Incorporating stochastic variables to reflect uncertainty in individual seepage interception system effectiveness, in addition to stochastic variables already present in GoldSim model v1, such as cover effectiveness and acid generation potential of each modelled waste dump. Formulating these variables stochastically in GoldSim model v2 allows water quality forecasts to be presented as a potential range rather than a single, deterministic forecast.
- Incorporating user friendly graphical user interfaces known as dashboards. The inclusion of dashboards provides intuitive menus, buttons, and descriptors that simplify the execution and manipulation of model simulations.

Evaluation of Faro WTP Sizing and Water Quality in Rose Creek at Monitoring Station X14 (CH2M, June 2013a). In response to a recommendation from the value engineering (VE) study for the replacement WTP design, this technical memorandum evaluated the potential effects on receiving water quality at Monitoring Station X14 in Rose Creek of constructing a WTP with a nominal treatment capacity of 33 ML/d (6,000 USgpm) versus 44 ML/d (8,100 USgpm) and extending the annual WTP operating duration. An important factor affecting X14 water quality is the lower flows in Rose Creek during the winter months, resulting in less clean water for dilution. Zinc was used as an indicator parameter for water quality, and a target zinc concentration of 0.1 milligram per litre (mg/L) was used in this analysis as being protective of aquatic life. Using the site-wide water quality GoldSim model v2, a variety of scenarios were evaluated using variables of WTP capacity, treatment season duration, WTP effluent zinc concentration, Faro Pit operation, CVD Pond operation, inclusion of other waters for treatment at the

WTP (i.e., CVD Pond SIS and Vangorda/Grum flows), and climate change-induced flow increases. This modelling analysis led to a recommendation to use a treatment capacity of 44 ML/d (8,100 USgpm) to allow greater flexibility and performance, and to eliminate the need to rely on the CVD Pond for flow equalization, as well as other WTP design recommendations.

Sensitivity Analysis of Assigned Neutralization Potential, Acid Potential, And Acid Generation Calculations in GoldSim for Waste Rock Dumps at the FMC (CH2M, October 2013b). This technical memorandum discusses a sensitivity analysis of geochemical parameter assignments and calculations used in, and retained from, the original GoldSim model v1. The GoldSim model was shown to be highly sensitive to geochemical parameter inputs for NP and AP, and further geochemical data collection and development of a geochemical mechanistic model was recommended.

Development of GoldSim Water Management Tool. A simplified and more flexible model was developed from GoldSim model v2 to allow streamlined evaluations of water quantities, without the water quality component. The model simulates the following:

- Faro, Vangorda, and Grum pits
- CVD Pond and ID Pond
- Existing connections between these storage reservoirs
- Hydraulic loading from collection systems (e.g., the ETA, S-wells, Zone II, and Grum-V15)

The simplified model uses total monthly inflows to the storage reservoirs, plus flows from the collection systems, as boundary conditions. Although there is no specific reference documenting the development of this tool, it has been used to support various evaluations conducted for the FMC (described below).

Review of Pit And Pond Water Elevations (CH2M, October 2013a). This technical memorandum reviewed water elevations in FMC storage facilities (e.g., Faro, Zone II, Vangorda, and Grum pits and CVD Pond, ID Pond, and Little Creek Pond). The GoldSim water management tool was used to model seven different water management scenarios at the FMC. The modelling results were used in developing a table of recommended 2013 water collection and storage targets, intended to limit offsite migration of deteriorated-quality water and maintain available storage capacity.

Faro Mine Interim Works Project Proposal Modelling (CH2M, March 2014b – Appendix 7B in CH2M, March 2014a). This report documents the extensive modelling conducted, using a modified Interim Works version of the site-wide GoldSim water quality model, to evaluate the effects of Interim Works at the FMC over the near-term (January 2014-December 2023). Concentrations of hardness, sulphate, and metals were predicted for receiving waters at nine key locations to evaluate the likelihood of exceeding guideline values. Modelling predicted that none of the contaminants are likely to be above guideline thresholds at the most downstream location (P4). However, consistent with past results, predictions indicate that certain parameters at some locations upstream of P4 in the Rose Creek, Anvil Creek, and Vangorda Creek drainages may exceed the determined guidelines. This report summarizes the modelling results, which are presented in more detail elsewhere (Minnow, 2014).

GoldSim Model Revisions (CH2M, March 2014c). This technical memorandum presented a comparison of three approaches for modelling waste dump seepage at selected locations of the FMC:

- Original GoldSim v2 model that incorporated SRK-assigned seepage water quality for individual WRDs and applied geochemical calculations embedded within the GoldSim v2 model (e.g. AP and NP calculations) to estimate the evolution of waste dump seepage through time.
- Modified GoldSim model (intermediate step) that incorporates the results from PHREEQC kinetic waste dump models. Waste dump water quality is replaced, but mixing at the nodes is still carried out within the GoldSim model.
- Waste dump water quality, mixing at nodes, and simulated stations is carried out in PHREEQC, generating lookup tables for GoldSim to reference in time series applications.

The results indicated that the PHREEQC model calculations matched observed data well and produced the most chemically viable results, and recommended that this approach be developed for the remaining nodes.

FY2013 Water Quality Modelling Analysis Report (CH2M, March 2014f). This report describes development work done on FMC geochemical and GoldSim models during FY2013, including a thorough review of, and revisions to, the existing GoldSim v2 model. A major update to the GoldSim v2 water quality model consisted of removing geochemical mixing calculations and replacing them with lookup tables generated by the PHREEQC geochemical software. The revised site-wide water quality model for FMC is considered GoldSim v3.

2.5.4.4 Outstanding Issues and Recommendations

One additional GoldSim modelling activity was completed in 2015-2016:

- **NFRC Modelling**: Incorporation of the NFRC Diversion and Seepage Collection Pond into the GoldSim Water Management Tool. This was used to support the NFRC design basis report (CH2M, March 2016b).

Other recommended GoldSim modelling activities that were included in the FY2015-FY2016 scope of work, but which were subsequently cancelled by YG, consisted of making the necessary refinements to the existing site-wide GoldSim water quality model to facilitate the integration of the GoldSim tool with the surface water, geochemistry, and groundwater modelling being performed at the site. This primarily would have included refining the level of detail of the representation of the NFRC and the accuracy of surface water flows and waste dump sources in the GoldSim model. Recommended tasks for continued development and use of the site-wide water quality model include the following:

- ***Upgrade Site-wide Water Quality Model to GoldSim version 11***. The FMC site-wide water quality model was developed in, and remains in, GoldSim model platform version 10. GoldSim version 11 is now available and it includes some significant upgrades. Consequently, conversion of the site-wide water quality model to GoldSim version 11 is recommended (the water management tool is already in GoldSim version 11.)
- ***Refine Representation of the NFRC and the WRD Sources.*** This task would consist of adding additional nodes within the GoldSim model to provide for a more detailed representation of the NFRC within the model. These additional nodes would define a larger number of stream reaches representing the NFRC, thereby allowing for a more detailed depiction of groundwater discharge to the creek and the associated contaminant loading to specific reaches. This task would also consist of refining the waste dump source terms within the GoldSim model to reflect the results of the recent geochemical modelling that provided improved estimates of source concentrations over time of each waste dump.
- ***Refine Transport of the WRD Source Mass to NFRC.*** This task would consist of refining the GoldSim model representation of the transport of source mass from the waste dump source areas to the NFRC or other downgradient discharge areas. This effort would integrate the particle tracking analysis from the groundwater modelling effort with the source loading forecast obtained from the WRD geochemical modelling. The particle tracks would provide a more definitive estimate of subsurface migration pathways relative to the waste dump locations as well as discharge points to NFRC. These data would be used to determine the best methodology to simulate the movement of contaminants from the source areas to downgradient discharge points, and therefore the best way to simulate this migration mechanism in the GoldSim model. This task would also capture the predicted changes in waste dump source fluxes over time.
- ***Incorporate Surface Water Modelling Results in GoldSim Model.*** This task would include the integration of surface water flow estimates from the surface water modelling effort into GoldSim

surface water quality forecasts. The surface water concentrations over time predicted by the GoldSim model downgradient of the Faro Mine Area are dependent on the assumed surface water flows across the site. The results of the surface water modelling performed to date would be used to ensure that the GoldSim model is using the best possible surface water flow estimates available for various climatic conditions (e.g., freshet or baseflow).

- ***Improve Representation of RCTA Loading.*** This task would include the effort required to refine the GoldSim model to reflect this year's update of the RCTA geochemical model. The recently completed geochemical model analysis of the RCTA provides forecasts of contaminant migration over time from the ETA and tailings materials. This task would be performed so that the results of the RCTA geochemical model simulations are represented in the GoldSim model forecasts.
- ***Refine Methodology to Support Evaluation of WRD Regrade and Cover.*** One of the remedial elements that can be evaluated using the GoldSim model is the closure concepts for regrade and cover of the waste dumps. This task would consist of reviewing the current process of simulating cover performance contained in the GoldSim model and revising this methodology as necessary to reflect current understanding of likely cover materials, distribution, and installation methods and timing.
- ***Confirm calibration of GoldSim Model to available flow and water quality data.*** Once the GoldSim model has been revised as discussed above, it will be necessary to recalibrate the model by comparing the predicted flow and concentrations to historical data. This would be done by simulating the historical site operations and comparing flows and surface water concentrations predicted by the GoldSim model to observed data. Model assumptions would be revised as necessary within acceptable ranges to achieve an acceptable match between simulated and observed values.
- ***Preparation of FY2015-2016 Site-Wide Water Quality Modelling Report.*** Under this task, a FY2015-2016 Site-wide Water Quality Modelling Analysis Report would be prepared. This report would document the refinements made to the GoldSim model as well as the results of the calibration efforts. The report would also describe the integration of the groundwater, surface water, and geochemical models into the site-wide GoldSim water quality model to improve prediction of downstream water quality over time.

2.6 Human Health and Ecological Risk Assessment

This section summarizes field and laboratory data collected by CH2M in support of the environmental and socioeconomic assessment of the FMC as described in Section 11, Regulatory Roadmap. It was not CH2M's scope to develop a standalone human health and ecological risk assessment document, but rather to incorporate risks, as appropriate, in the environmental and socioeconomic assessment.

2.6.1 Data Gap Evaluation Summary

As described in Section 2.3, CH2M, in 2012, completed a data gap assessment of the available reports, data, maps, and the analyses previously developed and prepared by other contractors and government entities to support the preparation of the final remediation plan for the FMC. A report was prepared that outlined the information not available to complete the engineering design to meet the regulatory requirements to the degree necessary for submission of the Project Proposal to YESAB. Within that report, the following data gaps were identified as they pertained to the assessment of risks:

- The surface water quality assessment prepared as part of previous investigations and reports, did not consider the implementation of all proposed remedial measures. As well, older data were used. Completion of the risk assessment needed to consider the implementation of the full suite of

remedial measures, and new surface water quality data were needed to be collected and incorporated into the assessment.

- The *Interim Environmental Monitoring Program: Vangorda Creek (2007) and Rose Creek (2008)* (Minnow Environmental, 2009) indicated that limited surface water toxicity testing had been performed. Chronic toxicity testing was recommended to better assess effects on Chinook salmon and grayling, which are present within the FMC.
- The assessment of the direct effects to aquatic receptors was insufficient and had not been previously well evaluated because of the limited site-specific tissue chemistry data. It was recommended that this data gap be addressed through the collection and analysis of fish, benthic invertebrate, and aquatic vegetation tissue samples.
- There was also a lack of sediment quality data, and the available data were older. It was recommended that new data be collected to better characterize the chemical baseline conditions within NFRC.
- Limited sediment toxicity testing had been completed to assess the effects of contaminants of concern (COCs) in sediment on benthic invertebrates. Additional testing was recommended to more accurately assess hazards under current conditions and to predict the potential for future risks.
- To better assess risks from exposure of COCs in soil, the baseline soil quality description needed to be updated because the data were old and there were no data for some areas. The collection of new data, including data from locations not previously assessed, would allow for a more accurate assessment of risks under current conditions and in the future.
- The assessment of direct effects on terrestrial receptors could have been better evaluated by collecting and analyzing tissue chemistry data. Existing data were old and there were no data for some areas. This information was needed to directly assess the effects to receptors and to assist in the determination of dietary exposure to top predators and consumption of game by humans.
- The assessment of risks potentially posed by the materials being used to cap the waste rock and other areas had to be evaluated. No soil toxicity studies had been completed for soil invertebrates and vegetation. This information was needed to directly assess the effects of soil COCs on soil invertebrates and vegetation.

2.6.2 2014 Field and Laboratory Program

A series of field investigations were completed in the summer of 2014 to address the data gaps identified for the risk assessment during the review of the existing information. Table C-3 of Appendix C summarizes field and laboratory programs conducted by CH2M at the FMC for FY2014. To support future completion of the risk assessment, small mammals, benthic invertebrates, fish, wetland and terrestrial vegetation, soil, sediment, and water samples were collected for chemical analyses. Toxicity testing was also completed on fish with water collected from the site, as well as on benthic invertebrates with sediment from the FMC. Toxicity testing was also carried out on soil invertebrates and vegetation, using site soils.

2.6.2.1 Aquatic Sampling

Field sampling was conducted in the summer 2014 to address information gaps and to provide baseline information on the aquatic ecosystems at the FMC. The scope of work for the aquatic component included collecting surface water and sediment quality information as well as samples for chemical analyses and toxicity testing. Fish, periphyton, benthic invertebrate, and aquatic vegetation samples were collected for tissue metal analyses. The Preliminary Surface Water and Aquatics 2014 Field Program Report provides a detailed description of the purpose and methodology involved in the aquatic sampling.

Surface water samples were collected to support chronic toxicity testing on a salmonid species (rainbow trout) that would provide a better assessment of the effects on grayling and Chinook salmon. The toxicity testing was completed following the Environment Canada Biological Test Method: Toxicity Test Using Early Life Stages of Salmonids (Rainbow Trout) (July 1998). Total suspended solids, pH, conductivity, hardness, alkalinity, colour, chemical/biological oxygen demand, and dissolved oxygen were also measured to support the interpretation of the toxicity testing results. The results were provided to YG as part of the draft tables, figures, and appendices associated with the Faro Mine Aquatic Baseline Study (Minnow, March 2015). There were indications that some of the data were of questionable value; it was planned to reconduct this surface water program in 2015, but the plan was cancelled.

Sediment samples were collected to facilitate the assessment of potential effects on benthic invertebrates. The benthic invertebrate toxicity testing was performed in accordance with the Environment Canada biological test methods Test for Survival and Growth in Sediment Using the Larvae of Freshwater Midges (*Chironomus tentans* or *Chironomus riparius*) and Test for Survival and Growth in Sediment Using the Freshwater Amphipod (*Hyalella Azteca*). Total organic carbon, grain size, pH, moisture content, redox potential and cation exchange capacity of sediment, and porewater ammonia and hydrogen sulphide concentration, were measured to support the interpretation of the toxicity test results. The results of the toxicity testing were provided to YG as part of the draft tables, figures, and appendices associated with the Faro Mine Aquatic Baseline Study (Minnow, March 2015).

2.6.2.2 Soil Invertebrates and Vegetation

Data gaps pertaining to the risk assessment terrestrial environment were addressed by collecting soil and vegetation samples during the summer of 2014. These samples were submitted for chemical analyses. Soil samples were also collected to facilitate toxicity testing. A detailed description of the purpose and methodology involved in the soil and vegetation sampling is located within the Site-wide Soils Characterization Report (CH2M, February 2015c) and Preliminary Vegetation Baseline Report (CH2M, November 2014l).

For the assessment of potential effects on soil invertebrates, soil was collected and tested according to Environment Canada biological test method Test for Measuring Survival and Reproduction of Springtails Exposed to Contaminants in Soil. Springtails were used as a surrogate for invertebrates/insects that would be present onsite and would be directly exposed to site soils. Chronic, single concentration testing was completed and soil samples were assessed for carbon, total and available nitrogen and phosphorus, organic matter, cation exchange capacity, grain size/texture, pH, conductivity and water holding capacity, to assist with interpreting the toxicity results. The results of the toxicity testing were provided to YG in March 2015.

Soil collection and toxicity testing of vegetation followed the guidance provided in two Environment Canada protocols: “Environment Canada Biological Test Method: Test for Growth in Contaminated Soil using Terrestrial Plants Native to the Boreal Region EPS1/RM/56” and “Environment Canada Biological Test Method: Test for Measuring Emergence and Growth of Terrestrial Plants Exposed to Contaminants in Soil EPS1/RM/45.” As per the protocols, carbon, total and available nitrogen and phosphorus, organic matter, cation exchange capacity, grain size/texture, pH, conductivity and water holding capacity were measured in each of the samples. The toxicity testing results were provided to YG in March 2015.

2.6.2.3 Wildlife

For the risk assessment, small mammal trapping was completed to address the data gaps that were identified for wildlife. Small mammals were collected within the FMC and in the Swim Lake area, and the concentrations of metals in tissues determined. The *Wildlife Baseline Studies: 2014 Summary Report, Faro Mine Remediation Project* (CH2M, March 2015aa) provides a detailed description of the purpose, scope of field work, and results of the sampling and testing.

2.6.2.4 Air Quality

Air quality was assessed as part of the FMC Interim Works (CH2M, November 2014i). A comprehensive modelling assessment was completed for several contaminants which were expected to be emitted as a result of Interim Works activities. The contaminants assessed included particulate matter, as well as metals within particulate matter. The results showed modest off-property concentrations for the particulate matter, but the off-property concentrations were predicted to be less than the applicable ambient air quality standards. Modelling of metals and particulate matter (total suspended particulates [TSP], particulate matter 10 and 2.5 micrometres or less in diameter [PM_{10}, and $PM_{2.5}$]) for Interim Works showed the highest offsite concentrations were downwind of the construction area along the northwestern part of the mining tenure area. The property line concentrations were less than applicable criteria.

For post-interim works, air quality is expected to be similar or better because activities onsite will be reduced or cease altogether, eliminating mechanical disturbances. Risk management measures will also be implemented which will stabilize site conditions, further reducing air emission sources.

As the air quality assessment did not identify any significant issues, no air monitoring was proposed or conducted. An assessment of air quality would need to be completed for the risk assessment, which could be performed based on a qualitative evaluation of modelled air results.

2.6.3 Conceptual Site Model

2.6.3.1 Ecological Conceptual Site Model

An ecological conceptual site model (EcoCSM) describes the predicted relationships between ecological receptors and the chemicals to which they might be exposed. Based on historical site practices and the contamination of various site media, the exposure pathways that would need to be quantitatively or qualitatively assessed in the Faro risk assessment include the exposure of benthic and pelagic invertebrates, fish, amphibians and riparian/aquatic vegetation through the sediment, surface water, and groundwater-to-surface-water pathways. The exposure of terrestrial receptors to groundwater COCs would need to be addressed, especially the potential for effects on vegetation. The risk assessment would also have to include an assessment of the exposure of soil invertebrates, terrestrial plants, reptiles, birds, and mammals to COCs in soil. Other pathways that would need to be addressed include the effects on terrestrial receptors from the uptake and inhalation of particulates, as well as food chain transfer through the consumption of contaminated prey or forage items, with consideration given to those COCs that can biomagnify (resulting in increased exposure and risk to higher trophic organisms). These pathways would be assessed using information from previously completed biological and chemical investigations combined with the chemistry data and associated toxicity testing that was undertaken in 2014. Table 2-5 provides a summary of the receptor groups, potential exposure pathways, and effect measures and lines of evidence, that would be used to assess the effects in the risk assessment.

Table 2-5. Ecological Risk Exposure Pathway Analysis
Faro Mine Remediation Project

Receptor Group	Potential Exposure Route	Effect Measure/Lines of Evidence
Benthic and Pelagic Invertebrates, Amphibians, Fish	Dermal contact and ingestion of surface water and possibly sediment	Tissue COC concentrations Water and sediment COC concentrations Site-specific media toxicity tests Biological surveys
Riparian/ Aquatic Plants	Root, stem, and foliar uptake of sediment and surface water	Plant tissue COC concentrations Water and sediment COC concentrations Biological surveys

Table 2-5. Ecological Risk Exposure Pathway Analysis
Faro Mine Remediation Project

Receptor Group	Potential Exposure Route	Effect Measure/Lines of Evidence
Soil Invertebrates	Dermal contact and ingestion of soil	Springtail tissue COC concentrations
	Vapour and soil inhalation	Soil and groundwater COC concentrations
	Dermal contact and vapour inhalation of groundwater	Site-specific media toxicity tests
Terrestrial Plants	Root uptake from soil and groundwater	Plant tissue COC concentrations
	Stem and foliar uptake from ambient air	Soil and groundwater COC concentrations
		Site-specific media toxicity tests
		Biological surveys
Birds and Mammals	Ingestion of soil	Tissue COC concentrations
	Dermal contact/vapour and soil inhalation	Soil and groundwater COC concentrations
	Dermal contact and vapour inhalation from groundwater	Oral exposure estimates
	Ingestion of prey/food	Biological surveys

2.6.3.2 Human Health Conceptual Site Model

A human health conceptual site model (HHCSM) describes the predicted relationships between human receptors under various land uses and the chemicals that they might be exposed to through air, soil, and water. The following potential pathways of exposure for the human receptors are present at the FMC:

- Direct contact with contaminated soil, which considers incidental dermal contact (skin contact) with soil or dust derived from soil and incidental or accidental ingestion of small amounts of soil or dust derived from soil (transferred from hands to mouth) based on activities onsite
- Direct contact with contaminated surface water, which considers dermal contact with surface water and incidental ingestion of surface water (transferred from hands to mouth) or ingestion of surface water as drinking water
- Direct contact with contaminated sediment, which considers incidental dermal contact (skin contact) with sediment and incidental or accidental ingestion of small amounts of sediment (transferred from hands to mouth) based on activities onsite in water courses
- Ingestion of contaminated groundwater, which considers the use of onsite well water for short-term drinking water
- Inhalation of contaminated dust in the air because of site activities or wind erosion, as well as the inhalation of volatile COCs released from soil
- Ingestion of plants (medicinal and berries) that uptake contaminants from soil or through deposition from airborne sources
- Ingestion of wildlife or game (e.g., bear, moose, caribou, beaver, hare, grouse, and ducks) that take up contaminants from soil, surface water, sediment, and prey items
- Ingestion of fish that take up contaminants from surface water, sediment, and contaminated prey

Table 2-6 provides a summary of the human receptor groups, potential exposure pathways, and effects measures/lines of evidence that would be used to assess risks in the risk assessment.

Table 2-6. Human Health Risk Exposure Pathway Analysis
Faro Mine Remediation Project

Receptor Group	Potential Exposure Route	Effect Measure/Lines of Evidence
Construction and Maintenance Workers	Direct contact with soil, groundwater, surface water, and sediment	COC concentrations in soil, groundwater, surface water, and sediment
	Inhalation of dust and inhalation of air with volatile COC concentrations	Modelled or measured COC concentrations in air
		Modelled or measured volatile COC concentrations in air
Regional Receptors (Recreational Users and First Nations)	Direct contact with soil, groundwater, surface water, and sediment	COC concentrations in soil, groundwater, surface water, and sediment
	Inhalation of dust and inhalation of air with volatile COC concentrations	Modelled or measured COC concentrations in air
		Modelled or measured volatile COC concentrations in air
	Ingestion of game, plants or fish	Modelled, surrogate or measured concentrations of COCs in wildlife, plants, and fish

2.6.4 Summary

Information collected and assessed per Section 2.6 would be used to complete the risk characterization for the risk assessment. The risk characterization provides a quantitative and qualitative estimate of the risks or likelihood of effects to humans and the environment. The results of the risk characterization would be used to provide recommendations on the requirement for, and extent of, risk management measures to be implemented at the FMC.

2.7 Existing Site Conditions

2.7.1 Background Documents

Since the mine ceased operating, YG and INAC have conducted extensive monitoring programs and investigations to characterize environmental conditions at and around the FMC. The programs have collected, compiled, and analyzed data to characterize site conditions, reference (i.e., background) conditions, and mine effects. The results of the programs have been used to define baseline conditions for geology, soils, climate, air quality, groundwater, surface water, fish, fish habitat, wildlife, and wildlife habitat, have been previously documented in many reports. This extensive body of information was made available to CH2M in late 2011 and has been assembled into a comprehensive electronic library. The full bibliography of FMC-related references available to CH2M is included in Appendix L.

As part of CH2M's work in support of the preparation of the Interim Works Project Proposal (IWPP) (CH2M, November 2014a), existing background information on the site conditions (both prior works and those collected and documented by CH2M through 2015), was reviewed, compiled, and summarized in the following appendices of the IWPP:

- Appendix 5C – Geochemical Characterization Report
- Appendix 5D – Hydraulics Characterization
- Appendix 6A – Climate Baseline Report
- Appendix 6B – Air Quality Baseline Report
- Appendix 6C – Hydrology Baseline Report
- Appendix 6D – Groundwater Baseline Report
- Appendix 6E – Aquatic Baseline Characterization
- Appendix 6F – Vegetation and Soils Baseline Report

- Appendix 6G – Terrestrial Wildlife Baseline Report

This section of the CDRMR summarizes the site conditions for geochemistry, hydrology, and groundwater and builds upon the information included in the appendices. Section 11, Regulatory Roadmap, describes work associated with the remaining technical areas listed above (climate, air quality, aquatic, vegetation, soils, and terrestrial wildlife).

It is not the intent of this CDRMR to resummarize information that has been previously well documented in prior reports. Therefore, a brief overview of site conditions as documented in these appendices and other key documents (e.g., the 2012 CSM Report) follows. Data gathering and interpretation has occurred in some technical areas since the timeframe that the body of work was documented in the IWPP appendices. For those technical areas, the recent studies are listed and a brief summary of the work and how it informs the understanding of site conditions, is provided.

2.7.2 Geology

Multiple existing documents describe the site's geologic setting in varying degrees of detail. The North Fork Rose Creek Design Basis Report (CH2M, March 2016b) provides a comprehensive summary of site physiography, bedrock geology, geologic structure, surficial geology, permafrost, seismic history, and seismic hazard.

As listed in Appendix C, Summary of Field Investigations and Analytical Programs, several boring, geophysical, and field reconnaissance programs have been conducted by CH2M that have evaluated geologic-related aspects of site closure planning and design (e.g., depth to bedrock, bedrock integrity, pre-mining topography, and suitability of materials for borrow purposes). The data summary reports listed in Section 2.4 provide additional reference documents that are available to evaluate geologic conditions at specific site locations.

2.7.3 Hydrogeology

2.7.3.1 Hydrogeologic Setting

Pre-mining regional groundwater flow within the Faro Mine Area likely mirrored the topographic gradient with flow oriented from the highlands towards the valley bottoms. This suggests the pre-mining groundwater moved south/southwest from Mount Aho and adjacent mountains in the north towards the Rose Creek valley; on the opposite side of the valley, north-to-northwest flow would be expected from the Rose Mountains towards Rose Creek. Between the Faro Mine Area and Vangorda/Grum Area, there is a surface drainage divide, which is assumed to be coincident with a groundwater flow divide. From this local topographic high, groundwater flow is expected to follow the gradient of Rose Creek and travel northwest to west toward the RCTA.

Mining activities have changed the landscape (e.g., generating new surface topography with open pits and waste rock piles, fracturing rock faces, and ponding water behind dams), altered the pre-mining site-wide permafrost distribution, and are actively controlling groundwater (i.e., depressurization of pit walls, groundwater capture via pumping wells, and altering recharge patterns with diversion channels), which influences the direction and quantity of groundwater flow. Factors controlling the pre-mining groundwater flow regime are expected to be regionally similar post-mining, but in local areas, groundwater flow would be altered, especially in areas with permafrost existence and ongoing degradation. A more detailed description of lithology and groundwater conditions in specific areas of the FMC is provided in Appendix D.

2.7.3.2 Faro Mine Area Hydrogeology

The NFRC area includes the Zone II Outwash, S-Wells areas, and the NFRD SIS, which are located between the Faro Valley Waste Dump and the NFRC. The stratigraphy within the Zone II Outwash and

S-Wells areas consists of alluvial/outwash materials overlying bedrock. In the area of the S-Wells, a shallow aquifer unit of sand and gravel is underlain by low-permeability till with an underlying deeper aquifer of sand and gravel overlying weathered bedrock. The bedrock in the S-cluster well area consists of schist of the Mount Mye Formation and is defined as calcareous schist to calcareous silicate (AECOM, 2009). Groundwater flow in the NFRC valley is towards the southwest, with a gradient of approximately 0.02 metre per metre (m/m), consistent with the gradient of the NFRC (SRK, 2010b).

In general, the Faro Pit is expected to act as a groundwater sink. The water level within the Faro Pit is actively managed by pumping, creating a local groundwater sink, potentially resulting in flow into the pit from most directions. Zone II Pit water elevations are managed by pumping to maintain below approximately 1,096 m. Maintaining Zone II Pit water levels below the NFRC stage ensures that seepage from the Zone II Pit will not flow toward and subsequently discharge into the NFRC. The ETA is located in the former Faro Creek Channel, downstream from the Faro Pit. A significant groundwater and surface water source to the ETA is the upgradient waste dumps and associated seeps (including seep location X23, which is surface expression of the groundwater flow traveling along the Faro Creek Channel).

The RCAA system is a fluvial depositional system deposited by Rose Creek and its tributary, the NFRC. The alluvial aquifer is composed of a heterogeneous mixture of silt, sand, gravel, and cobbles. The alluvial deposits are thickest near the centre of the valley, aligned with the ancestral thalweg of Rose Creek, with the thickest deposits around 50 m. Before tailings deposition, Rose Creek was flowing in a meandering stream channel that crossed the valley floor and was fed by several smaller streams that drained the hillsides of Rose Creek Valley. The water table of the underlying valley-fill aquifer was very close to the stream level, indicating a good hydraulic connection between the stream and the groundwater that flowed in the permeable valley sediments (RGC, November 1996). Following the onset of mining operations, tailings were deposited over the alluvial valley-fill deposits to a maximum thickness of about 25 m. The greatest thicknesses of tailings were deposited in the Original and Second impoundments, with thickness diminishing toward the edges of the valley (RGC, November 1996).

2.7.3.3 North Fork of Rose Creek Valley

Groundwater quality at the FMC has been continuously changing as a result of the ongoing geochemical processes within mine-impacted areas. The main contaminant load contributors to groundwater in the NFRC Valley are the waste dumps, including the Northeast WRD, Northwest WRD, Main Dump, and Intermediate Dump (including the infilled Zone II Pit). Since the early 1980s, numerous groundwater monitoring wells and piezometers have been installed and monitored within the NFRC drainage to characterize the local hydrogeological conditions and WRD drainage water quality. Most of these monitoring wells and piezometers have been sampled routinely since they were installed and comprise critical elements of the current site-wide routine groundwater monitoring program (CH2M, November 2014k). Historical water quality data sets are available for most of these locations and can be accessed through the project Environmental Quality Information System (EQuIS) database.

Runoff to the NFRC upstream from the FMC arises from two main catchment areas. The FCD receives runoff from a catchment area of approximately 16 km^2, which outlets to the NFRC northeast of the WRDs. The remaining runoff arises from an approximately 99-km^2 catchment upstream from the confluence of the NFRC and FCD. From this local topographic high upstream from the NFRC and FCD confluence, groundwater flow is expected to follow the gradient of the NFRC and travel southwest toward the Rose Creek Tailings Area. The NFRC valley is a typical alluvium-filled fluvial valley that runs along the eastern and southeastern margins of the FMC. The FCD discharges Faro Creek flows into the NFRC, just upstream from the Northeast WRD. From this point, the creek flows southwest at the base of the Northeast WRD, Zone II Pit (located beneath the Zone II WRD), and Intermediate Dump and flows beneath the Haul Road through the NFRD. The creek then continues past the S-Wells area, eventually joining the SFRC before entering the RCD.

Field investigations conducted by CH2M in 2013 indicate that the NFRC is a gaining stream along most of its length between its confluence with the FCD and the NFRD. These conditions indicate that groundwater contamination near the stream represents the most likely pathway for contaminants of concern to enter the stream system and degrade surface water quality (CH2M, August 2013a).

Additional detail on NFRC drainage is reported in the NFRC DBR (CH2M, March 2016b). A summary of groundwater quality for the NFRC valley is presented in Section 2.7.4.1.

2.7.3.4 Groundwater and Surface Water Interaction

Knowledge of surface water/groundwater interaction is somewhat limited across the site because of the limited amount of data available to support the characterization of the nature of stream-aquifer interaction at the site. Three individual studies were conducted between 2012 and 2014, consisting of the installation of streambed piezometers and associated stream stage gauges, to further quantify the nature of surface water/groundwater interaction within the Rose Creek drainage. Studies along the lower reach of Rose Creek below the CVD were conducted in 2012, followed by studies along the upper and lower reaches of the NFRC in 2013 and 2014, respectively. The results of the lower Rose Creek study indicated that gaining stream conditions are dominant throughout the lower portions of Rose Creek between the CVD and just downstream of X14. The results of the NFRC studies indicated that gaining stream conditions also dominate the NFRC from its confluence with the FCD through the haul road and extending to the Mine Access Road. Very limited lengths of losing stream conditions were indicated in the vicinity of the S-Wells SIS. Groundwater samples collected during the NFRC studies indicated modest levels of zinc in groundwater ranging from between 2 and 5 mg/L in the vicinity of the Zone II Outwash, NFRD, and S-Wells SIS. A more detailed description of surface water/groundwater studies is provided in Appendix C.

2.7.4 Groundwater Quality

This section describes the current distribution of groundwater contamination. The data will be used to evaluate the areas of highest groundwater contamination and assess the chemical breakthrough of constituents of concern such as zinc and sulphate. Chemical time series plots for selected locations throughout the study area are shown in Appendix G, Geochemistry Analyses Report (CH2M, April 2016b).

Groundwater quality at the site is changing and evolving as a result of the ongoing geochemical processes within mine-impacted areas. The three main contributors of contaminant load to groundwater are as follows:

- The waste dumps: the Northeast WRD, Northwest WRD, Main Dump, and Intermediate Dump (including the infilled Zone II Pit)
- The three open pits: the Faro, Grum, and Vangorda pits (including discrete inputs into the pits such as the pit walls, SISs, and surface runoff)
- Tailings: ETA and RCTA

The following paragraphs present mine-related water contamination information for known impacted areas of the FMC, while the following subsections summarize the current observed chemical loading and contributors to groundwater quality degradation at the various sites of interest.

Metal attenuation can be a result of adsorption to natural organic matter or to secondary oxyhydroxides, or co-precipitation of secondary mineral phases. This attenuation may act to retard the migration of trace metals away from the waste dumps within the shallow groundwater system, especially in the early stages of seep development when pH is near neutral, but zinc and sulphate are elevated. Sulphate is a relatively conservative and abundant constituent that generally is a good indicator for acid rock drainage. Zinc is used as an indicator metal representing several other trace

metals that are released during acid rock drainage production because of its more consistently higher concentrations making the analytical measurements and trends more reliable. Given this source material, zinc is the best indicator of trace metal breakthrough from sulphide mineral sources because of its higher concentrations and higher mobility compared to other metals such as cadmium. For the purposes of this discussion, and to be consistent with previous groundwater quality studies, the relative levels of contamination are categorized according to the concentrations listed below for use in illustrating figures and differentiating areas of impact within the text. These categories are based on zinc and sulphate concentrations (and are further described in the CSM [CH2M HILL, 2012; AECOM, March 2009]):

- Not impacted or minimally impacted: sulphate less than or equal to 40 mg/L and zinc less than or equal to 0.05 mg/L.
- Slightly impacted: sulphate greater than 40 mg/L and less than or equal to 400 mg/L or zinc greater than 0.05 mg/L and less than or equal to 0.5 mg/L.
- Moderately impacted: sulphate greater than 400 mg/L and less than or equal to 4,000 mg/L or zinc greater than 0.5 mg/L and less than or equal to 5 mg/L. This corresponds to sulphate and zinc concentrations one order of magnitude greater than the “slightly impacted” range.
- Highly impacted: sulphate greater than 4,000 mg/L or zinc greater than 5 mg/L. This corresponds to sulphate and zinc concentrations one order of magnitude greater than the “moderately impacted” range.

These categories were created for illustrative purposes to describe the nature and distribution of water quality characteristics at the site. The categories represent the range of conditions that can arise as geochemical processes progress in the mine waste materials and contaminant flow paths. The threshold between the not impacted or minimally impacted category and the slightly impacted category represents conditions when effects of geochemical processes are beginning to be apparent. The moderately impacted category represents progression of geochemical processes while the highly impacted category represents water quality conditions that are illustrative of well-developed sulphide oxidation processes. The categories were developed to describe onsite, mine-affected water and are not related to either human health or environmental effects.

In general, spring samples collected during the influence of freshet tend to show lower concentrations, except in years when the freshet comes too late or too early relative to the sampling event. By contrast, samples collected in summer and fall tend to show the highest concentrations.

For the purposes of this classification, the most recent sampling data were used. Data before 2013 are not considered in the overall impact assessment (that is, if wells have not be sampled since 2013, no classification is provided).

Historical groundwater data trends were analyzed using the Mann-Kendall trend test. Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit.

2.7.4.1 Faro Mine Area

Groundwater quality for the Faro Mine Area is described for each major area of interest in the following subsections. Figures 2-4 and 2-17 show the overall water quality effects at the Faro Mine Area for alluvial wells and bedrock wells, respectively.

Faro Pit

Faro Pit water quality is highly impacted with moderate sulphate concentrations (less than 1,000 mg/L) and high zinc concentrations (above 5 mg/L) based on data reviewed between 1998 and 2015 (DES, February 2012; CH2M, April 2016d). Temperature and conductivity profiles from Faro Pit lake for 2004 to 2012 suggested meromixis. The Faro Pit lake had a fresh water cap throughout the year, and spring turnover, fall turnover, and under-ice mixing did not occur. Following changes to water management at the FMC in 2013 (i.e., increased reliance of Faro Pit for storage and no seasonal pumping from the pit lake for water treatment), there has been a reduction in the fresh water cap at the surface; in October 2015, the contrast in conductivity between the surface and deep water had decreased such that the conductivity was almost uniform from top to bottom. As a result, Faro Pit is no longer meromictic and has mixed from top to bottom (CH2M, April 2016d). Corresponding with the addition of water pumped from the ID Pond and ETA to Faro Pit after the Mill WTP shutdown, the salinity stratification declined rapidly (Greg Lawrence and Associates Ltd., August 2016). Pit lake monitoring conducted in March 2016 indicates that the lake remains mixed.

Contaminated water from the S-Wells SIS, Zone II Pit, NFRD SIS, and PW14-06 are currently pumped to Faro Pit. During the WTP shutdown between 2013 and 2015, water from the ID Pond was also pumped to Faro Pit. Seep water flowing to Faro Pit (discharging from the waste dumps ranges in water quality from not impacted to highly impacted. Sulphate levels in Faro Pit water have remained steady, while zinc concentrations have steadily increased over the last decade (see Attachment G).

Main Dump and Intermediate Dump Areas

Figure 2-4 shows the overall impact for monitoring wells installed in the Main and Intermediate dumps. Groundwater quality within the Main and Intermediate dump areas is variable. RGC14-MW03 is considered slightly impacted in regards to both zinc and sulphate, with neutral pH values. Moderately impacted groundwater has been found at CH12-104-MW003, and RGC14-MW05, and within both nested wells at RGC14-MW04. Sulphate concentrations at these locations are between 1,400 and 3,500 mg/L, while zinc concentrations are between 0.1 and 2.6 mg/L. Magnesium and sulphate concentrations are showing significantly decreasing trends at CH12-014-MW003, while total alkalinity and dissolved iron concentrations are significantly increasing. Highly impacted groundwater is present at monitoring wells CH12-104-MW007 and RGC14-PW06, with very high zinc (up to 1,700 mg/L) and sulphate (up to 13,400 mg/L) concentrations. Total alkalinity is showing significantly decreasing trends at CH12-014-MW007, while dissolved iron concentrations are significantly increasing.

North Fork Rose Creek Valley

Figure 2-4 shows overall impact for piezometers installed in the NFRC valley bottom. Shallow stream-bed piezometers are considered not impacted for zinc and not impacted to slightly impacted for sulphate beneath NFRC from the confluence FCD to about Zone II outwash. Two piezometers southeast of the Northeast WRD (CH13-107-PZ007 and CH13-107-PZ008) are classified as moderately impacted because of sulphate. The pore-water in shallow stream-bed sediments adjacent and downstream of the Zone II outwash to the NFRD appear to be moderately impacted because of zinc concentrations that range from about 0.5 to 4 mg/L.

Zone II Pit and Outwash Area

Figures 2-4 shows overall impact for monitoring wells installed in Zone II Pit and Figures 2-5 and 2-6 show overall impact for monitoring wells installed in the Zone II Outwash area. Groundwater flows from the waste dumps west of the Zone II Outwash area. Groundwater in the waste-rock-filled Zone II Pit is managed (pumped) to mitigate potential seepage from the pit to the Zone II Outwash area. Groundwater contamination in the vicinity of the Zone II area may travel along two potential pathways: groundwater contamination could discharge to NFRC, in which case it would likely bypass the RCAA through the RCD, or it may travel as subsurface underflow, resulting in continued loading to the RCAA.

Leakage from the NFRC or RCD to the RCAA might also represent a possible pathway for contaminant loading to the groundwater system.

Water in the Zone II Pit (historically represented by X26, which was replaced by CH12-Z2-PW01 in 2012) is highly impacted. Since 2008, sulphate and magnesium concentrations have become more variable and show a long-term trend toward higher concentrations. Zinc concentrations are high but are not showing significant increases over time. Zinc and sulphate loads collected from the Zone II Pit were estimated as 5.8 tonnes per year (tpy) and 184 tpy, respectively, in 2011. In 2013, loads collected from the pit were approximately 8 tpy of zinc and 341 tpy of sulphate. Contaminant concentrations at X26 tend to be lower in the spring when meteoric water inputs are greater. Several seeps are present in the vicinity of the Zone II Pit on the Faro Pit side of the waste dump, but no seeps locations were noted at the toe of the waste dump in the immediate vicinity of the Zone II Outwash. There were seeps observed both downgradient and upgradient from the Zone II Outwash areas (CH2M, April 2016d).

In the alluvial aquifer, two wells (CH14-107-MW001 and CH14-107-MW002) are highly impacted, seven wells are moderately impacted (P05-04, BH6, CH14-107-MW005A, CH14-107-MW005A, CH14-107-MW004, CH14-107-MW006B, CH14-107-MW006A, and BH5), two wells (SRK08-P12B and CH14-107-MW005B) are slightly impacted. In the bedrock aquifer, BH8 near the toe of the WRD is highly impacted while the two monitoring wells further from the toe are moderately impacted (BH10B and CH14-1070MW003) and one well is slightly impacted (BH10A). Most groundwater, both in the shallow and bedrock aquifers in the Zone II Outwash, is moderately impacted, with some highly impacted groundwater near the toe of the waste dump (BH8). Concentrations have generally remained stable or show gradual increasing trends in Zone II Outwash wells over the monitoring period (see Appendix G). Monitoring wells to the north of Zone II Outwash have had substantial mine-related contamination increases in recent years (Northeast WRD). The *2014 Groundwater Quality Review* (RGC, March 2015a) suggests that the breakthrough of more highly contaminated groundwater might occur from the waste dumps south of the Zone II outwash. Monitoring well P96-6, which has a long term record, is classified as moderately impacted (Figure 2-5) because of sulphate concentrations, which show an increasing trend. However, zinc concentrations are less than 0.5 mg/L.

S-Wells Area

Figures 2-7 and 2-8 show the overall impact for monitoring wells installed in the S-Wells area. Contaminated groundwater daylights as seeps along the Intermediate Waste Dump face to the north of the S-Wells area and also flows south toward NFRC within alluvial, weathered bedrock, and bedrock aquifers. Groundwater contamination in this area discharges to NFRC and could contribute loading to the RCAA as leakage from the NFRC or RCD. The 2008 S-Wells groundwater investigation (SRK, February 2009) concluded “the plume of contaminated groundwater [in the S-Wells area] is likely moving underneath the NFRC in permeable materials and discharging to the NFRC at indeterminate locations.”

In general, groundwater in the S-Wells area is moderately to highly impacted, with one slightly impacted alluvial location to the east of the collection trench. The shallow groundwater system generally has the highest contamination, with 12 out of 18 wells classified as highly impacted (and 5 wells classified as moderately impacted). Groundwater contamination extends into the bedrock, with highly impacted groundwater detected in five bedrock well (SRK-08-SPW2, SRK05-SP5, SRK05-SP4A, SRK08-SP1, and S1A) and moderately impacted groundwater detected in one bedrock well S2A) and one slightly impacted bedrock well near NFRC.

An SIS was constructed in 2009 to intercept contaminated groundwater flowing from the Intermediate Dump before it reached NFRC. It consists of three parts, as follows (SRK, August 2011):

- A shallow rock-filled interceptor trench located in the shallow aquifer (overburden) with one pumping well (SRK08-PW3).

- Two pumping wells (SRK08-SPW1 and SRK08-SPW2) screened in the deeper bedrock aquifer. Only one well typically operates because the other well contains high iron concentrations.
- Surface water interception via a rock drain at the toe of the Intermediate Dump. Water is diverted to the shallow aquifer interceptor trench.

S-Wells SIS water is pumped to the Faro Pit and currently operates year-round (CH2M, August 2012g). Zinc and sulphate loads in 2011 captured by the S-Wells SIS were 21.3 tpy and 300 tpy, respectively. In 2015 the S-Wells SIS are estimated to have captured 43 tonnes of zinc and 636 tonnes of sulphate were captured at the S-Wells SIS.

Groundwater quality in wells classified as slightly to moderately impacted have relatively stable concentration trends. However, the water in some wells along the southern toe of the Intermediate Dump continues to deteriorate gradually (SRK05-SP1A/B and SRK05-SP2). Groundwater quality in the till unit, located to the west of the SIS, also continues to degrade (this water is not captured by the SIS). Groundwater quality in the bedrock aquifer is improving overall as a result of pumping the S-Wells SIS bedrock wells (see Attachment G). However, operation of the shallow aquifer interceptor trench of the S-Wells SIS has not made a noticeable impact on shallow groundwater quality (RGC, 2012).

Northeast Rock Dumps Area

Figures 2-9 and 2-10 show the overall impact in monitoring wells installed in or around the Northeast WRD. The Northeast WRD is located to the northeast of the Zone II Pit and east of the Faro Pit and covers an area of about 0.51 km^2, with a maximum elevation of 1,290 m above sea level. The near pit WRDs are located immediately to the south and southwest of the pit, just north of the Main and Intermediate dumps, and cover an area of 0.2 km^2, with a maximum elevation of 1,200 m above sea level (RGC, November 1996). Groundwater quality in the vicinity of the Northeast WRD can be summarized as follows:

- Northeast WRD: CH14-015-MW006 is screened in silty gravel and sandy alluvium beneath the waste rock. Groundwater quality at this location is considered highly impacted because of high sulphate and zinc concentrations, with pH values hovering around 5.
- Areas downgradient from the Northeast WRD: Two well pairs (BH13A/B and BH14A/B) are located at the toe of the Northeast WRD and are screened mainly in weathered bedrock and deeper bedrock (Figure 2-10). Groundwater conditions in this area continue to worsened (see Appendix G), and zinc concentrations exceeding about 10 mg/L have been detected at the southern-most well pair (BH14A/B; highly impacted). The well pairs located farther to the northeast have indicated moderate groundwater impacts, and except for BH13B, have not been reliably sampled in recent years. New monitoring wells installed in 2015 (CH15-107-MW030, CH15-107-MW032, CH15-107-MW033, and CH15-107-MW034) (Appendix B of CH2M, March 2016b) are moderately impacted indicated by the measured sulphate concentration.

Emergency Tailings Area

Figures 2-11 and 2-12 show the overall impact in monitoring wells installed in the ETA. The ETA has some of the highest contaminated groundwater and surface water in the Faro Mine Area and represents a major source of contaminant loading to the RCAA (SRK, November 2006b; AECOM, March 2009). The ETA seep, surface water, and groundwater monitoring locations are shown on Figures 2-11 and 2-12. Flow monitoring and sampling completed in 2005 and 2006 along Faro Creek below the ETA indicated that the total zinc load discharged from the ETA (surface flow and subsurface seepage discharging downstream from the Mine Access Road) ranged from about 35 to 80 tpy (RGC, April 2007). More recent estimates (Section 7) show the load has increased and in 2014, was estimated as 197 tpy. The contaminated seepage is a combination of surface flow originating as toe seepage from the Main Waste Dump and groundwater flow from the waste dump through highly permeable alluvial sediments from

the Old Faro Creek. The ETA tailings also contribute significantly to the groundwater and surface water contaminant loading (RGC, October 2006). Groundwater flow, seeps, and run-off from the Mill Building Area also contribute load. Seeps discharging to the ETA at the base of the Main Dump, which form flowing surface water across the ETA in Old Faro Creek and Mill Canyon Creek, are highly impacted and show increasing contaminant load trends, as evidenced by the water quality at X23 (see Appendix G). The most current field sampling results show that seepage from the Main Dump at X23 continues to deteriorate as sulphate, manganese, and dissolved metals concentrations increased and seepage became more acidic (RGC, March 2015a).

Surface water and groundwater quality in the ETA have increasing trends for acidity, sulphate, and zinc, and this trend is expected to continue (Appendix G). Seepage from the Main Dump and ore stockpiles has become slightly more acidic over the last 10 years, and alkalinity is becoming depleted, suggesting ongoing breakthrough of ARD products and a decline in the buffering capacity of the Main Dump waste rock and ETA alluvial soils (RGC, March 2015a). Groundwater seepage from the ETA expresses downgradient from the Mine Access Road. Groundwater within the ETA is highly impacted with zinc concentrations ranging about 10 to 880 mg/L and SO_4 ranging from 1,000 to about 10,000 mg/L. In 2006, an interim SIS was constructed at the southeast end of the ETA (just downgradient from the Mine Access Road) to collect surface water runoff and seepage (from two prominent seeps). The SIS has operated during the ice-free seasons, and collected water is pumped for direct treatment or to the Faro Pit. The ETA SIS intercepted an estimated 31.2 tpy of zinc and 488 tpy of sulphate in 2011 and an estimated 86 tpy of zinc and 1,000 tpy of sulphate in 2012. The ETA SIS has not operated since 2013. Seepage not intercepted by the SIS was observed discharging directly to Faro Creek Canyon. Since 2013, between 100 and 230 tpy of zinc, and between 1,000 and 2,000 tpy of sulphate, are estimated to have discharged through Faro Creek Canyon. This increase demonstrates both the effectiveness of the SIS at removing loads when operating and the deterioration of water quality in the ETA. Overburden and weathered bedrock groundwater quality and surface water quality downstream from the ETA are highly impacted (locations P09-ETA2 and FCS-4). However, groundwater in deep bedrock downgradient of the ETA does not show indications of mine-related contamination based on data from monitoring well P09-ETA1, which is classified as not impacted.

South Fork Rose Creek

Background groundwater quality concentrations can be estimated from wells located up and cross gradient from the waste rock dumps that demonstrate un-impacted water quality. Based on a review of available groundwater quality data, wells TH86-2, TH86-5, and TH86-17 appear to be a reasonable indicators of background groundwater quality, despite construction from steel casing (Figure 2-12). These wells are located in the alluvial aquifer upstream from the RCTA (Figure 2-10). Sulfate concentrations at this well have been stable between 10 and 20 mg/L for the last decade. Zinc concentrations have been consistently below 0.02 mg/L, sodium concentrations below 5 mg/L, and pH has been neutral.

2.7.4.2 Rose Creek Tailings Area

Generally, low metals bearing groundwater from the south and southeast flows to the RCTA, and Faro-Mine-contaminated groundwater flows to the RCTA from the north, with a significant portion of contamination associated with Faro Creek Canyon. Locally, the tailings contribute to groundwater contamination in the RCTA as well. The extensive leakage of clean water from the RCD (south of the RCTA) has a major influence on the spatial water quality trends in the RCAA, especially further downgradient near the CVD. There is a significant spatial trend from south to north of not impacted groundwater transitioning to moderately impacted groundwater in the western half of the RCTA. This section provides summary information on the water contamination in the RCTA.

All groundwater monitoring wells in the RCTA are screened within alluvium or tailings. Most locations are considered highly impacted, because of either high zinc or sulphate concentrations, or both.

Groundwater contains zinc concentrations of up to 2,510 mg/L, sulphate concentrations of up to 67,600 mg/L, with generally low pH values. A single non-impacted location within the RCTA is present at P03-03-01, which is screened in alluvium and is the deepest of the multi-port wells screens at this location.

A subset of groundwater wells in the tailings area was chosen for the Mann-Kendall analysis. The majority of the wells on the tailings are nested wells with 8 to 9 different depths, labelled in numerical order with the well port identified as “01” being the deepest.

For well P03-01, nested wells P03-01-02, P03-01-04, P03-01-06, P03-01-08, and P03-01-09 were chosen for Mann-Kendall analysis. Total alkalinity showed a significant increase in P03-01-02, and significant decrease in P03-01-04, with no significant trends in the other three nested locations. Dissolved iron showed a significant increase in P03-01-02, P03-01-06, and P03-01-09. Dissolved magnesium showed a significant decrease in P03-01-04, but significant increases in P03-01-06, P03-01-08, and P03-01-09. Dissolved zinc showed significant increases in P03-01-02, P03-01-04, and P03-01-06. The pH showed significant decreases in P03-01-04 and P03-01-06, while sulphate increased at P03-01-04 and P03-01-09.

The Mann-Kendall analysis was performed on P03-03 locations P03-03-02, P03-03-04, P03-03-06, P03-03-08, and P03-03-09. Results showed a significant decrease in total alkalinity at P03-03-04 and P03-03-06. Dissolved iron showed a significant decrease in all of the analyzed depths except P03-03-08, and dissolved magnesium and zinc both show significantly increasing trends at P03-03-04 and P03-03-06. P03-03-06 and P03-03-08 both show significant decreasing trends for pH. Sulphate significantly increased at P03-03-02, P03-03-04, P03-03-08, and P03-03-09.

Wells P03-04-02, P03-04-04, P03-04-06 and P03-04-08 were chosen for P03-04. Analyses showed that total alkalinity is significantly increasing at P03-04-02 and P03-04-04, but significantly decreasing at P03-04-06 and P03-04-08. Dissolved iron is significantly increasing at P03-04-04 and significantly decreasing at P03-04-06. Dissolved magnesium shows a significant increase at P03-04-02, P03-04-04, and P03-04-08. Dissolved zinc showed a significant increase in P03-04-02 and P03-04-08, but significant decrease at P03-04-04 and P03-04-06. Sulphate showed significant increases at P03-04-02 and P03-04-08, with a significant decrease at P03-04-04. No significant trends were found for pH.

Wells P03-05-02, P03-05-04, P03-05-05, P03-05-06, and P03-05-08 were chosen for P03-05. All of these locations showed a significant decrease in total alkalinity. Dissolved iron, magnesium, and zinc all showed significant increasing trends for these five locations. The pH showed a significant decreasing trend for locations P03-05-02 and P03-05-04. Sulphate significantly increased at locations P03-05-02, P03-05-05, P03-05-06, and P03-05-08.

For well P03-06, nested wells P03-06-01, P03-06-02, P03-06-03, P03-06-04, P03-06-05, and P03-06-06 were chosen. Total alkalinity was calculated to be significantly increasing at locations P03-06-01, P03-06-02, P03-06-03, and P03-06-04. Dissolved iron showed a significant increasing trend at all locations except P03-06-05. Dissolved magnesium and zinc both showed significant increasing trends at all locations except P03-06-06. Values for pH showed significantly decreasing trends at all locations, except P03-06-05. Sulphate significantly increased at locations P03-06-01, P03-06-02, P03-06-03, and P03-06-04.

Well P03-08 had statistical trend analyses performed on P03-08-02, P03-08-04, P03-08-06, and P03-08-07 locations. Total alkalinity showed a significant increasing trend for locations P03-08-02, P03-08-06, and P03-08-07. Dissolved iron showed a significantly decreasing trend at P03-08-02, and a significantly increasing trend at P03-08-04. Dissolved magnesium showed a significantly increasing trend at P03-08-02, but significant decreasing trends at the remaining three locations. Dissolved zinc showed significantly decreasing trends at P03-08-02 and P03-08-07. The only significant trend for pH was P03-08-06, which showed a significant increasing trend. Sulphate significantly decreased at locations P03-08-02, P03-08-04, P03-08-06, and P03-08-07.

X21-96A and X21-96B are also a nested well. Both of these showed a significant decreasing trend for total alkalinity, and significant increasing trend for dissolved iron. Dissolved magnesium showed a significantly decreasing trend for X21-96A, and significantly increasing for X21-96B. Dissolved zinc is significantly increasing at X21-96A, and pH is significantly decreasing at the same location. Sulphate significantly increased at both X21-96A and X21-96B.

Impoundments

Figure 2-13 shows the overall impact for monitoring wells installed in the Original and Second impoundments. Groundwater in the Original and Second impoundment area ranges from not impacted to highly impacted (P03-03-01), with the highest sulphate and zinc concentrations in the tailings. Higher concentrations are generally observed in groundwater in the northern portion of the RCAA likely because of contaminant discharges from the Faro Creek Canyon. The underlying alluvial aquifer in most areas, is highly-impacted; at P03-02 and P03-04, the lower portion of the alluvial aquifer are moderately impacted and at P03-01, the deepest well port is slightly impacted. The highest sulphate and zinc concentrations are detected in tailings porewater in the southeastern (multilevel wells P03-01 and P03-03) and northwestern (multilevel well P03-06) areas of the Second Impoundment. Zinc concentrations tend to be highest near the interface of the sand and gravel RCAA and the overlying tailings. Groundwater contamination in the far southeastern section of the impoundment (P03-01, P03-02, and P03-03) areas is thought to be mainly a result of direct tailings-related contamination (RGC, 2015).

There are continued increases in contamination in the alluvial aquifer near the mouth of Faro Creek Canyon (multilevel well P03-06, CH14-015-MW001A and CH14-015–MW001C, and CH14-015-MW002A), which is a primary flow path for contamination from the Faro Mine Area to the RCTA. These increases are a result of increased waste dump- and ETA-related contamination and may also be a result of seepage from the coarse tailings beach of the Original Impoundment. Contamination in the alluvial aquifer is also increasing within the central portion of the Second Impoundment. The increase in contamination may indicate that the neutralizing capacity of the aquifer is being exhausted in this area (AECOM, 2009).

Figure 2-13 shows overall impact for monitoring wells installed in the Intermediate Impoundment. Groundwater in the Intermediate Impoundment area ranges from slightly impacted to highly impacted as well, with the highest sulphate and zinc concentrations in the tailings. Sulphate and zinc concentrations are very high in shallow tailings pore water and have been relatively stable for the last 10 years. In contrast, alkalinity and pH have decreased substantially since 2009, indicating a breakthrough of the acid front in the Intermediate Impoundment area. Concentrations in the RCAA are gradually increasing in the Intermediate Impoundment. Seepage from the coarse tailings beach of the Second Impoundment and input from the Faro Creek Canyon are likely sources. Concentrations are expected to increase until they are similar to conditions observed in the Second Impoundment (RGC, March 2015a). The concentration differences between the northern side of the tailings area (slightly to highly impacted at CH13-204-MW016) in comparison to the southern side of the tailings area (slightly to moderately impacted at P03-08) are evident in Figure 2-13.

Toe of Intermediate Dam

Figures 2-14 and 2-15 shows the overall impact for monitoring wells installed at the toe of the ID. Groundwater in the RCAA at the toe of the ID is moderately impacted in the alluvium and till mainly because of sulphate concentrations (800 to 2,700 mg/L). The single exception is the southernmost monitoring well screened in alluvium, P01-04A, which is not impacted, as shown in Figure 2-14. Concentrations of mine-related contaminants have generally increased since 2001 in this area, Seepage from the coarse tailings beaches of the upgradient impoundments and input from Faro Creek Canyon are likely sources. Conditions are expected to deteriorate in the coming years as the groundwater contamination front in the RCTA, progresses. Groundwater in the southern portion of the area is generally less contaminated than in the northern portion because of the inflow of clean groundwater

leaking from the RCD to the south. However, concentrations in this area do show a significant increasing trend for sulphate, iron, magnesium, and manganese. It is believed that the mine-related total dissolved solids (TDS) plume front has reached this area, though on the northern side of the tailings area zinc concentrations are now greater than 0.2 mg/L (RGC, March 2015a).

Rose Creek Diversion

Figures 2-13 and 2-14 show the overall impact for monitoring wells installed along the RCD. Most RCD groundwater monitoring locations are screened within the alluvium and till and are not impacted. At these locations, zinc and sulphate concentrations are below 0.02 mg/L and 33 mg/L, respectively. Highly impacted water has been encountered in alluvium (sand) at the newly installed locations between the east limb of the Secondary Dam and the RCD, CH15-201-MW003 and CH15-201-MW004, where zinc concentrations were measured between 6 and 12 mg/L. Slightly impacted water was encountered in the next well pair to the east, CH15-201-MW05 and CH15-201-MW06, and at one of the well pair to the west, CH15-201-MW001.

The Mann-Kendall statistical analysis at X16A and X16B shows total alkalinity and dissolved magnesium significantly increasing, while dissolved iron is significantly decreasing. Sulphate is decreasing at X16A and increasing at X16B.

Toe of Cross Valley Dam

Figures 2-14 and 2-15 show the overall impact for monitoring wells installed at the toe of the CVD. Groundwater in the RCAA on the southern edge of the Rose Creek Valley, downgradient from the CVD, remains only slightly impacted by mine-related groundwater contamination. Concentrations increase from south to north at the toe of the CVD, as expected based on clean water inputs from the RCD. Groundwater contamination in the northern area has higher sulphate and magnesium concentrations, indicative of the leading edge of the TDS plume. Concentrations of sulphate and metals are gradually increasing in shallow groundwater along the north side of the valley downgradient of the CVD, and zinc concentrations remain low (about 0.07 mg/L at P05-02), but this recent increase appears to indicate the leading edge of the zinc plume has recently arrived at the CVD (RGC, March 2015b). Groundwater in bedrock at the toe of the CVD follows similar trends from south to north across the valley, as shown in Figure 2-15.

The majority of wells at the toe of the CVD are slightly to moderately impacted, because of sulphate (up to 2,100 mg/L). One non-impacted groundwater monitoring well, P09-C2, is screened within phyllite bedrock.

Load balance calculations completed for low flow conditions (and assuming complete, conservative mixing of groundwater and Rose Creek) suggest that the Canadian Council for Ministers of the Environment (CCME) guideline for zinc (0.03 mg/L) in Rose Creek (at X14) may be exceeded if a threshold concentration of 0.6 mg/L zinc is reached in the leading edge of the zinc plume in groundwater downgradient of the CVD after closure; this concentration could be reached in groundwater within about 8 to 10 years (around 2025), which would allow 5 to 10 years for construction and testing of the CVD SIS (RGC, March 2015b).

Groundwater farther downgradient from the CVD (wells X16A/B and CH12-204-MW006A, screened in alluvium) are not impacted. However, well pair upgradient from this location (X17A/B, P01-01A/B, X18A) have had increases in mine-related contamination since 2008, which is likely to continue. This water is now within the slightly to moderately impacted range, indicating continued movement of the leading edge of the TDS plume front down the valley (RGC, March 2015b). The deeper well, X17B, exhibits distinct seasonal variations with highest concentrations observed in the spring. This may be because of upwelling of deep groundwater from underlying bedrock, or might indicate that tailings impacted groundwater is flowing beneath the CVD (AECOM, March 2009).

A subset of groundwater wells in the CVD area were chosen for the Mann-Kendall analysis. Several of the wells at the CVD are nested wells with two or more different depths labelled in numerical order, with B or -01 being the deepest.

The Mann-Kendall statistical analysis at P01-11 shows total alkalinity, dissolved iron, and dissolved magnesium, and sulphate are significantly increasing, while pH is significantly decreasing.

For well P03-09, nested wells P03-09-01 to P03-09-09 were analyzed using the Mann-Kendall statistical test. Total alkalinity showed a significant decrease in P03-09-01, no significant trend in P03-09-02, and significant increases in the remaining seven nested locations. Dissolved iron showed a significant increase in P03-09-02, no significant trend in P03-09-01, P03-09-03, and P03-09-05, and a significant decrease in the remaining five nested wells. Dissolved magnesium showed significant increases in P03-09-02, P03-09-03, P03-09-04, P03-09-06, P03-09-07, P03-09-08, and P03-09-09. Dissolved zinc shows significant decreases in P03-09-02, P03-09-04, and P03-09-06. The pH showed significant decreases in P03-09-08 and P03-09-09. Sulphate showed significant increases at all locations, except P03-09-01 where no trend was observed.

The Mann-Kendall analysis was performed on P05-01 locations P05-01-01 to P05-01-06. Results showed a significant increase in total alkalinity at all nested wells except P05-01-01. Dissolved iron and dissolved magnesium results are significantly increasing at all depths. Dissolved zinc showed no significant trends at all depths, while sulphate showed increasing trends at all depths. The pH showed no significant trend at P05-01-01, while all other depths were significantly decreasing.

The Mann-Kendall statistical test was performed on depths A and B at well CH12-204-MW001. No significant trends were found for any parameters at depth B, while total alkalinity was found to be significantly increasing at depth A.

Well CH12-204-MW002B, dissolved iron, dissolved magnesium, and sulphate were significantly increasing. Well CH12-204-MW003B, showed a significantly increasing trend for dissolved iron.

The Mann-Kendall statistical test was performed on depths A and B at well CH12-204-MW004, but no significant trends were found at either depth.

For well P01-02, nested wells A and B were analyzed using the Mann-Kendall statistical test. Total alkalinity was significantly increasing at both depths. Dissolved magnesium was significantly increasing at A, while dissolved iron was increasing at B. Dissolved zinc was significantly decreasing at A, and the pH and sulphate were decreasing at B.

At well P05-02, significantly increasing trends were found for total alkalinity, dissolved iron, dissolved magnesium, dissolved zinc, and sulphate. The pH showed significantly decreasing trends. Well P05-03 showed significantly increasing trends for total alkalinity, dissolved iron, dissolved magnesium, and sulphate. At well P09-C1, total alkalinity, dissolved iron, and sulphate showed significantly increasing trends. Well P09-C2 showed significantly decreasing trends for dissolved iron, dissolved magnesium, and dissolved zinc. The pH showed an increasing trend. Well P09-03 showed significantly increasing trends for dissolved magnesium and pH. Wells MW1, MW2, RGC-PW1, and RGC-PW2 did not have enough data points for any parameters to allow statistical analysis using the Mann-Kendall test.

Monitoring well CH12-204-MW005B showed an increasing trend for total alkalinity and no significant trends for dissolved magnesium, pH, and sulphate. There was not enough data to conduct analyses for dissolved iron or dissolved zinc. CH12-204-MW006B did not have enough data to conduct analysis for dissolved iron. The remaining parameters showed no significant trends. Well P01-01A showed increasing trends for total alkalinity, dissolved magnesium and sulphate, and decreasing trends for dissolved iron, pH, and dissolved zinc. Well P01-01B showed increasing trends for total alkalinity and dissolved magnesium, decreasing trends for dissolved zinc and sulphate, and no significant trends for dissolved iron or pH. Monitoring well X17A showed increasing trends for total alkalinity, dissolved magnesium,

and sulphate. This location also showed decreasing trends for dissolved iron, dissolved zinc, and no significant trend for pH. Well X17B showed increasing trends for total alkalinity, dissolved iron, dissolved magnesium, and sulphate, and decreasing trends for pH and dissolved zinc. Well X18A showed increasing trends for total alkalinity, dissolved iron, and dissolved magnesium, a decreasing trend for dissolved zinc, and no trend for pH. Well X18B showed increasing trends for total alkalinity, dissolved magnesium, and sulphate, and decreasing trends for dissolved iron, pH, and dissolved zinc.

2.7.4.3 Vangorda/Grum Area

Most groundwater monitoring locations in the Vangorda/Grum Area are between the toes of the waste dumps and Vangorda Creek, as shown in Figures 2-18 and 2-19. In general, the Vangorda/Grum Area is characterized by low-permeability materials with some higher permeability alluvial material associated with current and former stream channels. Therefore, seepage from waste dumps is expected to follow preferential flow paths.

Grum Pit and Waste Rock

Figures 2-16 and 2-17 show the overall impact for monitoring wells installed around Grum Pit and WRD. The pit water quality is considered moderately impacted, though zinc concentrations are approaching the threshold of 5 mg/L for highly impacted water. One well pair is located on Grum Waste Dump (P09-GS1A/B), as shown on Figures 2-16 and 2-17. Groundwater quality in the overburden is classified as moderately impacted (based on sulphate concentrations), and groundwater in the underlying bedrock is classified as moderately impacted (based on sulphate and zinc concentrations). The high zinc concentrations in the overburden may be related to in situ leaching of mineralized waste rock in the area, but contamination may be influenced by seepage from the Grum Waste Dump (RGC, 2015).

At the southeast and western toes of the Grum Waste Dump and within Grum Creek, seep and shallow groundwater data indicate slight to moderate effects on groundwater quality from the Grum Waste Dump and seepage from Moose Pond. Groundwater quality appears to be greatly influenced by recharge events. The sulphate and other TDS plume parameters have migrated into the Vangorda Creek Valley and do extend beyond specific drainage channels, but zinc concentrations are still low in the area (typically less than 0.05 mg/L) (RGC, March 2015a).

Monitoring well CH12-014-MW011, located south of the Grum Pit between the Overburden Dump and the Grum Rock Dump, is screened within waste rock/alluvium/bedrock. The groundwater at this location showed increasing trends for total alkalinity and dissolved magnesium, and no significant trends for the remaining parameters. Well CH12-014-MW012, located on the southeastern toe of the Grum Sulphide Cell and upstream of Grum Creek, is screened in alluvium. The groundwater at this location showed an increasing trend for total alkalinity. No significant statistical trends were found for the remaining parameters; however, the data appears to suggest improved groundwater quality resulting from the cover constructed on the Grum Sulphide Cell in 2011. Measured zinc concentrations in groundwater at this location in 2012 were approximately 0.04 mg/L, and have since improved. Data gathered at this location from the spring 2014 sampling event onward show that zinc concentrations remain below 0.005 m/L.

According to RGC's 2014 Groundwater Quality Review (2015), groundwater quality in the shallow overburden soils to the south, southwest, and west of the Grum Waste Dump continues to gradually deteriorate (see Appendix G). As shown on Figure 2-17, wells screened in bedrock at the toe, or downstream of the toe, of the Grum Waste Dump (SRK08-P14, SRK08-P15, SRK05-07, and P96-9B) are classified as slightly to moderately impacted. Concentrations are typically lowest during the spring freshet (May) and highest during the summer months.

Vangorda Pit and Waste Rock

Figures 2-16 and 2-17 show the overall impact for monitoring wells installed around Vangorda Pit and Waste Dump. Vangorda Pit is expected to be a groundwater sink and is not considered a source of contamination to the Vangorda Creek drainage if the pit is maintained at or below its current water level. The pit water quality is highly impacted based on elevated zinc concentrations. Sulphate and zinc concentrations at the surface of Vangorda Pit have been steadily increasing since 2000.

Groundwater in the monitoring wells and seep collection wells located both within the Vangorda Waste Dump and at the toe of the waste dump is generally slightly to moderately impacted. Sulphate and TDS constituents in shallow groundwater downgradient of the Vangorda Waste Dump have been increasing, even in areas downgradient of the till berms installed in the waste dump to reduce seepage. Zinc generally remains low (less than 0.12 mg/L).

The highest impacts were seen at monitoring well CH12-014-MW013, screened in alluvium/weathered bedrock and located in the centre of the Vangorda Waste Dump. Both zinc (6 to 10 mg/L) and sulphate (3,000 to 4,000 mg/L) concentrations contribute to the impacts.

The Mann Kendall statistical analysis was conducted on the results from monitoring well CH12-014-MW013, located within the Vangorda Waste Dump. This location showed increasing trends for total alkalinity and dissolved magnesium, and no significant trends for the remaining parameters.

Little Creek Pond, located northwest of the Vangorda Waste Dump on Little Creek, holds water from the Vangorda Waste Dump seepage collection system, which is pumped to Vangorda Pit. Seepage from Little Creek Dam, where Vangorda Waste Dump seepage is collected, appears to have slight effects on downgradient water quality toward Vangorda Creek (RGC, 2015). However, the alluvial aquifer and bedrock wells in the vicinity of Little Creek Pond are considered slightly impacted because of sulphate concentrations with neutral pH (Figures 2-16). The sulphate and zinc concentrations of surface water in Little Creek Dam have steadily increased since 2004 (Appendix G).

Weathered bedrock and bedrock at the toe of the Vangorda Waste Dump have slightly (P09-VC1) to moderately (V34) impacted groundwater with less sulphate than detected in the overburden.

2.7.5 Hydrology

2.7.5.1 Hydrologic Setting

The FMC is located within the regional Vangorda Creek and Rose/Anvil Creek watersheds. As shown in Figure 2-18, The Faro Mine Area and RCTA are in the Rose Creek watershed, which drains to the Pelly River via the Anvil Creek. The Vangorda/Grum Area is in the Vangorda Creek watershed, which drains to the Pelly River at the Town of Faro.

Collection ditches and diversions were constructed as part of the mining development and have significantly altered local drainage patterns. Changes to the site including development of WRDs have also affected the hydrology of the site by altering drainage patterns and impacting runoff characteristics.

Appendix 6C, the Hydrology Baseline Report (CH2M, November 2014j) to the IWPP (YG, November 2014a) provides a detailed description of the existing hydrological conditions at the FMC. It also provides an assessment of information and data used to characterize surface water flow regimes in natural channels and stream diversions at the FMC.

Appendix 5D, the Hydraulics Characterization of Existing Facilities (CH2M, November 2014c) to the IWPP (YG, November 2014a) provides a description of the current status of hydraulic facilities at the FMC, including their existing capacity and condition. It also provides a summary of how these features are maintained and monitored, and their hydraulic functions in relation to the Interim Works.

2.7.5.2 Key Water Management Features

The following sections describe the hydraulic components that control surface water within the Faro Mine Area and the Vangorda/Grum portions of the FMC. Figure 2-19 shows the location of these hydraulic components.

Upper Guardhouse Creek

UGC is a mostly undisturbed natural creek that originally drained an approximately 4.5-km^2 catchment area west of the Faro Creek drainage basin. The natural creek route trended south, converging with Rose Creek at a location that is now downstream of the Intermediate Tailings Area. UGC collects local uncontaminated surface water runoff and directs it to the NWID.

Lower Guardhouse Creek

Lower Guardhouse Creek is an approximately 1.7-km-long, partly disturbed natural creek channel. It originally constituted the lower reach of Guardhouse Creek, a creek that drained an approximately 4.5-km^2 catchment area west of the Faro Creek drainage basin. The natural creek route trended south, converging with Rose Creek at a location that is now downstream of the Intermediate Tailings Area. Lower Guardhouse Creek conveys potentially contaminated mill area surface water to the Intermediate Pond which is then pumped for treatment.

North Wall Interceptor Ditch

The NWID intercepts runoff and shallow groundwater from the north side of the Rose Creek Valley and diverts it around the northern abutment of the CVD. It was constructed in 1980 and 1981 and consists of alternating reaches of natural creek channel and constructed diversion ditch. The NWID also diverts flows west from UGC, diverging from the natural creek channel at a location approximately 200 m northwest of the Truck Shop.

Emergency Tailings Area

The ETA is located between the Faro Mill and the Rose Creek Tailings Facility, and overlaps with a section of the old Faro Creek Channel. It is one of the contaminant sources to groundwater and surface water in the Faro Mine Area and as such a field investigation program was completed to determine the optimal location and capacity of the ETA surface water collection structure. The collection and compilation of surface water data was carried out at this location between 2012 and 2015 and is ongoing.

Rose Creek Tailings Area

The RCTA covers an area of over 200 ha in the original valley of Rose Creek, just downstream of the confluence of the NFRC and SFRC. The RCTA is composed of four dams (Original Dam, Secondary Dam, ID, and CVD) and the RCD. The Original, Secondary, and Intermediate dams retain a total of 55 million tonnes of tailings in the Rose Creek Valley. The CVD retains a pond that is used at times for final polishing of treated water. The RCD carries Rose Creek around to the southern side of these four dams. In 2012, an alternatives analysis was completed by CH2M HILL for the RCTA and presented to the IPRP (CH2M, November 2012f). General agreement was reached regarding closure of the RCTA and conveyance of probable maximum flood (PMF) flow around the ID, for protection of the mine tailings. In 2015, overarching design criteria, with respect to flow capacity of diversion structures, and alternative closure options were developed by CH2M HILL for the RCTA; the alternatives analyses were presented in the Alternatives Development Status Report (CH2M, March 2015ff).

Rose Creek Diversion

The RCD is located immediately south of RCTA and is approximately 4 km long. It travels northwest starting from the North Fork Diversion, immediately east of the original impoundment at the RCTA, and travels along the southern border of the RCTA past the CVD, where it intersects with Rose Creek. The

RCD runs along the southern end of the RCTA and diverts clean water from the NFRC and SFRC around the RCTA. It was originally designed to pass a 1-in-50-year flood event of approximately 79 cubic metres per second (m^3/sec), with 1 m of freeboard, and carry a 1-in-500-year flood event with no freeboard. Settlement of the RCD dike has reduced the capacity of the RCD from the original design; inclusion of recent storm event data in the hydrologic analysis has increased the estimated flow rate of the design events. Details of proposed upgrades to the RCD are included in the Rose Creek Diversion Upgrades – Basis of Design preliminary draft technical memorandum (CH2M, December 2015b) and the Down Valley Interim Hydraulic Upgrades – Updated Rose Creek Tailings Area Peak Flow Estimates technical memorandum (CH2M, February 2016a).

Faro Pit

Faro Pit is approximately 1,675 m long and 975 m wide, encompassing 1.06 km^2. Faro Pit is the main excavated pit in the Faro Mine Area and receives local surface water and pumped water from the ETA, ID Pond and groundwater from the Zone 2 wells and S-wells. It serves as a contaminated water storage reservoir, providing storage capacity to support seasonal summer water treatment and to reduce site water management risks. The Faro Pit has a storage capacity of approximately 43 million m^3 at elevation 1,153, which is the approximate elevation of fractured bedrock within the rim of the pit.

West Valley Interceptor Ditch

The WVID is an excavated ditch constructed adjacent to an access road immediately northwest of the Faro Valley Waste Dump. The WVID intercepts surface runoff and smaller tributaries on the western slope of Faro Creek Valley and conveys these flows to the confluence of Faro Creek and the FCD.

Faro Creek

Faro Creek is an undisturbed section of the original Faro Creek that is located north of the Faro Valley Waste Dump. Faro Creek collects uncontaminated surface water and conveys regional flows. Faro Creek is diverted from its natural alignment around the Faro Pit via the FCD.

Faro Creek Diversion

The FCD is located in the East Perimeter RU. The FCD conveys flow along the eastern slope of the Faro Creek valley, north of the Faro Pit, and subsequently southeast towards its confluence with the NFRC. The FCD acts as a diversion of Faro Creek, conveying uncontaminated surface water around Faro Pit and waste dumps directing the flow to the NFRC upstream of the waste dumps and mine area.

North Fork Rose Creek

The NFRC flows through the FMC to the east of the FMC waste dumps. The NFRC flows through a rock drain in the Haul Road. Downstream from the Haul Road, the NFRC is predominantly confined until it crosses the Mine Access Road (roughly parallel and about 700 m south of the Haul Road), where it splits into two channels. The original channel joins with the SFRC after flowing through five manmade ponds that were constructed to recharge nearby groundwater wells that supplied process water during mine operations. The second channel, the Lower NFRC Diversion, was constructed to allow for diversion of sediment-laden water away from the Pump House Pond during spring freshet. In 2016, the Preliminary Final DBR was completed for the NFRC, which presented the design framework and the Conceptual Design for the NFRC diversion (CH2M, March 2016b).

Vangorda Creek and Vangorda Creek Diversion

Vangorda Creek is undisturbed by mining upstream of the VCD. The VCD diverts stream flow from the original Vangorda Creek around Vangorda Pit. The existing VCD, which was originally designed with a capacity to divert the 1-in-100-year flood event, is located immediately north and adjacent to the Vangorda Pit. Although the existing VCD has been generally successful at diverting stream flow around the pit, the conveyance structure (consisting of half-round corrugated steel pipe) has failed at numerous

locations and has experienced overflow during extreme runoff events. Proposed upgrades to the VCD are detailed in the Task Authorization 018(A) Vangorda Diversion Design Definition report (CH2M, March 2014g).

Vangorda Pit

Vangorda Pit is an excavated mine pit in the Vangorda/Grum Area that receives local surface water runoff and seepage water. There is no direct contribution to surface water hydrology under operations of the Vangorda Diversion within its design parameters. It also receives pumped water from Little Creek Pond, Grum Pit, Grum V15, and Grum Sulphide Cell surface water collection ponds.

Grum Pit

Grum Pit is an excavated mine pit in Vangorda/Grum Area that collects local surface water.

Moose Pond

Moose Pond is a small pond that collects local surface water and is connected to the Vangorda Creek system. The collection and compilation of surface water data was carried out at this location between 2012 and 2015 and is ongoing.

Sheep Pad Ponds

The Sheep Pad Ponds are connected to the Vangorda Creek system and collect Grum Northeast Interceptor Ditch (Grum Interceptor Ditch) water for solids settling.

Grum Northeast Interceptor Ditch

The Grum Northeast Interceptor Ditch (Grum Interceptor Ditch) collects uncontaminated surface water runoff and discharges it to Vangorda Creek. The interceptor ditch also receives discharge from the Vangorda water treatment plant.

Little Creek Pond and Dam

The Little Creek Pond and Dam collect water from the Vangorda Waste Dump. Pond water is pumped to Vangorda Pit.

Dixon Creek

Dixon Creek is connected to the Vangorda Creek system and conveys local uncontaminated surface water.

2.7.5.3 Hydrology Data Collection and Reporting

Data continue to be collected from existing monitoring locations (shown in Figure 2-20), to maintain an active database of hydrological conditions. These monitoring locations are being maintained to monitor hydrological and meteorological variables that will support future remediation efforts at the FMC and will form a critical part of an active AMP. The relevant baseline hydrology-related data consist primarily of stream flow data and meteorological data, collected over various intervals, as part of FMC monitoring programs or other regional or federal data collection programs.

CH2M's Hydrology Baseline Report (CH2M, November 2014j) also summarizes additional supporting data sets that were collected as part of the FMC site characterization efforts. These consisted of physical data related to watershed and sub-watershed catchments at the FMC; it also incorporates available information from ongoing hydrological studies. Many of the historical data included in this baseline report were collected and reviewed as part of previous studies at the FMC, to determine the requirements for managing surface water and directing other site activities. This report also describes surface water management activities at the FMC. These are a significant component of the overall site hydrology; they include diverting surface water and managing potentially contaminated surface water, via containment and pumping for treatment.

Lastly, this report discusses the analytical methods used to characterize the hydrology at the FMC. It describes the hydrological and meteorological conditions at the FMC, based on available data and the results of previous and ongoing studies.

In support of ongoing closure planning and design of Interim Works projects, CH2M has continued to advance the hydrologic understanding of the site. In addition to the field investigations described in Section 2.4 and Appendix C, the main activities performed by CH2M are listed and described in the timeline in Table 2-7.

Table 2-7. Chronology of Key Hydrology Study Activities
Faro Mine Remediation Project

Date(s)	Activity
October 2013–March 2014	*Hydrology Baseline Report Faro Mine Interim Works* (CH2M, November 2014j) includes detailed descriptions of the existing hydrological conditions at the FMC and assesses the information and data used to characterize surface water flow regimes in natural channels and stream diversions. Relevant baseline hydrology-related data consist primarily of stream flow data and meteorological data, collected over various intervals, as part of FMC monitoring programs or other regional or federal data collection programs. This report also details development of rainfall Intensity-Duration-Frequency curves for the FMC.
October 2013-March 2014	*Hydraulics Characterization of Existing Facilities* (CH2M, November 2014c) describes the status of hydraulic facilities at the FMC at the time the report was written and summarizes how these features are maintained and monitored, and their hydraulic functions in relation to the Interim Works. Assesses the available information and data used to characterize the hydraulic functioning of engineered conveyance and impoundment features at the FMC. The sources of hydraulic data for the FMC and the analytical methods used to characterize the site hydraulics are presented.
March 2014	*Task Authorization 018(A) Vangorda Diversion Design Definition* (CH2M, March 2014g) presents a detailed review of previous design concepts and recent information related to the VCD. A Regional Analysis was performed to develop a relationship between catchment surface area and flooding events. The hydrology analysis updated previous frequency analyses and defined peak flows for VCD design.
February 2015	*2014 Hydrology Field Program Report* (CH2M, February 2015a) provides an update to the November 2014 Hydrology Baseline Report to reflect the existing hydrological conditions in the Rose Creek watershed at the FMC through 2014. Summarizes hydrology-related data collected onsite since 2011 that were not included in the analysis in the Hydrology Baseline Report. Discusses the analytical methods used to characterize hydrology at the FMC and describes the hydrological and meteorological conditions at the FMC.
March 2015	*Surface Water Data Processing Report* (CH2M, March 2015ii) details the processing of meteorological and flow data collected at the FMC as well as development of rainfall intensity duration frequency curves for the FMC.
March 2015	*Summary of 2014 Field Investigation – Site-Wide Surface Water Monitoring* (CH2M, March 2015dd) presents a summary of the field investigation activities performed at the FMC in 2014 in support of Site-wide Surface Water Monitoring Field Sampling Plan SW-005. Purpose of the investigation was to establish continuous flow monitoring at a number of existing surface water monitoring stations.
November 2015-March 2016	*North Fork Rose Creek Hydrology/Hydraulics Report* (Appendix D of the DBR) (CH2M, March 2016i) details the processing of meteorological and flow data collected at the FMC to support the hydrological/hydraulic analysis for the 30 percent design of the NFRC Project. Lithium tracer dye tests, a rapid geomorphic assessment, and terrain hazard assessment used in hydrologic/hydraulic analyses and models are also described. This report also discusses calculation of peak flow estimates for the FMC.

2.7.6 Geochemical Characterization

Between 2012 and 2015, CH2M completed four field seasons at the FMC, which included the collection of water quality and solid samples for geochemical analyses, and monitoring of temperature and pore-gas composition in selected waste dump locations. A comprehensive presentation of the results of these geochemical analyses completed between 2012 and 2015 are provided in Appendix G of this report. Geochemical analyses presented in Appendix G build on the findings of previous reports, which are listed in Table 2-8.The information provided in this section presents a brief overview of the FMC geochemical characterization based on the compilation of available data collected through 2015 for the following RUs: Perimeter, Faro Pit, WRD, Mill Building Area and ETA, RCTA, and Dams and CVD Pond. Geochemical data that has been collected but not previously included in a comprehensive data analysis report from other FMC mine areas (NFRC, Vangorda, Grum, and Borrow areas) is provided and discussed in Appendix G.

Table 2-8. Chronology of Key Geochemistry Study Activities
Faro Mine Remediation Project

Date(s)	Activity
May, July, and September 2012	*2012 Seepage, Surface Water, and Water Treatment Plant Influent Field Sampling Report* (CH2M, October 2013a) contains background on historical seep sampling programs and summarizes the 2012 seep sampling program and associated data to be used to support development of a site-wide geochemical loading model.
June 2012 – October 2012, March 2013	*Waste Rock Dump Monitoring Data Report* (CH2M, October 2013b) presents a summary of the field work completed in 2012 in support of the ongoing efforts to refine the site-wide geochemical model. The purpose of the field work was to assess the geochemical properties of the waste rock and underlying alluvium, and to assess the groundwater quality in the WRDs including seasonal variations.
July 2013 – September 2013	*2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report* (CH2M, February 2014q) presents a summary of the field work completed in 2013 to support the design of a seepage interception system downstream from the CVD. The report describes the geochemical properties of tailings materials to evaluate loading potential, and the level of contamination in the northern portion of the Intermediate Tailings Area to help further confirm geochemical modelling results.
June 2013 – July 2013, September 2013	*2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report* (CH2M, March 2014c) presents the results and interpretation of the 2013 seep sampling and WRD monitoring program. This report focuses on the geochemical characteristics throughout the site in order to help refine the site-wide geochemical model.
April 2014 – May 2014, July 2014 – September 2014, February 2015	*Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, March 2015b) summarizes the field investigations completed in 2014 to support the continued improvements of the site-wide geochemical loading models. It includes summaries of geochemical properties of the WRDs and geochemical reactions occurring within the WRDs, and site-wide groundwater quality data including seasonal variations.
June 2012 – September 2014	*Input to Analysis of 2012 to 2014 Solids Data* (CH2M, March 2015a) presents a comprehensive summary of all sampling methodologies and all solids data collected between 2012 and 2014, focusing on trace elements that are a potential concern for future decision making. The report also describes all the geochemical analyses that were performed on the solids data.
April 2015 – June 2015, September 2015 – November 2015	*Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 2016d) summarizes the geochemical monitoring field investigation completed in 2015 to support the understanding of site-wide geochemical properties, WRD pore-gas and temperature profiles, groundwater elevation, pit lake conditions, and seep and groundwater quality.

Table 2-8. Chronology of Key Geochemistry Study Activities
Faro Mine Remediation Project

Date(s)	Activity
February 2016 – March 2016, May 2016 -- June 2016	*Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, August 2016j) summarizes the geochemical monitoring field investigation completed in 2016 to support the understanding of site-wide geochemical properties, WRD pore-gas and temperature profiles, groundwater elevation, pit lake conditions, and seep and groundwater quality.
	2014 Geochemical Characterization Report (CH2M, November 2014b) describes the geochemical conditions and processes affecting water quality at the FMC based on background studies and data gathered through 2014.

2.7.6.1 Methodology of Geochemical Analyses

Selected water quality and solids samples were submitted to the laboratory for geochemical analyses. The following analytical testing procedures were carried out on selected samples collected at the FMC:

- Aqueous analysis (groundwater and seepage monitoring)
  - Full suite of water quality parameters
- Solids analysis
  - Total Metals– Estimates the total metal content of the sample that could be available for release to the environment as a result of long-term weathering
  - ABA – Predicts the tendency of a material to generate or neutralize acid by providing a snapshot (in time) of the balance between the acid production and acid neutralization, based on the sulphur content and presence of neutralizing species (such as carbonate minerals)
  - De-ionized Water Leach – Estimates the amount of readily soluble, elemental loading during sampling, without consideration of weathering reactions or secondary precipitation
  - Sequential Extraction – Determines the mobility and mineralogic association of trace metals within the solid material analyzed

Analytical results obtained from these investigations have been validated and stored in the FMC EQuIS database for subsequent interpretation. A detailed discussion of geochemical testing and analysis on samples collected between 2012 and 2015 is provided in Appendix G to this report.

2.7.6.2 Analytical Results and Discussions

Seepage Data

The main source of contaminant loading in the FMC is sulphide-containing waste rock material stored in the various waste dumps. Natural precipitation infiltrating through waste rock dump material causes oxidation and leaching of the mineralized waste rock as it migrates through relatively coarse waste rock material toward drainage collection points. As potentially contaminated seepage water migrates through the waste rock dump, it either infiltrates into the underlying native soil to impact groundwater quality, or emerges at the toe of the waste dumps and impacts surface water quality directly. This section focuses on discussions on seepage water quality only. Groundwater quality and surface water quality are discussed in Sections 2.7.3 and 2.7.4, respectively.

Geochemical characteristics of the waste dumps are developed based on the identified main seepage flow paths within each, as they provide the most representative geochemistry information for that waste dump. The Mann-Kendall analysis was conducted to identify any consistently increasing or

decreasing trends in a seepage dataset over time, in terms of the following key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters were identified as geochemically important during previous investigations at the FMC. A detailed discussion of seepage water quality is provided in Appendix G of this report, with key findings are as follows:

- Statistically significant increasing pH and decreasing alkalinity observed in seepage location FP05, which drains to Faro Pit. Other locations have indicated significant decreases in pH. These variations in seepage water quality highlight the variability of mine materials that seepage water encounters along flow paths toward the Faro Pit. These transitions in chemistry are important to the continued understanding of the site, and incorporation into the site wide water quality model.
- Faro Pit lake chemistry has been evolving through time. Most recently, the Mill WTP was shut down in September 2012 and the IWTS was not activated until April 2015. This interval without treatment impacted Faro Pit by increasing the water level, reducing the fresh water cap, resulting in the current more uniform, well mixed lake chemistry.
- Localised trends of increasing magnesium concentration (SRK-FD19) and decreasing pH (SRK-FD16) were noted in the Northwest WRDs, which drain toward UGC and the Upper Parking Lot WRD.
- Significant trends of increasing alkalinity, pH, and concentrations of dissolved iron, magnesium, sulphate, and zinc were noted at X23 (northwestern edge of the Main Dump). This steady increase in compounds of interest is likely associated with the breakthrough of other highly-impacted seeps draining toward X23, along flow paths.
- Seepage emanating from the Intermediate Dump (at SRK-FD54) is characterized by decreasing trends in alkalinity and pH, and increasing concentrations of magnesium and sulphate. These trends indicate the onset of ARD generation at this location.
- Increasing zinc concentrations have been noted along the eastern edge of the Northeast WRD (SRK-FD05), which has potential to directly impact water quality in upstream NFRC reaches.

Solids Data

Total Metals

The analytical results for total metals were compared to two interpretive indexes: (1) 10 times crustal abundance (Price, 1997) and (2) the geochemical abundance index (GAI). The GAI is one measure that provides an indication of any elemental enrichments that may be of environmental importance. A GAI value of 3 represents a concentration 12 times median world soil content, and is considered significant and warrants further examination, compared to a GAI value of 0 represents less than 3 times median soil content (INAP, 2013).

Appendix G of this report presents all total metals data obtained from field investigations completed between 2012 and 2015. A high level screening of these results identified the main elements of concern at the FMC to be arsenic, copper, lead, total sulphur (generally present as either primary sulphides or primary/secondary sulphates), and zinc. Other elements, such as antimony, cadmium, cobalt, and mercury, may be present at elevated concentrations in localised areas. Other elements that do not generally exceed the site-specific screening criteria, but are of interest for evaluating geochemical processes include iron, calcium, and magnesium. The interpretation of total metals data, including the geochemical modelling exercise, focused on the aforementioned metals of concern. Key findings from the total metals analysis are as follows:

- The fill material used to construct the FCD access road in the Perimeter RU was, at least in part, waste dump material with elevated concentrations of zinc, arsenic, cadmium, lead, and copper.
- Highly variable lithology types present in the waste dumps include waste rock that contains high total sulphur content and associated increased abundance of trace metals arsenic, cadmium,

copper, lead, and zinc. Zones of greater sulphide content are often observed with evidence of oxidative weathering and the formation of secondary sulphate salts, such as melanterite.

- The upper, weathered portion, Oxide Fines Stockpile (OXSP) and Low-grade Stockpile "C"(LGSPC), contained greater content of antimony, arsenic, cadmium, copper, lead, mercury, selenium, silver, sulphur, and zinc.
- Near surface samples collected from the Main and Intermediate dumps were associated with increased sulphur content and associated trace metals. Increased abundance of sulphide rock types and metals content was more widespread than previously identified sulphide cell boundaries.
- Although groundwater and seepage within the S-wells area contains increased contaminant loads, total metals analysis from the S-wells area samples showed very few exceedances of screening criteria; impacted seepage and groundwater are sourced from the upgradient Intermediate Dump.
- Samples collected from the proposed location of the future WTP in the Mill area exceeded the screening criteria for lead, mercury, and zinc in surficial samples, suggesting that the impacts may be related to historic dust deposits from historical ore processing and handling at the mill and are not naturally occurring.
- Total metals concentrations in the ETA and RCTA tailings material are greater than both the median world soil content and crustal abundance criteria. Total metals concentrations in the underlying native soil immediately below the tailings in the ETA are highly impacted. Total metals concentrations in the RCAA material immediately below the RCTA tailings were also impacted, but were much less than the observed concentrations in the tailings material. With increasing depth, the total metals concentration in the native RCAA material was more indicative of background levels at the FMC.
- With the exception of arsenic, there were very few total metals exceedances noted in the ID, CVD and CVD Pond area.

Acid Base Accounting

Various guidance criteria are published and used to provide the basis for determining the net potential for FMC materials to generate or neutralize acid. The relative amount of NP and generation potential (AP) is typically assessed through the NP:AP ratio. The following are NP:AP ratio threshold values published in guidance documents to the Canadian Mine Environment Neutral Drainage (MEND) program (MEND, 1991) and are referenced in this report:

- NP:AP values greater than 3:1 suggest non-acid-generating material
- NP:AP values less than 1:1 suggest potentially acid-generating material
- NP:AP values between 1:1 and 3:1 suggest intermediate or "uncertain" material

Results from ABA analysis are discussed in detail in Appendix G, with selected key conclusions presented in this section.

Near the FCD, waste rock material used as fill in the FCD access road had acidic paste pH; however, other ABA properties indicate net neutralizing properties. All other samples collected in the vicinity of the FCD were considered net neutralizing.

The materials contained within the Northwest WRD are generally characterized as having net neutralizing properties. However, localized zones of increased sulphide content were characterized as potentially acid generating material.

The Main and Intermediate dump samples represent a wide range of waste rock lithologies, including massive sulphides, phyllite, calc-silicate, and igneous rock types. Overall, the materials contained within the Main Dump that were submitted for analysis have net neutralizing properties, though localized

zones of acid generating material exist and can contribute to increased acid production and metal mobilization into the environment. The Intermediate Dump contains material that has greater potential for acid generation and metal mobilization than materials contained within the Main Dump. In general, samples collected near the surface of the Main and Intermediate dumps tended to have a greater acid potential than samples collected at depth. ABA characteristics of materials collected near the surface in the Zone II Outwash area included acidic paste pH and NP:AP ratios of less than 3.0 suggesting the near surface material may be acid generating.

FMC stockpiles contain high abundance of sulphide materials, and are therefore characterized as potentially acid generating. This is particularly likely in the unweathered, fine-grained material of OXSP, at depths of greater than 1 m.

S-wells area materials exhibited acidic paste pH; however, NP:AP ratios were indicative of net neutralizing sediment. Areas where acidic paste pH and net-neutralizing NP:AP ratios occur likely highlight the presence of buffering rock types such as calc-silicate rock to neutralize acid generated by sulphides.

Unconsolidated material near the Mill Building Area and ETA were characterized as potentially acid generating.

The ABA analytical results for samples collected in the RCTA RU generally indicate the tailings material is acid generating. Immediately beneath the tailings is an organic soil horizon; this typically has a high total sulphur content that results in a high calculated acid potential as it is intermixed with tailings material. Within the undisturbed RCAA, the presence or absence of naturally occurring sulphides (i.e., pyrite) results in a range of ABA determinations from potentially acid generating to non-acid-generating, depending on the pyrite content in the lithotypes present. In the areas directly north of the RCTA, adjacent to the ID Pond and the CVD Pond and downgradient of the CVD, sediments overlying bedrock were identified as net-neutralizing.

ABA analysis was also carried out on solid samples collected from the Vangorda and Grum areas. This detailed analysis is provided in Appendix G and not discussed in this section.

De-ionized Water Leach

DI water leach tests were completed on selected samples from each RU to determine the extent of readily mobile trace elements in FMC materials. A full discussion of DI water leach test results is provided in Appendix G and summarized in this section.

Samples collected from the FCD access road show potential influences from mine waste materials, and may be an important consideration in future activities. DI water leach samples from the RCD area generated slightly acidic to alkaline leachate that contained dissolved iron and zinc. The presence of iron and zinc likely indicates of highly soluble secondary sulphate salts, such as melanterite.

The final leachate from surface materials in the Northwest WRD was near-neutral and did not contain significant trace element concentrations, indicating trace elements are not likely to be mobilized during short-term disturbance of the WRD surface. At intermediate and deeper depths within the Northwest WRD, the final leachate tended to be acidic (low pH) and contained elevated concentrations of the trace metals cadmium, copper, iron, lead, and zinc, which is consistent with the borehole log identification of increased oxidative weathering and the presence of highly soluble secondary sulphate salts.

Final leachate results from surface materials collected from the OXSP and LGSPC were acidic with elevated arsenic, cadmium, copper, iron, lead, and zinc. These elements are likely tied to readily soluble secondary sulphate salts, such as melanterite, that have been observed in surface deposits on the OXSP. At depth, the material within the OXSP has not yet been oxidized and may have significant implications in the consideration of relocating, regrading, and resloping activities.

Final leachates extracted from Main Dump surface materials had variable composition. However, in general, the final leachate was acidic and contained elevated concentrations of arsenic, cadmium, copper, iron, lead, and zinc, implying increased mobility of these elements during flushing events (i.e., freshet or summer rain). The mobility of trace elements in the Main Dump surface materials may be because of the presence of readily dissolved secondary sulphate salts, such as melanterite.

The final leachate from DI-leach testing of waste rock material collected from test pits excavated into the upper 5 m of the Intermediate Dump surface was acidic in nearly every sample test, indicating the entire near-surface material of the Intermediate Dump has the potential to generate low pH runoff and contribute metal loading during disturbance and follow-on flushing.

Final leachate from DI-leach testing of materials from the S-wells area was acidic with elevated concentrations of arsenic, iron, lead, and zinc in near-surface samples. Potential mobility of trace elements at depth was not as pronounced.

Final DI-leach testing leachate of surface materials from the Northeast WRD was acidic, with elevated levels of copper, lead, and zinc. In contrast, DI-leach testing of Northeast WRD samples collected at depth were generally characterized by neutral to alkaline leachate with very low trace element concentrations in the final leachate, with exceptions noted where sulphate salts noted on the borehole log.

DI-leach test results from the Zone II pit area exhibited neutral to alkaline conditions, with increased concentrations of lead and zinc in the upper 3 m of the WRD material, and in discrete intervals at depth (approximately 35 to 40 metres below ground surface [mbgs]). In the Zone II Outwash area, DI-leach results showed increased concentrations of copper, lead, and zinc in shallow test pits excavated, and zinc in nearly all sample depths. Secondary sulphate salt formation was noted in the borehole logs, and likely the source of the soluble trace metals identified.

The final leachates from ETA samples are characterized by acidic conditions and elevated concentrations of arsenic, cadmium, copper, iron, lead, and zinc. With the high metal content in this material and lack of NP, this area continues to be an area of high impact from mining activities.

DI-leachate analysis was carried out on selected samples collected from the RCTA and underlying RCAA materials. Final leachate from the Original Tailings material is characterized as acidic, with elevated concentrations of cadmium, copper, lead, and zinc. The Intermediate Tailings Area is characterized by acidic leachate with increased concentrations of copper, iron, lead, and zinc. Leachate results from the RCAA material underlying the Intermediate Tailings indicate neutral to alkaline conditions persist with very little trace elements extracted by the DI-leach testing.

In general, leachate results from CVD investigation locations were generally neutral with very low trace elements levels in the final leachate. However, a few shallow and a few deeper samples in the CVD area subjected to DI-leach testing resulted in acidic leachate and increased concentrations of copper, iron, lead, and zinc. The readily mobile metals in these samples may be associated with secondary sulphate salt formation beneath the ground surface.

DI-leach testing and analysis carried out on NFRC, Vangorda, Grum, and Borrow areas is described in detail in Appendix G, and not discussed in this section.

Sequential Extraction

Selected samples were subjected to a sequential extraction procedure to characterize the mobility and mineralogic association of trace metals within the solid material contained within the FMC mine materials. Detailed analysis of these results are provided in Appendix G and summarized in this section.

In the waste dumps, much of the metal content is tied to primary sulphide mineral phases. However, secondary sulphate salt formation and other secondary minerals can contribute to readily mobile constituents when in contact with water or under slightly acidic conditions. The following key findings

highlight the information presented in Appendix G and should be considered during site-wide decision making:

- Although much of the potential contaminant load source in the Northwest WRD is tied to primary mineral phases, the presence of zinc and lead in neutral salt exchangeable and acid soluble phases suggest increased potential mobility of these constituents when in contact with water or if conditions become mildly acidic within the WRD.
- The presence of readily dissolved neutral salt exchangeable phases such as melanterite in the OXSP and LGSPC are key considerations for the mobilization of metals during reclamation activities.
- Near surface samples in the Main Dump also indicate a greater presence of zinc in neutral exchangeable salts such as secondary sulphates and acid soluble phases. Iron, zinc, and copper are also tied to neutral exchangeable salts in some deeper samples.
- Mobility of manganese and zinc in the Intermediate Dump are generally pH dependent, and highly mobile in acidic samples in the neutral salt exchangeable phase, suggesting these constituents are present in secondary salt deposits within the waste dump.
- More than 50 percent of the zinc present in the S-wells material is contained within more readily dissolved salts, acid soluble, and amorphous minerals.
- In the Northeast WRD, zinc is present in readily soluble neutral salt exchangeable and acid soluble phases. Evidence of sulphate salts present in the borehole materials was noted on the lithologic log from this area. Lead occurs as acid soluble and primary lead sulphide minerals.
- The presence of zinc the Zone II Outwash area is widely distributed across the following phases: neutral exchangeable salts, acid soluble, amorphous iron, crystalline oxide, and primary minerals. Secondary salt formation in the Zone II Outwash sediments may also contribute mobile forms of lead, copper, and arsenic.
- Highly soluble phases of manganese, zinc, and lead are present in the RCTA material and underlying RCAA material (where total metal content is also elevated).
- The presence of secondary iron sulphate salts may be a source of mobile trace metals, specifically zinc, in the materials downgradient of the CVD.

Pore Gas Data

Results from all WRD pore gas and temperature profile installations showed seasonal variation of temperatures within the upper 5 m of the WRDs with relatively stable temperatures below 5-m depth. Refer to Appendix G for greater detail.

Monitoring results from installations in the Intermediate Dump and Outer Haul Road East waste rock dump indicate more active pyrite oxidation than any other waste rock dumps at the FMC. Temperatures were elevated well above average ambient ground temperatures, and ranged up to 49 degrees Celsius (°C) at 20-m depth in approximately the center of the dump (monitoring location 60M1, measured in 2003). Results from location 60M1 indicate temperatures have cooled since monitoring was first started in 2003; temperatures at 20-m depth have fallen from 49°C in 2003 to 34°C 2016. No discernable long-term changes in temperatures were noted at the other monitoring locations. Oxygen concentrations ranged from near atmospheric to strongly depleted (approximately 0.5 percent). The temperature and oxygen concentration profiles suggest highly active pyrite oxidation is occurring, and oxygen transfer through the piles is dominated by convective air flow – most likely lateral air flow near the edges of the pile (CH12-014-MW007 and 30M1) and most likely vertical convective air flow near the middle of the pile (60M1).

Monitoring results from installations in the Main Dump indicate ARD activity ranges from strongly active near the middle of the dump (location CH14-106-MW009) to only slightly active at the north edge of the dump (CH12-014-MW003). Temperatures ranged up to 19°C at 36-m depth at CH14-106-MW009, and up to 8°C at CH12-014-MW003. No long-term changes in temperatures were observed. Oxygen concentrations are depleted throughout the monitored depths. The temperature and oxygen profiles from CH14-106-MW009 suggest oxygen transfer at the middle of the dump is driven primarily by convective air flow, both vertical and lateral. The profiles from CH12-014-MW003 suggest pyrite oxidation is limited by oxygen supply, which may be primarily through diffusion.

Monitoring results from CH14-015-MW004, installed in the Northwest WRD indicate pyrite oxidation is moderately active. Temperatures ranged up to 10°C at 10-m depth. No long-term changes in temperatures were observed. Oxygen concentrations are strongly depleted at 8-m depth and range to near-atmospheric at 0.5- and 25- to 30-m depths. The temperature and oxygen profiles suggest oxygen transfer is driven primarily by vertical convective air flow.

Monitoring results from CH14-015-MW004, installed in the Northwest WRD, indicate pyrite oxidation is moderately active. Temperatures ranged up to 10°C at 10-m depth. No long-term changes in temperatures were observed. Oxygen concentrations are strongly depleted at 8-m depth and range to near-atmospheric at 0.5- and 25- to 30-m depths. The temperature and oxygen suggest oxygen transfer is driven primarily by vertical convective air flow.

Monitoring results from CH12-014-MW005, installed in the Zone II WRD, indicate pyrite oxidation is moderately active. Temperatures ranged up to 8°C from 15 to 30 mbgs. No long-term changes in temperatures were observed. Temperature and oxygen profiles are suggest only moderate pyrite oxidation is occurring, and oxygen transfer within the pile is likely limited by diffusion.

Monitoring results from CH14-015-MW006, installed in the Northeast WRD, indicate pyrite oxidation is only slightly active. Temperatures ranged up to 4°C from 10 to 19 mbgs. No long-term changes in temperatures were observed. Oxygen concentrations were near-atmospheric at all monitored depths. The temperature and oxygen profiles suggest minimal pyrite oxidation is occurring, and oxygen transfer within the pile is likely dominated by diffusion.

Monitoring results from installations in the Grum Waste Dump indicate minimal ARD activity compared with the other WRDs at the FMC. Temperatures were only slightly elevated well above average ambient ground temperatures; temperatures ranged up to 5°C at 10M3 and CH12-014-MW012 located in the southeastern portion of the dump, and up to 4°C at CH12-014-MW011, located in the northern portion of the dump. No long-term changes in temperatures were observed. Oxygen concentrations ranged from near-atmospheric to slightly depleted at 10M3 and CH12-014-MW011. Strongly depleted oxygen concentrations were measured in the upper 15 m at CH12-014-MW012. The temperature and oxygen profiles suggest minimal pyrite oxidation is occurring, and oxygen transfer within the pile is likely dominated by diffusion.

Monitoring results from installations in the Vangorda Waste Dump indicate highly active pyrite oxidation is occurring. Temperatures were elevated well above average ambient ground temperatures and ranged up to 32°C at 10-m depth at location 10M4. Temperatures cooled notably at 10M4 between 2003 and 2009 (32°C to 16°C). Temperatures warmed slightly at CH12-014-MW013 (17°C in 2012 to 21°C in 2016 at 12 mbgs), and 30M4 (18°C in 2003 to 23 °C in 2016 at 20-m depth). Near-atmospheric oxygen concentrations were observed throughout the profile at 10M4 and from surface to 20 m at CH12-014-MW013. Depleted oxygen concentrations were observed at 25-m depth at CH12-014-MW013 and from 3 to 20 mbgs at 30M4. The temperature and oxygen profiles suggest oxygen transfer within the pile is likely dominated by convective air flow, both lateral and vertical.

2.7.7 Site-wide Borrow

Numerous studies have been conducted at the FMC with a specific focus on available potential onsite borrow sources. The main investigations with a direct or indirect focus on borrow source investigations or studies were reviewed by CH2M and summarized in the draft Borrow Baseline Design Criteria Report (Borrow Report) (CH2M, March 2015hh). The following subsections summarize the information contained in the Borrow Report. Section 2.8.11.1 describes prior works conducted by others, while Section 2.8.11.2 describes work conducted by CH2M. Section 2.8.11.3 provides information on general development of borrow sources; Section 2.8.11.4 summarizes the estimated borrow reserves.

2.7.7.1 Summary of Previous Work By Others

Summary of Quaternary History of the Region and Examination of the Utility of Till Geochemistry: The Exploration and Geological Services Division, Yukon Region, summarized the quaternary history of the region and examined the utility of till geochemistry for possible future mining activities (Bond, 1999a). A grid of samples were collected from north of the RCTA and from a vertical section of exposed till at the Vangorda Pit. The investigation demonstrated that there were dispersal trains of increased lead, copper, and zinc west of the Faro Pit, consistent with the advancement of glaciation east to west in this area. At the Vangorda Pit, the study showed that till zinc concentrations increased near the contact with underlying bedrock, but that lead concentrations were relatively high throughout the vertical section. The terrain maps produced as part of the field investigation from 1998 to 1999 (Bond, 1999b and 1999c) formed the basis for much of the current borrow report.

Phase 1 Borrow Source Survey (SRK, August 2002): The desktop study included a site visit and surficial sample collection of seven potential borrow areas to carry out one proctor test, one permeability test, one Atterberg test, and seven gradation tests. This study seems to be the first classic borrow study at the FMC. However, it does not provide exact sampling locations, and there seem to be some discrepancies in terms of sample numbers and laboratory test results. The investigation reported that sources of organic soil were insufficient for reclamation of the site. There are cohesive materials that may be suitable.

Phase 2 Borrow Source Survey (SRK, April 2003b): The study consisted of field reconnaissance, the excavation of 68 test pits, and laboratory testing of the collected samples (34 gradation tests, 13 Atterberg tests, 3 proctor tests, and 62 moisture-content tests). This report updated the Phase 1 quantity assessment and concluded that the available quantities of granular and low permeability soils are likely to be adequate for most cover scenarios. However, it is recognized that granular material is not suited as a cover material but may be suitable as the base for the cover.

Additional Borrow Studies 2004/05 Task 11a (SRK, March 2006): Additional studies were performed at three potential borrow areas (at Upper Vangorda Creek, east of Grum Pit, and east of Vangorda Pit) in the Vangorda/Grum Area. Aurora Geoscience investigated the areas through geophysical surveys using ground penetrating radar (GPR) and seismic refraction. However, the GPR method was not successful in mapping bedrock, potentially because of the presence of permafrost. A similar difficulty was encountered by the seismic refraction method because of the high-velocity returns of the below surficial ground and weathered bedrock stratigraphic units.

Anvil Range Mining Complex Additional Borrow Studies 2005/06 Task 17a (SRK, 2006): This report focused on identifying low-permeability borrow material at the Faro Mine Area, as most of the available material exists at the Grum Overburden Dump, which would require a long haulage of near 13 km to the Faro Mine Area. A site investigation was conducted in five areas to advance 23 boreholes, with 6 gradation tests conducted on collected samples. The investigated areas include the slope to the north of the CVD, the area between the Faro Valley Waste Dump and the Original Impoundment, east of the fresh water reservoir, east of NFRC, and northwest of the Faro Valley Waste Dump. A glacial till of greater than 2 m was encountered only in two of these areas (east of the fresh water reservoir and east

of NFRC). SRK indicated that the area east of the fresh water reservoir also requires a large footprint, which would leave only one potential borrow area; however, use of any of these areas was recommended to be further assessed against new disturbance areas resulting from their development.

2.7.7.2 Borrow-Related Studies Conducted by CH2M

Limited Borrow Material Reconnaissance, Faro Mine Remediation Project (CH2M, June 2013f): The original scope for this study was reduced at the client's request; as a result, no drilling or geotechnical laboratory testing were carried out for it. The work was limited to (1) shallow hand-dug pits used to collect samples from shallow ground surface or (2) road cuts for geochemical laboratory tests. Seven areas were investigated, with a total of 17 samples collected and submitted for geochemical laboratory analysis. The collected samples were tested for total soil metals and soil pH. Test results indicated that all samples will be acceptable to be used as cover material, with a pH test result of 5.1 to 8.6 and an average pH of 7.4.

Grum Overburden Dump Fatal Flaw Evaluation Data Report, Faro Mine Remediation Project (CH2M, June 2013i): Because of the high importance of the low permeability material borrow source, further site investigation and laboratory testing was carried out at the Grum Overburden Dump to check its suitability for the use as a cover material. A total of six boreholes and seven test pits were advanced through the predominantly silty sand to sandy silt glacial till. Although the overall test results did not reveal a fatal flaw to using this material as a borrow source, the geochemical test results for total metals indicated that some of the tested samples contain elevated metal levels, which will require careful screening. The gradation test results also indicated that about one-third of the tested samples would require further mechanical processing such as crushing or grinding, most likely because of the presence of friable phyllite.

2013 Borrow Source and Quarry Investigation, Faro Mine Remediation Project (CH2M, March 2014b): Test pits, hand pits, and pionjar drilling and sampling was carried out at the Haul Road Borrow, Rose Creek Haul Road, and Rose Creek Borrow areas. A total of 4 boreholes, 26 test pits, and 5 manual hand pits was advanced, with collected samples sent for geotechnical and geochemical laboratory testing. This investigation identified the encountered material as alluvial to glaciofluvial deposits, overlying moderately to highly weathered bedrock.

Phase II Borrow Reconnaissance, Faro Mine Remediation Project (CH2M, March 2014n): The investigation consisted of test pitting, sonic drilling, pionjar, and manual hand shovel ground surface sampling campaign at the North Wall of the Grum Open Pit and the Grum Overburden Dump foundation. The investigation results indicated a mixed glacial till and glaciofluvial origin for the overburden dump material and considered it the best-suited cover material available onsite in a large quantity.

2013 Vangorda Creek Diversion Field Investigation Data and Analysis Report (CH2M, March 2014d): This study was focused on the VCD; however, as part of this work, a geophysical survey (including short di-pole resistivity, GPR, and seismic refraction) was carried out at the Granitic Outcrop and Grum Waste Rock Dump Quarry to determine the bedrock profile and rock quality. Geological reconnaissance was carried out at the Granitic Outcrop and Grum Waste Rock Dump Quarry. Two boreholes were also advanced at the Granitic Outcrop, with local samples collected from the Granitic Outcrop and Grum Waste Rock Dump Quarry for laboratory analysis.

Summary of 2014 Field Investigations - Pump House Borrow Source, Faro Mine Remediation Project (CH2M, March 2015f): Five test pits were advanced in July 2014 to obtain information regarding the quantity and quality of the pump house borrow source. Tests pits were excavated by Castle Rock Enterprises of Whitehorse, using a LinkBelt 210 excavator (with CH2M oversight). Bulk samples were collected from each test pit; laboratory testing included both geotechnical and geochemical analyses. This investigation helped define the quantity of the borrow source by providing an improved estimate of

its perimeter area. Geotechnical laboratory testing results showed that the granular material has an alluvial source and would be a good source of granular material as fill with minimal processing, but it does not meet the requirement to be used in concrete mix.

Summary of 2014 Field Investigations - Granitic Rock Outcrop, Faro Mine Remediation Project (CH2M, March 2015g): The Granitic Outcrop was first investigated in 2013 via two boreholes and a geophysical survey line. In 2014, two additional boreholes were advanced in this area and two seismic refraction line surveys were performed, to collect further information regarding the quality and quantity of this borrow source. The investigation and laboratory analysis results of the collected rock core samples confirmed the Granitic Outcrop as a good borrow source to produce coarse rock fill and rip rap material. Geochemical analyses show that concentrations of metals within samples collected were generally within the crustal averages.

Site-wide Soil Characterization Report, Faro Mine Remediation Project (CH2M, February 2015c): Terrestrial ecosystem mapping was carried out to provide vegetation and surficial soil (0.5 to 1.2 m) baseline conditions at FMC. Soil characteristics defining organic and mineral horizons were noted and recorded, as were biological and environmental parameters such as rooting depth and abundance, and hydrological regime.

Supplemental borrow investigation for the NFRC design: Appendix E of the Preliminary Final North Fork Rose Creek Design Basis Report (CH2M, March 2016b) describes a supplemental borrow investigation consisting of 6 boreholes drilled in a potential borrow area located northwest of the proposed NFRC Seepage Collection Pond. Refer to Appendix E of the DBR for additional detail.

2.7.7.3 Borrow Source Development

The draft Borrow Report (CH2M, March 2015hh) describes three steps in the development of a borrow source: (1) finding out if a borrow source meets the required criterion to be considered as a borrow source in terms of its quality, available quantity, and impacted footprint, (2) developing and using the borrow source, and (3) closing and reclaiming the borrow area.

The draft Borrow Report also includes four criteria recommended for borrow source development. The following recommended criteria are expected to have a varying degree of importance depending on the type of borrow material:

1. Local stratigraphy of the borrow area, including type, geotechnical and geochemical properties of the borrow material and its overlying and underlying layers
2. Local topography, impacted area, and general grading of the borrow area and borrow haulage distance to destination use
3. Presence or absence of groundwater in the borrow area
4. Presence or absence of permafrost in the borrow area or underlying layers

2.7.7.4 Summary of Estimated Reserves

Table 2-9 summarizes the approximate surface areas of each borrow source and estimated quantities based on the investigations carried through March 2015 as presented in the 2015 draft Borrow Report (CH2M, March 2015hh). The estimated quantities shown should be considered preliminary and at a concept level. Further investigation is required for some of the identified borrow sources; however, as mentioned previously, there are many factors that need to be considered before a final decision is made regarding feasibility of a proven borrow source.

Table 2-9. Estimated Borrow Source Quantities
Faro Mine Remediation Project

Borrow Material Type	Borrow Area	Surface Area (m^2)	Estimated Quantity (m^3)	Comments
Low Permeability	North of Rose Creek Borrow	813,000	1,627,000	No investigation has been carried out at this site. The estimate is based on assumed 2-m thickness.
Low Permeability	North Slope above CVD	1,141,000	1,902,000	Not recommended to be used because of its large footprint and shallow thickness.
Low Permeability	Rose Creek Haul Road	220,000	440,000	Not recommended to be used because of its large footprint and shallow thickness.
Low Permeability	East of North Fork Rose Creek	1,569,000	4,963,000	Only 3 test pits and no lab results. Additional investigation is recommended in this area.
Low Permeability	Haul Road Borrow	418,000	1,091,000	Further testing is required.
Low Permeability	Northwest of Faro Waste Dumps	1,909,000	4,274,000	Not recommended to be used because of its large footprint, high elevation, and shallow thickness.
Low Permeability	Tailings Borrow Area East	467,000	1,868,000	East half of the area may have borrow source potential, which requires further investigation. Subject to decision making regarding possible effects on groundwater recharge.
Low Permeability	Tailings Borrow Areas West	351,000	1,017,000	Requires further investigation. Subject to decision making regarding possible effects on groundwater recharge.
Low Permeability	East of Fresh Water Supply Reservoir	2,655,000	6,638,000	Additional investigation is recommended in this area.
Granular	Rose Creek Borrow	820,000	2,800,000	Includes new areas added to the borrow site with no boreholes (west side).
Granular	Haul Road Borrow/Granular	81,000	318,000	Active borrow source.
Granular	Pump House Borrow	202,000	1,363,000	Small portions of this area have been used for borrow.
Rock Fill	RCD Quarry	55,000	330,000	No information is available for this site. The quantity has been assumed.
Rock Fill	NFRD at Haul Road	22,000	722,000	Based on SRK estimate.
Rock Fill	Faro Waste Dump	246,000	600,000	No new information is available for this site. Based on SRK estimate.
Organics	North Slope above the Cross Valley Dam/Organics	88,000	88,000	Includes two areas. No investigation has been carried out at these sites.
Low Permeability	Grum Overburden Dump	602,000	10,400,000	Based on CH2M estimation from 2012 and 2013 investigations and historical mapping by Curragh (1979).
Low Permeability	Grum Overburden Dump Foundation	602,000	11,900,000	Based on historic mapping by Curragh (1979). No borehole information available within this zone.
Low Permeability	North Wall of Grum Pit	1,250,000	6,250,000	Based on very limited information and assumption of 5-m thickness

Table 2-9. Estimated Borrow Source Quantities
Faro Mine Remediation Project

Borrow Material Type	Borrow Area	Surface Area (m^2)	Estimated Quantity (m^3)	Comments
Rock Fill	Grum Waste Rock Dump Quarry	268,000	804,000	Based on site reconnaissance information.
Rock Fill	Granite Rock Outcrop	449,000	2,700,000	Based on 2013 and 2014 investigations.

2.8 Site-wide Mapping and Data Management

2.8.1 Site-wide Mapping

This section summarizes the mapping development and survey work completed by CH2M from 2012 to present.

2.8.1.1 Project Datum

In 2010, Challenger Geomatics Ltd. (Challenger) set nine permanent control monuments at the FMC. All project mapping data are based on the following datum:

- Horizontal Geodetic Datum: North American Datum of 1983 Canadian Spatial Reference System Epoch 2002 (NAD83 CSRS)
- Map Horizontal Projection: Universal Transverse Mercator Zone 8 North (UTM Zone 8N)
- Vertical Geodetic Datum: Canadian Geodetic Vertical Datum of 1928 Height Transformation version 2.0 (CGVD28 HT version 2.0)
- Units: m

2.8.1.2 Site-wide Mapping Development

During field survey work conducted by Challenger in 2012, they observed that control point 8 had been destroyed. The control point is not critical to planned remediation work, was not replaced, and should not be used for future survey work. CH2M prepared the *Mapping Development Faro Mine Remediation Project* technical memorandum (CH2M, March 2013i), which summarized the following site-wide mapping development. This initial mapping work consisted of the following and set that stage for the current site-wide mapping available for the site:

- October 2011, Light Detection and Ranging (LiDAR) data and aerial photos of the Faro Mine Complex were acquired by BGC Engineering and Terra Remote Sensing Inc. for YG.
- In October 2012, Challenger performed a field survey to check various elevation ground shots throughout the site. These survey data were used to check the accuracy of the 2011 LiDAR data. The comparison showed a vertical root-mean-square-error (RMSE) of about 8.6 centimetres (cm) of the LiDAR points. YG specified a vertical RMSE of 15 cm. The computed vertical accuracy was better than the specification requirements.

- In August 2012, CH2M acquired aerial photography and Aerial Triangulation (AT) files from Eagle Mapping through their subconsultants, Peregrine Aerial Surveys Inc. and 4DGIS Ltd., respectively. The two aerial photography programs are referred to as follows:
  - Project Area: Low-altitude photography
    - The low-altitude photography was gathered using the Zeiss DMC II 230 camera on August 16, 2012, at an average image scale of 1:12,397. A total of 548 raw image panels were taken with a ground pixel resolution of approximately 7.5 cm.
  - Extended Area: High-altitude photography
    - The high-altitude photography was gathered on August 15 and 16, 2012 (same camera and aircraft), at an image scale of 1:44,223. A total of 384 images were taken with a ground pixel resolution of approximately 25 cm.
- The 2012 low-altitude stereo imagery was used to update the 2011 LiDAR Digital Terrain Models (DTMs) in areas where the LiDAR inappropriately filtered out data, and where the topography had changed since October 2011.
- Ten DTMs were created by Critigen from the same thinned 2011 LiDAR and break lines were added from the 2012 low-altitude stereo imagery.
- Planimetric Mapping was gathered by Critigen using the low-altitude stereo photography. Features gathered included major flow lines, major water edges, road edges, culverts, buildings, aboveground utilities, fences, walls, and major berms. Mapping scale is 1:600. Water lines were provided in Microstation V8i curve string format, and a stroked polyline (line string) format for optimized use in geographical information system (GIS) and other software. The planimetric mapping file was created by Critigen and is in Microstation V8i, ArcMap v. 10 and also available on the Faro Mine GIS Web Viewer.
- In September 2012, Laberge Environmental Services acquired the hydrographic survey and sub-bottom profiling of the Faro Pit. Their subcontractor, Gubala Consulting, supplied the primary mapping vessel with multi-beam and sub-bottom profilers. The sub-bottom profiling provided an estimate of the thickness of the unconsolidated material (tailings and emotional/rock material) that is contained within the pit lake. Critigen used the hydrographic survey and sub-bottom profiling data to create DTMs and incorporated it into the project computer-aided design (CAD), GIS, and Web viewer.

2.8.1.3 Pre-mining Mapping

Site-wide pre-mining digital elevation data were acquired from the Canadian Council on Geomatics database (1:50,000 scale) at the following website and is approximately +/-10 metre accurate: http://www.geobase.ca/geobase/en/data/cded/description.html

There is additional pre-mining mapping from other sources, which vary in site coverage and file format. Many of the historical sources either do not cover the entire site or are in a format that cannot be accurately reproduced. There is an effort that is currently underway to evaluate the accuracy of these other various pre-mining sources. It is recommended that this be evaluated moving forward and if there is more accurate site-wide pre-mining data available that it be adopted for the project.

2.8.1.4 Supplemental Field Survey

Table 2-10 summarizes the supplemental survey Challenger performed on the site.

Table 2-10. Supplemental Field Survey Summary
Faro Mine Remediation Project

Date of Survey	Survey Description
October 2013	Survey included all existing culverts within the FMC. Survey provided invert elevations, pipe material, size, ground elevations above the pipe and digital photos of both sides each culvert. The culvert locations and invert elevations are incorporated into the planimetric mapping.
October 2013	All exploration locations completed by CH2M in the 2012 field season were surveyed. These included new monitoring wells, staff gauge, test pits, and boreholes. A subset of historical monitoring well locations were also surveyed. Survey data were updated to EQuiS.
July 2013	NFRD Pond bottom was surveyed and incorporated into the DTM.
October 2013	Ground elevations were taken along the proposed VCD to check the accuracy of the LiDAR data in densely vegetated areas.
August 2013	Cross section surveys were performed at various locations along the NFRC.
August 2013	All exploration locations completed by CH2M in the 2013 field season where surveyed. Survey data were updated to EQuiS.
September 2014	Cross section surveys were performed along the Lower Guardhouse Creek, NWID, FCD, NFRC, and RCD at various locations.
September 2014	All exploration locations completed by CH2M in the 2014 field season were surveyed. Survey data were updated to EQuiS.
September 2015	Cross section surveys where performed at various locations along the NFRC.
September 2015	All existing active aboveground pipelines were surveyed for the entire FMC.
January 2016	As-built survey of the NFRC test cut construction was performed.

2.8.1.5 Supplemental Data

The following supplemental data were obtained by others and incorporated in the project mapping files:

- Existing Utility Location at the Faro Mill WTP Site. The existing underground utilities at the Faro Mine WTP site were located by Western Locators on June 20, 2012. CH2M's field team was onsite during the utilities location process. The data from the locate work was digitized from field sketches and is available in a Microstation V8i file on the CH2M ProjectWise CAD database. No depth, material type, or size data were provided by the utility locate work.
- The following historical geology GIS files were obtained from the Yukon Geological Survey's website:
  - Surficial Geology Reference:
    BOND J.D. (open File 1999-10)
    Surficial Geology Map and Till Geochemistry of Mount Mye (105K/3&6W)
    Central Yukon Territory
    Yukon Geological Survey, Whitehorse, Yukon
  - Bedrock Geology Reference:
    BULLETIN 15
    Bedrock geology compilation of the
    Anvil District (parts of NTS 105K/2, 3, 5, 6, 7 and 11)
    Central Yukon Territory
    Yukon Geological Survey, Whitehorse, Yukon

- As-built data provided by BGC for the NFRD Access Road was incorporated into the project DTMs.

2.8.1.6 Faro Mine Complex Web Viewer

During the project, CH2M developed and maintained a GIS web-viewer that contained all of the project mapping GIS layers. CH2M provided the files necessary to recreate the GIS web-viewer to YG and INAC as part of the MSA closeout.

2.8.1.7 Mapping Transition Plan

As part of the project closeout, CH2M will work with YG to develop a plan to transfer all electronic mapping files and survey data collected at the site. A transition plan will need to be developed for transfer of the FMC Web Viewer layers as well as the EQuIS database.

2.8.2 Site-wide Data Management

2.8.2.1 Introduction

This section briefly describes the development, evolution, and standardized workflow processes implemented for the data management activities for the FMRP.

2.8.2.2 Background – Status of Historical Data for the FMC in 2011

CH2M was tasked with developing a comprehensive data management model for the collection of historical data, as well future data collected by CH2M, YG, and subcontractors to YG.

In October 2011, YG provided CH2M with historical data from a wide range of sources, including: data obtained from the care and maintenance contractor's emLine database, the Gartner Lee database, data in MS Excel and PDF files, boring log data, well completion data, and surface and groundwater data collected for the confirmatory monitoring program by the Assessment and Abandoned Mines Branch (AAM), the groundwater sampling program, and the Pelly Aquatics sampling program.

2.8.2.3 CH2M Work Associated with Data Management Processes

As part of this comprehensive approach, project plans and reports were written to guide activities and report outcomes. These plans and reports included the following:

The FMRP required field sampling, assessments, design, construction, monitoring, operations and maintenance (O&M) information, and the collection of large amounts of data associated with these activities. A data management plan (DMP) was developed to effectively manage these large quantities of data. The DMP outlined the practices for collecting, organizing, backing up, storage and retrieval of the data. These DMPs were updated as the methodology or process changed.

Quality assurance project plans (QAPPs) were developed to ensure that environmental data collected are of the appropriate quality to achieve the project objectives. The QAPPs identified the method-specific QC requirements for each analytical parameter and matrix, and defined a plan to test that the correct sampling, analytical, and data reduction procedures have been followed. The QAPP was designed to supplement the field sampling plans and any other site-specific documents.

Sampling program definitions were developed that summarized the known sampling programs; contractor or agency responsible for sample collection; sampling locations, frequencies, matrixes, and methods; analytes; and laboratory reporting limits. These summaries of the FMC sampling and analysis activities were designed to help stakeholders understand the program and promote efficient use of resources, identify sampling schedule conflicts, and reduce duplication.

Technical memos were written yearly that described the quality assurance/quality control review and data set build process for the FMC. These technical memos summarized the data sets loaded into the FMC EarthSoft EQuIS databases for each fiscal year. The report summarized the specific field program

supported, source and type of the electronic deliverable (EDD) provided, quantity of data, and the kind of data that was provided in conjunction with each contractor.

Data quality evaluation (DQE) reports were written for defined CH2M sampling events. The QAPP identifies the method-specific QC requirements for each analytical parameter and matrix, and defined a plan to test that the correct sampling, analytical, and data reduction procedures were followed. The DQE reports summarize the findings of the data validation and provide a data usability assessment.

The chronology and specific plans, technical memos and reports are identified in Table 2-11.

Table 2-11. Chronology of the Data Management Process
Faro Mine Remediation Project

Dates	Activity
October 2011	Initial historical data were received and underwent a comprehensive evaluation as to the type and quantity of data received.
November 2011	Reviewed the YG database structure (emLine) and associated data flow process while comparing this structure to existing CH2M data models in an effort to improve database quality and data management efficiency.
December 2011-January 2012	EarthSoft EQuIS database on the Microsoft SQL platform was selected to house the FMC data warehouse. Historical data were formatted into the EQuIS historical data specification format and loaded to the project database.
February 2012	Initiated the writing of the Faro Mine DMP (CH2M, June 2012g).
March 2012	Initiated the writing of the QAPP (CH2M, May 2012f).
April 2012-December 2012	1. Normalized all data to be consistent with the EQuIS warehouse valid values. 2. The following data were loaded into EQuIS: – CH2M 2012 analytical results and measurements – Historical data obtained from the emLine database, Microsoft Excel, Microsoft Word, and PDF files – Historical boring log data and well completion data – 2011–2012 surface and groundwater data collected by the AAM and Laberge Environmental Services 3. Validated CH2M 2012 field season analytical data.
January 2013-March 2013	1. The following data quality evaluation reports for the 2012 field work were completed by CH2M: 2. Data Quality Evaluation Report, 2012 Soils, Faro Mine Remediation Project (CH2M, March 2013q). 3. Data Quality Evaluation Report, 2012 Groundwater, Surface Water and Seep Water, Faro Mine Remediation Project (CH2M, March 2013r). 4. Completed the Quality Assurance/Quality Control Review and Data Set Build Process (CH2M, March 2013j).
April 2013-December 2013	1. Revised the Faro Mine DMP (CH2M, August 2013c). 2. Revised the Faro Mine QAPP (CH2M, July 2013d). 3. Completed the FMC Site-wide Sampling Definition 2013-2014 (CH2M, August 2013a). 4. Validated CH2M 2013 field season analytical data.
January 2014-March 2014	1. The following data were uploaded into EQuIS: – CH2M 2013 analytical results and measurements 2009-2011 Non-care and Maintenance surface water data collected by Access Environmental – 2012 surface and groundwater data collected by the AAM and Laberge Environmental Services – 2013 Care and Maintenance data downloaded from emLine – 2013 surface water and groundwater data collected by the AAM and Environmental Dynamics Inc. (EDI)

Table 2-11. Chronology of the Data Management Process
Faro Mine Remediation Project

Dates	Activity
	– 2011-2013 Care and Maintenance meteorological data collected by Tlicho Engineering and Environmental Services (TEES) 2. The following data quality evaluation reports for the 2013 field work were completed by CH2M: – Cross Valley Dam Interception System 2013 Soil Sampling Data Quality Evaluation Report (CH2M, February 2014q, Appendix D). – Fall 2013 Potentiomanometer Study and Cross Valley Dam Seepage Interception System Sampling Data Quality Evaluation Report (CH2M, February 2014q, Appendix D). – Borrow Source Investigation Rose Creek Borrow and Haul Road 2013 Soil Sampling Data Quality Evaluation Report (CH2M, March 2014b, Attachment 3). – Spring/Fall 2013 Seep Sampling and Pit Lake Sampling Data Quality Evaluation Report (CH2M, March 2014c, Appendix C). – Spring/Fall 2013 Waste Rock Dump Groundwater Monitoring Data Quality Evaluation Report (CH2M, March 2014c, Appendix C). – Borrow Source Investigation Access Road Granitic Outcrop, Borrow Source Investigation Grum Dump Rock Quarry, and Construct New Vangorda Creek Diversion 2013 Soil Sampling Data Quality Evaluation Report (CH2M, March 2014d, Appendix F). – Fall 2013 North Fork Rose Creek Rock Drain Assessment, Intermediate Dam Crest Test Pits, and Faro-Grum-Vangorda Borrow Sources Sampling Data Quality Evaluation Report (CH2M, March 2014m, Appendix H). – Phase II Borrow Reconnaissance Data Quality Evaluation Report (CH2M, March 2014n, Appendix E). 3. Completed the Quality Assurance/Quality Control Review and Data Set Build Process technical memorandum (CH2M, March 2014r).
April 2014-December 2014	1. Revised the Faro Mine QAPP (CH2M, October 2014). 2. Validated CH2M 2014 field season analytical data.
January 2015-March 2015	1. The following data were uploaded into EQuIS: – CH2M 2014 analytical results and measurements – 2014 surface water and groundwater data collected by AAM, EDI, and Hemmera and Ecological Logistics & Research Ltd. (ELR) – 2014 Care and Maintenance data downloaded from emLine – 2013-2014 Rose Creek surface water and groundwater data collected by EDI – 2014 Rose Creek Monitoring Program data collected by EDI – 2014 NFRC seep identification and water quality sampling data collected by ELR – 2014 Winter Drilling Program NFRC data collected by Robertson GeoConsultants Inc. – 2013-2014 Care and Maintenance meteorological data collected by TEES 2. The following data quality evaluation reports for the 2014 field work were completed by CH2M: – Cross Valley Dam Subsurface Interception System 2014 Soil Sampling Data Quality Evaluation Report (CH2M, January 2015b, Attachment 3). – Data Quality Evaluation – 2014 Soil Fertility (CH2M, February 2015d). – Data Quality Evaluation – 2014 Site-wide Soil Toxicity (CH2M, March 2015dd). – 2014 Faro Mine Relocate Oxide Fines to LGSP C Data Quality Evaluation (CH2M, February 2016d). – 2014 Remove Tailings to RCTA Data Quality Evaluation (CH2M, February 2016e). – 2014 Site-wide Geochemical Monitoring Data Quality Evaluation (CH2M, February 2016f). – 2014 NFRC Area Field Summary Data Quality Evaluation (CH2M, February 2016g).

Table 2-11. Chronology of the Data Management Process
Faro Mine Remediation Project

Dates	Activity
	– Develop and Decommission Faro Borrow Sources – Granular Soil, Pump House Borrow Data Quality Evaluation (CH2M, February 2016h). – 2014 Waste Rock Dump Investigations Data Quality Evaluation (CH2M, February 2016i). – 2014 Tailings Area Field Summary Data Quality Evaluation (CH2M, February 2016j). 3. Completed the Quality Assurance/Quality Control Review and Data Set Build Process technical memorandum (CH2M, March 2015cc).
April 2015-December 2015	1. Revised the Faro Mine DMP (CH2M, December 2015g). 2. Revised the Faro Mine QAPP (CH2M, September 2015). 3. Completed the FMC Site-wide Sampling Definition 2015-2016 (CH2M, July 2015f). 4. Validated CH2M 2015 field season analytical data.
January 2016-March 2016	1. The following data were uploaded into EQuIS: – CH2M 2015 analytical results and measurements – 2015 surface water and groundwater data collected by AAM, EDI, and ELR – 2015 Care and Maintenance data downloaded from emLine – 2015 Rose Creek Monitoring Program data collected by EDI – BGC Engineering Inc. 2015 analytical results and measurements – 2014-2016 Care and Maintenance meteorological data collected by TEES 2. The following data quality evaluation reports for the 2015 field work were completed by CH2M: – Faro Mine Water Balance Investigation Data Quality Evaluation Report (CH2M, April 2016k). – Faro Mine Intermediate Dam Spillway Investigation Data Quality Evaluation Report (CH2M, April 2016j). – 2015 Field Investigation – Site-wide Geochemical Monitoring Data Quality Evaluation Report (CH2M, April 2016i). – 2015 North Fork of Rose Creek Diversion Investigation Data Quality Evaluation Report. This Data Quality Evaluation Report will be transmitted to YG during the project transition. 3. Completed the Quality Assurance/Quality Control Review and Data Set Build Process technical memorandum (CH2M, March 2015nn).
April 2016 – August 2016	1. The following data were uploaded into EQuIS: – CH2M 2016 analytical results and measurements – December 2014, January-March 2015, and February-March 2016 surface water data collected by EDI – 2016 Care and Maintenance data downloaded from emLine on June 30, 2016 – 2015-2016 Care and Maintenance meteorological data collected by TEES – April 2016 Care and Maintenance meteorological data collected by Parsons 2. The following data quality evaluation reports for the 2016 field work were completed by CH2M: – Faro Creek Diversion Realignment Investigation Data Quality Evaluation Report (CH2M, August 2016b). – Faro Mine CVP and IDP Drilling Data Quality Evaluation Report (CH2M, August 2016d). – 2016 Site-Wide Water Monitoring Investigation Data Quality Evaluation Report (CH2M, August 2016k). – 2016 Faro Creek Diversion Seepage Aquifer Testing Data Quality Evaluation Report (CH2M, August 2016i). 3. Completed the Quality Assurance/Quality Control Review and Data Set Build Process, August 2016 Update, Faro Mine Remediation Project Technical Memorandum (CH2M, August 2016e).

2.8.2.4 Recommendations

Before CH2M, a comprehensive approach to data management did not exist and data were scattered over hundreds of files and databases. Each time historical data were required, the disparate files and databases would have to be revisited or if data could not be located, additional and perhaps duplicative sampling and analysis was being performed. Today there is one comprehensive source with well over 4 million analytical results and measurements that is website accessible to users.

To maintain continuity and maintain the relevance of the current data management approach, system, and data, YG will need to identify qualified personnel or a contractor that can effectively manage the existing data management process and procedures. As well, this entity should be involved with all data collection activities to help ensure the results are useable and defensible.

SECTION 3

Water Treatment

3.1 Introduction

This section describes the status of water treatment facilities at the Faro Mine Area and RCTA portion of the FMC. For the purposes of this report, the combined Faro Mine Area and RCTA portion of the FMC will be referred to as the Faro Mine Area. Section 3.1.1 describes their status in 2011, when CH2M began work for YG, while Section 3.1.2 describes the current status of water treatment at the FMC. The following sections provide information on the activities leading to the current status: Section 3.2 summarizes work done by others at the site, as well as recommendations arising from it, and Section 3.3 details the CH2M work done at the site. Section 3.4 provides a crosswalk table for data gaps that have been identified at the site and the work activities performed to fill them.

3.1.1 Status of Water Collection and Treatment at the Faro Mine Complex in 2011

Water management systems at the FMC consisted of facilities for collection, storage, treatment, and discharge of mining-influenced water (MIW), as well as for disposal of water treatment sludge. The following paragraphs describe the existing water treatment system when CH2M began work at the site in autumn of 2011.

In the Faro Mine Area, MIW sources collected for treatment in 2011 consisted of the Faro Pit, Zone II Pit, ETA, ID Pond, the Zone II Pit dewatering well, and the S-Wells. Water from the Faro Pit, ETA, and ID Pond was pumped directly to the Mill WTP. Water from the Zone II Pit dewatering well and S-Wells was pumped to the Faro Pit.

In 2011, MIW was treated at the existing Faro Mill WTP. The WTP, located in the old Faro Mill Building, was assembled using existing ore-processing equipment that was not intended for water treatment, was at least 40 years old in 2011, and was in poor repair. It used a simple-mix lime treatment process in which lime was added directly to the influent water to neutralize acidity and precipitate metals, and no sludge was recycled. Separation of solids and liquids was accomplished by flocculant addition and gravity settling in a clarifier and a thickener, operated in parallel. Treated effluent (clarifier/thickener overflow) from the WTP was discharged by gravity flow to the CVD Pond for polishing settling. Additional lime slurry was added to the WTP effluent to add alkalinity to the CVD Pond, neutralize acidic seepage entering the pond, and supress ferrous iron in a precipitated state (to prevent it from dissolving, oxidizing, and forming ferric oxyhydroxide floc resulting in elevated turbidity and total suspended solids [TSS]). Final effluent was discharged from the CVD Pond via a siphon to Rose Creek at Station X5. Water treatment sludge (clarifier/thickener underflow) was wasted by pumping directly to the sludge disposal cells on the Original Impoundment of the RCTA (Deloitte and Touche, October 2003; CH2M, March 2012p).

The Mill WTP was operated only during the warmer months, from roughly mid-April to mid-October, depending on the year (potentially 5 to 6 months per year). The nominal design flow capacity of the existing Faro Mill WTP was given as 27 ML/d (5,000 USgpm), although the operator staff considered a flow of 22 ML/d (4,000 USgpm) to be a more accurate effective maximum.

In the Vangorda/Grum Area, sources of MIW collected for active treatment in 2011 consisted of the Vangorda Pit and the Vangorda Waste Dump seepage collection system, which was collected in Little Creek Pond and pumped to the Vangorda Pit lake. Water from Vangorda Pit was pumped directly to the Vangorda WTP for treatment. At that time, the Grum Pit lake was slowly filling and had not yet reached a level requiring discharge. Grum Pit lake water was being treated passively by nutrient addition to promote precipitation of metals by biological activity, although this treatment approach was incapable of achieving a total zinc concentration less than the discharge limit of 0.5 mg/L.

The Vangorda WTP, constructed in 1990, is a conventional lime neutralization system in which lime slurry is mixed with influent water to neutralize acidity and precipitate metals from solution. Separation of solids and liquids occurs in a lined settling pond (sludge pond), and there is no sludge recycle. Treated effluent (settling pond supernatant) from the Vangorda WTP discharges by gravity flow to the Grum Interceptor Ditch, and eventually to Vangorda Creek via the Sheep Pad Ponds (Figure 1-4). The water treatment sludge was allowed to dewater over the winter and was mechanically removed annually, and disposed of in unlined cells on the Grum Overburden Dump. The Vangorda WTP was (and still is) operated during the warm season, and has a nominal design flow rate of 11 ML/d (2,000 USgpm) (Deloitte and Touche, October 2003).

3.1.2 Current Status of Water Collection and Treatment at the FMC in 2016

The current status of water treatment at the FMC consists of the following:

- Collection, conveyance, and storage systems for MIW. These are the same as existed in 2011, except for the addition of the NFRD SIS and the new extraction well at the base of the Intermediate Dump (RGC-14-PW006), which pump water to the Faro Pit.
- An IWTS treating Faro Mine Area MIW on a seasonal basis (e.g., mid-April to mid-October), with piping for discharge of treated effluent and sludge. The IWTS was constructed to replace the existing Faro Mill WTP that was shut down because of its poor condition and safety concerns.
- A detailed (90 percent) design for an HDS WTP, referred to here as the replacement Faro WTP, that has not yet been constructed at the site
- The existing Vangorda WTP treating Vangorda Pit water, which has been in operation since 1991. Since 2013, water from Grum Pit has also been pumped to Vangorda Pit, for subsequent treatment at the Vangorda WTP.

The main activities performed by the PDT for YG, leading to the current status of water treatment at the FMC, are listed in Table 3-1. Studies related to the main water treatment activities performed by others before the PDT started work are summarized in Section 3.2. The main activities performed by the PDT, along with key reference documents, are described in Section 3.3. Apart from the activities in Section 3.3, numerous other evaluations and studies related to FMC water treatment have been performed by the PDT since 2011; these are documented in the bibliography at the end of this section.

Table 3-1. Chronology of Main Water Treatment Activities

Date(s)	Activity
March 2012	Faro Mill WTP evaluation
July-November 2012	Replacement Faro WTP pre-design activities
September 2012	Mill WTP last operated before permanent shutdown
October 2012-February 2014	Replacement Faro WTP design
July-November 2013	IWTS options evaluation
February-June 2014	IWTS design
September 2014	Partial IWTS start-up and operation
April-May through November 2015	Full IWTS start-up and operation

3.2 Summary of Background Work by Others

SRK (March 2010) assumed that the existing WTPs in both the Faro and Vangorda/Grum areas of the FMC will eventually be replaced with new WTPs more suitable for long-term operation. SRK's proposed plans and recommendations for replacement WTPs are summarized in the following subsections.

3.2.1 Faro Area Replacement Water Treatment Plant

- HDS plant with an initial capacity of 27 ML/d (5,000 USgpm)
- Future expansion of the WTP to add another estimated 27 ML/d (5,000 USgpm) when collection of contaminated groundwater from seepage below the tailings becomes necessary
- Seasonal treatment preferred – that is, operation of the new WTP for 90 to 120 days/year
- Estimates of future lime usage and sludge production provided
- Preferred WTP site – location of the former BXL site, at the east end of the RCTA
- WTP effluent discharge point – confluence of the NFRC and SFRC
- WTP sludge disposal – in Faro Pit, at the bottom of the pit lake

3.2.2 Vangorda/Grum Area Replacement Water Treatment Plant

- HDS plant with an initial capacity of 2.7 ML/d (500 USgpm) for treatment of MIW from Vangorda Pit only, assuming passive biological treatment of the Grum Pit lake via nutrient addition
- Future expansion of the WTP to add another estimated 11 ML/d (2,000 USgpm), yielding a total capacity of 13.6 ML (2,500 USgpm) if active treatment of all Vangorda and Grum Pit lake flows is required
- Seasonal treatment preferred – that is, operation of the new WTP for 30 to 60 days/year
- Estimates of future lime usage and sludge production provided
- Preferred WTP site – "somewhere between the Vangorda Pit and Vangorda Creek"
- WTP effluent discharge point – Vangorda Creek downstream of the Pit
- WTP sludge disposal – in Vangorda Pit, at the bottom of the pit lake

3.3 CH2M Work Associated with Main Water Treatment Activities

The main water treatment-related activities identified in Table 3-1 are discussed briefly in the following subsections, with citations to key reference documents produced by the PDT.

3.3.1 Existing Faro Mill Water Treatment Plant Evaluation

One of the first water treatment-related activities performed by CH2M was to evaluate the existing Faro Mill WTP and its appurtenances, to assess its ability to continue operating and providing effective treatment of MIW over the next several years.

Existing Faro Mill WTP evaluation (CH2M, March 2012p). This technical memorandum concluded that the Faro Mill WTP in operation at the time was subpar relative to typical industrial standards of operability, health and safety, and levels of corrosion. Based on the considerations of reliability,

operability, ability to meet treatment goals, and cost, it was recommended that the WTP be replaced as soon as practical.

3.3.2 Replacement Faro Water Treatment Plant Pre-design Activities

CH2M conducted a series of evaluations and studies to help establish the basis and criteria for design of a replacement Faro WTP.

Business case for WTP design capacity (CH2M, November 2012d). This document evaluated the economics of various sizing options for the proposed replacement Faro WTP. This technical memorandum recommended a design max flow of 44 ML/d (8,100 USgpm), as opposed to a smaller sizing that would require future expansion (see basis in CH2M [November 2012c]). This flow capacity would provide the lowest overall cost and the highest operational benefits, and would best serve site treatment needs initially and into the foreseeable future.

Influent characterization and plant capacity phasing (CH2M, November 2012c). This document evaluated potential flows and constituent concentrations for influent to the proposed replacement Faro WTP. The evaluation recommended the following:

- Using a design max flow of 44 ML/d (8,100 USgpm), based on the sum of (1) existing Faro Mine Area water treatment needs, (2) modeled flow from the proposed future CVD SIS, and (3) water treatment needs from the Vangorda/Grum Area (if a single WTP scenario were selected for the entire FMC).
- Using a design max influent strength equal to that of the HDS-2 pilot testing scenario (see pilot study report [CH2M, November 2012a]).
- Construction phasing as follows:
  - **Phase 1** – construct 44 ML/d HDS plant with one lime system, one 55-m-diameter thickener, and no filters
  - **Phase 2** – add filters when a new water licence is issued and if required to meet the new discharge limits
  - **Phase 3** – add required upgrades in the future based on long-term (e.g., 30+ years) of operating experience, after ARD-forming reactions have matured and their effects on MIW strength are known

One versus two plant comparison (CH2M, September 2012a). This document compared the alternative of building one new WTP in the Faro Mine Area to serve the entire FMC, coupled with a system to convey MIW to the new WTP from the Vangorda/Grum Area, with the alternative of constructing, operating, and maintaining two new WTPs, with one in each area of the complex. As reported in this technical memorandum, CH2M recommended one new WTP as the preferred alternative.

Plant siting (CH2M, November 2012b). This document compared three potential sites for construction of the replacement Faro WTP: the eastern end of the RCTA (BXL Site), southwest of the existing mill (Mill Site), and at the gravel borrow pit downstream from the CVD (Gravel Pit Site, also known as the Horse Corral). The Mill Site was recommended as the preferred alternative.

Water treatment pilot study (CH2M, November 2012a). This document describes HDS water treatment pilot testing conducted to support design of a replacement Faro WTP at the FMC. The study evaluated treatment of three different influent water qualities, intended to bracket the potential range of strengths to be treated at present and in the future:

- HDS-1 (lowest strength) – representing current influent (at the time) to the existing Faro Mill WTP, consisting of a flow-proportional blend of Faro Pit, ID Pond, and ETA waters

- HDS-2 (intermediate strength) – water strength about half-way between that of HDS-1 and HDS-3, consisting of a blend of Faro Pit, Vangorda Pit, and ETA waters.
- HDS-3 (highest strength) – intended to represent the potential maximum strength (in terms of lime demand, solids formed, sulphate, and metals) of influent water to be treated in the future, consisting of water from the ETA (one of the strongest sources on the FMC)

The pilot study results were used to evaluate achievable water quality and sludge quality and develop recommended design and operating data to support full-scale WTP design.

3.3.3 Shutdown of Existing Faro Mill Water Treatment Plant

The existing Faro Mill WTP was last operated during the 2012 treatment season and was shut down at the end of the season, in September of that year. It was not restarted in the spring of 2013 and was permanently shut down because of health and safety and other operational issues. Consequently, starting in spring 2013, all contaminated water collected in the Rose Creek watershed was pumped to Faro Pit for storage until another treatment system could be implemented.

3.3.4 Replacement Water Treatment Plant Detailed Design

The replacement Faro WTP was designed to be a lime HDS plant with a rated treatment capacity of 44 ML/d (8,100 USgpm), a total hydraulic capacity of 55 ML/d (10,100 USgpm), and located southwest of the old Faro Mill (Figure 3-1). It was designed on the basis of initially treating waters from the Faro Pit, ID Pond, and ETA. The principal design components of the replacement Faro WTP are as follows (Figure 3-2):

- Two-stage neutralization/oxidation reactor (Reactors B1 and B2)
- 55-m-diameter thickener with a dome cover
- Sludge recycling and wasting system (pumps and piping)
- Small sludge-lime contact reactor (Reactor A)
- Lime system (lime silo, slaker, slurry tank, and feed pumps/piping)
- Polymer flocculant system (storage, tanks, and feed pumps/piping)
- Aeration blowers
- Instrumentation and controls

The replacement Faro WTP has been designed to be able to operate year-round, with a design low temperature of -47°C. Treated effluent would discharge by gravity flow via a new pipeline that connects with the existing discharge pipeline to the CVD Pond or downstream to Rose Creek. Waste sludge would be pumped to the Faro Pit for disposal. The influent, effluent, and sludge pipelines would need to be winterized to allow winter operation. The plant is designed to accommodate future upgrades and expansion, such as addition of filters or inclusion of additional influent flows from new sources.

Detailed design of the replacement Faro WTP was performed in four phases: project design definition, schematic design, advanced design (sometimes called design development), and detailed design (sometimes called contract documents). All four of these phases have been completed:

Faro WTP design definition report (CH2M, January 2013c). This report summarized the key findings of the previous five pre-design documents, and established the process design basis.

Faro WTP schematic design report (CH2M, September 2013h). The schematic design phase continues development of the design and includes the design basis for all engineering disciplines, a partial set of preliminary drawings, and lists for drawings, specifications, equipment, and piping. This technical memorandum summarized key elements of the replacement Faro WTP design through the second phase (Schematic Design).

Faro WTP advanced design summary (CH2M, October 2013d). The advanced design phase continues development of design detail from the schematic design, and includes a revised drawings set and draft specifications. This technical memorandum summarized (1) key elements of the replacement Faro WTP design through the third phase (advanced design) and (2) issues to be addressed in the fourth design phase (detailed design).

The detailed design phase advances the design to the approximately 90 percent complete level. The following key documents are associated with the replacement Faro WTP detailed design:

- **Faro WTP detailed design summary** (CH2M, February 2014a). This technical memorandum identifies the detailed design deliverables and key design features.
- **Faro WTP detailed design drawings** (CH2M, February 2014b).
- **Faro WTP detailed design specifications** (CH2M, February 2014c).
- **Faro WTP class 2 capital cost estimate** (CH2M, February 2014o).

Other important documents pertaining to the replacement Faro WTP design include the following:

Faro WTP value engineering study (CH2M, May 2013a). This report presents the results of a value engineering (VE) study conducted after the draft schematic design, as well as a technical memorandum describing the design team's response to the VE recommendations. The VE study recommendations accepted by the design team were incorporated into the WTP detailed design. The alternatives retained after screening and proposed in the VE study, along with design team responses, were as follows:

1. Establish a fixed design life for the WTP. *Design team response: Accepted recommended design life of 100 years for structures, while mechanical and electrical equipment life may be 15 to 25 years because of wear.*
2. Extend the annual operation duration of the WTP (with a commensurate decrease in the WTP capacity). *Design team response: Accepted – winterization of the WTP to allow an extended annual operation could potentially allow reducing the nominal treatment capacity to 33 ML/d (6,000 USgpm) and a maximum hydraulic capacity of 41 ML/d (7,400 USgpm).*
3. Extend the tunnel to eliminate confined space and consider using "DuroMaxx" pipe. *Design team response: Accepted with modifications. Accept the VE proposal to extend the thickener underflow (pipe) tunnel to create a second entry and eliminate the confined space classification, but reject the use of DuroMaxx pipe in favor of regular cast-in-place concrete.*
4. Consider using wall insulation R-30 rather than R-20. *Design team response: Accepted.*
5. Include an electrical/maintenance shop and warehouse. *Design team response: Accepted, with modifications.*
6. Include a weigh scale for lime trucks. *Design team response: Accepted.*
7. Have windows in the process area. *Design team response: Accepted.*

Evaluation of Faro WTP sizing and water quality in Rose Creek at Monitoring Station X14 (CH2M, June 2013b). In response to the VE study recommendation to extend the annual operation duration of the WTP, this technical memorandum evaluated the potential effects on water quality at Rose Creek Monitoring Station X14 of building a WTP with a nominal treatment capacity of 33 ML/d (6,000 USgpm) versus 44 ML/d (8,100 USgpm). A variety of scenarios were evaluated using the site-wide water quality GoldSim model. An important factor affecting X14 water quality is the lower flows in Rose Creek during

the winter months, resulting in less clean dilution water. The following recommendations resulted from the analyses:

- A replacement Faro WTP capacity of 44 ML/d (8,100 USgpm) was recommended to allow greater flexibility and performance and eliminate the need to rely on the CVD Pond for flow equalization.
- Winterization of the replacement Faro WTP was recommended to allow operation for more than 5 months of the year, as may be required because of climate change-induced higher flows.
- Addition of filters to the replacement Faro WTP was recommended before incorporation of treatment of additional flows, such as those from the CVD SIS and the Vangorda/Grum Area.

The flow rate and winterization recommendations from this study were incorporated into the WTP detailed design; filters are recommended for future implementation.

Deferral of replacement Faro WTP construction (CH2M, October 2013j). This technical memorandum documents the decision of YG to defer construction of the replacement Faro WTP until after completion of the FMRP YESAA and permitting processes. These processes were expected to require through summer 2019 to complete, suggesting that replacement WTP construction might not begin until the 2020 season (i.e., a 5-year delay relative to the planned schedule). This technical memorandum also discusses the potential effects on related tasks and activities associated with replacement Faro WTP design, planning, procurement, and contracting.

3.3.5 Interim Water Treatment System Options Evaluation

After the Mill WTP shutdown, MIW was stored in Faro Pit. However, the storage capacity of Faro Pit is limited, and a means of treating MIW was needed for the interim period until the replacement Faro WTP could be constructed and commissioned. At the time, the replacement Faro WTP was scheduled to be operational in 2017, but, as mentioned above, this has been deferred.

Options analysis for Interim Treatment (CH2M, July 2013c). This technical memorandum screened process options and developed and analyzed collection and treatment alternatives for treating Faro Mine Area MIW during the period after shutdown of the Mill WTP and before construction of the replacement Faro WTP. Alternative MILL-2, consisting of an interim WTP in the mill area, was recommended if treatment effectiveness and sludge management were the overriding considerations (other alternatives were recommended if schedule and/or cost were the primary considerations).

Evaluation and recommendation of interim modular WTP (CH2M, September 2013e). This technical memorandum reported that the interim treatment alternative preferred by YG and INAC involved the use of a modular, lime-neutralization IWTS sized for up to 33 ML/d (6,000 USgpm) located in the Faro Mill yard. This technical memorandum evaluated proposals for two potentially suitable treatment processes: a system using a microsand-ballasted, high-rate clarification process for solids/liquid separation (marketed as ACTIFLO®) proposed by Veolia Water Systems (VWS), and a system using a more conventional lamella clarifier for solids/liquid separation proposed by WesTech. The VWS ACTIFLO® system was recommended, principally because of schedule and implementability considerations.

3.3.6 Interim Water Treatment System Design

The IWTS was designed for a rated treatment capacity of about 33 ML/d (6,000 USgpm), for treatment of MIW from the Faro Pit, ID Pond, and ETA, located immediately south of the existing Faro Mill WTP building on the former concentrate loadout foundation. The principal components of the IWTS are (1) a break tank where the influent streams are combined and (2) two parallel treatment trains consisting of a two-stage contact reactor (Stages #1 and #2), followed by an ACTIFLO® clarifier (including the combined lamella/conventional gravity clarifier vessel, and microsand separation and makeup systems), and two

sludge tanks in series. Additional equipment includes sludge recycling and wasting pumps, air blowers for aeration of the Stage #1 contact tanks, a lime system consisting of a portable silo (Pony Express™) and a portable slaker (PortaBatch®), a polymer flocculant system, and instrumentation and controls. Treated effluent discharges, by gravity flow, via a new pipeline section that connects to the pre-existing discharge pipeline to the CVD Pond or bypasses the CVD Pond to the NWID. Waste sludge is pumped through a new section of pipeline that connects to the existing sludge discharge pipeline that discharges into the tailings area sludge impoundments.

IWTS laboratory study report (included as part of Attachment A in CH2M, September 2014). This report presents the results of lab testing conducted by VWS on FMC waters to evaluate performance and reagent requirements for their ACTIFLO® system.

IWTS Package 2 basis of design (CH2M, February 2014d). This technical memorandum represents the basis of design for Package 2 of the IWTS. The Package 1 scope, completed by VWS, comprised design, procurement, and construction of the IWTS, including a pre-engineered, fabric-style, insulated and heated building to house the treatment system (Package 1 as-built drawings and supporting information can be found in the O&M manual described in Section 3.3.7). The scope of Package 2, completed by CH2M, consisted of design, procurement, and construction of infrastructure improvements to integrate the VWS system into the FMC; that is, all work associated with the IWTS other than Package 1.

IWTS Package 2 design drawings and specifications (CH2M, May 2014a, May 2014b, June 2014a, June 2014b). These design documents are divided into 2A (civil/site prep) and 2B (mechanical and electrical).

3.3.7 Interim Water Treatment System Startup and Operation

Following construction of the Faro IWTS, the system was partially started up and operated in September 2014. It was fully commissioned in April and May 2015, and performance testing and handover from CH2M to YG occurred in May 2015.

IWTS startup, commissioning, and performance testing plan (CH2M, September 2014). This technical memorandum describes startup, commissioning, and performance testing procedures for the IWTS. Attachments to this document include the IWTS performance guarantee from VWS, the VWS lab study report, the VWS startup protocol for the IWTS, and performance testing requirements.

IWTS O&M manual (VWS, July 2015a, b, c). This is the three-volume O&M manual for the Faro IWTS. As-built IWTS design drawings (Package 1) are included.

IWTS substantial completion (CH2M, June 2015). This memorandum documents conclusion of the substantial completion requirements and handover of the IWTS from CH2M to YG. Attachments include IWTS process and instrumentation diagrams (Revision 9), an inspection deficiencies summary, training records, commissioning checklist, and an email documenting the IWTS substantial completion inspection.

IWTS performance test report (VWS, July 2015d). Following full startup and commissioning of the IWTS, performance testing was conducted from May 1 through 15, 2015, to demonstrate compliance with the requirements of the performance guarantee. This report documents the performance test results.

IWTS lime system cost-benefit analysis (CH2M, November 2015c). This technical memorandum evaluates options for replacement of the portable lime system currently used for the IWTS with a more satisfactory lime system suitable for longer term use (i.e., 10 to 15 years). Of the four options analyzed based on cost, durability, reliability, operability, and capacity, a pre-fabricated silo quicklime slaking system was recommended.

Final inspection of the IWTS and acceptance by YG occurred in January 2016.

3.3.8 Outstanding Issues and Recommendations

The most significant outstanding item is the nearly complete replacement Faro WTP design. The replacement Faro WTP design has been developed through Detailed Design, which is considered to be approximately 90 percent complete. Other outstanding issues related to water treatment are listed below.

- **Ongoing CVD Pond water quality issues**. YG used portable filter trailers in 2013 and 2014 for polishing CVD Pond water to meet TSS discharge limits, and are currently preparing to add caustic (sodium hydroxide) to the pond. The objective is to increase pH and keep ferrous iron in a precipitated state.
- **Water conveyance inventory**. A FMC-wide water conveyance pipeline survey and inventory was recently conducted, and the results are documented in a technical memorandum and integrated into the project GIS webviewer (CH2M, March 2016c).
- **Replacement Faro WTP siting**. Siting for the replacement Faro WTP was recently re-evaluated (CH2M, April 2016a). This technical memorandum, which is included as Appendix I, considered two possible WTP locations –the Mill Area and the Gravel Pit (also known as the Horse Corral) – along with seasonal (5-month) versus year-round WTP operation. This re-evaluation was prompted by the considerably greater volume of water now projected for treatment compared with the amount estimated when the earlier siting study was performed (CH2M, November 2012b). The upward revision of the projected flow is caused by the higher flow now estimated (via modelling) for the future CVD SIS, as well as the addition of new sources not known at the time of the earlier study (the NFRC Seepage Collection Pond, and the potential treatment of water from the CVD Pond). This substantial increase in the projected flow to the replacement Faro WTP makes a low-elevation location near the future CVD SIS more attractive, considering long-term pumping costs. This technical memorandum concluded that the Gravel Pit site is the more cost-effective location for both seasonal and year-round WTP operation, and that year-round treatment would be more cost-effective than pumping water to Faro Pit for seasonal treatment. Consequently, the Gravel Pit site was recommended for the replacement Faro WTP.
- **New NFRC seepage collection dam**. A new seepage collection dam has been designed for the NFRC upstream of the Mine Access Road (CH2M, March 2016b). When implemented, that system will generate a new source of seepage/stormwater that will require treatment.

3.4 Crosswalk with Identified Data Gaps

As described in Section 2.3, one of the first activities conducted by CH2M after coming under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this review, CH2M recommended the necessary field investigations to support preparation of a YESAA Project Proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c and 2012d) and revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2013 Gaps Report were addressed or not during the conduct of CH2M's contract for closure planning work at the FMRP (crosswalk tables are included in Appendix B). Data gaps identified for the water treatment included the following:

- Availability and suitability of onsite borrow for backfill and concrete aggregate
- Discharge limits for treated water including sulphate/TDS
- Performance of new WTP in comparison to potential new discharge requirements, and filter system design and operating parameters

- Need for sulphide addition, nanofiltration (NF) and reverse osmosis (RO), or other advanced water treatment process to meet discharge limits
- Potential for precipitate formation and scaling in water collection and conveyance pipelines, and design features needed to mitigate problems from precipitation and scaling
- Quantity requirements and capacities for water and sludge storage in Faro Pit
- Geochemical stability of sludge deposited in Faro Pit

Section 2.7.2 describes studies conducted to evaluate available borrow material sources at the FMC. Section 11 describes efforts aimed at evaluating regulatory issues and requirements, including permitting (e.g., water licenses). Bill Slater evaluated water quality targets for assessing WTP performance (CH2M, June 2013d). Section 3.3.2 describes water treatment pilot testing and other work done to evaluate Permanent WTP design criteria. The pilot study evaluated WTP treatment performance, process options (such as sulphide addition), filtration performance requirements, and scaling potential, for a wide range of influent water qualities. The pilot study also determined sludge production (density and quantity) for the different water qualities tested. The actual sludge disposal quantity and volume will be a function of the flow of water treated, the solids formed from the influent water, and the final solids density (e.g., percent solids) of the sludge discharged to the pit. Construction of the replacement WTP has been deferred until a later date, so no evaluation of treatment performance by the permanent system has been possible, although the IWTS now provides full-scale seasonal treatment of Faro area water. Testing to evaluate the geochemical stability of WTP sludge in Faro Pit was not conducted. The geochemical stability of sludge deposited in Faro Pit should be evaluate through a combination of modelling and testing, but this is best done once the specific chemical make-up of the sludge and water chemistry of the pit hypolimnion are known (e.g, when newly identified MIW water sources are collected and the replacement WTP is constructed and in operation). Section 2.8.5 describes geochemical characterization work conducted for different RUs at the FMC, including the Faro Pit.

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SECTION 4

Perimeter Reclamation Unit

4.1 Introduction

This section describes the work conducted by CH2M to advance the understanding of site conditions at the Perimeter RU and provides a summary of initial closure planning activities. This section includes a summary of (1) key background documents that describe baseline conditions and pre-2011 closure planning studies, (2) field investigations and analyses conducted within the Perimeter RU, (3) modelling efforts related to the Perimeter RU, and (4) initial closure planning activities.

Figure 1-5 shows a plan view of the Faro Mine Area, and indicates the general boundaries and features of the Perimeter RU. The Perimeter RU consists of the "clean water boundaries" of the Faro Mine Area, including the creeks and diversion channels that route surface water around the mine workings, waste rock dumps, and tailings facilities. The following surface water features are present within the Perimeter RU:

- FCD: constructed channel that routes Faro Creek east around Faro Pit, discharging to the NFRC.
- WVID: constructed ditch that captures drainage from the western slope of the Faro Creek valley and directs flows northeast to the FCD.
- UGC: natural creek that flows south along the western perimeter of the Faro Mine Area. The creek originally discharged through Lower Guardhouse Creek to Rose Creek in an area that is presently covered by the intermediate tailings impoundment.
- NWID: constructed diversion that redirects flows from UGC west, across the northern slope of the Rose Creek Valley, into Rose Creek downstream of the CVD.
- NFRC: natural creek that flows southwest along the eastern perimeter of the Faro Mine Area. (The design of the NFRC Realignment Project is currently in progress. As noted in Section 1.1.3, CH2M's work associated with the NFRC is not included in this report because the NFRC Design Basis Report provides a comprehensive summary of the NFRC work.)
- SFRC: natural creek that drains the area southeast of the Faro Mine Area and flows northwest along the southern perimeter of the Faro Mine Area.
- Pump House Pond: pond constructed downstream of the confluence of the NFRC and SFRC to provide process water for mine operations.
- RCD: constructed diversion that directs discharge from the Pump House Pond and the existing Lower North Fork of the RCD (downstream of the Mine Access Road) around the southern perimeter of the RCTA.

Work completed by CH2M to advance the design of the NFRC Realignment Project is summarized and described in the NFRC DBR (CH2M, March 2016b). Work completed to advance remediation design related to the RCD is summarized and described in Section 8 as a component of the DVIHU project. Discussions relative to Lower Guardhouse Creek are included in Section 7, Mill Building Area and ETA RU, as it is a contaminated water diversion originating in the northern portion of this RU and does not form a clean water boundary to the site.

The main activities performed by CH2M related to the FCD and WVID, UGC, and NWID are listed in the timeline presented in Table 4-1. Perimeter RU information and closure planning performed by others before CH2M started work are summarized in Section 4.2. Key CH2M activities, along with key reference documents, are described in Section 4.3.

Table 4-1. Chronology of Perimeter RU Project Activities
Faro Mine Remediation Project

Date(s)	Activity
February 2012	Initial Data Gaps Assessment (revised Data Gaps Assessment in September 2013)
September 2012	Preparation of CSM Report (CH2M, September 2012)
Fiscal Year 2012 to present	Perimeter RU--related field investigations, data gathering, monitoring, and reporting. See Appendix B for listing of investigations specific to this RU.
Early 2012 to March 2014	Development of MTP and IWPP: reprioritized RPP work, with Interim Works projects now the highest priority; RPP field programs to fill data gaps continued at a decreased level
March 2015	Development of Alternatives Status Summary Report

4.2 Summary of Background Work by Others

Multiple prior studies have been conducted related to the FCD, WVID, UGC, and NWID components of the Perimeter RU. This section describes key background documents related to site conditions and closure planning for these areas that were prepared before CH2M coming under contract to YG.

4.2.1 Faro Creek Diversion, West Valley Interceptor, and Faro Pit Slope Stability

Down Valley Tailings Containment Project 1980-1981 Construction (Golder, February 1982): According to the Golder Associates (Golder) construction report, the upper portion of the NWID was constructed to contain the 1-in-50-year design flood of 8.9 m^3/sec.

Integrated Comprehensive Abandonment Plan (RGC, November 1996): The ICAP represents the first integrated evaluation and assessment of closure requirements and issues pertaining to the FMC. With respect to the FCD and WVID, the ICAP report summarized the following:

- The FCD is unlined and is known to leak. Estimated leakage along the entire length of the FCD is 40 L/s, with leakage along the upper reach into Faro Pit from approximately 22.5 L/s to 25 L/s.
- The design capacities of the FCD is not known. The capacity of the FCD is considered inadequate for long-term closure.
- Some mine rock used in construction of the upstream reaches of the diversion show iron oxide staining and is suspected to be a source of metal loading detected in surface water samples in the Faro Creek valley.
- There is concern that the scarp of the Faro Pit east wall might progress further upslope, undercutting the FCD.
- A requirement was identified for maintaining flood contingency storage volume in Faro Pit to accommodate short-term flows from the FCD if the diversion were to fail.

The following closure options for the FCD and WVID were identified and evaluated:

- Upgrade the FCD for a 1-in-500-year flood capacity. Maintain sufficient reserve storage capacity in Faro Pit to store the volume of water associated with a 7-day probable maximum flood (PMF) and 3 months of average discharge volume from the FCD. Evaluate the necessity of relocating the channel in the area of the northeastern pit wall instability after the Faro Pit has flooded and tailings deposited in the pit are buttressed against the base of the pit wall instability. Evaluate need to upgrade the WVID for a 1-in-500-year flood capacity after Faro Pit has flooded.

- Re-establish Faro Creek flow through Faro Pit under a “Flow through Pit” closure alternative. Maintain existing diversion until pit water quality improves to meet discharge water quality, then relocate the FCD along the western side of the Faro Creek valley, discharging to Faro Pit at the northern wall of the pit.

Faro Creek Diversion Rehabilitation – Technical Input (BGC, June 2002): In 2002, BGC issued a memorandum to Deloitte and Touche, that outlined the rehabilitation actions expected to occur (BGC, June 2002), as follows:

- Construct a pilot channel in the FCD through placement of local fill.
- Place two different types of geosynthetic liners between the fill and the upper riprap layer.
- Line the majority of the channel with a geotextile for separation and line the remainder of the channel with a geosynthetic clay liner to provide separation and act as a barrier to seepage.
- Place riprap, nominal 6-inch diameter, on the surface of the pilot channel fill.

BGC provided an informal ’technical commentary’ on the proposed designs of the pilot channel and provided recommendations on the types of geotextiles to be used and estimated of the required volumes of materials.

In that same year, BGC issued a memorandum estimating the required upgrades to the FCD, in order to handle the design flood considerations of a 1-in-500-year flood, a flood condition equal to half of the PMF, and the PMF. The corresponding design flows are 27, 75, and 150 m^3/sec, respectively. It was found that the channel section itself would handle the volume of water associated with those events. However, it would require the following upgrade: stabilizing the zones of sloughing, lining the channel to control seepage, and lining the channel with rip-rap to handle seepage velocities within the channel during extreme flow events.

In 2003, remedial works were completed on the FCD, which involved lining approximately 2,300 m of the diversion channel with a combination of Bentomat® clay liner and overlying protection with 100- to 300-mm riprap applied on the channel surface. The channel geometry changed as a result of this remediation, the access road between the ditch and the pit crest was adjusted and a safety berm was constructed between the northern crest of the east wall and the road (Golder, February 2004). No formal construction record reports were produced or issued, so the details regarding the location, placement, and volume of materials and the extents of the rehabilitation are largely unknown.

Detailed Comparison of Alternatives for the Relocation of the Faro Creek Diversion (Golder, February 2004): This report presents the results of a study completed from 2002 to 2003 to compare two alternatives for relocating the FCD and WVID. The following two alternatives were compared on the basis of long-term seismic and geotechnical stability, flood flow capacity, low flow ice damming potential, leakage, water quality, maintenance and monitoring needs, and cost:

- Relocate the diversion to an alignment along the western side of the Faro Creek valley to route flows west around Faro Pit, discharging into the existing UGC and NWID.
- Relocate the diversion upslope of the existing FCD, while maintaining flow direction so discharge would be into the existing FCD east of Faro Pit.

A field investigation was completed in June 2003 to support the comparison. The investigation included (1) excavation of 29 test pits along two alternate diversion alignments and (2) geological reconnaissance of UGC and the NWID. Refusal was met in shallow (1 to 3 mbgs) permafrost in 22 of the test pits. The preferred closure alternative recommended by Golder following the study was to relocate the diversion upslope of the existing FCD alignment.

This report also included an evaluation of the stability of the northeastern wall of the Faro Pit, to better understand the failure mechanism and estimate the failure rate. The evaluation included review of reports from during pit operation, review of aerial photographs, and a field reconnaissance completed in 2002. Two areas of large-scale pit slope failures were identified; Golder refers to these slope failures as the "North Instability" and "South Instability" zones. During active mining, the instability occurred as the result of planar failure along a foliation that was exposed and undercut by the bench faces on the pit wall. The foliation dips towards the west, into the pit, at an inclination of approximately 20 to 40 degrees. Golder reports that since cessation of mining activities, the east wall has continued to exhibit ongoing creep as the result of planar failure along the foliation and erosion and raveling caused by seepage emanating from the overburden/bedrock contact at the slope crest. It was concluded that the long-term creep instability was likely to continue to develop, and would eventually progress beyond the existing FCD alignment. Regression rates were estimated at approximately 1 m per year.

Faro Mine Complex Final Closure and Remediation Plan Project Description – Draft 4A (SRK, March 2010a): This report describes preferred closure options selected for the FMC and emphasized a number of information gaps and outstanding decisions for the closure project description to be finalized. The report noted that the document should be considered a work in progress, intended to be updated as decisions are made and technical data are made available. For the FCD and WVID, the report recommended constructing a new diversion channel upslope of the existing FCD and WVID, which would discharge into the existing FCD east of Faro Pit. Plan and profile concepts and general design specifications for the replacement diversion were presented. General design specifications included the following:

- Capacity to convey a 1-in-500-year flow event
- Emergency overflow system to direct PMF to Faro Pit
- Placement and compaction of a thermal protection blanket on exposed slope areas
- Installation of a geosynthetic clay liner topped with riprap

2010 Faro Pit Slope Stability Monitoring Data Review (Golder, February 2011; Golder, February 2013; and Golder, December 2014): Golder reported that little change occurred in the slopes between 2006 and 2014, based on observations and periodic surveys of monitoring pins, except for some retreat at the steep crest of the pit wall. It was noted that the crest recession was evolving at a much slower rate than originally anticipated in the report discussed in Section 4.2.1.2 (Golder, February 2004). Per Golder, the slopes within the instability zones appeared to have reached a condition of equilibrium for the overall failure, with only localized sloughing or ravelling occurring in the oversteepened head scarp areas within the overburden soil. Measurements from three monitoring pins recorded in 2014 indicate possible accelerated displacement (Golder, December 2014).

4.2.2 Upper Guardhouse Creek and North Wall Interceptor Ditch Information

Final Design Recommendations of the Down Valley Tailings Disposal Project, Faro, Yukon (Golder, June 1980): This report presents a design for the construction of the ID, CVD, Lower RCD, and NWID. With respect to the NWID, the report provided the following design information:

- Channel profile and hydraulic cross section designs based on a 1-in-50-year return period flow capacity
- Design for diversion structures to transfer flows westward across the northern valley wall from existing creek to existing creek
- Design for gravel blanket to protect permafrost in the deep cut required at the confluence with the CVD spillway

A Report to Cyprus Anvil Mining Summarizing the Down Valley Tailings Containment Project 1980-1981 Construction, Faro Yukon Territory (Golder, February 1982): This report summarized the construction of the Down Valley Tailings project between 1980 and 1981. The report described

construction of three ditch segments joined by natural creek beds, comprising the NWID. The construction of each segment is summarized as follows:

- The Mine leg is a ditch extending west from UGC. This segment was designed to contain a 1-in-50-year design flood of 8.9 m^3/sec. It was excavated in native till and alluvium primarily using dozers and scrapers, with some drilling and blasting required.
- The Borrow Area F segment is a ditch formed from a constructed dyke and the prepared, stripped surface of Borrow Area F. A 0.3-m fill blanket was placed over the stripped poor quality bedrock surface before a dyke was constructed from compacted Class VI/Class VII material. The channel was designed to carry over 12.4 m^3/sec with freeboard of 0.5 m. Riprap was placed on the dyke face and across the bottom of the ditch outlet. The right bank of the ditch was cut into bedrock.
- The North Abutment CVD segment ditch was constructed by excavating a channel into the northern abutment of the CVD. A seepage blanket was installed across the base of the excavation and a thermal liner was installed to the top of the hydraulic section. The channel was armoured with Class IV riprap.

Integrated Comprehensive Abandonment Plan (RGC, November 1996): With respect to the NWID, the ICAP report noted surface water quality showed some evidence of contaminant loading from the Upper Northwest WRD, which extends into UGC. One closure option for the NWID was identified as part of a closure alternative for the RCTA that involved partially relocating tailings to Faro Pit and establishing a water cover over the remaining tailings. Under this alternative, the NWID would be abandoned and the flow returned to its original channel (Lower Guardhouse Creek).

Faro Mine Complex Final Closure and Remediation Plan Project Description – Draft 4A (SRK, March 2010a): For the NWID, the report recommended constructing minor upgrades. General design specifications included the following:

- Clean out the existing ditch.
- Upgrade discharge location below the CVD.
- Construct a maintenance access road along the channel alignment.

4.3 Investigations and Studies Conducted by CH2M

4.3.1 Gaps Assessment

As described in Section 2.3, one of the first activities conducted by CH2M after coming under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this review, CH2M recommended the necessary field investigations to support preparation of a YESAA Project Proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c) and a revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2013 Gaps Report were addressed or not during the conduct of CH2M's contract for closure planning work at the FMRP (crosswalk tables are included in Appendix B). Data gaps identified for the FCD (including those related to the stability of the east wall in Faro Pit), WVID, and NWID included the following:

- Faro Pit Wall Stability: Technical uncertainties existed relative to the long-term stability of the pit walls and long-term management requirements, especially for the North Instability area, which is in close proximity to the FCD and its access road.
- FCD and WVID: Technical uncertainties existed concerning ground conditions and permafrost distribution along the alternate channel alignments, and channel seepage losses, water quality, and groundwater/surface water interaction in the existing diversion.

- UGC and NWID: Technical uncertainties existed concerning ground conditions, permafrost distribution, seepage losses, groundwater/surface water interaction, water quality, and hydraulics in the existing creek and diversion.

The following sections describe studies conducted by CH2M to address these data gaps.

4.3.2 Conceptual Site Model

As described in Section 2.2, the CSM report (CH2M, August 2012a) summarizes hydrologic, hydrogeologic, and geochemical processes that drive water and contaminant movement at the site, the physical and chemical properties of the subsurface environment, and the rates and volumes of water movement through the physical system. Relative to the FCD, WVID, and NWID, this report describes regional and local hydrology and hydrogeology and delineates catchment areas, provides estimated catchment runoff quantities and estimated 1-in-100-year floods.

4.3.3 Perimeter Unit-related Field Investigations and Data Gathering

Section 2.4 provides a summary of site-wide field investigations conducted by CH2M since 2012. Appendix C includes a tabular summary of field investigation programs organized by fiscal year from 2012 through 2016. The Appendix C summary tables (Tables C-1 through C-4) describe the area of the site investigated, purpose of the field program, and types of work conducted, and provide report citations for the applicable data/analysis report.

CH2M conducted the following Perimeter RU-related field investigations and monitoring programs:

- 2013 Faro Pit Stability Field Reconnaissance (see Section 4.3.4) (CH2M, March 2014q)
- 2014 Field Reconnaissance of FCD, WVID, and SRK 2010 Draft 4A proposed diversion alignment and survey of 20 channel cross sections in the existing diversions (CH2M, March 2015i)
- 2014 Field Reconnaissance of NWID, excavation of 5 test pits in the upper reach of the NWID and survey of 5 channel cross sections (CH2M, March 2015j)
- 2015 Rapid Geomorphic Assessment, Terrain Hazard Analysis, and survey of additional channel cross sections at the FCD, WVID, and NWID (Appendix E)
- 2015 Faro Pit Stability Investigation (see Section 4.3.5) (BGC, March 2016)
- 2015 Faro Valley Seepage Characterization Investigation (CH2M, March 2016d)
- 2016 Faro Creek Diversion Proposed Realignment Investigation (CH2M, August 2016a)

4.3.4 Faro Pit Wall Stability

Faro Mine Complex 2013 Pit Wall Stability Inspection. (CH2M, March 2014q): This report documents field observations made by CH2M during reconnaissance of the Faro Pit. CH2M compared the 2013 conditions with previous photographs by Golder to evaluate whether the slope failures had displaced further. Crest recession was evaluated by measuring the reference bars that are installed along the crest of the slope failures and comparing these with previous measurements. Limited rock discontinuity mapping was also conducted during the 2013 field reconnaissance. The purpose of this mapping was to provide a general sense of strike and dip of discontinuities that are adversely oriented towards the pit slope, potential failure mechanisms, and potential for future failure geometry based on slope angles and rock discontinuities. The general failure plane was fairly consistent overall and comprised mainly the westerly dipping foliations and fractures in the rock mass, which formed a planar rock failure. Steep, unstable slopes prevented a majority of the slide from being accessible; therefore, the discontinuity mapping was limited to localized areas. The report also provided qualitative opinions of the consequences of additional slope instability or failure based on visual site observations and engineering

judgment. Damage to the FCD and access road was identified as a potential concern that could occur as a result of progressive raveling, erosion, and sloughing of the steep head scarp areas of the North Instability zone. CH2M estimated that if the crest continues to retreat at the rates observed to date, the embankment at this location could become undermined in approximately 15 years, or sooner if unusually heavy precipitation, snowmelt, or diversion of increased runoff to the area occurs. The report also provided recommendations to continue monitoring, conduct periodic visual inspections, conduct a detailed slope stability analysis, and grade the access road to control and redirect drainage away from the slope crest as much as possible.

4.3.5 2015 Faro Pit Stability Investigation

Faro Open Pit Stability Assessment, Site-wide Design Basis Report. (BGC, March 2016): CH2M retained BGC to support the development and execution of this investigation. This report summarizes an investigation of the stability of the eastern wall of the Faro Pit, which included a literature review and a field investigation, and provides concept design recommendations for realignment of the FCD. The field investigation included drilling two deep borings into bedrock (approximately 150 mbgs) above the east wall of Faro Pit (one above each of the northern and southern instability zones), completing downhole acoustic and optical televiewer monitoring to characterize bedrock jointing, and installing slope inclinometer casings and vibrating wire piezometers. In addition, two standpipe piezometers were installed adjacent to the slope inclinometer locations, with screens set at the overburden and bedrock point of contact. The report also includes a schedule for monitoring of the slope inclinometers and piezometers, as well as continued monitoring of the existing survey prisms. These instruments are intended to be monitored over the course of a year and together with continued prism and crest regression monitoring, an assessment of the stability of the east wall can be made. Preliminary conclusions from the investigation include the following:

- The overall stability of the eastern wall of the Faro Pit has improved significantly since mining operations ceased.
- The risk of a large failure that could impact the FCD is considered low.
- Local crest regression caused by seepage emerging from the overburden-bedrock contact continues, and if left unmitigated, can be expected to eventually breach the FCD.

A localized realignment of the FCD around the northern instability zone was recommended as a design concept that would result in less area of surface runoff between the FCD and the Faro Pit, and would be shorter than the full East Interceptor option presented by SRK (2003) and Golder (2004). The design entails offsetting the FCD horizontally away from the pit crest in the vicinity of the northern instability such that the channel is cut into the bedrock surface (that is, similar to TA-02 described in Section 4.3.7). Conceptually, the local realigned channel would intercept the seepage that presently perpetuates the northern instability crest regression.

4.3.6 Perimeter Unit-related Modelling

Surface water modelling conducted by CH2M for the FMRP are described in Sections 2.5 and 2.7. Hydrological analyses related to the FCD, WVID, UGC, and NWID were limited to catchment delineation and calculation of peak instantaneous flow rate using the regional analysis prepared by CH2M (CH2M, March 2016b).

Hydrological and hydraulic analyses related to the NFRC and SFRC are described in the *Preliminary Final North Fork of Rose Creek Project Design Basis Report, Faro Mine Remediation Project* (CH2M, March 2016b). The analyses include development of peak flow estimates and runoff volumes for events ranging from the 1-in-2-year event to the PMF event. A hydraulic model of the NFRC from above the confluence with the FCD to the upstream end of the RCD was developed as also described in the Design Basis Report.

Hydrological and hydraulic analyses related to the RCD are detailed in *Task Authorization 016 Down Valley Interim Hydraulic Upgrades Phase 2 – Basis of Design Report* (CH2M, March 2014l). The analyses include development of flow estimates, analysis of attenuation impacts from the Haul Road, and hydraulic modelling of the RCD and adjacent tailings area. Peak flow estimates were updated in *Down Valley Interim Hydraulic Upgrades – Updated Rose Creek Tailings Area Peak Flow Estimate* (CH2M, February 2016a).

The Fiscal Year 2012 Water Modelling Analysis Report (CH2M, March 2013s) includes a description of development and preliminary calibration of a hydrological model of the FMC. The objective of this model was to develop a better understanding of the FMC hydrological characteristics and to support FMC future design and investigation activities. Locations of interest for model calibration included the NFRC as well as Rose Creek downstream of the FMC. This report summarizes meteorological and flow data available during development of the model as well as preliminary observations of rainfall-runoff and snowmelt processes within the Rose Creek catchment.

The calibrated transient groundwater flow model (CH2M, March 2016f) and Appendix D provide estimates of groundwater/surface water interaction for WVID, FCD, UGC and NWID.

4.3.7 Remediation Alternatives and Status

4.3.7.1 Alternatives Summary Status Report

The *Draft Alternative Development Status Report* (CH2M, March 2015ff) provides a snapshot of work completed through February 6, 2015, to develop conceptual approaches for remediation closure options. The focus of CH2M's work with respect to the FCD, WVID, UGC, and NWID since 2012 was in field investigations to fill known data gaps. Closure concepts for these project components have not been advanced as far as closure options for some other site areas.

Closure Objectives

The following key closure objectives were identified for UGC and the NWID:

- Increase channel capacity to convey selected design flows.
- Isolate diversion channels from potential contaminant sources.
- Integrate channel design with other remediation components.

The following key closure objectives were identified for the FCD and WVID:

- Reduce the potential for slope failure of Faro Pit to impact the FCD.
- Reduce seeps of clean water from entering Faro Pit.

Design Criteria

Design capacity for UGC and the NWID was selected by estimating peak flow in each channel for a range of return interval storms and for the PMF, and comparing the risk of failure, failure mode, and impacts of failure at each potential design capacity. Design for a 1-in-500-year return flow was determined to provide the most reliable, cost-effective protection.

A 1-in-500-year design capacity was selected for the FCD and WVID. It was, however, recognized that the consequences of failure under a PMF event would be significant, so the design criteria also entail construction of a berm on the pit side of the channel to contain PMF flows.

Alternatives Evaluation

Table 4-2 summarizes the alternatives considered in the Draft Alternatives Development Summary Report, alternatives recommended for further evaluation, and key areas needing further evaluation. The Alternatives Development Status Report provides additional detail on the closure work, including plan view and cross sectional profiles of the alternatives considered (CH2M, March 2015ff).

Table 4-2. Summary of Perimeter Reclamation Unit Alternative Analysis

Faro Mine Remediation Project

Perimeter Unit Component	Alternative Considered	Recommended Alternative	Additional Recommendations
UGC	TA-01—Draft 4A – Existing Alignment: Clean out existing ditch, upgrade discharge location if necessary, improve or construct access road. TA-02 – Existing Alignment Upgraded: Increase conveyance capacity to accommodate design event (TBD based on results of failure mode analysis) if necessary in current alignment which discharges to the NWID. Upgrades required in lower reach to accommodate future WRD SWM discharge.	TA-02	Field reconnaissance should be completed to determine if significant erosion during large storm events would occur, and what the consequences of such erosion would be. It may be possible that no modifications are required.
NWID	TA-01—Draft 4A – Existing Alignment: Remediate existing NWID in current alignment, which diverts unimpacted surface runoff from the northern side of Rose Valley, including UGC, to a discharge point below the CVD. TA-02 – Existing Alignment Upgraded: Remediate existing NWID in current alignment to a discharge point below the CVD. Increase conveyance capacity to accommodate design event if necessary. Upgrades required to accommodate future WRD SWM discharge.	TA-02	Field reconnaissance should be completed to determine if significant erosion during large storm events would occur, and what the consequences of such erosion would be. It may be possible that no modifications are required.
FCD and WVID	TA-01—Draft 4A: WVID and FCD with new alignments upslope from existing alignments. Includes consideration of long-term access roads for ditch maintenance. Channels are to be lined. Preservation of old channel. TA-02—Minimize Extent FCD: FCD with a new alignment upslope from existing alignment only along a minimum channel reach directly adjacent to northeast side of pit near unstable pit wall. Remainder of FCD (including WVID) stays in existing alignment. Includes consideration of long-term access roads for ditch maintenance and potential control of seepage using a lining.	TA-02	TA-02 needs to be optimized to reduce the required cut and excavation. Pit stability and the potential for the pit to fail needs to be further evaluated, including through field work, to determine long-term pit stability and suitability of the TA-02 alignment.

Note:

SWM = Stormwater management

SECTION 5

Waste Rock Dump Reclamation Unit

5.1 Introduction

This section describes the work conducted by CH2M in relation to waste rock grading and covering to advance the understanding of site conditions at the WRD RU and provides a summary of initial closure planning activities. (The hydrology, hydrogeology, and geochemistry associated with the waste dumps is described in Section 2).

This section includes a summary of (1) key background documents that describe baseline conditions and pre-2011 (pre-CH2M involvement) closure planning studies, (2) field investigations and analyses conducted within the WRD RU, (3) WRD-related modelling efforts, and (4) initial closure planning activities carried out by CH2M.

Figure 5-1 shows a plan view of the WRD RU and includes the approximate delineations of the individual waste dumps and surface water catchment boundaries. The main activities performed by CH2M related to the WRD RU are listed in the timeline presented in Table 5-1. Waste dump background information and closure planning performed by others before CH2M started work are summarized in Section 5.2. Key CH2M activities, along with key reference documents, are described in Section 5.3.

Numerous other evaluations and studies related to the WRD RU have been performed by CH2M over a period of approximately 4 years; these are documented in the bibliography in Section 5.5.

Table 5-1. Chronology of Waste Rock Dump Project Activities Conducted by CH2M
Faro Mine Remediation Project

Date(s)	Activity
February 2012	Initial Data Gaps Assessment (revised Data Gaps Assessment in September 2013).
September 2012	Preparation of CSM Report.
FY2012 to FY2016	WRD-related field investigations, data gathering, monitoring, and reporting.
FY2012 to FY2015	Development and refinement of predictive models (geochemistry, hydrology, hydrogeology, GoldSim). Modelling to evaluate water, seepage, and contaminant fate and transport within the WRD RU.
Early 2012[a] to November 2014[b]	Development of MTP and IWPP: Reprioritized RPP work, with Interim Works projects now the highest priority; RPP field programs to fill data gaps continued at a decreased level; WRD closure alternatives analysis adjusted to occur from March 2015 to October 2015.
September 8-11 and November 4-6, 2014; and February 10-12, 2015	IPRP meetings: a series workshops on the status and development of alternatives. Presented WRD grading and covers concepts, analysis approach, and bookend options for material movement (high and low end), identified trade-offs, and treatment cost-benefit. These workshops culminated in the submission of the Alternative Development Summary Status Report (CH2M, March 2015ff).
February 12, 2015	Faro Chartering meeting: YG directed CH2M to defer further analysis of closure options for RPP and instead to focus on developing the NFRC Project design.
March 2015	Preparation of Alternative Development Status Report, which summarized closure alternatives evaluated to date, organized by RU.
August 24 to 26, 2015	WRD/RCTA Covers Site Reconnaissance by CH2M's covers team which included cover-related specialists from BGC, O'Kane Associates, and Integral Ecology Group.
October 21 to 23, 2015	WRD/RCTA Covers Workshop with CH2M's covers team, YG and INAC.

Table 5-1. Chronology of Waste Rock Dump Project Activities Conducted by CH2M
Faro Mine Remediation Project

Date(s)	Activity
November 13, 2015	WRD/RCTA Covers Workshop meeting notes issued.

Note:

[a] Final draft of the MTP is dated March 26, 2014

[b] The IWPP was completed to a final draft stage (YG, November 2014a), but project priorities and regulatory strategy changed and the document was not finalized or submitted.

5.2 Summary of Background Work by Others

Multiple prior studies have been conducted related to the waste dumps at the FMC. This section describes key background documents related to the site conditions and closure planning for the FMC waste dumps that were prepared before CH2M came under contract to YG in the latter part of 2011.

Integrated Comprehensive Abandonment Plan (RGC, November 1996): The ICAP represents the first integrated evaluation and assessment of closure requirements and issues pertaining to the Faro and Vangorda Plateau mining areas. With respect to the waste dumps, the ICAP report summarized the following:

- History of the sequential development of the Faro waste dumps
- Dump composition (tonnage, height, surface area)
- Interpretations of physical stability of each dump
- Characteristics of different rock types within each dump (expressed as a percentage and tonnage)
- Results of the geochemical testing (used to estimate the range of metal content within the dump, the range of acid generation, acid neutralization potential, soluble load, and contaminant load predictions)
- Dump hydrology and drainage patterns

The following closure options for the waste dumps were identified and evaluated:

- Leaving as-is
- Relocating to another dump
- Relocating to the Faro Pit
- Recontouring waste dump upper surfaces
- Collecting and treating surface water and seepage
- Adding a low permeability cap on selective dumps

A site-wide closure schedule and cost estimate was also provided.

Options for Closure of the Faro Mine Complex (SRK, February 2008): This report document outlined closure options for the FMC, including the waste dumps. Following a lengthy consultation process, the option to stabilize in place was chosen.

Faro Mine Complex, Mine Area Cover Optimization and Landform Engineering (SRK, July 2008a): This report summarizes the results of FMC cover design and optimization studies. Cost-benefit analyses indicated that low infiltration covers on high strength sources of contamination will result in water treatment savings greater than the cost of cover construction. The analyses indicated that the relocation of high-strength sources of contamination to other parts of the waste rock piles does not lead to compensating savings in water treatment costs, with the possible exception of relocating the MGSP. The

report acknowledged that resloping of parts of the dumps to "natural" slopes will be challenging, but analyses indicated that stable land forms could be designed within the resloping constraints.

2008 Reconnaissance-level Landform Grading Field Investigation at the Faro Minesite **(SRK and BGC, May 2009):** This report summarizes a field reconnaissance conducted in September 2008 to provide additional data and observations to guide environmental assessment level landform design. The Faro Mine Area waste dumps were observed for indications of geotechnical and erosional stability of both the dump plateaus and slopes. Preliminary recommendations were made with respect to resloping for stability or whether some slopes and materials could be left at angle of repose. Methods to minimize slope erosion were discussed. Findings were summarized in a series of tables and photographs.

Faro Mine Complex Closure and Remediation Plan. Project Description – Draft 4A (SRK, March 2010a): This report describes preferred closure options selected for the FMC and emphasized a number of information gaps and outstanding decisions yet to be made before the closure project description could be finalized. The report noted that the document should be considered a work in progress with the intent to update it as decisions are made and technical data are made available. For the waste dumps, the report recommended three general types of covers for the top and sides of the dumps depending on the need to minimize infiltration: (1) rudimentary covers (up to 1 m of loosely compacted till and vegetation) were recommended for waste rock piles, (2) low infiltration covers (1-m-thick compacted till overlain by up to 1 m of loosely compacted till and vegetation) were recommended for moderately reactive dumps, and (3) very low infiltration covers (1 to 1.5 m of compacted till overlain by up to 1 m of loosely compacted till and vegetation or geomembrane) were recommended for the Main, Intermediate, and East Sulfide Cells and the highly reactive waste consolidated at the Low Grade Ore Stockpile C. Maximum slopes were recommended for the top and sides of the waste dumps for stability purposes.

5.3 Investigations and Studies Conducted by CH2M

The main waste-dump-related activities identified in Table 5-1 are described briefly in the following subsections, with citations to key reference documents produced by CH2M. Some waste-dump-related information is described in other sections of this report (primarily Section 2, Site Conditions); references to the applicable Section 2 information is also included in this section, as appropriate.

5.3.1 Gaps Assessment

As described in Section 2.3, one of the first activities conducted by CH2M after coming under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this review, CH2M recommended the necessary field investigations to support preparation of a YESAA Project Proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c) and revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2013 Gaps Report were addressed or not during the conduct of CH2M's contract for closure planning work at the FMRP (crosswalk tables are included in Appendix B). Data gaps identified for the WRD included the following:

- The availability of suitable onsite borrow material for covering and revegetating the recontoured waste dump top surface and slopes
- The lateral extent and volume of highly reactive waste piles that may be moved and consolidated with other waste dump piles before covering
- Geotechnical and geochemical characteristics of waste rock that may be exposed as a result of regrading or resloping and that may be integrated into cover systems (e.g., cushion layers)

Section 2.6.11 describes the borrow studies conducted to evaluate available site borrow for closure uses such as waste dump covers and revegetation. Section 5.3.3 describes field investigation programs conducted within the WRD RU to evaluate the other data gaps identified.

5.3.2 Conceptual Site Model

As described in Section 2.2, the CSM report (CH2M, September 2012f) summarizes (1) hydrologic, hydrogeologic, and geochemical processes that drive water and contaminant movement at the site, (2) the physical and chemical properties of the subsurface environment, and (3) the rates and volumes of water movement through the physical system. Relative to the WRDs, this report describes water flow through the waste dumps, the role of pre-mining drainage features in channeling infiltrating meteoric waters along preferential groundwater flow paths, and the oxidation process of reactive sulphide minerals in producing acid rock drainage (ARD) and its subsequent migration through the waste dumps to the environment.

5.3.3 Waste Dump-related Field Investigations and Data Gathering

Section 2.4 describes field investigations conducted by CH2M since 2012. Appendix C includes a tabular summary of field investigation and analytical programs organized by fiscal year from 2012 to the present. The Appendix C summary tables (Tables C-1 through C-4) describe the area of the site investigated, the purpose of the field program, and the types of work conducted, and provide report citations for the applicable field sampling plan and data/analysis report.

CH2M conducted the following WRD-related field investigations and monitoring programs:

- Seep and Surface Water Monitoring (FY2012 – 2016): Conducted site-wide (including the WRDs) monitoring to evaluate seepage water quality and ARD evolution; sampling occurred in spring and fall FY2012 through spring 2016 (CH2M, October 2013a for FY2012; Appendix G of this report for FY2013 through 2016).
- WRD Hydrostratigraphy, Geotechnical Properties of Waste Rock (FY2012): Drilled 4 borings through the waste dumps (Northeast, Zone II, Main, and Intermediate); completed borings as monitoring wells with thermistor and gas sampling ports (CH2M, October 2013b).
- WRD Groundwater Quality, ARD Evolution (FY2012 – 2016): Monitored thermistors, pore gas, and groundwater in spring, fall, and winter of each FY through spring 2016 (CH2M, October 2013b, Section 2 and Appendix G of this report for FY2013 through 2016).
- Upper Parking Lot WRD and Lower Northwest WRD (FY2013): Excavated 15 test pits to evaluate hydrostratigraphy and geotechnical characteristics (CH2M, March 2014m and Appendix G of this report).
- Oxide Fines Stockpile and Low Grade Ore Stockpile C (FY2014): Excavated 4 test pits to delineate the extent of the oxide fines stockpile and installed one monitoring well with thermistor and pore gas ports to evaluate geotechnical and geochemical characteristics (CH2M, March 2015l and Appendix G of this report).
- Main WRD and Intermediate WRD Sulfide Cells (FY2014): Excavated 12 test pits to evaluate regrading of the Main Dump and Intermediate Dump sulphide cells, delineate the extent of the Main Dump and Intermediate Dump sulphide cells, characterize the geotechnical properties of the sulphide material, and evaluate infiltration characteristics of the sulphide material (CH2M, March 2015o and Appendix G of this report).
- Faro WRDs – Upper Surfaces (FY2014): Excavated 7 test pits to evaluate geotechnical characteristics and geochemical kinetics and leachability of waste rock material (CH2M, March 2015p and Appendix G of this report).

- Faro WRDs – Toe of Slope (FY2014): Performed geologic reconnaissance and excavated 7 test pits to evaluate geotechnical foundation conditions and hydrostratigraphy along the toe of the Faro waste dumps in areas of potential waste dump footprint expansion CH2M, March 2015q and (AppendixG of this report).
- Cover Revegetation Studies (FY2014): Performed field survey of soil and vegetation and vegetation tissue and soil sample collection to evaluate revegetation approaches for covers. Waste dump areas sampled included the Zone II outwash, disturbed and undisturbed study areas, Low Grade Stockpile A, and Northeast WRD (CH2M, February 2015c and March 2015kk).

5.3.4 Waste Dump-related Modelling

Section 2.5 of this report describes the site-wide models (surface water, groundwater, geochemistry, and water quality [GoldSim]) developed by CH2M for the FMRP. For modelling conducted specific to the waste dumps and interpretation of conditions, refer to the following sections:

- Section 2.5.4 – Water Quality Modelling (GoldSim)
- Section 2.7.3 – Hydrogeology
- Section 2.7.4 – Groundwater Quality
- Section 2.7.5 – Hydrology
- Section 2.7.6 – Geochemical Characterization

5.3.5 Waste Dump Remediation Alternatives and Status

5.3.5.1 Medium Term Plan

As described in Section 1 and Section 11, faced with growing evidence of several critical issues associated with deteriorating site infrastructure and evolving geochemistry, the MTP (YG, March 2014) was developed to realign the site closure planning activities such that specific interim works projects could be designed and implemented within an approximate 5-year time frame. Efforts related to development of the RPP were to continue during this timeframe, but the interim works projects had a greater priority from a schedule and funding viewpoint. As such, data gathering and closure alternatives analysis in support of the RPP were reprioritized and submission of the RPP was proposed for July 2017. Following completion of the MTP additional changes in site priorities continued to erode the focus on the RPP. By 2015-2016, the completion of a comprehensive RPP was no longer a focus for the PDT, and the work plan and schedule for completion are now undefined. For the waste dumps in particular, field data gathering continued as described in Section 5.3.3, along with hydrogeologic and geochemical modelling.

5.3.5.2 Alternatives Summary Status Report

The Alternatives Summary Status Report (CH2M, March 2015u) provides a snapshot (work in progress) of work completed through February 6, 2015, to develop conceptual approaches for waste dump closure options. The focus of CH2M's work with respect to the waste dumps since 2012 was in field investigations to fill known data gaps as well as borrow studies to evaluate the potential site-wide quantity of material available for cover systems. Therefore, the closure concepts for the waste dumps were not as advanced as closure options for some other site areas at the time the Alternatives Status Summary Report was written.

Waste Dump Closure Objectives

Grading and covering of the waste dump surfaces (top and perimeter) are part of the site remediation approach to meet the following four key objectives:

- Reduce exposure of humans and wildlife to metal and salts contained within waste dump materials (either through direct uptake of sediment/ or dust or through exposure to impacted drainage).
- Reduce exposure of humans and wildlife to harm potentially created by unstable slopes or materials.
- Enhance surface drainage and reduce ponding to the extent practicable.
- Reduce, to the extent practicable and cost-effective, contaminant mass loading requiring water treatment.

In addition, the Alternatives Status Summary Report documented the following secondary objectives desirable for the grading and cover of the waste dumps:

- Dissuade wildlife from accessing pit-adjacent areas by a combination of slope and cover options.
- Create a vegetative cover that is self-sustaining and typical of surrounding areas of similar topography.
- Provide acceptable end land use that reflect pre-mining land uses where practicable.
- Minimize impacts created during construction and initial weathering of waste dump surfaces.

Design Criteria

Design criteria, which was previously discussed with the IPRP at the September and November 2014 meetings, guided the development of each alternative and the level of design detail in contour surfaces. The guidance criteria were as follows:

1. Stability criteria of 2H:1V on internal waste dump slopes.
2. Contour information detailed enough to produce comparable material movement (cut and fill) estimates for a qualitative cost comparison.
3. Contour information detailed enough to delineate major channel locations, drainage direction, and catchment boundaries.
4. Consideration of high-level construction feasibility, including the following:
    a. Factors that would influence access to crests, toes and slopes of the landforms to be graded
    b. Maintenance of critical access routes (e.g., the Faro Pit ramp) and infrastructure (for example, the Zone II pumps and wells)
    c. Volumes of cover materials required (e.g., low-ARD calc silicate and glacial till) and availability
    d. Haul distances for material movement and cover material
5. Construction and grading of surfaces suitable for the application, maintenance, and development of a vegetation cover – specifically 3H:1V slope or shallower, hillslope length appropriate for no future unplanned development of channel heads and resulting erosion of cover.

Alternatives Evaluation

The initial WRD alternatives evaluation considered separate alternatives for three major project elements: (1) grading and drainage direction for the waste dump top surface, (2) grading and drainage direction for the perimeter side slopes, and (3) cover layer types applicable to the top and perimeter slope surfaces. For each of these elements, a separate set of alternatives was developed initially to gain a better understanding and assessment of desirable alternative(s) for each element. These alternatives included approach proposed in SRK's Project Description 4A (SRK, March 2010a).

Separating these options out at this time was judged to be necessary to answer key concerns about closure (e.g., whether or not to cover parts of the perimeter waste rock surfaces, or what grading approach best matches available site borrow) and also allowed a comparison of relative feasibility and cost before the parts were assembled to develop integrated closure alternatives.

Conceptual designs of the various alternatives were developed to the extent necessary to compare alternatives. A qualitative comparison of alternatives was conducted using the following criteria:

- Implementability and constructability
- Effectiveness and longevity
- Required long-term care and maintenance
- Capital costs
- Operating and maintenance costs
- Replacement and no-routine maintenance costs
- Interaction with adjacent/other RU/components

Table 5-2 summarizes the waste dump alternatives considered in the draft Alternatives Summary Status Report, alternatives recommended for further evaluation, and key areas needing further evaluation. The Alternatives Status Summary Report provides additional detail on the waste dump closure work, including plan view and grading profiles of the alternatives considered, alternatives for locating surface water management ponds, and cover infiltration analyses.

5.3.5.3 Waste Rock Dump/Rose Creek Tailings Area Covers Reconnaissance and Workshop

In May 2015, CH2M was provided direction from YG and INAC to develop a site-wide DBR for all components of the FMC, with the exception of the projects currently being designed as interim works projects (e.g., DVIHU, RCD, NFRC, and IWTS) and those in the Vangorda/Grum Area. The objective of the site-wide DBR was to advance the closure concepts for each RU to a concept level such that an AACE Class 4 cost estimate could be developed. The draft site-wide DBR was to be delivered on March 31, 2016. The draft site-wide DBR has since been replaced by YG and INAC with this CDRMR.

As part of planning and staffing for the site-wide DBR, CH2M expanded their technical evaluation team for the closure concepts of the waste dumps and the RCTA to specifically include Mike O'Kane of O'Kane Consultants, Justin Straker of Integral Ecology Group (IEG), and Gord McKenna of BGC. Because BGC was already on the CH2M team, it was decided that BGC would subcontract with O'Kane Consultants and IEG to participate on the WRD/RCTA alternatives evaluation team.

To orient the new waste dump/RCTA covers team members to the site, to available background information, and to issues associated with the waste dump/RCTA, a 3-day site reconnaissance was conducted from August 24 to 26, 2015. At the end of the site reconnaissance, the CH2M/BGC team, along with YG, hand-sketched potential Base Case constraint maps (i.e., grading and cover options approaches) for both the waste dumps and RCTA and decided to more formally lay out the grading options, develop cut/fill quantities, and cover options that would then be presented and discussed with YG/INAC in a workshop from October 21 to 23, 2015.

The October waste dump/RCTA covers workshop was held in Vancouver, British Columbia, at the BGC offices and was attended by representatives of YG, INAC, and CH2M and its subconsultants. The purpose of the workshop was to discuss the Base Case grading/cover/surface water management approaches for both the waste dumps and RCTA. During the workshop, the group collaboratively established variations to the Base Case grading/cover approaches for the waste dumps and RCTA with the intent that the Base Case and its variations including treatment reduction cost benefit would be further evaluated). BGC prepared meeting summary minutes and figure exhibits that were distributed to YG, INAC, and CH2M on November 13, 2015 (BGC, November 2015).

Table 5-2. Summary of WRD Alternative Analysis
Faro Mine Remediation Project

WRD Component	Alternative Considered	Recommended Alternative	Additional Recommendations
Top Surface Grading	TA-01—Draft 4A: Regrade surface to stability objectives TA-02: Recontour top surface to maximize clean surface water drainage to clean receiving bodies, and achieve slope and sediment stability TA-03: Recontour top surface to minimize material movement required to achieve positive drainage to clean and unclean receiving bodies, and to stabilize slopes	The recommendation for the WRD top surface was to combine elements of TA-02 and TA-03 to reduce the high material movement volume in TA-02 and improve drainage direction contour in TA-03. A good balance exists between material movement and sending clean surface drainage to a clean receiving body, thereby reducing water treatment volumes generated by the WRD area.	Integration of the perimeter sloping approach with the top surface grading is critical to optimize the overall grading plan, especially for the Intermediate Sulphide Cell dump.
WRD Perimeter Slopes	TA-01—Draft 4A: regrade and reslope TA-02: Selective regrade to provide adequate factor of safety to unstable areas, accommodate drainage locations TA-03: Mix of selective regrade, cover and revegetation on slope with application of thin durable rock veneer layer on other slopes	The recommendation for the WRD perimeter slopes is to selectively regrade to address any areas of instability as per TA-02. This does not exclude the opportunity to later apply a vegetated layer depending on the configuration of the valley bottom in NFRC, but does have a lower capital cost and greater likelihood of implementability than either TA-01 or TA-03.	The Alternative Status Summary Report identified the need to interface perimeter sloping with the NFRC Project. This has been done in the NFRC Project design.
WRD Covers	TA-01—Draft 4A: Prescriptions for very low, low, and simple covers TA-02—Simple Cover: Growth-media layer (simple cover) applied to all WRD surfaces, regardless of location or underlying materials) – 1.0-m thickness, uncompacted till TA-03—Very Low Permeability Cover: Very low infiltration cover applied to all WRD surfaces, regardless of location or underlying materials – geomembrane, upper and lower bedding aggregate layers, and 1.0 m of uncompacted till applied as a growth medium	The Alternative Status Report recommended an optimized Draft 4A (TA-01) cover application. This would use simple covers (1.0 m of uncompacted glacial till) for the majority of the surface, and cost-effective application of HDPE lining fitted to portions of the recontoured surface.	Several additional evaluation needs were identified to further the cover alternative development, including (1) additional infiltration modelling, (2) appropriate methods of handling and placing glacial till material, (3) appropriate methods of placing growth media to avoid compaction, and (4) developing revegetation approaches that will result in competent self-sustaining covers that minimize erosion.

SECTION 6

Faro Pit Reclamation Unit

6.1 Introduction

This section describes field investigations conducted by CH2M related to the Faro Pit RU and the backfilled Zone II Pit. Other sections describe work conducted by CH2M related to these pits, as follows:

- Section 2, Site-wide Conditions, describes hydrogeologic and geochemical model development and modelling analyses conducted within the area of the Faro Pit and Zone II Pit.
- Section 3, Water Treatment, describes the use of the Faro Pit as part of water treatment system in the FMC and summarizes studies conducted to address potential infrastructure upgrades related to water and sludge storage within the Faro Pit.
- Section 4, Perimeter Remediation Unit, describes background studies and field investigations conducted to evaluate Faro Pit wall stability in an isolated area of the east pit wall as it relates to realignment of the Faro Creek Diversion.
- Section 5, Waste Rock Dump Remediation Unit, describes the work conducted related to the waste rock dumps surrounding the Faro Pit.

Figure 5-1 shows a plan view of the Faro Pit, the approximate Zone II Pit boundary, approximate boundaries of individual waste rock dumps, and subcatchment areas. Figure 6-1 shows a schematic cross section from the Faro Pit through the RCTA to the RCD. Figure 6-2 shows a section from the Faro Pit through the Zone II Outwash to NFRC.

Table 6-1 presents the timeline for the main activities performed by CH2M (from 2012 through 2016) related to the Faro Pit and Zone II Pit (other than those described in the earlier report sections). Background information prepared by others before CH2M's work are summarized in Section 6.2. Key activities conducted by CH2M, along with key reference documents, are described in Section 6.3.

Table 6-1. Chronology of Faro Pit and Zone II Pit Project Activities Conducted by CH2M
Faro Mine Remediation Project

Date(s)	Activity
February 2012	Initial Data Gaps Assessment (revised Data Gaps Assessment in September 2013)
September 2012	Preparation of CSM report
Fiscal Year 2012 to Fiscal Year 2015	Faro Pit- and Zone II Pit-related field investigations, data gathering, monitoring, and reporting
July 2012	Investigated problems with the pumping well drilled in the Zone II area in 2010 (PW-10-06); well did not provide adequate yield to meet project objectives and was extremely slow to recharge - new well recommended
August/September 2012	Drilling, installation, and development of replacement Zone II Pit pumping well
December 2014	Evaluated pumping capacity options for Zone II well
July/August 2016	Evaluated salinity stratification in Faro Pit lake

6.2 Summary of Background Work by Others

Many studies have been conducted related to the Faro and Zone II pits. This section describes key background documents related to the site conditions and closure planning for the Faro and Zone II pits.

Integrated Comprehensive Abandonment Plan (RGC, November 1996): The ICAP provides a detailed history of the development of the Faro and Zone II pits and summarizes geology, mining excavation volumes, water balance, geochemistry, tailings storage within the Faro Pit, and open pit water chemistry based on the available data. Two primary closure options were evaluated for the Faro Pit. Option 1 would maintain the pit in isolation from Faro Creek and use the pit as a secure long-term contaminated water storage facility that would require pumping and treatment in perpetuity. For Option 2, Faro Creek would be directed through the Faro Pit and it would become part of the Faro Creek system. For Option 1, the diversion of uncontaminated waters around the pit is maximized, and the use of the pit as a collector and long-term secure storage facility for contaminated water from the entire Faro site is optimized. Option 1 was recommended as the preferred option based on cost and the risk of whether an acceptable water quality would be achieved for the Faro Pit water over the long term if Option 2 were implemented.

For the Zone II Pit, the ICAP noted that closure options were limited and recommended continued pumping of the existing well located within the pit to maintain a water level in the pit at about elevation 1,110 m (3,642 feet) amsl. The ICAP also recommended additional monitoring of water levels in the eastern section of the Zone II Pit.

Options for Closure of the Faro Mine Complex (SRK, February 2008): Beginning in early 2005, SRK led the development of example closure alternatives for the FMC that were to represent the range of options that the prior work had shown to be technically reasonable. Work on the example alternatives continued through mid-2006. Between September 2006 and March 2007, the IPRP reviewed the example alternatives and the supporting technical documentation and provided their recommendations and concurrence for the example alternatives retained. The 2008 Options for Closure Report incorporated the IPRP recommendations. For the Faro Pit, the flow-through pit option (Option 2 of the ICAP) coupled with in-pit biological treatment was evaluated and screened out. Option 1 of the ICAP (use the Faro Pit as a storage facility for contaminated waters prior to treatment) was retained as the closure approach for the Faro Pit, with water treatment occurring at a new high density sludge treatment plant. Construction of a safety berm around the Faro Pit was also included as part of the retained closure option. For the Zone II Pit, continued extraction of contaminated pit water and pumping to the Faro pit for eventual treatment was retained.

Faro Mine Complex Final Closure and Remediation Plan Project Description – Draft 4A (SRK, March 2010a): This report describes preferred closure options selected for the FMC and emphasized a number of information gaps and outstanding decisions yet to be made before the closure project description could be finalized. The report noted that the document should be considered a work in progress, with the intent to update it as decisions are made and technical data are made available. For the Faro and Zone II pits, the closure options from the 2008 Options for Closure Report were re-evaluated and retained with added recommendations for increased pumping of the Zone II Pit water to reverse the direction of groundwater flow and system modifications to enable year-round pumping.

6.3 Investigations and Studies Conducted by CH2M

The Faro and Zone II pit components of work conducted by CH2M, as listed in Table 6-1, are described briefly in the following subsections.

6.3.1 Gaps Assessment

As described in Section 2.3, one of the first activities conducted by CH2M after coming under contract to YG was the review of the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this review, CH2M recommended the necessary field investigations to support preparation of a YESAA Project Proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c) and a revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2013 Gaps Report were addressed during CH2M's contract for closure planning work at the FMRP (crosswalk tables are included in Appendix B). Data gaps identified for the Faro Pit and Zone II Pit included the following:

- Faro Pit Safety Berm: required for safety purposes
- Optimize Zone II pumping: necessary to maintain gradient towards the pit and away from NFRC

Studies conducted by CH2M to address these data gaps are described in the following subsections. Studies related to the Faro Pit wall stability are summarized in Section 4 of this report.

6.3.2 Conceptual Site Model

As described in Section 2.2, the CSM report (CH2M, August 2012a) summarizes the following:

- Hydrologic, hydrogeologic, and geochemical processes that drive water and contaminant movement at the site
- Physical and chemical properties of the subsurface environment
- Rates and volumes of water movement through the physical system

Relative to the Faro Pit and Zone II Pit, this report describes the physical characteristics of the pits, as well as sulphate and zinc concentration trends over time, from available data.

6.3.3 Faro Pit and Zone II Pit Field Investigations and Data Gathering

Section 2.4 describes field investigations conducted by CH2M since 2012, while Appendix C includes a tabular summary of field investigation and analytical programs organized by fiscal year from 2012 to the present. The Appendix C summary tables (Tables C-1 through C-4) describe the area of the site investigated, the purpose of the field program, and the types of work conducted, and provide report citations for the applicable data report.

Faro Pit- and Zone II Pit-related field investigations and monitoring programs included the following:

- Faro Pit Seeps and Zone II Well Sampling (FY 2012 - 2015) (CH2M, October 2013a, March 2014c, March 2015b, April 2016d, and Appendix G of this report): Investigation activities included sampling of seeps into the Faro Pit, sampling of WRD wells, and geochemical profiling (monitoring and sampling).
- Faro Pit Safety Berm Field Reconnaissance (CH2M, March 2015o): A field reconnaissance of the Faro Pit was conducted in September 2014 to evaluate site conditions for a safety berm around the Faro Pit. The Faro Pit safety berm, proposed by SRK in 2010, is a linear earthen structure with an alignment that follows the perimeter of the Faro Pit at a proposed offset of 5 m from the edge. The reconnaissance included walking the alignment proposed in the Draft 4A Closure Plan (SRK, March 2010a) to document the foundation conditions observed at the surface and to identify potential locations that may require test pit exploration for evaluation of foundation conditions. CH2M's reconnaissance report recommended that for closure planning, a detailed plan should be developed to account for the appropriate pit wall hazards, long-term closure plan components, access requirements, and constructability and feasibility.

6.3.4 Faro Pit Lake Stratification

Geochemical profiling of Faro Pit lake completed between 2004 and winter 2016 indicated permanent salinity stratification (meromixis) from 2004 to 2012 with a stable fresher surface layer (mixolimnion) overlying more saline water at depth. The salinity stratification declined rapidly from 2013 to 2015 with the addition to the surface of large volumes of more saline ID Pond and ETA water. The profile data suggested the pit lake had mixed significantly by September 2014.

Task Authorization Component 009F, Faro Mine Remediation Project (Greg Lawrence and Associates Ltd., August 2016): At YG's request, CH2M reviewed data from Faro Pit lake to assess the conditions that initially led to stable salinity stratification, and led to its subsequent destratification. This included the compilation and forecast of Faro Pit chemistry and provided recommendations to establish the stratification and fresh-water cap in the Faro Pit.

6.3.5 Zone II Pumping System

The objective of water management at the Zone II Pit is to limit the migration of poor -quality groundwater towards the NFRC or the underlying alluvial aquifer. Until 2010, groundwater within the Zone II Pit was managed on a seasonal basis by pumping from a well (X26) located within the pit and then piping this water to the Faro Pit. Typically, pumping began in May and finished in September or October. Groundwater would then continue to recharge to the Zone II Pit during the winter, resulting in rising water levels until dewatering operations began again in the spring. The pump installed in well X26 could not be lowered beyond about 64 mbgs, therefore, YG decided to drill and install a replacement well in 2010.

A second well, PW-10-06, was installed in the Zone II Pit in 2010 to a total depth of 91.4 mbg (SRK, February 2011). The purpose of this well was to replace the X26 well. The new water conveyance system was constructed to provide for year-round management of the pit's groundwater levels to elevations lower than are currently achievable. However, the well yield of PW-10-06 was not sufficient to meet the dewatering objectives for the Zone II Pit, as it appeared that the well screen was positioned in bedrock below the depth of the backfilled Zone II Pit.

In 2012, a third well, CH12-Z2-PW01, was installed (CH2M, November 2012g). The following reports address CH2M's activities related to water management in the Zone II Pit.

Task Authorization Component 009 F Zone II Well Assessment, Faro Mine Remediation Project (CH2M, July 2012c): At the request of YG, CH2M reviewed reports about the water management activities at the Zone II Pit and documented the results of the review in this technical memorandum. This review concluded that a replacement dewatering well was required to effectively manage the groundwater elevation in the Zone II Pit, to meet the stated objective of limiting potential groundwater migration from the Zone II Pit to the receiving environment.

Task Authorization 007 Summary of Zone II Drilling Activities, Faro Mine Remediation Project *(*CH2M, November 2012g): This document briefly summarizes the history of the Zone II Pit water management activities. It also reports on the field activities that took place between August 25 and September 6, 2012, to drill, install, and develop a dewatering well in the deepest portion of the Zone II Pit. The objective of the new installation, CH12-Z2-PW01, was to allow the groundwater elevation to be maintained within the targeted levels and thus help limit the migration of contaminated groundwater from the Zone II Pit to NFRC or the alluvial aquifer underlying NFRC.

2014 Zone II Pumping System Capacity Options, Faro Mine Remediation Project, (CH2M, December 2014b): At YG's request, CH2M reviewed the Zone II pumping system in response to water elevation increases observed by the care and maintenance contractor. Specifically CH2M reviewed the pumping systems capacity to pump water at an increased rate. Based on several system assumptions, this review concluded that potential options to increase the capacity to pump water at an increased rate

from the Zone II Pit included (1) pumping at a higher rate with the current pump, (2) installing a new pump within the existing well capable of pumping at a higher rate, (3) operating the pump installed at X26 (old well), or (4) drilling and installing a larger-diameter borehole designed to accommodate a larger-capacity pump.

At the time of this report's preparation (August 2016), it is CH2M's understanding that YG continues to use the existing pump operated at its maximum capacity and that water levels within the pit continue to be managed at water elevations lower than the historic range. If this is not the case, and if there is a requirement to actively manage a greater volume of water in the Zone II Pit, it is recommended that YG do the following:

1. Operate the existing pump up to its maximum capacity and establish all automated controls
2. Purchase, install, and commission a new pump that is compatible with the existing pumping system and has capacity to pump water at an increased rate (such as Grundfos pump model 150S150-8), and add additional heat-traced discharge piping if needed, to enable year-round operation.

SECTION 6

Mill Building Area and Emergency Tailings Area Reclamation Unit

The Mill Building Area is located to the north of the ETA and to the west of the Main Dump. The location and key features of this areas are shown on Figure 7-1.

7.1 Mill Building Area

7.1.1 Introduction

7.1.1.1 Site History and Description

The Mill Building was used to process lead-zinc ore to produce lead and zinc concentrates for the mine. This area around the Mill Building also contained the majority of the maintenance and support facilities for the site.

Mining operations occurred under various owners from the late 1960s through 1998, when the Anvil Range Mining Corporation was placed into receivership. From 1998 until March 1, 2009, Canada paid for C&M work at the site by the court-appointed interim receiver, Deloitte and Touche. On March 1, 2009, YG took over management of the FMC from Deloitte and Touche (FMRP, 2010). Since that time, the Mill Building Area has been used mainly for (1) operation of the Mill Building as a WTP to treat water collected from the site to acceptable standards, (2) storage of materials and equipment used in site operations, and (3) as maintenance and millwrighting locations for site equipment. In 2013, YG completed a safety assessment of the existing Faro Mill WTP that ultimately determined that the facility was not suitable for use or rehabilitation and should be replaced. An IWTS was constructed in the Mill Building Area on top of the former concentrate loadout foundation.

At the time CH2M began work at the FMC, a number of locations in the Mill Building Area contained hazardous wastes and designated substances that required safe disposal. In addition, there were abandoned structures at the site that posed worker-related health and safety risks and environmental risks.

7.1.1.2 Hazardous Materials

Previous investigations by EBA Engineering Consultants Limited (EBA) (December 2011; August 2012) identified the need to remove hazardous materials (HAZMAT) located throughout the site, as these materials presented a significant environmental and human health risk associated with potential contact exposure. In some cases, materials contained in drums showed evidence of leaking into the natural environment, creating long-term environmental concerns and a concern that environmental remediation costs would exponentially increase because of the potential spread of contaminants. A number of wastes in the EBA HAZMAT Reports were identified as lower priority for removal and required no other immediate attention, providing the materials remained undisturbed and contained.

7.1.1.3 Abandoned Structures

The Mill Building and the Crusher Building are the structures that have been identified as being in the greatest disrepair and posing the most risk to workers at the site. Though strategies for decommissioning and handling of materials and waste have been contemplated, no steps have been taken toward establishing a decommissioning plan. Further review of the sensitivity of scrap steel prices versus the costs to prepare the structure (e.g., cutting to suitable sizes and cleaning to remove radiological materials and debris if required) and the costs associated with transport, is required. Such a

review will be used to identify if these considerations are relevant in the management strategy of these recyclable materials (i.e., whether they are recycled or managed onsite as demolition waste). This evaluation will be complicated since YG determined that, because of safety concerns, entry into the mill building was prohibited.

7.1.1.4 Contaminated Soils

Contaminated soils within the Mill Building Area have been identified and quantified in previous studies and additional investigation has been conducted by CH2M (Section 7.1.2.1). However, no steps have been taken toward establishing a contaminated soils management plan.

7.1.2 Remedial Objectives

7.1.2.1 Hazardous Materials

The primary remedial objective is removal of high priority HAZMAT as identified by EBA (EBA, December 2011; EBA, August 2012), with additional objectives that include removal and offsite disposal of remaining lower priority wastes. These wastes consist of miscellaneous chemicals (e.g., industrial cleaners, adhesives, solvents, acids, paints, and process chemicals), batteries (various types and sizes), calcium chloride, and designated substances within the Mill Building and Crusher Building that would require handling and removal before demolition.

7.1.2.2 Abandoned Structures

The remedial objective for abandoned buildings is to reduce the risk posed by these structures through demolition of the structures and management of recyclable materials, non-hazardous demolition wastes, and designated substances from within these structures. The rationale for demolition of these structures is to (1) mitigate the risk of designated substances used in the building construction to be disturbed, which could lead to air borne hazards and potential exposure by those working in or around the building, and (2) mitigate the risk of exposure to other environmental contaminants located throughout the Mill Building, including fine ore dusts.

7.1.2.3 Contaminated Soils

The remedial objective for contaminated soils within the Mill Building Area is to reduce the risks associated with these soils by either removal and offsite disposal of these soils, or suitable onsite management.

7.1.2.4 Key Decisions Made

As described in Section 7.1.1.1, YG determined in 2013 that the existing Faro Mill WTP was not suitable for use or rehabilitation and should be replaced. Other key decisions with respect to the Mill Building Area relate to (1) the removal of select HAZMAT wastes from the site (described in Section 7.1.2.1) and (2) establishing general demolition strategy considerations (described in Section 7.1.2.2).

In May 2013, AMEC conducted an independent review of the condition of the Mill Building (report not available to CH2M). Based on this review, YG determined that entry into the Mill Building by any personnel was no longer permitted.

7.1.2.5 Current Site Status

Section 7.1.2.2 describes the removal of high priority wastes from the site; however, numerous lower priority wastes still exist throughout the buildings, as listed in Section 7.1.2.1.

Some Mill Building Area buildings are actively used in site care and maintenance operations; others are abandoned and pose potential health and safety risks if workers were to enter. Previous building structural inspections are described in Section 7.1.2.3 and current infrastructure and buildings are described in Section 7.1.4.1.

Petroleum hydrocarbon (PHC) -contaminated soils have been identified within the Mill Building Area (Section 7.1.2.1). Investigation was conducted in 2004 and 2006 to delineate the types and extent of PHC contaminants in the Mill Building Area.

7.1.3 Summary of Background Investigations, Studies, and Waste Removal

7.1.3.1 Hazardous Materials Classification Studies

At the request of YG, EBA conducted two investigations at the site to do the following:

- Sample, classify, and quantify unknown materials and liquids stored in drums and tanks within the Mill Building Area.
- Perform a destructive assessment of building materials suspected of containing asbestos and lead.
- Visually assess building features suspected of containing polychlorinated biphenyls, ozone-depleting substances, and mercury.
- Classify wastes for removal as high priority (Level 1), immediate concern to human health if contact occurs, or lower priority (Level 2), no immediate concern to human health if left undisturbed.
- Quantify unknown containerized wastes found in large drum storage areas at the site (achieved by sampling the contents of these drums and inferring that the drums in each area contained similar wastes).

The results of these investigations are summarized in the following reports:

- Hazardous Materials Classification – Faro Mine Site: EBA File: W23101482 (EBA, December 2011)
- Hazardous Materials Classification – Faro Mine Site: EBA FILE: W23103015-01, Faro, Yukon (EBA, August 2012)

Table 7-1 summarizes the Level 1 priority wastes and estimated quantities from the EBA HAZMAT Reports (EBA, December 2011; EBA, August 2012).

Table 7-1. Hazardous Material Summary
Faro Mine Remediation Project

Item	Hazardous Material	Estimated Quantity	Location
1	Hydrocarbons and metals	540 L (3 drums)	Laydown Area, south of the Mill Building
2	Hydrocarbons and metals	Unknown (drums)	Vangorda/Grum WTP
3	Hydrocarbons, metals and glycol	36,000 L (200 drums)	Northern Barrel Stockpile
4	Water with hydrocarbons	4,500 L (25 drums)	Northwest Dump Area
5	Water with hydrocarbons, metals and glycol	10,080 L (56 drums)	Adjacent to the Northwest WRD
6	Waste oil	25,400 L (drums and tanks)	Behind the Mill Building
7	Gasoline	6,200 L (trailer tank)	Behind the Mill Building
8	Methyl isobutyl carbinol	18,750 L (150 drums)	Drum Collection
9	Glycols	3,800 L (tank)	Drum Collection
10	Soil with metals	7 m^3 (40 drums)	Upper Bench above the Northwest WRD
11	Miscellaneous liquid wastes [a]	250 L (miscellaneous containers)	Warehouse
12	Miscellaneous solid wastes [b]	65 kg	Warehouse, Reagents Building, and Mill Building

Table 7-1. Hazardous Material Summary
Faro Mine Remediation Project

Item	Hazardous Material	Estimated Quantity	Location

Notes:

[a] Miscellaneous containerized chemicals (less than 4 L per container) including ammonium chloride, liquid and rubber cements, adhesives, industrial cleaners, solvents, acids, and fuel conditioners

[b] Miscellaneous materials, including graphite flakes, percol pellets, ammonium chloride and beryllium x-ray tubes

kg = kilogram
L = litre

7.1.3.2 Hazardous Materials Removal

In September 2014, Quantum Murray (QM) was contracted by YG to conduct a two-phase HAZMAT removal program, consisting of (1) supplemental characterization of the high priority HAZMAT wastes and preparation of a quotation for the removal of the wastes and (2) packaging, removal, transport and offsite disposal of the wastes at a licensed waste receiving facility.

This work was documented in *Hazardous Material Characterization and Removal* (QM, January 2015). Table 7-2 summarizes the wastes removed during the two-phase HAZMAT removal program.

Table 7-2. Summary of Wastes Removed
Faro Mine Remediation Project

Substance	Quantity
Methyl isobutyl carbinol	128 drums
Sodium isopropyl xanthate	29 megabags 1 overpack bag 4 drums
Ferric sulphate	7 drums
Methyl isobutyl carbinol	20 drums
Diesel	3 drums
Lead-contaminated material	3 drums
Used glycol	5 drums
Water contaminated with hydrocarbons	35 drums
Waste petroleum grease	20 drums
Pails with miscellaneous hydrocarbons	2 megabags
Absorbents	3 drums
Rugs and absorbents	10 drums

7.1.3.3 Structural Inspections

In 2011, at the request of YG, Associated Engineering (Associated) conducted two inspections at the site to complete the following primary tasks:

- Detailed inspection on the roof and supporting structural members above the clarifiers in the Mill Building (in response to significant observed leaks)
- Semi-annual inspection following roof repairs conducted subsequent to recommendations made from the first inspection

The results of these inspections are summarized in the following reports:

- Localized Inspection of Structural Condition of Faro Mill Building (Associated, May 2011)
- Faro Mine Building – Roof Repair and Bi-annual Inspection (Associated, October 2011)

The initial inspection revealed that structural steel members were observed to be in reasonably good condition, but the following items of concern were identified:

- Severe corrosion was observed on steel decking in areas to the degree that material loss was evident.
- Significant lime dust and other mineral deposits were noted throughout the building.
- Many existing pipe supports and other equipment supports were broken or severely corroded.
- Some walkways were damaged and lighting in many areas was inadequate relative to occupational health and safety requirements.

A detailed list of recommended repairs was included in the report; however, because of budget constraints, a reduced scope of work was completed to address the highest priority repairs, limited to roof decking repairs on the Norcan Building (millwright/shop) and Mill Building. Following these repairs, Associated made the following the observations during their biannual inspection:

- Roof repairs were completed satisfactorily based on the visual inspection.
- Water ingress was noted on the lower basement level of the Mill Building.
- Other conditions noted from the previous inspection showed no visible evidence of worsening.

7.1.3.4 Petroleum Hydrocarbon Contamination

At the request of Deloitte and Touche (in its capacity as interim receiver of Anvil Range Mining Corporation), Gartner-Lee Limited (GLL) conducted a two-part field study consisting of a test pitting investigation in 2004 and a drilling program in 2005. The objective of the two field investigations was to determine the types and extent of PHC contaminants in the Mill Building Area and provide an improved estimate of PHC-contaminated soil quantities for future remediation planning.

The results of these investigations are summarized in *Anvil Range Mine – 20015 Investigation of Hydrocarbon-Contaminated Soils* (GLL, June 2006).

The specific locations within the Mill Building Area that were targeted in the field studies included the following:

- Faro Emergency Generator Yard
- Faro Mill Diesel Tank
- Faro Waste Oil Tank
- Faro Maintenance Bays Area
- Faro Lube Shack
- Faro Tank Farm

Based on the results of the field studies, the total estimated quantity of PHC-contaminated soils present within the Mill Building Area at the time of the studies was 57,800 m^3. Table 7-3 presents a further breakdown of the types of PHC contaminants and estimated PHC-contaminated soil quantities in specific locations within the Mill Building Area.

Table 7-3. PHC-Contaminated Soil Summary
Faro Mine Remediation Project

Location	Contaminant[a]	Estimated Area (m^2)	Estimated Depth (m)	Estimated Volume (m^3)
Lube Shack	F1, F2, F3	2,700	6.0	16,200
Tank Farm	F2, F3	900	4.0	3,600
Waste Oil Tank	Toluene, F2, F3, VPH	1,550	6.0	9,300
Maintenance Bays	Xylenes, F1, F2, F3	8,200	3.5	28,700
Total				**57,800**

Notes:

[a] F1: C6-C10 petroleum hydrocarbons; F2: C10-C16 petroleum hydrocarbons; F3: C16-C34 petroleum hydrocarbons; VPH: volatile petroleum hydrocarbons

m^2 = square metre

7.1.4 CH2M Gaps Assessment, Project-to-date Investigations, and Studies

7.1.4.1 Gap Assessment

As described in Section 2.3, one of the first activities conducted by CH2M under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this review, CH2M provided recommendations for field investigations to support preparation of the YESAA Project Proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c) and a revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2013 Gaps Report were addressed or not during CH2M's contract for closure planning work at the FMRP (crosswalk tables are included in Appendix B). Data gaps identified for the Mill Building Area included the following:

- Decontaminating and demolishing buildings
- Relocating or covering contaminated soil from Mill Building Area
- Relocating or covering contaminated soil from Faro lube shack and tank farm area

7.1.4.2 CH2M Investigation and Studies

Site Reconnaissance

CH2M conducted a site reconnaissance in September 2012 to gather additional information to prepare a scope of work and to develop an AACE Class 5 cost estimate for removal of hazardous waste identified in the EBA HAZMAT Reports. The site reconnaissance was used to obtain general information to begin planning for decommissioning and demolition of the Mill Building and Crusher Building, including the appropriate removal and disposal of designated substances identified in the EBA HAZMAT Reports.

As part of this process, CH2M visited the site in October 2012, accompanied by Priestly Demolition Inc., a nationally recognized demolition contracting firm. The visit allowed CH2M an opportunity to do the following:

- Estimate potential quantity for steel salvage and other recyclables onsite
- Develop an estimate of project duration and labour and equipment requirements to complete the decommissioning and demolition
- Determine possible handling for ore waste within the mill equipment
- Estimate potential abatement and demolition costs for the decommissioning of the mill

Shortly after the site visit, a decision was made by YG to not pursue abatement and demolition of buildings as an early action item. Additional efforts on advancing decommissioning were not continued at this time.

Supplemental Waste Characterization

Upon completion of an AACE Class 5 cost estimate, YG indicated interest in having Level 1 wastes removed from the site. CH2M recommended that a supplemental waste characterization be conducted to further understand the types and quantities of wastes present at the site and develop a plan for removal of the Level 1 priority wastes. This supplemental waste characterization was performed. Before mobilizing to the site to conduct the supplemental waste characterization, a detailed sampling plan outlining the areas requiring additional sampling and analyses was developed along with a task-specific Health and Safety Plan that included a prescription of minimum requirements for personal protective equipment.

Hazardous Waste Removal Approach Developed in the Medium Term Plan

CH2M developed a scope of work for removal of the Level 1 priority wastes, which included procurement and project support activities. Waste removal activities are summarized in Section 7.1.6.

7.1.5 Conditions and Features

7.1.5.1 Infrastructure and Buildings

There are 10 buildings, 2 site trailers, and multiple laydown areas on the site in the Mill Building Area (see Figure 7-2). Table 7-4 list the buildings in the Mill Building Area.

Table 7-4. Building Identification Numbers and Areas
Faro Mine Remediation Project

Building Number	Building Name	Area (m^2)
1	Warehouse	8,400
2	Norcan (Millwright/Shop) Building	990
3	Lube Storage Building	120
4	Mill Building	13,850
5	Cold Storage	380
6	Reagents Building	950
7	Crusher Building	340
8	Coarse Ore Bin	800
9	Guard House	320
10	Dry and Lunch Room (Two Atco Trailers)	250
11	Concentrate Loadout Building	50

The Mill Building has not been used to conduct water treatment operations since 2013, when YG completed a safety assessment of the Faro Mill WTP and determined that the existing WTP was not suitable for use or rehabilitation and should be replaced. In 2014 and 2015, the IWTS was constructed and commissioned in the Mill Building Area on top of the former concentrate loadout foundation. The Crusher Building is also a structure that is currently not in use and has no foreseeable use in the future.

The following observations on the condition of the Mill Building are based on the reports and other information compiled to date and on work performed by CH2M:

- The Mill Building is a 13,850-m^2, multi-level, steel-framed structure with concrete slab floor (with portions below grade), metal exterior cladding, and rolled roofing.
- The facility consists of a variety of work areas, including material processing areas, machine and electrical shops, offices, control rooms, utility and maintenance rooms, lunch rooms, and a laboratory.
- The building appeared to be in generally sound structural condition, as of October 2012.
- Some areas throughout the facility show evidence of weathering and water intrusion; however, the structural steel and concrete show minimal signs of degradation (as of October 2012) except the following: severe corrosion was observed on steel decking in areas to the degree that material loss was evident, many existing pipe supports and other equipment supports were broken or severely corroded, and some walkways were damaged. Lighting in many areas was inadequate relative to occupational health and safety requirements (see Section 7.1.3.3).
- The building is known to contain the following variety of designated substances within construction materials and equipment that were commonly used at the time the facility was constructed:
  - Chrysotile asbestos in vinyl floor tiles, drywall joint compound, mudded pipe insulation, and pump packaging
  - Amosite asbestos in mudded pipe insulation
  - Transite asbestos in rain water leaders and breakers
  - Vermiculite asbestos packaging
  - Lead-based paint
  - Polychlorinated biphenyls (PCBs) in light ballasts and transformers
  - Containerized ozone-depleting substances (ODS) and ODS in freezers and refrigerators
  - Mercury in fluorescent lamps and light switches

The following observations were made specifically regarding the condition of the Crusher Building:

- The Crusher Building is a steel-framed structure with metal cladding, a footprint of approximately 260 m^2, and a height of approximately 18 m.
- During EBA's inspection, the building was deemed to be in poor structural condition and unsuitable for entry. As a result, a thorough assessment of potential designated substances was not performed.
- Based on the investigation of other structures at the site, potential designated substances could include lead (paint, piping, and components), asbestos (pipe insulation, rain water leaders, breakers), mercury (light switches and fluorescent lamp tubes), PCBs (light ballasts and transformers), PHC (grease, motor oil, hydraulic fluid, gasoline), miscellaneous chemicals (industrial cleaners, adhesives, solvents), and high metals dust from the crushing operation.

7.1.5.2 Geology

From previous investigations and borehole logs collected in various areas, the site stratigraphy can generally be divided into the four areas summarized in Table 7-5 (GLL, June 2006).

Table 7-5. Site Stratigraphy
Faro Mine Remediation Project

Location	Description
North of Maintenance Buildings	Fill material consisting of sand with some gravel extending to between 1.2 m and 7 m; up to 0.5 m of native material consisting of topsoil (peat and silty sand) was beneath the fill material in some locations; this was followed by silt till extending to the maximum depth investigated (10.7 m); frozen soils were encountered at BH05-4 and BH05-14 below 3-m depth; groundwater was encountered at 6.0-m depth at BH05-4, and at 2.7-m depth at BH05-15; bedrock consisting of schist was encountered in BH05-15 at 5.8-m depth
Waste Oil Tank and Mill Diesel Tank Area	Silt and fine sand fill to between 2 and 4.5-m depth; underlain by silt till; the till extended to the schist bedrock, which was encountered between 4.6 and 6.4-m depth; groundwater was encountered near the till – bedrock interface
Lube Shack Area	Silt and sand till; groundwater was encountered in BH05-8 at 7-m depth; shale bedrock was encountered in BH05-10 at 7.2-m depth
Upper Tank Farm Area	Sand and silt fill material to between 5.8 and 6.7-m depth; underlain by waste rock consisting of gravel and cobbles

In 2012, CH2M completed an investigation of the area proposed for the replacement WTP to develop preliminary foundation and site grading recommendations and evaluate onsite soils for use in construction and in determining other project-specific geotechnical requirements (for example, excavation, fill, and slope stability). The findings of this investigation are documented in the following:

- *Water Treatment Plant Geotechnical Design Report, Faro Mine Remediation Project* (CH2M, March 2014gg)
- *Geotechnical Data Water Treatment Plant, Faro Mine Remediation Project* (CH2M, September 2012b).

7.1.5.3 Surface Water Hydrology

Information on surface water hydrology is presented in Appendix E to this report.

7.1.5.4 Geochemistry (Soil Contamination)

Locations with petroleum-contaminated soils were discussed in Section 7.1.2.1. Further information is presented in Appendix G to this report.

7.1.6 Remedial Alternatives Assessment and Status

Remedial alternatives for the Mill Building Area have not been formally developed or assessed. A general description of the likely remedial approaches are presented in the following subsections.

7.1.6.1 Hazardous Materials

Future remedial alternatives would include removal and offsite disposal of remaining lower priority wastes, described in Section 7.1.1.3.

7.1.6.2 Abandoned Structures

Future remedial alternatives would include eventual demolition of abandoned structures and development of a plan for the management of recyclable materials and non-hazardous demolition wastes, as well as designated substances.

As noted in Section 7.1.2.2, strategies for demolition and handling of the demolition materials (e.g., recycling of steel and other metals, removal and disposal of designated substances, possible onsite management options for general demolition debris) have been contemplated, though no steps have been taken toward establishing a demolition.

There is uncertainty in the quantity of steel located within mill buildings that may be available for salvage and as a credit to the cost of the demolition work. The potential sources of recyclable steel include structural steel beams and columns, metal cladding and roofing, metal tanks and drums, piping, mechanical equipment, duct work, fans, conduit, guard posts, railings, platforms and walkways.

There will always remain uncertainty in the value of scrap pricing. Major steel mills generally adjust the rates paid for scrap materials monthly to correspond against recognized material market value indices such as the American Metal Market index. These indices change based on currency fluctuations and the amount of available supply of scrap in the market (among other reasons) and can vary significantly from month to month. In addition, there is some uncertainty in transportation costs for long hauls based on fluctuating fuel costs and associated fuel surcharges.

There is also uncertainty as to whether the demolition materials are suitable for recycling. It is not uncommon for steel from mining sites to have higher than normal radioactivity, which could be in the form of surface debris from the mining processes and resulting airborne minerals or from the composition of the steel itself. Steel mills screen materials arriving for recycling to ensure that the radioactivity of the material is not above that of Normally Occurring Radioactive Materials (NORM). As a result, there is some uncertainty in the recycling value of the steel because of the potential for scrap steel to have a radioactivity higher than that of NORM. Steel with higher radioactivity than can be accepted at the chosen mill(s) could be rejected, and the steel would need to be disposed of as opposed to recycled (i.e., resulting in a cost as opposed to a credit).

7.1.6.3 Contaminated Soils

Remedial alternatives have not been developed or assessed for the management of PHC-contaminated soils in the Mill Building Area. General options to be assessed include (1) excavation and offsite disposal or disposal in a constructed onsite permitted facility and (2) management of contaminated soils in place with the installation of a soil cap. Assessment of these options will be required in considering future land use and corresponding remedial objectives for the Mill Building Area.

7.1.7 Approved Reclamation Approaches and Concepts

7.1.7.1 Current Status of Alternative Development

Only the general approaches summarized previously have been developed for the Mill Building Area. Consistent with direction provided by YG, CH2M has assumed Mill buildings will be removed and the site will either be covered or contaminated soils removed. The building materials will either be recycled or disposed of onsite, and hazardous materials will be hauled offsite.

7.1.8 Recommendations for Next Steps

Hazardous Materials

The following are recommended future activities to address the remaining hazardous materials within the Mill Building Area:

- Create an inventory of remaining wastes at the site. Review the EBA HAZMAT Reports in comparison to the QM Hazardous Material Characterization and Removal Report (QM, January 2015).
- Verify which remaining items on the EBA HAZMAT inventory are wastes versus materials and products that are currently being used by the care and maintenance contractor.
- Verify and finalize prioritization of wastes identified for removal.
- Develop a HAZMAT management plan, which may include the need for additional inventory of wastes for verification purposes, and may be a two-phase plan to separate the management of hazardous wastes throughout the Mill Building Area and the removal of designated substances from

the buildings (i.e., this scope of work may more suitably be included in the demolition plan described below).

- Procure specialized and qualified contractors to perform the waste removal activities identified in the HAZMAT Management Plan.

Abandoned Structures

The following are recommended future activities to address the abandoned structures within the Mill Building Area:

- Identify the buildings requiring demolition and prioritize demolition activities. Considerations will likely include imminent threat to workers at the site, environmental considerations, future use of the site, and potential interim or final use of competent structures.
- Complete a scrap steel assessment to determine scrap steel value, as the steel may be unsuitable for recycling as described in Section 7.1.6.2. The assessment of the scrap steel should include the following tasks:
  - Steel radioactivity should be measured onsite for comparison to mill acceptability criteria.
  - If steel radioactivity is above that of mill acceptability criteria, the source of the radioactivity should be confirmed (i.e., is the radioactivity from the steel itself or in the process debris on the surface of the steel).
  - If the source of radioactivity is process debris on the steel surface, a cost comparison should be conducted for the following options: (1) cleaning and recycling of the steel, (2) disposal of the steel offsite as waste, and (3) landfilling the steel onsite.
  - If the source of radioactivity is the steel itself, a cost comparison should be conducted for the following options: (1) disposal of the steel offsite as waste and (2) developing a plan to contain the steel and landfilling it onsite.
- Assess the potential cost benefits of constructing an onsite disposal cell to accommodate low-risk wastes such as asbestos-containing materials and PHC-contaminated soils, as an alternative to offsite disposal of designated substances.
- Evaluate underground utilities and yard piping that pose a potential environmental risk or potential conduit for contaminants as part of the removal process.
- Classify wastes present in process equipment, tanks, and pipes.
- Develop a decommissioning and demolition plan based on all of the considerations noted above.
- Develop bid specifications and contract documentation to procure specialized and qualified contractors to perform the activities identified in the decommissioning and demolition plan.

Contaminated Soils

Though remedial alternatives have not been assessed for the management of PHC-contaminated soils in the Mill Building Area, general options such as excavation and offsite disposal, construction of an onsite disposal cell, and management of contaminated soils in place with the installation of a soil cap have been considered. Assessment of these options will be required when considering future land use and corresponding remedial objectives for the Mill Building Area.

7.2 Emergency Tailings Area

7.2.1 Introduction

7.2.1.1 Site History and Description

The lower Faro Creek valley was used for emergency storage of tailings during mining operations, with the ETA adjacent to the Mill Building. When the mill operations were unable to discharge to the tailings pipeline because of problems at the mill or with the tailings pipeline, the mill tailings were discharged to this area. The tailings are contained by topographic features to the south, the FMC waste dumps to the east, the embankment of the Mill Building Area to the north, and the Mine Access Road to the southwest.

Significant contaminant loads of metals and sulphate are released via surface water and groundwater discharge from the ETA. Discharge from the ETA contains the accumulated contaminant load from waste rock dump seepage, runoff and seepage from the Mill Building Area (including the former concentrate loadout facility), and the tailings within the ETA. Natural drainage from the ETA is to the southwest, towards the Faro Creek Canyon and the RCTA.

There are an estimated 89,000 m^3 of tailings covering an area of 33,000 m^2 at the ETA, with an estimated 50,000 cubic cm of impacted soil below the tailings. This assumes an average depth of impacted soil of 1.5 m below the tailings (CH2M, March 2015ff).

Surface water from the ETA is routed through a culvert that crosses under the Mine Access Road and into a drop box from which it can be gravity discharged to either the ETA SIS manhole or to the Faro Creek Canyon. The Faro Creek Canyon conveys flow into the Intermediate Impoundment at the RCTA.

The ETA SIS was constructed downgradient of the ETA to collect contaminated water discharging from the ETA. The SIS was constructed in 2006 and first operated in 2007. It was built as an interim system that collected seepage and pumped to the Faro water treatment plant for treatment. It operated seasonally when the water treatment plant was operating.

7.2.1.2 Problem Statement

The ETA contains some of the most highly contaminated groundwater and surface water in the Faro Mine Area. It is a major source of contaminant loading to the RCAA. Sources of the contamination include the tailings within the ETA and the Faro waste dumps, which discharge through the Faro Creek Canyon (AECOM, March 2009; SRK, November 2006a) along with seepage and runoff from the Mill Building Area. The interim SIS operated about 5 months of the year during warm weather periods. It has not operated since October 2013, during the time the WTP has not been in operation; however, it is believed that YG plans to operate the system again in 2016. Surface and groundwater quality have increasing trends for acidity, sulphate, and zinc, and this trend is expected to continue. Seepage from the Main Dump and ore stockpiles has become slightly more acidic over the last 10 years, and alkalinity is becoming depleted, suggesting ongoing breakthrough of ARD products and a decline in the buffering capacity of the Main Dump waste rock and ETA alluvial soils (Appendix G).

7.2.1.3 Remedial Objectives

The ETA remedial objectives are as follows:

- Remove or cover tailings to prevent erosion and direct contact.
- Minimize generation of impacted water.
- Collect and convey impacted water to the WTP.

7.2.1.4 Key Decisions Made

No site-wide decisions have been made that affect the remedial approach for the ETA.

Recommendations have been made by the IPRP regarding removal of tailings versus covering and regrading and seepage collection preferences. These are presented in Section 7.2.5 as a component of the alternative development status.

7.2.1.5 Current Site Status

The interim SIS is installed, but has not been operated in recent years because of the closing of the mill WTP and the construction of the IWTS.

7.2.2 Summary of Background Investigations and Studies

The initial efforts to study the mine waste dumps impacts on water quality were documented in RGC 2004. This study included the review of water quality data associated with the ETA. Focused studies on the ETA were conducted by SRK and RGC beginning in 2005 and 2006 and continued through 2011.

The objectives of these studies were to do the following:

- Characterize sources of contamination that provide input to the ETA, including groundwater and surface water flow and contaminant concentrations emanating from up gradient waste dumps.
- Characterize the tailings and underlying contaminated soil within the ETA.
- Characterize groundwater and surface water hydrology, contaminant concentrations and trends, and mass loadings within and downgradient of the ETA.
- Obtain data to support construction of an interim SIS downgradient of the ETA.

The results of these studies were used to develop the *Faro Mine Complex, Closure and Remediation Plan, Project Description – Draft 4A* (SRK, March 2010a), which presented a conceptual remediation plan for the ETA.

7.2.3 CH2M Activities

Table 7-6 presents a chronology of CH2M activities at the site.

Table 7-6. Chronology of Main ETA Activities Conducted by CH2M
Faro Mine Remediation Project

Date(s)	Activity
October 2011	ETA Evaluation of early action technical memorandum prepared
February 2012	Site-wide Data Gaps identified
December 2012	ETA SIS upgrades developed in the MTP
2014	ETA field investigations performed to fill select data gaps
March 2015	Alternatives Summary Status report prepared
2015	Conceptual update of alternatives made, based on IPRP comments

7.2.3.1 ETA Evaluation of Early Action Technical Memorandum

The potential for early action at the ETA to improve the seepage capture of the existing SIS was evaluated in 2011 and presented in the *Emergency Tailings Area Evaluation of Proposed Near-term Upgrades, Faro Mine Remediation Project* technical memorandum (CH2M, October 2011). The technical memorandum evaluated existing data on the ETA and proposed approaches to winterize the ETA SIS

manhole and sump, relocate the seepage collection sump, extend the pipeline to the Faro Pit, and insulate and heat trace the pipeline to allow for year-round operation of the SIS.

7.2.3.2 Gaps Assessment

As described in Section 2.3, one of the first activities conducted by CH2M after coming under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this review, CH2M recommended the necessary field investigations to support preparation of a YESAA project proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c) and a revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2013 Gaps Report were addressed or not during the conduct of CH2M's contract for closure planning work at the FMRP (crosswalk tables are included in Appendix B). Data gaps identified for the ETA included the following:

- Conducting cone penetrometer tests and installation of an additional boring within the ETA to further delineate the thickness of the tailings and evaluate tailings chemistry
- Advancing two boreholes in the Mine Access Road to assess the geotechnical characteristics of the fill material
- Conducting geophysical survey in the Faro Creek Canyon to evaluate bedrock conditions
- Performing test-pitting to investigate the depth to competent bedrock for evaluating alignment of access road for proposed cutoff wall
- Installing a stream stage recorders at X23 and FCS-4
- Field surveying soil and vegetation to provide basis for ecosite delineation.
- Field validating existing ecosite attributes, including site features, contours, and vegetation communities

7.2.3.3 Emergency Tailings Area Seepage Interception System Upgrades Developed in the Medium Term Plan

The overall purpose of the MTP was to present the current design concepts and proposed path forward through design and construction for select actions at the FMC. These were early actions that were planned to be implemented in the next several years at the site.

For the ETA SIS specifically, the MTP presented the development of upgrades to improve seepage capture effectiveness. It did not address other issues with the ETA, such as whether to remove or cover the tailings deposited in the ETA. It was included in the MTP as an optional project. It provided a description of the activities that would be completed for the ETA SIS upgrade through construction and included the following:

- Basis of Design Assumptions
  - Primary considerations for ETA SIS upgrade
  - Activities required to implement scope
  - SIS upgrade design assumptions
  - Compatibility with the final remedy
- Work Scope
  - Predesign field investigation
  - Design definition
  - Conceptual design (30 percent)
  - Advanced design (60 percent)
  - Detailed design (90 percent)

  - Final design (100 percent)
  - Procurement/contracting
  - Permitting
  - Construction
  - Construction management

- Uncertainties
- Schedule

Upon completion of the MTP, selected early actions were carried forward to the IWPP, which further developed the selected projects. The ETA SIS upgrade was not selected to move forward.

7.2.3.4 ETA Field Investigations to Fill Select Data Gaps

Field investigations completed by CH2M are summarized in Appendix C and presented in further detail in the following documents:

- *Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tails Area FSP Name: 105.1 – Remove Tailings to Rose Creek Tailings Facility* (CH2M, March 2015m).
- *Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area FSP Name: 105.2 – Install Emergency Tailings Area Surface Water Collection System* (CH2M, March 2015n).

7.2.4 Conditions and Features

The ETA has been investigated and evaluated in a number of studies. A comprehensive summary of the site was presented in the MTP (YG, March 2014). This section provides a summary of conditions and features at the ETA and presents an update of the conditions based on recent monitoring results.

Key site features are shown on Figure 7-3. The figure presents the estimated extent of tailings deposition, boring, and cone penetrometer locations. Cross sections for the ETA are presented in Figure 7-4.

Photo 7-1 shows the current view of the ETA. Surface water and groundwater contamination loading in the ETA, seen in the photo, is from the following sources:

- Surface flow originating as toe seepage from the Main Dump in Old Faro Creek (near surface-water sampling location X23, shown on Figure 7-1)
- Groundwater flow from the FMC waste dumps through highly permeable alluvial sediments in the historic Faro Valley upon which the ETA is located
- Surface water and groundwater flow impacts from the ETA tailings
- Runoff and seepage from the Mill Canyon Creek area
- Runoff and seepage from the Mill Building Area, including the former concentrate load-out facility

Natural drainage from the ETA is to the southwest, towards the Faro Creek Canyon and the RCTA. Old Faro Creek gains significantly along its length, with much of the groundwater contributions to the stream likely occurring between X23 and the Mine Access Road (SRK, November 2006a). The ETA seep, surface water, and groundwater sampling locations are shown on Figure 7-1. Table 7-7 summarizes pH, sulphate, and zinc information for different ETA water units.

Table 7-7. ETA Water Quality
Faro Mine Remediation Project

Material	Sulphate (mg/L)	Zinc (mg/L)	pH
Groundwater in Tailings	5,000-18,500	300-870	4.1-6.8
Groundwater in Alluvium	5,000-10,000	<0.005-1,000	3.5-7.0
Groundwater in Overburden/Bedrock	4,000-7,000	75-400	6.0-6.5
Groundwater in Bedrock	<0.5-2,100	<0.001-50	6.5-8.0
Surface Water (X23)	4,500-12,000	200-1,500	2.5-7.5
Surface water (FCS-4)	1,500-10,000	60-1,600	3.3-6.5

Notes:

Groundwater (except for the tailings unit) and X23 surface water quality information approximated from 2006 through 2014 data from figures in RCG, March 2015a.

FCS-4 surface water and tailings unit groundwater quality information from 2006 through 2014 data from EQuIS.

< = less than

Seeps discharging to the ETA at the base of the Main Dump become flowing surface water across the ETA in Old Faro Creek and Mill Canyon Creek. The seeps are highly impacted, as evidenced by the water quality at surface-water sampling location X23 shown in Table 7-7. Surface water quality at X23 has increasing contamination trends, as presented in Appendix G.



Photograph 7-1. Emergency Tailings Area (looking southwest from the FMC waste dumps). Water seeping from the base of the Main Dump corresponds to Location X23 on Figure 7-1.

Groundwater in tailings and alluvium in the ETA is also highly impacted, and mine-related contamination is increasing. Iron concentrations are elevated in shallow ETA groundwater as well, because of leaching from the tailings. Groundwater in bedrock within the ETA is less affected by mine waste seepage than

the overlying alluvial channel, as described in Appendix G. The bedrock aquifer is considered to be a relatively minor contributor for the ETA's contaminant mass flux.

Overburden and weathered bedrock groundwater quality and surface water quality downstream of the ETA in Faro Creek Canyon is also highly impacted (locations P09-ETA2 and FCS-4). However, groundwater in deep bedrock downgradient of the ETA does not show indications of mine-related contamination based on data from monitoring well P09-ETA1 (see Appendix G).

The zinc load discharged from the ETA was estimated to be approximately 35 to 80 tonnes in 2005 and 2006 and 131 tonnes in 2009. To put these metal loads from the ETA in perspective, they can be compared to estimated loads (as calculated by modelling) originating from the tailings in the RCTA. The Rose Creek tailings water and load balance study (RGC, September 2005) estimated that the zinc load from the tailings in the RCTA to the RCAA from 2005 to 2010 would range from approximately 65 to 100 tonnes per year (tpy) for average conditions and 75 to 200 tpy for maximum conditions. This indicates that the ETA is a significant source of zinc to the aquifer. The ETA interim SIS was installed to intercept the ETA surface water and seep contamination.

Monthly and annual iron, sulphate, and zinc loading rates between 2010 and 2015 were calculated for the following locations:

- X23 – seep near toe of the Main Dump.
- FCS-2 and X7 (also called FCS-3) – located downstream of the Mine Access Road; FCS-2 is used to represents discharge emerging on the eastern side of the Faro Creek Canyon and X7 is a seep emerging on the western side of the Faro Creek Canyon.
- ETA Combined – downstream of X7, this represents the combined collection from the ETA SIS for years when the system was operating; since 2013, this represents water that discharges from the collection sump.
- FCS-4 – located downstream of the ETA SIS, this station represents surface water discharging through Faro Creek Canyon. It includes the majority of groundwater at this constricted location in the canyon that has discharged to the channel.

Figure 7-1 shows these locations. Figure 7-5 provides the calculated monthly load estimates along with measured concentrations for the upstream and downstream monitored locations (i.e., X23 and FCS-4) and Figure 7-6 provides the same information for the monitored locations internal to the ETA, downstream of the Mine Access Road (i.e., FCS-2, X7, and ETA Combined).

For instances of missing flow and concentration data in a given month, the annual loads were estimated by averaging the recorded monthly loads and applying that averaged load to the months with missing data. For instances where more than one sample was collected per month, the concentration from each sample was used to calculate a monthly load indicative of a load range to be expected. Two locations in particular, FCS-2 and X7, had very little concentration data available to calculate loads; therefore, the loads for these two monitoring wells are based on 1 to 2 months.

Monthly loading at X23 appears to be fairly steady, with the exception of peak loading calculated in 2013. Concentrations show a general increase, although following a peak in 2013 there has been a decreasing trend in the last couple of years. Monthly loading at FCS-4 appears to be increasing since 2010, although peak loading was again observed in 2013. For the most part, the peak loading in 2013 is coincident with peak concentrations.

No significant trends are apparent from the limited data for FCS-2 and X7. However, it is notable that sulphate and zinc loading from FCS-2 is up to an order of magnitude greater than the contribution from X7. In general, sulphate and zinc concentrations at the two locations are comparable, and the increased

loading reflects the higher flow at FCS-2. At ETA Combined, peak loading is generally observed in 2013, but overall there appears to be an increasing loading trend for all parameters since 2010.

Estimates of total annual loads from these locations between 2010 and 2015 are shown in Figure 7-7 and tabulated in Table 7-8.

Table 7-8. Estimated Total Annual Load
Faro Mine Remediation Project

Load	Year	Monitoring Location				
		X23	**FCS-2**	**X7**	**ETA Combined**	**FCS-4**
Estimated Total Annual Iron Load (tonnes)	2010	1	--	80	115	65
	2011	7	--	20	98	75
	2012	13	--	67	117	96
	2013	54	118	110	248	226
	2014	26	99	39	211	210
	2015	8	44	30	178	150
Estimated Total Annual Sulphate Load (tonnes)	2010	71	--	440	855	507
	2011	292	--	122	1,012	631
	2012	413	--	388	1,301	1,090
	2013	912	2,317	437	1,816	2,057
	2014	479	3,349	232	1,214	2,200
	2015	167	1,180	171	1,011	1,437
Estimated Total Annual Zinc Load (tonnes)	2010	5	--	26	54	28
	2011	27	--	7	68	39
	2012	43	--	25	109	83
	2013	124	304	33	178	230
	2014	58	254	17	98	197
	2015	16	121	12	75	109

Notes:

Where monthly flow data was missing, the annual load was estimated by averaging known monthly loads assuming similar loads for missing months.

Flow data in many cases is based on one or a few flow measurements per month.

The ETA SIS operated seasonally until 2013, but has not been operated since then. Between 2012 and 2013, loading at FCS-4 approximately doubled; in comparison, the load at ETA Combined only increased by about 40 percent. While loading at X23 approximately doubled, X23 comprises only about 40 percent of the total load at FCS-4. Therefore, in addition to reduced capture of loads, there has been an increase in the magnitude of the loading.

The flows that bypass the existing ETA SIS are transported down the Faro Creek Canyon. A portion of the surface water flow bypassing the ETA SIS (and associated metal load) infiltrates into the alluvial material in Faro Creek Canyon and into the tailings in the RCTA at the base of the Faro Creek Canyon (and also into the RCAA). The attenuation capacity of the RCAA is consumed by this metal loading. The remaining portion of the surface water flow that bypasses the ETA SIS diverts to the Intermediate Dam Pond.

Metal contamination in the RCAA is currently attenuated in the aquifer (largely by organic carbon in the aquifer matrix). Concentrations of sulphate and metals are gradually increasing in shallow groundwater along the northern side of the valley downgradient of the CVD, while zinc concentrations remain low (about 0.07 mg/L at P05-02). This recent increase appears to indicate the leading edge of the zinc plume has recently arrived at the CVD (RGC, 2015). The attenuation capacity of the RCAA, particularly along the perimeter of the RCAA where the depth to bedrock is relatively shallow (for example, along the alignment of the Faro Creek Canyon), is not fully quantified. The attenuation capacity is finite, and capacity is being consumed by ongoing discharges from the ETA. This is demonstrated by increasing metals concentrations in the RCAA, as described in Section 8, Rose Creek Tailings Area Remedial Unit.

The ETA has been the subject of a number of evaluations by SRK (November 2006b, September 2006b), RGC (July 2006, April 2007, March 2010, June 2011), Brodie Consulting Limited (BCL) (July 2010, November 2010), and CH2M (October 2011). These studies have evaluated flows and loads discharging from the ETA (SRK, November 2006b; RGC, July 2006; RGC, April 2007) and have also evaluated the efficiency of the current SIS (RGC, March 2010; RGC, June 2011) and made recommendations for improved capture of ETA discharge (RGC, June 2011; BCL, July 2010; BCL, November 2010). CH2M reviewed current conditions in the fall 2011 (CH2M, October 2011) and recommended proceeding with interim upgrades to improve capture efficiency and cold-weather conveyance to the Faro Pit.

7.2.4.1 Description of the Existing SIS

In 2006, an interim SIS was constructed at the southwestern end of the ETA, just downgradient of the Mine Access Road (see Figure 7-1), to collect surface water runoff and seepage from two prominent seeps. The action was taken to intercept a portion of the ETA contaminant load that would otherwise travel to the RCTA and RCAA. The SIS was operated during the ice-free seasons (RGC, March 2010). RGC (June 2011) estimates that the existing ETA SIS captures about 43 percent and 53 percent of the ETA's estimated total annual load of iron and zinc, respectively. Upgrades and year-round operation of the ETA SIS has been recommended to improve SIS capture efficiency and to reduce metal loading to the RCAA (RGC, June 2011; CH2M, October 2011).

Surface runoff from the ETA collects in a metal drop box immediately downstream from the mine access road culvert (location FCS-2). The ETA SIS manhole also collects subsurface seepage from the ETA in two sumps that isolate and collect the prominent seepage faces downgradient from the Mine Access Road. These sumps (East Sump – FCS-3a and West Sump – FCS-3b) were constructed by excavating partially into the surficial soils and shallow, weathered bedrock and filling the excavations with coarse drain rock. The downstream side of these collection sumps was reportedly sealed by a liner. Seepage collected in these two rock-filled sumps is conveyed by gravity flow via separate 3-inch polyvinyl chloride pipes into the ETA SIS manhole (RGC, March 2010).

The system was originally designed such that all seepage collecting in the manhole during the ice-free period was pumped uphill by either a 15-horsepower (hp) or a 30-hp sump pump to the 10-inch high-density polyethylene [HDPE] gravity line that discharges to the Intermediate Pond (this pipeline is no longer functional). In June 2010, the ETA SIS was upgraded to enable pumping of the collected seepage from the manhole to the WTP (via a 6-inch HDPE gravity line) when the WTP is operational (RGC, June 2011).

7.2.4.2 Efficiency of ETA SIS

According to the 2009 review of the ETA SIS (RGC, March 2010), the ETA SIS started up on May 4, 2009, and shut down on October 14, 2009. During this time, the system captured, on average, 7.9 L/s, which represents 88 percent of the estimated total flow under the low-flow conditions monitored. The seepage bypassing the ETA SIS averaged 1.1 L/s, representing 12 percent of the estimated seepage. The same analysis indicated 94 percent collection efficiency for zinc, even though the seepage collection was

only 88 percent efficient because of the relatively low zinc concentrations in the seepage bypass. The ETA SIS intercepted an estimated 31.2 tpy zinc and 488 tpy sulphate in 2011 (DES, February 2012).

Seepage bypassing the SIS has been observed immediately below the ETA SIS (CH2M, October 2011). This seepage flows along the Faro Creek Canyon (primarily on bedrock) directly to FCS-4, with little opportunity to re-infiltrate. Past evaluations have also concluded that additional bypass of seepage from the ETA via groundwater flow is likely relatively small because (1) the topographic drop in the Faro Creek Canyon will likely cause seepage bypass in the shallow groundwater (in the overburden and upper weathered bedrock) to discharge to Faro Creek, (2) drilling suggests that deep bedrock is competent, and (3) deeper bedrock wells downgradient of the ETA (for example, P09-ETA1) indicate no impact from ETA seepage (RCG, March 2015a).

A review of the overall annual capture efficiency of the ETA SIS concluded that the system captured only about 43 percent and 53 percent of the estimated total annual load of iron and zinc, respectively (RGC, June 2011). Based on observed flows in 2009 and earlier year-round monitoring of seepage flow in the ETA and Faro Creek Canyon, the seepage not collected during winter (192 days) is estimated to be approximately 126,800 m^3, which represents approximately 7.6 L/s over that period.

7.2.4.3 Limitations of the Current ETA SIS Configuration

The following limitations were identified for the ETA SIS:

- RGC (June 2011) concluded that the current ETA SIS has a relatively high efficiency of seepage collection during the open-water season (capturing about 88 percent of total seepage); however, significant contaminant loading bypasses the ETA SIS during the prolonged winter shutdown (typically between mid-October and early May). As a result, the overall efficiency of seepage interception considering the entire calendar year, is estimated to be on the order of 50 percent. The seasonal operation of the system is the main limitation.
- The operational period during which the ETA SIS can currently convey the collected seepage to treatment is dictated by the operating period of the WTP, which is largely a function of weather (the WTP only operates during summer months). The start date is dictated by the commencement of consistent non-freezing temperatures. The end date for operation of the WTP is based on the requirements to meet operation targets in the Faro Pit lake, ID Pond and CVD Pond. In some years, the WTP ceases operation in August (but more typically in September or October); in 2015, operation extended in to November.

7.2.5 Remedial Alternatives Assessment and Status

7.2.5.1 Alternatives Summary Status Report

Three alternatives were developed and evaluated for the Alternatives Summary Status Report (CH2M, March 2015ff). These alternatives included an alternative that was based on the FMC Closure and Reclamation Plan Project Description 4A (SRK, March 2010a) and two additional alternatives. This section presents a brief summary of the following:

- Design criteria
- Alternatives considered
- Results of evaluations
- Comments by IPRP
- Assumptions and constraints
- Current status
- Recommendations for next steps

Design Criteria

Key criteria are the design capacity (return interval design flow) of the upstream diversion ditches and downstream surface water and seepage collection system. The upstream diversion ditches will limit clean runoff entering the ETA and allow for more efficient collection of impacted runoff and seepage from the downstream collection system.

Alternatives Considered

General design considerations developed during the conceptual design of the ETA remedial alternatives are presented in the Alternative Summary Status Report (CH2M, March 2015ff).

Table 7-9 summarizes the alternatives for the ETA.

Table 7-9. Emergency Tailings Area Alternatives
Faro Mine Remediation Project

Alternative	Name	Description
TA-01	Draft 4A—remove tailings and revegetate, stormwater and groundwater collection and conveyance	Implement alternative as described in Project Description 4A. Remove tailings and dispose of either with Rose Creek tailings or in Faro Pit. Remove impacted soil under tailings and revegetate area. Install stormwater and groundwater collection and conveyance systems. Install clean stormwater diversion channels around ETA and maintain until ETA runoff is clean.
TA-02	Cover tailings in place, stormwater and groundwater collection and conveyance	Keep tailings in place and place cover over tailings. Install stormwater and groundwater collection and conveyance systems. Includes SIS and stormwater sump at X23 and Mill Canyon. Includes concrete stormwater cutoff wall in Faro Creek Canyon down stream of Mine Access Road. Include clean water diversions upstream of ETA (may include diversion channels after upstream WRDs are graded and covered).
TA-03	Remove tailings and cover/ revegetate, stormwater and groundwater collection and conveyance. Downstream stormwater and groundwater collection upgraded equivalent to TA-02	Remove tailings as in TA-01 but upgrade cover post removal and upgrade stormwater and seep collection downgradient of ETA. Remove tailings and dispose of either with Rose Creek tailings or in Faro Pit. Remove impacted soil under tailings. Revegetate area. Install stormwater and groundwater collection and conveyance systems. Includes stormwater retention structure in Faro Creek Canyon downstream of Mine Access Road. Install clean stormwater diversion channels around ETA and maintain until ETA runoff is clean.

Figures E-3 and E-4 of the Alternative Summary Status Report shows plan view for Alternatives TA-01 and TA-02, Figure E-5 shows the ETA subsurface interception system, and Figure E-6 shows the plans and quantities for the TA-03 (CH2M, March 2015ff).

Results of Evaluations

A summary of the alternative evaluation is presented on Figure H-11 of the Alternative Summary Status Report. TA-03 is expected to be the most effective overall at controlling contaminant migration from the ETA and have lower care and maintenance costs than a cover-in-place alternative (TA-02). It has a slightly higher estimated capital cost compared to TA-01, but it may not be significant.

Comments by IPRP

The IPRP provided comments on the alternatives presented in February 2015 IPRP meeting, which are the same alternatives documented in the Alternative Summary Status Report. A comment by the IPRP was made regarding the ETA alternatives presentation at this meeting:

> *The IPRP concurs with tailings (not underlying soils) removal to TSF. The contaminated seepage and runoff from upstream ARD sources should be collected and channeled through the area. Consideration can then be given to placing a 0.5 m reclamation solid cover on the contaminated soils. Consider with or without base pumping to WTP and channeling flood flows to the NF SWM or CVD. Collect and channel seepage downstream of road to NF SWM or CVD (no wells or pumps).*

Formal comments were provided by the IPRP on the Alternative Summary Status Report in the *Technical Memorandum re: Review Comments – Faro Mine Remediation Project Joint Design Team/IPRP Workshop – Faro Mine Remediation Plan* (IPRP, February 2015); however, no ETA comments were included by the IPRP in this document.

Following the IPRP FMC site visit from June 8 through 10, 2015 (IPRP, September 2015), the IPRP provided the following recommendation and comment with respect to the ETA:

- *Consider utilizing the Faro Pit and a SWMP* [storm water management pond] *located in the ETA area as the main SWMP[']s rather than the one, as proposed, on the west side of the WRDs.*
- *The seepage potential from this SWMP has to be reliably determined. The continuity and permeability of the bedrock underlying alluvial valley fill and side slopes has to be determined. The IPRP notes the observed high permeability of the shallow weathered bedrock encountered at the ETA seepage collection point.*

7.2.5.2 Assumptions and Constraints

Surface water management is a key component of the remedy at the ETA. Clean surface water runoff from the upstream waste dumps and Mill Building Area can be diverted to minimize the catchment area that the ETA surface water and seep collection system must manage. The currently envisioned collection system is a small concrete dam located in a bedrock notch downslope of the Mine Access Road. The structure provides a relatively small water retention volume due to the topography constraints.

Iron oxidation and precipitation within the collection and conveyance system will be an issue; as it is currently. Access to the water retention structure for cleaning and ability to pig the pipelines will be required for efficient operation.

Surface water from the ETA is currently routed through a culvert under the Mine Access Road to a drop box and into a pipe that transports it to the ETA SIS sump. Without this drop box and piping, water discharged from the culvert would bypass the current SIS sump or future concrete retention structure and would flow in an adjacent channel to Faro Creek and not be captured for collection and treatment. If the current culvert is retained for routing ETA flows through the Mine Access Road, redesigning and sizing of this drop box and pipe conveyance will need to be incorporated into a new design.

7.2.6 Current Status of Alternative Development

No formal alternative development has been conducted beyond the Alternative Summary Status Report. However, based on IPRP comments and additional considerations, the current concept for the ETA includes the following actions:

- Remove the ETA tailings and consolidate them with the RCTA tailings.

- Construct drainage ditches from X23 and Mill Canyon through the former ETA to a culvert under the mine access road discharging to Faro Creek Canyon. These ditches would be constructed in the alluvium and would provide positive drainage for X23, Mill Canyon, and the alluvium in the former ETA.
- Leave in place the contaminated alluvium (that had underlain the tailings). Given that X23 water will be conveyed through this area, the metal load from the contaminated alluvium would be small in comparison to X23.
- After tailings removal, cover area with till layer and revegetate. A trafficability layer would likely not be needed because after removal of the tailings, the alluvium would be the surface material.
- Route upstream clean water diversion ditches above the ETA either down the Mine Access Road to the east or down Faro Creek below the ETA. Routing of clean water will depend on overall site water management plans and timing of the remediation at the ETA.
- Collect the contaminated water downstream of the former ETA in the water retention structure described in the Alternative Summary Status Report and then either pump to the WTP or allow it to flow by gravity down to the Intermediate Dam Pond or other contaminated water collection system.

7.2.7 Recommendations for Next Steps

Hydrologic monitoring of the ETA at X23 and FCS4 is ongoing and additional hydrologic evaluations are needed to establish design criteria for components of the ETA water collection and conveyance system. Additional evaluation and coordination with the RUs is required to verify that an overall integrated strategy is implemented.

7.3 Lower Guardhouse Creek

7.3.1 Introduction

This subsection describes the work conducted by CH2M to advance the understanding of site conditions along Lower Guardhouse Creek and provides a summary of initial closure alternatives analysis.

Figure 7-8 shows the location of Lower Guardhouse Creek. The creek is an approximately 1.7-km-long partly disturbed natural channel that originally constituted the lower reach of Guardhouse Creek, a creek that drained an approximately 4.5-km^2 catchment area west of the Faro Creek drainage. The natural creek route trended south, converging with Rose Creek at a location that is now beneath the Intermediate Tailings Area. The NWID, constructed in 1980–1981, diverts flows west from Upper Guardhouse Creek, diverging from the natural creek channel at a location approximately 200 m northwest of the Truck Shop (RGC, November 1996). The reach of the original creek downstream of this diversion is now known as Lower Guardhouse Creek.

The upstream 250-m portion of the present Lower Guardhouse Creek is an east-west-aligned ditch located between the Truck Shop (to the south) and the Lower Parking Lot waste dump (to the north). The ditch is east of the original Guardhouse Creek alignment. Topographic maps from before mining occurred (RGC, November 1996) indicate the alignment of the ditch is roughly coincident with the alignment of a historical tributary creek to Guardhouse Creek. The tributary originated at a location approximately 400 m to the east of the upstream end of the present ditch. The pre-mining topography indicates the tributary creek received drainage from the area to the north where the Northwest WRD and Parking Lot waste dump are now located, and from the areas to the east and southeast where the Crusher Stockpile, Mill Building, and Truck Shop are now located.

Lower Guardhouse Creek drains to the ID Pond and collects mine-influenced seepage emanating from the waste dumps. At monitoring station SRK-FD01, located at the headwaters of Lower Guardhouse

Creek, sulphate and metal concentrations reflect highly impacted water with sulphate ranging from about 3,000 to 5,500 mg/L and zinc concentrations ranging from about 70 to 200 mg/L). Concentrations of both constituents were increasing until 2012 but have been relatively stable since then. At monitoring station GDHSECK, located closer to the RCTA, observed sulphate concentrations range between about 500 and 2,000 mg/L, while zinc concentrations have ranged between about 2 and 30 mg/L since 2012.

Contaminant concentrations were steadily increasing in Lower Guardhouse Creek, with seepage from the southern toe of the Northwest WRD (SRK-FD19) contributing 50 percent of Lower Guardhouse Creek flow. This seepage was highly impacted, with trends of decreasing alkalinity from 2003 to 2013 (403 mg/L to 151 mg/L), but this began to increase again after 2013. By 2015, the concentration had returned to 401 mg/L. Similarly, sulphate concentrations, which had been consistently increasing over the same time frame of 2003 to 2013 (from 3,810 mg/L to 6,300 mg/L), began to decrease after 2013. In September 2015, the recorded concentration was 4590 mg/L. Concentrations of zinc increased from 44.9 mg/L in 2003 to 257 mg/L in 2013, and only decreased to 201 mg/L by September 2015.

The main activities performed by CH2M related to Lower Guardhouse Creek are listed in the timeline presented in Table 7-10. Key CH2M activities, along with key reference documents, are described in Section 7.3.2.

Table 7-10. Chronology of Lower Guardhouse Creek Project Activities Conducted by CH2M
Faro Mine Remediation Project

Date(s)	Activity
February 2012	Initial Data Gaps Assessment (revised Data Gaps Assessment in September 2013)
September 2012	Preparation of CSM report
June 2014, September 2015	Lower Guardhouse Creek-related field reconnaissance, data gathering, and reporting
March 2015	Development of Alternatives Status Summary Report

7.3.2 Investigations and Studies Conducted by CH2M

7.3.2.1 Gaps Assessment

As described in Section 2.3, one of the first activities conducted by CH2M after coming under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. The Draft 4A Closure Plan remediation alternative recommended for Lower Guardhouse Creek included channel remediation if necessary, a seepage interception system, piping collected flow back to the Faro Pit, with remaining Lower Guardhouse Creek flow directed to the ETA and eventually to the Intermediate Dam Pond.

Based on the review of existing data and studies, CH2M identified technical uncertainties and recommended the necessary field investigations to support preparation of a YESAA Project Proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c) and revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2013 Gaps Report were addressed or not during the conduct of CH2M's contract for closure planning work at the FMRP (crosswalk tables are included in Appendix B).

The primary technical uncertainties identified for Lower Guardhouse Creek included estimating annual flow contributions from surface water and seepage, groundwater and surface water interaction, ground conditions and topography, capacity of the existing channel, and ability to intercept seepage. To address these uncertainties and with the objective, at that time, being to prepare and develop a cost estimate for a conceptual design for a YESAA proposal, CH2M proposed a field scope of work that included

surveying, bed and bank characterization, flood plain cover characterization, continuous flow monitoring, seismic refraction surveys, installation of monitoring wells and water collection for chemistry and for aquifer properties, and geotechnical sampling and testing.

Because of shifting priorities to address more critical site needs, the majority of the Lower Guardhouse Creek field investigations and data gathering were cancelled by YG and INAC. The field investigations that were conducted are described in Section 7.3.2.2.

7.3.2.2 Field Investigations

Field investigations conducted along the Lower Guardhouse Creek alignment included a 1-day geological reconnaissance conducted in June 2014 (CH2M, March 2015k) and a 1-day rapid geomorphic assessment of the creek channel, bed, and bank materials in September 2015 (Appendix E of this CDRMR).

The purpose of the 2014 reconnaissance was to gather information about Lower Guardhouse Creek to inform the potential design of a seepage interception system and the general condition of the channel. The alignment was walked, photos were taken, and observations documented.

The 2015 rapid geomorphic assessment was conducted to assess the condition of the channel and its capacity for flood conveyance. The rapid geomorphic assessment documented observations on surface water flows and groundwater seepage, channel shapes, bed and bank materials, approximate flow depths, and relative velocities within the channel.

7.3.2.3 Modelling

Appendix E of this CDRMR describes the HEC-RAS hydraulic modelling conducted by CH2M from the Lower Guardhouse Creek inception to just above RCTA. Flood magnitudes for the 1-in-20-year (1.1 m^3/sec) and PMF (7 m^3/sec) were estimated in HEC-HMS and used as HEC-RAS model flows. Erosive energy, expressed as shear stress, at the 1-in-20-year and PMF floods was also calculated.

The conveyance of the trapezoidal Lower Guardhouse Creek channel was evaluated using an at-a-station hydraulic analysis of a single cross section (River Station 1230). This analysis produced the discharge of the Lower Guardhouse Creek as a function of depth (or stage) in the channel. Appendix E includes the rating curve for Lower Guardhouse Creek at RS1230. For an estimated reach slope of 1.3 percent, the RS 1230 cross section conveys the 1-in-20-year and PMF floods at stages of roughly 0.3 and 0.7 m. The Lower Guardhouse Creek conveys roughly 100 m^3/sec before overtopping its banks.

As a flood conveyance channel, the Lower Guardhouse Creek has the capacity to convey floods up to the PMF. However, the bed and bank material of the channel is largely native, in situ material, or placed gravel to small cobble. The resulting shear stress values at high floods may erode the channel bed and banks causing channel failure.

7.3.3 Remediation Alternatives and Status

The Draft Alternatives Summary Status Report (CH2M, March 2015ff) provides a snapshot of work completed through February 6, 2015, to develop conceptual approaches for remediation of Lower Guardhouse Creek. As described in Section 7.3.2.1, substantial portions of planned field investigations were not conducted based on higher site priorities and available funding. Therefore, the Lower Guardhouse Creek closure concepts are not as advanced as closure options for some other site areas at the time the Alternatives Status Summary Report was written.

7.3.3.1 Closure Objectives

The following key closure objectives for Lower Guardhouse Creek were identified in the Draft Alternatives Summary Status Report:

- Realign channel and Increase channel capacity to convey selected design flows.
- Isolate diversion channels from potential contaminant sources.
- Integrate channel design with other remediation components.
- Near-term objective: Use the realigned channel as part of contaminated water collection and treatment system.
- Long-term objective: When flow meets identified water quality standards, reroute lower portion of channel to discharge into the NWID.

7.3.3.2 Design Criteria

Design capacity for Lower Guardhouse Creek was selected by estimating peak flow in the channel for a range of return interval storms and for the PMF, and comparing the risk of failure, failure mode, and impacts of failure at each potential design capacity. Design for a 1-in-500-year return flow was determined to provide the most reliable, cost-effective protection.

The risk of failure for a greater than 1-in-500-year event was considered low because Lower Guardhouse Creek has an available floodplain and the failure mode was discharge of impacted water to the tailings area and the CVD Pond.

7.3.3.3 Alternatives Evaluation

Conceptual designs of alternatives were developed to the extent necessary to compare to the Draft 4A alternative for Lower Guardhouse Creek. A qualitative comparison of alternatives was conducted using the following criteria:

- Implementability and constructability
- Effectiveness and longevity
- Required long-term care and maintenance
- Capital costs
- Operating and maintenance costs
- Replacement and no-routine maintenance costs
- Interaction with adjacent/other RU/components

Table 7-11 summarizes the alternatives considered for Lower Guardhouse Creek in the Draft Alternatives Development Summary Report, alternatives recommended for further evaluation, and key areas needing further evaluation. Alternative TA-02, upgrades to the existing channel, was recommended. The Alternatives Development Status Report provides additional detail on the closure work, including plan view and cross sectional profiles of the alternatives considered (CH2M, March 2015ff).

Table 7-11. Summary of Lower Guardhouse Creek Alternatives
Faro Mine Remediation Project

	Alternative Considered	Recommended Alternative	Additional Recommendations
Upper Guardhouse Creek	TA-01—Draft 4A – Existing Alignment Remediated and Seepage Collection: Remediate existing channel, if necessary; install SIS system at the mill pad and associated stockpiles and redirect flow to Faro Pit via a pipeline connecting to the ETA pipeline; excess Lower Guardhouse Creek flows discharge to ETA and eventually Intermediate Dam Pond. TA-02 – Existing Alignment Upgraded and Discharge to CVD Pond: Increase conveyance capacity to accommodate design event, with a new channel outlet to CVD	Recommend Alternative TA-02	Additional field reconnaissance should be completed to determine if significant erosion during large storm events would occur in the existing channel, and what the consequences of such erosion would be. It may be possible that only minimal modifications to the Lower Guardhouse Creek alignment and profile are required.

SECTION 6

Rose Creek Tailings Area Reclamation Unit

8.1 Introduction

This section describes the work conducted by CH2M to advance the understanding of site conditions with respect to grading and cover closure alternatives at the RCTA RU and provides a summary of initial closure planning activities conducted by others. This section includes a summary of (1) key background documents that describe baseline conditions and pre-2011 closure planning studies pertaining to the tailings and cover, (2) field investigations and analyses conducted within the tailings area of the RCTA RU by CH2M, (3) RCTA-related modelling efforts by CH2M, and (4) initial closure planning activities prepared by CH2M.

Sections 2.5 and 2.7 of this report describe the groundwater, surface water, and geochemistry modelling and related site conditions of the RCTA.

As described in Section 1.1.4, the RU demarcations were not established until late 2014 and the description of some of CH2M's prior and subsequent work does not always cleanly fit within the organizational format of describing work on an RU basis. This is especially so for the RCTA, which includes the tailings areas, ID, CVD, ID Pond, and CVD Pond, and is bounded on the south by the RCD. When the RUs were established, the concept was that the tailings impoundments presented a certain set of remediation requirements, and could be grouped into the RCTA RU, while the ID Pond, the CVD Pond, and the CVD present different requirements and could be grouped in the Dams and CVD Pond RU. Therefore, in organizing this report, CH2M has chosen to describe the RCTA tailings grading and cover alternatives work in Section 8, and the activities and alternatives associated with other elements of the RCTA, such as, the CVD, the ID Pond, the CVD Pond, the CVD SIS, and the DVIHU in Sections 2 and 9.

Figure 8-1 shows a plan view of the RCTA RU and identifies the major elements within the RU: those listed above, and the Original, Secondary, and Intermediate impoundments.

The main activities performed by CH2M related to the RCTA RU grading and covers are included in the timeline presented in Table 8-1. RCTA background information and closure planning performed by others (October 2011 and before), before CH2M started work, are summarized in Section 8.2. Key CH2M activities, along with key reference documents, are described in Section 8.3.

Numerous other evaluations and studies related to the RCTA RU have been performed by CH2M over a period of approximately 4 years; these are documented in the bibliography in Section 8.5.

Table 8-1. Chronology of Rose Creek Tailings Area Project Activities Conducted by CH2M
Faro Mine Remediation Project

Date(s)	Activity
February 2012	Initial Data Gaps Assessment (revised Data Gaps Assessment in September 2013)
September 2012	Preparation of CSM report
FY2012 to FY2016	RCTA-related field investigations, data gathering, monitoring, and reporting
FY2012 to FY2015	Developed and refined predictive models (geochemistry, hydrology, hydrogeology, GoldSim). Modelling evaluations to evaluate surface water, groundwater, and contaminant fate and transport within the RCTA RU
Early 2012[a] to November 2014[b]	Development of MTP and IWPP: Reprioritized RPP work, with Interim Works projects now the highest priority; RPP field programs to fill data gaps continued at a decreased level

Table 8-1. Chronology of Rose Creek Tailings Area Project Activities Conducted by CH2M
Faro Mine Remediation Project

Date(s)	Activity
September 8 - 11 and November 4 - 6, 2014; and February 10 - 12, 2015	IPRP meetings (September, November, February): a series workshops on the status and development of alternatives. Presented RCTA covers concept, analysis approach, and bookend options for material movement (high and low end), and identified trade-offs. This culminated in the submission of the Alternative Development Summary Status Report (CH2M, March 2015ff)
February 12, 2015	Faro Chartering meeting: YG directed CH2M to defer further analysis of closure options for RPP and instead to focus on developing the NFRC Project design
March 2015	Preparation of Alternative Development Status Report, which summarized closure alternatives evaluated to date, organized by RU
August 24 - 26, 2015	WRD/RCTA Covers Site Reconnaissance by CH2M's covers team, which included cover-related specialists from BGC, O'Kane Associates, and Integral Ecology Group
October 21 – 23, 2015	WRD/RCTA Covers Workshop with CH2M's covers team, YG and INAC
November 13, 2015	WRD/RCTA Workshop meeting notes issued

Notes:

[a] Final draft of the MTP is dated March 26, 2014.

[b] The IWPP was completed to a final draft stage (YG, November 2014a), but project priorities and regulatory strategy changed and the document was not submitted.

8.2 Summary of Background Work by Others

Multiple prior studies have been conducted related to the RCTA at the FMC. This section describes key background documents related to site conditions and closure planning for the RCTA that were prepared before CH2M came under contract to YG.

Significant Event Report (Environment Canada, 1975). This report describes the failure of the dike containing the Original Tailings Impoundment, failure of a temporary dike located downstream of the Original Impoundment, and the discharge of approximately 54 million gallons of tailings into Rose Creek and the floodplain downstream of the site. Tailings were observed within Rose Creek downstream of the site past Anvil Creek.

Anvil Range, 2003 Project 18b. Assessment of Tailings Outside of Containment (GLL, 2004). In 2003, an Environmental Assessment was completed for the Anvil Range Water License Renewal. The assessment identified four areas outside of the RCTA tailings impoundments where mine process tailings were known to exist. These include the ETA, the area downstream of the CVD, the area east of the Original Impoundment, and an area adjacent to the RCD near the Secondary Dam.

Down Valley Tailings Containment Project 1980-81 Construction, Faro Yukon (Golder, 1982). This is the construction report for the RCD, CVD, and ID Pond. It describes the conditions of the Rose Creek Valley, roadways, tailings, and use of materials within the valley as borrow sources.

Integrated Comprehensive Abandonment Plan (RGC, November 1996). The ICAP represents the first integrated evaluation and assessment of closure requirements and issues pertaining to the Faro and Vangorda Plateau mining areas. With respect to the RCTA, the ICAP report summarized the following:

- Construction history of the sequential development of the tailings impoundments
- Results of the geochemical testing
- Infiltration to tailings
- Tailings and alluvial aquifer hydrogeology including hydraulic conductivity and groundwater flow estimates

The following closure options for the waste dumps were identified and evaluated:

- Partial relocation of tailings to Faro Pit; water cover over remaining tailings
- Relocate all tailings to Faro Pit, re-establish Rose Creek channel
- Composite cover on Original and Second Impoundments, Water Cover on Intermediate Dam Impoundment
- Redistribute tailings from Original and Second Impoundments to Intermediate Impoundment – raising intermediate dam to flood all tailings
- The preferred closure option presented in the ICAP report was partial relocation of tailings to Faro Pit; water cover over remaining tailings.

Rose Creek Tailings Impoundment Site Characterization and Seismic Stability Assessment Report (Golder Associates, June 2004). This report characterizes the tailings impoundment, specifically seismic stability, using laboratory testing of fine and coarse gradations of tailings and cone penetration tests (CPT). Previous geotechnical investigations, historical records of dam construction, and tailings deposition were also used for additional context.

Triaxial tests were performed on fine and coarse tailings samples to determine index properties and the critical state line. The resulting evaluation provided the range of anticipated soil properties within the in situ fines content of the tailings deposit. Soil properties are critical input parameters in the assessment of liquefaction potential from the CPT data.

In October 2003, a CPT program was performed at the RCTA. Thirty-six holes were completed for a total length of 482 m of cone soundings. The CPT measures the soil response to the displacement caused by the penetrometer. The CPT soundings showed that tailings slimes were undrained. Undrained CPT behavior exhibited by the slimes resulted in a non-standard method of liquefaction potential estimation, which predicted widespread liquefaction of tailings slimes in the 0.05 to 0.1g peak ground acceleration. Despite this uncertainty in approach, results were corroborated by unusually high excess pore pressures measured during CPT testing.

The findings of the seismic stability assessment had implications for closure and cover design:

- In the event of tailings movement, the volume of the impoundment may not be sufficient to contain tailings.
- Cover construction will be difficult due to low trafficability and the potential to increase pore pressure.
- Large differential settlement is expected and would threaten integrity of the cover.
- The weight of the cover will generate excess tailings pore water requiring water management.
- Moderate seismic loading is expected to trigger liquefaction of fine tailings zones and potential flowslide displacements.

In a response to questions regarding extent of displacement, Golder confirmed that they expect displacements of at least 2 m, given that the CPT results were among the weakest they had ever measured (Golder, September 2006).

Results from Trial Covers at Rose Creek Tailings Impoundment (SRK, April 2006). This report presents the results of monitoring of the construction and performance of trial covers on areas of the Rose Creek tailings impoundment. Trial covers were constructed in April 2004, and were monitored during the snow-free seasons of 2004 and 2005. Each cover was approximately 80 cm thick, 625 m^2 in size, and constructed of calc-silicate waste rock. Most of the grain-size distribution was characterized as silty to clayey gravel. One of the two tailings covers (West Pad) was constructed on a non-woven geotextile

(Armtec 350) to prevent migration of fines. Covers were intended to limit infiltration, prevent wind erosion, and discourage vegetation on the tailings surface.

Monitoring of the trial covers in 2004 and 2005 indicated that rapid and variable settlement had occurred during the monitoring period, largely attributed to consolidation (weight of the cover) and thaw of localized excess ice. No evidence of fines migration was observed

Required thickness of the cover to prevent exposure of the tailings during a seismic event was also estimated, assuming that the mode of failure is the formation of sand boils to dissipate pore pressure. Empirical data were used to conclude that portions of the tailings impoundment would require excessive cover depths (greater than 2 m) to prevent tailings sand boils.

Options for Closure of the Faro Mine Complex (SRK, February 2008). This report synthesizes options for closure and remediation that have been developed over a period of 25 years, develops example alternatives, and refines the range of options based on 2006-2007 IPRP reviews. Specific closure options were recommended for further consideration. For the RCTA, these options included (1) stabilization in place, (2) complete relocation, and (3) and partial relocation. For all three alternatives, the risk of mobilization of tailings is mitigated by upgrading the RCD channel.

Faro Mine Complex Final Closure and Remediation Plan Project Description – Draft 4A (SRK, March 2010a). This report describes preferred closure options selected for the FMC and emphasized a number of information gaps and outstanding decisions yet to be made before the closure project description could be finalized. The report noted that the document should be considered a work in progress, with the intent that it be updated as decisions are made and technical data is made available. For the RCTA, three closure options, as previously described, were initially considered but stabilization in place was identified as the preferred alternative. The preferred option also recommends a tailings cover consisting of a waste rock trafficability layer under an infiltration resisting layer of glacial till. The two-layer cover would then be revegetated.

The cover would consist of 0.5 m of waste rock and 1.5 m of compacted till. The cover would be graded to provide an overall slope of 0.15 percent towards the pond upstream of the Intermediate Dam. Locally steep areas would be regraded to a 3H:1V slope. These activities would occur in the context of upgrades and modifications to the RCD, ID, and CVD.

8.3 Investigations and Studies Conducted by CH2M

The main grading and cover RCTA-related activities identified in Table 8-1 are described briefly in the following subsections, with citations to key reference documents produced by CH2M. Some RCTA-related information is described in other sections of this report.

8.3.1 Gaps Assessment

As described in Section 2.3, one of the first activities conducted by CH2M after coming under contract to YG was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the FMRP. Based on this review, CH2M recommended the necessary field investigations to support preparation of a YESAA Project Proposal. These recommendations were summarized in the Gaps Report (CH2M, February 2012c) and revised Gaps Report (CH2M, March 2014o). Section 2.3 describes a crosswalk process conducted by CH2M to document whether specific gaps identified in the 2012 and 2013 Gaps Reports were addressed by field investigations conducted at the site. (crosswalk tables are included in Appendix B). Data gaps identified for the RCTA included the following:

- A better definition of the extent of liquefiable conditions at the East Limb of the Secondary Dam, in situ shear wave velocities, and the cyclic shear strength in the clayey soils in the CVD foundation

- Vane shear data and discrete samples in relatively undisturbed areas for additional characterization across the tailings impoundment
- Implementation of a sampling and monitoring program in the saturated sediments and tailings adjacent to the ID
- A trafficability study required over representative sections of the tailings to provide additional insight into the requirements for cover placement
- Large-scale load tests to provide insight into the anticipated tailings consolidation and differential settlement after loading with the vegetation cover
- Identification of a source of granular material

Section 2.6.11 describes the borrow studies conducted to evaluate available site borrow for closure uses such as RCTA covers and revegetation. Section 8.3.3 describes field investigation programs conducted within the WRD RU to evaluate the other data gaps identified.

8.3.2 Conceptual Site Model

As described in Section 2.2, the CSM report (CH2M, September 2012f) summarizes (1) hydrologic, hydrogeologic, and geochemical processes that drive water and contaminant movement at the site, (2) the physical and chemical properties of the subsurface environment, and (3) the rates and volumes of water movement through the physical system. Relative to the RCTA, the CSM summarizes the movement of contaminants. The CSM states that the tailings contain significant concentrations of trace metals within reactive sulphide minerals. Oxidation of these minerals results in ARD. The infiltration of precipitation and snowmelt into the RCTA dissolves the secondary minerals and mobilizes the ARD downward to the water table.

Generally, clean groundwater from the south and southeast flows to the RCTA, and Faro-Mine-contaminated groundwater flows to the RCTA from the north, with a significant portion of contamination associated with the Faro Creek Canyon. Locally, the tailings contribute to groundwater contamination in RCTA, as well. The extensive leakage of clean water from the RCD (south of the RCTA) has a major influence on the spatial water quality trends in the RCAA, especially further downgradient near the CVD. There is a significant spatial trend from south to north of unimpacted groundwater transitioning to moderately impacted groundwater in the western half of the RCTA.

8.3.3 Rose Creek Tailings Area-related Field Investigations and Data Gathering

Section 2.4 describes field investigations conducted by CH2M since 2012. Appendix C includes a tabular summary of field investigation and analytical programs organized by fiscal year from 2012 to the present. The Appendix C summary tables (Tables C-1 through C-4) describe the area of the site investigated, the purpose of the field program, and the types of work conducted, and provide report citations for the applicable data/analysis report.

CH2M conducted the following RCTA-related field investigations and monitoring programs:

- Under FSP *Construct Cross Valley Dam Interception System* (FY2012): Seven borings were advanced to bedrock at the toe of the CVD and completed as monitoring wells; four shallow-paired borings were advanced adjacent to Rose Creek and completed as monitoring wells as described in Section 9; and groundwater samples were collected from all new wells and 56 existing locations in the RCTA and downstream of the CVD (CH2M, March 2013m).
- Under FSP *Construct Cross Valley Dam Interception System* (FY2013): Installed four monitoring wells in three boreholes in the northern portion of the Intermediate Impoundment: one deep alluvium well, one shallow alluvium well and two wells completed as a nested installation screened within the

middle and deep tailings material. Also drilled, installed, and conducted aquifer tests on six well clusters along the RCD, each consisting of paired wells and a stream stage. Conducted a specific conductivity survey in the RCD adjacent to the Second Impoundment. Groundwater samples were collected from all new wells and select existing locations in the RCTA and downstream of the CVD (CH2M, February 2014q).

- Under FSP *Dewater and Cover Intermediate Tailings Area* and *Construct New Side Channel and Side Channel Dike* (FY2014): Drilled 5 borings and performed 12 CPT soundings to delineate thickness and geotechnical properties of tailings, and to determine seasonal frost penetration. (CH2M, March 2015x and March 2015z, and Appendix F of this report).
- Under FSP *Site Wide Geochemical Monitoring* (FY2014): Installed three monitoring wells in the Original Impoundment: two wells completed in tailings and one in the alluvial aquifer underlying the tailings. Groundwater samples were collected from all new wells and select existing locations in the RCTA and downstream of the CVD (CH2M, March 2015b and Appendix G of this report).
- Cross Valley Dam and ID Ponds Geochemical and Geotechnical Characterization (FY2015): Performed six CPT soundings in the ID Pond and six CPT soundings in the CVD Pond. Performed sludge sampling with Sonic AquaLock technology at 6 locations in the CVD Pond.
- East Limb of Secondary Tailings Dam Liquefaction Evaluation (FY2015): Advanced six borings along the RCD in the East Limb of the Secondary Tailings Dam and conducted downhole shear wave velocity testing. Completed geophysical surveys including resistivity, seismic refraction, and surface wave surveys (CH2M, March 2016b and Appendix J of this report).
- Under FSP *Site Wide Geochemical Monitoring* (FY2015): Collected groundwater samples from all new wells and select existing locations in the RCTA and downstream of the CVD. Collected temperature data were from five thermistors previously installed in the RCTA (CH2M, April 2016d and Appendix G of this report).

8.3.4 Rose Creek Tailings Area-related Modelling

Section 2.5 of this report describes the site-wide models (surface water, groundwater, geochemistry, and water quality [GoldSim]) developed by CH2M for the FMRP. For modelling conducted specific to the RCTA, refer to the following sections:

- Section 2.5.1 – Groundwater Modeling
- Section 2.5.2 – Surface Water Modeling
- Section 2.5.3 – Geochemistry Modeling
- Section 2.5.4 – Water Quality Modelling (GoldSim)
- Section 2.7.3 – Hydrogeology
- Section 2.7.4 – Groundwater Quality
- Section 2.7.5 – Hydrology
- Section 2.7.6 – Geochemistry

8.3.5 Rose Creek Tailings Area Remediation Alternatives and Status

8.3.5.1 Medium Term Plan

As described in Section 1 and Section 11, the MTP (YG, March 2014) was developed to realign the site closure planning activities such that the YESAA RPP and specific interim works projects could be designed and implemented within an approximate 5-year time frame. Efforts related to development of the RPP were to continue during this timeframe, but the interim works projects were to have a greater priority from a schedule and funding viewpoint. As such, data gathering and closure alternatives analysis in support of the RPP were reprioritized and submission of the RPP was proposed for July 2017.

Following completion of the MTP, additional changes in site priorities continued to reduce the focus on the RPP. By 2015-2016, the completion of a comprehensive RPP was no longer a focus for the PDT, and the work plan and schedule for completion are now undefined. Field data collection continued for the RCTA, as described in Section 8.3.3, as well as hydrogeologic and geochemical modelling.

8.3.5.2 Alternatives Summary Status Report

This Alternatives Summary Status Report (CH2M, March 2015ff) provides a snapshot of work completed through February 6, 2015, to develop conceptual closure approaches for the entire site, as well as the RCTA. As described in Section 8.3.5.1, the focus of CH2M's work since 2012, with respect to the RCTA covers, has been to address known data gaps in the characterization of the geotechnical and geochemical properties of the tailings. The current status of other elements of the RCTA (dams, ponds, and the RCD) is described in Sections 2 and 9. These elements are focused on stable routing of the PMF. The work that CH2M completed with respect to RCTA closure options was completed as part of IPRP meetings in September 2014, November 2014, and February 2015. As part of this series of workshops, CH2M presented RCTA covers and water management concepts. This culminated in the submission of the Alternative Development Summary Status Report (CH2M, March 2015ff).

Rose Creek Tailings Area Closure Objectives

The closure of the RCTA involves multiple structural elements including the three dams (Original, Secondary, and Intermediate), a pond (ID Pond), and the adjacent RCD. Each individual element has specific objectives that contribute to meeting the overall objectives; these objectives (related to dam and RCD stability and flood passage) are discussed in Section 9. The closure objectives for the RCTA with respect to covers (SRK, March 2010a) are as follows:

- Prevent direct contact by wildlife and birds with tailings.
- Minimize contaminated runoff.

Design Criteria

Design criteria develop by SRK (March 2010a for the tailings area covers within the RCTA are as follows:

- Cover Performance – infiltration less than 10 percent of mean annual precipitation (range 5 to 20 percent)
- Tailings Cover Design – 0.5-m-thick layer of waste rock (trafficability); may not be necessary for trafficabilty on the surface of the Original and Secondary impoundments
  - 1.5-m-thick layer of loosely compacted till (growth medium)
  - Swales to route runoff towards pond upstream of the ID
  - Revegation
- Other Design Criteria – 0.15 percent slope towards pond upstream of the ID; excludes the regraded slope on the downstream face of the embankment at the Second Impoundment

Alternatives Evaluation

The RCTA alternatives evaluation presented in the Alternative Development Status Report (CH2M, March 2015ff) focuses on determining means of flood routing, pond and dam modifications, and surface water management. It also includes alternative concepts evaluated to provide clean water separation. Analysis was also completed to provide estimates of the volume of fill required to cover the tailings upstream of the ID to provide positive, continuous drainage off the tailings surface. These estimates were prepared for the sole purpose of understanding the approximate fill volumes required to achieve

different runoff slopes within the tailings area. With respect to cover type, the previous preferred alternative of Draft 4A was modified to include the following primary features:

- Rudimentary cover (1-m waste rock layer and 0.3- to 1.0-m uncompacted till growth medium) applied as a store and release cover.
- Hummock and swale pattern surface contouring to reduce air turbulence over the surface of the valley floor; to dissipate surface flows during freshets and high precipitation events; and to maintain appropriate cover moisture to support a vegetative cover.
- Development of an evapotranspirative vegetation cover (store and release) that separates precipitation (clean water) from tailings-contacted or pore water.
- Filling in ID Pond.
- Seepage collection on upstream side of the ID to collect tailings seepage/runoff, and convey collected water to Faro Pit and WTP.

Considerations for runoff management post construction include the following:

- Divert clean surface water around the northern side of the RCTA to the NWID.
- Collect and divert mine-impacted runoff and seepage from the toe of the waste dumps and direct it northeast of the RCTA.
- Manage runoff of clean surface water off covered tailings.

8.3.5.3 Waste Rock Dump/Rose Creek Tailings Area Covers Reconnaissance and Workshop

As described in Section 5.3.5.3, in 2015, CH2M expanded the technical evaluation team for the closure concepts of the waste dumps and the RCTA to specifically include Mike O'Kane of O'Kane Consultants, Justin Straker of IEG, and Gord McKenna of BGC. The site visit in August and the October workshop covered both waste dump and RCTA grading and cover option approaches. Meeting notes from the 2015 October workshop were issued by BGC on November 13, 2015.

8.3.5.4 Seismic Stability Analyses of Selected Dams for the Faro Mine Remediation Project

Appendix J provides the results of the foundation investigation and analysis completed by CH2M to evaluate the seismic stability of the East Limb of the Secondary Dam at the RCTA.

SECTION 7

Dams and Cross Valley Dam Pond Reclamation Unit

9.1 Introduction

Tailings in the RCTA, shown in Figure 9-1, are contained by a series of three dams: the Original Dam, the Secondary Dam, and the ID, constructed across the Rose Creek Valley, as shown on Figure 9-2. The Original Dam is completely buttressed by tailings on both sides, so it is no longer functioning as a significant dam structure. The CVD Pond, downstream of the tailings impoundment dams, serves as a polishing pond for the treated effluent from the IWTS, although it is anticipated that treated effluent could possibly bypass the CVD Pond in the future and be released directly into Rose Creek, downstream from the CVD. The other main element in the RCTA includes the RCD on the southern side of the valley.

The ID is the major tailings impoundment structure that normally contains flood waters entering the intermediate tailings area from a small residual catchment area, while the Rose Creek flows are routed around the RCTA in the RCD. Rose Creek was rerouted from its original course to accommodate the tailings impoundments. Rose Creek now flows through the RCD, a constructed channel that follows in generally a straight path along the southeastern boundary of the tailings impoundment. The RCD is approximately 5 km long, with a 0.23 percent to 5 percent varying gradient containing numerous drop weirs located in the area of the CVD. The RCD was originally designed and constructed to convey a 1-in-500 year flood event, without freeboard. Because the RCD dike has settled as thawing in the foundation has occurred over the years, and the hydrological estimates of flood flows have been updated (CH2M, 2015i), the RCD is now estimated to convey less than a 1-in-50-year flood before the waters in the RCD will overflow onto the intermediate tailings area. As part of the RCD Upgrades project (CH2M, February 2016c), the RCD dike will be raised such that no overtopping of the RCD dike would occur until the 1-in-200-year flood event is exceeded. Any floodwater routed through the ID spillway would flow into the CVD Pond, and once the storage capacity of the CVD Pond is exceeded, water would flow through the CVD spillway down into Rose Creek Valley, where it would flow into Rose Creek. However, this water routing is not part of day-to-day operations and has not been used to convey flood waters since construction of the RCD in the early 1980s.

The existing ID spillway (with a capacity of approximately 32 m^3/sec) cannot safely pass a moderate or major flood event without overtopping and potentially breaching the ID. Such a breach failure would result in an environmentally-damaging discharge of metals-laden tailings to the Rose Creek Valley, Anvil Creek, and the Pelly River. Failure of the Original Dam in 1975 within the Rose Creek Valley resulted in a loss of wildlife habitat, with little recovery evident more than 35 years later.

In meetings between the YG, INAC, and the IPRP, it was agreed that the ID spillway should be designed to pass the PMF flood, based on the significant potential for very severe environmental consequences in case of an uncontrolled release of tailings. This design criteria was included in the draft closure plan prepared by SRK (SRK, November 2010). Details of flood routing alternatives for the RCTA, and the selected alternative adopted for the project, are provided in the next section.

In accordance with recommendations from the IPRP, the CVD will be retained to provide an emergency storage facility for sedimentation of tailings that may erode during extreme runoff events, to capture contaminated water that may surface downstream of the ID, and to provide emergency storage for other site ARD facilities, including the CVD SIS, anticipated to be constructed within the next 10 to 15 years. At present, there is no agreement regarding the long-term disposition (closure configuration) of the CVD Pond. There is recognition that sudden release of polishing pond water may be sufficient to

fail the ID. (KCB, April 2008b). To mitigate this potential, the CVD spillway will be upgraded to PMF capacity to prevent overtopping and breaching of the CVD. Because the CVD Pond will contain significant amounts of impacted water during construction and the operations periods, it is recommended that it be designed for seismic loading consistent with the Maximum Credible Earthquake (MCE).

9.2 Summary of Background Work by Others

Numerous studies to assess the stability of the dams have been undertaken by different consultants in the decade before CH2M became involved in the project. Many of these evaluations were seismic stability assessments by Golder (June 2004) and Klohn Crippen Consultants (KCC) (later Kohn Crippen Berger [KCB]) for the tailings dams and the CVD. Periodic dam safety reviews and annual dam safety inspections have been performed and documented by KCC and BGC over the last 10 to 15 years (KCB, December 2002; KCB, 2008b; BGC, 2003). The first dam safety review by KCC (December 2002) triggered a number of the seismic and flood studies previously referenced. The 2002 report also reviewed the safety of the Fresh Water Supply Dam on the South Fork of Rose Creek located upstream of the tailings area. In 2003, that dam was breached, eliminating the hazard to the downstream environment (SRK, February 2003).

The Draft 4A Closure Plan (SRK, November 2010) included flood routing of the PMF storm event through the RCTA by the following:

- Constructing a fuse plug at the RCD
- Covering the tailings area and creating swales to convey the flood flow to the ID spillway and increasing the capacity of the ID spillway by raising the ID by 5 to 9 m
- Constructing a new ID spillway to convey a PMF
- Breaching the CVD

The Draft 4A preliminary design for the new PMF spillway at the ID consists of a relatively deep excavation in the right abutment with side slopes of 1H:1V in rock and 2.5H:1V in overburden, and 5-m-wide benches at 10-m intervals. The concept is shown in Figure 9-3.

9.2.1 Rose Creek Tailings Alternatives Evaluation (CH2M, August 2012k and November 2012f)

Because of uncertainties in the Draft 4A design, and specifically because of concerns with the ability of the multi-swale configuration to prevent channelization and serious erosion or scour of the tailings cover during large flood flow, CH2M developed the Rose Creek Tailings Alternatives Evaluation (CH2M, August 2012k; CH2M, November 2012f). This evaluation included the development of three flood routing alternatives, risk analyses, and order-of-magnitude cost estimates to compare the performance, reliability, and costs of these alternatives for flood routing. The following three alternatives were selected for the evaluation:

- **Alternative 1:** Pass PMF through enlarged RCD only.
- **Alternative 2**: Spill flows larger than 1-in-500-year flood and up to the PMF over a new overflow weir and onto a 40-m-wide and 5-m-deep, riprap-lined side channel. Improve the RCD upstream of the fuse plug to carry the PMF as for Alternative 1, and upgrade the RCD downstream of the fuse plug to pass a 1-in-500-year flood.
- **Alternative 3**: Similar to Alternative 2, with a 120-m-wide shallow riprap swale (1.5 m deep) instead of a side channel.

The results of the evaluation were presented to YG, INAC, and the IPRP in August 2012. Based on those discussions, a concept using a single, large-armoured channel (the side channel) to convey flood through the Intermediate Tailings Area was selected. The side channel would run parallel and adjacent to the RCD, be principally founded on soil and bedrock, and would carry flows greater than the 1-in-500-year flood that would spill over the top of the new overflow weir. Once the floodwater is in the side channel, it would be conveyed to the ID Pond and will then be routed through a new PMF spillway at the right abutment of the ID. These features are shown in Figure 9-4.

Since completion of the alternative assessment, an additional option for the ID spillway design was developed. This option reduces the required height increase of the ID rise by incorporating an ogee crest into the ID spillway.[1] The design also relies on steepening the spillway channel to increase flow capacity, necessitating concrete reinforcement of the channel. This design approach is shown in Figure 9-5. The associated ID crest raise is shown in Figure 9-6.

Improvements to the tailings area will include covering with a trafficability layer that consists of relatively free-draining waste rock (it will also provide a capillary break), and covering with fine-grained soils for vegetation. At the ID, a SIS will be connected to the trafficability layer to collect impacted seepage.

Because of the length of time anticipated for implementation of these flood routing concepts, including additional geotechnical investigations, design, regulatory approval, and licensing for constructing the permanent ID spillway with PMF capacity, and construction, the IPRP recommended interim upgrades to the RCD and the ID to reduce the current risks of overtopping the ID during large flood events. The DVIHU (CH2M, November 2014g) project was identified and scoped with the goal to provide an interim upgrade to the hydraulic capacity of the RCD and ID spillway to safely pass a 1-in-500-year flood event. The DVIHU project, and its evolution, is discussed in more detail in Section 9.4.

Extensive seismic stability assessments have been performed to evaluate the potential of liquefaction in the tailings dams and CVD foundations and the seismic slope stability (KCB, March 2006; KCB, June 2006). These assessments indicated that the dams are generally stable under the Maximum Credible Earthquake (MCE), except for the CVD and the East Limb of the SD. In both cases, the instability resulted from liquefiable foundation conditions. The previous evaluations were based on the ground motions from the Atkinson (May 2004) seismic hazard assessment.

The seismic hazard assessment was updated in 2013 (Atkinson and Assatourians, April 2013), resulting in significantly lower predicted ground motion estimates than the ground motions estimated by Atkinson in the 2004 assessment. In 2016, CH2M performed additional seismic stability assessments to re-assess the stability of the CVD and the East Limb of the SD and to modify the mitigation concepts, if necessary. This assessment is presented in Appendix J of this report, Seismic Stability Analyses of Selected Dams for the Faro Mine Remediation Project. Results from the numerical seismic analyses using FLAC-2D indicate that relatively large deformations of about 1.4 to 1.6 m are predicted for the CVD. These deformations are predicted for a 1-in-10,000-year event, and do not require remediation given that the vertical distance (freeboard) between the top of dam core and the maximum operating level is 2.2 m. Even if the freeboard is considered as the vertical distance between the top of the core and the full pool elevation, i.e., a vertical distance of 1.7 m, the freeboard would not be compromised and the drainage system should still largely be intact. However, deformation predictions are considered more unreliable as their magnitudes increase, and especially as they increase beyond about 1.5 m (5 feet).

[1] Two ID spillway and dam raise options were included in the Draft 4A Closure Plan; these were based on studies by KCB (April 2008b; October 2009). In the first option, the spillway invert is maintained with minor to no regrading of the tailings surface, but this resulted in an ID raise of 9.4 m. For the second option, in which the dam raise would only be 2 m, a significant regrading of the tailings surface and lowering of the spillway invert elevation would be required.

If the CVD Pond will be operated as a full pond (elevation 1,030.8 m), the safety margin against exceeding the top of core following the design earthquake will be small, and if there are concerns about the uncertainty in predicting and the consequences of the deformations, liquefaction mitigation can be considered and evaluated to provide operation and maintenance continuity, and to minimize risks to uncontrolled release of the reservoir contents. If the CVD Pond will be operated below the normal maximum operating level of 1,030.3 m, the safety margin following the design earthquake is significantly higher, and liquefaction mitigation is not considered necessary.

With respect to the East Limb of the Secondary Dam, results from the numerical seismic analyses for the predicted displacements of less than 1 m (about 0.6 m), indicate satisfactory performance under the design earthquake loading. The estimated displacements are not considered large enough to warrant liquefaction mitigation for this dam.

9.2.2 Alternative Development Analysis Report (CH2M, March 2015ff)

Section 8 of Alternatives Analysis Report includes an evaluation of four alternatives for the CVD; (1) breach the dam, consistent with the Draft 4A Closure Report (SRK, November 2010), (2) retain the dam and operate as a wet pond, (3) retain the dam with minor modifications to the pond for operations as a wet pond, and (4) retain the dam with major modifications to the pond for operations as a wet pond having enhanced treatment capabilities. To retain the dam will require upgrading or replacement of the existing CVD spillway, since it only has about half of the capacity necessary to pass the PMF. The preliminary concept for a PMF spillway is to deepen the existing spillway channel, incorporate a concrete grade control sill and plunge basin energy dissipater, and to reinforce the spillway channel with reinforced concrete or grouted riprap (see Figure 9-7). If the CVD dam is not raised, there will be a significant reduction in storage capacity of the CVD Pond resulting from the excavation for the new spillway channel. Storage capacity could be increased by using an ogee structure, increasing the spillway width, or raising the dam, if the reduced storage is deemed unacceptable.

The report also includes evaluation of three alternatives for reducing the RCTA catchment area and separation of clean water from impacted water. The basic concept was to identify potential clean and impacted-water-catchment areas and to regrade and reroute clean-water areas to provide offsite discharge of clean water (CH2M, March 2015ff).

9.3 Gaps Assessment, PDT Investigations, and Studies

Under Task Authorization (TA) 002 (TA002), dated November 4, 2011, CH2M developed an understanding of the Draft 4A Closure Plan (SRK, November 2010), and reviewed existing data and reports for the Faro Mine Remediation Project. Based on this review, CH2M recommended the necessary field investigations to support preparation of a YESAA project proposal. These recommendations were presented in the Gaps Reports (CH2M, February 2012c and February 2012d). The following field investigations were performed to fill the gaps identified in the 2012 Gaps Assessment report for the dams and CVD Pond.

9.3.1 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report (CH2M, March 2014m)

This investigation was conducted to (1) collect geotechnical information for raising the effective dam crest by embedding a geomembrane into the compacted core of the ID and extending the geomembrane vertically to the crest of the ID, (2) determine the nature of the materials in the upper 2 m of the ID spillway channel to evaluate its excavation ability, (3) collect geotechnical and hydraulic information for evaluations of the Haul Road embankment (including the NFRD) to function as a stable water-retaining structure during large flood events and to attenuate flood flows, and (4) Identify areas

of the RCD where vegetation removal and maintenance or repair are required. The following field investigation tasks were performed during the 2013 field season:

- Visually observed, mapped, and documented conditions along the entire length of the RCD. This included observations and documentation of areas of ravelled riprap slopes, erosion, and over-steepened slopes and areas where maintenance and repair are necessary. It also included delineation of areas where vegetation removal is needed.
- Excavated, logged, and sampled seven test pits along the crest of the ID to assess the condition of the clay core and embankment material.
- Excavated, logged, and sampled three test pits in the ID spillway to assess the material in the upper spillway channel.
- Completed five geophysical surveys across the NFRC, upstream and downstream from the NFRD, to characterize the bedrock topography in the area. The geophysical surveys provided additional information to support the estimation of the depth of the competent bedrock surface and the thickness of weathered bedrock overlying competent bedrock.
- Drilled, logged, and sampled two boreholes to evaluate foundation conditions at the downstream toe of the Haul Road embankment (including the NFRD) and calibrated the geophysical surveys conducted in the NFRC.
- Established continuous flow monitoring stations on the NFRC upstream from the NFRD at Station R10 and downstream from the NFRD at Station X2. Stations collected continuous water surface elevation data via data loggers.
- Performed dye tests to monitor flow through the NFRD.
- Installed staff gauges and regularly measured pond elevation directly upstream from the NFRD at Station NF1 and directly downstream from the NFRD at Station NF2.
- Excavated, logged, and sampled 15 test pits in the Upper Parking Lot and NWL WRD to evaluate the suitability of the material for use in gabion baskets.

9.3.2 Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike, Technical Memorandum (CH2M, March 2015z)

The field investigation performed during the 2015 field season comprises the following elements:

- Four soil borings, including undisturbed sampling, field vane shear strength testing, and thermistor port installation.
- Thirteen CPT soundings including seismic CPT profiling and porewater pressure dissipation testing
- Laboratory analyses including geotechnical and geochemical analyses.

9.3.3 Summary of 2015 Field Investigation – Construct Intermediate Dam Spillway, Draft Technical Memorandum (CH2M, April 2016f)

The field investigation performed during the 2015 field season comprises the following elements:

- Performing a geophysical survey of one 890-m length of electric resistivity tomography line and six shorter, perpendicular, multi-channel-analysis-of-surface-waves lines, and seismic refraction.
- Drilling five borings, two through the overburden and into at least 9.1 m (30 feet) of bedrock, one to the top of bedrock, and two others in overburden. The drilling included standard penetration tests (SPT) in the overburden and HQ (88.9-mm outer-diameter) wireline size core drilling into bedrock.

- Performing packer testing in two of the five borings to collect data for characterizing the potential for underseepage and uplift pressures.
- Installing a monitoring well in each of the five borings within the overburden material.
- Collecting soil samples for geochemical (e.g., pH, total metals, total sulphur, leaching, and modified neutralization potential) and geotechnical testing (Atterberg limits for cohesive soils and gradation with hydrometer).
- Collecting rock samples for geotechnical testing (specific gravity, adsorption, unconfined compressive shear strength, and soundness).

9.3.4 Summary of FY2015 and 2016 Field Investigations – CVD and ID Ponds Field Data Report, Draft Technical Memorandum (CH2M, August 2016c)

Field investigations in the CVD Pond were conducted to gather data to (1) generate a higher resolution stage/storage curve to support water management decisions and (2) characterize deposited sludge material and develop an estimate of sludge volume and variation of thickness of deposits in the pond.

Field investigations in the ID Pond were conducted to gather data to (1) generate a higher resolution stage/storage curve to support water management, (2) develop estimates of the fill volume that would be required to fill the pond behind the ID as part of potential alternatives for closure, and (3) characterize physical properties of the tailings and sediment within the pond such as compressibility and strength parameters.

The 2015 and 2016 field investigations included the following:

- Cone penetration tests through subgrade materials beneath the CVD and ID ponds (eight gamma seismic cone penetration tests and three gamma flow (ball) penetration tests in softer areas) and pore pressure dissipation tests at multiple subgrade depths
- Sonic drilling in the CVD Pond and sampling pond bottom materials with an AquaLock sampler
- Bathymetric surveys of the bottom topography of the CVD and ID ponds using multi-beam sonar (supplemented by a single-beam sonar in shallow areas) and real time kinematic global positioning system (RTK-GPS) technology to define the shoreline
- Acoustic sub-bottom profiling in the CVD and ID ponds

9.4 Down Valley Interim Hydraulics Upgrades Project

The purpose of the DVIHU project was to protect the ID and the impounded tailings during the Interim Period (that is, the period until the final closure plan would be developed, approved, and implemented). The existing ID spillway, with a capacity of 32 m^3/sec at the dam core, (nhc, June 2006) cannot safely pass a moderate or major flood event without overtopping and potentially breaching the dam.

In conformance with the MTP, the Faro Mine PDT proceeded with the development of the design of the DVIHU. Results of the hydraulic analyses demonstrated that the proposed interim upgrades would increase the ID spillway capacity to 115 m^3/sec, equal to the estimated 1-in-500-year flood event peak flow, assuming attenuation of flood flows by the NFRD on the NFRC. Peak flood flows would also be attenuated as flood water is routed through the Intermediate Impoundment.

An increase in the ID spillway capacity would also provide mitigation for other RCD failure mechanisms. These include (1) failure of the RCD dike by piping or slope instability during moderate flood events, (2) landslide or debris flow originating on the mountainous slopes south of the RCD that would block the RCD and cause overtopping of the RCD dike, and (3) ice buildup in the RCD resulting in overtopping of the RCD dike.

The initial work on the DVIHU design consisted of two design phases. Phase 1, presenting concept designs, preliminary hydrologic and hydraulic analyses, and design criteria, was submitted to YG on March 27, 2013 (CH2M, March 2013p). Phase 2, submitted March 28, 2014, provided a detailed design and cost estimate for completing the DVIHU (CH2M, March 2014m).

The design components of the DVIHU project include the following:

- Increasing the ID spillway capacity by deepening the spillway channel
- Protecting the ID spillway channel by placing gabion mattresses on the channel surface and gabion cells on the channel sidewalls
- Raising the effective ID crest elevation by the use of gabions and a geomembrane
- Raising the crest of the RCD dike to meet freeboard criteria
- Improving the RCD capacity by removing vegetation and other debris from the RCD dike
- Improving the RCD condition by repairing riprap and slope sloughing at locations in the RCD

Because failure of the Haul Road embankment, including the NFRD, during a large flood event, has the potential to adversely affect the RCD and the ID, the flow-through capacity of the NFRD and the stability of the embankment under high-flow conditions, were also evaluated as part of the project.

Since submittal of the detailed design in 2014, CH2M completed a site-wide hydrologic analyses integrating major storm events and elevated streamflow observed at Vangorda Creek into the analysis. (CH2M, 2015i). In addition, because the NFRC Realignment Project now anticipates opening the Haul Road to allow the NFRC PMF flow to pass through the embankment without attenuation, the estimated 1-in-500-year ID spillway design flood has changed.

Because the existing Faro Mill WTP was shut down in 2013 in response to safety concerns, the potential for increasing the capacity of the ID spillway by lowering the spillway, and thus the storage capacity of the ID Pond, was not accepted as the preferred design approach. An alternate concept incorporating a reinforced concrete ogee weir structure, which allowed no deepening and achieved the required spill capacity, was adopted instead.

Both of these factors have since resulted in re-evaluation of the DVIHU designs.

9.4.1 Design Analysis Completed

Down Valley Interim Hydraulic Upgrades Phase I - Design Definition Report (CH2M, March 2013p)

This report presented concept designs and preliminary hydrologic and hydraulic analyses, and also defined design criteria for the DVIHU, including the Haul Road embankment and NFRD. The report identified data gaps and a scope for field work to be completed prior to completing the design of the DVIHUs. A few conceptual drawings and a drawing list were included in the deliverable.

2014 Down Valley Interim Hydraulic Upgrades

The Phase 2 Design Definition Report, submitted March 28, 2014, provided the basis of design and the detailed design for the DVIHU project (CH2M, March 2014m). The detailed design is approximately equivalent to a 90 percent level of engineering design. The submittal presented the following:

- Project description, project objectives, and design criteria for the DVIHU, including the NFRD.
- Hydrological and hydraulic analysis results including estimates of flows for the inflow design flood, which is the 1-in-500-year flood event for the interim upgrades.
- Evaluation of the adequacy of the Haul Road embankment and the NFRD, to remain stable during large flood events. The analysis included evaluation of ravelling and slope stability. Also considered

were other potential failure modes such as the wash-out of finer particles in the schistose fill resulting in piping.

- Pipeline relocation criteria and concept evaluations.
- Detailed design drawings.
- Detailed design specifications.
- Class II cost estimate.

2015 Revised ID Spillway Concept Design

Following issuance of the 90 percent DVIHU design deliverable in March 2014, YG determined that increasing the capacity of the ID spillway by lowering the spillway crest elevation resulted in an unacceptable reduction in ID Pond storage capacity. In response, a revised ID spillway design incorporating an ogee weir for the 1-in-500-year annual exceedance probability (AEP) spillway was developed (CH2M, January 2015a) as shown in Figures 9-8 and 9-8. The revised concept provided an increase in the spillway capacity while maintaining the existing storage capacity. The revised concept did not take into account the change in the hydrologic estimates of the 1-in-500-year flood event or the potential increase in flow resulting from opening the Haul Road in the near term and the loss of attenuation of flood flows by the NFRD.

9.4.2 Design Status

In concert with development of other site-wide closure alternatives, design concepts for passing a PMF flood event at the ID spillway were developed. These were presented to YG, INAC, and the IPRP at meetings in February 2015 and included in the *Alternative Analysis Status Report* (CH2M, March 2015ff). These design concepts provided significant improvements to previous designs developed and presented in the *Faro Mine Complex Final Closure and Remediation Plan, Project Description – Draft 4A* (SRK, November 2010) by incorporating a 60-m-long ogee weir into the spillway design (Figure 9-5). This change would reduce the required ID raise significantly, without having to perform significant tailings regrading (Figure 9-6). The design concept would also reduce the requirements for dewatering and removing sludge from the CVD Pond to complete the dam raise.

2015 Intermediate Dam Spillway Tradeoff Study

Upon their review of the revised DVIHU design, the IPRP recommended the completion of a trade-off study comparing the costs and benefits of constructing either the 1-in-500-year AEP spillway or a PMF spillway. Following the IPRP recommendation, CH2M completed a tradeoff study to compare the risks and costs between either constructing a PMF spillway or a 1-in-500-year AEP spillway (CH2M, July 2015a). This study demonstrated that constructing the PMF spillway as soon as practical minimizes the ID failure risk (expressed as an encounter probability) and results in the lowest net present value. Based on these results, YG and INAC have indicated that the DVIHU project would not be constructed.

2015 Updated Regional Hydrologic Analysis

Concurrent with the tradeoff study, CH2M (July 2015a) developed an updated regional hydrologic analysis (CH2M December 2015i), which provides a revised estimate of flood flows for various return period events within the FMC. This analysis incorporated significant storm events and streamflow on Vangorda Creek that have occurred since earlier hydrologic studies (nhc, June 2004). The results of the analysis indicate increased flows for flood events less than the PMF. The updated regional hydrologic analysis did not evaluate or modify the PMF. The increase in the estimated 1-in-500-year flood event would result in a larger, more costly spillway, providing more support for constructing a PMF capacity spillway.

2016 Rose Creek Diversion Upgrades

Considering the time needed to design the PMF spillway at the ID, and the vulnerability posed by the existing RCD, the RCD Upgrades project was intended to modify the RCD to pass the flood flow estimated under the DVIHU project. The updated hydrologic analysis indicated that the planned DVIHU would enable flood flow conveyance up to a 1-in-200-year flood event, assuming that the Haul Road was breached and that the NFRD no longer provided attenuation. The updated hydrologic analyses resulted in an increase in the 1-in-500-year return period flood estimates for the RCD from 136 m^3/sec to 179 m^3/sec.

The design included 90 percent design drawings for clearing vegetation from within the RCD, raising the RCD dike crest, augmenting channel riprap, and conducting other miscellaneous housekeeping improvements to the structure. As part of this project, additional hydraulic modelling and design analyses were completed for the RCD Upgrades project (CH2M, February 2016c). The 90 percent design for the RCD Upgrades project was completed, however, review of the design by BGC resulted in determination that the dike repairs completed by BGC in 2004 did not conform to the original design intent (BGC, June 2005). The repairs completed over approximately 1,100 m of the dike channel did not incorporate fine-grain material into the repair of the seepage layer. In addition, riprap placed over this interval consisted of rounded rock, rather than angular rock, necessary for stable protection of the channel embankment.

9.4.3 Summary and Recommendations

The DVIHU project has evolved to a point where the project has been divided into two components: (1) design and construction of a new ID spillway with PMF spill capacity, and (2) finalization of the design of the RCD Upgrades project and its construction. It is important that both these projects be pursued and implemented as soon as possible. It will take a few years to implement the PMF spillway, but given the nearly complete design and relatively low implementation cost of the RCD Upgrades project, it is recommended that this project be constructed as soon as possible. We also recommend that the sand and gravel, and rounded riprap, placed on the dike in 2004 be removed and replaced with materials that conform to the original RCD design specifications. An alternative to removal and replacement of the sand and gravel is to place a geomembrane through these materials into the underlying seepage layer. This approach is not preferred as it may not be compatible with future dike improvements.

9.5 Cross Valley Dam Seepage Interception System

This section provides a description of the CVD SIS proposed for construction downgradient of the CVD. The purpose of the system, when constructed, will be to collect, convey, and treat metals-contaminated water discharging through the RCAA. The source of the contamination includes mine-impacted water originating from the waste rock dumps, ore piles, and oxide fine piles present in the area of Faro Pit and the Mill Area and the ETA and RCTA.

9.5.1 Current Conditions

The RCAA system is a fluvial depositional system deposited by Rose Creek and its tributaries, the NFRC and the SFRC. The alluvial aquifer is composed of a heterogeneous mixture of silt, sand, gravel, and cobbles. The alluvial deposits are thickest near the centre of the valley, aligned with the ancestral thalweg of Rose Creek. The thickest deposits of alluvium encountered during drilling are on the order of 50 m (164 feet). Groundwater quality data indicate that contamination originating from the tailings and the ETA is present within the RCAA and is moving downgradient from southeast to northwest, consistent with the flow direction of Rose Creek.

Contamination originating from within the tailings deposits, as well as from the ETA, is migrating through the RCAA toward the CVD (RGC, October 2006). Attenuation processes acting within the alluvial

aquifer system are currently limiting the rate of movement of these contaminants downgradient. The nature of this attenuation has been studied in previous laboratory investigations, and results indicate that the RCAA soils have the ability to attenuate zinc transport as well as to neutralize acidity (SRK, July 2006b). Although the exact nature of the attenuation process remains uncertain, an SRK study conducted in 2006 indicates that "mineralogical observations and correlations in the chemical analyses suggest that organic material is the most significant attenuating phase…" (SRK, July 2006b).

Observed groundwater contaminant concentrations indicate increasing trends within the Primary and Second Impoundments, as well as at the northern abutment of the ID. Increasing zinc concentrations suggest the attenuation capacity of the aquifer is becoming exhausted and concentrations of metals are expected to increase as a result (RGC, March 2013). The actual timing associated with the breakthrough of contaminants is unknown. Zinc concentrations at the CVD are still low, but could start increasing when the attenuation capacity of the aquifer is exhausted.

Because of uncertainty in the attenuation processes, the length of time over which these processes will continue to limit contaminant movement is unknown. Data indicate increases in zinc and sulphate concentrations at the ID and at the northern portion of the CVD. The risk of contaminant breakthrough remains high, because the rate of the contaminant migration is difficult to estimate. Therefore, the installation of a groundwater interception system downgradient of the CVD is necessary to protect Rose Creek surface water quality downstream of the CVD. The CVD SIS represents the potential last line of defence for protecting Rose Creek groundwater and surface water from mine-related contamination.

Because the RCAA is a groundwater receiving zone for the FMC, any contaminated groundwater bypass flow beneath the CVD could directly impact the water quality in the downstream water bodies. In addition, recently collected data indicate that sections of Rose Creek downstream of the confluence with the RCD exhibit gaining conditions, and therefore could receive, and be impacted by, contaminated groundwater flowing through the underlying aquifer system.

These data indicate that construction of an SIS capable of intercepting a high percentage of the groundwater flow through the RCAA might be required over the next 5 to 10 years (RGC, June 2012), downgradient of the CVD, to protect groundwater and surface water quality downstream from the CVD. Although the timing of the breakthrough of zinc and other contaminants is uncertain, data indicate that a significant threat to downgradient water quality will persist until an SIS is implemented to intercept contaminated groundwater.

9.5.2 Design Analysis Completed to Date

Various levels of design have been completed for the proposed CVD SIS. Analyses and design approaches for these designs are summarized in this section.

***Water and Load Balance Study for Rose Creek Tailings Storage Facility, Faro Mine, Yukon Territory* (RGC, September 2005)**

RGC developed a comprehensive water and load balance model for the Rose Creek valley (surface and groundwater) for the evaluation of current and future sources of contaminant loading to the Rose Creek aquifer and Rose Creek. The work included a detailed review of all relevant data, including characterization studies of the tailings and aquifer materials as well as a review of historic surface water and groundwater data. Important findings include the following:

- Seepage flow at the old Faro Creek Canyon (from the ETA area) discharges about 100 tons per year of zinc and 1,700 tons per year of sulphate into the Intermediate Impoundment area, most of which is lost to seepage before it reaches the ID Pond.
- About 200 L/s leak from the RCD downstream of the ID.
- The area between the CVD and Rose Creek is a major groundwater discharge zone.

- Rose Creek is a gaining stream, with as much as 200 L/s of groundwater discharging into the creek between Station X14 and Next Creek.

The report included estimates of zinc and sulphate loading, zinc attenuation, and projections of future loading and water quality computed for different options pertaining to tailings remediation and groundwater collection.

***Design of Groundwater Interception System for Rose Creek Tailings Storage Facility, Faro Mine, Yukon Territory* (RGC, October 2006)**

RGC conducted a comprehensive groundwater study in development of the design for a groundwater interception system downgradient of the CVD. The study included the installation of two pumping wells just downstream of the CVD, performance of the pump tests, development and calibration of a groundwater model using the finite difference model MODFLOW, simulation of alternative groundwater interception scenarios, and a pre-feasibility design of a groundwater pumping system at the toe of the CVD. Based on the results of this study, RGC concluded that ten extraction wells located at the toe of the CVD would provide full capture, with less than 1 percent bypass of contaminated groundwater downstream of the CVD. Total capture was estimated at approximately 72 L/s. RGC recommended that additional characterization work be completed, including (1) additional pumping test in the deeper portion of the aquifer and (2) drilling and hydraulic testing on the northern and southern side on the proposed alignment of the fence of wells, including in shallow bedrock.

Technical Memorandum *Groundwater Management Alternatives* (SRK, December 2007)

SRK and RGC prepared an analysis of groundwater capture design approaches for the NFRC and the Lower Rose Creek Valley. The analysis compares six options for groundwater collection downstream of the RCTA: (1) two of the options include pumping wells, with and without a cutoff wall that fully penetrates into fractured bedrock, (2) two of the options have an open trench with a fully penetrating cutoff wall, with and without relief wells that fully penetrate into fractured bedrock, and (3) two of the options have a shallow gravel-filled drain, with and without a pipe and both with a fully penetrating cutoff wall. Pertinent observations and conclusions reached in the report include the following:

- Incorporation of a cutoff wall is included as a contingency in the pumping well design; it is required for all designs that rely on relief wells or a shallow trench.
- Shallow trenches offer the same limitations as shallow, partially penetrating wells in providing only limited drawdown and potentially allowing deep system bypass.
- The combination of a cutoff wall and a shallow trench can achieve high efficiencies, virtually identical to a fence of pumping wells, provided the cutoff wall is keyed into tight bedrock.

***Faro Mine Complex Closure and Remediation Plan, Project Description – Draft 4A* (SRK, November 2010)**

This report included a cutoff wall and a groundwater seepage collection system located across the Rose Creek Valley between the ID and the CVD. The system would consist of a cutoff wall keyed into bedrock and an up-gradient shallow permeable trench with a series of pumping wells that would convey flow to either Faro Pit or a water treatment plant. The concept included breaching the CVD as part of the final closure plan.

***Faro Mine Remediation Project Medium Term Plan Work Plan FY2014-2017* (YG, December 2012)**

The draft MTP included a concept design for the CVD SIS located immediately downgradient of the CVD consisting of 10 extraction wells oriented across the valley at the downstream toe of the dam. The wells would be spaced approximately 55 m apart and screened along the entire thickness of the glaciofluvial sediments (drilled into the weathered bedrock). The actual number of wells would be decided during the design process following completion of an additional field investigation.

Review Comments – Faro Mine Remediation Project – Medium Term Plan for FY 2013-2017 **(IPRP, January 2013)**

In review of the MTP (YG, December 2012), the IPRP stated, with respect to a seepage interception system, "As part of the design works there is a need to consider other alternatives for seepage collection and also to decide on and incorporate the future long term use of the CVD Pond. As far as the SIS system design is concerned, the use of cut off walls and/or trench collection systems should also be evaluated."

Cross Valley Dam Seepage Interception System Phase 1 - Design Definition Summary **(CH2M, March 2013f)**

This report presented concept designs and analysis of five design concepts for the CVD SIS. These included (1) six extraction wells at the north end of the RCAA, without a slurry wall, (2) nine extraction wells, with a slurry wall extending across the RCAA, (3) nine extraction wells, with a slurry wall extending across the RCAA and a wall extension along the RCD, (4) one shallow trench, with a slurry wall extending across the RCAA, and (5) one shallow trench, with a slurry wall extending across the RCAA and a wall extension along the RCD. Because of the lower-required groundwater extraction rates and lower potential construction costs, vertical extraction wells were recommended as the preferred approach for the design. While the addition of a slurry wall across the RCAA would allow for more complete capture of the flows downgradient of the CVD, the report concluded that it would not be cost-effective to install a low-permeability cutoff wall either across the Rose Creek Valley, required to a depth of approximately 50 m across the Rose Creek valley or adjacent to the RCD.

Cross Valley Dam Interception System Investigation Data Report **(CH2M, March 2013m)**

This report included geological and hydraulic data, obtained during a 2012 field investigation, collected from the alluvial and weathered bedrock units. These data were used to support the design of a SIS for the collection of groundwater moving through the RCAA downstream from the ID, and geochemical data to support the calibration of geochemical modelling of the RCTA. Eleven boreholes were advanced in the alluvium downstream from the CVD and adjacent to Rose Creek with monitoring wells installed at six locations including four well pairs. Monitoring wells were selectively screened to target alluvium and weathered bedrock. Soil analytical results indicated elevated total metals concentrations with pH values ranging from 3.4 to 7.9. Hydraulic data collected beneath the Rose Creek channel indicated shallow groundwater levels beneath the streambed typically have a higher hydraulic head than the overlying surface water. This indicates predominantly gaining stream conditions are present within Rose Creek, downstream from the CVD.

2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report**) (CH2M, February 2014q)**

This investigation was conducted to (1) define the bedrock surface topography in the vicinity of the proposed CVD SIS downstream from the CVD, (2) collect additional data to assess the degree of hydraulic connection between the RCAA and a suspected fractured bedrock zone that may have been indicated by previous drilling and packer testing, and (3) collect data to quantify the spatial and temporal distribution of the magnitude of leakage from the RCD into the RCAA, in the vicinity of the RCTA. The work included the following:

- Completion of a surface geophysical survey along the proposed alignment of the CVD SIS to assist in the characterization of the bedrock topography in the area. The geophysical survey supported the estimation of the depth of the competent bedrock surface, the thickness of weathered bedrock overlying competent bedrock, and the identification of relative high- and low-permeability units.
- Drilling, installation, and development of one new monitoring well along the proposed CVD SIS alignment at the location where previous drilling indicated the presence of a possible fractured bedrock zone in the subsurface.

- Drilling, installation, and development of seven monitoring well clusters along with a single monitoring well at the planned location of the eighth well cluster, as well as six associated stream-stage recorders along the RCD. Aquifer testing following well development in four of the RCD well clusters.
- Deployment of pressure transducers in select RCD wells and stream stage recorders for the collection of a continuous record of water level elevation (groundwater and surface water) measurements.
- Groundwater sampling at each of the new monitoring wells in the Intermediate Impoundment and CVD, at the shallow well of each well cluster along the RCD, and at selected existing monitoring wells.

9.5.3 Basis of Design

Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Report **(CH2M, February 2014n)**

This report, building on the Phase 1 Design Definition Report submitted March 29, 2013, provided the basis of design and the conceptual design for the CVD SIS. The conceptual design is approximately equivalent to a 30 percent level of engineering design. The submittal addressed the following:

- Project description, project objectives, and design criteria
- Design criteria for pipeline, mechanical, well, civil, structural, electrical, and instrumentation and controls disciplines
- Conceptual design drawings
- Specifications list
- Phase 2 groundwater modelling technical memorandum
- Class III cost estimate
- Insulated trench standards
- Freezing and Thawing Indices in Northern Canada
- Hydraulic analysis
- Surge analysis technical memorandum
- Air pocket analysis
- Conceptual design specification List

The design included a SIS located downgradient of the CVD consisting of the following elements:

- Ten extraction wells and pump houses, at the toe of the CVD
- A header pipe, and a buried 500-mm-diameter HDPE conveyance pipeline that will run from the header pipe to the WTP
- A backup generator with integrated 7,570-L (2,000-gallon) sub-base fuel tank and a single auxiliary 19,685-L (5,200-gallon) storage tank to provide 5 days of operation of the CVD SIS during a power outage
- Features designed for a 100-year lifespan, assuming year-round operations
- Upgrading existing overhead power from the WTP to the last pole, located northeast of the CVD

- Filling in the existing CVD toe seepage drainage open ditch and replacing it with a perforated pipe trench drain system
- Potentially, constructing a cutoff wall at the toe of the CVD and along the northern side of the RCD

***Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Repor*t (CH2M, March 2014i)**

This report, building on the Phase 2 Design Definition Report submitted February 14, 2014, provides the basis of design and the advanced design for the CVD SIS. The Advanced Design is approximately equivalent to a 60-percent level of engineering design. The submittal updated design elements included in the conceptual design, provided the design specifications, provided an additional 18 drawings, and presented the results of sensitivity studies for evaluating the installation of various cutoff walls either across the Rose Creek Valley or adjacent to the RCD, to reduce the volume of flow that would need to be collected by the CVD SIS.

Technical Memorandum *Review Comments – Faro Mine Remediation Project Sub-Project Design Review IPRP Review, May 12 to 13, 2014* (IPRP, May 2014)

This technical memorandum summarizes IPRP review comments pertaining to a number of site issues and levels of design, including the CVD SIS. This was the first review meeting held since November 2013. At the May meeting, the FMRP execution team briefed the IPRP on several elements of the project including the 60 percent design and cost estimate for the CVD SIS. Observations by the IPRP pertaining to the 60 percent CVD SIS included the following:

- A formal alternative evaluation should be conducted comparing the proposed active pumping system with a system that would rely on a dewatering trench, relief wells, and, potentially a cutoff wall. The evaluation should consider effectiveness, implementability, and cost.
- Alternative locations for the CVD SIS should be considered to assess the effect of a full pool at the CVD Pond on hydraulic gradients under the CVD and dam abutments.
- The IPRP expressed concern that while the groundwater-model grid sizing was likely suitable for the design of the wells, discharge rates, and sizing of pumps and infrastructure, the discretization may not be sufficient to assess SIS performance. This is because of the potential presence of heterogeneous high permeable channels in the deep alluvial sediments, the CVD geometry, the internal drainage within the CVD, and seepage through the dam abutments.

Technical Memorandum *Review Comments – Faro Mine Remediation Project Joint Design Team/ IPRP Workshop – Faro Mine Remediation Plan* (IPRP, September 2014)

This technical memorandum summarizes IPRP review comments pertaining to development of the Faro Mine Remediation Plan. The meetings focused on overall site remediation plans and water management. The IPRP also commented on the design for the CVD SIS. No work had been completed to further develop the CVD SIS design since the 60 percent design submittal and receipt of IPRP comments pertaining to the design. The September technical memorandum recommended that the CVD SIS design should be further developed to optimize the location, the manner of hydraulic controls, and the need, if any, for a downstream cutoff wall. Consideration should be given to maximizing the engineering reliability of operating the system in a northern climate and incorporating design elements to minimize collection and pumping of clean water. They also noted the importance of incorporating heterogeneity in the RCAA by refining the groundwater model grid, incorporating other available geologic, hydrogeologic, and hydrologic information on spatial variability of aquifer hydraulic properties, and using geostatistical or stochastic methods to represent the aquifer for modelling purposes.

Technical Memorandum – *Summary of Baseline Design Concepts after November 2014 Meeting with the Independent Peer Review Panel* (CH2M, November 2014o)

This technical memorandum solicited IPRP's concurrence on the design concepts discussed during a workshop held November 4 through 6, 2014, attended by the IPRP, YG, INAC, and CH2M. The purpose of the workshop was to further the development of a water management plan for the Faro Mine Remediation Project that advances the concepts contained in the Closure and Remediation Plan (SRK, November 2010). The workshop followed from the September 2014 meeting, which had a similar purpose. The technical memorandum included two tables. The first included design concepts presented at the November workshop. General IPRP agreement on this table was requested. The second table identified design elements that CH2M proposed to advance. An update would be provided at a design review meeting scheduled for February 2015. For the CVD SIS, the following work was proposed to be conducted for the February 2015 meeting:

- Refine the model grid for evaluation of the CVD SIS design and verify model calibration
- Run multiple failure mode scenarios on (1) the active extraction system (well only) and (2) pumping with an induced drawdown trench and well system; both with and without a cross-valley cutoff wall
- Complete evaluation of constructability and cost of the various SIS design options, including its reliability and resilience

Memorandum Responding to CH2M HILL Draft Technical Memorandum dated November 25, 2014. *Summary of Baseline Concepts after November 2014 Meeting with IPRP on Faro Mine Remediation Project* (IPRP, December 2014)

This memorandum is a response to a request from CH2M to provide general agreement and concurrence on specific remediation design approaches for the site. These were presented to the IPRP at meetings held on November 4 through 6, 2014, and formalized in a technical memorandum submitted to IPRP dated November 25, 2014. With respect to the CVD SIS system, the IPRP noted that the groundwater model should be modified to allow for the evaluation of the effect of complex and unknown variations in subsurface fluvial flow channels. The evaluation should consider the SIS constructability and operations at a remote site given harsh environmental operating conditions, and the potential for geochemical precipitation and corrosion associated with mixing upstream acidic ARD and downstream alkaline water. The IPRP noted that this mixing would occur in close proximity to and in the wells.

***Cross Valley Dam Seepage Interception System Test Pit Data Summary* (CH2M, January 2015b)**

This report provided the results of a subsurface field investigation conducted in July 2014, to collect data for the completion of the CVD SIS pipeline, from the CVD to the Mill Buildings Area. The locations included the access road at the north CVD abutment, the northern edge (interior side) of the existing unpaved access roadway between the CVD and the Mill Building Area, and areas disturbed by mining activity around the Mill Building Area. Laboratory testing included moisture content, Atterberg limits, gradation, and soil corrosivity testing.

***CVD SIS Alternative Development Analysis Report* (CH2M, March 2015gg)**

This report provides a detailed description of modifications made to the groundwater model used to evaluate the alternatives under consideration for the CVD SIS design. It presents alternative designs, and analyzes the strengths and weaknesses of each alternative with respect to the following:
(1) implementability and constructability, (2) effectiveness and longevity, (3) required long-term O&M, (4) capital costs, (5) O&M costs, (6) replacement and non-routine maintenance, (7) interaction with other remediation units and components, and (8) life-cycle costs.

Modifications to the groundwater modelling included the following:

- Enhancing the spatial resolution of the model grid in the vicinity of the CVD by adding additional model layers to enhance the vertical resolution of the model.
- Incorporating significant aquifer heterogeneity by representing high-permeability gravel channels and low-permeability till layers.
- Conducting additional model simulations to determine whether the presence of high-permeable channels could be detected by using water level data collected from a monitoring network in the vicinity of the CVD. This was done by using a model calibration simulation of a 4-day aquifer test conducted at the site in 2012. These results indicate that adding the high-permeability gravel channels to the model does not result in water level drawdown time series that are significantly different than those simulated assuming no gravel channels.

Six alternative design configurations were developed for analysis. These included the following:

- A system of conventional extraction wells constructed across Rose Creek Valley connected to a common header pipe for conveyance to the water treatment plant. The two proposed locations for the well system were evaluated, one at the toe of the CVD and one approximately 100 m downgradient from the CVD. An additional alternative included a low-permeable cutoff wall downgradient from the SIS.
- A trench-based system consisting of a series of passive extraction wells constructed across Rose Creek Valley that connect to a permeable collection trench. One location approximately 100 m downgradient from the CVD was evaluated.
- A trench-based system consisting of a series of passive extraction wells constructed across Rose Creek Valley that connect to piped collection system. One location, approximately 100 m downgradient of the CVD was evaluated. An additional alternative included a low-permeable cutoff wall downgradient from the SIS.

Implementability and Constructability

- **Conventional Extraction Wells:** No difficulties are anticipated with well drilling and construction. Wells of the same type have been constructed and tested at the location of the planned SIS without any difficulty. Materials and supplies for the extraction wells, including pumps and controls, are readily available.
- **Integrated trench/well system**: Construction of the passive relief wells would be similar to the construction of the conventional groundwater extraction wells except that the wells would be constructed at the bottom of an excavation. Construction of the permeable trench and connection of the passive wells to the trench system will be more difficult than the conventional extraction wells. The depth to the top of the trench will range from 5 m at the center of the valley to over 10 m on the southern side of the valley. On the northern side of the valley, the CVD spillway will need to be integrated with the excavation, estimated to be over 7 m in depth. It may not be possible to install or maintain individual flowmeters in wells located at the bottom of a trench. Without flow data, it will not be possible to monitor flow rate changes in each well over time, which would be indicative of progressive well fouling.
- **Cutoff Wall**: The construction of a cutoff wall will pose significant implementability and constructability challenges. Access requirements for the equipment needed to construct this cutoff wall to depths approaching 50 mbgs will require significant excavation or fill to provide access and for leveling activities across the valley. The availability of equipment required for cutoff wall construction is limited, and mobilization of this equipment from significant distances may be

required. A pressure-grouting program for the weathered bedrock beneath the cutoff wall will likely be required.

- **Phased implementation**: It is anticipated that the SIS will be implemented in phases, with the first phase consisting of several extraction wells operating on the north side of the valley, where initial breakthrough of contamination is anticipated to occur. As the area of contaminant migration expands, additional extraction wells will be constructed to intercept contamination across the width of the valley. This approach favors installation of conventional extraction wells rather than wells that need to be located at the bottom of a trench positioned 7 to 10 m below the ground surface on the flanks of the valley.

Effectiveness and Longevity

- **Conventional extraction well system:** This system is flexible in optimizing the pumping distribution across the valley and responding to changes in well efficiency as well screens begin to foul. This type of system also provides recovery from well failure; pumping rates from adjacent wells can be increased temporarily to compensate for the failed well until repairs are made.
- **Integrated trench and well system:** The trench-based system limits the amount of drawdown that can be imposed on the passive wells and, therefore, limits the flow rates that can be achieved. As well efficiencies decline over time because of fouling or other factors, the flow rate attainable at each well at a given drawdown will be reduced. It may be necessary to increase the number of extraction wells in the system to maintain minimum-flow requirements for capture. A lack of flexibility in managing the operations of passive wells will result in reduced effectiveness. The mixing of dissimilar groundwater qualities and the potential for high-iron concentrations in the collected water increase the likelihood that the permeable trench backfill may experience significant fouling and clogging because of mineral precipitation or microbial growth.

Long-term Operations and Maintenance

- **Remote operations in cold weather environments:** Properly designed, installed, and configured pumps, pipes, and other equipment will operate reliably over extended periods in remote, cold weather, extreme environments with minimal downtime.
- **Local operations capability:** Local and indigenous labour forces can effectively operate and maintain pumps, pipes, and control equipment at remote locations with minimal training. Common sense and operator-friendly designs enable pumps to be operated manually and remotely. Programmable logic controller interfaces allow remote monitoring and more operator flexibility than strict manual operations alone.
- **Conventional extraction well system:** Periodic rehabilitation and replacement of the extraction wells will be required. Pigging of the common header pipe and the conveyance pipeline to the WTP will also be required. The design incorporating individual pumps at each well provides a significant advantage and redundancy compared to a system that relies on one or two pumps. If a single-pump service within the multiple pump field is interrupted, the drawdown at other wells can be increased to overcome this interruption. Variations in head and seepage collection rates are best addressed by varying the pumping rates at individual well locations. This capability will allow operators to respond to changes in flow conditions, downtime of individual wells, or plugging of well screens or piping because of metals precipitation.
- **Trench-based system:** Mixing of groundwater with dissimilar qualities in the permeable collection trench and conveyance pipeline will likely result in precipitation of mineral deposits and the growth of bacteria that will clog the trench and reduce well efficiencies and flow capacity in the pipeline. Declines in well efficiency and pipeline capacity can be addressed through a periodic rehabilitation program. Access to the wells at the bottom of a trench will be more difficult than for conventional

extraction wells. The flow from the individual wells cannot be independently controlled. The amount of water produced by each well will depend on the transmissivity of the sediments penetrated by the well screen and the drawdown imposed in the trench. The resulting configuration of pumping withdrawals may result in an inefficient distribution of pumping through the system. The total flow rate from this trench system is constrained by the depth of the trench. This may be an issue as precipitates form within the wells and well efficiencies decline.

Capital and Lifecycle Costs

The Alternative Development Analysis Report (CH2M, March 2015gg) provides a detailed analysis of capital and lifecycle costs.

9.5.4 Design Status

The 60 percent design has been completed for a conventional extraction well system located immediately downgradient of the CVD.

9.5.5 Summary and Recommendations

Based on the assessment presented herein and in the Alternative Development Analysis Report (CH2M, March 2015gg), CH2M recommends construction of conventional extraction wells at the base of the CVD, with a cutoff wall as a contingency item. It is anticipated that breakthrough of contaminated groundwater will initially be limited to the northern portions of the RCAA and that this initial migration of contamination could be addressed by installing and operating only the number of extraction wells necessary to capture the extent of contamination at that time.

As contaminant levels increase over time and occupy a larger area of the RCAA, the extraction well system could be expanded to address the increased contaminant footprint. Once the full well field (estimated at nine extraction wells) has been constructed to fully capture the contaminant plume, continued monitoring of groundwater levels and quality would be conducted. If a breakthrough of contamination is indicated, the low-permeability cutoff wall could be installed across the Rose Creek Valley immediately downgradient from the SIS, extending down to the full depth of the RCAA. Bedrock grouting beneath the cutoff wall would likely be required to provide full containment of the contaminant plume.

Model simulations performed, assuming a full pool is behind the CVD, suggest that when the CVD Pond is full, a marginally-higher extraction rate (approximately 10 percent increase) would be required from the SIS to maintain hydraulic capture. If it is determined that a full-pool condition will likely exist at the site for an extended period of time, it may be advantageous to locate the SIS farther downstream to reduce the required extraction rates.

The downside to locating the SIS further downgradient from the CVD is that either additional seepage from the RCD will be collected, conveyed, and treated, or a cutoff wall will need to be constructed to isolate the SIS from the RCD. If it is determined that a downgradient location is preferred, then an investigation will need to be completed to confirm subsurface geotechnical and geohydrotechnical characteristics. Regardless of the selected location of the well extraction system, an additional subsurface exploration will need to be conducted for design of a cutoff wall, if determined necessary.

SECTION 7

Vangorda Creek Diversion

10.1 Introduction

This section summarizes background information pertinent to the VCD project through the completion of CH2M's March 2014 Design Definition Report (e.g., concept design) (CH2M, March 2014g).

Table 10-1 presents the timeline for the main activities performed by CH2M for YG and other FMC stakeholders, leading to the current status of the VCD project. Background information prepared by others (October 2011 and before) before CH2M's work, are summarized in Section 10.2. Key activities conducted by CH2M, along with key reference documents and information on project decisions, are described in Section 10.3.

Table 10-1. Chronology of Vangorda Creek Diversion Project Activities
Faro Mine Remediation Project

Date(s)	Activity
October 2011 and before	Background studies and design alternatives analysis conducted by others
February 2012	Initial Data Gaps Assessment (revised Data Gaps Assessment in September 2013)
September 2012	Hydrologic analysis of impacts to Vangorda Pit should VCD breach at design capacity flows
December 2012 [a]	Appendix C5 – VCD of the MTP identifies replacement of the VCD as an Interim Works project
July 2013	Initiation of field investigations, modelling, engineering analysis, and preparation of Design Definition Report for replacement of VCD
December 2013	VCD Design and Physical Modelling Technical Memorandum
March 2014	VCD Field Investigation Data and Analysis Report
March 2014	VCD Design Definition Report
Mid-March 2014	YG/INAC decision to defer further design and modelling studies of VCD and future implementation

Note:

[a] Final draft of MTP is dated March 26, 2014 (YG, March 2014).

10.1.1 Project Background

The approximately 1,200-m-long VCD was constructed in 1991, around the northern perimeter of Vangorda Pit to limit the amount of runoff that entered the pit (SRK, April 2010a). The diversion was realigned between 1991 and 1992 because of the changing footprint of Vangorda Pit. Since then, upgrades and maintenance to the VCD have occurred, but the design and alignment have not changed (SRK, March 2010a). The existing VCD, which was originally designed with a capacity to divert the 1-in-100-year flood event, is located immediately north of and adjacent to Vangorda Pit. The structure has deteriorated because of corrosion and erosion, and has been further damaged by ice formation, ice movement, and the removal of ice and snow during winter maintenance.

The VCD has generally been successful in conveying Vangorda Creek flows around the pit during normal runoff events (SRK, March 2010a), but two flood events within the last 10 years have damaged the diversion. An event in June 2004 had a magnitude equivalent to the estimated 1-in-100-year flood event, and an event in June 2012 overtopped the diversion (CH2M, September 2012c). The June 2004

event damaged the VCD and required extensive repairs. In addition, slope failures and ice buildup have compromised the diversion and resulted in significant maintenance issues.

The VCD has been maintained, since the cessation of mining in 1998, to limit the flow of runoff to the Vangorda Pit while a long-term management plan for the diversion is developed. The following are current conditions and failure potentials (Appendix C5, Medium Term Plan Work Plan FY2014-2017 [YG, March 2014]):

- Existing flume structures are failing, potentially resulting in reduction in flow capacity, plugging, erosion of the roadway, and discharge to Vangorda Pit.
- Drop structures at roadways are at risk of plugging and overtopping.
- The diversion does not have capacity to convey peak flow in excess of 10 m^3/s, which is the 1-in-100-year design peak flow event. Flows of 10 m^3/s or more have occurred twice since 2004.
- The VCD is located adjacent to Vangorda Pit and slopes above and below are at risk for failure.
- Ice damage is increasing the instability of the diversion structures.
- Pit wall instability threatens the VCD.
- Stability of the diversion is a requisite for sustainable support of downstream aquatic habitat provided by the Vangorda flows.
- Instability of the diversion represents a potential health and safety risk to site personnel engaged in infrastructure maintenance.

The existing diversion has also experienced plugging and overtopping. In 1999, a rock fall occurred at a near-vertical slope, which overlooks one section of the flume; that necessitated emergency replacement of approximately 39 m of the flume (SRK, March 2010a). In addition, the existing diversion is located adjacent to the Vangorda Pit, where there is risk of slope instability above the diversion and below the diversion adjacent to the pit. Analyses completed by CH2M (September 2012b) show that if the VCD were to breach at the initiation of sustained peak flows equal to the design capacity of the VCD (i.e., 10 m^3/s), there is a danger of the Vangorda Pit reaching the overflow water level elevation within 7 days. The length of time over which the VCD was flowing full during the 2012 storm event is not known and flow monitoring records that quantify the length of time over which peak flows were sustained are not available. The duration of such a flood event is directly dependent on a number of meteorological factors (e.g., snowpack depth, temperature, rainfall, or antecedent soil moisture). Risks to the receiving watercourse (original alignment of Vangorda Creek) are significant should a breach occur and, as such, design and construction of the upgraded VCD has been made a priority.

10.1.2 Project Justification

Section 2.2.7 of the MTP describes the justification to include the design and construction of a replacement diversion to the current VCD as follows (YG, March 2014):

> The purpose of the VCD work package is to replace the current diversion, which routes stream flow from Vangorda Creek around Vangorda Pit, with a higher-capacity diversion along a new alignment that is not immediately adjacent to the pit. Due to the close proximity of the existing VCD to the Vangorda Pit highwall, a complete failure of the VCD (i.e., due to pit wall collapse) would allow all of the Vangorda Creek stream flow to enter the Pit. Such an event could not be quickly or easily repaired, and any attempt to do so would expose site staff to considerable health and safety risks. If VCD failure occurred at the initiation of sustained peak flows equal to the design capacity of the VCD (i.e., 10 m^3/s during a 1-in-100-year flood event), overtopping of the pit and release of contaminated water to the

environment could occur in less than 7 days. Even with dilution by clean Vangorda Creek water, poor pit water quality (e.g., pH 3; zinc, 180 milligrams per litre [mg/L]) presents significant environmental risks if released to the environment because the lower reaches of Vangorda Creek provide recharge to the Faro water supply and are fish bearing.

In a failure scenario, it would not be possible to commission ample pumping capacity to transfer water around Vangorda Pit. The pit barge and pumping system could also be severely damaged and rendered inoperable by excessive inflows. Design and construction of a new diversion in an emergency situation could not be completed in one season, indicating that there is the possibility for contaminated water to flow out of the pit and into the receiving environment in an uncontrolled manner for several weeks or more. Should Vangorda Pit fill and the pit pumping system remain operational, the Vangorda WTP would be unable to treat the necessary volume of water in a single season to reduce pit water levels below their maximum recommended elevation (3,000,000 cubic metres (m^3) of water would need to be treated to reduce pit water levels from the overflow elevation of 1,122 metres above sea level [masl] to the maximum recommended elevation of 1,085 masl). This concern will be exacerbated from 2013 onwards, when the Vangorda WTP will also begin treating water from the Grum Pit, effectively doubling its current annual throughput from 400,000 m^3 to 800,000 m^3. Essentially, there would be little excess water treatment capacity available to reduce pit water levels, and this would result in contaminated water management challenges that would persist for years.

10.2 Background Studies by Others

The Design Definition Report for the VCD provides a concise summary of prior studies relevant to the VCD, alternative assessments, and an initial design report for replacement of the VCD (CH2M, March 2014g). This prior work included the following:

- Geotechnical/Hydraulic Design Vangorda Creek Diversion Facility (SRK, 1990): This report details the design of the existing VCD; key design criteria were to accommodate a 1-in-100-year flood event and to minimize seepage losses to Vangorda Pit.
- *Anvil Range Mining Complex – Integrated Comprehensive Abandonment Plan, Volume 1* (ICAP) (RGC, November 1996): The ICAP provides history of the development of Vangorda Pit and construction of the VCD in 1991. Inspections conducted in 1996 documented that (1) there were no signs of settlement or instability of the headworks embankment, (2) the half-round culvert had incurred no major structural damage during its 5-year life, and (3) periodic settlement of riprap is occurring around the culvert. The ICAP report also noted that the decommissioning objective for the VCD was to maintain the realignment around Vangorda Pit, providing a system that would accommodate the 1-in-500-year flood event and minimize long-term maintenance and monitoring requirements.
- *Alternatives Assessment for the Vangorda Creek Diversion* (SRK, April 2003a): This report developed and assessed three closure alternatives for the VCD: (1) divert around the northern perimeter, (2) construct a realigned Vangorda Creek on a causeway built through a partially backfilled Vangorda Pit, and (3) realign Vangorda Creek in an open channel above Vangorda Pit and over to Dixon Creek to the south. Advantages/disadvantages and cost estimates were provided for the three alternatives; a preferred alternative was not selected.
- *Options for Closure of the Faro Mine Complex* (SRK, February 2008): This report documented extensive maintenance of the existing diversion, indicated that Pit wall raveling would eventually cut

off the current alignment of the diversion, and noted that without an upgraded diversion, flood events will breach the diversion and cause Vangorda Creek to flow into the contaminated Vangorda Pit. Such flow from the creek could cause a release of contaminated water from the pit that would severely affect aquatic ecosystems. Two VCD alignments were recommended contingent on the closure options selected for the Vangorda Waste Dump and the Vangorda Pit. Common to both VCD options was the recommendation to move the new VCD channel to a stable location and design it to accommodate the 1-in-500-year flood event.

- *Faro Mine Complex Closure and Remediation Plan. Project Description – Draft 4A* (SRK, March 2010a): This report noted that the final design of the VCD was in progress at the time and would be completed in 2010. Key design considerations for the VCD were listed as energy dissipation, erosion prevention, and intake structure design. The IPRP supported the VCD in previous reviews for interim works (IPRP, August 2010).
- *Faro Mine Complex Vangorda Creek Diversion Design Report – Draft* (SRK, April 2010a): This design report advanced the VCD alternative of diverting flow around the northern perimeter of Vangorda Pit; the design added a plunge pool at the bottom of the VCD to dissipate energy before discharging to Vangorda Creek. The risk of eventual pit wall failure was addressed by moving the alignment farther north, outside the area of possible impacts caused by failure of the pit wall.

The SRK draft design (April 2010a) provided an initial basis for preparation of the CH2M March 2014 design definition report (described in Section 10.3).

10.3 CH2M Investigations, Studies, and Design Work

Table 10-1 lists the general chronology of key activities and reports prepared by CH2M in support of the VCD project. Those main activities, along with key decisions and reference documents, are described in the following subsections. Supporting work will be summarized briefly, while more substantive work will be described in greater detail.

10.3.1 Vangorda Creek Diversion Field Investigation and Data Analysis

CH2M's scope of work for field reconnaissance and data analysis for the VCD is summarized in TAR007(I), FY2013-FY2014 Field Investigation (CH2M, May 2013f). Details are provided in the *Construct the New VCD Field Sampling Plan* TM (CH2M, June 2012l).

The investigation collected geologic and hydraulic information to support the design of the replacement VCD. The objectives of the field investigation included the following:

- Obtain additional information to support the evaluation of erosion potential, seepage, and slope stability for SRK's 2010 proposed VCD and associated components.
- Collect flow information to update the regional hydrological analysis and refine peak instantaneous flood estimates.
- Determine bedrock and overburden characteristics including bedrock topography.
- Characterize the geochemical and geotechnical properties of potential construction materials.

10.3.1.1 Scope of Work and Reporting

The scope of work included the following activities:

- Conduct geophysical surveys of the SRK-proposed VCD alignment, Granitic Outcrop, and Grum Waste Rock Dump Quarry to determine bedrock profile and rock quality.
- Complete a drilling program at the Granitic Outcrop and the SRK-proposed VCD alignment.

- Collect and log surface samples from the Granitic Outcrop and Grum Waste Rock Dump Quarry.
- Conduct topographic surveys of SRK's 2010 proposed VCD.
- Perform fluvial geomorphic assessments of Vangorda Creek.
- Inspect the meteorological stations.
- Conduct a reconnaissance of SRK's 2010 proposed VCD alignment.
- Install and collect data from stream gauges in Vangorda Creek.
- Collect samples from the proposed VCD, the Granitic Outcrop, and the Grum Waste Rock Dump Quarry for laboratory analysis.

The *2013 Vangorda Creek Diversion Field Investigation Data and Analysis Report* (CH2M, March 2014d) includes detailed descriptions of the work conducted and data interpretations and results. The report appendices contain the following information:

- Appendix A – Geophysical Survey Reports
- Appendix B – Borehole Logs
- Appendix C – Photograph Log
- Appendix D – Meteorological Station Inspection Reports
- Appendix E – Laboratory Reports
- Appendix F – Data Quality Evaluation Report
- Appendix G – Rapid Geomorphic Assessment Data Sheets

10.3.1.2 Summary Findings of Vangorda Creek Diversion Field Investigation and Data Analysis

Detailed summaries of the findings of the VCD field investigation and data analysis work are included in the CH2M Field Investigation Report (March 2014d). Key summary points of the field investigation report include the following:

- Subsurface investigations at SRK's 2010 proposed alignment indicate that the overburden in the lower end of the VCD is composed of a glacial till that ranges from 5.8 mbgs to greater than 34 mbgs (at the Haul Road embankment). The underlying bedrock is composed of weathered phyllite.
- The hydraulic conductivity at CH13-302-BH001, located along the downstream end of the proposed alignment is estimated to be on the order of $1x10^{-3}$ to $1x10^{-4}$centimetres per second (m/s), and the hydraulic conductivity at CH13-303-BH002, located in near the plunge pool, is estimated to be less than $1x10^{-6}$ cm/s.
- Supplemental mapping in the VCD area improved the accuracy of the Digital Terrain Model in areas with dense vegetation.
- Investigations at the Granitic Outcrop found granodiorite bedrock at approximately 1 mbgs, extending north to the Haul Road and south to the Mine Access Road. Two boreholes were advanced in the area, one of which returned a highly fractured, poor quality granite with Rock Quality Designation (RQD) values ranging from 0 to 62. The material from the second borehole was very hard, dark grey, good to excellent quality granite, with an RQD ranging from 40 to 100. Laboratory testing indicated that samples from the area are resistant to weathering, had unconfined compressive strengths ranging from 67.2 to 166.3 megapascals, and have absorption values ranging from 0.33 to 0.74 percent.
- Reconnaissance at the Grum Waste Rock Dump Quarry found a rocky hilltop extending north of the existing quarry and west of the Grum Sulphide Cell. The material is composed of gabbro and tonalite and had unconfined compressive strengths ranging from 87.0 to 135.2 megapascals. The

material experienced minor weathering when subjected to laboratory durability testing and had absorption values of 0.28 to 0.87 percent.

- Additional instantaneous discharge data are required at Station V1 during high-flow events to supplement the rating curve and improve the accuracy of flow measurements at this station, particularly during peak flow events.
- The reach of Vangorda Creek downstream from the existing VCD outlet demonstrates the following instabilities: degradation and basal erosion, incision and active channel widening, mass wasting from banks and excessive undercutting, and leaning and fallen vegetation. A vertical face may be present.
- The reach of Vangorda Creek upstream from the existing VCD headworks demonstrates the following instabilities: degradation and basal erosion, incision and active channel widening, mass wasting from banks and excessive undercutting, and leaning and fallen vegetation. A vertical face may be present.
- The sensors at the two onsite meteorological stations require routine cleaning and inspection. The 2014 Field Investigation and Data Analysis Report recommended that meteorological equipment should be calibrated within the following year (CH2M, March 2014d).

10.3.2 Vangorda Creek Diversion Design Definition

In December 2012, as part of the MTP, CH2M provided YG with a scope for completing the VCD replacement design, which included design definition. TAR018 authorized CH2M to proceed with the design definition phase for the replacement VCD.

10.3.2.1 Scope of Work and Reporting

The scope of work for design definition included the following elements of work:

- Existing options data review
- Design criteria development
- Options development and selection
- Preferred option concept development
- Geotechnical and geophysical analysis
- Hydrologic analysis
- Preliminary hydraulic analyses
- Climate change impact assessment
- Physical modelling
- Cost-benefit risk analysis

The draft Vangorda Diversion Design Definition Report (CH2M, March 2014g) includes detailed descriptions that identified work to be carried out. The following subsections include key summary points and recommendations resulting from it.

10.3.2.2 Field Program

CH2M field reconnaissance staff inspected the existing VCD (including channel conditions immediately upstream and downstream of the diversion) and the replacement VCD alignment proposed by SRK (April 2010a). The Draft Design Definition Report included the following results of the field reconnaissance (CH2M, March 2014g):

- There are concerns regarding the existing capacity of the plunge pool to handle the new design discharge. The existing plunge pool upstream of the Haul Road is wide and long; however, the pool is shallow and it may not meet the definition of a plunge pool. The plunge pool needs to be re-evaluated for a design flood event during the design phase.

- The Vangorda Pit side walls adjacent to the VCD show rock ravelling and slumping failures. The VCD should be moved to the northwest, farther away from Vangorda Pit.
- Upstream portions of the alignment proposed by SRK should be moved southeast, which is estimated to have gentler side slopes ranging from 4V:1H to 5V:1H. This move would also reduce the depth of the excavations required to construct the replacement VCD.
- The location of the headworks proposed by SRK should be moved approximately 200 to 300 m south, in an area with a gentler side slope. Additional survey and geotechnical data are required for this area to properly position the head pond works. Depending on the height of the dam, this move could reduce design and construction costs. This structure would be classified as a dam in accordance with Canadian Dam Association guidelines based on the height and volume of impounded water.
- A one-lane access road constructed parallel to the VCD would minimize excavation work and reduce disturbances to the uphill slope. The road would allow the VCD channel to be widened in locations where uphill slopes are minimal; turning bays would be provided.

10.3.2.3 Hydrology

The hydrology analysis updated previous frequency analyses and defined peak flows for VCD design. The 1-in-500-year flood event calculated in the updated frequency analysis (33.0 m^3/sec) was slightly lower than the 1-in-500-year upper envelope flood event peak flow rate (34.01 m^3/sec) calculated by SRK (April 2010a) and used for the conceptual design in this report. The 1-in-200-year flood event calculated in the updated frequency analysis (20.7 m^3/sec) is close to the SRK (April 2010a) 1-in-500-year Upper Envelope flood event peak flow rate (18.08 m^3/sec). Finally, the 1-in-100-year flood event calculated in the updated frequency analysis (14.7 m^3/sec) is the same as the SRK (April 2010a) 1-in-200-year flood event peak flow rate (CH2M, March 2014g).

Flood events from the updated frequency analysis are used in the design definition cost-benefit analysis and related recommendations.

10.3.2.4 Geotechnical and Geophysical Evaluation

The following summarizes the results of the geotechnical and geophysical evaluations (CH2M, March 2014g):

- Field reconnaissance noted that phyllite bedrock is exposed in the bottom of the creek at the head pond works. It can be assumed that bedrock in the creek bed is very shallow in this area.
- Along the upper reaches of the VCD (see Figure 10-1), the overburden of glacial till is generally from 1 to 5 m deep. Along the lower reaches, the glacial till generally extends from 1 to 7 m below the existing ground surface.
- Borings and test pit data indicate that the depth of stripping will vary from zero to 1.5 m. An average of 0.9 m of material will need to be stripped to reach the fill materials, except in the headwater area.
- Soil along the alignment options is generally over-consolidated glacial till overlying bedrock; the soil is not subject to significant consolidation settlement.
- Seismic velocity within rock was used as an indicator of the rippability of the bedrock materials. The unrippable excavation, as a percent of total excavation, varies between 10 and 40 percent for the different options.
- The required setback distance from the ravelling crest of Vangorda Pit was estimated by using an assumed conservative value of 22 degrees for the stable slope angle for long-term conditions at the crest of the pit wall. The recommended setbacks (see Figure 10-1) vary from 5 to 20 m.

- For channel side slope stability, cut-and-fill slope inclinations on each side 2H:1V are proposed for unsaturated conditions. The maximum slope height varies for the different alternative options, up to 20 m of cut and 10 m of fill.
- Preliminary observations note that fill slopes for embankments along the VCD options are generally stable, except where the water level in the diversion channel is elevated above the toe of the fill slope. Detailed slope analyses are required during detailed design once the alignment and headworks configurations are confirmed.

10.3.2.5 Climate Change Impact Assessment

The following summarizes the literature review for climate change (CH2M, March 2014g):

- Climate change will continue to occur in the future. The impacts of climate change are more severe in the north than other areas in the world.
- Over the past few decades, the average annual temperature in the Arctic has increased by 1.5 to 2°C. Current emission scenarios and global climate models (GCMs) predict this trend will continue over the next century. The average annual temperature in the Yukon may increase by 6.8°C over the next century.
- Most studies indicate an increase in precipitation in the Yukon. There will be greater variability in the types of weather events that occur and an increase in the frequency of extreme precipitation events.
- The most significant hydrological impacts associated with climate change in the north include permafrost degradation, changes to the freeze-thaw cycle, and glacial melt. Permafrost degradation affects local hydrological processes and has severe implications for infrastructure. Potential changes in the north freeze-thaw cycle are numerous and difficult to predict.
- Climate change has significant implications for the mining industry in the north, particularly the remediation and closure of mine sites. Because most mines were designed without consideration of climate change, adaptive measures must be included in mine closure plans.

10.3.2.6 Landform Analysis

A terrain analysis of the Vangorda Creek area assessed natural hazards for the VCD. The analysis determined how water flows across the area, where potentially unstable terrain is located, and where these intersect. The preferred alignment (Option 12) crosses two flow paths, as well as potentially unstable terrain. These areas should be further evaluated during detailed design to determine the level and extent of the hazards. These activities should include an assessment of the material properties of the landforms, observations for evidence of recent changes, a field evaluation of slope and toe stability, and an assessment of mobility of potential upstream sediment deposits (CH2M, March 2014g).

10.3.2.7 Vangorda Creek Diversion Alignment Options

Twelve alternative alignment options for the VCD were evaluated based on the following (CH2M, March 2014g):

- Their proximity to Vangorda Pit and the ravelling areas
- The channel horizontal alignment and vertical profile
- Earthworks
- Overall channel length
- The diversion channel configuration at the head pond
- The dam configuration
- Geotechnical and geological issues
- Road horizontal and vertical alignments

After implementing a systematic selection process, Option 12 (includes a dam) or Option 12B (does not include a dam) were selected as the preferred alignments for consideration during the Detailed Design phase (CH2M, March 2014g).

10.3.2.8 Preferred Alignment Hydrotechnical Analysis and Design

The design definition and criteria addressed the following (CH2M, March 2014g):

- Design life, design discharge, access, and maintenance road design features
- Headworks, plunge pool, and channel design features
- Erosion, scour, and energy dissipation considerations
- Debris flow, sediment, frazil ice, and ice considerations
- Geotechnical considerations
- Climate change impact consideration
- Culverts

The results for one-dimensional numerical modelling for the preferred alignment (Option 12) are presented in the design definition report. Spillover into Vangorda Pit during flood events that exceed the design flood is a major risk. This scenario would increase the volume of water for treatment, and it would affect pumping rates, the duration of treatment, the capacity of the water treatment plant, and, therefore, treatment costs (CH2M, March 2014g).

10.3.3 Design Definition Report Recommendations

The following recommendations are included in the draft Vangorda Diversion Design Definition Report (CH2M, March 2014g):

- Option 12 is identified as the recommended preferred alignment option. A comparative cost estimate for the level of service is presented based on various design floods. Cost estimates are based on very preliminary extrapolated geotechnical information and concept figures and do not include several elements that will be developed during conceptual design.
- The detailed design should progress based on the subcritical and critical flows in the reaches identified in the profiles for Option 12.
- Physical modelling should be conducted to determine protective measures and the flow rate reduction at step pools.
- The detailed design should progress based on the preferred alignment of Option 12.
- The potential landform hazards identified during the terrain analysis should be physically observed and verified. This includes inspecting landforms and their material properties to update and calibrate the stability mapping models.
- Additional geotechnical and geological investigations of the subsurface along the proposed alignment should be conducted to gather data for analyzing seepage and slope stability and to determine stable channel embankment slopes.
- Additional investigation should be conducted before selecting a connection (dam or no dam) at the headworks.
- An access maintenance roadway should be included on the downslope side of the channel in the detailed design stage.
- The design capacity should consider (1) reliability of the diversion channel to accommodate extreme storm and runoff events, (2) uncertainty regarding the hydrological analyses related to the shortness of the period of record of flow data and climate change, (3) increase in capital costs for increase in

capacity, (4) reduction in potential operations costs during extreme events, (5) ability of the site operations staff to respond to overflow events, and (6) potential impact on Vangorda Pit because of infilling.

10.3.4 Status Following Completion of CH2M Work (March 2014)

At the time of this report's preparation (March 2016), the status of the VCD project is as follows:

- Deferment of Project: CH2M was notified by YG in mid-March 2014 that further design work and implementation of the VCD project was being deferred.
- Draft Design Definition Report: To CH2M's knowledge, the March 2014 VCD Design Definition Report was not reviewed by YG, INAC, or the IPRP. No review comments were provided to CH2M.

SECTION 7

Regulatory Roadmap

11.1 Introduction

This section summarizes the PDT's regulatory work related to both environmental and socio-economic assessment (i.e., YESAA) and permitting (e.g., water licence). Table 11-1 presents a timeline for the main regulatory activities.

Table 11-1. Chronology of Regulatory Activities
Faro Mine Remediation Project

Date(s)	Activity
October 2011 to March 2012	Initial gaps assessment, development of environmental and socio-economic assessment methodology, initial definition of project and assessment scopes.
2012	Initial baseline data collection programs
2012 and 2013	Development and refinement of Table of Contents for RPP
March 2013	Level of Design Workshop
July 2013	Level of Design and Gaps Refinement Workshop
May 2013 to November 2014	Preparation of IWPP
2013	Interim Works baseline data collection programs
2014	Continued baseline data collection programs

11.2 Regulatory Strategies

11.2.1 General Strategies

When initially engaged in 2011, the primary focus of the PDT was the preparation of the Faro Mine RPP for submission to the YESAB Executive Committee. Project planning at the time envisioned that a second phase of work would commence once the Project Proposal was complete. The second phase was to include stewardship of the RPP through the YESAA process, as well as preparation of permit applications and completion of permitting processes.

From the outset, the PDT envisioned a regulatory approach that would deliver high quality, technically sound regulatory documents to meet or exceed all regulatory requirements and support efficient and timely regulatory processes. Transparency and effective engagement with interested parties were key principles of the approach. Achieving these principles was to rely on the establishment of, and ongoing engagement with, a regulatory working group composed of representatives from interested parties and regulatory agencies. The group was to be a forum for discussing regulatory information needs, expectations, processes, and approaches so that challenges and concerns could be addressed during preparation of application documents.

The PDT also envisioned a comprehensive and systematic approach to addressing regulatory requirements for the FMRP as a whole, recognizing that other activities (e.g., field investigations) in addition to final remediation may trigger regulatory requirements. At the outset, the PDT, Canada, and YG established the Regulatory Leadership Team (RLT) to define and guide the regulatory components of

the project. Collectively, the RLT expressed a goal for the FMRP to "*be held up as an example of regulatory integrity, environmental performance and socio-economic cooperation for other developments in the Yukon, and for other large scale environmental projects in Canada and beyond*" (CH2M, December 2011b).

Changing project priorities and shifts in regulatory direction led to significant challenges for the preparation of regulatory documents. As the project focus shifted to address immediate priorities (e.g., water treatment, flood management, and eventually contamination in the NFRC), the focus of, and approaches for, regulatory activities also shifted. In 2013, the regulatory focus shifted to developing the IWPP for submission to the YESAA Designated Office.

The IWPP addressed site operations, site investigations, and interim flood management improvements. The completion of the IWPP's YESAA process was intended to provide a foundation for more straightforward assessments of any subsequent early remediation activities. Throughout IWPP preparation, the PDT continued to advocate for application of the same principles defined for the overall regulatory strategy, including regulatory excellence and transparency. The IWPP was completed to a final draft stage (YG, November 2014a), but project priorities and regulatory strategy changed and the document was not finalized or submitted.

Consultation and engagement presented challenges for the implementation of the proposed transparent and collaborative regulatory approach. YG and Canada maintained a leadership role for consultation and engagement, but no overall consultation and engagement plan to support regulatory activities was prepared. Without this overall plan, consultation and engagement relied on ad-hoc approaches for specific activities. Government requirements for consultation and engagement activities sometimes constrained the PDT's ability to gather information that was needed in these circumstances.

Although work progressed on the RPP and IWPP, the regulatory strategy for activities that occurred throughout the period of the PDT's involvement relied, with a few minor exceptions, on authority granted by a Minister's Determination under the *Waters Act*. Activities undertaken during that time period were not the subject of any YESAA process. The project did obtain permits for certain specific activities, such as licences for fish and wildlife investigations.

As of early 2016, the PDT does not have clear direction about the overall approach for assessment and permitting of the final remediation plan or early remediation activities. Several options for addressing regulatory requirements for early remediation activities and the final remediation plan have been discussed (Slater Environmental Consulting, October 2015), but the FPET has not advised the PDT about a regulatory path forward. Work on the RPP has ceased, pending decisions about how to address overall regulatory requirements.

Throughout its regulatory work on the FMRP, the PDT relied on the following assumptions:

- The RPP will require assessment by the YESAA Executive Committee. Therefore, the RPP must be prepared to meet the Executive Committee requirements, including the requirement for consulting relevant First Nations and communities.
- The final remediation plan will remain substantially consistent with the project described in the Draft 4A Closure Plan (SRK, November 2010).
- Canada and YG are co-proponents for FMRP activities. As co-proponents, Canada and YG are obliged to meet the requirements of YESAA with respect to activities carried out at the site. YG has authority to carry out certain activities without obtaining a water licence, in accordance with the Minister's Determination under the *Waters Act*. Various other permits and licences may be required for certain activities, and some of these cannot be issued without YESAA assessments.

11.2.2 Types of Activities at the Faro Mine Complex Considered in Regulatory Requirements

The PDT has considered regulatory requirements for four general (sometimes overlapping) categories of activities that are part of the overall FMRP (Slater Environmental Consulting, October 2015):

- Site Operations and Maintenance. Site operations entails ongoing site activities that prevent adverse effects of the FMC on persons, property, or the environment, and mitigate adverse effects that occur. This includes care-and-maintenance activities as well as the application of comprehensive risk assessment, monitoring, and adaptive management programs. Because of changing conditions at the FMC, the site operations scope includes the implementation of responses that arise from the adaptive management plan (e.g., interim groundwater collection systems).
- Site Investigations. Site investigations are activities that are required to understand site conditions and support the design of remediation and closure elements. These activities will continue to occur throughout the site and extend over the duration of the development of the final remediation plan. Site investigation activities will include, for example: soil and rock sampling, geotechnical investigations, aquifer testing, environmental monitoring, field trials, vegetation sampling, wildlife surveys, aquatic studies, and geophysics. Specific investigation requirements and locations will evolve to address site conditions, the results of sequential investigations, and design requirements.
- Early Remediation Measures. Early remediation measures are those measures that the proponents must implement to address unacceptable conditions or risks at the site. In some cases, these may be interim measures to minimize effects or risks until implementation of the final remediation plan (e.g., Interim Water Treatment System). In other cases, the measures may be part of the final remediation solution for the component (e.g., Grum Sulphide Cell Cover).
- Final Remediation Measures. The final remediation plan will entail extensive remediation works to address pits, waste rock, tailings, water management, site infrastructure, and other issues. Once these works are completed, the plan will also include permanent site maintenance, water management, and water treatment activities.

Each of these categories can include activities that exceed thresholds for both YESAA assessment and permitting. During the period from 2011 to 2016, the PDT has prepared documentation to support regulatory processes for activities in each of these categories, most notably the IWPP (YG, November 2014a) that addresses activities in the first three categories, and supporting documentation for the RPP that addresses activities in the fourth category.

11.2.3 Overview of Regulatory Requirements

The primary regulatory work of the PDT was premised on an understanding of assessment and permitting requirements associated with the FMRP. The PDT focused its regulatory efforts on the requirements of three statutes: the federal YESAA, territorial *Waters Act* and federal *Fisheries Act*. While there are many other specific permit requirements associated with ongoing and proposed activities at the FMC, these three have the most comprehensive application requirements and are likely to drive the regulatory schedules and information requirements. General descriptions of the PDT's understanding of regulatory requirements under these statutes are provided below, based on the assumption that Canada and YG are co-proponents for the activities.

11.2.3.1 Yukon Environmental and Socio-economic Assessment Act

YESAA is federal legislation that prohibits Canada and YG from undertaking or authorizing projects until they have made a YESAA decision after considering the recommendations from assessments completed by the independent YESAA assessment bodies. There are specific thresholds for the types and sizes of

activities that require assessments. Many ongoing and proposed activities at the FMC exceed these thresholds.

In general, Canada and YG must initiate assessments under YESAA if any of the following is true:

- YG is the proponent and an authorization would be required for the activity to be undertaken by a private individual.
- An authorization (e.g., water licence, Fisheries Act Authorization [FAA]) or grant of interest in land (e.g., land lease) is required for the activity to be undertaken.
- Federal government (Canada) is the proponent.

Once Canada or YG makes a YESAA decision, they are obliged to implement the conclusions of the assessment, including any mitigation identified. In the case of the FMRP, the proponent-related triggers appear to generally activate the YESAA obligations for Canada and YG. These YESAA obligations apply regardless of requirements for specific permits or authorizations.

Authorization-related triggers for the FMRP also activate the YESAA obligations for specific federal Decision Bodies (e.g., Fisheries and Oceans Canada for FAAs and Natural Resources Canada for Explosives Permits) or specific YG agencies with designated authority as Decision Bodies (e.g., Environment Yukon for Storage Tank Permits and Health and Social Services for Sewage Disposal Systems). These Decision Bodies or agencies with designated authority as Decision Bodies are prohibited from issuing permits or authorizations until an applicable YESAA assessment is complete.

YESAA assessments can be initiated at the following two different levels, with thresholds defined in regulations:

- Evaluations are conducted by local, community-based Designated Offices.
- Screenings are conducted by the Whitehorse-based Executive Committee.

Larger and more complex projects are to be assessed by the Executive Committee in a more comprehensive process with somewhat longer time lines. For the FMRP, proposed remediation activities (both early and final) will exceed some thresholds for screenings by the Executive Committee. In some cases, the application of thresholds is subject to some interpretation. For example, YG, Canada, and the YESAA Assessment Bodies discussed the scope of the IWPP and concluded that the activities in that proposal did not exceed any of the Executive Committee thresholds and could be assessed by the Designated Office.

11.2.3.2 Waters Act

The *Waters Act* is YG legislation that is binding on YG and prohibits the use of water and deposit of waste except as authorized in a water licence. The *Waters Act* establishes thresholds for Type A and Type B water licences, where Type A licences are for larger projects. Water use and deposit of waste at the Faro Mine exceed the thresholds for water licences. Some activities (e.g., site investigations) would usually trigger Type B licences, while others (e.g., tailings dams) require Type A licences. The Water Board cannot issue any water licence until a YESAA assessment is completed.

Subsection 37(1) of the *Waters Act* provides a YG Minister with authority to take action to prevent or mitigate adverse effects on persons, property or the environment where a mine site is abandoned and there is a threat to persons, property or the environment.

On February 27, 2009, Kevin McDonnell, acting on behalf of the Minister of the Department of Environment, issued a Minister's Determination under Subsection 37(1). The Minister's Determination recognized the environmental risks at the FMC and authorized AAM to use any of the following

measures to "prevent, counteract, mitigate, or remedy any resulting adverse effects on persons, property, or the environment, and in particular the surrounding waters:"

1. *"Access the mine and surrounding area, with the exception of any place being used as a temporary or permanent private dwelling place.*
2. *Collection, testing, treatment, and discharge of treated waste water.*
3. *Maintaining, upgrading, inspecting and improving the diversions and dams at the mine.*
4. *Re-sloping and covering and/or relocating waste rock to prevent further contamination of any of the waters at or around the mine.*
5. *Construction of a water treatment plant at the mine.*
6. *Any such other activities either directly or indirectly related to the use of waters or deposit of waste in waters that are necessary in order to undertake any of the above*."

Since February 28, 2009, AAM has relied on the authority provided by the Minister's Determination to bypass the licensing requirement in the *Waters Act*. The authority provided by the Minister's Determination does not appear to address requirements and obligations created by legislation other than the *Waters Act* (e.g., YESAA, *Fisheries Act*, and *Environment Act*).

11.2.3.3 Fisheries Act

The *Fisheries Act* is federal legislation that prohibits activities that cause serious harm to fish (i.e., "*the death of fish or any permanent alteration to, or destruction of, fish habitat*") and the deposit of deleterious substances.

Under *Fisheries Act* Paragraph 35(2)(b), projects that cause serious harm to fish can be undertaken if they are completed in accordance with an FAA issued by the federal Minister of Fisheries and Oceans. Applications for FAAs require detailed information about the fish habitat, effects on fish and fish habitat, and proposed mitigation measures. They also require detailed descriptions of offsetting plans (i.e., fish habitat compensation). Fisheries and Oceans Canada cannot issue a FAA until a YESAA assessment is completed.

The *Fisheries Act* does not provide specific thresholds for activities that require FAAs. Fisheries and Oceans Canada provides guidance about types of waterbodies where activities can be undertaken without causing serious harm to fish, and types and scales of activities that can be undertaken without causing such harm. For the FMRP, activities like the NFRC Realignment do not appear to meet these conditions and the PDT has assumed that such activities will require an application for a FAA.

There is no *Fisheries Act* provision allowing issuance of FAAs for deposit of deleterious substances. Projects can only deposit deleterious substances if the deposits are in accordance with regulations under the *Fisheries Act*. There are no *Fisheries Act* effluent regulations that apply to the FMC. For projects in the Yukon with no applicable *Fisheries Act* regulations, water licenses under the *Waters Act* have often been used to define the thresholds for deposit of deleterious substances. Generally, as long as projects are complying with water licences, they are considered to be in compliance with the prohibition on deposit of deleterious substances under the *Fisheries Act*. In the absence of a water licence for the FMC, past experience suggests that Environment Canada may consider any effluent concentrations that exceed those specified in the *Metal Mining Effluent Regulations*[2] as an unauthorized deposit of a deleterious substance.

[2] The *Metal Mining Effluent Regulations* are regulations under the *Fisheries Act* that apply to metal mines in Canada, but the FMC does not fit into the application criteria for the regulations because of the date when it ceased commercial operation.

11.2.3.4 Other Regulatory Requirements

Because of the wide range of ongoing and proposed activities at the FMC, there are many regulatory instruments that will apply to individual activities. For example, field investigations may require Scientific Licences, or site operations may require Storage Tank Permits. The PDT evaluated the need for these specific permits on a case-by-case basis during planning for each activity.

11.3 Field Work, Care and Maintenance, and Early Remediation (Interim Works Project Proposal)

11.3.1 Regulatory Approaches – sequences, decisions, status

The initial, overall regulatory goal for the PDT was the preparation of the RPP, with a scope focused on the final remediation plan. However, the preparation of the plan and management of site risks in the interim required activities with their own regulatory implications. The PDT was not initially engaged to address the ancillary regulatory requirements associated with site operations or early remediation at the scale eventually considered by the FPET. In early 2013, based on the scope of the MTP (YG, March 2014), the FPET decided that it should seek regulatory approval for site operations, site investigations, and certain early remediation activities. This decision led to the development of the IWPP.

The MTP identified the following four priority remediation projects that were to be initiated before the RPP could be completed and implemented:

- Replacement of the existing Faro Mill WTP
- Hydraulic upgrades to structures in the Rose Creek Valley (DVIHU)
- Enabling Works for interception of groundwater in the Rose Creek Valley Alluvial Aquifer (CVD SIS)
- Replacement of the VCD

The PDT worked with YG and Canada, with input from YESAB, to develop a regulatory strategy for these projects and define the scope for a proposed YESAA assessment. The team identified a scope that included the WTP replacement, DVIHU, and CVD SIS enabling works. The scope did not include the VCD replacement project because the proposed replacement would be early implementation of a final remediation measure, thereby triggering a more lengthy YESAA assessment by the Executive Committee. The PDT recognized that the VCD replacement would have its own regulatory requirements but did not receive any final direction about the regulatory strategy for that component.

In defining the scope for a YESAA assessment of the early remediation activities, the PDT and YG agreed that a YESAA Project Proposal would need to include the site operations activities. Because the site operations have never been assessed under YESAA, the PDT and YG concluded that the YESAA Designated Office would be unable to assess the construction of a water treatment facility without considering its operation, including effluent discharge. Therefore, submitting a Project Proposal that did not address site operations would likely lead to significant process delays. The inclusion of site operations in the scope of the project meant that the CVD SIS enabling works did not need to be explicitly described because the activities would fall within the scope of ongoing site operations.

During planning for 2012 and 2013 field programs, the PDT identified several field investigation activities (e.g., drilling and aquifer pump tests) that would require YESAA assessments and permitting if undertaken by private sector proponents, and advised that these appeared to require YESAA assessments in the context of the FMRP. In most cases, YG and Canada advised the PDT to proceed with programs based on YG's authority under the Minister's Determination. However, in some cases, proposed field activities were constrained, especially those that required access to previously undisturbed areas. The PDT, YG, and Canada concluded that field investigations should be within the scope of the IWPP because they recognized that field investigations would continue on an ongoing basis

to support the development of the RPP and designs for the final remediation plan. Inclusion of the field investigations in the scope of the IWPP would provide greater flexibility for implementing effective field programs.

The spring 2013 closure of the existing Faro Mill WTP and decision to build the IWTS led to a further refinement of the scope of the Interim Works. The timeline for construction of the IWTS did not provide sufficient time to complete the YESAA and water licence processes. YG and Canada agreed to proceed with the IWTS project under the authority of the Minister's Determination. As a result, the replacement of the WTP was removed from the scope of the Interim Works, though its operation remained within the scope as part of site operations.

11.3.2 Interim Works Project Proposal

11.3.2.1 Timeline

In June 2013, YG and Canada approved CH2M to proceed on a narrow scope of initial tasks for the IWPP, including the following:

- Development of the assessment scope and initial project description
- Completion of a baseline gaps analysis for the IWPP
- Development of models to support analysis of effects

The PDT's work on the IWPP began with the development of the assessment scope and methodology and a preliminary project description (CH2M, July 2013e). Both documents served as guidance documents for the team in conducting the environmental and socio-economic assessment (CH2M, July 2013e), and eventually formed the basis for the project scope, assessment scope and assessment methodology descriptions in the IWPP (CH2M, July 2013e).

TA008C (August 2013) provided CH2M with approval for scoping and work/plan development for a socio-economic assessment. CH2M engaged Hemmera to carry out the socio-economic assessment for the IWPP.

After some planning and approval delays, TA008D and TA008E (CH2M, August 2013f and August 2013g) provided CH2M with approval for developing the IWPP with a proposed delivery date of a draft IWPP on January 6, 2014, and a final version, incorporating comments from Canada and YG, on February 11, 2014. CH2M delivered the draft IWPP on March 14, 2014. TA008I (CH2M May 2014f) provided approval for CH2M to complete final revisions to the IWPP. Following receipt of comments from Canada and YG, and discussion of comments in workshops, CH2M delivered a final draft IWPP in November 2014.

11.3.2.2 Scope and Assessment

The final scope of the project addressed in the assessment in the IWPP included the following:

- Site operations
- Site investigations
- DVIHU
- Ancillary activities associated with completing site operations, site investigations, and the DVIHU (e.g., worker accommodation and borrow source development).

The initial assessment was based on work completed for the RPP, with refinements to address the smaller scope of the IWPP activities as discussed at a team workshop in July 2013. Valued environmental components for the IWPP included the following:

- Air quality

- Surface water quality and quantity – Refined to cover only surface water quality because changes in flow were expected to be minimal and all interactions would be addressed through consideration of effects on fish and fish habitat
- Aquatic environment and organisms – Refined to cover fish and fish habitat, as a more accurate descriptor of the intended value
- Wildlife and wildlife habitat

In addition, CH2M's socio-economic assessment team identified the following valued socio-economic components:

- Economy and employment
- Community stability and wellbeing
- Infrastructure and services
- Land use and access
- Culture and heritage
- Human health and safety

In addition to valued components, the assessment methodology and scope (CH2M, July 2013) defined the geographic assessment scope, assessment temporal boundaries, and baseline scope. It also defined a systematic method for conducting assessments, beginning with a matrix-based identification of project interactions with valued components, and concluding with evaluation of significance based on a pre-defined set of criteria (direction, magnitude, likelihood, duration, geographic extent, frequency, reversibility and socio-economic context).

While an initial gaps assessment had been completed for the RPP, the narrower scope of the IWPP required a separate evaluation of information needs, and characterization of gaps specifically for the activities proposed in the IWPP. The PDT conducted an analysis of baseline data gaps for the IWPP in June and July 2013. The timing was intended to provide the opportunity for collecting any additional data during summer 2013 if necessary. CH2M delivered the final *Faro Interim Works Project Proposal Environmental Baseline Gaps* technical memorandum in January 2014, describing the results of the baseline gaps analysis (CH2M, January 2014b). The results had already been used to support data gathering about birds and waterfowl in August and September 2013, which was the only area where a critical baseline data gap was identified for the IWPP.

CH2M's socio-economic team for the IWPP also completed a gaps analysis, with results described in Interim Works socio-economic existing conditions gap analysis (Hemmera, December 2013a). The gap analysis formed the basis for a research plan (Hemmera, December 2013b) that describes primary and secondary research methods expected for characterizing socio-economic conditions and evaluating potential effects.

The IWPP describes baseline environmental and socio-economic conditions for the following range of relevant components, including information about baseline periods, assumptions, and challenges for baseline characterization:

- Geology and Soils (Appendix 6F to the IWPP [CH2M, November 2014l]). including bedrock geology, surficial geology and soils, seismic and terrain hazards, and geochemistry of borrow materials. Descriptions of geology and soils relied on data collected and compiled to support design activities.
- Climate (Appendix 6A to the IWPP [CH2M, November 2014h]). including temperature, precipitation, wind speed, wind direction, solar radiation, evaporation and evapotranspiration, and relative humidity. Baseline characteristics were defined based on both on site and regional climate stations.
- Air Quality (Appendix 6B to the IWPP [CH2M, November 2014i]). including criteria air contaminants and metals contained in particulate matter. Characterization of baseline air quality conditions for

the IWPP relied heavily on data from National Air Pollution Surveillance data collected at locations distant from the FMC. As such, the conditions may not provide an accurate characterization of site-specific conditions.

- Hydrology (Appendix 6C to the IWPP [CH2M, November 2014j]). including characterization of extreme flood events. Descriptions of hydrology baseline conditions relied on data collected and compiled to support design activities.
- Groundwater Quantity and Quality (Appendix 6D [CH2M, November 2014k]). While groundwater was not identified as a valued component for the environmental assessment, the IWPP recognized its importance as a vector for contaminant transport at the FMC. The baseline characterization of groundwater for the IWPP focused on describing groundwater within the FMC footprint, recognizing that much of the groundwater has been adversely affected by contaminants from mine waste. Descriptions of groundwater quality and quantity relied on data collected and compiled to support design activities.
- Surface Water Quality, including water quality in background (i.e., reference) and mine-affected areas. The characterization of baseline conditions identified and focused on key indicator parameters, comparing conditions in mine-affected areas to both background conditions and relevant receiving water quality guidelines, primarily the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 1999). The water quality characterization relied on data from 2008 through to 2012.
- Aquatic Ecosystems and Resources, including habitat characteristics and descriptions, stream sediment quality, periphyton communities, benthic invertebrate communities, and fish distributions and relative abundances. Characterization of aquatic ecosystems and resources relied on data collected through previous FMC investigations and monitoring programs, and results of the fish telemetry program conducted by EDI on behalf of CH2M (EDI, March 2015a).
- Vegetation (Appendix 6F to the IWPP [CH2M, 2014l]). including vegetation associations and contaminant concentrations in vegetation. During the data gaps analysis for the Interim Works, the PDT identified a lack of data to characterize the presence of rare plants in potentially affected areas, but concluded that it was not practical to collect relevant data because of the lack of certainty about locations of potential disturbances. Instead, the team concluded that the most practical approach for addressing YESAA requirements for the Interim Works was to establish and implement standard operating procedures that would include completing vegetation surveys before proceeding with any works requiring disturbance of previously undisturbed vegetation. In areas other than rare plants the characterization of vegetation baseline relied on data collected and compiled to support design activities. The team recognized that a more robust approach would be required for the RPP.
- Wildlife, including species at risk, abundance and distribution of wildlife species (moose, thinhorn sheep, caribou, grizzly bear, furbearers, canids, avifauna, small mammals, amphibians, and invertebrates), and wildlife habitat. Characterization of baseline conditions for wildlife relied on previously collected data and reports as well as results from two investigations specifically conducted to support baseline characterization for the FMRP. These included a 2012 winter track study in support of the RPP (ELR, November 2012) focused on compiling information about furbearers, and a 2013 waterfowl study in support of the IWPP (ELR, December 2013).
- Socio-economic Conditions, for the Town of Faro, Ross River Dena Council/Ross River, Selkirk First Nation/Pelly Crossing, Liard First Nation/Watson Lake and the Kaska Dena Council. In each community, the IWPP characterized existing conditions for population and demographics, economy and employment, community well-being, infrastructure and services, and, where relevant, land use and FMC access. The broad geographic scope for characterizing existing socio-economic conditions addresses the requirements defined by YESAA but also includes additional First Nations and

communities to address requirements established in the Yukon Northern Affairs Program Devolution Transfer Agreement (PWGSC, October 2001). While the IWPP recognized that potential effects from proposed activities would likely vary substantially depending on the proximity of communities to the FMC, the baseline characterization attempted to provide similar levels of information for all communities. The socio-economic assessment team faced significant challenges in compiling baseline information, primarily because the schedule and timing for completion of the IWPP precluded any opportunity for the completion of any primary research about socio-economic conditions; i.e., direct discussion with people and organizations potentially affected by the Interim Works activities. The socio-economic team prepared a research plan (Hemmera, December 2013b) that included both primary and secondary research, but FPET was unable to gain approval for primary research activities within the time lines necessary to deliver the IWPP.

- Heritage Values: The PDT did not conduct any research related to heritage values. Instead, it relied on heritage assessment completed by Ecofor on behalf of YG for characterizing heritage values (Ecofor, January 2013).

The IWPP describes the results of effects assessments for each valued component. The first step in conducting the effects assessment involved a comprehensive identification of potential interactions between Interim Works activities and valued components. It also classified the interactions to highlight those warranting detailed consideration in the effects assessment. This step took place during two workshops: one for environmental valued components, and one for socio-economic valued components, applying a consistent, systematic approach to create a matrix of project activities and VCs regardless of scale, magnitude, or direction (Table 7-4 in the IWPP). Within the matrix, each project-activity/VC intersection was classified according to the following numerical criteria:

- “0” = No Interaction: no measurable interaction that could cause an effect
- “1” = Weak Interaction: minimal interaction where measureable effects are possible, but the effects will be avoided or suitably mitigated through compliance with regulatory requirements and application of standard best management practices
- “2” = Strong Interaction: potential interaction where measurable effects are likely even with application of best management practices, or where understanding the scale or magnitude of effects requires detailed analysis

The assessment addressed interactions classified as “1” by identifying specific regulatory requirements and best management practices to eliminate or suitably mitigate potential effects (YG, November 2014a, S. 7.3.2 and Table 7-5). The assessment addressed interactions classified as “2” by conducting more detailed analyses of potential effects by applying analytical processes to understand the interaction pathways, predict the effects, identify appropriate mitigation measures, evaluate the significance, and design monitoring plans to confirm the validity of the assessment (YG, November 2014a, Ss. 7.3.3 – 7.3.6). Information about the effects assessments for each Valued Component is provided below.

- Air Quality: The effects assessment for air quality used emission inventory and dispersion modelling to evaluate the air quality effects of the proposed Interim Works activities, with dust resuspension and dust emission identified as the pathways for potential effects. Modelling predicted short-term, localized exceedances of some air quality ecological objectives near active construction areas, even with application of dust control measures. Because of the conservative approach to modelling, with all potential sources considered at the same time, actual exceedance was determined to be unlikely. The model did not predict any offsite exceedance. The assessment concluded that significant effects were not likely to occur.
- Aquatic Environment – Water Quality, and Fish and Fish Habitat: The critical pathways of potential effects on the aquatic environment were all related to potential contaminant release from mine waste. The FMC context had a significant influence on the aquatic effects assessment, primarily

because the activities proposed in the IWPP were intended to minimize and mitigate potential effects on the aquatic environment from existing conditions at the FMC. As a result, the aquatic effects assessment considered two scenarios and applied different approaches for assessing effects of those scenarios.

First, the assessment considers a "Normal" scenario that used a water and load balance model (CH2M, November 2014n) to predict water quality in the streams affected by the FMC. Second, the assessment considered an "Adverse" scenario that assumed a new source or transport pathway leading to a rapid increase in aquatic zinc concentrations. The adverse scenario was assumed to exist for a limited time until mitigation measures described in an AMP (CH2M, November 2014f) could be implemented to return conditions to Normal. Predictions for the Adverse scenario were based on 2013 monitoring data that indicated a new zinc load to the NFRC.

The aquatic effects assessment focused on contaminants observed at concentrations exceeding water quality guidelines and background concentrations at locations downstream of the mine, including cadmium, cobalt, iron, lead, manganese, sulphate and zinc. Zinc was the primary focus of the assessment. The assessment identified some potential exceedances of environmental objectives, especially for the adverse scenario, but concluded these could be managed by appropriate mitigation and adaptive management responses.

- Wildlife and Wildlife Habitat: The assessment of potential effects on wildlife and wildlife habitat considered a range of potential effect pathways including destruction or alteration of habitat, metals uptake, entrapment, vehicle collisions, and sensory disturbance. The assessment applied quantitative and qualitative approaches to characterize potential effects and identified several mitigation measures that would be necessary to avoid causing significant effects.
- Economy and Employment: The assessment considered business development, economic diversification, employment and income levels, and employment and training. Overall positive effects were identified.
- Community Stability and Well-being: The assessment considered community demographics, and cultural well-being. Because of the past experience of the communities with mining projects, the team concluded that the communities were sufficiently resilient to withstand any changes associated with the Interim Works activities without significant effects.
- Infrastructure and Services: The assessment considered roads and traffic, housing, health and emergency services, and community infrastructure. Many of the proposed Interim Works activities were similar to existing activities (e.g., site operations) and the scope of additional activities was considered small enough that demand on infrastructure would only change incrementally and not be significant.
- Land Use and Access: The assessment considered traditional land use, recreation and tourism; and timber harvest. While the approach to access management was expected to change, mitigation was identified to minimize potential effects.
- Culture and Heritage: The assessment considered heritage values and traditional First Nations' culture. The assessment recognized that it was not practical to complete a detailed archaeological assessment for all potential areas of disturbance for the Interim Works. Instead, the assessment conclusions relied on a Heritage Resource Management Plan for the FMC that was part of the Environmental Management Plan (YG, November 2014b). The Heritage Resource Management Plan establishes protocols for evaluating and addressing archaeological values before specific activities proceed. With respect to culture, the assessment concluded that effects would be minor due to the small potential for additional disturbance.

Overall, the IWPP concluded that the Interim Works would not cause significant adverse environmental or socio-economic effects.

The final draft IWPP was not submitted to the YESAA Designated Office. However, the information compiled in the document will form a strong basis for preparing any future regulatory submissions.

11.4 Final Remediation Activities (Remediation Project Plan)

11.4.1 Regulatory approaches – sequences, schedules, decisions, status

The FPET initially engaged the PDT for the primary purpose of preparing the RPP supported by a 60 percent design, with a planned completion date in early 2013. The PDT conducted an initial gaps assessment in 2011-2012 and, based on the results, developed a cost opinion estimating the cost of all activities needed to support completion of the RPP and the 60 percent design (CH2M, December 2011a).

The level of effort and costs associated with the 60 percent design, as well as further review of requirements for YESAA project proposals led the FPET to direct that the PDT refine the gaps assessment to address the needs for a YESAA Project Proposal and design to support a Class 3 cost estimate (an approximate 30 percent concept design) (CH2M, February 2012c). The gaps assessment supported the development of a comprehensive work plan and schedule for the RPP and design. In early 2012, the PDT estimated completion of the RPP by approximately October 2014. Achieving this aggressive schedule would have required extensive field investigation programs in both 2012 and 2013 to support completion of designs, and the environmental and socio-economic assessments.

The April 2012 FPET decision to pursue replacement of the existing Faro WTP and development of the MTP (YG, March 2014) redefined the schedule for the RPP, with completion proposed for July 2017. Following completion of the MTP, additional changes in site priorities continued to erode the focus on the RPP. By 2015-2016, the completion of a comprehensive RPP was no longer a focus for the PDT and the work plan and schedule for completion are now undefined.

11.4.2 Remediation Project Proposal

11.4.2.1 Effects Assessment Scoping

The work on the environmental and socio-economic assessment began with a scoping exercise to define the scope of project, scope of assessment and methods for the assessment and preparation of a draft table of contents for the RPP (YG, March 2013).

The PDT prepared the draft working copy of the assessment methodology and scope (CH2M, January 2012b) in association with Canada and YG. This document provided the basis for a workshop held in February 2012 to refine recommendations for valued components, indicators, study areas and temporal boundaries (CH2M, February 2012b). The results of the workshop are provided in notes (CH2M, March 2012o), study area maps (Figures 1 through 3 in CH2M, March 2012w, CH2M, March 2012x, and CH2M, March 2012y) and a draft table of valued components (CH2M, March 2012v). These documents were intended to guide the PDT's work on the environmental and socio-economic assessment and support consultation and engagement about the scope of the assessment. As priorities shifted, consultation and engagement activities about the RPP did not occur.

11.4.2.2 Gaps Assessment and YESAA Information Requirements

The gaps assessment conducted in 2011-2012 (CH2M, February 2012c) included regulatory gaps, specifically outstanding data and research requirements for completion of the environmental and socio-economic assessments. Most of the assessment-related gaps were associated with the inadequacy of baseline information. In many cases, the data gaps for the assessment overlapped with gaps for design. As a result, data collected to support design could be used for assessment purposes.

The discussions during completion of the gaps analysis highlighted the need to develop a better understanding of information requirements for the RPP versus those for design and cost estimating. The PDT held two workshops (March 2013 and July 2013) to discuss the level of design required to meet the needs of a YESAA Project Proposal, and to refine the gaps analysis to reflect the selected level of design. The results of the March 2013 workshop are provided in *Faro Mine Remediation Project YESAA Engineering Requirements Workshop. March 5 & 6, 2013 – Whitehorse, Yukon* (Cambio Consulting, March 2013), while the overall results are provided in *YESAA Level of Design and Gaps Analysis Update, Faro Mine Remediation Project* (CH2M, March 2014p). At the conclusion of the workshops, the PDT recommended that 30 percent design would likely achieve the information needs for a YESAA assessment, because it would achieve the following goals:

- Sufficient level of detail in design for physical elements to demonstrate the practicability of the proposed project, and support prediction of project performance for environmental and socio-economic effects assessments
- Sufficient level of detail in design to develop management plans that will support prediction of project performance for environmental and socio-economic effects assessments
- Sufficient understanding of physical and management elements of design so that modelling can provide suitable accuracy of, and confidence about, predicted environmental and socio-economic effects

YESAA Level of Design and Gaps Analysis Update, Faro Mine Remediation Project defined the outstanding gaps needed to support the RPP, including several baseline information gaps, where additional data would be needed to complete the environmental and socio-economic assessment.

11.4.2.3 Baseline Data Collection

The PDT collected and analyzed baseline data for several environmental components, to support development of the RPP. For many environmental components (e.g., groundwater), baseline and design data needs overlapped and data collection for environmental assessment purposes was conducted as part of engineering data collection programs. In some instances, as described below, specific data collection programs were conducted to meet assessment needs. In some cases, data were analyzed and compiled into baseline reports.

- A 2-year (2012-13 and 2013-14) fish telemetry program used radio-tagged Arctic grayling to develop an understanding of fish presence and habitat use in and around the FMC (EDI, March 2015a; EDI, December 2012; EDI, November 2012).
- The *Geology and Terrain – Preliminary Baseline Report, Faro Mine Remediation Project Proposal* (CH2M, March 2015jj) compiles baseline information about surficial geology, bedrock geology, terrain, and soils.
- A series of toxicity tests were completed in 2014 to support ecological risk assessment, though no analysis or interpretation of results was completed. The tests included the following (Maxxam Analytics, March 2015):
  - Toxicity of site water to fish
  - Toxicity of sediment to benthic invertebrates
  - Toxicity of site soils to soil invertebrates and vegetation
- The *2014 Hydrology Field Program Report, Faro Mine Remediation Project* (CH2M, February 2015a) provided an update to the hydrology baseline report completed for the IWPP (CH2M, November 2014j), incorporating data collected in 2014.

- The *Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal* (CH2M, March 2015kk) describes vegetation and soil conditions at the FMC, including results of terrestrial ecosystem mapping and rare plant surveys conducted in 2014.
- The *Wildlife Baseline Studies: 2014 Summary Report, Faro Mine Remediation Project* (ELR, November 2014) describes the results of a wildlife camera study, a breeding bird survey, and a small-mammal contaminants study conducted in 2014. These wildlife studies supplemented earlier studies that included a 2012 winter track study compiling information about furbearers (ELR, November 2012), and a 2013 waterfowl study in support of the IWPP (ELR, December 2013).
- A 2014 field program conducted by Minnow Environmental collected baseline data related to the aquatic ecosystem. Some data were reported in *Draft Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014* (Minnow, March 2015). Minnow Environmental prepared a final report directly for YG in 2015.

11.4.2.4 Socio-economic Assessment

In 2014 and early 2015, Tera Consultants (Tera) completed some research and planning related to the environmental and socio-economic assessment. This included recommendations about assessment methodology and scope (Tera, December 2014), and an initial characterization of baseline conditions and assessment scope (Tera, January 2015).

11.5 Other Regulatory Activities

The PDT completed several independent, regulatory-related activities to address specific needs of the FMRP. These included the following:

- Under TAC009D (CH2M, May 2012d), the PDT evaluated the volume of water that could be safely released from X5 during spring low-flow conditions. Results were presented in the *Response to Objective 1 Task Authorization Component 009-D Water Management Support, Faro Mine Remediation Project* technical memorandum (CH2M, October 2012a).
- Under TAC9GG (CH2M, March 2015pp), the PDT developed a protocol for direct discharge from the IWTS. The protocol was described in *Faro Mine Complex – Interim Water Treatment System, Monitoring and Discharge Protocols for Direct Discharge of Treated Effluent to the North Wall Interceptor Ditch* (Slater Environmental Consulting, March 2015). This version was revised later in 2015 (Slater Environmental Consulting, July 2015).
- Under TA21 (2015/16 [CH2M, April 2015) the PDT developed a regulatory options analysis for the FMRP, including approaches to address regulatory requirements for the proposed NFRC realignment. The FMRP regulatory options analysis was completed only to the draft stage and was not finalized, pending receipt of comments from YG.

SECTION 7

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CH2M HILL Canada Limited (CH2M). March 2014a. *Cross Valley Dam Pond Boom/Baffle Curtain System Installation*, *Faro Mine Remediation Project.* Technical memorandum. Draft. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31.

CH2M HILL Canada Limited (CH2M). March 2014b. *Faro Water Treatment Plant Geotechnical Design Report Addendum, 2013 Borrow Source and Quarry Investigation*, *Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31.

CH2M HILL Canada Limited (CH2M). March 2014c. *2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31.

CH2M HILL Canada Limited (CH2M). March 2014d. *2013 Vangorda Creek Diversion Field Investigation Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28.

CH2M HILL Canada Limited (CH2M). March 2014ee. *Water Treatment Plant Geotechnical Design Report, Faro Mine Remediation Project.* Technical memorandum. Final. Prepared for Government of Yukon. March 11.

CH2M HILL Canada Limited (CH2M). March 2014f. *Fiscal Year 2013 Water Quality Modelling Analysis, Faro Mine Remediation Project.* Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. Draft. March 28.

CH2M HILL Canada Limited (CH2M). March 2014g. *Task Authorization 018(A) Vangorda Diversion Design Definition, Faro Mine Remediation Project.* Draft. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28.

CH2M HILL Canada Limited (CH2M). March 2014gg. *Water Treatment Plant Geotechnical Design Report, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 11.

CH2M HILL Canada Limited (CH2M). March 2014i. *Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Report, Faro Mine Remediation Project.* Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. Draft. March 28. (60% design)

CH2M HILL Canada Limited (CH2M). March 2014k. *Cross Valley Dam Seepage Interception System Air Pocket Analysis* Technical memorandum. Draft. Prepared for Government of Yukon. March 14. (Appendix G to *Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Report* [60% design])

CH2M HILL Canada Limited (CH2M). March 2014l. *Task Authorization 016 Down Valley Interim Hydraulic Upgrades Phase 2 – Basis of Design Report, Faro Mine Remediation Project.* Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. Final. March 28. (90% design)

CH2M HILL Canada Limited (CH2M). March 2014m. *2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. Appendix H.

CH2M HILL Canada Limited (CH2M). March 2014n. *Phase II Borrow Reconnaissance, Faro Mine Remediation Project*. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28.

CH2M HILL Canada Limited (CH2M). March 2014o. *Revised Gaps Assessment Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 27.

CH2M HILL Canada Limited (CH2M). March 2014p. *YESAA Level of Design and Gaps Analysis Updates, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 26.

CH2M HILL Canada Limited (CH2M). March 2014r. *Quality Assurance and Quality Control Review and Data Set Build Process, March 2014 Update, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 31.

CH2M HILL Canada Limited (CH2M). March 2014s. *Failure Modes and Effects Analysis – Faro Mine Water Collection and Conveyance Systems.* Technical memorandum. Final. Prepared for Government of Yukon. March 11.

CH2M HILL Canada Limited (CH2M). March 2014w. *GoldSim Model Revisions, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 20.

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CH2M HILL Canada Limited (CH2M). February 2014b. *Faro Water Treatment Plant Detailed Design Summary, Faro Mine Remediation Project, Issued for 90% Detail Design Review, Drawings.* Prepared for Government of Yukon. February.

CH2M HILL Canada Limited (CH2M). February 2014c. *Faro Water Treatment Plant Detailed Design Summary, Faro Mine Remediation Project, Issued for 90% Detail Design Review, Specifications.* Prepared for Government of Yukon. February.

CH2M HILL Canada Limited (CH2M). February 2014d. *Faro Interim Water Treatment Plant – Package 2 Basis of Design, Remediation, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. February 27.

CH2M HILL Canada Limited (CH2M). February 2014g. *Task Authorization 016 Down Valley Interim Hydraulic Upgrades Phase 2 – Basis of Design Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and the Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. February 14. (60% design)

CH2M HILL Canada Limited (CH2M). February 2014n. *Cross Valley Dam Seepage Interception System Air Pocket Analysis* Technical memorandum. Draft. Prepared for Government of Yukon. February 14. (Appendix G to *Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Report* [30% design])

CH2M HILL Canada Limited (CH2M). February 2014o. *Water Treatment Plant Class 2 Capital Cost Estimate, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. February 7.

CH2M HILL Canada Limited (CH2M). February 2014q. *2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 7. Appendix D.

CH2M HILL Canada Limited (CH2M). January 2014b. *Faro Interim Works Project Proposal Environmental Baseline Gaps.* Technical memorandum. Final. Prepared for Government of Yukon. January 23.

CH2M HILL Canada Limited (CH2M). January 2014d. *Down Valley Interim Hydraulic Upgrades Class 3 Capital Cost Estimate, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. (Submitted on January 16; previously submitted on November 14, 2013)

CH2M HILL Canada Limited (CH2M). January 2014e. *Seeding as a Revegetation Strategy in the Yukon - Background Information.* Technical memorandum. Prepared for Government of Yukon. January 14.

CH2M HILL Canada Limited (CH2M). December 2013e. *Interim Water Treatment Plant Class 3 Capital Cost Estimate, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. December 20.

CH2M HILL Canada Limited (CH2M). November 2013b. *Task Authorization 016 Down Valley Interim Hydraulic Upgrades Phase 2 – Basis of Design Report, Faro Mine Remediation Project*. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. November 25. (30% Design)

CH2M HILL Canada Limited (CH2M HILL). October 2013a. *2012 Seepage, Surface Water, and Water Treatment Plant Influent Field Sampling Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon. October 29.

CH2M HILL Canada Limited (CH2M HILL). October 2013b. *Waste Rock Dump Monitoring Report.* Technical memorandum. Final. Prepared for Government of Yukon. October 29.

CH2M HILL Canada Limited (CH2M). October 2013a. *2012 Seepage, Surface Water, and Water Treatment Plant Influent Field Sampling Report, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. October 29.

CH2M HILL Canada Limited (CH2M). October 2013d. *Faro Water Treatment Plant Advanced Design Summary, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. October 3.

CH2M HILL Canada Limited (CH2M). October 2013f. *Sensitivity Analysis of Assigned Neutralization Potential, Acid Potential, and Acid Generation Calculations in GoldSim for Waste Rock Dumps at the Faro Mine Complex, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. October 24.

CH2M HILL Canada Limited (CH2M). October 2013h. *Review of Pit and Pond Water Elevations, Faro Mine Remediation Project.* Draft. Technical memorandum. Prepared for Government of Yukon. October 11.

CH2M HILL Canada Limited (CH2M). October 2013i. *Water Treatment Plant Class 3 Capital Cost Estimate, Faro Mine Remediation Project.* Final. Technical memorandum. Prepared for Government of Yukon. October 8.

CH2M HILL Canada Limited (CH2M). October 2013j. *Comparison of Interim and Permanent Water Treatment Plants, Faro Mine Remediation Project.* Draft. Technical memorandum. Prepared for Government of Yukon. October 4.

CH2M HILL Canada Limited (CH2M). October 2013m. *Deferral of Faro Water Treatment Plan Construction Recommended Scope Modifications for Task Authorization 013.* Technical memorandum. Prepared for Government of Yukon. October 24.

CH2M HILL Canada Limited (CH2M). October 2013l. *Faro Water Treatment Plant Advanced Design – Design Basis Verification, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. October 3.

CH2M HILL Canada Limited (CH2M). September 2013a. *Faro Water Treatment Plant, Faro Mine Remediation Project, Issued for Advanced Design Review. Specifications.* September 2013.

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CH2M HILL Canada Limited (CH2M). September 2013e. *Technical Evaluation and Recommendation of Interim Modular WTP, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. September 20.

CH2M HILL Canada Limited (CH2M). September 2013h. *Schematic Design Report, Faro Water Treatment Plant, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. September.

CH2M HILL Canada Limited (CH2M). September 2013q. *Summary of Subsurface Exploration for IP Dam and Spillway. Technical Memorandum. Task Authorization 016(A) Down Valley Interim Hydraulic Upgrades Phase I - Design Definition, Faro Mine Remediation Project.* Prepared for Project Files. September 5, 2013.

CH2M HILL Canada Limited (CH2M HILL). August 2013f. *Task Authorization 008(D) Regulatory – 2013/14 Socio-economic Baseline and Effects Assessment, Project Design Team for Faro Mine Remediation Contract Number C00010250. Task Authorization Request.* Prepared for Government of Yukon. August 16.

CH2M HILL Canada Limited (CH2M HILL). August 2013g. *Task Authorization 008(E) Regulatory – 2013/14(August 12, 2013 – March 31, 2014), Project Design Team for Faro Mine Remediation Contract Number C00010250. Task Authorization Request.* Prepared for Government of Yukon. August 22.

CH2M HILL Canada Limited (CH2M). August 2013a. *Faro Mine Complex Site-wide Sampling Definition 2013-2014, Faro Mine Remediation Project.* Technical memorandum. Final. Prepared for Government of Yukon. August 19.

CH2M HILL Canada Limited (CH2M). August 2013c. *Faro Mine Complex Data Management Plan.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. August 12.

CH2M HILL Canada Limited (CH2M). August 2013d. *Faro Water Treatment Plant Procurement and Construction Contracting Plan Part 1, Faro Mine Remediation Project*. Technical memorandum. Draft. Prepared for Government of Yukon. August 5.

CH2M HILL Canada Limited (CH2M). July 2013c. *Options Analysis for Interim Treatment of Contaminated Runoff Water, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. July 3.

CH2M HILL Canada Limited (CH2M). July 2013d. *Quality Assurance Project Plan, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. July 3.

CH2M HILL Canada Limited (CH2M). July 2013e. *Section 7: Assessment Scope and Methodology.* Draft. July 7.

CH2M HILL Canada Limited (CH2M). June 2013b. *Addendum Evaluation of Faro Water Treatment Plant Sizing and Water Quality in Rose Creek at Monitoring Station X14.* Technical memorandum. Prepared for Government of Yukon. June 17.

CH2M HILL Canada Limited (CH2M). June 2013d. *Regulatory Strategy and Preliminary Water Quality Targets for Evaluation of Water Treatment Plant Performance, Faro Mine Remediation Project.* Final memorandum. Prepared for Government of Yukon. June 17.

CH2M HILL Canada Limited (CH2M). June 2013e. Power Point Presentation: *Faro WTP Design Review June 11, and 12, 2013.*

CH2M HILL Canada Limited (CH2M). June 2013f. *Limited Borrow Material Reconnaissance, Faro Mine Remediation Project.* Technical memorandum. Final. Prepared for Government of Yukon. June 10.

CH2M HILL Canada Limited (CH2M). June 2013g. *Evaluation of Faro Water Treatment Plant Sizing and Water Quality in Rose Creek at Monitoring Station X14.* Technical memorandum. Prepared for Government of Yukon. June 7.

CH2M HILL Canada Limited (CH2M). June 2013h. *Basis of Design, Pumping Intermediate Dam Pond to Faro Pit Lake, Faro Mine Remediation Project.* Technical memorandum. Final. Prepared for Government of Yukon. June 4.

CH2M HILL Canada Limited (CH2M). June 2013i. *Grum Overburden Dump Fatal Flaw Evaluation Data Report, Faro Mine Remediation Project.* Technical memorandum. (Final). June 10.

CH2M HILL Canada Limited (CH2M HILL). May 2013a. *Intermediate Dam Pond to Faro Pit Lake and Water Treatment Plant Conveyance Systems Surge Analysis, Faro Mine Remediation Project.* Draft. Technical memorandum. Prepared for Government of Yukon. May 23. (Attachment 2 to *Basis of Design Pumping Intermediate Dam Pond to Faro Pit Lake)*.

CH2M HILL Canada Limited (CH2M). May 2013b*. Intermediate Dam Pond to Faro Pit Lake and Water Treatment Plant Conveyance System Hydraulic Analysis, Faro Mine Remediation Project.* Draft. Technical memorandum. Prepared for Government of Yukon. May 23. (Attachment 3 to *Basis of Design Pumping Intermediate Dam Pond to Faro Pit Lake*).

CH2M HILL Canada Limited (CH2M). May 2013c. *Review of Environmental Dynamics, Inc. Reports on Grum Overburden Dump and Grum Sulphide Cell Revegetation Work, and Proposed Scope of Work for 2013.* Technical memorandum. Prepared for Government of Yukon. May 24.

CH2M HILL Canada Limited (CH2M). May 2013d. Power Point Presentation: *Faro WTP Capacity and Discharge Evaluation.* May 22.

CH2M HILL Canada Limited (CH2M). May 2013e. *Value Engineering Study of Faro Water Treatment Plant, Faro Mine Remediation Project. Final Report.* Prepared for Government of Canada as Represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. May.

CH2M HILL Canada Limited (CH2M). May 2013f. Task *Authorization 007(I) Fiscal Year 2013-2014 Field* Investigation. *Task Authorization Request.* Prepared for Government of Yukon. May 31.

CH2M HILL Canada Limited (CH2M HILL). March 2013m. *Cross Valley Dam Interception System Investigation Data Report Faro Mine Remediation Project.* Technical memorandum. Draft. Prepared for Government of Yukon. March 28.

CH2M HILL Canada Limited (CH2M HILL). March 2013s. *Fiscal Year 2012 Water Modelling Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 8.

CH2M HILL Canada Limited (CH2M). March 2013b. *Grum Pit to Vangorda Pit Pumping and Piping Basis of Design, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 31.

CH2M HILL Canada Limited (CH2M). March 2013c. *Vangorda Water Treatment Plant Sludge Pumping to Vangorda Pit Basis of Design, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 31.

CH2M HILL Canada Limited (CH2M). March 2013d. *Faro Mine Complex Water Management Infrastructure Inventory.* Memorandum. Final. Prepared for Government of Yukon. March 31.

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CH2M HILL Canada Limited (CH2M). March 2013f. *Cross Valley Dam Seepage Interception System Phase 1 – Design Definition Summary.* Technical memorandum. Final. Prepared for Government of Yukon. March 29.

CH2M HILL Canada Limited (CH2M). March 2013i. *Mapping Development, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 29.

CH2M HILL Canada Limited (CH2M). March 2013j. *Quality Assurance/Quality Control Review and Data Set Build Process, Faro Mine Remediation Project.* Technical memorandum. March 29.

CH2M HILL Canada Limited (CH2M). March 2013m. *Cross Valley Dam Interception System Investigation Data Report Faro Mine Remediation Project.* Technical memorandum. Draft. Prepared for Government of Yukon. March 28.

CH2M HILL Canada Limited (CH2M). March 2013o. *Fiscal Year 2012 Site-wide Water Quality Modelling Report, Faro Mine Remediation Project.* Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 27.

CH2M HILL Canada Limited (CH2M). March 2013p. *Task Authorization 016(A) Down Valley Interim Hydraulic Upgrades Phase I - Design Definition, Faro Mine Remediation Project.* Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 27.

CH2M HILL Canada Limited (CH2M). March 2013q. *Data Quality Evaluation Report, 2012 Soils, Faro Mine Remediation Project.* Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 22.

CH2M HILL Canada Limited (CH2M). March 2013r. *Data Quality Evaluation Report, 2012 Groundwater, Surface Water and Seep Water, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 14.

CH2M HILL Canada Limited (CH2M). March 2013s. *Fiscal Year 2012 Water Modelling Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 8.

CH2M HILL Canada Limited (CH2M). February 2013a. *Vangorda Water Treatment Plant Upgrade to Limited HDS, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. February 28.

CH2M HILL Canada Limited (CH2M). February 2013b. *Evaluation of Purchase of Used Lime System Equipment.* Technical memorandum. February 22.

CH2M HILL Canada Limited (CH2M). February 2013c. *Water Treatment Plant Draft Class 3 Capital Cost Estimate, Faro Mine Remediation Project.* Technical memorandum. Draft. Prepared for Government of Yukon. February 21.

CH2M HILL Canada Limited (CH2M). February 2013d. *Update on the Tectonic Setting of the Faro Mine Complex. Report prepared for Government of Yukon*. Prepared for Government of Yukon. February 12.

CH2M HILL Canada Limited (CH2M). January 2013a. *Faro WTP Design Definition – Procurement and Construction Contracting Plan, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. January 17.

CH2M HILL Canada Limited (CH2M). January 2013b. Power Point Presentation: *Faro WTP Schematic Design Report Draft Submission.* January 25.

CH2M HILL Canada Limited (CH2M). January 2013c. *WTP Design Definition Report, Faro Mine Remediation Project.* Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. Final. January 21.

CH2M HILL Canada Limited (CH2M HILL). November 2012f. *Conclusions from Rose Creek Tailings Area Alternatives Evaluation.* Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. November.

CH2M HILL Canada Limited (CH2M HILL). November 2012g. *Task Authorization 007 Summary of Zone II Drilling Activities, Faro Mine Remediation Project*. Technical memorandum. Draft. Prepared for Karen Furlong/Government of Yukon (YG). November 1.

CH2M HILL Canada Limited (CH2M). November 2012a. *Water Treatment Pilot Study Report, Faro Mine Remediation Project, TA 013.* Technical Memorandum No. 4. Prepared for Government of Yukon and Aboriginal Affairs and Northern Development Canada (AANDC). November 27.

CH2M HILL Canada Limited (CH2M). November 2012b. *Faro WTP Design Definition – Plant Siting, Faro Mine Remediation Project.* Technical memorandum No. 3. Final. Prepared for Government of Yukon. November 23.

CH2M HILL Canada Limited (CH2M). November 2012c. *Water Treatment Plant Design – Influent Characterization/Plant Capacity Phasing, Faro Mine Remediation Project.* Technical memorandum No. 1. Final. November 23.

CH2M HILL Canada Limited (CH2M). November 2012d. *Faro Water Treatment Plant Design Definition – Business Case to Support Recommendation on Faro Water Treatment Plant Initial Design Capacity, Faro Mine Remediation Project.* Draft. Business case. Prepared for Government of Yukon. November 7.

CH2M HILL Canada Limited (CH2M). November 2012f. *Conclusions from Rose Creek Tailings Area Alternatives Evaluation.* Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. November.

CH2M HILL Canada Limited (CH2M). October 2012a. *Response to Objective 1 Task Authorization Component 009-D Water Management Support, Faro Mine Remediation Project.* Technical memorandum. Draft. Prepared for Kaori Torigai, Government of Yukon. October 12.

CH2M HILL Canada Limited (CH2M). October 2012b. *Faro Mine Remediation Project Water Treatment Plant Workshops Meeting Agenda.* Meeting Date: October 16 – 18, 2012, with lunch provided. Prepared for Government of Yukon.

CH2M HILL Canada Limited (CH2M). October 2012c. *Faro Mine Remediation Project Water Treatment Plant Workshops Meeting Notes. Meeting Date: October 16, 2012.* Prepared for Government of Yukon. October 16.

CH2M HILL Canada Limited (CH2M). October 2012d. *Faro Mine Remediation Project Water Treatment Plant Workshops Meeting Notes. Meeting Date: October 17, 2012.* Prepared for Government of Yukon. October 17.

CH2M HILL Canada Limited (CH2M). October 2012e. *Faro Mine Remediation Project Water Treatment Plant Workshops Meeting Notes. Meeting Date: October 18, 2012.* Prepared for Government of Yukon. October 18.

CH2M HILL Canada Limited (CH2M). October 2012f. *Technical Review Board Summary Report 3: Rose Creek Tailings Area, Faro Mine Remediation Project.* Draft. Prepared for CH2M HILL. October.

CH2M HILL Canada Limited (CH2M HILL). September 2012c. *Response to Objective 5 of Task Authorization Component 009-D Water Management Support, Faro Mine Remediation Project*. Technical memorandum. Draft. Prepared for Kaori Torigai at Yukon Government. September.

CH2M HILL Canada Limited (CH2M HILL). September 2012f. Standard Operating Procedure SMP006, *Surface and Subsurface Soil Sampling.* Prepared for Government of Yukon. September.

CH2M HILL Canada Limited (CH2M). September 2012a. Faro WTP Design Definition – One versus Two Plant Comparison, *Faro Mine Remediation Project.* Technical memorandum No. 2. Final. Prepared for Government of Yukon. September 4.

CH2M HILL Canada Limited (CH2M). September 2012b. *Geochemical Data Water Treatment Plant, Faro Mine Remediation Project.* Technical memorandum*.* Prepared for Government of Yukon. September 21.

CH2M HILL Canada Limited (CH2M). September 2012c. *Response to Objective 5 of Task Authorization Component 009-D Water Management Support, Faro Mine Remediation Project.* Draft technical memorandum*.* Prepared for Kaori Torigai, Government of Yukon. September 4.

CH2M HILL Canada Limited (CH2M HILL). September 2012f. *Conceptual Site Model, Faro Mine Remediation Project*. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. August 17.

CH2M HILL Canada Limited (CH2M). August 2012a. *Conceptual Site Model, Faro Mine Remediation Project*. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. August 17.

CH2M HILL Canada Limited (CH2M). August 2012g. *Response to Objectives 2 Task Authorization Component 009-D Water Management Support, Faro Mine Remediation Project.* Draft technical memorandum*.* Prepared for Kaori Torigai, Government of Yukon. August 21.

CH2M HILL Canada Limited (CH2M). August 2012h*. Interim Water Modelling Analysis in Support of the Faro Water Treatment Plant Design, Faro Mine Remediation Project.* Draft. Technical memorandum. Prepared for Government of Yukon. August 17.

CH2M HILL Canada Limited (CH2M). August 2012j. *Water Modelling Work Plan, Faro Mine Remediation Project.* Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. August 17.

CH2M HILL Canada Limited (CH2M). August 2012k. *Alternatives Evaluation and Risk Analyses for the Rose Creek Tailings Area, Faro Mine*. Prepared for Government of Yukon. August.

CH2M HILL Canada Limited (CH2M). August 2012l. *Response to Task Authorization Component 009-E, Vangorda Sludge Storage Qualitative Assessment, Faro Mine Remediation Project.* Draft technical memorandum*.* Prepared for Kaori Torigai, Government of Yukon. August 31.

CH2M HILL Canada Limited (CH2M HILL). August 2012a. *Conceptual Site Model, Faro Mine Remediation Project*. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. August 17.

CH2M HILL Canada Limited (CH2M HILL). July 2012c*. Task Authorization Component 009 F Zone II Well Assessment.* Technical memorandum. Preliminary Draft. Prepared for Karen Furlong, Government of Yukon (YG). July 12.

CH2M HILL Canada Limited (CH2M). June 2012a. *Water Modelling Approach, Faro Mine Remediation Project.* Technical memorandum. June 21.

CH2M HILL Canada Limited (CH2M). June 2012c. *07.01.04-20 – 101.1 and 301.1 Construct new Faro and Vangorda Water Treatment Plant and Piping Activities 101.1 and 301.1; HCSS Bid Items 10110 and 30110, Construct New Faro and Vangorda Water Treatment Plant and Piping – 2012 Field Sampling Plan Addendum 1.* Prepared for Government of Yukon. June 12.

CH2M HILL Canada Limited (CH2M). June 2012g. *Faro Mine Data Management Plan.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. June.

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CH2M HILL Canada Limited (CH2M). May 2012c. *Response to Objectives 1 and 2 TAC #:009-C Water Treatment Plant Mitigation.* Preliminary draft technical memorandum. Prepared for Kaori Torigai, Government of Yukon. May 11.

CH2M HILL Canada Limited (CH2M). May 2012e. *Review of Environmental Dynamics Inc. Scope of Work Letter (dated March 30, 2012) for Faro Mine Complex Revegetation Activities.* Technical memorandum. Prepared for Dustin Rainey, Government of Yukon and Deborah Pitt, Government of Yukon. May 3.

CH2M HILL Canada Limited (CH2M). May 2012f. *Quality Assurance Project Plan, Faro Mine Remediation Project*. Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. May.

CH2M HILL Canada Limited (CH2M). May 2012g. *Assessment and Abandoned Mines – Faro Project Execution Team Approval for CH2M HILL Task Authorization Component (TAC) of Task Authorization (TA) 009 On-call Technical Assistance Master Service Agreement (MSA) #C00010250. Task #: 009 D, TAC Title: CM – Water Management Support.* Prepared for Government of Yukon. May 10.

CH2M HILL Canada Limited (CH2M). March 2012o. *Faro Assessment Methodology Workshop – Notes, February 21, 2012 (Aquatics) and February 22, 2012 (Terrestrial and Air) – 8:30-5:00 p.m., CH2M HILL Toronto Office.* Prepared for Government of Yukon. March 23.

CH2M HILL Canada Limited (CH2M). March 2012p. *Faro Mill Water Treatment Plant Evaluation, Faro Mine Remediation Project, TA 004*. Technical memorandum. March 14.

CH2M HILL Canada Limited (CH2M). March 2012v. *Assessment Methodology and Scope, Faro Mine Remediation Project, Table X: Faro Mine Remediation Project, Valued Components.* Draft 2. March 30.

CH2M HILL Canada Limited (CH2M). March 2012w. *Figure 1, Proposed Aquatic Regional and Local Assessment Study Areas.* March.

CH2M HILL Canada Limited (CH2M). March 2012x. *Figure 2, Proposed Terrestrial and Aesthetic Local Assessment Study Area.* March.

CH2M HILL Canada Limited (CH2M). March 2012y. *Figure 3, Proposed Air Quality Regional Assessment Study Area.* March.

CH2M HILL Canada Limited (CH2M HILL). February 2012c. *Gap Assessment Report, Faro Mine Remediation Project. Volume 1: Report.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 22.

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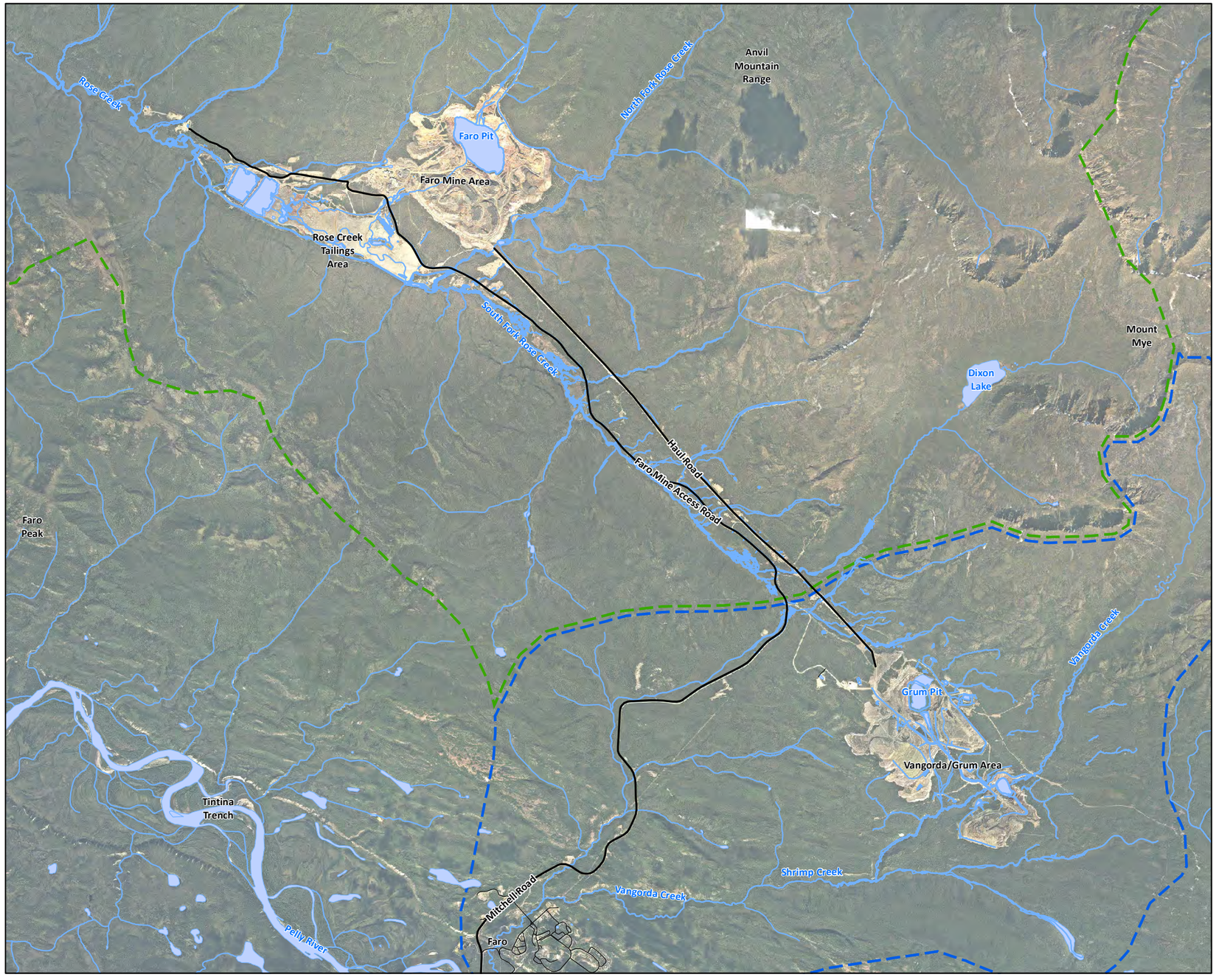
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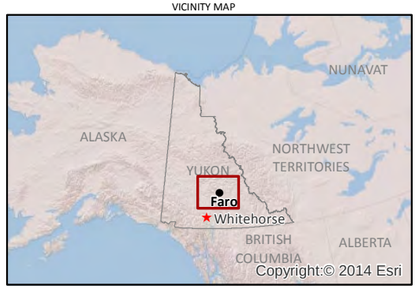
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Appendix A
Figures





LEGEND

- Rose Creek Watershed
- Vangorda Creek Watershed

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FIGURE 1-1
Faro Mine Complex Overview
Faro Mine Remediation Project

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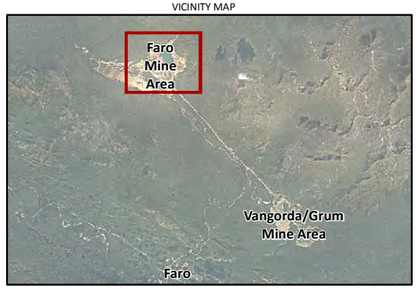
Project Activity or Milestone	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
Contract Award and Kickoff	◆				
Developed YESAA Project Proposal	▬	▬	▬		
Decision to Re-evaluate Draft 4a Alternatives				◆	
Field Work to Support Project Proposal and/or Design	▬	▬	▬	▬	▬
Direction to Prepare Comprehensive Design Report					◆
YG Direction to Postpone YESAA Project Proposal and instead Design a Replacement WTP	◆				
Prepared Faro Water Treatment Plant 95% Design	▬	▬	▬		
Prepared Draft Medium Term Plan		▬			
Initiate Execution of Draft MTP		◆			
Prepared Down Valley Interim Hydraulic Upgrades 90% Design		▬	▬	▬	▬
Prepared Cross Valley Dam SIS 60% Design		▬	▬	▬	
Prepared Vangorda Creek Diversion Design Definition		▬	▬		
Prepared Interim Works Project Proposal		▬	▬	▬	
Decision to not to submit IWPP				◆	
Decision to Construct Interim Water Treatment System instead of Replacement WTP			◆		
Designed and Constructed Interim Water Treatment System			▬	▬	▬
MTP Signed			◆		
Vangorda Grum Removed from MTP Scope			◆		
Decision to halt MTP Work and instead advance the design of the NFRC Realignment Project				◆	
Prepared North Fork of Rose Creek Realignment 30% Design				▬	▬
Contract End					◆

Notes:
FY = fiscal year
IWPP = Interim Works Project Proposal
MTP = Medium Term Plan
NFRC = North Fork Rose Creek
SIS = seepage interception system
WTP = water treatment plan
YESAA = Yukon Environmental and Socio-economic Assessment Act
YG = Government of Yukon

Figure 1-2
Summary of Project Activities and Milestones
Faro Mine Remediation Project



VICINITY MAP



LEGEND

Road Unpaved

Notes:

1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Abbreviations:
   NFRC = North Fork Rose Creek
   SIS = seepage interception system

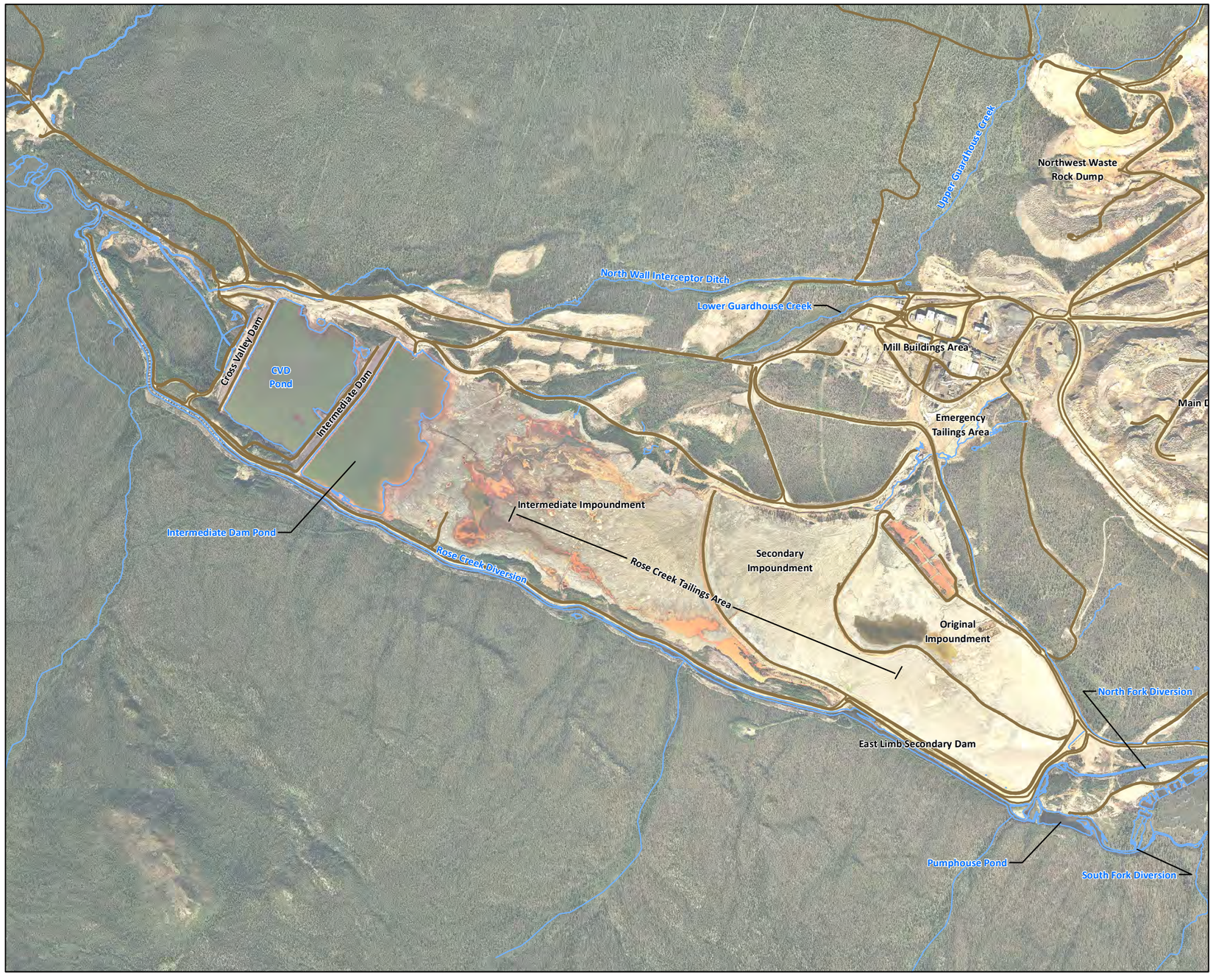
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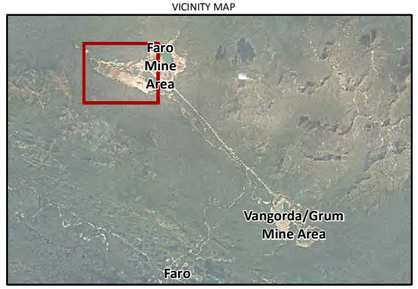
Metres

FIGURE 1-3
Faro Mine Area
Faro Mine Remediation Project

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VICINITY MAP



LEGEND

Road Unpaved

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Abbreviation:
   CVD = Cross Valley Dam

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FIGURE 1-4
Rose Creek Tailings Area Plan View
Faro Mine Remediation Project

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\\WATERLOO\GIS\PROJECTS\FARO\GIS\MAPFILES\DESIGN\SECTION1\FIG1-4.MXD KSCHONKNECHT 8/31/2015 2:15:41 PM

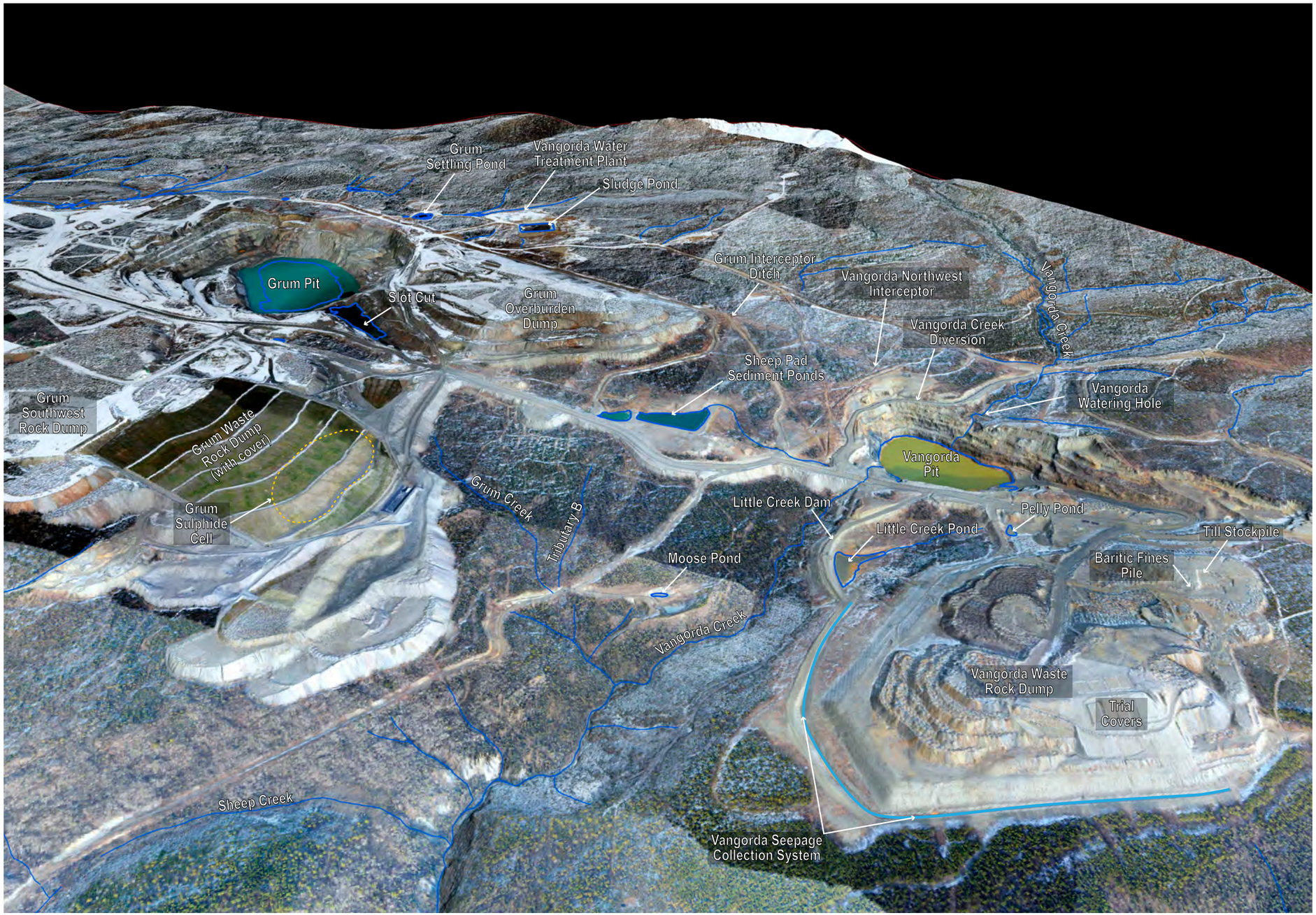


FIGURE 1-5
Vangorda/Grum Area Overview
Faro Mine Remediation Project

ES071912212959SAC grum_vangorda_overview.ai 08-14-12 dash

West Perimeter RU

West Valley Interceptor Ditch

Upper Guardhouse Creek

West Perimeter RU

Northwest Interceptor Ditch

Mill / Emergency Tailings Area RU

Faro Creek Diversion

Faro Pit RU

Lower Guardhouse Creek

Rose Creek Tailings Area RU

Rose Creek

North Fork

East Perimeter RU

Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond RU

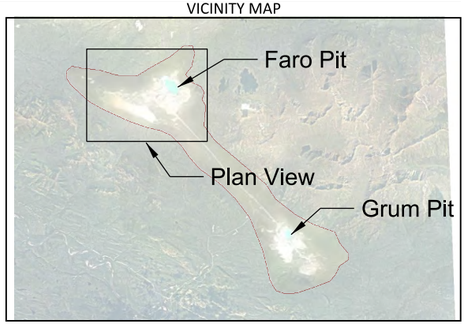
Rose Creek Diversion

South Perimeter RU

Waste Rock Dumps RU

South Fork Rose Creek

VICINITY MAP



LEGEND

Surface Water Catchment Boundaries

Notes:

1. RU boundaries shown are approximate and are intended to delineate areas of similar waste materials and to provide a visual concept of "clean" boundary conditions (i.e. perimeter streams) with contaminated source materials contained within.
2. The areas west and east of the Mill/ETA RU are not shown as individual RUs nor contained within larger adjacent RUs since major remedial activities are not anticipated within these areas (other than surface water management infastructure, grading, and perhaps revegetation). It is acknowledged the Lower Guardhouse Creek may be realigned in the future.

ETA = Emergency Tailings Area
RU = Remediation Unit

N

0 500 1000 Metres

Figure 1-6
Remediation Units
Faro Mine Remediation Project

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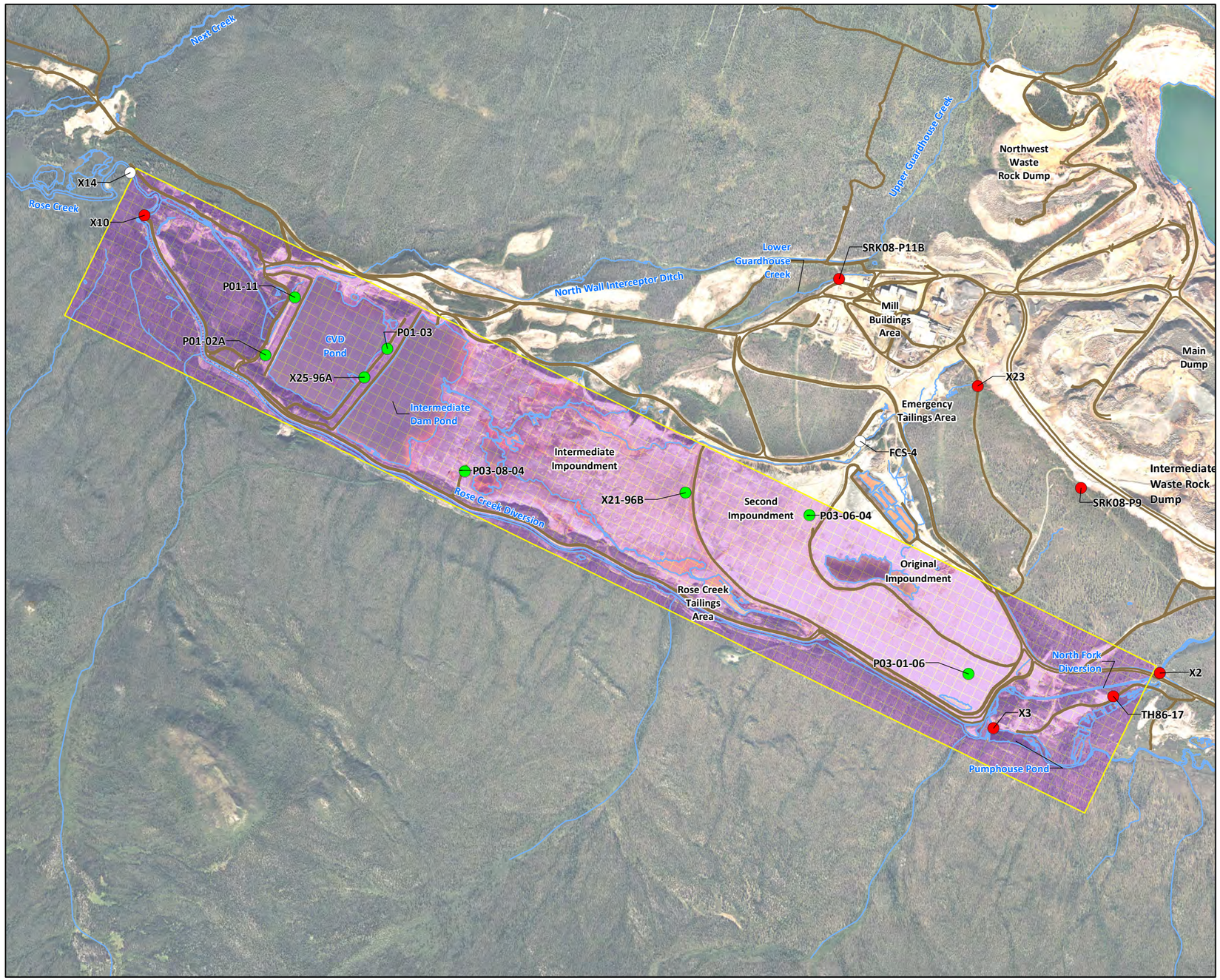
- Monitoring Well Location
- Surface Water Monitoring Station
- Stream Survey Cross-section
- Contour (20-metre Interval)
- Faro Mine Site Watercourse
- Faro Site Waterbody

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

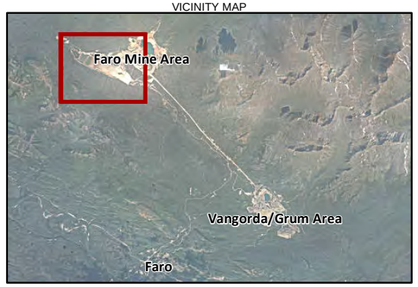
N

0 50 100 150 200
Metres

FIGURE 2-1
Perimeter Unit East Faro Creek Diversion (FCD) Location Map
Faro Mine Remediation Project



VICINITY MAP



LEGEND

- General Reference Well or Surface Water Location
- PHAST Chemistry Flux Well or Surface Water Location
- PHAST Calibration Target Well or Surface Water Location
- PHAST Model Grid

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

CVD = Cross Valley Dam

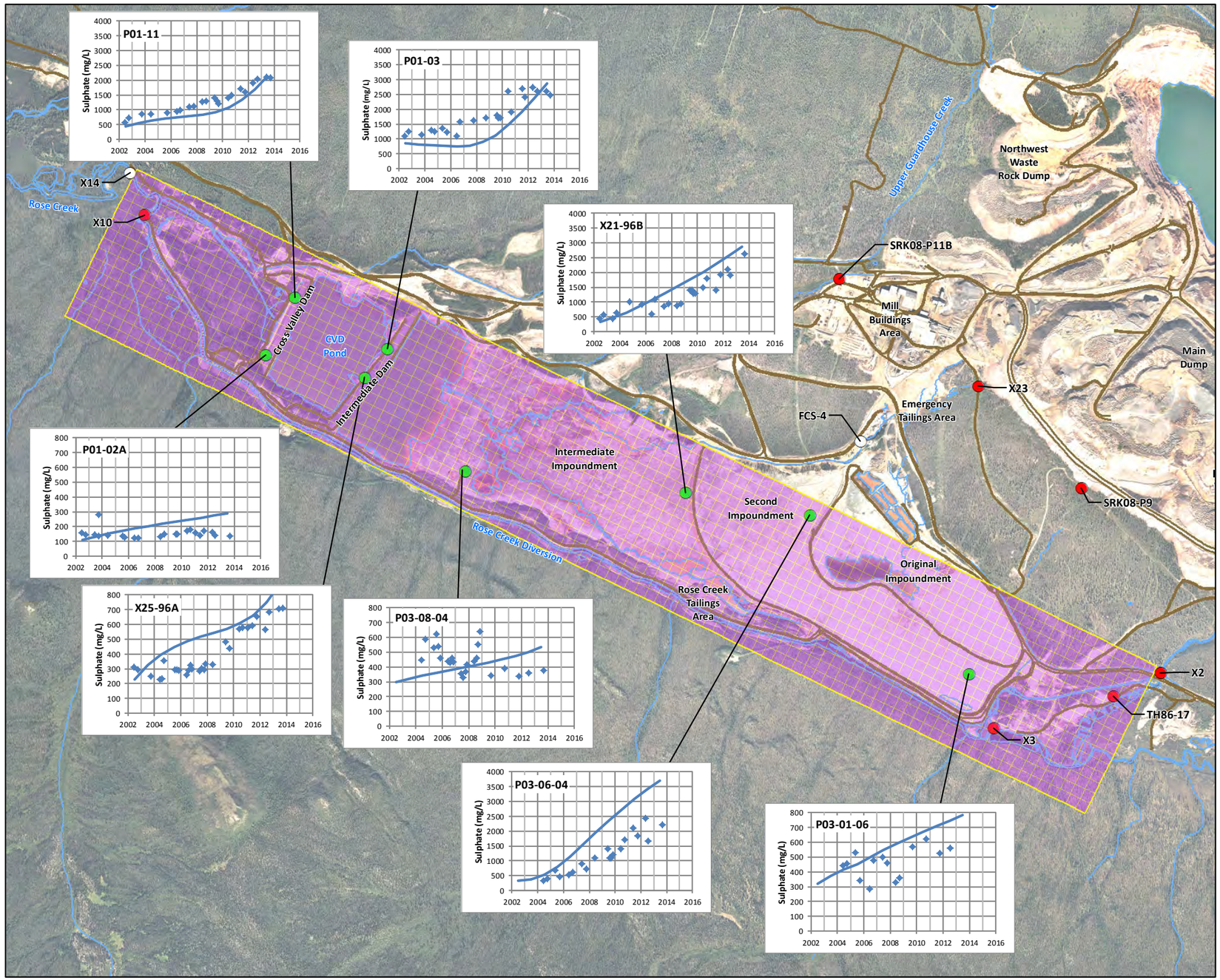
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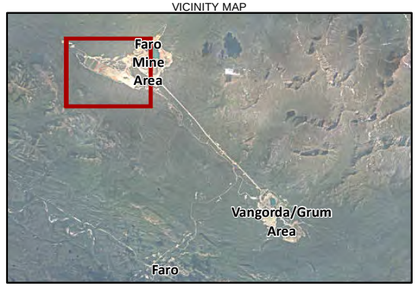
0 200 400 600 800
Metres

Created by:
CRITIGEN

FIGURE 2-2
Rose Creek Tailings Area Transport Model Grid
Faro Mine Remediation Project

ch2m





LEGEND

- General Reference Well or Surface Water Location
- PHAST Chemistry Flux Well or Surface Water Location
- PHAST Calibration Target Well or Surface Water Location
- PHAST Model Grid

Graph Legend

- Actual Concentration
- PHAST Simulated Concentrations

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

CVD = Cross Valley Dam

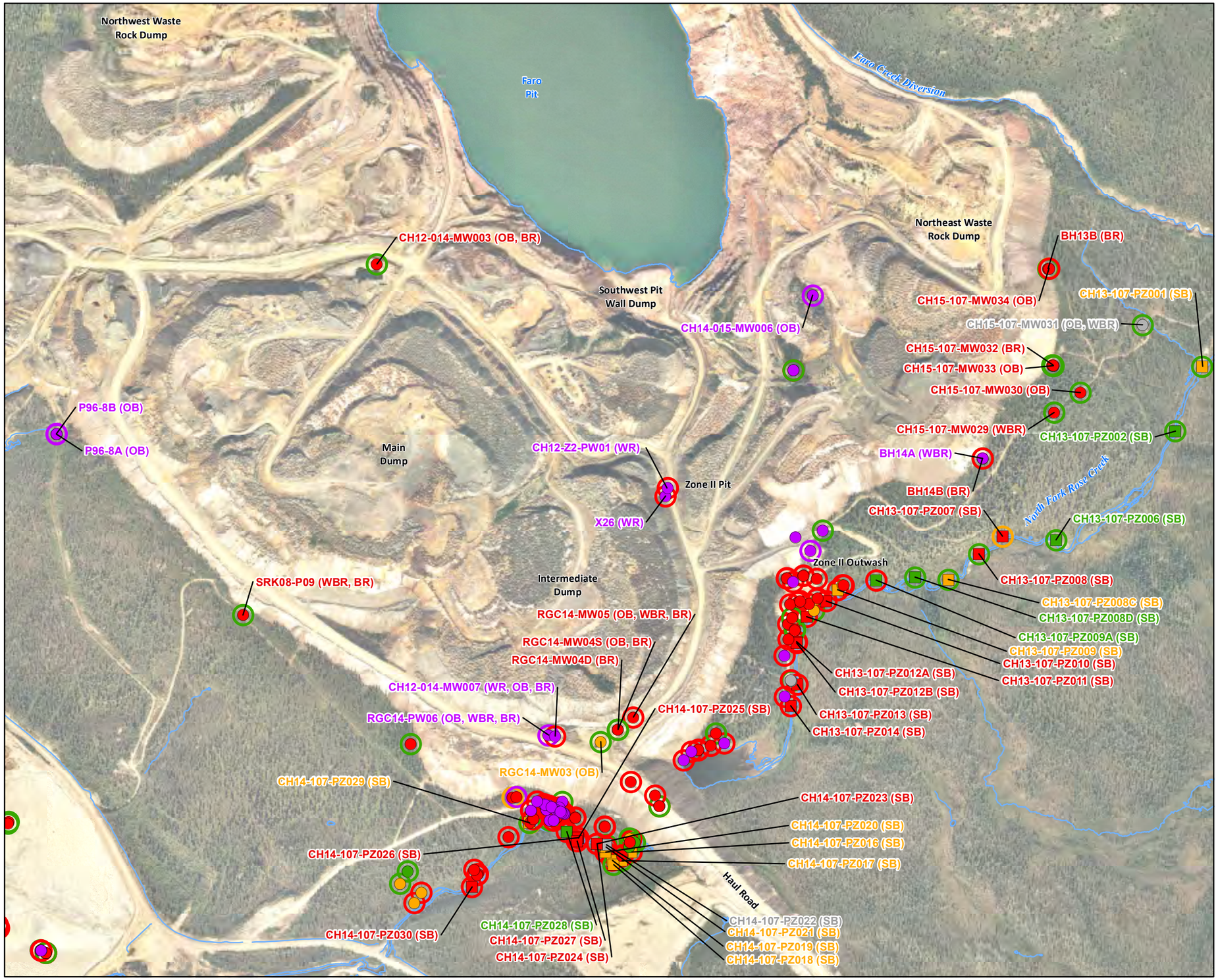
N

0 200 400 600 800
Metres

Created by:
CRITIGEN

FIGURE 2-3
Rose Creek Tailings Area Transport Model Calibration Results - Sulphate
Faro Mine Remediation Project

ch2m



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType
- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

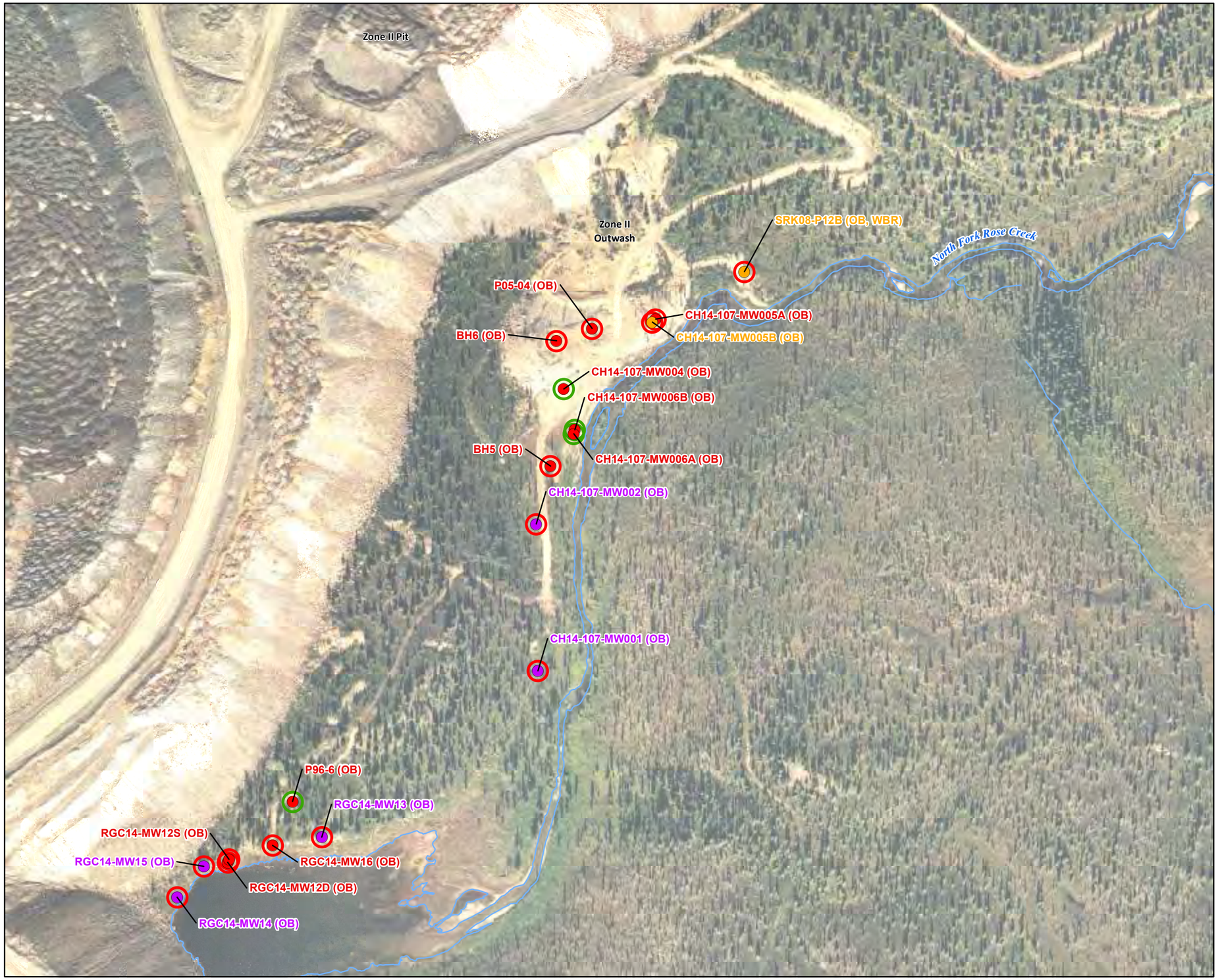
pH
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 200 400
Metres

FIGURE 2-4
Groundwater Quality:
Faro Mine Area Waste Rock Dumps
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 50 100
Metres

FIGURE 2-5
Groundwater Quality:
Zone II Overburden
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

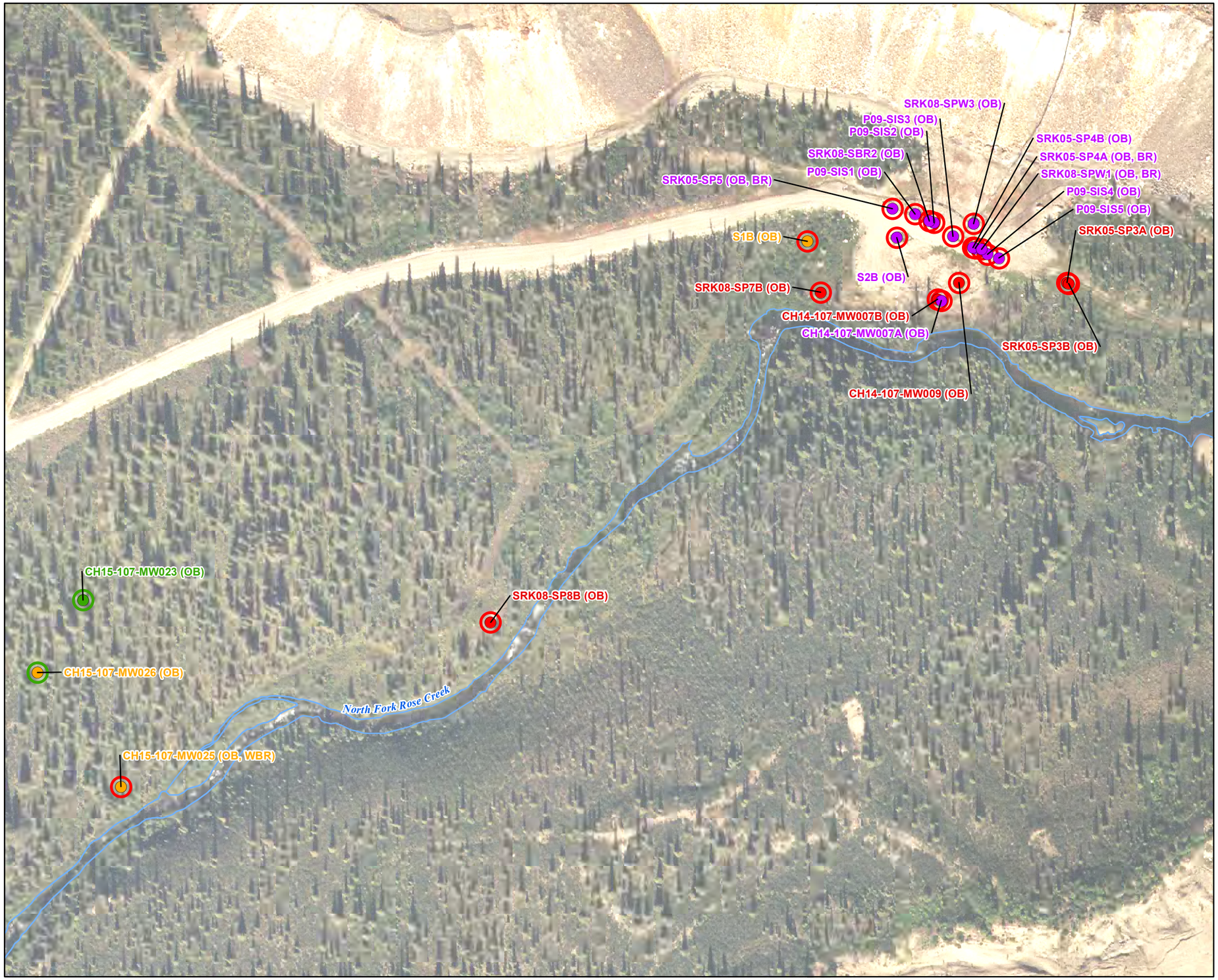
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 50 100
Metres

FIGURE 2-6
Groundwater Quality:
Zone II Bedrock
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

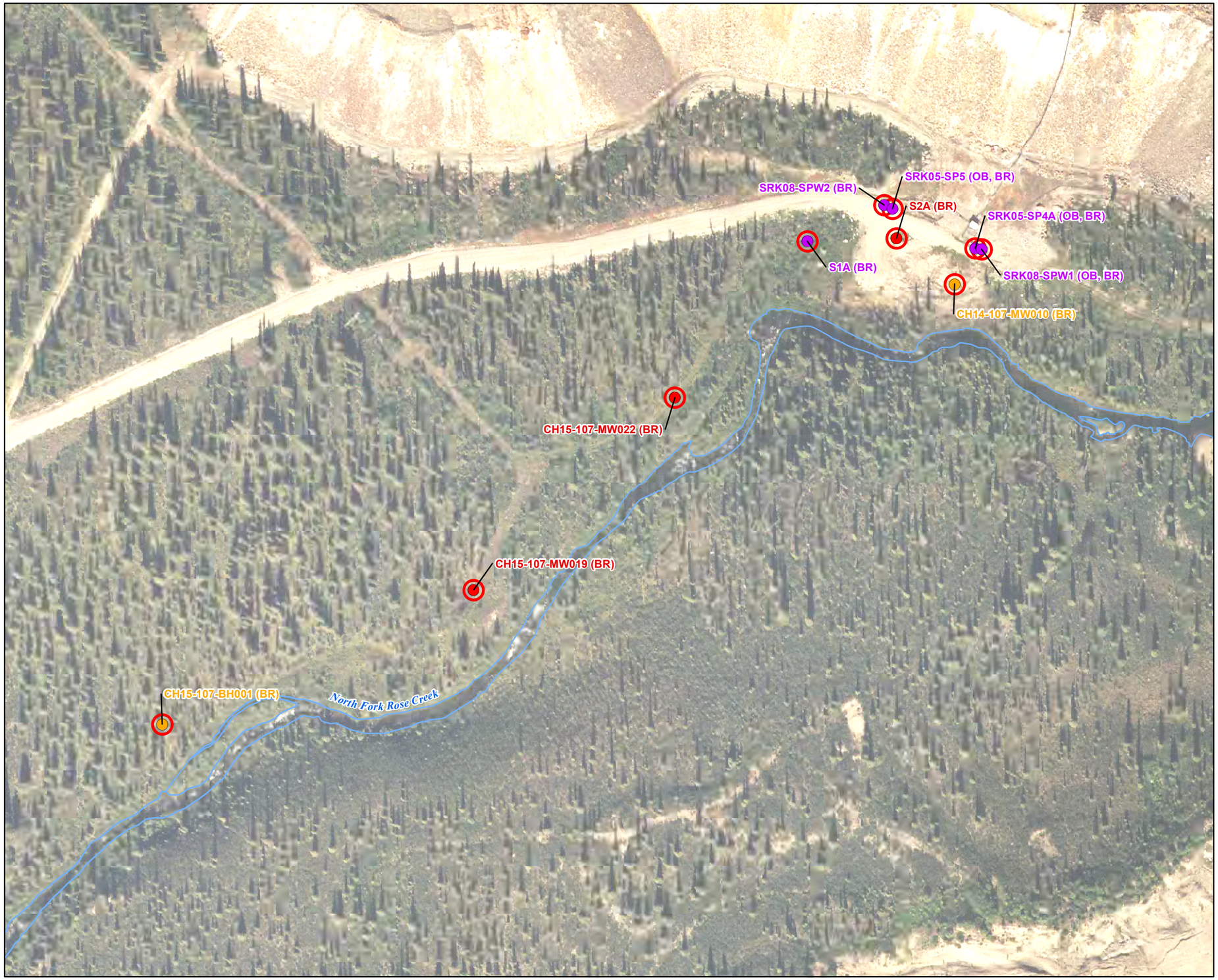
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 30 60
Metres

FIGURE 2-7
Groundwater Quality:
S-Wells Overburden
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType
- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

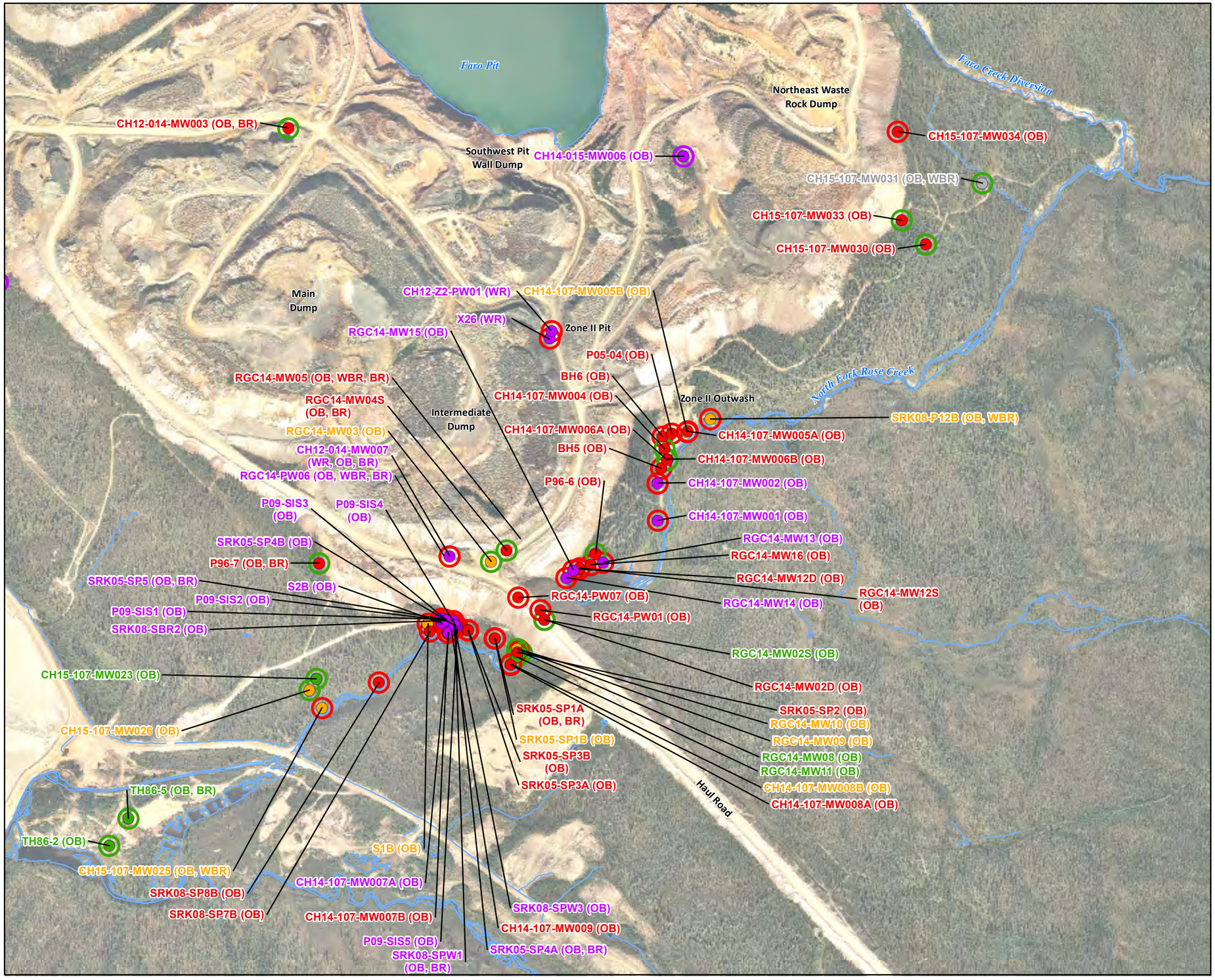
pH
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 50 100
Metres

FIGURE 2-8
Groundwater Quality:
S-Wells Bedrock
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType
- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 200 400
Metres

FIGURE 2-9
Groundwater Quality:
North Fork Rose Creek Overburden
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 200 400
Metres

FIGURE 2-10
Groundwater Quality:
North Fork Rose Creek Bedrock
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 50 100
Metres

FIGURE 2-11
Groundwater Quality:
Emergency Tailings Area Overburden
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

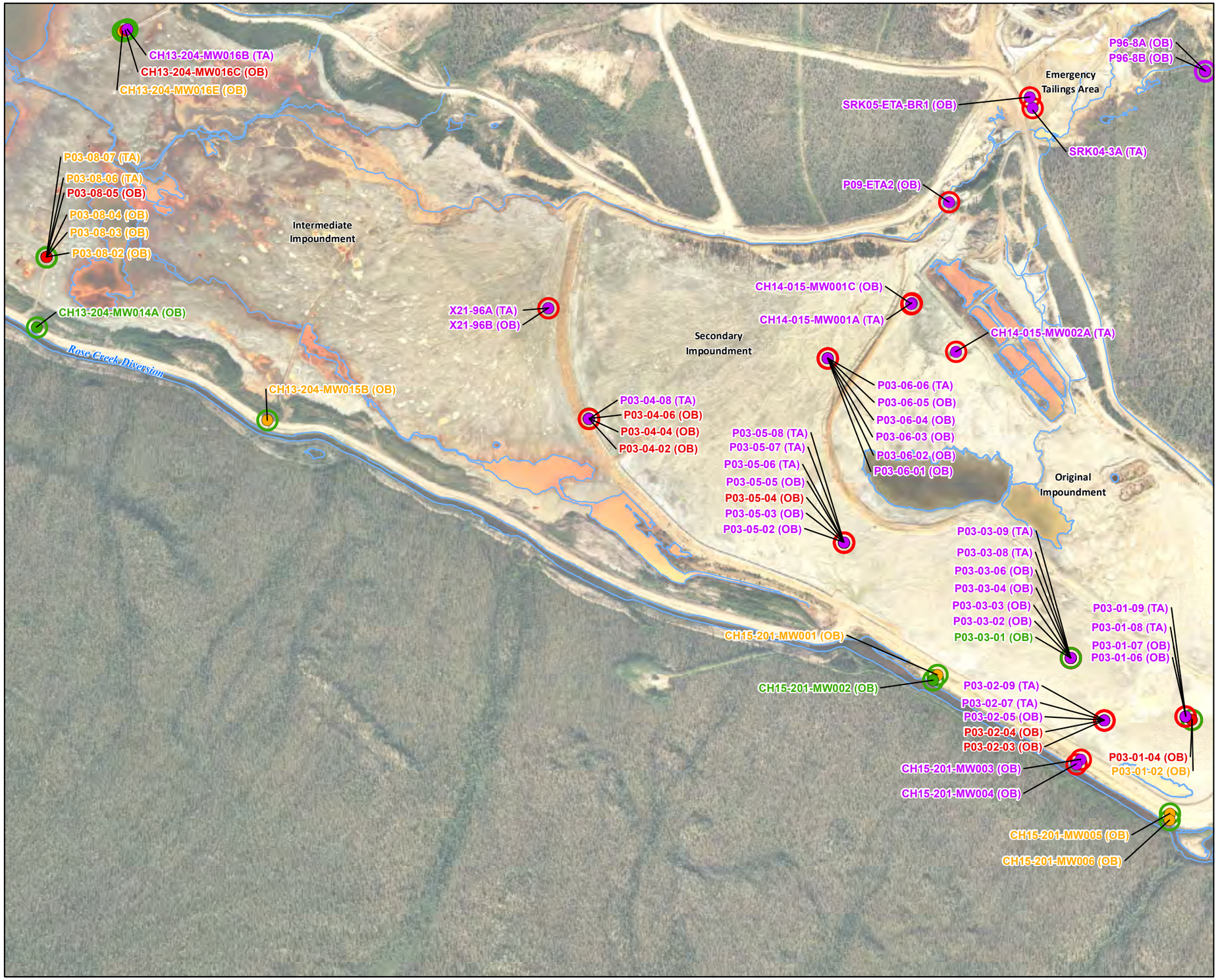
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 50 100
Metres

FIGURE 2-12
Groundwater Quality:
Emergency Tailings Area Bedrock
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

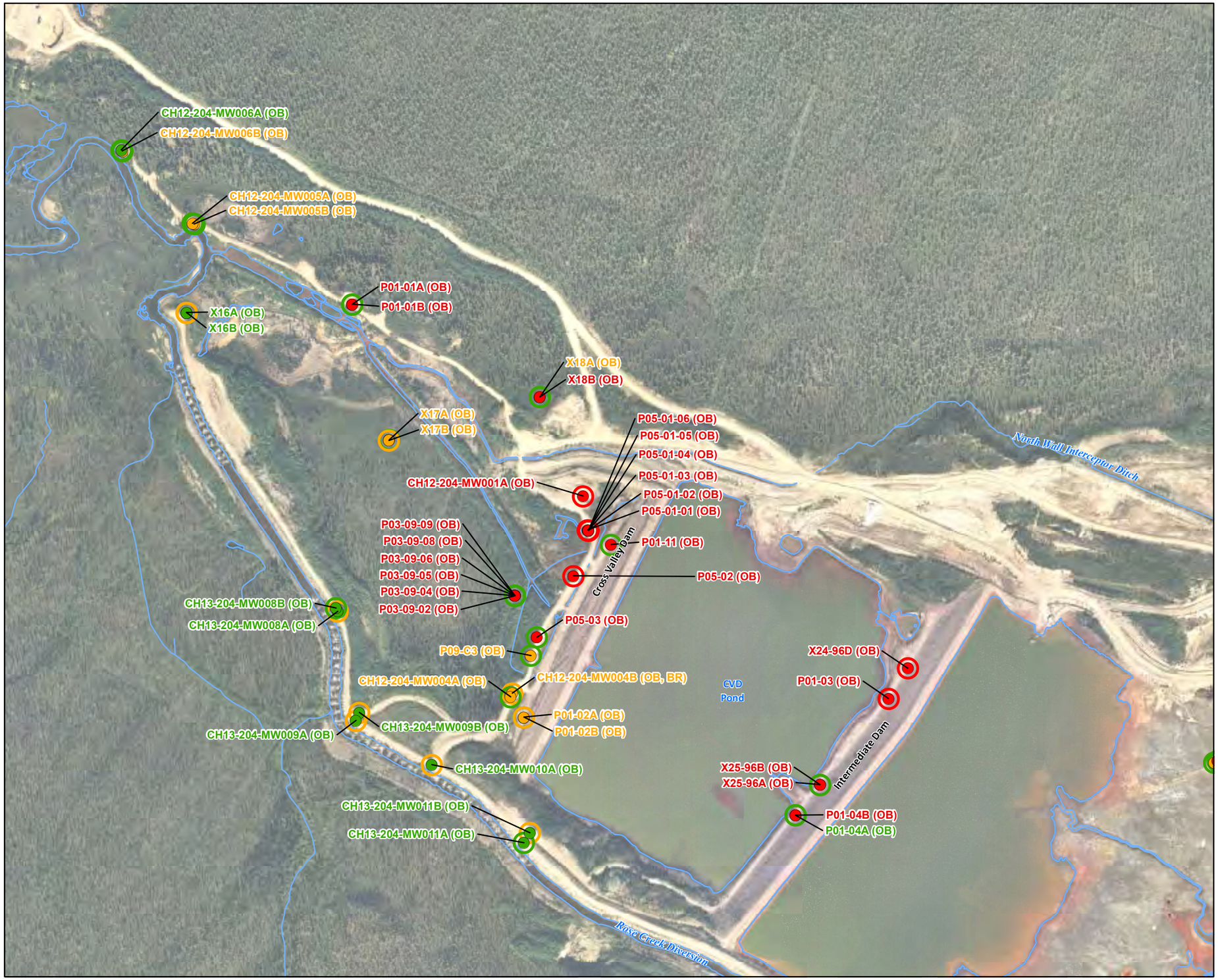
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 200 400
Metres

FIGURE 2-13
Groundwater Quality:
Tailings Area Overburden
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   CVD = Cross Valley Dam
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

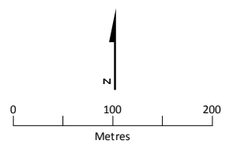


FIGURE 2-14
Groundwater Quality:
Cross Valley Dam Overburden
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:

1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   CVD = Cross Valley Dam
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 100 200

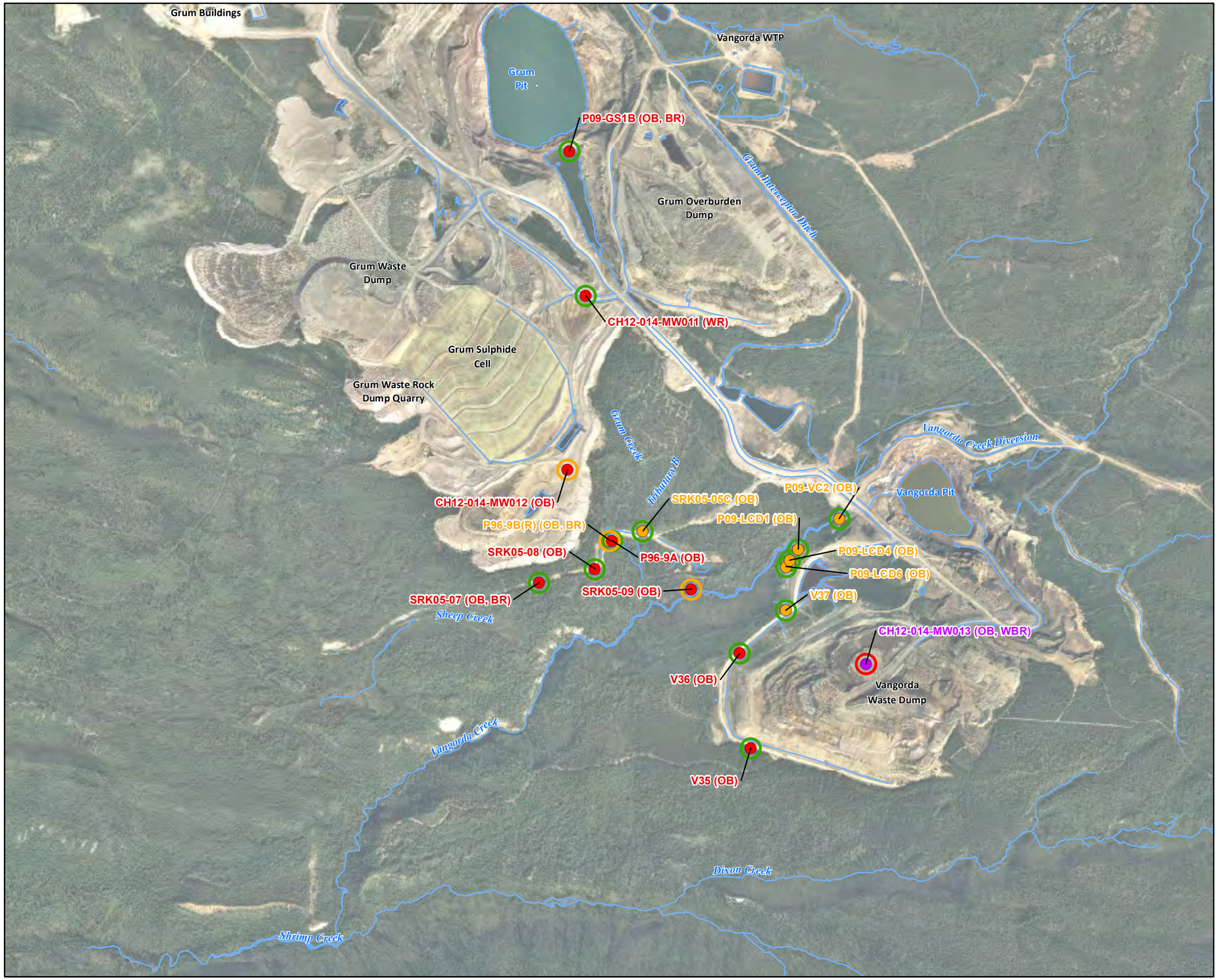
Metres

FIGURE 2-15

Groundwater Quality:

Cross Valley Dam Bedrock

Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   WTP = Water Treatment Plant
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 200 400
Metres

FIGURE 2-16
Groundwater Quality: Vangorda/Grum Overburden
Faro Mine Remediation Project



VICINITY MAP



Stream, Lake, Pond, or Pool

LocationType

- Groundwater Monitoring Wells
- Streambed Piezometers/Drivepoints
- Highly Impacted (SO_4 ≥ 4,000 mg/L or Zn ≥ 5 mg/L)
- Moderately Impacted (SO_4 ≥ 400 and < 4,000 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Slightly Impacted (SO_4 ≥ 40 and < 400 mg/L or Zn ≥ 0.5 and > 5 mg/L)
- Not Impacted to Mildly Impacted (SO_4 < 40 mg/L and Zn < 0.5 mg/L
- No Data

pH

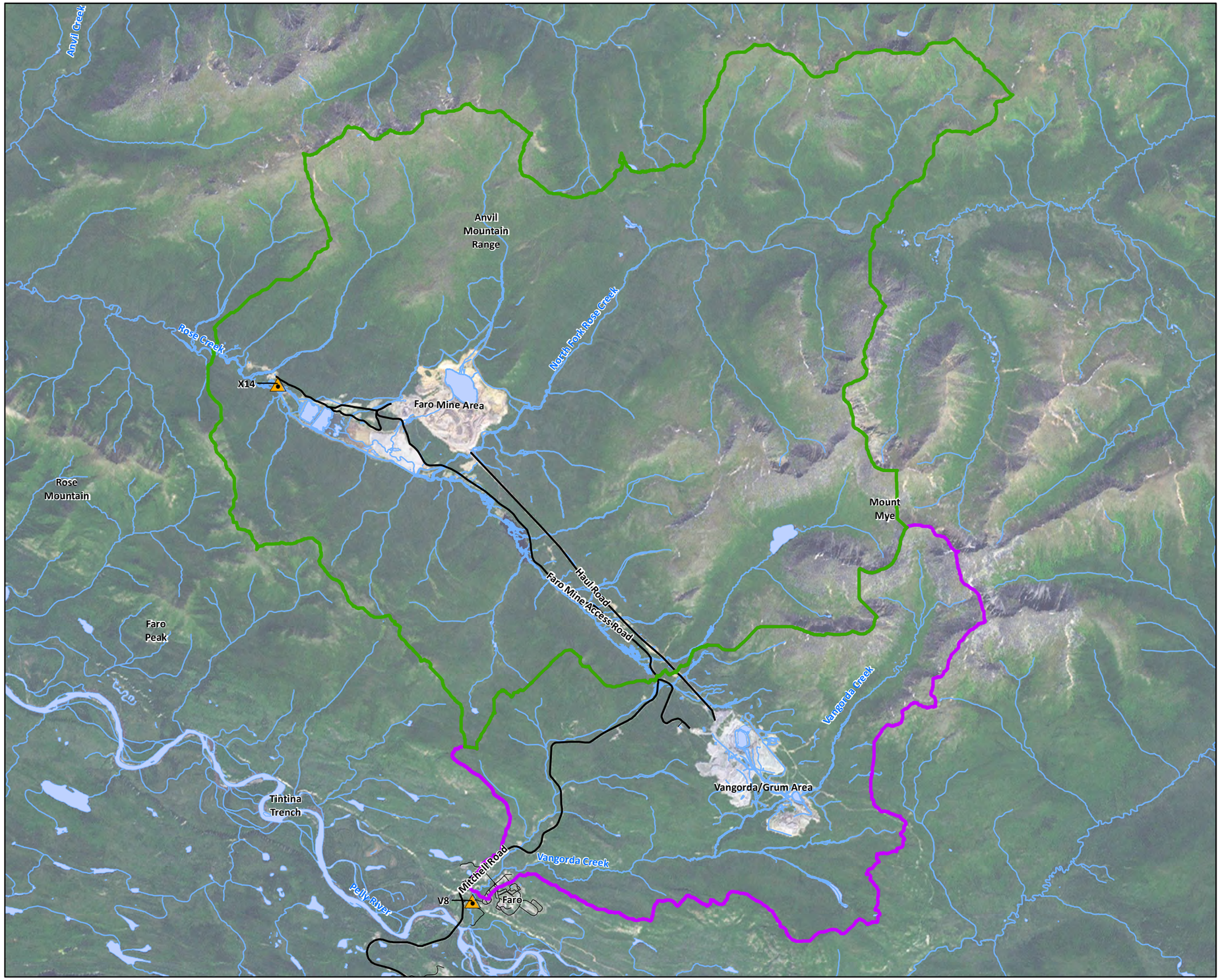
- Very Low (pH <5)
- Low (pH ≥5 and <6.5)
- Neutral (pH ≥6.5 and <7.5)
- High (pH ≥7.5)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Abbreviations:
   (BR) = Bedrock
   (OB) = Overburden
   (SB) = Streambed
   SO_4 = Sulphate
   (TA) = Tailings
   (UK) = Unknown
   (WBR) = Weathered Bedrock
   (WR) = Waste Rock
   WTP = Water Treatment Plant
   Zn = Zinc
3. Symbol colour shows the highest impact at each well pair or cluster location. Sample location text colour shows impact level of that particular location

N

0 200 400
Metres

FIGURE 2-17
Groundwater Quality:
Vangorda/Grum Bedrock
Faro Mine Remediation Project





LEGEND

- Flow Monitoring Location
- Rose Creek Regional Catchment
- Vangorda Creek Regional Catchment

Notes:

1. Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
2. Faro = Town of Faro

N

0 1,250 2,500 3,750 5,000

Metres

FIGURE 2-18

Faro Mine Complex Regional Catchments

Faro Mine Remediation Project



VICINITY MAP



LEGEND

- Major Road
- Road Unpaved
- Watercourse
- Faro Mine Complex

Notes:

1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. CVD = Cross Valley Dam
   SIS = Seepage Interception System
   WTP = Water Treatment Plant

N

0 750 1,500 2,250 3,000

Metres

FIGURE 2-19

Faro Mine Complex Surface Water Conveyance and Management Features

Faro Mine Remediation Project

R:\FAROMINE_20000342\MAPFILES\TAR08\6B_HYDRAULICS\FIG6B-1_FARO_COMPLEX.MXD ECLARK 2/13/2014 11:47:51 AM

West Perimeter RU

West Valley Interceptor Ditch

Upper Guardhouse Creek

West Perimeter RU

Mill / Emergency Tailings Area RU

Northwest Interceptor Ditch

Faro Pit RU

Lower Guardhouse Creek

Rose Creek Tailings Area RU

Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond RU

Rose Creek Diversion

South Perimeter RU

East Perimeter RU

Waste Rock Dumps RU

South Fork Rose Creek

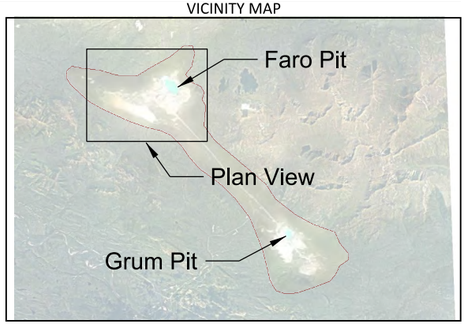
Rose Creek

North Fork

Faro Creek Diversion

FDU (FCD-1)
FCO
FCD-2
FCD-3
A-30
FCD-4
FCD
X22b
SP5-6
X23
X7
ETA Combined
FCS-4
GDHSECK
X4
X14
X10
X5
X11
X5P
X13
WEIR3
X12
R8
FAROCR
R7
R9
R10
NFRC SC-3
NFRC SC-2
NFRC SC-4
NFRC SC-1
NF2
X2
RCSG-4
X3A
X3
R1

VICINITY MAP



LEGEND

- Main Faro Mine Site Watercourse
- Surface Water Catchment Boundaries
- Tributary Faro Site Watercourse
- Continuous Water Level Station
- Spot Flow Station
- Seep Monitoring Station
- FCD — Faro Creek Diversion
- NFRC — North Fork Rose Creek
- ETA — Emergency Tailings Area

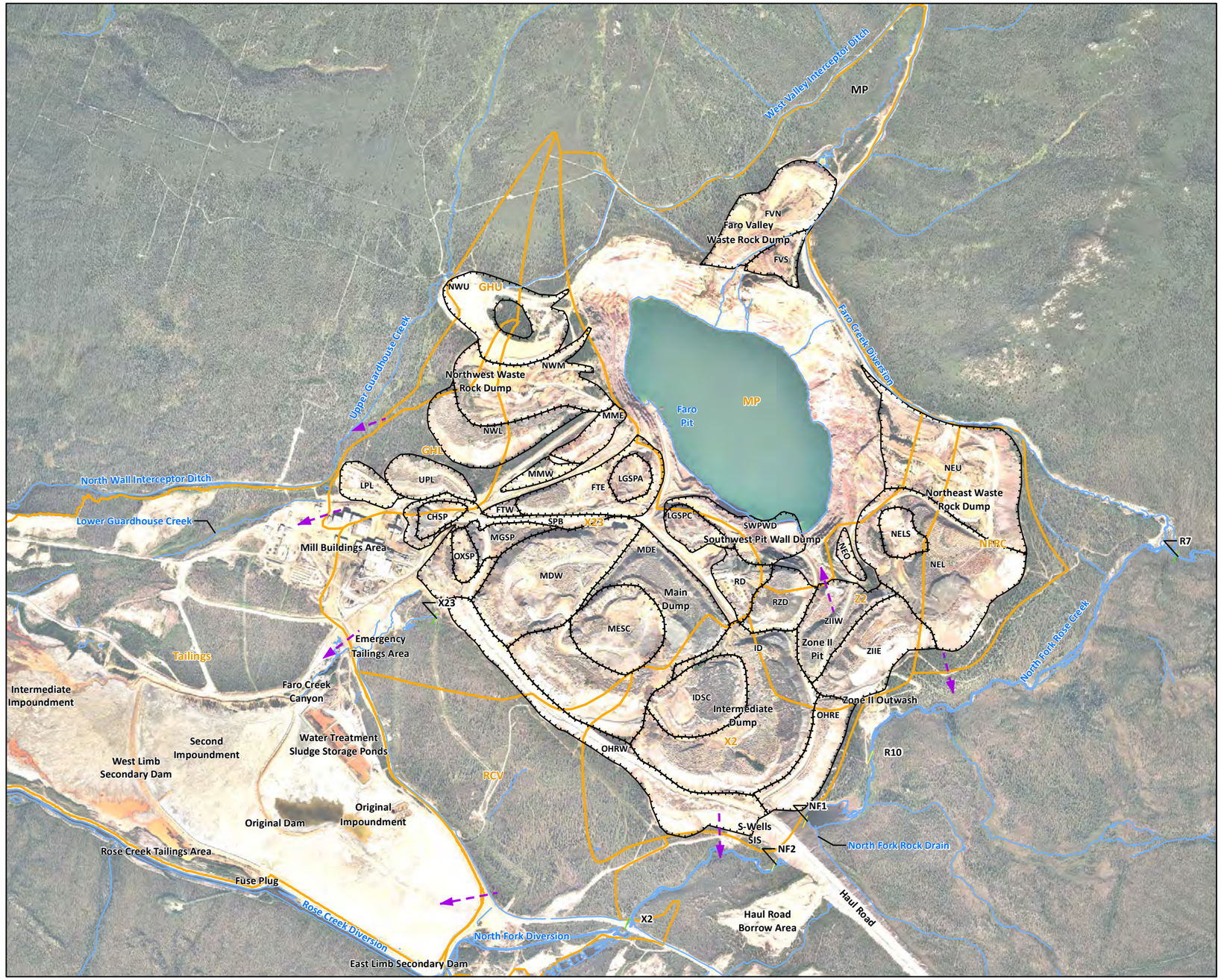
Notes:

1. RU boundaries shown are approximate and are intended to delineate areas of similar waste materials and to provide a visual concept of "clean" boundary conditions (i.e. perimeter streams) with contaminated source materials contained within.
2. The areas west and east of the Mill/ETA RU are not shown as individual RUs nor contained within larger adjacent RUs since major remedial activities are not anticipated within these areas (other than surface water management infastructure, grading, and perhaps revegetation). It is acknowledged the Lower Guardhouse Creek may be realigned in the future.

N

0 500 1000 Metres

Figure 2-20
Surface Water and Seepage Monitoring Stations by Remediation Unit
Faro Mine Remediation Project



VICINITY MAP



LEGEND

- Continuous Flow Monitoring Location
- Spot Flow Monitoring Location
- Catchment Pour Point
- Catchment Area
- Waste Dump

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Rose Creek Tailings Area is also called Down Valley Tailings Area, and is where the Rose Creek Alluvial Aquifer is located.
4. Waste Dump Definitions:

CHSP - Crusher Stockpile
FTE - Fuel Tank East
FTW - Fuel Tank West
FVN - Faro Valley North
FVS - Faro Valley South
ID - Intermediate Dump
IDSC - Intermediate Dump Sulphide Cell
LGSPA - Low Grade Stockpile A
LGSPC - Low Grade Stockpile C
LPL - Lower Parking Lot
MDE - Main Dump East
MDW - Main Dump West
MESC - Main Dump Sulphide Cell
MGSP - Medium Grade Stockpile
MME - Mt. Mungly East
MMW - Mt. Mungly West
NEL - Northeast Lower
NELS - Northeast Lower Sulphide Cell
NEO - Northeast Outer
NEU - Northeast Upper
NWL - Northwest Lower
NWM - Northwest Middle
NWU - Northwest Upper
OHRE - Outer Haul Road East
OHRW - Outer Haul Road West
OXSP - Oxide Fines Stockpile
RD - Ranch Dump
RZD - Ramp Zone Dump
SPB - Stock Piles Base
SWPWD - Southwest Pit Wall Dump
UPL - Upper Parking Lot

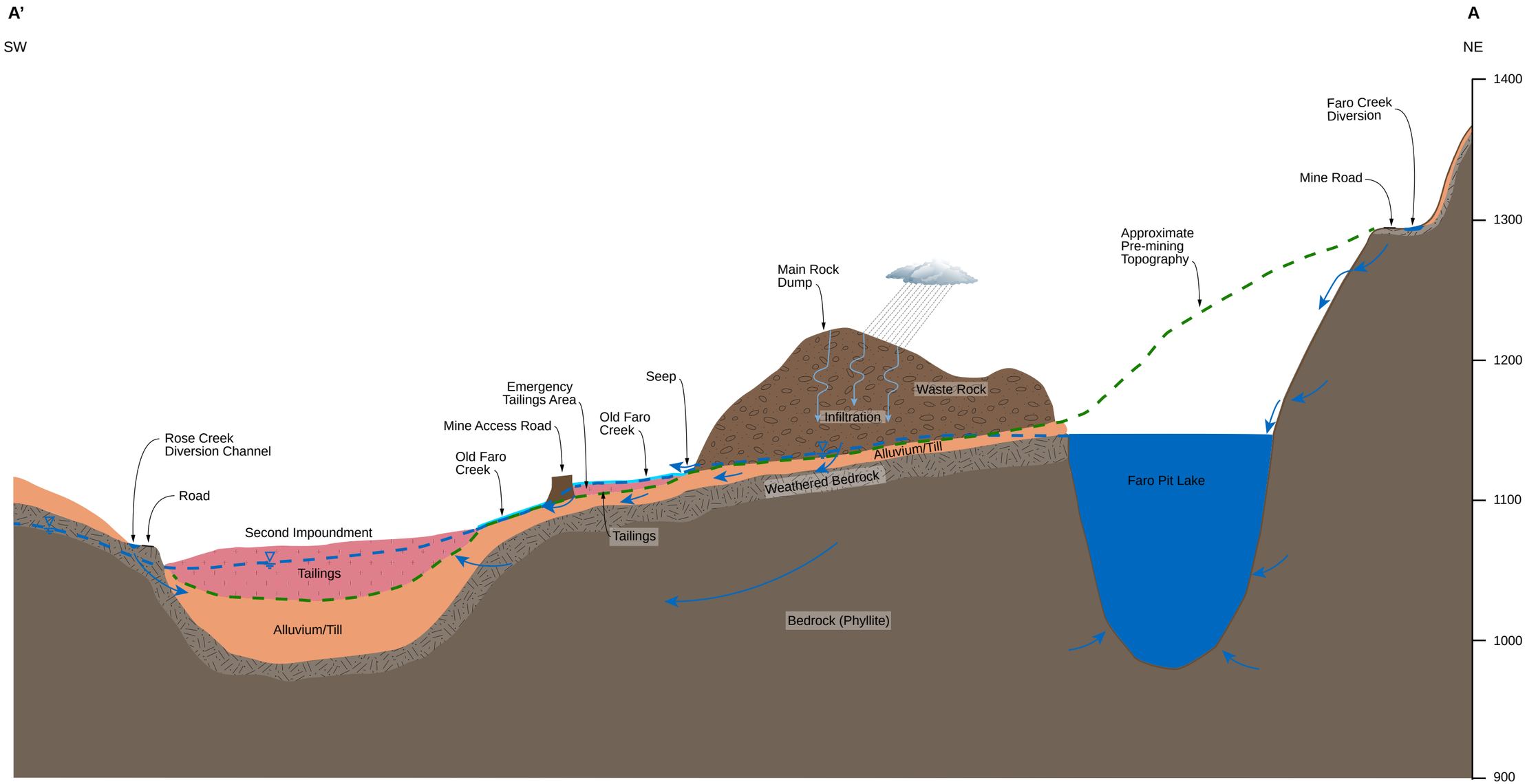
N

0 250 500 750 1,000
Metres

FIGURE 5-1
Faro Waste Rock Dump Plan View
Faro Mine Remediation Project

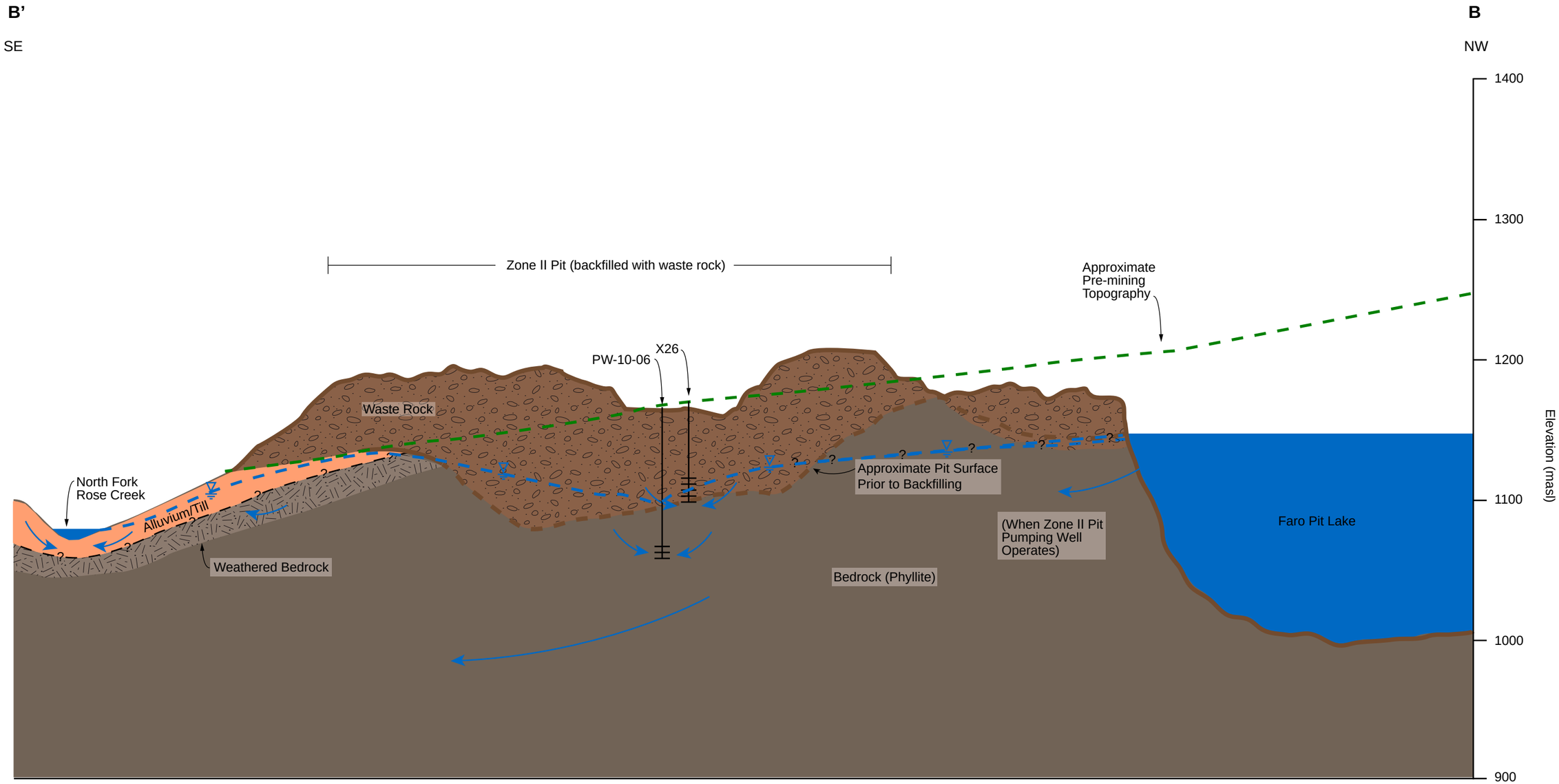
ch2m

R:\FAROMINE_20000342\MAPFILES\IWPP\2014\FIG5-4.MXD ECLARK 6/25/2014 4:07:20 PM



Notes:
Cross Section location on Figure 3-1
masl = metre above sea level

FIGURE 6-1
Schematic Cross Section from Faro Pit to Rose Creek Tailings
Faro Mine Remediation Project



LEGEND

Water Table

Generalized Groundwater Flow Direction

0 200m

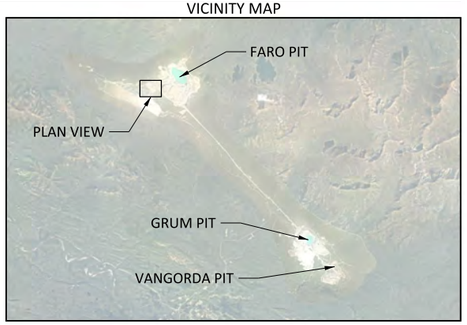
Vertical Exaggeration: 1.4x

Notes:
Cross section location on Figure 3-1
masl = metre above sea level

FIGURE 6-2
Schematic Cross Section from Faro Pit to Zone II Outwash
Faro Mine Remediation Project



VICINITY MAP



N

0 100 200

METRES

NOTES:

1. Topography and Aerial Photo Prepared from Lidar Dated 10-03-11
   Horizontal Datum: NAD83 CSRS
   Vertical Datum: CGVD28 (HTv2.0)

LEGEND

- • Monitoring Well Location
- △ Seep Location
- □ Surface Water Sampling Location
- Existing Water Courses
- Emergency Tailings Area

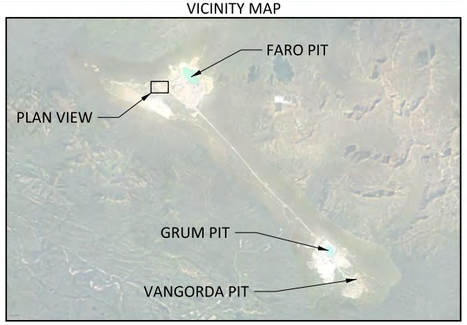
FIGURE 7-1

Emergency Tailings Areas and Faro Mill Location Map
Faro Mine Remediation Project

ch2m



VICINITY MAP



N

0 50 100

METRES

LEGEND

X Building Designation

Indicates Buildings not Currently On Site (Former Building Location)

Approximate Boundary of Laydown Areas

Building Key

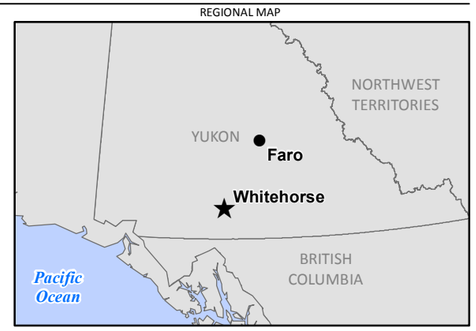
1	Warehouse
2	Norcan Shop
3	Lube Storage Building
4	Mill Building
5	Cold Storage
6	Reagents Building
7	Crusher Building
8	Coarse Ore Bin
9	Guard House
10	Dry & Lunch Room
11	Loadout Building

Notes:
1. Aerial Photo shown dated August 2012.

Figure 7-2
Aerial View of the Faro Mill Area
Faro Mine Remediation Project

ch2m.





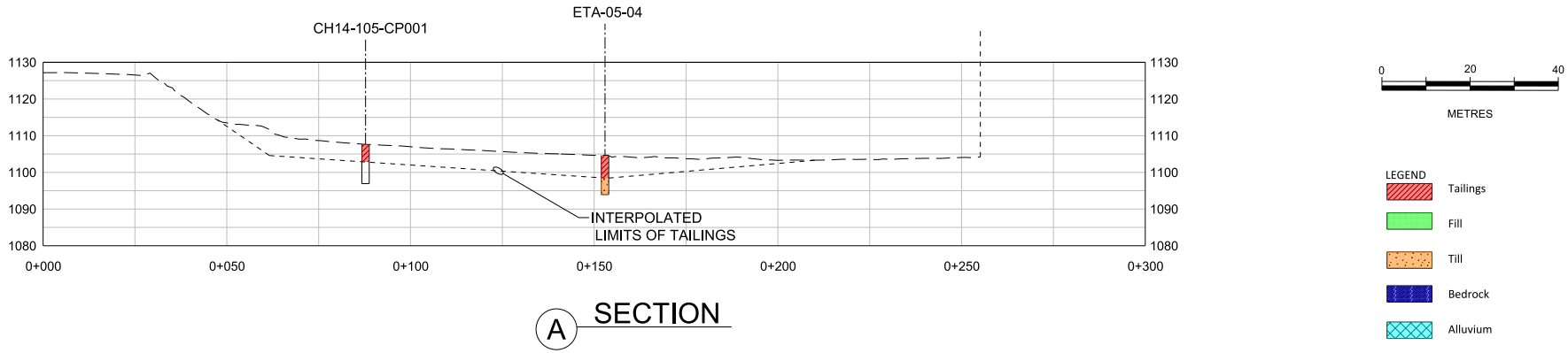
- Borehole Sampling Location
- Cone Penetrometer Sampling Location
- Monitoring Well Sampling Location
- Seep Sampling Location
- Surface Water Sampling Location
- Test Pit Sampling Location
- Faro Mine Site Watercourse
- Approximate Limit of Tailings
- Contour (m)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Boring, monitoring well and cone penetrometer locations based on field survey by Challenger
4. Abbreviations:
   ETA = Emergency Tailings Area
   m = metre

N

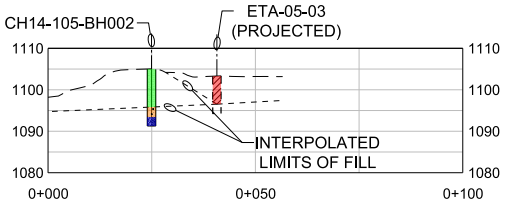
0 25 50 75 100
Metres

FIGURE 7-3
Emergency Tailings Area Site Features
Faro Mine Remediation Project



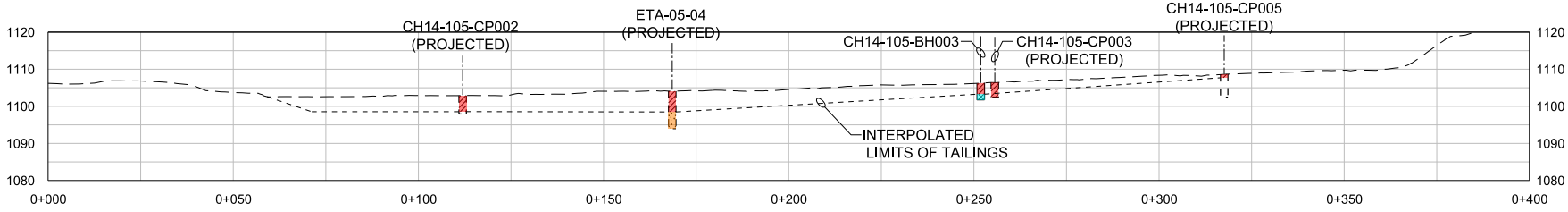
A SECTION

FIG-1



B SECTION

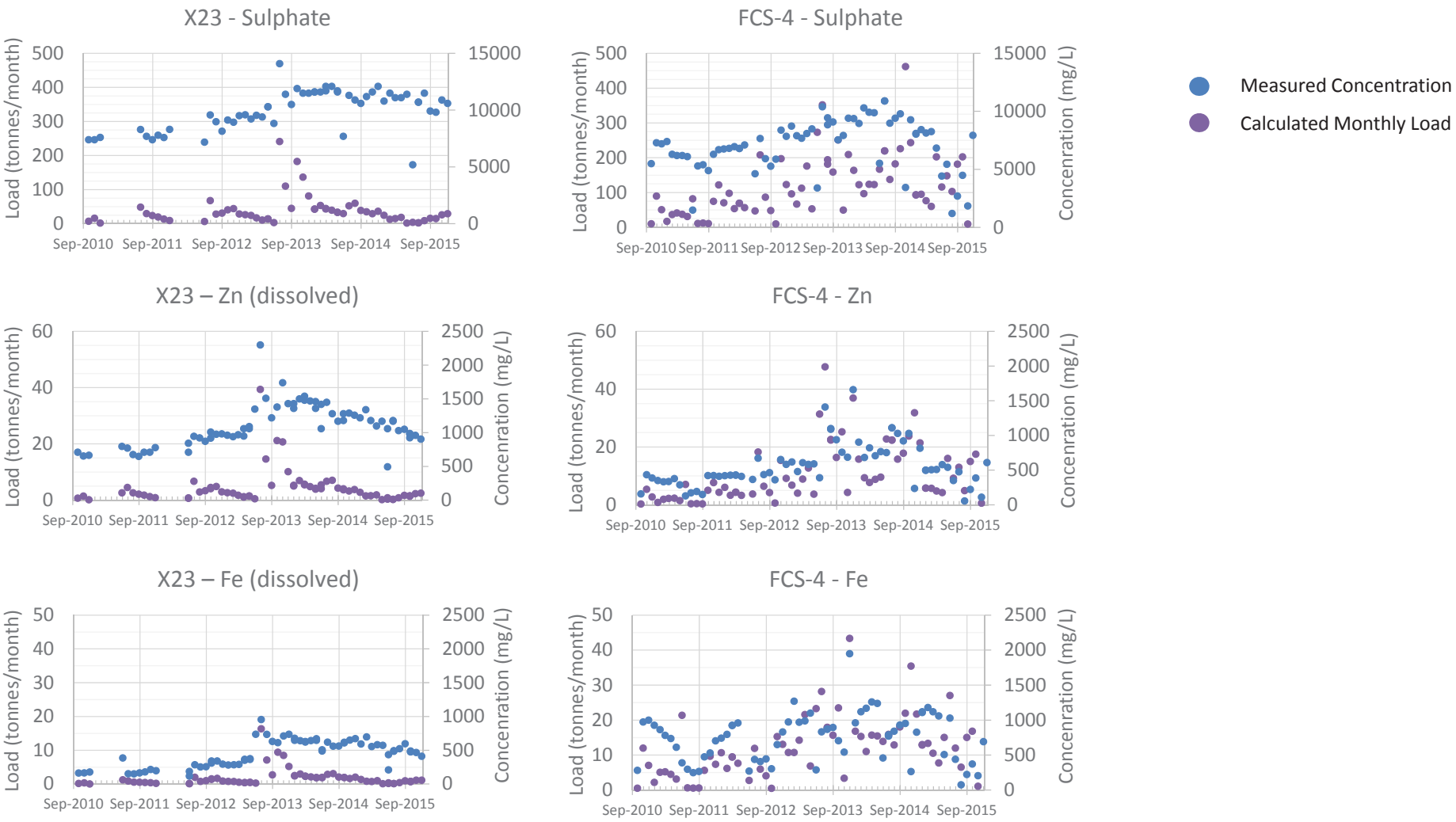
FIG-1



C SECTION

FIG-1

FIGURE 7-4
Emergency Tailings Area Cross Sections
Faro Mine Remediation Project



Note:
mg\L = milligrams per litre

FIGURE 7-5
Calculated Monthly Load Estimates and Measured Concentrations – Upstream and Downstream Sampling Locations
Faro Mine Remediation Project

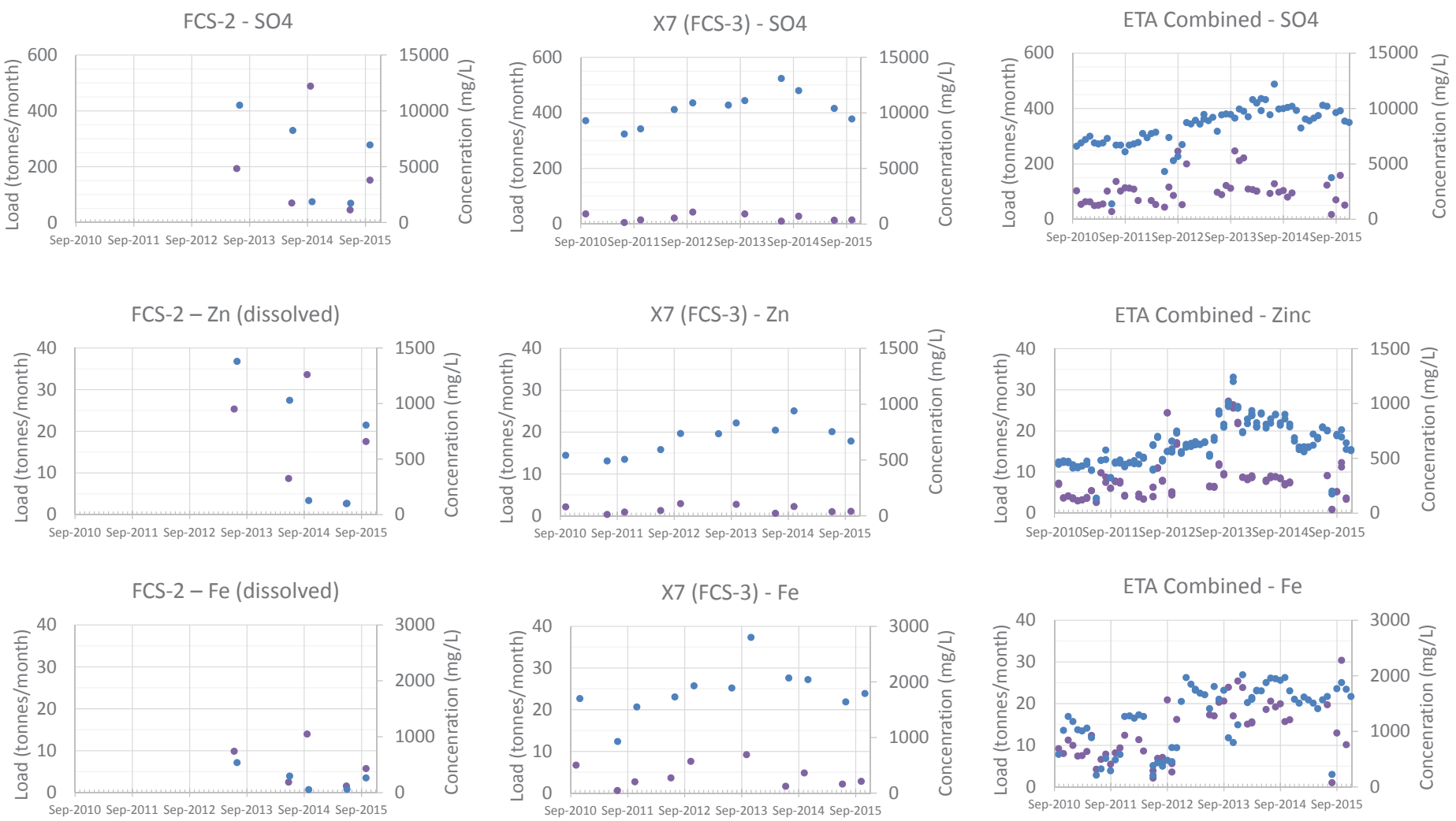
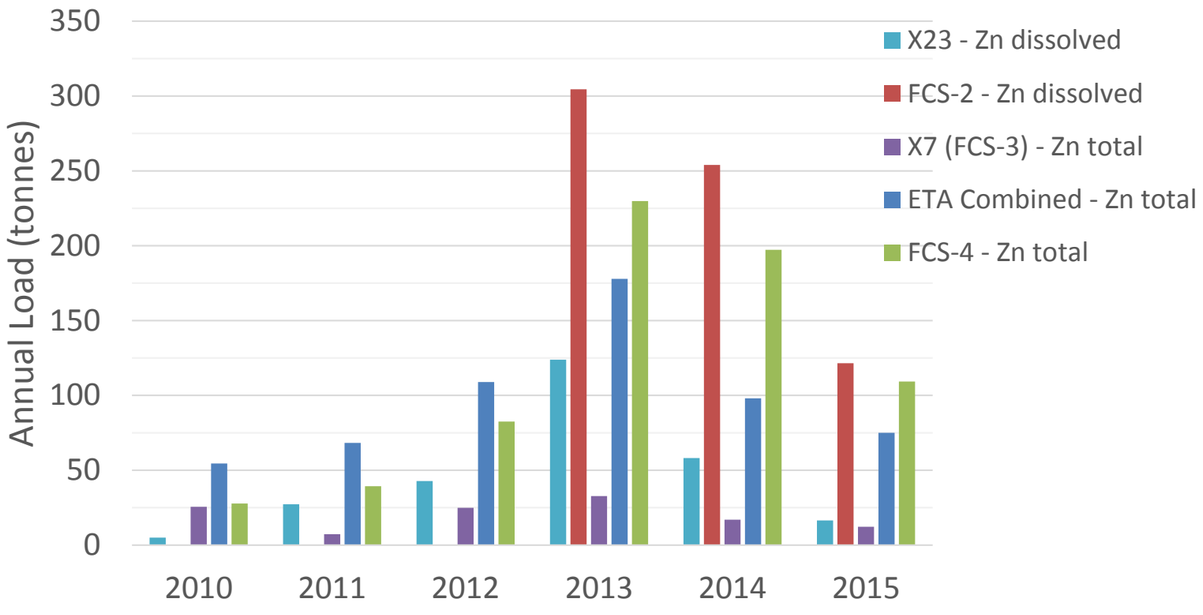
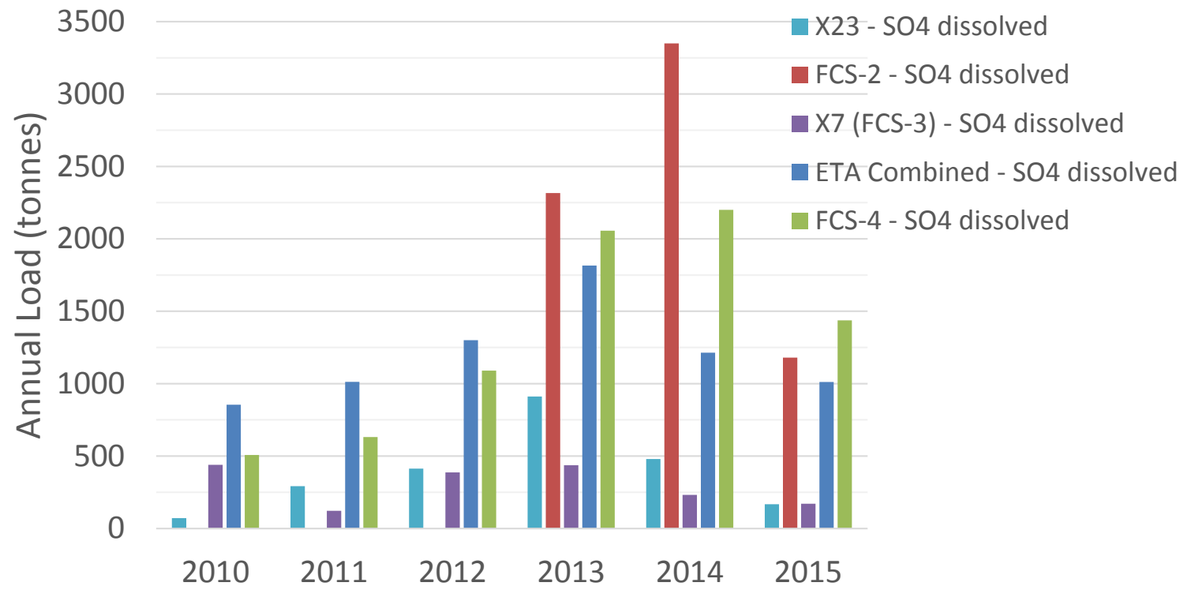


FIGURE 7-6
Calculated Monthly Load Estimates and Measured Concentrations – Downstream of Mine Access Road
Faro Mine Remediation Project

Note:
mg\L = milligrams per litre





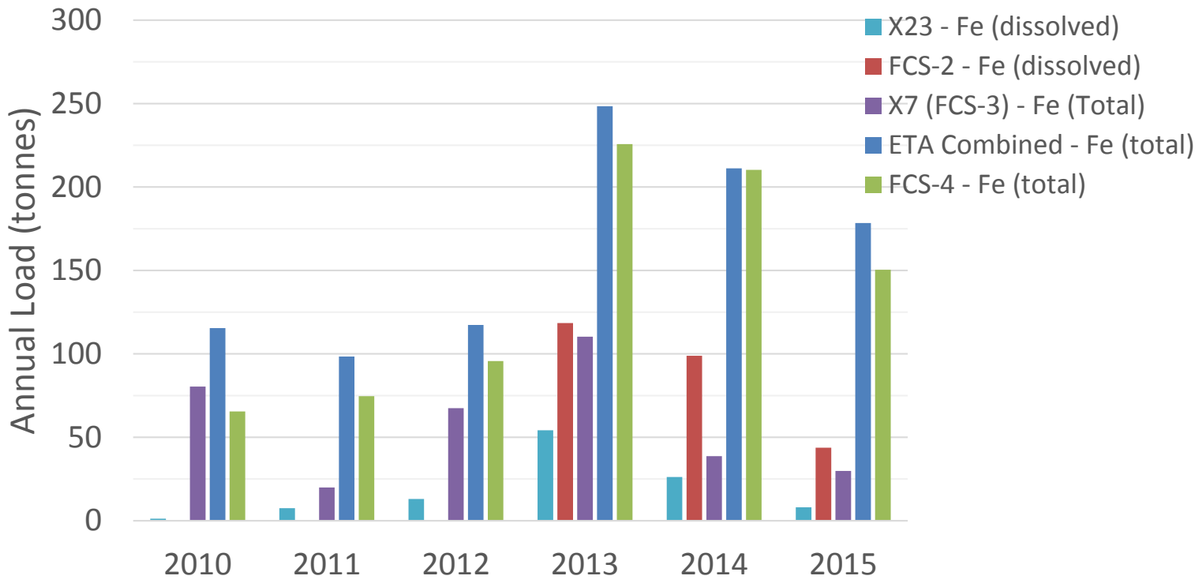


FIGURE 7-7
Calculated Total Annual Loads
Faro Mine Remediation Project



REGIONAL MAP



- Photo/Observation Location, June 2014 Geological Reconnaissance
- Approximate Lower Guardhouse Creek Channel Alignment
- Faro Mine Site Watercourse

Note:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.

N

0 50 100 150 200
Metres

FIGURE 7-8
Lower Guardhouse Creek Alignment
Faro Mine Remediation Project

\\WATERLOO\GIS\PROJECTS\FARO\GIS\MAPFILES\CDRM\PHOTO_OBSERVATION_LOCATION.MXD SLAW3 3/31/2016 2:51:49 PM



VICINITY MAP



LEGEND

Road Unpaved

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

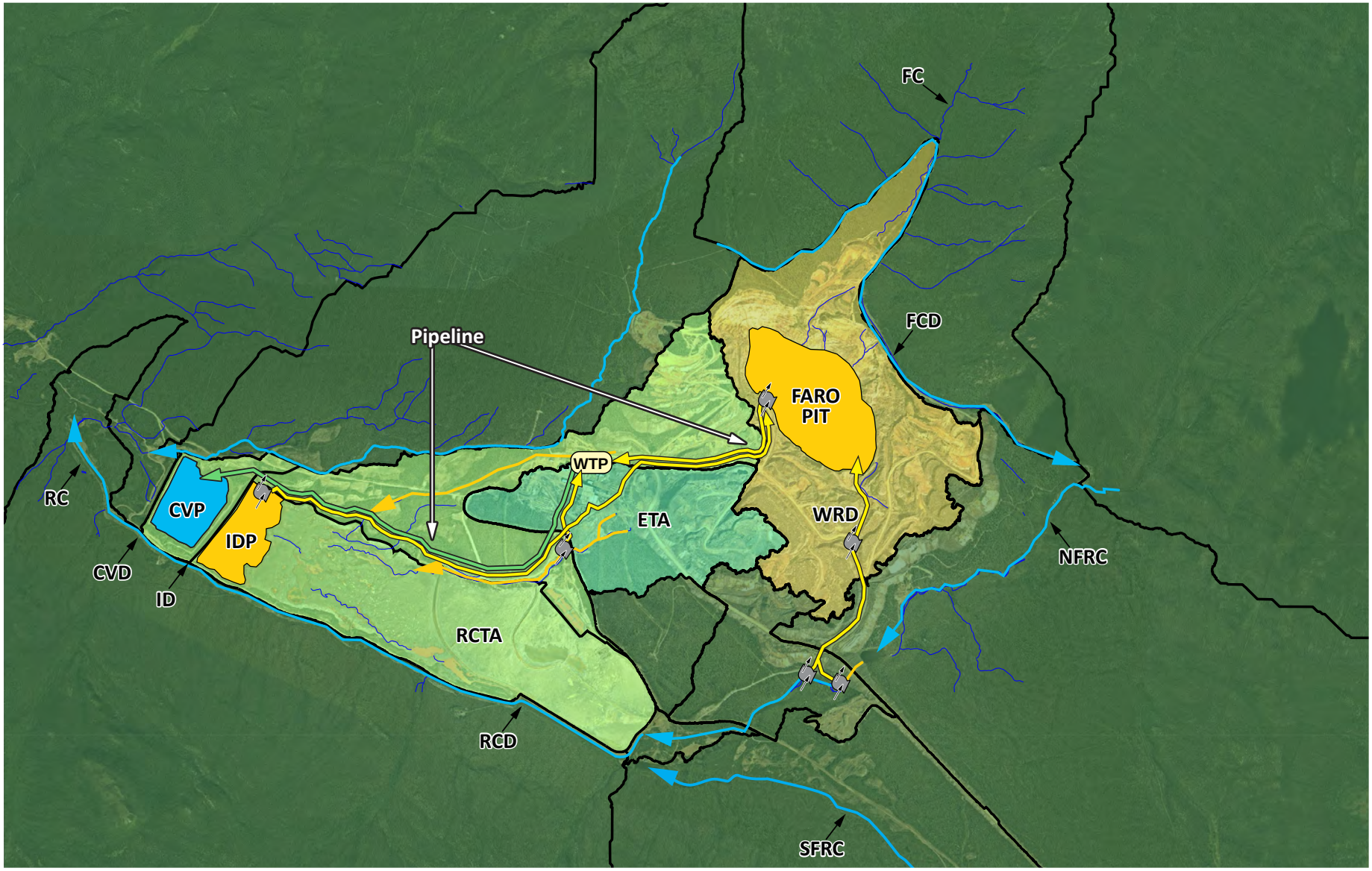
N

0 200 400 600 800

Metres

FIGURE 8-1
Rose Creek Tailings Area
Faro Mine Remediation Project

\\WATERLOO\GIS\PROJECTS\FARO\GIS\MAPFILES\DESIGN\SECTION1\FIG1-4.MXD KSCHONKNECHT 8/31/2015 2:15:41 PM



Legend

- Clean Water
- Mine Impacted Water
- Surface Water
- Pipeline (yellow = impacted; green = clean)
- Collection/Conveyance Point

Notes:

CVD = Cross Valley Dam
CVP = Cross Valley Pond
ETA = Emergency Tailings Area
FC = Faro Creek
FCD = Faro Creek Diversion
ID = Intermediate Dam
IDP = Intermediate Dam Pond
NFRC = North Fork Rose Creek
RCD = Rose Creek Diversion
RCTA = Rose Creek Tailings Area

FIGURE 9-1
Faro Mine Area
Faro Mine Remediation Project

ES102011123831RDD FARO_Figure9-1_V2.ai cmont 04/08/16

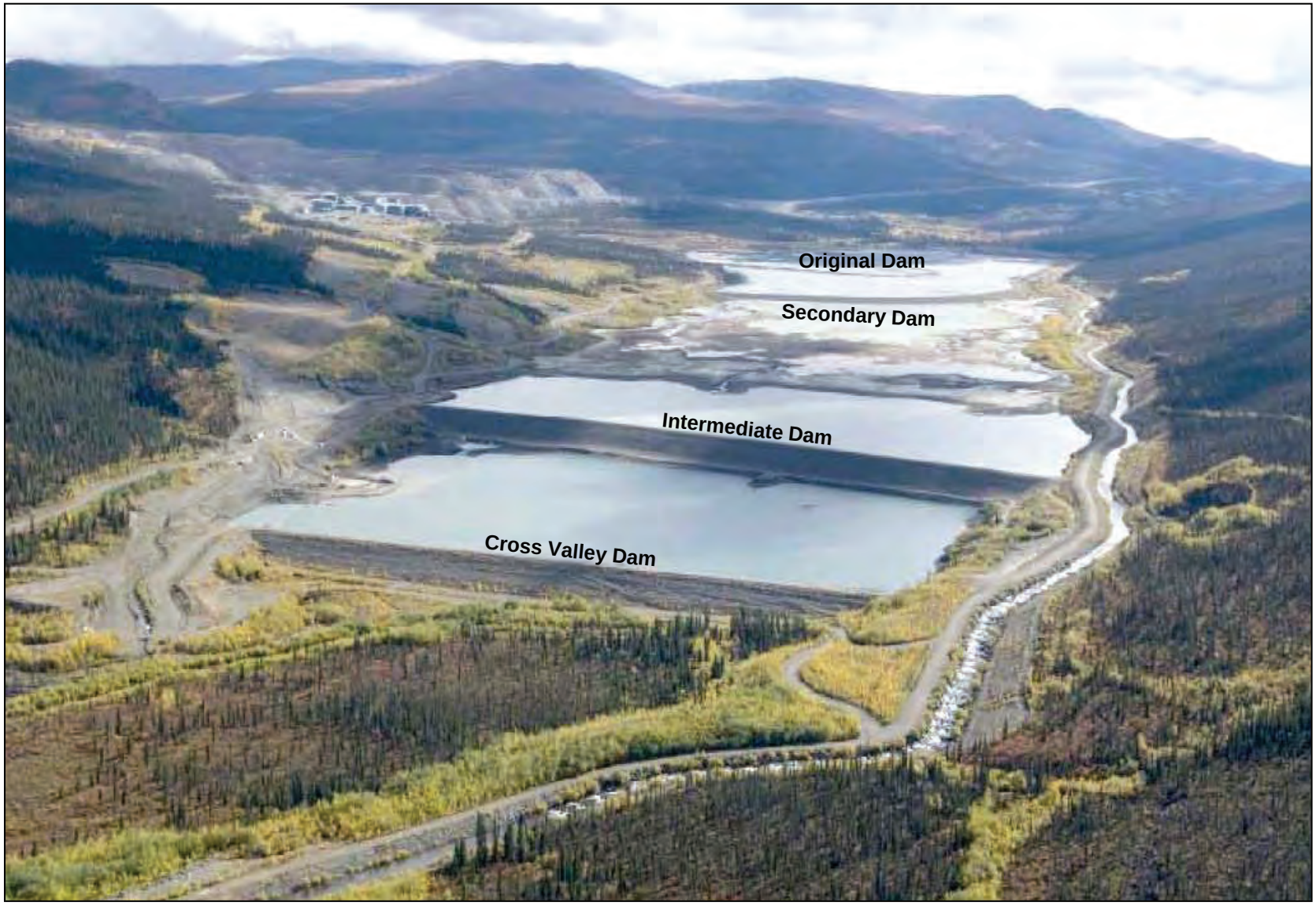
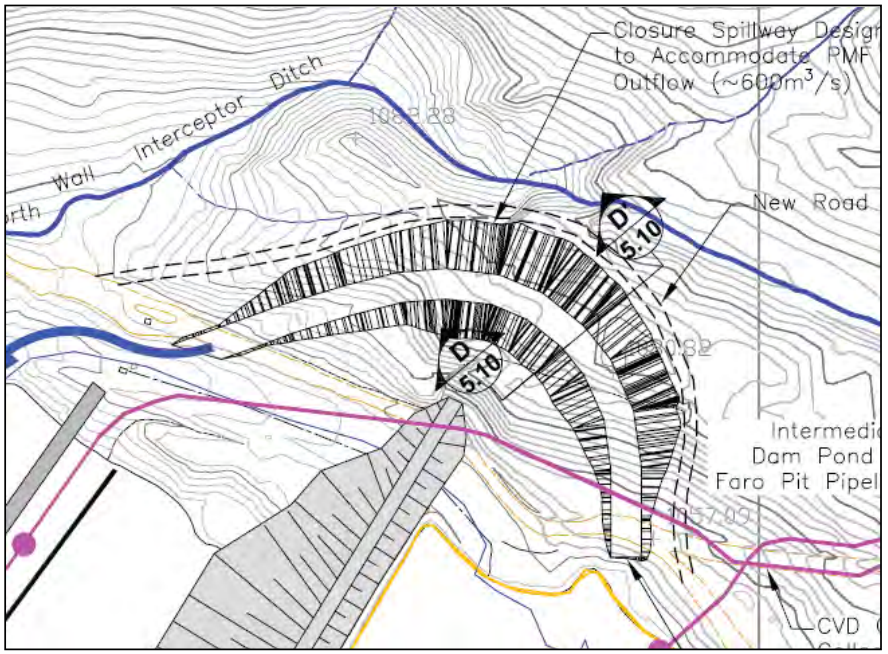
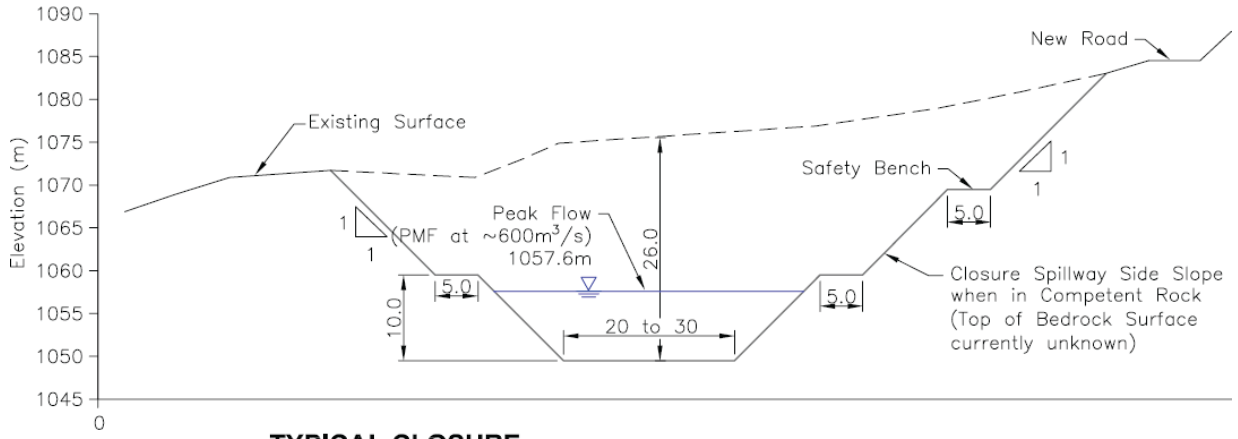


FIGURE 9-2
Rose Creek Tailings Area
Faro Mine Remediation Project

ch2m





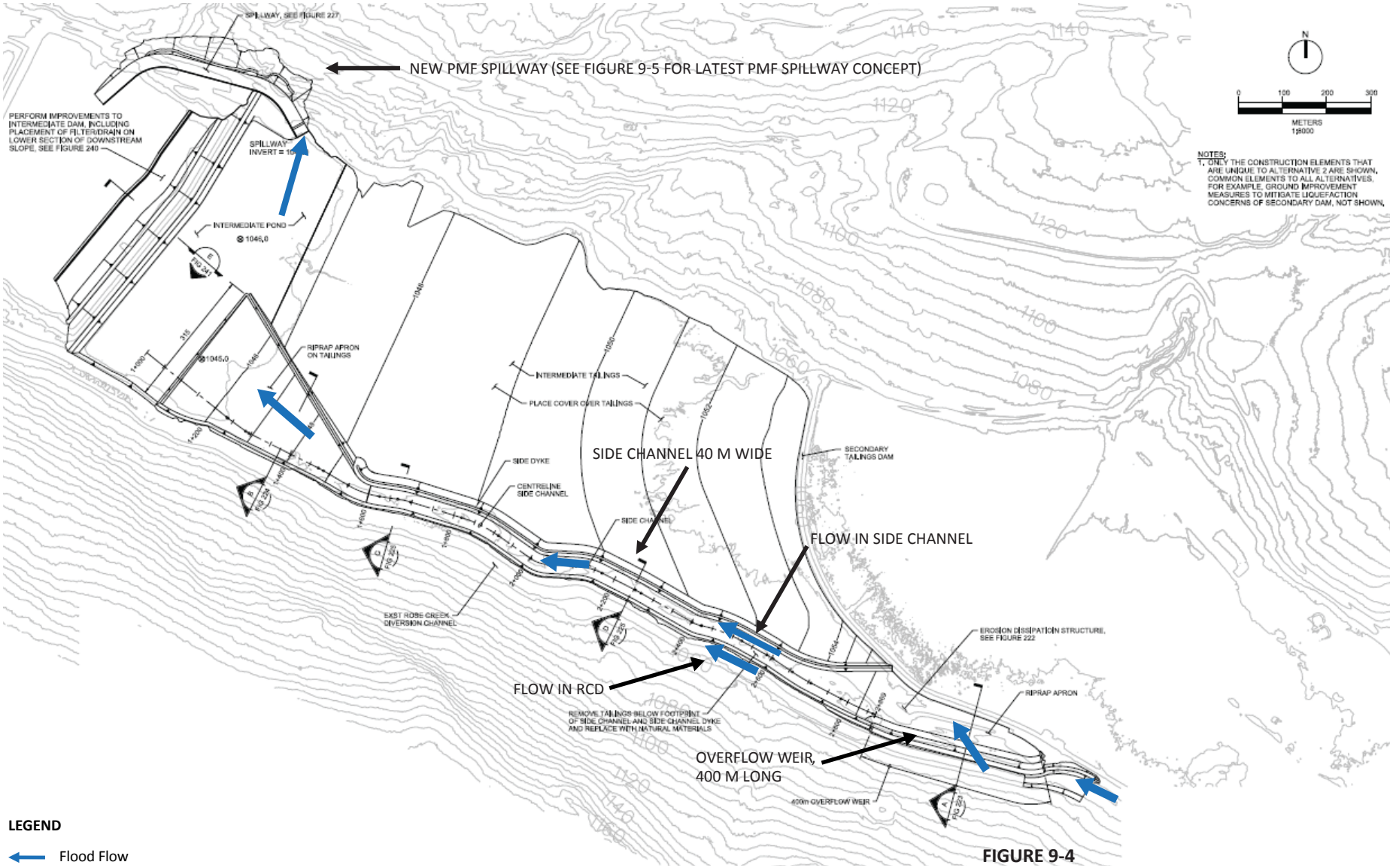
TYPICAL CLOSURE SPILLWAY SECTION

D
5.9

0 5 10 15 20 25
Scale In Metres

Notes:
CVD = Cross Valley Dam
m = metre
PMF = probable maximum flood

FIGURE 9-3
Draft 4A Closure Plan Intermediate Dam Spillway
Faro Mine Remediation Project

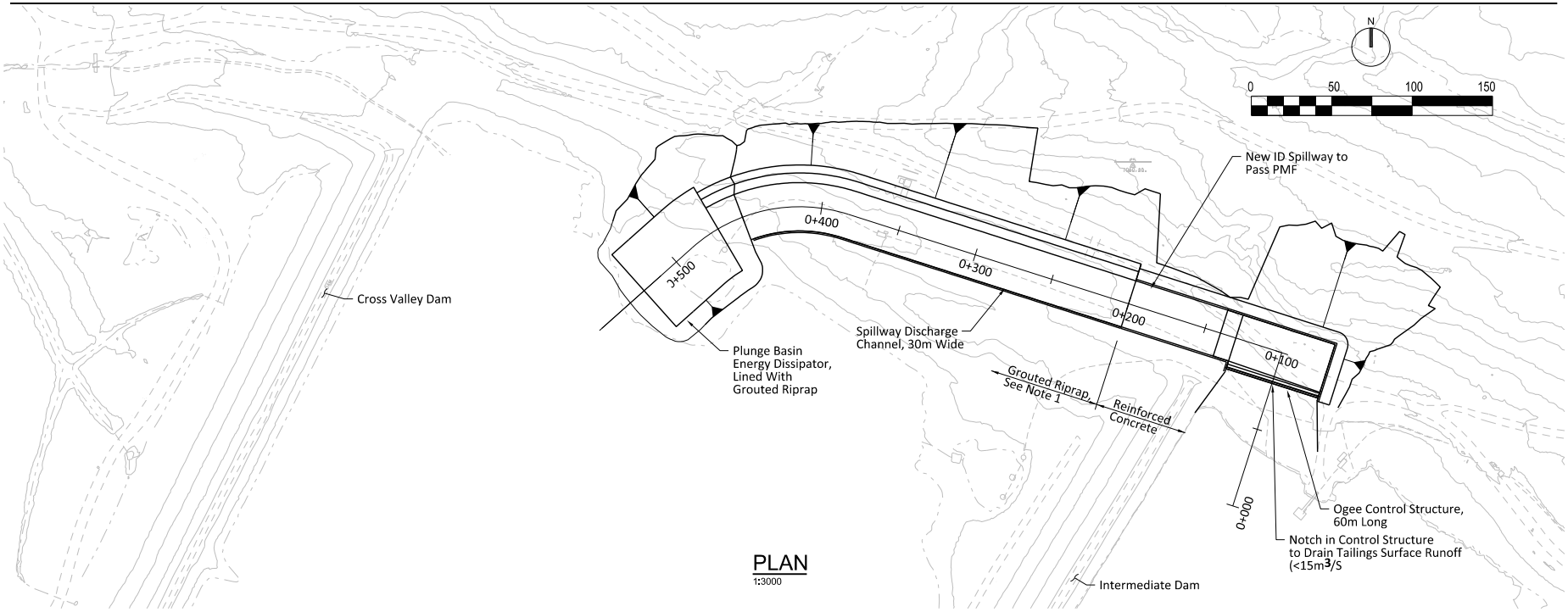


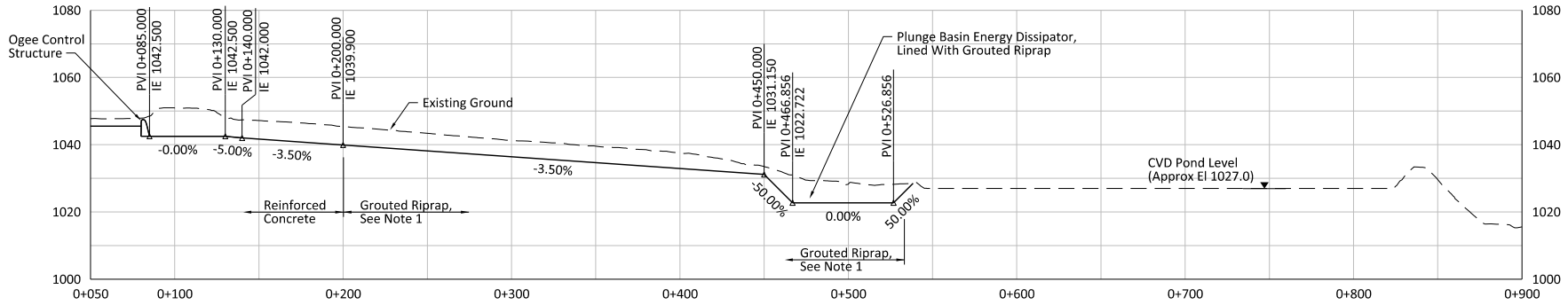
LEGEND

Flood Flow

Notes:
M = metre
PMF = probable maximum flood
RCD = Rose Creek Dam

FIGURE 9-4
Selected Probable Maximum Flow Flood Routing Concept
Faro Mine Remediation Project





Notes:

1. As an alternative to grouted riprap, reinforced concrete will be considered.
2. CVD = Cross Valley Dam
3. M = metre
4. PMF = probable maximum flood

FIGURE 9-5
Intermediate Dam Probable Maximum Flow Spillway Concept Plan and Profile
Faro Mine Remediation Project

ch2m

NOTES:

1. PLACE 0.5 m SAND AND GRAVEL PROTECTIVE COVER/ DRIVABLE SURFACE AS SHOWN.
2. FILL EXISTING GULLIES/ RILLS DEEPER THAN 100 mm ON DOWNSTREAM SLOPE ALONG ENTIRE LENGTH OF DAM USING COARSE POORLY GRADED GRAVEL. LEVEL TOP OF CREST AS NECESSARY TO LIMIT CONCENTRATED FLOW OVER SLOPE.
3. NEAR THE CENTERLINE, THE DAM CORE WAS FOUND TO BE W/IN 0.3 TO 0.6 m OF THE GROUND SURFACE AS OBSERVED DURING THE 2013 TEST PIT INVESTIGATION BY CH2M HILL, THIS ELEVATION IS EXPECTED TO VARY.
4. EXCAVATE TRENCH TO INSTALL GEOMEMBRANE, REPLACE AND COMPACT WITH LOW PERMEABILITY MATERIAL WHERE EXCAVATION PENETRATES EMBANKMENT CORE AS VERIFIED BY ENGINEER IN THE FIELD.

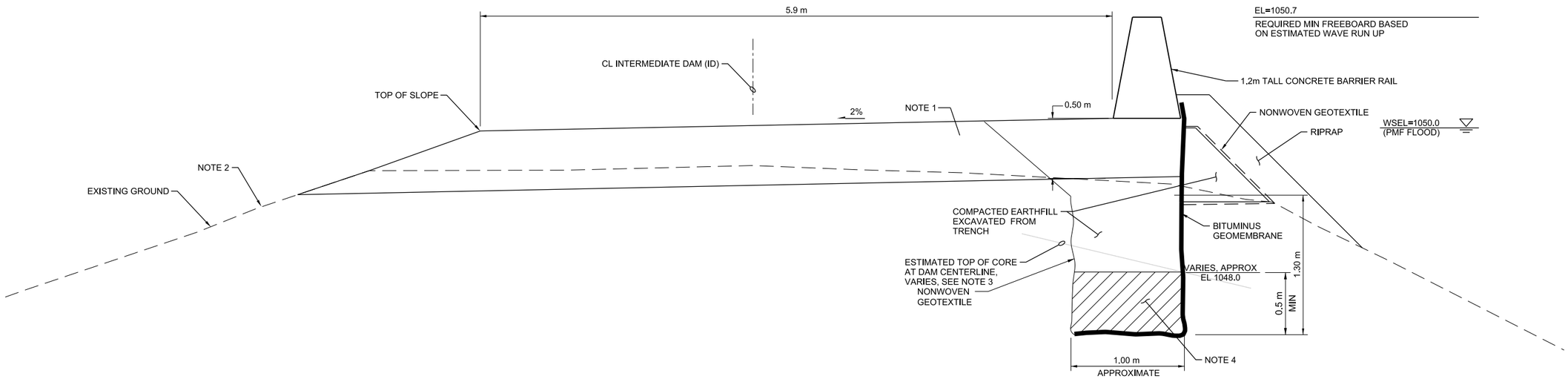
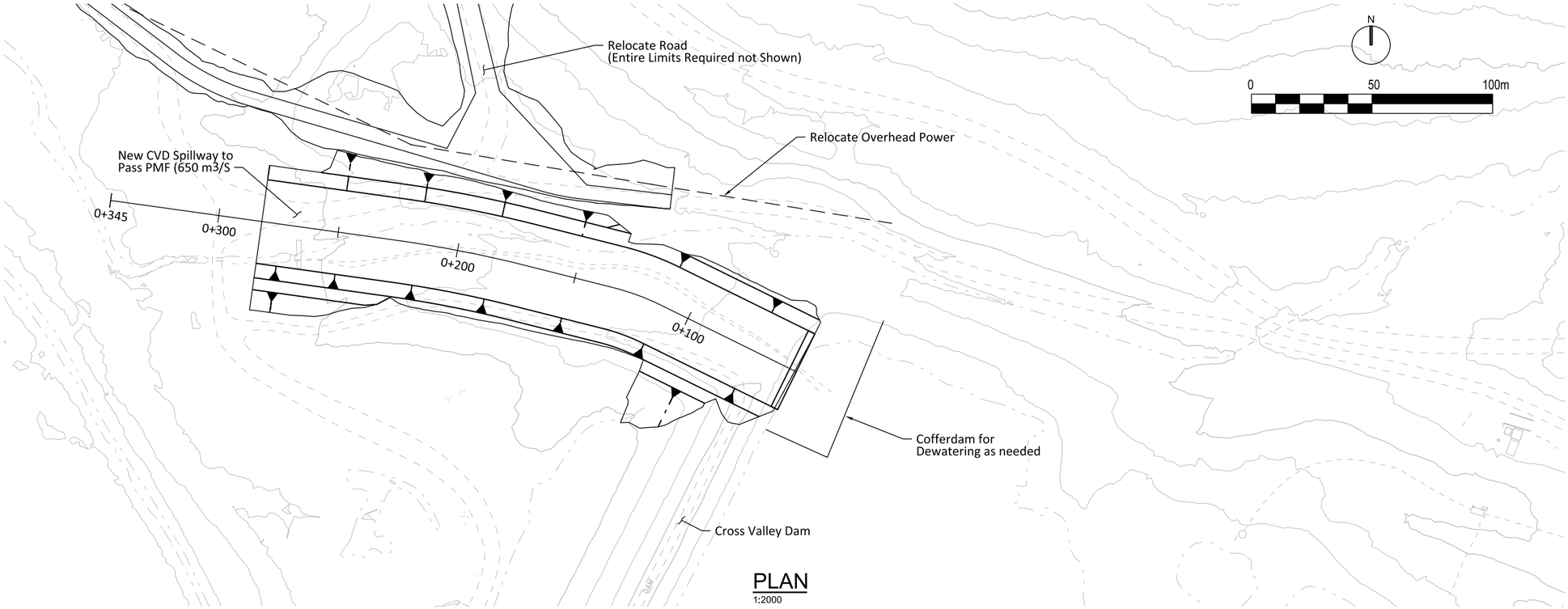
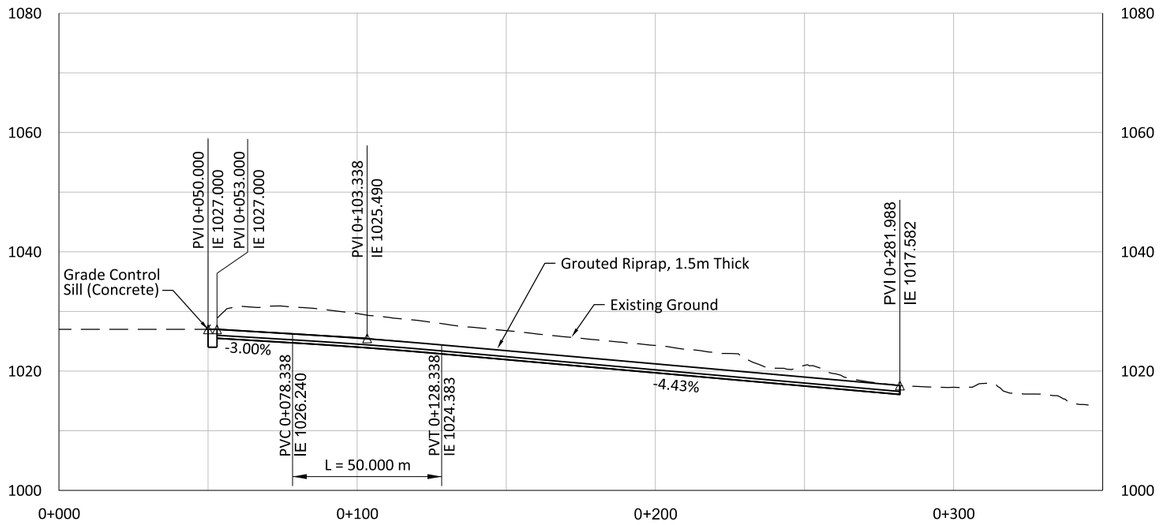


FIGURE 9-6
ID Crest Raise for PMF Routing
Faro Mine Remediation Project

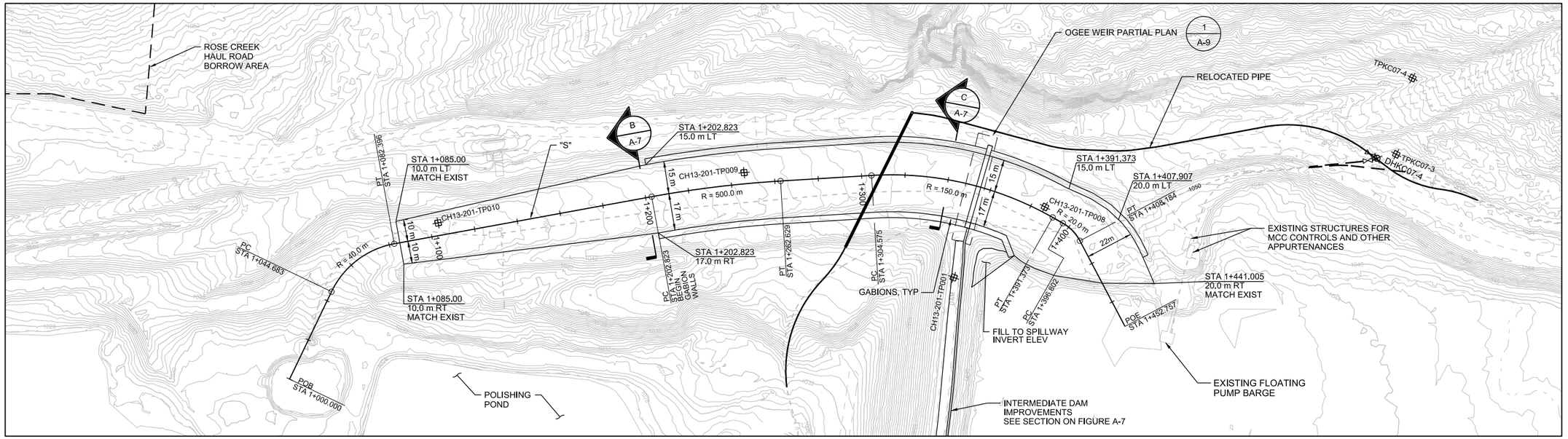


PLAN
1:2000



CVD SPILLWAY CENTERLINE PROFILE
1:2000 HORIZ
1:1000 VERT

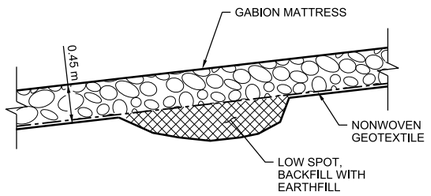
FIGURE 9-7
CVD Spillway Concept Plan & Profile
Faro Mine Remediation Project



PLAN

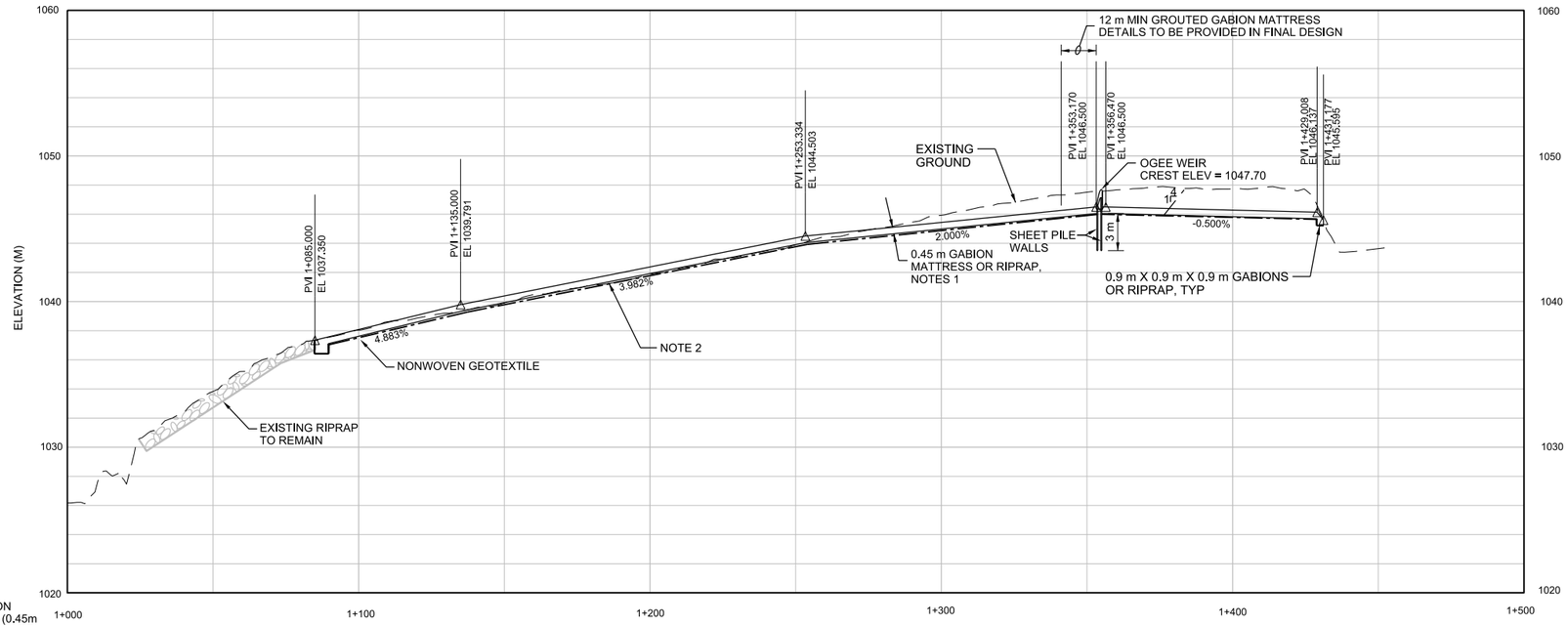
SCALE: 1:1000 (FULL SIZE)
1:2000 (HALF SIZE)

N



1 DETAIL

NTS



NOTE:

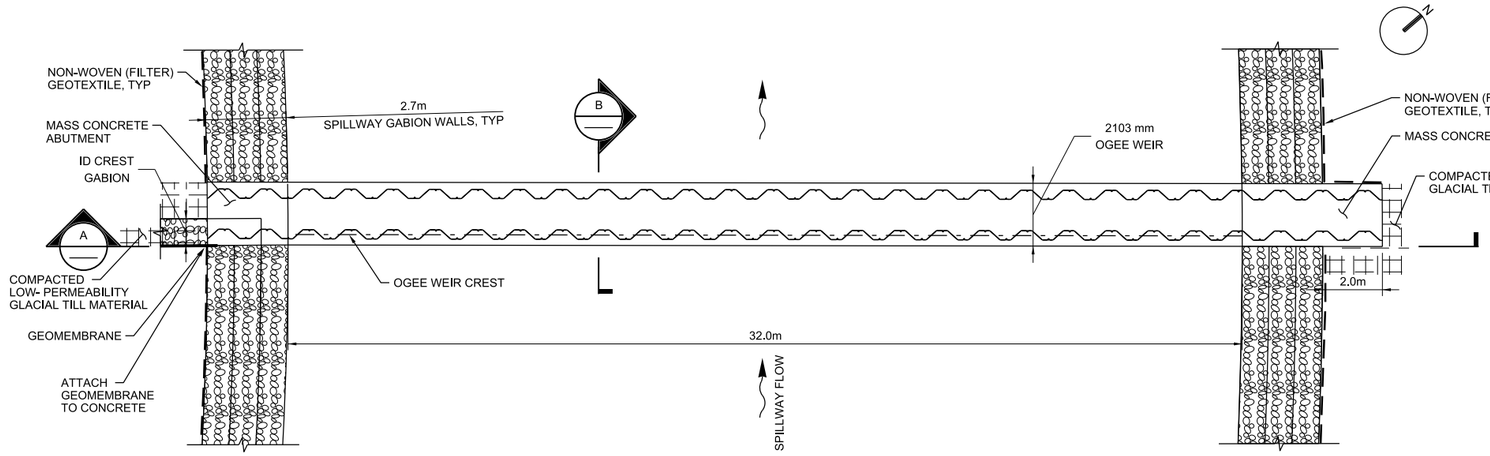
1. EXCAVATE SPILLWAY TO GRADE SHOWN ON PROFILE AND INSTALL GABION MATTRESS (0.45m THICK MACCAFERRI GABION MAT OR EQUAL) OR RIPRAP. EROSION PROTECTION TO BE EVALUATED MORE DURING FINAL DESIGN.
2. BOTTOM OF GABION MATTRESS OR RIPRAP TO CONFORM TO EXISTING SPILLWAY BOTTOM. IF LOW SPOTS ARE ENCOUNTERED REFER TO DETAIL 1.

SOURCE: DRAWING NO. C-3, SPILLWAY IMPROVEMENT - PLAN AND PROFILE, (CH2M, January 2015a)

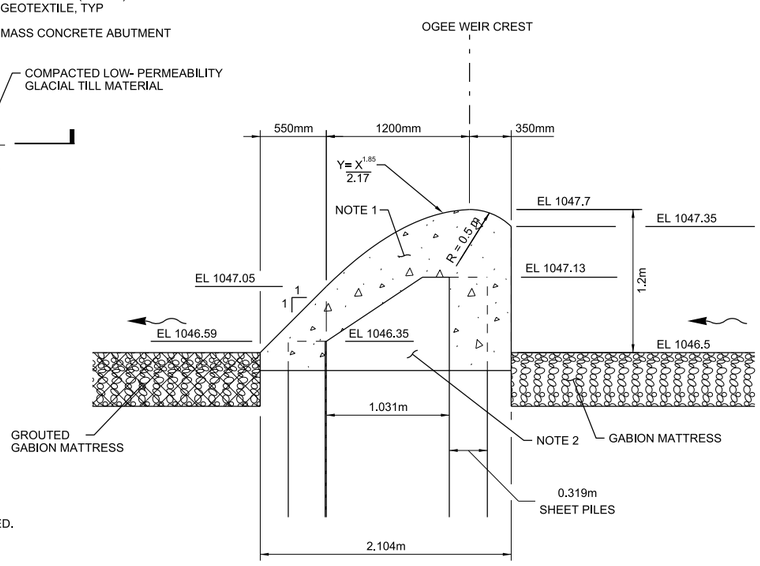
PROFILE "S"

SCALE: HORIZ: 1:1000 VERT: 1:200 (FULL SIZE)
HORIZ: 1:2000 VERT: 1:400 (HALF SIZE)

FIGURE 9-8
Interim ID Spillway Plan & Profile
Faro Mine Remediation Project



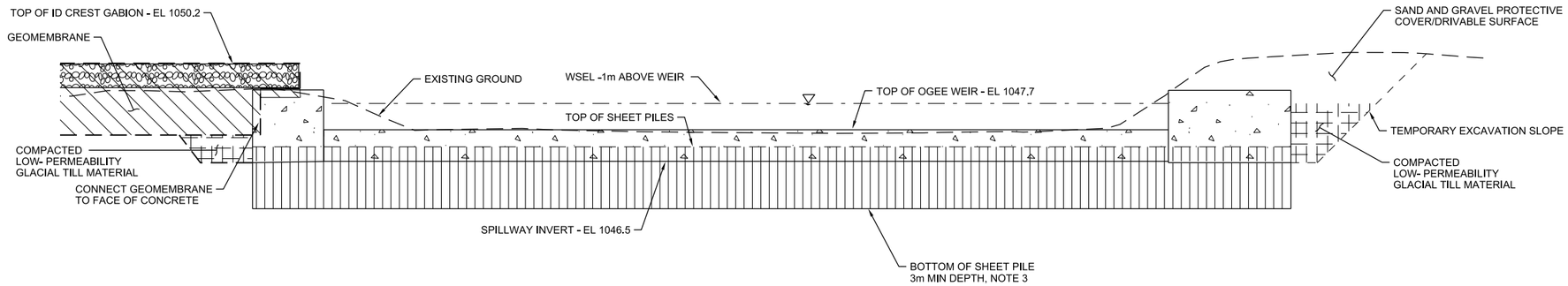
1 OGEE WEIR PARTIAL PLAN
1:100
FIG A-8



B SECTION
1:25

NOTES:

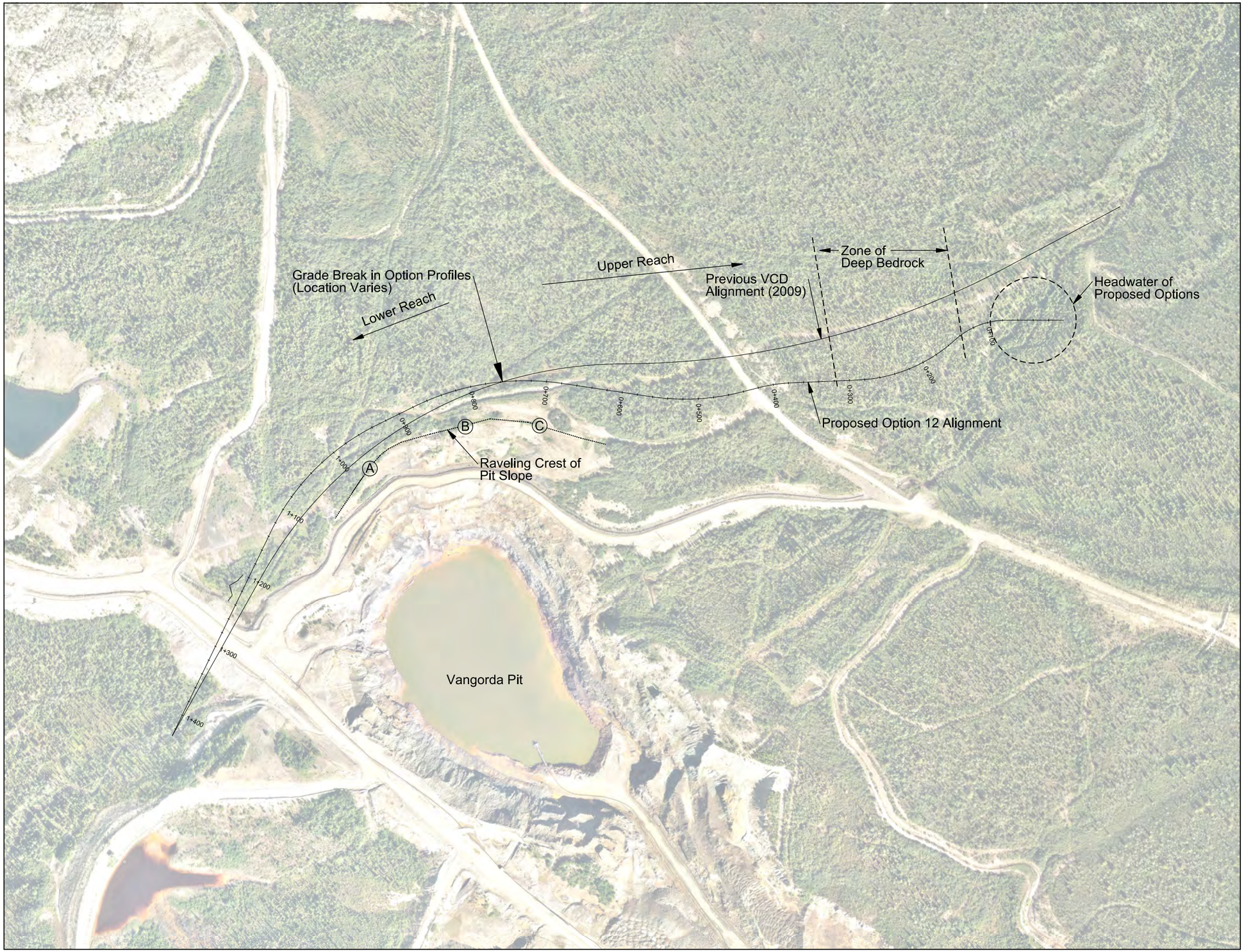
1. REINFORCED CONCRETE. WILL EVALUATE CAST-IN-PLACE AND PRECAST OPTIONS IN FINAL DESIGN.
2. INFILL MATERIAL TYPES WILL BE EVALUATED IN FINAL DESIGN TO REDUCE THE AMOUNT OF CONCRETE REQUIRED.
3. SHEET PILE DEPTH TO BE DETERMINED IN FINAL DESIGN.



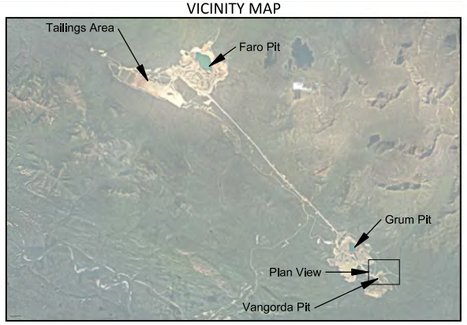
A SECTION
1:100

SOURCE: DRAWING NO. C-11A, SECTIONS AND DETAILS - OGEE WEIR, (CH2M, January 2015a)

FIGURE 9-9
Interim ID Spillway Ogee Weir
Faro Mine Remediation Project



VICINITY MAP



N

Drawing Scale = 1:5000H

Source: Task Authorization 018(A) Vangorda Diversion Design Definition, (CH2M, March 2014g).

FIGURE 10-1
Vangorda Creek Diversion - Diversion Features
Faro Mine Remediation Project

2016_CDRM_Figure10-1.dgn 4/4/2016 1:30:31 PM

Appendix B
Data Gaps Crosswalk

APPENDIX B

Data Gaps Crosswalk Comprehensive Design Road Map

Introduction

One of the first activities conducted by CH2M HILL Canada Limited (CH2M) after coming under contract to the Government of Yukon was to review the Draft 4A Closure Plan (SRK, March 2010a) and existing data and reports for the Faro Mine Remediation Project. Based on this review, CH2M identified gaps in existing Faro Mine Complex (FMC) information that would be necessary to support preparation of a *Yukon Environmental and Socio-economic Assessment Act* Project Proposal. The data gaps were identified based on the assumption that a 60 percent level of design would be required for submission of the Project Proposal.

CH2M recommended field investigations to address both engineering and regulatory gaps of information and data. These recommendations were summarized in tabular form in the Gaps Assessment Report (CH2M, February 2012c) and Revised Gaps Assessment Report (CH2M, March 2014o).

For this Comprehensive Design Road Map Report, CH2M has reviewed and augmented the tables included in the Revised Gaps Assessment Report. Columns have been added to describe and document whether specific gaps identified in the Revised Gaps Assessment Report have been addressed since preparation of that report. Where available, references are listed identifying reports or other documents that have been prepared to address the data gap. Remaining data gaps are identified.

Many of the data gaps identified in the 2012 and 2014 reports have been addressed, or are no longer identified as data gaps, as a result of the following:

1. Field work has been completed to address the data gap.
2. Analyses has been completed showing that additional field work is not necessary to address the particular data gap.
3. The data gap is specific to the Vangorda/Grum Area and that area has been removed from the Faro Mine Remediation Project.
4. The understanding of the level of design required for preparation of the Project Proposal has changed since preparation of the 2012 and 2014 data gaps reports.
5. The scope of work needs to be re-evaluated based on changes to the design, identification of alternative design approaches, and discussions with YG, INAC, and the IPRP.

The process of comparing and documenting whether data gaps have been addressed is referred to as the Gaps crosswalk comparison. The updated Gaps Assessment tables documenting this crosswalk process are included in this appendix. Tables are included for both engineering gaps (Appendix B-1) and regulatory gaps (Appendix B-2).

Table B-1. 2016 Engineering Gaps Analysis Table

Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
SW-001	Mapping	Sitewide	Visual Aesthetics mapping for reclamation landscape planning. Provide detailed topography required for design at select locations.	Location of permafrost areas for planning of engineering structures. Existing onsite surface material quality and texture. Existing onsite vegetation status.	Prepare current surface cover mapping; include layers for particle size distributions, existing vegetation type, and density. Multi-spectral satellite imagery to assist with delineation of wet areas and zones of frozen sediment. Need to check whether 2012 aerial photography (which included infrared) is adequate).	Existing utility data; existing above ground and buried pipelines. Bathymetry surveys; IP Pond, Polishing Pond, Vangorda Pit, Grum Pit. Select locations may require surveys in key areas where tree cover may reduce accuracy of LIDAR mapping. Geotechnical and chemical sampling location to date. Review vegetation regrowth on Faro, Grum, and Vangorda dump sites. Nested, comprehensive, fertility/texture data mapped onto surface topography.	Y Y Y Y Y N	Surveyed and inventoried sitewide water conveyance infrastructure (CH2M February 2016b) Mapping webviewer developed and operational Bathymetric survey of Cross Valley Dam Pond complete' Bathymetry surveys planned of Intermediate Dam Pond complete June 2016; Vangorda Pit and Grum Pit removed from scope of work. Surveyed all new sample locations Surveyed all new sample locations Conducted sitewide Vegetation and Soil survey Work stopped on preparation of Project Proposal	CH2M Canada Limited (CH2M). March 2016c. *Water Conveyance System Mapping and Inventory, Faro Mine Remediation Project.* Technical memorandum. (Final). Prepared for Government of Yukon. March 21. See CDRM/ Section 2.8 Aurora Geosciences Ltd. April 2016. Draft Technical Report Hydrographic and Sub-Bottom Profiling Survey – Cross Valley Dam Pond. Prepared for CH2M HILL Canada Limited. April 25. See individual data and field reports See individual data and field reports CH2M HILL Canada Limited (CH2M). March 2015kk. Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal. (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9.	None for pipelines; still remaining for powerlines, buildings, misc structures; existing waste disposal areas Routine updates and maintenance as additional data is produced Comphrehensive GIS mapping with all data (vegetation/ soils/ chemistry/ etc.) not prepared
SW-002	Data Management and Chemistry	Sitewide	Incorporate additional historical electronic analytical, geochemical, and geotechnical data into warehouse if acquired. New data added to the database as acquired.	Formatting of available electronic data requires additional processing to incorporate into data warehouse, and data that require processing before being loaded into the database will need QA/QC validation.	Integrate chemical and geotechnical data with GIS for SharePoint lookup.	Uncertain until data compiled and reviewed.	N	Database structures completed; valid location names identified and corrected; valid values for all fields tested and corrected. Systems established for uploading and validating EMLINE data and new electronic data from laboratories. All existing EMLINE data, all CH2M analytical data, soil index testing results obtained since 2012 entered into database	CH2M HILL Canada Limited (CH2M HILL). March 2013g. Data Quality Objective Review Process for Environmental Monitoring at the Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 29. CH2M HILL Canada Limited (CH2M HILL). August 2013a. Faro Mine Complex Site-wide Sampling Definition 2013-2014, Faro Mine Remediation Project. Technical memorandum. Final. Prepared for Government of Yukon. August 19. Quality Assurance and Quality Control Review and Data Set Build Process, Faro Mine Remediation Project, March 2016 Update	Database needs final QA/QC to remove some data duplication; will need to be updated to include future data as data is collected by other contractors, requires routine updating from EMLINE, and requries instruction manual for use and maintenance
SW-003	Site Access Roads	Sitewide	Design access roads to provide reliable access to critical site locations during large storms events.	Design criteria for Access Roads; current capacity. Existing culvert capacities and physical condition.	Design flow for culvert and drainages, loading capacity and use, requirements for all-weather access.	Condition survey of existing roads for use in short-term and long-term access.	N	Work stopped on preparation of Project Proposal	N/A	Condition survey of existing roads; determination of what access roads will be retained as part of closure planning
SW-004	Regional Groundwater Flow Modelling	Sitewide	Prepare a site-wide groundwater flow model of the Faro Mine Area and the Vangorda/Grum Area. This will be two separate models, one for each area. These models will provide estimates of groundwater flow directions, rates, and exchange between the surface water and groundwater systems within the model domain. The groundwater flow models will be used to estimate contaminant loading from groundwater to surface streams, support the design of groundwater interception systems, and evaluate the sensitivity of the performance of various waste rock cover systems on groundwater flow rates and SIS effectiveness.	The magnitude of the water budget components of the Faro Mine and Grum/Vangorda systems. The GoldSim model will provide initial estimates of these quantities. The bedrock topography across the site, the spatial distribution of the hydraulic properties of the weathered rock aquifer and alluvial aquifer systems. The spatial and temporal distribution of hydraulic interaction between the surface water and groundwater systems.	Interpretation and integration of existing site water budget data with information collected during the 2012 field effort to develop a quantitative conceptual model of the site and convert that conceptual model into a numerical groundwater flow model.	The bedrock topography across the site, the spatial distribution of the hydraulic properties of the weathered rock aquifer and alluvial aquifer systems. The spatial and temporal distribution of hydraulic interaction between the GW/SW systems. Collects results of fieldwork for individual areas of interest such as geophysics, drilling, well installation, and aquifer testing to use for the development of a regional GW flow model.	N Y	Site-wide modelling completed; higher resolution grids developed for CVD SIS and for NFRC. No modelling completed for Vangorda/Grum Area - removed from scope of work. See area-specific investigations	CH2M HILL Canada Limited (CH2M HILL). March 2014e. Cross Valley Dam Seepage Interception System Phase 2, Groundwater Modelling, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. March 28. (Appendix A to Task Authorization 016 Down Valley Interim Hydraulic Upgrades Phase 2 – Basis of Design Report [60% design]) CH2M Canada Limited (CH2M). April 2016c. Fiscal Year 2015 Groundwater Flow Model Development Report, Faro Mine Remediation Project. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. April 5. CH2M Canada Limited (CH2M). March 2016. North Fork of Rose Creek Groundwater Report (Appendix C in Preliminary Final Design Basis Report, North Fork of Rose Creek Realignment Project). Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31. See individual data and field reports, listed in CDRM Appemn	None for Faro Area; No work completed on Vangorda/Grum area
SW-005	Surface Water Modelling	Sitewide	Developed site-wide hydrological model HEC-HMS in 2012, 2013 including all major conveyance elements and structures. Modeled subcatchments to be used as tool for site-specific remediation activities including diversion designs. Water balancing and support for other disciplines. A number of site specific hydraulic models were also developed to assess the Rose Creek diversion options. Additional site specific hydraulic models will be developed as required.	Some model parameterization components such as infiltration rates under various cover scenarios at some remedial areas on the site such as rock waste dumps are still unknown but will be supplied from efforts in other technical areas such as GW and re-vegetation. Cover types in certain areas will be supplied from assessments in re-vegetation areas. The extent of the model discretization in certain areas such as the waste rock dumps is to be determined as it related to needs of particular diversion designs. The interaction of GW and surface water will be further examined and incorporated into modelling considerations. Uncertainties exist regarding the closure of several conveyance components, RCDC, Vangorda Creek, North Fork Rose Creek and additional opportunities for Grum Interceptor Ditch. These are to be assessed through alternatives review.	Refinement of existing HEC-HMS hydrological model specific to each diversion design need and modelling of design storms specific to each diversion/catchment area. Integration of GW/SW interactions into hydrologic modelling. Some site specific hydraulic modelling is required to provide water surface profiles for some diversion structures. Additional flow monitoring at selected locations and acquisition of physical site data that vary by specific location onsite and diversion objectives is being collected as part of 2013 field efforts. Physical site data including infiltration rates at specific features such as waste rock dumps and under various cover scenarios.Bed and bank materials characterizations to be carried out based on diversion design requirements. Integration of re-vegetation and covers designs into catchment area model descriptions.	Infiltration rates at specific areas including waste rock dumps under various cover scenarios. This will be provided through efforts in GW and re-vegetation discipline through modelling, literature reviews, and review of existing site data. Site specific physical data such as bed and bank materials within diversions. Cover types in specific catchment areas. Sub-catchment delineation in site specific model areas such as waste rock dumps.	N Y N Y	Calibrated Meteorological stations. Work stopped on preparation of Project Proposal Bathymetric survey of Rock Drain Pond ; Geomorphic assessment and Bed and bank material characterization completed in FCD, NFRC, Vangorda Creek Diversion, Upper Guardhouse Creek and North Wall Interceptor Ditch Work stopped on preparation of Project Proposal Subcatchment areas for WRD and NFRC delineated	CH2M HILL Canada Limited (CH2M HILL). March 2014m. 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M HILL). March 2014m. 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M HILL). March 2014d. 2013 Vangorda Creek Diversion Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M HILL). March 2014m. 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M). March 2015k. Summary of 2014 Field Investigation – Lower Guardhouse Creek Interception FSP Name: 102.4 – Lower Guardhouse Creek Interception. Technical memorandum. Prepared for Government of Yukon. March 19. CH2M HILL Canada Limited (CH2M). March 2015n. Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area FSP Name: 105.2 – Install Emergency Tailings Area Surface Water Collection System. Technical memorandum. Prepared for Government of Yukon. March 9. CH2M HILL Canada Limited (CH2M). March 2015i. Summary of 2014 Field Investigation – Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch FSP Name: 102.1 – Faro Creek Diversion (East Valley); 102.2 – Faro Creek Diversion (West Valley Interceptor Ditch). Technical memorandum. Prepared for Government of Yukon. March 18. CH2M Canada Limited (CH2M). March 2016i. North Fork of Rose Creek Hydrology/Hydraulics Report (Appendix B in Preliminary Final Design Basis Report, North Fork of Rose Creek Realignment Project). Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31. CH2M Canada Limited (CH2M). April 2016h. Summary of 2015 Field Investigation – West Side and East Side Diversions, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. April. CH2M HILL Canada Limited (CH2M HILL). November 2014l. Faro Mine Vegetation and Soils Baseline Report, Faro Mine Interim Works. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. November. (Appendix 6F to the Final Draft Faro Mine Interim Works Project Proposal) CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9. CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March.	Additional flow monitoring stations installed in 2015; requries monitoring; calibration; data compilation. For all stations - record stage data and measured flow during elevated flow conditions; for all stations; dedicated monitoring by knowledgable staff required Use soil data from soils report and getech investigations to estimate infiltration rates, cover type compatability and benefits of applying different covers to reduce infiltration and provide geotechnical stability for regrading. Use soil data from CH2M, November 2014l and individual geotechnical investigations to estimate infiltration rates, cover type compatability and benefits of applying different covers to reduce infiltration and provide geotechnical stability for regrading.

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
						Conduct field surveys for use in SW modelling; cross sections, floodplains, structures etc. Confirm locations and scope through field reconnaissance. This will be completed for individual activity locations	Y	Completed channel cross section surveys in FCD, NFRC, Upper Guardhouse Creek, Vangorda Creek Diversion, RCD, North Wall Interceptor Ditch, South Fork Rose Creek Installed water level transducers at additional SW stages in FCD, NFRC, SFRC, and RCD Work not completed for VGA/ work stopped	(Report Link), (CH2M HILL Canada Limited (CH2M). March 2015k. Summary of 2014 Field Investigation – Lower Guardhouse Creek Interception FSP Name: 102.4 – Lower Guardhouse Creek Interception. Technical memorandum. Prepared for Government of Yukon. March 19. (Report Link),(CH2M HILL Canada Limited (CH2M). March 2015n. Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area FSP Name: 105.2 – Install Emergency Tailings Area Surface Water Collection System. Technical memorandum. Prepared for Government of Yukon. March 9. CH2M March 2015i) CH2M HILL Canada Limited (CH2M). December 2015i. Faro Mine Complex Design Flood Manual. Draft Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. December 11.	
SW-006	Site-Wide Groundwater/Surface Water Management Plan	Sitewide	Develop an overall site-wide strategy that considers the GW/SW objectives and key performance indicators (KPI) required to integrate the various onsite GW/SW activities. GW/SW man-agement activities assessed within an adaptive management plan (AMP).	Interactions of the GW and SW components. AMP integration of hydrology/hydraulic, groundwater, aquatics, wetland and terrestrial systems, and socio-economic objectives for water management planning.	Integration of all GW/SW diversion/water quality objectives and KPIs. Integration of aquatics, wetland, terrestrial systems, and socio-economic KPIs.	Objectives and KPIs on a site-wide basis for related disciplines.	N	Site-wide surface water plans were developed and presented to IPRP/ INAC/YG in series of meetings held in 2014 and 2015. Work stopped on VGA	CH2M HILL Canada Limited (CH2M HILL). December 2014a. Faro Mine Complex – 2015 Water Management Plan. Final – For Approval. Prepared for Government of Yukon. December 14. Independent Peer Review Panel (IPRP). February 2015. Technical Memorandum re: Review Comments – Faro Mine Remediation Project Joint Design Team/IPRP Workshop – Faro Mine Remediation Plan. February 10-12, 2015. Independent Peer Review Panel (IPRP). September 2015. Technical Memoradum re: Faro Mine Site Visit June 8th to 10th - Report on Site Visit and Presentations by CH2M HILL. September 8.	Partial agreement from IPRP in response to Water Management Plan. Additional agreement for specific areas required.
SW-007	Cover Design Surface Analysis	Sitewide	Coarse woody debris as erosion control and revegetation cover support has been proposed; however, source, storage, and implementation have not been assessed. CHRM model results used to design and evaluate alternative covers need to be evaluated fully and tested against current performance on Grum Sulphide Cell. Other unsaturated flow models (SHAW and VADOSE/W) need to be evaluated to model flow and snow/snowmelt effects. Cover infiltration descriptions suggest uncertainty regarding how the tailings cover will work with respect to vegetation cover.	Meso- and micro-topography information is missing from the cover type information and is a critical factor for this ecosystem. Resulting suitability for vegetation types and cover volumes needs to be assessed to provide appropriate topographic and planting opportunities. Vegetation cover types depend on cover depth and microsite variation. Providing topography may require greater cover depths or gentler slopes to allow working of the cover material, which affects the material balance and landform planning. Surface treatments cited in the C&R Plan are not used on maps – DSS, RAS, WDS, and SCS. Must re-evaluate the assumptions for very-low- and low-infiltration covers and locations shown in C&R Plan; compacted till may be adversely affected by freeze-thaw cycles. Consider ET cover design instead of, or in addition to, low infiltration covers for areas where cover material selection is proposed.	Review surface treatment types and reconcile to current reclamation plan. Coarse, woody debris usage needs to be assessed for feasibility. Review CHRM model results with Grum Sulphide Cell performance. Need to review low- and very-low-infiltration cover locations onsite. Application of alternative unsaturated flow model (SHAW or VADOSE/W). ET cover design evaluation as addition to or replacement for low-infiltration covers. Function of cover materials is different for waste rock and tailings. Clarify cover expectations and revegetation planning over tailings for EA Reconciliation of surface treatments from C&R Plan to current mapping of the site. Reconciliation of meso- and micro-topography requirements (for different cover types and revegetation requirements) with available cover material volumes. Review basis of design for Reclamation Landform Unit (RLU) surfaces and amendments, including topography, cover material type, and surface amendments. Analysis will be conducted related to waste rock dumps regrading and resloping related to the impacts of snow accumulation (particularly due to wind loading and wind redistribution) on: Landform design as it pertains to resloping and regrading waste rock dumps, snow loading on the leeward side of landforms, and upslope migration and deposition of snow in depressions on windward faces. The geometry of proposed surface water management channels, conveyance of spring meltwater, snow blockage, and construction approaches that reduce mechanical clearing and provide capacity to keep meltwater contained in the channel.	Assessment of coarse woody debris sources, storage, and application onsite to support this as a basis for reclamation surface design. Check on area application of RLU types in current plan; review for new closure surface including ET covers. Confirmation of very-low-infiltration cover performance and predictions of CHRM model. Application of alternative unsaturated flow model. Review ET cover design implications for very-low- and low-infiltration covers. Bulk density data for proposed cover materials, which are required to relate to soil erosion and vegetation establishment data. Initial soil bulk density is a critical factor in the success of any proposed ET soil cover. Measure soil-water characteristic curves (SWCC) for representative growth media (till and fines).	N N N N N N N	Work stopped on preparation of Project Proposal Site visit and covers workshop completed in 2015		Most elements of cover design need to be addressed; Cost benefits of limiting infiltration, Cost benfits of reducing inflow to Faro Pit or NFRC required for treatment Continue pore gas and temperature profiling to monitor waste pile maturation. Final selection of cover types; idetification of soil amendment source
SW-008	Integrated Site Closure Plan	Sitewide	Completion of a closure drainage (surface and groundwater sources_ and allied landform plan, then overlaid by cover materials (soils) and revegetation plan. Required to be basis of closure impact and residual risk analysis for site environmental assessment, and to provide footprint information for drainage, access and landform features of the closure landscape to inform construction activities.	Closure plan for the site does not currently exist. A reclamation landform units plan exists in minimal detail, but it does not integrate drainage (or wet landscape) details or specify soil and vegetation prescriptions.	Completion of integrated closure planning will require input from the following technical disciplines: · Hydrology · Water quality · Hydrogeology · Risk assessment · Waste rock and covers · Revegetation/reclamation · Construction sequencing · Wildlife and fisheries	Planning activities will require integrated plan review meetings for all disciplines, focused workshops on key disturbed/undisturbed interface locations (NFRC, Emergency Tailings Area) and development of ArcView mapping layers for an integrated drainage plan, overlaid by soil prescription and vegetation (wetland and upland) layers.	N	Work has been completed under individual disciplines (groundwater, hydrogeology) and covered in site-specific activities; not compiled into integrated plan Arcview mapping layers not developed Work stopped on preparation of Project Proposal	CH2M HILL Canada Limited (CH2M HILL). December 2014a. Faro Mine Complex – 2015 Water Management Plan. Final – For Approval. Prepared for Government of Yukon. December 14. Independent Peer Review Panel (IPRP). February 2015. Technical Memorandum re: Review Comments – Faro Mine Remediation Project Joint Design Team/IPRP Workshop – Faro Mine Remediation Plan. February 10-12, 2015. Independent Peer Review Panel (IPRP). September 2015. Technical Memoradum re: Faro Mine Site Visit June 8th to 10th - Report on Site Visit and Presentations by CH2M HILL. September 8.	Compilation of existing work required and agreement on Water Management Plan Arcview mapping to be developed
SW-009	Revegetation Materials Planning and Sourcing	Sitewide	Sourcing revegetation materials will require a 4- to 5-year lead time to grow plant material and prepare the large volumes of planting material for use exactly when required for erosion control.Seeding materials need to be sourced and checked for reliable quality with respect to weedy seed inclusion and large volumes required for native species and proposed agronomic species.	Helicopter seeding has been proposed for steep revegetation areas; this needs to be assessed for feasibility, cost, seed volume, and timed with regrading and cover material sequencing. Some materials are planned to be whips or cuttings; source areas need to be identified for capacity to provide material and whether the areas have been assessed in the environmental assessment. Additional source areas may be required and must be identified. Methods of collection and planting need to be assessed for large areas planned in annual reclamation increments. Use of legume species for soil nitrogenation and revegetation support. Assessment of capacity for projected vegetation volumes needs to be performed so that material is grown with a 4- to 5-year lead time prior to revegetation requirements. Not clear if facilities outside the province would be required to provide bulk vegetation volumes for annual reclamation.	Review of potential vegetation sources, with preference for (1) First Nations greenhousing or propagation facilities and (2) Yukon-based facilities. Environmental assessment needs to review if vegetation cutting/whip collection areas have been included in assessment. These need to be optimized to map potential donor areas with areas likely to be disturbed during construction and access work.	Identification of potential greenhousing and nursery facilities. Identification of suitable seed sources and cutting/whip sources to be included in the local study area, if required. Identification of seed application methods to be considered in reclaimed surface preparation including helicopter, hydroseeding, or surface application.	N	Work stopped on preparation of Project Proposal		All work remaining
SW-010	Sitewide Soils Mapping	Sitewide	Soils data are currently dispersed in different formats and documents. Need site-wide database of soil quality to provide basis for material movement and balance, and planned reclamation covers.		Need to categorize data to help identify problematic high or low levels of Ph, Pb, As, Zn, and coarse fragments. Consolidation of current soils information needs to be augmented with baseline data collected for new borrow areas.	Production of site-wide soil database to house existing data and new baseline data to be collected for new borrow areas. Identification of problematic Ph, metals, and coarse fragment levels to assist in allocation of cover materials to reclaimed surface planning.	Y Y	Completed site-wide soil characterization survey (CH2M February 2015c) Compiled results of all borrow investigations ; scope for investigating Tailings Borrow Area West not approved	CH2M HILL Canada Limited (CH2M). February 2015c. *Site-wide Soil Characterization Report, Faro Mine Remediation Project*. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9. CH2M HILL Canada Limited (CH2M). March 2015hh. *Borrow Baseline Design Criteria Report, Faro Mine Remediation Project*. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March.	Potential till sources in Faro Mine Area could be further defined; very limited near surface sampling took place at Tailings Borrow Area West
SW-011	Update 2004 Site-Specific Seismic Hazard Assessment	Sitewide	The seismic hazard assessment was updated in 2013 by Dr. Gail Atkinson (Final Report titled Seismic Hazard Assessment for Faro, YK, April 2, 2013).	None.	None.	None.	Y	Seismic stability Assessment Completed	CH2M HILL Canada Limited (CH2M HILL). February 2013d. Update on the Tectonic Setting of the Faro Mine Complex, Faro Mine Remediation Project. Technical memorandum. Prepared for Government of Yukon. February 12. Atkinson, Gail M., Ph.D., P.Geo. and Assatourians, Karen, Ph.D. April 2013. *Seismic Hazard Assessment for Faro, YK . Final Report:* April 2. Prepared for CH2MHILL Canada Ltd. April.	

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
SW-012	Identify Additional Areas with a High Probability of Becoming Contaminated Groundwater Discharge Pathways in the Future	Sitewide	Identify additional areas with a high probability of becoming groundwater discharge pathways in the future as ARD reactions continue to accelerate. Support the development of a long-term monitoring network that will identify areas of degrading groundwater quality and potential ARD pathways to be addressed through the AMP.	Implications of new excavations along toe of existing waste rock dumps associated with trenching and borrow source development. May need to design sump areas to collect seepage along the waste rock perimeter and incorporate in GW/SW interaction model.	Perform GIS analysis comparing current topography with pre-mining topography to identify buried drainages that may concentrate groundwater discharge.	Further investigate areas with a high potential to be future contaminant seepage pathways.	N	Developed Site-wide (Faro Mine Area and RCTA) groundwater model showing flow paths from all Waste Rock Dumps Work stopped in Vangorda Grum Mine Area	CH2M Canada Limited (CH2M). April 2016c. Fiscal Year 2015 Groundwater Flow Model Development Report, Faro Mine Remediation Project. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. April 5. CH2M Canada Limited (CH2M). April 2016e. Groundwater Analysis, Faro Mine Remediation Project. Draft. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March. CDRM Appendix	CH2M recently (2016) compiled additional pre-mining topographic maps into 1 mapping file; this needs to be compared with 2012 mapping
SW-013	Delineation of Permafrost at Faro Mine and Grum/Vangorda Area	Sitewide	The presence of massive or discontinuous permafrost within the groundwater system has a significant influence on groundwater flow directions, rates, and SW/GW interaction.	The design of an effective SIS requires knowledge of permafrost in the immediate area of the system. Permafrost may also alter contaminant migration pathways and require modification to groundwater monitoring network designs.	Perform detailed literature review to located previous studies or field investigations that delineated permafrost extent at the FMC. Proposed geophysical surveys in the vicinity of SIS installations can be expanded to identify the presence of permafrost in those areas. This is the same permafrost survey identified under the regulatory data gaps.	The potential for permafrost to influence the effective operation of the groundwater interception systems. Evaluate the potential of using multispectral satellite imagery and post-processing to identify areas with a high probability of having near-surface permafrost.	Y N	See area- specific investigations. Probability mapping presented the NFRC DBR report Work stopped on preparation of Project Proposal	CH2M Canada Limited (CH2M). March 2016. Preliminary Final Design Basis Report, North Fork of Rose Creek Realignment Project). Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31.	Work completed for NFRC area; not other areas. Compilation of frozen conditions encountered by soil borings and test pits needs to be compiled on site-wide basis Work not completed on Vangorda/Grum Area
SW-014	Site-wide Water Balance Model and Piezometer Installation	Sitewide	Develop an integrated GW/SW model that will provide an estimate of the site-wide water balance, contaminant loading, and surface water quality. Install piezometers into the Grum, Vangorda, and Faro waste rock dumps to monitor seasonal groundwater level fluctuations using recording pressure transducers.	Existing model assumptions pertaining to flow/drainage conditions applications and geochemical model for waste rock dumps and tailings. Quality of existing and new data needs to be evaluated and confirmed for appropriate use. Magnitude of fluctuation in groundwater levels driving the geochemical reactions within the waste rock.	Review current model capabilities pertaining to water balance and model functionality. Build mass balance equations in the model to track water throughout the system under different hydrologic conditions and stages of remediation. User interface will be developed that facilitates sensitivity studies, summarizes all the user inputs, and promotes tool functionality. Check of the improved model equations and conduct model runs at different scenarios. Conduct sensitivity analysis on key parameters that influences the water balance and contaminant loading throughout the system. Develop post-processing tools to report results and summarize results of predictive modelling. Incorporate the observed groundwater level fluctuations into the geochemical analysis performed to estimate future seep and groundwater quality.	Update infiltration and cover infiltration data with more accurate data if available. SRK (2006) provided an update to the infiltration rates, more recent data might be available. Information about the tailings location and how they are connected in the water balance. Need access to the site hydrologic and analytical data and compile site-wide hydrologic and flow data. Calibrate model with existing field conditions from field data. Magnitude of seasonal groundwater level fluctuation within Faro, Grum and Vangorda waste rock dumps.	N N Y	Work stopped on preparation of Project Proposal Development of remediation plan for NFRC prioritized in 2015 to address developing issue of contaminated seepage from Intermediate WRD. Continuous water level monitoring completed in Faro, Grum and Vangorda WRDs	CH2M Canada Limited (CH2M). April 2016l. Preliminary Final North Fork Rose Creek Realignment Project Design Basis Report. Prepared for Government of Yukon. CH2M HILL Canada Limited (CH2M HILL). October 2013b. Waste Rock Dump Monitoring Report. Technical memorandum. Final. Prepared for Government of Yukon. October 29. CH2M HILL Canada Limited (CH2M HILL). March 2014c. 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31. CH2M HILL Canada Limited (CH2M). March 2015b. Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31. CH2M Canada Limited (CH2M). April 2016d. Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring, FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. April 15.	Update infiltration and cover infiltration data Model inputs will need to be updated as additional surface water quantites and quality become available and change through time Data not compiled or evaluated for VGA
SW-015	Develop Geochemical Loading Models	Sitewide	Develop individual geochemical models for the waste rock dumps, the Rose Creek Tailings Facility, and the three pit lakes. Integrate into the overall site-wide water balance model to generate a comprehensive predictive water quality model for the site.	Currently do not have possession of geochemical models developed for the waste rock piles and Rose Creek Tailings Facility. Existing modelling did not include three pit lakes. Assume requirement to rebuild geochemical models for waste rock piles, tailings facility, and pit lakes.	Review of the working functions of all current models and submodels. Current model feeds on a series of geochemical submodels for each facility type (that is, WD, pit, TSF), which in turn are based on a series of field and lab tests and assumptions. Field and laboratory tests included oxygen and temperature profiles and static and kinetic laboratory testing. Review additional documents pertinent to the model development may also be necessary (for example, geochemical reports).Spreadsheet database working functions need to be developed and the model needs to be calibrated and compared to the existing geochemical component of the GoldSim model. Exportable outputs need to be developed to export into the GoldSim model.	Anticipate water quality of surface runoff and seepage from waste rock dumps during construction and leaching potential and sediment loading potential of freshly exposed (regraded) waste rock from each of the waste rock dumps. Update geochemical sub models based on historical and field data to use as inputs to the GoldSim model. Update model with latest data available for each source included in the model (that is, 33+WRDs, 3 pits, and 2 TSF).	N N N	Drilled and install 10 GW, pore gas and thermistor port installations in sitewide WRDs; Completed 3x annual (Spring, Summer and Winter) monitoring of CH2M and Existing SRK WRD installations. Completed site-wide seep sampling and pit lake profiling Drilled and install GW monitoring cluster in north portion of Intermediate Tailings Drilled and installed 2 GW monitoring clusters in the Original Tailings Impoundment at mouth of the ETA canyon Work stropped on preparation of Project Proposal	CH2M HILL Canada Limited (CH2M HILL). October 2013b. Waste Rock Dump Monitoring Report. Technical memorandum. Final. Prepared for Government of Yukon. October 29. CH2M HILL Canada Limited (CH2M HILL). March 2014c. 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31. CH2M HILL Canada Limited (CH2M). March 2015b. Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31. CH2M Canada Limited (CH2M). April 2016d. Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring, FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. April 15. CH2M HILL Canada Limited (CH2M). March 2015l. Summary of 2014 Field Investigation – Relocate Oxide Fines to Low-grade Stockpile "C" FSP Name: 104.1 – Relocate Oxide Fines to LGSPC. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015o. Summary of 2014 Field Investigation – Delineate Main and Intermediate Sulphide Cells for Regrading and Capping Design FSP Name: 106.1 – Regrade and Reslope Main and Intermediate Sulphide Cells. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015p. Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Upper Surface) FSP Name: 106.2 – Regrade and Reslope Faro Waste Rock Dumps (Upper Surfaces). Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M HILL). February 2014q. 2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 7. CH2M HILL Canada Limited (CH2M). August 2016j. Summary of 2016 Field Investigation Site-wide Geochemical Monitoring, Field Sampling Plan: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. August 18.	Completion of site-wide geochemical model required for effects assesment (for completion of Project Proposal)
Faro Mine Area (Activity Code 100)										
101 – Faro Pit Safety Berm										
101.1	Faro Pit Wall Stability Management	Faro Mine WRDs and Faro Pit	Evaluate pit wall stability and consequences of failure	Long term stability of pit walls and long term management requirements. Consequences of pit wall failures - a rapid slide in pit may cause wave that could endanger pumping infrastructure and operating personnel)	Field inspection and evaluation to determine requirements/needs for (1) analytical stability evaluation, (2) instrumentation and monitoring, and (3) slope management including possible stabilization measures.	Requirements/needs for stability evaluation, subsurface information gathering and instrumentation and monitoring	Y	Complete pit wall stability evaluation geological reconnaissance Drill, install and monitor 2 slope inclinometers and vibrating wire piezometers and 2 standpipe piezometers at Faro Creek Diversion along Northeast wall of Faro Pit. Downhole acoustic televiewer observations performed in boreholes before completing installs to characterize bedrock jointing	CH2M HILL Canada Limited (CH2M HILL). March 2014q. Faro Mine Complex 2013 Pit Wall Stability Inspection, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 26. BGC Engineering Inc. (BGC). March 2016. Faro Open Pit Stability Assessment, Site-wide Design Basis Report. Draft. Prepared for CH2M HILL Canada Limited (CH2M HILL). March 18.	Monitoring of inclinometers, piezometers and monuments required, data compiled and evaluated
101.2	Safety Berm around the Pit	Faro Mine WRDs and Faro Pit	Construct berm around Faro Pit to restrict physical access.	H&S implications regarding the timing of berm construction. Need to allow for ongoing spalling of pit walls; 5-m offsets proposed can be expected to vary.	Identify borrow materials. Evaluate spalling of pit walls.		Y	Geological Reconnaissance completed at Faro Pit	CH2M HILL Canada Limited (CH2M). March 2015oo. Summary of 2014 Field Investigation – Faro Pit Safety Berm; FSP Name: Activity 101.2 – Field Reconnaissance for the Faro Pit Safety Berm. Technical memorandum. Draft. Prepared for Government of Yukon. March 12.	
102 – Surface Water Diversions										
			Relocate existing diversion channel to new alignment up hillside; intercept and convey Faro Creek along the eastern slope of Faro Creek Valley above the existing diversion channel.Evaluate	Discontinuous permafrost, ground conditions, channel seepage losses, water quality, interaction of GW and SW, hydraulic analysis, and stability of the pit wall. Management of localized flows captured in	Reassess diversion options, preliminary design criteria (C&R Plan, Table 4.1) Review of existing information regarding geotechnical, water quality, pit wall stability, channel stability, seepage, hydrology, hydraulics, assess current channel design capacity, diversion opportunities, and icing potentials. Determination of local SW flow characteristics and drainage area to the	New channel bed and bank material characterizations; additional soils data including more information on presence and extent of permafrost and ice content. Golder report (detailed comparison of alternatives) described test pits along alignment but refusal at shallow depths because of permafrost. Geotechnical data gaps at the new diversion channel alignment include Depth to bedrock	Y Y	Completed cross section surveys Completed rapid geomorphic assessment Geological reconnaissance of existing diversion and SRK 2009 Proposed diversion alignment Drill 6 borings, install piezometers and thermistor ports along	CH2M HILL Canada Limited (CH2M). March 2015i. Summary of 2014 Field Investigation – Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch FSP Name: 102.1 – Faro Creek Diversion (East Valley); 102.2 – Faro Creek Diversion (West Valley Interceptor Ditch). Technical memorandum. Prepared for Government of Yukon. March 18. CH2M Canada Limited (CH2M). April 2016g. Summary of 2015 Field Investigation - Faro Valley Seepage Investigation, Faro Mine Remediationn Project, Field Sampling Plan Name: 106.1 – Faro Valley Seepage Investigation. Technical memorandum. Draft. Prepared for Government of Yukon. April 1.	Develop DTMs using cross section data and input into hydraulic analyses

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
102.1	Faro Creek Diversion (East Valley)	East Side ARD Collection and Diversions	design criteria, need for overflow structure where natural creek meets diversion to spill excess floodwater into pit. Address local SW flow to Faro Pit.Consider alternative of building new diversion along the west side that can potentially flow to North Wall Interceptor/Guardhouse Creek.Design to preliminary design level of detail.	Stability of the pit wall. Management of localized flows captured in existing FCDC drainage area. The existing FCDC will remain but will be revegetated. Local drainage will be captured, but the discharge from the existing FCDC needs to be considered in terms of drainage area and seepage and discharge points for high precipitation events that may overflow the revegetated channel.	existing FCDC and pit area have been carried out. This analysis will be refined. Overflow structure foundation and stability evaluations. Potential hydraulic analysis of structure. Permafrost impacts on design considerations. Riparian and floodplain re-vegetation designs. Hydrologic model analysis for design flows in diversion. Diversion design to preliminary level including channel and floodplain geometry, stability and catchment area.	Soil and rock mass strengths Additional flow monitoring data collection at recommended 2013 stations for additional model refinement.	Y Y	Drill borings, install piezometers and thermistor ports along potential FCD alignment Completed 21 surface geophysical transects covering potential FCD alignments Investigated seepage through Faro Valley: Drill and install 3 well clusters Complete aquifer testing and FCD stream flow monitoring Continuous SW level monitoring transducers deployed	CH2M Canada Limited (CH2M). April 2016h. Summary of 2015 Field Investigation – West Side and East Side Diversions, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. April. CH2M Canada Limited (CH2M). September 2016a. Summary of 2016 Field Investigation – Faro Creek Diversion Proposed Realignment, Field Sampling Plan Name: Faro Creek Diversion New Alignment Drilling. Technical memorandum. Draft. Prepared for Government of Yukon. September 5. CH2M HILL Canada Limited (CH2M). August 2016h. Summary of 2016 Field Investigation – Faro Creek Diversion Aquifer Testing, Field Sampling Plan Name: Faro Creek Diversion Aquifer Testing. Technical memorandum. Draft. Prepared for Government of Yukon. August 24.	Complete SW discharge measurments in FCD Monitor SW and evaluate data;
102.2	West Valley Extension	East Side ARD Collection and Diversions	Direct clean water from west side of valley around Faro Pit. Minimize seepage losses.	Same as Activity 102.1.	Same as Activity 102.1.	Same as Activity 102.1.	Y	Same as 102.1	Same as 102.1	Same as 102.1
102.3	North Wall Interceptor Ditch	West Side Diversions	Remediate existing North Wall Interceptor ditch (NWID) and discharge to Rose Creek below Cross Valley Dam; improve or construct access. The Upper Guardhouse Creek flows into the NWID. Water from the creek is generally clean but contributes hydraulic load.Design to preliminary design level of detail.	Discontinuous permafrost.Amount of GW/SW interaction. Water quality. Little information available for area, need care to separate from Lower Guard House Creek. Design criteria needs to be evaluated in the context of the overall closure. Soil cover and revegetation plan required for remediated ditch area. Discharge design for section below Cross-valley Dam needs to be determined. Discontinuous permafrost, ground conditions, channel seepage losses, interaction of GW and SW, hydraulic analysis.	Some site specific hydraulic modelling required to provide water surface profiles. Geotechnical, water quality, channel stability, seepage, hydrology, hydraulics modelling refinements, design storm flows, icing, soil cover, and revegetation options. Limited data have been collected from the UGC and the NVID in terms of site-specific information. The valley slopes are extreme and determining channel capacity and design for erosion control is key. Preliminary information indicates depth of overburden in some areas; uncertain information. Determine impacts of flow on Rose Creek downstream from convergence. Permafrost impacts on design considerations. Diversion design to preliminary level including channel and floodplain geometry, stability and catchment area.	Detailed cross section data including channel and floodplain for Upper Guardhouse Creek and NVID for modelling obtained from LiDAR. Channel bed and bank materials characterizations for modelling. Assess area below Cross Valley Dam for discharge design requirements to Rose Creek – flow management and design requirements. Geotechnical data gaps at the new diversion channel alignment includes the following: Depth to bedrock Soil and rock mass strengths Presence and extent of permafrost	Y Y N Y Y	Completed channel cross section surveys Completed rapid geomorphic assessment Work stopped on preparation of Project Proposal Excavated 5 test pits and completed geological reconnaisance. Further characterization not required for Conceptual Design of Diversion Not observed during test pit excavations or field reconnaissance. Down Valley Tailings design and construction reports indicated permafrost was present at the downstream end of the diversion.	CH2M HILL Canada Limited (CH2M). March 2015i. *Summary of 2014 Field Investigation – Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch FSP Name: 102.1 – Faro Creek Diversion (East Valley); 102.2 – Faro Creek Diversion (West Valley Interceptor Ditch)* . Technical memorandum. Prepared for Government of Yukon. March 18. CH2M Canada Limited (CH2M). April 2016h. Summary of 2015 Field Investigation – West Side and East Side Diversions, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. April.	Assess area below Cross Valley Dam for discharge design requirements to Rose Creek – flow management and design requirements.
102.4	Lower Guardhouse Creek	RCTA	Intercept seepage from mill and stockpiles. Direct water to Faro Pit by pipeline (ETA Activity 105). Install GW and SW monitoring network.Improve or construct access road to the NW Dump near Upper Guardhouse Creek. Remove waste rock between W8 and W10 on Upper Guardhouse Creek. Design to preliminary design level of detail.	Seepage rates, water quality, interception potential, long-term performance of interception. Design criteria provided in the C&R Plan, Table 4.3, require definition and linkage to seepage management and water quality. SW contribution to flows. Hydraulic modelling to contain design flow rates. Establish final design flow rate estimates and integrate evaluation of GW and SW. Evaluate GW interception based on monitoring results. Discontinuous permafrost, ground conditions, channel seepage losses, interaction of GW and SW, hydraulic analysis.	Refinement of hydrologic models to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Establish design flow rate estimates and integrate evaluation of GW and SW. Evaluate GW interception based on monitoring results. Seepage rates, water quality, interception potential, and long-term performance of interception. Design criteria provided in the C&R Plan, Table 4.3, require definition and linkage to seepage management and water quality.	Detailed cross section survey data including channel and floodplain areas; channel bed and bank materials characterizations; soils data including permafrost; historical channel ice data, flow monitoring, and water profile data (surface elevations). Additional flow monitoring data for model calibration and validation. Depth to bedrock and aquifer properties in area of planned seepage collection system. Geotechnical data gaps includes: Depth to bedrock Soil and rock mass strengths Presence and extent of permafrost Permeability of soil and rock Effectiveness of current system and need for enhancement.	Y Y N N N N N N N	Completed geological reconnaissance Completed specific conductivity survey Completed periodic flow and water quality monitoring and at GDHSCK and SRK-FD01 Work stopped on preparation of Project Proposal Need to more fully develop conceptual closure plan to evaluate intended use	CH2M HILL Canada Limited (CH2M HILL). March 2014c. 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31. CH2M HILL Canada Limited (CH2M). March 2015b. Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31. CH2M Canada Limited (CH2M). April 2016d. Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring, FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. April 15.	Need to more fully develop closure plan to evaluate intended use. Cross section surveys if closure plan requires use during construction or post closure Leakage from NWID into LGC needs to be evaluated (dilution of impacted seepage) Geomorphic Assessment Required
103.1	Install Pump in Existing Wells, Piping, Heat Tracing	Faro WRDs and Pit	Reduce effects of contaminant yield from Zone II Pit. Maintain water level in Zone II Pit to maintain gradient towards the pit, away from NFRC. (New well-constructed in FY 2012).	Access and maintenance of year-round pumping system with minimal O&M costs.	Automate operations.	Detail field conditions of pipeline Record operating data (pumping rate, water level, operation duration, etc.)	Y Y	New well constructed by CH2M in 2012 Zone II pumping well operated and monitored by site Care and Maintenance Operator Water conveyance inventory included documentation of Zone II pipeline	CH2M HILL Canada Limited (CH2M HILL). November 2012g. Task Authorization 007 Summary of Zone II Drilling Activities, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Karen Furlong/Government of Yukon (YG). November 1. CH2M Canada Limited (CH2M). March 2016c. Water Conveyance System Mapping and Inventory, Faro Mine Remediation Project. Technical memorandum. (Final). Prepared for Government of Yukon. March 21.	
104 – Oxide Fines and Low-grade Ore										
104.1	Relocate Oxide Fines to Low-grade Ore Stock Piles (LGSP) C	Faro WRDs and Pit	Relocate oxide fines to LGSP C to reduce contamination from these sources to GW and SW. Alternative – Relocate oxide fines to the sulphide cells as a levelling (cushion) layer below the synthetic cover.	Volume of material to be relocated and covered. Foundation conditions of LGSP C (water table, and geotechnical properties) Constructability implications (for example, requirements for specialized equipment or operating procedures). Under the alternative to relocate oxide fines to the sulphide cells, geochemical compatibility of oxide fines with sulphide waste.	Refined volume of oxide fines material to be relocated and covered. Final landform design options, including water management plan – both LCSP C and sulphide cells. Optimize removal and consolidation to reduce footprint and costs; minimize environmental risk (for example, constructability, minimize disturbance). Alternatives Assessment – Relocate oxide fines to LGSP C versus to sulphide cells.	Oxide Fines Stockpile: characterize material types, geochemical and geotechnical properties down to the original topography as well as better definition of the areal extent of the oxide fines LGSP C: Characterize Foundation stability, material gradation, GW characteristics and trafficability. Estimate material volumes in Oxide Fines Stockpile Estimate material volumes in Plant Site Area – Better delineation to assess both the horizontal and vertical (depth below surface) extent of these materials. For alternative to relocate oxide fines to sulphide cells, geochemical compatibility of oxide fines with sulphide waste.	Y Y N N N	Drilled 1 boring in Oxide Fines Stockpile and install GW monitoring well, thermistor port and pore gas ports Excavated 3 test pits in Oxide Fines Stockpile Excavated test pit and collected shallow surface samples in LGSP C Preliminary evaluation of results corroborate depths determined from pre-mining topography Work stopped on preparation of Project Proposal Work stopped on preparation of Project Proposal Work stopped on preparation of Project Proposal	CH2M HILL Canada Limited (CH2M). March 2015l. Summary of 2014 Field Investigation – Relocate Oxide Fines to Low-grade Stockpile "C" FSP Name: 104.1 – Relocate Oxide Fines to LGSPC. Technical memorandum. Prepared for Government of Yukon. March 13.	Need to complete written evaluation Estimate material volumes in Plant Site Area – Better delineation to assess both the horizontal and vertical (depth below surface) extent of these materials. For alternative to relocate oxide fines to sulphide cells, geochemical compatibility of oxide fines with sulphide waste.
	Relocate Medium-grade Ore (MGO),		Relocate MGO to LCSP C to reduce contamination from these sources to GW and SW.	Foundation conditions of LGSP C (water table and geotechnical properties) Health and safety issues of moving MGO and brown/green oxide	Final landform design options – both LGSP C and sulphide cells. Optimize removal and consolidation to reduce footprint and costs; minimize	LGSP C – Foundation stability, material gradation, GW characteristics, and trafficability.	Y	LGSP C – See 104.1 above		Complete geological reconnaissance to write up material characteristics

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
104.2	Including Brown and Green Oxide Fines (Oxide Fines #1) to	Faro WRDs and Pit	Same issue as above. Alternative – Relocate this waste to the sulphide cells as a levelling (cushion) layer below the synthetic cover.	Health and safety issues of moving MGO and brown/green oxide fines. Constructability implications (for example, requirements for specialized equipment or operating procedures). If alternative, geotechnical compatibility of MGO with sulphide waste.	Optimize removal and consolidation to reduce footprint and costs, minimize environmental risk (for example, constructability, minimize disturbance). Alternatives evaluation that includes removing MGO to LGSP C versus to sulphide cells.	MGO – Material gradation. For alternative to relocate MGO to sulphide cells, geochemical compatibility of MGO with sulphide waste, final landform design of sulphide cells (footprint, slope angles, height of capped cell)	N N	Work stopped on preparation of Project Proposal Work stopped on preparation of Project Proposal		Complete geological reconnaissance to write up material characteristics Geochem testing to evaluate potential placement into Faro Pit
104.3	Cover and Revegetate LGSP A	Faro WRDs and Pit	Reduce contamination from these sources to GW and SW. Alternative – Relocate this waste to the sulphide cells as a levelling layer for the synthetic cover or consolidate in LGSP C.	Implications for cover design if capped material generates heat. Grum Sulphide Cell is already capped with a very-low-infiltration cover that needs monitoring and possibly instrumentation. Need to maximize capping design and performance information for LGSP sites by closely monitoring results of existing GSC cover work. Proposed reclamation surface is rough and loose; however, the field investigation concluded that the microtopography is bad for plateau areas because it promotes ponding and infiltration.	Infiltration modelling (cover optimization); VADOSE/W, SLIDE (slope stability); TEMP/W; and re-evaluate design criteria in the C&R Plan, Table 4.6. Evaluate SW management – energy/erosion potential. Geochemical compatibility of low-grade ore with sulphide waste needs to be assessed in terms of potential leachability. Health and safety issues of moving low-grade ore.	Review RLU planning basis with the Waste Pile and Tailings Discipline Team, Cover and revegetation trial for LGSP reclamation to be recommended in the project proposal. Existing site water balance versus water balance after final grading needs to be evaluated to determine surface and GW impacts. Water/sediment management plans: Drainage plan, sedimentation ponds/wet landscape options, existing stockpile topography; and final landform design options. Design life reduction of the membrane due to conditions (temperature/caustic gas production). Water table location and fluctuation.	N N N N N N	Completed vegetation and soil survey (CH2M March 2015z), (CH2M February 2015c) Work stopped on preparation of Project Proposal	CH2M HILL Canada Limited (CH2M). March 2015kk. Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal. (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9.	Complete geological reconnaissance to write up material characteristics, aerial extent, volume
104.4	Cover and Revegetate LGSP C	Faro WRDs and Pit	Reduce contamination from these sources to GW and SW.	Implications for cover design if capped material generates heat or caustic gas is produced. Grum Sulphide Cell is capped with a very-low-infiltration cover needs monitoring, and possibly instrumentation. Need to maximize capping design and performance information for LGSP sites by closely monitoring results of existing GSC cover work. Design life reduction of the membrane due to conditions (temperature/caustic gas production). Proposed reclamation surface is rough and loose; however, the field investigation concluded that the microtopography is bad for plateau areas because it promotes ponding and infiltration.	Infiltration modelling (cover optimization); VADOSE/W, SLIDE (slope stability); TEMP/W; and re-evaluate design criteria in the C&R Plan, Table 4.6. Evaluate SW management – energy/erosion potential.	Review RLU planning basis with Waste Pile and Tailings Discipline; consider a revegetation trial on this kind of slope/material. Existing site water balance versus water balance after final grading needs to be evaluated to determine surface and GW impacts. Water/sediment management plans: Drainage plan, sedimentation ponds/wet landscape options, existing stockpile topography; and final landform design options.	N N N N	Excavated 1 test pit in LGSP C Completed vegetation and soil survey Work stopped on preparation of Project Proposal	CH2M HILL Canada Limited (CH2M). March 2015l. Summary of 2014 Field Investigation – Relocate Oxide Fines to Low-grade Stockpile "C" FSP Name: 104.1 – Relocate Oxide Fines to LGSPC. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015kk. Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal. (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9.	Complete geological reconnaissance to write up material characteristics, aerial extent, volume
105 – Emergency Tailings Area										
105.1	Remove Tailings to Rose Creek Tailings Facility	Mill and ETA	Remove tailings to Rose Creek Tailings Facility to reduce contaminant loading to GW and SW. Alternative – Leave the tailings in place and cover; channelize flow of major seeps (for example, X23) in granular trenches to a seepage collection point (part of 105.2 below).	Constructability Implications (for example, requirements for specialized equipment or operating procedures). Under alternative to leave tailings in place, geotechnical condition of Mine Access Road as a (pervious) solids retaining structure.	Excavation plan that includes sequencing and hydrology and sediment management. Hydrology and GW/SW interaction of closure configuration. Alternatives Assessment – Relative merits of removing tailings and underlying impacted soils versus leaving tailings in place and covering. For example, removal of the tailings could drain the wetland upgradient (SE of ETA).	Suitable disposal location for tailings and underlying impacted soils. Quantity of contaminated fill to be removed downgradient from the Access Road.	Y N	Drilled one boring through ETA tailings into native overburden Drilled two borings through mine access road to bedrock Advanced six seismic CPT soundings	CH2M HILL Canada Limited (CH2M). March 2015m. Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tailings Area FSP Name: 105.1 – Remove Tailings to Rose Creek Tailings Facility. Technical memorandum. Prepared for Government of Yukon. March 9.	
105.2	Install GW and SW Collection Systems	Mill and ETA	Intercept contaminated GW and SW before discharge into the Rose Creek Tailings Area. A low head concrete dam will be constructed at the entrance of the topographic "funnel" south of the Access Road. Since there is little soil cover at this location, it will be mainly a surface water collection system with the concrete structure founded on bedrock. Construct diversion ditches, sump, and pumping stations for diversion of waters from ETA during construction. Pipe to Faro Pit.	Define bedrock surface. Quantify site water budget. Hydrogeologic assessment: seepage interception (funnel and gate) design options.	Foundation evaluation for concrete dam structure, Concrete dam stability: Seepage and stability	Detailed cross section survey data including potential channel and floodplain areas. Potential channel bed and bank materials characterizations and floodplain cover characterization. Bedrock contact delineation in Mill Canyon and Old Faro Creek immediately downgradient from the WRD. Aquifer property information in the Mill Canyon area. Rate of GW and SW inflow from Mill Building Site. Rate of GW and SW inflow from Mill Creek Canyon. Alluvial aquifer thickness and bedrock topography south of the Mine Road.	N N N Y Y	Some topography survey completed through survey of geophysical lines Work stopped on preparation of Project Proposal Work stopped on preparation of Project Proposal Some surface water estimates X23, FCS4, monitoring well levels available for review Installed stilling wells and water level transducers at two SW locations Two borings drilled through Mine Access Road; Completed geological reconnaissance Test Pit completed near ETA collection sump; Geophysical surveys completed	CH2M HILL Canada Limited (CH2M). March 2015n. *Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area FSP Name: 105.2 – Install Emergency Tailings Area Surface Water Collection System.* Technical memorandum. Prepared for Government of Yukon. March 9. CH2M HILL Canada Limited (CH2M HILL). October 2013b. Waste Rock Dump Monitoring Report. Technical memorandum. Final. Prepared for Government of Yukon. October 29. CH2M HILL Canada Limited (CH2M HILL). March 2014c. 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31. CH2M HILL Canada Limited (CH2M). March 2015b. Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31. CH2M Canada Limited (CH2M). April 2016d. Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring, FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. April 15.	
105.3	Cover and Revegetate ETA	Mill and ETA	Determine appropriate closure cover for ETA after tailings closure option is chosen (remove or leave in place). Tie revegetation plan in to existing adjacent vegetation at the toe of the Faro waste rock piles. This is a high-visibility area adjacent to the site access point and, therefore, requires proactive planning for the reclamation surface.	Closure cover depends on the decision regarding the final disposal of tailings. Existing vegetation needs to be characterized – will be affected by tailings removal due to impoundment of water in this area. Revegetation footprint could then be larger than the ETA. Potential impact on North Fork Rose Creek downstream of the rock drain needs to be considered in revegetation and contour planning.	Closure surface configuration and capping materials need to be designed (if applicable). Cover soil availability and type needs to be determined. Appropriate vegetation cover to fit in with existing adjacent vegetation. Area needs to be assessed and planned. Failure modes and effects analysis of various ETA SIS configurations (for example, failure of active pumping).	SW flow calculations. Detailed cross section survey data including potential channel and floodplain areas; potential channel bed and bank material characterizations and floodplain cover characterization. Integration of SW and GW modelling approaches and results. Existing vegetation and soils need to be characterized to assess impact of remediation. Type and quantity of borrow materials required for regrading and revegetation (depends on design alternative selected).	Y N N Y Y	See 105.2 See 105.2 Work stopped on preparation of Project Proposal Completed vegetation and soil survey See borrow investigation sections (400 code activities)	See 105.2 CH2M HILL Canada Limited (CH2M). March 2015kk. Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal. (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9. See borrow investigation sections (400 code activities)	Existing vegetation and soils need to be characterized to assess impact of remediation. See borrow investigation sections (400 code activities)
106 – Waste Rock Dumps										
106.1	Regrade and Reslope Main and Intermediate Sulphide Cells	Faro WRDs and Pit	Consolidate smaller piles of highly reactive material into larger dumps where practical.Predictive modelling (geochemical, hydrologic, and GW/SW interaction) and monitoring program to provide basis for AMP.Alternative – consolidate oxide fines and MGO to sulphide cells as cushioning layer below liner if alternative assessments for those areas warrant doing so.	Chemical compatibility of sulphide cells with other fine grained materials to be capped under very low infiltration liners. Use fines as a cushioning layer for the liner. Delineation of sulphide cell footprint. Suitability of regraded/resloped waste surface to serve as foundation for cover.	Optimize regrading/resloping plan. Develop sediment control plan.Assess GW and SW interaction in affected foundation areas. Assess geotechnical stability of regraded/resloped waste.Assess suitability of regraded/resloped waste surface to serve as cover foundation. Confirm delineation of sulphide cell footprint. For alternatives that include relocating oxide fines and/or MGO to sulphide cells, optimize regrading/resloping plan and use of fines as cushioning layer for the liner.	Confirmation of sulphide cell footprint. Physical characteristics, including gradation of waste rock and any other materials that would form the foundation for the cover (necessary to design cushion layer for very low infiltration cover).	Y Y	Excavated 12 test pits; no clear delineation of sulfide cells Drilled boring through Main Dump and completed with pore gas and thermistor ports	CH2M HILL Canada Limited (CH2M). March 2015o. Summary of 2014 Field Investigation – Delineate Main and Intermediate Sulphide Cells for Regrading and Capping Design FSP Name: 106.1 – Regrade and Reslope Main and Intermediate Sulphide Cells. Technical memorandum. Prepared for Government of Yukon. March 13.	Data evaluation and analysis required

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
106.2	Regrade and Reslope Waste Rock Dumps (upper surfaces)	Faro WRDs and Pit	Reduce infiltration in the plateaued upper surface of the dumps. Construct geotechnically stable landforms. Alternative - Consider infiltration galleries to manage 100-year flood conditions.	SW, GW, and geochemical modelling are not well integrated. IPR provided recommendations for review; enhanced modelling is underway to estimate the effectiveness of remediation over time and the application of adaptive management principals. Location or application of wet landscape features, such as retention ponds/wetlands to retain flood flows and reduce the hydrograph peakiness. Destination of surface water runoff from waste rock plateau. Implications of using infiltration galleries to minimize runoff/sediment erosion.	Update/integrate previous modelling (hydrology, water balance, and geochemical). Develop surface water management plan during and after construction. Optimize regrading/resloping plan. Establish cut/fill volumes for/from outside sources (that is, need for calc-silicate waste rock for drainage material on tailings; addition of material from Haul Road). Develop sediment control plan. Assess borrow materials (till). Assess potential locations for large scale waste rock processing facilities to generate appropriately graded borrow.	Geotechnical characteristics of waste rock and soils.	Y	Excavated seven test pits.	CH2M HILL Canada Limited (CH2M). March 2015p. Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Upper Surface) FSP Name: 106.2 – Regrade and Reslope Faro Waste Rock Dumps (Upper Surfaces). Technical memorandum. Prepared for Government of Yukon. March 13.	Data evaluation and analysis required
106.3	Regrade and Reslope Waste Rock Dumps (perimeter slopes)	Faro WRDs and Pit	Construct geotechnically stable landforms.Minimize erosion of fine grained sediment. Provide robust means to convey storm flows down slopes (failure modes and effects analysis).Alternative: Where possible, use "hybrid" option; combination of talus slopes and revegetated benches. Selective use of infiltration galleries will reduce the potential for erosion (for example, talus slopes).	SW, GW, and geochemical modelling are not well integrated. IPR provided recommendations for review; enhanced modelling in underway to estimate the effectiveness of remediation over time and the application of adaptive management principals. Destination of surface water runoff from waste rock plateau.Implications of using infiltration galleries to minimize runoff/sediment erosion.	Update/integrate previous modelling (hydrology, water balance, and geochemical).Develop surface water management plan during and after construction. Develop sediment control plan.Develop final landform design under the following considerations:Optimizes regrading/resloping;Defines final footprint of the waste rock dumps (for example, shift waste rock laterally to areas with a larger buffer zone between the toe of the slope and downgradient water bodies);Considers Rose Creek stream realignment;Incorporates existing talus slopes for energy dissipations, and;Flattening the waste rock slope upgradient from the S-Wells will cover the seepage interception system and result in the covering Rose Creek (stream realignment considerations). Pulling the material up will be more expensive and technically challenging.Establish cut/fill volumes for/from outside sources (for example, need for calc-silicate waste rock for drainage material on tailings; addition of material from Haul Road, etc.).Assess the potential for using foundation material as borrow in areas where till or organics will be covered by resloped waste pile. Under alternative design option, evaluate "hybrid" closure resloping and regrading geometries – combination of leaving existing talus slopes, adding benches, and selective revegetation. Determine if hybrid combination of talus slopes and benches is suitable for revegetation and if stakeholders will approve.Assess impacts of expanding beyond area covered by current EA (for example, lateral shift of some waste rock material to the SW of the S-Wells may result in disturbance outside of current EA footprint).	Geotechnical and geochemical characteristics of waste rock that will be exposed as a result of regrading/resloping. Volume of foundation materials at toe of waste rock dumps suitable for borrow. Locations of suitable areas for infiltration galleries to help control surface runoff and erosion. Ecosystem services analysis required to assess options for North Fork Rose Creek (downstream of rock drain) undisturbed reaches, with respect to resloping and cover on adjacent waste rock areas and hydrology of area depending on tailings removal or capping.	Y N Y N	See 106.2 Completed geolocial reconnaissance Excavated seven test pits Drilled and excavated approximately 21 other locations around toe of WRD slopes under other investigations Work stopped on preparation of Project Proposal	See 106.2 CH2M HILL Canada Limited (CH2M). March 2015q. Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Toe of Slope) FSP Name: 106.3 – Regrade and Reslope Faro Waste Rock Dumps (Toe of Slope). Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015t. Summary of 2014 Field Investigation – Install Zone II Outwash Collection System FSP Name: 107.4 – Install Zone II Outwash Collection System. Technical memorandum. Prepared for Government of Yukon. March 2. CH2M HILL Canada Limited (CH2M). March 2015u. Summary of 2014 Field Investigation – Install S-Wells Groundwater Collection System FSP Name: 107.5 – Install S-Wells Groundwater Collection System. Technical memorandum. Prepared for Government of Yukon. March 19. CH2M HILL Canada Limited (CH2M). March 2016j. North Fork Rose Creek Geotechnical Report. Draft. Prepared for the Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31.	Data evaluation and analysis required Data evaluation and analysis required Ecosystem services analysis required
106.4	Cover and Revegetate East Sulphide Waste	Faro WRDs and Pit	Consolidate the smaller piles of highly reactive material into the larger dumps where practical, reduce infiltration, and revegetate. Alternative – Subaqueous deposition of sulphidic wastes in Faro Pit.	Effectiveness, reliability, and performance of covers in short term and long term for stability, erosion protection, and reduction of infiltration. Very high-cost item for project.	Infiltration modelling, impacts to GW and SW. Assess design criteria in the C&R Plan, Table 4.9. Cover optimization and identification of source material; optimization of short- and long-term vegetative performance is critical. Consideration of wildlife requirements (habitat and/or exclusion) in cover vegetation design.	Need to review RLU planning basis to determine cover volume and suitability. Existing site water balance versus water balance after final grading needs to be evaluated to determine surface and GW impacts.	N N	Completed vegetation and soil survey Worked stopped on project Proposal Advanced boring through east sulphide cell and completed with GW monitoring well, thermistor and pore gas ports. Work stopped on project proposal	CH2M HILL Canada Limited (CH2M). March 2015kk. Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal. (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9. CH2M HILL Canada Limited (CH2M). March 2015b. Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31.	Data evaluation and analysis required Data evaluation and analysis required
106.5	Cover and Revegetate Main and Intermediate Sulphide Cells	Faro WRDs and Pit	Maximize ET potential of the cover. Minimize energy of runoff from covers and surrounding areas to limit erosion of fine grained sediment.	Proposed reclamation surface is rough and loose; however, the field investigation concluded that the microtopography is sub-optimal for plateau areas as it promotes ponding and infiltration.	Cover optimization and identification of source material; optimization of short- and long-term vegetative performance is critical. Consideration of wildlife requirements (habitat and/or exclusion) in cover vegetation design.	Same as Activity Code 106.1.	N	See 106.1		Data evaluation and analysis required
106.6	Place Cover on Remaining Waste Rock and Revegetate	Faro WRDs and Pit	Reduce infiltration in the dumps; construct geotechnically stable landforms; maximize diversion of uncontaminated run off from covers and surrounding areas; and revegetate disturbed areas on all dump areas. Revegetation information for steep waste rock areas with loose cover is not provided; feasibility of applying covers to 2:1 slopes and revegetating needs to be considered to confirm that this is a viable RLU.	Additional technical considerations addressed under 106.1A/B.	Steep (2:1) slopes for waste rock are not feasible from a cover and revegetation perspective. Loose cover material faces three issues: how to apply it, how to keep it from working down into the waste rock surface and no longer providing a vegetation support, and how to prevent it from being eroded by surface water. Cover optimization and identification of source material; optimization of short- and long-term vegetative performance is critical. Consideration of wildlife requirements (habitat and/or exclusion) in cover vegetation design.	Review RLU planning basis with Waste Pile and Tailings Discipline Team to provide basis for access, cover material type and available volume. Existing site water balance vs. water balance after final grading needs to be evaluated to determine surface and GW impacts.	N N	Completed vegetation and soil survey Worked stopped on preparation of project Proposal		Data evaluation and analysis required Data evaluation and analysis required
106.7	Cover and Revegetate Mt. Mungly (E&W) and Southwest Pit Wall Dump	Faro WRDs and Pit	Apply low-infiltration covers to the Mt. Mungly waste dumps (East and West) and the Southwest Pit Wall Dump. Revegetation information for steep waste rock areas with loose cover is not provided; feasibility of applying covers to 2:1 slopes and revegetating needs to be considered to confirm that this is a viable RLU.		Cover optimization. Detailed regrading plans, Reclamation Landform Unit (RLU) specifications.Steep (2:1) slopes for waste rock are not workable from a cover and revegetation perspective. Loose cover material faces three issues: how to apply it, how to keep it from working down into the waste rock surface and no longer providing a vegetation support, and how to keep it from being eroded by surface water. Cover optimization and identification of source material; optimization of short- and long-term vegetative performance is critical.Consideration of wildlife requirements (habitat and/or exclusion) in cover vegetation design.	Need to review RLU planning basis with Waste Pile and Tailings Discipline Team. Existing site water balance vs. water balance after final grading needs to be evaluated to determine surface and GW impacts.	N N	Completed vegetation and soil survey Worked stopped on preparation of project Proposal	CH2M HILL Canada Limited (CH2M). March 2015kk. Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal. (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9.	Data evaluation and analysis required Data evaluation and analysis required
107 - Faro Groundwater										
			Protect North Fork of Rose Creek from potential sources of contamination. Divert from Faro waste rock piles. Increase capacity to 1:500 year event at 81 m^3/sec and manage the PMF 384 m^3/sec. Remove the NFRD and build new channel.	Discontinuous permafrost, ground conditions, channel seepage losses, interaction of GW and SW, hydraulic analysis. Soil and permafrost conditions, geotechnical conditions, seepage rates, channel stability	Refinement of hydrologic and hydraulic models to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Bed and bank materials characterizations. Some site specific hydraulic modelling required to provide water surface profiles.Review design criteria,	Hydrologic and hydraulic model to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results; detailed cross section survey data, bed and bank materials characterizations. Soils data (geotech) ice data, flow data, and water profile data (surface). Additional flow monitoring data collection at Station "R7" for model calibration and validation.	Y	Completed surface geophysical transects across NFRC Completed GW/SW interaction potentiomanometer study upstream of rock drain Completed geological reconnaissance / bed and bank material characterization	CH2M HILL Canada Limited (CH2M HILL). March 2014m. 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M). February 2014q. 2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 7. CH2M HILL Canada Limited (CH2M). March 2015r. Summary of 2014 Field Investigation – Upgrade North Fork Rose Creek FSP Name: 107.1 – Upgrade North Fork Rose Creek. Technical memorandum. Prepared for Government of Yukon. March 19.	

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
107.1	Upgrade North Fork Rose Creek	East Side ARD Collection and Diversions	Divert from Faro waste rock piles. Increase capacity. Design to preliminary design level of detail. Requires final selection of preferred alternative through an alternatives assessment.	condition, geotechnical conditions, seepage, creek channel stability, flow, seepage, seepage management, contaminate source loading. Location of diversion relative to toe of waste piles, stability of piles, and effects on diversion. Uncertain as to final alignment. NFRC noted to be prone to rockfall hazards (Section 4.6.2) but this is not planned for in consideration of moving the creek channel and replacement of floodplain areas. (Source: C&R Plan Chapter 4). In addition, aquatic assessment recommends more structures and features for fish habitat and reclamation of riparian areas and banks, but there are no details in the Source: C&R Plan. (Chapter 8). The inclusion of Faro diversion as upstream tributary is not yet decided.	PMP, PMF and water quality estimates. Channel design needs to provide low infiltration, long-term performance and a floodplain to handle the PMF. Establish final alignment and floodplain characteristics.Geotechnical, water quality, channel stability, seepage, hydrology, hydraulics modelling refinements, design storm flows, icing, soil cover, and re-vegetation options. Diversion design to preliminary level including channel and floodplain geometry, stability and catchment area.Rockfall issues appear to be a natural hazard in headwaters area and a construction hazard when working with the Faro Mine waste rock piles. If Rose Creek is planned to be reconstructed with a liner, then consideration needs to be given to where it is best located in the valley to protect it from rock fall and seepage/GW from the waste rock slopes. Riparian areas in the floodplain need to be an integral part of channel planning. Permafrost impacts on design considerations. Potential Faro diversion as tributary input depends on outcome of Faro diversion evaluations.	Integrated planning required for the NFRC channel and valley area (including riparian and ponded areas), in conjunction with activities to reslope waste rock pile and remove all or part of haul road; need to weigh against possible cut-off wall construction. Ecosystem Services analysis required to quantify creek protection options for cut-off wall, creek liner, remove rock drain, and realign creek. Impact of rerouting creek beds to reduce contaminated GW impact or construction of slurry walls that may cause daylighting of GW.	Y Y Y	Completed cross section surveys Completed terrain hazard assessment GW/SW interaction potentiomanometer study downstream of rock drain Geotechnical Investigation - Drilling, piezometer and thermistor installation, test pitting, surface geophysical surveys, ground temperature monitoring Groundwater Investigation - Aquifer testing, Slug testing, Water Level monitoring, Groundwater sampling Completed rapid geomorphic assessment Completed tracer dilution study, cross section surveys	CH2M HILL Canada Limited (CH2M). March 2016j. North Fork Rose Creek Geotechnical Report. Draft. Prepared for the Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31. CH2M HILL Canada Limited (CH2M). March 2015jj. Geology and Terrain – Preliminary Baseline Report, Faro Mine Remediation Project Proposal. Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). March 2015t. Summary of 2014 Field Investigation – Install Zone II Outwash Collection System FSP Name: 107.4 – Install Zone II Outwash Collection System. Technical memorandum. Prepared for Government of Yukon. March 2. CH2M HILL Canada Limited (CH2M). March 2015u. Summary of 2014 Field Investigation – Install S-Wells Groundwater Collection System FSP Name: 107.5 – Install S-Wells Groundwater Collection System. Technical memorandum. Prepared for Government of Yukon. March 19. CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March. CH2M Canada Limited (CH2M). April 2016h. Summary of 2015 Field Investigation – West Side and East Side Diversions, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. April. CH2M Canada Limited (CH2M). March 2016i. North Fork Rose Creek Hydrology/Hydraulics Report. Draft. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31.	
107.2	North Fork Rose Creek Cut-off Wall	East Side ARD Collection and Diversions	Protect NFRC from contamination. Construct cut-off wall and isolate creek from GW interception.	Location for placing wall; effectiveness, requirements for pumping (volume, duration, construction materials, and timing for pumping, and automation). Potential for bypassing cutoff and contaminating GW.	Optimize location for accessibility, short term, and long term performance; evaluate construction materials; reduce cost; and maximize GW cutoff effectiveness.	Hydrologic and hydraulic modeling to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Detailed cross section survey data and bed and bank material characterizations. Soils data (geotechnical), ice data, flow data, and water profile data (surface elevations). Bedrock contact delineation.	Y Y Y Y	Design Concept Changed - See 107.1	CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March.	
107.3	Relocate Zone II Outwash Material to Intermediate Sulphide Cell	East Side ARD Collection and Diversions	Remove outwash material to Intermediate Sulphide Cell to reduce contaminant loading to NFRC and underlying aquifer; and construct access roads. Alternative - Cover in place.	Stability of upgradient waste rock slope under current condition and during materials relocation. Volume depth of affected materials that will need to be relocated.	Assessment of volumes of Zone II Outwash materials and underlying impacted soils to relocate. Geotechnical assessment of upgradient waste rock slope under current conditions and during relocation activities. Final landform design that incorporates upgradient waste rock dump. Alternatives Assessment - Relocate outwash material versus cover in place.	Volume of materials, including underlying impacted soils to relocate. Stability of upgradient waste rock slope Leaching characteristics of Zone II Outwash Material	Y N Y	Design concept changed - See 107.1 Excavated four test pits (3 in outwash, 1 in upgradient Waste Rock Slope) Drill, install and develop 8 monitoring wells Scope of work has changed based on NFRC DBR	CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March. CH2M HILL Canada Limited (CH2M). March 2015t. Summary of 2014 Field Investigation – Install Zone II Outwash Collection System FSP Name: 107.4 – Install Zone II Outwash Collection System. Technical memorandum. Prepared for Government of Yukon. March 2. CH2M HILL Canada Limited (CH2M). March 2015s. Summary of 2014 Field Investigation – Relocate Zone II Outwash Material to Intermediate Sulphide Cell FSP Name: 107.3 – Relocate Zone II Outwash Material to Intermediate Sulphide Cell. Technical memorandum. Prepared for Government of Yukon. March 19.	WRD Slope stability evaluation required
107.4	Install Zone II Outwash Collection System	East Side ARD Collection and Diversions	Intercept seepage from the Zone II Outwash Area; reduce contaminant loading to the NFRC and underlying aquifer.	Configuration of bedrock surface. Distribution of aquifer properties. Magnitude and distribution of surface water/groundwater interaction between the NFRC and the underlying alluvial aquifer. Extent of GW contamination in the deeper portions of the aquifer. Response of aquifer system to GW pumping.Magnitude of site water budget components. Geochemical conditions within the aquifer and potential for well fouling. Number of wells required for effective interception. Need for permeable trench and cut-off walls. Number and spacing of extraction wells; permeable trench location. Estimate GW flow and contaminant mass loading from extraction system (average and peak).	Develop three-dimensional numerical GW flow model. Investigate various alternative configurations of SIS design to optimize efficiency and minimize cost. Define bedrock surface. Define distribution of aquifer properties. Determine three dimensional extent of GW contamination. Quantify site water budget. Define degree and pattern of surface water/groundwater interaction.	Spatial distribution of alluvial aquifer thickness in outwash zone. Spatial distribution of bedrock topography in outwash zone. Hydraulic properties of the backfill materials in Zone II Pit. Spatial and temporal extent of GW/SW interaction between the alluvial aquifer and the NFRC. Horizontal GW flow patterns in the bedrock aquifer. Three-dimensional distribution of contaminants near the proposed GW interception system. Extent of hydraulic connection between the Zone II Pit and the outwash area, and the GW flux originating in the vicinity of the pit.	Y Y Y Y Y Y Y	Drill, install and develop 8 monitoring wells. Complete packer testing in bedrock. Complete stream stage monitoring. Complete surface geophysical transect. Design concept changed - See 107.1	CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March. CH2M HILL Canada Limited (CH2M). March 2015t. Summary of 2014 Field Investigation – Install Zone II Outwash Collection System FSP Name: 107.4 – Install Zone II Outwash Collection System. Technical memorandum. Prepared for Government of Yukon. March 2.	
107.5	Install S-wells GW Collection System	East Side ARD Collection and Diversions	Upgrade and complete existing GW SIS. Provide for permanent pumps, piping, power, and access.	Configuration of bedrock surface. Distribution of aquifer properties. Response of aquifer system to GW pumping. Magnitude of site water budget components. Geochemical conditions within the aquifer and potential for well fouling. Number of wells required for effective interception. Need for cut-off wall.	Develop three-dimensional numerical GW flow model. Investigate various alternative configurations of SIS design to optimize efficiency and minimize cost.	Alluvial aquifer thickness and the hydraulic properties of the alluvial and bedrock aquifers north of the SIS. Aquifer properties of the deep weathered bedrock aquifer in the vicinity of the existing SIS. Alluvial aquifer properties between existing SIS and the NFRC. Bedrock topography in the vicinity of the existing SIS. Spatial and temporal extent of GW/SW interaction between the alluvial aquifer and the NFRC.	Y Y Y Y Y	Design concept changed - See 107.1 Drill, install and develop 6 monitoring wells Install and monitor 16 streambed piezometers for GW/SW interaction study Complete one seismic refraction geophysics line	CH2M HILL Canada Limited (CH2M). March 2015u. Summary of 2014 Field Investigation – Install S-Wells Groundwater Collection System FSP Name: 107.5 – Install S-Wells Groundwater Collection System. Technical memorandum. Prepared for Government of Yukon. March 19. CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March.	
107.6	S-Wells GW Collection (part of ADM to capture future concentrated zones near source)	East Side ARD Collection and Diversions	Shallow and deep aquifer interception systems were constructed in 2009. Final component is installation of cut-off wall if monitoring indicates shallow aquifer sump and deep aquifer pumping wells do not provide sufficient capture.	Evaluation of adequacy of shallow and deep aquifer pumping wells to provide sufficient capture of contaminated GW. Method of installation of the cut-off wall; location of bedrock, extent of wall required, and requirements for additional wells.	Three-dimensional GW flow model; incorporate most recent operational data to estimate effectiveness of existing SIS and system enhancements. Conduct optimization study to maximize the capture of contaminated GW flow and cost.	GW seepage will be addressed at this site by the activities recommended under Activity Code 107.5.	Y	See 107.5	See 107.5	
108 - Faro Miscellaneous										
108.1	Reclaim Unnecessary Roads	Sitewide	Prevent long-term erosion and breach crossings to prevent blockage.	Road areas will require specific reclamation plans in keeping with required surface drainage plans and surrounding reclamation prescriptions.	Assessment needs to be made about culverts and crossings to be breached and resloped, and drainages restored. Previous closure prescription is to scarify road surfaces and revegetate, but no information available on quality of road construction materials.	Require assessment of road material quality. Require assessment for basis of design of road reclamation – revegetation or swale/channel formation as part of surface drainage plan.	N N	Worked stopped on Project Proposal		Assessment of roads; existing conditions; RPP plans for roads
108.2	Reclaim Zone II Outwash Area	Faro WRDs and Pit	Cover and revegetate Zone II Outwash Area after installation of collection system to provide stable creek floodplain. Alternative design: Cap in place.	Configuration of outwash collection system and final placement of NFRC after rock drain is removed will dictate the cover and revegetation plan surface. Revegetation of this area is not currently considered within the reclamation plan but needs to be tailored to location of NFRC (if moved) and to existing valley vegetation.	Once location of reconfigured NFRC is planned; need to assess loss of current vegetation cover and what can be salvaged and moved to other locations for soil and vegetation. Area may be covered by waste rock if NFRC is moved.	Assess current vegetation cover. Assess current soil type and quality. Locate stockpiling or direct placement areas. Confirm availability of suitable cover material. Confirm availability of suitable riparian plant species.	Y Y Y Y Y	Conduct sitewide Vegetation and Soil survey Design Concept Changed - See 107.1	CH2M HILL Canada Limited (CH2M). March 2015kk. Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal. (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). February 2015c. Site-wide Soil Characterization Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9.	
				Sampling for ACM and other designated substances may not be	Site visit to identify items that might have been missed. Follow up sampling	Obtain, review, and catalogue site and building as-built plans and other construction documentation. Determine if sufficient sampling has been performed to mitigate costs for abatement of materials assumed to contain designated substances due to lack of information to the contrary. Building and waste materials quantification.	Y N N	Compiled and scanned available as-built plans and construction documentation Work stopped on preparation of Project Proposal		Building and waste materials quantification.

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
108.3	Decontaminate and Demolish Buildings	Mill and ETA	The existing mill, administrative buildings, and surrounding infrastructure will be removed to mitigate potential long-term safety hazards. Extent of contamination of surfaces through plant is unknown.	substantive enough to be useful for decommissioning purposes. Areas around buildings that are not tested may need to be treated as designated or ACM substances. Extent of process materials (rock and others) in pipelines, equipment, vessels, and holding areas is not extensively documented. Requirement to remove extensive volumes of this material will complicate decommissioning. Site plans, surveys, Material Safety Data Sheets, and other information involving plant construction and makeup are not currently available. A review of laydown areas in close proximity to the plant (boneyards) has not been completed. Implications and cost for decommissioning has not been evaluated. Options to revegetate and reclaim the site as part of the natural landscape after decommissioning need to be evaluated. Site survey required.	may be required. Address safety concerns with any of the onsite buildings and to clear areas for safe access to complete other assessments that may be required. Perform site utility surveys. Use ground penetrating radar (GPR) if necessary for decommissioning and to understand H&S risks during work. Determine and obtain permits required to perform demolition. Analyze existing structures (plans if available) to determine less costly design for removal, decontamination, transport, and recycling or placement in a landfill. Hold discussions with Care and Maintenance staff to identify potential underground structures. Review and catalogue mill drawings.	Waste disposal recommendations. Salvage assessment and evaluation of transportation cost to ship scrap to markets. Utility and site surveys. Confirm availability of suitable cover material. Assess suitable revegetation cover and cover microtopography. Extent of contamination is not certain. Appropriate cover type and revegetation plan needs to be assessed for this area for long-term liability management. Determine if portions of foundations may be covered and revegetated. Determine available cover material types and volumes and appropriate revegetation plan.	N N N N N N N N	 See borrow investigation sections (400 code activities) Work stopped on preparation of Project Proposal	 CH2M HILL Canada Limited (CH2M). March 2015hh. *Borrow Baseline Design Criteria Report, Faro Mine Remediation Project.* Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March.	Waste disposal recommendations. Salvage assessment and evaluation of transportation cost to ship scrap to markets. Utility and site surveys. Cover analysis and agreement of final cover design is requried Assess suitable revegetation cover and cover microtopography. Extent of contamination is not certain. Appropriate cover type and revegetation plan needs to be assessed for this area for long-term liability management. Determine if portions of foundations may be covered and revegetated. Determine available cover material types and volumes and appropriate revegetation plan.
108.4	Relocate Contaminated Soil from Mill Site Area and Cover (rudimentary)	Mill and ETA	Remove hazardous materials and contaminated soil from Plant Site Area. Regrade Mill Area, cover, and revegetate.	Characterize contaminants, identify contamination levels, determine volume of material excavation; volume and source of backfill. Concentration threshold criteria for soil removal.	Determine appropriate location for an onsite landfarm for hydrocarbon contaminant treatment. Specific revegetation prescription required, especially because this area is a candidate for an ET cover. Hold discussions with Care and Maintenance staff to identify potential underground structures.	Extent of soil metals and hydrocarbon contamination and acid generating soils (lateral and vertical) near the Vehicle Maintenance Complex, Emergency Generator Area, Mill Diesel Tank, and Waste Oil Tank. GW flow directions. Extent of associated GW contamination. Assess suitable cover material quality. Assess potential for ET vegetation cover, or appropriate revegetation prescription.	N Y N N N	 Work stopped on preparation of Project Proposal	 CH2M Canada Limited (CH2M). April 2016c. Fiscal Year 2015 Groundwater Flow Model Development Report, Faro Mine Remediation Project. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. April 5.	Extent of soil metals and hydrocarbon contamination and acid generating soils (lateral and vertical) near the Vehicle Maintenance Complex, Emergency Generator Area, Mill Diesel Tank, and Waste Oil Tank. Extent of associated GW contamination. Assess suitable cover material quality. Assess potential for ET vegetation cover, or appropriate revegetation prescription.
108.5	Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover (rudimentary)	Faro WRDs and Pit	Remove hazardous materials and contaminated soil from the Plant Site Area. Regrade Mill Area, cover, and revegetate.	Characterize contaminant levels, determine volume of material excavation; volume and source of backfill. Concentration threshold criteria for soil removal.	Determine appropriate location for onsite landfarm for hydrocarbon contaminant treatment. Specific revegetation prescription required, especially because this area is a candidate for an ET cover. Hold discussions with Care and Maintenance staff to identify potential underground structures.	Determine permitting requirements Extent of soil hydrocarbon contamination (lateral and vertical) near the Lube Shack and Tank Farm Area. GW flow directions. Extent of associated GW contamination. Assess suitable cover material quality. Assess potential for ET vegetation cover, or appropriate revegetation prescription.	N N Y N N N	 Two test pits completed to augment delineation performed by Gartner Lee (2005) Site-wide modelling completed showing flowpaths Not expected that special covers; other than rudimentary covers, would be required for area. All contamination expected to be moving to either RCTA or to Faro Pit See borrow investigation sections (400 code activities)	 CH2M HILL Canada Limited (CH2M). March 2015v. Summary of 2014 Field Investigation – Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover FSP Name: 108.5 – Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover. Technical memorandum. Prepared for Government of Yukon. March 12. CH2M Canada Limited (CH2M). April 2016c. Fiscal Year 2015 Groundwater Flow Model Development Report, Faro Mine Remediation Project. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. April 5.	No work done on permitting Extent of soil hydrocarbon contamination (lateral and vertical) near the Lube Shack and Tank Farm Area. Extent of associated GW contamination. Assess suitable cover material quality. Assess potential for ET vegetation cover, or appropriate revegetation prescription.
Tailings Area (Activity Code 200)										
201- Dams										
201.1	Dewater Intermediate Tailings Area	RCTA	Current concept is for a dry revegetated surface on top of a cover over all the tailings surfaces. Evaluate potential for backfilling the Intermediate Pond with coarse granular (for example, processed waste rock) or dewatered (dry) tailings prior to installing cover and revegetation of cover. Revegetated surface and surface runoff will be isolated from tailings porewater.	Geochemical and geotechnical characteristics of tailings slimes and sediments. Volume of sediment. Dewatering characteristics. Sediment control and method of removal.	Evaluation of tailings consolidation and the need for the waste rock trafficability layer to act as a drainage layer. Evaluation of the depth of freezing within the fine zone of the Intermediate Tailings Area and the implications for trafficability. Time for consolidation to occur. Assess need for accelerated consolidation (for example, wick drains or similar).	Rheologic parameters of tailings to evaluate pumpability and thickening characteristic. Geotechnical information for the area within 500m of the Intermediate Dam. Geotechnical parameters (for example, undrained shear strength, depth of tailings, and porewater pressure). Consolidation characteristics of tailings to enable prediction of tailings porewater expelled, rate of consolidation, and total depth of consolidation (to model drainage above tailings). Seepage/water balance to determine design requirements of the backfilled pond area adjacent to the Intermediate Dam and options for actively managing tailings seepage by sump dewatering. Possible requirement for processing waste rock for the trafficability layer to enable function as a drainage layer. Evaluation of freezing profile.	Y Y Y Y Y Y	(1) agreed upon closure approach does not require this information Drilled 5 borings and advanced 12 CPT soundings in Intermediate Tailings Installed and monitored 5 thermistor ports in intermediate tailings Advanced 8 CPT soundings in intermediate dam pond Completed bathymetric survey with subbottom profiling Data requirements for 30% design reduced from that required for 60% design	CH2M HILL Canada Limited (CH2M). March 2015ff. *Alternative Development Status Report.* Draft. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 6. CH2M HILL Canada Limited (CH2M HILL). November 2012e. Alternatives Evaluation and Risk Analysis for the Rose Creek Tailings Area, Faro CH2M HILL Canada Limited (CH2M). March 2015x. Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area FSP Name: 201.1 – Dewater and Cover Intermediate Tailings Area. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015z. Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike FSP Name: 201.5 – Construct New Side Channel and Side Channel Dike. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M HILL). November 2012e. Alternatives Evaluation and Risk Analysis for the Rose Creek Tailings Area, Faro Mine. Prepared for Yukon Government. November. RCTA Alternatives Analysis CH2M HILL Canada Limited (CH2M). August 2016c. Summary of Fiscal Year 2015 – 2016 Field Investigations – CVD and ID Pond Field Data Report. Technical memorandum. Prepared for Government of Yukon. August 25. Aurora Geosciences. 2016b. Technical Report. Hydrographic and Sub-Bottom Profiling Survey – Intermediate Dam Pond. Prepared for CH2M HILL. August 12. CH2M HILL Canada Limited (CH2M). March 2015ff. Alternative Development Status Report. Draft. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 6. CH2M HILL Canada Limited (CH2M HILL). March 2014i. Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Report, Faro Mine Remediation Project. Draft. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. (60% design)	Continue to monitor GW levels; impoundment levels at ID and CVD, pumped volumes to IWTS. Compile for water balance analysis.
201.2	Dewater Cross-valley Dam Pond	RCTA	Dewater the pond by pumping the water to the Faro Pit. Current concept is to retain the Cross Valley Dam, but to keep the Cross Valley Pond drained. Remove sludge and sediments to (1) facilitate construction of the Intermediate Tailings Dam raise and (2) to create a surface that can be revegetated. Collections systems to be installed downstream of the Intermediate Dam within the CVP area.	Chemical and physical characteristics of sludge and sediments; volume of sediment; dewatering characteristics; method for controlling surface and groundwater during excavation. Sediment control and method of removal.	Methods of dewatering, treatment as required, and discharge of treated water. Methods of sludge removal, stabilization/drying of sludge, transportation of sludge, and sludge disposal at the existing sludge pond north of tailings impoundment. Stability of Intermediate Tailings Dam (seepage and piping, and drawdown slope stability) after dewatering of the Cross Valley Impoundment.	Volume of sludge and sediment to be removed at Cross Valley Dam Pond. [*Previous investigation by Ecometrix (Report titled Investigation on Zinc Controls at the Cross Valley Pond – Faro Mine Complex dated October 2010 was to investigate zinc concentrations in pond water, sludge and porewater in the CVP. Chemical testing was performed and lime demand estimated. The study did not characterize the volumes of sludge*] Conduct geochemical and treatability testing as necessary [Ecometrix report has some information]. Rheologic parameters of sediment to evaluate pumpability and thickening characteristics)	Y Y	Completed bathymetric survey with subbottom profiling Advanced 3 CPT soundings and 8 sonic borings	Aurora Geosciences. 2016a. Technical Report. Hydrographic and Sub-Bottom Profiling Survey – Cross Valley Dam Pond. Prepared for CH2M HILL. August 22. CH2M Canada Limited (CH2M). August 2016c. Summary of FY 2015 Field Investigations – CVD and ID Pond Field Data Report, Field Sampling Plan Name: CVP and ID Pond CPT and Sonic Sampling. Technical memorandum. Prepared for Government of Yukon. August 15.	

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
201.3	Retain Cross-valley Dam	RCTA	To keep Cross Valley Pond as emergency storage facility and to capture any potential contaminated seep water. To allow flood water to egress from the Intermediate Dam spillway into the Cross Valley Pond, then exit through a new PMF spillway at the Cross Valley dam, and then enter the Rose Creek downstream from the Cross Valley Dam.	Removal of Cross Valley Dam needs to be further evaluated. IRP recommends Cross Valley Pond be retained. Requires evaluation of Cross Valley Dam stability and spillway requirements (hydrology, hydraulics, and foundation conditions. Location and foundation conditions for downstream SIS will need evaluation.	Identify operational failure scenarios in which the Cross-valley Pond would be used if retained. Evaluate the potential effectiveness of treatment that would be provided under those scenarios. Flood routing (hydraulics) study: Route flow through pond and spillway at right abutment of Cross Valley Dam. Flood routing/dissipation in area downstream from Cross Valley Dam before floodwater discharges into Rose Creek If Cross Valley Dam is retained, dam stability evaluations: Seepage and slope stability Liquefaction potential and mitigation Deformation analyses (seismic) Slope protection Geotechnical instrumentation	Foundation conditions for new PMF Spillway and low level outlet. Hydrologic and hydraulic model to provide influent SW flow data and elevations as well as routing and velocity data for spillway to Rose Creek.	N N	Completed surface geophysical surveys at CVD spillway Excavated test pit in CVD Spillway	CH2M Canada Limited (CH2M). April 2016f. *Summary of 2015 Field Investigation – Construct Intermediate Dam Spillway, Faro Mine Remediation Project, Field Sampling Plan Name: 201.6 Construct Intermediate Dam Spillway.* Technical memorandum. Draft. Prepared for Government of Yukon. April. CH2M HILL Canada Limited (CH2M). January 2015b. Cross Valley Dam Seepage Interception System Test Pit Data Summary, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. January 30.	Investigation needs to be conducted for CVD spillway Hydrualic model development
201.4	Raise Intermediate Dam (ID)	RCTA	To pass – without overtopping – floods larger than the 500-year return event and up to the Probable Maximum Flood (PMF) and route through new spillway. Consider dam stability and contaminated groundwater collection. Based on preliminary hydrologic analyses, an Intermediate Dam raise to El 1052 m (about 2.6m raise) is estimated	Dam stability during PMF (flooding) and maximum credible earthquake (MCE) (seismic) events; requirements to modify internal drain and filters (will no longer have Cross Valley Dam water against downstream slope); liquefaction potential and seismic slope stability. Need to finalize/verify the amount of dam raise.	Flood routing (hydraulic) study to determine optimum dam raise in conjunction with spillway configuration and size. Dam stability evaluations: Seepage and slope stability Internal filter and drain system adequacy Liquefaction potential and mitigation Deformation analyses (static and seismic) Borrow material considerations Slope protection Geotechnical instrumentation Design of dewatering and excavation requirements for regrading tailings, including contaminated groundwater collection.	Borrow material sources and borrow material characteristics (dike and dam embankment materials, filter/drain material, slope protection, tailing covers). Assume that Cross Valley Dam will be drained with no tailwater against the downstream slope. Tailings permeability for dewatering (assumed to be covered under the Tailings Cover task). Hydrologic and hydraulic model to provide influent SW flow data and elevations as well as routing and velocity data.	Y Y N	See borrow investigation sections (400 code activities) Drilled 5 borings and advanced 12 CPT soundings in Intermediate Tailings	CH2M HILL Canada Limited (CH2M). March 2015x. Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area FSP Name: 201.1 – Dewater and Cover Intermediate Tailings Area. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015z. Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike FSP Name: 201.5 – Construct New Side Channel and Side Channel Dike. Technical memorandum. Prepared for Government of Yukon. March 13.	Analysis of CPT data required Hydrualic model development
201.5	Construct New Side Channel and Side Channel Dike	RCTA	In 2012, CH2M HILL performed an alternatives evaluation for flood routing of the Rose Creek through the Rose Creek tailings area. The evaluations are documented in the CH2M HILL report titled *"Conclusions from Rose Creek Tailings Area Alternatives Evaluation"* dated November 2012. This report details the evaluation of three different alternatives to route flood flows through the RCTA, and the risk analyses that were performed to form the basis for selecting a preferred alternative. The preferred alternative entailed the use of a single, large, armoured channel (the side channel) located immediately adjacent (north) of the Rose Creek Diversion (RCD) into which flood flows greater than the 500-year flood will be channeled. Flood flows in the side channel would then be routed through a new PMF Spillway at the right abutment of the Intermediate Dam.	Foundation conditions for new side channel dike. Thickness and nature of tailings under the dike as well as the side channel bottom footprint. Stability and integrity of the existing Rose Creek Diversion dike	Side channel dike stability evaluations: Seepage and slope stability Internal filter and drain system adequacy Liquefaction potential and mitigation Deformation analyses (static and seismic) Borrow material considerations Slope protection Geotechnical instrumentation Design of dewatering and excavation requirements for tailings below the side channel, or means for stabilizing/confining it in place.	Subsurface information (foundation conditions) along the RCDC dike.	Y	Drilled 5 borings and advanced 12 CPT soundings in Intermediate Tailings Installed and monitored 5 thermistor ports in intermediate tailings	CH2M HILL Canada Limited (CH2M). March 2015x. Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area FSP Name: 201.1 – Dewater and Cover Intermediate Tailings Area. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015z. Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike FSP Name: 201.5 – Construct New Side Channel and Side Channel Dike. Technical memorandum. Prepared for Government of Yukon. March 13.	
201.6	Construct Intermediate Dam Spillway	RCTA	Route the peak flood flows large enough to erode the fuse plug without overtopping the Intermediate Tailings Dam. Construct new spillway in bedrock at the north abutment of Intermediate Tailings Dam. Consider alternative of passing design flood over the top of a hardened embankment. Operational considerations: SW assumed to be clean (long-term) and gravity drain; SW to be collected initially for monitoring and possible treatment GW to be collected in waste rock layer underneath till cover and pumped for treatment	Optimize dam raise with spillway design (size, location, invert, overflow length, and location of tailings. Design criteria require review.	Flood routing (hydraulics) study: PMF flood Flow velocity Scour criteria Incorporate potential for ice flows in flood routing For concrete control structure, perform seepage analyses to evaluate uplift forces and to design underdrain, uplift, or both Flow routing downstream from Intermediate Dam including channelization and erosion protection Potential for winter flows and ice blockages	Subsurface conditions for spillway: Rock mass quality Erosion resistance Permeability (to evaluate uplift and seepage under concrete control spillway structure) Subsurface conditions for energy structure/modifications downhill from the spillway. Hydrologic and hydraulic model to provide influent SW flow data and elevations as well as routing and velocity data for spillway. PMF handling has been assessed previously and considerable information is available. Flooding information should be incorporated into any new hydraulic models developed.	Y Y Y Y Y N	Drilled 7 borings into bedrock Completed packer testing Installed and developed 2 pumping wells and 3 piezometers Completed surface geophyscial surveys	CH2M HILL Canada Limited (CH2M HILL). March 2014m. *2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Re* CH2M Canada Limited (CH2M). April 2016f. Summary of 2015 Field Investigation – Construct Intermediate Dam Spillway, Faro Mine Remediation Project, Field Sampling Plan Name: 201.6 Construct Intermediate Dam Spillway. Technical memorandum. Draft. Prepared for Government of Yukon. April. CH2M HILL Canada Limited (CH2M). March 2015aa. Summary of 2014 Field Investigation – Construct Intermediate Dam Spillway FSP Name: 201.6 – Construct Intermediate Dam Spillway. Technical memorandum. Prepared for Government of Yukon. March 13.	Discussion of bypass spillway, directing overflow from Intermediate pond around the CVP to discharge to Rose Creek. Aquifer tests in pumping wells Hydrualic model development
201.7	Stabilize Secondary Dam by Densifying Foundations for East Limb Embankment	RCTA	Mitigation against liquefaction and dam instability during MCE. Also include embankment stability under all other loading conditions and erosion protection during PMF flooding.	Most cost-effective seismic mitigation: Extent of liquefaction and slope instability Appropriate methods of ground improvement	Pseudo-static LE analyses to evaluate different stabilization alternatives. Two-dimensional (FLAC2D) dynamic/seismic analyses to more appropriately determine the cyclic shear stresses in the embankments for liquefaction assessments and mitigation design (shortcoming of the previous liquefaction assessment was using SHAKE91 [a one-dimensional analysis] for two-dimensional geometry). Use FLAC2D to evaluate seismic deformation to optimize mitigation options. Criteria for acceptable deformations must be established first.	Subsurface information covering the full length (for example, filling the gaps, of the East Limb of Secondary Dam) (existing borings tend to be clustered with gaps greater than 500 m between clusters). Shear wave velocity (Vs) information. Liquefaction assessments will be more reliable with direct measurement of Vs instead of estimating these values from correlations with SPT blowcounts.	Y Y	Drilled and installed 3 well pair clusters with provision for downhole GPX Completed downhole and surface geophysical surveys Completed pump testing and groundwater monitoring at well clusters	CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March.	
202 - Tailings Cover										
202.1	Cover Intermediate Tailings Area	RCTA	Prevent direct contact by wildlife with the tailings and minimize contaminated runoff. Current concept is for a dry revegetated surface on top of a cover over complete intermediate tailings surfaces. The Intermediate Pond will be filled with coarse granular (for example, processed waste rock) or dewatered (dry) tailings prior to installing cover and revegetation of cover.	The condition of the surface of the tailings within the tailings area varies by season. These conditions limit when and where equipment can successfully work on the tailings surface. Behavior of cover surface over long term after adding large fill thickness in pond area.	Determine settlement/differential settlement predictions; determine stability assessments (for example, edge effects during construction); hydrology, energy dissipation features; TEMP/W drainage, slope stability, and settling assessments; design of basal support layer (waste rock or geogrid); manage risks associated with differential settlement especially in area of energy dissipation features. Determine cover placement method, depth of cover material, suitable surface cover material and microtopography features. Revegetation cover design requires consideration of ET or other cover requirements.	Hydrologic and hydraulic model to provide influent SW flow data and elevations as well as routing and velocity data in relation to swales. Erosive and conveyance characteristics of swales materials and vegetative cover. Source of base granular drainage material, filter compatible layer and final cover. Implications of geochemistry (leachability, decomposition of waste rock above tailings). Determine if material from NFRD the best source or can "less useful" waste rock be used. Thickness of growth media (water balance). Energy dissipation structure design and risks.	N	Work on Project Proposal and Cover Design Stopped	CH2M HILL Canada Limited (CH2M). March 2015x. Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area FSP Name: 201.1 – Dewater and Cover Intermediate Tailings Area. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015z. Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike FSP Name: 201.5 – Construct New Side Channel and Side Channel Dike. Technical memorandum. Prepared for Government of Yukon. March 13. See borrow investigation sections (400 code activities)	Hydrologic and hydraulic model to provide influent SW flow data and elevations as well as routing and velocity data in relation to swales. Erosive and conveyance characteristics of swales materials and vegetative cover. Source of base granular drainage material, filter compatible layer and final cover. Implications of geochemistry (leachability, decomposition of waste rock above tailings). Determine if material from NFRD the best source or can "less useful" waste rock be used. Thickness of growth media (water balance). Energy dissipation structure design and risks.

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
						Ultimate contouring of tailings impoundment and the dynamics of any future intermediate pond (emergent vegetation). Feasibility of sump in WR pore space adjacent to the Intermediate Dam to store tailings porewater covered with till/clay revegetated layer.				Ultimate contouring of tailings impoundment and the dynamics of any future intermediate pond (emergent vegetation). Feasibility of sump in WR pore space adjacent to the Intermediate Dam to store tailings porewater covered with till/clay revegetated layer.
202.2	Place Covers on Original and Secondary Impoundments and Revegetate	RCTA	To prevent direct contact by wildlife and birds with the tailings and to minimize contaminated runoff.	Detailed design of capture and conveyance measures; requirements for accessibility; cover stability; and long-term vegetation stability; differential and total settlement. Current revegetation design includes use of agronomic grass species, out of keeping with revegetation of the contiguous Rose Valley area and may be an issue for further revegetation and development of an ET cover.	Surface hydrology (swales, ditching, and energy dissipation features); GW/SW interaction. Microtopography and mesotopography determination, growth medium characterization in tailings cover material, vegetation type and application method. Integrated assessment of geotechnical and vegetation cover (agronomic or native) issues for the tailings pond is needed to inform cover design.	Need to assess mesotopographic and microtopographic features for tailings cover, and assess available cover material volumes and appropriate vegetation plan. Need to assess optimal cover material types in different areas of tailings cover to facilitate drainage of porewater and separation of clean SW from seepage areas. Lysimeter installation required in dry consolidated and wet unconsolidated (but due to be drained) tailings materials. Cover and revegetation trial required for the tailings surface. Revegetation plan and evapotranspirative aspect of the cover design. Energy dissipation structure and implications for revegetation planning. Microtopography and landforming.	N	Work stopped on preparation of Project Proposal	None	Need to assess mesotopographic and microtopographic features for tailings cover, and assess available cover material volumes and appropriate vegetation plan. Need to assess optimal cover material types in different areas of tailings cover to facilitate drainage of porewater and separation of clean SW from seepage areas. Lysimeter installation required in dry consolidated and wet unconsolidated (but due to be drained) tailings materials. Cover and revegetation trial required for the tailings surface. Revegetation plan and evapotranspirative aspect of the cover design. Energy dissipation structure and implications for revegetation planning. Microtopography and landforming.
203 - Rose Creek Diversion										
203.1	Upgrade Rose Creek Diversion Upstream from Fuse Plug	RCTA	The Rose Creek Diversion upstream from the fuse plug and downstream from the convergence of the North and South Forks of Rose Creek currently has capacity for the 674 m3/sec PMF based on the cross-sectional area between the Secondary Dam and the hillside. The upgrade is required to stabilize the existing embankments. Perform modifications to pass the PMF through upstream portion of RCDC, including widening and/or deepening of the channel. Provide erosion protection of channel sideslopes and channel bottom. Design to preliminary design level of detail.	Stability of the channel banks need to be addressed. Design of new approximately 400m overflow weir in the location of the existing fuse plug/overflow weir needs to be are discussed in separate activity below and must be considered for design of the RCD upstream of the overflow weir. Rose Creek Diversion Channel needs to increase capacity; stability of the channel banks needs to be addressed. Existing channel carries salmon and is considered a navigable water. Assess changing elevation of channel with respect to tailings and effects on seepage and contamination. Icing of channel resulting in reduction of flow capacity during high flow events. Assess icing related risks. Discontinuous permafrost, ground conditions, channel seepage losses, interaction of GW and SW, hydraulic analysis.	Refinement of hydrologic and hydraulic models to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Bed and bank materials characterizations. Some site specific hydraulic modelling required to provide water surface profiles. Permafrost impacts on design considerations. Diversion design to preliminary level including channel and floodplain geometry, stability and catchment area. Geotechnical, water quality, channel stability, seepage, hydrology, hydraulics modelling refinements, design storm flows, icing, soil cover, and re-vegetation options. Existing channel carries salmon and is considered a navigable water. Assess changing elevation of channel with respect to tailings and effects on seepage and contamination. South slope stability: Rock cut slope stability Assess permafrost issues and potential stability issues Assess potential for channel blockages due to the follow: (1) debris flows, or south slope slides, (2) icing problems, and (3) minor slope failures (during smaller floods) and vegetation.	Additional flow monitoring data collection at stations in place. Rock mass strengths and soil strengths to assess cut slope stability of south slope. Debris flow potential. Potential for icing. Quarry sources for large angular riprap. Infiltration rates for any tributary covers. Cover material in catchment area.	Y N N Y Y Y Y	Instrumented two stream stages (X10, RCSG-4) with continuous monitoring transducers Completed 2 channel cross section surveys Cross section data available; USC test resutlts See borrow investigation sections (400 code activities) Regional surface water modelling and Site-wide GW modelling have provided sufficient information for Concept Design Regional surface water modelling and Site-wide GW modelling have provided sufficient information for Concept Design	CH2M HILL Canada Limited (CH2M). March 2015dd. Summary of 2014 Field Investigation – Site-wide Surface Water Monitoring FSP Name: SW-005 – Site-wide Surface Water Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31. CH2M HILL Canada Limited (CH2M). March 2015y. Summary of 2014 Field Investigation – Upgrade Rose Creek Diversion FSP Name: 201.3 – Upgrade Rose Creek Diversion. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). March 2015bb. Summary of 2014 Field Investigation – Erosion Dissipation Structure FSP Name: 203.2 – Erosion Dissipation Structure. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M HILL). November 2012e. Alternatives Evaluation and Risk Analysis for the Rose Creek Tailings Area, Faro Mine. Prepared for Yukon Government. November. CH2M HILL Canada Limited (CH2M). March 2015hh. *Borrow Baseline Design Criteria Report, Faro Mine Remediation Project.* Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March.	Continue to monitor SW stations Geomorphic Assessment Required
203.2	Construct Erosion Dissipation Structure	RCTA	Construct an erosion dissipation layer on tailings cover downstream from a new overflow weir. Flood water will flow from the erosion dissipation structure into a new side channel that will run parallel and immediately next to the Rose Creek Diversion.	Potential backwater conditions require hydraulic modelling to evaluate whether the flood can pass the lower channel without overtopping the dike or intermediate dam.	Review of current PMP and PMF estimates. Erosion potential, water quality, stability, hydrology, hydraulics, and construction materials (riprap sources). Assessment of the design of the energy dissipation structures and settlement of underlying material.	Hydrologic and hydraulic model to provide influent SW flow data including velocities, erosive forces, and elevations. Foundation strength: natural versus tailings area. Define extent of waste materials (assume it will be removed). Detailed topographic survey data, potential bed and bank material characterizations. Flow data, and water profile data (surface elevations). Borrow sources for riprap.	N N Y N Y	Completed geological reconnaissance Sufficient topographic data available for Concept Design; bed and bank material characterization required See 203.1 See borrow investigation sections (400 code activities)	CH2M HILL Canada Limited (CH2M). March 2015bb. *Summary of 2014 Field Investigation – Erosion Dissipation Structure FSP Name: 203.2 – Erosion Dissipation Structure.* Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M HILL). November 2012e. Alternatives Evaluation and Risk Analysis for the Rose Creek Tailings Area, Faro Mine. Prepared for Yukon Government. November. CH2M HILL Canada Limited (CH2M). March 2015hh. *Borrow Baseline Design Criteria Report, Faro Mine Remediation Project.* Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March.	Hydrologic and hydraulic model to provide influent SW flow data including velocities, erosive forces, and elevations. Foundation strength: natural versus tailings area. Define extent of waste materials (assume it will be removed). Potential bed and bank material characterizations. Flow data, and water profile data (surface elevations).
203.3	North Fork Rock Drain, Create Channel	RCTA	Create channel through rock drain by either (1) installation of a culvert (trenchless installation or by cut and cover), or by breaching the road embankment to create a notch for the channel. To restore the North Fork of Rose Creek and protect from potential sources of contamination. Restore the North Fork of Rose Creek and protect it from potential sources of contamination. Design to preliminary design level of detail. (Coordinate with Activity Code 107.1)	Determine the concept for rock drain [complete rock drain removal vs. creating a channel (notch) through the rock drain vs. installing a large culvert (trenchless installation or cut and cover)]. Large undertaking will remove primary access route from Faro and Vangorda/Grum sites. Key issues are slope stability, maintenance of access, geochemical conditions, sedimentation, and constructability. Effects on wildlife, including resident grayling must be integrated into design. The extent of effects on fish and fish habitat are unknown. Discontinuous permafrost, ground conditions, channel seepage losses, interaction of GW and SW, hydraulic analysis.	Geotechnical, hydrology, and hydraulics for passing flow through new channel section and erosion potential. Refinement of hydrologic and hydraulic models to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Bed and bank materials characterizations. Fisheries and fish habitat reviews are required to determine the quality and quantity of fish habitat that would be incorporated into design. Permafrost impacts on design considerations. Re-vegetation requirements. Diversion design to preliminary level including channel and floodplain geometry, stability and catchment area. Rock drain may have some flood attenuation capacity that can be incorporated in hydrological evaluations.	Geotechnical data along new alignment, including excavatability, permeability, erosion potential, etc. Geochemical properties of Haul Road embankment (rock drain) for use as borrow source at the tailings dam. Rock drain hydraulic characteristics.	Y Y Y	Completed surface geophysical surveys across NFRC upstream and downstream of Rock Drain Drilled 2 borings at the downstream toe of the Rock Drain Advanced 1 boring through the Rock Drain (CH15-107-MW035) Performed tracer test through the Rock Drain Collected weekly water level elevation surveys at NF1 and NF2	CH2M HILL Canada Limited (CH2M HILL). March 2014m. 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M). March 2016j. North Fork Rose Creek Geotechnical Report. Draft. Prepared for the Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31.	
203.4	Construct New Overflow Weir	RCTA	Replace existing fuse plug/overflow section with a new overflow weir. Weir will be hardened to resist erosion.	Design criteria and functionality of the overflow weir. Length and configuration of overflow weir required.	Hydrology, hydraulics, erosion potential, and functional parameters associated with the overflow weir. Design of the overflow weir embankment including seepage and slope stability, and erosion protection. Hydrology, hydraulics, and erosion potential.	Hydrologic and hydraulic model to provide influent SW flow data and elevations and erosion/load information for the design of the fuse plug. Detailed cross section survey data.	N Y	Completed 2 channel cross section surveys	CH2M Canada Limited (CH2M). March 2015n. Summary of 2014 Field Investigation – Upgrade Rose Creek Diversion FSP Name: 201.3 – Upgrade Rose Creek Diversion. Technical memorandum. Prepared for Government of Yukon. March 13.	Hydrologic and hydraulic model to provide influent SW flow data and elevations and erosion/load information for the design of the fuse plug.

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
				Embankment and foundation conditions for overflow weir.	Evaluation of foundation conditions for overflow weir.	Soils data (geotechnical), ice data, flow data, and water profile data (surface elevations). Quarry sources for fuse plug material.	Y Y	Advanced 2 borings into bedrock See borrow investigations (400 area activities)	CH2M HILL Canada Limited (CH2M). March 2015cc. *Summary of 2014 Field Investigation – Construct New Overflow Weir FSP Name: 203.4 – Construct New Overflow Weir.* Technical memorandum. Prepared for Government of Yukon. March 13.	
203.5	Upgrade Rose Creek Diversion Downstream from Fuse Plug	RCTA	Provide adequate freeboard to enable the RCDC to pass the flow of Rose Creek on a year-round basis for all flows up to the 500-year flood event. Provide adequate freeboard to enable the RCDC to pass the flow of Rose Creek on a year-round basis for all flows up to the 500-year flood event.	Significant leakage from the channel in its current configuration – 30% at low flow. The relationship defining flows related to the RCDC and the ID spillway. The settlement of the RCDC dike upstream of the Intermediate Tailings Dam.	Geotechnical, hydrology, hydraulics, and erosion potential. Repairs and improvements to the channel and the dike, riprap modifications, steep channel section, portions of the dike may be raised and/or buttressed to mitigate settlement or loss of freeboard. Rose Creek Diversion dike stability: Seepage and slope stability Internal filter and drain system adequacy Liquefaction potential and mitigation Deformation analyses (static and seismic) Borrow material considerations Slope protection Geotechnical instrumentation	Hydrologic and hydraulic model to provide influent SW flow data and elevations. Detailed cross section survey data, bed and bank material characterizations. Flow data, and water profile data (surface elevations). Relationship determination between the RCDC flows, water surface elevations, and the raising/flow requirements in the Intermediate Tailings Dam spillway. Seepage losses from RCDC.	N Y Y Y	Instrumented two stream stages (X10, RCSG-4) with continuous monitoring transducers Completed 2 channel cross section surveys Completed geological reconnaissance of RCD Drilled installed and developed six monitoring well clusters along the RCDC dike crest Completed aquifer testing at monitoring well clusters Deployed and monitored water level transducers at monitoring well clusters	CH2M HILL Canada Limited (CH2M). March 2015dd. Summary of 2014 Field Investigation – Site-wide Surface Water Monitoring FSP Name: SW-005 – Site-wide Surface Water Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31. CH2M Canada Limited (CH2M). 2015q. Summary of 2014 Field Investigation – Erosion Dissipation Structure FSP Name: 203.2 – Erosion Dissipation Structure. Technical memorandum. Prepared for Government of Yukon. March 13. CH2M HILL Canada Limited (CH2M). February 2014q. 2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 7. CH2M HILL Canada Limited (CH2M). March 2014m. 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28.	Hydrologic and hydraulic model to provide influent SW flow data and elevations.
203.6	Construct a Fish Bypass (ladder)	RCTA	Replacement of existing drop structures in the downstream portion of the RCDC with a larger fish bypass system.	Fish surveys indicate fish bypass ladder not required			Y	Fisheries report indicates that ladder is not requried	Environmental Dynamics Inc. (EDI). March 2015a. Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014. (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25.	
203.7	Revegetate Riparian and High Bank Areas	RCTA	Erosion control and habitat (fish and wildlife) require vegetated surfaces to work concurrently with engineered diversion structures.		Locate appropriate soils for growth medium. Complete revegetation design for riparian areas and associated wetlands. Design soil and vegetation covers based on engineering design for creek, to enhance geotechnical design.	Characterize source and availability of soil cover materials. Characterize vegetation community for riparian revegetation.	Y Y	See borrow investigations (400 area activities)	None	
204 – Groundwater Collection										
204.1	Construct Intermediate Dam Cut-off Wall	CVD	Install grout cut-off wall to bedrock in the area of the Intermediate Tailings and Cross Valley dams to direct water either to a central sump or directly into a pipeline; water will be pumped to Faro Pit or directly to the WTP.	Foundation information is not available for the area between the Intermediate Tailings and Cross Valley dams. Data show subsurface at the cross valley and downstream location consist of loose alluvium. Cut-off wall would be located downstream from Cross Valley Dam if Cross Valley Dam is retained.	Assessment of cut-off wall design required. Optimization and detailed design will need to be done during the detailed engineering design phase. Before completion of the cut-off wall and trench, a monitoring system will be installed both upgradient and downgradient from the collector system.	Potential interaction with SW. Bedrock contact delineation.	Y Y	Design Concept Changed to DS of CVD Design Concept Changed to DS of CVD	See CDRM Section 9	Requirements depend on selection of CVD SIS cut-off location
204.2	Construct Intermediate Dam Interception Trench (changed to CVD SIS)	CVD	Direct water either to a central sump or directly into a pipeline; water will be pumped to the Faro Pit or directly to the WTP during the treatment period of the year (early spring to early winter).	Configuration of bedrock surface. Distribution of aquifer properties. Response of aquifer system to GW pumping. Magnitude of site water budget components. Geochemical conditions within the aquifer and potential for well fouling. Number of wells required for effective interception. Need for permeable trench and cut-off walls. Effectiveness of collector trench and need for additional GW wells extending to bedrock.	Develop three-dimensional numerical GW flow model. Investigate various alternative configurations of GW interception design to optimize efficiency and minimize cost. Use GoldSim model or other model to provide boundary conditions for the GW flow model. Estimate GW flow and contaminant mass loading from extraction system (average and peak). This approach is also required if SIS is constructed downstream from Cross Valley Dam.	Potential interaction with SW. Extent of hydraulic connection between the alluvial aquifer and Rose Creek downstream from the Cross Valley Dam. Bedrock topography in the vicinity of the GW interception system downstream from the Cross Valley Dam. Aquifer properties of both the alluvial and weathered bedrock aquifers along the interception system alignment, including areas on the northeast and southwest extents of the valley fill aquifer. Delineation of the alluvial aquifer thickness, bedrock topography, and aquifer properties downgradient from the planned GW interception system.	Y Y Y Y Y	Design Concept Changed to DS of CVD Design Concept Changed to DS of CVD	CH2M HILL Canada Limited (CH2M HILL). March 2013m. Cross Valley Dam Interception System Investigation Data Report Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. March 28. CH2M HILL Canada Limited (CH2M). February 2014q. 2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 7. CH2M HILL Canada Limited (CH2M). January 2015b. Cross Valley Dam Seepage Interception System Test Pit Data Summary, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. January 30. CH2M HILL Canada Limited (CH2M HILL). March 2014i. Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Report, Faro Mine Remediation Project. Draft. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. (60% design)	Remaining gaps depends on final location of CVD SIS; if not positioned as designed, then needs to be re-evaluated
205 - Miscellaneous Closure Activities										
205.1	Construct New Polishing Pond near the New Faro Area WTP	Mill / ETA			None. Not required		Y	Design of Replacement WTP does not rely on Polishing pond	CH2M HILL Canada Limited (CH2M HILL). January 2013e. *WTP Design Definition Report, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. January 21	
Vangorda/Grum Area (Activity Code 300)										
301 - Vangorda Pit										
301.1	Pit Wall Stability (new activity)		Evaluate pit wall stability including stability of slopes above the access road ramp where pipeline is located. This is a new activity.	Long term stability of pit walls. Consequences of pit wall failures (slide in pit may cause wave that could endanger pumping infrastructure and operating personnel)	Field inspection and evaluation to determine requirements/needs for (1) analytical stability evaluation, (2) instrumentation and monitoring, and (3) slope management including possible stabilization measures. Slope stability analysis.	Requirements/needs for stability evaluation, subsurface information gathering and instrumentation and monitoring.	Y	Completed geological reconnaissance VGA removed from project proposal scope	CH2M HILL Canada Limited (CH2M). March 2014q. Faro Mine Complex 2013 Pit Wall Stability Inspection, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 26.	
301.2	Construct Safety Berms (Vangorda Pit)		Construct the safety berms around Vangorda Pit. Construct an access road along the alignment of the berm.	Construction and design optimization will be completed during the detailed engineering process.	Surface hydrology (drainage ditches) and sediment control (retention/settling ponds).		Y	VGA removed from project proposal scope	None	
301.3	Reslope and Cover Vangorda Pit Waste Rock Piles		Regrade smaller waste rock dumps in the southeastern portion of Vangorda Pit. Cover with till – ET cover. Revegetate areas within days of sloping. Construct rock drains/ditches to prevent seeps from daylighting and ponding on revegetated surfaces.	Pit walls are retrogressing in some areas; slope instability issues. Potential of rockfalls. Water level fluctuation in pit (risk of flooding revegetated areas and killing vegetation). Geotechnical and geochemical variability of deposit. Available subsurface information. Location and number of seeps that could daylight on revegetated surface.	Equipment access and foundation conditions. Water level fluctuations, pit wall stability. Appropriate cover material volumes and revegetation planning.	Cover material volumes. Cover microtopography and revegetation plan. Geochemical and geotechnical characterization of waste piles within the open pit. Slope stability study and analysis of pit walls. Evaluate requirements for slope stability monitoring (install inclinometers actively survey pit walls during construction, or bore holes if needed).	Y	VGA removed from project proposal scope	None	
302 - Vangorda Dump										
302.1	Reslope Vangorda Waste Dump (plateau area)		Decrease infiltration through the dump, prevent dust generation and migration, and prevent direct uptake by wildlife. Control SW runoff.	Geotechnical properties and geochemical variability of waste. Runoff volumes, efficient and reliable control structures.	Optimize resloping plan. Develop surface water management plan during and after construction.	Geotechnical and geochemical characteristics of waste rock and soils.	Y	VGA removed from project proposal scope	None	
302.2	Reslope Vangorda Waste Dump (perimeter slopes)		Construct geotechnically stable landforms that are consistent with long-term revegetation plans.	Conveyance of surface water runoff down the dump slopes without eroding cover. Failure modes and effects analysis of water conveyance channels (that is, ice jam)	Develop final landform design under the following considerations: Optimized resloping Toe of slope is constrained by creeks in several areas; limited opportunities for downgradient sediment management. Protection of the stream channel immediately to the south of the toe of the Vangorda WR Dump. Develop surface water management plan during and after construction. Develop sediment control plan. Assess foundation conditions to	Stability of 2.7:1 slope for erosion revegetation (slope facing creek).	Y	Vangorda Grum mine area removed from project proposal scope	None	

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
	slopes)			(that is, ice jam).	allow for sediment collection ditch. Optimize seepage interception along toe of slope (currently appears to be part way up the slope).	Geotechnical and geochemical characteristics of waste rock that will be exposed as a result of regarding/resloping. Reactivity of regraded waste rock for sediment management and long term revegetation.				
302.3	Place Low-infiltration Cover on Vangorda Waste Rock and Revegetate		Place low-infiltration cover on Vangorda Waste Rock dump and revegetate.	Allowable infiltration through cover, optimization of cover versus seepage interception and treatment. Proposed reclamation surface is rough and loose; however, field investigation concluded that microtopography is bad for plateau areas because it promotes ponding and infiltration.	Cut and fill optimization. Infiltration modelling/cover optimization. Need to review RLU planning basis with Waste Pile and Tailings Discipline Team.	Final topography of waste dump. Sediment characteristics (geochemical and geotechnical) of material to be exposed during cut/fill (especially erodible fines). Cover material needs to be identified for source and quality. Existing site water balance versus water balance after final grading needs to be evaluated to determine surface and GW impacts. Evaluate till stockpile as a potential borrow source. Sediment control, especially on freshly covered slopes.	Y	Vangorda Grum mine area removed from project proposal scope	None	
302.4	Place Very Low Infiltration Cover Over Baritic Fines		Prior to regrading waste rock, cover baritic fines stockpiled on the northeastern side of the dump with a very-low-infiltration cover. Slope waste rock upslope of the fines and cover with a low-infiltration cover. Alternative – Relocate baritic fines to sulphide cell as bedding layer for very low infiltration line. Only feasible if baritic fines have not migrated/leached excessively into the underlying waste rock.	Clear delineation of limits of baritic fines/cover suitability and short-term and long-term performance. If alternative design: Chemical compatibility of baritic fines with material in sulphide cell.	Infiltration modelling/cover optimization. Sediment control and management of contaminated water (primarily surface contact water).	Need geotechnical information for baritic fines to evaluate capping design and possible relocation. Evaluation of possible contamination of waste rock below baritic fines due to leaching of baritic fines. Accurate delineation for baritic fines (conflicting areas and volumes). Sediment control plans during construction (if moved: relocate toward centre of Sulphide Cell rather than toward slope of waste rock pile).	Y	Vangorda Grum mine area removed from project proposal scope	None	
302.5	Place Very Low Infiltration Cover over Main Dump Sulphide Cell		To decrease infiltration through the dump and to prevent dust migration and direct uptake by wildlife. Alternative 1 – Consider consolidating baritic fines on sulphide cell as finer (cushion) layer at liner contact. Alternative 2 – Design 2:1 slopes for impervious liner and develop 3:1 or flatter slopes outside the liner to facilitate revegetation.	Allowable infiltration through cover; optimization of cover versus seepage interception and treatment. If Alternative 1: Chemical compatibility of baritic fines with material in sulphide cell	Cut and fill optimization and infiltration modelling/cover optimization. Lessons learned from capping Grum Sulphide Cell. Need to monitor processes ongoing in that cover and requirement for liner. Merits of very low infiltration cover need to be assessed. Additional monitoring (for example, lysimeters and monitoring wells). Design evaluations of Alternatives 1 and 2.	Cover material volumes need to be assessed for this area. Cover microtopography and revegetation plan needs to be assessed. Gradation of waste rock (relates to necessity for cushion layer below cap).	Y	Vangorda Grum mine area removed from project proposal scope Installed CH12-014-MW013 Vangorda Grum mine area removed from project proposal scope	None	
303 - Vangorda Creek Diversion										
303.1	Construct New Vangorda Diversion		Potential revegetation of the diversion and adjacent areas needs to be assessed. To permanently realign Vangorda Creek around Vangorda Pit to minimize leakage into pit and provide a safe setback for the diversion away from the pit slope. Vangorda diversion is a component of the MTP and detailed design will be completed.	The existing final design for the permanent realignment of the Vangorda Creek Diversion was performed by others; energy dissipation, erosion prevention measures and intake structure were incorporated into the final design. Potential revegetation of the diversion and adjacent areas needs to be assessed. Energy dissipation design elements especially along steep sections. Erosion protection requirements. Discontinuous permafrost, ground conditions, channel seepage losses, interaction of GW and SW, hydraulic analysis. Design flows have been selected. The exact alignment and hydraulic design are still uncertain.	Refinement of hydrologic and hydraulic models to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Bed and bank materials characterizations. Some site specific hydraulic modelling required to provide water surface profiles. Physical hydrologic/hydraulic modelling is required for final design. Alignment, energy dissipation, routing, gradient, materials, cost, geotechnical conditions, hydrology, hydraulics, erosion potential, and potential revegetation to manage erosion. Impacts on downstream Dixon Creek will need to be considered in the selected design. Re-vegetation to manage erosion needs to be included in design basis to assess cover materials and vegetation species required. Permafrost impacts on design considerations. Diversion design to final level including channel and floodplain geometry, stability and catchment area.	Geotechnical data and soils data collection along final route only in the case the route alignment will change from the current SRK alignment. The final alignment has not been selected. Revegetation planning for channel stabilization and riparian area erosion control. Additional flow monitoring data being collected in 2013/14 for Vangorda, data to be coincident with precipitation data collected at existing meteorological stations (the Grum Dump) for additional model calibration and validation.	N N N Y	Drill 3 borings along proposed VCD alignment (SRK 2010), complete as standpipe piezometers Complete surface geophysical survey transects at SRK proposed VCD alignment Topographic Survey of SRK's proposed VCD alignment Fluvian geomorphic assessment of Vangorda creek Inspect Meteorological stations (CH2M March 2014d) Reconnaissance of SRK's proposed VCD alignment (CH2M March 2014d) Vangorda Grum mine area removed from project proposal scope Vangorda Grum mine area removed from project proposal scope Instumented and monitored additional stream stages (V2, V8) with continuous monitoring transducers	CH2M HILL Canada Limited (CH2M). March 2014d. 2013 Vangorda Creek Diversion Field Investigation Data and Analysis Report, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M). March 2014d. *2013 Vangorda Creek Diversion Field Investigation Data and Analysis Report, Faro Mine Remediation Project*. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28.	
303.2	Upgrade Runoff Interceptor Ditch to Dixon Creek		Divert uncontaminated surface runoff from the northeast side of the Vangorda to the south and into Dixon Creek via the Dixon Creek Diversion. Upgrade channel to pass the 500-year storm. Place filter material and riprap sized for the flows in the channel, to prevent erosion. Design to preliminary design level of detail.	Seepage rates, water quality, interception potential, long-term performance of interception. Design criteria provided in Table 4.3 require definition and linkage to seepage management and water quality. Erosion protection requirements. Discontinuous permafrost, ground conditions, channel seepage losses, interaction of GW and SW, hydraulic analysis.	Refinement of hydrologic and hydraulic models to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Bed and bank materials characterizations. Some site specific hydraulic modelling required to provide water surface profiles. Geotechnical, hydrology, hydraulics, and erosion potential. Permafrost impacts on design considerations. The GW/SW interaction is particularly important because of the seepage issue. Diversion design to preliminary level including channel and floodplain geometry, stability and catchment area. Geotechnical, water quality, channel stability, seepage, hydrology, hydraulics modelling refinements, design storm flows, icing, soil cover, and re-vegetation options.	Flow data, and water profile data (surface elevations). Availability of flow data in Dixon Creek upstream from the confluence of Dixon Creek with Shrimp Creek. Subsurface conditions: Permeability Permafrost occurrence Erodability of base material	N N N N N N	Vangorda Grum mine area removed from project proposal scope	None	
304 - Grum Pit										
304.1	Pit Wall Stability		Evaluate pit wall stability specifically the alluvium/colluviums slope at east wall of Grum Pit. Perform stability evaluation and install slope movement instrumentation (prisms)	Long term stability of pit walls and management requirements. Consequences of pit wall failures (slow movements of large volume of material may impact available storage in pit and a rapid slide in pit may cause wave that could endanger pumping infrastructure and operating personnel)	Slope stability assessment: Development of analytical slope stability model Calibration with measured slope movements Assessment of margin of safety against slope failure	Rate and magnitude of alluvium/colluvium soil slope movement	Y	Geological reconnaissance and survey monument installation	CH2M HILL Canada Limited (CH2M). March 2014q. Faro Mine Complex 2013 Pit Wall Stability Inspection, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 26.	
304.2	Construct Safety Berms (Grum Pit)		Restrict access to human and wildlife for safety purposes.	Acceptable methods for providing safer barricades that will not be snow covered and ineffective.	Safety berms around Grum Pit and polishing ponds in the slot.	Sufficient geotechnical data.			None	
305 - Grum Interceptor Ditch										
305.1	Divert Grum Interceptor Ditch away from Grum Pit		Interceptor ditch will be diverted away from Grum Pit. Design to preliminary design level of detail.	Foundation conditions along Access Road next to the proposed ditch alignment and at the earth dam proposed at headworks. Characteristics of overburden at the trapezoidal interceptor channel and cut slots at pit bench crest and at the south end of Grum Pit.	Refinement of hydrologic and hydraulic models to provide influent SW flow data and elevations. Integration of SW and GW modelling approaches and results. Bed and bank materials characterizations. Some site specific hydraulic modelling required to provide water surface profiles. Geotechnical, hydrology, hydraulics, and erosion potential. Interceptor will be diverted away from Grum Pit. Permafrost impacts on design considerations. Re-vegetation requirements. Diversion design to preliminary level including channel and floodplain geometry, stability and catchment area.	Soils data (geotechnical), ice data, flow data, and water profile data (surface elevations).	N	Vangorda Grum mine area removed from project proposal scope	None	
305.2	Construct Algae Filter at Slot Cut in Grum Pit		YG discontinued algal treatment in 2012. It will not be resumed. Grum Pit water will be treated in the Faro WTP.						None	
306 - Grum Waste Dump										

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
306.1	Reslope and Regrade Grum Waste Dump and Pull Back Crest		Reduce infiltration in the plateaued upper surface of the dumps. Construct geotechnically stable landforms. Minimize energy of runoff from covers and surrounding areas. Revegetate disturbed areas on all dump areas.	SW, GW, and geochemical modelling are not well integrated. IPR provided recommendations for review. Enhanced modelling is underway to estimate the effectiveness of remediation over time and the application of adaptive management principals.	Update and integrate previous modelling (hydrology, water balance, and geochemical) to optimize ET model and erosion reduction. Develop surface water management plan during and after construction. Consider infiltration galleries to facilitate surface water management Optimize regrading/resloping plan considering final footprint constraints; evaluate option of expanding the toe. Development sediment control plan. Assess borrow materials (till).	Geotechnical and geochemical characteristics of waste rock and soils, including those that will be exposed as a result of regrading/resloping. Volume of foundation materials at toe of waste rock dumps suitable for borrow. Locations of suitable areas for potential infiltration galleries to help control surface runoff and erosion.	N N N	Installed CH12-014-MW011, CH12-014-MW012 Vangorda Grum mine area removed from project proposal scope Vangorda Grum mine area removed from project proposal scope	None	
306.2	Place Very Low Infiltration Cover on Grum Sulphide Cell		Control infiltration to significantly reduce the amount of water entering the surface of the waste (less than 0.5% of the mean annual precipitation). Bottom third of waste pile remains at high slope angle; SW appears contaminated; and need long term plan for SW disposition.	No lysimeters are installed to monitor infiltration. It is difficult (nearly impossible) to determine the effectiveness of the existing cover without installing new instrumentation. Must conduct detailed lessons learned exercise for the Grum sulphide cover to optimize cover design going forward.	Cell already capped. Need to evaluate the performance of the cap for stability, reducing infiltration, and reducing contaminate discharge. Final waste pile geometry and disposition of SW.		Y	Vangorda Grum mine area removed from project proposal scope	None	
306.3	Place Vegetative Cover on Grum Waste Dump and Revegetate		Control infiltration and maintain vegetation growth. Cover the Main Dump with a rudimentary cover that has the minimum thickness of soil needed to allow plant growth.	Optimum cover and vegetative materials. Cover layer has been packed smooth, which may contribute to runoff Revegetation of drainage-related structures does not appear to be in t Location and quality of borrow material.	Evaluate performance of annual rye seeding, root and leaf density, and ability to continue with revegetation of deeper-rooted species/whips and cuttings into surface. Continue evaluation of vegetation performance to provide information for soil cover composition, topography, and vegetation cover on other proposed, very low infiltration covers. Evaluate performance of drainage structures without vegetative cover.	Data on seeding versus barley performance. Review of planned further revegetation efforts. Continued review of vegetation performance over next 5 years. Review of revegetation planning to align with planning for other landforms. Review of soil cover physical and geochemical characteristics.	Y	Vangorda Grum mine area removed from project proposal scope	None	
307 - Grum Overburden Dump										
307.1	Reslope Grum Overburden Dump and Revegetate		The Grum Overburden Dump is the primary source of glacial till borrow material; after all borrow material at the dump has been removed, the area will be regraded and revegetated. Potential integration of final excavated area for use as storage for emergency pit water management.	Appropriate configuration for terrestrial wildlife. Sediment control. Need to understand the contribution of surface texturing (ripping versus vertical or horizontal rilling) to sediment movement off-slope and moisture retention in soils. Current revegetation trial appears to have used graded phyllite (ore) rather than glacial till. Need to understand geochemical and textural impact, because this is not the planned material for other cover areas.	Infiltration modelling; VADOSE/W; SLIDE (slope stability), and TEMP/W (freeze-thaw). Review sediment data from Grum OB Dump toe ditches and review literature regarding rill design. Need to assess geochemical and textural impact of using phyllite rather than glacial till as vegetation cover substrate. Develop surface water management plan during and after construction. Optimize regarding/resloping plan. Develop sediment control plan. Evaluate disposition of treatment plant sludge as potential subgrade material for liner or disposal in Grum Pit.	Foundation conditions along dump perimeter are not defined.	Y	Vangorda Grum mine area removed from project proposal scope	None	
308 - Grum Ore Transfer Pad										
308.1	Regrade, Cover and Revegetate Ore Transfer Pad		Cover pad with very low infiltration cover, seed, and allow to revegetate naturally. Construct a temporary sediment collection ditch to divert runoff from the revegetated ore transfer pad away from a nearby stream until the vegetation has established. Alternative – Consider consolidation or complete removal of the geochemically reactive fines (typically less than 1-m thick) and exposure of underlying phyllite waste rock that could be exploited as a potential borrow source	Infiltration rates through cover. Appropriate configuration for terrestrial wildlife. Sediment control. Proposed reclamation surface is rough and loose; however, the field investigation concluded that microtopography is bad for plateau areas because it promotes ponding and infiltration. If the thin layer of sulphidic fines is removed and the underlying phyllite is exploited, it will be necessary to develop appropriate closure scenario. Could potentially include development of constructed wetland. Impact on surrounding wetland areas needs to be assessed.	Infiltration modelling (cover optimization); surface hydrology, energy dissipation swales; and TEMP/W. Need to review RLU planning basis with Waste Pile and Tailings Discipline Team, and plan a revegetation trial on this kind of slope/material. Evaluate the potential for consolidation or complete removal due to limited thickness of geochemically reactive fines. Evaluate phyllite as potential borrow source for low visibility areas or as vegetation growth medium.	Revegetation trial required ore transfer pad covers and slopes, especially where hydrocarbon-contaminated or sludge materials may be applied. Cover material needs to be identified for source and quality. Need to assess impact of ore transfer pad on adjacent pond and wetland complex. Determine rationale for capping without consolidation. Geotechnical characterization of ore transfer waste material (gradations, angularity, and hardness). Thickness of geochemically reactive fines.	Y	Vangorda Grum mine area removed from project proposal scope	None	
309 - Vangorda/Grum Groundwater										
309.1	Install Grum GW Collection and Cut-off Walls		Capture contaminated GW seeping from the Grum Waste Rock Dump. Optimization and detailed design will be performed during the detailed engineering design phase. If monitoring indicates insufficient capture of contaminated GW, a cut-off wall and permeable collector trench will be constructed along the Access Road. Pumps would be installed in the collector trench to direct water to the Central Pond.	Pre-mining land surface topography and bedrock topography, subsurface material properties within and beneath Grum WRD, and areas where future seepage from the WRD may occur.	Condition of the Access Road below Grum Dump (construction vehicle access). Pads for pumping wells and clear pipeline alignments. Evaluate central pond foundation in vicinity of Grum Creek crossing. Pump wells and pipelines. House primary discharge pump in a heated enclosure on the side of the central holding pond. Install GW monitoring wells between and downgradient from the pumping wells. Evaluate GW flow directions and GW quality at existing and planned monitoring well and piezometer locations. Develop three-dimensional numerical GW model of the Vangorda/Grum Area to simulate GW levels and GW flow directions. This model will also be used to forecast performance of the Grum WRD SIS under different assumed configurations to optimize interception efficiency and minimize cost. This model will aid in forecasting metal loading to the SIS.	Bedrock surface topography, pre-mining land surface topography, spatial distribution of hydrostratigraphic units, and saturated thickness within and beneath Grum WRD and along the associated proposed SIS corridor. Reliable XYZ locations of existing monitoring and operational infrastructure in the Grum Area. Seasonal gaining versus losing reaches along Vangorda Creek between Vangorda and Grum WRDs. GW monitoring network in Grum Area to provide sufficient early warning triggers in accordance with the AMP. GW flow directions near proposed SIS corridor and near the Grum WRD toe. Subsurface hydraulic properties along and upgradient from the proposed SIS corridor.	Y	Vangorda Grum mine area removed from project proposal scope	None	
309.2	Install VWRD Seepage Collection System		Minimize contaminant loading with covers to decrease infiltration and subsequent seepage. A conceptual design for a GW collection system will be developed.		Seepage collection system in place at the Vangorda Waste Rock Dump consists of French drains to funnel the seepage into a collection ditch that discharges to Little Creek Pond. More active collection of GW seepage from the VWRD is currently not required but may become necessary in the future if contaminant concentrations increase significantly.	Addressed under Activity Code 309.6.			None	
309.3	Install Vangorda GW Collection System		Capture contaminated GW seeping from the Vangorda WRD.	Pre-mining land surface topography and bedrock topography, subsurface material properties within and beneath Vangorda WRD, and areas where future seepage from the WRD may occur	Evaluate GW flow directions and GW quality at existing and planned monitoring well and piezometer locations. Develop three-dimensional numerical GW model of the Vangorda/Grum Area to simulate GW levels and GW flow directions. This model will also be used to forecast performance of the Vangorda WRD SIS under different assumed configurations to optimize interception efficiency and minimize cost. This model will aid in forecasting metal loading to the SIS.	Bedrock surface topography, pre-mining land surface topography, spatial distribution of hydrostratigraphic units, and saturated thickness within and beneath Vangorda WRD. Reliable XYZ locations of existing monitoring and operational infrastructure in the Vangorda Area. Robust GW monitoring network in Vangorda Area to provide sufficient early warning triggers in accordance with the AMP. GW flow directions near proposed SIS corridor and near the Vangorda WRD toe. Subsurface hydraulic properties along and upgradient from the proposed SIS corridor.	Y	Vangorda Grum mine area removed from project proposal scope	None	
310 - Vangorda/Grum Miscellaneous										
310.1	Remove Culverts, Decommission, and Revegetate		Breach all culverts and crossings, and revegetate the disturbed areas. Not yet determined whether haul road should be used as source of cover material; quality needs to be tested.	The flattening and revegetation of the haul road sideslope is currently under review. Will need to develop a sediment control and SW management plan for the work. Possible source material for covers may be incorporated in haul road, but need to core road to check. Removal of haul road across entire Rose Creek valley needs to be assessed.	Remove culverts (includes 10 major culverts in the North Fork River drainage). Decommission embankments. Remove/flatten safety berms. Reclaim by hydroseeding each dump site, breached area, and area of disturbance to eliminate the potential need for hauling and placing topsoil.	Flow requirements for redesigned conveyance components.	Y	Vangorda Grum mine area removed from project proposal scope	None	
			Remove existing buildings and infrastructure that will not be required after closure to mitigate potential long-term safety hazards. Extent of contamination of surfaces through buildings is unknown. Demolish buildings along with their	Sampling for ACM and other designated substances may not be substantive enough to be useful for decommissioning purposes. Areas	Obtain, review, and catalogue site plans and other construction	Sufficient sampling to mitigate costs for abatement of materials assumed to contain designated substances due to lack of information to the contrary. Process material quantification.				

Table B-1. 2016 Engineering Gaps Analysis Table

Faro Mine Remediation Project

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310.2	Demolish Buildings (treatment plant and the steel culvert over Grum Portal)		[illegible] foundations. Only the contaminated foundation components will be removed for proper disposal while the clean foundations will be covered in place (some may be buried within the toe of the Resloped waste rock dump) and revegetated. Prior to any demolition works, a full inspection will be conducted on all site buildings to identify all hazardous waste, salvageable materials, and structural safety concerns. A solid waste management plan will be developed and a list of permits prepared.	around the buildings that are not tested may need to be treated as designated or ACM substances. Site plans, surveys, Material Safety Data Sheets, and other information involving plant construction and makeup are not currently available. Options to revegetate and reclaim the site as part of the natural landscape after decommissioning need to be evaluated. Remove existing buildings that will not be needed after closure and that would be a long-term safety hazard. Revegetate site and reclaim as part of a landscape plan.	documentation for competitive procurement. Depending on EBA's scope, obtain a demolition execution approach through a structural engineer. Site visit to identify items that may have been missed. Follow up sampling may be required. Address safety concerns with onsite buildings to clear areas for safe access to complete other assessments that may be required. Perform site utility surveys. Use GPR if necessary for decommissioning and to understand H&S risk during work. Retain a demolition contractor to assist in scrap assessment. Determine and obtain permits required to perform demolition.	Waste disposal recommendations. Salvage assessment. Utility and site surveys. Assess suitable cover material quality. Assess potential for ET vegetation cover, or appropriate revegetation prescription. Specific revegetation prescription required, this area is a candidate for an ET cover.	Y	Completed inventory of water conveyance infrastructure Vangorda Grum mine area removed from project proposal scope	CH2M HILL Canada Limited (CH2M). February 2016b. *Water Conveyance System Mapping and Inventory, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. February 1.	
310.3	Remove WTP Settling Pond		Construction of the new single WTP at the Faro Mine makes the current settling pond unnecessary. Sludge will be dredged to the Grum Pit using the new dredge system with conveyance in the existing pipeline and a new section into the pit opposite the pump barge.	Closure and disposal requirements for material below the pond. Settling ponds have had leakage issues in the past.	After the water treatment settling pond is cleaned of sludge, the berm should be breached. Breach, riprap, and cover the Water Treatment Settling Pond after the new plant is operational. Breach the dams at the Sheep Pad Ponds (built to capture sediment from the Grum Interceptor Ditch before discharging into Vangorda Creek); the pad ponds do not need to be covered.	Subsurface conditions below the settling pond.	Y	Vangorda Grum mine area removed from project proposal scope	None	
310.4	Remove Contaminated Soils (Fuel Lube Station)		Remove hazardous materials and contaminated soil at the site that could cause a long-term impact on the surrounding environment.	Volume of material excavation; volume and source of backfill. Concentration threshold criteria for soil removal.	The C&R Plan, Table 6.13, outlines design criteria.	Extent of soil hydrocarbon contamination (lateral and vertical) near the Lube Shack and Tank Farm. GW flow directions. Extent of associated GW contamination.	Y	Vangorda Grum mine area removed from project proposal scope	None	
310.5	Construct Bioremediation Cell		Treat hydrocarbon contaminated soil.	Location of landfarm is to be determined; likely on a waste rock dump near mill buildings.	The C&R Plan, Table 6.13, outlines design criteria.		Y	Vangorda Grum mine area removed from project proposal scope	None	
310.6	Reclaim Roads		Prevent long-term erosion and breach crossings to prevent blockage. Culverts and crossings will be breached and resloped and drainages restored. Scarify road surfaces and revegetate.	Road areas will require specific reclamation plans in accordance with required surface drainage plans and surrounding reclamation prescriptions.	There is currently no specific prescription for road revegetation or information about road material quality to predict vegetation success.	Require assessment of road material quality for use as cover materials or requirements for revegetation. Require assessment for basis of design of road reclamation – revegetation or swale/channel formation as part of surface drainage plan.	Y	Vangorda Grum mine area removed from project proposal scope	None	
310.7	Little Creek Pond		The C&R Plan does not provide for the Little Creek Dam, but notes that it may be used. It is assumed that the dam will be used as part of closure.	The need for this structure is undefined and will be determined based on the need for SW and GW collection and storage. The dam is considered a low-hazard dam; therefore, it has a small spillway (500-year event). C&R Plan states that the future of the LCP is yet to be determined, but it will probably not continue to function as a collection pond for seepage from the Vangorda Waste Rock Dump. The C&R Plan suggests that the LCP might be used as a polishing pond for the WTP	Initial review indicates polishing pond in conjunction with a new WTP not required. If retained, review of geologic mapping and as-built information. Engineering analyses: Spillway capacity Seepage analysis Slope stability including pseudostatic (seismic) stability	Embankment and foundation properties (strength and permeability). Piezometric conditions in the dam and the foundation. Erosion protection (riprap) requirements for wave action (assuming that a pond will need to be retained).	Y	Vangorda Grum mine area removed from project proposal scope	None	
400 - Site Wide Activities										
401 - Haul Road										
401.1	Remove Culverts, Decommission, and Revegetate		Breach all culverts and crossings, and revegetate the disturbed areas. Not yet determined whether the haul road should be used as a source of cover material; quality needs to be tested. The flattening and revegetation of the haul road sideslope is currently under review. Will need to develop a sediment control and SW management plan for the work.	Rockfall issues appear to be a natural hazard in valley areas and are construction hazards in dealing with the Faro Mine waste rock piles and high Haul Road berms. Value of reconstruction of valley areas after Haul Road material removal needs to be assessed. Possible source material for covers may be incorporated in Haul Road, but need to sample road materials to confirm. Removal of Haul Road across entire Rose Creek Valley needs to be assessed.	Remove culverts (includes 10 major culverts in the North Fork River drainage). Decommission embankments. Remove or flatten safety berms. Reclaim by hydroseeding each dump site, breached area, and area of disturbance to eliminate the potential need to haul and place topsoil. Integrated planning required for the NFRC valley area (including riparian and ponded areas), in conjunction with activities to reslope the waste rock pile and remove all or part of the haul road.	Dump or cover materials resulting from decommission of haul road not yet assessed in revegetation and reclamation planning; need to study and report back into waste rock and cover inventory.	Y	Scope of work needs to be re-evaluated	None	
401.2	Alternative analysis for retention of haul road		To provide route for Vangorda pipeline to WTP at Faro, Haul Road may be retained.	Need to assess potential interim 10-15 year impact to wildlife and fish during interim works; then perpetual impact as part of closure surface. Approx 800,000 m3 of waste rock from the Haul Road was planned for cover on the Rose Creek Tailings Facility.	Alternatives analysis required for retention of Haul Road impact on material balance, fish and wildlife access. Assess whether portion of haul road can be used as borrow source.	Require wildlife and fisheries alternatives analysis. Require material balance review. Require analysis of rock drain retention options for fish passage in NFRC.	N	Scope of work needs to be re-evaluated. Design basis specifies installation of culvert at haul road.	CH2M Canada Limited (CH2M). March 2016b. *Preliminary Final North Fork Rose Creek Design Basis Report.* Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March.	Scope of work needs to be re-evaluated
401.3	Construct Haul Road Access from Vangorda to RCTA		Breach all culverts and crossings, and revegetate the disturbed areas. The flattening and revegetation of the haul road sideslope is currently under review. Will need to develop a sediment control and SW management plan for the work.		Construct temporary haul roads. Not clear if haul road access alignment has been assessed in the environmental assessment. Need to check if undisturbed areas will be affected by construction; assess and plan for conservation and reclamation of area.	Review of new haul road access area inclusion in environmental assessment, and basis of reclamation design required for affected area.	N	Vangorda Grum mine area removed from project proposal scope	None	Review of new haul road access area inclusion in environmental assessment, and basis of reclamation design required for affected area.
401.4	Construct Cross-Site Mine Water Pipeline		A new HDPE cross-site pipeline will be constructed on the Haul Road to convey Vangorda/Grum-area water to the new Faro WTP. This pipeline will also have a branch to the Faro Pit for temporary storage. It will be operated only during the warm season (e.g. May-Sept) and will be dewatered prior to winter. Cleanout will by pigging. For protection from the elements as well as from traffic damage and vandalism, it is expected to either be buried shallowly or have fill placed over it.	Detailed alignment up from Vangorda and Grum Pits and along the Haul Road. Design Capacity (preliminary design capacity is 2,000 USgpm).	Determine final alignment. Determine final design capacity.	Subsurface conditions along alignment. Source of fill if covered rather than buried	N N	Conceptual design developed. Vangorda Grum mine area removed from project proposal scope	CH2M HILL Canada Limited (CH2M HILL). January 2013b. Power Point Presentation: Faro WTP Schematic Design Report Draft Submission. January 25.	Scope of work needs to be re-evaluated
402 - Water Treatment										
				C&R Plan includes potential for two new WTPs, Faro Area and Vangorda/Grum Area. YG has decided to construct a single WTP located in the southwest corner area of the Faro Mill Yard. The plant will initially not have filters and will discharge through the CVP. A new pipeline will be constructed on the Haul Road to transport Vangorda/Grum-area water to the new WTP or to the Faro Pit for temporary storage (See Activity Code 301.2). Vangorda/Grum-area water will be collected and stored in the Vangorda and Grum Pits and will be pumped through this pipeline during the warmer months, e.g. May – September. On-site borrow source for backfill and for concrete aggregate is uncertain.	Determine source(s) of on-site borrow for backfill and concrete aggregate.	Availability and suitability of on-site borrow for backfill and concrete aggregate.	Y	See Borrow Investigation Sections (400 series activities)	See site-wide borrow tasks. CH2M HILL Canada Limited (CH2M HILL). March 2014b. Faro Water Treatment Plant Geotechnical Design Report Addendum, 2013 Borrow Source and Quarry Investigation, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31.	
				Effluent discharge limits is critical to WTP filter system design. Treatment effectiveness achievable by a new HDS/filtration system (ability to consistently meet discharge limits). Design and operating parameters for achieving optimum WTP performance.	Evaluation of concentrations based on a risk assessment and treatment technology-specific achievable basis. Use 2012 pilot test results to assess potential performance required from the future filtration system. Evaluation of WTP performance without filters in comparison to potential new discharge requirements.	Discharge limits for treated water including sulphate/TDS. Performance of new WTP in comparison to potential new discharge requirements Filter system design and operating parameters.	N	Expired water license used as design basis. No new discharge limits developed		Datagaps remain

Table B-1. 2016 Engineering Gaps Analysis Table
Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
402.1	Construct new Faro Water Treatment Plant and Piping		Design and build new WTP and pipelines to treat contaminated wate. (design completed to ~90% level under TAR 13)	If site discharge limits require very low effluent concentrations, an advanced treatment process may be required in addition to filtration. If sulphate discharge is regulated, NF/RO treatment may be required. Precipitation and scale formation in pipelines is unknown but likely if waters allowed to oxidize or sources waters blended. Sludge disposal capacity in Faro Pit now that it will also store sludge produced from treatment of Vangorda/Grum-area water. The appropriateness and effectiveness of sludge disposal in the pits.	Evaluate discharge limits relative to treatment performance expected for the HDS/filtration process. Review chemical composition of water to be piped and possible different waters to be combined in pipelines. Geochemical modelling. Calculate annual net water balance of water collected and conveyed to new WTP (GoldSim modelling). Calculate estimated annual sludge production and solids volume conveyed to Faro Pit as well as final in-situ storage volume over time. Assessment of sludge dissolution, fate, and effects on water chemistry.	Need for sulphide addition, NF/RO, or other advanced water treatment process to meet discharge limits. Potential for precipitate formation and scaling in water collection and conveyance pipelines. Design features needed to mitigate problems from precipitation and scaling. Quantity requirements and capacities for water and sludge storage in Faro Pit. Geochemical stability of sludge deposited in Faro Pit.	N N N	No scope was authorized to evaluate future water chemistries that could be combined in pipelines. Water storage volume requirements evaluated using GoldSim modelling. Estimated thickener underflow waste volume. Faro pit lake profiling and sampling completed annually	Discussed in Section 2.5 CH2M HILL Canada Limited (CH2M HILL). March 2014b. Faro Water Treatment Plant Geotechnical Design Report Addendum, 2013 Borrow Source and Quarry Investigation, Faro Mine Remediation Project. Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31. CH2M Canada Limited (CH2M). April 2016c. Fiscal Year 2015 Groundwater Flow Model Development Report, Faro Mine Remediation Project. P repared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. April 5. CH2M Canada Limited (CH2M). April 2016d. Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring, FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. April 15. CH2M HILL Canada Limited (CH2M). March 2015b. Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Prepared for Government of Yukon. March 31. CH2M HILL Canada Limited (CH2M HILL). March 2013r. Data Quality Evaluation Report, 2012 Groundwater, Surface Water and Seep Water, Faro Mine Remediation Project. Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March 14.	Datagaps remain Datagaps remain Datagaps remain Geochemical stability of sludge deposited in Faro Pit needs to be evaluated
402.2	Polishing Pond		Construct new Polishing Pond near the new Faro Area WTP. CH2M HILL has determined that a polishing pond is not required following construction of the HDS treatment facilities.	None – not required				No longer planned or required	None	
402.3	Construct Vangorda WTP and Piping		A single WTP located in the area of the Faro Mill will be constructed. Piping route evaluated under separate activity.	None – not required						
403 - Borrow Area Development										
403.1	Develop and Decommission Faro Borrow Sources	Sitewide	Identify all necessary borrow sources and develop plans to rehabilitate borrow areas. Impact on fish and terrestrial habitats, habitat compensation and contamination in Haul Road granular sources.		Some assessments completed on borrow sources. Good quality armour rock is hard to find. Environmental assessment not completed for borrow areas – vegetation and rare plant surveys required. Reclamation planning for borrow sources needs to be included in revegetation plan.	Delineation of sources d/s of tailings area. Environmental assessment not completed for borrow areas – vegetation and rare plant surveys required. Reclamation planning for borrow sources needs to be included in revegetation plan.	Y		See specific areas below	
403.2	Develop and Decommission Faro Borrow Sources – Granular Soil	Sitewide	Identify all necessary granular borrow sources and develop plans to rehabilitate borrow areas. Expand Rose Creek borrow site. New – Intermediate Dam spillway. Potential – east of North Fork of Rose Creek. Could be developed in connection with relocation of NFRC.	Impact on fish and terrestrial habitat and habitat compensation. Quality and quantity of borrow material is undefined or poorly defined. Limiting EA issues associated with various potential sources.	Environmental assessment not completed for borrow areas – vegetation and rare plant surveys required. Reclamation planning for borrow sources needs to be included in revegetation plan. Delineation of sources downstream of tailings area.	Amount and quality/composition of material that has been used since the estimates were developed. Geochemical/geotech parameters Delineation of sources. Environmental assessment not completed for borrow areas – vegetation and rare plant surveys required. Reclamation planning for borrow sources needs to be included in revegetation plan.	Y Y Y	Excavated test pits Drilled borings Completed Surface Geophysics	CH2M HILL Canada Limited (CH2M). March 2015hh. Borrow Baseline Design Criteria Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). March 2016j. North Fork Rose Creek Geotechnical Report. Draft. Prepared for the Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31.	
403.3	Develop and Decommission Faro Borrow Sources – Low Permeability	Sitewide	Identify necessary granular borrow sources and develop plans to rehabilitate borrow areas. Rose Creek Haul Road. Expand tailings borrows.	Potential Areas: East of North Fork of Rose Creek; could be developed in connection with relocation of NFRC Between Faro Waste Rock Dump and original Tailings Impoundment East of Fresh Water Supply Reservoir Impact on fish and terrestrial habitat and habitat compensation Quality and quantity of borrow material is undefined or poorly defined. Limiting EA issues associated with various potential sources.	Environmental assessment not completed for borrow areas – vegetation and rare plant surveys required. Reclamation planning for borrow sources needs to be included in revegetation plan. Delineation of potential borrow sources d/s of RCTA.	Amount and quality/composition of material that has been used since the estimates were developed. Geochemical/geotech parameters. Delineation of sources. Environmental assessment not completed for borrow areas – vegetation and rare plant surveys required. Reclamation planning for borrow sources needs to be included in revegetation plan.	Y Y Y	Excavated test pits Drilled borings Completed Surface Geophysics	CH2M HILL Canada Limited (CH2M). March 2015hh. Borrow Baseline Design Criteria Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March. CH2M HILL Canada Limited (CH2M). March 2016j. North Fork Rose Creek Geotechnical Report. Draft. Prepared for the Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March 31.	
403. 4	Develop and Decommission Haul Road as a Borrow Source	Sitewide	Haul Road material to be used to cover tailings area, contouring, and regarding.	Quality and quantity of borrow material is undefined or poorly defined.	Investigations to date on the Haul Road have been minimal and inconsistent.		Y	Reviewed construction and current conditions Advanced a boring through the haul road near the rock drain	CH2M HILL Canada Limited (CH2M HILL). March 2014e. Cross Valley Dam Seepage Interception System Phase 2, Groundwater Modelling, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. March 28. (Appendix A to Task Authorization 016 Down Valley Interim Hydraulic Upgrades Phase 2 – Basis of Design Report [60% design]) CH2M Canada Limited (CH2M). March 2016b. Preliminary Final North Fork Rose Creek Design Basis Report. Prepared for Government of Yukon and Government of Canada as represented by Indigenous and Northern Affairs Canada. March.	Entire length of Haul Road not evaluated;
403.5	Develop and Decommission Vangorda-Grum Granular Borrow Areas	Sitewide	Identify necessary borrow sources and develop plans to rehabilitate borrow areas. Impact on fish and terrestrial habitats and habitat compensation.	Impact on fish and terrestrial habitats and contamination in Haul Road granular sources. Quality and quantity of borrow material is undefined or poorly defined. Limiting EA issues associated with various potential sources	Some assessment completed on borrow sources. Environmental assessment not completed for borrow areas – vegetation and rare plant surveys are required. Reclamation planning for borrow sources needs to be included in the revegetation plan.	Delineation of sources around Moose Pond and Grum Creek. Environmental assessment not completed for borrow areas; vegetation and rare plant surveys required. Reclamation planning for borrow sources needs to be included in the revegetation plan.	N	Vangorda Grum mine area removed from project proposal scope	None	Conduct Initial field reconnaissance program: Dig test pits in proven borrows (Grum Creek/Moose Pond) Conduct field mapping and pionjar surveys of undefined sources.
403.6	Develop and Decommission Grum Overburden Dump Borrow	?	Identify volumes, geotech/geochem parameters of Grum OB dump and Grum overburden dump foundation (approximately 8 million m^3 +	Grum Sulphide Cell used till from South Till Borrow Area; contractors indicated that Grum overburden pile would require significant effort to sort oversized materials (that is, may be large percentage of boulders in till material). Amount used was 240,227 m^3 Impact on fish and terrestrial habitats and contamination in Haul Road granular	Volume decline. Geotechnical characterizations. Geochemical characterizations. Foundation Investigations. Reclamation planning for borrow sources needs to be included in revegetation plan. Evaluate Till	Geochemical/geotech parameter studies are underway.	Y	Completed geological reconnaissance of North Wall of Grum Pit Excavated 10 test pits at Grum Overburden Dump Drilled 11 sonic borings in the Grum Overburden Dump	CH2M HILL Canada Limited (CH2M). March 2015hh. Borrow Baseline Design Criteria Report, Faro Mine Remediation Project. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March.	

Table B-1. 2016 Engineering Gaps Analysis Table

Faro Mine Remediation Project

Activity ID	Task	Reclamation Unit	Description	Technical Uncertainties	Technical Assessments Required	Data Gaps Identified in 2013	Data Gap addressed (Y/N)	Work Completed/Rationale for not completing work (ie. 60% design scaled back to 30% design)	Reference Report	Remaining Gaps
	Area (Low Permeability Soils)		1 million m^3 = 9 million m^3).	sources. Quality and quantity of borrow material is undefined or poorly defined. Limiting EA issues associated with various potential sources.	Stockpile at Vangorda Waste Dump.	Depth of foundation investigation is underway.	Y	Excavated 4 test pits in the Grum Overburden Dump Foundation Drilled 1 sonic boring in the Grum Overburden Dump Foundation		
403.7	Develop and Decommission Area Northeast of Grum Pit (Low Permeability Soils)	?	Identify volumes, geotechnical, and geochemical parameters of low-permeability borrow source; North Wall of Grum Pit. SRK Additional Borrow Studies 2004, Task 11a indicates bedrock ranges from 9 to 18m bgs (based on GPR) with probable overlying till.	Impact on fish and terrestrial habitats and contamination in Haul Road granular sources. Quality and quantity of borrow material is undefined or poorly defined. Limiting EA issues associated with various potential sources.	Volume decline. Geotech characterizations. Geochem characterizations. Foundation Investigations. Reclamation planning for borrow sources needs to be included in revegetation plan.	Geochemical/geotech parameter studies are underway. Depth of foundation investigation is underway.	Y Y	See 403.6	See 403.6	
403.8	Develop and Decommission Area Rip Rap Sources (Faro Grum Vangorda Areas)	Sitewide	Identify and develop borrow sources of strong chemically stable rock for use in surface channels and drainage systems. Quarries will need to be excavated from granitic bedrock outcrops. Alternative: Investigate suitability of using cobbles/boulders mechanically separated from till overburden or geochemically inert waste rock during rock processing for other activities (that is, 201.1/.2/.3, 202, which requires large quantities of drainage rock to cover tailings area).	BGC indicates Grum Dump Rock Quarry has been exhausted (personal communication Nov. 2011).	Diamond drill and/or blasting exploration for four potential riprap quarries: Expanded existing RCDC quarry. Possible gabbro quarry site located downstream and uphill from the Cross-valley Dam but unsure of outcrop. Possible buried granite quarry location at north end of FCDC. No current outcrop noted and location may be outside mine footprint (EA issue). Possible granite quarry located north of the main haul road and west of the Grum transfer station; Faro Mine Road Granite Outcrop. Outcrop currently exists.	Total volumes of riprap and rockfill required. Estimate of size ranges for these materials. Location of accessible quarry sites for production of these materials. Quantity and quality of the rock materials in potential quarry sites.	N	Drilled 4 borings at Granitic Rock Outcrop Completed surface geophysical transects at Granitic Rock Outcrop and Grum Waste Rock Dump Quarry Explored shallow bedrock south of Faro Main WRD: Advanced 6 diamond drill holes Excavated 12 test pits Completed surface geophysical transects	CH2M HILL Canada Limited (CH2M). March 2015hh. *Borrow Baseline Design Criteria Report, Faro Mine Remediation Project*. Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March.	Total volumes of riprap and rockfill required. Estimate of size ranges for these materials. Evaluate calc-silcate sources in Faro WRD area Evaluate calc-silcate sources in Faro WRD area

Table B-2. 2016 Regulatory Gaps Analysis Tables – Current Status Summary

Faro Mine Remediation Project

Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.02.02 - Hydrogeology							
R05.02.02a	Delineate the extent of surface water or groundwater interaction at each of the major groundwater seepage sites, including spatial and temporal variability.	This information is critical to improving the understanding of site conditions in the following areas: • Quantify the magnitude of sulphate- and metals-loading from groundwater-seepage sites to target surface streams, such as North Fork/Rose Creek (NFRC), Vangorda Creek, and the Rose Creek Tailings Impoundment • Provide calibration targets for groundwater flow model(s) developed to support design efforts to ensure that the numerical tools adequately replicate the observed stream and aquifer interaction • Support the evaluation of changes in groundwater discharge to streams in winter and the potential effects on fish-rearing conditions • Provide flow data to evaluate the effect that groundwater interception may have on reducing stream flows under low-flow conditions • Provide vertical hydraulic gradient information in the vicinity of steam reaches where lining is being considered, a necessary consideration in development of the liner design	1	Perform potentiomanometer investigations to collect in-stream data to map gaining and losing reaches of the major streams within the FMC (CVD completed 2013). Install pressure transducers in monitoring wells adjacent to target stream reaches (preferably monitoring well clusters). Drill additional wells if existing wells do not exist in critical locations. Establish stream-stage monitoring stations on target stream reaches. Complete survey of all culverts for accurate comparison of groundwater elevations and stream-stage conditions. Additional wells needed in the Vangorda, Grum, Zone 2 Outwash, and S-wells areas.	Potentiomanometer investigations in NFRC completed in 2013 and 2014 (CH2M February 2014q), (CH2M March 2015u) WL transducers installed in wells adjacent to NFRC at S-wells and Zone II Outwash (CH2M March 2015t), (CH2M March 2015u) and RCDC (2015 NFRC DBR GW appendix) (CH2M February 2014q) Stream stage monitoring stations established in NFRC adjacent to S-wells and Zone II Outwash (CH2M March 2015t), (CH2M March 2015u), and in RCDC adjacent to Secondary Tailings Impoundment (2015 NFRC DBR GW appendix)	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. Design concept for NFRC refined in 2014 / 2015. Existing creek channel to become a seepage collection channel, negating requirement for design of interception systems at Zone II Outwash and S-Wells SIS.	Delineate the extent of surface water or groundwater interaction at Vangorda, Grum and Lower Guardhouse Creek, including spatial and temporal variability.
R05.02.02b	Delineate the properties of the aquifer system in the vicinity of the planned groundwater interception systems.	An accurate characterization of site aquifer property distribution is necessary to design a groundwater interception system. This data help determine the geometry of the following interception infrastructure concerns: • Spacing of extraction wells • Need for and extent of permeable trenches • Need for and extent of associated low-permeability barrier systems • Interception flows delivered to a treatment plant	1	Perform aquifer testing in each area where groundwater interception is planned (CVD completed 2013). More data collection will be required in areas, such as the Grum and Vangorda dumps, where little data currently exists. Less data will be required at the S-Wells and Zone II outwash areas. Operational data will be used in areas where the groundwater extraction system currently operates (S-Wells and ETA) to estimate aquifer properties.	Specific capacity testing completed in new well installations at Zone II Outwash and S-wells in 2014 (CH2M March 2015t), (CH2M March 2015u) Aquifer testing completed at the proposed NFRC seepage collection dam area downstream of S-wells and at the east limb of the Secondary tailings impoundment Dam. (2015 NFRC DBR GW `) Aquifer testing and GW modelling completed downstream of the CVD at the proposed location of the CVD SIS. (CH2M HILL, 2014e, 2014i, 2015gg)	Same as above.	Delineate the properties of the aquifer system in the vicinity of the planned groundwater interception systems at Lower Guardhouse Creek, Vangorda WRD and Grum WRD.
R05.02.02c	Define bedrock topography and saturated alluvial thickness in areas where groundwater interception is planned.	A detailed depiction of the bedrock surface and the thickness of available saturated alluvium are both critical elements to the design of a high-efficiency groundwater interception system. The bedrock topography will define the target extraction well depths and permeable trench configuration, and will influence the design approach of any low-permeability hydraulic barriers that may be included in the design. The saturated thickness of the target aquifer may constrain the operational strategy of the interception system and place limitations on available extraction rates.	1	Perform geophysical surveys in the vicinity of the interception system alignments (CVD completed in 2013). Drill soil borings to correlate geophysical data.	Geophysical surveys and coincident borings completed at the S-Wells (CH2M March 2015u), Zone II Outwash (CH2M March 2015t), proposed NFRC seepage collection pond area and east limb of the Secondary tailings impoundment Dam (2015 NFRC DBR GW appendix). Field investigation conducted for CVD SIS included borings to bedrock and geophysical survey (CH2M HILLL, 2014q)	Same as above.	Define bedrock topography and saturated alluvial thickness in remaining areas where groundwater interception is planned. (requires further development of PP to define locations)

Table B-2. 2016 Regulatory Gaps Analysis Tables – Current Status Summary

Faro Mine Remediation Project

Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.02.02d	Delineate the 3D extent of the target areas for hydraulic capture at each planned groundwater interception area.	A refined delineation of the 3D extent of the site COCs that require hydraulic capture is needed to develop a highly effective groundwater interception system.	1	Drill additional monitoring wells where data gaps exist in the monitoring network. The Vangorda/ Grum area will require a greater extent of investigation. The S-wells and Zone II outwash areas have a greater number of existing monitoring wells and will require fewer additional wells to complete delineation of the target zone.	Monitoring wells installed since 2012 include: • 7 Wells at toe of CVD (CH2M February 2014q) • 1 Well in the Outer Haulroad West WRD between the Intermediate WRD and the S-Wells (CH2M October 2013b) • 1 Well in the Main WRD (CH2M October 2013b) • 1 Well in the Northeast WRD (2014 SW-015 Report) • 2 Wells in the Grum WRD (CH2M October 2013b) • 1 Well in the Vangorda WRD (CH2M October 2013b) • 15 Wells along RCDC downstream of fuse plug (CH2M February 2014q) • 3 Wells in the north portion of the Intermediate Tailings impoundment (CH2M February 2014q) • 3 Wells in the Original Tailings Impoundment at the mouth of the ETA canyon (CH2M March 2015b) • 4 Wells between the S-wells SIS and the NFRC (CH2M March 2015u) • 2 Wells downstream of the Rock Drain and upstream of the S-Wells (CH2M March 2015u) • 11 Wells downstream of the S-wells (2015 DBR GW appendix) • 6 Wells in the Zone II Outwash (CH2M March 2015t Report) • 2 Wells downstream of the Zone II Outwash (CH2M March 2015t) • 6 Wells below the Northeast WRD (2015 DBR GW appendix) • 6 Wells at the Secondary Tailings Impoundment Dam East Limb (2015 DBR GW appendix)	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD. Design concept for NFRC refined in 2014 / 2015. Existing creek channel to become a seepage collection channel, negating requirement for design of interception systems at Zone II Outwash and S-Wells SIS.	Delineate the 3D extent of the target areas for hydraulic capture at Lower Guardhouse Creek, Vangorda WRD and Grum WRD
R05.02.02e	Delineate permafrost at the Faro Mine, Grum, and Vangorda areas.	The presence of massive or discontinuous permafrost in the groundwater system has a significant influence on groundwater flow directions and rates, and the surface water and groundwater interaction. The design of an effective SIS system requires knowledge of permafrost in the immediate area of the system. Permafrost may also alter contaminant migration pathways and require modification to groundwater monitoring network designs.	1	Perform geophysical surveys in the vicinity of proposed SIS installations to assist in identifying permafrost in those areas.	Geophysical surveys performed at toe of CVD (CH2M February 2014q Report), ETA (105.2), Zone II (CH2M March 2015t), S-wells (CH2M March 2015u),	Same as above.	Delineate permafrost at Lower Guardhouse Creek, Grum WRD, Vangorda WRD

Table B-2. 2016 Regulatory Gaps Analysis Tables – Current Status Summary

Faro Mine Remediation Project

Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.03.02 - Hydrology							
R05.03.02a	Conduct cross-section field surveys.	The hydrologic and hydraulic models will require detailed cross-sectional information for all creeks and diversions so that the models can be accurately constructed. This is particularly important since the accuracy of the model is related to the accuracy of water-level predictions, peak flow rates, and erosion potentials, as well as water quality.	1 for engineering; 3 for regulatory YESAB requirements	Complete cross section field surveys of creek and ditch channels that were under water during LIDAR aerial mapping.	Cross section surveys have been completed in the following creeks and diversions since 2012: • RCDC (CH2M March 2015n) • SFRC (CH2M March 2015i), (NFRC DBR Hydrology Appendix) • NFRC (CH2M March 2015i), (NFRC DBR Hydrology Appendix) • FCD (CH2M March 2015k), (2015 TA020 RGA) • Upper Guardhouse Creek (CH2M March 2015j), (2015 TA020 RGA) • NWID (CH2M March 2015j), (2015 TA020 RGA) • Vangorda Creek Diversion (CH2M March 2014d)	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	None (assumes no additional work will be required as result of PP development)
R05.03.02b	Assess creek and diversion (all waterways) bed material and bank material for stability.	The size of the material that comprises the creek or diversion bed and side slopes to the flood levels is integral to proper model calibration (roughness coefficients). The material that makes up the channel has a significant impact on the conveyance capacity and the flow velocities that contribute to erosion potential.	1 for engineering; 3 for regulatory YESAB requirements	Complete field surveys, included in the engineering data gaps.	Qualitative bed and bank material characterization completed in the following creeks and diversions: • NFRC (NFRC DBR Hydrology Appendix) (CH2M March 2016b) • Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch (CH2M March 2015j) • Lower Guardhouse Creek (CH2M March 2015k) • North Wall Interceptor Ditch and Upper Guardhouse Creek (CH2M March 2015j)	Same as above.	Bed and bank material characterization required for RCD, SFRC, VCD, Vangorda Creek, Run-off Interceptor Ditch to Dixon Creek
R05.03.02c	Assess soils types in creek and diversion areas.	This is required to better define infiltration components in the hydrology model. The interaction of surface water and groundwater is key to understanding channel base flows and water quality under low-flow conditions.	1 for engineering; 3 for regulatory YESAB requirements	Complete field surveys to determine surficial soils and local geology, included in the engineering data gaps.	Surficial materials characterized by borings, test pits, geophysical surveys and geological reconnaissance completed for engineering investigations.	Same as above.	None (Note that NFRC DBR recommends additional field work downstream of Mine Access Road)
R05.03.02d	Monitor pre-closure water flow at specific hydrology points in each of the major drainage channels.	Required for the calibration of the hydrology model. Calibration of the model under rainfall conditions is key to the success of extrapolating the model to determine flows under large theoretical events conditions, such as the 500-year-return rainfall and the probable maximum precipitation event. The results are also key to establishing the rates of groundwater seepage or groundwater infiltration, since they indicate the availability of surface water under low-flow conditions to support habitats and vegetation.	1 (YESAB 4.1.10)	Develop a monitoring plan that includes monitoring locations, parameters, and frequency and protocols for sampling.	Additional continuous flow monitoring stations installed to supplement existing monitoring plan as detailed in: • *2014 Hydrology Field Program Report* (CH2M, February 2015a) • *Surface Water Data Processing Report* (CH2M, March 2015ii) • *Summary of 2014 Field Investigation – Site-Wide Surface Water Monitoring* (CH2M, March 2015dd) • *North Fork Rose Creek Hydrology/Hydraulics Report (Appendix D of Design Basis Report;* CH2M, March 2016i)	Same as above.	Rating curves not yet established for new continuous flow monitoring stations. Updates to existing rating curves required to account for changes in channel morphology and to supplement range of recorded events (emphasis on capturing large runoff events such as freshet).

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.03.02e	Develop information from downstream of the mine site to establish baseline conditions. This could include hydrology components of flows and water-surface elevations under various return periods, TSS primarily from a hydrology perspective, and socio-economic parameters from a water-use perspective.	Baseline required to determine impacts to Value Components (VC). The project will need to establish the temporal and spatial requirements of the hydrology VCs and potential effects of the project.	1 (YESAB 6.3.2 and 6.3.3 indicate the need for baseline information on effects integrated across VCs; because hydrology was not identified as a VC in the past, this effort may be significant)	Develop field studies and monitoring plan to augment existing data as part of the engineering analysis. Existing information needs to be entered into spatial and temporal context.	None	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Develop field studies and monitoring plan to augment existing data as part of the engineering analysis. Existing information needs to be entered into spatial and temporal context.
R05.03.02f	Monitor the pre-closure downstream TSS outside of the area-wide site. Selected sites should be designated at key locations within the local site areas, as well, to gauge areas for TSS load.	Required to develop a database of baseline suspended solids loading downstream of the mine site and at selected key locations for Faro, Vangorda, and Rose Creek diversions. Other critical areas that have a high risk of slope failure should be monitored. This will allow for performance monitoring later in the maturation of the reclaimed areas and forms part of the AMP triggers.	1 (YESAB 4.1.10)	Develop a monitoring plan that includes monitoring locations, parameters, and frequency and protocols for sampling.	None	Same as above.	All work remains
R05.03.02g	Collect rainfall data for Faro and Vangorda sites during all phases of activity and post-closure.	Rainfall data will be required to support the hydrologic model calibration efforts and to correlate rainfall event IDF with concurrent monitored stream flows. Continuation during construction allows monitoring of TSS and flows to be correlated to rainfall events, and triggers to be set for managing water flow or runoff onsite during construction. After construction, the information will be used to continually improve the modelling calibration as part of the AMP.	1 (YESAB 4.15)	Develop a monitoring plan that includes a review of current monitoring sites and protocols and a description of future requirements.	Meteorological data from Faro station collected and processed as detailed in: • *Surface Water Data Processing Report* (CH2M, March 2015ii) • *North Fork Rose Creek Hydrology/Hydraulics Report (Appendix D of Design Basis Report;* CH2M, March 2016i) Meteorological data from Faro Airport compiled for comparison with FMC data	Same as above.	Ongoing operations and maintenance of meteorological stations to confirm conformance with manufacturer's requirements.
R05.04.02 - Surface Water Quality and Aquatic Ecosystem							
R05.04.02a (Task 1) R05.04.02b (Task 2)	Define aquatic species-at-risk.	This is a requirement for the Project Proposal. Previous definitions exist for plants, birds, and wildlife, but are lacking for aquatic species (for example, aquatic plants, fish, invertebrates, and amphibians).	1	Task 1: Review Yukon species-at-risk lists, and identify any species that could be present within the project area based on distribution and preferred habitat. Task 2: If there are any species-at-risk at Faro, undertake a field survey; produce an Aquatic Species-at-Risk Report (primary deliverable); and summarize results for the baseline chapter of the Project Proposal (secondary deliverable).	None	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	All work remains

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R05.04.02c	Update the benthic invertebrate baseline description and current impacts.	The Executive Committee Project Proposal (Hardrock Mining) requires an inventory of benthic invertebrates and baseline data for affected drainages, including, where applicable, sample site descriptions, species abundance, spatial distribution, taxonomy, and biomass. There are deficiencies associated with the AECOM baseline descriptions and Chapter 4 of the draft Project Proposal that summarize key baseline information. Also, there is additional information available now that should be incorporated. Mainly, existing data are old and will need to be updated to reflect current baseline conditions. The benthic invertebrate impact assessment (CABIN approach) by DeGraff (2010) lacked supporting details, such as a statistical model or reference-area characteristics, and the production quality of Appendix 4 is almost illegible. Baseline data should be presented in quantitative format to allow for quantitative future comparisons to baseline conditions.	1	Conduct benthic invertebrate community and biomass surveys. Implement recommendations by Minnow (2010a) and Laberge (2010), particularly with respect to inclusion of more reference areas and appropriate statistical analyses. Sample up to six stations along the North Fork Rose Creek and Rose Creek diversion for baseline data to support monitoring associated with the fisheries compensation plan (community and biomass analysis) and risk assessment (tissue metals).	Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March. Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.	Same as above.	Updating of data if needed to address regulatory requirements for specific PP projects.
R05.04.02d	Prepare periphyton baseline description and current impacts.	The Executive Committee Project Proposal (Hardrock Mining) requires an inventory of periphyton baseline data for affected drainages, including, where applicable, sample site descriptions, species abundance, spatial distribution, taxonomy, biomass, and chlorophyll contents. However, no data or discussions were included in the AECOM baseline or in the draft Project Proposal. Biomass and chlorophyll-a estimates are also important for fisheries compensation planning and follow-up monitoring. A periphyton community survey was done by DeGraff (2010) but lacked interpretation and supporting details (e.g., explanation of statistical model and reference-area locations and characteristics), and the production quality of Appendix 4 is almost illegible. Most existing data are old and will need to be updated to reflect current baseline conditions.	1	Collect samples for the periphyton community at same locations as for benthic invertebrates (30 areas) to allow for assessment of current effects through statistical reference-exposure comparisons. Collect periphyton samples from six near-field areas for analysis of tissue concentrations, biomass, and chlorophyll-a.	Periphyton sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March. Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.	Same as above.	Updating of data if needed to address regulatory requirements for specific PP projects.
R05.04.02e	Update fisheries baseline description, and fill information gaps.	Fish are an important VC. Good baseline information is required to complete a defensible impact assessment and provide a basis for quantitative future comparisons. Past studies largely focussed on fisheries in the immediate mine area only, were not quantitative (densities), are missing information on seasonal utilization patterns, and lack regional context. Little fisheries data exists for Rose and Anvil Creeks downstream of X14.	1	Conduct field survey work to develop density estimates and fill in gaps respecting seasonal utilization patterns and aquatic habitat characteristics in ponds and pools used by fish. Some aspects addressed by 2012-2013 fish telemetry programs.	Fisheries sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March. Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25. Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.	Same as above.	Updating of data if needed to address regulatory requirements for specific PP projects.

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.06.02 - Fish Habitat Compensation							
R05.04.02a	Fill in gaps for detailed fish habitat mapping (e.g., spawning, rearing, and over-wintering areas) and characterization (e.g., substrate composition) information on the creeks, focussing on Arctic grayling and Chinook salmon (likely VCs or indicator species for the EA).	There are types of fish habitat present that are not fully documented or quantified. For example, information is missing about fish overwintering in areas where surface water quality is currently impacted and where winter water quality is worse than at other times of the year. With the fish habitat compensation measures to be implemented, need to study if fish could be impacted if we create areas where opportunity for fish exposure is higher than it is currently.	1	Conduct fish habitat field surveys. Some aspects addressed by 2012-2013 fish telemetry programs.	Habitat surveys were conducted during the fish telemetry study (EDI March 2015) at locations where: • Spring spawning was suspected based on the presence of spawning-stage fish or disturbed substrate; and, • Summer feeding was suspected based on the presence of radio tagged adult grayling.	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Habitat surveys in areas that may be affected by any off-site proposed habitat compensation programs.
R05.04.02b	Fill in gaps for quantitative information about the determination of seasonal and local fish population densities, habitat use, and migration relative to regional population characteristics and habitat availability and accessibility.	The use of fish habitat is not fully documented or quantified in creeks that may be affected by the FMRP. Further characterization is needed to understand baseline conditions and support development of fish habitat compensation plans. Information regarding nearby unaffected areas is also required to provide context about compensation needs and how compensation efforts are likely to perform.	1	Use radio-telemetry to track seasonal movements, home range, and habitat preferences of grayling over 1-2 years. (in process 2013)	Radio tags deployed in 35 and 37 arctic grayling in the Rose Creek Watershed in 2012 and 2013 respectively. Tags were tracked in Spring, Summer and Winter Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25.	Same as above.	Information about fish use in areas that may be affected by any off-site proposed habitat compensation programs.
R05.04.02c	Fill in gaps for information on seasonal surface-water levels, flow patterns and needs, DO and temperature profiling, and groundwater inflow locations and flow measurement in the local study area.	This engineering data is needed for replacement stream design.	1	Undertake field surveys and continue for one full field season.	Continuous surface water levels and temperatures monitored at select stream stages in FCD, Rose Creek, RCDC, NFRC, SFRC, Vangorda Creek Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25. Potentiomanometer investigations in NFRC completed in 2013 and 2014 (CH2M February 2014q), (CH2M March 2015u) WL transducers installed in wells adjacent to NFRC at S-wells and Zone II Outwash (CH2M March 2015t), (CH2M March 2015u) and RCDC (2015 NFRC DBR GW appendix) (CH2M February 2014q)	Same as above.	Collect and compile data at all stations.

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R05.10.02 - Human Health and Ecological Risk Assessment							
R05.10.02a	Collect recent surface water quality data, including data from new stations, to better characterize baseline conditions and for future monitoring purposes.	The baseline should reflect current conditions. The AECOM baseline was 2005 to 2007. Updated data is available for Faro and Vangorda Areas. The Minnow (2010) aquatic monitoring plan indicated more and newer reference locations are needed for water assessment, at least in the short-term.	1	Collect surface water quality information at new stations; consider future monitoring requirements for establishing new stations.	Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March. Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Review of Minnow reports required to determine if data gaps adequately addressed.
R05.10.02b	Complete limited surface water chronic toxicity testing.	Chronic testing more accurately reflects the potential effects expected. Testing has not been completed on a salmonid species to better assess the effects on Chinook salmon and grayling, which will likely be identified as VCs for the EA.	2	Collect onsite water quality samples from areas of current and future impact, and conduct testing.	Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.2M HILL. March.	Same as above.	Further additional chronic toxicity testing required for salmonids due to performance of control samples during laboratory testing Review of Minnow reports required to determine if data gaps adequately addressed.
R05.10.02c	Update old baseline sediment quality data.	The sediment data is old (from 2004 to 2006) and is not available for all required watercourses. Actual measured sediment concentrations are preferable to those that were calculated through the development of site-specific water-to-sediment distribution coefficients.	2	Collect onsite sediment samples and conduct laboratory analysis.	Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March.	Same as above.	Review of Minnow reports required to determine if data gaps adequately addressed.
R05.10.02d	Complete limited sediment chronic toxicity testing to directly assess effects on benthic invertebrates, which will be exposed to COCs in sediment.	Chronic testing more accurately reflects potential effects expected and has not yet been conducted.	2	Collect onsite sediment samples from areas of current and future impact, and conduct laboratory testing.	Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March. Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.2M HILL. March.	Same as above.	Review of Minnow reports required to determine if data gaps adequately addressed.
R05.10.02e	Fill in gaps for tissue chemical analysis data that does not exist or is not present for some aquatic biota.	Tissue data provides a more accurate assessment of risks than modelling.	2	Collect fish, benthic invertebrate, and aquatic vegetation samples for tissue analysis.	Benthic sampling program in 2014. Reported in: Minnow Environmental Inc. (Minnow). March 2015. *DRAFT Tables, Figures and Appendices associated with the Faro Mine Aquatic Baseline Study, 2014.* Report Prepared for: CH2M HILL. March. Fish habitat investigation completed by EDI in 2014, in association with the fish telemetry program. Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M HILL). March 25. Under separate contract with YG, Minnow prepared data interpretation; report not provided to CH2M HILL.2M HILL. March.	Same as above	Review of Minnow reports required to determine if data gaps adequately addressed.

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.10.02f	Update baseline soil quality description, as all of the data is old and no information is present in some areas. This information is needed to assess risks to human and ecological receptors.	Existing data insufficient, analyses are Not completed in all areas of the site or on the full suite of expected COCs.	1	Collect soil samples and conduct laboratory testing.	Site-wide soil characterization survey completed (CH2M February 2015c)	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated
R05.10.02g	Complete soil toxicity studies on soil organisms and vegetation. This information is needed to directly assess effects to these receptors that will likely be identified as VCs for the EA.	Direct impacts of soil COCs on soil organisms (for example, insects, such as spiders, beetles, ants, and grasshoppers) and plants are not known. This testing is likely needed for the unreclaimed areas of the site to ensure there are no expected long-term effects to terrestrial flora and fauna.	2	Collect soil samples from the site, and conduct toxicity testing to assess current risks, which will involve acute testing on two species.	Soil toxicity testing completed with site wide soil characterization survey (CH2M February 2015c)	Same as above.	Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated
R05.10.02h	Complete soil-chemical bioavailability analyses. This information will assist in the determination of the bioavailable fraction of each chemical in soil and the potential for uptake or exposure to human and ecological receptors.	The percent of potentially available fraction of a chemical is not known and may be important to determine if biological tissue data is limited.	2	Perform leachate analyses of select soil samples.	DI leach and sequential extractions completed on soil samples collected for engineering investigations and borrow material characterization.	Same as above.	Need to compile and evaluate data collected
R05.10.02i	Complete soil organism and plant tissue analysis in unsampled areas and in areas where updated soil-chemistry data will be collected. This information is needed to directly assess effects to these receptors and to assist in the determination of dietary exposure to top predators, all of which will likely be identified as VCs for the effects assessment.	This information is needed to assess direct effects on those ecological receptors and for the assessment of effects on wildlife through the food chain.	1	Collect soil organism and plant samples collocated with soil samples and conduct testing.	Collected plant tissue samples collocated with soil samples during site wide soil characterization survey (CH2M February 2015c)	Same as above	Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.10.02j	Collect data on tissue-chemical concentrations in small mammals.	This information is required to address risks directly to these receptors, which will be identified as VCs in the effects assessment, as well as to higher trophic animals.	2	Conduct a field survey to collect red-backed voles or similar small mammals throughout the site. Can be completed while other wildlife programs are being undertaken. Discussions with FPET in January 2012 identified concerns about community sensitivities for this proposed program, however during the July 2013 gaps workshop contaminant data was considered to be important to the overall risk assessment process. Community sensitivities should not be great enough so as to limit the collection of data that will be needed for the YESAA Project Proposal.	Wildlife baseline study conducted in 2014 included small-mammal tissue sampling (CH2M March 2015aa)	Same as above.	Report evaluation required in conjunction with development of PP to determine if all areas planned for disturbance have been evaluated
R05.10.02l	Collect information related to dust to assess effects to human and ecological receptors. This data will be critical to the assessment of risks during the construction period with the movement of wasterock.	There is a major exposure pathway during construction.	1	Undertake data collection, modelling, and monitoring.	None	Same as above.	All work remains
R05.07.02 - Terrain, Geology, Geological Hazards, and Seismicity							
R05.07.02c	Compile bedrock geology for the site. Yukon geological survey bedrock mapping coverage of the study area exists at a 1:25,000 scale, comprising 17 map sheets and associated reports. Summarize data into one overall baseline document.	The lithology and structure is required for overall site characterization, geohazards, geochemistry, hydrogeology, and quarry locations.	1	Create a desktop summary of site geology and structure, and rock descriptions. Conduct confirmatory field surveys as needed, including collecting representative rock samples of key units for mineralogy/petrology to confirm composition. Complete a tie-in program with engineering. Engineering properties will not be determined under this task item. Data available from the Yukon Geological Survey (i.e. Lee Pigage) will be reviewed prior to conducting supplemental sampling, if required.	NFRC Realigned Channel Project DBR (2016b) and Tectonic Setting Evaluation (2103d) both evaluated bedrock geology and compiled mapping. Geohazards evaluation completed for NFRC. See CDRM report Section 2.8 for a listing of compiled mapping. .	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	None
R05.07.02d	Compile Quaternary geology for the study area. YGS has 1:25,000 surficial geology maps covering the southern portion of study area. Summarize data into one overall baseline document.	Identify major Quaternary geology units, terrain, soils, and location of bedrock exposures. This provides understanding of geological history to support aerial photography interpretation and forms the base of geohazards mapping and permafrost assessment. Surficial geology and Quaternary aerial photography interpretation will supplement and extend this data across the study area. This is required for overall site characterization, geochemistry, hydrogeology, and borrow areas.	1	Create a desktop summary of Quaternary and surficial geology units. Describe Quaternary geological history and major units. Transfer mapping data onto a new project DEM GIS database. Conduct limited field program, as needed, to groundtruth data.	Not completed	Same as above.	All work remains
R05.07.02e	Interpret aerial photographs of geohazards and mapping, and assess the study area.	Within the study area, identify areas of instability, erosion, mass wasting, permafrost degradation, debris flows, and avalanches that may affect closure design or impact the environment.	1	Carry out geohazard assessment, and compile data onto a site DEM topographic GIS database. Carry out field surveys as needed to groundtruth hazards and assess recent activity.	Geohazard surveys completed in Faro Creek, NFRC and Rose Creek Watersheds (CH2M March 2015jj)	Same as above.	None for Faro Mine Area or RCTA

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R05.07.02f	Identify permafrost characterization and distribution within the study area. This applies to locations with planned construction only (SIS, toes of slopes, channels, etc.)	The site is located in the discontinuous permafrost zone, so it is necessary to identify areas containing permafrost that may be affected by reclamation and closure activities.	1	Conduct aerial photography interpretation to note permafrost and periglacial terrain features. Supplement photos with data collected from Quaternary, geohazards, and surficial geology mapping. Carry out separate aerial photography interpretation of vegetation cover characteristics. Derive detailed slope aspect, elevation, and angle data from the site DEM topographic database. Compile local weather station data, preferably from various elevations and other attributes, as input to a permafrost model. Collect regional climate, global warming, and permafrost degradation information. Compile ground temperature data from existing thermistors, and relate to air temperature data. These activities will be undertaken as needed in relation to areas of planned construction.	Completed permafrost delineation in NFRC valley, including thermistor installation and monitoring (CH2M HILL, 2016b) Completing permafrost delineation in Faro Valley, including thermistor installation and monitoring (2016 FCD drilling)	Same as above.	Requires query of EQuiS database for site-wide evaluation and comparison with results of site specific explorations. Also, compare with probabilistic mapping presented in NFRC DBR. Vegetation analyses. Compilation of permafrost data.
R05.07.02g	Update seismology study.	Completed in 2012.	1	None. Completed in 2012.			
R05.08.02 - Vegetation and Reclamation							
R05.08.02a	Fill gaps in baseline documentation (Section 4.1.3 YESAB Proponent's Guide) on soil and vegetation classification for disturbed areas.	Existing vegetation in the project footprint needs to be considered for the ETA, NFRC, the Grum/Vangorda Creek Valley, and onsite regrowth areas to assess additional disturbance for revegetation planning. The rationale of using existing condition as baseline needs to be supported, but is not currently in enough detail, so status needs to be checked in disturbed areas. A bioavailable metals assessment needs to be part of screening to check if micronutrient levels are high enough for toxicity or for adverse food-chain impacts (Pb, As, Zn, and B will likely be the main focus).	1	Conduct field studies to document vegetation in: • North Fork Rose Creek Valley • ETA adjacent areas • Grum Creek/Vangorda Valley • Regrowth areas on the mine(s) footprint	Vegetation characterization survey completed (CH2M March 2015z)	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Report adequacy needs to be reviewed in conjunction with PP preparation.
R05.08.02b	Update vegetation survey at Survey Intensity Level SIL 3 for the LSA in 2007. This data will be 7 years old by the Project Proposal submission.	Determine if YESAB feels the data needs to be recollected for current conditions. Recommend that vegetation is unlikely to have changed much over this period in the LSA, with the exception of areas proximal to mine disturbance.	3	Recollect SIL 3 vegetation data in the entire LSA.	Vegetation baseline characterization survey completed at SIL 3 level (CH2M March 2015z)	Same as above.	Report adequacy needs to be reviewed in conjunction with PP preparation.
R05.08.02c	Access the raw field data to determine if soil surveys were collected during the vegetation survey work within the LSA.	Ecological land classification requires a survey of both vegetation and soil to confirm mapping and classification activities. This activity needs to be weighed against a verification of mapping required by YESAB in LSA areas outside the disturbance footprint. This is less important than reporting of soil conditions in disturbed or mine-proximal areas, but the requirement needs to be discussed with YG/YESAB.	2	Collect SIL 3 soils-mapping data within the LSA.	SIL 3 baseline soil characterization survey completed (CH2M February 2015c)	Same as above.	Report adequacy needs to be reviewed in conjunction with PP preparation.

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.08.02d	Fill in information gaps for riparian revegetation details missing from the vegetation section after baseline data. There is almost no data on wetlands or riparian areas at all within the EA or in the closure design it is based on. Even if we do not want wetlands, we will need to plan to ensure that they cannot form (wildlife proximity issue) (Source: Chapter 8 of the draft Project Proposal).	Wet landscape planning has to be included in the revegetation plan to ensure that seepage and ponding areas are included or deliberately excluded. Mapping existing wetland areas within the LSA is a necessary part of the EA, as they are currently treated as a vegetation community, but no wetlands-specific vegetation or soils data has been collected. This is needed to set baseline conditions and as a planning tool for the reclamation surface.	1	Collect wetlands soil and vegetation baseline data within the LSA. Create a map interpretation for RSA.	Wetlands soils and vegetation investigated in site wide soil and vegetation characterization surveys (CH2M February 2015c), (CH2M March 2015z)	Same as above.	Report adequacy needs to be reviewed in conjunction with PP preparation.
R05.08.02e	Determine contaminant characterization, load in wetland, riparian vegetation, and food chains.	Determine if the existing wetlands need to be cleaned up (for example, excavated or capped) and re-established, if selected sites can offer transplant options, and which plants are suitable for wildlife habitat wetlands and treatment wetlands. Determine whether and in what form contaminants are sequestered in organics, and if any existing organic soils be used in part for reclamation, what the nutrient status of established wetlands is, and if there is a correlation with the vegetation community. Bioavailable metals assessment needs to check if micronutrient levels are high enough for toxicity or for adverse food-chain impacts (Pb, As, Zn, and B are likely the main focus).	1	Conduct a basic risk assessment in wetland/riparian communities, food-chain sampling (vegetation tissue and soil-fauna samples), and wetland soil toxicity sampling. Compare with other RSA wetlands/riparian areas.	Vegetation tissue and soil-fauna samples collected and soils baseline and rare plants surveys completed (CH2M February 2015c), (CH2M March 2015z)	Same as above	Report adequacy needs to be reviewed in conjunction with PP preparation.
R05.08.02f	Characterize potential borrow and quarry areas in undisturbed locations for: • Vegetation and soils baseline • Rare plants • Actual borrow volumes (and plant and soil salvage volumes) (Source: Chapter 4 of the draft Project Proposal).	Materials and quarry rock should be covered, as riprap and armouring appear to be minimal, and additional borrowing for hard rock and till is potentially required. There is some reference to additional borrow sites for peat and construction materials, but they do not appear to have been included in baseline work or characterized for closure planning. The location of borrow and quarry sites needs to be verified, and baseline soils and vegetation information collected for areas not yet covered in the LSA.	1	Conduct a field program to characterize: • Vegetation and soils baseline • Rare plants • Actual borrow volumes (and plant and soil salvage volumes)	Vegetation and soils baseline and rare plants surveys completed (CH2M February 2015c), (CH2M March 2015z) Results of field explorations of borrow areas provided in Borrow Report (CH2M HILL, 2014hh	Vangorda and Grum mine areas removed from project scope in spring, 2014. Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Reports adequacy needs to be reviewed in conjunction with PP preparation.
R05.08.02g	Document wildlife use or avoidance of wetland and riparian zones (e.g., moose, sheep, grizzly bear, muskrat, and waterfowl [lesser sand hill crane, trumpeter swan, et al.]).	To identify the appropriate juxtapositions of wetlands according to migration paths and other habitats. This does not appear to have been specifically addressed to date, but this information is important for wetlands planning in the closure landscape.	2	Conduct seasonal surveys documenting specific wildlife use of wetland and riparian zones.	Limited studies completed by ELR/ Terrestrial Wildlife Baseline Report (Appendix 6G to IWPP CH2M,2014); CH2M HILL (2015ll). Wildlife Baseline Studies ELR (2013) Waterfowl Studies; ELR (2012) Winter Tracks Study	Same as above.	Additional studies required

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Faro Mine Remediation Project

Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.08.02h	Identify permafrost locations not identified in the EA or closure plan (Source: Section 4.1.3 YESAB Proponent's Guide).	Permafrost locations are not noted in the EA or closure plan, either as baseline or as closure features. Not clear how this information is to be handled within the reclamation planning.	1	Map current and potential permafrost areas, and groundtruth permafrost areas onsite. Predictive mapping and groundtruthing carried out in the terrain and geology section. Scope is limited to areas of proposed construction activities.	Completed permafrost delineation in NFRC valley, including thermistor installation and monitoring (2015 DBR) Completing permafrost delineation in Faro Valley, including thermistor installation and monitoring (2016 FCD drilling)	Same as above.	Compilation of data entered into EQuIS and comparison with field investigation reports required.
R05.08.02i	Study dust issue in the Vangorda/Grum Area and as a result of the Grum Sulphide cell sedimentation pond blow-out for baseline (Source: Chapter 4 of the draft Project Proposal).	There may be areas in addition to those in the baseline studies that merit a check on dust or sediment impact on previously undisturbed areas. These should be coordinated with baseline surveys for existing vegetation areas, but also identified as specific responses to dust and sediment issues, as well as for assessment of mitigation and closure landscape design.	1	Discuss with YG and the field program to assess impact of dust and sediment in the areas below the Grum Sulphide Cell and towards Moose Pond.	None	Same as above.	All work remains
R05.08.02j	Conduct more extensive rare plant surveys, especially if further borrow areas are required. The impact on undisturbed ETA-adjacent areas and creek channel realignments will also require this (Source: Chapter 4 of the draft Project Proposal).	Currently there is a lack of rare plant information with little data. Only the toe of four waste-rock areas has been surveyed. Any further disturbance in the LSA needs to be surveyed, and there should be a discussion with YG about rare plant surveys in the LSA.	1 for disturbed LSA areas 3 for the entire LSA	Conduct field program to characterize rare plants in undisturbed areas likely to be impacted by construction and reclamation activities, and potentially within the LSA.	Rare plants survey completed as part of site wide baseline vegetation survey (CH2M March 2015z)	Same as above	None (Need to confirm/ review report in conjunction with PP development)
R05.09.02 - Wildlife							
R05.09.02a	Review baseline study plan with YG wildlife managers.	Prior to beginning a baseline study program for 2014, prepare a summary of the intended study program to present to YG's wildlife managers. This would provide an opportunity for YG to comment on the program, and also would provide an opportunity to identify potential comments and synergies to improve the program.	1	Organize a presentation with details of the program, and present this to YG wildlife managers (and potentially YESAB).	None	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	All work remains
R05.09.02b	**Furbearers** Collect data to determine the distribution and abundance of furbearer species within the LSA.	Furbearers were selected as a VC in the existing EA and appear to have high local value. Data on species occurrences, distribution (according to vegetation type), and relative abundance of furbearer species was collected during the winter of 2012. This data is currently believed to be sufficient, however it will need to be considered in the future to determine whether it is still relevant based on the project timing (i.e. age of data. *S. 4.1.9 Describe abundance and distribution of major wildlife species.*	3	Potentially conduct a follow-up field study to collect further information on furbearer abundance and distribution. The required field study would be a winter track count that uses track transects arranged by site vegetation type to determine presence and relative abundance.	Initial study complete – ELR November 2012.	Same as above.	Additional study based on review of initial study. May require update depending on when PP prepared.

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.09.02c	**Thinhorn Sheep** Collect data describing the usage, timing, and location of Thinhorn sheep migration corridors through the Vangorda/Grum Area and potentially the site access road.	Results from YG wildlife key area datasets and other data have established that migration corridors exist through the Vangorda/Grum and access road areas. Corridors are used through the spring and fall, and migration could be impacted by activities onsite, traffic, and habitat changes. Information regarding the use of these corridors is outdated (from 1980); therefore, impacts cannot be accurately assessed. This data will also be used to feed into adaptive management plans for sheep. *S. 4.1.9 Describe any transportation corridors and critical, key or sensitive habitats.(YESAB Proponent's Guide)*	1	Discussions with FPET and government wildlife experts in January 2012 concluded that earlier studies combined with ongoing site observations are sufficient to characterize migration corridors through the site and that efforts should focus on maintaining these corridors while protecting sheep from adverse effects. Conducting limited further studies on site is still recommended to better refine both the location / routing of migration corridors, as well as the characteristics of movements (timing on a seasonal basis, frequency, and characteristics of individuals (e.g. rams, ewes, nursery groups).	None	Same as above.	Conducting limited further studies on site is recommended to better refine both the location / routing of migration corridors, as well as the characteristics of movements (timing on a seasonal basis, frequency, and characteristics of individuals (e.g. rams, ewes, nursery groups).
R05.09.02d	**Water Birds and Waterfowl** Collect data regarding waterfowl use of pits and ponds in the Faro Mine Complex area, and also data regarding the risks of use of these habitats (the current quality of habitat is water, sediment, and biota).	Waterfowl and water birds are potential seasonal or temporary users of the Faro Mine site on an annual basis. Waterfowl might also use pits and ponds, and as the ponds slowly recolonize with plants and invertebrates over time, the chance of exposure, contamination, or mortality may increase. We have only anecdotal data regarding water bird use at the mine pits and ponds, and there appears to be no data about existing pit and pond sediment quality and biota. *S. 6.2.1.3 (YESAB Proponent's Guide)*	1	Address data gap with a field survey of waterfowl and water bird use of pits and ponds in the mine area during staging and breeding seasons. Partially addressed by work conducted in fall 2013.	Partial completion in fall 2013. No further work completed. (ELR 2013) Wildlife Baseline Study 2014 Summary report (CH2M,2015ll).	Same as above.	Completion of field work required; additional surveys; different times of year
			2	Investigate habitat, and conduct a desktop study to determine and document conditions in which we can determine the likelihood of feeding or ingestion by waterfowl/water birds. This habitat investigation would investigate the current habitat conditions, including depth, presence of vegetation, sediment metal levels, and existence of any potential feeding sources, such as benthic invertebrates. Partially addressed by work conducted in fall 2013.	Partial completion in fall 2013. No further work completed. (ELR 2013) Wildlife Baseline Study 2014 Summary report (CH2M,2015ll).	Same as above.	
R05.09.02e	**Grizzly Bear** Collect data regarding the potential for Grizzly Bear denning in the LSA and vicinity.	As a species-at-risk at the site, grizzly bears have potential to use the site in a variety of ways, including for denning (overwintering) at the site. The existing EA in the draft Project Proposal states that this is low potential; however, based on the existing information, we feel this should be revisited. As earthworks are anticipated to occur year-round at the site through the decommissioning period, there is potential for abandonment of den sites, mortality, or other effects. Information regarding the potential suitability of the LSA area for grizzly bear habitat will help to focus the effects assessment, and determine whether further studies (e.g., denning) may be required prior to or during the closure process. *S. 4.1.9 (YESAB Proponent's Guide)*	1	Conduct habitat suitability modelling to provide a concept of the likelihood of grizzly bear habitat, including denning habitat. This modelling would use existing datasets (e.g., elevation, vegetation, substrate, slope, and aspect) to determine whether suitable habitats exist, and whether further study is warranted.	Desktop study initiated (CH2M, 2015ll)	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Additional field work required

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.09.02f	**Small Mammal Sampling for Contaminant Data** Collect small mammals, and perform laboratory analysis to provide recent contaminants data.	Up-to-date information regarding contaminants data in small mammals is required for local mine areas to feed into the risk assessment process and to determine potential effects on small mammal populations.	2	Collect a limited number of small mammals, and send to the laboratory for analysis; required to fill this data gap. Collections would be performed during the summer and fall of 2012 in conjunction with other wildlife field programs. Discussions with FPET in January 2012 identified concerns about community sensitivities for this proposed program, however during the July 2012 gaps workshop contaminant data was considered to be important to the overall risk assessment process. Community sensitivities should not be great enough to limit data collection for information that needs to be included in the YESAA Project Proposal.	Wildlife baseline study conducted in 2014 included small-mammal tissue sampling (CH2M March 2015aa)	Same as above.	Depending on when PP developed, additional sampling and testing may be required.
R05.09.02g	**Wetland and Riparian Wildlife Use** Document wildlife use or avoidance of wetland and riparian zones (moose, sheep, grizzly bear, muskrat, waterfowl, and migratory birds).	To identify appropriate juxtapositions of wetlands regarding wildlife migration paths and other habitats. This does not appear to have been specifically addressed to date, but is information desirable for wetlands planning in the closure landscape.	2	Conduct seasonal surveys documenting specific wildlife use of wetland and riparian zones. Recommend a combination of camera, observational, plot, and transect surveys in riparian areas to record occurrence of wildlife signs (e.g., trails and pellet groups). These would be tied to ELC groupings to allow data to be fed into wildlife modelling for effects and closure works. Winter wildlife riparian habitat has already been captured during 2012 furbearer surveys.	The wildlife baseline study conducted in 2014 included cameras in riparian areas (CH2M March 2015aa)	Same as above.	Data needs to be evaluated to determine if additional field work required.
R05.09.02h	**Moose Late Winter Survey** Collect information to add on to fall moose data, but for the critical late winter period, where disturbance effects can be greater for moose.	Generally, surveys of moose are conducted at times and locations that give information relevant to the project and potential impacts. The late-winter period is critical to moose because of low energy reserves and limiting habitat, making them susceptible to disturbance or predation. Recent information (2011) for early winter moose distribution has been collected, however no information on late-winter distribution in the project area exists	3	As a first step in addressing this gap, conditions at the FMC will be compared and evaluated for habitat suitability for late winter use by moose (through comparison with regional conditions in known areas of late winter use). Should areas of the site offer suitable habitat conditions, then completion of an aerial survey in March of moose distribution in the study area may be undertaken to fill this gap. This survey would be conducted in the area local to the mine to determine abundance and distribution in relation to project areas, snow load, and habitat areas. The need for late winter field data will be assessed based on the results of habitat modelling.	None	Same as above.	All work remains

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.11.02 - Air Quality, Climate, and Noise							
R05.11.02a	Define air-quality baseline conditions. Previous monitoring results attempted to characterize TSP, PM_{10}, and metals, but have not been optimal or successful in defining air-quality baseline conditions. Lack of quality data affects the characterization of background ambient concentrations in the vicinity of the mine, as well in the Town of Faro.	Several air quality monitoring studies had a number of shortcomings, such as low retrieval rate (Senes, 2008), laboratory errors (Senes, 2009), wet conditions leading to low and non-representative baseline concentrations (RWDI, 2006; and Senes, 2008), and poor siting of stations. YESAB's response to Eagle Gold includes the statement: "Please make sure to include among others information regarding CAC emission inventories and PM monitoring." YESAB Proponent's Guide, Sections 4.1.6, specifically asks for available background information on existing ambient conditions. However, current data is more indicative of pristine conditions, without the effects of care-and-maintenance activities.	1	An emissions inventory and air dispersion modelling, in conjunction with the available monitoring data, is recommended to characterize the current conditions because of the cost of the air quality monitoring program and possible difficulties in obtaining reliable data from a single monitoring season. Specifically, the current monitoring data, which is more indicative of pristine background conditions, can be added to concentrations predicted from air-dispersion modelling for typical care-and-maintenance activities to characterize current ambient conditions for a number of contaminants. Because of the vast area of the mining site and the multiple emission sites, a significant number of monitoring stations would be required to properly characterize the PM and metal emissions from the site. Also, additional factors, such as heavy precipitation over the course of the summer, could affect the quality of the data and proper characterization of ambient conditions. This option would be more cost-effective than performing another air monitoring program for particulates, metals, and possibly CACs. Since the baseline for this particular project includes some care-and-maintenance activities, an emissions inventory that accounts for these activities, in addition to the estimates of pristine conditions through the previous monitoring programs, should provide a good estimate of current baseline conditions.	Baseline ambient air quality study completed in 2014 (CH2M November 2014i). Air quality modelling study completed in 2014 (CH2M November 2014m)	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	None
R05.12.02 - Socio-economic ***The socio-economic gaps have not been updated since the 2012 Gaps Report because CH2M HILL did not re-engaged a socio-economic team until late July 2013 to address needs for the Interim Works Project Proposal. That team has not yet addressed gaps for the FMRP.***							
R05.12.02a	Collect labour-force information for both Aboriginal and non-Aboriginal population (by industry, occupation, experience, training, wages/earning, participation rates, and employment rates) (LSA and RSA).	Provides information on labour pool and an inventory of statistics to determine impact and possible mitigation methods for anticipated labour-force changes, demands, and wage inflation. Essential for data analysis.	1	Research secondary sources for data and project-relevant statistics, and conduct primary research to complete missing data.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Research required specific to work that will be defined in PP.

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.12.02b	Study fishing activity (Aboriginal and non-Aboriginal), including subsistence, commercial (including tourism), recreational, and traditional.	To determine the impact of the Faro project on possible socio-economic fishing and related activities in the LSA. It is an important indicator of community economic use of the land base.	1	Conduct a primarily desktop analysis using secondary sources, and share data with other Faro project technical teams (i.e., the fisheries or aquatics technical focus teams). Augment data with primary research where needed.	None	Same as above.	Same as above.
R05.12.02c	Collect information on gathering activities (including hunting) for Aboriginal and non-Aboriginal communities, including activities, intensity, and harvest statistics, with a focus on LSA.	To determine impacts of project on existing gathering activities (hunting and land use). It is an important indicator of community economic use of the land base.	2	Research primary data sources and existing traditional knowledge reports for hunting information. Cross-reference with other Faro technical teams. Augment data with primary research where needed.	None	Same as above.	Same as above.
R05.12.02d	Collect trapping-specific data, including LSA trap activities, registered interests, trapline locations, and economic data (Aboriginal and non-Aboriginal).	To determine baseline conditions for trapping activities in the Faro project area, evaluate potential impacts from the project, and permit the development of possible mitigation methods for adverse project impacts.	2	Contact Yukon Environment for trapping statistics and registered trapline information. Additional communications with primary sources may be required to complete data collection and confirmation.	None	Same as above.	Same as above.
R05.12.02e	Research education statistics for LSA and RSA, including highest level of education, elementary and high school enrolment, school attendance, relevant skills programs, and training facilities/training capacity (Aboriginal and non-Aboriginal).	To assess the possibility of locally sourcing talent for the project and to determine ability for project to use local facilities for training and education purposes. Also permits analysis of LSA capacity to absorb possible population growth, and affects the funding needs of communities.	2	Collect statistics from secondary research sources, augmented where necessary from primary sources.	None	Same as above.	Same as above.
R05.12.02f	Research occupational breakdown of LSA and RSA labour force, with particular focus on needed project-specific talent.	To assess, evaluate, and maximize deployment of the Yukon labour force on the Faro project.	1	Research secondary labour-force statistics, and confirm with primary sources as needed.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Same as above.	Same as above.
R05.12.02g	Assess opportunities for local employment and training	To determine the ability of local residents to capture employment and possible service contract opportunities. This is of prime importance to project stakeholders and a probable key VSEC.	1	Collect statistics from secondary research sources, augmented where necessary from primary sources.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Research required specific to work that will be defined in PP.

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.12.02h	Assess municipal infrastructure, such as sewage, parks, power, and telecommunications and services, such as social services and childcare in the LSA communities.	To determine impact of increased population and activity on LSA communities. Important to determine community impact of project.	2	Collect statistics from secondary research sources, augmented where necessary from primary sources.	None	Same as above.	Same as above.
R05.12.02i	Research traffic volumes in LSA and RSA, including highways, roads, airports, transportation infrastructure, accident statistics, transportation modes, and commuting patterns as relevant to project.	To determine impact of increased population and activity on Yukon communities and transport infrastructure. Essential for community impact analysis.	1	Collect statistics from secondary research sources, augmented where necessary from primary sources.	None	Same as above.	Same as above.
R05.12.02j	Research income and earnings in the LSA and RSA (Aboriginal and non-Aboriginal), as well as Yukon economic indicators.	Essential to evaluate and determine economic impacts on communities.	1	Collect statistics from secondary research sources, augmented where necessary from primary sources.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Same as above.	Same as above.
R05.12.02k	Conduct a scan of locally owned businesses in the LSA, both Aboriginal and non-Aboriginal.	To understand the local capacity to maximize economic benefits to nearby goods and services suppliers.	1	Research primary sources because of the small size and geographic distribution of population and businesses.	None	Same as above.	Same as above.
R05.12.02l	Assess taxation revenue impacts for local, territorial, and federal governments.	To provide baseline and analysis information on government revenues.	2	Collect statistics from secondary research sources, augmented where necessary from primary sources.	None	Same as above.	Same as above.
R05.12.02m	Research population and personal income fluctuations in LSA communities using historical information.	Establish implications for diversification within the project timeline.	1	Collect statistics from secondary research sources, augmented where necessary from primary sources.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Same as above.	Same as above.
R05.12.02n	Collect data on the ability of LSA and RSA business capacity to service the project.	Ensure that Yukon businesses maximize economic benefits from the project.	1	Collect statistics from secondary research sources, augmented where necessary from primary sources.	None	Same as above.	Same as above.
R05.12.02o	Research the number of business licenses in LSA, and the number of businesses and employees in LSA and RSA.	To determine the ability of Yukon businesses to capture current and ongoing benefits from the project.	1	Research using mostly secondary research sources because of distributed communities.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Same as above.	Same as above.
R05.12.02p	Collect population counts (LSA and RSA), both Aboriginal and non-Aboriginal.	To determine impact of project activities on local communities.	2	Research using mostly secondary research sources because of distributed communities.	None	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Research required specific to work that will be defined in PP.

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Activity Code	Data or Information Gap	Rationale	Importance[a]	Actions Required to Address Gap	Actions Completed to Address Gap	Changes in Scope	Remaining Gaps
R05.12.02q	Collect information regarding community events, including descriptions and numbers.	To determine impact of project activities on local communities.	2	Research using mostly secondary research sources because of distributed communities.	None	Same as above.	Same as above.
R05.12.02r	Study area mobility status (LSA and RSA, both Aboriginal and non-Aboriginal, where appropriate), including mobility status, age and sex, family size, and marital status.	To build baseline information and allow for project impact analysis.	1	Collect statistics from secondary research sources, augmented where necessary from primary sources.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Same as above.	Same as above.
R05.12.02s	Establish the number of dwelling units; housing prices; land lots for development; number of leasing properties, rental vacancies, or transactions; occupied private-dwelling characteristics; housing sales forecasts; and property values.	To build baseline information and allow for project impact analysis.	1	Research using mostly primary research sources due to distributed communities. Augment data with primary research where needed.	None	Same as above.	Same as above.
R05.12.02t	Establish community crime rates in LSA, and identify the type of crime and frequency.	To determine impact of project activities and increased population on local communities.	2	Collect statistics from secondary research sources, augmented where necessary from primary sources.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Same as above.	Same as above.
R05.12.02u	Research leisure and recreational activities, including description, type, and nature of use of existing recreation facilities in the LSA, including Aboriginal and non-Aboriginal population centres.	To determine impact of project activities and increased population on local communities.	2	Research using mostly primary research sources because of distributed communities and small sample set.	None	Same as above.	Same as above.
R05.12.02v	Update information on Aboriginal governments (RRDC, LFN, and SFN) and applicable municipal and territorial governments, and identify other relevant major projects in LSA and RSA.	To determine the impact of project activities on local government capacity and services.	2	Interview primary sources (governments, First Nations, and community groups).	None	Same as above.	Same as above.
R05.12.02w	Research domestic violence occurrences.	To analyze the effects of domestic violence on an increased population in smaller communities.	2	Interview primary sources (governments, First Nations, community leaders, and community support organizations).	None	Same as above.	Same as above.
R05.12.02x	Describe health and social services.	Assess the ability of local communities to provide services to additional community members.	1	Research using mostly primary research sources because of distributed communities.	None	Same as above.	Same as above.

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R05.12.02y	Research health characteristics, hospitalization rates, medical facilities, medical staff, alcohol and drug use, domestic abuse and violence, and community health characteristics, both Aboriginal and non-Aboriginal (LSA and RSA).	Assess the ability of local communities to absorb additional community members.	1	Collect statistics from secondary research sources, augmented where necessary from primary sources.	None	Development of Remediation Project Proposal suspended in spring 2015, and development of remediation plan for NFRC prioritized to address developing issue of contaminated seepage from Intermediate WRD.	Research required specific to work that will be defined in PP.
R05.12.02z	Research the number of mining-related accidents each year.	Assess the ability of local communities to provide services to additional community members.	2	Collect statistics from secondary research sources, augmented where necessary from primary sources.	Secondary research completed pertaining to IWPP. (CH2M HILL, March 2014ff	Same as above.	Same as above.
R05.12.02aa	Study the quality of life of the Aboriginal population, including measures of health, community life, political stability, climate and geography, job security, and gender equality (RRDC, LFN, and SFN).	Assess the impact of the project on local First Nations well-being and community fabric.	1	Research using mostly primary research sources because of distributed communities. Augment data with primary research where needed	None	Same as above.	Same as above.
R05.12.02bb	Seek out community input on VSEC priorities.	To ensure that communities support the selected VSECs.	1	Conduct community meetings, discussions, and outreach.	None	Same as above.	Same as above.
R05.12.02cc	Identify other capacity constraints that may impact community engagement capacity, consultation, and engagement approach (e.g., C&C staffing and labour shortages).	Essential for correct interpretation of data.	1	Assess other major projects in the LSA and the RSA (understand capacity issues, and competition for goods, services, and human resources) as they relate to community capacity and impacts discussions with First Nations and local communities. Comprises primary and secondary research.	None	Same as above.	Same as above.

[a] Importance: 1=Critical – must do; 2=Ideal; 3=Minor – nice to have but not necessary

Notes:

3D	=	three-dimensional	LSA	=	local study area
AMP	=	adaptive management plan	NFRC	=	North Fork Rose Creek
As	=	arsenic	ºC	=	degrees Celsius
B	=	barium	Pb	=	lead
CAC	=	criteria of concern	PM_{10}	=	particulate matter less than 10 micrometres in aerodynamic diameter
CO	=	carbon monoxide	PMF	=	probable maximum flood
COC	=	contaminant of concern	RRDC	=	Ross River Dene Council
DEM	=	digital elevation map	SFN	=	Selkirk First Nation
DO	=	dissolved oxygen	SIL	=	survey intensity level
EA	=	environmental assessment	SIS	=	seepage interception system
EDI	=	EDI Consultants	TSS	=	total suspended solids
GIS	=	geographic information system	YESAB	=	Yukon Environmental and Socio-economic Assessment Board
IDF	=	intensity, duration, and frequency	YG	=	Yukon Government
km^2	=	square kilometre	YGS	=	Yukon Geological Survey
LFN	=	Liard First Nation	yr	=	year
LIDAR	=	light detection and ranging	Zn	=	zinc

Appendix C
Summary of Field and Analytical Testing Programs

Introduction

This appendix includes tabular summaries of field investigation conducted by CH2M from fiscal year (FY) 2012 to FY2016. The tables (C-1 through C-5) show the applicable geographic site area, program objectives, summary of completed fieldwork scope, and applicable data report document citations for each program.

Table C-1. Summary of Field and Analytical Programs for FY2012-2013

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
Site-wide	Wildlife Baseline - Winter Furbearer and Wildlife Tracking Survey	• Characterize presence, relative abundance, and habitat use by furbearers and other wildlife species during winter	• Completed 12 transects (each composed of a triangle with 1-km side length) • Identified and count wildlife tracks	Ecological Logistics & Research Ltd. (ELR). November 2012. *Faro Mine Site Winter Track Study Memo – Activity R05.09.02B.* Memo. Prepared for CH2M HILL Canada Limited (CH2M), Chuck Shewen, B.Sc., P.Biol. November 9.
RCTA, CVD	Construct Cross Valley Dam Interception System	• Characterize hydrostratigraphy • Evaluate GW quality • Investigate GW/SW interaction in Rose Creek	• Drilled seven borings to bedrock at toe of CVD and completed as monitoring wells • Drilled four shallow paired borings downstream adjacent to Rose Creek and completed as monitoring wells • Collected GW samples from all new wells and 56 existing locations • Completed aquifer tests at all installed wells, including the four-day aquifer test using multiple pumping wells • Installed and monitor 16 streambed piezometers	CH2M HILL Canada Limited (CH2M). March 2013m. Cross Valley Dam Interception System Investigation Data Report Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. March 28.
Site-wide Waste Dumps, Site-wide Pits	Seep and Surface Water Monitoring	• Characterize seepage water quality • Characterize ARD evolution • Characterize WTP influent quality	• Sampled 109 seep locations and 10 SW locations in spring and fall	CH2M HILL Canada Limited (CH2M). October 2013a. *2012 Seepage, Surface Water, and Water Treatment Plant Influent Field Sampling Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon. October 29.
Rose Creek, NFRC, SFRC	Fish Telemetry Survey	• Investigate seasonal movements, habitat use, critical habitat of Arctic Grayling	• Sampled, tagged, and completed telemetry monitoring of arctic grayling	Environmental Dynamics Inc. (EDI). November 2012. *Faro Mine Fish Telemetry Project – Interim Field Report No. 1*. Prepared for CH2M HILL Canada Limited (CH2M), Dawn Kelly, Project Manager. November 6. Environmental Dynamics Inc. (EDI). December 2012. *Faro Mine Remediation Project Fish Telemetry Program – Interim Field Report No. 2*. Prepared for CH2M HILL Canada Limited (CH2M), Charles Shewen. December 13.
Main Dump, Zone II Waste Dump, Intermediate Dump, Grum Waste Dump, Vangorda Waste Dump	Waste Rock Dump Monitoring	• Characterize hydrostratigraphy • Characterize GW quality • Characterize ARD evolution • Characterize geotechnical properties of waste Rock and underlying native material	• Drilled six borings through waste dumps (NE, Zone II, Main, Intermediate, Grum, Vangorda), completed as monitoring wells, thermistor ports, gas sampling ports • Sampled groundwater wells, and monitored temperatures and pore gas in fall and winter	CH2M HILL Canada Limited (CH2M). October 2013b. Waste Rock Dump Monitoring Report. Technical memorandum. Final. Prepared for Government of Yukon. October 29.
Mill Building Area	Construct new Faro and Vangorda Water Treatment Plant and Piping	• Investigate geotechnical foundation conditions • Characterize WTP influent water quality	• Drilled 10 borings into bedrock. Completed borings as piezometers and developed • Monitored water levels	CH2M HILL Canada Limited (CH2M). December 2012. *Geotechnical Design Report, Water Treatment Plant, Faro Mine Remediation Project.* Technical memorandum. Draft. Prepared for Government of Yukon. December 7.
Zone II Pit	Replace Zone II Pit Pumping Well	• Characterize hydrostratigraphy in backfilled Zone II Pit	• Drilled, installed, and developed replacement Zone II pit pumping well	CH2M HILL Canada Limited (CH2M). November 2012g. Task Authorization 007 Summary of Zone II Drilling Activities, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Karen Furlong/Government of Yukon (YG). November 1.
Site-wide	Develop and Decommission Faro and Vangorda Grum Borrow Sources	• Assess overall areal limit of potentially viable, currently undisturbed borrow source materials	• Performed geological reconnaissance • Hand-dug 20 test pits	CH2M HILL Canada Limited (CH2M). June 2013f. *Limited Borrow Material Reconnaissance, Faro Mine Remediation Project*. Technical memorandum. Final. Prepared for Government of Yukon. June 10.
Grum Overburden Dump	Develop Grum Overburden Dump Borrow Source	• Quantify available borrow material • Characterize geochemistry, fertility, and geotechnical properties of borrow material	• Drilled six borings • Excavated eight test pits	CH2M HILL Canada Limited (CH2M). June 2013i. *Grum Overburden Dump Fatal Flaw Evaluation Data Report, Faro Mine Remediation Project.* Technical memorandum. (Final). June 10
Site-wide Surface Water	Construct New Faro and Vangorda Water Treatment Plant and Piping	• Characterize water quality from pits and water collection systems • Characterize WTP influent water quality	• Collected SW samples from eight locations three times (spring, fall, winter)	CH2M HILL Canada Limited (CH2M). October 2013a. *2012 Seepage, Surface Water, and Water Treatment Plant Influent Field Sampling Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon. October 29. CH2M HILL Canada Limited (CH2M). November 2012c. *Water Treatment Plant Design – Influent Characterization/Plant Capacity Phasing, Faro Mine Remediation Project.* Technical memorandum No. 1. Final. November 23.

Table C-1. Summary of Field and Analytical Programs for FY2012-2013

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
NFRC, SFRC, Rose Creek	Aquatic Community and Habitat Baseline Field Study	• Estimate fish density • Characterize fish habitat	• Deployed and track radio tags • Collected and analyze tissue samples • Collected habitat data	Environmental Dynamics Inc. (EDI). March 2015a. *Arctic Grayling Telemetry & Fish Habitat Investigations, Faro Mine, 2012-2014.* (Final). Prepared for CH2M HILL Canada Limited (CH2M). March 25.
WTP	Construct New Faro and Vangorda Water Treatment Plant and Piping	• Evaluate sludge and effluent qualities produced using high-density sludge treatment	• Operated three high-density sludge pilot WTP systems • Tested effluent and sludge qualities under varying influent chemistries and system configurations	CH2M HILL Canada Limited (CH2M). November 2012a. *Water Treatment Pilot Study Report, Faro Mine Remediation Project, TA 013.* Technical Memorandum No. 4. Prepared for Government of Yukon and Aboriginal Affairs and Northern Development Canada (AANDC). November 27.

Notes:

AANDC = Aboriginal Affairs and Northern Development Canada
ARD = acid rock drainage
CH2M = CH2M HILL Canada Limited
CVD = Cross Valley Dam
FSP = field sampling plan
FY = fiscal year
GW = groundwater
km = kilometre
NE = northeast
NFRC = North Fork Rose Creek
RCTA = Rose Creek Tailings Area
SFRC = South Fork Rose Creek
SW = surface water
WRD = waste rock dump
WTP = water treatment plant

Table C-2. Summary of Field and Analytical Programs for FY2013-2014

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
RCD, CVD, Intermediate Impoundment, NFRC	Construct Cross Valley Dam Interception System	• Characterize hydrostratigraphy • Characterize GW Quality • Characterize GW/SW interaction in RCD and NFRC	• Completed surface geophysical transect along potential CVD SIS alignment (GPR, resistivity, seismic refraction) • Drilled one boring downstream from CVD to investigate potential fractured bedrock zone • Drilled, installed and developed six well clusters along the RCD - each consisting of paired wells and a stream stage • Drilled, installed, and developed a well cluster of three wells in the north portion of the Intermediate Impoundment • Collected GW samples • Conducted four aquifer tests at RCD well clusters • Installed and monitored 19 streambed piezometers in the NFRC upstream of the Rock Drain • Conducted a specific conductivity survey in the RCD adjacent to the Secondary Impoundment	CH2M HILL Canada Limited (CH2M). February 2014q. *2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 7.
Vangorda Creek, Granitic Rock Outcrop, Grum Waste Rock Dump Quarry	Construct Replacement Vangorda Creek Diversion	• Characterize Hydrostratigraphy • Evaluate channel hydraulics and morphology • Characterize geotechnical foundation conditions • Characterize rip rap borrow material geotechnical properties	• Drilled three borings along proposed VCD alignment (SRK, November 2010), completed as standpipe piezometers • Completed resistivity, GPR, seismic reflection and seismic refraction geophysical surveys of SRK's proposed VCD alignment, granitic rock outcrop, and Grum Waste Rock Dump Quarry • Collected and logged surface samples from Granitic Rock Outcrop and Grum Waste Rock Dump Quarry • Drilled two diamond core drill holes in the Granitic Rock Outcrop • Completed topographic survey of SRK's proposed VCD alignment • Completed fluvial geomorphic assessment of Vangorda Creek • Inspected meteorological stations • Completed reconnaissance of SRK's proposed VCD alignment	CH2M HILL Canada Limited (CH2M). March 2014d. *2013 Vangorda Creek Diversion Field Investigation Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28.
Ridge North of Grum Pit, Grum Overburden Dump, Haul Road Borrow, Rose Creek Borrow	Develop and Decommission Faro-Grum-Vangorda Borrow Sources	• Characterize geotechnical properties, geochemistry, and fertility of potential borrow material • Quantify available borrow material	• Logged and sampled surface bedrock exposures • Collected surface soil samples • Drilled 14 pionjar borings • Drilled six sonic borings • Excavated 40 test pits	CH2M HILL Canada Limited (CH2M). March 2014n. *Phase II Borrow Reconnaissance, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28. CH2M HILL Canada Limited (CH2M). March 2014b. *Faro Water Treatment Plant Geotechnical Design Report Addendum, 2013 Borrow Source and Quarry Investigation*, *Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31.
Faro Pit, Vangorda Pit, Grum Pit	Evaluate pit wall stability	• Investigate slope stability of pit walls	• Completed field reconnaissance/mapping • Installed survey monitoring points at Grum Pit	CH2M HILL Canada Limited (CH2M). March 2014q. *Faro Mine Complex 2013 Pit Wall Stability Inspection, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 26.
NFRD, RCD, ID, NFRC, SFRC, Upper Parking Lot Waste Dump, Lower Northwest Waste Dump	Construct Down Valley Interim Hydraulic Upgrades	• Characterize hydrostratigraphy • Characterize geotechnical properties at base of Rock Drain, RCD, and ID • Characterize geochemical and geotechnical properties of potential calc silicate borrow material • Characterize flows in NFRC and RCD	• Performed geological reconnaissance of RCD • Excavated seven test pits along crest of ID • Excavated three test pits in ID spillway • Completed five geophysical transects across NFRC upstream and downstream of the NFRD • Drilled two borings at downstream toe of Rock Drain • Established continuous stream stage monitoring at SW stations R10 and X2 • Performed dye test through the NFRD • Surveyed weekly water elevations at NF1 and NF2 • Excavated 15 test pits in the Upper Parking Lot WRD and Lower Northwest WRD	CH2M HILL Canada Limited (CH2M). March 2014m. *2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 28.

Table C-2. Summary of Field and Analytical Programs for FY2013-2014

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
Site-wide Waste Dumps, Site-wide Pits	Seep and Surface Water Monitoring	• Characterize seepage water quality • Characterize ARD evolution • Characterize WTP influent quality	• Sampled 109 seep locations and 10 surface water locations in spring and fall	CH2M HILL Canada Limited (CH2M). March 2014c. *2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report, Faro Mine Remediation Project.* Final. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March 31.
Main Dump, Zone II Waste Dump, Grum Waste Dump, Intermediate Dump, Vangorda Waste Dump	Waste Rock Dump Monitoring	• Characterize GW quality • Characterize ARD evolution	• Monitored thermistors, pore gas and groundwater in spring, fall and winter	CH2M HILL Canada Limited (CH2M). March 2013n. *Waste Rock Dump Monitoring Data Report Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 28.
Site-wide Surface Water Bodies	Waterfowl Study	• Characterize quality of potential waterfowl habitat • Evaluate potential for contaminant ingestion	• Performed visual survey of potential waterfowl habitat with spotting scope and binoculars • Performed waterfowl habitat surveys • Sampled vegetation and sediment	Ecological Logistics & Research Ltd (ELR). December 2013. *Faro Mine Complex 2013 Waterfowl Studies.* Prepared for CH2M HILL Canada Limited (CH2M), Chuck Shewen. December 12.

Notes:

ARD = acid rock drainage
CVD = Cross Valley Dam
FY = fiscal year
GPR = ground-penetrating radar
GW = groundwater
ID = Intermediate Dam
NFRC = North Fork Rose Creek
RCD = Rose Creek Diversion
SRK = SRK Consulting Engineers and Scientists
SW = surface water
VCD = Vangorda Creek Diversion
WRD = waste rock dump

Table C-3. Summary of Field and Analytical Programs for FY2014-2015

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
Faro Pit	Construct Faro Pit Safety Berm	• Observe surface conditions and hydrologic	• Performed geological reconnaissance of pit perimeter berm alignment provided in SRK Draft 4a Closure Plan (SRK, November 2010)	CH2M HILL Canada Limited (CH2M). March 2015oo. *Summary of 2014 Field Investigation – Faro Pit Safety Berm; FSP Name: Activity 101.2 – Field Reconnaissance for the Faro Pit Safety Berm.* Technical memorandum. Draft. Prepared for Government of Yukon. March 12.
FCD	Upgrade Faro Creek Diversion	• Characterize surface conditions at existing diversions • Characterize surface conditions along SRK proposed replacement Faro Creek Diversion alignment (SRK, November 2010)	• Performed geological reconnaissance • Performed Bed and Bank Material Characterization • Completed 20 channel cross section surveys	CH2M Canada Limited (CH2M). March 2015i. *Summary of 2014 Field Investigation – Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch FSP Name: 102.1 – Faro Creek Diversion (East Valley); 102.2 – Faro Creek Diversion (West Valley Interceptor Ditch).* Technical memorandum. Prepared for Government of Yukon. March 18.
NWID	Upgrade North Wall Interceptor Ditch	• Characterize channel shape and surface conditions • Characterize geotechnical properties of channel bank material	• Excavated four test pits • Performed geological reconnaissance • Completed eight channel cross section surveys	CH2M HILL Canada Limited (CH2M). March 2015j. *Summary of 2014 Field Investigation – North Wall Interceptor Ditch and Upper Guardhouse Creek FSP Name: 102.3 – Upgrade North Wall Interceptor Ditch.* Technical memorandum. Draft. Prepared for Government of Yukon. March 19.
Lower Guardhouse Creek	Install Lower Guardhouse Creek Interception System	• Characterize channel shape and general conditions	• Performed geological reconnaissance • Performed specific conductivity survey	CH2M HILL Canada Limited (CH2M). March 2015k. *Summary of 2014 Field Investigation – Lower Guardhouse Creek Interception FSP Name: 102.4 – Lower Guardhouse Creek Interception.* Technical memorandum. Prepared for Government of Yukon. March 19.
Oxide Fines Stockpile, Low Grade Ore Stockpile C	Relocate Oxide Fines to Low-grade Stockpile "C"	• Characterize geotechnical properties of oxide fines stockpile and LGSPC • Characterize geochemical properties of the oxide fines stockpile and LGSPC • Delineate extent of oxide fines stockpile	• Drilled one boring in Oxide Fines Stockpile and installed a GW monitoring well, thermistor port, and pore gas ports • Excavated four test pits • Collected two shallow hand-dug test pit samples	CH2M HILL Canada Limited (CH2M). March 2015l. *Summary of 2014 Field Investigation – Relocate Oxide Fines to Low-grade Stockpile "C" FSP Name: 104.1 – Relocate Oxide Fines to LGSPC.* Technical memorandum. Prepared for Government of Yukon. March 13.
ETA	Remove ETA Tailings to Rose Creek Tailings Facility	• Investigate tailings thickness and geotechnical properties • Characterize extent of contamination in tailings and underlying soils • Characterize geotechnical properties of road fill in mine access road adjacent to ETA	• Drilled three borings • Advanced six seismic CPT soundings	CH2M Canada Limited (CH2M). March 2015m. *Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tails Area FSP Name: 105.1 – Remove Tailings to Rose Creek Tailings Facility.* Technical memorandum. Prepared for Government of Yukon. March 9.
ETA	Design of a Surface Water Collection Structure for the Emergency Tailings Area	• Characterize bedrock conditions • Characterize overburden and bedrock conditions along the proposed alignment of the mine Access Road • Quantify surface water flow at FCS-4 and X-23	• Completed two seismic refraction surface geophysical survey lines • Excavated one test pit • Installed stilling wells and water level transducers at two SW locations • Performed geological reconnaissance	CH2M Canada Limited (CH2M). March 2015n. *Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area FSP Name: 105.2 – Install Emergency Tailings Area Surface Water Collection System.* Technical memorandum. Prepared for Government of Yukon. March 9.
Main Dump, Intermediate Dump	Regrade and Reslope Main Dump and Intermediate Dump Sulphide Cells	• Delineate geographic extent of the Main Dump and Intermediate Dump sulphide cells • Characterize geotechnical properties of the sulphide material • Determine foundation preparation requirements for a cover • Characterize infiltration properties of the sulphide cell material	• Excavated 12 test pits • Drilled one boring in the Main WRD and installed a thermistor port and pore gas ports	CH2M HILL Canada Limited (CH2M). March 2015o. *Summary of 2014 Field Investigation – Delineate Main and Intermediate Sulphide Cells for Regrading and Capping Design FSP Name: 106.1 – Regrade and Reslope Main and Intermediate Sulphide Cells.* Technical memorandum. Prepared for Government of Yukon. March 13.
Faro Waste Dumps	Regrade and Reslope Faro Waste Rock Dumps	• Characterize geotechnical properties of waste rock material • Characterize geochemical kinetics and leachability of waste rock material	• Excavated seven test pits.	CH2M HILL Canada Limited (CH2M). March 2015p. *Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Upper Surface) FSP Name: 106.2 – Regrade and Reslope Faro Waste Rock Dumps (Upper Surfaces).* Technical memorandum. Prepared for Government of Yukon. March 13.
Faro Waste Dumps	Regrade and Reslope Faro Waste Rock Dumps	• Characterize geotechnical foundation conditions along toe of Faro WRDs	• Performed geological reconnaissance • Excavated five test pits.	CH2M HILL Canada Limited (CH2M). March 2015q. *Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Toe of Slope) FSP Name: 106.3 – Regrade and*

Table C-3. Summary of Field and Analytical Programs for FY2014-2015

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
		• Characterize hydrostratigraphy in areas of potential WRD footprint expansion		*Reslope Faro Waste Rock Dumps (Toe of Slope).* Technical memorandum. Prepared for Government of Yukon. March 13.
NFRC, SFRC	Upgrade North Fork Rose Creek	• Document general conditions along NFRC and SFRC	• Performed geological reconnaissance • Characterized bed and bank material • Completed 14 channel cross section surveys	CH2M Canada Limited (CH2M). March 2015i. *Summary of 2014 Field Investigation – Upgrade North Fork Rose Creek FSP Name: 107.1 – Upgrade North Fork Rose Creek.* Technical memorandum. Prepared for Government of Yukon. March 19.
Zone II Outwash	Relocate Zone II Outwash Material to Intermediate Sulphide Cell	• Delineate extent of contamination in Zone II outwash sediments	• Excavated four test pits.	CH2M Canada Limited (CH2M). March 2015j. *Summary of 2014 Field Investigation – Relocate Zone II Outwash Material to Intermediate Sulphide Cell FSP Name: 107.3 – Relocate Zone II Outwash Material to Intermediate Sulphide Cell).* Technical memorandum. Prepared for Government of Yukon. March 19.
Zone II Outwash	Install Zone II Outwash Collection System	• Characterize hydrostratigraphy in Zone II Outwash	• Drilled, installed, developed and sampled eight monitoring wells • Performed packer testing in bedrock • Completed stream stage monitoring • Completed one seismic refraction geophysics line	CH2M HILL Canada Limited (CH2M). March 2015t. *Summary of 2014 Field Investigation – Install Zone II Outwash Collection System FSP Name: 107.4 – Install Zone II Outwash Collection System.* Technical memorandum. Prepared for Government of Yukon. March 2.
S-Wells	Install S-Wells Groundwater Collection System	• Characterize hydrostratigraphy in S-Wells area • Investigate GW/SW interaction in the NFRC downstream of the Rock Drain	• Drilled, installed, developed and sampled six monitoring wells • Installed and monitored 16 streambed piezometers • Performed packer testing in bedrock • Completed one seismic refraction geophysics line • Completed stream stage monitoring	CH2M HILL Canada Limited (CH2M). March 2015u. *Summary of 2014 Field Investigation – Install S-Wells Groundwater Collection System FSP Name: 107.5 – Install S-Wells Groundwater Collection System.* Technical memorandum. Prepared for Government of Yukon. March 19.
Former Faro Lube Shack and Tank Farm	Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover	• Delineate extent of hydrocarbon contamination	• Excavated two test pits	CH2M HILL Canada Limited (CH2M). March 2015v. *Summary of 2014 Field Investigation – Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover FSP Name: 108.5 – Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover.* Technical memorandum. Prepared for Government of Yukon. March 12.
Intermediate Tailings Impoundment	Dewater and Cover Intermediate Tailings Area	• Delineate thickness and geotechnical properties of tailings.	• Drilled one boring and completed with thermistor port casing • Advanced three CPT soundings	CH2M Canada Limited (CH2M). March 2015m. *Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area FSP Name: 201.1 – Dewater and Cover Intermediate Tailings Area. Technical memorandum.* Prepared for Government of Yukon. March 13.
Intermediate Tailings Impoundment	Construct New Side Channel and Side Channel Dike	• Delineate thickness and geotechnical properties of tailings • Evaluate seasonal frost penetration.	• Drilled 4 borings and completed with thermistor port casings • Advanced 9 CPT soundings • Monitored thermistor ports in fall and winter.	CH2M Canada Limited (CH2M). March 2015o. *Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike FSP Name: 201.5 – Construct New Side Channel and Side Channel Dike.* Technical memorandum. Prepared for Government of Yukon. March 13.
ID Spillway	Construct Intermediate Dam Spillway	• Characterize geotechnical foundation conditions along proposed ID Spillway alignment	• Drilled two borings into bedrock • Performed packer testing	CH2M Canada Limited (CH2M). March 2015p. *Summary of 2014 Field Investigation – Construct Intermediate Dam Spillway FSP Name: 201.6 – Construct Intermediate Dam Spillway.* Technical memorandum. Prepared for Government of Yukon. March 13.
RCD	Upgrade Rose Creek Diversion	• Characterize channel morphology	• Completed two channel cross section surveys	CH2M Canada Limited (CH2M). March 2015n. *Summary of 2014 Field Investigation – Upgrade Rose Creek Diversion FSP Name: 201.3 – Upgrade Rose Creek Diversion.* Technical memorandum. Prepared for Government of Yukon. March 13.
Secondary Tailings Impoundment near Fuse Plug	Construct Erosion Dissipation Structure	• Characterize local setting and foundation conditions at location of proposed erosion dissipation structure	• Performed geological reconnaissance	CH2M Canada Limited (CH2M). 2015q. *Summary of 2014 Field Investigation – Erosion Dissipation Structure FSP Name: 203.2 – Erosion Dissipation Structure.* Technical memorandum. Prepared for Government of Yukon. March 13.
RCD near Fuse Plug	Construct New Overflow Weir	• Investigate geotechnical foundation conditions at location of proposed overflow weir	• Advanced two borings into bedrock	CH2M HILL Canada Limited (CH2M). March 2015cc. *Summary of 2014 Field Investigation – Construct New Overflow Weir FSP Name: 203.4 – Construct New Overflow Weir.* Technical memorandum. Prepared for Government of Yukon. March 13.
Pump House Pond	Develop and Decommission Faro Borrow Sources – Granular Soil, Pump House Borrow	• Characterize geotechnical and geochemical properties of borrow material • Delineate extent of potential borrow source	• Excavated five test pits	CH2M Canada Limited (CH2M). March 2015f. *Summary of 2014 Field Investigations – Pump House Borrow Source, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 27.

Table C-3. Summary of Field and Analytical Programs for FY2014-2015

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
Granitic Rock Outcrop	Develop and Decommission Grum/Vangorda Rip Rap Sources – Granitic Rock Outcrop	• Characterize geotechnical properties of borrow material • Delineate extent of potential borrow source	• Drilled two borings • Completed two seismic refraction geophysics lines	CH2M Canada Limited (CH2M). March 2015g. *Summary of 2014 Field Investigations – Granitic Rock Outcrop, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. March 27.
RCD, NFRC	Site-wide Surface Water Monitoring	• Characterize surface water flows	• Installed stilling wells and water level transducers at five surface water monitoring locations	CH2M HILL Canada Limited (CH2M). March 2015dd. *Summary of 2014 Field Investigation – Site-wide Surface Water Monitoring FSP Name: SW-005 – Site-wide Surface Water Monitoring.* Technical memorandum. Prepared for Government of Yukon. March 31.
Site-wide Waste Dumps, RCTA	Site-wide Geochemical Monitoring	• Characterize seepage water quality • Characterize ARD evolution • Characterize GW quality in RCAA • Characterize pit Lake water quality • Characterize WTP influent quality • Characterize waste rock geotechnical and geochemical characteristics and extents • Characterize contaminant loading to Rose Creek Alluvial aquifer from ETA.	• Drilled 5 borings in Original Tailings Impoundment, Northwest Dump and Northeast Dump • Installed, and develop four monitoring wells in WRDs and Original tailings impoundment • Installed gas ports and thermistor ports in two WRD borings • Monitored WRD GW, thermistor, soil gas (spring, fall, winter) • Sampled 14 streambed piezometers upstream of Rock Drain • Sampled 85 wells in RCTA (fall) • Monitor 188 seeps (spring, fall). Complete Pit Lake Profiling.	CH2M HILL Canada Limited (CH2M). March 2015b. *Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring FSP Name: SW-015 – Site-wide Geochemical Monitoring.* Technical memorandum. Prepared for Government of Yukon. March 31.
Zone II Outwash	Reclaim Zone II Outwash	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	CH2M HILL Canada Limited (CH2M). March 2015kk. *Vegetation and Soil – 2014 Field Summary Report, Faro Mine Remediation Project Proposal.* (Final). Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. March.
Site-wide Mine Disturbance Areas	Baseline Mine Vegetation Regrowth Study	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	CH2M HILL Canada Limited (CH2M). February 2015c. *Site-wide Soil Characterization Report, Faro Mine Remediation Project.* Draft. Prepared for Government of Canada as represented by Aboriginal Affairs and Northern Development Canada and the Government of Yukon. February 9.
Undisturbed Portions of Local Study Area	Site-wide Soils and Vegetation Baseline Study	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	
LGSP A	Cover and Revegetate LGSP A	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	
ETA	Cover and Revegetate ETA	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	
Northeast WRD	Cover and Revegetate Northeast Sulphide Cell	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	

Table C-3. Summary of Field and Analytical Programs for FY2014-2015

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
Main Dump and Intermediate Dump	Cover and Revegetate Main Dump and Intermediate Dump Sulphide Cells	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	
Mt. Mungly Waste Dump and Southwest Pit Wall Dump	Cover and Revegetate Mt Mungly (East and West) and Southwest Pit Wall Dumps	• Determine terrain Classification • Characterize vegetation community • Characterize soil series • Investigate toxicology	• Conducted field survey of soil and vegetation • Collected vegetation tissue and soil samples	
Pipeline Alignment from CVD to WTP	Construct Cross Valley Dam SIS Pipeline	• Characterize geotechnical conditions along proposed CVD SIS pipeline alignment	• Excavated 10 test pits	CH2M HILL Canada Limited (CH2M). January 2015b. *Cross Valley Dam Seepage Interception System Test Pit Data Summary, Faro Mine Remediation Project*. Technical memorandum. Draft. Prepared for Government of Yukon. January 30.

Notes:

CVD = Cross Valley Dam
ETA = Emergency Tailings Area
FCD = Faro Creek Diversion
FY = fiscal year
GW = groundwater
ID = Intermediate Dam
LGSPC = low-grade ore stock pile “C”
NFRC = North Fork Rose Creek
RCD = Rose Creek Diversion
NWID = North Wall Interceptor Ditch
SFRC = South Fork Rose Creek
SIS = seepage interception system
SRK = SRK Consulting Engineers and Scientists
WRD = waste rock dump
WTP = water treatment plant
YG = Government of Yukon

Table C-4. Summary of Field and Analytical Programs for FY2015-2016

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
Site-wide Waste Dumps and Pits, RCTA	Site-wide Geochemical Monitoring	• Characterize seepage water quality • Characterize ARD evolution • Characterize GW quality in RCAA • Characterize pit lake water quality	• Monitored WRD GW, thermistor, soil gas (spring, fall, winter) • Sampled 85 wells in RCTA (fall) • Monitored 188 seeps (spring, fall) • Completed pit lake profiling (fall, winter)	CH2M Canada Limited (CH2M). April 2016d. Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring, FSP Name: SW-015 – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. April 6.
FCD and Faro Valley	Upgrade Faro Creek Diversion	• Characterize hydrostratigraphy in Faro Valley • Evaluate proportion of leakage from FCD vs. quantity of GW flow beneath channel •	• Drilled, installed, and developed three well clusters (three wells per cluster) •	CH2M Canada Limited (CH2M). April 2016g. Summary of 2015 Field Investigation - Faro Valley Seepage Investigation, Faro Mine Remediation Project, Field Sampling Plan Name: 106.1 – Faro Valley Seepage Investigation. Technical memorandum. Draft. Prepared for Government of Yukon. April 1.
Faro Pit and FCD	Upgrade Faro Creek Diversion	• Characterize geotechnical conditions and stability of east wall of Faro Pit	• Drilled two borings into bedrock, • Performed downhole acoustic and optical televiewer surveys • Installed two slope inclinometers nested with vibrating wire piezometers • Drilled two shallow borings and completed with standpipe piezometers • Established routine monitoring schedule for piezometer and inclinometer installations	BGC Engineering Inc. (BGC). March 2016. Faro Open Pit Stability Assessment, Site-wide Design Basis Report. Draft. Prepared for CH2M HILL Canada Limited (CH2M HILL). March 18
FCD, Upper Guardhouse Creek, NWID	Upgrade Faro Creek Diversion, Upper Guardhouse Creek and NWID	• Characterize channel shape and morphology	• Complete rapid geomorphic assessment • Survey channel cross sections at nine locations	CH2M Canada Limited (CH2M). April 2016h. Summary of 2015 Field Investigation – West Side and East Side Diversions, Faro Mine Remediation Project. Technical memorandum. Draft. Prepared for Government of Yukon. April 1.
FCD	Upgrade Faro Creek Diversion	• Characterize geotechnical conditions along proposed replacement FCD alignment • Characterize hydrostratigraphy and permafrost conditions in Faro Creek Valley • Confirm bedrock characterization at east wall of Faro Pit North Instability	• Completed 21 surface geophysical survey transects • Drilled six borings into bedrock • Installed monitoring wells and thermistor ports in five borings	CH2M Canada Limited (CH2M). August 2016a. Summary of 2015-2016 Field Investigation – Faro Creek Diversion Proposed Realignment, Field Sampling Plan Name: Faro Creek Diversion New Alignment Drilling. Technical memorandum. Draft. Prepared for Government of Yukon. August 18.
CVD Pond, ID Pond	Remediate CVD and ID Pond	• Prepare higher resolution CVD Pond stage - storage curve • Characterize thickness and volume of deposited sediment and tailings • Characterize geochemical and geotechnical properties of sediments in CVD and ID ponds	• Bathymetry and sub-bottom profiling of CVD Pond • Advanced eight CPT soundings in the ID Pond • Advanced three CPT soundings in CVD Pond • Drilled eight sonic borings in CVD Pond	CH2M Canada Limited (CH2M). August 2016c. Summary of FY 2015 – 2016 Field Investigations – CVD and ID Pond Field Data Report, Field Sampling Plan Name: CVP and ID Pond CPT and Sonic Sampling. Technical Memorandum. Prepared for Government of Yukon. August 25.
ID Spillway	Upgrade Intermediate Dam Spillway	• Characterize depth and condition of bedrock surface in the area of the proposed PMF spillway • Characterize geotechnical conditions in ID Spillway footprint • Characterize permeability of overburden at upstream and downstream end of spillway	• Complete one surface geophysical survey lines with seismic reflection and resistivity • Complete six surface geophysical survey lines with multichannel analysis of surface waves and seismic refraction • Drill five borings into bedrock, and install and develop two pumping wells and three piezometers • Complete packer testing in bedrock	CH2M Canada Limited (CH2M). April 2016f. Summary of 2015 Field Investigation – Construct Intermediate Dam Spillway, Faro Mine Remediation Project, Field Sampling Plan Name: 201.6 Construct Intermediate Dam Spillway. Technical memorandum. Draft. Prepared for Government of Yukon. March 31.
Site-wide	Water Management Inventory	• Document locations and specifications of water conveyance infrastructure	• Complete survey and inventory of water conveyance structures	CH2M HILL Canada Limited (CH2M). February 2016b. *Water Conveyance System Mapping and Inventory, Faro Mine Remediation Project.* Technical memorandum. Prepared for Government of Yukon. February 1.

Notes:

ARD = acid rock drainage
BGC = BCG Engineering
CPT = cone penetration test
CVD Pond = Cross Valley Pond
FCD = Faro Creek Diversion
GW = groundwater
ID = Intermediate Dam
PMF = probable maximum flood
RCAA = Rose Creek Alluvial Aquifer

Table C-5. Summary of Field and Analytical Programs for FY2016-2017

Faro Mine Remediation Project

Geographic Areas	Remediation Design Purpose	Characterization Objectives	Completed Fieldwork Scope	Data Report Reference
Site-wide Waste Dumps and Pits, RCTA	Site-wide Geochemical Monitoring	• Characterize seepage water quality • Characterize ARD evolution	• Monitored WRD GW, thermistor, soil gas (spring) • Monitored 188 seeps (spring)	CH2M Canada Limited (CH2M). August 2016j. Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring. Technical memorandum. Draft. Prepared for Government of Yukon. August 18.
FCD and Faro Valley	Upgrade Faro Creek Diversion	• Characterize hydrostratigraphy in Faro Valley • Evaluate proportion of leakage from FCD vs. quantity of GW flow beneath channel • Delineate spatial extent of permafrost	• Completed aquifer testing at three well clusters • Completed surveying of 21 surface geophysical transects FCD alignment • Collected volumetric discharge measurements at four locations • Collected GW samples from one location at each well cluster	CH2M Canada Limited (CH2M). August 2016h. Summary of 2016 Field Investigation – Faro Creek Diversion Aquifer Testing, Faro Mine Remediation Project. Technical Memorandum. Draft. Prepared for Government of Yukon. August 24.
ID Pond	Remediate ID Pond	• Prepare higher resolution ID Pond stage - storage curve • Characterize thickness and volume of deposited sediment and tailings	• Bathymetry and sub-bottom profiling of ID Pond • Completed surveying of 7 surface geophysical transects for ID PMF Spillway	CH2M Canada Limited (CH2M). August 2016c. Summary of FY 2015 – 2016 Field Investigations – CVD and ID Pond Field Data Report, Field Sampling Plan Name: CVP and ID Pond CPT and Sonic Sampling. Technical Memorandum. Prepared for Government of Yukon. August 25.

Notes:

ARD = acid rock drainage
CPT = cone penetration test
CVD Pond = Cross Valley Pond
FCD = Faro Creek Diversion
GW = groundwater
ID = Intermediate Dam
RCTA – Rose Creek Tailings Area
WRD – Waste Rock Dump

Appendix D
Hydrogeology Data Analysis Report

Groundwater Analysis of 2014 - 2016 Field Data, Faro Mine Remediation Project

Prepared for

Government of Yukon and the Government of Canada as represented by Indigenous and Northern Affairs Canada

August 2016

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Acronyms and Abbreviations

2D	two-dimensional
3D	three-dimensional
CDRM	Comprehensive Design Road Map
CSM	conceptual site model
CVD	Cross Valley Dam
ETA	Emergency Tailings Area
FCD	Faro Creek Diversion
FMC	Faro Mine Complex
FY	Fiscal Year
GFM	groundwater flow model
GW	groundwater
ID	Intermediate Dam
K_h	horizontal hydraulic connectivity
K_v	vertical hydraulic conductivity
L/s	litre(s) per second
m	metre(s)
m/d	metre(s) per day
masl	metre(s) above sea level
mbgs	metre(s) below grade
mm/yr	millimetre(s) per year
NFRC	North Fork Rose Creek
NWID	North Wall Interceptor Ditch
RCD	Rose Creek Diversion
RCTA	Rose Creek Tailings Area
RU	remediation unit
SIS	seepage interception system
S_s	Specific Storage
S_y	Specific Yield
SW	surface water
UGC	Upper Guardhouse Creek
WRD	waste rock dump
WVID	West Valley Interceptor Ditch
YG	Government of Yukon

SECTION 1

Introduction

1.1 Purpose

Hydrogeologic-related field work completed during Fiscal Year (FY) 2014 through FY2016 at the Faro Mine Complex (FMC) has been documented in field data reports that included limited data evaluation and analyses. This Comprehensive Design Road Map Report (CDRMR) Appendix D provides hydrogeologic analyses not included in those field data reports, ties the analyses to data collected during previous investigations, and summarizes the results of recent hydrogeological modelling conducted for the site.

1.2 Scope of Work

Groundwater (GW) data collected at the FMC since the 1990s have been used to develop and refine a numerical groundwater flow model (GFM) that simulates subsurface flow processes in the FMC. The underlying conceptual site model (CSM) used as a basis for development of the GFM is documented in the *Conceptual Site Model, Faro Mine Remediation Project* (CH2M, August 2012a) and several subsequent reports (CH2M, March 2013o, March 2013f, March 2013n, March 2013m, February 2014q, March 2014i, November 2014k, March 2015gg, RGC, 2015). The *FY2015 Groundwater Flow Model Development Repor*t (CH2M, March 2016e) documents the development and calibration of a refined transient GFM, which was developed to support the design of the NFRC Realignment Project and could be applied site-wide to the Faro Mine Remediation Project.

The GFM has incorporated field data collected through September 2015, including boring logs, geological cross sections, geophysical testing, aquifer testing, as well as regional surficial geological and bedrock geology mapping. This CDRMR Appendix D presents results from GFM simulations to assess GW budgets, GW flow directions, and GW exchange with surface water (SW).

The descriptions of the hydrogeologic system presented in this report represents steady-state conditions based on the spatial and temporal distribution of available hydrogeologic data incorporated into the GFM. It should be noted that the accuracy of the model is highly dependent on the density and accuracy of the field data.

The estimated GW flux values presented in the water budget summary results support the overall understanding of GW movement across the site. These results can be used to assist in decision making for prioritizing remediation efforts as well as to plan additional subsurface investigations in areas where significant data gaps exist. In viewing the results of this modelling, the reader should consider that mathematical models can only approximate physical systems and processes, models are inherently inexact, and the understanding of interrelated physical and chemical processes is incomplete. Furthermore, the collection of additional data will likely lead to revisions in the underlying model assumptions (e.g., material distribution, material properties) and will likely lead to changes in model results. The document *FY2015 Groundwater Flow Model Development Report* (CH2M, March 2016e) provides a more in-depth discussion regarding specific limitations associated with the use of the FMC GFM.

This report is organized in accordance with remediation unit (RU) boundaries proposed for the site. The FMC consists of three main areas, the Faro Mine Area, the Rose Creek Tailings Area (RCTA), and the Vangorda/Grum Area. Each area has been subdivided into RUs based on location, contaminate sources and characteristics, topography, and site-wide remediation objectives. The RUs are organized as follows:

- Perimeter (freshwater diversions, subdivided into west, east, and south)

- Waste dumps (as an RU, referred to as the waste rock dump [WRD] RU)
- Faro Pit RU
- Mill Building Area and Emergency Tailings Area (ETA)
- RCTA (including Lower Guardhouse Creek)
- Dams and the Cross Valley Dam (CVD) Pond

Note that the East Perimeter RU includes the Faro Creek Diversion (FCD) and the North Fork of Rose Creek (NFRC). Analysis of hydrogeologic data and modelling related to design of the NFRC Realignment Project is discussed in detail in the *Final North Fork Rose Creek Design Basis Report* (CH2M, August 2016l) and is only discussed in this appendix as pertinent to areas adjacent to NFRC. Also, because of the close proximity and interaction between the WRD RU and Faro Pit RU, for this appendix these RUs are discussed together in Section 3.

In FY2014, FY2015, and FY2016, groundwater-related field work was completed in three of the RUs: the Perimeter, the WRD, and the RCTA. Sections 2 through 6 of this report provide a brief summary of the field work performed, if applicable, and a discussion of the data evaluation and interpretation, including a summary of GW flow paths, flux, and water budgets using results of the steady-state GFM.

1.3 Application of the Groundwater Flow Model to this Analysis Report

The steady-state and transient GFM (CH2M, March 2016e) was developed and calibrated to support the design of the CVD SIS and the NFRC Realigned Channel Project. While the GFM is capable of evaluating changes in GW conditions both spatially and temporally, the results presented in this report pertain to steady-state conditions, representing long term average conditions of the hydrologic system rather than short-term transient conditions. The averaging period used to calibrate the steady-state version of the GFM, water years 2008 through 2015, was selected based on the availability of hydrogeologic data, including precipitation records, GW levels, streamflow measurements, and pond and pit stages.

A numerical model domain is discretized to represent the real world continuous space of a hydrologic system. To maximize the resolution of the numerical solution in areas of interest, while minimizing model run times, the model domain is subdivided into grid blocks of various sizes. Denser, smaller grid blocks are incorporated into the modelling domain where more resolution in the numerical solution is desired, whereas larger grid blocks are used in areas of the modelling domain located away from the main areas of interest. The model grid sizing (horizontal and vertical spacing) is documented in the GFM Development Report (CH2M, March 2016e). The horizontal cells range from 100 metres (m), the uniform value initially assigned throughout the modelling domain, to 12.5 m in the NFRC corridor near the waste dumps, ETA, Rose Creek Diversion (RCD), and CVD area. These subareas were viewed as areas where enhanced cell resolution would facilitate calibrating to local-scale features and allow for enhanced resolution in model output in priority areas around the NFRC and CVD. Cells representing Faro Creek, FCD, waste dumps, Faro Pit, the northern reach of NFRC, and the area between the waste dumps and X14, including the RCTA, have 25-m cell spacings.

All relevant field data collected through September 2015 were used in the GFM to assign material properties. Defined input values include cell-by-cell horizontal and vertical hydraulic conductivity (K_h and K_v respectively), Specific Yield (S_Y) and Specific Storage (S_s). Assignment of K_h and K_v values throughout the GFM (CH2M, March 2016e) involves assigning material properties consistent with data resulting from slug tests, packer tests, aquifer tests, professional judgment, and previous calibration efforts (CH2M, 2013o, 2014i, 2016e) and then modified during the calibration process. Only the transient version of the GFM requires S_s and S_y input values. These values were initially assigned for each model layer based on the interpretation of aquifer testing data and supplemented by literature values for similar geologic materials. The GW storage coefficient for a given cell is computed internally based on

the layer type (i.e., confined versus convertible and between confined and unconfined) and the simulated GW level within that cell.

Initial and boundary conditions are also informed by the data collected during the completed field investigations and are described in the GFM Development Report (CH2M, March 2016e). The assignment of an initial head value at each active cell within the model domain was informed by the GW elevation data from site wells, however, these only represent a small fraction of the entire GFM domain.

Boundary conditions for GFM are mathematical statements (i.e., rules) that specify head or GW flux at particular locations within the model domain. Boundary conditions include specified head, specified flux, and head-dependent flux. Specified head boundary conditions are specified from observed water elevations in Faro Pit, the Intermediate Dam (ID) Pond, and the CVD Pond. Specified flux boundaries add or remove a specified volumetric flow to or from a model cell. They were used to define water pumped from wells or trenches. Water is currently pumped from three wells and two sumps in the model domain: Well CH12-Z2-PW001 in the buried Zone II Pit and Wells SRK08-SPW1 and SRK08-SPW2 in the S-Wells SIS. The extraction from Well SRK08-SPW3 in the S-Wells SIS and the ETA extraction system, represented by flow at FCS-4, are both conceptualized as sumps whose outflow depend on the heads near that boundary. As such, these are head-dependent. Extraction rates were taken from recorded site data and previous studies (CH2M, March 2015gg).

The flow budget figures presented in this report include the potentiometric surface of the water table. The flow budget summarizes the net flux of the first three model layers. In some instances, the direction of flow implied by the net flux arrow does not appear consistent with the direction of GW flow implied by the GW contours. This discrepancy is an artifact of depicting a three-dimensional (3D) flow system on a two-dimensional (2D) figure.

The following is relevant to the discussion on water balances presented for Faro Pit (in Section 3), the ID Pond (in Section 5), and the CVD Pond (in Section 6):

- The pumping associated with Faro Pit and the CVD and ID ponds is not actively simulated in the steady-state model. The water balance is representative of long-term average conditions.
- GW-SW exchange is governed by the difference between the assigned stages in these SW bodies, the modelled heads in the underlying aquifer, and the hydraulic conductivity of the bottom sediments in these SW bodies.

GW and SW exchanges are presented for selected reaches in each RU. Along a stream reach there can be gaining and losing components, however, for the purposes of presentation clarity, only the net flux is shown. GW and SW fluxes within the selected reaches are calculated and indicated by purple lines perpendicular to the channel. These stream reach dividers include a small buffer around the rivers (creeks) to capture GW seepage to the ground surface (which would then briefly flow overland to the nearby surface water body).

The convention used to describe boundary fluxes in this document is aquifer-centric. That is, inflow is flow from a boundary to the aquifer, outflow is flow from the aquifer to a boundary, and the net flow is the inflow minus the outflow.

SECTION 2

Perimeter Remediation Units

2.1 Field Investigation Activities

Field investigations completed within the Perimeter RU in FY2014, FY2015, and FY2016 include the following:

- FY2015 FCD Seepage Investigation (CH2M, March 2016d): To support the understanding of hydrostratigraphy, aquifer properties, soil geotechnical and geochemical properties, and hydraulic gradients within the Faro Creek valley, CH2M completed drilling and monitoring well installation in November 2015.
- FY2016 FCD Seepage Investigation (CH2M, August 2016h): A continuation of the FY2015 work, GW sampling, stream stage monitoring, and aquifer testing was completed in June FY2016.
- FY2015 FCD Realignment Investigation: The remediation design concept for the FCD is to realign the existing diversion upslope from its current alignment to mitigate potential failure of the diversion resulting from pit wall erosion or slope failure into Faro Pit. The purpose of the investigation was to collect data to evaluated short term and long term pit wall stability. The investigation began in early March 2016. Data were collected pertaining to permafrost presence and distribution, soil conditions, depth to bedrock, bedrock conditions, depth to GW, and geotechnical conditions. Data pertaining to permafrost is not currently available. The final version of this CDRMR report will incorporate relevant data from this investigation.
- FY2015 GW-related investigations for the NFRC Realignment Project: The NFRC Groundwater Report, Appendix C to the *North Fork Rose Creek Design Basis Report* (CH2M, March 2016b) provides details on these investigations.
- FY2014 GW-related investigations for Zone II Outwash Area and S-Wells Area (CH2M, March 2015s, March 2015t, March 2015u): Information from these investigations informed the NFRC Realignment Project. It is also detailed in the NFRC Groundwater Report, Appendix C to the *North Fork Rose Creek Design Basis Report*, (CH2M, March 2016b).

Figure 2-1 presents a map of the completed investigation locations and key features for the FCD in the east subarea of the Perimeter RU.

2.2 Perimeter West – Field Investigation Data Evaluation

Although no specific GW-related field investigations were completed within this RU during FY2014 through FY2016, data are available from earlier investigations that have been incorporated into the GFM and were used to develop the conceptual model for this area. Results from the steady-state GFM, including an assessment of GW flux, GW and SW exchange, and GW flow paths include the following:

- A GW flow budget summary for the west subarea of the Perimeter RU is presented in Figure 2-2. It includes fluxes summarizing GW and SW vertical exchange.
- Upper Guardhouse Creek (UGC), the natural steep channel draining the uplands above Faro Pit, is losing GW to SW (i.e., gaining stream), estimated as about 1.2 litres per second [L/s]).
- North Wall Interceptor Ditch (NWID), the constructed diversion that conveys UGC away from the Mill Area and the RCTA and discharges downstream of the CVD, is losing SW to GW (i.e., losing stream).

As shown on Figure 2-2, model results suggest that GW flow from the hillside north of the Perimeter RU convey minimal quantities of water (generally less than 1 L/s).

Vertical GW exchange between the alluvial materials and underlying bedrock are shown on Figure 2-3. Within the west subarea of the Perimeter RU, vertical GW exchange between the alluvium and bedrock is minimal (less than 1 L/s).

The calibrated annual average recharge rate is presented in the GFM Development Report (CH2M, March 2016e). For most areas of the model, the calibrated GW recharge rate is approximately 40 millimetres per year (mm/yr) (or about 13 percent of mean annual precipitation rate of 320 mm/yr), with lower values in the RCTA and higher values in areas of deposited waste rock.

Modelled flow paths depicted on Figure 2-4 show GW movement downslope from the northern side of Rose Creek Valley that discharges to SW, such as Lower Guardhouse Creek, or reaches the central portion of the valley. Significant GW does not flow west, continuously down valley beneath NWID.

GW flow paths also indicate that GW originating in the Perimeter RU flows parallel to, or into, the WRD RU. GW that originates in the waste dumps does not discharge into the Perimeter RU, except for, at the toe of the Northwest WRD, where it was deposited into UGC.

2.3 Perimeter East – Field Investigation Data Evaluation

This subsection provides an interpretation of data from the November 2015 and June 2016 FCD seepage investigation (CH2M, August 2016h).

Previous estimates indicate a significant proportion of the water input to Faro Pit via the Faro Valley Waste Dump is leakage from the FCD, GW flow under the FCD, or a combination of both. From a hydrogeology perspective, the primary purpose of the investigation is to:

- Evaluate the proportion of leakage from the FCD in comparison to the quantity of GW flow beneath the diversion channel
- Improve the understanding of the hydrostratigraphy and aquifer properties, including the extent that frozen ground impedes the flow of GW, or limits infiltration, to the active layer above the permafrost

Results from this investigation can be used to assess mitigation options, although remediation alternatives are not addressed in this report. By understanding this, an effective remediation design concept for this project component can be defined. The goal of the remediation design is to keep clean water from entering the Faro Valley Dumps where it becomes impacted. Potential alternatives to capture this source water originating from outside the mine site include lining the upgraded FCD when constructed if a significant portion of the water is sourced from the FCD itself; installing GW cut-off walls, gravity drainage interception trenches, or SISs with active pumping if a significant portion of the water is sourced as GW flow beneath the FCD; or a combination of different measures.

Nine monitoring wells were installed in the following three clusters (Figure 1):

- Cluster 1 - adjacent to the western limb of the FCD (the West Valley Interceptor Ditch [WVID])
  - CH15-106-MW001, CH15-106-MW002, and CH15-106-MW007
- Cluster 2 - east side of the Faro Creek valley, adjacent to the FCD
  - CH15-106-MW003, CH15-106-MW004, and CH15-106-MW008
- Cluster 3 - near the Faro Creek, WVID, and FCD confluence
  - CH15-106-MW005, CH15-106-MW006, and CH15-106-MW010

GW monitoring data were collected in June 2016 at all nine monitoring wells and surface water elevation at FCD-1. The inferred GW contours are presented in Figure 2-5.

2.3.1 Hydrostratigraphy Summary

A detailed description of the investigation and materials encountered is presented in the field summary reports (CH2M, March 2016d; CH2M, August 2016h). The general hydrostratigraphy at each well cluster is as follows.

2.3.1.1 Cluster 1 - Adjacent to the West Limb of FCD (WVID)

The overburden is comprised mostly of sand and gravel, of varying compositions from grade to approximately 5.7 metres below grade (mbg) in two wells, and 15.5 mbg in CH15-106-MW007, where refusal was encountered on bedrock. The maximum depth to bedrock was deeper than anticipated prior to the investigation based on the regional surficial geology mapping [Bond, 1999]).

Static water level elevations in November 2015 for CH15-106-MW001 and CH15-106-MW002, which are the closest to the WVID, were 1,321.5 and 1,319.4 metres above sea level (masl), respectively. MW007, located approximately 10 m lower, had a GW elevation of 1,310.9 masl. Similar elevations were observed during the June 2016 monitoring event at CH15-106-MW001 and CH15-106-MW007, but the groundwater elevation was approximately 2 m lower at CH15-106-MW002 in June 2016. Based on the relative close proximity of these wells to one another, this indicates a very steep localized hydraulic gradient in the area, as depicted on Figure 2-5. Cross sections of the WVID were completed by CH2M in 2014 (CH2M, March 2015i). Based on the cross section WVID-14, located in the vicinity of Cluster 1, the elevation of the WVID base is approximately 1,319.6 masl. The location of cross section WVID-14 relative to Cluster 1 is shown on Figure 2-5. Based on these elevations, and the approximate depth of water in the WVID of 0.1 m, the GW table during November 2015 was within 1 m of surface water in the WVID, suggesting that GW may be at an elevation higher than the base of the WVID in this area during seasonally high GW table periods. Additional seasonal GW data are needed to confirm this hypothesis.

2.3.1.2 Cluster 2 - East Side of Faro Creek Valley, Adjacent to the FCD

All three borings in Cluster 2 were terminated before they reached bedrock; the maximum drilling depth was 29.1 mbg (95.5 feet) at CH15-106-MW003. Similar to Cluster 1, this depth was significantly deeper than anticipated. Although field observations indicated that the overburden at Cluster 2 was composed of sand, silt, and gravel; differences from Cluster 1 were noted. The lithology at CH15-106-MW003 appeared to be very tightly compacted road base fill with a silty matrix from grade to approximately 2.7 mbg. Fat clay was also observed in CH15-106-MW003 around 28.5 mbg. Boring CH15-106-MW004, from the surface to approximately 2.7 mbg, comprised more coarser-grained material with less fine-grained matrix within the road base fill.

Static water level elevations in the Cluster 2 wells ranged from 1,285.5 to 1,289.4 masl during the November 2015 monitoring event and were similar elevations (less than 1-m change at each well location) during the June 2016 event. Cross-section FCDE-21 (CH2M, March 2015i), located in the vicinity of Cluster 2, identified the base of the FCD at an approximate elevation of 1,297 masl, and with a stream depth of approximately 0.25 m, indicates a significantly higher surface water elevation than the observed static GW elevations. The location of FCDE-21 relative to Cluster 2 is shown on Figure 2-5.

GW was noted infiltrating into boring CH15-106-MW004, which is located at elevation 1,295.8 masl, at around 2.7 mbg, a thin 0.06-m-thick GW bearing seam was also observed in the boring CH15-106-MW003 at elevation 1,294.5 masl. These elevations are at or just below original ground surface. Based on the observed groundwater discharge zones on the upslope side of the FCD and the presence of a surface water drainage channel leading toward the FCD on the eastern slope, this water is interpreted to be water discharging from the upslope areas east of the FCD. However, this

interpretation is speculative, and the water entering the borings could have originated from the FCD as well.

2.3.1.3 Cluster 3 - near the Faro Creek, WVID, and FCD Confluence

The results from the Cluster 3 drilling indicated that the localized bedrock profile may slope from south to north, but the general bedrock slope in the investigation area sloped towards the base of the Faro Creek valley and Faro Creek Channel. The overburden is comprised mostly of sand and gravel of varying compositions, from the surface to about 6 mbg in CH15-106-MW005 and CH15-106-006 and to 17 mbg in CH15-106-MW010, where bedrock refusal was encountered.

Static water level elevations for the Cluster 3 wells ranged from 1,310.0 to 1,311.2 masl during both the November 2015 and June 2016 monitoring events. The WVID base elevation near CH15-106-MW010 was 1,311.7 masl, compared to the -MW010 GW elevation of 1,311 masl, indicating GW was within 1 m of the base of the FCD in this area. The GW elevation at MW005 was 1,310.0 masl compared to the nearby FCD elevation of about 1,309.65 (1,309.4 masl streambed base and an approximate stream depth of 0.25 m). The GW in this area is at or slightly higher than the FCD, indicating that the FCD is potentially receiving GW discharge in this area, depending on its seasonal stage elevation. November GW elevations may reflect a lower water table period for the area, and as such, the FCD likely behaves as a point of discharge for most of the year, in this area. Additional seasonal monitoring data would be needed to confirm this, although this hypothesis is consistent with the observation that this Cluster location lies in the central portion of the Faro Creek valley in an area where a natural channel resides and which is likely sustained by GW baseflow. Diversions on either side of the valley are more likely perched above the local water table. The estimated depths of the WVID and the FCD in the vicinity of Cluster 3 were obtained from cross sections WVID-18 and FCDE-19 (CH2M, March 2015i). Their location relative to Cluster 3 is shown on Figure 2-5.

2.3.2 Aquifer Properties and Volumetric Discharge

Aquifer testing was performed at the well clusters during May and June 2016. The results are summarized in the following sections, followed by a discussion of water balance for the Faro Creek Valley.

2.3.2.1 Cluster 1 - Adjacent to the West Limb of FCD (WVID)

Well CH15-106-MW007 did not produce sufficient water for an aquifer test, and CH15-106-MW002 was used as a substitute pumping well. CH15-106-MW002 was pumped at 0.13 L/s for 8 hours with a maximum drawdown of 1.35 m. Drawdown was not observed at monitoring wells CH15-106-MW001 or CH15-106-MW007. Evaluation of the aquifer test data suggested that the hydraulic conductivity of the alluvium ranges from 5 to 10 metres per day (m/d), and that of the weathered bedrock is 0.1 m/d. These properties are not believed to be uniform across the western slope between the WVID and Faro Creek, because of the poor yield at well CH15-106-MW007. Groundwater flow off the western hillsides likely follows preferential flowpaths or localized areas of thicker alluvium, deeper bedrock, or both.

2.3.2.2 Cluster 2 - Eastern Side of Faro Creek Valley, Adjacent to the FCD

There were no successful aquifer tests performed at Well Cluster 2 because of poor production or limited water column in the wells. The bedrock in this area is very deep (greater than 29 m bgs at CH15-106-MW003), while the wells are screened well above this elevation. Water levels at CH15-106-MW004 experienced an approximately 1-m decline following attempted testing (water levels did not return to previous static), suggesting that the well may be screened in a perched zone. Furthermore, the relatively higher groundwater elevations at CH15-106-MW008 suggests that groundwater flow directions here are anomalous, and not toward the Faro Creek valley bottom as with other locations in this area.

2.3.2.3 Well Cluster 3 - near the Faro Creek, WVID, and FCD Confluence

Well CH15-106-MW006 was pumped at 0.25 L/s with a maximum drawdown of 1.84 m. Drawdown was observed at monitoring wells CH15-106-MW005 and CH15-106-MW010. Evaluation of the drawdown data suggests that the hydraulic conductivity of the alluvium in this area is about 3 to 5 m/d, with a zone of very high hydraulic conductivity (300 m/d) in the vicinity of CH15-106-MW006 and CH15-106-MW010. This zone may be associated with the original Faro Creek channel deposits, and may provide a pathway for upgradient groundwater and/or FCD leakage to enter the original Faro Creek valley.

2.3.3 Faro Creek Valley Water Budget

During June 2016, surface water discharge at FCO (an established flow and monitoring station at the outlet of the original Faro Creek Channel to the pond upstream of the Faro Valley WRDs) was about 7 L/s. The sources of water to Faro Creek at FCO were identified as discharge from the western ditch (the small ditch below the WVID) at 0.5 L/s, water seeping from the FCD roadway (approximately 1 L/s) and a spring located in the central portion of the valley (approximately 6 L/s). These sources all originate as groundwater (as seeps or springs as opposed to surface flow from upgradient areas), although the ultimate origin of this emergent groundwater (either FCD leakage or upgradient groundwater) is undetermined.

2.3.4 Permafrost

Permafrost in the area of the FCD may impede GW movement or provide a perched aquifer where supra-permafrost resides and interacts with the diversion.

A local empirical-statistical permafrost probability model for the Faro Mine Area was developed by Bonaventura and Lewkowicz (2008 and 2012). This model is based upon a combination of bottom-of-the snowpack temperature measurements in winter and ground truthing of frozen ground in summer. Using this model, the probability of permafrost in the area of the mine ranges from roughly 60 to 82 percent. The probability of permafrost is generally highest on north facing slopes, at the bottom of valleys, and along ridgetops.

The following sections provide a review of the field investigations in the vicinity of the FCD and WVID with respect to observations of permafrost.

2.3.4.1 2003 Golder Investigation

Permafrost was encountered in June 2003 when test pits were dug in the vicinity of the FCD and WVID (Golder, 2004). These test pits were advanced further upslope along an alternative alignment for the FCD. The following identifies the Golder test pits located in the near vicinity of CH2M's monitoring well clusters and details refusal on permafrost and seepage observations by Golder:

- Golder test pits TP03-02, TP03-03, and TP03-04 were located in the vicinity of CH2M Well Cluster 1. Test pit, TP03-03, observed refusal on permafrost at a depth of 0.8 mbg, and seepage at a depth of 0.5 mbg on top of the permafrost. Further to the northeast, TP03-04 observed similar conditions at a depth of 0.4 m and seepage at 0.2 mbg, while further southwest along the WVID, TP03-02 observed refusal on permafrost at a depth of 4.1 mbg.

  Given the varied depth of permafrost observation by Golder, it may have a bearing to impeding supra-permafrost and GW flow, given that GW was observed at a depth of 2.7 to 2.8 mbg in November.

- Golder test pits TP03-18 and TP03-19 were located in the vicinity of CH2M Well Cluster 2. These test pits, located east of the FCD, observed refusal on permafrost at a depth of 0.6 and 1.8 mbg, respectively. Seepage was observed at depths of 0.2 and 0.4 mbg, respectively, above the

permafrost. This range of permafrost depth was generally consistent for all test pits along the FCD area.

Depending on the depth to which permafrost extends in this area, it may not impede GW, which was observed at a depth of 12 to 13 mbg. It would, however, affect the observed leakage from the FCD in this area. Permafrost was not observed during the November investigation. Leakage from the FCD was observed at a depth of 2.8 mbg.

- Golder test pit TP03-10 was located at the confluence of WVID and Faro Creek, upstream of CH2M Well Cluster 3. Permafrost was observed starting at 0.15 mbg and refusal within the permafrost was at 0.4 mbg. No seepage was observed within this test pit.

  GW was observed to be quite shallow (within 1 mbg) in the area of the confluence of WVID, FCD, and Faro Creek in November 2015. As such, permafrost would likely have a bearing on the supra-permafrost and GW flow.

2.3.4.2 2014 CH2M Field Investigations

During the 2014 geology and terrain preliminary baseline field investigation work (CH2M, March 2015jj), no evidence of permafrost was found along the FCD alignment. However, degraded permafrost was observed almost exclusively on the eastern hillslopes of the Faro Creek valley. A portion of the western side of the Faro Creek Valley was also investigated but till deposits are thicker, and evidence of either bedrock outcrops or degraded permafrost was limited.

2.3.4.3 FY2015 Drilling Investigations

No visible permafrost was observed during the November 2015 drilling at any of the wells; however the drilling method used (ODEX) was not specifically intended to identify permafrost soils or collect preserved ice samples.

The FCD realignment drilling investigation program (March 2016) was completed using specialized drilling equipment for identifying permafrost (e.g., CRREL barrel). Additional data regarding the presence or absence of permafrost and how it affects GW flow will be incorporated into the final report.

2.3.5 Groundwater and Surface Water Interaction and Water Balance

2.3.5.1 Groundwater

During development of the GFM, limited field data were available for the FCD area. Instead, geology and hydrostratigraphy data used in the model were interpreted for the FCD area based on regional site conditions. Based on the results of investigations completed in FY2015 and FY2016, the model representation in this area could now be refined.

The GW flow budget for the Perimeter RU is presented on Figure 2-2, including vertical exchange between GW and SW. Results from the steady-state GFM estimates leakage from the FCD at an approximate rate of 1.3 L/s (Figure 2-2).

Model results suggest the net GW flow from the Perimeter RU into the WRD RU is about 7 L/s; with approximately 5 L/s originating from the eastern side of the valley and about 2 L/s originating from the west of the WVID. Net GW discharge to the creek running through the central portion of the valley is approximately 5 L/s over the reach between the WVID/FCD/Faro Creek confluence and the Faro Valley Dumps.

The GFM does not include the WVID as a water feature. The water elevations in the area of Cluster 1 were simulated at an elevation about 4 m below those observed in November 2015 which creates a larger, drier zone then reflected by observed conditions. This will likely have an effect on the flux estimated by the model on the west side of the Faro Valley. Further refinement of the GW flow model

would be required, using the recently collected field data to update model layers, material properties, and model calibration. Based on the hydrostratigraphy information detailed above regarding Cluster 1, if GW partially discharges seasonally to the WVID, then this would decrease the net GW inflow to Faro Creek itself.

Flow measurements were recorded at monitoring station FCO, located within Faro Creek channel downstream of the confluence of Faro Creek and FCD, at the northeast toe of the Faro Valley Dumps. FCO flow data plotted over time is presented in Figure 2-6. As Faro Creek is diverted to the FCD, the contribution to the FCO flow would be both GW and SW runoff generated within the small watershed bounded by the WVID and FCD. The FCD flow data indicates a general base flow of about 2 to 3 L/sec in drier periods. As noted above, incorporating WVID into the GW model, would reduce the net flow to Faro Creek in this reach. A rate of 2 to 3 L/s is on the order of estimated flows that could be expected.

Flow measurements were collected by the Care and Maintenance contractor at locations FCD-1 and FCD-2, located at the confluence with Faro Creek and approximately 1,000 m downstream in the FCD, respectively. FCD-1 includes the combined flow from WVID and Faro Creek. The data were collected between 2007 and 2010 and presented on Figure 2-6. The earlier data presented in Figure 2-6 (2007) show very close agreement between discharge at FCD-1 and FCD-2, with values typically within about 20 percent of each other and flow at FCD-1 typically higher than at FCD-2. After 2007, there are very large differences in the measurements between the stations: the flows at FCD-2 are typically reported as higher than at FCD-1, and there are generally odd patterns (such as the very low ratio of flow at FCD-1 to FCD-2 following the later 2008 data, and the reversal of the relationship in flow between the stations between 2009 and 2010). Overall, the evaluation of the FCD-1 and FCD-2 discharge data yield inconsistent trends and extreme differences in discharge between these two nearby stations. Because of these apparently anomalous trends in the FCD flow data, it was not possible to evaluate gaining and losing trends along this reach. The June 2016 discharge measurements found that discharge at the two stations was within computed error ranges as to have no significant difference (flow was about 400 L/s). At the same time, discharge of seeps flowing from the hillside into the FCD between FCD-1 and FCD-2 was about 2 L/s, or 0.5 percent of stream discharge. It is possible that increased hillside discharge during spring snowmelt events of the past may have contributed a much larger percentage of water to the FCD, but increases of 1,000 to 4,000 L/s between FCD-1 and FCD-2 as shown in the historical data seems very unlikely given the incremental increase of catchment size over the 1,000-m stream reach.

To provide a visual aide to present GW discharge to a particular region from source areas (whether mine-impacted or non-mine impacted water), particle tracking was performed for the Faro Mine Area. The components of these flows were assessed using Mod-Path3DU (Muffels, 2011) particle tracking. Mod-Path3DU particles were started on the water table within or beneath the waste dumps and tracked forward to their ultimate discharge location at a hydrologic boundary (e.g., rivers, wells, ponds). The particle's endpoint boundary type and location data provide the information needed to define the contributing area (e.g., individual WRD subcatchments) that discharges to a particular region. Particle traces generated from this analysis are shown in Figure 2-4. These flowlines suggest that GW in the area flows toward and discharges into the Faro Creek channel deposits and then flows southwest through these deposits prior to discharge into Faro Pit.

2.3.5.2 Groundwater and Surface Water Quality

In June 2016, groundwater samples were collected from the three pumped wells: CH15-106-M002, CH15-106-MW006, and CH15-106-MW008 (CH2M, August 2016h). Water quality was not uniform between the three well clusters, and the following notable observations were made:

- Total dissolved solids increased an order of magnitude in the downstream direction between each cluster.
- Phosphorous was one order of magnitude higher at CH15-106-MW006 than at the other wells.

- Sulphate increased in the downstream direction between each cluster.
- Dissolved metals cobalt, ferrous iron, and manganese were two orders of magnitude higher at CH15-106-MW006 than at the other wells.
- Dissolved zinc was an order of magnitude higher at CH15-106-MW006 than at CH15-106-MW002, and even higher at CH15-106-MW008, where it exceeded the 0.03 milligram per litre (mg/L) screening level with a value of 0.085 mg/L. The road embankment in this area of the FCD (i.e., Well Cluster 2) is suspected to have been constructed from PAG material.
- Fluoride exceeded the screening level of 0.12 mg/L at CH15-106-MW008, with a value of 0.123 mg/L.

2.3.6 Summary and Recommendations

Significant depths of permeable sediments were identified underlying the WVID and FCD. Current modeling, based on generic material properties, suggests about 60 percent of the discharge to Faro Pit through the Faro Valley Waste Dump, is sourced from GW flowing underneath the FCD and WVID. The source of the remaining 40 percent is interpreted to be leakage from the FCD (between the Faro Creek confluence and FCD-1), potential minimal leakage from the WVID, and the minimal amount of run-off generated within the Faro Creek valley (between the WVID and FCD) (Figure 2-1).

Aquifer properties within the Faro Creek valley varied considerably across the valley. At Well Clusters 1 and 3, the alluvial aquifer has hydraulic conductivity values ranging from 3 to 10 m/d, with potential preferential flow zones of much higher permeability at cluster 3 (Table 11). The hydraulic conductivity of the upper bedrock was 0.1 m/d. At Well Cluster 2, hydraulic conductivities were not quantified but are assumed to be very low, because the wells here were not able to sustain continuous pumping even at very low rates.

Stream discharge measurements were inconclusive with respect to identifying whether the reach between FCD-1 and FCD-2 is a gaining or losing reach. Seeps (about 2 L/s) entering the eastern side of the FCD totaled about 0.5 percent of the discharge in the FCD (about 380 to 395 L/s), whereas the error associated with the stream discharge measurements is on the order of 20 to 40 L/s).

Groundwater flow directions were observed to generally follow the pattern of surface topography, with flow toward the original Faro Creek (Figure 2-5). A spring in the center of the valley provided most of the water flowing at FCO. Seeps were observed coming from the roadway on the eastern side of the valley, and were estimated to be about 20 percent of the flow at FCO. A ditch intercepts groundwater along the western side of the valley, with about 10 percent of the flow at FCO. While it is clear that all of these sources are from groundwater, it is not possible to determine if the groundwater originated from upstream groundwater flowing under the FCD and/or the WVID or from stream leakage through the streambed. The presence of the very high hydraulic conductivity zone at Well Cluster 3 suggests that a pathway may exist from upgradient groundwater underneath the FCD, and this may be a significant source of groundwater to discharging springs in the Faro Creek valley.

CH2M recommends the following work be completed to further support the hydrogeological assessment of seepage in the Faro Creek valley area:

- Continue to monitor GW elevations in the monitoring wells in the Faro Creek valley to evaluate seasonal fluctuations.
- Review the original field data provided by the Care and Maintenance contractor for discharge measurements and/or stage rating curves for FCD-1 and FCD-2 to assess the reliability and quality of the data. Update the GFM based on the results of this and other field investigations for improved interpretation and accuracy in predictions.

- Replace destroyed FCD-2.
- Review raw historical stream discharge data at FCD-1 and FCD-2 for accuracy. Rating curves also need to be established at the monitoring station to obtain stage/discharge relationships for accurate calculation of flow rates.
- Collect additional GW samples from the monitoring wells and SW sample from the diversion to assess a SW signal in the shallow GW. A water quality survey of the Faro Creek drainage, including seeps coming from the FCD roadway, springs along the valley bottom, and groundwater intercepted by the western ditch, would assist in determining the relative portion of leaking surface water to upslope groundwater contributing to total flow at FCO.

2.4 Perimeter South – RCD Field Investigation Data Evaluation

2.4.1 Model Results

This section provides key observations using results from the steady-state GFM including an assessment of GW flux, GW and SW exchange, and GW flow paths. The steady-state GW flow budget for the Perimeter RU is presented on Figure 2-2. A significant volume of the GW flows into the RCTA RU and the Dams and CVD Pond RU from the south subarea of the Perimeter RU. Model results suggest that approximately 64 L/s of GW flows from the Perimeter RU into the RCTA RU and 26 L/s flows into the Dams and CVD Pond RU from the south. This GW contribution is a combination of the leakage from the RCD and GW originating from upslope areas on the south side of the Rose Creek valley. The majority of the GW inflow from the south is attributed to leakage from the RCD (Figure 2-2); model results suggest there is about 45.9 L/s of leakage from the RCD in the reach adjacent to Intermediate Impoundment, about 6.7 L/s of leakage from the reach adjacent to the ID Pond, and about 24 L/s of leakage from the reach adjacent to the CVD Pond.

Consistent with observed gradients between the Original Impoundment and the RCD, model results suggest net GW flux is about 2.1 L/s from the southeast corner of the RCTA into the Perimeter RU and the majority of this water discharges from the tailings/GW aquifer to SW in the adjacent reach of the RCD (Figure 2-2).

Average annual GW flow in the Rose Creek Alluvial Aquifer (RCAA) passing under the CVD into the Perimeter South RU, suggested by the modelling results, is approximately 27 L/s. The model results suggest that GW flow in the RCAA continues to flow west from the Perimeter RU (i.e., approximately marked by X14) at approximately 28 L/s.

As may be expected because of its location at the valley bottom and at the toe of the CVD, the area between the CVD and approximately X14 is a significant area of GW discharge to SW. As noted on Figure 2-2, GW is estimated to discharge to the X13 seepage ditch from the RCAA at about 34 L/s. An additional 26.6 L/s discharges to the seepage ditch at the toe of the CVD upstream of X13. Along Rose Creek, between the confluence of NWID and X14, net GW discharge to the Rose Creek is approximately 27.9 L/s (Figure 2-2). This is consistent with results from field investigations along lower portions of Rose Creek that indicated that gaining stream conditions are dominant (CH2M, March 2013m). On the southern side of the valley, where RCD continues to be diverted away from the valley bottom, model results suggest that SW from RCD contributes a net 56.1 L/s to the RCAA along the reach downstream from CVD to about X10. In this area, net GW discharge from bedrock to the alluvium is estimated to be about 1.6 L/s (Figure 2-3).

Modelled flowpaths (Figure 4-5) suggest that most of GW flow originating from the tailings and waste dumps discharge to the SW downstream of the CVD (i.e., X13 seepage ditch or Rose Creek). Surface water leaking from the RCD is interpreted to comprise the majority GW flow in the RCAA that moves downstream beyond X14.

SECTION 3

Waste Rock Dump Remediation Unit (Includes Faro Pit RU)

3.1 Field Investigation Activities

In FY2014 and FY2015, CH2M completed the following field investigations to inform the hydrogeological understanding of the WRD RU:

- Two boreholes were advanced and completed as monitoring wells, CH14-015-MW004 in the Northwest WRD and CH14-015-MW006 (Northeast WRD) (CH2M, March 2015b). The primary purpose of this investigation, from a hydrogeological perspective, was to gain an improved understanding of acid mine drainage from the waste rock material and to assess and characterize the flow regimes within the lower WRD and the underlying shallow alluvial aquifer beneath the WRD. Seasonal GW elevation data could also be used to characterize infiltration through the waste dumps.
- One borehole was advanced (CH14-106-MW009) in the area, which is commonly identified as a sulphide cell in the Main Dump (SRK, March 2010a). This investigation was documented in CH2M March 2015o. From a hydrogeological perspective, the primary purpose of this investigation of the Main Dump was to characterize infiltration, but GW was not encountered and this location was not completed with a well for monitoring GW; gas monitoring and thermistor ports were installed.

Prior to FY2014, the following investigations were completed that have been used to supplement hydrogeological understanding in the WRD RU:

- Monitoring wells were installed through the waste dumps in 2012 on the northern side of the Main Dump (CH12-014-MW003), in the Northeast WRD (CH12-014-MW005), and on the southern side of the Intermediate Dump (CH12-014-MW007) (CH2M, March 2013n). With the exception of CH12-014-MW005, which was terminated within the dump, the boreholes were extended through the waste rock, into the underlying alluvium or bedrock, or both.

CH2M has reported annual monitoring of GW elevation and water quality since 2012 (CH2M, March 2013n, March 2014c, March 2015b, and March 2016f). Trends in GW quality are documented in Appendix G to this document, Geochemical Data Analyses.

Figure 3-1 presents a map of the completed investigation locations described in this Section and key features for the WRD RU.

3.2 Field Investigation Data Evaluation

The FY2014 and FY2015 field investigation data evaluation for investigations within the WRD RU includes consideration of the Faro Pit RU. This section will provide interpretation of data from the investigations described in Section 3.1 to provide the following:

- An evaluation of seasonal variations in GW elevation
- An evaluation of GW elevation in response to the increase in Faro Pit lake elevation as a result of the WTP shutting down before the 2013 treatment season

- An assessment of GW flux, GW and SW exchange, and GW flow paths to summarize understanding of hydrogeologic conditions using results of the steady-state GFM informed by data collected during these and previous field investigations

3.2.1 Groundwater Elevation and Faro Pit Lake Elevation

Figure 3-2 presents the GW elevation with time, monitored at CH12-014-MW003 and CH12-014-MW007, the locations where semi-continuous data are collected. These plots are superimposed with shading to highlight seasonal periods: winter (November through April), spring (May and June), and summer (July through October). The calibrated annual average recharge rate through the waste dumps is approximately 64 percent of mean annual precipitation, or 205 millimetres. These values are within a similar range to estimates at other cold/arid regions (Nichol, 2002; Marcoline, 2008; Janowicz et al., 2008; Momeyer, 2014) and are expected given the high permeability of the waste rock materials, the lack of vegetation on the dumps, and the significant depth to GW beneath the dumps. However, a large variation is anticipated seasonally, annually, and spatially across the waste dumps. At the FMC, the northern-, eastern-, and western-facing slopes experienced the lowest evaporation because of lower energy received at the surfaces. On the southern-facing slope, competing factors of rapid snowmelt infiltration played against increased energy directed at the surface leading to higher seasonal evaporation (Janowicz et al., 2008). The highest evaporation is likely experienced from flat surfaces and southern- and western-facing slopes, and the greatest net percolation is likely experienced across the other aspect slopes.

Seasonal infiltration into the WRD is evident in the GW elevation time series presented for CH12-014-MW003 (Figure 3-2). During the winters (2012, 2013, 2014), GW elevation exhibits small-scale fluctuations of less than several centimetres. A rapid increase in GW elevation is observed in May and June in response to the melting snowpack accumulated on the WRD surface. The recorded increases were approximately 0.3 and 0.2 m in 2012 and 2013, respectively. A more subdued reflection of snowmelt infiltration was recorded in 2014. Over the summer period, the GW elevation continues to increase in response to snowmelt infiltration which is flowing through slower flowpaths or in response to infiltrating rainfall. A direct estimation of snowpack infiltration is complicated because of sublimation, ablation, and redistribution, the importance of aspect, and the effect of the surrounding topography on wind patterns.

Observations of seasonal infiltration in the vicinity of CH12-014-MW007 is complicated by a large magnitude increase in GW elevation recorded between March 8 and 19, 2014. This corresponds to the drilling of PW14-06, completed less than 20 m to the west of CH12-014-MW007. Following this large magnitude increase, seasonal changes in groundwater elevation or changes resulting from the increasing water elevation in Faro Pit are indistinguishable, as the GW elevation appears to be slowing and decreasing back to static conditions. Before March 2014, the seasonal response in GW elevation at CH12-014-MW007 is similar to that described from CH12-014-MW003.

Fluctuations in GW elevation in the three monitoring wells in the WRD area (CH12-014-MW003, CH14-015-MW006, and CH12-014-MW007) were compared to fluctuations in the water elevation in Faro Pit to assess the potential relationship between the two (Figure 3-3). Since 2013, the elevation of water in the Faro Pit has risen from approximately 1,140.9 masl to 1,153.2 masl; the maximum elevation was reached on April 27, 2015. Between 2013 and April 2015 and, except for less than a month in the Fall of 2014, no WTP capacity was available at the site and Faro Pit was used as the main storage reservoir for water collected from the ID Pond, Zone II Pit, S-Wells, and NFRD SIS. In addition, Faro Pit receives GW seepage through the pit walls, runoff from the waste dumps (directly and as conveyed by ditches adjacent to roadways on the waste dumps), and direct precipitation. In response, the water elevation in Faro Pit (Figure 3-3) increased at rates of 0.004 to 0.042 m/day. Following the start-up and operation of the interim water treatment system in the spring 2015, the water elevation in Faro Pit

decreased to approximately 1,151 masl by November 2015, when the interim water treatment system operation shut-down for the year.

As shown in Figure 3-3, for certain areas of the waste dumps (e.g., CH12-014-MW003), there appears to be a hydraulic connection between Faro Pit and the GW elevation. As the water level in Faro Pit has risen since 2013, so has the water elevation in CH12-014-MW003, despite the GW elevation remaining higher than Faro Pit water elevation. This is interpreted to reflect a regional rise of the water table resulting from the additional pressure of greater volume of water stored in Faro Pit (about 6.5 million cubic metres additional water). As shown in Figure 3-3, the GW elevation in CH12-014-MW003 has increased about 0.7 m and has fluctuated from elevations as low as the weathered bedrock to elevations into the native surface in more recent years.

The GW elevation measured at CH14-015-MW006, shown in Figure 3-3, has been stable at about 1,186.8 masl, in 2014 and 2015. The GW elevation here is higher than the original ground surface and is mounded about 2 m into the WRD material, indicating saturation of the base of waste rock dump in this area. The water quality results from CH14-015-MW006 reflect highly impacted GW (defined for the project as sulphate greater than 4,000 mg/L or Zn greater than 5 mg/L. At CH14-015-MW006, sulphate has ranged from about 3,000 mg/L to 4,000 mg/l and Zn has been about 100 mg/L). This water either interacts with or receives seepage from the WRD.

As stated in the preceding discussion, the recorded GW elevation at CH12-014-MW007 appears to be affected by the drilling of PW14-06. The drilling activity corresponds to the sharp increase in GW elevation, recorded by the pressure transducer data logger and by subsequent manual water monitoring. The increase in GW elevation recorded between October 2012 and March 2014 appears to reflect seasonal infiltration during the spring and summer and is not related to the increase in water elevation in the Faro Pit. The falling GW elevation after March 2014 may be a reflection of the water elevation returning to a static level or may reflect another process. The water elevation in Faro Pit and GW at CH12-014-MW007 appear poorly connected; this could be a response of the large structural control (i.e., “Big Indian” fault) that runs northeast-southwest between this location and Faro Pit; it also may represent low permeability of the material between the Faro Pit and this location. Although this location is interpreted to be installed in an area of concentrated drainage based on pre-mining topography, and hydraulic conductivity of the alluvium was estimated as about $1x10^{-5}$ m/s (CH2M, October 2013b), it is noteworthy that the GW elevation response to the disturbance from drilling PW14-06 appears to slowly return to static conditions (Figure 3-3). The GW elevation in CH12-014-MW007 fluctuates between the native surface and the waste dump material, where up to the bottom 1 m is variably saturated. The water quality results from CH14-015-MW006 reflect highly impacted GW (sulphate has ranged from about 6,000 mg/L to greater than 10,000 mg/L and zinc has ranged from several 100s to 1000s of mg/L), which either interacts with or receives seepage from the WRD.

3.2.2 Model Results

This section provides key observations using results from the steady-state GFM, including an assessment of GW flux, GW and SW exchange, and GW flow paths. The steady-state GW flow budget for the Faro Pit and WRD RUs is presented on Figure 3-4.

In general, the Faro Pit is expected to act as a GW sink. With the exception of the period between 2013 and 2015 when no water treatment capacity was available, the water level within the Faro Pit is managed by pumping, creating a local GW sink. This results in flow into the pit from all directions (Figure 2-4). Model results (Figure 3-4 and 2-3) suggest that the three main sources of the GW discharge to Faro Pit are as follows:

1. Discharge through pit (rock) face seepage; estimated as approximately 5.5 L/s.

2. Inflow from the Faro Valley Waste Dump, located northeast of the Faro Pit; estimated as approximately 4.7 L/s.
3. Net vertical GW discharge into Faro Pit is estimated as approximately 4.4 L/s.

The net vertical GW discharge shown on Figure 2-3 in this case represents GW flow from bedrock in model layer 4 to bedrock in model layer 3, underlying Faro Pit. It is part of the Faro Pit RU GW balance, but this value represents deeper GW flow into shallower bedrock and is not a separate input to Faro Pit. Eventually this GW discharges to the pit, and the flux is represented by the vertical GW discharge to Faro Pit when it discharges from model layer 1 to Faro Pit.

Much less GW is estimated to discharge into the Faro Pit from the more topographically elevated areas to the west and east of the pit that are covered by the Northwest and Northeast WRDs; the estimates for these are about 0.6 and 0.3 L/s, respectively. GW flows into the pit (through overburden) from other areas around the Faro Pit, are estimated to have minimal contribution (less than 1 L/s).

Operation of the GW extraction well in the Zone II Pit may result in limited outflow from the southeast portion of the Faro Pit. This outflow is likely captured by the extraction well and treated. During the period in which no water was removed from Faro Pit, hydraulic gradients may have been increased between Faro Pit and Zone II Pit area or south of this area; however as shown on Figure 3-2 and 3-3 (described in Section 3.1.1), the gradient is towards the pit in areas to the east of Faro Pit (and likely to the North).

The GW flow budget summary for the WRD RU is also presented in Figure 3-4. Key observations from these results of average annual discharge of mine-impacted GW from the FMC waste rock dumps, are as follows:

1. The greatest net GW flux from the WRD RU occurs in the area of the Main Dump and various ore stockpiles towards the ETA; modelling results suggest the discharge is approximately 7.4 L/s. This is also the area discharging the greatest load (see CDRM Section 7, Mill Building Area and ETA RU).
2. Net GW flux from the area of the Intermediate Dump to the areas of the S-Wells is estimated to flow at approximately 2.3 L/s.
3. GW flux, into the NFRC area upstream of the Haul Road, from the adjacent waste dumps, is estimated to flow at approximately 1.7 to 0.4 L/s from each dump (a total of 3.5 L/s) as shown on Figure 3-4.
4. Leakage from the FCD adjacent to the Northeast WRD is estimated as 0.7 L/s (Figure 2-2). All of this flow is suggested to flow as GW into the area of the Northeast WRD (Figure 3-4).
5. GW flux from the area of the Main and Intermediate dumps to the forested area between the ETA and S-Wells is estimated at approximately 0.7 L/s.
6. Less than 0.5 L/s of GW is estimated to discharge from the Northwest WRD to the Perimeter RU, towards the RCTA in vicinity of Lower Guardhouse Creek, or to the mill area (Figure 3-4).

In the WRD RU, net GW flow suggested by the model results is from the alluvium into the underlying bedrock. Model results suggests the net result is approximately 6.2 L/s of deep GW discharge (Figure 2-3).

GW recharge on the waste dumps flows vertically downward until it reaches the pre-mining ground surface. Upon reaching the pre-mining ground surface, it flows south and east, depending on the pre-mining topography. Modelled flowpaths are shown on Figure 2-4; the individual WRD subcatchments are largely identifiable in this figure, including the Faro Pit GW catchment. Mine-impacted GW discharges to SW in the Faro Pit and along the base of the southern and eastern sides of the waste dumps, through seeps and into channels, including NFRC. A portion of the GW also takes a deeper path and flows beneath the NFRC to the RCAA where it eventually daylights at the series of Rose

Creek Valley dams or continues downstream in the RCAA. GW leaving the waste dumps seeps out around the base of the waste dumps and discharges to the NFRC and ephemeral streams in the ETA. These results suggest that although there may be specific areas where GW discharge may coalesce, GW flows from the WRD RU into the surrounding Perimeter RU, the Mill Building Area, and ETA RU to the east and south. There is limited discharge towards the west.

3.3 Summary and Recommendations

As a result of strong seasonal variation in net deep percolation and evaporation, we recommend consideration of seasonality, at a monthly or finer scale, when determining and applying evaporation estimates to the waste dumps. Previous work has shown that annual net percolation and evaporation estimates as a percentage of annual rainfall, can vary significantly with variation in annual rainfall.

To better evaluate the connection between Faro Pit and regional GW, additional modelling runs should be completed with transient water elevations in Faro Pit, reflecting the observed change between 2013 and 2015.

SECTION 4

Mill Building Area and Emergency Tailings Area Remediation Unit

4.1 Field Investigation Activities

No specific GW-related investigations were completed in the Mill Building Area and ETA RU during FY2014 or FY2015. However, other investigation in the ETA area consisted of advancing three boreholes and five CPTs to determine the thickness of tailings, assess the extent of contamination in the underlying soils and within the tailings, and assess the geotechnical characteristics of the tailings and mine Access Road fill (CH2M, March 2015m).

In support of the design of a SW collection structure at the ETA, 2014 field investigation also included geophysical surveys, a test pit investigation program, and geological reconnaissance (CH2M, March 2015n). Stream stage recorders were installed at FCS-4 and X-23 by instrumenting the existing 90-degree V-notch weirs at these locations with stilling wells and water level transducers (CH2M, March 2015n).

Figure 4-1 presents a map showing these investigation locations and the key features within the ETA.

4.2 Field Investigation Data Evaluation

Although no specific GW-related field investigations were completed in this RU during FY2014 and FY2015, data are available from previous investigations that has been incorporated into the GFM to improve understanding of hydrogeologic conditions. This section provides interpretation of results from the GFM, including an assessment of GW flow paths and flux, summary water budgets using results of the steady-state GFM informed by data collected during these field investigations.

Modelling results suggest that average annual discharge of mine-impacted GW to the ETA from the FMC waste dumps located northeast of the ETA (including the Main Dump and various ore stockpiles) is approximately 7.4 L/s (Figure 4-2). The GW flow suggested by the model from the Mill Building Area, which also contributes load to the ETA, is about 1.3 L/s. There is a net gain of GW to the alluvium from underlying bedrock (Figure 2-3) and the majority of the GW that flows into the ETA area discharges as SW in the Faro Creek Canyon (estimated at about 9.3 L/s) (Figure 4-2). This result is consistent with a thinning of the overburden through Faro Creek Canyon and the lower-permeability competent bedrock (calcareous phyllite of the Vangorda Formation) providing the foundation (AECOM, March 2009). Less than 1 L/s discharges from the ETA RU to the RCTA RU as GW (Figure 4-2).

SECTION 5

Rose Creek Tailings Area Remediation Unit

5.1 Field Investigation Activities

In FY2014 and FY2015, CH2M completed the following field investigations, in part, to inform hydrogeological understanding in the RCTA RU:

- In FY2014, CH2M drilled and installed three monitoring wells (CH14-015-MW01A, CH14-015-MW01C, and CH14-015-MW02A) in the original impoundment of the RCTA (CH2M, March 2015b). From a hydrogeology perspective, the primary purpose of this investigation was to assess the recent deterioration of GW quality at P03-06 and to evaluate if the primary source contribution was bypass loading from the ETA SIS or tailings porewater from the coarse tailings beaches in the Original Impoundment. Results of this investigation were used to inform the GFM; Appendix G to this document provides additional information on the GW quality results.
- During a FY2015 investigation of the eastern limb of the Secondary Dam between the RCTA and RCD, monitoring wells CH15-201-MW001 through MW006 and stream stage gauges (CH15-201-SG002 to CH15-201-SG004) were installed. Appendix C to the *North Fork Rose Creek Design Basis Report* (CH2M, March 2016b) provides further detail. From a hydrogeology perspective, this investigation was intended to perform aquifer testing to better define the hydraulic properties of aquifers between the Second Impoundment and the RCD. This information was necessary to evaluate leakage from the Second Impoundment into the RCD.

Figure 5-1 presents a map showing these investigation locations and the key features within the RCTA RU.

5.2 Field Investigation Data Evaluation

Data from the field investigations completed in this RU during FY2014 and FY2015 have been incorporated into the GFM to improve understanding of hydrogeologic conditions. This section provides interpretation of results from the GFM that includes an assessment of GW flow paths and flux, including summary water budgets, using results of the steady-state GFM informed by data collected during these field investigations.

The calibrated annual average recharge rates are presented in CH2M (March 2016e). Based on the depositional history, the tailings are classified as coarse or fine (RGC, September 2005). The annual average recharge rates are estimated as 34 mm/yr (for the coarse tailings) and 16 mm/yr (for fine tailings).

Figure 5-2 presents flow budget for model layer 1, which in the RCTA RU generally represents tailings (except in the areas where there are no tailings, such as to the north of the RCTA and south of NWID). As is expected in this fine-grained material, GW flux is small. Net GW flux into the tailings area is from both the northern and southern sides of the valley, including in the area adjacent to the Secondary Dam; however, the magnitude in this area is small (about 0.2 L/s). The largest contribution to the RCTA (an estimated 2.8 L/s) is from the north into the Second and Intermediate impoundments. It is interpreted to be shallow GW originating from the ditch that conveys water from Faro Creek Canyon to RCTA. In the southeastern portion of the RCTA, two additional observations on the net GW flux are suggested by the model results. These are as follows:

- GW flows to the east from the tailings into the Perimeter RU at the upstream end of the RCTA
- GW flows to the north from the Perimeter RU into the RCTA in the southeast corner

In both of these areas, the magnitude is negligible (Figure 5-2). As described in Section 4.2, there is minor GW contribution into the tailings from the ETA, as most of the GW discharges to SW before flowing from the ETA RU.

Model results of vertical flux between the tailings and RCAA suggest there are areas of upwelling and downward flow (Figure 5-4). For the majority of the RCTA, flux in either direction is estimated to vary from between 0 and $1x10^{-2}$ cubic metres per day per square metre.

Figure 5-3 presents the GW flow budget for the alluvial aquifer within the RCTA. Key observations from these results of average annual discharge of GW in the RCTA area are as follows:

1. The greatest net GW flux into the RCTA RU occurs from the RCD on the southern side of Rose Creek Valley; modelling results suggest the GW flow into the RCAA is approximately 55.2 L/s. This non-mine-impacted GW is sourced from leakage from RCD and GW originating from upslope areas to the south. Model results of GW and SW exchange (Figure 2-2) suggest that the net leakage from the RCD between the area known as the Fuse Plug and roughly where the tailings beach enters the ID Pond, is 44.8 L/s. Net leakage from the RCD adjacent to the ID Pond is losing 6.5 L/s to GW. This discharges to RCAA along with about 2.4 L/s of GW originating from uplands located to the south.
2. The net GW flux passing under the eastern edge of the RCTA in the RCAA, from the NFRC and SFRC valley, is estimated at approximately 13.6 L/s.
3. The contribution of GW into the RCAA from the northern side of the valley is negligible (less than 0.2 L/s) in comparison to the flows from the south and east. This includes flow from the ETA area, as reported in Section 4.2.
4. GW flux passing under the ID in the Dams and CVD Pond RU is approximately 68.6 L/s.

In the RCTA, net GW flow suggested by the model results, is from the underlying bedrock into the RCAA, as is typical in mountainous environments, where the upland mountain areas act as GW recharge areas and the valley bottoms as GW discharge areas. Model results suggests this occurs at approximately 7 L/s (Figure 2-3). In the area just north of the RCTA and bounded by NWID, net GW flow suggested by the model results, is from the alluvium into bedrock at rate of approximately 1 L/s.

Originating north of the Mill Building Area, Lower Guardhouse Creek conveys FMC WRD seepage and run-off to the RCTA. Model results of the GW and SW exchange reported on Figure 5-2 suggest that Lower Guardhouse Creek is a net gaining stream, estimated to receive approximately 1.8 L/s of GW discharge.

The RCD, adjacent to secondary dam, is gaining a net of 2 L/s from GW (Figure 2-2).

Modelled flowpaths are shown on Figure 2-4. Non-impacted and mine-impacted GW that does not discharge to SW originating in most areas of the site, flows through the RCAA. Model results suggest flow coalesces on the northern side of the northern half of Rose Creek Valley. This is consistent with evolving water quality which shows elevated concentrations of sulphate and metals in water measured in the northern portions of the RCTA. Non-impacted mine water sourced from RCD is expected to comprise the majority of flow in the south half of the RCAA. The RCAA is a fluvial depositional system deposited by Rose Creek and its tributary, the NFRC. The alluvial deposits are thickest near the centre of the valley, aligned with the ancestral thalweg of Rose Creek, with the thickest deposits around 50 m thick.

SECTION 6

Dams and Cross Valley Dam Pond Remediation Unit

6.1 Field Investigation Activities

No GW-related investigations were completed in the Dams and CVD Pond RU during FY2014 or FY2015.

6.2 Field Investigation Data Evaluation

Although no specific GW-related field investigations were completed in this RU during FY2014 and FY2015, data are available from previous investigations (CH2M, March 2013m) that have been incorporated into the GFM and are used to summarize the GW budget and conceptual model of this area. This section provides key observations using results from the steady-state GFM, including an assessment of GW flux, GW and SW exchange, and GW flow paths.

Average annual GW flow in the RCAA passing under the ID suggested by the modelling results, is approximately 68.6 L/s (Figure 4-2). A significant volume of the GW flows into the Dams and CVD Pond RU from the south subarea of the Perimeter RU. This GW contribution is a combination of the leakage from the RCD and GW originating from upslope areas on the southern side of Rose Creek Valley. As shown on Figure 4-2, approximately 26 L/s are estimated to discharge from the Perimeter RU into the Dams and CVD Pond RU from the south; less than 1 L/s enters from the northern slopes of the Perimeter RU. The majority of the GW inflow from the south is attributed to leakage from the RCD (Figure 2-2); model results suggest there is about 24 L/s of leakage in the reach adjacent to the CVD Pond.

As is typical in mountainous environments, the upland mountain areas are expected to act as GW recharge areas and the valley bottoms as GW discharge areas. As noted on Figure 4-2, GW is estimated to discharge to CVD Pond from the RCAA at about 43 L/s. GW discharge from bedrock to the alluvium is estimated to be about 2.5 L/s (Figure 2-3).

The model results suggest that the GW flow in the RCAA that continues under the CVD into the south subarea of the Perimeter RU is 27.3 L/s.

SECTION 7

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Figures





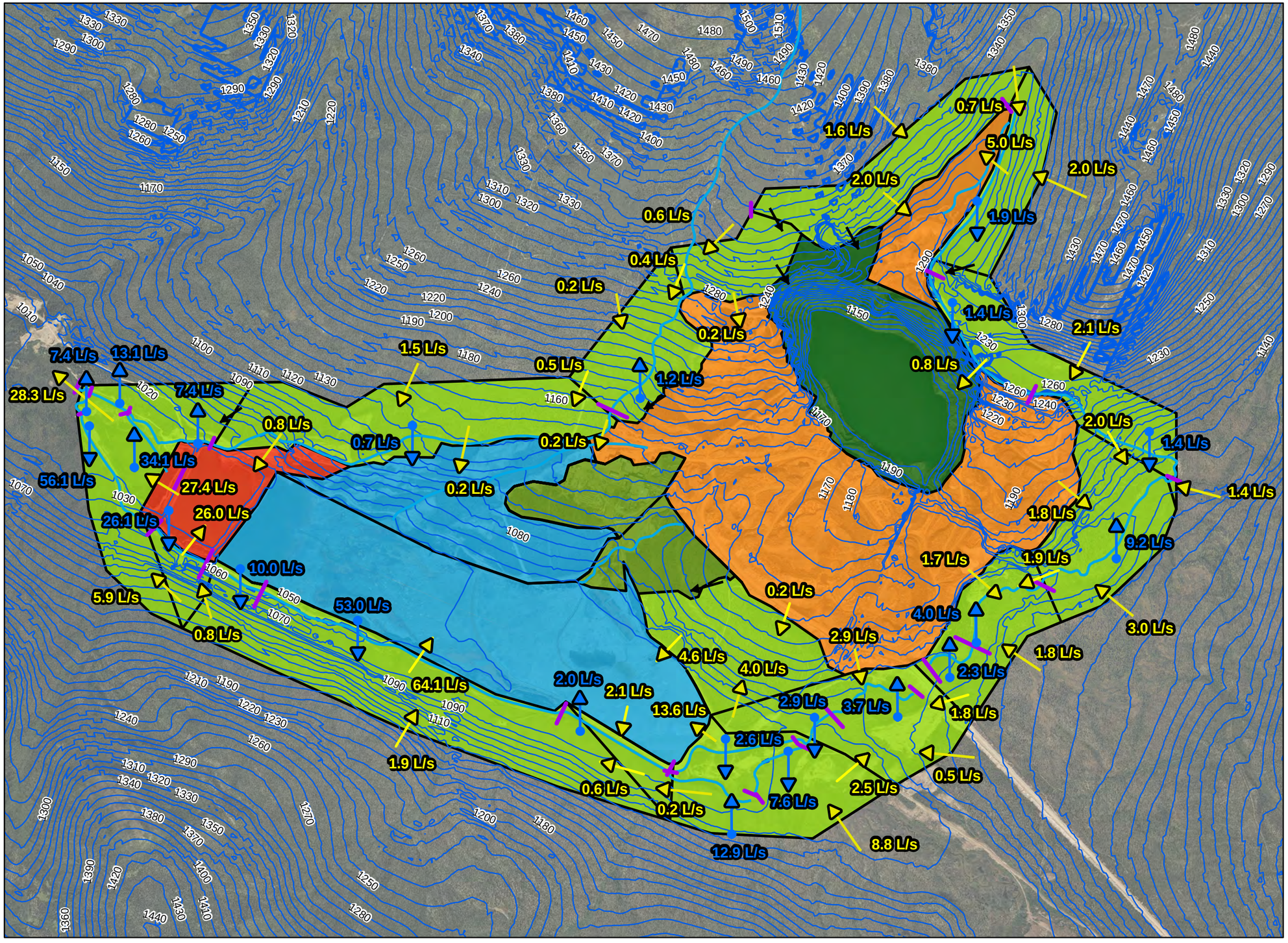
- Monitoring Well Location
- Surface Water Monitoring Station
- Stream Survey Cross-section
- Contour (20-metre Interval)
- Faro Mine Site Watercourse
- Faro Site Waterbody

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

N

0 50 100 150 200
Metres

FIGURE 2-1
Perimeter Unit East Faro Creek Diversion (FCD) Location Map
Faro Mine Remediation Project



Reclamation Units

- RCTA Unit
- META Unit
- Faro Pit Unit
- Dams and CVP Unit
- Perimeter Unit
- WRD Unit
- Potentiometric Surface (m)
- Flow Budget Division
- Surface Water Segment Divisions
- Streams

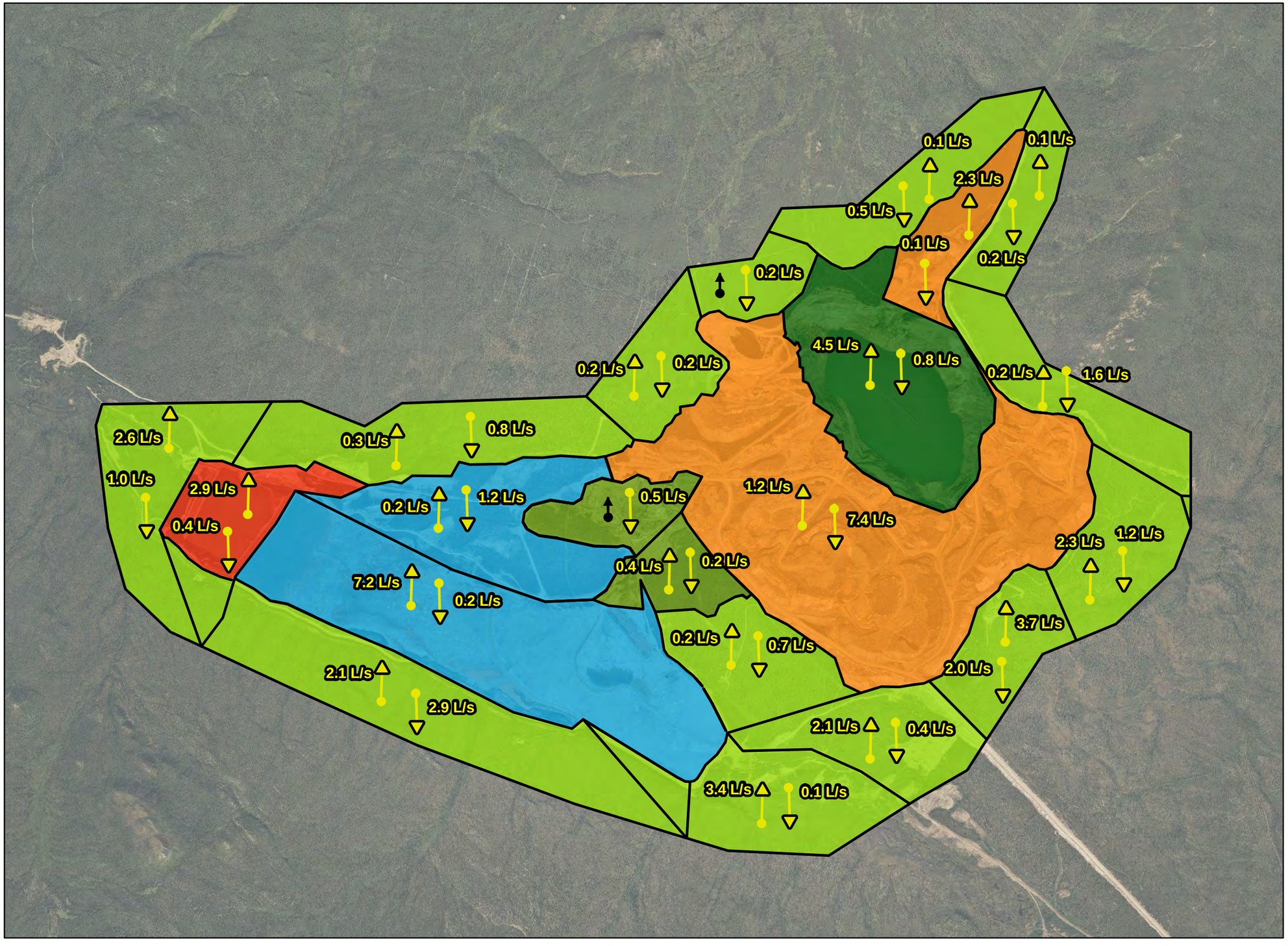
Groundwater flow (L/s).
Arrow indicates
flow direction across boundary.

All flow values are approximate and represent steady-state (average annual) conditions.

Note: Fluxes less than or equal to 0.1 L/s are depicted by an arrow, but are not labeled with the numeric value.

Net groundwater exchange with surface water (L/s).
Up arrow = flow from groundwater into surface water.
Down arrow = flow from surface water into groundwater.
CVP = Cross Valley Pond
m = metre
L/s = litre per second
RCTA = Rose Creek Tailings Area
WRD = Waste Rock Dump

FIGURE 2-2
Perimeter Unit Flow Budget
Faro Mine Remediation Project



Reclamation Units

- RCTA Unit
- META Unit
- Faro Pit Unit
- Polishing Pond Unit
- Perimeter Unit
- WRD Unit
- Flow Budget Division

Groundwater flow (L/s). Arrow indicates flow direction (upward or downward vertical flux).

All flow values are approximate and represent steady-state (average annual) conditions.

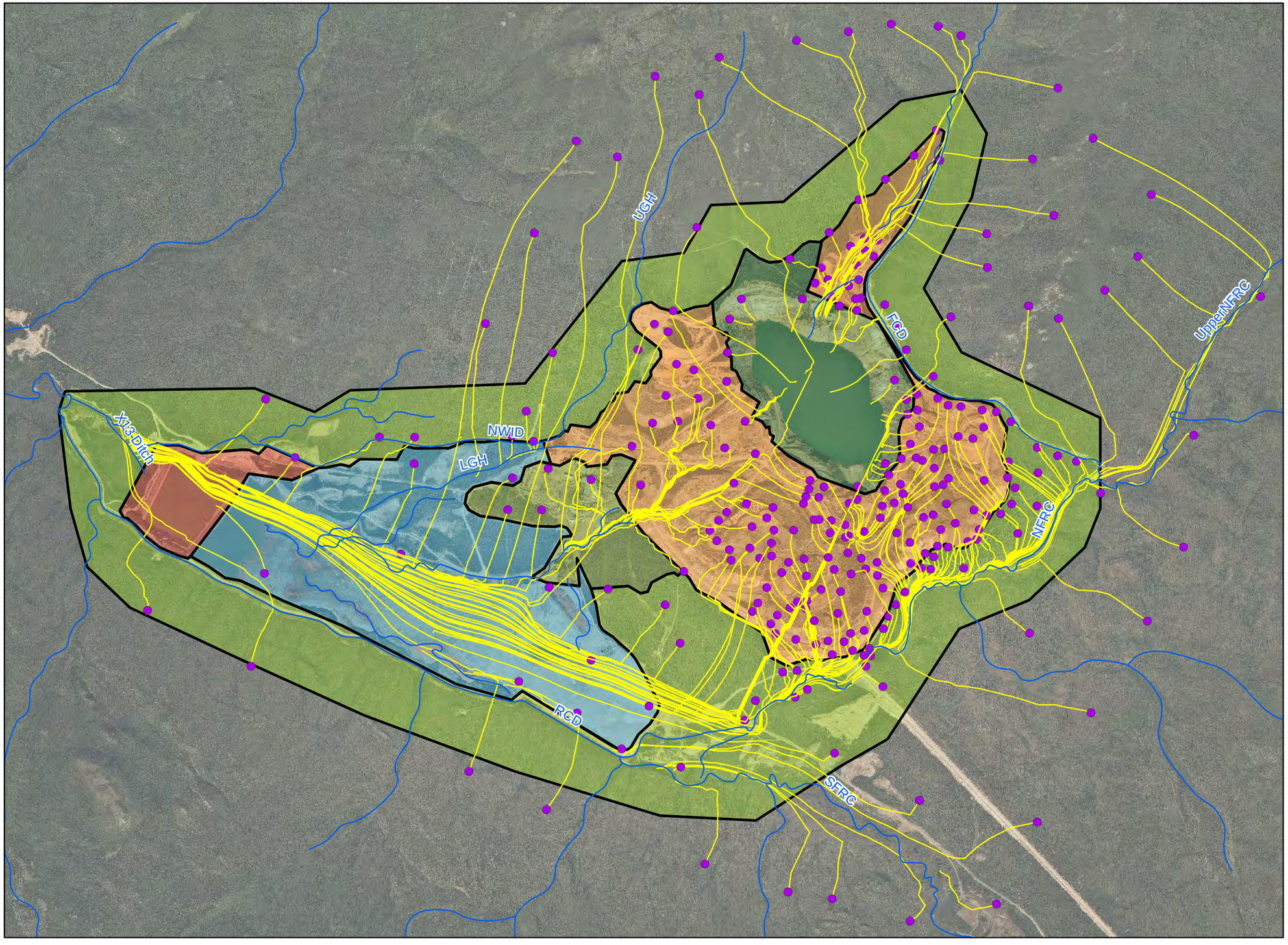
Note: Fluxes less than or equal to 0.1 L/s are depicted by an arrow, but are not labeled with the numeric value.
L/s = litre per second
RCTA = Rose Creek Tailings Area
WRD = Waste Rock Dump

0 250 500 750 1,000 1,250
Meters

N

FIGURE 2-3
Site-wide Bedrock-Alluvium Exchange
Faro Mine Remediation Project

ch2m.



Streams_2

Pathlines

Reclamation Units

- RCTA Unit
- META Unit
- Faro Pit Unit
- Polishing Pond Unit
- Perimeter Unit
- WRD Unit

Notes:

Purple dot indicates path line starting location.

Groundwater path lines generated using steady-state (average annual) conditions.

Flow lines that appear to cross indicate variable head gradients with depth and other subsurface complexities such as perched conditions and flow through preferential pathways.

FCD = Faro Creek Diversion
LGH = Lower Guardhouse Creek
NFRC = North Fork Rose Creek
NWD = North Wall Interceptor Ditch
RCD = Rose Creek Diversion
RCTA = Rose Creek Tailings Area
SFRC = South Fork Rose Creek
UGH = Upper Guardhouse Creek
WRD = Waste Rock Dump

0 250 500 750 1,000 1,250
Meters

N

FIGURE 2-4
Site-wide Groundwater Flow Path Lines
Faro Mine Remediation Project

ch2m.



REGIONAL MAP



- Monitoring Well Location
- Surface Water Monitoring Station
- Stream Survey Cross-section
- Contour (20-metre Interval)
- Faro Mine Site Watercourse
- Faro Site Waterbody
- Inferred Groundwater Flow Direction
- Inferred Groundwater Contours (2-metre interval)

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Groundwater elevation data from June 1, 2016.

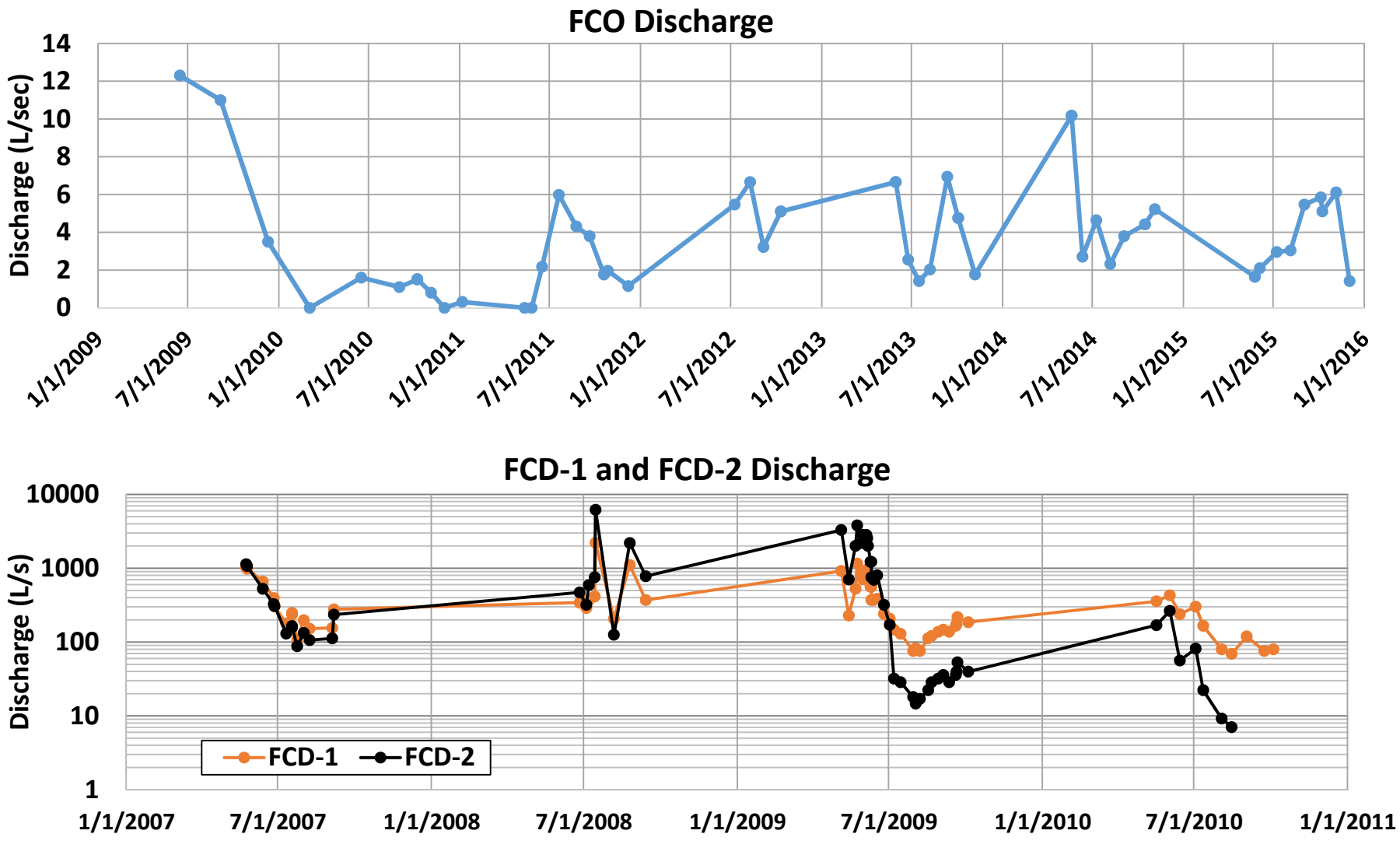
N

0 50 100 150 200
Metres

FIGURE 2-5
Perimeter Unit East Faro Creek Diversion (FCD)
Inferred Groundwater Contours
Faro Mine Remediation Project

ch2m

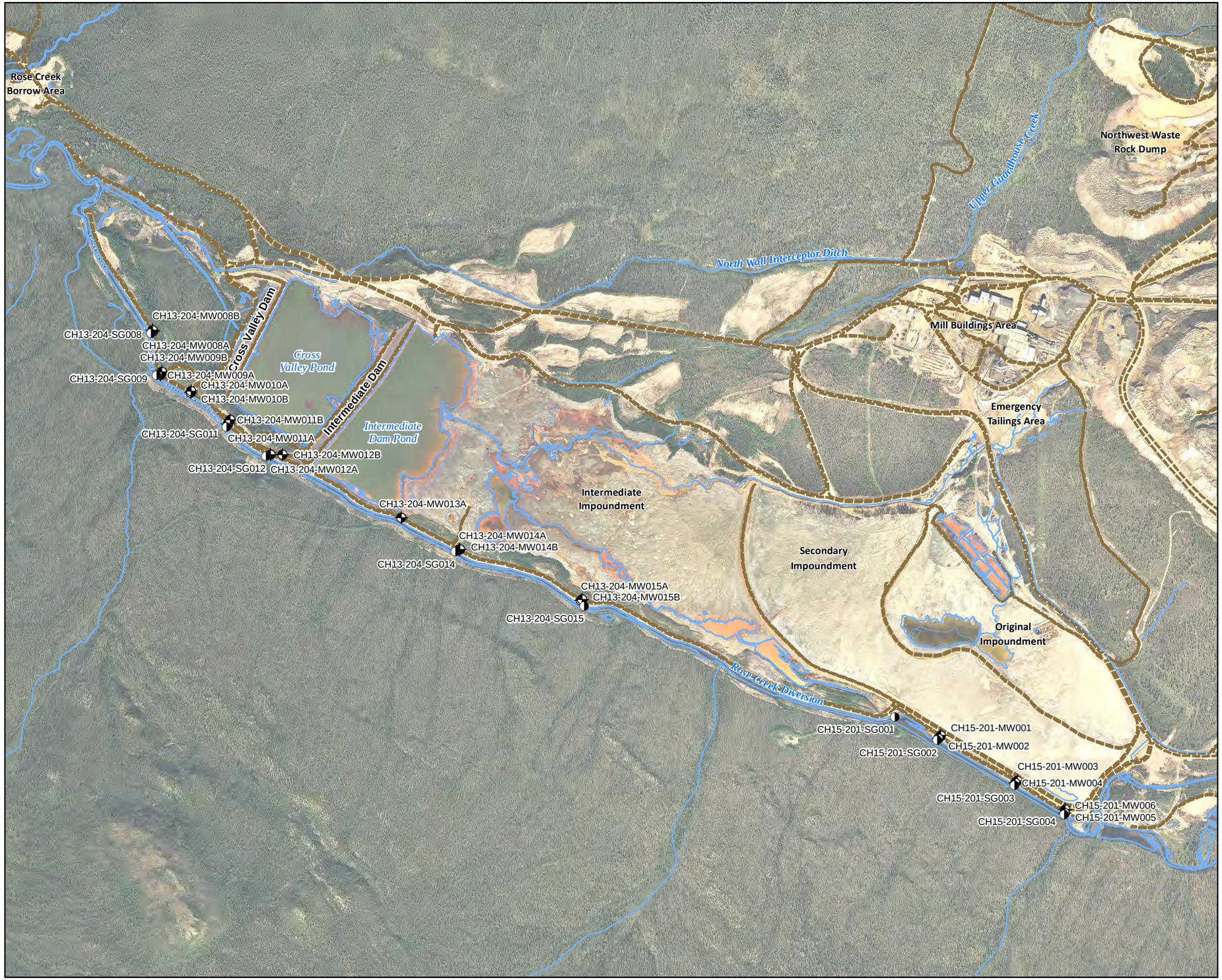
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Notes:

1. Scale of X and Y axis' are different for each chart.
2. FCD = Faro Creek Diversion, FCO = Faro Creek Original, L/s = Litres per second

FIGURE 2-6
Stream Flow Measurements – FCO, FCD-1, FCD-2
Faro Mine Remediation Project



REGIONAL MAP



- Monitoring Well Location
- Stage Gauge
- Roads Unpaved
- Faro Mine Site Watercourse

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

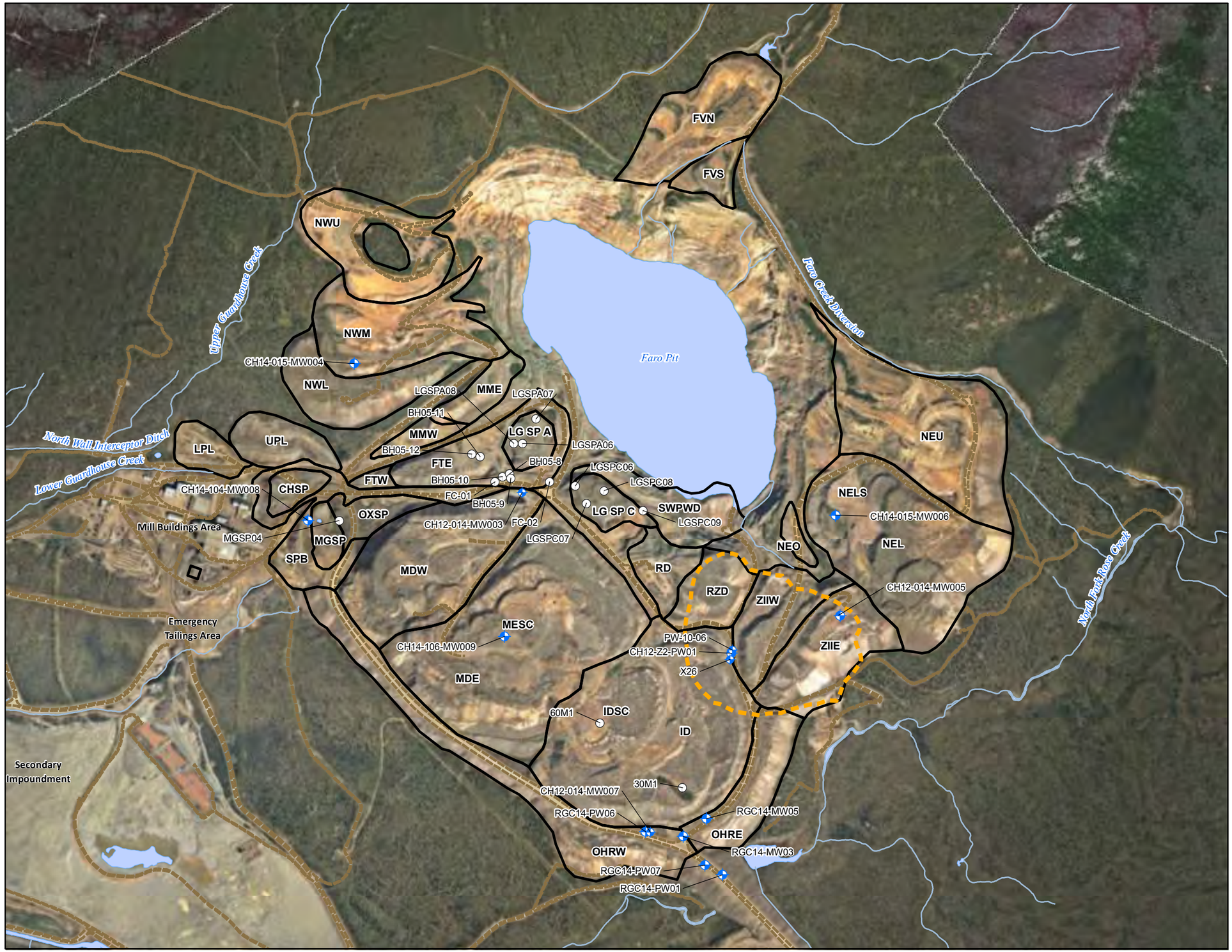
N

0 100 200 300 400
Metres

FIGURE 2-7
Perimeter Unit South Rose Creek Diversion (RCD) Location Map
Faro Mine Remediation Project

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ch2m



VICINITY MAP



- Borehole
- Monitoring Well
- Roads Unpaved
- Stream
- Reservoir, Lake, or Pond
- Zone Pit Boundary
- Waste Rock Dump

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Waste Rock Dump definitions:

CHSP = Crusher Stockpile
FTE = Fuel Tank East
FTW = Fuel Tank West
FVN = Faro Valley North
FVS = Faro Valley South
ID = Intermediate Dump
IDSC = Intermediate Dump Sulphide Cell
LGSPA = Low Grade Stockpile A
LGSPC = Low Grade Stockpile C
LPL = Lower Parking Lot
MDE = Main Dump East
MDW = Main Dump West
MESC = Main Dump Sulphide Cell
MGSP = Medium Grade Stockpile
MME = Mt. Mungly East
MMW = Mt. Mungly West
NEL = Northeast Lower
NELS = Northeast Lower Sulphide Cell
NEO = Northeast Outer
NEU = Northeast Upper
NWL = Northwest Lower
NWM = Northwest Middle
NWU = Northwest Upper
OHRE = Outer Haul Road East
OHRW = Outer Haul Road West
OXSP = Oxide Fines Stockpile
RD = Ranch Dump
RZD = Ramp Zone Dump
SPB = Stockpiles Base
SWPWD = Southwest Pit Wall Dump
UPL = Upper Parking Lot
ZIIE = Zone 2 East
ZIIW = Zone 2 West

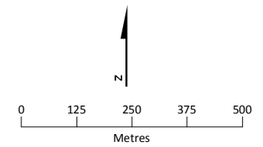
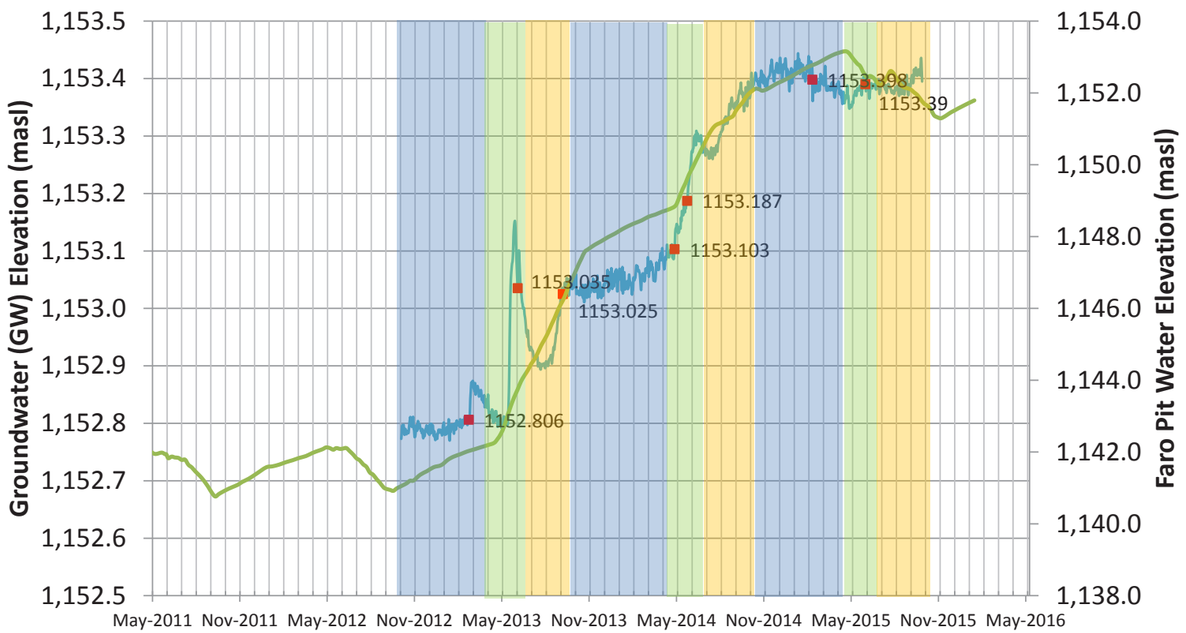


Figure 3-1
Waste Rock Dump Reclamation Unit Investigation Location
Faro Mine Remediation Project



CH12-014-MW003

GW Pressure Transducer Measurements

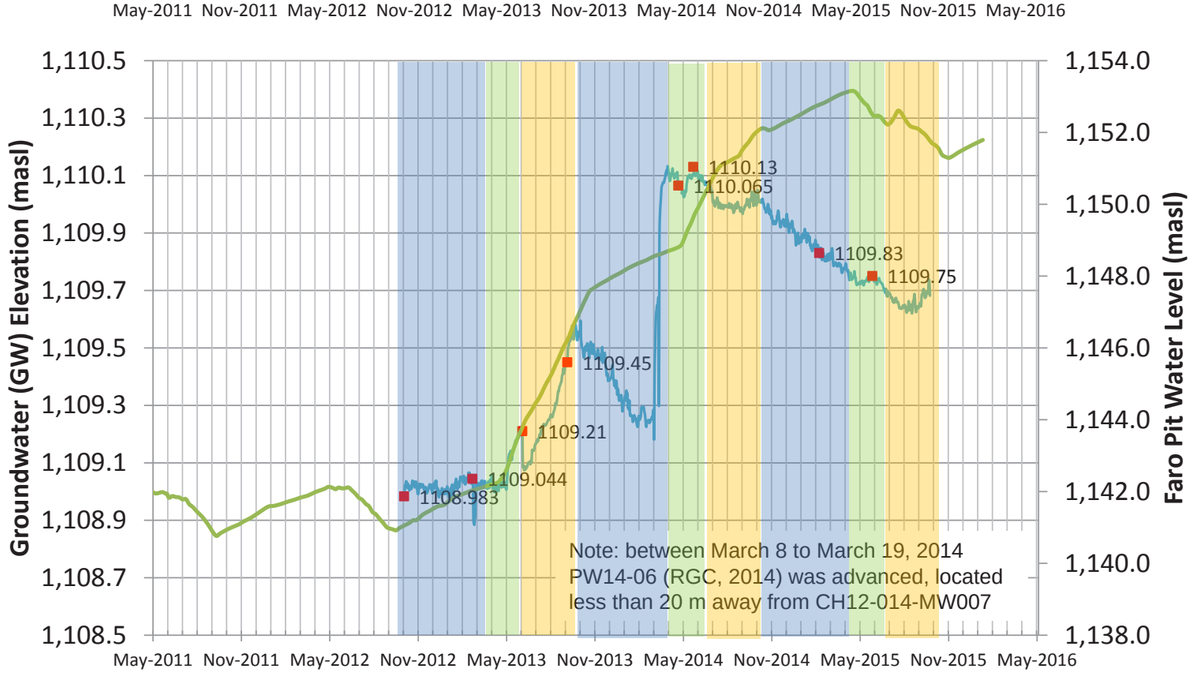
GW Static Measurements

Faro Pit Water Level

CH12-014-MW003
Native Surface:
Approximately 1159.58 masl

Weathered Bedrock:
Approximately 1153.18 masl

Fresh Bedrock:
Approximately 1150.78 masl



CH12-014-MW007

GW Pressure Transducer Measurements

GW Static Measurements

Faro Pit Water Level

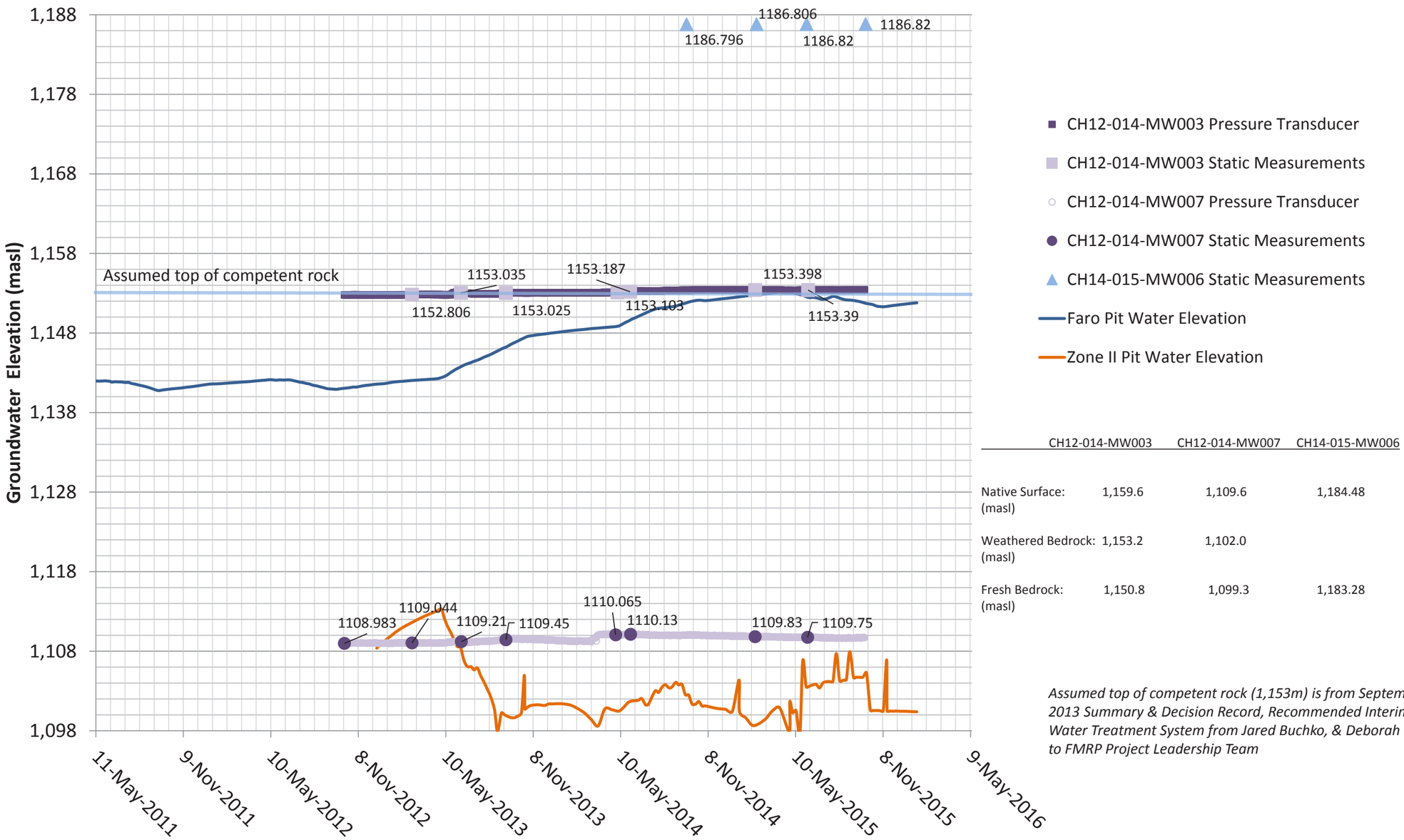
CH12-014-MW007
Native Surface:
Approximately 1109.64 masl

Weathered Bedrock:
Approximately 1102.04 masl

Fresh Bedrock:
Approximately 1099.34 masl

Notes:
m = metre
masl = metre above sea level

FIGURE 3-2
Monitoring Wells CH12-014--MW003 and CH12-014-MW007 Groundwater Elevations
Faro Mine Remediation Project

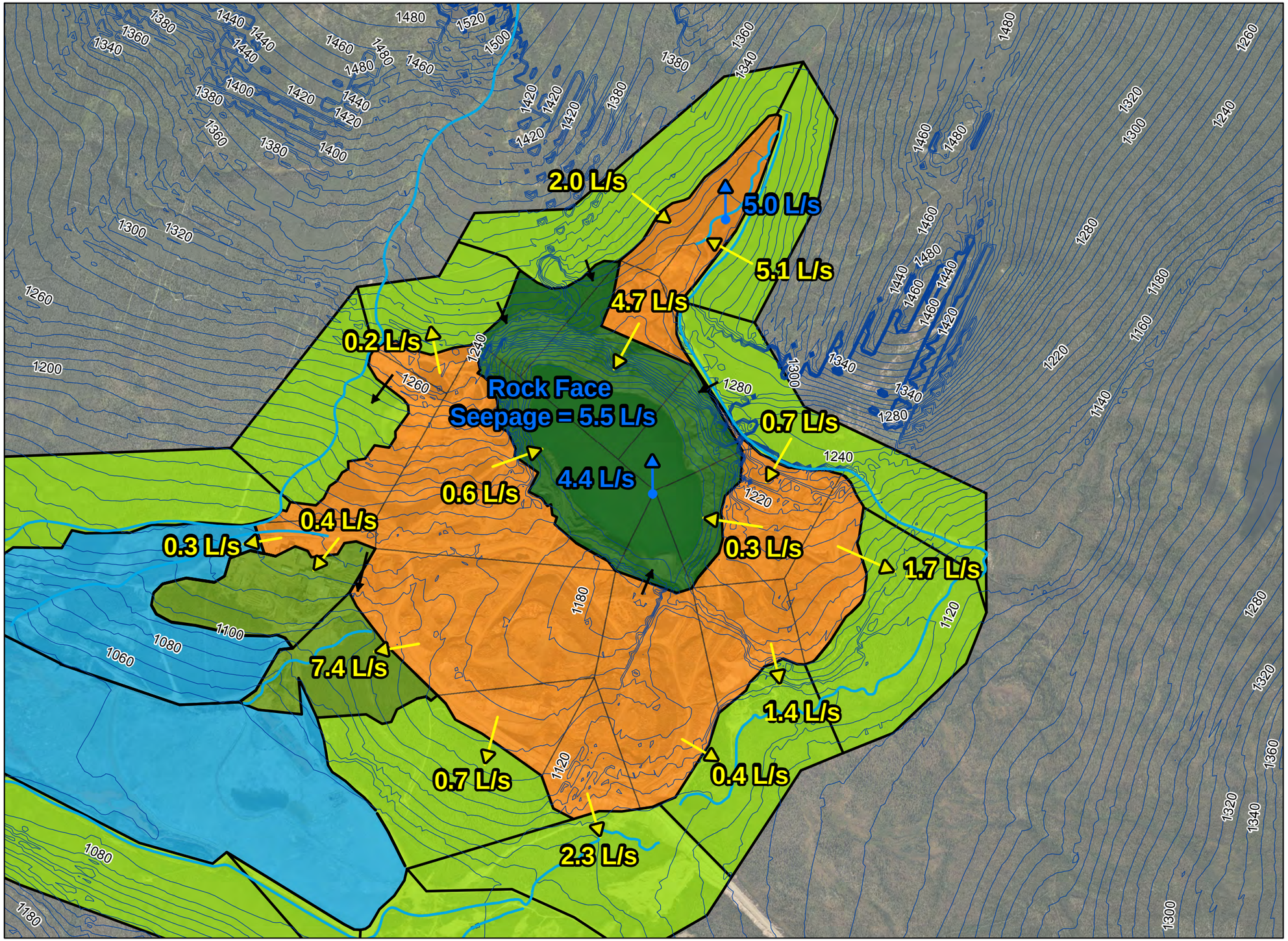


	CH12-014-MW003	CH12-014-MW007	CH14-015-MW006
Native Surface: (masl)	1,159.6	1,109.6	1,184.48
Weathered Bedrock: (masl)	1,153.2	1,102.0	
Fresh Bedrock: (masl)	1,150.8	1,099.3	1,183.28

Assumed top of competent rock (1,153m) is from September 2013 Summary & Decision Record, Recommended Interim Water Treatment System from Jared Buchko, & Deborah Pitt to FMRP Project Leadership Team

Note:
masl = metre above sea level

FIGURE 3-3
Faro Pit, Zone II Pit and Monitoring Well Water Elevations
Faro Mine Remediation Project



Reclamation Units

- RCTA Unit
- META Unit
- Faro Pit Unit
- Perimeter Unit
- WRD Unit
- Flow Budget Division
- Potentiometric Surface (m)
- Streams

Groundwater flow (L/s).
Arrow indicates
flow direction across boundary.

All flow values are approximate
and represent steady-state
(average annual) conditions.

Note: Fluxes less than or equal to
0.1 L/s are depicted by an arrow,
but are not labeled with the
numeric value.

Net groundwater exchange with
surface water (L/s).
Up arrow = flow from
groundwater into surface water.
Down arrow = flow from
surface water into groundwater.

L/s = litre per second
m = metre(s)
RCTA = Rose Creek Tailings Area
RU = Reclamation Unit
WRD = Waste Rock Dump

0 250 500 750 1,000
Meters

FIGURE 3-4
Faro Pit and Waste Rock Dump RU Flow Budget
Faro Mine Remediation Project



REGIONAL MAP



- Borehole
- Cone Penetrometer
- Monitoring Well
- Surface Water
- Faro Mine Site Watercourse

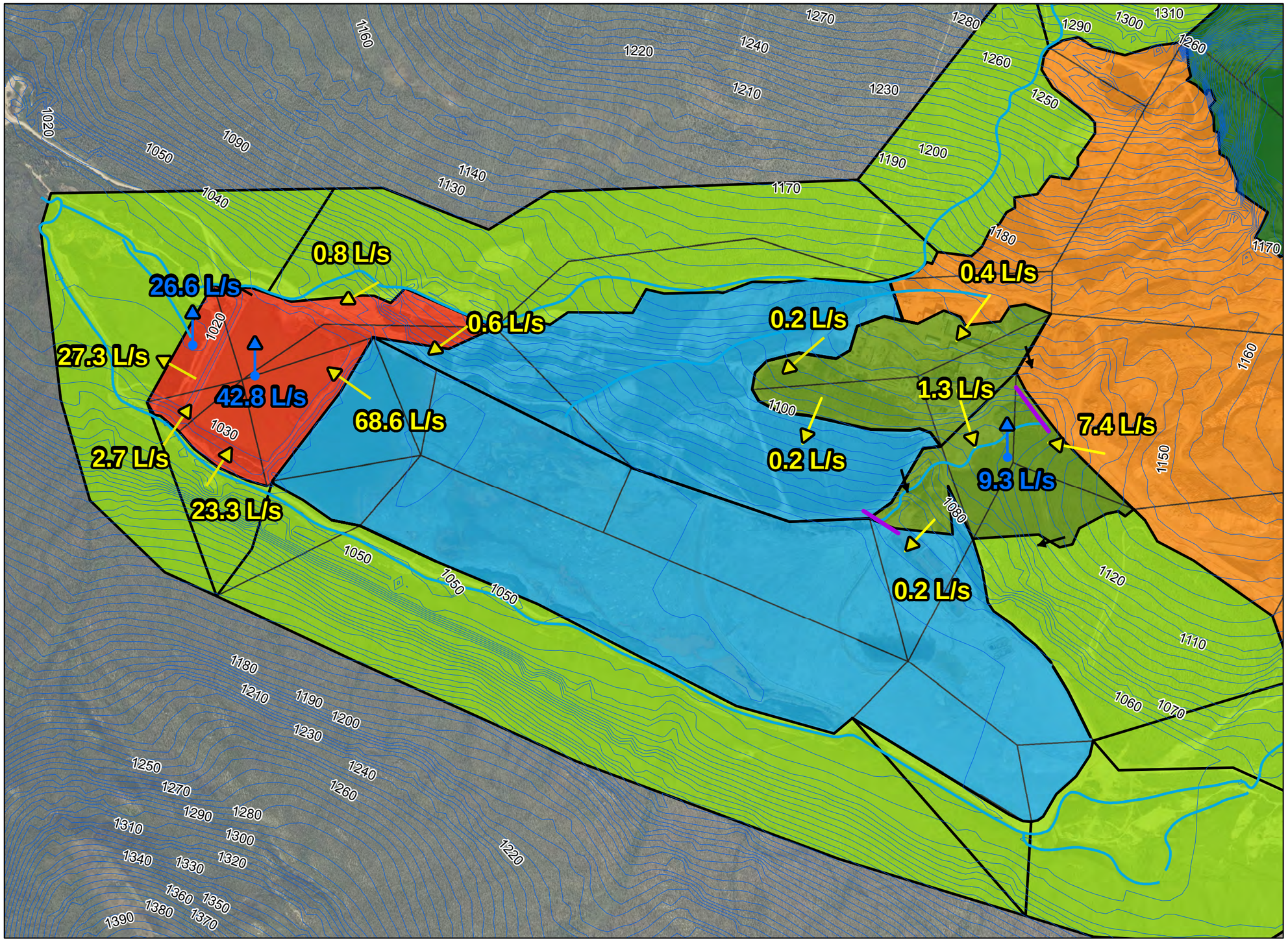
Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

N

0 50 100 150 200
Metres

FIGURE 4-1
Emergency Tailings Area Location Map
Faro Mine Remediation Project

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Reclamation Units

- RCTA Unit
- META Unit
- Faro Pit Unit
- Dams and CVP Unit
- Perimeter Unit
- WRD Unit
- Flow Budget Division
- Potentiometric Surface (m)
- Surface Water Segment Divisions
- Streams

Groundwater flow (L/s).
Arrow indicates
flow direction across boundary.

All flow values are approximate and represent steady-state (average annual) conditions.

Note: Fluxes less than or equal to 0.1 L/s are depicted by an arrow, but are not labeled with the numeric value.

Net groundwater exchange with surface water (L/s).
Up arrow = flow from groundwater into surface water.
Down arrow = flow from surface water into groundwater.

ETA = Emergency Tailings Area
L/s = litre per second
m = metre(s)
RCTA = Rose Creek Tailings Area
WRD = Waste Rock Dump

0 250 500 750
Meters

FIGURE 4-2
Miil/ETA Groundwater Flow Budget
Faro Mine Remediation Project

REGIONAL MAP



- Multi-level Well
- Borehole
- Monitoring Well
- Seep
- Surface Water
- Faro Mine Site Watercourse

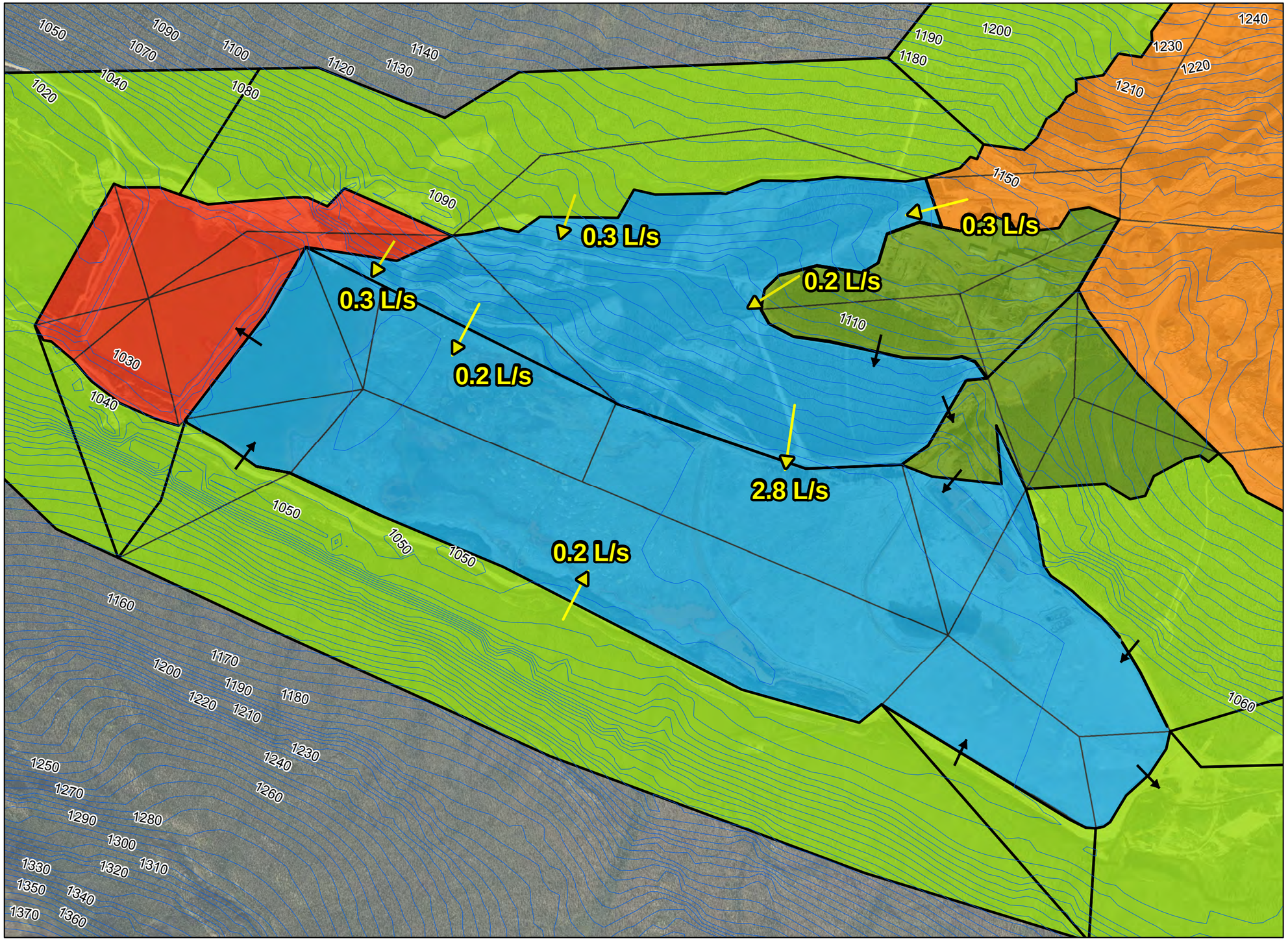
Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

N

0 150 300 450 600
Metres

FIGURE 5-1
Rose Creek Tailings Area
Location Map
Faro Mine Remediation Project

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Reclamation Units

- RCTA Unit
- META Unit
- Polishing Pond Unit
- Perimeter Unit
- WRD Unit
- Flow Budget Division
- Potentiometric Surface (m)

Groundwater flow (L/s).
Arrow indicates
flow direction across boundary.

All flow values are approximate
and represent steady-state
(average annual) conditions.

Note: Fluxes less than or equal to 0.1 L/s are depicted by an arrow, but are not labeled with the numeric value.

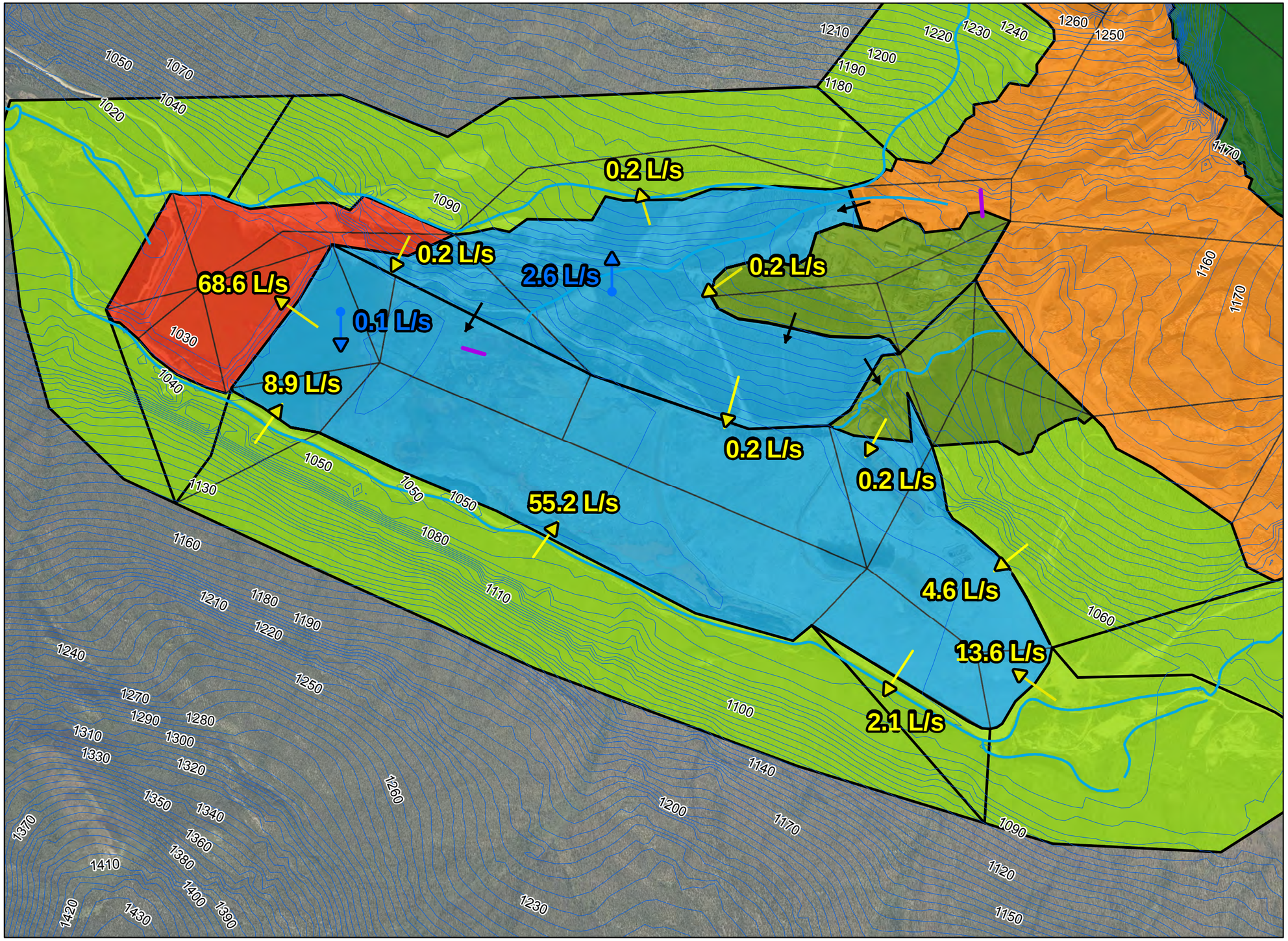
L/s = litre per second
m = metre(s)
RCTA = Rose Creek Taiings Area
WRD = Waste Rock Dump

0 250 500
Meters

N

FIGURE 5-2
Rose Creek Tailings Area Tailings Flow Budget
Faro Mine Remediation Project

ch2m



Reclamation Units

- RCTA Unit
- META Unit
- Faro Pit Unit
- Dam and CVD Unit
- Perimeter Unit
- WRD Unit
- Flow Budget Division
- Potentiometric Surface (m)
- Surface Water Segment Divisions
- Streams

Groundwater flow (L/s).
Arrow indicates
flow direction across boundary.

All flow values are approximate and represent steady-state (average annual) conditions.

Note: Fluxes less than or equal to 0.1 L/s are depicted by an arrow, but are not labeled with the numeric value.

Net groundwater exchange with surface water (L/s).
Up arrow = flow from groundwater into surface water.
Down arrow = flow from surface water into groundwater.

L/s = litre per second
m = metre(s)
RCTA = Rose Creek Tailings
Area WRD = Waste Rock Dump

0 250 500 750
Meters

N

FIGURE 5-3
RCTA Alluvial Aquifer Flow Budget
Faro Mine Remediation Project

ch2m



LEGEND

Tailings and RCAA GW Exchange (m3/d/m2)

- -0.28 – -0.16
- -0.15 – -0.09
- -0.08 – -0.04
- -0.03 – -0.01
- -0.01 – 0.00
- 000 – 0.01
- 002 – 0.04
- 0.05 – 0.33

Notes: Positive values are upward flux and negative values are downward flux.

RCAA GW = Rose Creek Alluvial Aquifer Groundwater

North

0 250 500

Approximate scale in metres

Figure 5-4
Vertical Groundwater Exchange between Rose Creek Alluvial Aquifer and Tailings
Faro Mine Remediation Project

Appendix E
Hydrology Data Analysis Report

F I N A L

Hydrologic Analysis of 2014 – 2015 Field Data, Faro Mine Remediation Project

Prepared for

Government of Yukon and the Government of Canada as represented by Indigenous and Northern Affairs Canada

August 2016

CH2M HILL, Canada Limited
309 Strickland Street
Suite 301
Whitehorse, Yukon Y1A 2J9

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6-2 Longitudinal Profile of Lower Guardhouse Creek (Derived from HEC-RAS Model)
6-3 Lower Guardhouse Creek Shear Stress versus HEC-RAS River Stationing
6-4 Stage-discharge Rating Curve for Lower Guardhouse Creek River Station 1230

SECTION 1

Introduction

1.1 Purpose

The purpose of this appendix is to provide an overview of the surface water field activities and data evaluations completed in 2014 and 2015 in support of the remediation and closure planning of the Faro Mine Complex (FMC). This appendix references key deliverables which have previously been prepared by CH2M HILL Canada Limited (CH2M) in support of the Faro Mine Remediation Project (FMRP) co-proponents (the Government of Canada, as represented by Indigenous and Northern Affairs Canada [INAC], and the Government of Yukon [YG]).

1.2 Scope of Work

This appendix provides a summary of field investigations and data evaluations for each of the Reclamation Units (RUs) within the Faro Mine Area (FMA).

The FMA has been divided into the following RUs:

- Perimeter (west, east, and south)
- Faro Pit
- Waste Rock Dump (WRD)
- Mill Building Area and Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam and Intermediate Dam and Associated Ponds (Dams and CVD Pond)

Figure 1-1 outlines the boundaries of the RUs, key channels and diversions discussed in this appendix, and the surface water and seepage monitoring stations located within each of the RUs.

Emphasis has been placed on comparing the 2014 and 2015 field activities and data evaluations to the *Revised Gaps Assessment Faro Mine Remediation Project* report (CH2M, March 2014o) to identify where surface water data gaps have been closed and where they still exist. Table 1-1 outlines the data gaps and field work necessary to close the data gaps. A high-level summary of completed field work and data evaluations pertaining to these gaps is also included in this appendix.

SECTION 2

Perimeter Reclamation Units

2.1 Field Investigation Activities

2.1.1 West Perimeter RU

The North Wall Interceptor Ditch (NWID) and Upper Guardhouse Creek (UGC) are located within the West Perimeter RU. The NWID, constructed in 1980 and 1981, diverts flows west from UCG, diverging from the natural creek channel that flows south towards where the Intermediate Impoundment is currently located. The reach of the original UGC downstream of this diversion is now known as Lower Guardhouse Creek, which is discussed further in the Rose Creek Tailings Area RU section. Construction records indicate that the NWID was designed and constructed to convey a 1-in-50-year storm event (Golder, 1982). The NWID consists of alternating reaches of natural creek channel and constructed diversion ditch. UGC is a mostly undisturbed natural creek that originally drained an approximately 4.5--square-kilometre (km^2) catchment area west of the Faro Creek drainage basin. The natural creek route trended south, converging with Rose Creek at a location that is now downstream of the Intermediate Tailings (CH2M, March 2015j).

Field investigations were performed in 2014 at the NWID and UCG. The purpose of the investigations was to gather information about the NWID and UCG to inform the evaluation of flow capacity and design of potential channel improvements. The investigation was also intended to evaluate the channel's suitability to convey flows from Faro Creek in a western valley diversion routing configuration. A field investigation and sampling program was conducted in accordance with Field Sampling Plan (FSP) 102.3 (CH2M, June 2014f) to support the characterization of the existing channel, which included cross section surveys, an engineering geological field reconnaissance, and excavation of test pits (CH2M, March 2015j). The geological reconnaissance and test pits are discussed in Appendix F, Geotechnical Data Analysis, of this report.

2.1.1.1 Cross Section Surveys and Rapid Geomorphic Assessment

A two-person team from Challenger Geomatics Ltd. (Challenger) completed three channel cross section surveys at UCG and five at the NWID on September 18 and 21, 2014, using a Leica Viva RTK GNSS differential global positioning system (GPS). Cross section survey methodology and results are detailed in the *Summary of 2014 Field Investigation – North Wall Interceptor Ditch and Upper Guardhouse Creek* technical memorandum (CH2M, March 2015j). These details include cross section survey data and corresponding photos.

Field reconnaissance of UGC and the NWID was also performed in 2014 and 2015 to assess their flood conveyance capacity and the condition of the channels, and their confluences. The UGC is a natural channel which begins on the lower southeast flank of Mount Aho. The UGC is a variably steep (3 to 10 percent), first-order channel, draining approximately 231 hectares at the point where it becomes the NWID. The UGC flows at the toe of the Northwest Dump for approximately 100 metres (m), upslope of the NWID transition. Within this 100-m reach, the UGC exhibits excess sedimentation and has a high width-to-depth ratio and relatively flat channel slope. The UGC generally flows from northeast to southwest until it becomes the NWID, which flows east to west. The NWID begins just north of the LGC. By contrast, the NWID is trapezoidal and much flatter in slope than the UGC. The NWID drains 300 hectares until its confluence with a natural drainage channel 200 m north of the Rose Creek Tailings Area (RCTA).

2.1.1.2 Surface Water Data Collection

The FMC has various surface water stations and seepage stations that allow for the development of flow estimates for each. Stations with only staff gauges installed are referred to as spot flow stations. Stations with a pressure transducer and level logger installed are referred to as continuous water level stations.

One surface water monitoring station, X5, is present in the West Perimeter RU, as listed in Table 2-1. Figure 1-1 depicts its location. Spot flow data was collected from X5 in 2014 and 2015.

2.1.2 East Perimeter RU

The Faro Creek Diversion (FCD), West Valley Interceptor Ditch (WVID) and North Fork Rose Creek (NFRC) are located in the East Perimeter RU. The WVID travels northeast across the western slope of the Faro Creek valley where it joins Faro Creek. The FCD conveys flow along the eastern slope of the Faro Creek valley, north of the Faro Pit and subsequently southeast towards its confluence with the North Fork of Rose Creek.

Field investigations were performed at the FMC in 2014 at the existing FCD and WVID, and along a potential replacement diversion channel alignment proposed by Steffen Robertson and Kirsten Consulting Engineers and Scientists (SRK) (SRK, March 2010a). The purpose of the investigation was to gather information about the existing diversions that would help with the design of the relocated diversion channel and investigate conditions along the proposed replacement channel alignment. A field investigation and sampling program was conducted in accordance with FSPs 102.1 (CH2M, June 2014d) and 102.2 (CH2M, June 2014c) to support the characterization of the existing channel, which included cross section and bed and bank characterization surveys and an engineering geologic field reconnaissance (CH2M, March 2015i). The geological reconnaissance completed within the East Perimeter RU is discussed in Appendix F, Geotechnical Data Analysis.

2.1.2.1 Cross Section Surveys and Rapid Geomorphic Assessment

A two-person team from Challenger completed 10 channel cross section surveys at the WVID and 10 at the existing FCD on September 20 and 22, 2014, using a Leica Viva RTK GNSS differential GPS. Cross section survey methodology and results are detailed in the *Summary of 2014 Field Investigation – Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch* technical memorandum (CH2M, March 2015i). These details include cross section survey data and corresponding photos.

Channel cross section surveys were also completed in support of the NFRC Temporary Diversion design efforts. Details of these surveys can be found in Appendix B of the *Draft Preliminary Final Design Basis Report* (CH2M, March 2016b).

In addition to these cross sectional surveys, a rapid geomorphic assessment was completed for the WVID and the FCD in 2014 and 2015 to assess the condition of the channel. The WVID begins roughly 0.5 kilometre (km) due east of UGC at an elevation of 1370 m. The WVID is an along-contour ditch that intersects the natural Faro Creek Channel at an elevation of roughly 1313 m. From that confluence, the ditch system becomes the FCD, and continues as an along-contour ditch to an elevation of roughly 1280 m. From that elevation, the FCD drains to the NFRC. The WVID drains an area of 157 hectares and the FCD drains approximately 1461 hectares.

The WVID is an excavated ditch constructed adjacent to an access road. As noted in the *Summary of 2015 Field Investigation – West Side and East Side Diversions, technical memorandum* (CH2M, 2016h), the WVID exhibits multiple bedrock outcrops and is downslope of several small slope failures. These conditions limit the conveyance of the WVID. The sediment produced by mass wasting and bedrock weathering obstruct flow and flatten the channel slope.

After the confluence with the Faro Creek Channel, the diversion ditch, now termed the FCD, is a trapezoidal channel with a marked increase in conveyance capacity and is lined with angular riprap. This condition continues to the point where the FCD follows gravity drainage to NFRC.

2.1.2.2 Surface Water Monitoring Plan Implementation

In support of the Site Wide Surface Water Monitoring Field Sampling Plan SW-005 (CH2M, March 2014i) stilling wells and water level transducers were installed at three existing staff gauge locations (FCD-2, FCD-3, and FCD-4) in the East Perimeter RU on October 8, 2014. CH2M's technical memorandum, *Summary of 2014 Field Investigation – Site-wide Surface Water Monitoring* (CH2M, March 2015dd) outlines the installation details. Stilling wells were installed by fastening well screens to the staff gauges. Water level transducers were suspended within the inner stilling wells and winterized with an antifreeze mechanism. Instrumentation was also installed at two existing streambed piezometers in the East Perimeter RU, CH13-107-PZ011 and CH14-107-PZ028.

2.1.2.3 Surface Water Data Collection

Eighteen surface water monitoring stations are present in the East Perimeter RU, as listed in Table 2-1. Figure 1-1 depicts their locations.

Spot flow measurements were collected from eight stations in 2014 and ten stations in 2015. Continuous water level measurements were collected for five stations in 2014 and 2015.

2.1.3 South Perimeter RU

The Rose Creek Diversion (RCD) is located within the South Perimeter RU, immediately south of the RCTA and is approximately 4 km long. It travels northwest starting from the North Fork Diversion, immediately east of the original impoundment at the RCTA, and travels along the southern border of the RCTA past the Cross Valley Dam (CVD), where it intersects with Rose Creek.

Field investigations were performed at the RCD in 2014 to gather information about the RCD channel morphology to inform the design of channel upgrades. The field investigation was conducted in accordance with FSP 203.1 (CH2M, June 2014h) and consisted of two cross section surveys and a bed and bank material characterization survey (CH2M, March 2015y). The geological reconnaissance completed at East Perimeter RU is discussed in Appendix F Geotechnical Data of this report.

2.1.3.1 Cross Section Survey

A two-person team from Challenger completed two cross section surveys (cross sections RCD 43 and RCD 44) at the RCD on September 18, 2014, using a Leica Viva RTK GNSS differential GPS. Cross section RCD 43 was completed at the approximate mid-point of the RCD. Cross section survey methodology and results are detailed in the *Summary of 2014 Field Investigation – Upgrade Rose Creek Diversion* (CH2M, March 2015y). These details include cross section survey data and corresponding photos.

2.1.3.2 Surface Water Monitoring Plan Implementation

In support of the Site Wide Surface Water Monitoring Field Sampling Plan SW-005 (CH2M, March 2014v), stilling wells and water level transducers were installed at two existing staff gauge locations, RCSG-4 and X10, in the West Perimeter RU on October 8, 2014. CH2M's technical memorandum, *Summary of 2014 Field Investigation – Site-wide Surface Water Monitoring* (CH2M, March 2015dd) outlines the installation details. Stilling wells were installed by fastening well screens to the staff gauges. Water level transducers were suspended within the inner stilling wells and winterized with an antifreeze mechanism.

2.1.3.3 Surface Water Data Collection

Four surface water monitoring stations (X3A, RCSG-4, X10, and X14) are present within the South Perimeter RU. Figure 1-1 depicts their location. Spot flow data was collected at X3A, X10, and X14 in 2014 and 2015. No spot flow data was collected at RCSG-4 in either 2014 or 2015. Continuous water level data was collected for X14 in 2014 and 2015.

2.2 Field Investigation Data Evaluation

2.2.1 West Perimeter RU

With respect to the rapid geomorphic assessment, the hydraulic attributes and conveyance capacity of the UGC and NWID were evaluated by constructing a one-dimensional Hydrologic Engineering Centre's River Analysis System (HEC-RAS) hydraulic model from 400 m above the Northwest Dump to the confluence with the natural drainage 200 m north of the RCTA (Figure 2-1). This entire ditch system is characterized by three natural reaches and two constructed, trapezoidal reaches. The natural channels are broad swales with a minor inset active channel. Within the hydraulic model, the UGC is approximately 1700 m in length, or from River Station (RS) 3894 – 2291. The NWID begins at RS 2291 and continues to RS 9. Within the NWID reach, there are two constructed, trapezoidal reaches separated by two intervening natural reaches (RS 1181 to approximately RS 702 and RS 209 to RS 9).

The model geometry consists of cross-sections created from a Lidar-derived 1-m grid cell digital elevation model (Figure 2-1). The cross sections are on approximate 15-m centers. Flood magnitudes for the 1-in-20-year flood and probable maximum flood (PMF) were estimated in Hydrologic Engineering Center's-Hydrologic Modeling System (HEC-HMS) and used as HEC-RAS model flows. The UGC catchment has estimated 1-in-20-year and PMF floods of 1.2 and 8 cubic metres per second (m^3/sec), respectively. The NWID catchment has estimated 1-in-20-year and PMF floods of 2.2 and 19 m^3/sec, respectively.

Results show that the longitudinal profile of the UGC and NWID (Figure 2-2) is concave-upwards to the transition to the NWID. There are some knickpoints (steep regions along the creek profile) within the upper portion of the UGC profile segment, likely because of bedrock outcrop and encroachment by the Northwest Dump (RS 3465 – 3323). From RS 2291 to RS 1181, the NWID is a constructed trapezoidal channel and its profile is nearly flat. This reach is characterized by a high width-to-depth ratio and periodic mid-channel bars, indicating lack of stream power to transport sediment. The profile of the downstream natural reach is generally straight, with a significant convexity at the downstream end (RS 821 to RS 702). At this convexity, the channel flows through a bedrock notch, forming an effective waterfall. This resistant feature causes the profile to flatten for roughly 100 m immediately upstream of the waterfall lip. The remainder of the profile, to RS 209, is again uniform and flat, characteristic of the constructed trapezoidal reaches. This constructed reach drains into a natural swale, and this final 200 m of the profile is concave-upwards, typical of a natural channel.

Figure 2-3 shows erosive energy, expressed as shear stress, at the 1-in-20-year and PMF floods. Shear values are lowest in the constructed trapezoidal channel segments. Highest shear stress values are observed in the downstream-most 200 m, where the channel drops steeply to another natural channel. High shear stress values are also characteristic of a first-order, headwater channel like the UGC. Given the low channel slopes of the constructed trapezoidal reaches, these reaches exhibit the lowest shear stress values as well.

The conveyance of the NWID was evaluated using an at-a-station hydraulic analysis of four of the NWID cross-sections (NWID 1 to 4, as defined in the Rapid Geomorphic Assessment 2015 Field Data Report [CH2M, 2016h]). These four cross-sections are all within the first constructed trapezoidal reach between RS 2291 and 1181. This analysis produced the discharge of the NWID as a function of depth (or stage) in the channel. These parameters are shown in the rating curves (Figures 2-4 through 2-7). All four cross

sections easily convey the PMF flood of 19 m^3/sec. However, the bed and bank material of the channel is largely placed gravel to small cobble. The resulting shear stress values at high floods may erode the channel bed and banks causing channel failure.

The capacity at bank overtopping stage ranges from 113 to 170 m^3/sec for the four cross sections. However, the HEC-RAS hydraulic model of the NWID shows extensive overtopping of the NWID at the PMF at RS 1334 to RS 1181 (Figure 2-8). This overtopping may result from backwater effects at the transition to the natural channel at RS 1181.

The UGC and NWID ditch system is moderately complex owing to the juxtaposed natural and constructed channel reaches. Distinct changes in channel geometry and slope create vulnerable areas in the ditch system. Additionally, connection to the UGC enhances sedimentation potential to the NWID.

2.2.2 East Perimeter RU

With respect to the rapid geomorphic assessment, the hydraulic attributes and conveyance capacity of all channel segments was evaluated by constructing a one-dimensional HEC-RAS hydraulic model from the WVID inception to just above NFRC. The model geometry consists of cross sections created from a Lidar-derived 1-m grid cell digital elevation model (Figure 2-9). The cross sections are on approximate 25-m centers. Flood magnitudes for the 1-in-20-year flood and PMF were estimated in HEC-HMS and used as HEC-RAS model flows. The modeled 1-in-20-year flood for the WVID is 0.9 m^3/sec, and then is increased to 5.2 m^3/sec at the Faro Creek confluence. The modeled PMF flood magnitude for the WVID is 6 m^3/sec and is then increased to 58 m^3/sec at the Faro Creek confluence. Results show that the combined longitudinal profile of the WVID and FCD (Figure 2-10) is concave-upwards, with localized convexities or knickpoints, up to approximately RS 1200. From RS 1200 to the end of the modeled reach, the profile is convex. The transition to a convex profile begins roughly where the FCD is at its point of closest approach to the Faro Pit, and may indicate the presence of resistant bedrock underlying the channel. The knickpoints in the profile are near (downstream) areas where bedrock outcrops or slope failures were mapped, and near mapped in-channel depositional areas.

Erosive energy, expressed as shear stress, at the 1-in-20-year and PMF floods is shown in Figure 2-11. Shear values are lowest in the FCD segment between the Faro Creek confluence and the point where the FCD begins gravity drainage to NFRC. Shear values fluctuate within the WVID as knickpoints are encountered, which locally oversteepen the profile and increase shear stress.

The conveyance of the trapezoidal channel was evaluated using an at-a-station hydraulic analysis of a single surveyed cross section (FCD 3). This analysis produced the discharge of the FCD as a function of depth (or stage) in the channel. These parameters are shown in the rating curve (Figure 2-12) for the FCD 3 cross section. For an estimated reach slope of 0.5 percent, the FCD 3 cross section conveys the 1-in-20-year and PMF floods at stages of roughly 0.4 and 1.0 m. The FCD 3 cross section conveys roughly 500 m^3/sec before overtopping its banks. The extent of flood inundation on the WVID during the PMF is shown in Figure 2-13. Reaches where the WVID is overtopped by the PMF are circled. The FCD generally conveys the PMF within banks, but there are limited reaches that are overtopped. For the 1-in-20-year flood, the WVID is also overtopped at the same approximate locations (Figure 2-14). The FCD conveys the 1-in-20-year flood without overtopping. Because extent of inundation is influenced by the modeled hydraulic roughness, these results are approximate. However, these results do confirm field observations of limited conveyance in the WVID.

The FCD generally has the capacity to convey floods up to the PMF. However, an incipient motion analysis would be required to determine if the FCD can transport flood flows without failure because of erosion and transport of the ditch riprap lining. The transport capacity of the WVID is limited in multiple reaches because of interaction with the hillslope, both slope failures and bedrock outcrops. These features generate sediment by erosion and weathering, and are routed to the WVID. Improvement to the WVID are required and should take into account interactions with the hillslope.

Details of the NFRC surface water data evaluation can be found in Appendix B of the *Draft Preliminary Final Design Basis Report* (CH2M, March 2016b).

2.2.3 South Perimeter RU

No data evaluation was completed in 2014 or 2015 for surface water within the South Perimeter RU.

SECTION 3

Faro Pit RU

3.1 Field Investigation Activities

Faro Pit is located within the Faro Pit RU and is approximately 1,675 m long and 975 m wide, encompassing 1.06 km^2. The Faro Pit is at 975 m above mean sea level, an elevation 335 m lower than the highest point of the western pit wall (CH2M, March 2015oo). In 2010, SRK proposed the installation of the Faro Pit Safety Berm – a linear earthen structure with an alignment that follows the perimeter of the Faro Pit at a proposed offset of 5 m from the edge of the pit. The purpose of the safety berm is to restrict access to the Faro Pit (CH2M, March 2015oo).

In 2014, field reconnaissance was conducted which included walking the proposed alignment to identify potential locations that may require test pit exploration for evaluation of foundation conditions. The work was conducted in accordance with FSP 101.2 (CH2M, May 2014g) by a geotechnical engineer/geological engineer. In particular, observations of groundwater seeps or surface water along the proposed alignment were noted. Details of the field reconnaissance are available in the *Summary of 2014 Field Investigation – Faro Pit Safety Berm* technical memorandum (CH2M, March 2015oo). Of relevance to surface water, the northern pit edge has several springs and a boggy area near the pit edge of the segment. The extent of the soft soils is not expected to be problematic for berm construction if pervious riprap and waste rock materials or large boulders, which do not obstruct water flow, are placed as barriers.

One surface water monitoring station (X22b) and one seepage station (A30) are present in the Faro Pit RU, as listed in Table 2-1. Figure 1-1 depicts their location. Spot flow data was collected from X22b during 2014 and2015; no seepage data was collected for A30 during 2014 or 2015.

3.2 Field Investigation Data Evaluation

From the field reconnaissance, it was determined that no additional test pits are recommended to support the existing alignment (CH2M, March 2015oo). However, revisions to the alignment may warrant additional investigations, including surface water observations.

SECTION 4

Waste Rock Dump RU

4.1 Field Investigation Activities

No surface water field activities were completed in 2014 or 2015 for the WRD RU.

One surface water monitoring station (FCO) and one seepage station (SP5-6) are present in the WRD RU, as listed in Table 2-1. Figure 1-1 depicts their location. No surface water data was collected from FCO during 2014 or 2015; seepage spot flow data was collected for SP5-6 during 2014 and 2015.

4.2 Field Investigation Data Evaluation

No data evaluation was completed in 2014 or 2015 for surface water within the WRD RU.

SECTION 5

Rose Creek Tailings Area RU

5.1 Field Investigation Activities

Two surface water monitoring stations (GDHSECK and X4) are present in the Rose Creek Tailings Area (RCTA) RU, as listed in Table 2-1. Figure 1-1 depicts their location. Spot flow data was collected from both stations during 2014 and 2015.

5.2 Field Investigation Data Evaluation

No data evaluation was completed in 2014 or 2015 for surface water within the RCTA RU.

SECTION 6

Mill Building Area and Emergency Tailings Area RU

6.1 Field Investigation Activities

The ETA and Lower Guardhouse Creek (LGC) are located within the Mill Building Area and ETA RU. The ETA is located between the Faro Mill and the Rose Creek Tailings Facility, and overlaps with a section of the old Faro Creek Channel. The ETA is one of the contaminant sources to groundwater and surface water in the Faro Mine Area and as such, a field investigation program was completed to determine the optimal location and capacity of the ETA surface water collection structure (CH2M, March 2015n). Limited surface flow data at FCS-4 and X-23 was identified as a data gap for the design of the ETA surface water collection structure. In 2014, field reconnaissance that included a hydrologic investigation conducted at X23 and FCS-4 (seepage and surface water monitoring stations located upstream and downstream of the ETA, respectively) was undertaken to close the aforementioned data gap. CH2M installed stream stage recorders at FCS-4 and X-23 in October 2014 by instrumenting the existing 90-degree V-notch weirs at these locations with stilling wells and water level transducers. Details of the field reconnaissance are available in the *Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area* technical memorandum (CH2M, March 2015n). Photographs taken at FCS-4 and X-23 during the hydrologic investigation in 2014, including the seep sampling and stream stage recorder installation, are included in the photo log presented in Attachment 4 of the 2015 technical memorandum.

Two additional surface water monitoring stations (ETA Combined and X7) are present within the Mill Building Area and ETA RU. Table 2-1 outlines the data available in 2014 and 2015 for these two stations. Figure 1-1 depicts their location. Seepage spot flow data was collected for X23 in 2014. Surface water spot flow data was collected for ETA Combined, X7 and FCS-4 in 2014 and 2015.

Lower Guardhouse Creek (LGC) is an approximately 1.7- km-long, partly disturbed natural creek channel. It originally constituted the lower reach of Guardhouse Creek, a creek that drained an approximately 4.5-km^2 catchment area west of the Faro Creek drainage. The natural creek route trended south, converging with Rose Creek at a location that is now beneath the Intermediate Tailings.

Field investigation activities were conducted on June 30, 2014, and consisted of geologic reconnaissance along LGC in support of FSP 102.4 (CH2M, June 2014g). The creek was surveyed along its approximate 1.7-km length; the investigation was focused on the upstream portion of the creek. In addition to the geologic reconnaissance, additional observations and photos from these areas were collected during other investigation activities completed between May 2014 and September 2015. These were focused on surface water flows and groundwater seepage, namely channel shapes, bed and bank materials, approximate flow depths, and relative velocities were noted for surface water channels. Details of the reconnaissance are available in the *Summary of 2014 Field Investigation – Lower Guardhouse Creek Interception* technical memorandum (CH2M, March 2015k). Locations where groundwater seepage was observed were also noted were observed and photographed and are included in Attachment 1, Table 1, and Figure 1 of the 2015 technical memorandum.

6.1.1 Cross Section Surveys and Rapid Geomorphic Assessment

Field reconnaissance of LGC was performed in 2014 and 2015 to assess the condition of the channel and its capacity for flood conveyance. The LGC begins just south of where the UGC ends and the NWID begins (immediately north of the CH2M office trailers) and drains an area of 205 hectares. At its

inception, the LGC is a constructed, trapezoidal ditch for roughly 230 m. This segment is incised 2 to 3 m below the surrounding ground surface. It then transitions to a broad (75- to 85-m-wide) natural valley to the Mine Access Road, crossing over a channel length of roughly 700 m. Within this segment, the channel is braided with multiple threads in a wide floodplain. Below the Mine Access Road, the LGC follows a swale (for approximately 450 m) to its confluence with the RCTA. This swale is broad and the channel is weakly defined.

6.1.2 Surface Water Monitoring Plan Implementation

The *Revised Gaps Assessment Faro Mine Remediation Project* report (CH2M, March 2014o) outlined the need to have a surface water monitoring station installed along Lower Guardhouse Creek and continuous water level data collected. A station was not installed in 2014 or 2015.

6.2 Field Investigation Data Evaluation

The hydraulic attributes and conveyance capacity of all channel segments was evaluated by constructing a one-dimensional HEC-RAS hydraulic model from the LGC inception to just north of the RCTA. The model geometry consists of cross sections created from a Lidar-derived 1-m grid cell digital elevation model (Figure 6-1). The cross sections are on approximate 15-m centers. Flood magnitudes for the 1-in-20-year (1.1 m^3/sec) and PMF (7 m^3/sec) were estimated in HEC-HMS and used as HEC-RAS model flows. Results show that the longitudinal profile of the LGC (Figure 6-2) is straight to convex up to the last 160 m or so of the profile. The downstream 160 m has an average slope of 13 percent, but the remaining upstream profile has an average slope of 5 percent. Erosive energy, expressed as shear stress, at the 1-in-20-year and PMF floods is shown in Figure 6-3. Shear values are lowest in the segment characterized by a wide floodplain and indistinct channel (approximately RS 950 to RS 600). Shear values are highest in the steepest portion of the profile (last 160 m before the RCTA). Upstream of this reach, spikes in shear stress are observed where flow is confined, decreasing flow area and increasing flow velocity. In general, shear stress is greatest where channel slope is highest.

The conveyance of the trapezoidal channel was evaluated using an at-a-station hydraulic analysis of a single cross section (RS 1230). This analysis produced the discharge of the LGC as a function of depth (or stage) in the channel. These parameters are shown in the rating curve (Figure 6-4) for RS 1230. For an estimated reach slope of 1.3 percent, the RS 1230 cross section conveys the 1-in-20-year and PMF floods at stages of roughly 0.3 and 0.7 m. The LGC conveys roughly 100 m^3/sec before overtopping its banks.

As a flood conveyance channel, the LGC has the capacity to convey floods up to the PMF. However, the bed and bank material of the channel is largely native, in situ material, or placed gravel to small cobble. The resulting shear stress values at high floods may erode the channel bed and banks causing channel failure.

No data evaluation was completed in 2014 or 2015 for surface water within the Mill Building Area and ETA RU.

SECTION 7

Cross Valley Dam and Intermediate Dam and Associated Ponds RU

The Rose Creek tailings impoundment stores more than 55 million tonnes of tailings within an unlined containment area approximately 4 km long and 1 km wide. A series of three dams hold the tailings in place: the Primary Dam, Secondary Dam, and the Intermediate Dam (ID) (CH2M, March 2014m).

One surface water monitoring station (X5P) and four seepage monitoring stations (Weir 3, X11, X12, and X13) are present in the Dams and CVD Pond RU, as listed in Table 2-1. Figure 1-1 depicts the location of the four stations within the RU. Surface water data was collected from X5P during 2014 and 2015; seepage data was collected from all seepage stations in 2014 only.

7.1 Field Investigation Activities

No surface water field activities were completed in 2014 or 2015 for the Dams and CVD Pond RU.

7.2 Field Investigation Data Evaluation

The ID spillway does not have the capacity to safely pass a moderate or major flood event without potentially overtopping the dam, in the event of a breach of the RCD dike and flooding of the Intermediate Impoundment. The existing ID spillway has a capacity equal to approximately 32 m^3/sec. The 1-in-500-year annual exceedance probability (AEP) return period runoff at the ID equals approximately 115 m^3/sec; the PMF event has a runoff at the ID of approximately 674 m^3/sec. The CVD spillway has a capacity of approximately 300 m^3/sec (CH2M, July 2015a).

CH2M submitted conceptual and advanced designs to YG for the Down Valley Interim Hydraulic Upgrades. These designs increased the hydraulic capacity of the ID spillway by (1) raising the effective height of the ID crest, (2) increasing the cross sectional area of the spillway, and (3) removing existing pipelines and equipment from the spillway. The increase in cross sectional area would be achieved by increasing the width of the spillway and by lowering the bottom of spillway. Lowering the bottom of the ID spillway would reduce the storage capacity behind the ID. Operationally, this is an unaccepted reduction in storage.

As an alternative to reducing the storage capacity behind the ID spillway, CH2M prepared a revised ID spillway design that incorporated an ogee weir for the 1-in-500-year AEP spillway, replacing a broad crested weir. The revised concept provides an increase in the spillway capacity and maintains the existing storage capacity.

At the same time as the revised ID spillway design, and in conjunction with development of site-wide remediation concepts, CH2M developed design concepts for passing a PMF flood event at the ID spillway. The new design concepts provided significant improvements to previous designs developed and by incorporating a 60-m-long ogee weir into the spillway design. This change would reduce the required ID raise, estimated to be a minimum of 4.6 m (without the loss of storage capacity), to about 2 m. The change would reduce the requirements for dewatering and removing sludge from the CVD Pond to complete the dam raise.

In 2015, a trade-off study was completed to provide information for use in decision making regarding the schedule and sequence of constructing the 1-in-500-year annual AEP capacity spillway or the PMF capacity spillway at ID and CVD (CH2M, July 2015a). Details of this study are outlined in the draft *Task*

Authorization 016 Rose Creek Tailings Area Intermediate Dam Spillway and Cross Valley Dam Spillway Trade-off Study report (CH2M, July 2015a). The following three options were evaluated:

- Option 1: Upgrade the existing ID spillway to increase its capacity to the 1-in-500-year AEP flood event, followed by constructing the permanent ID spillway with capacity for the PMF event to 13 years later.
- Option 2: Construct the permanent ID spillway with capacity for the PMF event as soon as can be reasonably achieved and without the temporary spillway improvements.
- Option 3: Construct the permanent ID spillway with capacity for the PMF event 8 to 13 years from 2016.

Suboptions were developed for Options 1 and 3. These options are further detailed in the report.

An event tree risk model was developed using three inputs for the trade-off analysis: (1) estimated construction and O&M costs for each option, (2) timelines for design, construction, and operation of each option, and (3) estimated ID failure probabilities. It was determined that Option 2, which involves the construction of the PMF spillway as soon as practical, minimizes the ID failure risk (expressed as an encounter probability). In addition, Option 2 is estimated to have the lowest net present value, because the escalation rates are greater than the discount rates.

SECTION 8

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Tables

Table 1-1. Summary of Completed Field Work and Data Evaluations Compared to Data Gaps Identified in the *Revised Gaps Assessment Faro Mine Remediation Project* Report (CH2M, March 2014o)

Faro Mine Remediation Project

Activity	Task	Surface Water Data Gap	Required Field Work	Summary of Completed Field Work and Data Evaluations
Site Wide				
SW-005	Surface Water Modelling	Site-specific physical data such as bed and bank materials within diversions. Subcatchment delineation in site specific model areas such as waste dumps. Conduct field surveys for use in surface water modelling; cross sections, floodplains, structures, and similar. Confirm locations and scope through field reconnaissance. This will be completed for individual activity locations.	Maintain existing flow monitors and rainfall monitors. Obtain additional meteorological data at existing stations if equipment operational. Obtain precipitation data concurrent with flow monitoring data collection. Collect continuous flow data at newly established monitoring locations.	Table 2-1 outlines the data collected in 2014 and 2015 for the surface water and seepage stations (31 and 8 stations respectively); both spot flow and continuous water level measurements. 38 of the 38 stations have staff gauges installed to record spot flow measurements. The following summarizes the spot flow data received for 2014 and 2015: - 20 stations with 2014 and 2015 - 5 stations with 2014 data only - 2 stations with 2015 data only - 11 stations with no 2014 or 2015 data 18 of the 38 stations have pressure transducers and level loggers installed to record continuous water level measurements. The following summarizes the continuous water level data received for 2014 and 2015: - 6 stations with 2014 and 2015 - 12 stations with no 2014 or 2015 data
Surface Water Diversions				
102.1	Faro Creek Diversion (East Valley)	Bed and bank materials characterizations. Additional flow monitoring data collection at recommended 2013 stations for additional model refinement.	Physical survey for cross sections, bed and bank materials characterizations, and floodplain cover. Monitor surface flow at North Fork Rose Creek monitoring stations and Faro Creek Diversion.	Ten cross section surveys were completed along the West Valley Interceptor Ditch on September 20 and September 22, 2014. Bed and bank material characterizations were completed during the field investigation conducted June 28 and June 29, 2014. North Fork Rose Creek monitoring stations include the following 11 stations: R7, R8, R9, R10, NF2, NFRC-SC1, NFRC-SC2, NFRC-SC3, NFRC-SC4, X2, and X3. Faro Creek Diversion monitoring stations include the following 7 stations: FDU (FCD-1), FCO, FCD-2, FCD-3, FCD-4, FCD, and FAROCR. Table 2-1 outlines the surface water monitoring data collected for these stations. A rapid geomorphic assessment was completed for the Faro Creek Diversion in 2014 and 2015 to assess the condition of the channel.
102.2	Faro Creek Diversion (West Valley Interceptor Ditch)	Same as Activity 102.1.	Physical survey for cross sections, bed and bank materials characterizations, and floodplain cover.	Ten cross section surveys were completed along the West Valley Interceptor Ditch on September 20 and September 22, 2014. Channel cross section surveys were also completed in support of the North Faro Rose Creek Temporary Diversion design efforts. Bed and bank material characterizations were completed during the field investigation conducted June 28 and June 29, 2014. A rapid geomorphic assessment was completed for the West Valley Interceptor Ditch and the Faro Creek Diversion in 2014 and 2015 to assess the condition of the channel.
102.3	North Wall Interceptor Ditch	Detailed cross section data including channel and floodplain for Upper Guardhouse Creek and the North Wall Interceptor Ditch for modelling obtained from LiDAR. Channel bed and bank materials characterizations for modelling. Assess area below Cross Valley Dam for discharge design requirements to Rose Creek – flow management and design requirements.	Surveys for detailed cross section data, bed and bank materials characterizations, and floodplain cover characterization. Collect ice data, flow data, and water profile data (surface water elevations).	Three channel cross section surveys were completed at Upper Guardhouse Creek and five at the North Wall Interceptor Ditch on September 18 and 21, 2014. Field reconnaissance of Upper Guardhouse Creek and the North Wall Interceptor Ditch was performed in 2014 and 2015 to assess their flood conveyance capacity, the condition of the channels, and their confluences. One surface water monitoring station, X5, is present in the West Perimeter Remediation Unit; spot flow data was collected from X5 in 2014 and 2015.
102.4	Lower Guardhouse Creek	Detailed cross section data including channel and floodplain areas; channel and bed and bank materials characterizations; soils data including permafrost; historical channel ice data, flow monitoring, and water profile data (surface elevations). Additional flow monitoring data for model calibration and validation.	Surveys for detailed cross section data, bed and bank materials characterizations, and floodplain cover characterization. Evaluate flow data, and water profile data (surface elevations). Establish a flow monitoring station and collect continuous flow data.	No cross section surveys were conducted for Lower Guardhouse Creek. Field reconnaissance of Lower Guardhouse Creek was performed in 2014 and 2015 to assess the condition of the channel and its capacity for flood conveyance No flow monitoring station was established along Lower Guardhouse Creek.
203.1	Rose Creek Diversion	Establish flow monitoring station on Rose Creek upstream from the confluence with the North Fork Rose Creek for model calibration and validation. Collect additional flow monitoring data at stations RCDC and X14. Determine existing channel morphology	Survey channel cross sections along the existing RCD upstream of the fuse plug. Conduct bed and bank material and floodplain cover characterization survey from the fuse plug to just downstream of the North Fork Rock Drain.	Two cross section surveys (cross sections RCD 43 and RCD 44) were completed at the Rose Creek Diversion on September 18, 2014. Stilling wells and water level transducers were installed at two existing staff gauge locations, RCSG-4 and X10. Four surface water monitoring stations (X3A, RCSG-4, X10, and X14) are present within the South Perimeter Remediation Unit. Spot flow data was collected at X3A, X10, and X14 in 2014 and 2015. No spot flow data was collected at RCSG-4 in either 2014 or 2015. Continuous water level data was collected for X14 in 2014 and 2015.

Table 2-1. Summary of Spot Flow and Continuous Flow Data Received for 2014 and 2015

Faro Mine Remediation Project

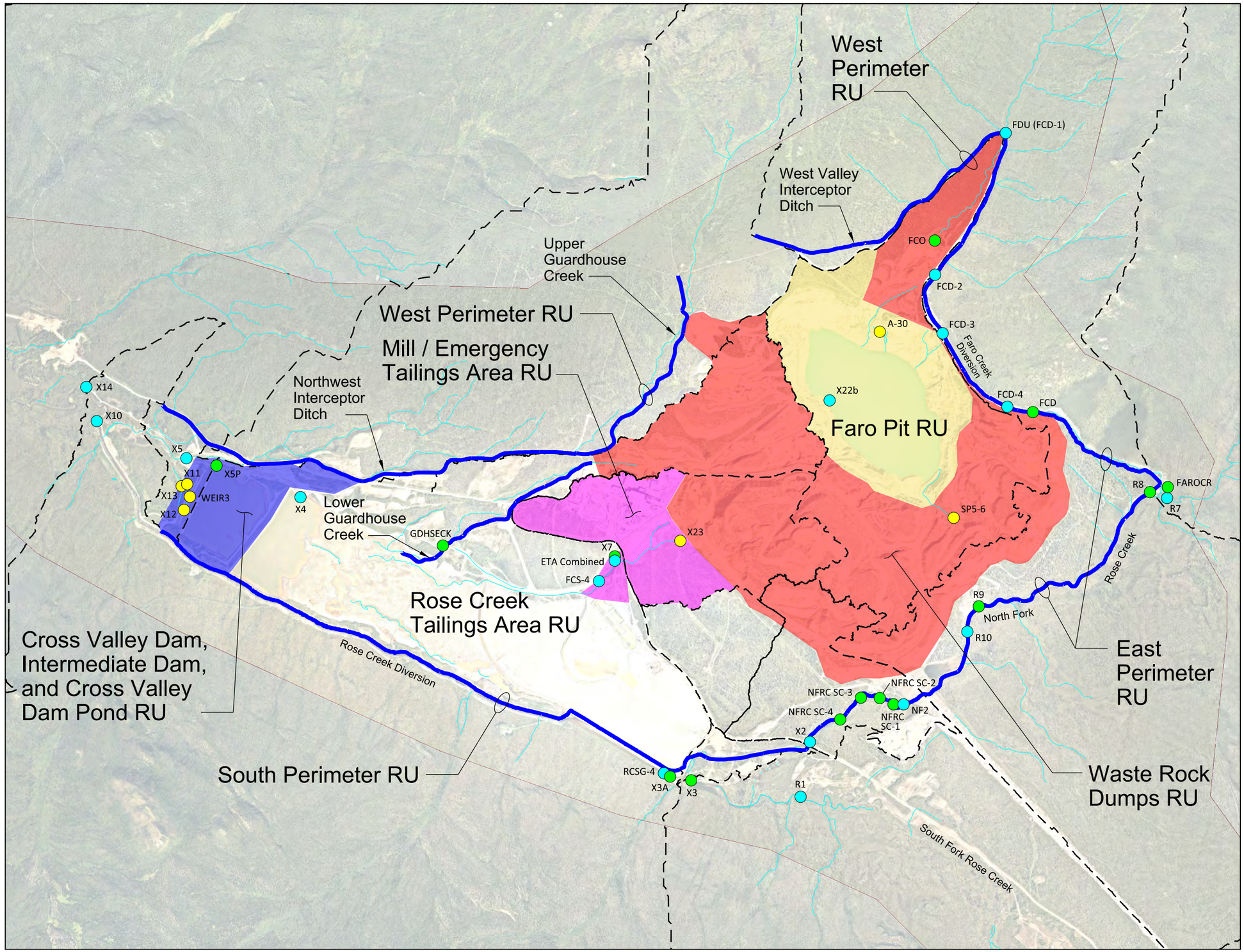
Reclamation Unit	Station Name	Station Details		Available 2014 and 2015 Data	
		Type of Flow	Type of Station	Spot Flow	Continuous Water Level
West Perimeter	X5	surface water	continuous water level	2014, 2015	None
East Perimeter	FDU (FCD-1)	surface water	continuous water level	2014, 2015	2014, 2015
East Perimeter	FCD-2	surface water	continuous water level	None	None
East Perimeter	FCD-3	surface water	continuous water level	2015	None
East Perimeter	FCD-4	surface water	continuous water level	2015	None
East Perimeter	FCD	surface water	spot flow	None	N/A
East Perimeter	FAROCR	surface water	spot flow	2014, 2015	N/A
East Perimeter	R7	surface water	continuous water level	2014, 2015	2014, 2015
East Perimeter	R8	surface water	spot flow	None	N/A
East Perimeter	R9	surface water	spot flow	None	N/A
East Perimeter	R10	surface water	continuous water level	2014, 2015	None
East Perimeter	NF2	surface water	continuous water level	2014, 2015	2014, 2015
East Perimeter	NFRC-SC1	surface water	spot flow	None	N/A
East Perimeter	NFRC-SC2	surface water	spot flow	None	N/A
East Perimeter	NFRC-SC3	surface water	spot flow	None	N/A
East Perimeter	NFRC-SC4	surface water	spot flow	None	N/A
East Perimeter	X2	surface water	continuous water level	2014, 2015	2014, 2015
East Perimeter	R1	surface water	continuous water level	2014, 2015	2014, 2015
East Perimeter	X3	surface water	spot flow	2014, 2015	N/A
South Perimeter	X3A	surface water	spot flow	2014, 2015	N/A
South Perimeter	RCSG-4	surface water	continuous water level	None	None
South Perimeter	X10	surface water	continuous water level	2014, 2015	None
South Perimeter	X14	surface water	continuous water level	2014, 2015	2014, 2015
Faro Pit	X22b	surface water	continuous water level	2014, 2015	None
Faro Pit	A-30	seepage	spot flow	None	N/A
Waste Rock Dumps	FCO	surface water	spot flow	None	N/A
Waste Rock Dumps	SP5-6	seepage	spot flow	2014, 2015	N/A
Mill Buildings Area and ETA	X7	surface water	spot flow	2014, 2015	N/A
Mill Buildings Area and ETA	FCS-4	surface water	continuous water level	2014, 2015	None
Mill Buildings Area and ETA	ETA Combined	surface water	continuous water level	2014, 2015	None
Mill Buildings Area and ETA	X23	seepage	continuous water level	2014	None
Rose Creek Tailings Area	GDHSECK	surface water	spot flow	2014, 2015	N/A
Rose Creek Tailings Area	X4	surface water	continuous water level	2014, 2015	None
Cross Valley Dam and Intermediate Dam and Associated Ponds	X5P	surface water	spot flow	2014, 2015	N/A
Cross Valley Dam and Intermediate Dam and Associated Ponds	Weir 3	seepage	spot flow	2014	N/A
Cross Valley Dam and Intermediate Dam and Associated Ponds	X11	seepage	spot flow	2014	N/A
Cross Valley Dam and Intermediate Dam and Associated Ponds	X12	seepage	spot flow	2014	N/A
Cross Valley Dam and Intermediate Dam and Associated Ponds	X13	seepage	spot flow	2014	N/A

Notes:

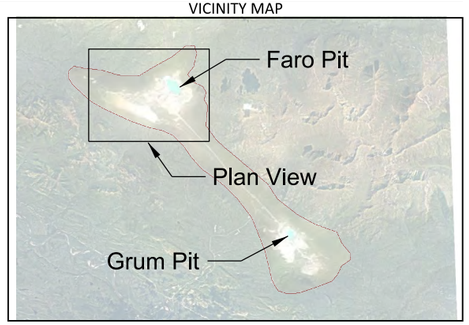
ETA = Emergency Tailings Area

N/A = not applicable

Figures



VICINITY MAP



LEGEND

- Main Faro Mine Site Watercourse
- Surface Water Catchment Boundaries
- Tributary Faro Site Watercourse
- Continuous Water Level Station
- Spot Flow Station
- Seep Monitoring Station
- FCD — Faro Creek Diversion
- NFRC — North Fork Rose Creek
- ETA — Emergency Tailings Area

Notes:

1. RU boundaries shown are approximate and are intended to delineate areas of similar waste materials and to provide a visual concept of "clean" boundary conditions (i.e. perimeter streams) with contaminated source materials contained within.
2. The areas west and east of the Mill/ETA RU are not shown as individual RUs nor contained within larger adjacent RUs since major remedial activities are not anticipated within these areas (other than surface water management infastructure, grading, and perhaps revegetation). It is acknowledged the Lower Guardhouse Creek may be realigned in the future.

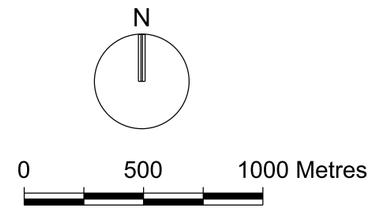
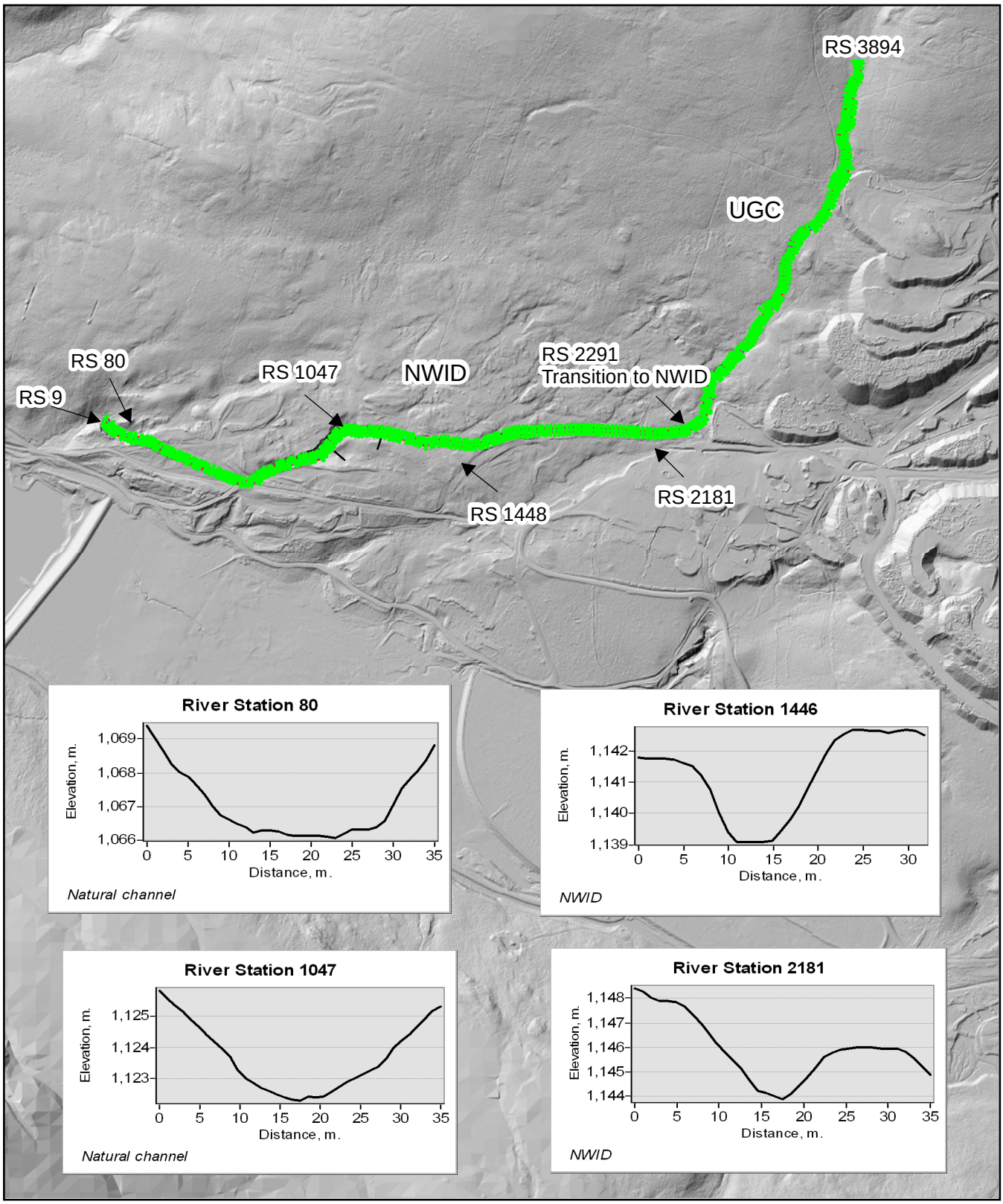


Figure 1-1
Surface Water and Seepage Monitoring Stations by Remediation Unit
Faro Mine Remediation Project



Notes:
HEC–RAS = Hydrologic Engineering Center – River Analysis System (U.S. Army Corps of Engineers)
m = metre
NWID = North Wall Interceptor Ditch
RS = river station
UGC = Upper Guardhouse Creek

LEGEND
RAS Cross Sections
RAS Centerline

North

0 300 600
Approximate scale in metres

FIGURE 2-1
HEC-RAS Model Plan View of Upper Guardhouse Creek and North Wall Interceptor Ditch
Faro Mine Remediation Project

ch2m

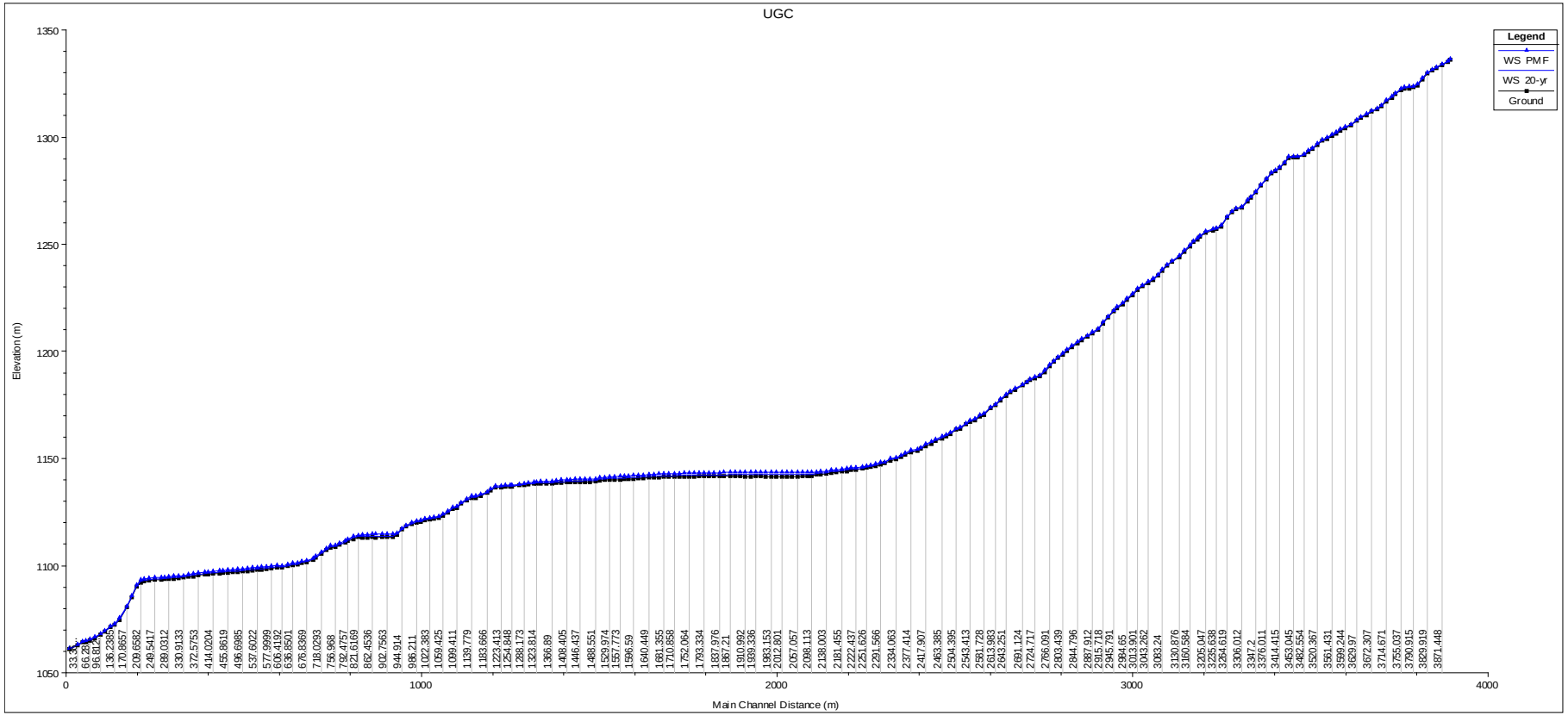


FIGURE 2-2
Longitudinal Profile of Upper Guardhouse Creek and North Wall Interceptor Ditch (Derived from HEC-RAS Model)
Faro Mine Remediation Project

Notes:
HEC–RAS = Hydrologic Engineering Center–River Analysis System (U.S. Army Corps of Engineers)
m = metre
WS = water surface
WS PMF = water surface probable maximum flood

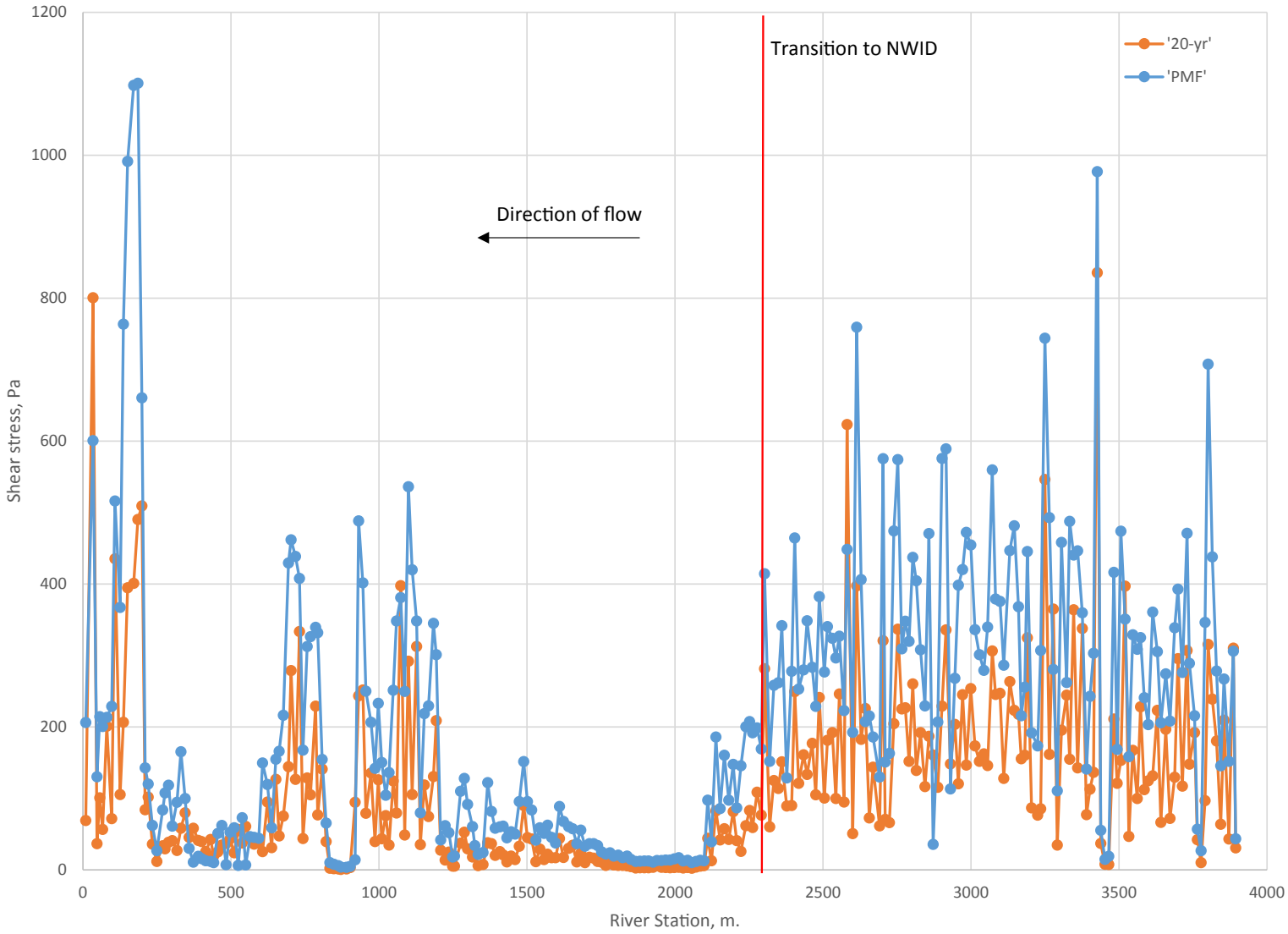


FIGURE 2-3
Upper Guardhouse Creek and North Wall Interceptor Ditch Shear Stress versus HEC-RAS River Stationing
Faro Mine Remediation Project

Notes:
HEC–RAS = Hydrologic Engineering Center–River Analysis System (U.S. Army Corps of Engineers)
m = metre
NWID = North Wall Interceptor Ditch
Pa = pascal
PMF = probable maximum flood

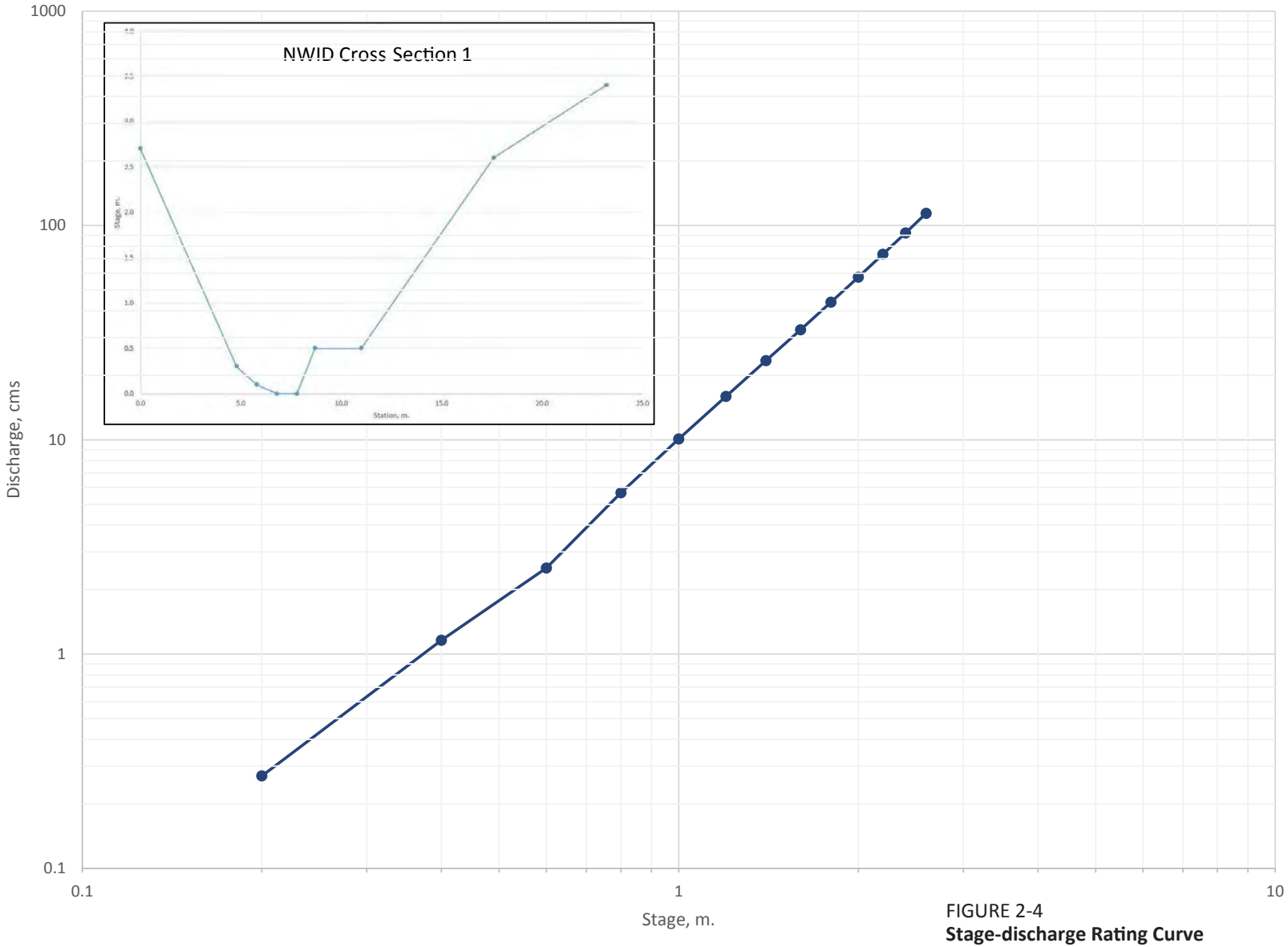


FIGURE 2-4
Stage-discharge Rating Curve
for North Wall Interceptor Ditch Cross Section 1
Faro Mine Remediation Project

Notes:
cms = cubic metres per second
m = metre
NWID = North Wall Interceptor Ditch

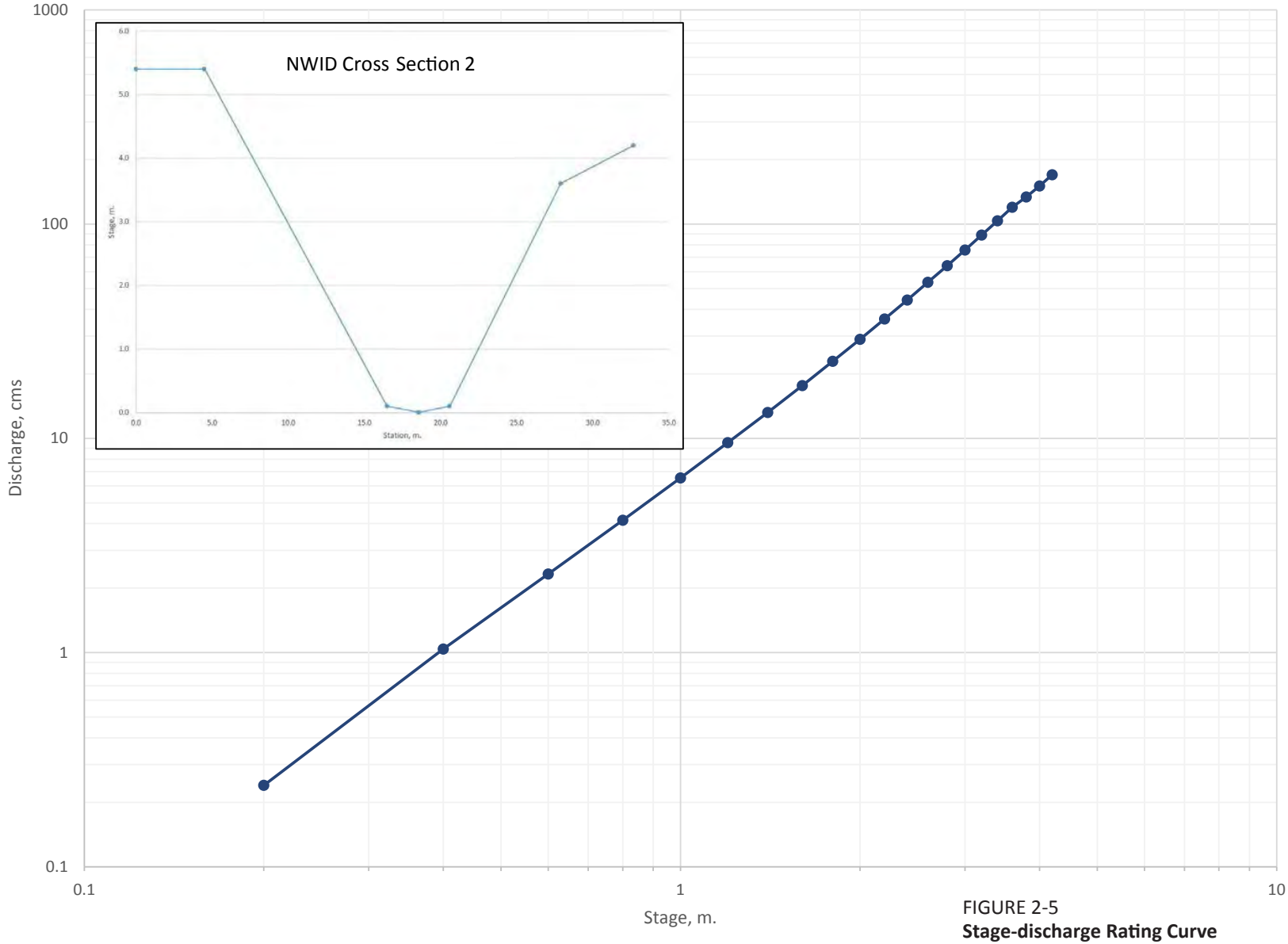


FIGURE 2-5
Stage-discharge Rating Curve
for North Wall Interceptor Ditch Cross Section 2
Faro Mine Remediation Project

Notes:
cms = cubic metres per second
m = metre
NWID = North Wall Interceptor Ditch

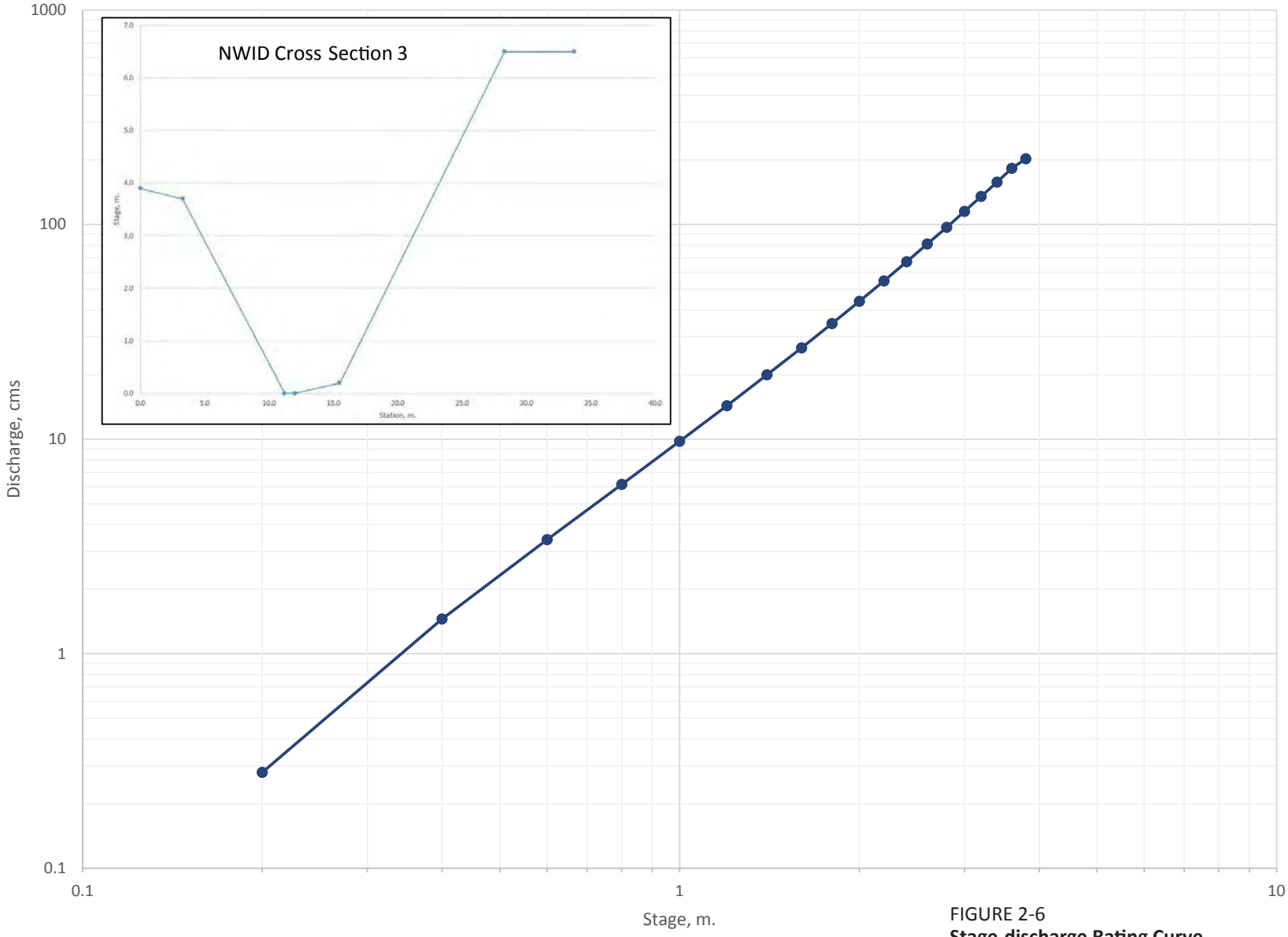


FIGURE 2-6
Stage-discharge Rating Curve
for North Wall Interceptor Ditch Cross Section 3
Faro Mine Remediation Project

Notes:
cms = cubic metres per second
m = metre
NWID = North Wall Interceptor Ditch

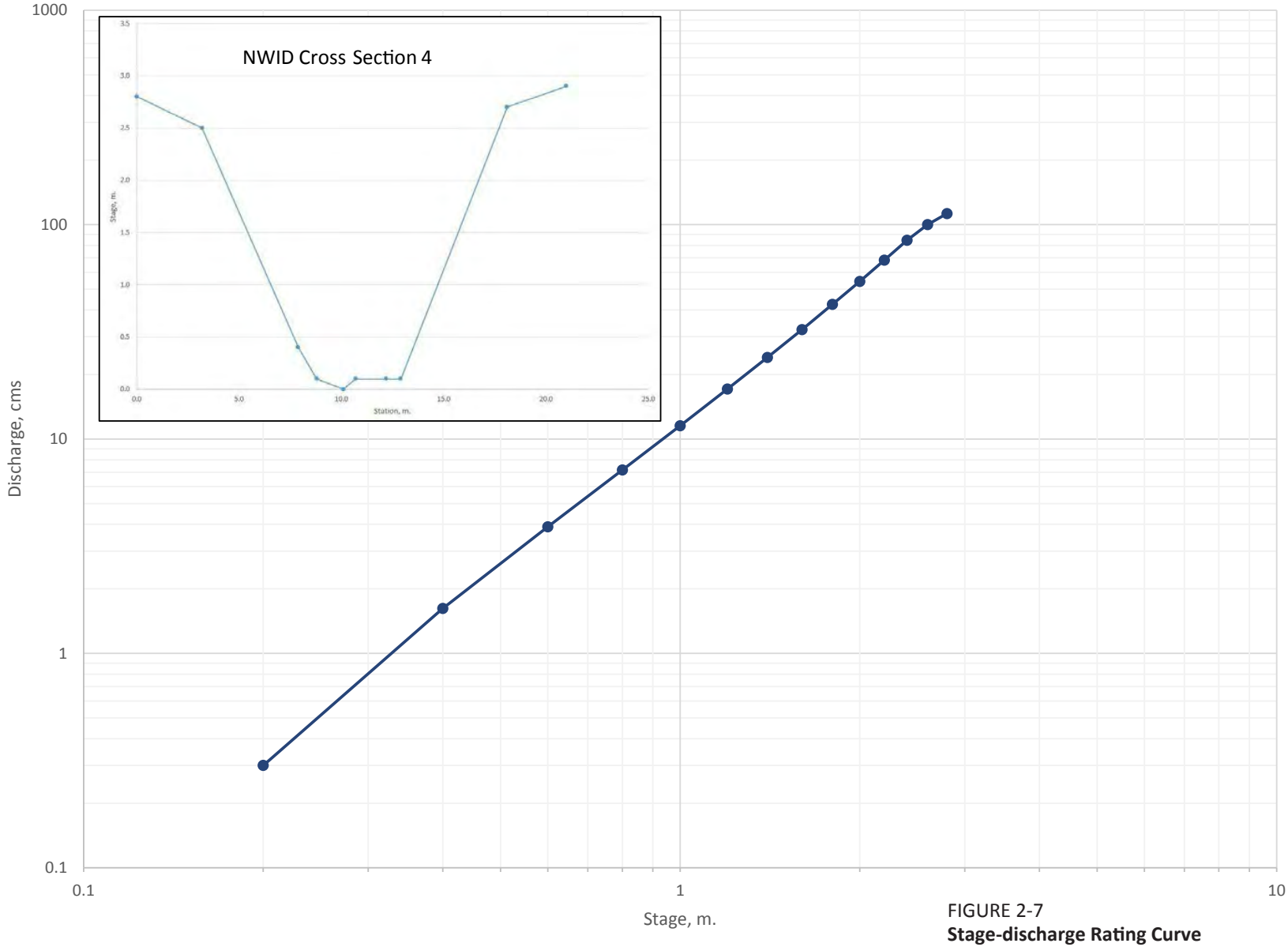


FIGURE 2-7
Stage-discharge Rating Curve
for North Wall Interceptor Ditch Cross Section 4
Faro Mine Remediation Project

Notes:
cms = cubic metres per second
m = metre
NWID = North Wall Interceptor Ditch

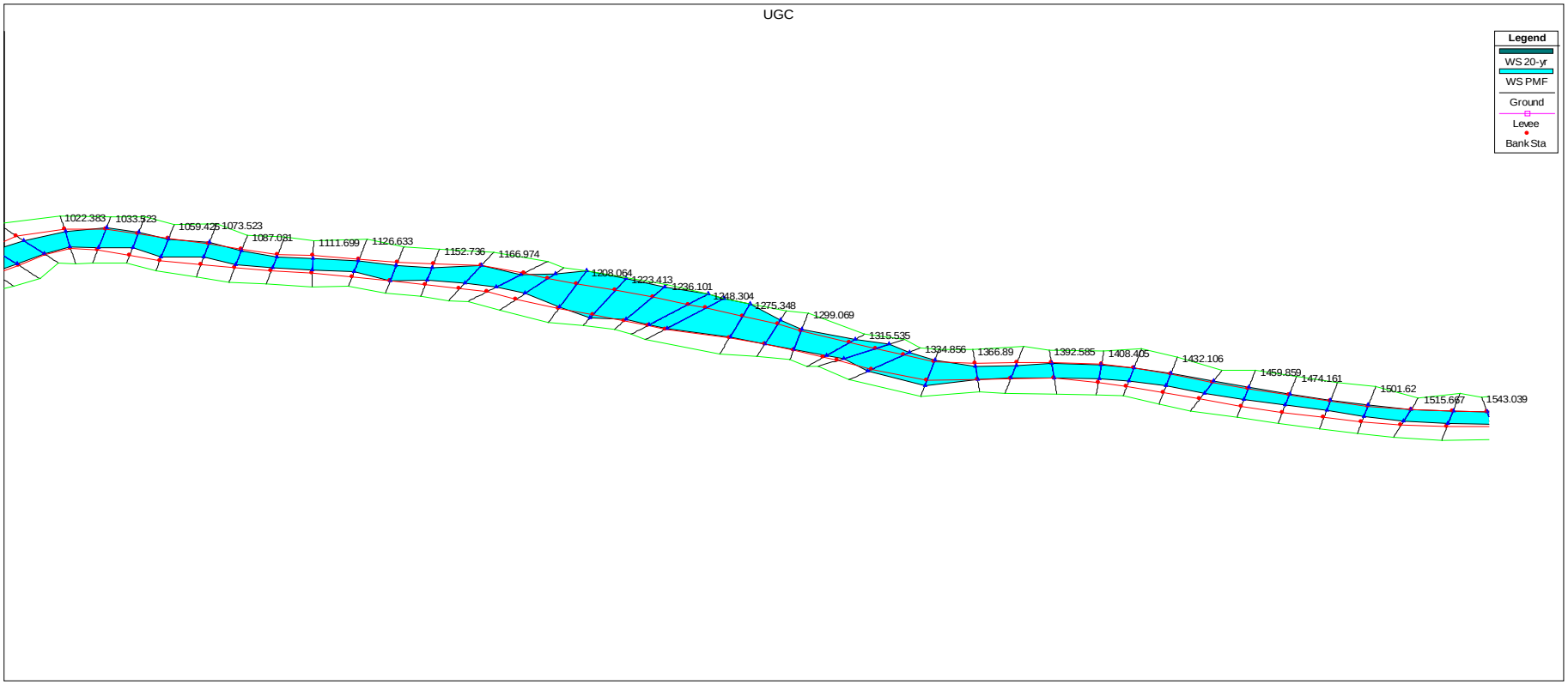
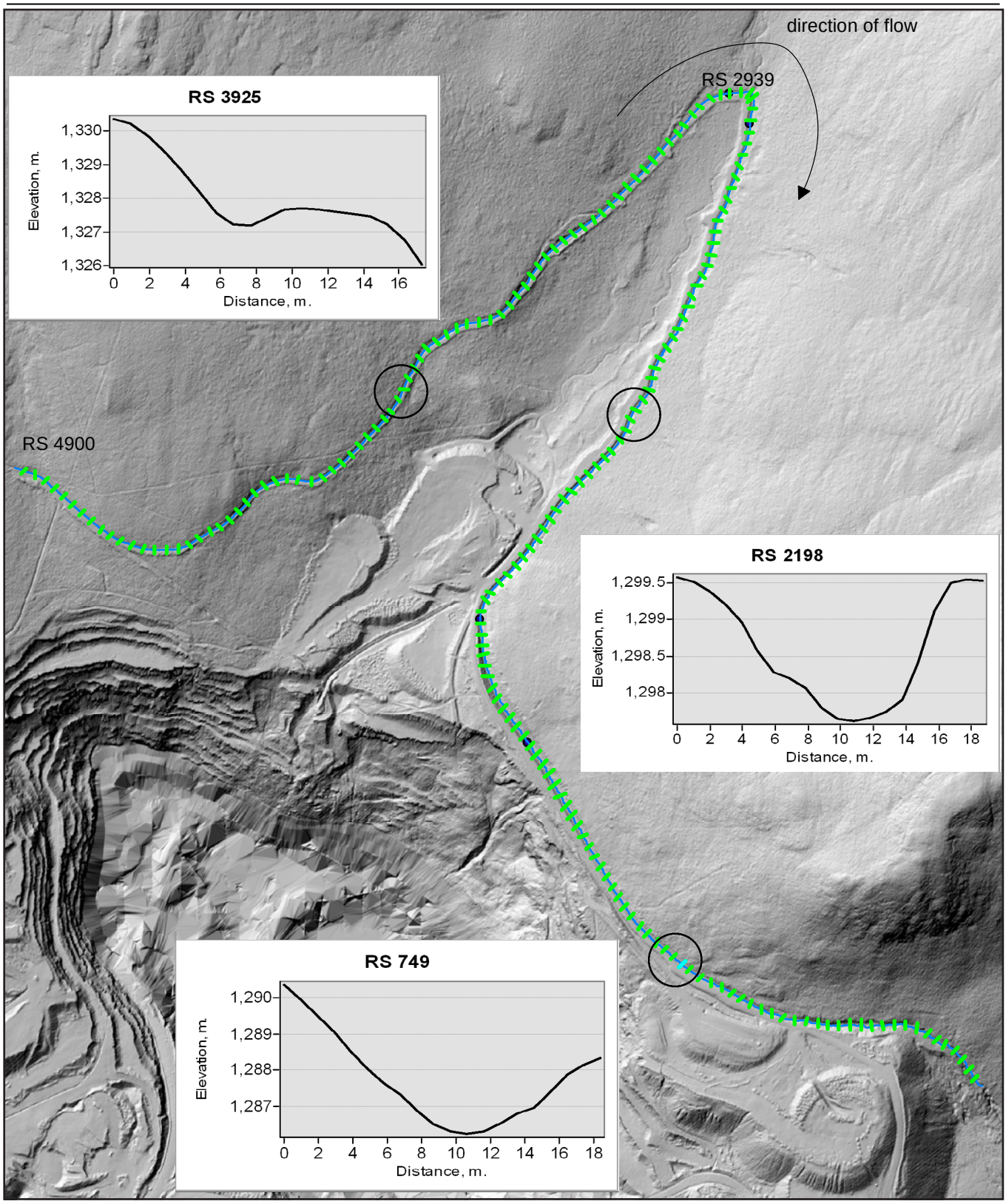


FIGURE 2-8
Extent of Inundation at Probable Maximum Flood (North Wall Interceptor Ditch)
Faro Mine Remediation Project

Notes:
UGC = Upper Guardhouse Creek
WS = water surface
WS PMF = water surface probable maximum flood



LEGEND

RAS Cross Sections

RAS Centerline

North

0 200 400

Approximate scale in metres

FIGURE 2-9

HEC-RAS Model Plan View of West Valley Interceptor Ditch and Faro Creek Diversion

Faro Mine Remediation Project

Notes:

HEC–RAS = Hydrologic Engineering Center–River Analysis System (U.S. Army Corps of Engineers)

m = metre RAS = rock armoured RS = River Station

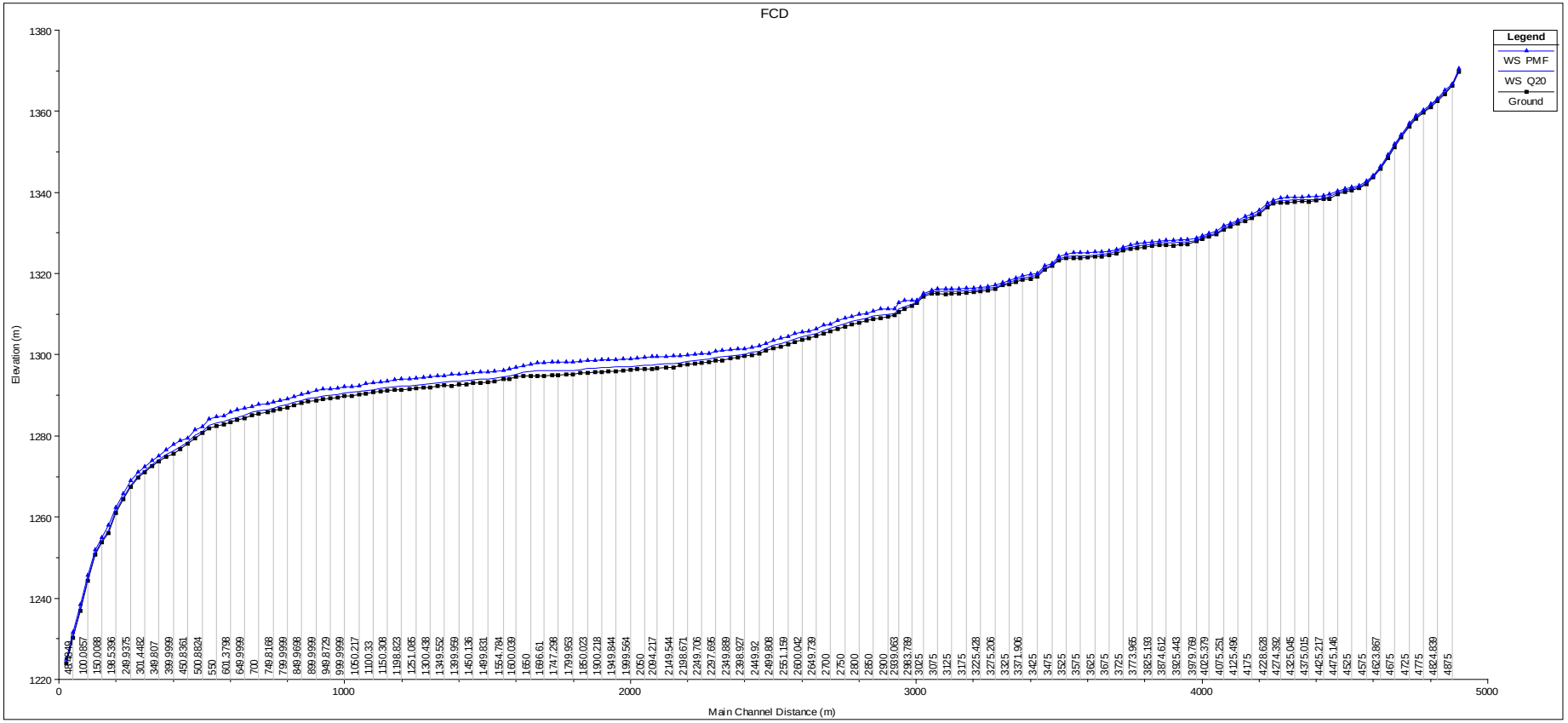


FIGURE 2-10
Longitudinal Profile of West Valley Interceptor Ditch and Faro Creek Diversion (Derived from HEC-RAS Model)
Faro Mine Remediation Project

Notes:
m = metre
WS = water surface
WS PMF = water surface probable maximum flood

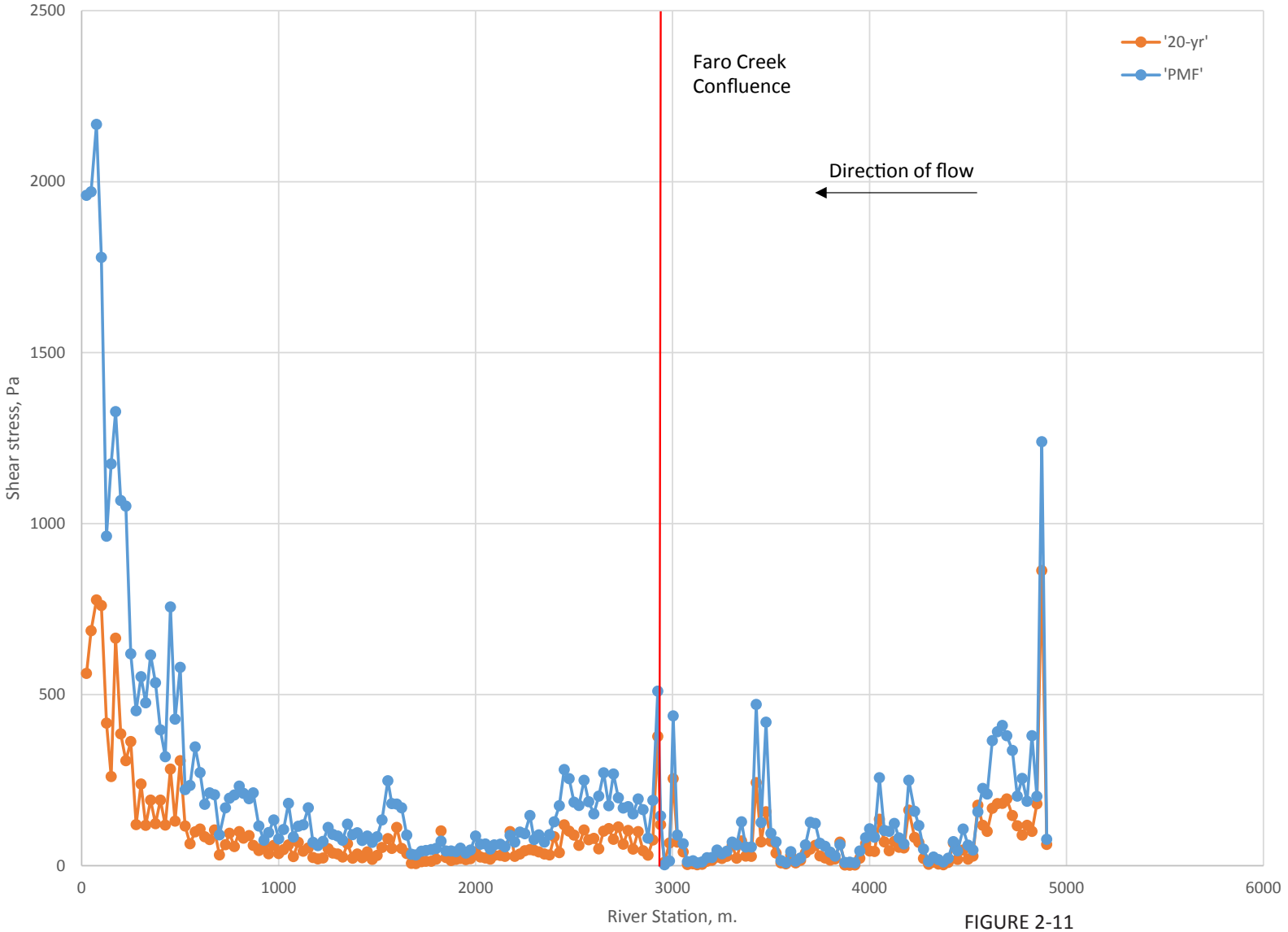


FIGURE 2-11
West Valley Interceptor Ditch and Faro Creek Diversion Shear Stress versus HEC-RAS River Stationing
Faro Mine Remediation Project

Notes:
HEC–RAS = Hydrologic Engineering Center–River Analysis System (U.S. Army Corps of Engineers)
Pa = pascal
yr = year
m = metre
PMF = probable maximum flood

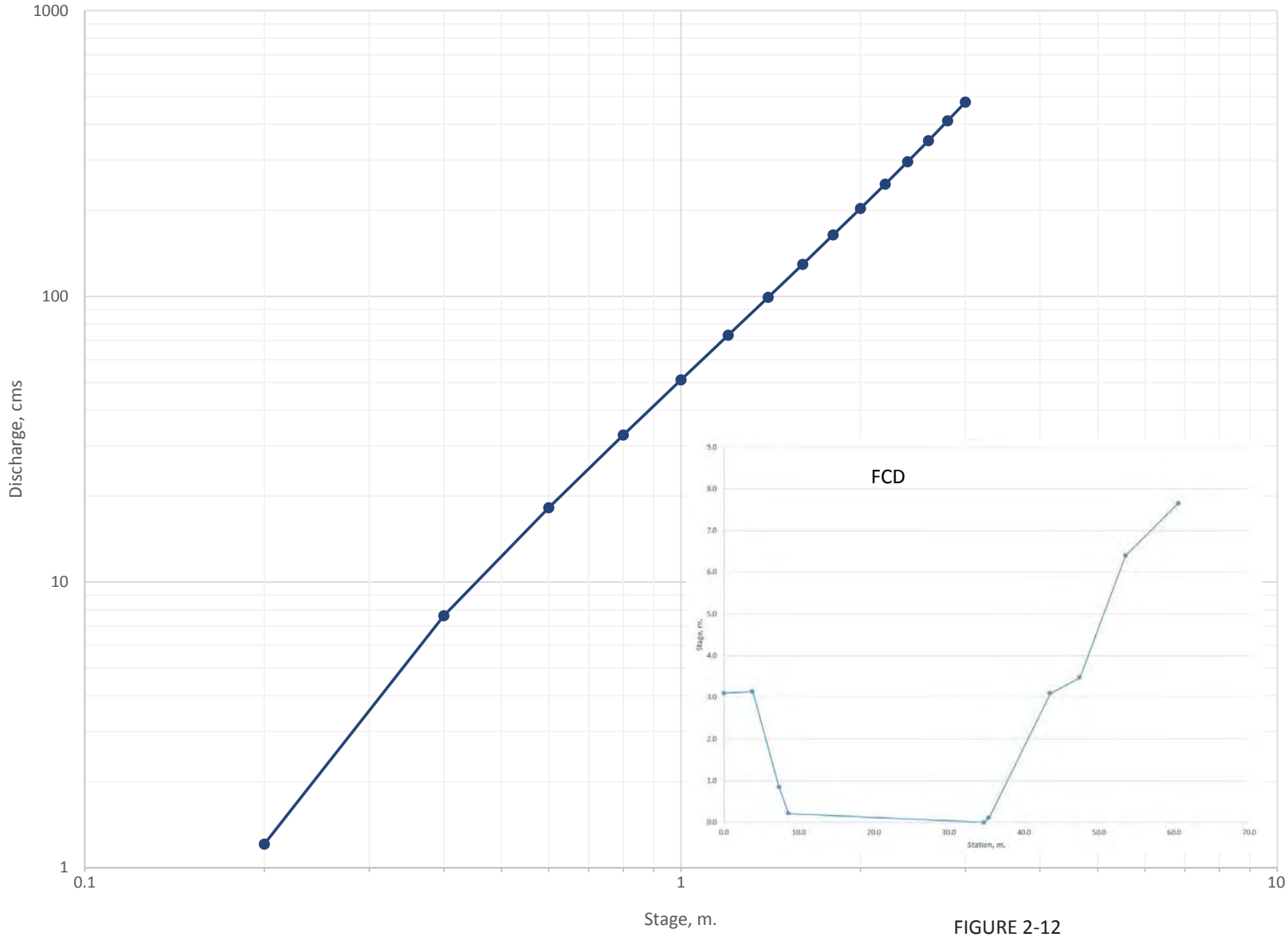


FIGURE 2-12
Stage-discharge Rating Curve
for Faro Creek Diversion Cross Section 3
Faro Mine Remediation Project

Notes:
cms = cubic metres per second
FCD = Faro Creek Diversion
m = metre

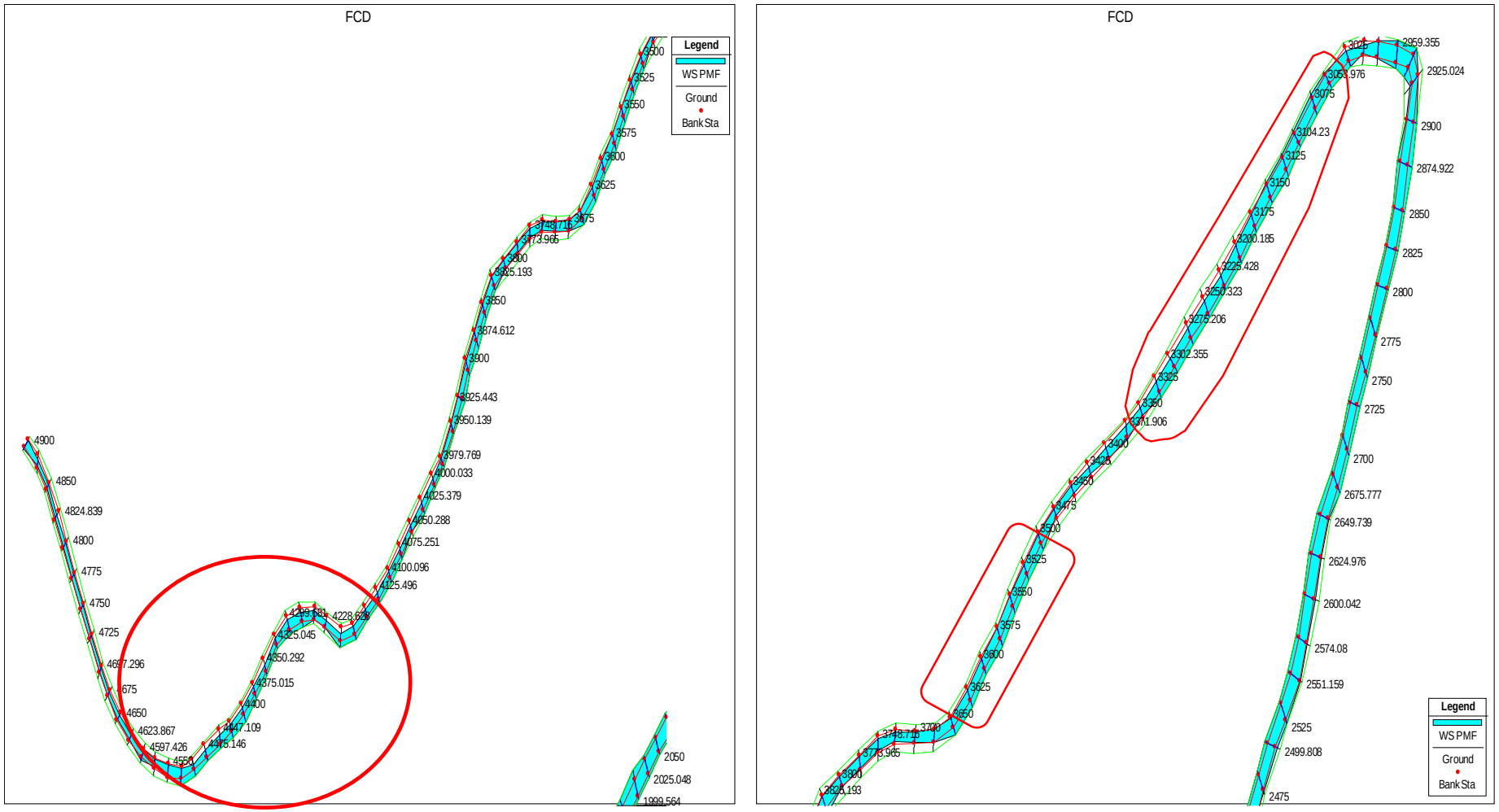
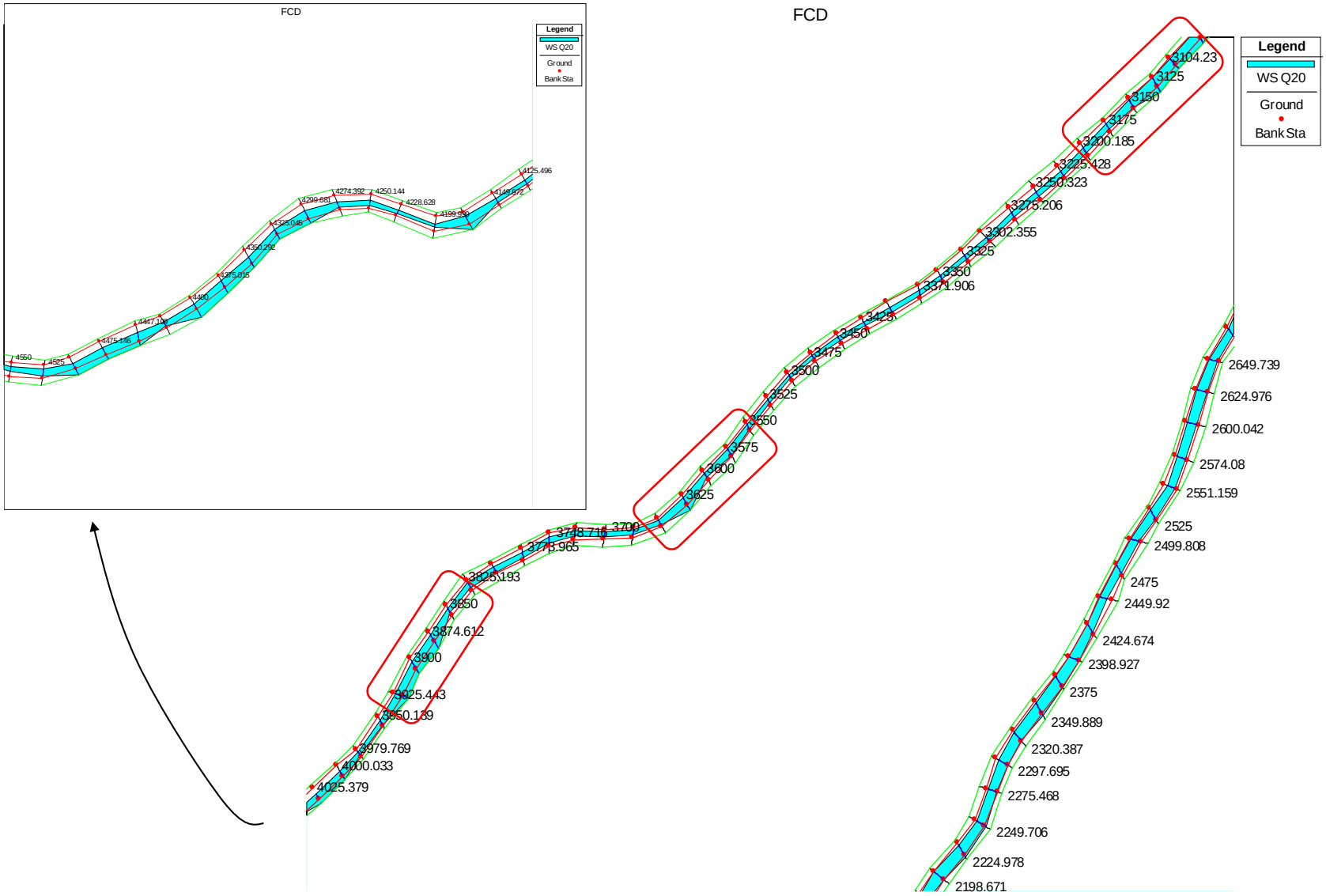
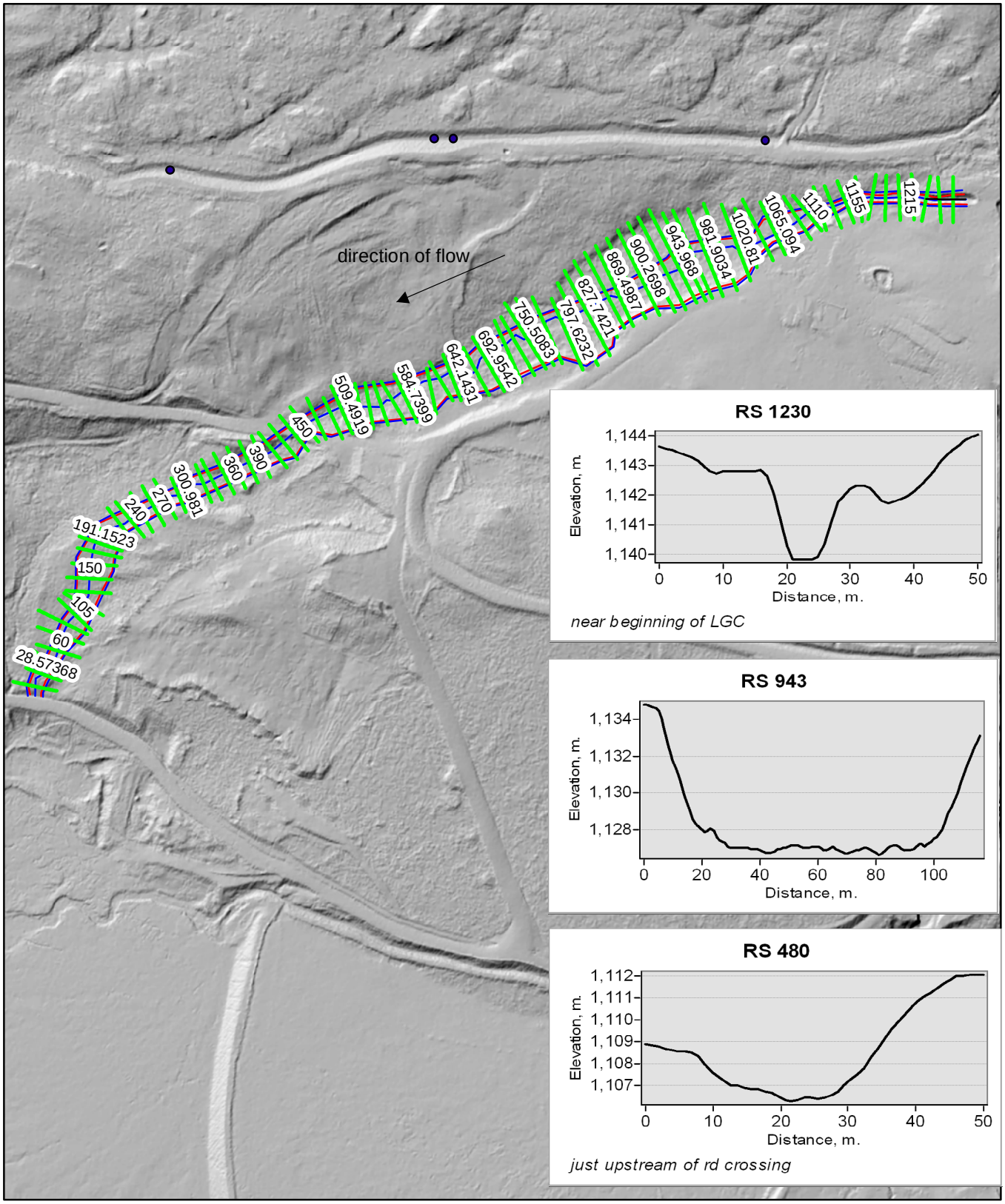


FIGURE 2-13
Extent of Inundation at Probable Maximum Flood (West Valley Interceptor Ditch)
Faro Mine Remediation Project

Notes:
FCD = Faro Creek Diversion
WS PMF = water surface probable maximum flood


FCD
Legend
WS Q20
Ground
Bank Sta
4550
4625
4700
4775
4850
4925
5000
5075
5150
5225
5300
5375
5450
5525
5600
5675
5750
5825
5900
5975
6050
6125
6200
6275
6350
6425
6500
6575
6650
6725
6800
6875
6950
7025
7100
7175
7250
7325
7400
7475



Notes:
HEC–RAS = Hydrologic Engineering Center – River Analysis System (U.S. Army Corps of Engineers)
LGC = Little Guardhouse Creek
m = metre
RAS = rock armoured
rd = railroad

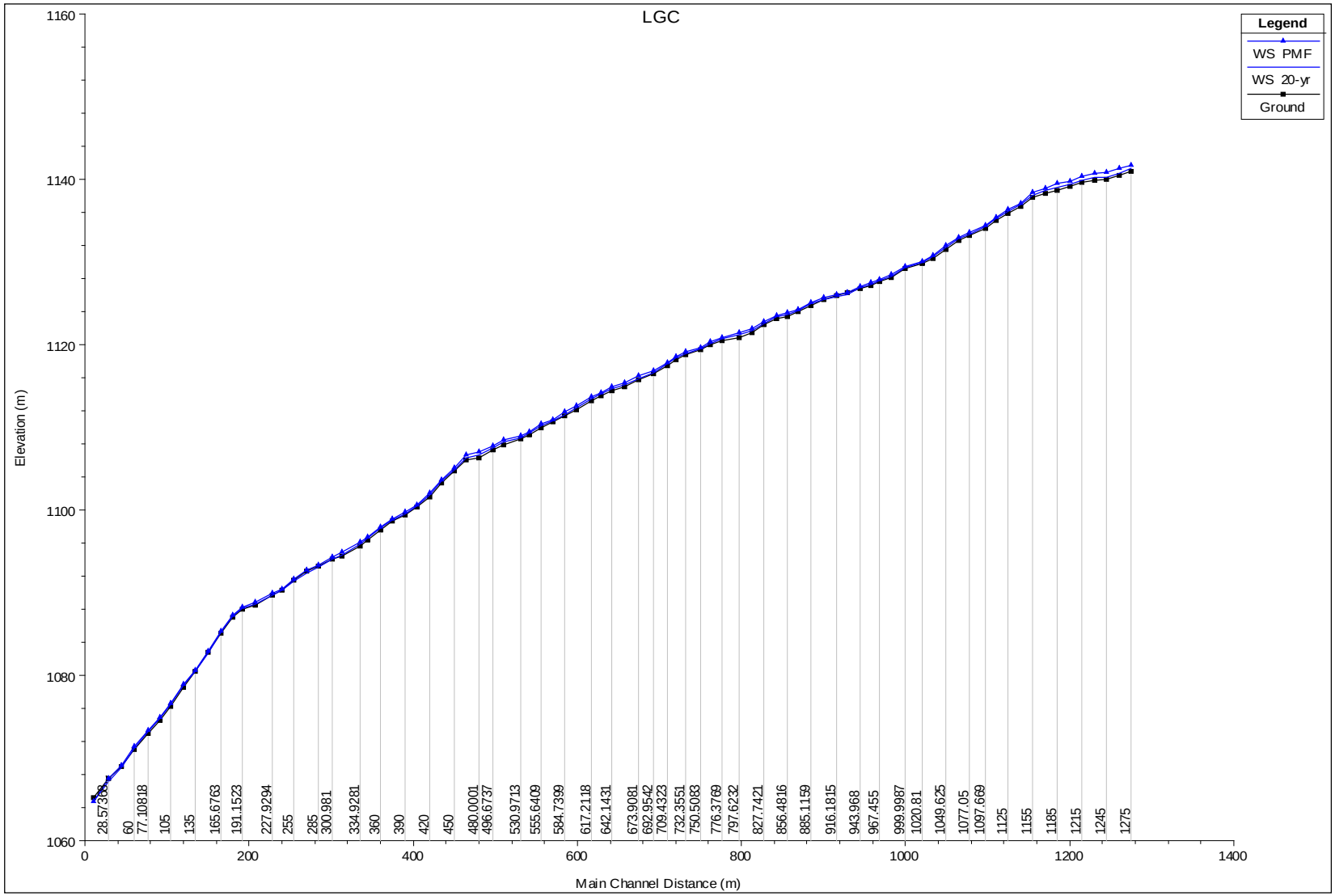
LEGEND
RAS Cross Sections
RAS Centerline

North

0 100 200
Approximate scale in metres

FIGURE 6-1
HEC-RAS Model Plan View of Lower Guardhouse Creek
Faro Mine Remediation Project

ch2m



Notes:
HEC–RAS = Hydrologic Engineering Center – River Analysis System (U.S. Army Corps of Engineers)
LGC = Little Guardhouse Creek
m = metre
WS = water surface
WS PMF = water surface probable maximum flood

FIGURE 6-2
Longitudinal Profile of Lower Guardhouse Creek (Derived from HEC-RAS Model)
Faro Mine Remediation Project

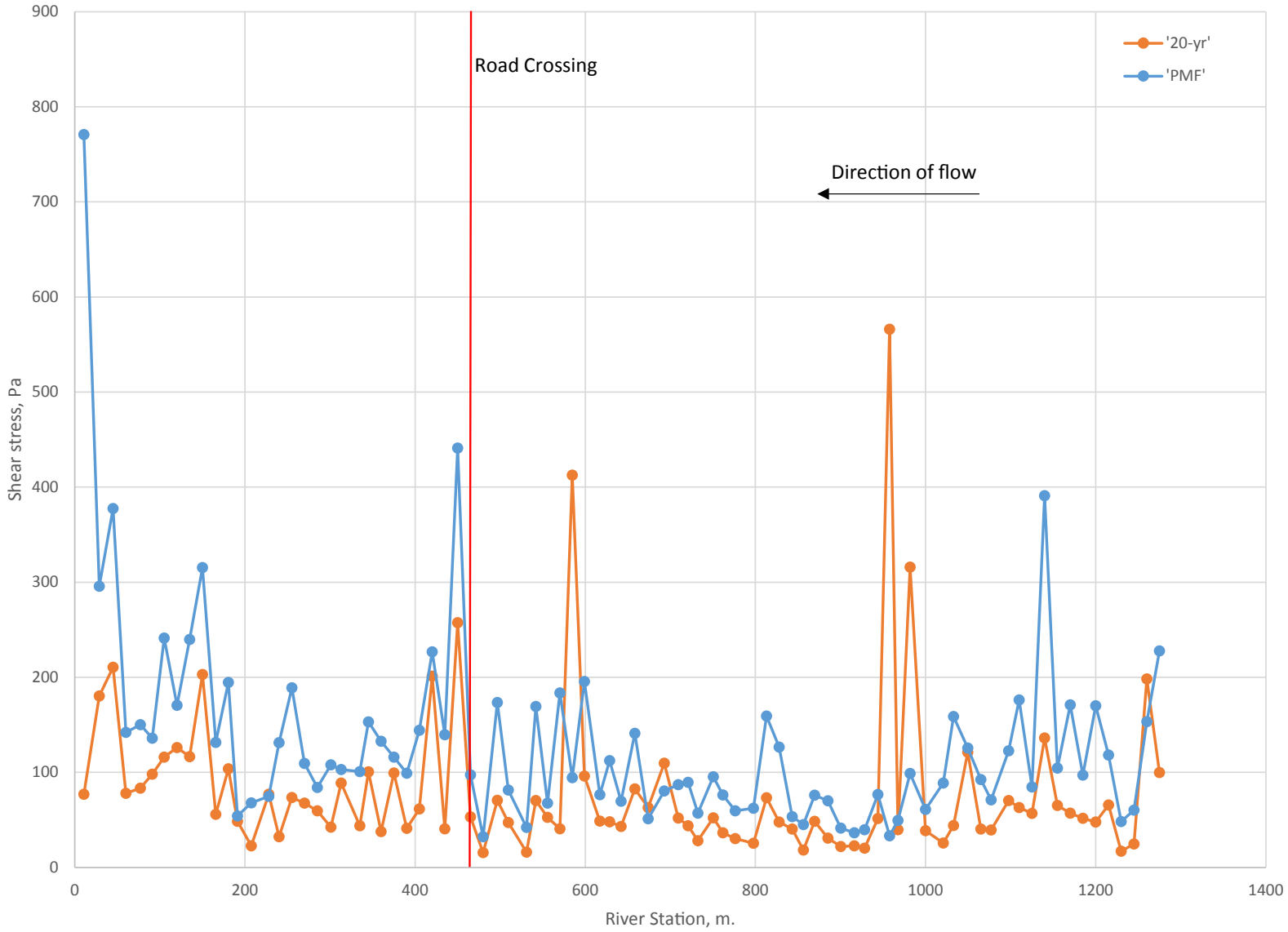


FIGURE 6-3
Lower Guardhouse Creek Shear Stress versus HEC-RAS River Stationing
Faro Mine Remediation Project

Notes:
HEC–RAS = Hydrologic Engineering Center – River Analysis System (U.S. Army Corps of Engineers)
m = metre
PA = pascal
PMF = probable maximum flood
yr = year

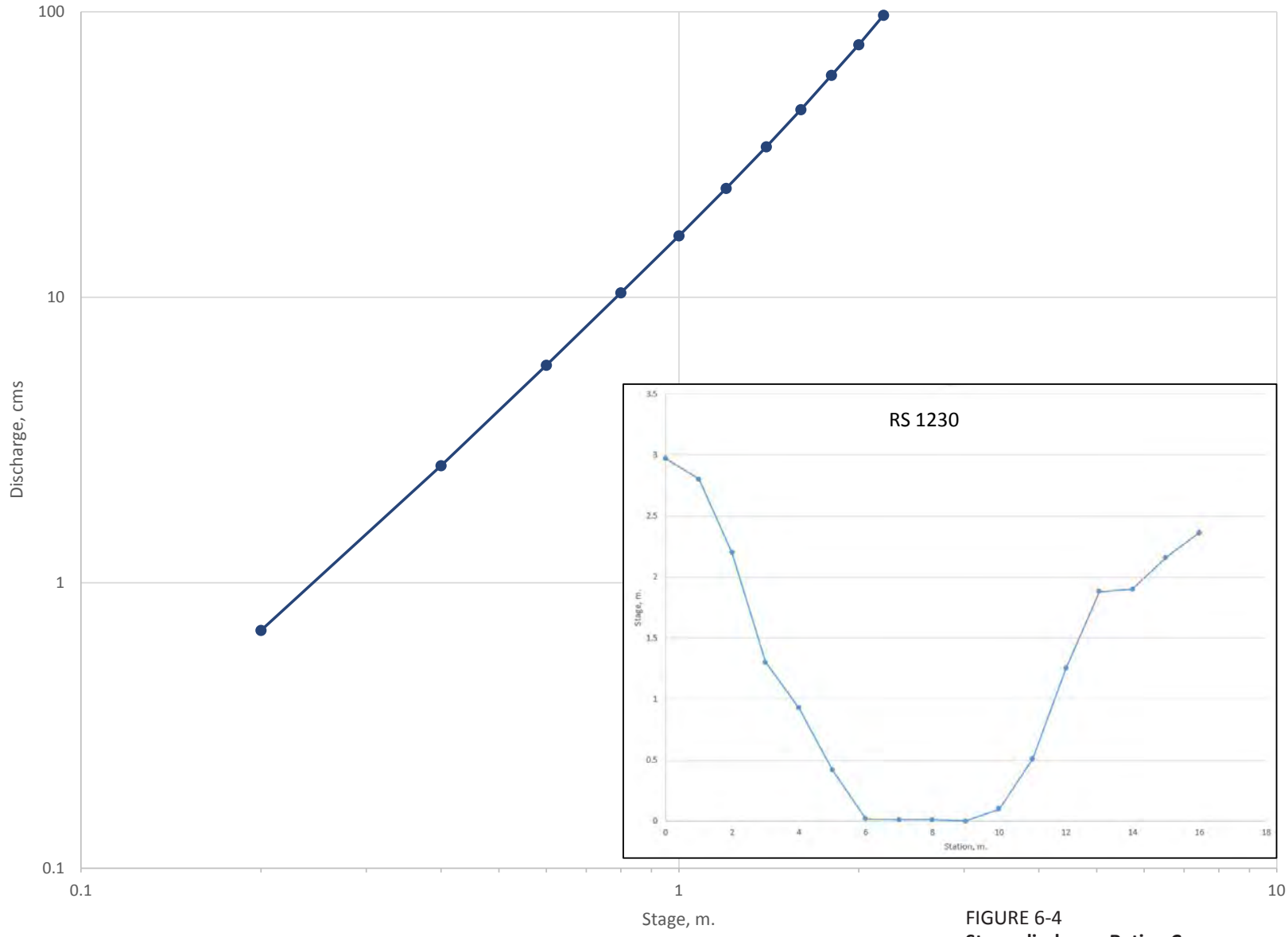


FIGURE 6-4
Stage-discharge Rating Curve
for Lower Guardhouse Creek River Station 1230
Faro Mine Remediation Project

Notes:
cms = cubic metres per second
m = metre
RS = river station

Appendix F
Geotechnical Data Analysis Report

REPORT

Geotechnical Analysis of 2014 to 2016 Field Data, Faro Mine Remediation Project

Prepared for

Government of Yukon and the Government of Canada as represented by Indigenous and Northern Affairs Canada

August 2016

CH2M HILL, Canada Limited
309 Strickland Street
Suite 301
Whitehorse, Yukon Y1A 2J9

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5-1 Stage-storage Relationship for the Cross Valley Dam Pond

Acronyms and Abbreviations

BGC	BGC Engineering Inc.
CDRM	Comprehensive Design Road Map
CDRMR	Comprehensive Design Road Map Report
CH2M	CH2M HILL Canada Limited
cm/sec	centimetre(s) per second
ConeTec	ConeTec Investigations Ltd.
CPT	cone penetration test
CVD	Cross Valley Dam
ETA	Emergency Tailings Area
FCD	Faro Creek Diversion
FMC	Faro Mine Complex
H	horizontal
ID	Intermediate Dam
km	kilometre(s)
m	metre(s)
m/s	metre per second
m^3	cubic metre(s)
mbgs	metre(s) below ground surface
mm	millimetre(s)
MPa	mega Pascal
NFRC	North Fork Rose Creek
NWID	North Wall Interceptor Ditch
ODEX	Overburden Drilling Excentric
PMF	probable maximum flood
PPD	pore pressure dissipation
ppm	part(s) per million
RCD	Rose Creek Diversion
RCTA	Rose Creek Tailings Area
RU	remediation unit
sCPT	seismic cone penetration test
SIS	Seepage Interception System
SPT	Standard Penetration Test
SRK	SRK Consulting Canada Inc.

UGC	Upper Guardhouse Creek
V	vertical
WRD	waste rock dump
WVID	West Valley Interceptor Ditch
YG	Government of Yukon

SECTION 1

Introduction

1.1 Purpose

Between 2012 and 2016, CH2M HILL Canada Limited (CH2M) completed five field seasons at the Faro Mine Complex (FMC), during which subsurface geotechnical investigations were conducted in various areas of the mine where remediation work is planned. The field work has been performed to provide geotechnical criteria and data to support design and selection of various remediation alternatives for the affected mine areas. Work has included geotechnical investigations with borings, test pits, geophysical surveys, and reconnaissance. These field activities are summarized by time, location, and activity in Appendix C of the Comprehensive Design Road Map (CDRM) Report (CDRMR). Data gathered from the 2014 through 2016 field programs were presented in field investigation summary reports, but the data were not evaluated or interpreted. This report summarizes geotechnical evaluations of the data collected from these recent field programs.

1.2 Scope of Work

In 2015 and 2016, a series of data reports were submitted to the Government of Yukon (YG) to (1) describe the field investigation activities that were completed during the 2014 through 2016 field seasons and (2) provide a summary of the geotechnical data collected by CH2M. These data reports are listed below and provide the basis for the geotechnical evaluations summarized in this document.

- Summary of 2014 Field Investigation – North Wall Interceptor Ditch and Upper Guardhouse Creek (CH2M, March 2015j)
- Summary of 2014 Field Investigation – Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch (CH2M, March 2015i).
- Summary of 2014 Field Investigation – Lower Guardhouse Creek Interception (CH2M, March 2015k)
- Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tailings Area (CH2M, March 2015m)
- Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area (CH2M, March 2015n)
- Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area (CH2M, March 2015x).
- Summary of 2014 Field Investigation – Construct New Overflow Weir technical memorandum (CH2M, March 2015cc)
- Summary of 2014 Field Investigation – Erosion Dissipation Structure technical memorandum (CH2M, March 2015bb).
- Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike (CH2M, March 2015z)
- Summary of 2014 Field Investigation – Construct Intermediate Dam Spillway technical memorandum (CH2M, March 2015aa)
- Cross Valley Dam Seepage Interception System Test Pit Data Summary (CH2M, January 2015b)
  - Summary of 2015 Field Investigation – Faro Valley Seepage Investigation (CH2M, April 2016f)

  - Summary of 2016 Field Investigation – Faro Creek Diversion Proposed Realignment (CH2M, August 2016b)
  - Summary of FY 2015 and 2016 Field Investigations – CVD and ID Pond Field Data Report (CH2M, August 2016c)

The FMC consists of three main areas, as described in the CDRMR: the Faro Mine Area, the Rose Creek Tailings Area (RCTA), and the Vangorda/Grum Area. To facilitate the analysis of potential remedial alternatives at appropriate spatial scales, the Faro Mine Area is subdivided into smaller remediation units (RUs) based on location and similar characteristics. These RUs are shown on Figure 1-5 of the CDRMR. The interpretation of data in this report includes data collected from geotechnical investigations performed in the following RUs:

- Perimeter (i.e., freshwater diversions, subdivided into west, east, and south)
- Mill Building Area and Emergency Tailings Area (ETA)
- Rose Creek Tailings Area
- Cross Valley Dam (CVD) and Intermediate Dam (ID) and Associated Ponds (Dams and CVD Pond)

Geotechnical investigations performed in other areas are being, or have already been, reported in separate geotechnical reports, including work performed at the following locations:

- RUs
  - Waste dumps (referred to as the Waste Rock Dump [WRD] RU)
  - Faro Pit
  - North Fork Rose Creek (NFRC), a component of the east Perimeter RU
- Non-RU areas
  - Borrow Sources
  - Vangorda/Grum Area

SECTION 2

Perimeter Units

2.1 Geotechnical Investigation Activities

2.1.1 West Perimeter Remediation Unit

CH2M conducted field investigations in the West Perimeter RU in the summer of 2014 and 2015. These field investigations included test pits, geologic reconnaissance activities, and rapid geomorphic assessments of the Upper Guardhouse Creek (UGC) and North Wall Interceptor Ditch (NWID) alignments to evaluate the constructability of proposed improvements to the NWID and UGC. The locations of the field test pits, and the NWID and UGC, are shown in Figure 2-1. The results and details of the field investigations are compiled in the *Summary of 2014 Field Investigation – North Wall Interceptor Ditch and Upper Guardhouse Creek* (CH2M, March 2015j). An analysis of the rapid geomorphic assessments is provided in the hydrology appendix (Appendix E) to the CDRMR.

Five test pits (CH14-102-TP001 through CH14-102-TP005) were excavated adjacent to the NWID in 2014. These test pits were located on the southern side of the NWID to investigate the condition of the embankment and its foundation. Some test pits were advanced into the embankment fill material. Laboratory testing was performed on representative samples of subsurface materials and existing embankment fill collected from the test pits. Testing included gradation, plasticity, and moisture content.

A geologic reconnaissance was also conducted along the NWID in 2014. Geotechnical observations included identification of bedrock outcrops, classification of shallow soil materials where exposed or within hand excavations, and identification of groundwater seeps.

2.1.2 East Perimeter Remediation Unit

CH2M conducted field investigations in the East Perimeter RU in the summer of 2014 and 2015. Additional investigation work was performed during March 2016. The project features in the East Perimeter RU area are shown in Figure 2-2. The surface water flow upgradient of the Faro Pit is intercepted beginning on the western valley slope of Faro Creek in the West Valley Interceptor Ditch (WVID). The flow from WVID combines with Faro Creek and continues as the Faro Creek Diversion (FCD) along the eastern valley slope to the confluence with NFRC. Investigations have been conducted for two alternative realignments that are proposed to divert flow around a potentially unstable zone in the Faro Pit wall, namely Alternative TA-01 and Alternative TA-02, as shown in Figure 2-2. Alternative TA-01 intercepts surface flow higher up the slope from the existing diversions on the western and eastern valley slopes, and the reconstructed channel length is approximately 6 kilometres (km). Alternative TA-02 is a shorter realignment section with a reconstructed channel length of approximately 0.5 km.

In 2003, a subsurface investigation was completed by Golder Associates along a proposed full-length FCD realignment (Alternative TA-01), upslope of the existing FCD. On the western side of Faro Valley, 16 test pits were excavated using an excavator along the proposed alignment up to a maximum depth of 5.1 m. On the eastern side of Faro Valley, 15 test pits were excavated on the slope up to a depth of 3.2 m. Two of the test pits were in the vicinity of the proposed Alternative TA-02 localized FCD realignment, but were further than 70 m upslope from the proposed realignment. The results of this investigation are presented in the *Detailed Comparison of Alternatives for the Relocation of the Faro Creek Diversion* (Golder, February 2004).

During the 2014 field season, CH2M conducted bed and bank material characterization along the existing FCD and WVID. This characterization included documentation of observations and pictures of

the conditions along diversion channels. CH2M also conducted a geologic reconnaissance along the proposed alternative TA-01 FCD realignment. Geotechnical and geological observations were compiled for these features, which included identification of bedrock outcrops, classification of shallow soil materials where exposed or within shallow test pits excavated by hand, identification of groundwater seeps, and other conditions. The results and details of the 2014 field investigations are compiled in the *Summary of 2014 Field Investigation – Faro Creek Diversion East Valley and Faro Creek Diversion West Valley Interceptor Ditch* (CH2M, March 2015i). A rapid geomorphic assessment of the FCD was also conducted, and is evaluated in the hydrology appendix (Appendix E) to the CDRMR.

Additional work around the FCD was conducted during 2015 and 2016. These investigations included:

- Geophysical surveys along 21 transects crossing perpendicular to the existing WVID and FCD and the proposed realignments, completed in October 2015
- Five exploration boreholes adjacent to the existing FCD and the proposed FCD realignment alternative TA-02, completed in March 2016, and
- A seepage investigation along the existing alignment that included installation of three well clusters on both sides of the Faro Creek valley, and at the confluence of Faro Creek and the existing FCD, completed in November 2015.

Exploration locations are shown in Figure 2-2. The results of the geophysical surveys are included in the *Multi-electrode Resistivity, Seismic Refraction, and Multi-Spectral Analysis of Surface Waves Surveys* report (Frontier, 2016). Details of the investigation and the data collected from the exploration boreholes along the WVID and FCD are summarized in the technical memorandum *Summary of 2015-2016 Field Investigation – Faro Creek Diversion* Proposed Realignment (CH2M, August 2016c). The results of the seepage investigation are compiled in the draft memorandum *Summary of 2015 Field Investigation – Faro Valley Seepage Investigation* (CH2M, April 2016f).

The stability of the northern wall of Faro Pit as it relates to the FCD was evaluated in 2015 by BGC Engineering Inc. (BGC). The findings of this evaluation are presented in the draft report *Faro Open Pit Stability Assessment, Site-Wide Design Basis Report* (BGC, 2016). One of the borings completed in March 2016, CH16-102-BH008, was located near the northeastern Faro Pit slope and was drilled at an inclination of 53 degrees from horizontal to confirm geological interpretation that was assumed by BGC in the Faro Pit stability assessment. The angled borehole confirmed that an intensely sheared and altered zone within the quartz monzonite is confined to the Big Indian Fault Zone, and the rock mass between the fault zone and Faro Pit is of higher quality than encountered in the altered rock zone.

CH2M completed schematic design for the realignment of the NFRC in March 2016. The intent of the NFRC realigned channel project is to relocate the NFRC downstream of the confluence with the FCD to a new alignment located east of the existing NFRC channel. This design included extensive geotechnical and geologic assessments in the NFRC channel realignment and proposed seepage collection dam area. Summaries of geotechnical investigations performed for the NFRC are included in Appendix E of the NFRC Design Basis Report (CH2M, March 2016b).

2.2 Field Investigation Data Evaluation

2.2.1 West Perimeter RU

The subsurface conditions observed along the NWID alignment generally consisted of glacial till overlying bedrock. The glacial till consisted of silty sand with gravel, sandy silt with gravel, and sandy gravel with silt. The till also contained cobbles and occasional boulders. A boulder as large as 1.5 metres (m) in diameter was encountered in one test pit immediately below the ground surface. The till is therefore highly variable, with a wide range of particle sizes. The soils along the West Perimeter RU are

underlain by phyllite bedrock as noted in mapping by Bond (1999b). Bedrock was encountered as shallow as 0.6 m, but was deeper than the maximum depth explored (5 m) in some test pit locations. The upper 0.2 to 0.8 m of bedrock in the test pits were very intensely weathered to decomposed phyllite, transitioning into less weathered phyllite that could not be excavated with the excavator.

The existing embankment for the NWID was observed to be constructed from native glacial till material similar to native soils encountered in the vicinity. The bottom of the embankment fill could generally be identified by the presence of topsoil and organic deposits, ash deposits, roots, and wood. These observations suggest that minimal foundation preparation was performed before embankment construction.

Saturated soils were encountered in three out of the five test pits at depths ranging from 4 to 5 metres below ground surface (mbgs). The observed water could be leakage from the existing NWID because the test pits were located downgradient of the ditch. Hydraulic conductivity tests of the soil were not performed, but the embankment is estimated to have medium hydraulic conductivity typical of silty sand soil. Frozen soil was not encountered at any of the test pit locations.

Signs of embankment instability along the NWID were not observed. The channel slopes were constructed with side slopes of 2 horizontal to 1 vertical (2H:1V) and 3H:1V along the length of the channel.

2.2.2 East Perimeter RU

2.2.2.1 Faro Creek Diversion – West Valley

Shallow bedrock is prevalent throughout the initial reach, from the start down to geophysical transect CH15-102-GX003, of the existing WVID (southwestern portion); nearly continuous outcropping is found in the channel bed and banks, consisting of granodiorite, biotite muscovite schist, and calc-silicate. The channel is up to approximately 1 m deep. Soil overburden is predominately colluvium. At borehole CH16-102-MW007, bedrock was encountered approximately 4 m below the ground surface, but the borehole location was in the access road embankment and is estimated that at least 1 m of soil overburden consisted of embankment fill material judging from the site topography. The top of bedrock corresponded to a P-wave velocity of approximately 1,000 m per second (m/s) as depicted in the velocity profile developed by Frontier at CH15-102-GX001, which crosses over CH16-102-MW007.

Along the channel reach from transect CH15-102-GX003 to the confluence with the flow from Faro Creek, the top of bedrock in WVID is below the channel, and is estimated to be between depths of 1 to 2 m below the channel bottom as interpreted from the results of the geophysical surveys. The depth to bedrock is highly variable in the boreholes drilled for the seepage investigation. At Well Cluster 1, the depth to bedrock at the three wells was approximately 3, 15, and 4 mbgs, in CH15-106-MW001, CH15-106-MW002, and CH15-102-MW007, respectively. These boreholes were separated horizontally by approximately 40 m. Bedrock was difficult to verify from the cuttings, which were generated by ODEX (Overburden Drilling eccentric) drilling methods, and was likely encountered shallower than recorded (15 m) at CH15-102-MW002, as suspected from high blow counts beginning around 8 mbgs. Geophysical survey data suggests that bedrock is likely at a depth of 3 to 4 mbgs in the vicinity of all the wells in Cluster 1, according to P-wave velocity profiles in transect CH15-102-GX007.

The shallow subsurface materials along the proposed Alternative TA-01 realignment of the FCD in the western valley are till and colluvium soil consisting of mixtures of clay, silt, sand, gravel, and cobbles. The ground in undisturbed areas was generally covered by a thin layer (up to 0.3 m thick) of organics consisting of moss and roots.

Frozen soil was encountered in 8 of the 16 test pits excavated along the TA-01 realignment in 2003 at depths from 0.1 to 4.1 mbgs. Frozen ground was not encountered in the shallow hand-dug pits in 2014, but these were only excavated to 0.3 mbgs. The thermistor data at CH16-102-MW007 did not show

evidence of frozen ground in June, 2016. According to these observations, frozen ground is intermittently present through the TA-01 realignment in the West Valley.

Groundwater seeps were observed in many locations along the valley slopes. Approximately 15 individual seeps were observed along the west valley slope. Seepage estimates are reported in Appendix D, Groundwater Analysis, of the CDRMR.

The slopes of the existing WVID channel embankment are roughly 3H:1V, and the maximum bank height is 2 m. Signs of embankment instability were not observed.

2.2.2.2 Faro Creek Diversion – East Valley

The subgrade in the area of the proposed FCD realignment alternatives generally consists of glacial till materials that consist of silty or clayey sand and gravel with cobbles and occasional boulders.

At Well Cluster 2 that was installed in the seepage investigation (CH2M, April 2016f), bedrock was not identified in the boreholes that were drilled up to a depth of 29.1 mbgs. It appears that weathered bedrock may have been encountered at approximately 10 m depth based on the very high blow counts and dry cuttings. The P-wave velocity at 10 meters was approximately 1,000 m/s, in agreement with other borehole locations where weathered bedrock was confirmed and correlated with the geophysical data. The depth of soil overburden along the proposed alternative TA-01 FCD realignment varies along the length, up to a maximum depth of approximately 18 m from a study of the geophysical profiles, assuming that a P-wave velocity of 1,000 m/s represents the top of weathered bedrock. A P-wave velocity of 1,000 m/s is typical for a soft shale of stiff clay, indicating that the schist is highly weathered at the top of bedrock.

The flowline of the proposed FCD realignment TA-02 would be in the glacial till material only near where the realigned channel deviates from the existing channel. The flowline will encounter bedrock (weathered) within approximately 20 m away from the existing channel according to interpretation of the geophysical profiles. The bedrock encountered in the field investigations consisted of schist and felsic granite. Both of these rock types tested from the rock cores collected from the boreholes had high durability and good resistance to deterioration under repeated wetting and drying.

One of the 2014 hand-excavated test pits encountered frozen ground at a depth of 0.3 m. All of the test pits excavated by Golder in 2003 met refusal upon frozen ground, except for one that encountered shallow bedrock. The depth to frozen ground varied from 0.2 to 3.2 mbgs.

Frozen ground was not observed in boreholes adjacent to alternative TA-02 FCD realignment, except for the drill pad fill material that was mixed with snow and ice during construction of the pads. These boreholes were advanced through the overburden using ODEX drilling methods and Standard Penetration Test (SPT) sampling to observe frozen ground if present. Thermistor readings in June 2016 revealed frozen ground only in the upper 1 m beneath the ground surface at two (CH16-102-MW005 and CH16-102-MW006) out of the four thermistor installations in the East Valley. Test pits excavated in 2003 by Golder on the uphill side of the existing FCD encountered frozen ground in most of the test pits. Test pit TP03-23 encountered refusal on frozen soil at a depth of 0.75 mbgs, which was located closest to the proposed FCD realignment, approximately 85 m uphill from CH16-102-MW003. However, the frozen soil may be limited to shallow depths according to conditions observed at the 2016 boreholes.

Numerous seeps were observed along the proposed alignment. Golder (February 2004) identified a shallow depth to subsurface seepage in the upper active layer during summer and fall seasons. Investigations to characterize this shallow seepage were undertaken in May/June 2016 and are reported in *Summary of 2015 Field Investigation – Faro Valley Seepage Investigation* (CH2M, April 2016f).

Tension cracks were observed on the slope banks in the existing FCD in two locations during the geologic reconnaissance. The FCD has bank slopes as steep as 1.2H:1V at cross section FCDE-28, where tension

cracks were observed. These failures appear to be localized slope instabilities where the channel slope is oversteepened.

2.3 Summary and Recommendations

2.3.1 West Perimeter – North Wall Interceptor Ditch

The general character of subsurface materials along the NWID was determined at the test pit and boring locations. The depth to bedrock was observed to vary up to 8 mbgs, and appears to vary abrubtly over short distances. Riprap protection will likely be required for many portions of the channel, depending on the depth of the cut required for drainage grade for the TA-01 realignment alternative.

Frozen ground is prevalent along the TA-01 realignment alternative. The depth that the frozen soil extends to is not known. Frozen soils may lose shear strength or settle because of the volumetric reduction when pore ice melts to water. The magnitude of reduction in shear strength and the volumetric strain caused by thaw depends upon the ice content, which is directly related to the density of the soil. High ice-content soils that thaw may have a significant loss in shear strength if the meltwaters do not readily drain, which can create excess pore water pressures. If the meltwaters drain, the soil may have relatively high levels of thaw strain.

Activities such as clearing vegetation cover or constructing an embankment or cut slope can alter the pre-disturbance geothermal regime. The design objective when constructing on permafrost is to minimize thermal disturbance and maintain shear stresses induced by the work within acceptable limits. This is achieved through implementing one or more of the following measures:

- Insulating the permafrost, such as by adding a granular cover of sufficient thickness that seasonal thawing is constrained to this cover
- Using relatively shallow slope angles for embankments or cut slopes
- Minimizing exposure time of frozen excavated faces to above-freezing ambient temperatures

2.3.2 East Perimeter - Faro Creek Diversion Realignment

The observed depth to bedrock in the boreholes was compared to the P-wave velocity of the subsurface materials measured in the geophysical surveys. A P-wave velocity of 1,000 m/s was estimated to represent the top of weathered bedrock material. The bedrock was estimated by Frontier to have a P-wave velocity of 2,500 m/s, but this higher velocity appears to represent more competent bedrock according to correlations with the borehole data where available. The excavator used by Golder in 2003 appears to have met refusal in rock with an estimated P-wave velocity of approximately 1,000 m/s, extrapolating conditions observed at geophysical transect CH15-102-018 located approximately 20 m from the test pit.

According to the seismic refraction geophysical survey results, the depth to a subsurface layer with a velocity of approximately 1,000 m/s varies between 2 to 5 m along the proposed alternative TA-02 FCD realignment. The design concept for the proposed realignment of the FCD intends that the flowline of the new diversion channel be below the top of bedrock so that seepage along the bedrock surface would “daylight” into the channel, thereby reducing the amount of seepage reaching the Faro Pit. According to the results of the field investigation, the proposed diversion channel will penetrate into bedrock along the length of the diversion, and seepage on top of bedrock will be intercepted by the realigned channel.

Riprap protection will likely be required for many portions of the alternative TA-01 FCD realigned channel, depending on the depth of cut required to maintain drainage grade, because of the significant depth to bedrock in some areas. Riprap protection of the proposed alternative TA-02 FCD realigned

channel will not likely be required except for the portion where the realigned channel ties into the existing channel.

Numerous seeps would present a challenge to maintaining dewatered conditions for construction of fill embankments. These seeps could also lead to areas of instability where channel slopes are saturated. A dewatering or seepage management plan should be prepared and followed to manage the wet conditions during construction.

The frozen ground that is present in some areas along the proposed alternative FCD realignments on the eastern valley slope may present a challenge in design of stable embankments and cuts. The design and construction issues discussed for the frozen soils in West Valley will apply to the East Valley also.

SECTION 3

Mill Building and Emergency Tailings Area RU

The ETA is located between the Mill Building Area and the Mine Access Road and contains mine tailings and mine waste with the potential to negatively affect the local groundwater and surface water. To reduce the potential impact of the ETA, geotechnical investigations were conducted in 2014 to characterize the subsurface conditions for the following evaluations:

- Feasibility of relocating tailings from the ETA to the RCTA or covering the tailings in place
- Feasibility of using the existing Mine Access Road to contain the tailings
- Design of a surface water collection structure for the ETA, to intercept contaminated groundwater and surface water before discharge into the RCTA

3.1 Field Investigation Activities

3.1.1 Lower Guardhouse Creek Interception

Geological reconnaissance was completed along Lower Guardhouse Creek during 2014, focusing on the upstream portion of the creek. Observations included surficial soil profiles, possible seepage locations, and general terrain. No subsurface geotechnical work was performed. A description of general conditions observed at Lower Guardhouse Creek is presented in the *Summary of 2014 Field Investigation – Lower Guardhouse Creek Interception* technical memorandum (CH2M, March 2015k).

3.1.2 Emergency Tailings Area

In August 2014, one borehole and six seismic cone penetration test (sCPT) soundings were advanced in the ETA, as shown in Figure 3-1. The sCPT soundings included continuous profiling of the subsurface conditions, and seismic shear wave velocity measurements. Pore pressure dissipation (PPD) testing was also performed in the tailings material at various depths selected by CH2M. The sCPTs were advanced to depths of approximately 4 to 11 mbgs.

Borehole CH14-105-BH003 was advanced to 4.6 m below the ETA surface using a hollow stem auger. Sampling was performed using a split-spoon sampler that was larger (62-millimetre [mm] inside diameter) than the SPT sampler (35 mm inside diameter). The larger split spoon was used to collect a larger volume of tailings material for each sample. It should be noted that the tailings surface was very soft and would not support the drill rig at the originally proposed drill location, which was shifted 10 m west to accommodate rig access. Geotechnical samples were analyzed for gradation and moisture content. The results and details of the recent field investigations are compiled in the *Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tailings Area* technical memorandum (CH2M, March 2015m).

Prior to the 2014 CH2M investigation, SRK Consulting Canada Inc. (SRK), Inc. advanced 8 boreholes and excavated 1 test pit in the ETA (Figure 3-1). Their investigations were conducted in 2004 and 2005, and provide additional data on the thickness of tailings (SRK, September 2006).

3.1.3 Mine Access Road Investigation

Two boreholes (CH14-105-BH001 and CH14-105-BH002) were advanced through the Mine Access Road to evaluate the road embankment for suitability as a permanent retention structure if the tailings are covered in place. In general, SPT sample recovery was poor because of the coarse nature of the road fill materials. Soil samples from the boreholes were analyzed in the laboratory for gradation and moisture

content. Both boreholes were drilled to a total depth of approximately 13 m using ODEX methods. The results and details of the field investigations are compiled in the *Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tailings Area* technical memorandum (CH2M, March 2015m).

3.1.4 Water Collection Structure Location

The Alternative Development Status report (CH2M, 2015ff) proposed that a low-head concrete cutoff wall be constructed across the original Faro Creek channel, downstream of the Mine Access Road, as shown in Figure 3-1. In July 2014, CH2M supervised two seismic refraction surveys in the ETA downgradient, or southwest, of the Mine Access Road. The purpose of these geophysical surveys was to characterize the subsurface conditions at the proposed water collection structure, including estimating the depth to bedrock and the weathering profile of the rock. The locations of geophysical survey lines CH14-105-GX001 and CH14-105-GX004 are shown on Figure 3-1.

CH2M excavated one test pit in 2014 to a depth of approximately 3 mbgs in the ETA downgradient, or southwest, of the Mine Access Road. Representative soil samples collected from the test pit were tested for gradation, moisture content, Atterberg limits, and moisture-density relationship. The location of test pit CH14-105-TP001 is shown on Figure 3-1.

CH2M conducted a geological reconnaissance in the ETA in June 2014 at the proposed water collection structure location. Geotechnical observations included identification of bedrock outcrops and general terrain assessment.

The details and findings of these field investigations are compiled in the *Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area* technical memorandum (CH2M, March 2015n).

3.2 Field Investigation Data Evaluation

3.2.1 Lower Guardhouse Creek Interception

Lower Guardhouse Creek flows through a variety of conditions, including a constructed diversion channel, natural marshland, and its native alluvial channel. Bedrock was observed to outcrop adjacent to the creek bank near the Rose Creek Haul Road. Subsurface investigations were not performed at Lower Guardhouse Creek.

3.2.2 Emergency Tailings

The 2014 CH2M geotechnical investigations within the ETA provided improved data for characterization of the volume and geotechnical properties of the tailings and the underlying materials.

Cross sections of the ETA are shown on Figure 3-2. The tailings thickness was found to be greatest along the original Faro Creek Channel, which generally trends from northeast to southwest across the ETA. The average thickness across the central portion of the tailings is approximately 5 m, and generally thins towards the edges. Immediately upgradient of the Mine Access Road, the tailings thickness was approximately 7 m based on the boreholes advanced by SRK in 2004. At cone penetration test (CPT) location CH14-105-CP001 in the upgradient portion (northeastern area) of the ETA, the thickness of tailings may be as thick as 9.5 m; however, the interpretation between tailings and native alluvial soil in the CPT data is difficult, and the tailings thickness may actually be closer to 5 m as shown on the cross section of Figure 3-2.

The tailings were predominantly silty sand or sandy silt. In some samples, fine gravel was present. The tailings within the ETA were found to contain 12 to 98 percent passing the No. 200 (0.075 mm) sieve.

Blow counts (6-mm inside diameter split spoon) ranged from 7 to 25 blows per 0.3 m (1 foot) in the tailings. The blow counts measured with the larger sampler split spoon are greater than what would be measured with the smaller SPT sampler. The blow counts approximately indicate very loose to medium dense material. Based on the shear wave velocity profiling data from the CPT soundings, the likelihood of liquefaction of the tailings is low at all CPT locations except for CPT CH14-105-CP002, where liquefaction is possible if an earthquake event were large enough to exceed the threshold strains required for liquefaction. This conclusion is based on correlations with normalized shear wave velocity (Youd et al, 2001).

PPD testing in the tailings indicated a fairly rapid dissipation of excess pore pressures. Equilibrium pore pressures were reached generally within 5 minutes after stopping penetration, but in one case took approximately 10 minutes. The PPD results are typical for a sandy silt soil, with some zones of clayey material of lower permeability. The estimated hydraulic conductivity for the tailings was estimated to be between $1x10^{-5}$ to $1x10^{-7}$ centimetres per second (cm/sec), based on approximate correlations with the dissipation times (Robertson et al, 1992).

The native material underlying the ETA tailings at borehole CH14-105-BH003 consisted of a thin organic layer underlain by silt, sandy silt, and silty sand materials. Field blow counts were generally greater than 50 per 0.3 m, approximately indicating very dense material. The borehole was drilled to refusal at 4.3 mbgs in well graded gravel with sand.

PPD testing provides an indication of the hydrostatic groundwater level at the CPT locations. The groundwater depth in the ETA was found to be between 2 to 3 mbgs upstream (northeast) of the Mine Access Road. At CH14-105-CP001, located on the northwestern boundary of the ETA, the groundwater depth was estimated to be 4.7 mbgs during the investigation. At CH14-105-CP004, on the southwestern edge of the ETA, the depth to groundwater was found to be approximately 0.5 mbgs. The location of these CPT soundings is shown on Figure 3-1.

CH2M assessed the volume of tailings contained within in the ETA as well as remediation alternatives. These assessments are documented in the *Alternative Development Status Report* (CH2M, March 2015ff). The volume of tailings was estimated to be 89,000 cubic metres (m^3), and covers an area of 33,000 square metres.

3.2.3 Mine Access Road

Boreholes (CH14-105-BH001 and CH14-105-BH0020) advanced through the Mine Access Road adjacent to the ETA provided geotechnical data for the road fill, and underlying soil and bedrock.

The road embankment fill generally consisted of well-graded silty gravel and sand with cobbles and boulders. An organic layer was observed beneath the fill embankment. Weathered phyllite schist bedrock was encountered 8 to 9 m beneath the road surface. The degree of weathering was observed to decrease approximately 2 to 3 m below the surface of the rock. Groundwater was observed in the boreholes near the top of the bedrock.

Geotechnical laboratory testing was limited to gradation and moisture content evaluation. Because of the coarse nature of the in situ materials, sieve analysis results are not expected to be entirely representative of the grain size because of the small diameter of the split spoon in relation to the coarse particles. Diamond rock coring was not performed; as such, the bedrock encountered was evaluated from rock fragments observed within the ODEX drill cuttings.

3.2.4 Water Collection Structure

Results from seismic refraction survey line CH14-105-GX001 indicate that the weathered bedrock surface generally undulates between 1 and 3 mbgs. The interpreted contact with competent bedrock surface undulates between 2.0 and 4.5 mbgs.

The geophysical survey at CH14-105-GX004 indicated that the weathered bedrock surface varies between 1 and 4 mbgs (deepening toward the northern end of the survey line). The interpreted competent bedrock surface roughly paralleled the weathered bedrock surface between 1.5 and 6 mbgs. The seismic refraction survey results from the southern end of CH14-105-GX004 (0- to 10-m stations) were not consistent with the observations made during the geologic reconnaissance. The geologic reconnaissance indicated bedrock outcropping at the surface in this location. The resolution of geophysical data at the ends of seismic refraction lines is generally poor, and the reconnaissance data should instead be relied upon in this area.

The ground surface north of the proposed ETA seepage collection sump appeared to be sand and gravel fill with low-plasticity fines between 19 to 26 percent. South of the proposed collection sump, a 15-m-deep cut as narrow as 4 m was observed, with bedrock outcrops on each side. The bedrock is weathered phyllite.

Test pit CH14-105-TP001 was excavated approximately 8 m west of the seismic refraction survey lines. Laboratory testing on representative samples from the test pit indicated that the soils from 0 to approximately 2 mbgs consisted of clayey to silty gravel with sand, and the soils from 2 to 3 mbgs consisted of silty sand with gravel. Weathered bedrock composed of phyllite was noted from 3 mbgs to the bottom of the test pit at 3.2 mbgs. Groundwater was encountered seeping into the northwestern wall of the test pit at approximately 2.9 mbgs.

3.3 Summary and Recommendations

The geotechnical information collected from the field program was used to compile the *Alternative Development Status Report* (CH2M, March 2015ff), which evaluated the feasibility of relocating tailings from the ETA to the Rose Creek Tailings Area (RCTA) and covering the tailings in place. The recommended mitigation in the *Alternative Development Status Report* was to remove the ETA tailings and enhance the downstream seepage collection through construction of a concrete cutoff wall that is keyed into the shallow bedrock.

The boreholes and CPT soundings provided additional data on the thickness of the tailings, which can be used to get an approximate volume of tailings material in the ETA. However, additional boreholes or CPT soundings are recommended if an improved accuracy of the tailings volume is required.

If the tailing were left in place, some localized saturated zones within the tailings material may be subject to liquefaction in a large earthquake event. The consequences of liquefaction within the ETA are relatively minor, consisting in potential material settlement. Lateral spreading would not be a concern because the tailings are contained behind the road embankment. The Mine Access Road embankment is founded on native coarse-grained soil, and is not subject to liquefaction based on the measured blow counts in the boreholes drilled in the through the access road embankment. If the tailings are covered in place, additional borings with SPT sampling should be performed to evaluate the extents of liquefaction and estimate the amount of settlement.

The water collection concrete structure will mainly retain surface water, and will be founded on bedrock. This structure will have a low bearing pressure, and have a low water head that is not anticipated to pose a hazard of piping through the weathered bedrock. However, considering the discrepancy between the geologic reconnaissance and CH14-105-GX004, the depth and nature of bedrock should be verified at the proposed structure location in order to properly design a cutoff wall. The rock should be cored to evaluate the rock quality, and packer testing should be performed to evaluate the hydraulic conductivity of the rock.

SECTION 4

Rose Creek Tailings Area RU

For the RCTA, alternatives are being considered to route flood flow through the RCTA over a new overflow weir structure into an erosion dissipation structure and armored channel constructed with a side channel dike parallel to the Rose Creek Diversion (RCD). Flood water may then be routed over the tailings surface immediately upstream of the ID embankment to an improved spillway in rock, cut on the right abutment of the ID. The existing ID Pond may be filled, covered, and protected in place; the cover design is currently being evaluated by BGC. Details of the proposed alternatives for the RCTA are presented in the CDRMR. The RCTA Area RU, including the investigation locations and proposed features, is shown in Figures 4-1 and 4-2.

4.1 Geotechnical Investigation Activities

4.1.1 Intermediate Tailings Area

One borehole (CH14-201-TH001), and three cone penetrometer soundings were advanced in the Intermediate Tailings Area in August 2014 to improve understanding of the impounded tailings for development of alternatives for a RCTA cover. The borehole included SPT, downhole field vane shear testing, and sample collection. Samples were sent to the laboratory for testing of moisture content, gradation, and Atterberg limits. A thermistor port was installed in the borehole after completion, and subsequently monitored. The CPT soundings were advanced to probe refusal, and included shear wave velocity profiling and PPD testing. The details and results of the field investigations are compiled in the *Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area* technical memorandum (CH2M, March 2015x).

4.1.2 Rose Creek Diversion at Proposed Overflow Weir

Two boreholes (CH14-203-BH001 and CH14-203-BH002) were advanced along the RCD dike using ODEX and diamond core methods in August 2014 to support the design of a proposed overflow weir. The field investigation program consisted of drilling, sampling, and downhole in situ testing. Boreholes included SPT testing in soil and NQ (47.6 mm core diameter) triple-tube diamond coring in bedrock. Laboratory testing of soil samples included gradation testing, and rock samples were submitted for compressive strength analysis. The results and details of the field investigations are compiled in the *Summary of 2014 Field Investigation – Construct New Overflow Weir* technical memorandum (CH2M, March 2015cc).

4.1.3 Flow Routing over Intermediate Tailings Area

A geological reconnaissance was conducted at the proposed location of an erosion dissipation structure on the south side of the Secondary Dam. The proposed structure includes a layer of riprap placed downstream of the RCD overflow structure to dissipate energy and prevent erosion of the Intermediate Tailings Area. The reconnaissance was completed in the area where the Secondary Dam intersects the RCD. The geologic reconnaissance considered visible surface conditions as they relate to the proposed structure. Observations included bedrock exposures, surficial soils, surface water flows, groundwater seeps, and general site setting and topography. The details and results of the field investigations are compiled in the *Summary of 2014 Field Investigation – Erosion Dissipation Structure* technical memorandum (CH2M, March 2015bb).

Four boreholes (CH14-201-TH002 to CH14-201-TH004 and CH14-201-TH006) were advanced in the Intermediate Tailings Area in August 2014, to support the conceptual design of the proposed Rose Creek Side Channel and associated Side Channel Dike. The boreholes included SPT, downhole field vane shear

testing, and sample collection. Soil samples sent to the laboratory were tested for moisture content, gradation, and Atterberg limits. Thermistor ports were installed in the boreholes after completion, and subsequently monitored. Ten CPT soundings were also advanced to probe refusal, and included shear wave velocity profiling and PPD testing. The results and details of the field investigations are compiled in the *Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike* technical memorandum (CH2M, March 2015z).

4.1.4 Intermediate Dam Spillway

A geotechnical investigation was performed at the ID spillway in August 2014 to support the design of a new ID spillway to pass the probable maximum flood (PMF). The investigation locations are shown in Figure 4-2. Two geotechnical boreholes (CH14-201-BH003 and CH14-201-BH004) were advanced within the existing spillway. The boreholes included SPT sampling and rock coring. In addition, two hydraulic pressure (packer) tests were completed in each borehole. Representative samples of soil were tested for moisture content and gradation, and rock cores were tested for durability and compressive strength. The details and results of the field investigations are compiled in the *Summary of 2014 Field Investigation – Construct Intermediate Dam Spillway* technical memorandum (CH2M, March 2015aa).

Additional field investigation and soil sampling was conducted in November 2015. The investigation consisted of five geotechnical boreholes (CH15-201-MW007 through CH15-201-MW011). Two boreholes were drilled through the overburden and into the bedrock at least 9 m, one was drilled to the top of bedrock, and two others were drilled in overburden only. Drilling included SPTs in soil, and HQ-size (63.5 mm core diameter) core drilling in bedrock. In situ packer testing was completed in bedrock within two of the boreholes to characterize the hydraulic conductivity of the bedrock. Laboratory testing on soil samples included Atterberg limits and gradation, and rock cores were tested for specific gravity, absorption, soundness, and compressive strength.

Geophysical surveys were also completed in this area in October 2015. The survey consisted of one long transect along the length of the spillway, and six lines perpendicular to the spillway. Methods included electric resistivity testing, multi-channel-analysis-of-surface-waves lines, and seismic refraction. The details and results of the additional 2015 field investigations are compiled in the *Summary of 2015 Field Investigation – Construct Intermediate Dam Spillway* technical memorandum (CH2M, May 2016b).

4.1.5 Cross Valley Dam Seepage Interception System Pipeline

Ten test pits (CH14-204-TP001 through CH14-204-TP010) were completed along the proposed CVD Seepage Interception System (SIS) pipeline alignment in July 2014. The alignment follows a path from the CVD, across the north side of the RCTA RU, ending at the Mill Buildings Area. Test pits were excavated to depths up to 5.5 mbgs. Soil samples sent to the laboratory were tested for moisture content, gradation, and Atterberg limits. Tests were also performed to evaluate soil corrosivity to aid in engineering design of pipeline materials. Corrosivity testing included chloride, oxidation-reduction potential, pH, sulphate, and sulphide content. The results and details of the field investigations are compiled in the *Cross Valley Dam Seepage Interception System Test Pit Data Summary* (CH2M, January 2015b).

4.2 Data Evaluation

4.2.1 Intermediate Tailings Area

Permafrost conditions were not observed within the Intermediate Tailings Area. Thermistor measurements indicate an active temperature zone (depth to where temperature variation occurred over different seasons of the year) from the ground surface down to a depth of approximately 6 mbgs.

For the period of record, frost penetration was observed to depths of approximately 2.5 m in February 2015. Deeper frost penetration is possible later in the winter, or during more severe winters.

The sensitivity of tailings investigated within the Intermediate Tailings Area can be described as insensitive to medium sensitive based on the CPT results. Sensitive soil is defined as soil susceptible to strength loss when subjected to strain.

The tailings are generally consistent in gradation and stiffness at the areas explored. All boreholes encountered a stiffer surface crust approximately 1 to 1.5 m thick where exposed materials are believed to have been over-consolidated by water level fluctuations and repeated wetting and drying cycles. Tailings generally consisted of sandy silt, with sand content varying from 1 to 43 percent. The thickness of the tailings was observed to be as thin as 3 m near the edge, and as thick as 20 m further away from the edge. Native material underlying the tailings consisted of silty sand with gravel, silty gravel with sand, and silt.

In general, two shear vane tests were attempted per hole. However, based on the low plasticity of the silt, results of the shear vane test cannot be relied upon.

Based on observed samples and PPD testing within the CPT soundings, the depth to groundwater within the Intermediate Tailings Area is generally estimated to be between 1 and 1.5 m below the tailings surface, corresponding closely with the water surface adjacent to the ID.

4.2.2 Rose Creek Diversion at Proposed Overflow Weir

In general, the subsurface materials encountered in the vicinity of the overflow weir consisted of coarse granular fill materials overlying native glacial till and bedrock. The bedrock surface slopes from the south to the north, with depths of 5.2 m to 9.6 mbgs at the two borehole locations. Bedrock is highly laminated and foliated, and the rock core broke easily by hand along the foliations. Frozen soil was not encountered.

Intact rock samples tested for compressive strength were classified as strong to very strong (Hoek, 2007). However, it was noted that cores were difficult to handle without causing additional separations along foliation planes. An evaluation of rock mass strength was performed using the RocData computer analysis program, Version 5.004 (Rocscience, 2015). This evaluation indicates that the rock mass strength may be represented by a cohesion of 2.5 mega Pascals (MPa) and an internal friction angle of 25 degrees.

4.2.3 Intermediate Tailings Area at Proposed Erosion Dissipation Structure

The southeastern area of the Intermediate Tailings Area contains a wide variety of fill materials (i.e., sand, gravel, cobbles, and boulders) used to construct the adjacent embankments, the RCD dike, and the Secondary Dam. The channel flows through these fill materials into the Intermediate Tailings Area, where the bottom of the channel becomes very soft silt tailings. Soft tailings were noted to liquefy upon disturbance. Signs of embankment instability were not observed. The channel slopes were estimated to vary between 1.5H:1V and 2H:1V.

4.2.4 Intermediate Dam Spillway

In general, the materials encountered beneath the proposed ID spillway were found to consist of silty sand and gravel alluvium overlying native till and bedrock. The soil was stratified, with some layers of clean sand and gravel, with occasional cobbles and boulders noted.

The depth of bedrock varied from about 0 to 11 mbgs at the exploration locations. In the vicinity of the proposed spillway, a weathered bedrock outcrop is present, along the northern side of the road, proximal to CH14-201-BH003. The bedrock is a dark grey to blue-grey, intensely foliated, medium-strong schist with quartz veins. Rock cores retrieved during the drilling program were noted to readily separate

along the foliation planes. Review of borehole data indicates that the bedrock surface slopes downward generally from east to west. An evaluation of rock mass strength was performed using the RocData computer analysis program (Rocscience, 2015). This evaluation indicates that the rock mass strength may be represented by a cohesion of 6 MPa and an internal friction angle of 32 degrees.

Frontier Geoscience, Inc., under subcontract to CH2M, prepared a geophysical report (Frontier, 2015) summarizing the results of the geophysical data collection. The analysis was completed in conjunction with review of nearby borehole logs. In general, the results of the geophysical survey are consistent with the materials observed at the surface and encountered within the boreholes. Seismic refraction results indicate that the survey area is underlain by up to four distinct shear wave velocity layers. Underlying the shallow surficial layer (maximum thickness of 9 m) is an upper intermediate layer with velocities consistent with denser overburden of unsaturated sands, gravels, clays, and silts. The thickness of this layer varies between approximately 1 m at the northeastern end of line SL-201-6 (east of the ID), up to approximately 11 m on line SL-201-4 (aligned with the ID). Below the upper intermediate velocity layer, a second, higher velocity layer is interpreted in most of the survey area. These velocities are generally indicative of dense, saturated sands, gravels, and till. Boreholes and testpits in relatively close proximity to survey lines intersected weathered bedrock at the top of this velocity layer. This layer is highly variable in thickness. The bedrock surface rises in elevation to the northeast.

Results of packer testing at two monitoring wells completed in 2015 indicate that the deeper bedrock has lower hydraulic conductivity than the upper more weathered bedrock.

4.2.5 Cross Valley Dam Seepage Interception System Pipeline

Data evaluation and geotechnical design criteria for the pipeline are provided in the *Cross Valley Dam Seepage Interception System Test Pit Data Summary* (CH2M, January 2015b). Overall characterizations are summarized below.

The particle sizes of subsurface materials varied widely from clay up to large boulders, but in general consisted of silty or clayey sand and gravel. The fines content ranged from less than 5 percent up to 45 percent. Large boulders up to a diameter of 1 m were observed.

Bedrock was encountered in five out of the ten test pits, and consisted of phyllite, schist, or granodiorite. The depth to bedrock varied from the ground surface to depths greater than 5.5 mbgs.

Frozen ground was not observed at the time of test pit excavation. However, the temperature was measured as low as 0 degrees Celsius at the bottom of some test pits.

Only one of the soil samples had properties that would classify as corrosive, from test pit CH14-204-TP010. This sample was in artificial fill material near the Mill Building Area that contained mine debris or mine waste rock materials with corrosive properties. All of the native soil samples had properties indicating non-corrosive soil.

4.3 Summary and Recommendations

4.3.1 Overflow Weir

Depending on the depth to which the base of the RCD overflow weir will be constructed, piping of fines may occur if it is constructed directly on top of the silty sand materials. A filtration layer beneath the riprap will likely be required. Additional erosion control measures along the downstream slope of the weir, such as concrete blocks or grouted riprap should be considered and evaluated. It is recommended that packer testing is completed within the vicinity of the proposed overflow weir, in order to further characterize hydraulic properties of the bedrock. This will allow evaluation of potential percolation issues that could decrease stability along the base of the weir.

4.3.2 Tailings Cover

It is recommended that studies be performed to assess the performance of the tailings, especially in the areas where significant grading will be performed, such as the ID Pond, where fill placement of between 7 and 9 m may occur. Design issues include the performance of the tailings cover as the tailings consolidate. Construction issues include trafficability and dewatering.

4.3.3 Side Channel and Side Channel Dike

Refer to Section 9 of the CDRMR for a discussion of the proposed design of the side channel. It is proposed that the side channel dike be founded on suitable natural ground. Tailings under the footprint of the dike should be removed.

Alternatively, ground improvement techniques for tailings in the foundation vicinity may be evaluated. Approaches such as incremental loading with and without wick drains and soil improvements using compacted sand and stone columns may achieve necessary ground strengths at relatively low costs. Consolidation testing should be completed, if incremental loading is considered for ground improvement.

4.3.4 Intermediate Dam Spillway

The proposed ID spillway concept requires approximately 4 m of excavation along the centerline of the spillway channel, up to approximately 10 m in the basin immediately downstream of the control structure, and up to 15 m in the plunge basin (energy dissipater). Based on available data, it is anticipated that scouring may occur into the right abutment of the ID. Therefore, it is proposed that a reinforced concrete wall on the southern side of the channel be used to separate the spillway channel from the ID embankment. In addition, it is anticipated that dental concrete, rock bolting, or equivalent measures will be necessary on the base and sides of the spillway to protect against scour. It is recommended that an additional study on these erosion protection measures is completed to provide necessary design criteria.

4.3.5 Erosion Dissipation Structure

Based on available geotechnical information, filter layers beneath riprap should be included in the design to mitigate issues related to loss of fines by piping and erosion beneath the riprap. In consideration of designing the erosion dissipation layering, it is recommended that samples be collected along the length of the channel for grain size analysis. Gradation of the channel base can be used to determine the required layers and gradation of the erosion dissipation structure. The erosion dissipation structure should be designed with consideration of suitable borrow sources onsite.

4.3.6 Cross Valley Dam Seepage Interception System Pipeline

The characterization of subsurface material along the proposed CVD SIS pipeline was completed based on the conditions encountered at the test pits. The subsurface investigation provided data necessary for the pipeline design.

The proposed pipeline trench excavation will encounter phyllite or schist bedrock over some portion of the proposed pipeline alignment, anticipated along at least 1500 m of the pipeline length.

The pipeline will be installed in what appears to be the active zone for frost penetration and temperature variation with seasons. The pipe should be protected by insulation to prevent freezing.

SECTION 5

Dams and Cross Valley Dam Pond

As described in the CDRMR, one alternative for remediation includes using the CVD Pond as temporary storage during construction and then emergency storage for long-term care and maintenance. Field investigations were conducted in the CVD Pond to develop a higher resolution stage-storage curve in support of current water management and closure alternatives being considered for the CVD Pond, and to characterize sludge material properties and presence within the pond.

Field investigations in the ID Pond were conducted to develop a higher resolution stage-storage curve in support of water management and possible backfilling of the ID Pond, and to characterize the tailings and sediment deposited in the pond.

5.1 Field Investigation Activities

Under subcontract to CH2M, Aurora Geosciences Ltd. performed bathymetric and sub-bottom profile surveys of the CVD Pond in October 2015 and of the ID Pond in June 2016 . Multi-beam sonar, single-beam sonar, acoustic sub-bottom profiling, and real-time kinematic global positioning surveying methods were used to define the pond perimeter, bottom material deposits, and layers beneath the pond.

In March 2016 under supervision by CH2M, additional field exploration was performed including 8 CPT soundings in the ID Pond, 3 CPT soundings in the CVD Pond, and 14 boreholes in the CVD Pond. The CPT soundings were advanced from the frozen pond surface by ConeTec Investigations Ltd. (ConeTec) of British Columbia. Drilling within the CVD Pond was performed by ConeTec using a track-mounted sonic drill rig set upon the frozen surface of the pond. Sampling of the pond bottom soil, sludge, and tailings was performed using an Aqualock piston sampler in the sonic boreholes. The sampling and borehole locations are shown in Figure 5-1.

The details and results of these field investigation activities are compiled in the *Summary of Fiscal Year 2015 and 2016 Field Investigations – Cross Valley Dam and Intermediate Dam Ponds Field Data* (CH2M, August 2016c).

5.2 Field Investigation Data Evaluation

5.2.1 CVD Pond Volume

The CVD Pond has a maximum depth of 14.25 m below the water level elevation 1,028.68 m at the time of the bathymetry survey. The total volume of water in the CVD Pond was estimated to be 1,414,765 m^3, not including a minor amount of volume around the perimeter of the pond where the water becomes too shallow for the survey methods. A new stage-storage curve for the pond was prepared based upon the results of the bathymetric survey. Using the bathymetry data, the stage-storage curve was developed up to water surface elevation 1,027 m, above which the bathymetric survey becomes unreliable for volume estimates in the shallow water that existed during the survey. Above elevation 1,027 m, the data from the 2011 LIDAR survey of the entire project area were used (CH2M, October 2013i). The LIDAR survey was performed when the water level was below 1,027 m. The updated stage-storage curve is presented in the *Summary of the 2015-2016 Bathymetry and Sub-Bottom Data Review and Stage Storage Curve Development for the Faro Mine Remediation Project* (CH2M, August 2016k).

5.2.2 ID Pond Volume

The maximum depth of the ID pond is 7.8 m in the most western part of the pond. The pond bottom is mostly featureless and becomes shallower to the east. The volume of the ID Pond was estimated at the time of the survey to be 1,473,145 m^3, not including a minor amount of volume around the perimeter of the pond where the water becomes too shallow for the survey methods. The water level at the time of the survey was 1,045.98 m. A new stage-storage curve for the pond was prepared based upon the results of the bathymetric survey below elevation 1,043.6 m, and the 2011 LIDAR survey (CH2M, October 2013i) above elevation 1,043.6 m. The updated stage-storage curve is presented in the *Summary of the 2015-2016 Bathymetry and Sub-Bottom Data Review and Stage Storage Curve Development for the Faro Mine Remediation Project* (CH2M, August 2016k).

5.2.3 CVD Pond Sludge Characterization

Total suspended solids in the CVD pond suspected to be formed from ferrous iron sludge oxidation has resulted in operational changes to the CVD pond discharge protocols. As described in the *Summary of Fiscal Year 2015 and 2016 Field Investigations – Cross Valley Dam and Intermediate Dam Ponds Field Data* (CH2M, August 2016c), an investigation to characterize sludge material properties and presence within the pond was performed to support current water management issues and closure alternative considerations. Sludge was only observed in three of the boreholes (CH16-201-BH008, CH16-201-BH011, and CH16-201-BH011A) completed in the CVD Pond, and the CPT results were inconclusive because the sludge was too soft. The sludge was observed towards the northern end of the pond with an estimated sludge thickness of up to 1.7 m at the borehole locations. Where encountered, the apparent sludge consisted of primarily silt and clay-sized material that had a consistency that appeared to range from that of an extremely soft soil to a viscous fluid. The color was generally bluish-green, and began to change to orange when exposed to air, likely due to iron oxidation.

The sub-bottom survey resulted in a profile of layers beneath the ponds with different reflective properties. For the CVD Pond, the layers were segregated into Feature B through G (Feature A is the mudline). For the ID Pond, the layers were segregated into Feature 1 and 2.

Comparison of the borehole and CPT-sounding data in the CVD Pond with results of the sub-bottom profiling analysis, performed by Aurora, suggests that the possible sludge deposits approximately correlate to the Feature B reflective layer identified by the sub-bottom survey. The estimated top and bottom elevation of sludge material is summarized in Table 5-1 according to observations in the soil borings and sub-bottom profiling results. As can be seen in Table 5-1, the bottom of Feature B, or sludge, measured using the two separate methods was generally within one-half meter of each other, but in some cases almost one meter in difference. However, there are limited locations with data to draw conclusions from. The borehole thickness or depth observations were not consistently greater or less than the sub-bottom profiling measurements, leading to a conclusion that the methods are approximate as a result of the extremely soft soil to viscous-fluid characteristics.

As shown in Figure 5-2, the Feature B layer is found primarily in relatively shallow water at the northern end of the pond, where the Feature B thickness ranges from about 1 to 5 m. Interpreted sludge deposits are also identifiable as Feature B along the southern shore of the CVD Pond. This finding of sludge thickness and spatial distribution is consistent with the historical water treatment activities as described by D. Duivenvoorden, a long-time FMC employee (Duivenvoorden, pers. Comm, 2016). According to Duivenvoorden, from approximately 1997 to 1999, lime was added at the southern shore of the CVD Pond via a slurry tank. The lime-rich water was then pumped into the ID Pond, which at that time was operated with a much higher water level in the pond. As a result, the high pH water would migrate towards the spillway and flow down it, back into the CVD Pond. The majority of deposited sludge is expected to have originated from the Down Valley Treatment System, constructed in 2002 to treat siphoned ID Pond water through agitation with a lime slurry. Treated effluent water was then

discharged into the CVD Pond from the peninsula on the northern shore where water was retained to allow for treatment solids to settle out of suspension. The spatial distribution of Feature B correlates with the bulk of the sludge deposits along the northern edge near the ID Pond spillway and the peninsula on the northern shore.

5.2.4 Pond Bottom Deposits in the ID Pond

The sub-bottom survey resulted in a profile of two principal layers beneath the ID Pond, Feature 1 and 2. Feature 1 was interpreted by Aurora to be possible tailings deposits. These tailings would be intermixed with soil sediment settling out of the ponds over the years. The thickest pond bottom deposits were in the deepest part of the ID Pond along the dam. A thickness of up to 12 m was estimated from the results of the sub-bottom survey.

Feature 2 was interpreted by Aurora to possibly be bedrock; however, based on borings advanced prior to construction of the ID pond by Golder Associates (Golder 1980), the depth to bedrock beneath the ID Pond is on the order of 40 meters beneath the original ground surface. Feature 2 is more likely a dense alluvial material.

5.3 Summary and Recommendations

Based on results of the field investigation it appears that approximately 1 to 5 m of sludge deposits are located at the north end of the pond in the vicinity of the peninsula on the north shore of the CVD Pond. The sludge consists primarily of silt and clay-sized material that had a consistency that appeared to range from that of an extremely soft soil to a viscous fluid. According to sub-bottom profiling, less than 0.3 m of sludge is interpreted across the majority of the pond bottom. Near the southern shore, about 1 to 2.5 m of sludge is interpreted to be loosely settled on the pond bottom.

SECTION 6

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Table

Table 5-1. Comparison of Pond Bottom and Sludge Depth Determined from Boreholes versus Sub-Bottom Profiling

Faro Mine Remediation Project

		ConeTec Borehole Data				Aurora Bathymetry and Sub-Bottom Profiling			Comparison : Difference between Borehole and Sub-Bottom Profiling	
SoundingID	Elevation of Top of Ice (m)	Measured Depth to Mudline (mbgs)	Pond Bottom Mudline Elevation (m)	Observed Sludge Thickness in Borehole (m)	Estimated Bottom of Sludge in the Borehole[a] (m)	Pond Bottom (Mudline) Elevation (m)	Feature B (Sludge) Thickness (m)	Bottom of Feature B (Sludge) Elevation (m)	Pond Bottom (m)	Bottom of Sludge (m)
CH16-201-BH005	1029.945	9.23	1020.72		1020.42	1020.85	0.00	1020.84	-0.13	-0.43
CH16-201-BH005A	1029.950	9.30	1020.65		1020.35	1020.81	0.00	1020.81	-0.16	-0.46
CH16-201-BH005B	1029.920	9.35	1020.57		1020.27	1020.76	0.00	1020.76	-0.19	-0.49
CH16-201-BH006	1029.950	13.35	1016.60		1016.30	1016.92	0.05	1016.86	-0.32	-0.56
CH16-201-BH006A	1029.943	13.33	1016.61		1016.31	1016.65	0.03	1016.61	-0.04	-0.30
CH16-201-BH007	1030.044	7.10	1022.94		1022.64	1023.11	0.00	1023.11	-0.16	-0.46
CH16-201-BH008	1029.941	15.21	1014.73	0.71	1014.02	1015.15	0.24	1014.91	-0.42	-0.89
CH16-201-BH009	1029.961	9.67	1020.29		1019.99	1020.44	0.02	1020.41	-0.14	-0.42
CH16-201-BH010	1029.976	15.50	1014.48		1014.18	1014.33	0.29	1014.04	0.15	0.14
CH16-201-BH010A	1029.966	15.72	1014.25		1013.95	1014.46	0.31	1014.15	-0.22	-0.21
CH16-201-BH011	1029.931	7.20	1022.73	1.5 to 1.7	1021.23[c]	1022.33	2.02	1020.31	0.40	0.89
CH16-201-BH011A	1029.994	6.90	1023.09	1.5 to 1.7[b]	1021.29[c]	1022.32	1.99	1020.33	0.78	0.93
CH16-201-BH012	1030.037	14.51	1015.53		1015.23	1015.57	0.37	1015.21	-0.04	0.02
CH16-201-BH012A	1029.895	13.45	1016.45		1016.15	1016.78	0.92	1015.86	-0.33	0.29
								Average:	**-0.06**	**-0.14**

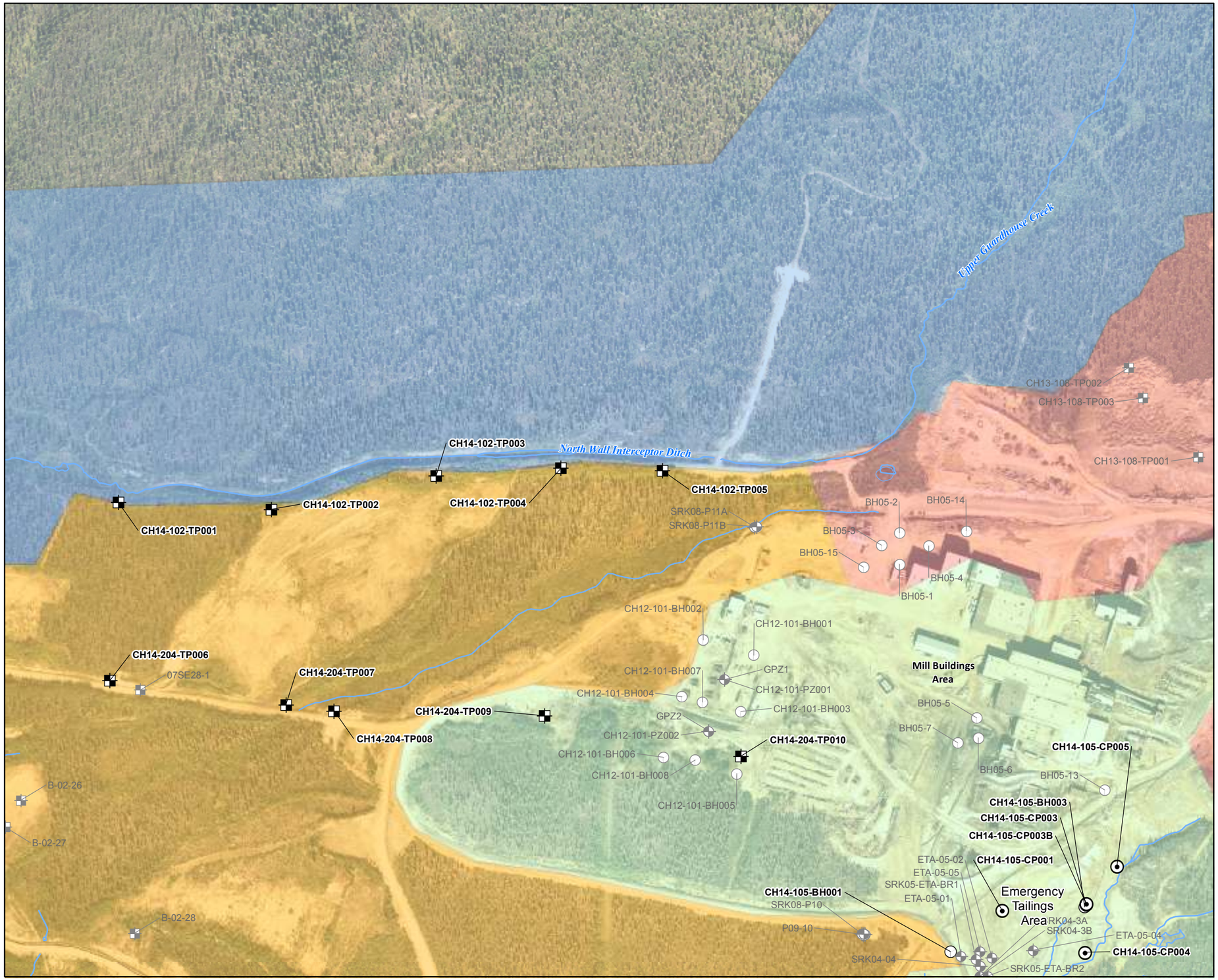
Notes:

[a] The bottom of sludge at boreholes where sludge was not observed was assumed to be 0.3m below the measured mudline elevation

[b] The thickness of sludge at borehole CH16-201-BH011A was assumed to be equal to CH16-201-BH011

[c] The estimated bottom of sludge at borehole where sludge was observed was according to the depth below top of ice rather than the observed thickness

Figures



REGIONAL MAP



- Faro Mine Site Watercourse

Completed 2014, 2015, 2016
- Borehole
- Cone Penetrometer
- Test Pit

Completed Before 2014
- Borehole
- Monitoring Well
- Test Pit

Remediation Unit
- Perimeter Unit
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Boring, monitoring well and cone penetrometer locations based on field survey by Challenger.
4. CVD = Cross Valley Pond

N

0 50 100 150 200
Metres

FIGURE 2-1
Perimeter Remediation Unit West Investigation Locations
Faro Mine Remediation Project

REGIONAL MAP



- Geophysical Transect
- Proposed Realignment of Faro Creek Diversion TA-01
- Proposed Realignment of Faro Creek Diversion TA-02
- Faro Mine Site Watercourse

Completed 2014, 2015, 2016
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

Completed Before 2014
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

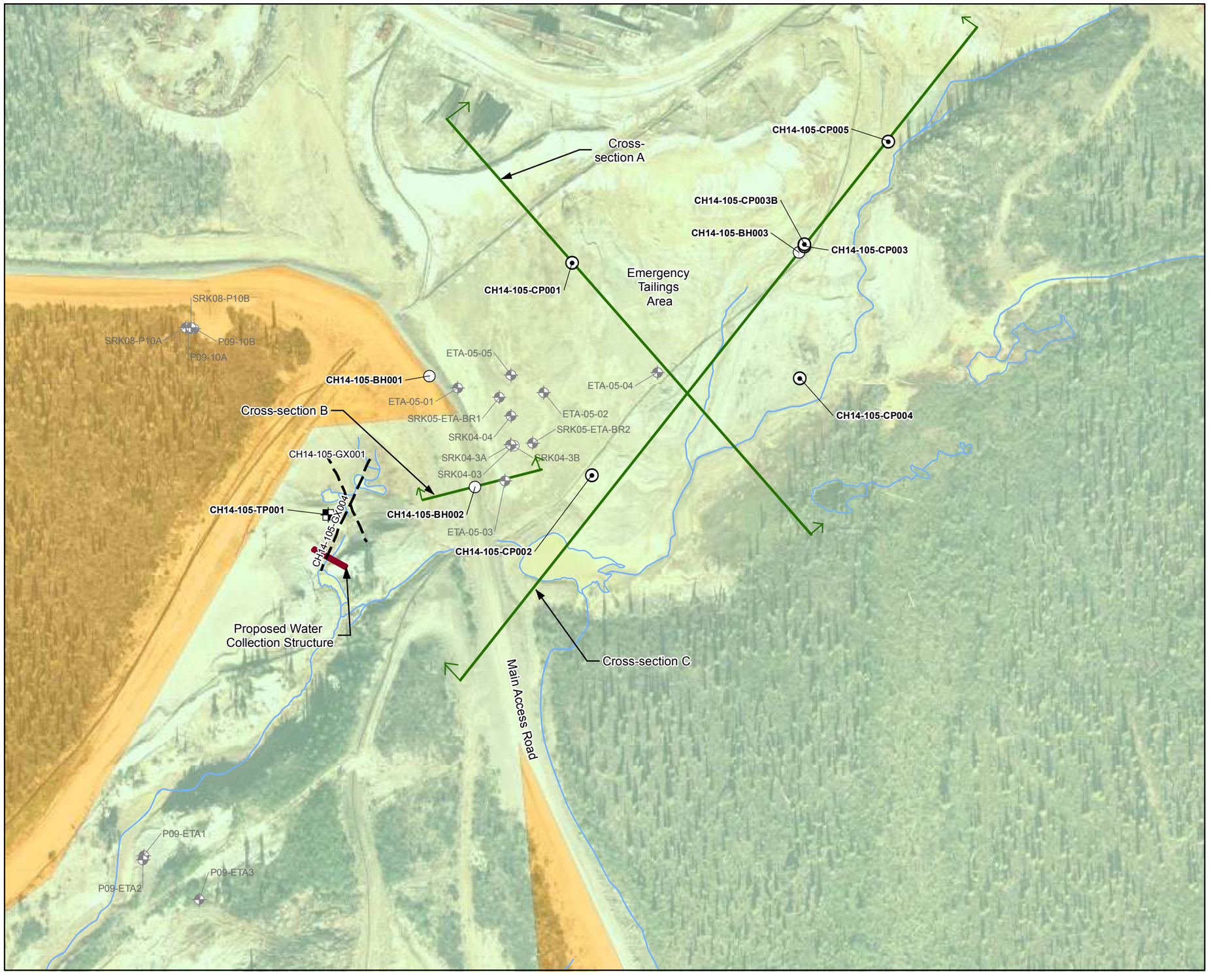
Remediation Unit
- Perimeter Unit
- Faro Pit
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Boring, monitoring well and cone penetrometer locations based on field survey by Challenger.
4. CVD = Cross Valley Pond

N

0 100 200 300 400
Metres

FIGURE 2-2
Perimeter Remediation Unit East Investigation Locations
Faro Mine Remediation Project



REGIONAL MAP



- Geophysical Transect
- Cross-section Location
- Proposed Water Collection Structure
- Faro Mine Site Watercourse

Completed 2014, 2015, 2016
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

Completed Before 2014
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

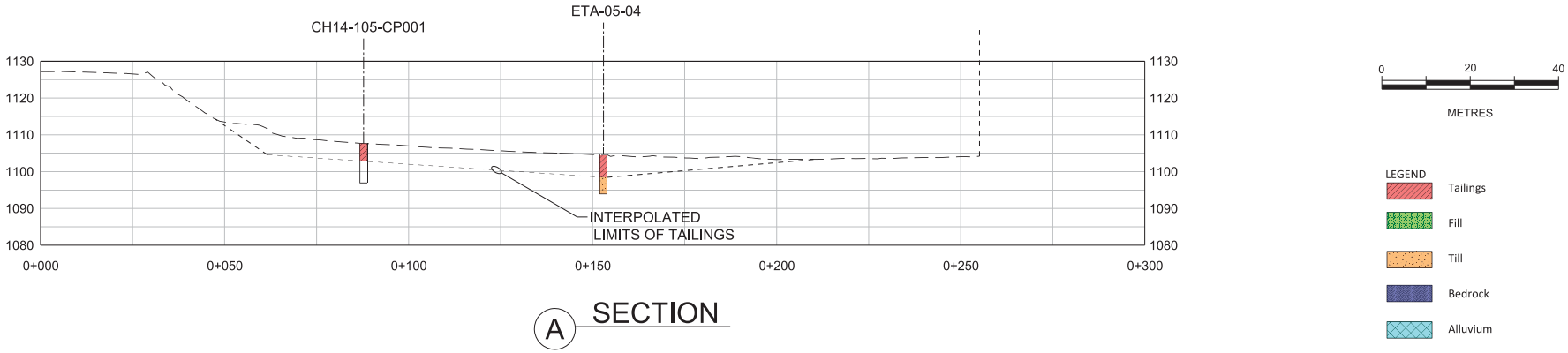
Remediation Unit
- Perimeter Unit
- Faro Pit
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
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3. Boring, monitoring well and cone penetrometer locations based on field survey by Challenger.
4. CVD = Cross Valley Pond

N

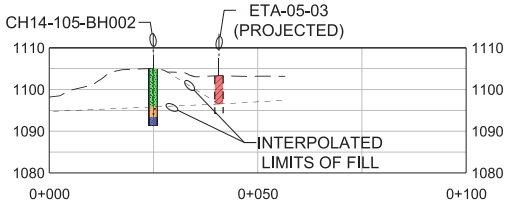
0 25 50 75 100
Metres

FIGURE 3-1
Mill and Emergency Tailings Area
Remediation Unit Investigation Locations
Faro Mine Remediation Project



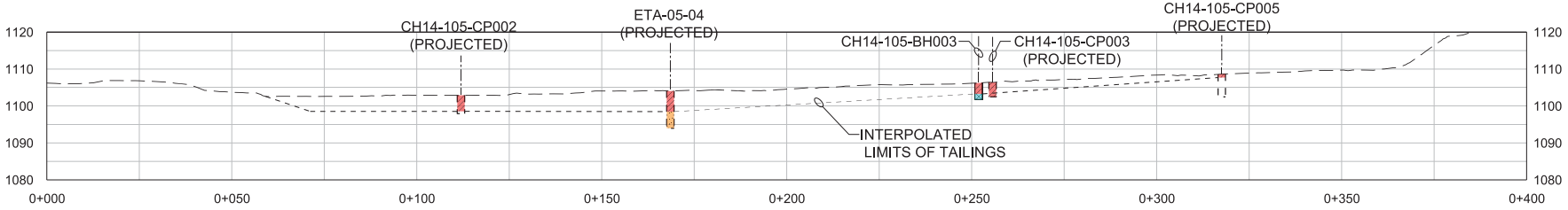
A SECTION

FIGURE 3-1



B SECTION

FIGURE 3-1



C SECTION

FIGURE 3-1

FIGURE 3-2
ETA Cross Sections
Faro Mine Remediation Project

REGIONAL MAP

NORTHWEST TERRITORIES
YUKON
Faro
Whitehorse
BRITISH COLUMBIA
Pacific Ocean

- Geophysical Transect
- Faro Mine Site Watercourse

Completed 2014, 2015, 2016
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

Completed Before 2014
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

Remediation Unit
- Perimeter Unit
- Faro Pit
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Boring, monitoring well and cone penetrometer locations based on field survey by Challenger.
4. CVD = Cross Valley Pond

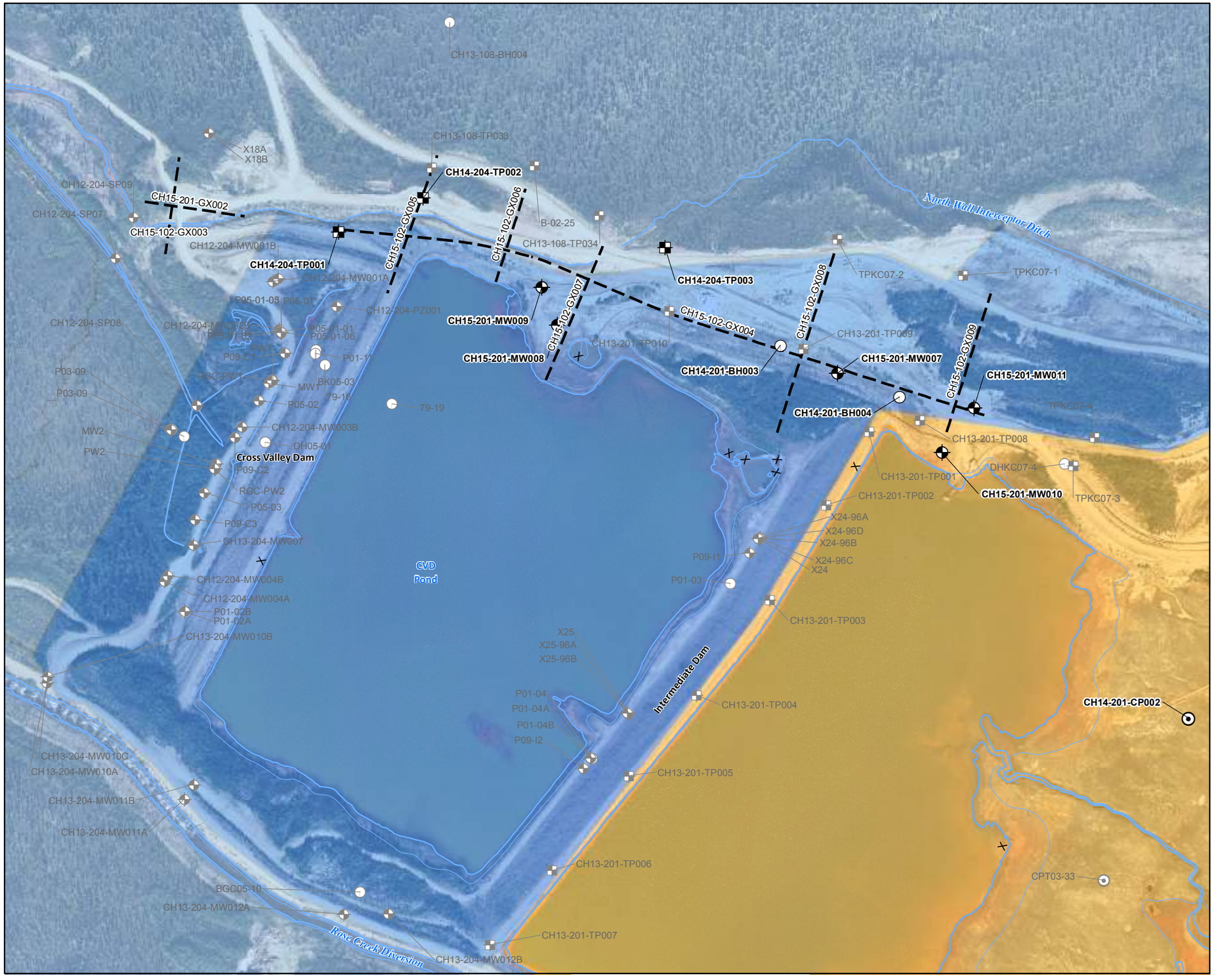
N

0 25 50 75 100
Metres

FIGURE 4-1
Rose Creek Tailings Area Remediation Unit Investigation Locations
Faro Mine Remediation Project

ch2m

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REGIONAL MAP



- Geophysical Transect
- Faro Mine Site Watercourse

Completed 2014, 2015, 2016
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

Completed Before 2014
- Borehole
- Cone Penetrometer
- Monitoring Well
- Test Pit

Remediation Unit
- Perimeter Unit
- Faro Pit
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Boring, monitoring well and cone penetrometer locations based on field survey by Challenger.
4. CVD = Cross Valley Pond

N

0 25 50 75 100
Metres

FIGURE 4-2
Cross Valley Dam SIS Pipeline and Intermediate Dam Spillway Investigation Locations



VICINITY MAP



Exploration Type

- Borehole
- Gamma Flow (Ball) Penetration Test (BGCPT) Cone Penetrometer
- Gamma Seismic Cone Penetration Test (GSCPT) Cone Penetrometer
- Hand Probe

Sample type

- Grab
- Sonic

Notes:

1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. Definitions:

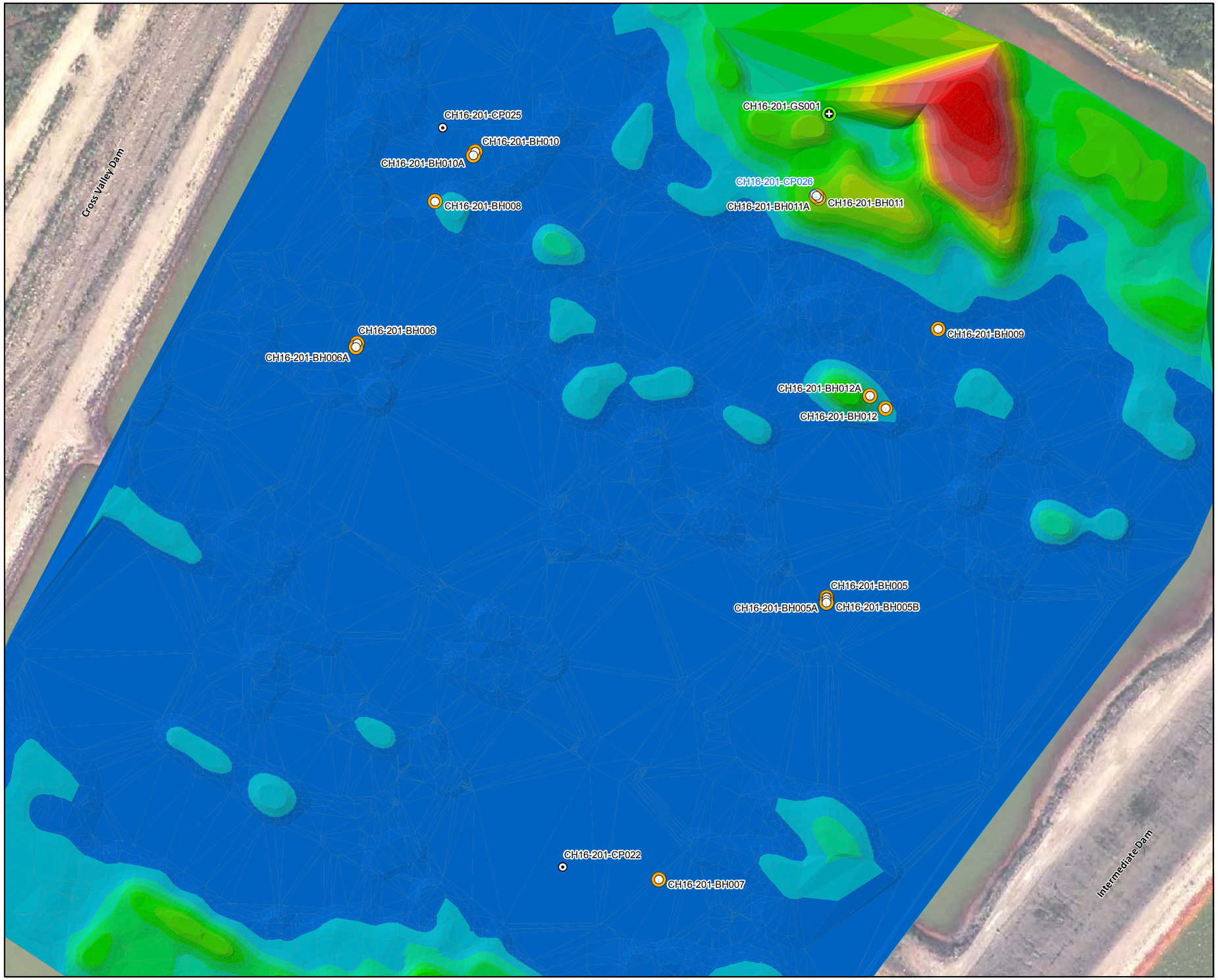
GSCPT: Gamma Seismic Cone Penetration Test
BGCPT: Gamma Flow (Ball) Penetration Test
CVD Pond = Cross Valley Dam Pond
ID = Intermediate Dam

N

0 50 100 150 200
Metres

DRAFT

FIGURE 5-1
Field Investigation Locations in the Cross Valley Dam and Intermediate Dam Ponds
Faro Mine Remediation Project



VICINITY MAP



Exploration Type
- Borehole
- Gamma Flow (Ball) Penetration Test (BGCPT) Cone Penetrometer
- Gamma Seismic Cone Penetration Test (GSCPT) Cone Penetrometer
- Hand Probe

Sample type
- Grab
- Sonic

Feature B Thickness (m)
- 5.082 - 5.4
- 4.765 - 5.082
- 4.447 - 4.765
- 4.129 - 4.447
- 3.812 - 4.129
- 3.494 - 3.812
- 3.176 - 3.494
- 2.859 - 3.176
- 2.541 - 2.859
- 2.224 - 2.541
- 1.906 - 2.224
- 1.588 - 1.906
- 1.271 - 1.588
- 0.953 - 1.271
- 0.635 - 0.953
- 0.318 - 0.635
- 0 - 0.318

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

DRAFT

N

0 15 30 45 60
Metres

FIGURE 5-2
Feature B Layer Thickness in Cross Valley Dam Pond
Faro Mine Remediation Project

Appendix G
Geochemical Data Analysis Report

Geochemical Analysis of 2012 – 2016 Field Data, Faro Mine Remediation Project

Prepared for

Government of Yukon and the Government of Canada as represented by Indigenous and Northern Affairs Canada

August 2016

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Acronyms and Abbreviations

µm	micrometre
°C	degree(s) Celsius
ABA	acid-base accounting
AP	acid potential
APHA	American Public Health Association
ARD	acid rock drainage
BC MOE	British Columbia Ministry of the Environment
$CaCO_3$	calcium carbonate
$CaCO_3$ eq/tonne	calcium carbonate equivalent per tonne
CDRM	Comprehensive Design Road Map
CH2M	CH2M HILL Canada Limited
CVD	Cross Valley Dam
DI-leach	de-ionized leach test
DVIHU	Down Valley Interim Hydraulic Upgrades
EQuIS	Environmental Quality Information System
ETA	Emergency Tailings Area
FCD	Faro Creek Diversion
FMC	Faro Mine Complex
FY	fiscal year
GAI	geochemical abundance index
GARD	Global Acid Rock Drainage
ID	Intermediate Dam
kg	kilogram(s)
LGSPC	Low-grade Stockpile “C”
m	metre(s)
mbgs	metre(s) below ground surface
MDE	Main Dump East
MDW	Main Dump West
MEND	Mine Environment Neutral Drainage
mg/kg	milligram per kilogram
MGSP	Medium Grade Stockpile
mm	millimetre(s)
NFRC	North Fork Rose Creek

NFRD	North Fork Rock Drain
NP	neutralization potential
NWID	North Wall Interceptor Ditch
NWL	Lower Northwest
NWM	Middle Northwest
NWU	Upper Northwest
OXSP	Oxide Fines Stockpile
PMF	probable maximum flood
PVC	polyvinyl chloride
RCAA	Rose Creek Alluvial Aquifer
RCD	Rose Creek Diversion
RCTA	Rose Creek Tailings Area
RU	remediation unit
SIS	seepage interception system
SPLP	synthetic precipitation leaching procedure
TIC	total inorganic carbon
TOC	total organic carbon
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
WRD	waste rock dump
WTP	water treatment plant
ZIIE	Zone II East

SECTION 1

Introduction

1.1 Purpose

This document provides supporting information to the Comprehensive Design Road Map (CDRM) by presenting the analyses of geochemical data collected at the Faro Mine Complex (FMC) that have either not been previously incorporated into any other geochemical analysis report or have only been presented in data reports without analysis and interpretation. Between 2012 and 2016, CH2M HILL Canada Limited (CH2M) has completed five field seasons at the FMC. Field activities included the collection of water quality and solid samples for geochemical analyses, and monitoring of temperature and pore-gas composition in selected waste dump locations. The results of these geochemical analyses completed between 2012 and 2016 have been validated and are stored in the Environmental Quality Information System (EQuIS) database established by CH2M for the FMC.

Analyses of geochemical data collected during field seasons 2012 and 2013 have been reported previously in the following reports:

- Analysis of 2012 Site-wide Field Data Report (CH2M, March 2013e)
- Geochemical Characterization Report (CH2M, November 2014b)
- 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report (CH2M, March 2014c)
- Fiscal Year 2013 Water Quality Modelling Analysis Report (CH2M, March 2014f)
- 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report (CH2M, March 2014m).
- 2012 Seepage, Surface Water, and Water Treatment Plant Influent Sampling Report (CH2M, October 2013a)
- Waste Rock Dump Monitoring Report (CH2M, October 2013b).
- Geotechnical Design Report, Water Treatment Plant (CH2M, December 2012).
- Cross Valley Dam Interception System Investigation Data Report (CH2M, March 2013m)
- 2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report (CH2M, February 2014q)
- Limited Borrow Material Reconnaissance Faro Mine Remediation Project (CH2M, June 2013f)
- Faro Water Treatment Plant Geotechnical Design Report Addendum, 2013 Borrow Source and Quarry Investigation (CH2M, March 2014b).
- Grum Overburden Dump Fatal Flaw Evaluation Data Report (CH2M, June 2013i).

In fiscal year (FY) 2014 through FY2016, a series of documents were submitted to describe the field investigation activities that were completed and to provide a summary of the geochemical data collected by CH2M during these field seasons, respectively. In addition, a comprehensive dataset of solids data collected between 2012 and 2014 was compiled and described in a data report for later analysis. These data reports provide the basis for the geochemical analysis included in this document. The supporting data reports that contributed to this analysis include the following:

- Input to Analysis of 2012 to 2014 Solids Data (CH2M, March 2015a)

- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2014 Field Investigation – Relocate Oxide Fines to Low-Grade Stockpile "C" (CH2M, March 2015l)
- Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tailings Area (CH2M, March 2015m)
- Summary of 2014 Field Investigation – Design of a Surface Water Collection Structure for the Emergency Tailings Area (CH2M, March 2015n)
- Summary of 2014 Field Investigation – Delineate Main and Intermediate Sulphide Cells for Regrading and Capping Design (CH2M, March 2015o)
- Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Upper Surfaces) (CH2M, March 2015p)
- Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Toe of Slope) (CH2M, March 2015q)
- Summary of 2014 Field Investigation – Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover (CH2M, March 2015v)
- Borrow Baseline Design Criteria Report (CH2M, March 2015hh)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2016)
- FCD Field Data report (CH2M, April 2016)
- ID PMF Spillway Field Data Report (CH2M, April 2016)

Summaries of geochemical data collected during the 2016 field season have been reported in the following reports:

- Summary of 2016 Field Investigation – Faro Creek Diversion Proposed Realignment (CH2M, August 2016a)
- Summary of Fiscal Year 2015-2016 Field Investigations – CVD and ID Pond Field Data Report (CH2M, August 2016c)
- Summary of 2016 Field Investigation – Faro Creek Diversion Aquifer Testing (CH2M, August 2016h)
- Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring (CH2M, August 2016j)

As geochemical data collected by CH2M before 2014 have been analyzed in one or more of the reports listed above, this *Geochemical Data Analysis Report* focuses on (1) field activities and data collected between 2014 and 2016 and (2) updated trend analysis of key geochemical data (pre-2012 to present). This report intends to further support the understanding of the FMC geochemical conditions as described in previous geochemical analysis reports. The FMC consists of three main areas: the Faro Mine Area, the Rose Creek Tailings Area (RCTA), and the Vangorda/Grum Area. To facilitate the analysis of potential remedial alternatives at appropriate spatial scales, the Faro Mine Area is has been organized into smaller remediation units (RUs) based on location and similar characteristics. For discussion purposes, this *Geochemistry Data Analysis Report* is organized according to the following RUs:

- Perimeter (i.e., Upper Guard House Creek, Faro Creek Diversion, downstream of North Fork Rose Creek, Rose Creek Diversion, and Downstream of the Cross Valley Dam, sub-divided into West, East, and South)

- Waste dumps (referred to as the waste rock dump [WRD] RU, subdivided into the following groups for the purpose of this report: Faro Valley, Northwest, Stockpiles, Main, Intermediate, S-Wells area, Northeast, and Zone II, which includes the Zone II Outwash Area)
- Mill and Emergency Tailings Area (ETA)
- RCTA
- Intermediate Dam (ID), Cross Valley Dam (CVD), and CVD Pond
- Faro Pit

In addition to the designated RUs, analysis was performed at the following FMC locations:

- North Fork Rose Creek (NFRC)
- Borrow Sources
- Vangorda/Grum Area

1.2 Scope of work

CH2M has previously submitted summaries and analyses of available geochemical data. This document has been developed to complete the requested geochemistry data analysis. The scope of this document includes the following:

- Summarize the field investigation and sampling activities completed in the FY2012 through FY2016 field seasons to collect geochemical data.
- Summarize the geochemical analyses performed in laboratories.
- Present available geochemical data stored in the FMC EQuIS database (2012-2015 for solids data and 2014-2015 for the rest) in concise tables.
- Describe the statistical analyses performed on the available geochemical data.
- Describe the understanding of FMC geochemical conditions, including apparent evolution of geochemical characteristics between 2012 and 2016, based on interpretation of the available geochemical data.

CH2M previously produced the *Input to Analysis of 2012 to 2014 Solids Data* report (CH2M, March 2015a), summarizing the geochemical analyses results for the solids samples collected at the FMC between 2012 and 2014. Preliminary observations of the available data at the time were presented in the 2015 report to assist with future analysis and interpretation. The solids data discussion presented herein builds on the information presented in the 2015 report and incorporates additional data collected in 2015. Solids data collected from a Faro Creek Diversion (FCD) drilling program completed in March 2016 are not included in this draft geochemistry analysis report, but will be included in the final version of this report. Data presented include total metals, acid-base accounting (ABA), de-ionized leach tests (DI-leach), synthetic precipitation leaching procedure (SPLP), and modified sequential extraction tests.

Water samples collected from groundwater seepage and monitoring well locations through time have been used to provide input to a comprehensive site-wide geochemical model. A summary of the geochemical modelling activities is provided in Section 2 of the main CDRM report; more detailed discussions on the geochemical model and modelling results are presented in the following reports:

- NFRC Geochemical Report (CH2M, March 2016g)
- Fiscal Year 2013 Water Quality Modelling Analysis Report (CH2M HILL, March 2014f)

This document presents the current understanding of water chemistry changes at the FMC as a result of ongoing geochemical processes within the mine impacted areas. Statistical analysis completed on the available seepage and groundwater quality data identify trends in water quality data through time. To facilitate a more thorough understanding of water quality conditions, the water quality data discussion presented herein should be read in conjunction with the *Groundwater Analysis Report* (CH2M, April 2016e) and *Hydrology Data Analysis Report* (CH2M, April 2016k). In addition, this report includes vertical profile temperature and pore-gas concentration measurements recorded from the thermistor and pore-gas ports installed at WRD RU monitoring locations.

1.3 Analytical Methods

Geochemical laboratory analyses were conducted on solids and water samples collected during the 2012 through 2016 field investigations. The following sections summarize the analyses performed by the laboratory.

1.3.1 Solids Samples

Samples were selected from each location based on the data required to support each field investigation, samples available, materials found, and engineering judgment. Approximately 1 kilogram (kg) of material was collected for each solids sample and sent to the laboratory for geochemical analysis. Solids samples collected during the 2012 through 2016 field investigations were analyzed for some or all of the following:

- Total metals analysis
- ABA parameters:
  - Paste pH
  - Total sulphur
  - Acid-soluble sulphate
  - Sulphate attributed to barium (using lithium metaborate fusion)
  - Neutralization potential (NP) (using modified Sobek analysis)
- 96-hour DI-leach test
- Modified SPLP at three pH conditions (pH 3, 4, 5)
- Sequential extraction procedure as outlined in the *Quality Assurance Project Plan* (CH2M, September 2015)
- General chemical parameters:
  - Soil pH measurement (1:2 soil:solution ratio)
  - Total organic carbon (TOC)
  - Total inorganic carbon (TIC)

The analytical methodologies applied to the solids samples are further described in this section.

1.3.1.1 Total Metals Analysis

ALS Laboratory conducted total metals analyses following the British Columbia *Contaminated Site Regulations* analytical method, Strong Acid Leachable Metals in Soil (BC MOE, 2009) and procedures adapted from the United States Environmental Protection Agency (USEPA) *Method 200.2* (USEPA, 1994). This method uses a mixture of hydrochloric and nitric acids to digest the sample, which was pulverized by the laboratory. This digestion may dissolve metals at concentrations that are unlikely to dissolve at a given time under natural environmental conditions; however, it estimates the total metal content of the sample that could be available for release to the environment as a result of long-term weathering and diagenesis. The total metal concentrations do not provide insight into the mineralogy of the overburden material and therefore the efficacy for dissolution. However, by determining total metals, a screening tool is gained to identify the potential environmentally available quantity of constituents. These results

can be used to identify anomalous geochemical samples and material with relatively elevated total metal concentrations.

Total metal results were compared to the *Global Acid Rock Drainage Guide* (GARD Guide) (INAP, 2013) and Mine Environment Neutral Drainage (MEND) screening criteria to highlight potential sources of constituent loading to key locations at the FMC. Since the material around the FMC contains both crustal material (e.g., primary WRD material) as well as soil (including not only native soil, but also weathered WRD material), the total metals concentrations are compared with elemental crustal abundance concentrations (MEND) and median world soil concentrations to identify relative elevated concentrations (GARD). Concentrations of elemental crustal abundance are sourced from Price (1997) and presented as 10 times the average value in the continental crust, which is the expected range in a meta-volcanic mineralized terrane. The median world soil concentrations are reported in the GARD Guide (INAP, 2013) and are used to calculate a geochemical abundance index (GAI). The GAI is a calculated measure of elemental enrichment relative to a reference material. The GAI compares the actual concentration of an element in a sample with the median abundance for that element in the most relevant media (such as crustal abundance, soils, or a particular rock type). The main purpose of the GAI is to provide an indication of any elemental enrichments that may be of environmental importance. The GAI is calculated by:

$$GAI = \log_2(\text{element concentration}/1.5 \times \text{reference material concentration})$$

A GAI value of between 3 and 4 represents a concentration 12 to 24 times the reference material content. As such, the GARD Guide considers any GAI value greater than 3 is significant and warrants further examination (INAP, 2013). Because a GAI of 3 is equivalent to 12 times the reference value, the total metals results were compared to 12 times the median world soil concentrations. Some elements tend to be more enriched in the crustal material than in the soil material and vice-a-versa. As such, elements that exceed both criteria in a sample are of greatest interest.

1.3.1.2 Acid Base Accounting

Selected samples collected during the 2012 through 2015 field investigations also underwent ABA analysis. ABA analysis is generally used to predict the tendency of a material to generate or neutralize acid by providing a snapshot (in time) of the balance between the acid production and acid neutralization, based on the sulphur content and presence of neutralizing species, such as carbonate minerals.

Paste pH analysis estimates the readily available acidity or alkalinity in a solid and generally represents in situ weathering conditions of FMC materials. The paste pH methodology followed methods of Canadian Society of Soil Science (Price, 1997) and American Public Health Association (APHA) Method 4500H (1992). In general, a paste pH greater than 7 indicates the presence of a reactive carbonate phase, and a paste pH less than 5 may signify the sample has already gone acidic (i.e., a previously weathered sample) (MEND, March 1991).

Total sulphur was determined using Leco high-temperature induction furnace analysis that followed International Organization for Standardization Method 15178 (2000). The sample was ignited in a combustion analyzer, where sulphur in the reduced sulphur dioxide gas is determined using a thermal conductivity detector.

Acid-soluble sulphur tests are used to determine how much of the total sulphur will react with oxygen to create acid. The test method used by ALS Laboratories follows the procedures outlined in *Field and Laboratory Methods Applicable to Overburdens and Minesoils* (USEPA, 1978). This method involves extractions using hydrochloric acid and then nitric acid, followed by DI-leaching to remove chlorides. The sample is then dried, filtered, and analyzed for total sulphur.

Total barium is obtained by analyzing for lithium metaborate using Method 6020A. This method uses inductively coupled plasma-mass spectrometry. Similar to inductively coupled plasma – atomic emission spectrometry, the sample must be digested in acid before filtration and analysis (USEPA, 2007).

NP values were determined by using the modified Sobek method (MEND, March 1991; Lawrence et al, March 1989). This method involves adding hydrochloric acid to the sample and rating the amount of "fizz" that occurs. This fizz rating is used to determine the strength and molarity of hydrochloric acid required to perform the analysis. The sample is heated in stages, first with hydrochloric acid, then with DI water, and subsequently titrated to obtain the NP (USEPA, 1978). Analyzing NP by the modified Sobek method generally provides a more realistic indication of the readily available carbonate minerals than other NP determination methods, such as the standard Sobek method (MEND, March 1991).

For this evaluation, acid potential (AP) was determined based on the sulphide sulphur content in the material and was converted to units of calcium carbonate equivalent per tonne ($CaCO_3$ eq/tonne). The sulphide content of the FMC samples was determined using the total sulphur content and subtracting the acid-soluble sulphate sulphur, the barium sulphate sulphur, and the amount of theoretical sulphur associated with non-acid generating metal sulphides, such as lead, and zinc. This complex calculation used concentrations of barium, lead, and zinc to estimate the sulphur content not associated with highly reactive iron sulphides. The calculations generally followed the following equation (SRK, June 2004b):

$$SF_{Fe}(\,percent) = S_{\,total}(\,percent) - 32.15 * \left[\frac{Zn\,(\,percent)}{65.4} + \frac{Pb\,(\,percent)}{207} + \frac{Ba(\,percent)}{137}\right] - S_{sulphate}$$
(percent)

Where:

SF_{FE}	=	sulphide sulphur content
S_{total}	=	total sulphur content
Zn	=	zinc
Pb	=	lead
Ba	=	barium
$S_{suplphate}$	=	sulphate sulphur content

An important note, at some locations where potentially acid generating material was not anticipated or thought to be very low (e.g., Perimeter RU), solid samples were not submitted for analysis of the complete suite of ABA parameters (i.e., acid-soluble sulphate and Ba were not determined). However, ABA calculations were still determined based solely on total sulphur under the assumption that all sulphur present in the sample was sulphide sulphur. Notably, the calculations of AP based on total sulphur alone may be overly conservative with respect to the acid generation potential of FMC materials.

Although static testing methods provide a fast and cost-effective means of measuring the ABA properties of a material, the interpretations may be limited by the following factors that static tests do not measure: rates of acid generation and NP depletion, actual sample stoichiometries, presence of long-term acid-consuming materials versus highly reactive and readily available acid-consuming materials, and sample variability (MEND, March 1991).

The relative amount of NP and AP is typically assessed through the NP:AP ratio, calculated by dividing the NP by the AP. Various guidance criteria are published and used in decision making. Generally, these criteria are divided into categories of "potentially acid-generating," "non-acid-generating," and "intermediate" for the ABA characteristics and provide the following threshold values (USEPA, 1999):

- NP:AP values greater than 3:1 suggest non-acid-generating material.
- NP:AP values less than 1:1 suggest potentially acid-generating material.
- NP:AP values between 1:1 and 3:1 suggest intermediate or "uncertain" material.

These criteria provide the basis for determining the net potential for FMC materials to generate or neutralize acid.

1.3.1.3 De-ionized Water Leach

The objective of the 96-hour DI-leach test (i.e., shake flask test) was to estimate the amount of readily soluble, elemental loading during analyses (e.g., without consideration of weathering reactions or secondary precipitation). The readily soluble elemental load determined by the 96-hour DI-leach test provides insight into the initial chemistry, solubility limits, and geochemical conditions under which contaminants may be released to the environment. DI water is used because it is essentially devoid of dissolved cations or anions that can influence the solubility of the material being tested; therefore, the resulting leachate is solely representative of the material being tested. While the slightly acidic nature of the initial DI water mimics typical precipitation pH, it can also impact elemental solubility from samples with little to no buffering capacity. The 3:1 ratio coupled with the 96-hour leach time was selected to maintain consistency with the SRK leach procedure previously used for FMC materials. However, results from this test do not indicate future drainage chemistry (Price, 2009).

The 96-hour modified shake flask extractions were performed with DI water and a water-to-solids ratio of 3:1. The lab used ultra-pure deionized water (Type 1 Laboratory water) generated from an ELGA water purification system that had an initial pH between 5.5 and 5.8. Following the extraction step, the extract was centrifuged and decanted, filtered through a 0.45-micrometre (µm) filter, then acidified (ultrapure nitric acid to 2 percent) before being analyzed. This procedure is based on the method outlined by Price (1997) and follows the DI-leach testing procedures historically employed at the FMC (SRK, June 2004b).

1.3.1.4 Modified Synthetic Precipitation Leaching Procedure

Selected samples underwent modified SPLP analysis, based on USEPA Method 1312 (USEPA, September 1994). The SPLP is a static leach test that measures readily soluble constituents of mine and process wastes and provides an initial estimate of a material's potential to mobilize constituents in the environment. However, SPLP analysis does not provide information related to the reaction rates controlling constituent mobilization. The modified-SPLP analysis was performed on three splits of the same sample, with a water-to-solids ratio of 20:1 for 16 to 20 hours and using three extraction fluids (one for each split), at pH 3, pH 4, and pH 5. In the modified SPLP analysis, pH was adjusted using sulphuric acid (USEPA, September 1994). The extract was filtered through a 0.6- to 0.8-µm glass fibre filter before undergoing analysis for dissolved metals.

In the modified SPLP tests, adjustment of the pH of the extractant from pH 5 through pH 3 demonstrates the effect of different pH waters on the sample (e.g., from slightly acidic precipitation to more acidic mine drainage). The 20:1 ratio for the modified SPLP was selected to remain consistent with the traditional SPLP method. The higher dilution ratio prevents potential solubility limitations from impacting the results, and the high leachate to solid ratio limits the buffering capacity of the solid, thereby allowing a constant pH to be maintained during the extraction.

The SPLP data has not been included in this report as there was no new data from the 2015 field season. All of the SPLP data is presented and discussed in the previous report *Input to Analysis of 2012 to 2014 Solids Data* (CH2M, March 2015a).

1.3.1.5 Sequential Extraction Procedure

Selected samples were subjected to sequential extraction procedures to determine the mobility and mineralogic association of trace metals within the solid material analyzed at the FMC. Solids samples were subjected to extractions using six successively more aggressive dissolution techniques following the protocol described in Thomas (2002). The purpose of the extraction sequence was to determine how trace metals are bound within the solids sample using operational defined extraction steps aimed at

selectively releasing trace metals from a particular target phase. In theory, the extraction scheme first releases (1) weakly bound, neutral-salt exchangeable trace metals, followed by (2) acid-soluble material, such as carbonates, acid volatile sulphides, and some aluminum compounds, (3) trace metals associated with amorphous iron and manganese oxides, (4) pyrophosphate extractable materials, such as humic substances or metals complexed with organic matter, (5) trace metals associated with crystalline iron and manganese oxides, and (6) recalcitrant material, such as metal sulphides, resilient metal oxides, and refractory organic material. Silicate minerals are generally not dissolved in this extraction scheme (Thomas, 2002). Results from the sequential extraction procedure, in combination with total metals analysis in a given sample, provide information on the mobility of trace elements during weathering in mine environments.

1.3.1.6 General Chemical Parameters

Following the Soil Science Society of America method (Loeppert and Suarez, 1996), TIC was determined at the laboratory by decomposing the sample with acid in an open system and releasing carbon dioxide. Determined gravimetrically, the release of the carbon dioxide from the sample is proportional to the carbonate content of the sample. The fraction of total organic carbon was determined using CSSS Method 21.2 (Tiessen and Moir, 1993), which uses potassium dichromate and sulphuric acid to oxidize the organic carbon. The organic carbon content of the sample was used to determine the organic matter content using the Van Bemmelon factor.

1.3.2 Water Samples

Seepage and groundwater samples were collected from accessible seepage locations, groundwater monitoring wells, and streambed piezometers. The following field parameters were measured at all water sampling locations:

- Temperature
- pH
- Specific conductance
- Dissolved oxygen
- Oxidation-reduction potential
- Turbidity (groundwater samples only)

Water samples were filtered and persevered in the field, as appropriate, and sent to the laboratory for a suite of water quality analyses, including the following:

- Acidity or hot peroxide acidity
- Alkalinity
- Ammonia
- Anions
- Dissolved metals
- Dissolved organic carbon
- Ferrous iron
- Total dissolved solids
- Total suspended solids

Select samples were also tested for unfiltered free cyanide.

SECTION 2

Perimeter Remediation Unit

2.1 Field Investigation Activities

Field investigation activities completed within the Perimeter RU during the 2012 to 2015 field seasons were to support the characterization of undisturbed areas bordering defined RUs. The Perimeter RU comprises the West, East, and South portions surrounding the Faro Mine Area and the RCTA. This section focuses on the field investigations between completed in the Perimeter RU West and Perimeter RU South.

Many of the locations where investigation activities were completed between 2012 and 2015 fall within the general geographic extents of the Perimeter RU, but were investigated with the primary purpose of supporting specific design objectives. Locations that were investigated in the Perimeter RU to support the NFRC diversion design are discussed in Section 8. Locations that were investigated in the Perimeter RU to support borrow material investigation are discussed in Section 9. Locations that were investigated in the perimeter RU to support characterization of the Zone II outwash are discussed in Section 3.

2.1.1 Test Pit Excavation

Five test pits completed in 2014 were located downgradient of the Northeast and Zone II WRDs. Although these test pit locations fall within Perimeter RU East, relevant discussions are presented in Section 3 Waste Rock Dumps RU as the data are relevant to understanding soil quality as a result of geochemical processes in the WRDs. A total of 37 test pits were completed in the NFRC valley and proposed realignment channel as part of the NFRC Realignment Project in 2015. Although these test pits were located within Perimeter RU East, they are discussed separately in Section 8 North Fork Rose Creek. In addition, 31 test pits in potential borrow areas were completed in 2014 and 2015, including 5 in the area east of the RCTA, 13 in the area northwest of the proposed NFRC Seepage Collection Dam, and 13 at the Fresh Water Supply Dam embankment. These potential borrow areas are discussed in Section 9, Borrow Sources.

2.1.2 Borehole Drilling and Monitoring Well and Thermistor Port Installation

During the 2012 field season, 11 boreholes were drilled down valley from the CVD, and four of these locations (two well clusters) are located in the West Perimeter RU. Wells were installed in clusters of two with one shallow and one deep well screen. These locations were drilled to collect data to support the development of an effective monitoring system to detect breakthrough of mine impacted groundwater from the RCTA to the receiving environment. Further description of the drilling and installation activities, along with the laboratory analyses and discussion are presented in the report titled *Construct Cross Valley Dam Interception System - 2012 Field Sampling Plan* (CH2M, March 2013m).

During the 2015 field season, nine boreholes were drilled adjacent to the FCD in support of the Faro Valley Seepage Investigation. These boreholes were drilled in clusters of three through the overburden with the intent of reaching competent bedrock and installing monitoring wells across the saturated formation within the overburden. The maximum depth of these borings ranged between 5.49 and 29.11 metres below ground surface (mbgs), and the midpoint of well screen ranged between 3.99 and 11.82 mbgs. Description of the drilling and monitoring well installation activities, laboratory analyses, and results discussion are presented in a report titled *Summary of 2015 Field Investigation – Faro Valley Seepage Investigation* (CH2M, April 2016f).

As part of the NFRC Realignment Project investigation in 2015, six boreholes were drilled at the Rose Creek Diversion adjacent to the RCTA. These monitoring wells will be discussed in Section 5 RCTA RU. A

further six boreholes were drilled in the proposed borrow area northwest of the proposed NFRC Seepage Collection Dam, which will be discussed in Section 9, Borrow Sources.

During the 2016 field investigation, six boreholes were drilled as part of the FCD proposed realignment investigation (five completed with piezometers and thermistor ports). One of the boreholes was drilled at an angle near the edge of the Faro Pit to a 60-metre (m) depth to help confirm the bedrock material in that area. The other five boreholes were drilled along the proposed realignment of the FCD. A detailed description of the activities, laboratory analyses, and results is presented in the *Summary of 2016 Field Investigation – Faro Creek Diversion Proposed Realignment* technical memorandum (CH2M, July 2016a).

2.1.3 Seep Sampling

Although some seepage monitoring locations fall along the boundary and ultimately flow into the Perimeter RU, all relevant discussions will be presented in Section 3, WRD RU, as the data are relevant to understanding seep water quality originating from the WRDs.

2.1.4 Groundwater Sampling

A total of 25 groundwater monitoring wells located within the South and East Perimeter RUs were visited in 2014 and 2015, and 15 locations were sampled. In 2014, one groundwater sampling event took place within the South Perimeter RU and East Perimeter RU between September 10 and 19. In 2015, the sampling event took place between October 3 and 13. Descriptions of groundwater sampling events that took place in 2014 and 2015 are presented in the field summary reports *Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, March 2015) and *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, March 2016d).

2.2 Field Investigation Data Evaluation

2.2.1 Solids Data

2.2.1.1 Total Metals Analysis

Total metals concentrations in all sampled analyzed from locations CH12-204-MW005B and CH12-204-MW006B were less than both 12 times the median world soil content and 10 times the crustal abundance. These monitoring wells are located in an area that was unaffected by mining activities, along Rose Creek downstream of the diversion channel, which explains the background levels of metals throughout each borehole. Samples collected from locations CH16-102-MW003 through CH16-102-MW007 also contained concentrations below both guidelines. These locations are all in the unaffected mining area above the FCD.

Samples from locations CH15-106-MW003, CH15-106-MW004, CH15-106-MW005, and CH15-106-MW010 contained multiple exceedances. These monitoring wells are located north of the Faro Pit and were drilled into the road along the FCD, where fill material was used to create the road. The samples with exceedances were taken from the road fill material.

Exceedances from these locations include arsenic, cadmium, copper, lead, mercury and zinc. The highest arsenic concentration recorded was in sample CH15-106-MW003_SOd with a concentration of 862 milligrams per kilogram (mg/kg), almost 12 times more than the higher guideline. Sample CH15-106-MW010_SOb had the highest recorded lead concentration of 12,900 mg/kg, which is over 30 times the higher of the two guidelines. The highest zinc concentration recorded was 2,100 mg/kg, also in sample CH15-106-MW003_SOd, almost double the higher of the two guidelines for zinc.

Complete total metals results can be found in Table 2-1.

2.2.1.2 Acid Base Accounting

ABA characteristics were measured in materials collected from the drilling of CH12-204-MW005B and CH12-204-MW006B. Paste pH was relatively neutral in all samples, ranging from 6.34 to 7.25, and the calculated NP:AP ratios were all greater than 3.0 indicating the material is non-potentially acid generating.

ABA properties were also assessed in samples collected from the Faro Creek Valley Seepage Investigation 2015 drilling program (Table 2-2). Monitoring locations CH15-106-MW003 and CH15-106-MW004 had acidic paste pH values, however the ratio of NP to AP for all samples was greater than 3.0, indicating the material is not potentially acid generating. Samples collected from the other monitoring locations, CH15-106-MW005 and CH15-106-MW010, had neutral paste pH and net-neutralizing NP:AP ratios (i.e., greater than 3.0), indicating the material is also non-potentially acid generating.

2.2.1.3 De-ionized Water Leach Test

DI-leach testing was conducted on samples collected during 2015 drilling near the FCD at monitoring well locations CH15-106-MW003 (eastern valley), CH15-106-MW005 (western valley), and CH15-106-MW010 (up valley). The DI-leach tests of the borehole materials collected from the upper valley and west side of the Faro Creek valley locations resulted in a final leachate that was near-neutral, but contained elevated concentrations of copper, lead, and zinc, suggesting the potential for increased mobility of these metals. Increased mobility of these constituents in the relatively undisturbed areas of the Faro Creek valley is likely the result of weathering processes of naturally occurring mineralized zones near the land surface. Monitoring location CH15-106-MW003 was drilled through the FCD access road, and samples collected at intermediate depths (approximately 8 mbgs) show potential influences from mine waste materials. Leachate results from this location were acidic and contained readily dissolved sources of cadmium, copper, lead, and zinc. It is estimated that at least a portion of the FCD access road or road bed was constructed using WRD materials, affecting the sediments beneath the roadway. This is supported by total metal analysis of samples collected in this area.

DI-leach testing was also conducted on samples collected from CH12-204-MW005B and CH12-204-MW006B. The final leachate was near neutral for these samples, and the SOb samples from each location contained elevated levels of copper, iron, and lead. This again suggests the potential for increased mobility of these metals, and because of the samples proximity to the surface could also be attributed to natural weathering processes.

All DI-leach results can be found in Table 2-3.

2.2.2 Groundwater Data

In 2014 and 2015, most monitoring wells located within the Perimeter RU were sampled only once a year, during the fall. However, monitoring wells P01-01A and P01-01B were also sampled during the summer in 2015. The analytical results and a summary of some key parameters can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, March 2016d). All groundwater analytical data was compared to groundwater quality guidelines established in the Canadian Environmental Quality Guidelines (CCME, 2016).

Groundwater data trends using historical (pre-2012) and current (post-2012) water quality data were also analyzed using the Mann-Kendall trend test, the results of which can be found in Table 2-4. Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations (CH2M, March 2014c). The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit.

Monitoring well CH12-204-MW005B showed an increasing trend for total alkalinity and no significant trends for dissolved magnesium, field pH and sulfate. There was not enough data to conduct analysis for dissolved iron or dissolved zinc. CH12-204-MW006B did not have enough data to conduct analysis for dissolved iron. The remaining parameters showed no significant trends. Nine wells installed in either 2012 or 2013 did not have enough data to evaluate statistical trends (Table 2-4). P01-01A showed increasing trends for total alkalinity, dissolved magnesium, and sulphate, and a decreasing trend in field pH. There were no trends in the data evaluated for dissolved iron and dissolved zinc. P01-01B showed increasing trends for total alkalinity, dissolved magnesium, and sulphate. There are no other statistically significant trends in the other analytes evaluated. Monitoring well X16A exhibited significant increasing trends in total alkalinity and dissolved magnesium and significant decreasing trends in dissolved iron and dissolved zinc. Sulphate and field pH did not show any significant trends. Monitoring wells X16B and X17A showed increasing trends for total alkalinity, dissolved magnesium, and sulphate, and decreasing trends for dissolved iron. These two wells did not exhibit significant trends for field pH or dissolved zinc. Monitoring wells X17B and X18A showed increasing trends for total alkalinity, dissolved iron, dissolved magnesium, and sulphate, but no significant trends for either field pH or dissolved zinc. Monitoring well X18B showed increasing trends for total alkalinity, dissolved magnesium, and sulphate, and decreasing trends for dissolved iron, field pH, and dissolved zinc.

2.2.3 Summary and Recommendations

Results from geochemical testing and analysis of the Perimeter RU materials provides the basis for characterization of key locations within areas bordering the RUs. Results of the solid materials collected are summarized below:

- The fill material used to construct the FCD access road was, at least in part, WRD material with elevated concentrations of zinc, arsenic, cadmium, lead, and copper.
- All the materials evaluated with ABA methods from the borings completed at the FCD are net-neutralizing.
- Material from the FCD leakage investigation subjected to DI-leach testing resulted in near-neutral leachate with significant amounts of copper, lead and zinc in leachate of samples from the northern end of the FCD and western side of Faro Valley.
- DI-leach testing of FCD samples from the eastern side of Faro Valley generated acidic leachate with significant amounts of cadmium, copper, lead, and zinc. This is most likely attributable to the presence of WRD material in the fill used to construct the FCD access road.

Groundwater geochemical testing indicates:

- Water quality in the Rose Creek Valley downstream of the CVD shows significant trends of decreasing pH. Also noted were significant trends of increasing alkalinity and dissolved magnesium, and concentrations of iron and zinc.

SECTION 3

Waste Rock Dump Remediation Unit

The WRD RU encompasses almost all defined WRDs in the Faro Mine Area and some parts of the Perimeter RU, including the Zone II Outwash area, the S-Wells area, and the area to the southwest of the WRDs. Because these parts of the Perimeter RU receive groundwater seepage from the WRDs, the geochemical data obtained in these areas are considered closely representative of that in the WRDs and are discussed in this section. The one exception is the Faro Valley Waste Dump, which drains exclusively to the Faro Pit. The waste dump was not sampled for solids analysis, and only seepage data flowing into the Faro Pit was collected. As such, the Faro Valley Waste Dump is included in the Faro Pit RU.

3.1 Field Investigation Activities

Field investigation activities were completed within the WRD RU from 2012 through 2015 to support the following objectives:

- Locating of suitable material for use in gabion baskets for the Down Valley Interim Hydraulic Upgrades (DVIHU) design (CH2M, March 2014m)
- Understanding of site-wide geochemical properties and WRD pore-gas profiles (CH2M, October 2013b; CH2M, March 2015b; CH2M, April 2016d; CH2M, August 2016h)
- Proposed relocation of material from the Oxide Fines Stockpile (OXSP) to the Low-grade Stockpile "C" (LGSPC) (CH2M, March 2015l)
- Delineation of the sulphide cells in support of the design of regrading, cover, and revegetation of the Main Dump and Intermediate Dump (CH2M, March 2015o)
- The design of regrading and resloping the Faro Mine Area waste dumps (CH2M, March 2015p; CH2M, March 2015q)
- Relocation of Zone II Outwash Material (CH2M, March 2015s)
- Design of a seepage interception system at the Zone II Outwash (CH2M, March 2015t)
- Design of a seepage interception system at the S-Wells (CH2M, March 2015u)
- Proposed excavation and disposal of petroleum contaminated material near the old Faro Lube Shack and Tank Farm Area (CH2M, March 2015v)

3.1.1 Test Pit Excavation

During the 2013 field season, 11 test pits were excavated in the Lower Northwest (NWL) WRD, and samples were selected from five of these locations to send to the laboratory for geochemical analyses. These test pits were excavated as part of the DVIHU field investigation to evaluate the suitability of the material in the NWL WRD to be used in gabion baskets.

A total of 33 test pits were completed in the WRD RU during the 2014 field season, at locations within the boundaries of WRDs, at the Zone II Outwash area, and along the toes of the WRD slopes. Typically, samples collected from the shallow and bottom-of-pit intervals within each test pit were sent to ALS Laboratory for geochemical analyses; middle interval samples from selected test pits were also submitted for analyses. Two hand samples were also collected from two shallow holes (approximately 0.20 mbgs) hand dug on the northern side of the LGSPC in July 2014. The collected material was logged according to the Unified Soil Classification System (USCS).

Description of the test pit excavation activities, laboratory analyses, and results discussion are presented in the following documents:

- 2013 Down Valley Interim Hydraulic Upgrades Field Investigation Data and Analysis Report (CH2M, March 2014m).
- Summary of 2014 Field Investigation – Relocate Oxide Fines to Low-grade Stockpile "C" (CH2M, March 2015l)
- Summary of 2014 Field Investigation – Delineate Main and Intermediate Sulphide Cells for Regrading and Capping Design (CH2M, March 2015o)
- Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Upper Surfaces) (CH2M, March 2015p)
- Summary of 2014 Field Investigation – Regrade and Reslope Faro Waste Rock Dumps (Toe of Slope) (CH2M, March 2015q)
- Summary of 2014 Field Investigation – Relocate Zone II Outwash Material to Intermediate Sulphide Cell (CH2M, March 2015s)
- Summary of 2014 Field Investigation – Relocate Contaminated Soil from Faro Lube Shack and Tank Farm Area and Cover (CH2M, March 2015v)

3.1.2 Borehole Drilling and Monitoring Well, Thermistor Port, and Gas Port Installation

During the 2012 field investigation three boreholes were drilled in the WRD RU: CH12-014-MW003 near the Main Dump, CH12-104-MW005 in the Zone II WRD, and CH12-104-MW007 at the toe of the Intermediate Dump. These boreholes were drilled as part of the site-wide WRD monitoring program. All three locations with installed with monitoring wells, thermistor ports, and gas ports.

During the 2014 field season, four boreholes were drilled within the WRD RU: CH14-015-MW004 in the Northwest WRD, CH14-015-MW006 in the Northeast WRD, CH14-104-MW008 in the OXSP, and CH14-106-MW009 in the Main Dump that was designed to go through the sulphide cell. The borings were advanced to native materials underlying the waste rock to a maximum depth of between 32.8 and 65.5 mbgs.

In addition, a total of fourteen boreholes were drilled in areas adjacent to the Faro Mine Area WRDs, including eight borings in the Zone II Outwash area and six borings in the S-Wells area. The maximum depth of boreholes in the Zone II Outwash area ranged between 3.05 mbgs (a shallow monitoring well in a paired cluster, drilled to just below stream level in the NFRC) and 50.5 mbgs (drilled into bedrock to conduct packer testing). The maximum depth of boreholes in the S-Wells area ranged between 6.10 mbgs (a shallow monitoring well in a paired cluster) and 37.20 mbgs (drilled into bedrock to conduct packer testing).

Most borings were completed with monitoring wells; thermistor ports and gas ports were also installed in select locations.

Description of the drilling and instrument installation activities, laboratory analyses, and results discussion are presented in the following documents:

- Waste Rock Dump Monitoring Report (CH2M, October 2013b)
- Summary of 2015 Field Investigation – Faro Valley Seepage Investigation (CH2M, April 2016f)
- Summary of 2014 Field Investigation – Relocate Oxide Fines to Low-grade Stockpile "C" (CH2M, March 2015l)

- Summary of 2014 Field Investigation – Delineate Main and Intermediate Sulphide Cells for Regrading and Capping Design (CH2M, March 2015o)
- Summary of 2014 Field Investigation – Install Zone II Outwash Collection System (CH2M, March 2015t)
- Final North Fork Rose Creek Design Basis Report (CH2M, August 2016m)

3.1.3 Seep Sampling

Seep sampling was conducted twice per year, in the spring during peak freshet and in the early fall "dry" season, starting in 2012 and continuing through the spring of 2016. Seeps were selected for analytical sampling based on frequency of historical sampling, geochemical modelling needs, and environmental monitoring needs. New sampling locations were established where data gaps were identified or new seeps were discovered. Seeps associated with the ETA, Faro Pit (distinct from the WRDs, with the exception of the Faro Valley Waste Dump), and Vangorda/Grum Area are discussed in Sections 4, 7, and 10, respectively.

Annual seep reports including laboratory analyses and results discussion are presented in the following documents:

- 2012 Seepage, Surface Water, and Water Treatment Plant Influent Sampling Report (CH2M, October 2013a)
- 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report (CH2M, March 2014c)
- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2015d)
- Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring (CH2M, August 2016j)

3.1.4 Groundwater Sampling

Groundwater in the WRDs was sampled multiple times per year, typically once in the winter (February/March), once in the spring (May/June), and once in the fall (September/October). In 2014, the winter event was not completed, and instead two sampling events occurred in the spring: one event before freshet and one event approximately coincident with peak freshet.

Previous groundwater investigations in the WRD area, including laboratory analyses and results discussion are presented in the following documents:

- Waste Rock Dump Monitoring Report (CH2M, October 2013b)
- 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report (CH2M, March 2014c)
- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2015d)
- Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring (CH2M, August 2016j)

3.1.5 Temperature and Pore Gas Monitoring

Temperature and gas concentration data were measured at WRD monitoring locations installed by CH2M during the same sampling events mentioned above in Section 3.1.4, concurrent with the groundwater sampling events. Temperature and gas were also measured during these sampling events

at historical monitoring locations (10M3, 10M4, 30M1, 30M4, and 60M1) installed by SRK Consulting starting in the spring of 2013.

3.2 Field Investigation Data Evaluation

3.2.1 Solids Data

3.2.1.1 North Faro Valley Waste Dump

Although included with the Faro Pit RU and discussed in Section 7, the North Faro Valley Waste Dump is mentioned here for cohesion. The waste dump is located just north of Faro Pit within the former Faro Creek valley. Waste rock material was placed on top of the former Faro Creek channel, which controls seepage in this area. There were no solids collected from the North Faro Valley Waste Dump. Seep data for this area are presented in Section 7.2.1.

3.2.1.2 Northwest Waste Rock Dump

There were three main activities in the Northwest WRD that resulted in solid sample collection for geochemical analysis: a single borehole (CH14-015-MW004) for gas/temperature/monitoring well installation, five test pits to evaluate suitability of the NWL WRD material for gabion baskets as part of the DVIHU field investigations, and two test pits around the crest of the Northwest WRD to evaluate material as part of the WRD slope regrading design. In this section, complete geochemical analysis of materials from the three investigations are discussed separately.

Total metals analyses was performed on selected samples from the single Northwest WRD borehole, CH14-015-MW004 (Table 3-1). The upper portion (surface to approximately 5.5 mbgs) of the waste rock material from MW004 contains relatively low amounts of sulphide minerals (based on total sulphur content) and as such has a low trace element content (i.e., no trace elements exceeding both screening criteria). Sulphide mineral content increases sharply and is the greatest at approximately 8.23 mbgs based on the spike in total sulphur and iron and parallel increases in the key trace elements arsenic, copper, lead, and zinc (Figures 3-1 and 3-2). Within the sulphide mineral-rich portions of the recovered samples, numerous trace elements exceed, as is to be expected, both the 10 times crustal abundance and 12 times median world soil content screening criteria employed for the FMC solids evaluations. A second sulphide-rich zone occurs near the bottom of the boring at approximately 17.7 mbgs with copper, lead, and zinc exhibiting spikes in concentration mimicking the increase in total sulphur and iron. Near the bottom of the WRD (approximately 28 mbgs), the sulphide content decreases significantly and although trace elements are still elevated, they are generally less than the two screening criteria with the exception of lead which exceeds both criteria. The underlying till, approximately 35 mbgs, is only slightly impacted by arsenic and total sulphur which exceeds the 10 times crustal abundance criteria, while the deeper weathered bedrock material (35.4 mbgs) exhibits no significant impacts at all.

Samples collected from the Northwest WRD were generally composed of phyllite and schist waste rock types, with varying degrees of weathering present. In samples collected from borehole CH14-015-MW004, located in the Middle Northwest (NWM) WRD, a high degree of oxidation and the presence of yellow and or white secondary mineral formation was noted during the investigation. These samples were characterized by acidic paste pH (2.49 – 5.84) and NP:AP ratios of less than 3.0 (Table 3-2). Lenticular zones of highly oxidized minerals were also noted in these samples. Deeper samples within the NWM at CH14-015-MW004 (approximately 35 mbgs), fragments of calc-silicate rock were noted, characterized by near neutral paste pH and a net-neutralizing NP:AP ratio of 201.

DI-leach testing of samples collected from CH14-015-MW004 suggest select trace elements may be highly mobile at specific depth horizons within the Northwest WRD, but not near the surface. Final leachate from samples of CH14-015-MW004 surface materials was near-neutral and did not contain elevated trace elements of concern (Table 3-3). The final leachate of samples collected between 5 and

20 mbgs, where total metal concentrations were found to be elevated, was acidic with elevated concentrations of cadmium, copper, iron, lead, and zinc. Based on borehole logs, WRD materials in this interval exhibited a high degree of oxidation and the presence of yellow and or white secondary mineral formation. These data support the following discussion of sequential extraction test results, which identify readily soluble salts and acid-soluble phases that could mobilize metals when in contact with water.

Sequential extractions were completed on samples collected from borehole CH14-015-MW004 to characterize the mobility and mineralogic association of trace metals within the solid material contained within the Faro Northwest WRD (Table 3-4 and 3-5). Although the sequential extractions analyze for a full suite of trace metal analytes, this section focuses on the key constituents to the FMC area: iron, manganese, zinc, lead, copper, and arsenic. Iron is generally extracted in one of three dominant phases in the Northwest WRD samples (Figure 3-3): amorphous oxides (e.g., ferrihydrite), crystalline oxides (e.g., goethite or schwertmannite), or in the residual fraction (e.g., primary pyrite). Manganese is mainly extracted in the amorphous oxide and residual (e.g., primary mineral phases) fractions, with a notable presence (samples SOf and SOi) of a readily soluble neutral salt exchangeable phase and an acid-soluble fraction. Zinc is predominantly extracted in the residual (i.e., sulphide) or one of the two oxide (amorphous and crystalline) phases; however, in two samples (SOf and SOi), where considerable oxidation and weathering was noted in the boring logs and where increased trace element content was observed in the final DI leachate, a significant portion of the zinc fraction was extracted in the neutral salt exchangeable and acid-soluble phases (Figure 3-3). Lead was largely extracted in either the acid-soluble or residual phases. The acid-soluble lead is most likely lead oxide which can be dissolved under low pH conditions, while the residual phase is most likely lead associated with the sulphide fraction (either the lead sulphide, galena, or as a coprecipitate within pyrite). Copper is extracted mainly in the residual fraction (most likely occurring as a primary sulphide phase) with minor amounts extracted in the amorphous oxide fraction (Figure 3-3). Arsenic is mainly extracted in one of three phases: residual (likely primary arsenic-bearing sulphides), and one of the two oxide fractions (likely as absorbed or coprecipitated arsenic with iron oxides). Considerations should be made when selecting remediation alternatives for the Northwest WRD; although much of the potential contaminant load is tied to primary mineral phases, the presence of zinc and lead in neutral salt exchangeable and acid-soluble phases at certain depths in the WRD suggest the potential for increased mobility of these constituents when in contact with water.

The five samples collected for geochemical analysis from the five test pits to evaluate suitability of the NWL WRD material for gabion baskets as part of the DVIHU field investigations were submitted for total metal analysis. Field observations noted that the waste rock deposited on the lower bench of the NWL WRD contains much less sulphide mineral content that the material encountered during the drilling of CH14-015-MW004. In general, total trace element content was fairly low with a few of the samples (CH13-108-TP006-SOa or CH13-108-TP0015-SOa) exceeding the 10 times crustal abundance screening criteria for arsenic, cadmium, and zinc. All samples with the exception of CH13-108-TP011-SOa exceeded the 10 times crustal abundance criteria for lead. Two samples also exceeded both screening criteria for lead (CH13-108-TP006-SOa and CH13-108-TP0015-SOa) and one of these two samples also exceeded both screening criteria for cadmium (CH13-108-TP006-SOa). However, all of these samples had a near-neutral to slightly alkaline paste pH, very low acid potential (except CH13-108-TP0015-SOa which had only mild acid potential), and very high NP (though CH13-108-TP0015-SOa had about half the NP of the other test pit samples) (Table 3-2). All samples had a very high NP:AP ratio – greater than 250 – with the exception of CH13-108-TP0015-SOa, which was still high, but only 29.8. Unfortunately, no leach testing was performed on these samples. Although a few of the total trace elements exceeded the established screening criteria for the FMC in these samples, the very high NP:AP ratio and the neutral paste pH suggest that the material is still a good candidate for the gabion baskets in the DVIHU design. However, further testing (specifically DI-leach testing) is recommended before selecting the final materials for the gabion baskets.

The final two test pits were excavated around the crest of the Northwest WRD to evaluate material as part of the WRD slope-regrading design. Both test pit samples submitted for geochemical analyses were composite samples of three subsamples collected between the surface and 5 mbgs at the top, middle, and bottom of the respective test pit. Sample CH14-106-TP013-SOCOMP had fairly low total iron (for WRD material) and only exceeded the 10 times crustal abundance criteria for lead. Sample CH14-106-TP014-SOCOMP also had fairly low iron relative to most WRD samples and only exceeded the 10 times crustal abundance for total sulphur and zinc; however, this sample also exceeded both screening criteria for lead.

The ABA analysis (Table 3-2) of samples from the two test pits excavated along the crest of the Upper Northwest (NWU) WRD suggest the upper 5 m of material is near-neutral (paste pH), with fairly low acid potential and very high NP, and is net-neutralizing (NP:AP values between 17 to 28). The DI-leach testing (Table 3-3) also results in near-neutral final pH of the leachates with very low trace element content. Sequential extractions were completed on the composite sample collected from test pit CH14-106-TP013 to characterize the mobility and mineralogic association of trace elements within the outer edge of the WRD that could be impacted by regrading activities (Table 3-4 and 3-5). Sequential extraction data for the CH14-106-TP013 identify two main phases of iron: crystalline oxide and the residual fraction (i.e., pyrite). Most of the manganese was extracted in the amorphous oxide step followed by the residual and the crystalline oxide fractions. Zinc was predominantly found in the residual fraction (most likely associated with sulphides), but a significant amount was also extracted in the crystalline oxide phase. Lead was largely extracted in the acid-soluble and residual phases, which most likely implies lead is present in the WRD material as lead oxides, which are susceptible to leaching under mildly acidic conditions, and as primary sulphide minerals, respectively. Copper is predominantly measured in the residual fraction, which is most likely extracted from primary sulphide mineralization. Finally, greater than 90 percent of the arsenic extracted comes from the residual phase, suggesting most of the arsenic present occurs associated with sulphides. Altogether, the data from these two test pits suggest the WRD material at shallow depths near the crest of the NWU is non-potentially acidic and fairly stable with little potential for mobilization of trace elements during regrading of the slope in this area.

3.2.1.3 Stockpiles

Total metals analyses were performed on samples collected from investigations on the stockpiles (LGSPC and OXSP), which included drilling one borehole (CH14-104-MW008) in the OXSP and excavating three test pits (CH14-104-TP001 through CH14-104-TP003) in the LGSPC. As expected from ore and oxide fines stockpiles in the FMC, almost all of the samples from the upper portion of the boring as well as the test pits exceeded the screening criteria for antimony, arsenic, cadmium, copper, lead, mercury, selenium, silver, sulphur, and zinc (Table 3-1).

The boring log indicates that the upper portion of the OXSP, as represented by sample CH14-104-MW008-SOb (3.7 to 4.0 mbgs), contained significant massive sulphide, specifically pyrite, as supported by the very high total sulphur and iron content in the sample (Figure 3-4) with elevated trace element concentrations (Figure 3-5). Below 4 mbgs, the total sulphur and iron content dropped sharply, but was still elevate down to approximately 13 mbgs, indicative of WRD material. The trace element content was also consistent between 4 and 13 mbgs. However, the trace elemental concentration dropped further below approximately 16.5 mbgs, suggesting a lower sulphide content in the lower WRD material of the OXSP. In the two WRD samples at or below 16.5 mbgs (CH14-104-MW008-SOg and CH14-104-MW008-SOi), the only trace element that exceeds both the 10 times crustal abundance and 12 times median world soil contents screening criteria is total sulphur in sample CH14-104-MW008-SOi. In fact, only arsenic, cadmium, and lead exceed the 10 times crustal abundance criteria in CH14-104-MW008-SOg, while total sulphur is the only exceedance in CH14-104-MW008-SOi. This trend continues into the underlying native organic soil (CH14-104-MW008-SOl), where only lead and total sulphur exceed the 10 times crustal abundance criteria.

ABA data collected from the stockpiles (LGSPC and OXSP) characterize the potential for these sulphide-rich dumps to generate acid over time (Table 3-2). Samples collected from the surface and shallow depths (less than 5 mbgs) within the LGSPC contained high sulphide mineral content and were characterized as potentially acid generating, with acidic paste pH and NP:AP ratios of less than 1.0. Similarly, samples collected in the upper portion of the OXSP were characterized by acidic paste pH and NP:AP ratios less than 1.0. However, the samples from deeper in the OXSP (greater than 16.5 mbgs) and from the underlying native organic soil have a near neutral paste pH, a significantly lower acid potential, and very high NP, such that the material at depth in the OXSP stockpile is net neutral with an NP:AP ratio greater than 10 (Table 3-2). When considering remediation alternatives for these two stockpiles, it is important to note the relative reactive surface area of the sulphides present. In the LGSPC, large, angular sulphide rock fragments are present and highly weathered. In contrast, the OXSP is characterized by fine grained, processed sulphide rocks, and visible oxidation is present in the upper 1 meter of material. Regrading and resloping or even relocation of the upper OXSP material could expose the previously un-weathered sulphide materials, and increase the potential for acidic drainage and metal mobilization.

DI-leach samples collected from the OXSP and LGSPC support the characterization of potential trace element mobility within these stockpiles at the surface and at depth (Table 3-3). Final leachate results from surface materials collected from borehole CH14-104-MW008 (OXSP) and test pits CH14-104-TP001, CH14-104-TP002, and CH14-104-TP003 (LGSPC) was acidic and contained elevated levels of arsenic, cadmium, copper, iron, lead, and zinc. These trace elements are likely tied to readily soluble salts, such as melanterite, that have been observed in surface deposits on the OXSP. The final leachate from samples collected at depth in the OXSP (CH14-104-MW008SOg through SOl) had a near-neutral final pH with very low dissolved trace element content.

Sequential extraction tests were completed on samples collected from borehole CH14-104-MW008, test pit CH14-104-TP03, and two grab samples (CH14-104-SS01 and CH14-104-SS02) to characterize the mobility and mineralogic association of trace metals contained within the OXSP and LGSPC (Tables 3-4 and 3.5; Figure 3-6). Extraction results from the OXSP boring support the field observation of a weathered “zone” or increased weathering at moderate depth (12.5 to 12.8 mbgs) and the presence of soluble salts near the surface (3.7 to 4 mbgs) as well as at moderate depth (12.5 to 12.8 mbgs). Greater than 80 percent of the total iron is extracted in the residual phase in the upper portion of the OXSP stockpile as iron is most likely present as pyrite. Notably, there was no iron extracted in the neutral salt exchangeable fraction in either of the near-surface samples. At moderate depth, iron is predominantly extracted in the residual and crystalline oxide fractions with a lesser amount occurring in the amorphous oxide phase, indicating significant oxidation of primary pyrite to secondary iron oxides in this sample. In the deepest portions of the OXSP stockpile almost 90 percent of the iron is extracted in the residual fraction with a minor amount extracted in the amorphous oxide fraction. Unlike the apparent immobility exhibited by iron in the OXSP samples, greater than 70 percent of the total manganese is extracted in the neutral salt exchangeable fraction in the near surface sample (CH14-104-MW008-SOb) and in the weathered zone at moderate depth (CH14-104-MW008-SOe); the remaining manganese is largely extracted in the residual phase. In the deeper portions of the OXSP stockpile, manganese is extracted in the residual and acid-soluble phases. Similar to manganese, about half of the zinc is extracted in the neutral salt exchangeable fraction in both samples from near the surface as well as the weathered zone at moderate depth; the remaining zinc in these zones is largely extracted in the residual fraction. In the apparently less weathered material (CH14-104-MW008-SOd), greater than 80 percent of the total zinc is extracted in the residual fraction (Figure 3-6) suggesting it is present in primary sulfide material. In the deeper portions of the OXSP stockpile, zinc in the residual fraction gives way to a greater portion of zinc extracted in the amorphous and crystalline oxide phases even though the fraction of iron and manganese oxides extracted at depth is proportionately less. This demonstrates the preferential retention of zinc in the secondary amorphous and crystalline oxides after being mobilized from the primary residual phase. Near surface, lead is predominantly extracted in the acid-soluble fraction with

lesser amounts of lead in the residual phase. With depth, the amount of acid-soluble lead decreases while the amount of residual lead increases. The acid-soluble lead is likely associated with secondary lead carbonates, oxides, or even sulfates. In the deepest portions of the OXSP stockpile, the balance between acid-soluble (secondary) and residual (primary) lead is about equal. Copper is dominantly extracted in the residual fraction at all depths of OXSP stockpile. The copper balance is largely extracted in the amorphous oxide fraction with the exception of the weathered zone at moderate depth, where the residual copper phase is balanced by copper extracted in the neutral salt exchangeable fraction. Similarly, arsenic is predominantly extracted in the residual fraction in the upper portion of the OXSP stockpile with a small portion contained in the crystalline oxide phase. In the deeper portion of the OXSP stockpile, arsenic is largely associated with amorphous oxides with the remaining arsenic extracted in the residual phase (Figure 3-6).

The remaining sequential extraction data are from samples collected in test pits excavated in the upper portion of the LGSPC. As such, the samples exhibit signs of partial weathering in the sequential extraction data. While iron is predominantly extracted in the residual fraction (i.e., present as sulphide), there is also significant iron extracted in the crystalline iron phase and to a lesser extent some neutral salt exchangeable iron as well (Figure 3-6). Manganese, on the other hand, is dominantly extracted in the neutral salt exchangeable fraction with the balance largely in the residual fraction and minor amounts in crystalline and amorphous oxide phases and the acid-soluble phase. Similar to manganese, zinc is largely extracted in the neutral salt exchangeable fraction with the balance in the residual phase. In most samples, copper is predominantly (40 to 90 percent) extracted in the residual phase with the balance largely occurring in the neutral salt exchangeable fraction. The elevated concentration of manganese, zinc, and copper in the neutral salt exchangeable fraction suggests that these trace metals could be readily mobilized from the upper portion of the LGSPC during regrading/resloping or relocating activities. Lead and arsenic are also largely present in the residual extraction step, but are also found in secondary mineral phases: lead in the acid-soluble phase, likely as secondary oxides, carbonates, or sulfates, and arsenic associated with the oxide fractions (mainly crystalline oxide). The arsenic extracted in the pyrophosphate step at pH 10 is likely because of arsenic desorption from crystalline iron oxides at high pH.

This sharp decrease in total elemental content of the OXSP stockpile below approximately 16.5 mbgs coupled with the net neutral and relatively stable mineralogy has significant implications for potential relocation of the material as part of the final WRD closure design. If the OXSP is relocated, the upper 12 to 15 m may have to be moved, though the highest trace metal content is concentrated in the upper 5 m. Investigations at the LGSPC indicate that the upper portion of the pile is highly impacted and there is high potential for mobility of manganese, copper, and zinc if the material is disturbed and exposed to flushing because of precipitation.

3.2.1.4 Main Dump

Investigations in the Main Dump included two borings, CH12-014-MW003 and CH14-106-MW009, drilled to install monitoring wells and gas/temperature ports for long-term monitoring of the WRD and support the site-wide geochemical modeling effort. In addition, eight test pits were excavated around the top of the Main Dump to help delineate the upper portion of the sulphide cell and evaluate the upper portion of the WRD material. One test pit, CH14-106-TP015, was also excavated along the outer edge of Main Dump to support the WRD regrading and resloping design efforts.

Boring CH12-014-MW003 was drilled on the northernmost side of the Main Dump directly above the former Faro Creek channel. This location was selected to provide a monitoring point on the upgradient edge of the Main Dump to compliment the long-term monitoring point, X23, downgradient of the Main Dump within the former Faro Creek channel. Total metals analysis was conducted on all samples except CH12-014-MW003-SOj, SOk, SOl, which were submitted for additional ABA analysis after the initial samples were analyzed. As such, the sample identification for these three late samples is alphabetically

after the originally submitted samples, even though they are taken from 2.4, 14.0, and 14.9 mbgs, respectively. The highest trace element concentration measured comes from near surface samples (Table 3-1, Figures 3-7 and 3-8). Arsenic, cadmium, lead, zinc, and total sulphur exceed both screening criteria for the FMC in sample CH12-014-MW003-SOa, collected at the surface (Table 3-1). The trace element concentration generally decreases with depth in the CH12-014-MW003 boring (Figure 3-8) with the exception of a small spike in values at approximately 20 mbgs (sample CH12-014-MW003-SOe) and again near the bottom of the boring at approximately 29 mbgs (sample CH12-014-MW003-SOh). A large increase in total sulphur is observed at approximately 2.4 mbgs (CH12-014-MW003-SOj); however, no total elemental data is available from this horizon.

The paste pH of samples from the upper 2.4 m of boring CH12-014-MW003 is mildly acidic, whereas the deeper samples are all near-neutral (pH 6.5 to 7.5) to slightly alkaline. The acid potential is moderate down to approximately 14 mbgs with the exception of CH12-014-MW003-SOj at 2.4 mbgs, which has a high acid potential (622 kg $CaCO_3$ eq/tonne). Below approximately 14 mbgs, the acid potential is relatively mild. In contrast, the NP is generally relatively high for the entire boring, ranging from 340 to 730 kg $CaCO_3$ eq/tonne, with the highest values occurring in the upper 2.4 m of the boring. Consequently, the NP:AP ratio is greater than 3.0 and generally higher than 10.0 with the exception of CH12-014-MW003-SOj at 2.4 mbgs, where the NP:AP is 1.1. As such, the majority of the samples at this location are net-neutral and the only potential for acid generation occurs at 2.4 mbgs. DI-leach testing suggests that this acid potential is not immediate, as the final pH of the leachate from all CH12-014-MW003 boring samples was near-neutral to slightly alkaline. However, the specific conductance of the final leachate from the upper 5 m is elevated ranging from a high (2,880 micro-Siemens per centimetre) at 2.4 mbgs, decreasing to 1,580 microSiemens per centimetre at 5.2 mbgs. The elevated specific conductance in these near surface samples is reflected in the high sulfate concentration (1,840 to 883 mg/L) in the final leachate from the upper 5 m of the boring. The total elemental concentrations, however, are generally low in the leachate from all samples with the exception of CH12-014-MW003-SOj, which has slightly elevated concentrations of lead and zinc.

Sequential extractions were performed on two samples from the boring: one in the WRD material near the surface (CH12-014-MW003-SOa) and one in the underlying alluvium (CH12-014-MW003-SOf). A duplicate from the alluvium (SOf) was also subjected to sequential extractions (Table 3-4 and 3-5). In both material types, between 70 and 80 percent of the iron was extracted in the residual phase (likely as sulphide minerals), while the remaining 20 to 30 percent was extracted in either the amorphous or crystalline oxide fraction (Figure 3-9). Manganese was largely extracted in either the residual or amorphous oxide fraction with minor amount in an acid-soluble phase near the WRD surface in CH12-014-MW003-SOa. The deeper alluvium sample had greater residual manganese with the balance split between amorphous oxide and an acid-soluble phase. Zinc was extracted in the residual (i.e., primary sulphide), amorphous oxide, and acid-soluble fractions with lesser amounts of neutral salt exchangeable and crystalline oxide fractions in the near surface WRD sample (Figure 3-9). The acid-soluble zinc may be the result of zinc desorption from oxide surfaces, while the neutral salt exchangeable is likely related to secondary sulfate salts typically found in shallow WRD samples at the FMC. In the alluvium sample, a larger portion of zinc was extracted in the residual fraction with most of the balance in either the crystalline or amorphous oxide fractions. The minor amount of acid-soluble zinc in this sample could be related to sorption of zinc to an oxide surface. The majority of the lead in the near surface WRD material was extracted in either the acid-soluble or the alkaline pyrophosphate step (Figure 3-9). These extraction phases likely represent secondary lead minerals such as oxides, sulfate, or carbonates which can be dissolved under these conditions. A minor amount of primary lead sulphide is extracted in the residual fraction. In the alluvium, most of the lead is found in the residual phase with lesser amounts associated with secondary mineralization (i.e., amorphous oxides, acid-soluble, alkaline pyrophosphate extractable lead). Greater than 70 percent of the total copper resides in the residual fraction in the WRD material with the remaining associated with amorphous oxides or acid-soluble phases. In the underlying alluvium, greater than 80 percent of the total copper is residual (i.e., sulphide) with the balance largely

occurring in amorphous oxide phases. The distribution of arsenic is similar in both the WRD material and the underlying alluvium with most of the arsenic extracted in the residual fraction and the remaining mostly occurring in either the amorphous or crystalline oxide fraction (Figure 3-9).

Boring CH14-106-MW009 was drilled near the center of the estimated boundaries of the Main Dump Sulphide Cell. However, the total metal and sulphur analyses suggest the boring encountered very little sulphide-rich material (Table 3-1). Total iron was significantly greater than total sulphur indicating most of the iron present was not associated with sulphide minerals and the only samples where total sulphur exceeded both screening criteria was CH14-106-MW009-SOa near the surface and CH14-106-MW009-SOp near the bottom (48.5 to 48.8 mbgs) of the boring (Figure 3-10). In the rest of boring total sulphur exceeded the crustal abundance criteria with the exception of one sample near the bottom of the WRD and the sample of native material underlying the WRD (Table 3-1). The trace element trends largely mimicked total iron and sulphur though the shifts between the highest and lowest concentrations were slightly more exaggerated than iron and sulphur trends at the same depth intervals (Figure 3-11). Notably, sample CH14-106-MW009-SOp, where total sulphur is elevated, is the only depth where any trace elements (i.e., lead and zinc) exceed both screening criteria (Table 3-1). Even in the near surface sample (CH14-106-MW009-SOa), where total sulphur is also elevated, the only trace element of concern that exceeds the screening criteria is lead and it only exceeds the 10 times crustal abundance criteria. Of the main trace elements of concern at the FMC, only arsenic (in three samples) exceeded the 10 times crustal abundance in the remaining boring samples; the majority of the trace elements in the rest of the boring samples fall below the screening criteria. With the exception of one sample, CH14-106-MW009-SOp, the paste pH at this location was neutral to slightly alkaline. CH14-106-MW009-SOp had a mildly acidic paste pH (5.17) and is one of the two samples with total sulphur that exceeded both screening criteria. The acid potential, was fairly low for all samples with the exception of the two samples (CH14-106-MW009-SOa and CH14-106-MW009-SOp) where total sulphur exceeded both screening criteria and even the acid potential in these two samples was only moderate (Table 3-2). The NP for all samples is relatively high and as such the NP:AP ratio for all samples is greater than 3.0 and the samples are all considered net-neutral. Similar to the paste pH results, DI-leach testing performed on the boring samples resulted in near-neutral to slightly alkaline pH of the final leachate with the exception of CH14-106-MW009-SOp, which was slightly acidic (pH 6.5). The final leachate from CH14-106-MW009-SOp also had the highest sulfate (979 mg/L) and slightly elevated concentrations of lead and zinc (Table 3-3), but generally did not exhibit elevated trace elements. All of the other samples from boring CH14-106-MW009 did not contain any elevated trace element concentrations.

Sequential extractions were performed on seven samples from the boring (Table 3-4 and 3-5): six in the WRD material (CH14-106-MW009-SOa, CH14-106-MW009-SOd, CH14-106-MW009-SOi, CH14-106-MW009-SOk, CH14-106-MW009-SOm, CH14-106-MW009-SOp) and one in the underlying alluvium (CH14-106-MW009-SOt). With the exception of one sample (CH14-106-MW009-SOp), approximately 90 percent of the total iron was extracted in the residual fraction in both the WRD and underlying alluvium samples (Figure 3-9). The balance was extracted as amorphous and crystalline oxide phases. In sample CH14-106-MW009-SOp, a little over 70 percent of the total iron was extracted in the residual fraction with the remaining largely extracted as crystalline oxide and minor amorphous oxide. While the residual fraction is typically assumed to represent iron sulphides, the disparity in total iron being significantly greater than total sulphur indicates that the iron was extracted from another residual source, potentially silicate minerals susceptible to the residual extraction step. Manganese was also largely extracted in the residual fraction, but to a slightly lesser extent (65 to 85 percent). Near the surface, the balance was largely acid-soluble manganese, which could represent secondary carbonates, adsorbed manganese, or manganese oxides susceptible to acid solubilisation. At depth, amorphous and crystalline oxide phases of manganese largely made up the balance. In the alluvial sample, the residual manganese was largely balanced by the acid-soluble fraction. Zinc was largely extracted in the residual fraction (most likely as a primary sulphide) and balanced by amorphous and crystalline oxide phases (Figure 3-9). The lead extracted from the CH14-106-MW009 samples was predominantly either in a

residual phase (i.e., primary sulphide) or an acid-soluble phase (i.e., secondary mineral). Copper was mostly extracted in the residual phase (i.e., primary sulphide) with amorphous oxides making up the majority of the balance. Arsenic is also largely extracted in the residual fraction with the exception of sample CH14-106-MW009-SOm and CH14-106-MW009-SOt (alluvium sample), which both had very low total arsenic concentrations. As such, accurate interpretation of sequential extraction data is hampered by non-detects in many of the extraction steps.

A total of nine test pits were excavated within the Main Dump. Eight test pits were dug to help delineate the upper portion of the sulphide cell and evaluate the upper portion of the WRD material. Material from these eight test pits was collected from either the top (SOa), middle (SOb), or bottom (SOc) of the test pit with several depth samples from each test pit submitted for geochemical analysis. Alternatively, the one test pit, CH14-106-TP015, which was also dug along the outer edge of Main Dump to support the WRD regrading and resloping design efforts, only had one composite sample covering all three depth intervals submitted for analysis. Unlike the two borings drilled in the Main Dump, the test pits tended to have total elemental concentrations that exceeded at least one of the two screening criteria established for the FMC (Table 3-1). Arsenic exceeded at least one of the two criteria in every sample except CH14-106-TP001-SOc and was exceedingly elevated in samples CH14-106-TP003-SOa, CH14-106-TP004-SOa and CH14-106-TP004-SOc, and CH14-106-TP006-SOa and CH14-106-TP006-SOc. Copper on the other hand was generally below the two screening criteria in every sample except CH14-106-TP004-SOa and CH14-106-TP006-SOa and CH14-106-TP006-SOc, where the copper values were greater than both criteria. Lead exceeded one of the two criteria in all samples except CH14-106-TP005-SOa and CH14-106-TP008-SOc, but significantly exceeded both criteria in samples CH14-106-TP001-SOa; CH14-106-TP002-SOa and CH14-106-TP002-SOc; CH14-106-TP003-SOa, CH14-106-TP003-SOb, and CH14-106-TP003-SOc; CH14-106-TP004-SOa and CH14-106-TP004-SOc; and CH14-106-TP006-SOa and CH14-106-TP006-SOc. Zinc exceeded both criteria in all samples except CH14-106-TP002-SOc, CH14-106-TP005-SOa and CH14-106-TP005-SOc, and CH14-106-TP008-SOa, CH14-106-TP008-SOb, and CH14-106-TP008-SOc. Also with the exception of CH14-106-TP002, zinc concentrations increased with depth at each of the test pit locations near the center of the Main Dump. Near the edge of the Main Dump, arsenic and lead exceeded 10 times crustal abundance in CH14-106-TP015-SOCOMP, but only zinc exceeded both criteria at this location. Total sulphur exceeds at least the 10 times crustal abundance screening criteria in all test pit samples except for CH14-106-TP015-SOCOMP. However, there are few distinct trends in the individual test pits. For example, at test pit location CH14-106-TP001, the total sulphur is very high near the surface (53,300 mg/kg in sample CH14-106-TP001-SOa), but an order of magnitude lower at depth (5,500 mg/kg in sample CH14-106-TP001-SOc). Other than location CH14-106-TP001, most total sulphur values appear to be within natural variation between the depths at a particular location. The locations that have the highest total sulphur concentrations across all depths are: CH14-106-TP003, CH14-106-TP004, and CH14-106-TP006.

ABA properties were characterized in samples collected from the Main Dump East (MDE) and Main Dump West (MDW) waste dumps (Table 3-2); however, not all of the samples collected were submitted for ABA analysis (i.e., did not have NP analyzed at a minimum to permit ABA calculations). Lithologic logs from the test pits in the MDE and MDW indicate highly variably lithology within these WRDs, and therefore ABA properties were also widely variable, dependent on lithology. Where abundant pyrite or massive sulphide waste rock noted, as observed in CH14-106-TP001, CH14-106-TP004, and CH14-106-TP006, acidic paste pH and NP:AP ratios of less than 1:0 were measured (Table 3-2). Many samples contained mixed lithology rock fragments, including weathered phyllite, massive sulphide, quartzite, and calc-silicate rock. In these samples, the presence of massive sulphide rock and it's acid generating properties were buffered by the presence of calc-silicate rock, represented by near-neutral to slightly acidic paste pH and NP:AP ratios of greater than 3 (Table 3-2). Overall, the material contained within the MDE and MDW have net-neutralizing properties. However, localized zones of acid generating material exist and can contribute to increased acid production and metal mobilization into the environment.

Factors that would influence potential acid generation include WRD infiltration flowpaths and regrading/resloping activities.

DI-leach samples collected from the Main Dump were used to characterize the mobility of constituents near the surface and edges of the Main Dump. Sample results from surface materials collected from test pits located near the northern edge of the Main Dump (CH14-106-TP004 and CH14-106-TP006) had acidic leachate (pH 2.03 within 2 mbgs at both locations) that contained greater concentrations of arsenic, cadmium, copper, iron, lead, and zinc (Table 3-3). Mobility of trace metals in these samples may be because of the presence of readily dissolved secondary salts, such as melanterite. In contrast, the composite sample taken from the test pit on the southern edge of the Main Dump (CH14-106-TP015-SOCOMP) generated a slightly alkaline leachate with low final sulphate and trace elemental content. Other surface samples collected from excavated test pits showed greater variability in material composition, however a trend of generally increased mobility of trace metals across the surface materials of the Main Dump was observed (Table 3-3).

Sequential extraction tests were completed on samples collected from test pits (CH14-106-TP001, CH14-106-TP002, CH14-106-TP003, CH14-106-TP004, CH14-106-TP005, CH14-106-TP006, CH14-106-TP008, and CH14-106-TP015) to characterize the mobility and mineralogic association of trace metals within the solid material contained within the Main Dump (Tables 3-4 and 3-5). Iron is predominantly extracted in the residual phase (presumably as a sulphide) with crystalline oxide making up the majority of the remaining iron extracted (Figure 3-12). Iron is also extracted to a lesser extent in the amorphous oxide fraction. In the two samples (CH14-106-TP004-SOa and CH14-106-TP006-SOa) where the final DI leachate was highly acidic (pH 2.03), there is a small amount of iron extracted in the neutral salt exchangeable fraction which is most likely attributable to highly soluble and highly acidic secondary iron sulfates, such as melanterite. Manganese distribution is highly variable and somewhat dependent on the total manganese concentration in the sample. In samples where the manganese is very high, manganese is recovered mainly in the amorphous oxide fraction with the remaining extracted in the residual fraction. In samples where the total manganese concentration is considerably lower and possibly depleted, a large portion of manganese is extracted in the neutral salt exchangeable fraction with an increase in manganese in the crystalline oxide phase and the balance in the residual fraction. For other samples with more median manganese concentrations, the acid-soluble and residual phase are the main steps where manganese is extracted with amorphous oxides playing a lesser role. The presence of manganese in the acid-soluble phase in sample locations where the paste pH was near-neutral and the shift to manganese in the neutral salt exchangeable fraction at sample locations where the paste pH was highly acidic, suggests that much of the manganese in the surface samples of the Main Dump may be susceptible to mobilization should the soil pH decrease. The distribution of zinc within the sequential extraction steps is tied to the soil pH of the sample. In samples where either the paste pH or final DI-leach pH was moderately to highly acidic (CH14-106-TP001-SOa, CH14-106-TP004-SOa, and CH14-106-TP006-SOa and SOc), a significant portion of the total zinc is extracted in the neutral salt exchangeable fraction, suggesting zinc is associated with highly soluble secondary sulfate salts. The remaining zinc is extracted in the crystalline oxide and residual fractions in these samples (Figure 3-12). In the more neutral samples (with the exception of CH14-106-TP001-SOc, CH14-106-TP003-SOc, and CH14-106-TP004-SOc), zinc is largely extracted in the residual or amorphous and crystalline oxide phases, indicating zinc associated with either primary sulphides or secondary (e.g., iron) oxides, respectively. In samples CH14-106-TP001-SOc, CH14-106-TP003-SOc, and CH14-106-TP004-SOc, a significant portion of the total zinc is extracted in the acid-soluble fraction, which could be the result of desorption of surface bound zinc from oxide minerals under mildly acidic conditions as the drop in pH changes the surface charge of the secondary oxides causing the weakly-bound zinc to desorb. As such, the acid-soluble zinc fraction is considered susceptible to mobilization. With the exception of sample CH14-106-TP003-SOa, lead is largely extracted in either the residual or acid-soluble fraction (Figure 3-12). The residual lead is likely present as primary lead sulphides whereas the acid-soluble lead is likely present as secondary lead-bearing minerals such secondary lead-oxides, -sulphates, or possibly –carbonates. The presence of

the secondary acid-soluble fraction indicates that lead may be susceptible to mobilization under changing site conditions (i.e., acidification). Sample CH14-106-TP003-SOA also contains lead in the residual and acid-soluble fractions, but lead is predominantly extracted in the amorphous oxide phase, which is a more stable secondary lead-bearing fraction. Copper is largely extracted in the residual and amorphous oxide fractions with minor amounts of acid-soluble phases present (Figure 3-12). In the samples with the acidic soil pH, copper is also extracted in the neutral salt exchangeable fraction and no acid-soluble phase is detected. This indicates that copper can become highly mobile if the WRD material becomes acidic and suggest at least a portion of the total copper is readily mobile in the samples that already have a low soil pH. Arsenic is largely associated with primary minerals (residual phase) or oxide minerals (predominantly crystalline oxides, but to a lesser extent amorphous oxides). Since arsenic forms oxyanions that can be negatively charged and absorb to mineral surfaces (e.g., oxides) at neutral to alkaline soil pH, the high pH pyrophosphate extraction step is likely targeting arsenic oxyanions and causing desorption by generating negative charged surfaces on the secondary oxides. Under acidifying conditions, these oxyanions would become more tightly bound to the more positively charged surface of the secondary oxide mineral.

3.2.1.5 Intermediate Dump

Investigations in the Intermediate Dump included a single boring, CH12-014-MW007, drilled to install monitoring wells and gas/temperature ports for long-term monitoring of the WRD and support the site-wide geochemical modeling effort. In addition, five test pits were excavated around the top of the Intermediate Dump to help delineate the upper portion of the sulphide cell and evaluate the upper portion of the WRD material. Two additional test pits, CH14-106-TP016 and CH14-106-TP017, were also excavated along the outer edge of Intermediate Dump to support the WRD regrading and resloping design efforts.

CH12-014-MW007 was drilled on the Haul Road below the upper bench of the main portion of the Intermediate Dump and within a pre-mining drainage pattern that drained from the center of the Intermediate Dump towards the S-Wells area. The CH12-014-MW007 monitoring well and temperature/gas ports were installed in this location in an attempt to collect data from the Intermediate Dump in a location upgradient of the S-Wells. The boring drilled through approximately 47 m of WRD material, approximately 7.5 m of native soil (alluvium), a little less than 3 m of weathered bedrock, and 7 m of bedrock material, for a total depth of 212 m. Two samples of the underlying alluvium and one sample of the weathered bedrock were submitted for geochemical analysis to evaluate the impacts of the WRDs on the underlying native geologic material.

Total metals analyses were performed on WRD samples collected from CH12-014-MW007 (Table 3-1). In general, the total iron concentrations are fairly consistent within the WRD material ranging from 52,600 mg/kg near the surface to a high of 75,400 mg/kg at the bottom of the WRD material (Figure 3-13). The WRD material is slightly depleted in total sulphur near the surface (less than 2 m), but steadily increases down to approximately 16 mbgs. Below 16 mbgs, the total sulphur fluctuates likely reflecting the variability in sulphide content of the WRD material. At the bottom of the WRD material, there is a spike in total sulphur content implying a sharp increase in sulphide content of the WRD (Figure 3-13).

Similar to total sulphur and iron, the total trace element concentrations are slightly depleted near the surface, but increase below 2 m and maintain a fairly consistent concentration down to approximately 28 mbgs (Figure 3-14). Copper, lead, and zinc increase steadily between 28 and 44.5 mbgs before the concentrations drop sharply in the underlying alluvium and weathered bedrock. In contrast, arsenic tends to maintain a fairly constant concentration with depth. In all samples, measured arsenic is above the 10 times crustal abundance screening criteria, but only exceeds both criteria in a few samples (Table 3-1). There are no arsenic exceedances in the underlying native material. Despite the steady increase in copper concentration, there are no screening criteria exceedances for copper in the CH12-014-MW007

boring. Every WRD sample has lead greater than both screening criteria with the exception of a few samples where only the 10 times crustal abundance criteria is exceeded. The underlying alluvium also has elevated lead above 10 times crustal abundance, whereas the weathered bedrock does not (Table 3-1). There are two depth intervals where zinc exceeds both screening criteria (10 to 14 mbgs and at the bottom of the boring, 40 to 44.5 mbgs), but at most other depths, the zinc concentration is relatively low. Interestingly, the total zinc concentration in the underlying alluvium exceeds both screening criteria, suggesting that the underlying alluvium is impacted by the overlying WRD material.

The WRD material in CH12-014-MW007 is near-neutral (pH 6.5 to 7.5) down to a depth of approximately 37 mbgs. Below this depth, the paste pH of WRD material is slightly acidic (i.e., below pH 6.5) becoming mildly acidic (i.e., below pH 6.0) near the bottom of the WRD (44.5 mbgs). The underlying alluvium is also mildly acidic (pH 5.6) immediately below the WRD, but is only slightly acidic near the bottom of the alluvium and in the weathered bedrock. The alluvium and weathered bedrock have fairly low buffering capacity (i.e., NP 40 to 60 kg $CaCO_3$ eq/tonne) and as such, the slightly to mildly acidic pH is likely because of impacts from the overlying WRD material. In fact, at the very bottom of the WRD (44.5 mbgs), the highest AP and the lowest NP in the boring is encountered. This sample, CH12-014-MW007-SOi, is the only sample from the boring that was definitively net acidic (NP:AP = 0.3). There are two more samples, CH12-014-MW007-SOb and CH12-014-MW007-SOp, at depths of 10.4 mbgs and 15.8 mbgs, respectively, where the NP:AP ratio is less than 3.0 (indicating material at these depths may be net acidic). The rest of the WRD and the underlying native material from the boring is net neutral and not expected to generate acidity over time. As such, with the exception of a few mineralized zones, the WRD material at CH12-014-MW007 is not expected to contribute to acid generation from the Intermediate Dump.

Random samples based on observations made during drilling the CH12-014-MW007 boring were submitted for DI-leach analysis (Table 3-3). Unfortunately, the most sulphur-rich samples (CH12-014-MW007-SOi) were not submitted. In general, the DI leaching generated a near neutral final leachate with low trace element content, indicating that, of the samples submitted, the trace elements were relatively stable and not immediately mobile from the WRD material. Two samples from boring CH12-014-MW007 were submitted for sequential extraction analysis: CH12-014-MW007-SOi, from the mineralized zone at the very bottom of the WRD, and CH12-014-MW007-SOj, from the very top of the underlying alluvium (Figure 3-15). These samples were selected to characterize the mobility and mineralogic association of trace metals across the contact of the WRD with the underlying native soil. Despite the significant different in total elemental content between the two samples, in general, the sequential extraction results are very similar between the two distinctly different sample types. This might be because of some of the WRD material washing down into the alluvium when it was initially deposited. In other words, the elemental content of the underlying alluvium may be caused, in large part, by contamination by WRD material, though there are some slight differences. In both samples, iron is predominantly extracted in the residual fraction and is likely present in sulphide and recalcitrant silicate minerals (Figure 3-15). At the bottom of the WRD, about 10 percent of the iron is extracted in the amorphous oxide phase while the remaining 5 percent is extracted as crystalline oxide. In contrast, the underlying alluvium has approximately 15 percent of the iron present as crystalline oxide and a little less than 5 percent as amorphous iron. A little more than 70 percent of the total manganese is extracted in the residual phase in both material types, with a little more than 10 percent as amorphous oxide in the WRD and a little less than 5 percent as amorphous oxide in the underlying alluvium. Both materials have about 10 percent of the manganese extracted in the highly mobile neutral salt exchangeable fraction with a small amount of manganese also occurring in an acid-soluble phase within the alluvium. In general, manganese in the underlying alluvium appears to be slightly more mobile than in the overlying WRD material. Greater than 95 percent of the total zinc in the WRD material is extracted in the residual fraction (i.e., sulphide phase), whereas only 65 percent of the total zinc in the alluvium is residual (Figure 3-15). In fact, the alluvium has about 5 percent neutral salt exchangeable zinc and a little more than 15 percent acid-soluble zinc. The neutral salt exchangeable zinc is likely present in secondary

sulfate salts that have formed in the alluvium and are highly mobile under saturated (i.e., freshet) conditions. The acid-soluble zinc may be zinc adsorbed to oxide mineral surfaces that would be mobilized under acidic conditions. The remaining zinc in the alluvium is associated with amorphous and crystalline oxides (likely iron or manganese). Lead is predominantly extracted in the residual fraction (i.e., sulphide) in both material types, but the balance of each extraction sequence is largely in more potentially mobile fractions. Both samples have significant acid-soluble lead and the WRD sample also has significant neutral salt exchangeable lead. The neutral salt exchangeable lead is likely associated with secondary sulfate salts that form within the WRD material, while the acid-soluble phase is likely a secondary lead mineral that is susceptible to dissolution under mildly acidic conditions. Copper is almost solely (greater than 95 percent) extracted in the residual phase (i.e., primary sulphide minerals) in the WRD sample and predominantly (greater than 85 percent) in the residual fraction in the sample of the alluvium. The bulk of the extraction balance for copper occurs in the amorphous oxide fraction of both samples. Arsenic is largely extracted in the residual fraction (85 to 90 percent) in both samples with most of the remaining total arsenic recovered in the amorphous oxide fraction, though some arsenic is recovered in the crystalline oxide step of the alluvium sequential extraction sequence (Figure 3-15). In general, the sequential extractions suggest that the trace elements content of both of these samples is fairly stable and resistant to mobilization under current conditions as most of the trace elements were recovered in the residual step.

A total of seven test pits were excavated within the Intermediate Dump. Five test pits were dug to help delineate the upper portion of the sulphide cell and evaluate the upper portion of the WRD material. Material from these five test pits was collected from either the top (SOa), middle (SOb), or bottom (SOc) of the test pit with several depth samples from each test pit submitted for geochemical analysis. Alternatively, the two test pits, CH14-106-TP016 and TP017, which were dug along the outer edge of Intermediate Dump to support the WRD regrading and resloping design efforts, only had composite samples covering all three depth intervals submitted for analysis. Compared to CH12-014-MW007, the test pits tended to have much higher total elemental concentrations, especially the test pits excavated to delineate the sulphide cell (Table 3-1). Every sample submitted for total elemental analysis exceeded both screening criteria for the FMC except for samples CH14-106-TP007-SOc, CH14-106-TP009-SOa and SOc, and CH14-106-TP012-SOa, which only exceeded the 10 times crustal abundance criteria. Cadmium exceeded at least the 10 times crustal abundance screening criteria in every samples except CH14-106-TP010-SOa and both criteria in half of the samples submitted. Copper exceeded at least the 12 times median world soil content screening criteria in 7 out of 12 samples and exceeded both criteria in 3 out of those 7 samples. With the exception of test pit CH14-106-TP012, copper was always more concentrated in the near surface (SOa) sample. Every samples submitted for total lead exceeds both screening criteria with the exception of CH14-106-TP010-SOc, which only exceeds the 10 times crustal abundance criteria and CH14-106-TP009-SOc which was lower than both screening criteria. Likewise, every sample submitted for total zinc analysis exceeds both screening criteria with the exception of CH14-106-TP012-SOa, which only exceeds the 10 times crustal abundance criteria, and CH14-106-TP009-SOc, which was lower than both screening criteria. In general, location CH14-106-TP009 has the lowest total elemental concentrations in the central Intermediate, while locations CH14-106-TP007 and CH14-106-TP010 have some of the highest total elemental concentrations (Table 3-1).

Similar to the test pits excavated within the interior of the Intermediate Dump, the two test pits (CH14-106-TP016 and TP-017) excavated along the outer margin had very high total elemental concentrations. In all three composite samples from the two locations, arsenic, cadmium, lead, and zinc concentrations exceeded both screening criteria. Copper exceeded the 12 times median world soil content screening criteria in CH14-106-TP017-SOCOMPA and CH14-106-TP017-SOCOMPB, but was not significantly elevated in CH14-106-TP0016-SOCOMP. While both locations had elevated total elemental concentrations that generally exceeded the FMC screening criteria, CH14-106-TP017 had significantly greater total elemental concentrations

Similar to the Main Dump, ABA characteristics of samples collected from the Intermediate Dump represent a wide range of waste rock lithologies, including massive sulphides, phyllite, calc-silicate, and igneous rock types. However, samples collected from the Intermediate Dump generally contained greater abundance of sulphide minerals and therefore had increased potential to generate acid. In samples where massive sulphides were noted on the log, paste pH values were acidic and very little, if any, NP was measured (Table 3-2). In fact, with the exception of test pit location CH14-106-TP009 and samples CH14-106-TP007-SOc, CH14-106-TP012-SOa, and CH14-106-TP016-SOCOMP, all samples had a moderately to highly acidic paste pH and every samples with an acidic paste pH, with the exception of CH14-106-TP010-SOc and CH14-106-TP011-SOc, had an NP:AP ratio less than 1.0. CH14-106-TP011-SOc had a paste pH of 4.5 and an NP:AP ratio of 1.8, while CH14-106-TP010-SOc had a paste pH of 3.8, but a very high NP (1,030 kg $CaCO_3$ eq/tonne), resulting in an NP:AP of 19.1 (Table 3-2). In samples, where an absence of massive sulphide waste rock was noted on the lithologic logs (i.e., CH14-106-TP009-SOa and SOc, CH14-106-TP007-SOc, CH14-106-TP012-SOa, and CH14-106-TP016-SOCOMP), the paste pH was near-neutral and the NP:AP ratio was greater than at least 7.0 (Table 3-2). Overall, the Intermediate Dump contains material that has greater potential for acid generation and metal mobilization than materials contained within the MDE or MDW.

DI-leach testing conducted on near-surface samples collected from test pits excavated into the upper 5 m of the Intermediate Dump surface were used to characterize the mobility of constituents at different locations within the Intermediate Dump. The final leachate of samples from CH14-106-TP007, CH14-106-TP010, CH14-106-TP011, CH14-106-TP012, and CH14-106-TP017 was mildly to highly acidic and contained substantial levels of arsenic, cadmium, copper, iron, lead, and zinc (Table 3-3). Mobility of trace metals in these samples may be because of the acidic conditions generated by the increased abundance of sulphide minerals contained within the Intermediate Dump. While some of the increased sulphide materials can be linked to the Intermediate Dump Sulphide Cell, the presence of acid and metals leaching in nearly all of the surface samples indicates a more widespread concern for metal mobility in the Intermediate Dump.

Select samples from test pits CH14-106-TP007, CH14-106-TP009, CH14-106-TP010, CH14-106-TP011, CH14-106-TP012, and CH14-106-TP017 were subjected to a sequential extraction procedure to characterize the mobility and mineralogic association of trace metals within the solid material contained within the Intermediate Dump (Table 3-4 and 3-5). Iron is predominantly extracted in the residual fraction (30 to 85 percent of the total) and is most likely present as primary iron-bearing sulphides and silicates (Figure 3-16). The remainder of the iron is largely extracted in the crystalline oxide step with lesser amounts of amorphous oxide also present. The phase of iron in these samples does not appear to be affected by the soil pH of the sample. In contrast both manganese and zinc phases are highly impacted by the soil pH. In all of the samples, approximately 25 to 50 percent of the total manganese is extracted in the residual step. In the near-neutral samples, a significant portion of the remaining manganese is extracted in the acid-soluble fraction with the remaining occurring in either the crystalline or amorphous oxide phase. In contrast, the samples with an acid paste pH, exhibit a significant reduction in the acid-soluble phase coupled to a significant increase neutral salt exchangeable manganese, suggesting a large portion of the total manganese in these samples is likely present in secondary salt that are susceptible to mobilization. Similar to manganese, the distribution of zinc in the extraction fractions is dependent upon the paste pH of the sample. For most samples, residual zinc is the dominant fraction. However, for near neutral or mildly acidic samples, the remaining zinc is extracted in acid-soluble and amorphous and crystalline oxide fractions. In contrast, the remaining zinc in samples with an acidic paste pH occurs in the highly soluble neutral salt exchangeable fraction with a significant to complete diminish in the acid-soluble phase (Figure 3-16). One exception is in sample CH14-106-TP010-SOc, which has a paste pH of 3.8, but zinc is still dominantly extracted in the acid-soluble phase with a lower percentage in the neutral salt exchangeable fraction. This may be because of the fact that CH14-106-TP010-SOc has a very high NP that acts to buffer the dissolution of the acid-soluble zinc phase and formation of the neutral salt exchangeable secondary salt phase. Lead does not appear to be

significantly impacted by the paste pH of the sample with most of the extracted lead occurring in either the residual or acid-soluble fraction. Similarly, copper is not distinctly impacted by the paste pH of the sample. The majority of the total copper is extracted in the residual fraction. In samples with an acidic paste pH, copper is extracted in the neutral salt exchangeable fraction and in most samples, there is no copper in the acid-soluble fraction. In contrast, acid-soluble copper is more significant in samples with a near neutral paste pH. Arsenic is extracted in one of three of the sequential extraction steps in almost all samples with little discernible impact to paste pH of the sample. The majority of the arsenic is recovered in the residual fraction which likely represents arsenic associated with primary sulphides (Figure 3-16). The remaining arsenic was recovered in either the crystalline oxide or the alkaline pyrophosphate step. The arsenic liberated during the alkaline pyrophosphate likely occurs as arsenic oxyanions that have a negative charge and are bound to positive (typically oxide) surfaces. The increased pH of the extraction step, changes the surface charge of oxyhydroxides to more negative, which, in turn, causes surface bound arsenic to be released to the extractant. As such, most of the arsenic in these samples is either present in primary sulfides, or coprecipitated in or adsorbed to secondary oxides.

3.2.1.6 S-Wells Area

Total metals analyses were performed on selected samples from the S-Wells investigations, which includes three boreholes (CH14-107-MW007B, CH14-107-MW008B, and CH14-107-MW010). Overall there were very few samples with reported concentrations exceeding the standards for metals (Table 3-1). One sample from CH14-107-MW010 exceeded both standards for arsenic, with a concentration of 153 mg/kg; this was the only arsenic exceedance. Two samples from the same location, CH14-107-MW010, exceeded one or both of the zinc standards. These samples had concentrations of 915 and 1,220 mg/kg. A few exceedances were noted for selenium and silver, and the remaining samples fell under the metal standards.

Results from ABA testing on S-Wells material were characterized as acidic paste pH; however NP:AP ratios for all samples were greater than 3.0, indicative of net-neutralizing material (Table 3-2).

DI-leach samples were collected from the S-Wells area and were used to characterize the mobility of constituents near the land surface and at depth. Sample results from boreholes CH14-107-MW008B and CH14-107-MW010 had acidic leachate near the surface that had greater potential to mobilize arsenic, iron, lead, and zinc (Table 3-3). At depth, leachate from these locations was neutral, with potential mobility of zinc.

Sequential extraction tests were completed on samples collected from borehole CH14-107-MW010 to characterize the mobility and mineralogic association of trace metals within the solid material contained within the S-Wells area (Table 3-4 and 3-5). Iron is predominantly present in the S-Wells area as primary iron sulphide (i.e., pyrite) as well as crystalline iron oxide phases (Figure 3-15). Manganese is generally present in amorphous iron oxide, crystalline iron oxides, and primary mineral phases. Greater than 50 percent of the zinc present in the S-Wells material is contained within more readily dissolved salts, acid-soluble, and amorphous iron oxide phases. Lead is associated with amorphous iron oxide and primary mineral phases in samples collected in the S-Wells area downgradient of the intermediate dump. Copper is mainly found in either amorphous iron oxides or primary mineral phases. Arsenic in the borehole samples is associated with amorphous iron oxide phases, crystalline iron oxides, and primary sulphide minerals.

3.2.1.7 Northeast Waste Rock Dump

Total metals analyses were performed on selected samples collected from the Northeast WRD investigations, which include one borehole (CH14-015-MW006) and eight test pits (CH14-106-TP018 through to CH14-106-TP026). In general, the samples analyzed fell under the two standards for metals, excluding arsenic and lead (Table 3-1). Arsenic concentrations exceeded one or both of the standards in samples from two of the three locations (CH14-015-MW006 and CH14-106-TP019). The highest

concentration of arsenic reported was 183 mg/kg in a sample collected from CH14-015-MW006, which exceeds both of the standards for arsenic. Samples from all three locations exceeded one or both of the standards for lead, with the highest concentration reported also in a sample from CH14-015-MW006, at 1560 mg/kg. Elemental concentrations with depth in CH14-015-MW006 show no distinct trend; however, total sulfur concentrations are very constant with depth (Figure 3-17, 3-18).

ABA samples were collected during the borehole drilling and test pit excavation in the Northeast Lower WRD. Samples of waste rock were collected from various lithologies, including calc-silicate, phyllite, schist, and granite. Although paste pH was acidic in some samples, the NP:AP in all samples was greater than 3.0, indicating net-neutralizing properties (Table 3-2). One sample collected from CH14-015-MW006 (27 mbgs) contained secondary sulphur salts formed on rock fracture surfaces. However, the presence of calc-silicate rock provides a buffer to any acid generated from these secondary salt deposits.

DI-leachate samples collected from the surface and deeper materials of the Northeast WRD were used to characterize the mobility of constituents within the WRD. One test pit excavated into the upper 5 m of the Northeast Upper WRD surface (CH14-106-TP019) show potential for acidic leachate, with increased mobility of trace metals copper, lead, and zinc (Table 3-3). In contrast, samples collected from borehole CH14-015-MW006, located in the Northeast Lower WRD were characterized by neutral to alkaline leachate with trace metals generally immobile. One exception is the presence of arsenic at depth, approximately 27 mbgs (Table 3-3). Secondary sulfur salts were noted in the borehole log and likely are the source of the readily dissolved arsenic. Test pits excavated within the access road to the base of the NE WRDs were characterized by near-neutral leachate containing slightly elevated concentrations of copper, iron, lead, and zinc (CH15-107-MW030, CH15-107-MW032, CH15-107-MW034, CH14-106-TP020, CH14-106-TP025, and CH14-106-TP026) near the surface, and at depth.

Sequential extraction tests were completed on samples collected from borehole CH14-015-MW006 and test pit CH14-106-TP019 to characterize the mobility and mineralogic association of trace metals within the solid material contained within the Northeast WRD (Tables 3-4 and 3-5). Iron is generally present in the Northeast WRD as one of three dominant phases (Figure 3-19): amorphous iron oxide, crystalline iron oxides (e.g., Schwertmannite), or as primary pyrite (residual). Manganese in borehole and test pit samples generally is present in the acid-soluble phase, possibly associated with carbonate minerals, crystalline iron oxides, and primary manganese mineral phases. Zinc mobility generally follows iron in these samples, with additional presence of readily soluble neutral salt exchangeable and acid-soluble phases. As noted in the ABA data and borehole logs, secondary sulfosalts were observed in CH14-015-MW006, which may be the readily soluble source of zinc. Acid-soluble lead and primary lead sulphide (i.e., galena) are the main phases of lead in northeast WRD samples. Three copper phases are dominant in the Northeast WRD samples: acid-soluble copper, copper associated with amorphous iron oxide, and copper associated with primary sulphide minerals. In the Northeast WRD, arsenic is generally associated with amorphous oxide phases, crystalline iron oxides, and primary mineral phases. In CH14-015-MW006, the relative percentage of arsenic tied to amorphous oxide phases increases with depth. Readily mobile zinc and lead in the form of secondary sulfate salts and acid-soluble phases could potentially contribute to increased metal loading to drainage areas during reclamation activities and contact with water.

3.2.1.8 Zone II Pit and Outwash Area

Total metals analyses were performed on selected samples from the Zone II Pit and Outwash Area investigations (Table 3-1). Overall, very few exceedances were reported for samples collected from CH14-107-MW001 to CH14-107-MW004, and the remaining 13 locations contained a significant amount of exceedances. CH12-014-MW005, was drilled in the Zone II WRD, contained the most exceedances. Elemental concentrations in CH12-014-MW005 had two spikes with depth; concentrations spiked around 10.5 and 37.5 mbgs (Figure 3-20, 3-21). The deeper of the two spikes is especially noticeable in total iron and sulfur concentrations with depth.

Samples collected from 11 different locations contained exceedances for arsenic, including almost all of the samples analyzed from CH12-014-MW005, located on the Zone II WRD. The highest concentration of arsenic was 2,370 mg/kg, which came from a sample collected during the drilling of CH12-014-MW005 and exceeds both of the standards for arsenic. The highest concentration of arsenic recorded from the Zone II Outwash was 77.8 mg/kg in a sample from CH14-107-MW005B, which is significantly less than the Zone II Pit. However, the concentration still exceeds both of the standards.

Cadmium concentrations exceeded the standards in samples from four different investigation locations. The highest cadmium concentration reported was 35.4 mg/kg, in a sample collected from CH14-107-TP001 in the Zone II Outwash.

Only two different locations contained samples that exceeded the copper standards: CH12-014-MW005 and CH14-107-TP001. The highest concentration came from CH12-014-MW005, with a sample reaching a concentration of 1,270 mg/kg copper, more than double the higher of the two standards.

Samples from ten locations contained concentrations of lead exceeding one or both of the standards. The highest concentration of lead recorded was 6,430 mg/kg, also in a sample collected from CH12-014-MW005 in the Zone II WRD. The higher of the two standards for lead is the Median Soil Content, with a value of 420 mg/kg. The average concentration in samples collected from CH12-014-MW005 exceeded that, at 1,305 mg/kg. In the Zone II outwash, the highest concentration of lead was 4,990 mg/kg, reported for a sample collected from CH14-107-MW005B.

Sulphur concentrations were quite high in CH12-014-MW005 with an average of 23,758 mg/kg, almost three times the higher of the two standards. The remaining locations in the area generally fell under the standards.

Seven locations contained samples that exceeded the standards for zinc. The highest recorded concentration of zinc once again came from CH12-014-MW005, with the concentration in one sample as high as 12,200 mg/kg.

ABA characteristics of materials collected near the land surface in the Zone II Outwash area included acidic paste pH and NP:AP ratios of less than 3.0 (Table 3-2). At depth, paste pH was neutral in most samples with NP:AP ratios of greater than 3. In the Zone II WRD (location CH12-104-MW005) the NP:AP ratios were generally greater than 3, indicating net-neutralizing material.

DI-leach samples collected from the surface and deeper materials of the Zone II Pit were used to characterize the mobility of constituents in the Zone II East (ZIIE) WRD. One test pit excavated into the upper 5 m of the ZIIE WRD surface (CH14-107-TP001) show potential for neutral to alkaline leachate, with increased mobility of lead and zinc in the upper 3 m of the WRD (Table 3-3). Samples collected from borehole CH12-014-MW005, located near the Zone II Pit, were generally characterized by neutral leachate with limited metal mobility (Table 3-3). However, discrete intervals at approximately 10 mbgs and from 35 to 40 mbgs were characterized by acidic leachate and the presence of mobile trace metals arsenic, cadmium, iron, lead, and zinc.

In the Zone II Outwash area, DI-leach results show increased potential for mobility of copper, lead, and zinc (Table 3-3) in shallow test pits excavated (CH14-107-TP002, CH14-107-TP003, and CH14-107-TP004). Samples collected from boreholes showed increased mobility of zinc in nearly all sample depths, likely associated with secondary salt formation. Local variations in material types were observed in the leachate results, with potentially increased mobility in arsenic (CH14-107-MW002 and deeper samples in CH14-107-MW003), copper (CH14-107-MW002), and lead (CH14-107-MW002, CH14-107-MW005B, and CH14-107-MW006B).

Sequential extraction tests were completed on samples collected from borehole CH12-014-MW005 and test pit CH14-107-TP001 to characterize the mobility and mineralogic association of trace metals within the solid material contained within the Zone II Pit area (Table 3-4 and 3-5). Iron is generally present in

the Zone II Pit area as one of three dominant phases (Figure 3-22): amorphous iron oxide, crystalline iron oxides (e.g., Schwertmannite), or as primary pyrite (residual). Manganese and zinc in Zone II Pit area borehole and test pit samples generally is present in readily soluble salts, acid-soluble phases, crystalline iron oxides, and primary manganese mineral phases. Secondary salts containing lead, acid-soluble phases, and primary lead sulphide (i.e., galena) are the main phases of lead in zone II pit area. Copper and arsenic are predominantly present in primary sulphide minerals, and to a lesser extent, amorphous iron oxides. In addition to these two phases, arsenic also has a minor presence in crystalline iron oxides.

Sequential extractions were completed on selected samples collected from boreholes (CH14-107-MW003, CH14-107-MW004, CH14-107-MW005B, and CH14-107-MW006B) and test pits (CH14-107-TP002, CH14-107-TP003, and CH14-107-TP004) to characterize the mobility of iron, manganese, zinc, lead, copper, and arsenic in the Zone II Outwash area (Table 3-4 and 3-5; Figure 3-23, 3-24). Shallow borehole and test pit sample data show the partitioning of iron into two main phases: crystalline iron oxides and primary pyrite. At depth, iron is also present in the amorphous phase, as exhibited in CH14-107-MW004 (SOi sample). Manganese in the Zone II Outwash samples generally occurs in the primary mineral, crystalline iron oxide, and amorphous iron phases, with a minor fraction of the manganese contained in secondary salts and acid-soluble phases. The presence of zinc in shallow borehole and test pit samples is widely distributed across the following phases: neutral exchangeable salts, acid-soluble, amorphous iron, crystalline iron oxide, and primary minerals. Zinc at depth, in sample CH14-107-MW004 (SOi sample), is less associated with primary mineral phases and more abundant in amorphous iron oxide phases. Secondary salts containing lead, acid-soluble, amorphous iron oxides, and primary lead sulphide minerals are the main phases of lead in the Zone II Outwash area. Copper is mainly present in primary mineral phases in the Zone II Outwash material; however, there is a minor readily mobile copper in secondary salts and acid-soluble phases. In shallow borehole and test pit samples, arsenic is generally associated with crystalline iron oxides and primary mineral phases. In deeper samples, arsenic can be mobilized from water interacting with secondary salts, acid-soluble phases, and amorphous iron phases.

3.2.2 Seepage Data

There are 70 seeps that are associated with the WRD RU. Seeps are sampled twice a year, once during the spring, close to freshet, and once during the fall. The analytical data, field parameter results, and a summary of some key parameters can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 2016d).

Historical seepage data trends were also analyzed using the Mann-Kendall trend test, which statistically determines whether a data set consistently increases or decreases over time. The test requires at least five data points above the detection limit to produce an accurate result. Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit. Table 3-6 presents the results from the Mann-Kendall analyses. Figures 3-25 through 3-28 provides time-trend graphs of all the seep data to complement the Mann-Kendall analysis.

3.2.2.1 Northwest Waste Rock Dump

There are five seep locations associated with the Northwest WRD. Out of these five locations, significant trends were only observed in two seeps. SRK-FD18 exhibited a decreasing trend in dissolved zinc and no trend in the other parameters analyzed. SRK-FD19 has a significant increasing trend in dissolved iron, dissolved magnesium, dissolved zinc, and sulphate, while the field pH exhibited a significant decreasing trend.

3.2.2.2 Stockpiles

The stockpile areas include the OXSP, the LGSPC, and the Medium Grade Stockpile (MGSP). There are six seeps total associated with these locations, two at each stockpile.

Out of the parameters at each location that could be tested, none at the MGSP or OXSP showed any significant statistical trends. At the LGSPC, SRK-FD38 shows significant increasing trends for dissolved iron, sulphate and dissolved zinc. The remaining parameters showed no significant trends. Two of the LGSPC seeps (CH-FD-66 and SRK-FD38) and one of the MGSP seeps (SRK-FD37) were also plotted on time-series plots to help confirm the Mann-Kendall results (Figure 3-26). Along with confirming the Mann-Kendall results for SRK-FD38, Figure 3-26 also shows increasing trends of sulphate, dissolved iron, dissolved magnesium, and dissolved zinc concentrations at SRK-FD37.

3.2.2.3 Main Dump

Eight locations are associated with seepage from the Main Dump.

Mann-Kendall statistical analyses were performed on data collected from the Main Dump area seeps. Because of minimum data requirements, analysis could only be performed on seven of the eight locations for field pH, and only on five of the seven for the remaining key parameters. Only three of these five seeps exhibited any significant trends. SRK-FD12, SRK-FD31, and X23 all exhibited decreasing trends in total alkalinity and field pH and increasing trends in dissolved iron, dissolved magnesium, and dissolved zinc. SRK-FD12 and SRK-FD31 also exhibited an increasing trend in sulphate; there was no sulphate trend evident in the Mann-Kendall analysis for X23. The same six key parameters were plotted over time for four of the seeps in the Main Dump area, SRK-FD09, SRK-FD30, SRK-FD31, and X23 (Figure 3-26). These time-series plots also show decreasing total alkalinity trends at SRK-FD31 and X23, and increasing dissolved magnesium, zinc, and iron concentrations at the same two locations. Sulphate concentrations at SRK-FD31 are also increasing over time.

3.2.2.4 Intermediate Dump

There are 12 locations associated with seepage from the Intermediate Dump. Because of the minimum data requirements for Mann-Kendall analysis, nine of the locations around the Intermediate Dump did not have enough data points for any of the parameters to be tested. Three of those nine locations (SRK-FD49, SRK-FD52, and SRK-FD55) had enough data for field pH to be tested, but no significant trend was found at any of the three locations. Three locations (CH-FD56, SRK-FD13, and SRK-FD54) had enough data points for trend analysis to be completed; no trends were observed at CH-FD56. At SRK-FD13, dissolved iron and sulphate have increasing trends over time, while the remaining parameters showed no significant trends. SRK-FD54 has decreasing trends for total alkalinity and field pH, and an increasing trend for dissolved iron. There were no significant trends for the other parameters at SRK-FD54. Data from the same six key parameters for SRK-FD13 and SRK-FD54 was plotted on time-series charts (Figure 3-27). These charts confirm the Mann-Kendall results, and also suggest that sulphate, dissolved magnesium, and dissolved zinc also have increasing concentrations over time.

3.2.2.5 Northeast Waste Rock Dump

The Northeast WRD has 23 seepage locations. Seven of the Northeast WRD seepage locations did not have enough geochemical data to calculate any of the statistical trends. An additional eight locations only had enough field pH data to calculate statistical trends. Of the eight locations analyzed for trends in field pH, only two locations, CH-FD-62 and CH-FD-68, exhibited trends; CH-FD-62 had a decreasing trend in pH, while CH-FD-68 had an increasing trend in pH.

Of the remaining eight locations, only five locations exhibited significant trends. NE1 had decreasing field pH and dissolved zinc with no other significant trends, while NE2 exhibited an increasing trend in dissolved magnesium and dissolved zinc with no other significant trends. At SRK-FD05, dissolved magnesium, dissolved zinc, and sulphate increased over time with no other trends observed. At SRK-

FD24, total alkalinity and field pH trended down over time, while dissolved iron, dissolved magnesium, dissolved zinc, and sulphate all increased over time. At SRK-FD26, dissolved magnesium and sulphate decreased over time with no other trends observed at that location. The same six key parameters were plotted with time for four of the Northeast WRD seeps to assist with analyzing trends (Figure 3-28). The only evident visual trend from these charts is increasing concentrations of dissolved iron at SRK-FD24.

3.2.2.6 Other Locations

Other locations contained in the WRD RU are the Zone II WRD, Ramp Zone WRD, Parking Lot WRD, and one location associated with the FCD (eight seep locations altogether).

None of the three Zone II WRD seep locations (SRK-FD07, SRK-FD50, and CH-FD-74) had enough data points to do a statistical analysis. The FCD location (SRK-FD20) only had enough results for field pH to calculate the trend, and no significant trend was found. Out of the three Parking Lot WRD seep locations, CH-FD-65 only had enough results for field pH to evaluate the trends and no significant trend was found; while SRK-FD01 had no significant trend for total alkalinity and dissolved iron, increasing trends for dissolved magnesium, dissolved zinc, and sulphate, and decreasing trend of field pH; SRK-FD02 did not have enough data to perform the trend analysis. The time-series trend plots (Figure 3-25) also visually confirms the Mann-Kendall trends for SRK-FD01. For the Ramp Zone WRD location, SRK-FD14, there was not enough data to perform trend analysis on dissolved iron, but dissolved magnesium was found to exhibit an increasing trend, while there was no significant trend found in any of the remaining analytes evaluated.

3.2.3 Groundwater Data

There are 6 groundwater monitoring wells associated with the WRD RU. Monitoring wells are sampled and monitored three times a year: once during the winter or spring, once in the summer, and once during the fall. The analytical data and field parameter results can be found in Tables 3-7 to 3-9, and a summary of some key parameters can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 2016d) and *Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, August 2016j). All groundwater analytical data was compared to groundwater quality guidelines established in the Canadian Environmental Quality Guidelines (CCME, 2016).

Historical groundwater data trends were also analyzed using the Mann-Kendall trend test (Table 3-11). Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit.

3.2.3.1 Main Dump

CH12-014-MW003 showed a significant decreasing trend for sulphate and no significant trend for any other parameter analyzed.

3.2.3.2 Intermediate Dump

CH12-014-MW007 showed decreasing trend in magnesium and no significant trends in any other analyte evaluated.

3.2.3.3 Northeast Waste Rock Dump

CH14-015-MW006 exhibited a significant decreasing trend in dissolved zinc, but no other significant trends in the remaining parameters.

3.2.4 Temperature and Pore Gas Data

There are 15 WRD monitoring locations across the FMC: 9 locations associated with the Faro WRDs and 6 locations associated with the Vangorda/Grum Waste Dumps. Monitoring was completed at these locations from 2003 to 2016 and a discussion of the general trends observed at the Faro WRD locations are presented herein. WRD profile graphs showing the relationships between depth, temperature, oxygen concentrations, and carbon dioxide concentrations (where available) are provided on Figures 3-31 through 3-39. Discussions of the Vangorda/Grum locations are presented in Section 10.

30M1

Temperature generally decreased with depth, starting from the shallowest measurement depth of 0.7 to 20 mbgs, and ranged from 0.7 degrees Celsius (°C) to 37°C. Temperatures were relatively constant with respect to depth from 20 to 30 mbgs, ranging from 33 to 38°C.

Oxygen concentration remained fairly consistent from 0.7 to 20 mbgs at approximately 17 percent, but decreased to almost 0 percent at 30 mbgs during some of the monitoring events.

60M1

Temperature generally decreased from 0.7 to 20 mbgs and ranged from 1.4 to 48.8°C. Below 20 mbgs, the temperature steadily decreased to approximately 10°C at 60 mbgs. Oxygen concentration fluctuated throughout the depth of the measurements, but generally appeared to decrease from 15 percent near the surface to 5 percent at 20 mbgs, increasing back to 15 percent at 60 mbgs.

CH14-106-MW009

Temperature consistently decreased from near the surface to 36 mbgs and ranged from -1.27 to 19°C. Below 36 mbgs, the temperature appeared to decrease slightly to the maximum measurement depth of 41 mbgs.

The oxygen concentration varied throughout the depth of the measurements, but generally decreased to a depth of 50 mbgs and increased slightly below 50 mbgs. The oxygen concentration ranged from 0 to 20 percent.

CH14-104-MW008

The temperature varied from 0.91 mbgs (the shallowest measurement depth) to 10.91 mbgs and ranged from -0.45 to 8.66°C. The temperature below 10.91 mbgs was approximately 6.5°C. The oxygen concentration generally increased from 4 percent at 0.91 mbgs to 16 percent at 16.9 mbgs, decreased to 10 percent at 13.64 mbgs, then increased to 19 percent at the deepest measurement depth, at 22.78 mbgs.

CH14-015-MW006

Temperature varied the most in the top 10 mbgs, with the most variation observed at the surface. The temperature at the surface ranged from 0.28 to 13.31°C and reached a temperature of 4°C below 10 mbgs. Oxygen concentration increased from approximately 16.5 percent at 4.50 mbgs (the shallowest measurement depth) to 20.5 percent at 18.2 mbgs (the deepest measurement depth).

CH14-015-MW004

Temperature varied the most in the top 10 mbgs, with the most variation observed at the surface. The temperature at the surface ranged from -1.42 to 9.54°C. Below a depth of 10 mbgs, the temperature decreased gradually to approximately 5°C at 41 mbgs (the deepest measurement depth). Oxygen concentration decreased from approximately 15 percent at 1.448 mbgs (the shallowest measurement depth) to approximately 0 percent at 8.458 mbgs and increased to approximately 20 percent at 23.698

mbgs. The concentrations remained about the same below 23.698 mbgs to 30 mgs (the deepest measurement depth).

CH12-014-MW007

Temperature varied the most in the top 10 mbgs, but generally increased with depth and ranged from -4 to 20°C at 40 mbgs (the deepest measurement depth). Oxygen concentration generally decreased from 20 percent at 5 mbgs to 5 percent at 12.71 mbgs, increased to 20 percent at 30.21 mbgs, and then decreased to approximately 5 percent at 40 mbgs.

CH12-014-MW005

Temperature varied the most in the top 10 mbgs, with the most variation observed at the surface. The temperature at the surface ranged from -0.1 to 9.82°C. Below a depth of 10 mbgs, the temperature remained fairly constant at approximately 7°C to 25 mbgs (the deepest measurement depth). Oxygen concentration generally decreased from 20 percent at 8.956 mbgs to 15 percent at 13.956 mbgs, increased to 20 percent at 18.956 mbgs, and then decreased to approximately 5 percent at 23.956 mbgs (the deepest measurement depth for oxygen concentration).

CH12-014-MW003

Temperature varied the most in the top 10.27 mbgs, with the most variation observed at the surface. The temperature at the surface ranged from -2.91 to 9.33°C. Below a depth of 10.27 mbgs, the temperature decreased gradually to approximately 7°C at 15.27 mbgs and remained near this temperature to 25.27 mbgs (the deepest measurement depth). Oxygen concentrations generally increased from 10 percent at 5.27 mbgs to 15 percent at 10.27 mbgs, then decreased to 5 percent from 15.27 mbgs to 20.27 mbgs (the deepest measurement depth for oxygen).

3.2.5 Summary and Recommendations

The WRD RU contains highly variable geochemical properties, which are dependent on the lithologies present in each WRD. Data collection and analysis included in the FMC characterization investigations was integral to the improvements made to the geochemical models that support the site-wide water quality model. The associations of geochemical properties with specific mineral assemblages used in the modelling effort were supported by the data presented in this document, with particular emphasis on WRD composition. The following sections provide a summary of key findings for each WRD area.

3.2.5.1 Northwest Waste Rock Dump

- Increased abundance of trace elements arsenic, copper, lead and zinc were determined in the high sulphide content material encountered at intermediate depths within the Northwest WRDs.
- In general, the Northwest WRD contains near-neutral, net-neutralizing material, with localized mid-depth zones of acidic and potentially acid-generating material. The acidic zones coincide with oxidized sulphide material and the formation of secondary sulphate salts, as noted in borehole logs.
- The final leachate from surface materials in the Northwest WRD was near-neutral and did not contain significant trace element concentrations, indicating trace elements are not likely to be mobilized during short-term disturbance of the WRD surface. At intermediate and deeper depths within the Northwest WRD, the final leachate tended to be acidic (low pH) and contained elevated concentrations of the trace metals cadmium, copper, iron, lead, and zinc, which is consistent with the borehole log identification of increased oxidative weathering and the presence of highly soluble secondary sulphate salts.

- Although much of the potential contaminant load in the Northwest WRD is tied to primary sulphide mineral phases, the presence of zinc and lead in neutral salt exchangeable and acid-soluble phases suggest increased mobility of these constituents when in contact with water or during storm events.
- Analysis of seepage water quality identified localised trends of increasing magnesium concentration (SRK-FD19) and decreasing pH (SRK-FD16) were noted in the Northwest WRD, which drain toward Upper Guardhouse Creek and the Upper Parking Lot WRD.
- Monitoring results from CH14-015-MW004, installed in the Northwest WRD, indicate pyrite oxidation is moderately active. Temperatures ranged up to 10°C at 10-m depth. No long-term changes in temperatures were observed. Oxygen concentrations are strongly depleted at 8-m depth and range to near-atmospheric at 0.5- and 25- to 30-m depths. The temperature and oxygen suggest oxygen transfer is driven primarily by vertical convective air flow.

3.2.5.2 Stockpiles

- The upper, weathered portion of the OXSP and LGSPC contained greater content of antimony, arsenic, cadmium, copper, lead, mercury, selenium, silver, sulphur, and zinc.
- The Faro stockpiles (LGSPC and OXSP) contain high abundance of sulphide minerals and increased potential to generate acid, especially in the unweathered fine-grained material of the OXSP, at depths of greater than 1 mbgs.
- Final leachate results from surface materials collected from the OXSP and LGSPC were acidic, with elevated arsenic, cadmium, copper, iron, lead, and zinc. These elements are likely tied to readily soluble secondary sulphate salts, such as melanterite, that have been observed in surface deposits in the OXSP.
- The presence of readily dissolved neutral salt exchangeable phases such as melanterite in the OXSP and LGSPC are key considerations for the mobilization of metals during reclamation activities.
- Trends of increasing concentrations of sulphate, dissolved iron, and dissolved zinc were identified at seepage monitoring locations SRK-FD37 and SRK-FD38.
- Measured increased temperature at intermediate depths within the OXSP, combined with increased carbon dioxide production from the consumption of available NP and depleted oxygen, signifies ongoing pyrite oxidation reactions occurring within the stockpile.

3.2.5.3 Main Dump

- Near surface samples collected from the Main Dump were associated with increased sulphur content and associated trace metals. Increased abundance of sulphide rock types and metals content was more widespread than previously identified sulphide cell boundaries.
- ABA properties in the Main Dump exhibited a wide range in values, because of the wide range in lithologies of waste rock deposited. Overall, the Main Dump contains net-neutralizing material with localized zones of massive sulphide rock where acid generation is expected.
- Final leachates extracted from Main Dump surface materials had variable composition. However, in general, the final leachate was acidic and contained elevated concentrations of arsenic, cadmium, copper, iron, lead, and zinc, implying increased mobility of these elements during flushing events (i.e., freshet or summer rain). The mobility of trace elements in the Main Dump surface materials may be because of the presence of readily dissolved secondary sulphate salts, such as melanterite.
- Shallow samples collected from the Main Dump indicate a greater presence of zinc in neutral exchangeable salts such as melanterite and acid-soluble phases. Lead mainly occurs as primary lead minerals and acid-soluble lead phases. The presence of copper in the main dump is generally

incorporated into primary mineral phases or associated with amorphous iron oxide. Similar to trends observed in iron and zinc, copper is also tied to neutral exchangeable salts in CH14-106-TP004 and CH14-106-TP006, and acid-soluble phases in shallow test pit samples. Arsenic is associated mainly with crystalline iron oxides and primary mineral phases, with some shallow samples also tied to amorphous phases.

- Significant trends of increasing alkalinity, pH, and concentrations of dissolved iron, magnesium, sulphate, and zinc were noted at X23 (northwestern edge of the Main Dump). This steady increase in ions and metals of interest is likely associated with the breakthrough of other highly-impacted seeps draining toward X23, along flow paths.
- Monitoring results from installations in the Main Dump indicate acid rock drainage (ARD) activity ranges from strongly active near the middle of the dump (location CH14-106-MW009) to only slightly active at the northern edge of the dump (CH12-014-MW003). Temperatures ranged up to 19°C at 36-m depth at CH14-106-MW009, and up to 8°C at CH12-014-MW003. Oxygen concentrations are depleted throughout the monitored depths. The temperature and oxygen profiles from CH14-106-MW009 suggest oxygen transfer at the middle of the dump is driven primarily by convective air flow, both vertical and lateral. The profiles from CH12-014-MW003 suggest pyrite oxidation is limited by oxygen supply, which may be primarily through diffusion.

3.2.5.4 Intermediate Dump

- The Intermediate Dump Sulphide Cell is not as well defined as previously thought, with massive sulphide rock types present at near surface and at depth, widely distributed within the Intermediate Dump.
- Near surface samples collected from the Intermediate Dump were associated with increased sulphur content and associated trace metals. Increased abundance of sulphide rock types and metals content was more widespread than previously identified sulphide cell boundaries.
- ABA properties in the Intermediate Dump were highly variable, as observed in the Main Dump. However, the abundance of massive sulphide rock was much greater in the Intermediate Dump than in the Main Dump, and overall has substantial potential to generate acid.
- The final leachate from DI-leach testing of waste rock material collected from test pits excavated into the upper 5 m of the Intermediate Dump surface was acidic in nearly every sample test, indicating the entire near-surface material of the Intermediate Dump has the potential to generate low pH runoff and contribute metal loading during disturbance and follow-on flushing.
- Mobility of manganese and zinc in the Intermediate Dump is generally pH dependent, and highly mobile in acidic samples in the neutral salt exchangeable phase. This suggests these constituents are present in secondary salt deposits within the waste dump.
- Seepage emanating from the Intermediate Dump (at SRK-FD54) is characterized by decreasing trends in alkalinity and pH, and increasing concentrations of magnesium and sulphate. These trends indicate the onset of ARD generation at this location.

3.2.5.5 S-Wells

- Although groundwater and seepage within the S-Wells area contains increased contaminant loads, total metals analysis from the S-Wells area samples showed very few exceedances of screening criteria.
- S-Wells area materials exhibited acidic paste pH, however, NP:AP ratios were indicative of net-neutralizing sediment. Areas where acidic paste pH exist but net-neutralizing NP:AP ratios persist

likely highlight the presence of buffering rock types such as calc-silicate rock to neutralize acid generated by sulphides.

- Final leachate from DI-leach testing of materials from the S-Wells area was acidic, with elevated concentrations of arsenic, iron, lead, and zinc in near-surface samples. Potential mobility of trace elements at depth was not as pronounced.
- Greater than 50 percent of the zinc present in the S-Wells material is contained within more readily dissolved salts, acid-soluble, and amorphous minerals.

3.2.5.6 Northeast Waste Rock Dump

- Arsenic and lead exceeded one or both of the screening criteria in samples collected from the Northeast WRD.
- Although paste pH was acidic in some samples, the NP:AP in all samples was greater than 3.0, indicating net-neutralizing properties. Acid generated from secondary sulphur salts formed on rock fracture surfaces is expected to be buffered by the presence of calc-silicate rock.
- Final DI-leach testing leachate of surface materials from the Northeast WRD was acidic, with elevated levels of copper, lead, and zinc. In contrast, DI-leach testing of Northeast WRD samples collected at depth were generally characterized by neutral to alkaline leachate with very low trace element concentrations in the final leachate, with exceptions noted where sulphate salts noted on the borehole log.
- In the Northeast WRD, zinc is present in readily soluble neutral salt exchangeable and acid-soluble phases. Evidence of sulphate salts present in the borehole materials was noted on the lithologic logs from this area. Lead occurs as acid-soluble and primary lead sulphide minerals.
- Increasing zinc concentrations have been noted along the eastern edge of the Northeast WRD (SRK-FD05), which has potential to directly impact water quality in upstream NFRC reaches.
- Monitoring results from CH14-015-MW006, installed in the Northeast WRD, indicate pyrite oxidation is only slightly active. Temperatures ranged up to 4°C from 10 to 19 mbgs. Oxygen concentrations were near-atmospheric at all monitored depths. The temperature and oxygen profiles suggest minimal pyrite oxidation is occurring, and oxygen transfer within the pile is likely dominated by diffusion.

3.2.5.7 Zone II Waste Rock Dump and Outwash

- Trace elements arsenic, cadmium, copper, lead, and zinc were abundant in the Zone II Outwash surface and intermediate depth materials.
- ABA characteristics of materials collected near the land surface in the Zone II Outwash area included acidic paste pH and NP:AP ratios of less than 3.0. At depth, paste pH was neutral in most samples with NP:AP ratios of greater than 3.0.
- DI-leach test results from the Zone II Pit area exhibited neutral to alkaline conditions, with increased concentrations of lead and zinc in the upper 3 m of the WRD material, and in discrete intervals at depth (approximately 35 to 40 mbgs). In the Zone II Outwash area, DI-leach results showed increased concentrations of copper, lead, and zinc in shallow test pits excavated, and zinc in nearly all sample depths. Secondary sulphate salt formation was noted in the borehole logs, and likely the source of the soluble trace metals identified.
- The presence of zinc the Zone II Outwash area is widely distributed across the following phases: neutral exchangeable salts, acid-soluble, amorphous iron, crystalline oxide, and primary minerals.

Secondary salt formation in the Zone II Outwash sediments may also contribute mobile forms of lead, copper, and arsenic.

- Monitoring results from CH12-014-MW005, installed in the Zone II WRD, indicate pyrite oxidation is moderately active. Temperatures ranged up to 8°C from 15 to 30 mbgs. Temperature and oxygen profiles are suggest only moderate pyrite oxidation is occurring, and oxygen transfer within the pile is likely limited by diffusion.

SECTION 4

Mill Building and Emergency Tailings Area Remediation Unit

The Mill Building Area and ETA RU encompasses the area around the main FMC mine processing, maintenance, and support facilities, as well as the ETA tailings discharge deposits contained within the lower Faro Creek valley, south of the Mill Building area.

4.1 Field Investigation Activities

The ETA has been identified as a contaminant source to groundwater and surface water, and the tailings material in this area are planned to be either relocated or covered in place. Field investigation activities completed within the Mill Building Area and ETA RU during the 2014 field season were to support the determination of ETA thickness and extent of contamination in the underlying soils and within the tailings.

In addition, a pipeline that will convey contaminated groundwater from the toe of the CVD to the proposed water treatment plant (WTP) was being designed. The proposed pipeline alignment goes through the Mill Building Area and ETA RU; therefore, some investigations completed within this area were to support to design of this pipeline.

Limited test pit excavation and borehole drilling activities were conducted within the Mill Building Area and ETA RU in the 2014 field season. Although these activities were mainly for the purpose of geotechnical investigations, select samples were sent to the laboratory for geochemical analyses to support the overall understanding of geochemical conditions at the FMC. No monitoring wells were installed within the Mill Building Area and ETA RU.

4.1.1 Test Pit Excavation

During the 2014 field season, a total of ten test pits were completed along the proposed CVD SIS pipeline alignment between the CVD and the proposed WTP. Two of these test pits were located within the Mill Building Area and ETA RU, whereas the other eight were located within either the RCTA RU (discussed in Section 5) or the Dams and CVD Pond RU (discussed in Section 6). Test pits were excavated to approximately 5 mbgs, with soil samples collected in approximately 1.5 m depth intervals. The main purpose of these soil samples was for geotechnical analyses; however, limited geochemical (i.e., corrosivity) data was also obtained, including chloride, oxygenation reduction potential, pH, sulphate, and sulphide.

Additional test pit excavation was completed within the Mill Building and ETA RU in 2014; however, the principle purpose of those activities were geotechnical investigation and as such, no geochemical data was obtained.

4.1.2 Borehole Drilling

During the 2012 field season, two piezometers (CH12-101-PZ001 and PZ002) were installed and eight borings (CH12-101-BH001 through BH008) were drilled in the Mill Building Area at the proposed location of the replacement WTP. While these piezometer installations and borings were mainly conducted for geotechnical purposes, geochemical data was also collected to assess any potential impacts to the proposed area. Further discussion on the drilling and sample collection is present in the report titled *Geotechnical Data Water Treatment Plant* (CH2M, December 2012).

During the 2014 field season, three boreholes were drilled in the ETA and on the Mine Access Road downstream (west) of the ETA. The ETA has been identified as a contaminant source to groundwater and surface water, and the tailings are planned to be either relocated or covered in place.

Geochemical analyses were conducted on samples from the one boring drilled through the tailings and into the underlying alluvium within the ETA. In addition, one grab sample and a duplicate sample were collected from one of the borings on the Mine Access Road at approximately 10.7 mbgs because of strong petroleum hydrocarbon odour detected during the investigation. Laboratory analyses for VOCs and hydrocarbons were completed on these samples. There were no detections of VOCs in this material; however, hydrocarbons F2 (C10-C16) and F3 (C16-C34) were detected in the parent sample at 501 and 209 mg/kg, respectively. The duplicate sample reported similar concentrations.

Description of the drilling activities, laboratory analyses, and results discussion are presented in a report titled *Summary of 2014 Field Investigation – Relocate ETA Tailings to Rose Creek Tailings Area* (CH2M, 2015m).

4.1.3 Seepage Investigation

Seepage investigation in the Mill Building Area and ETA RU was completed as part of the side-wide seep sampling program in 2014 and 2016. There are 12 seeps that are associated with the Mill Area and six seeps associated with the ETA. Discussions of seep sampling activities and data analyses are summarized in Section 3.1.3, and the detailed descriptions are presented in the following reports:

- 2012 Seepage, Surface Water, and Water Treatment Plant Influent Sampling Report (CH2M, October 2013a)
- 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report (CH2M, March 2014c)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2016d)
- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring (CH2M, August 2016j)

4.2 Field Investigation Data Evaluation

4.2.1 Solids Data

4.2.1.1 Total Metals

From the 8 borings and 2 piezometers completed in the Mill Area at the proposed site of the replacement WTP in 2012, 27 samples plus 4 duplicate samples were submitted for total metals analysis; full results from the analysis can be found in Table 4-1. In general these samples were only mildly impacted to not impacted at all; most exceedances were greater than 10 times the average crustal abundance, but less than 12 times the mean world soil content. Lead, mercury, and zinc were the only elements measured that exceeded both criteria in any sample measured. Lead and zinc exceeded both criteria in samples CH12-101-BH004-SOa and CH12-101-PZ002-SOa; mercury also exceeded both criteria in sample CH12-101-BH004-SOa. Lead also exceeded both criteria in samples CH12-101-BH001-SOa and CH12-101-BH003-SOa. Arsenic and cadmium, among a handful of other elements, were measured greater than 10 times the crustal abundance at a few other sample locations, but were always less than 12 times mean world soil content. Strikingly, almost all of the exceedances were measured in fairly shallow or even surficial soil samples suggesting that the impacts may be related to historic dust deposits related to ore process and handling at the mill and are not naturally occurring. This trend can be seen in Figures 4-1 to 4-14, which show elemental concentrations with depth in CH12-101-BH001 to

CH12-101-BH005 and both piezometers. A surficial soil – dust study may be warranted before construction of the WTP in this area to evaluate the hazards and risk created by construction activities and to evaluate the risk to human health during construction. Since this area is not believed to contain mineralized soil and rock, the metals measured in these samples do not present any long-term issue or concern to the proposed WTP structure.

The single boring drilled in the ETA, CH14-105-BH003, was intended to determine the depth of the tailings and to collect samples from the tailings and the underlying alluvium to determine the extent of contamination. Five samples and one duplicate from this boring were submitted for geochemical analysis: two samples in the upper and lower tailings (CH14-105-BH003-SOa and CH14-105-BH003-SOd), one sample in the alluvium at the upper contact with the tailings (CH14-105-BH003-SOd-B), and two samples distinctly in the underlying alluvium (CH14-105-BH003-SOe and CH14-105-BH003-SOg). As expected, the tailings samples contain very high elemental concentrations that generally exceeded either the 10 times crustal abundance and/or the 12 times median world soil content standards, while elemental concentrations are decreased in the underlying alluvium samples (Figures 4-15 and 4-16). However, the surficial tailings sample (CH14-105-BH003-SOa and duplicate CH14-105-BH903-SOa), which was collected between 0 and 0.5 mbgs, was depleted in more acid-mobile metals such as cadmium, copper, lead, magnesium, and zinc relative to the concentrations of the same metals observed in the tailings between 2.3 and 2.7 mbgs (CH14-105-BH003-SOd). Meanwhile, less acid-mobile elements, such as arsenic, were only slightly depleted. For example, cadmium and zinc were at or below both screening criteria in the surficial sample, but were more than six and twenty times, respectively, greater than the higher of the two screening criteria (i.e., 12 times mean world soil content) in the deeper tailings material. In contrast, arsenic was almost four times the mean world soil content criteria at the surface and only slightly higher (five times mean world soil content) at depth. It is notable that magnesium, which is commonly the first element coupled to sulphate that indicates impacted waters at the FMC, is highly depleted in the upper tailings material and is even enriched in the underlying alluvial material.

The total elemental concentrations of the underlying alluvium exhibits a sharp drop with depth. However, there is evidence of vertical migration of trace elements just below the tailings contact. Sample CH14-105-BH003-SOd-B of the alluvium immediately beneath the tailings has almost identical elemental concentrations to the tailings material overlying it, however, the total sulphur content of CH14-105-BH003-SOd-B is an order of magnitude lower than the tailings material. Given that (1) the tailings in the ETA were deposited as a slurry, (2) this upper alluvial layer is fine to coarse gravel, and (3) the similarity in elemental composition with the overlying tailings, suggests this upper alluvial horizon contains a significant amount of primary tailings material, but the order of magnitude lower sulphur content also indicates that at least some of the elemental content in this horizon may be because of vertical migration of elements leached from the overlying tailings material and retained in the alluvium.

Below the tailings-alluvium contact zone (2.3 to 2.7 mbgs), the alluvium still exhibits elemental concentrations indicative of impact from the overlying tailings down to the deepest sample (CH14-105-BH003-SOg) at 4.3 to 4.7 mbgs. However, starting at 3.2 to 3.5 mbgs, there are fewer elemental exceedances of either screening criteria and the elemental concentrations are generally an order of magnitude lower than the tailings material. Still arsenic, cadmium, lead, and zinc remain significant concerns even at depth and zinc, which has been demonstrated to be one of the more mobile trace elements at the FMC exhibits a potentially increasing trend with depth.

Based on the results from this single core through the ETA tailings material, it appears that trace elements in the upper surface of the tailings have been disproportionately leached or otherwise mobilized – most likely because of acid-generation and related weathering reactions – relative to the elemental concentrations observed deeper in the tailings material. The underlying alluvium exhibits impacts from the tailings up to 2 m below the tailings-alluvium interface, which may be the result of

vertical migration of trace elements leached from the tailings, though impacts from original deposition of the slurried tailings material cannot be completely ruled out. Further investigations with additional samples across the tailings-alluvium interface and deeper into the alluvium are warranted to establish trends across the ETA. Mineralogical evaluation of the trace element mineralization within the alluvium may also help to determine the nature of the elemental impacts (i.e., primary deposition or secondary mineralization because of leaching of the overlying tailings).

4.2.1.2 Acid Base Accounting

ABA data collected from the tailings material from boring CH14-105-BH003 indicate general acid-generating materials, with paste pH between 1.7 and 4.7 and the most acidic samples occurring at the surface where the NP has been depleted (i.e., NP not detected in this sample). The lack of NP and exposure to weathering has accelerated the oxidation of sulphides, the generation of acid, and the leaching of trace elements at the surface. In contrast, the moderately acidic sample (CH14-105-BH003-SOd) 2.3 to 2.7 mbgs is buffered from rapid oxidation and accelerated acid generation because it still contains a significant amount of the original NP (350 kg $CaCO_3$ eq/tonne) from mill process that generates the tailings under alkaline conditions. The lack of NP in the upper alluvium sample (CH14-105-BH003-SOd-B; NP below detected) further supports the assumption that trace elements present in this sample are not associated with primary deposition of tailings as primary tailings typically contain some NP (or are highly acidic and trace element depleted). The trace elements in CH14-105-BH003-SOd-B are more likely because of secondary mineralization resulting from vertical migration of tailings leachate. Regardless, the NP:AP ratios both tailings samples and the upper alluvium was less than 1.0, indicating the materials will ultimately become acid generating. This is not unexpected for the tailings material which is predominantly fine-grained sulphide material. Full ABA data and results are presented in Table 4-2.

4.2.1.3 DI Leach

DI-leach tests were carried out on samples collected from shallow borehole CH14-105-BH003, completed in the ETA materials. Leachate from this area is characterized by acidic conditions and highly mobile constituents: arsenic, cadmium, copper, iron, lead, and zinc. With the high metal content in this material and lack of NP, this area continues to be an area of high impact from mining activities. DI-leach results are found in Table 4-3.

4.2.2 Seepage Data

There is a total of eighteen seep sample locations within the Mill Building Area and ETA RU. A summary of some key parameters can be found in the four reports mentioned in section 4.1.3.

4.2.2.1 Mill Area

Historical seepage data trends were analyzed using the Mann-Kendall trend test, which statistically determines whether a data set consistently increases or decreases over time. The test requires at least five data points above the detection limit to produce an accurate result. Statistical analyses were calculated for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the non-detectable limit.

Out of the 11 locations in the Mill Area, six locations did not have enough data to evaluate with the Mann-Kendall trend test. Three locations (CH-MILL-01, CH-MILL-02, CH-MILL-04) only had enough field pH data to complete statistical trend analyses and there were no trends observed. Location SRK-FD33 showed significant decrease over time for field pH, but no significant trend for the other key parameters. CH-MILL-03 showed no significant trend for any of the key parameters. These results can be found in Table 4-4a.

4.2.2.2 Emergency Tailings Area

Seep sampling location CH-ETA-03 is the only location in the ETA that did not have enough data points to perform statistical analysis on any analytes. With the exception of FCS-4, the remaining seep sampling locations only had enough field pH data for Mann-Kendall analysis. CH-ETA-01 exhibited a significant decreasing trend in field pH, while CH-ETA-02, FCS-2, and FCS-3 did not show any significant trends in field pH. The FCS-4 sampling location exhibited a significant increasing trend in dissolved magnesium and dissolved zinc, but no significant trend in total alkalinity, dissolved iron, or sulphate. The field pH at FCS-4 showed a significant decreasing trend over time. These trend results can be found in Table 4-4b.

4.2.3 Summary and Recommendations

Results from the Mill Area and ETA are summarized below:

- Lead, mercury, and zinc were the only elements measured that exceeded both 10 times the average crustal abundance and 12 times the mean world soil content in a few of the samples analyzed from the Mill Area. However, almost all of the exceedances were measured in surficial soil samples suggesting that the impacts may be related to historic dust deposits from historical ore processing and handling at the mill and are not naturally occurring.
- Trend analysis completed on water quality parameters in seepage locations near the Mill Area showed decreasing pH in one location (SRK-FD33), and no other significant trends for other key parameters. Trend analysis in the ETA found that dissolved magnesium and dissolved zinc are increasing concomitant with a decreasing trend in pH at FCS-4, suggesting the drainage may be in the early stages of evolving towards more acidic conditions. Continued monitoring is recommended at this location.
- Surficial ETA materials have been depleted in acid-mobile trace metals because of weathering processes. At depth, the total metal content in the tailings material deposited in the ETA has greater content of constituents of concern. The underlying alluvium exhibits impacts from the tailings up to 2 m below the tailings-alluvium interface, which may be the result of vertical migration of trace elements leached from the tailings.
- ABA properties measured in the ETA tailings and upper alluvial material indicate acid generating materials, with limited NP available. Leachate from this area is characterized by acidic conditions and highly mobile constituents: arsenic, cadmium, copper, iron, lead, and zinc. Water quality trends in the ETA show increasing concentrations of sulphate, iron, magnesium and zinc. Associated decreases in pH have been observed at key locations within the ETA.
- The Mill Area and ETA continue to be areas of high impact from historical mining activities.

Recommendations for further work include:

- A surficial soil-dust study may be warranted before construction of the WTP in the Mill Area to evaluate the hazards and risk created by construction activities and to evaluate the risk to human health during construction.
- Further investigations with additional samples across the tailings-alluvium interface and deeper into the alluvium are warranted to evaluate the migration of trace metals into the underlying alluvium in the ETA. Mineralogical evaluation of the trace element mineralization within the alluvium may also help to determine the nature of the elemental impacts (i.e., primary deposition or secondary mineralization because of leaching of the overlying tailings).

SECTION 5

Rose Creek Tailings Area Remediation Unit

The RCTA RU encompasses the Original Impoundment, Secondary Impoundment, Intermediate Impoundment, the ID Pond (ID Pond), and the area east of Faro Canyon and north of the RCTA up to the North Wall Interceptor Ditch (NWID). This RU does not include the Rose Creek Diversion (RCD), ID, CVD or CVD Pond.

5.1 Field Investigation Activities

Field investigation activities completed within the RCTA RU during the 2013 to 2015 field seasons were to support the following objectives:

- Further quantify groundwater flow components in the RCTA to support design of the CVD Seepage Interception System (SIS) and site-wide geochemical and water quality modelling efforts at the site
- Improvements to the understanding of site-wide geochemical properties and the site-wide water quality model
- Improvements to the understanding of the impounded tailing characteristics for planned cover-in-place reclamation activities

5.1.1 Borehole Drilling and Monitoring Well and Thermistor Port Installation

During the 2013 field season, one well cluster was drilled in the Intermediate Impoundment of the RCTA. The CH13-204-MW016 well cluster consisted of four monitoring wells installed in three boreholes: one deep alluvium well (CH13-204-MW016E), one shallow alluvium well (CH13-204-MW016C) and two wells (CH13-204-MW016A/B) completed as a nested installation screened within the middle and deep tailings material. Soil samples were collected during the drilling of these monitoring wells and selected samples were submitted for geochemical analyses.

During the 2014 field season, three boreholes were drilled in the Original Impoundment within the RCTA RU, to investigate groundwater quality beneath the tailings in the Rose Creek Alluvial Aquifer (RCAA) just downgradient of monitoring location FCS-4 within the lower portion of Faro Canyon of the ETA. Boreholes were advanced into the tailings material and the underlying alluvium, with maximum depths ranging from 16.76 mbgs (into gravel below the tailings) to 47.24 mbgs (into bedrock). Selected samples were submitted for geochemical analyses. Monitoring wells were installed in each of these borings.

Five boreholes were also drilled in the Intermediate Impoundment during the 2014 field season. Four of these boreholes were drilled to collect subsurface data to support design efforts for the proposed new side channel dike structure, and the remaining borehole was drilled to help improve understanding of the impounded tailing characteristics for planned cover-in-place reclamation activities. Borings were advanced into the native materials beneath the tailings, to maximum depths ranging from 3.50 mbgs to 20.42 mbgs. Samples were collected for geochemical analyses. One 25.4-millimetre (mm) (1-inch) -diameter thermistor port was installed in each of these borings.

Description of the drilling and monitoring well and thermistor port installation activities, laboratory analyses, and results discussion are presented in the following documents:

- 2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report, Faro Mine Remediation Project (CH2M, February 2014q)
- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)

- Summary of 2014 Field Investigation – Dewater and Cover Intermediate Tailings Area (CH2M, March 2015x)
- Summary of 2014 Field Investigation – Construct New Side Chanel and Side Channel Dike (CH2M, March 2015z)

5.1.2 Seep Sampling

The RCTA seep sampling is part of the site-wide seep sampling program, which was discussed previously in in Section 3.1.3. There are 11 seeps that are associated with the RCTA and surrounding area. Four seeps are monitored at the base of the Secondary Impoundment dam (CH-RCTA-03, CH-RCTA-07, CH-RCTA-08 and CH-RCTA-09). Two of these seeps (CH-RCTA-03 and CH-RCTA-07) are collected where water emanates directly from the Secondary Impoundment dam. One of these seeps, CH-RCTA-09, is monitored where water seeps from the lower western face of the RCD dam that diverts water from the original (pre-1981) RCD channel. The fourth seep, CH-RCTA-08, is monitored directly from the water that flows west through the original (pre 1981) RCD channel to the Intermediate Impoundment. Water sampled at CH-RCTA-08 represents aggregate flow from the seeping lower face of the Secondary Impoundment dam and RCD dam.

CH-RCTA-04 is monitored downstream of CH-RCTA-08 along the same flowpath, on the surface of the Intermediate Impoundment. CH-RCTA-06 is monitored at a pool of water on the Intermediate Impoundment surface approximately 650 m west of CH-RCTA-04. CH-RCTA-05 is monitored where seepage from the RCD drains toward the Intermediate Impoundment. FCS-5 is monitored near the Secondary Impoundment dam within the ditch that conveys water from the ETA (i.e., FCS-4) to the ID Pond. GDHSCK, CH-RCTA-01, and CH-RCTA-02 are monitored on the northern side of the RCTA, downstream from the Secondary Impoundment dam.

5.1.3 Groundwater Sampling

Groundwater was sampled in the RCTA annually in the late summer to early fall. In 2014, one groundwater sampling event took place within the RCTA RU between September 10 and September 20. In 2015, sampling events took place between October 4 and 11.

5.2 Field Investigation Data Evaluation

5.2.1 Solids - Total Metals

The CH13-204-MW016 well cluster was installed in the northern portion of the Intermediate Tailings Impoundment to address a data gap in groundwater chemistry in the tailings and underlying RCAA in support of development of the RCTA PHAST model. Samples of the tailings and underlying aquifer material were submitted for geochemistry including total metals. The tailings are approximately 8.7 metres (m) thick in this location and three samples with one duplicate were submitted for total metals analysis including a surface sample, a bottom sample, and a middle depth sample. As expected, the total metal concentrations in the tailings are elevated and numerous elements exceed both the median world soil content and the crustal abundance standards (Table 5-1). There is no discernible trend in elemental concentrations with depth in the tailings material (Figures 5-1 and 5-2); the variation in samples from different depths is not significantly different relative to the natural variation of duplicate samples taken from the same depth. Although the deepest tailings sample is geochemically similar to the overlying tailings samples, the boring log from this depth horizon indicates there is native organic material (i.e., decomposing roots and sticks) suggesting that there is a transition zone between the upper RCAA and the deposited tailings material. Given that thick, peaty organic material is observed in the floodplains adjacent to undisturbed streams in the FMC, it is likely that the tailings were simply pumped as a slurry over this organic material resulting in a zone that contains native organic material

but is geochemically similar to overlying tailings material. Within a half meter, the elemental concentrations drop sharply indicative RCAA material (Figures 5-1 and 5-2), but trace element concentrations are still elevated, but with only a few exceedances, indicating there is some impact from the overlying tailings material. With depth into the RCAA, the elemental concentrations are more indicative of background levels found at the FMC with only a few exceptions.

The CH14-015-MW001 and CH14-015-MW002 boring clusters were drilled in the Original Tailings Impoundment at the base of Faro Canyon, just downstream of the ETA and sampling location FCS-4. These clusters were drilled to install wells in the tailings and RCAA material in an effort to fill data gaps in the groundwater chemistry in this area. The main objective was to determine how much seepage from the WRDs moving through the ETA via Faro Canyon was seeping into the upper RCAA below the tailings and to establish groundwater chemistry in this area for improvements in the RCTA PHAST model. As expected, the total metal concentrations in the tailings are elevated and numerous elements exceed both the crustal abundance standards and the median world soil content (Table 5-1). There is no discernible trend in elemental concentrations with depth in the tailings material (Figures 5-3 and 5-4). There is a sharp decrease in elemental concentrations between the bottom of the tailings at 16.8 mbgs and the top of the alluvium at 19.2 mbgs. With the exception of total S in the upper 1 to 2 m of the alluvium, there are no elemental exceedances relative to the mean world soil content and crustal abundance screening criteria. Total S steadily decreases more than an order of magnitude from the top of the RCAA at 19.2 mbgs and the deepest alluvium sample at 25.9 mbgs. Over the same interval, iron values barely decrease, perhaps suggesting a shift from more iron sulphide in the upper portions of the RCAA to more iron oxyhydroxides deeper in the RCAA. The trace elements all conform to a similar trend with depth below the tailings in the RCAA sediments, suggesting a similar mechanism is controlling the fate and transport of trace elements within the alluvium.

During the 2014 field season, a series of borings were conducted in the southern portion of the Intermediate Tailings Impoundment along the path of the proposed probable maximum flood (PMF) spillway side-channel dike to mainly conduct geotechnical investigations. A total of 15 samples of mostly tailings material from a total of 5 boreholes were also submitted for geochemical analysis. As expected, the total metal concentrations in the tailings are elevated and numerous elements exceed both the crustal abundance standards and the median world soil content (Table 5-1). A few holes were drilled deep enough to penetrate the underlying native material. At boring CH14-201-TH002, two samples (SOp and SOp-B) were collected at the tailings-RCAA contact at depth of 19.8 to 20.3 mbgs. Sample CH14-201-TH002-SOp is identified as organic material and likely represents the original peaty growth that existed before tailings deposition, while sample CH14-201-TH002-SOp-B is identified as silt, but based on geochemical composition is likely some of the initial tailings material deposited on top of the native peaty substrate and occurs interbedded with the organic substrate. The only elements that exceed both the crustal abundance and the mean world soil content criteria in the organic material (CH14-201-TH002-SOp) are lead, total sulphur, and zinc; iron is also an order of magnitude lower in this sample than the overlying tailings material. Boring CH14-201-TH004, which is close to the southern margin of the Intermediate Tailings, encountered till material at a depth of 3 to 3.5 mbgs. A single sample, TH003-SOd-B, was submitted for geochemical analysis of this till material. The sample does exhibit slight impacts from the tailings material, but only exceeds both criteria for total sulphur and zinc. Given the disproportionately high levels of total sulphur and zinc relative to other elements typically elevated in the tailings source material, it is likely the sulphur and zinc represent secondary deposition or migration of these elements from the tailings source material deeper into the underlying RCAA. The mobilization of zinc and sulphur from the tailings material, followed by secondary deposition of these elements in the RCAA has implications for the fate and transport within the RCTA. Further illustrating the potential impacts of the tailings material on the underlying RCAA, a sample of weathered bedrock, CH14-201-TH004-SOf, was collected from a fairly shallow depth (6.1 to 6.6 mbgs). This weathered bedrock at this depth exhibited elevated trace elements with arsenic, lead, mercury, total sulphur, and zinc exceeding both the crustal abundance and the mean world soil content criteria. The final non-tailings sample,

CH14-201-TH006-SOe, submitted for geochemical analyses was collected in alluvium below the tailings at a depth of 5.2 to 5.6 mbgs. Surprisingly, this sample was only moderately impacted with only arsenic and total sulphur exceeding both criteria.

5.2.2 Acid Base Accounting

Results from ABA testing on samples collected in the RCTA RU characterize the tailings material as well as the native soils, alluvial sediments, and weathered bedrock underlying the RCTA (Table 5-2). Paste pH was generally acidic in the fine grained tailings material with NP:AP ratios of less than 1.0. Organic soils were observed underlying the fine-grained, pyrite-rich tailings material (CH14-201-TH002-SOp). Although the organic soils had near-neutral paste pH, the elevated total sulphur resulted in a very high calculated acid potential (178 kg $CaCO_3$ eq/tonne). Because the non-sulphide fractions, acid-soluble sulphate and barium sulphate, were not determined, the AP was calculated conservatively assuming all of the total sulphur is attributable to sulphide. As such, the NP:AP ratio were less than 1, suggesting potentially acid generating material, however, as noted above, the total sulphur in this sample may be secondary, which would not contribute to acid potential. Thus, while the organic material is certainly impacted from the overlying tailings, the potential to generate acid from this horizon is dubious given the neutral pH of the sample and the lack of complete data for the ABA calculation. Lithologic logs from RCTA field investigation locations identify unconsolidated alluvial sediments (silts, sands, and gravels) underlying the organic soils beneath the tailings deposits. ABA parameters measured in samples collected from these sediments seemed to be related to overall pyrite content in the sediments. Where clasts of diorite, quartz, and phyllite were noted, paste pH was generally near neutral and NP:AP ratios were greater than 3.0. Where abundant pyrite grains were noted on the lithologic logs, paste pH was more acidic and NP:AP ratios were generally less than 3.0, and often less than 1.0. Samples collected from weathered phyllite bedrock in the RCTA were characterized as near neutral (paste pH) and NP:AP of greater than 3.0. In summary, the ABA data in the RCTA generally indicate potentially acid generating tailings material overlie heterogeneous alluvial materials, ranging from non acid-generating to potentially acid generating, depending on the pyrite content.

5.2.3 DI Leach

DI-leach extractions were carried out on selected samples collected from boreholes (CH14 -015-MW001A, CH14-015-MW001C, CH14-015-MW002A, CH13-204-MW016C, and CH13-204-MW016E) and test holes (CH14-201-TH001) completed in the RCTA and underlying materials (Table 5-3). DI-leach testing on samples from the original tailings material generated a leachate with a final pH that was acidic and contained elevated concentrations of cadmium, copper, lead, and zinc, indicating these elements are readily mobile. The final leachate from the Intermediate Tailings Area samples is characterized by acidic leachate with elevated concentrations of copper, iron, lead, and zinc. DI-leach test results from the alluvial material underlying the Intermediate Tailings Area resulted in a neutral to alkaline final leachate without any of the trace elements significantly elevated in the solution, indicating that the trace elements detected in the total metal analysis are associated with relatively stable mineral phases that do not readily dissolve.

5.2.4 Sequential Extraction

Sequential extraction tests were completed on samples collected from the RCTA to characterize the relative mobility and mineralogic association of trace elements within the tailings and underlying alluvial material. Sequential extractions were carried out on samples collected from the following locations: CH13-204-MW016C, CH13-204-MW016E, and CH14-015-MW001C. Although the sequential extractions analyze for a full suite of trace element analytes (Tables 5-4 and 5-5), this section focuses on the key constituents to the FMC area: iron, manganese, zinc, lead, copper, and arsenic. Iron is generally present in the RCTA tailings, fill, and underlying alluvium in one of three of the extraction steps (Figures 5-5

and 5-6): amorphous iron oxides (e.g., ferrihydrite,), crystalline iron oxides (e.g., goethite, schwertmannite), or in the residual fraction (e.g., the iron sulphide, pyrite). Manganese in the tailings is mainly extracted in the residual fraction (likely as a coprecipitate in primary sulphide phases) followed by the neutral-salt exchangeable fraction (e.g., highly soluble secondary sulphate salts). Manganese in the tailings is also extracted, to a lesser extent, in the amorphous and crystalline oxide phases. Manganese in the underlying alluvial sediments is also predominantly extracted in the residual phase with the remaining manganese balance distributed in the acid-soluble and amorphous oxide phases and to a lesser extent, the neutral-salt exchangeable and crystalline oxide phases. In a few samples (CH13-204-MW016E-SOd, SOe, and SOi), a significant portion (greater than 10 percent) of the total manganese is extracted in the neutral-salt exchangeable fraction indicating manganese at these depths is readily mobile. In boring CH14-015-MW001C, zinc exhibits a bimodal distribution from the surface down to 16.8 mbgs, extracted in either the residual phase (e.g., zinc-bearing sulphide) or in the neutral-salt exchangeable fraction (e.g., highly soluble, secondary sulphate salts); the total zinc content is also higher in these samples. Below approximately 16.8 mbgs, zinc is still predominantly extracted in the residual fraction, but is fairly equally distributed between the amorphous and crystalline oxide phases and the neutral-salt exchangeable phase, suggesting a higher partitioning of zinc into secondary oxide phases with depth in the tailings material, although the total zinc content is significantly lower with depth. Within the alluvium underlying the tailings, zinc distribution is largely bimodal occurring predominantly in the residual phase (i.e., zinc-bearing sulphides), but also significant distribution in the crystalline oxide phase (i.e., iron and/or manganese oxides). Minor amounts of zinc are also extracted in the amorphous oxide fraction. This suggests that the majority of the zinc measured in the RCAA is likely primary in nature, though secondary zinc may be associated with crystalline oxides through adsorption. In boring CH14-015-MW001C, lead is almost completely extracted in the residual (i.e., sulphide) fraction near the surface (i.e., 2.2 mbgs in sample CH14-015-MW001C-SOa). At approximately 16.8 mbgs, very little lead is recovered in the residual fraction (approximately 20 percent) with most of the lead recovered in the neutral-salt exchangeable (i.e., secondary sulfo-salts) and acid-soluble (i.e., lead carbonates and some lead oxide) fractions. At greater depths in the tailings at CH14-015-MW001C, the total lead concentration is very low making sequential interpretation of sequential extraction data dubious, however, lead is largely distributed between the residual, acid-soluble, and amorphous oxide fractions. In boring cluster CH13-204-MW016, lead is largely extracted in the acid-soluble and neutral-salt exchangeable fractions in the tailings and upper RCAA where total lead is elevated. There is a significant amount of lead extracted in the alkaline (pH 10) pyrophosphate phase, though the reasoning for this is not immediately apparent, but it could be a carryover from the amorphous oxide extraction step. As the lead concentration drops below the tailings in the RCAA, the lead distribution shifts to more in the residual and amorphous oxide fractions. There is still significant lead extracted in the pyrophosphate fraction. In both CH13-204-MW016 and CH14-015-MW001 boring clusters, copper was largely extracted in the residual (i.e., sulphide) and amorphous oxide fractions, while arsenic was largely extracted in three main phases: amorphous oxides, crystalline oxides, and the residual fraction.

5.2.5 Seepage Data

There were 11 seep locations monitored within the RCTA to provide additional water chemistry estimates of the RCTA pore water in support of the PHAST model for the RCTA. These data have been reported in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, 2015).

Seepage data trends were analyzed using the Mann-Kendall trend test, which statistically determines whether a data set consistently increases or decreases over time. The test requires at least five data points above the detection limit to produce an accurate result. Statistical analyses were calculated for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the non-detectable limit.

Three seep sampling locations, CH-RCTA-01, CH-RCTA-02, and CH-RCTA-09, did not have enough data to perform Mann-Kendall analyses. Given the general low pH of seep, CH-RCTA-03, total alkalinity was not generally measured at this location and therefore no trend analysis was conducted (Table 5-6). CH-RCTA-03 did exhibit a significant decreasing trend in dissolved iron, but no other trends were observed in the remaining data set. CH-RCTA-07 showed a significant decreasing trend for iron, sulphate, and dissolved zinc, but no significant trends for total alkalinity, dissolved magnesium, or field pH. CH-RCTA-08 only had enough field pH data to perform Mann-Kendall analysis; there was no significant trend in the field pH data. Four seeps, CH-RCTA-04, CH-RCTA-05, CH-RCTA-06, and GDHSCK, only have enough field pH data to conduct the Mann-Kendall trend analysis. All four locations had no significant trend in field pH. The final seep sampling location in the RCTA is FCS-5. Mann-Kendall analysis found a significant increasing trend in field pH, but no trends in the other parameters tested; there was not enough data to test total alkalinity.

5.2.6 Groundwater Data

There are 41 groundwater monitoring wells associated with the RCTA RU that are sampled as part of the yearly fall sampling program. In 2014 and 2015, most monitoring wells were sampled only once a year, during the fall. However, in 2015 monitoring wells P03-06-01, P03-06-03, and P03-06-06 were also sampled during the summer. The analytical data and field parameter results can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 20156d.

Groundwater data trends employing current and historical data sets were analyzed using the Mann-Kendall trend test. Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit.

A subset of groundwater wells in the tailings area were chosen for the Mann-Kendall analysis. The majority of the wells on the tailings are nested wells with 8-9 different depths, labelled in numerical order with 01 being the deepest. A summary of the results of the Mann-Kendall analysis are presented in Table 5-7.

For well P03-01, nested wells P03-01-02, P03-01-04, P03-01-06, P03-01-08, and P03-01-09 were chosen for Mann-Kendall analyses. Total alkalinity showed a significant increase in P03-01-02, and significant decrease in P03-01-04, with no significant trends in the other three nested locations. Dissolved iron showed a significant increase in P03-01-02, P03-01-06, and P03-01-09, with no significant trends in the other two nested locations. Dissolved magnesium showed a significant decrease in P03-01-04, but significant increases in P03-01-06 and P03-01-09, with no significant trends in the other three nested locations. Dissolved zinc showed significant increases in the deepest three nested locations analyzed (P03-01-02, P03-01-04, and P03-01-06), with no significant trends in the two shallow nested locations. Field pH showed significant decreases in P03-01-04 and P03-01-06, with no significant trends in the other three nested locations. Sulphate decreased at P03-01-02 and increased at P03-01-06, with no significant trends at the remaining nested locations.

Mann-Kendall analyses were performed on P03-03 at sampling depths P03-03-02, P03-03-04, P03-03-06, P03-03-08, and P03-03-09. Results showed a significant decrease in total alkalinity at P03-03-04 and P03-03-06 with no significant trend at any other depth. Dissolved iron exhibited a significant increase in all of the analyzed depths except P03-03-08. Dissolved magnesium increased significantly at P03-03-04 and P03-03-06 depths, but no trends were observed at the other depths. Dissolved zinc only exhibited a significant increasing trend at the P03-03-04 depth interval and no trends at any other depth interval. . P03-03-06 and P03-03-08 are the only depths that show a significant trend (decreasing) for pH. Sulphate significantly increased at every depth except P03-03-08, which exhibited no significant trend over time.

Wells P03-04-02, P03-04-04, P03-04-06 and P03-04-08 were chosen for P03-04 nested cluster. Analyses showed that total alkalinity significantly increased at P03-04-02 and P03-04-04, but significantly decreasing at P03-04-06 and P03-04-08. Dissolved iron significantly increased at P03-04-04 and significantly decreased at P03-04-06; there was no significant trend in dissolved iron at either the P03-04-02 or P03-04-08 depth interval. Dissolved magnesium shows a significant increase at every depth interval except P03-04-06, which does not exhibit a significant trend. Dissolved zinc showed a significant decrease at the P03-04-04 and P03-04-06 depth intervals and no trend at the P03-04-02 and P03-04-08 depths. Sulphate exhibited an increasing trend in the two deepest depth horizons (P03-04-02 and P03-04-04), a significant decrease at P03-04-06, and no trend at the shallowest interval, P03-04-08. No significant trends were found for the field pH.

Wells P03-05-02, P03-05-04, P03-05-05, P03-05-06, and P03-05-08 were chosen for P03-05. All of these locations showed a significant decrease in total alkalinity with the exception of P03-05-05 which does not exhibit a significant trend. Dissolved iron and dissolved magnesium all showed significant increasing trends for all five depth intervals. All depths exhibit a significant increasing trend in sulphate with the exception of P03-05-05, which does not exhibit a significant trend. Dissolved zinc showed a significant increasing trend in the two deepest depth intervals (P03-05-02 and P03-05-04), but no discernible trend in the three shallowest intervals. The field pH showed a significant decreasing trend for locations P03-05-02, P03-05-04, and P03-05-06.

For well P03-06, nested wells P03-06-01, P03-06-02, P03-06-03, P03-06-04, P03-06-05, and P03-06-06 were chosen. In the deepest four depth intervals (P03-06-01, P03-06-02, P03-06-03, and P03-06-04), dissolved iron, dissolved magnesium, dissolved zinc, and sulphate all exhibited significant increasing trends, while total alkalinity and field pH showed significant decreasing trends. The shallowest two depth intervals (P03-06-05 and P03-06-06) were more variable, with no trend for total alkalinity at either depth; increasing dissolved magnesium, dissolved zinc, and sulphate at the P03-06-05 depth; and increasing dissolved iron and decreasing field pH at the P03-06-06 depth. All other parameters at these two depth intervals did not exhibit any significant trends.

Well P03-08 had statistical trend analyses performed on P03-08-02, P03-08-04, P03-08-06 and P03-08-07 locations. Total alkalinity showed a significant increasing trend for locations P03-08-02, P03-08-06, and P03-08-07 and no discernible trend at the other two depths. Dissolved iron showed a significantly increasing trend at P03-08-04 and no trends at any other depth interval. Dissolved magnesium showed a significantly increasing trend at P03-08-02, but significant decreasing trends at the remaining three depth intervals. Dissolved zinc showed significantly decreasing trends at P03-08-02 and P03-08-07 and no trends at the other three depth intervals. The only significant trend for pH was observed at the P03-08-06 depth interval, which showed a significant increasing trend. Sulphate exhibited no trend in the deepest two depth intervals, and a significantly decreasing trend at the upper three depth locations (P03-08-06, P03-08-07, and P03-08-08).

X21-96A and X21-96B is a nested well pair. Both of these showed significant decreasing trends for total alkalinity and field pH and significant increasing trends for dissolved iron, dissolved zinc, and sulphate. Dissolved magnesium showed a significantly decreasing trend for X21-96A, but a significantly increasing trend for X21-96B.

5.2.7 Summary and Recommendations

Investigations carried out to characterize the materials contained within the RCTA RU include the following key observations:

- Total metals concentrations in the tailings material are greater than both the median world soil content and crustal abundance criteria.

- Total metals concentrations in the underlying RCAA material were much less than the observed concentrations in the tailings material, and indicative of background levels at the FMC.
- Some exceedances of total metals lead and zinc were measured in the organic soil layer immediately underlying the tailings material.
- The tailings material is generally acidic with NP:AP ratios of less than 1.0. Although the organic soils immediately underlying the tailings had near-neutral paste pH, the elevated total sulphur content resulted in a very high calculated acid potential, resulting in net acid generating properties. Thus, while the organic material is certainly impacted from the overlying tailings, the potential to generate acid from this horizon is dubious given the neutral pH of the sample and the lack of complete data for the ABA calculation
- ABA data in the RCTA generally indicate potentially acid generating tailings material overlie heterogeneous alluvial materials, ranging from non acid-generating to potentially acid generating, depending on the pyrite content.
- DI-leach testing on samples from the original tailings material generated a leachate with a final pH that was acidic and contained elevated concentrations of cadmium, copper, lead, and zinc. The final leachate from the Intermediate Tailings Area samples is characterized by acidic leachate with elevated concentrations of copper, iron, lead, and zinc.
- DI-leach test results from the alluvial material underlying the Intermediate Tailings Area resulted in a neutral to alkaline final leachate without any of the trace elements significantly elevated in the solution, indicating that the trace elements detected in the total metal analysis are associated with relatively stable mineral phases that do not readily dissolve.
- Results from sequential extraction analysis identify highly soluble phases of manganese, zinc, and lead in the tailings material and underlying RCAA materials (where total metal content is also elevated).
- Overall the groundwater trends in the RCTA show increasing concentrations of sulphate, dissolved iron, dissolved magnesium, and dissolved zinc.

SECTION 6

Intermediate Dam, Cross Valley Dam, and Cross Valley Dam Pond Remediation Unit

6.1 Field Investigation Activities

Field investigation activities completed in the area that includes the Dams and CVD Pond RU during the 2012 and 2016 field seasons were to support the following objectives:

- Design of a seepage interception system (SIS) to collect groundwater moving through the RCAA, downstream of the ID (CH2M, March 2013m)
- Design of the ID PMF Spillway as part of long-term routing of water around the RCTA (CH2M, April 2016f)

6.1.1 Borehole Drilling and Monitoring Well Installation

During the 2012 field investigations seven boreholes were drilled in the Dams and CVD Pond area along the proposed CVD SIS alignment. Samples were collected from these borings and selected samples sent to the laboratory for geochemical analyses. The boreholes were completed with 203-mm monitoring wells constructed with schedule 40 polyvinyl chloride (PVC) well casing equipped with 0.04-inch slot PVC screened section from 6.1 to 18.3 m long; in some cases, they included a sump (up to 6.1 m long), constructed of a section of solid PVC. These wells were intended for use in aquifer testing.

Two boreholes were drilled on the existing ID Spillway during the 2014 field season. Both borings were advanced through the overburden and at least 4.6 m into the bedrock, terminating at a maximum depth of 8.15 mbgs and 16.92 mbgs, respectively. Although these borings were drilled primarily for geotechnical investigation, samples collected in the overburden were selected for geochemical analyses including past pH and total metals.

As additional foundation information was required to support the concept design of the ID PMF Spillway, five boreholes located within, and near, the existing ID Spillway were drilled during the 2015 field season. One of these boreholes is located near the approximate boundary between the RCTA RU and the Dams and CVD Pond RU; however, as these boring were completed at the same time for the ID PMF Spillway design, they are all covered in this section. Two borings were terminated at 27.1 and 24.1 mbgs, respectively, without encountering bedrock, because of the extent of overburden being greater than anticipated. One boring terminated at the top of bedrock at 10.82 mbgs. The remaining two borings were drilled through the overburden and cored into the bed rock at 24.08 mbgs. One monitoring well was installed in each of these borings to allow for future pump testing.

During the 2016 field investigation, sonic borehole drilling occurred on the CVD Pond while it was frozen to collect samples of the sludge on the bottom of the pond. Six sample locations were originally planned; however, recovery was very poor for some samples, so ten in total were collected.

Description of the drilling and monitoring well installation activities, laboratory analyses, and results discussion are presented in the following documents:

- Cross Valley Dam Interception System Investigation Data Report (CH2M, March 2013m)
- Summary of 2014 Field Investigation – Construct Intermediate Dam Spillway (CH2M, March 2015aa)
- Summary of 2015 Field Investigation – Construct Intermediate Dam Spillway (CH2M, April 2016f)
- Summary of 2016 Field Investigation – CVD and ID Pond Field Data Report (CH2M, August 2016c)

6.1.2 Cone Penetrometer Testing and Sonic Aqualock Sampling

Cone penetrometer testing was performed on both the CVD and ID ponds during the 2016 field investigation. A total of eight gamma seismic cone penetration tests and three gamma flow (ball) penetration tests were performed on the frozen ponds during the winter season. Ball penetration tests were used when the material was too soft for a seismic cone penetration test. Further description of these investigations, the laboratory analyses results, and discussion are presented in the document titled *Summary of Fiscal Year 2015-2016 Field Investigations – CVD and ID Pond Field Data Report* (CH2M, August 2016c).

6.1.3 Groundwater Sampling

Groundwater sampling events within the Dams and CVD Pond RU were conducted in the summer in 2012, and in early fall in 2013 to 2015 field investigations.

Description of the groundwater monitoring activities, laboratory analyses, and results discussed are presented in the following documents:

- Cross Valley Dam Interception System Investigation Data Report (CH2M, March 2013m)
- 2013 Cross Valley Dam Seepage Interception System Field Investigation Data and Analysis Report (CH2M, February 2014q)
- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2016d)

6.2 Field Investigation Data Evaluation

6.2.1 Total Metals

Total metal results were compared relative to the 10 times crustal abundance and 12 times median world soil content criteria (Table 6-1). Very few exceedances were noted in the Dams and CVD Pond area, excluding the samples collected during the 2016 sampling of the tailings beneath the ID Pond (these samples had exceedances for ten different metals, which is expected in tailings materials and therefore not discussed here). Arsenic had the most exceedances, with concentrations exceeding the crustal abundance value of 18 mg/kg in 17 samples from 8 different locations. The highest arsenic concentration recorded was 268 mg/kg, from a sample collected during the drilling of CH12-204-MW002B. No exceedances were noted for any of the key elements of concern for the FMC: cadmium, copper, iron, lead, or zinc. A few exceedances were noted for sulphur and selenium (relative to 12 times crustal abundance only), but generally all samples fell below the two screening criteria.

Boring CH15-201-MW010 was drilled as part of geotechnical investigations to support design for the proposed spillway at the ID Pond Dam. Three samples and one duplicate were submitted for geochemical analyses in addition to the geotechnical investigations. These samples were typical of background soil samples from the FMC and exhibited no exceedances of concern. In addition, two samples had slightly elevated selenium values that exceeded 12 times the average crustal abundance, but were well 10 times mean world soil content. The samples from analyzed from this boring, indicate that location is un-impacted by activities at the FMC.

6.2.2 Acid Base Accounting

This section describes ABA results from samples collected from six borehole locations to the north of the RCTA near the proposed ID spillway and six borehole locations downgradient of the CVD. Collected in thick unconsolidated sediments overlying bedrock to the north of the RCTA, ABA parameters from this

area are characterized by neutral to alkaline paste pH, and NP:AP ratios much greater than 3.0. These sediments are considered net-neutralizing, and are not expected to generate acidic conditions over time. Sediments collected from boreholes located downgradient of the CVD also exhibited net-neutralizing potential, with NP:AP greater than 3.0 and near neutral paste pH. ABA results are presented in Table 6-2.

6.2.3 DI Leach

DI-leach testing was conducted on samples collected from the CVD area in an effort to characterize the potential mobility of constituents within the areas immediately downgradient of the CVD Pond. Final leachates from CVD investigation locations (CH12-204-MW001B, CH12-204-MW003B, CH12-204-MW005B, and CH12-204-PZ001) were generally near-neutral with very low dissolved trace element content. However, samples from just below the surface (CH12-204-MW004B_SOb) and at greater depths (CH12-204-MW002_SOf) that were subjected to DI-leach testing exhibited acidic leachate and increased concentrations of copper, iron, lead, and zinc. These readily mobile metals may be associated with secondary salt formation beneath the ground surface. The following discussion of sequential extraction results provides additional insight into the partitioning of metals within the solid material collected from the CVD investigation locations. All DI-leach analytical results are presented in Table 6-3.

6.2.4 Sequential Extraction

Sequential extractions were conducted on samples collected from boreholes (CH12-204-MW001B, CH12-204-MW002B, CH12-204-MW003B, CH12-204-MW004B, CH12-204-MW005B, and CH12-204-PZ001) downgradient of the CVD. Although the sequential extractions analyze for a full suite of trace metal analytes (Tables 6-4 and 6-5), this section focuses on the key constituents to the FMC area: iron, manganese, zinc, lead, copper, and arsenic. Iron is generally present in the CVD area as one of three dominant phases (Figure 6-1): amorphous oxides (e.g., ferrihydrite), crystalline oxides (e.g., goethite or possibly schwertmannite), or as in the residual fraction (i.e., primary pyrite). However, in two locations (CH12-204-MW002B and CH12-204-MW004B) iron is extracted in the neutral salt exchangeable fraction in substantial proportions (greater than 70 percent in CH12-204-MW004B). Manganese is mainly extracted in the acid-soluble, crystalline oxide, residual fractions, with a notable presence in the neutral salt exchangeable fraction in CH12-204-MW002B. Zinc is generally present in two main phases: crystalline oxide and residual (i.e., primary zinc-bearing sulphides). To a lesser extent, zinc is also associated with the amorphous oxide and acid-soluble fractions. In CH12-204-MW002B, zinc is largely extracted in the neutral salt exchangeable phase, which could suggest association with secondary iron sulfate salt deposits, such as melanterite. Lead is mainly extracted in the acid-soluble, amorphous oxide, and residual fractions. Copper is mainly extracted in the residual and amorphous oxide phases, with a minor component extracted in the neutral salt exchangeable and acid-soluble phases. Arsenic in the CVD area samples is extracted within the residual (i.e., primary minerals) phase, or associated with the crystalline and amorphous oxide fractions. Arsenic is also extracted in the neutral salt exchangeable fraction of CH12-204-MW002B.

6.2.5 Groundwater Data

There are 36 groundwater monitoring wells associated with the CVD RU that are sampled as part of the yearly fall sampling program. In 2014 and 2015, most monitoring wells were sampled only once a year, during the fall. However, in 2014, monitoring well P09-C2 was sampled in the summer. And, in 2015 monitoring wells P01-11, P05-01-03, P05-01-05, P09-C2, and P09-C3 were also sampled during the summer. A summary of the groundwater sampling data including key parameters can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 2016d).

Recent (2012 to present) and historical (pre-2012) groundwater data trends were analyzed using the Mann-Kendall trend test. Statistical analyses were conducted for six key parameters: pH, total alkalinity,

sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit. Mann-Kendall results are summarized in Table 6-6.

A subset of groundwater wells in the CVD area were chosen for the Mann-Kendall analysis. Several of the wells at the CVD are nested wells with 2 or more different depths, labelled in numerical order with B or -01 being the deepest.

For well P03-09, nested wells P03-09-01 to P03-09-09 were analyzed using Mann-Kendall statistics. Total alkalinity showed a significant decrease in P03-09-01, no significant trend in P03-09-02, and significant increases in the remaining seven nested locations. Dissolved iron showed a significant increase in P03-09-02 and significant decreases in P03-09-08 and P03-09-09; no significant trend in dissolved iron was observed in the remaining five nested wells. Dissolved magnesium showed significant increases at every depth except P03-09-01 and P03-09-05, which did not have significant trends. There are no significant trends in the field pH data except for P03-09-08, which exhibited a significant decreasing trend. Sulphate was shown to be increasing at every depth interval except P03-09-01, which did not exhibit a significant trend. Dissolved zinc shows significant decreases in P03-09-02, P03-09-04, and P03-09-06 and no significant trends at any other depth.

Mann-Kendall analyses were performed on P05-01 locations P05-01-01 to P05-01-06. Results showed a significant increase in total alkalinity at all nested wells except P05-01-01. Dissolved iron, dissolved magnesium, and sulphate all exhibited significantly increasing trends at all depths. Dissolved zinc decreased significantly over time in the deepest sampling intervals (P05-01-01 to P05-01-03), with no significant trends at the remaining depths. The field pH showed significant decreasing trends at every well cluster depth except P05-01-01, which did not have a significant trend.

Mann-Kendall statistics were performed on depths A and B at well CH12-204-MW001. No significant trends were found for any parameters at depth B, while total alkalinity was found to be significantly increasing at depth A.

At well CH12-204-MW002B, dissolved iron, dissolved magnesium, and sulphate were significantly increasing. Well CH12-204-MW003B showed a significantly increasing trend for dissolved iron.

Mann-Kendall statistics were performed on depths A and B at well CH12-204-MW004, but no significant trends were found at either depth.

For well P01-02, nested wells P01-02A and P01-02B were analyzed using Mann-Kendall statistics. Total alkalinity was significantly increasing at both depths. Dissolved magnesium was significantly increasing at P01-02A, while dissolved iron was increasing at P01-02B. There were no additional discernible trends in P01-02A, but field pH and sulphate were both found to have significant decreasing trends in P01-02B.

Well P01-11 showed significantly increasing trends for total alkalinity, sulphate, dissolved iron, dissolved magnesium, and dissolved zinc and significantly decreasing trends for field pH.

At well P05-02, significantly increasing trends were found for total alkalinity, dissolved iron, dissolved magnesium, dissolved zinc, and sulphate. Field pH showed a significantly decreasing trend.

Well P05-03 showed significantly increasing trends for total alkalinity, sulphate, dissolved iron, and dissolved magnesium and significantly decreasing trends for field pH and dissolved zinc.

At well P09-C1, total alkalinity, sulphate, and dissolved iron showed significantly increasing trends, but no trends dissolved magnesium, dissolved zinc, and field pH.

Well P09-C2 showed significantly decreasing trends for dissolved iron, dissolved magnesium, dissolved zinc, and sulphate. Field pH showed an increasing trend.

P09-C3 showed significantly increasing trends for dissolved magnesium and sulphate and a significantly decreasing trend in dissolved zinc. The remaining parameters did not exhibit any significant trends.

Wells MW1, MW2, RGC-PW1, and RGC-PW2 did not have enough data points for any parameters to allow statistical analysis using Mann-Kendall.

6.2.6 Summary and Recommendations

Results from the Dams and CVD Pond area provide key information on the geochemical properties of the materials in these areas, and provide the following findings:

- With the exception of arsenic, there were very few total metals exceedances noted in the Dams and CVD Pond area.
- The unconsolidated sediments overlying bedrock in the areas directly north of the RCTA, as well as downgradient of the ID and CVD ponds, were net-neutralizing and not expected to generate acidic drainage through time.
- Final leachates from CVD investigation locations were generally near-neutral with very low dissolved trace element content. However, two samples (CH12-204-MW004B_SOb and CH12-204-MW002_SOf) exhibited acidic leachate and increased concentrations of copper, iron, lead, and zinc, indicating the possible presence of secondary salt formation beneath the ground surface.
- Sequential extractions were conducted on samples collected from locations downgradient of the CVD. Trace metals present in readily soluble phases (neutral salt exchangeable and acid-soluble) in these samples could be indicative of trace metal association (particularly zinc) with secondary iron sulfate deposits
- The overall groundwater trend in the CVD area indicates increasing total alkalinity, dissolved iron, dissolved magnesium, and sulphate concentrations. There is also a general decreasing trend of pH values.

SECTION 7

Faro Pit Reclamation Unit

The Faro Pit RU encompasses the pit walls and draining areas to the Faro Pit. Because all of the seeps sampled in the Faro Valley Waste Dump flow to the south into Faro Pit and there was no solids investigation of this waste dump, the Faro Valley Waste Dump is included in this RU. Geochemical field investigation activities assigned to the Faro Pit RU are described in this section.

7.1 Field Investigation Activities

Field investigation activities completed within the Faro Pit RU were limited to seep sampling within and around the Faro Pit, which was conducted semi-annually as part of the side-wide seep sampling program, and water quality profiling and depth-specific sampling in the Faro Pit lake that was conducted annually under subcontract by Laberge Environmental Services (Laberge).

There is a total of 42 seepage locations within the Faro Pit RU. Some of these locations have not been sampled since 2012 or earlier because of access restrictions, seepage drying up, or seepage taking a new path and being given a new name. Data collected from some of these accessible seep locations within the Faro Pit RU are in fact used to describe geochemistry in the Faro Mine Area waste dumps; therefore, they are not covered in this section.

Description of the site-wide seep sampling activities, laboratory analyses, and data discussions are summarized in section 3.1.3 and documented in the following reports:

- Activity Code SW-015, Field Sampling Plan for 2012 Seep and Surface Water Monitoring (CH2M HILL, May 2012d)
- 2013 Seep Sampling and Waste Rock Dump Monitoring Data and Analysis Report (CH2M HILL, March 2014c)
- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2016d)
- Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring (CH2M, August 2016j)

Summary reports provided by Laberge on the annual water quality profiling and depth-specific sampling have been included in the afore-mentioned reports as an appendix.

7.2 Field Investigation Data Evaluation

7.2.1 Seep Sampling

A total of 24 seep locations within Faro Pit were accessed during the fall 2015 seep sampling event, including 16 field parameter-only locations and 8 sample collection locations. Some of these locations were found to be dry or underwater because of rise in the Faro Pit lake level; therefore, only 6 samples and 8 additional sets of field parameters were obtained. The Faro Pit seep analytical data and field parameter results for the 2015 field season can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 2016d).

In addition to the seep locations sampled and monitored by CH2M, Laberge has supported the fall sampling event since 2013 and sampled a total of 11 seep locations on the edge of the Faro Pit that are accessible by boat only. Seep sampling activities and observations noted during each sampling event are

presented in a summary report, attached to CH2M's annual seep reports (March 2014c; March 2015b; April 2016d).

Historical seepage data trends were analyzed using the Mann-Kendall trend test, which statistically determines whether a dataset consistently increases or decreases over time. The test requires at least five data points above the detection limit to produce an accurate result. Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit. Unless otherwise stated in the summary below, the Mann-Kendall analyses results exhibited no significant trends. Mann-Kendall results tables are found in Table 7-1.

Historical and current data from a total of 28 seep locations within or around Faro Pit was evaluated for the Mann-Kendall test. Of these 28 seep locations, 12 did not have enough data to perform any statistical analysis. Of the remaining 16 seep locations, 6 (CH-FP-25, CH-FP-37, CH-FP-39, FP07, FP10, and FP18) only had enough data to analyze field pH. With the exception of FP18, all of these locations did not exhibit a significant trend in field pH; FP18 showed a significant decreasing trend, where the field pH value reduced from 8.30 in fall 2009 to 7.72 in fall 2015. The remaining 10 seep locations had enough laboratory analytical data to perform Mann-Kendall analysis on at least a portion of the data set. Mann-Kendall results for location A25 exhibited a significant decreasing trend in total alkalinity, but no trends in any other parameter tested. FP01 showed significant increase in dissolved magnesium and dissolved zinc, but no other trends were observed. FP02 showed a significant decrease in sulphate, but no trends in total alkalinity, dissolved magnesium, or dissolved zinc. There were not enough data points to evaluate dissolved iron or field pH. FP05 showed a significant increasing trend for pH, and a significant decreasing trend for total alkalinity, but no trends in the remaining analytical data. FP06 exhibited significant increasing trends in total alkalinity and dissolved magnesium, but no trends in field pH, sulphate, or dissolved zinc. There was not enough data to evaluate dissolved iron. FP09 showed a significant decrease in total alkalinity and field pH and a significant increase in dissolved magnesium and sulphate. No trend was observed in the dissolved zinc data and there was not enough dissolved iron data to evaluate. There were no trends in seepage data from FP11 or FP12. FP13 showed a significant decrease in dissolved magnesium, sulphate and dissolved zinc, while FP14 exhibited a significant increase in dissolved iron, dissolved magnesium, and sulphate.

Fourteen seep locations flowing into Faro Pit from the Faro Valley Waste Dump were considered for Mann-Kendall evaluation. Of the 14 locations, 3 (CH-FP-22, CH-FP-26, CH-FP-40) did not have enough data to conduct the analysis and another 3 (CH-FP-29, CH-FP-39, CH-FP-42) only had enough field pH to evaluate; there was no trend observed in the 3 locations where only field pH was evaluated. Seep sampling location A30 is one of two major seep locations with the Faro Valley Waste Dump. Total alkalinity and field pH both exhibited significant decreasing trends, while dissolved iron, dissolved magnesium, and dissolved zinc all had significant increases. There was no significant trend in sulphate at seep A30. Location CH-FP-30 exhibited a significant increasing trend for total alkalinity, but no significant trends in the remaining parameters evaluated. Seeps CH-FP-31 and CH-FP-33 did not have any significant trends in any of the parameters evaluated. CH-FP-34 exhibited a significant decrease in dissolved zinc, whereas CH-FP-35 showed a significant decrease in dissolved magnesium and sulphate; other parameters evaluated at these locations did not exhibit any significant trends. CH-FP-36 showed an increase in field pH, but no other trends were observed. Location SRK-FD40 has significant decreasing trends for dissolved iron, dissolved magnesium, dissolved zinc, and sulphate. The remaining trend analyses showed no significant trends. Mann-Kendall analysis results tables for the Faro Valley Waste Dump seeps are found in Table 7-1.

Time-series charts were also plotted for the same six key parameters at 12 locations in the Faro Pit area (Figure 7-1). These confirm the Mann-Kendall results for FP05, and also show increasing trends for

sulphate and dissolved magnesium at this location. CH-FP-30 and FP18 were not graphed, however the time-series charts for SRK-FD40 do not show obvious increasing trends for dissolved iron, dissolved magnesium, dissolved zinc, or sulphate as the Mann-Kendall results identify. No other major trends are discernible in the time-series charts.

7.2.2 Faro Pit Lake Profiling

As reported by Laberge, the most striking change in the Faro Pit lake water quality profile between 2013 and 2015 is the reduction in the fresh water cap at the surface. This observation was particularly apparent in October 2015, when the contrast in conductivity between the surface and deep water was gone, and the conductivity was almost uniform from top to bottom. The temperature of the Faro Pit lake was also quite uniform and was close to the temperature of maximum density adjusted for salinity, (3.7°C). These observations are indicative of the Faro Pit lake being no longer meromictic, and now being mixed from top to bottom.

Water quality profiling and depth-specific sampling activities and observations noted during each sampling event are presented in a summary report, attached to CH2M's annual seep reports (March 2014c; March 2015b; April 2016d).

7.2.3 Summary and Recommendations

Long-term seepage and Faro Pit lake monitoring programs have provided the following key findings for the Faro Pit RU:

- Statistically significant increasing pH and decreasing alkalinity observed in seepage location FP05. Other locations have indicated significant decreases in pH. These variations in seepage water quality highlight the variability of mine materials that seepage water encounters along flow paths toward the Faro Pit. These transitions in chemistry are important to the continued understanding of the site, and incorporation into the site wide water quality model.
- Faro Pit lake chemistry has been evolving through time, with recent observations highlighting the reduction of the fresh water cap, and a more uniform, well mixed lake chemistry is observed throughout.

SECTION 8

North Fork Rose Creek

In the winter of 2013, water quality monitoring in the NFRC indicated that seepage of high concentration zinc-contaminated water was impacting the NFRC in the area of the North Fork Rock Drain (NFRD). Following completion of an initial field investigation and preliminary remedial measures to collect the contaminated seepage, it was determined that the NFRC Realignment Project was required to provide necessary protection for the NFRC and Rose Creek, downstream from the FMC. The project consists of realignment of the NFRC, separation of clean and contaminated mine water, and the collection and treatment of mine-impacted water.

This section covers the area of the Faro Mine Area that was investigated for the NFRC Realignment Project. Although most of the area discussed herein falls within the Perimeter RU for the purpose of site-wide remediation, geochemistry data collected in the NFRC area have been presented separately in a report titled *North Fork Rose Creek Geochemical Report* (CH2M, March 2016g) and will be used to support the realignment design of the NFRC. As such, the analyses of this geochemistry data are being presented separately from the rest of the Perimeter RU.

8.1 Field Investigation Activities

Field investigations completed in 2015 for the NFRC Realignment Project were mostly for geotechnical purposes; however, select samples were submitted to the laboratory for geochemical analyses in order to support the overall understanding of geochemical conditions at the FMC.

8.1.1 Test Pit Excavation

During the 2015 field season, a total of 37 test pits were excavated in the NFRC valley and proposed realigned channel area as part of the NFRC Realignment Project. Selected samples were submitted to ALS Laboratories for geochemical analyses.

Description of the test pit excavation activities, laboratory analyses, and results discussion are presented in the *North Fork Rose Creek Geotechnical Report* (CH2M, March 2016i).

8.1.2 Borehole Drilling and Monitoring Well and Thermistor Port Installation

A total of 39 boreholes were drilled in the NFRC area during the 2015 field season, including 12 boreholes at the proposed Seepage Collection Pond, and 27 boreholes along the proposed realigned channel. Many of the boreholes were advanced through the soil overburden and into the bedrock for the purpose of geotechnical investigation. Monitoring wells or piezometers were installed in these 37 boreholes. In addition, some of these locations were completed with a nested thermistor monitoring port.

Description of the drilling and monitoring well and thermistor port installation activities, laboratory analyses, and results discussion are presented in the *North Fork Rose Creek Geotechnical Report* (CH2M, March 2016i).

8.1.3 Groundwater Sampling

Samples were collected from a subset of the NFRC groundwater wells and streambed piezometers and the results and discussion of this groundwater sampling program can be found in Appendix C, North Fork Rose Creek Groundwater Report, to the *North Fork Rose Creek Design Basis Report* (CH2M, August 2016m).

8.2 Field Investigation Data Evaluation

8.2.1 Solids Data

Total metals analyses were performed on samples collected from the 2015 field season NFRC investigations. In general, the elemental concentrations in samples from the NFRC area fell under the 10 times crustal abundance and 12 times median world soil content criteria established as a screening tool for the FMC. A few localized areas did have elemental concentrations above the two screening criteria. The area with the highest amount of samples exceeding the criteria was near the toe of the NE WRD, in the northern portion of NFRC area.

Eight locations with a total of 13 samples yielded arsenic concentrations that exceeded at least one of the two criteria. The highest concentration of arsenic reported in the NFRC area (98.1 mg/kg), which exceeded both screening criteria, came from a sample collected during the drilling of CH15-107-MW035. This is the only sample that exceeded the 12 times median world soil content criteria while a duplicate of the same sample only exceeded the 10 times crustal abundance criteria. The remaining arsenic exceedances are concentrations which only exceed the 10 times crustal abundance value of 18 mg/kg; the lower of the two standards for arsenic.

One sample from the NFRC area, collected from CH15-107-MW032, exceeded both criteria for cadmium. The concentration of cadmium in this sample was 9.52 mg/kg. Total cadmium in all the remaining samples was lower than both screening criteria (10 times crustal abundance was the lower of the two at 1.5 mg/kg).

One sample from CH15-107-MW034 had an elevated copper concentration, with a reported value of 589 mg/kg, exceeding the 12 times median world soil content criteria of 360 mg/kg; the higher of the two criteria. All remaining samples were lower than both of the criteria for copper. All samples except one also met both the screening criteria for zinc. One sample from CH15-107-MW032 had a zinc concentration of 1,070 mg/kg, which exceeds the crustal abundance criteria of 700 mg/kg.

Select samples also exhibited total concentrations of molybdenum, selenium, silver and sulphur which exceed the lower of the two standards. All total metals results are presented in Table 8-1.

ABA analysis was completed on 2015 drilling materials collected near the RCD. The upper 5 m of material in two monitoring locations, CH15-201-MW001 and CH15-201-MW003, had acidic paste pH (Table 8-2). Samples collected at depth in all monitoring stations were characterized by near neutral to alkaline paste pH. All samples in the NFRC area analyzed with ABA had very low sulphur (i.e., AP) and generally high NP. As such, every sample analyzed was net-neutral by a significant amount and no acid generation is anticipated from any location sampled.

Leachate tests were completed on selected samples collected during the NFRC borehole drilling and test pit investigations. Monitoring stations installed near the base of the northeast WRDs were characterized by near-neutral leachate containing slightly elevated concentrations of copper, iron, lead, and zinc (CH15-107-MW030, CH15-107-MW032, and CH15-107-MW034) near the surface, and at depth. Two monitoring locations did not show contain readily leachable metals: CH15-107-MW029 (at depth) and CH15-107-MW031.

DI-leach testing was also conducted on samples collected during 2015 drilling near the RCD at monitoring well locations CH15-201-MW002, CH15-201-MW003, and CH15-201-MW005 (Table 8-3). Results from the DI-leach testing from borehole materials collected from CH15-201-MW002 generated an iron-bearing, yet alkaline leachate. At monitoring locations CH15-201-MW003 and CH15-201-MW005, leachate from samples collected between 3.0 and 9.0 mbgs was slightly acidic and contained elevated concentrations of zinc.

8.2.2 Groundwater Data

Groundwater analytical results from the NFRC study investigation and discussion of these results is presented in Appendix C, North Fork Rose Creek Groundwater Report, to the *North Fork Rose Creek Design Basis Report* (CH2M, August 2016m).

8.2.3 Summary and Recommendations

A detailed description of the geochemical field investigations in the NFRC area is provided in the North Fork Rose Creek Geochemical Report (CH2M, March 2016k). However, analysis of solids data collected as part of the North Fork Geochemical Report was not previously reported, and is included in this report. Key findings of the data are provided below:

- Increased abundance of total metals arsenic, cadmium, and copper were measured in samples collected from the toe of the Northeast WRD.
- All samples in the NFRC area analyzed contained very low sulphur (i.e., AP) and generally high NP, suggesting net-neutralizing conditions in these materials.
- Monitoring stations installed near the toe of the northeast WRDs were characterized by near-neutral leachate containing elevated concentrations of copper, iron, lead, and zinc near the surface, and at depth. Leachate from samples collected between 3.0 and 9.0 mbgs at monitoring locations CH15-201-MW003 and CH15-201-MW005 was slightly acidic and contained elevated concentrations of zinc.

SECTION 9

Borrow Sources

9.1 Field Investigation Activities

Field activities have been completed across the FMC in search for suitable borrow material that are required for the proposed FMC closure activities. Existing onsite borrow areas and potential future borrow areas have been investigated by means of test pit excavation and borehole drilling. Detailed description of each borrow area and investigation activities completed through the 2014 field season are presented in a report titled *Borrow Baseline Design Criteria Report* (CH2M, March 2015hh).

9.1.1 Test Pit Excavation

During the 2012 field investigation, shallow test pits were excavated using hand tools in 15 different locations across the site to investigate potential borrow materials. Only limited samples from these test pits were sent for geochemical analyses. Further discussion on the excavation and sampling of these test pits, including geochemical results and discussion, can be found in the report titled *Limited Borrow Material Reconnaissance Faro Mine Remediation Project* (CH2M, June 2013f).

During the 2013 field investigation, 26 test pits were excavated at locations throughout the Haul Road, Rose Creek Haul Road, and Rose Creek borrows to depths of 0.6 to 6.0 mbgs, and samples were taken at selected depths during excavation. Five manual test pits were also excavated in the Rose Creek Borrow using a shovel and grab sampling methods. Selected samples from these excavations were sent to the laboratory for paste pH, total metals, and ABA analyses.

During the 2015 field season, a total of 26 test pits were completed in potential borrow source areas at the FMC, including 13 in the area northwest of the proposed NFRC Seepage Collection Dam, and 13 at the Freshwater Supply Dam. Although these investigations were mainly for the geotechnical purposes, selected samples were submitted to ALS Laboratories for geochemical analyses. Description of the 2015 test pit excavation activities including sampling methodology, laboratory analyses, and results discussion are presented in the *North Fork Rose Creek Geotechnical Report* (CH2M, March 2016i).

9.1.2 Borehole Drilling

Four boreholes were completed in the Rose Creek Haul Road and Rose Creek Borrows during the 2013 field investigation using a Pionjar drill rig down to a depth of 2.0 mbgs, or refusal, whichever was reached first. Further discussions of the 2013 borrow investigations are presented in the report titled *Faro Water Treatment Plant Geotechnical Design Report Addendum, 2013 Borrow Source and Quarry Investigation* (CH2M, March 2014b).

During the 2015 field season, six boreholes were drilled in the potential borrow area northwest of the proposed NFRC Seepage Collection Dam. Many of the boreholes were advanced through the soil overburden and into the bedrock for the purpose of geotechnical investigation. Description of the 2015 drilling activities, laboratory analyses, and results discussion are presented in the *North Fork Rose Creek Geotechnical Report* (CH2M, March 2016i).

9.2 Field Investigation Data Evaluation

9.2.1 Solids Data

Total metals analyses were performed on samples collected from the borrow investigations completed in the 2012 to 2015 field seasons. All samples submitted for total metal analysis were below the 10

times crustal abundance and 12 times median world soil content screening criteria used at the FMC for all elements except for samples from test pits in both the Rose Creek Borrow Area and the Fresh Water Supply Dam Area, which had arsenic concentrations exceeding the 10 times crustal abundance criteria of 18 mg/kg, but still lower than the 12 times median world soil content criteria of 72 mg/kg. The concentration of arsenic in these samples was still relatively close to the crustal abundance criteria, with 62.5 mg/kg the highest concentration recorded in the Rose Creek Borrow Area and only 27.4 mg/kg the highest concentration in the Fresh Water Supply Dam Area. All of the samples with arsenic exceedances came from near the surface. All total metals analytical results are presented in Table 9-1.

Samples collected from the borrow areas were submitted for ABA analysis between 2012 and 2016 to evaluate the potential for proposed borrow source material to generate acidic drainage. With the exception of a few acidic paste pH values measured in samples collected from the pump house ponds area (CH14-403-TP001, CH14-403-TP002, and CH14-403-TP004), the material collected from the various borrow source areas had near neutral to alkaline paste pH and low calculated AP. Ratios of NP to AP in these samples ranged up to about 4,200, indicating net-neutralizing properties (Table 9-2).

In 2015, shallow samples were collected in the vicinity of the Freshwater Dam and selected samples were sent for ABA analysis. The unconsolidated freshwater dam materials are characterized as non acid generating, with neutral to alkaline paste pH and NP:AP ratios much greater than 3.0 (Table 9-2).

DI-leach tests were also carried out on selected sample intervals from the general NFRC area borrow source areas. All of the borrow source samples generated neutral to alkaline leachate with very low trace element concentrations. However, a few surface samples at the following locations did generate leachate with elevated arsenic, copper, iron, lead, and zinc: CH15-403-TP008, CH15-403-TP010, and CH15-403-TP014. At all three of these locations, permafrost or cold soils were noted in the test pit logs. These locations are also adjacent to and just below the Haul Road between the Intermediate and Main Dumps. Although the total elemental concentration of these samples is low, the combination of dust or runoff from the Haul Road and the limited penetration and flushing of runoff in these locations because of frozen soil at depth, could explain the presence of secondary sulfate salts in the samples that build-up overtime in the soil. As such, the total metal content is low, but there is enough secondary salt in the soil that it would show up in the first flush (i.e., DI-leach testing). Given that the concentrations in the DI-leach test is not exceedingly high and the total metals are low, these locations are still deemed suitable for borrow material from a geochemical perspective. DI-leach analytical results are presented in Table 9-1.

9.3 Summary and Recommendations

Geochemical results from the borrow investigations provide supporting documentation for the composition of materials potentially used in construction or remediation. The key characteristics of the borrow materials sampled are listed below.

- Total metals analysis results characterize the borrow material as having total metal concentrations of less than both the 10 times crustal abundance and 12 times median world soil content screening criteria. Arsenic was an exception in shallow test pit samples, however, concentrations were not elevated at significant levels.
- Borrow investigation materials generally were characterized as neutral to alkaline paste pH, low AP, and net-neutralizing NP:AP ratios.
- Leachate generated from the borrow material generally was neutral to alkaline with low trace element concentrations. Potential impacts from the Haul Road and adjacent Intermediate Dump was noted in a few samples where frozen ground limited infiltration and mobility of constituents, and allowed for the buildup of secondary sulfosalts. Further investigation into the role of frozen ground on shallow soil chemistry is warranted to characterize the geochemical processes occurring in these zones.

SECTION 10

Vangorda/ Grum Area

This section discusses the investigations completed in the Vangorda/ Grum Area, which are within the FMC but not encompassed in defined RUs as presented in previous sections. Geochemical data collected in the Vangorda/Grum Area were analyzed to further characterize the FMC materials. Areas discussed in this section include the following:

- Vangorda Pit and Vangorda Waste Dump
- Grum Pit and Grum Waste Dump
- Grum Overburden Dump

10.1 Field Investigation Activities

Previous investigations in the Vangorda/Grum Area reported that till overburden material was excavated from the Grum Pit and placed to the east of the pit into the Grum Overburden Dump. The majority of the Vangorda/Grum field investigations in 2012 and 2013 field seasons were to help confirm this information. Other field investigations included a WRD investigation. As with the Faro Mine WRDs, borehole investigations in the Grum and Vangorda Waste Dumps were conducted in 2012 and 2013. The purpose of these investigations was to increase understanding of geochemical properties and WRD pore-gas profiles.

10.1.1 Test Pit Excavation

Seven test pits were drilled in the Grum Overburden Dump during the 2012 field investigation. Test pits were advanced to depths of between 4.5 and 6.1 mbgs, and composite soil samples were collected from each test pit. Composite samples were submitted to the laboratory for geochemical analyses. Further discussion can be found in the report titled *Grum Overburden Dump Fatal Flaw Evaluation Data Report* (CH2M, June 2013i).

During the 2013 field investigation, 14 test pits were excavated and 14 surface samples were collected in the Grum Area. Test pits were excavated to a maximum depth of 5.79 mbgs with soil samples collected at various depths during excavation. Surface samples were collected using a shovel from pits dug to a maximum depth of 1 mbgs. All samples from the surface locations and selected samples from the test pits were sent to the laboratory for geochemical analyses. Further discussion of the field investigation including data reporting and analysis can be found in the report titled *Phase II Borrow Reconnaissance* (CH2M, March 2014n).

10.1.2 Borehole Drilling and Monitoring Well Installation

During the 2012 field investigation, three boreholes were drilled in the Vangorda and Grum areas: CH12-014-MW011 and CH12-014-MW012 in the Grum Waste Dump, and CH12-014-MW013 in the Vangorda Waste Dump. There boreholes were drilled to investigate the geochemical and hydraulic properties of the waste rock, and to monitor soil-gas and temperature profiles in the WRDs. All boreholes were completed with monitoring wells, thermistor ports, and soil-gas ports. Soil samples were collected during drilling and select samples were submitted to the laboratory for geochemical analyses.

Six boreholes were drilled in the Grum Overburden Dump during the 2012 field investigation. The depths of the boreholes ranged from 41.15 to 44.20 mbgs. Composite grab soil samples were collected during drilling of the boreholes at approximately 5-m intervals, and selected samples were submitted to the laboratory for geochemical analyses. The boreholes were backfilled with bentonite chips after reaching the target depth. Further discussion of the 2012 drilling activities including sample analyses

results and discussion can be found in the Technical Memorandum *Waste Rock Dump Monitoring Report* (CH2M, October 2013b).

During the 2013 field investigation, 16 boreholes were drilled in the Grum Mine Area. Five of these boreholes were drilled using a sonic rig in the Grum Overburden dump to depths of 50.29 mbgs, ten boreholes were drilled using a Pionjar north of the Grum Pit to a maximum depth of 3.79 mbgs, and one borehole was drilled using the sonic rig drill rig north of the Grum Pit to a depth of 17.7 mbgs. Some of the Pionjar locations did not recover enough material to submit to the laboratory for testing, so in this case hand samples were dug adjacent to the boreholes to supplement the material. Composite soil samples of approximately 1-m-long sections were collected from the sonic boring locations. Selected samples from the locations were submitted to the laboratory for analyses.

10.1.3 Seep Sampling

Seepage investigation in the Vangorda/Grum Area is part of the side-wide seep sampling program, which was discussed previously in Section 3.1.3. There are 20 seeps associated with the Vangorda Pit and WRD, and 48 seeps associated with the Grum Pit and WRDs (including 3 seeps at the toe of the southern edge of the Grum Waste Dump, along Vangorda Creek).

Description of the seep sampling activities is presented in the following documents:

- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2016d)
- Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring (CH2M, August 2016j)

10.1.4 Groundwater Sampling

Groundwater samples were collected from the Vangorda/ Grum Area as part of the site-wide groundwater sampling program. A total of five groundwater sampling events were completed in 2014 and two completed in 2015. Description of the groundwater sampling activities is presented in the following documents:

- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2016d)

10.1.5 Pore Gas and Soil Temperature Monitoring

Pore gas and soil temperature data were collected from all locations within waste dumps where gas ports and thermistor ports (or permanent thermistor strings) were installed. During the 2014 and 2015 field seasons, pore gas and temperature in the Vangorda Waste Dump was monitored at locations 10M4, 30M4, and CH12-014-MW013; pore gas and temperature in the Grum Waste Dump was monitored at locations 10M3, CH12-014-MW011, and CH12-014-MW012.

Description of the pore gas and soil temperature monitoring activities is presented in the following documents:

- Summary of 2014 Field Investigation – Site-wide Geochemical Monitoring (CH2M, March 2015b)
- Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring (CH2M, April 2016d)
- Summary of 2016 Field Investigation – Site-wide Geochemical Monitoring (CH2M, August 2016j)

10.2 Field Investigation Data Evaluation

10.2.1 Solids Data

10.2.1.1 Total Metals

All the samples analyzed in the Vangorda area came from drilling one borehole, CH12-014-MW013. The majority of samples analyzed from the borehole exceeded the lower of the two standards for, selenium, and silver, and exceeded both the standards for arsenic, cadmium, copper, lead, mercury, sulphur, and zinc (Table 10-1). Trace element concentrations generally decrease with depth at CH12-014-MW013, however total iron and sulphur concentrations varied significantly with depth (Figure 10-1 and 10-2).

Arsenic concentrations in the Vangorda area averaged 447 mg/kg, and the highest concentration recorded was 728 mg/kg. Cadmium had an average concentration of 23.9 mg/kg, and the highest recorded concentration was 44.8 mg/kg. Average copper concentration in the Vangorda samples was 1,098 mg/kg, and the highest concentration recorded at this location was 2,280 mg/kg. The highest lead value recorded was 14,200 mg/kg, and the average across all samples was 7,102 mg/kg. Average mercury concentration in the samples was 7.71 mg/kg, with a highest concentration recorded of 17.1 mg/kg. Sulphur concentrations had a highest recorded concentration of 252,000 mg/kg with an average of 138,788 mg/kg over all samples. The average zinc concentration was 13,631 mg/kg with a highest recorded concentration 33,000 mg/kg.

The Grum Overburden Dump area had slightly more exceedances, but overall was still below the standards. 16 investigation locations in this area had samples that exceeded one or both of the standards for arsenic. The highest recorded concentration of arsenic was 260 mg/kg and came from a sample collected during the drilling of CH13-311-BH015.

Concentrations of cadmium exceeded the standards in four locations from the Grum Overburden Dump. The highest recorded concentration was also in a sample collected from CH13-311-BH015, with a concentration of 8.43 mg/kg, exceeding both standards.

Nine locations in the Grum Overburden Dump contained samples that exceeded the standards, and the majority of these samples exceeded both of the standards. The highest concentration came from a sample collected during the drilling of CH13-311-BH014, with a lead concentration of 2,000 mg/kg.

Zinc concentrations exceeded the standards in samples from five investigation locations. The highest concentration recorded was 6,490 mg/kg in a sample collected from CH13-311-BH014, which exceeds both of the standards.

The locations in this area which contained the most exceedances are CH12-311-BH004, CH13-311-BH013, CH13-311-BH014, CH13-311-BH015, and CH13-311-TP004. Excluding CH13-311-TP004, these investigation locations are all in the same area of the Grum Overburden Dump.

In the Grum Waste Dump area, samples were collected from two boring locations. Elemental concentrations in these two locations were generally consistent with depth, excluding total lead which increased with depth at both locations (Figures 10-3 through 10-6). The majority of these samples fell under both standards. Select samples from both locations exceeded the lower of the two standards for arsenic, and the highest recorded concentration was 38.1 mg/kg. The only exceedance for lead was in a sample from CH12-014-MW011, and exceeded both standards with a concentration of 467 mg/kg. Selenium, antimony, silver, and sulphur each had at least one sample exceeding the lower standard.

Similar to the Grum Waste Dump, the Grum Pit area and remaining area surrounding the Grum site also had very few exceedances. One arsenic exceedance was recorded in the sample collected at CH13-311-SS031 near the Grum Pit with a value of 19.3 mg/kg, exceeding crustal abundance standard of 18 mg/kg, which is the lower of the two standards for this metal. Arsenic exceedances were also recorded in four

locations in the surrounding Grum area. Three locations contained exceedances for selenium, CH13-311-SS028, CH13-311-SS029, and CH13-311-BH010. These were the only reported exceedances in the Grum Pit and surrounding Grum area.

10.2.1.2 Acid-base Accounting

ABA parameters measured in the general area of the Grum mine, including the Grum Pit, waste dump, and overburden dumps highlight the near neutral paste pH and net acid neutralizing NP:AP greater than 3.0) characteristics of the Grum mine materials. ABA analyses were not carried out on materials collected from the Grum Sulphide Cell.

In contrast, the Vangorda mine materials are characterized by acidic paste pH and NP:AP ratios of less than 1.0. Only one weathered bedrock sample (CH12-014-MW013_SOh) was analyzed for ABA parameters and was characterized as potentially net acid neutralizing with a slightly acidic paste pH and NP:AP ratio greater than 3.0.

All ABA results are presented in Table 10-2.

10.2.1.3 DI Leach

DI-leach tests were completed on material sampled from boreholes drilled in the Grum Overburden Dump area. With the exception of mobile forms of arsenic in a few discrete samples collected from boreholes, leachate results show neutral to alkaline conditions and limited mobility of trace metals in the subsurface materials. Similar results were exhibited in surface samples collected from the Grum Overburden Dump test pit excavations, with isolated occurrences of mobilized arsenic, lead and zinc, measured in the neutral to alkaline leachate.

In contrast, results from DI-leach testing on materials collected from borehole CH14-014-MW013 indicate acidic leachate, with mobile trace metals cadmium, iron, lead, and zinc at depths greater than 9 mbgs. Surficial samples collected in shallow boreholes near the Vangorda Waste Dump showed increased potential for arsenic, copper, lead, and zinc to mobilize.

All DI-leach analytical results can be found in Table 10-3.

10.2.1.4 Sequential Extraction

Sequential extraction tests were completed on samples collected from boreholes CH14-014-MW011, CH14-014-MW012, and CH14-014-MW013 to characterize the mobility and mineralogic association of trace metals within the solid material contained within the Grum and Vangorda waste dumps (Tables 10-4 and 10-5). Although the sequential extractions analyze for a full suite of trace metal analytes, this section focuses on the key constituents to the FMC area: iron, manganese, zinc, lead, copper, and arsenic. Iron is generally present in the Grum and Vangorda waste dumps as one of three dominant phases (Figure 10-7): amorphous iron, crystalline iron oxides (e.g., schwertmannite), or as primary pyrite (residual). Manganese mainly occurs as readily dissolved acid-soluble phases (such as carbonate minerals), amorphous, and primary mineral phases. The presence of zinc in the Grum Waste Dumps is associated with amorphous iron, crystalline oxides, and primary zinc sulphide (sphalerite). In the Vangorda Waste Dump, greater than 80 percent of the zinc occurs as primary sulphide minerals. Lead occurs in both Grum and Vangorda waste dumps as acid-soluble phases, primary minerals (galena), and in some samples collected from the Grum Waste Dump, lead is associated with amorphous iron mineral deposits. Grum Waste Dump samples contain copper associated with primary sulphide minerals and amorphous iron, and a minor presence of copper present in neutral salt exchangeable and acid-soluble phases. Copper is mainly present in primary sulphide minerals at the Vangorda Waste Dump, with a minor fraction associated with amorphous iron and acid-soluble phases. Arsenic in the Grum and Vangorda samples is not contained in readily soluble salts. Instead, arsenic is predominantly found in amorphous, crystalline oxide, and primary mineral phases.

10.2.2 Seepage Data

There are 82 seeps that are associated with the Vangorda/Grum Area. Seeps are sampled twice a year, once during the spring close to freshet, and once during the fall. The analytical data and field parameter results along with a summary of some key parameters can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 2016d). All seep analytical data was compared to freshwater quality guidelines established in the Canadian Environmental Quality Guidelines (CCME, 2016).

Historical seepage data trends were also analyzed using the Mann-Kendall trend test, which statistically determines whether a data set consistently increases or decreases over time. The test requires at least five data points above the detection limit to produce an accurate result. Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit. A summary of the Mann-Kendall results is presented in Table 10-6.

10.2.2.1 Grum Waste Rock Dump

There are 26 seep locations associated with the Grum Waste Dump. Of the 26 seep locations, 6 locations did not have enough data for any statistical evaluation and 5 locations (SRK-GD08, SRK-GD10, SRK-GD12, SRK-GD20, SRK-GD23) only had enough field pH data to evaluate; no trends in the field pH data from these five locations was observed. Five of the remaining seep locations (GD05 d/s, SRK-GD16, SRK-GD24, Sweet Creek, and WTA02) had enough data to evaluate with Mann-Kendall, but no significant trends were observed in any of the parameters evaluated. Mann-Kendall results from the remaining 10 seeps indicate very few statistical trends. Sheep Creek exhibited a significant increase in dissolved zinc, but no other trends. SRK-GD01 showed a significant increase in dissolved magnesium and sulphate and a significant decrease in dissolved zinc. SRK-GD02 exhibited a significant increase in dissolved magnesium, but not other significant trends. SRK-GD05 showed a significant increase in total alkalinity, dissolved magnesium, and sulphate with a significant decrease in dissolved zinc. SRK-GD06 exhibited an increase in dissolved magnesium and sulphate. SRK-GD07 showed an increase in total alkalinity, but did not exhibit any other significant trends. SRK-GD11 and SRK-GD13 exhibited a significant increase in total alkalinity, dissolved magnesium, and sulphate, but no other significant trends. Mann-Kendall analysis on concentrations at location V15 show statistically increasing total alkalinity, dissolved magnesium, and dissolved zinc, and decreasing values of field pH. WGD01 showed a significant increase in dissolved magnesium, but no other trends were observed. Figure 10-8 shows time trend graphs for the same key parameters for locations SRK-GD01, SRK-GD05, SRK-GD15, and V15. This contradicts the Mann-Kendall results for V15, as the charts show almost stable dissolved zinc. Other noticeable trends in Figure 10-8 are increasing sulphate over time at SRK-GD05 and SRK-GD13, and increasing dissolved zinc at SRK-GD13.

10.2.2.2 Vangorda Waste Dump

There are ten seep locations in the Vangorda Waste Dump area. Two seep locations (SRK-VD01 and SRK-VD12) did not exhibit any significant trends in the Mann-Kendall analysis. SRK-VD05, SRK-VD06, and SRK-VD07 have a significant decrease in field pH, but no other significant trends. SRK-VD02 showed a significant decrease in total alkalinity and a significant increase in dissolved iron and dissolved zinc, with no other trends observed. SRK-VD003 exhibited an increase in dissolved iron, dissolved magnesium, sulphate, and dissolved zinc and a decrease in field pH. SRK-VD04 showed an increase in dissolved iron and field pH. SRK-VD09 also exhibited an increase in dissolved iron, but had a decrease in field pH. SRK-VD10 exhibited a significant increase in dissolved iron, dissolved magnesium, and sulphate, but no trends in dissolved zinc or field pH. Figure 10-9 shows time-series plots for all six parameters for seep

locations SRK-VD01, SRK-VD02, SRK-VD03, SRK-VD04, and SRK-VD05. These charts help to confirm the results of the Mann-Kendall analyses. From the time-series charts it is also evident that SRK-VD04 and SRK-VD05 have increasing concentrations of sulphate, dissolved iron, and dissolved magnesium.

10.2.2.3 Grum Pit

The Grum Pit area has 28 seepage locations (Table 10-6). Of the 28 seep locations, 8 did not have enough data to perform the Mann-Kendall test. Of the 20 seep sampling locations with data, 11 only had enough field pH data to evaluate, and no significant trends were found at any of these locations. Of the remaining 9 seep sampling locations, four locations (CH-GP-19, GP04, GP08, and GP12) did not have a significant trend in any parameter evaluated. GP02 exhibited a significant increase in dissolved iron and decrease in field pH. GP03 showed a significant increase in dissolved magnesium. GP07 had a significant decrease in field pH, but all other parameters evaluated did not exhibit a significant trend. GP09 showed a significant increase in total alkalinity, while GP10 had a significant increase in dissolved iron. Four seep locations (GP02, GP09, GP12, and V23) were plotted over time for the same six key parameters, and help to confirm the Mann-Kendall results (Figure 10-10). They also show decreasing concentrations of sulphate at GP12.

10.2.2.4 Vangorda Pit and In-pit Dumps

The Vangorda Pit area has 16 seepage locations. The only statistical trend calculated in this area was for pH values at VP10, which are significantly decreasing over time. The remaining locations and parameters either did not have enough data points to perform the analysis, or no significant trends were found. Four of the seepage locations (CH-VP-17, CH-VP-18, CH-VP-20, and VP09) were plotted on time-series charts for the same six key parameters (Figure 10-11). These charts show increasing trends of sulphate, dissolved magnesium, and dissolved iron at location VP09.

10.2.3 Groundwater Data

In 2012, CH2M installed two groundwater monitoring wells in the Grum Waste Dump (CH12-014-MW011 and CH12-014-MW012) and one groundwater monitoring well in the Vangorda Waste Dump (CH12-014-MW013). The monitoring wells are sampled and monitored three times a year: once during the winter or spring, once in the summer, and once during the fall. The analytical data and field parameter results can be found in Table 10-7, and a summary of some key parameters can be found in *Summary of 2015 Field Investigation – Site-wide Geochemical Monitoring* (CH2M, April 2016d). All groundwater analytical data was compared to groundwater quality guidelines established in the Canadian Environmental Quality Guidelines (CCME, 2016).

Historical groundwater data trends were also analyzed using the Mann-Kendall trend test. Statistical analyses were conducted for six key parameters: pH, total alkalinity, sulphate, dissolved magnesium, dissolved iron, and dissolved zinc. These parameters have been identified as geochemically important during previous investigations. The level of significance tested is 95 percent, and any non-detectable concentrations were reduced to half of the detection limit. A summary of the Mann-Kendall results for the groundwater locations is presented in Table 10-8.

10.2.3.1 Vangorda Waste Rock Dump

CH12-014-MW013 showed increasing trends for total alkalinity, dissolved magnesium, and sulphate with no significant trends for the remaining parameters.

10.2.3.2 Grum Waste Rock Dump

CH12-014-MW011 and CH12-014-MW012 both exhibited increasing trends for total alkalinity and no significant trends for any other parameter tested.

10.2.4 Temperature and Pore Gas Data

There are six waste dump pore gas and temperature monitoring locations associated with the Vangorda Grum mine area, including three locations in the Grum Waste Dump and three locations in the Vangorda Waste Dump. Monitoring was completed at these locations from 2003 to 2016. A discussion of the general trends are presented in the following sections. The soil temperature profiles and graphs showing the relationships between depth and oxygen concentrations are provided on Figures 10-12 through 10-17.

10.2.4.1 Vangorda and Grum Waste Rock Dumps

CH12-014-MW011

Temperature varied the most in the top 10 mbgs during the observed years, with the most variation observed at the surface. The temperature at the surface generally ranged from -3 to 15°C and reached a temperature of 3°C below 10 mbgs. Oxygen concentrations remained fairly consistently between 19 and 21 percent throughout the measure depths and seasons.

CH12-014-MW012

Temperature varied the most in the top 8 mbgs during the observed years, with the most variation observed at the surface. The temperature at the surface generally ranged from -3 to 14°C and reached a temperature of 4.5°C below 8 mbgs. Oxygen concentration measurements were fairly steady between the different seasons: typically around 12 percent at 5 mbgs (the shallowest measurement depth), decreasing to about 2 percent at a depth of 10 mbgs, then continuing to increase to 21 percent at a depth of 18 mbgs.

CH12-014-MW013

Temperature generally climbed from between the depth of 2.45 mbgs (the shallowest measurement depth) to 12.45 mbgs and slowly decreased to a depth of 25 mbgs. The temperature ranged from -2 to 21°C from 2.45 to 12.45 mbgs and from 21 to 15°C from 12.45 to 25 mbgs. Oxygen concentration was approximately 20 percent from 5 to 20 mbgs and dropped to nearly 0 percent at 25 mbgs.

10M3

The temperature varied between -5 and 10°C above the depth of 10 mbgs and typically reached a temperature of 5°C at a depth of 10 mbgs (the deepest measurement depth). Oxygen concentrations generally dropped from 20.5 percent at 0.7 mbgs (shallowest measurement depth) to approximately 15 percent at 3 mbgs, and increased to approximately 17 percent below 5.6 mbgs.

10M4

The temperature generally decreased through the measured depths and ranged from -4 to 15°C. The temperatures measured in 2003 were significantly higher than in the subsequent years. Oxygen concentrations appeared to increase to a depth of 1.4 mbgs from as low as 14.3 percent and remained fairly consistent with depth at approximately 20 percent below 1.4 mbgs.

30M4

Temperature varied the most in the top 5 mbgs during the observed years, ranging from -5 to 15°C. The temperature continued to increase from near surface to 20 mbgs. At 20 mbgs, the temperature was typically 20°C and the temperature decreased slightly to the deepest measured depth at 30 mbgs. Oxygen concentrations decreased quickly from saturation near the surface to near depletion at 2.8 mbgs. Below 2.8 mbgs the oxygen concentration increases to a maximum of 3 to 8 percent at 10 mbgs before decreasing to near depletion at 20 mbgs. At the bottom of the hole, the oxygen

concentrations range from near depletion to approximately 15 percent with most measurements falling below approximately 5 percent.

10.3 Summary and Recommendations

Results from data collected as part of the various field investigations in the Vangorda and Grum areas are summarized below:

- Representative samples collected from the Vangorda Waste Dump contained greater content of arsenic, cadmium, copper, lead, mercury, sulphur, and zinc than both of the reference criteria, with greater concentrations in the waste rock near the ground surface.
- The Vangorda Waste Dump area contains net acid generating properties, based on ABA data.
- Materials from the Vangorda Waste Dump have the potential to generate acidic leachate, with mobile trace metals arsenic, copper, lead, and zinc in the shallow WRD, and cadmium, iron, lead, and zinc at depths greater than 9 mbgs.
- Selected samples collected from the Grum Overburden Dump, Grum Waste Dump, and Grum Pit area contained greater abundance of arsenic, cadmium, zinc, and lead.
- The material contained within the Grum Waste Dump is characterized by near-neutral paste pH and net acid neutralizing materials.
- Materials from the Grum Overburden Dump area are expected to generate neutral to alkaline leachate conditions, and limited mobility of trace metals. However, shallow samples collected from test pits showed increased potential for trace metal mobility, specifically arsenic, lead, and zinc.
- Sequential extraction results from both Vangorda and Grum materials identify potential mobile fractions of copper, manganese, and lead. Greater than 80 percent of the zinc present in the Vangorda Waste Dump materials is in the residual (sulphide mineral) phase.
- In general, seepage water quality in the Vangorda Waste Dump and Vangorda Pit show trends of increasing sulphate, magnesium, dissolved iron, and dissolved zinc, and decreasing pH. Similar trends have also been observed in Vangorda Waste Dump groundwater.
- Seepage water quality of the Grum Waste Dump through time shows increasing concentrations of magnesium and stable values of dissolved zinc. Increases in alkalinity and magnesium concentrations have also been noted in Grum Waste Dump area groundwater. Observed increases in sulphate concentration have been noted at SRK-GD01, SRK-GD05, SRK-GD06, SRK-GD11, and SRK-GD013. Increases in dissolved zinc were observed at Sheep Creek and V15. In the Grum Pit, observed decreasing pH has been noted at GP02 and GP07.

SECTION 11

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Tables

Table 2-1. Total Metals Analysis and General Chemical Parameter

Faro Mine Remediation Project

Remediation Unit				Perimeter (West)		Perimeter (West)		Perimeter (West)		Perimeter (West)		Perimeter (West)		Perimeter (West)		Perimeter (West)		Perimeter	
Sample ID				CH12-204-MW005B-SOA		CH12-204-MW005B-SOB		CH12-204-MW005B-SOC		CH12-204-MW005B-SOD		CH12-204-MW905B-SOD		CH12-204-MW006B-SOA		CH12-204-MW006B-SOB		CH12-204-MW006B-SOC		CH12-204-MW006B-SOD		CH15-106-MW002_Sok	
Sample Interval (mbgs)				0 - 0.5		1.8 - 2.2		3.8 - 4.2		5.7 - 6.1		5.7 - 6.1		0 - 1.5		1.5 - 3		3 - 4.6		4.6 - 6		7.47 - 8.99	
Sample Date				7/8/2012		7/8/2012		7/8/2012		7/8/2012		7/8/2012		7/7/2012		7/7/2012		7/7/2012		7/7/2012		10/28/2015	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]																				
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	10,900		11,500		9,820		14,500		13,700		16,400		19,600		20,500		18,400		11,900	
Antimony	mg/kg	**60**	2	0.42		0.47		0.6		1.31		1.18		0.56		0.45		0.45		0.46		0.55	
Arsenic	mg/kg	**72**	18	7.77		6.28		8.46		10.5		9.20		12.6		8.54		14.2		13.2		7.75	
Barium	mg/kg	**6,000**	4,250	79.4		95.2		58.8		326		287		165		130		98.5		653		169	
Beryllium	mg/kg	**72**	30	0.40		0.58		0.41		0.68		0.63		0.59		0.8		0.78		0.66		0.67	
Bismuth	mg/kg	-	**0.085**	0.23		0.61		0.33		0.4		0.35		0.24		0.28		0.3		0.24		0.63	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.229		0.612		0.269		0.774		0.683		0.33		0.3		0.182		0.281		0.44	
Calcium	mg/kg	180,000	**415,000**	3,110		3,410		3,320		16,800		14,000		15,900		6,800		8,580		1,670		3,080	
Chromium	mg/kg	840	**1,020**	33.4		30.8		27.8		36.2		31.4		35		43.7		43.8		41.7		26	
Cobalt	mg/kg	96	**250**	9.43		8.39		8.88		13.7		11.9		11.6		12.5		14		12.2		8.83	
Copper	mg/kg	360	**600**	13.1		34.4		16.1		30.5		27.7		28.4		28.5		35.9		31.5		25.4	
Iron	mg/kg	480,000	**563,000**	21,800		18,500		19,400		28,400		25,500		26,300		26,900		32,100		28,600		21,700	
Lead	mg/kg	**420**	140	14.1		16.4		14.4		22.9		20.5		72.7		26.9		24.6		21.6		94.3	
Lithium	mg/kg	**300**	200	33.5		23		17.5		31.3		29.8		27.6		33.2		31.7		29.3		24.1	
Magnesium	mg/kg	60,000	**233,000**	5,600		5,430		5,810		8,970		7,890		9,050		9,350		9,710		9,870		4,950	
Manganese	mg/kg	**12,000**	9,500	461		232		278		554		479		351		202		240		365		315	
Mercury	mg/kg	0.72	**0.85**	0.009		0.014		0.013		0.04		0.035		0.055		0.045		0.01		0.023		0.08	
Molybdenum	mg/kg	**24**	12	0.94		1.08		1.09		1.3		1.37		1.19		0.77		0.84		0.76		0.79	
Nickel	mg/kg	600	**840**	22.1		26.9		29		37.2		32.8		34.4		38.2		39.5		37.9		22.8	
Phosphorus	mg/kg	9,600	**10,500**	740		571		631		956		807		628		464		689		562		455	
Potassium	mg/kg	168,000	**208,500**	1,860		950		740		2,870		2,750		2,050		1,590		2,120		2,120		2,160	
Selenium	mg/kg	**4.8**	0.5	0.22		0.29		0.2	U	0.56		0.55		0.2	U	0.50		0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.1	U	0.11		0.1	U	0.24		0.23		0.18		0.12		0.13		0.14		0.21	
Sodium	mg/kg	60,000	**235,500**	220		210		210		260		240		460		530		700		660		213	
Strontium	mg/kg	3,000	**3,700**	23.4		29.5		30		67.9		61.7		69.1		48.2		72.5		81.8		24	
Sulphur	mg/kg	**8,400**	3,500	700		600		500	U	1,000		1,200		600		600		700		500	U	600	
Thallium	mg/kg	**108**	8.5	0.214		0.13		0.11		0.27		0.255		0.189		0.179		0.218		0.201		0.24	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	467		345		289		831		791		392		573		538		457		510	
Uranium	mg/kg	24	**27**	1.07		1.31		0.7		1.77		1.69		0.867		1.06		0.681		0.672		0.75	
Vanadium	mg/kg	1,080	**1,200**	27.0		25.2		25.5		49.1		44.6		34.2		40.7		40.2		39		33.5	
Zinc	mg/kg	**1,080**	700	93.1		195		91.7		156		129		141		91.0		100		97.8		126	
Moisture	percent	-	-					9.86		NT		NT		NT		NT		10.8		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	5.92		7.56		7.73		8.22		8.21		8.34		7.71		8.51		8.62		7.83	
Organic Matter	percent	-	-	NT		NT		0.7	U	NT		NT		NT		NT		0.7	U	NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		0.4	U	NT		NT		NT		NT		0.4	U	NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.34		0.34		0.29		0.1	U	0.1	U	0.21		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.7	U	0.7	U	0.7	U	2.83		2.82		2.4		0.7	U	0.75		1.78		NT	

Table 2-1. Total Metals Analysis and General Chemical Parameter

Faro Mine Remediation Project

Remediation Unit				Perimeter		Perimeter		Perimeter		Perimeter		Perimeter		Perimeter		Perimeter		Perimeter	
Sample ID				CH15-106-MW003_Sod		CH15-106-MW003_Son		CH15-106-MW004_Soe		CH15-106-MW004_Soq		CH15-106-MW904_Soq		CH15-106-MW005_Sob		CH15-106-MW010_Sob		CH15-106-MW010_Soh		CH16-102-MW003_SOc		CH16-102-MW004_SOc	
Sample Interval (mbgs)				1.52 - 2.74		8.84 - 10.36		2.74 - 4.27		13.41 - 15.09		13.41 - 15.09		0 - 1.52		0 - 1.37		4.42 - 5.94		2.4 - 4		2.7 - 4.3	
Sample Date				11/1/2015		11/1/2015		11/3/2015		11/3/2015		11/3/2015		10/30/2015		10/29/2015		10/29/2015		3/5/2016		3/6/2016	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]																				
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	12,100		9,990		14,300		5,510		5,200		5,080		8,340		6,160		29,600		32,300	
Antimony	mg/kg	**60**	2	38.3		0.51		9.1		0.16		0.16		1.81		16.9		0.35		0.1	U	0.3	
Arsenic	mg/kg	**72**	18	862		7.22		220		2.82		2.98		44.4	J	168		5.6		3		5	
Barium	mg/kg	**6,000**	4,250	492		151		283		44.3		41.1		213		641		151		244		117	
Beryllium	mg/kg	**72**	30	1.14		0.61		1.18		0.52		0.44		1.12		0.72		0.49		1.89		0.82	
Bismuth	mg/kg	-	**0.085**	4.32		0.46		0.85		0.47		0.44		0.64		1.57		0.22		0.36		0.94	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	2.13		0.37		2.43		0.11		0.09		2.42		1.2		0.36		0.033		2.630	
Calcium	mg/kg	180,000	**415,000**	1,340		3,220		2,420		1,540		1,360		2,710		1,660		1,680		50	U	50	U
Chromium	mg/kg	840	**1,020**	32.3		26.7		34.1		10.6		9.91		21.5		21.9		13.5		76.8		290.0	
Cobalt	mg/kg	96	**250**	17.2		7.51		14.7		3.24		3.13		18.8		11.3		7.06		27		44	
Copper	mg/kg	360	**600**	499		17.8		175		6.17		5.75		365		302		11.9		38		105	
Iron	mg/kg	480,000	**563,000**	66,100		19,300		38,200		11,200		10,600		54,700		48,000		14,700		59,800		44,900	
Lead	mg/kg	**420**	140	5,660		19		1590		8.29		7.54		629	J	12,900		95.7		8		7	
Lithium	mg/kg	**300**	200	20.6		21.1		24		20.6		18		10.1		16.4		17.2		70		43	
Magnesium	mg/kg	60,000	**233,000**	4,680		3,970		4,580		2,050		1,960		6,030		2,450		2,320		12,800		18,800	
Manganese	mg/kg	**12,000**	9,500	276		309		252		163		138		481		203		424		613		304	
Mercury	mg/kg	0.72	**0.85**	4.8		0.02		1.6		0.005	U	0.005	U	0.44		9.78		0.17		0.01		0.01	
Molybdenum	mg/kg	**24**	12	2.89		1.02		1.59		0.56		0.45		1.82		2.79		0.86		1.14		9.29	
Nickel	mg/kg	600	**840**	37.4		25.3		34.3		7.39		6.95		34.9		21.5		13.9		55.8		381.0	
Phosphorus	mg/kg	9,600	**10,500**	573		661		585		366		418		372		584		402		525		910	
Potassium	mg/kg	168,000	**208,500**	4,240		1,860		2,120		1,330		1,240		1,430		2,710		890		13,000		2,130	
Selenium	mg/kg	**4.8**	0.5			0.2	U	0.48		0.2	U	0.2	U	0.31		1.23		0.2	U	0.20	U	2.38	
Silver	mg/kg	-	**0.75**	10.6		0.12		3.71		0.1	U	0.1	U	1.6		12.1		0.2		0.1	U	0.4	
Sodium	mg/kg	60,000	**235,500**	102		201		142		80		74		61		106		125		50	U	50	U
Strontium	mg/kg	3,000	**3,700**	12.9		22.5		19.2		6.23		5.41		13.6		28.6		11.4		0.5	U	0.5	U
Sulphur	mg/kg	**8,400**	3,500	3,000		600		1,900		500	U	500		10,800		6,100		600		1,100		900	
Thallium	mg/kg	**108**	8.5	7.91		0.18		1.56		0.15		0.13		2.17		2.68		0.13		0.53		0.30	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2.1		2	U	2.0	U	2.0	U
Titanium	mg/kg	-	**56,500**	490		531		388		338		286		81.8		291		205		2,080.0		598.0	
Uranium	mg/kg	24	**27**	5.51		1.35		4.94		1.32		1.28		1.55		2.88		1.85		1.56		7.55	
Vanadium	mg/kg	1,080	**1,200**	35.9		33.4		38.9		14.6		14		31.8		28		18.5		79.0		80.3	
Zinc	mg/kg	**1,080**	700	2,100		76.7		1,410		37.5		35.1		853		819		62.6		91.7		189	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		9.30	
pH (1:2 soil:water)	pH Units	-	-	4.97		7.01		5.76		7.84		7.51		7.84		7.3		7.14		7.5		7.5	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 2-1. Total Metals Analysis and General Chemical Parameter

Faro Mine Remediation Project

Remediation Unit				Perimeter		Perimeter		Perimeter		Perimeter	
Sample ID				CH16-102-MW005_SOj		CH16-102-MW006_SOq		CH16-102-MW007_SOb		CH16-102-MW903_SOc	
Sample Interval (mbgs)				7.0 - 8.5		16.2 - 17.8		2.7 - 3.35		2.4 - 4	
Sample Date				3/12/2016		3/4/2016		3/17/2016		3/5/2016	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]								
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	10,500		9,070		26,100		28,200	
Antimony	mg/kg	**60**	2	0.3		0.4		0.2		0.1	U
Arsenic	mg/kg	**72**	18	6		5		5		3	
Barium	mg/kg	**6,000**	4,250	86		127		138		238	
Beryllium	mg/kg	**72**	30	0.96		0.58		1.18		1.76	
Bismuth	mg/kg	-	**0.085**	0.81		0.47		0.52		0.32	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.280		0.250		0.446		0.037	
Calcium	mg/kg	180,000	**415,000**	50	U	50	U	50	U	50	U
Chromium	mg/kg	840	**1,020**	26.6		16.7		60.5		74.8	
Cobalt	mg/kg	96	**250**	8		6		18		26	
Copper	mg/kg	360	**600**	20		12		34		37	
Iron	mg/kg	480,000	**563,000**	19,700		16,200		45,700		58,100	
Lead	mg/kg	**420**	140	16		10		24		8	
Lithium	mg/kg	**300**	200	23		22		64		66	
Magnesium	mg/kg	60,000	**233,000**	20	U	20	U	13,200		12,300	
Manganese	mg/kg	**12,000**	9,500	248		241		462		613	
Mercury	mg/kg	0.72	**0.85**	0.01		0.01		0.01		0.01	U
Molybdenum	mg/kg	**24**	12	1.21		0.86		0.86		1.09	
Nickel	mg/kg	600	**840**	25.5		13.8		61.8		52.9	
Phosphorus	mg/kg	9,600	**10,500**	468		493		1,270		477	
Potassium	mg/kg	168,000	**208,500**	2,640		1,420		6,470		12,700	
Selenium	mg/kg	**4.8**	0.5	0.20	U	0.56		0.20	U	0.20	U
Silver	mg/kg	-	**0.75**	0.1		0.1	U	0.2		0.1	U
Sodium	mg/kg	60,000	**235,500**	50	U	50	U	50	U	50	U
Strontium	mg/kg	3,000	**3,700**	0.5	U	0.5	U	0.5	U	0.5	U
Sulphur	mg/kg	**8,400**	3,500	600		1,800		700		1,100	
Thallium	mg/kg	**108**	8.5	0.23		0.17		0.50		0.51	
Tin	mg/kg	**48**	23	2.0	U	2.0	U	2.0	U	2.0	U
Titanium	mg/kg	-	**56,500**	466.0		486.0		923.0		1,900.0	
Uranium	mg/kg	24	**27**	2.35		1.56		1.08		1.45	
Vanadium	mg/kg	1,080	**1,200**	25.9		27.9		54.2		76.1	
Zinc	mg/kg	**1,080**	700	67.5		56.8		97.6		89.3	
Moisture	percent	-	-	NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	7.57		7.8		7.61		NT	
Organic Matter	percent	-	-	NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT	

Table 2-1. Total Metals Analysis and General Chemical Parameter
Faro Mine Remediation Project

Notes:
Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.
Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.
Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.
Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content ***and*** 10x the crustal abundance.
[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London
[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).
12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

$CaCO_3$ = calcium carbonate
J = This analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NT = not tested
QA/QC = Quality Assurance and Quality Control
R = Data rejected
U = This analyte was analyzed for but not detected at the specified detection limit

Table 2-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential							Neutralization Potential					
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	
CH12-204-MW005B-SOA	**Perimeter**	0	0.5	7/8/2012	6.34		NT		NT		700		*2.19*	NT		NC		NT		NC
CH12-204-MW005B-SOB	**Perimeter**	1.8	2.2	7/8/2012	6.83		823		0.01		600		1.26	18		180		20		143
CH12-204-MW005B-SOC	**Perimeter**	3.8	4.2	7/8/2012	7.02		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH12-204-MW005B-SOD	**Perimeter**	5.7	6.1	7/8/2012	7.2		1,170		0.04	J	1,000		1.62	34		340		38		210
CH12-204-MW905B-SOD	**Perimeter**	5.7	6.1	7/8/2012	7.25		877		0.01	J	1,200		3.23	28		280		31		86.7
CH12-204-MW006B-SOA	**Perimeter**	0	1.5	7/7/2012	6.94		NT		NT		600		*1.88*	NT		NC		NT		NC
CH12-204-MW006B-SOB	**Perimeter**	1.5	3	7/7/2012	7.01		NT		NT		600		*1.88*	22		220		25		117
CH12-204-MW006B-SOC	**Perimeter**	3	4.6	7/7/2012	7.14		NT		NT		700		*2.19*	NT		NC		NT		NC
CH12-204-MW006B-SOD	**Perimeter**	4.6	6	7/7/2012	7.02		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH15-106-MW002_Sok	**Perimeter**	7.5	9.0	10/28/2015	7.7		NT		NT		600		*1.88*	NT		NC		NT		NC
CH15-106-MW003_Sod	**Perimeter**	1.5	2.7	11/1/2015	4.78		NT		0.3		3,000		*9.38*	6		60		NT		6.4
CH15-106-MW003_Son	**Perimeter**	8.8	10.4	11/1/2015	6.76		NT		NT		600		*1.88*	10		100		NT		53.3
CH15-106-MW004_Soe	**Perimeter**	2.7	4.3	11/3/2015	5.79		NT		0.05		1,900		*5.94*	7		70		NT		11.8
CH15-106-MW004_Soq	**Perimeter**	13.4	15.1	11/3/2015	7.79		NT		NT		500	U	*1.56*	7		70		NT		44.8
CH15-106-MW904_Soq	**Perimeter**	13.4	15.1	11/3/2015	7.58		NT		NT		500		*1.56*	6		60		NT		38.4
CH15-106-MW005_Sob	**Perimeter**	0	1.5	10/30/2015	7.53		NT		0.04		10,800		*33.8*	31		310		NT		9.2
CH15-106-MW010_Sob	**Perimeter**	0.0	1.4	10/29/2015	7.15		NT		0.24		6,100		*19.1*	4		40		NT		2.1
CH15-106-MW010_Soh	**Perimeter**	4.4	5.9	10/29/2015	6.47		NT		NT		600		*1.88*	6		60		NT		32.0

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Analytical results for neutralization potential by the AOAC 955.01 and MOD-SOBEK-3.2.3 methods are reported; results by the MOD-SOBEK-3.2.3 method are indicated using "*".

AOAC 955.01 is the preferred analytical method for neutralization potential; however, MOD-SOBEK-3.2.3 was applied to some samples collected in 2012 due to miscommunication.

Analytical results by the AOAC 955.01 method should be considered in future analysis and decision-making process.

Calculated values of acid potential presented italics were calculated based on total sulphur content, and represent conservative estimates of the acid generation potential

$CaCO_3$ = calcium carbonate

CaO = calcium oxide

J = Analyte was present but the reported value may not be accurate or precise.

kg = kilogram

LMB =

mbgs = metre below ground surface

mg/kg = milligram per kilogram

NC = not calculated

NP/AP = nuetralization potential divided by acid potential

NT = not tested

ppm = parts per million

QA/QC = Quality Assurance and Quality Control

U = This analyte was analyzed for but not detected at the specified detection limit.

Table 2-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

	Remediation Unit		Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter	Perimeter	Perimeter
	Sample ID		CH12-204-MW005B-SOB	CH12-204-MW005B-SOD	CH12-204-MW905B-SOD	CH13-108-BH001-SOB	CH13-108-BH002-SOB	CH12-204-MW006B-SOB	CH15-106-MW003_Sod	CH15-106-MW005_Sob	CH15-106-MW010_Sob
	Depth From (mbgs)		1.8	5.7	5.7	0.5	0.5	1.5	1.5	0	0
	Depth From (mbgs)		2.2	6.1	6.1	1	1	3	2.7	1.5	1.3
	Sample Date	Screening Level	7/8/2012	7/8/2012	7/8/2012	8/22/2013	8/22/2013	7/7/2012	11/1/2015	10/30/2015	10/29/2015
pH	Result (pH units)	6.5-9.0	7.57	7.13	7.22	6.73	6.26	7.52	4.96	7.68	6.97
	Result Qualifier								J	J	J
Acidity	Result (mg/L)	-	2.7	1.7	1	8.4	7.7	5.8	140	1	1
	Result Qualifier				U				J	U	U
Total Alkalinity	Result (mg/L)	-	25.1	155	168	63.5	45.9	45.9	1	58.2	23.7
	Result Qualifier								UJ	J	J
Specific Conductance	Result (µS/cm)	-	119	1020	761	NT	NT	85.6	967	443	96.5
	Result Qualifier										
ORP Leachable	Result (mV)	-	NT	NT	NT	488	485	NT	298	254	305
	Result Qualifier								J	J	J
Aluminum	Result (mg/L)	0.005 to 0.1[b]	0.363	0.01	0.005	3.16	3.71	4.77	0.29	0.005	0.005
	Result Qualifier			U	U					U	U
Antimony	Result (mg/L)	1.6	0.00106	0.00353	0.00297	0.00178	0.00029	0.00217	0.00052	0.0001	0.00028
	Result Qualifier								J	U	
Arsenic	Result (mg/L)	0.005	0.0028	0.002	0.0022	0.0258	0.0043	0.0203	0.0014	0.001	0.001
	Result Qualifier			U						U	U
Barium	Result (mg/L)	2.3	0.0605	0.0676	0.166	0.114	0.114	0.106	0.03	0.03	0.36
	Result Qualifier			J	J						
Beryllium	Result (mg/L)	0.0053	0.0005	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U
Boron	Result (mg/L)	1.5	0.01	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier			U		U	U		U	U	U
Bromide	Result (mg/L)	-	0.05	0.5	0.5	NT	NT	0.25	NT	NT	NT
	Result Qualifier		U	U	U			U			
Cadmium	Result (mg/L)	Variable[c]	0.000197	0.00065	0.00005	0.000234	0.000054	0.000213	0.06	0.0034	0.001
	Result Qualifier			J	UJ						
Calcium	Result (mg/L)	-	12	218	155	22.9	19.4	10.7	106	32	11.1
	Result Qualifier										
Chloride	Result (mg/L)	120	0.5	5	5	NT	NT	2.5	NT	NT	NT
	Result Qualifier		U	U	U			U			
Chromium	Result (mg/L)	0.0089	0.00155	0.001	0.0005	0.00727	0.00327	0.0108	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U				U	U	U
Cobalt	Result (mg/L)	-	0.00124	0.00501	0.00184	0.00882	0.00202	0.00418	0.3	0.00532	0.0001
	Result Qualifier			J	J						U
Copper	Result (mg/L)	0.002 to 0.004[d]	0.0068	0.002	0.001	0.0209	0.0132	0.0246	0.15	0.04	0.0086
	Result Qualifier			U	U						
Fluoride	Result (mg/L)	0.12	0.762	0.36	0.29	NT	NT	0.54	NT	NT	NT
	Result Qualifier										
Iron	Result (mg/L)	0.3	2.09	0.03	0.03	63.2	4.48	13.2	0.03	0.03	0.03
	Result Qualifier			U	U				U	U	
Lead	Result (mg/L)	0.001	0.00728	0.0002	0.0001	0.0293	0.00685	0.0447	3.01	0.04	0.21
	Result Qualifier			U	U						
Lithium	Result (mg/L)	-	0.005	0.011	0.0068	0.005	0.005	0.005	0.04	0.02	0.008
	Result Qualifier		U			U	U	U			
Magnesium	Result (mg/L)	-	2.68	17.6	15.5	4.53	2.44	2.92	26.5	33.5	1.71
	Result Qualifier										
Manganese	Result (mg/L)	-	0.0795	3.37	1.11	0.547	0.197	0.0572	11.3	0.14	0.64
	Result Qualifier			J	J						
Mercury	Result (mg/L)	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005			0.00316
	Result Qualifier		U	U	U	U	U	U			J
Molybdenum	Result (mg/L)	0.073	0.014	0.0172	0.0286	0.00173	0.00064	0.00819	0.0001	0.00049	0.0001

Table 2-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

	Remediation Unit		**Perimeter (West)**	**Perimeter (West)**	**Perimeter (West)**	**Perimeter (West)**	**Perimeter (West)**	**Perimeter (West)**	**Perimeter**	**Perimeter**	**Perimeter**
	Sample ID		**CH12-204-MW005B-SOB**	**CH12-204-MW005B-SOD**	**CH12-204-MW905B-SOD**	**CH13-108-BH001-SOB**	**CH13-108-BH002-SOB**	**CH12-204-MW006B-SOB**	**CH15-106-MW003_Sod**	**CH15-106-MW005_Sob**	**CH15-106-MW010_Sob**
	Depth From (mbgs)		1.8	5.7	5.7	0.5	0.5	1.5	1.5	0	0
	Depth From (mbgs)		2.2	6.1	6.1	1	1	3	2.7	1.5	1.3
	Sample Date	**Screening Level**	7/8/2012	7/8/2012	7/8/2012	8/22/2013	8/22/2013	7/7/2012	11/1/2015	10/30/2015	10/29/2015
Molybdenum	Result Qualifier								U		U

Table 2-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

	Remediation Unit		Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter	Perimeter	Perimeter
	Sample ID		CH12-204-MW005B-SOB	CH12-204-MW005B-SOD	CH12-204-MW905B-SOD	CH13-108-BH001-SOB	CH13-108-BH002-SOB	CH12-204-MW006B-SOB	CH15-106-MW003_Sod	CH15-106-MW005_Sob	CH15-106-MW010_Sob
	Depth From (mbgs)		1.8	5.7	5.7	0.5	0.5	1.5	1.5	0	0
	Depth From (mbgs)		2.2	6.1	6.1	1	1	3	2.7	1.5	1.3
	Sample Date	Screening Level	7/8/2012	7/8/2012	7/8/2012	8/22/2013	8/22/2013	7/7/2012	11/1/2015	10/30/2015	10/29/2015
Nickel	Result (mg/L)	0.025	0.00182	0.0164	0.00771	0.01	0.00619	0.0185	0.16	0.00459	0.00147
	Result Qualifier			J	J						
Nitrate	Result (mg/L)	13	0.194	0.05	0.05	NT	NT	0.187	NT	NT	NT
	Result Qualifier			U	U						
Nitrite	Result (mg/L)	0.06	0.0083	0.01	0.016	NT	NT	0.0147	NT	NT	NT
	Result Qualifier			U							
Potassium	Result (mg/L)	-	7.3	7.5	5.8	2.1	2.4	5.8	10.2	5.2	5.3
	Result Qualifier										
Selenium	Result (mg/L)	0.001	0.0005	0.0019	0.0009	0.0005	0.0005	0.00468	0.0005	0.0005	0.0005
	Result Qualifier		U	J	J	U	U		U	U	U
Silicon	Result (mg/L)	-	6.02	2.87	3.44	13.9	13.3	11.9	6.77	0.85	3.26
	Result Qualifier										
Silver	Result (mg/L)	0.0001	0.00005	0.0001	0.00005	0.000163	0.000169	0.000338	0.00005	0.00005	0.000057
	Result Qualifier		U	U	U				U	U	
Sodium	Result (mg/L)	-	3.5	2	2	2	2	3.1	NT	NT	NT
	Result Qualifier			U	U	U	U				
Strontium	Result (mg/L)	-	0.0619	0.449	0.403	0.103	0.0784	0.0468	0.12	0.11	0.08
	Result Qualifier										
Sulphate	Result (mg/L)	100	29.3	464	269	8.4	2.61	6.8	501	159	21.3
	Result Qualifier			J	J						
Sulphur	Result (mg/L)	-	9.67	149	89.1	1.9	1.92	2.73	168	55.4	7.03
	Result Qualifier			J	J						
Thallium	Result (mg/L)	0.0008	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.00096	0.00167	0.0001
	Result Qualifier		U	U	U	U	U	U			U
Titanium	Result (mg/L)	0.1	0.015	0.01	0.01	0.143	0.091	0.19	0.01	0.01	0.01
	Result Qualifier			U	U				U	U	U
Uranium	Result (mg/L)	0.015	0.000215	0.012	0.0141	0.000769	0.000251	0.000607	0.000388	0.000163	0.000056
	Result Qualifier										
Vanadium	Result (mg/L)	-	0.0029	0.002	0.001	0.0243	0.0089	0.026	0.001	0.001	0.001
	Result Qualifier			U	U				U	U	U
Zinc	Result (mg/L)	0.03	0.021	0.023	0.01	0.023	0.012	0.05	70.1	0.03	0.06
	Result Qualifier				U						

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1,000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness > 180 mg/L, the CWQG is 4 µg/L; At hardness ≥ 82 to ≤ 180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465}$ * 0.2 / 1,000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness > 180 mg/L, the CWQG is 7 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1,000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness > 180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1,000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

> = greater

≥ = greater than or equal to

< = less than

≤ = less than or equal to

Table 2-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter (West)	Perimeter	Perimeter	Perimeter
Sample ID		**CH12-204-MW005B-SOB**	**CH12-204-MW005B-SOD**	**CH12-204-MW905B-SOD**	**CH13-108-BH001-SOB**	**CH13-108-BH002-SOB**	**CH12-204-MW006B-SOB**	**CH15-106-MW003_Sod**	**CH15-106-MW005_Sob**	**CH15-106-MW010_Sob**
Depth From (mbgs)		1.8	5.7	5.7	0.5	0.5	1.5	1.5	0	0
Depth From (mbgs)		2.2	6.1	6.1	1	1	3	2.7	1.5	1.3
Sample Date	**Screening Level**	7/8/2012	7/8/2012	7/8/2012	8/22/2013	8/22/2013	7/7/2012	11/1/2015	10/30/2015	10/29/2015

°C = degrees Celsius

µg/L = micrograms per litre

µS/cm = micro-Siemens per centimetre

CCME = Canadian Council of Ministers of the Environment

CWQG = Canadian Water Quality Guidelines

FIGQG =

J - analyte was present but the reported value may not be accurate or precise

mbgs = metre below ground surface

mg/L = milligrams per litre

mV = millivolt

NTU = Nephelometric Tubidity Unit

ORP = Oxidation-reduction Potential

R = result has been rejected for use

U = analyte was analyzed for but not detected at the specified detection limit

UJ = analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Table 2-4. Fall 2015 - Perimeter Remediation Unit Groundwater Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH12-204-MW005B	95.8% (sig +)		75.8% (+)		86.4% (-)	59.2% (-)	
CH12-204-MW006B	59.2% (+)		59.2% (+)		64.0% (+)	59.2% (+)	
CH13-204-MW008A							
CH13-204-MW008B							
CH13-204-MW009A							
CH13-204-MW009B							
CH13-204-MW010A							
CH13-204-MW011A							
CH13-204-MW011B							
CH13-204-MW014A							
CH13-204-MW015B							
P01-01A	100.0% (sig +)	60.4% (-)	100.0% (sig +)	99.5% (sig -)	99.7% (sig -)	100.0% (sig +)	50.7% (+)
P01-01B	100.0% (sig +)	87.8% (+)	100.0% (sig +)	86.9% (-)	65.4% (-)	100.0% (sig +)	55.2% (+)
X16A	100.0% (sig +)	99.7% (sig -)	99.7% (sig +)	98.8% (sig +)	86.5% (+)	94.2% (-)	98.0% (sig -)
X16B	100.0% (sig +)	99.8% (sig -)	100.0% (sig +)	99.8% (sig +)	88.7% (+)	100.0% (sig +)	73.9% (-)
X17A	100.0% (sig +)	98.5% (sig -)	100.0% (sig +)	99.5% (sig +)	52.2% (+)	100.0% (sig +)	72.5% (-)
X17B	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	97.6% (sig +)	91.7% (-)	100.0% (sig +)	79.4% (-)
X18A	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	99.3% (sig +)	58.6% (-)	100.0% (sig +)	94.6% (-)
X18B	100.0% (sig +)	99.4% (sig -)	100.0% (sig +)	95.9% (sig +)	95.4% (sig -)	100.0% (sig +)	95.7% (sig -)
CH12-204-MW005B	↑	ND	NT	ND	NT	NT	ND
CH12-204-MW006B	NT	ND	NT	ND	NT	NT	ND
CH13-204-MW008A	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW008B	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW009A	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW009B	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW010A	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW011A	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW011B	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW014A	ND	ND	ND	ND	ND	ND	ND
CH13-204-MW015B	ND	ND	ND	ND	ND	ND	ND
P01-01A	↑	NT	↑	↓	↓	↑	NT
P01-01B	↑	NT	↑	NT	NT	↑	NT
X16A	↑	↓	↑	↑	NT	NT	↓
X16B	↑	↓	↑	↑	NT	↑	NT
X17A	↑	↓	↑	↑	NT	↑	NT
X17B	↑	↑	↑	↑	NT	↑	NT
X18A	↑	↑	↑	↑	NT	↑	NT
X18B	↑	↓	↑	↑	↓	↑	↓

Notes:

Mann-Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Non-detectable concentrations were reduced to half the non-detectable limit.

Duplicate measurements were removed.

↑ - Significant increasing trend

↓ - Significant decreasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD**	
Sample ID				**CH12-014-MW003-SOA**		**CH12-014-MW003-SOJ**		**CH12-014-MW003-SOB**		**CH12-014-MW003-SOC**		**CH12-014-MW003-SOK**		**CH12-014-MW003-SOL**		**CH12-014-MW003-SOD**		**CH12-014-MW003-SOE**		**CH12-014-MW003-SOF**		**CH12-014-MW903-SOF**		**CH12-014-MW003-SOG**		**CH12-01S**	
Sample Interval (mbgs)						**2.44**		**5.18 - 5.18**		**11.58 - 11.58**		**14.02**		**14.94**		**16.45 - 16.45**		**19.8 - 19.8**		**23.46 - 23.46**		**23.46 - 23.46**		**25.9 - 25.9**		**28.95**	
Sample Date		**12x Median Soil Content** [a]	**10x Crustal Abundance** [b]	**7/29/2012**		**7/29/2012**		**7/29/2012**		**7/30/2012**		**7/30/2012**		**7/30/2012**		**7/30/2012**		**7/30/2012**		**7/30/2012**		**7/30/2012**		**7/30/2012**		**7/30**	
Geological Unit				**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**Alluv**		**Alluv**		**Alluv**		**A**	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**
Aluminum	mg/kg	**852,000**	823,000	22,600		NT		12,300		12,200		NT		NT		16,300		22,900		21,700		21,600		17,800		19,300	
Antimony	mg/kg	**60**	2	24.1		NT		1.03		0.52		NT		NT		0.97		3.17	J	0.39		0.34		0.19		1.24	
Arsenic	mg/kg	**72**	18	163		NT		47.8		13.7		NT		NT		21.8		45.1	J	10.1		16.6		13.2		22	
Barium	mg/kg	**6,000**	4,250	169		NT		81.8		261		NT		NT		284		140		202		191		200		127	
Beryllium	mg/kg	**72**	30	1.74		NT		1.5		1.21		NT		NT		1.14		0.94		0.87		0.85		0.89		0.59	
Bismuth	mg/kg	-	**0.085**	2.52		NT		0.2	U	0.35		NT		NT		1.69		0.67		0.43		0.67		0.24		0.3	
Boron	mg/kg	-	**100**	10	U	NT		10	U	10	U	NT		NT		10	U	10	U	10	U	10	U	10	U	10	
Cadmium	mg/kg	**4.2**	1.5	11.5		NT		4.33		1.83		NT		NT		1.09		3.48		0.292	J	0.488		0.219		0.952	
Calcium	mg/kg	180,000	**415,000**	4,910		NT		15,000		12,200		NT		NT		12,600		19,300		10,100		9,750		13,600		20,900	
Chromium	mg/kg	840	**1,020**	69.3		NT		43		33.9		NT		NT		45.3		43.4		42.1		42.1		37.7		114	
Cobalt	mg/kg	96	**250**	31.9		NT		32		16.6		NT		NT		21.4		18.1		21.6		24.5		17.5		17.1	
Copper	mg/kg	360	**600**	485		NT		136		51.9		NT		NT		74.2		90.4		51.8	J	65.4		40.2		55.5	
Iron	mg/kg	480,000	**563,000**	70,800		NT		59,700		48,000		NT		NT		54,000		38,600		41,100		41,700		38,400		30,700	
Lead	mg/kg	**420**	140	9,580		NT		1,560		245		NT		NT		531		1,590		149		187		65.3		507	
Lithium	mg/kg	**300**	200	44.2		NT		22.9		24.8		NT		NT		29.9		42		39		39.5		35.2		40.1	
Magnesium	mg/kg	60,000	**233,000**	12,900		NT		7,820		10,700		NT		NT		13,700		10,100		11,700		11,200		11,700		13,800	
Manganese	mg/kg	**12,000**	9,500	1,040		NT		629		591		NT		NT		657		467		379		410		405		384	
Mercury	mg/kg	0.72	**0.85**	4.77		NT		1.08		0.105		NT		NT		0.068	J	2.16		0.122		0.172		0.038		0.316	
Molybdenum	mg/kg	**24**	12	5.44		NT		1.38		2.3		NT		NT		1.53		1.49		2.08		1.39		1.3		0.5	
Nickel	mg/kg	600	**840**	66.9		NT		43.7		40.4		NT		NT		48.4		36.1		36.8		41.2		36		83.7	
Phosphorus	mg/kg	9,600	**10,500**	577		NT		401		642		NT		NT		684		489		618		693		574		582	
Potassium	mg/kg	168,000	**208,500**	3,750		NT		2,520		2,340		NT		NT		4,530		3,540		7,390		7,320		6,780		2,090	
Selenium	mg/kg	**4.8**	0.5	0.99		NT		0.5		0.27		NT		NT		0.47		0.27		0.33		0.44		0.34		0.21	
Silver	mg/kg	-	**0.75**	13.1		NT		0.86		0.33		NT		NT		1.55		1.92		0.52		0.47		0.28		0.72	
Sodium	mg/kg	60,000	**235,500**	100	U	NT		100	U	100	U	NT		NT		100	U	100	U	100	U	100	U	100	U	100	
Strontium	mg/kg	3,000	**3,700**	47.3		NT		45.6		39.8		NT		NT		45.9		107		51.2		49		35.9		99.9	
Sulphur	mg/kg	**8,400**	3,500	27,100		199,000		35,600		6,500		13,100		8,500		5,600		1,800		3,700	J	8,800	J	5,400		4,000	
Thallium	mg/kg	**108**	8.5	3.49		NT		0.295		0.331		NT		NT		0.783		0.677		0.934	J	0.664		0.704		0.247	
Tin	mg/kg	**48**	23	4.2		NT		2	U	2	U	NT		NT		2	U	2	U	2	U	2	U	2	U	2	
Titanium	mg/kg	-	**56,500**	372		NT		182		217		NT		NT		571		682		916		963		776		599	
Uranium	mg/kg	24	**27**	3.04		NT		0.849		1.76		NT		NT		1.36		1.61		1.22		1.32		1.17		0.831	
Vanadium	mg/kg	1,080	**1,200**	57.2		NT		40.5		36.4		NT		NT		50.3		46.9		57.8		54.2		48.6		41.6	
Zinc	mg/kg	**1,080**	700	9,700		NT		2,830		685		NT		NT		661		2,760		262		326		236		655	
Moisture	percent	-	-	22.5		7.58	J	NT		NT		15.7	J	14.9	J	NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	6.48		NT		7.92		8		NT		NT		8.35		8.45		8.14		8.17		8.12		8.45	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	NT		0.1	U	0.1	U	NT		NT		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.57		NT		6.65		3.98		NT		NT		4.59		3.09		1.05 J		2.16	J	4.07	J	6.23	

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				(Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)	
Sample ID				4-MW003-OH		CH12-014-MW003-SOI		CH14-106-MW009-SOA		CH14-106-MW009-SOD		CH14-106-MW009-SOI		CH14-106-MW009-SOK		CH14-106-MW909-SOK		CH14-106-MW009-SOM		CH14-106-MW009-SOP		CH14-106-MW009-SOT		CH14-106-TP001-SOA		CH14-106-TP001-SOC			
Sample Interval (mbgs)				- 28.95		29.87 - 29.87		2.44 - 2.74		13.11 - 13.41		28.04 - 28.35		32.92 - 33.22		32.92 - 33.22		40.84 - 41.15		48.46 - 48.77		60.05 - 60.35		1.3 - 1.3		5 - 5			
Sample Date		12x Median	10x Crustal	)/2012		7/30/2012		8/16/2014		8/17/2014		8/17/2014		8/17/2014		8/17/2014		8/17/2014		8/19/2014		8/19/2014		7/18/2014		7/18/2014			
Geological Unit		Soil Content [a]	Abundance [b]	lluv		BR - PHY		WR		WR		WR		WR		WR		WR		WR		NATIVE GROUND		WR		WR			
Analyte	**Unit**			Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	mg/kg	**852,000**	823,000		30,000		16,800		13,900		6,080		13,200		13,600		32,900		7,940		41,900		13,800		22,000			
Antimony	mg/kg	**60**	2		0.69		0.35		0.34		0.29		0.17		0.3		0.1	U	3.02		0.1	U	5.32		0.33			
Arsenic	mg/kg	**72**	18		36.1		8.05		48.9		30.1		11.3	J	49.4	J	0.50		48.8		1.88		135		8.98	J		
Barium	mg/kg	**6,000**	4,250		42.0		229		156		109		208		188		319		301		222		80.1		105			
Beryllium	mg/kg	**72**	30		0.79		1.55		1.41		1.05		1.40		1.38		2.22		2.06		1.83		0.98		2.07			
Bismuth	mg/kg	-	**0.085**		0.2	U	0.69		0.87		0.26		0.27		0.39		0.2	U	2.86		0.2	U	1.63		0.63			
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U		
Cadmium	mg/kg	**4.2**	1.5		0.411		0.901		1.27		0.123		0.227		0.212		0.05	U	1.41		0.081		1.12		7.9			
Calcium	mg/kg	180,000	**415,000**		89,400		11,100		6,960		2,730		4,550		4,740		4,570		3,080		17,900		5,280		30,600			
Chromium	mg/kg	840	**1,020**		298		43.6		37.2		20.3		30.6		30.7		49.3		30.8		78.1		39.9		41.7			
Cobalt	mg/kg	96	**250**		34.7		26.2		24.1		25.1		18.5		20.9		15.5		36.4		15.6		38.6		45.4			
Copper	mg/kg	360	**600**		56.7		51.5		57.6		55.4		29		34.6		26.3		207		21.2		332		43.4			
Iron	mg/kg	480,000	**563,000**		49,300		53,200		56,500		63,100		55,100		55,500		52,100		71,100		46,300		115,000		42,800			
Lead	mg/kg	**420**	140		69.6		142		43.2		16.6		103		132		7.57		722		18.3		3,170		197	J		
Lithium	mg/kg	**300**	200		87.3		30.1		30.5		12.4		30.1		32.4		58.7		14.1		44.4		20.7		37.2			
Magnesium	mg/kg	60,000	**233,000**		32,800		12,500		10,600		9,330		10,400		10,300		13,800		7,650		20,400		7,630		12,500			
Manganese	mg/kg	**12,000**	9,500		1,120		572		630		673		548		564		209		772		500		416		1,750			
Mercury	mg/kg	0.72	**0.85**		0.061		0.098		0.019		0.005	U	0.12	J	0.034	J	0.005	U	0.736		0.005	U	1.67		0.026			
Molybdenum	mg/kg	**24**	12	U	0.5	U	5.45		0.5	U	0.5	U	0.69		0.67		0.57		0.71		0.75		1.68		0.58			
Nickel	mg/kg	600	**840**		233		50.1		47.8		38.1		40.2		44		39.9		55.4		38.2		43.5		61.8			
Phosphorus	mg/kg	9,600	**10,500**		477		509		417		294		391		431		334		589		479		403		606			
Potassium	mg/kg	168,000	**208,500**		790		4,100		4,580		1,750		2,420		2,110		14,400		2,630		8,580		5,580		1,090			
Selenium	mg/kg	**4.8**	0.5		0.2	U	0.52		0.2	U	0.2	U	0.2	U	0.2	U	0.29		0.59		0.2	U	0.73		0.29			
Silver	mg/kg	-	**0.75**		0.18		0.34		0.29		0.16		0.17		0.23		0.1	U	2.34		0.1	U	2.85		0.35			
Sodium	mg/kg	60,000	**235,500**	U	100	U	100	U	180		100	U	100	U	100	U	400		100	U	150		310		120			
Strontium	mg/kg	3,000	**3,700**		419		37.7		33.2		12.5		18.8		19.5		19.4		10.5		195		30.2		86.1			
Sulphur	mg/kg	**8,400**	3,500		2,100		15,800		4,200		4,800		4,000		5,200		2,100		14,200		1,200		53,300		5,500			
Thallium	mg/kg	**108**	8.5		0.076		0.335		0.302		0.191		0.318		0.358		0.567		1.240		0.223		1.2		0.125			
Tin	mg/kg	**48**	23	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U		
Titanium	mg/kg	-	**56,500**		202		349		517		43.6		267		222		1,590		217		643		635		29			
Uranium	mg/kg	24	**27**		0.921		2.68		0.8		0.61		1.03		1.1		1.06		1.37		1.35		0.92		1.12			
Vanadium	mg/kg	1,080	**1,200**		85.5		41.6		30.1		21.3		26.5		26.3		49.2		29.9		51.6		42.4		65			
Zinc	mg/kg	**1,080**	700		253		413		160		88.8		227		188		107		1,200		100		1,250		5,790			
Moisture	percent	-	-		NT		10.6	J	5.61	J	5.13	J	9.11	J	8.24	J	10.1	J	9.89		19		7.84	J	13.7	J		
pH (1:2 soil:water)	pH Units	-	-		8.88		8.57		8.37		8.07		8.1		7.99		8.17		7.14		8.16		3.83		7.19			
Organic Matter	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT			
Total Organic Carbon	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT			
Total Inorganic Carbon	percent	-	-	U	0.1	U	0.5		0.4		0.82		0.29		0.25		0.24		0.23		0.44		0.1	U	0.39			
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-		34.00		4.13		3.31		6.82		2.46		2.08		2.04		1.95		3.67		0.8	U	3.26			

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD (Main)		WRD
Sample ID				CH14-106-TP901-SOC		CH14-106-TP002-SOA		CH14-106-TP002-SOC		CH14-106-TP003-SOA		CH14-106-TP003-SOB		CH14-106-TP003-SOC		CH14-106-TP004-SOA		CH14-106-TP004-SOC		CH14-106-TP005-SOA		CH14-106-TP005-SOC		CH14-106-TP006-SOA		CH14-1(S
Sample Interval (mbgs)				5 - 5		2.5 - 2.5		5 - 5		1.4 - 1.4		4.1 - 4.1		5.3 - 5.3		1.8 - 1.8		5.1 - 5.1		2.3 - 2.3		5.4 - 5.4		1.6 - 1.6		5.3
Sample Date	12x Median	10x Crustal		7/18/2014		7/18/2014		7/18/2014		7/19/2014		7/19/2014		7/19/2014		7/19/2014		7/19/2014		7/19/2014		7/19/2014		7/19/2014		7/19
Geological Unit	Soil Content [a]	Abundance [b]		WR		WR		WR		WR		WR		WR		WR		WR		WR		WR		WR		V
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**
Aluminum	mg/kg	**852,000**	823,000	24,200		2,850		8,130		9,080		12,800		14,800		1,540		3,880		27,800		26,500		1,050		10,000
Antimony	mg/kg	**60**	2	0.39		4.62		9.39		8.27		1.84		8.82		16.9		6.76		0.29		0.49		30.4		13.6
Arsenic	mg/kg	**72**	18	4.58	J	42.9		66.2		2,080		22.1		112		1,130		204	J	43.6	J	61.8	J	429	J	906
Barium	mg/kg	**6,000**	4,250	120		170		182		164		337		122		92.2		97.5		201		241		108		81.7
Beryllium	mg/kg	**72**	30	2.16		1.33		1.59		1.14		1.60		1.56		0.24		1.57		1.23		1.62		0.28		0.68
Bismuth	mg/kg	-	**0.085**	0.2	U	2.72		0.92		1.79		3.05		1.37		5.33		1.58		0.21		0.62		7.62		18.6
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10
Cadmium	mg/kg	**4.2**	1.5	6.72		2.46		0.764		2.2		8.29		8.76		1.23		6.92		0.283		1.91		2.6		12.3
Calcium	mg/kg	180,000	**415,000**	29,800		4,760		7,240		11,100		14,500		18,200		4,350		7,510		39,000		25,200		2,460		8,500
Chromium	mg/kg	840	**1,020**	44.8		20.8		24.0		20.9		38.3		57.7		5.82		14.8		279		153		4.77		55.6
Cobalt	mg/kg	96	**250**	46.7		29.2		22.9		21.7		21.1		24.4		60.5	J	33.1		53.5		36		20.3		41.1
Copper	mg/kg	360	**600**	43.2		308		122		250		86.9		220		654	J	253		109		83.2		2,700		1,410
Iron	mg/kg	480,000	**563,000**	44,000		86,000		62,400		66,600		53,300		70,600		114,000		80,700		62,000		56,100		109,000		117,000
Lead	mg/kg	**420**	140	64.3	J	1,040		841		1,990		774		3,410		5,650		3,220		41.2		194		7,900		3,980
Lithium	mg/kg	**300**	200	39.3		5.8		19.0		17.7		25.6		32.2		5	U	6		42.8		50		5	U	13.1
Magnesium	mg/kg	60,000	**233,000**	13,100		10,100		9,830		9,470		10,700		12,600		252		5,650		25,600		19,700		403		4,170
Manganese	mg/kg	**12,000**	9,500	1,660		1,400		864		994		918		1,020		197		1,000		937		918		214		248
Mercury	mg/kg	0.72	**0.85**	0.025		1.05		0.152		0.761		0.552		2.06		1.62		2.52		0.012		0.037		2.6		2.25
Molybdenum	mg/kg	**24**	12	0.57		2.03		0.73		1.38		0.99		2.09		3.12		1.55		0.81		0.72		9.25		1.75
Nickel	mg/kg	600	**840**	58.2		50.5		44.6		40.3		46.7		63.4		22.4	J	39.3		330		177		18.8		44.1
Phosphorus	mg/kg	9,600	**10,500**	622		340		449		456		581		950		398		382		673		527		639		587
Potassium	mg/kg	168,000	**208,500**	1,240		890		1,580		2,130		2,390		2,170		1,370		1,300		4,870		5,900		730		3,070
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.49		0.21		0.41		0.7		0.75		2.07		0.53		0.54		0.42		2.67		1.22
Silver	mg/kg	-	**0.75**	0.17		3.27		2.78		6.83		1.62		3.59		12.5		3.68		0.32		0.48		20		7.7
Sodium	mg/kg	60,000	**235,500**	140		100	U	100	U	100	U	140		100		100	U	100	U	390		530		100	U	400
Strontium	mg/kg	3,000	**3,700**	89.5		18.1		22.3		34.2		56.7		59.4		24.6		21		58.1		56.8		29.5		34.3
Sulphur	mg/kg	**8,400**	3,500	5,000		8,300		12,100		22,100		13,300		36,100		75,000		45,800		7,100		5,000		26,200		90,500
Thallium	mg/kg	**108**	8.5	0.151		0.73		1.01		1.83		0.905		1.62		6.08		3.12		0.883		0.702		6.25		3.76
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2		2.9		2.1		2	U	2	U	2	U	2.1		2.3
Titanium	mg/kg	-	**56,500**	32.1		12.1		101		126		118		148		14.9		54.5		960		808		3.8		320
Uranium	mg/kg	24	**27**	1.18		1.97		2.69		1.19		1.51		2.11		0.77		2.13		1.21		1.33		1.83		1.3
Vanadium	mg/kg	1,080	**1,200**	68.7		26.1		27.2		37.4		56.8		58		13.3		26.2		81.8		64		22.4		27.9
Zinc	mg/kg	**1,080**	700	4,760		1,540		400		1,210		1,640		5,240		1,830		5,430		183		669		2,800		6,150
Moisture	percent	-	-	14	J	6.03	J	6.32	J	6.53	J	7.39	J	7.74	J	9.43	J	7.71	J	7	J	6.79	J	9.31	J	11
pH (1:2 soil:water)	pH Units	-	-	7.43		7.96		7.82		7.82		7.86		7.33		2.15		6.72		7.79		7.76		2.23		2.66
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT
Total Inorganic Carbon	percent	-	-	0.46		0.78		0.48		0.49		0.63		0.52		0.1	U	0.39		1		0.61		0.1	U	0.1
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	3.84		6.52		4		4.07		5.22		4.33		0.8	U	3.25		8.37		5.1		0.8	U	0.8

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				**(Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Main)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**	
Sample ID				**)6-TP006-OC**		**CH14-106-TP008-SOA**		**CH14-106-TP008-SOB**		**CH14-106-TP008-SOC**		**CH14-106-TP015-SOCOMP**		**CH12-014-MW007-SOM**		**CH12-014-MW007-SOA**		**CH12-014-MW007-SON**		**CH12-014-MW007-SOO**		**CH12-014-MW007-SOB**		**CH12-014-MW007-SOC**		**CH12-014-MW007-SOP**	
Sample Interval (mbgs)				**- 5.3**		**2 - 2**		**3.5 - 3.5**		**5.2 - 5.2**		**1.5 - 5.5**		**surface**		**1.82 - 1.82**		**3.05**		**5.49**		**10.36 - 10.36**		**14 - 14**		**15.85**	
Sample Date		**12x Median**	**10x Crustal**	**/2014**		**7/19/2014**		**7/19/2014**		**7/19/2014**		**7/19/2014**		**7/31/2012**		**7/31/2012**		**7/31/2012**		**7/31/2012**		**7/31/2012**		**7/31/2012**		**7/31/2012**	
Geological Unit		**Soil Content [a]**	**Abundance [b]**	**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**	
Analyte	**Unit**			**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000		14,200		29,300		33,000		27,400		NT		16,100		NT		NT		6,160		9,400		NT	
Antimony	mg/kg	**60**	2		0.42		0.67		0.74		0.52		NT		0.7		NT		NT		2.63		1.95		NT	
Arsenic	mg/kg	**72**	18	J	101		34.4	J	42.4	J	22.4		NT		24.7		NT		NT		111		69.8		NT	
Barium	mg/kg	**6,000**	4,250		161		310		407		431		NT		138		NT		NT		185		196		NT	
Beryllium	mg/kg	**72**	30		1.51		1.41		1.98		1.69		NT		1.6		NT		NT		0.76		1.17		NT	
Bismuth	mg/kg	-	**0.085**		0.28		0.2	U	0.2	U	0.90		NT		0.88		NT		NT		1.22		0.94		NT	
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	NT		10	U	NT		NT		10	U	10	U	NT	
Cadmium	mg/kg	**4.2**	1.5		1.16		1.32		0.938		2.28		NT		1.01		NT		NT		2.5		2.09		NT	
Calcium	mg/kg	180,000	**415,000**		11,500		23,000		27,400		13,600		NT		17,500		NT		NT		3,430		3,650		NT	
Chromium	mg/kg	840	**1,020**		58.7		191		182		67		NT		48.7		NT		NT		15.5		24.5		NT	
Cobalt	mg/kg	96	**250**		28.3		36.8		39.8		32		NT		22.7		NT		NT		27.8		34		NT	
Copper	mg/kg	360	**600**		40.6		36.8		40.7		44.9		NT		62		NT		NT		359		272		NT	
Iron	mg/kg	480,000	**563,000**		61,700		65,500		70,900		61,300		NT		52,600		NT		NT		64,500		72,800		NT	
Lead	mg/kg	**420**	140		146		227		119		177		NT		1,050		NT		NT		763		846		NT	
Lithium	mg/kg	**300**	200		37		58		63.6		39.3		NT		32.3		NT		NT		11.8		18.2		NT	
Magnesium	mg/kg	60,000	**233,000**		15,400		31,200		28,000		15,700		NT		12,700		NT		NT		5,980		8,140		NT	
Manganese	mg/kg	**12,000**	9,500		683		788		864		887		NT		734		NT		NT		679		657		NT	
Mercury	mg/kg	0.72	**0.85**		0.015		0.071		0.079		0.18		NT		0.027		NT		NT		0.499		0.357		NT	
Molybdenum	mg/kg	**24**	12		3.68		1.81		1.69		0.91		NT		1.13		NT		NT		2.02		1.99		NT	
Nickel	mg/kg	600	**840**		80		182		214		88.7		NT		45.4		NT		NT		32.7		40.3		NT	
Phosphorus	mg/kg	9,600	**10,500**		614		798		875		518		NT		513		NT		NT		500		603		NT	
Potassium	mg/kg	168,000	**208,500**		1,700		2,380		6,640		4,480		NT		3,810		NT		NT		1,680		2,640		NT	
Selenium	mg/kg	**4.8**	0.5		0.69		0.42		0.52		0.41		NT		0.48		NT		NT		0.71		0.5		NT	
Silver	mg/kg	-	**0.75**		0.30		0.37		0.19		0.7		NT		0.47		NT		NT		3.01		1.7		NT	
Sodium	mg/kg	60,000	**235,500**		100	U	150		340		680		NT		100	U	NT		NT		100	U	110	U	NT	
Strontium	mg/kg	3,000	**3,700**		39.9		53.3		73.4		98.5		NT		76.9		NT		NT		22.9		17.4		NT	
Sulphur	mg/kg	**8,400**	3,500		9,500		7,400		7,800		3,000		5,000		2,900		8,200		9,100		15,000		15,900		21,100	
Thallium	mg/kg	**108**	8.5		0.373		0.445		0.678		0.408		NT		0.346		NT		NT		1.66		1.2		NT	
Tin	mg/kg	**48**	23		2	U	2	U	2.3		2	U	NT		2.1		NT		NT		2	U	2	U	NT	
Titanium	mg/kg	-	**56,500**		115		433		762		459		NT		523		NT		NT		122		190		NT	
Uranium	mg/kg	24	**27**		2.78		1.76		2.35		1.75		NT		2.54		NT		NT		1.6		1.71		NT	
Vanadium	mg/kg	1,080	**1,200**		71.8		92		105		61.7		NT		43.4		NT		NT		22.2		28.3		NT	
Zinc	mg/kg	**1,080**	700		259		479		456		1,560		NT		297		NT		NT		1,320		1,330		NT	
Moisture	percent	-	-	J	7.94	J	7.21	J	7.81	J	9.04	J	3.4	J	NT		5.95	J	4.44	J	NT		NT		16.2	J
pH (1:2 soil:water)	pH Units	-	-		7.79		7.85		7.93		7.99		NT		8.44		NT		NT		5.25		5.00		NT	
Organic Matter	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	U	0.64		0.7		0.98		0.34		NT		0.47		NT		NT		0.24		0.16		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	U	5.31		5.87		8.13		2.81		NT		3.95		NT		NT		2.02		1.36		NT	

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

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Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				**ermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**		**WRD (Intermediate)**	
Sample ID				**)6-TP007-OA**		**CH14-106-TP907-SOA**		**CH14-106-TP007-SOC**		**CH14-106-TP009-SOA**		**CH14-106-TP009-SOC**		**CH14-106-TP010-SOA**		**CH14-106-TP010-SOB**		**CH14-106-TP010-SOC**		**CH14-106-TP011-SOA**		**CH14-106-TP011-SOC**		**CH14-106-TP012-SOA**		**CH14-106-TP012-SOB**	
Sample Interval (mbgs)				**- 1.4**		**1.4 - 1.4**		**5.5 - 5.5**		**1.5 - 1.5**		**5.5 - 5.5**		**1.5 - 1.5**		**3.9 - 3.9**		**5.5 - 5.5**		**1.5 - 1.5**		**5 - 5**		**1.8 - 1.8**		**4.1 - 4.1**	
Sample Date		**12x Median Soil Content [a]**	**10x Crustal Abundance [b]**	**/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**		**7/20/2014**	
Geological Unit				**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**	
Analyte	**Unit**			**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000		6,420		15,700		29,400		31,900		7,170		12,400		18,700		12,000		18,800		12,200		4,170			
Antimony	mg/kg	**60**	2		29.8		11.6		1.73		1.24		22.8		9.64		1.95		30.1		7.10		3.66		23.2			
Arsenic	mg/kg	**72**	18	J	144	J	67.0	J	32.3	J	49.3	J	660	J	668	J	118	J	281	J	297	J	29.8	J	427			
Barium	mg/kg	**6,000**	4,250	J	53.9	J	96.6		323		636		8.21		73.9		129		57.4		155		234		171	J		
Beryllium	mg/kg	**72**	30		0.83		1.10		4.21		3.15		0.21		0.70		2.43		3.52		1.45		2.30		2.19			
Bismuth	mg/kg	-	**0.085**		1.37	J	6.24		1.93		1.02		2.11		7.48		1.01		1.87		1.75		2.34		2.11			
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U		
Cadmium	mg/kg	**4.2**	1.5		19.7	J	5.85		3.92		1.63		1.15		3.39		16.5		13.8		8.66		1.86		2.92	J		
Calcium	mg/kg	180,000	**415,000**		3,680	J	13,100		21,400		31,900		8,110		24,800		45,100		9,260		14,200		10,100		3,080			
Chromium	mg/kg	840	**1,020**		42.1		63.2		134		286		29.8		54.6		103		87.4		144		49.8		25.1			
Cobalt	mg/kg	96	**250**		48	J	30.3		34.4		35.6		56.6		23.1		42.3		32.6		54.0		22.6		27			
Copper	mg/kg	360	**600**		609	J	232		117		53.3		789		488		483		794		258		138		726			
Iron	mg/kg	480,000	**563,000**		124,000		79,500		61,600		57,000		182,000		149,000		70,800		102,000		78,800		53,000		69,600			
Lead	mg/kg	**420**	140		11,000		4,250		670		75.2		8,970		5,140		386		6,150		1,710		746		4,020			
Lithium	mg/kg	**300**	200		8.1		34.1		51.7		56.6		11.6		20.2		27.5		22.3		35.6		34.8		8.1			
Magnesium	mg/kg	60,000	**233,000**		4,200		10,300		19,400		30,200		3,060		6,130		12,300		7,860		17,400		9,790		3,080			
Manganese	mg/kg	**12,000**	9,500		548		738		634		707		104		222		1,270		552		1,110		504		625			
Mercury	mg/kg	0.72	**0.85**		7.47	J	2.6		0.703		0.04		7.15		3.07		0.132		4.46		1.25		0.392		1.83	J		
Molybdenum	mg/kg	**24**	12		3.43		2.05		3.42		1.97		3.21		1.65		1.14		3.32		2.45		1.24		1.58			
Nickel	mg/kg	600	**840**		84.3	J	88.3		127		234		12		24.5		142		74.8		177		51.1		38.6			
Phosphorus	mg/kg	9,600	**10,500**		540		559		731		676		261		576		591		539		575		393		528			
Potassium	mg/kg	168,000	**208,500**		1,310		2,650		7,110		6,580		3,150		4,150		1,520		2,110		5,320		3,050		1,310			
Selenium	mg/kg	**4.8**	0.5		1.4		1.24		0.54		0.25		1.54		1.58		0.36		1.08		0.59		0.56		0.79			
Silver	mg/kg	-	**0.75**		16		8.33		1.52		0.41		12.4		8		0.69		10.9		3.26		1.98		8.82			
Sodium	mg/kg	60,000	**235,500**	U	100	U	250		350		580		490		490		180		100	U	370		100	U	100	U		
Strontium	mg/kg	3,000	**3,700**		23.7		55.8		102		147		32.5		70.2		190		42.8		50.2		39.9		27.4			
Sulphur	mg/kg	**8,400**	3,500		138,000		37,800		5,400		5,500		238,000		57,600		17,300		55,900		70,100		19,400		18,200	J		
Thallium	mg/kg	**108**	8.5		4.27		1.74		1.07		1.05		3.96		2.08		0.358		5.44		1.47		1.17		2.55			
Tin	mg/kg	**48**	23		4.3		3.1		5.3		4.8		5.3		3.9		3.3		2.3		3.1		3.7		2.2			
Titanium	mg/kg	-	**56,500**		59.9		244		533		544		342		377		92.5		144		517		126		5.9	J		
Uranium	mg/kg	24	**27**		2.21	J	1.89		2.66		1.55		0.415		0.492		3.07		5.75		2.5		4.63		3.51			
Vanadium	mg/kg	1,080	**1,200**		34.6		52.6		90.5		97.7		43.2		50.7		48.4		41.9		76.7		32.9		26.7			
Zinc	mg/kg	**1,080**	700		12,100	J	4,240		1,230		367		1,340		2,100		12,400		8,560		6,690		923		2,220	J		
Moisture	percent	-	-	J	8.56	J	8.74	J	6.48	J	7.83	J	12.5	J	16.1	J	11	J	11.8	J	8.99	J	7.76	J	10.4	J		
pH (1:2 soil:water)	pH Units	-	-		4.07		6.77		8.38		8.52		2.12		2.28		5.08		3.79		5.71		7.87		6.88			
Organic Matter	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT			
Total Organic Carbon	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT			
Total Inorganic Carbon	percent	-	-	U	0.13		0.31		0.55		0.87		0.1	U	0.1	U	0.62		0.12		0.46		0.43		0.1	U		
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	U	1.09		2.6		4.54		7.27		0.8	U	0.8	U	5.14		0.99		3.82		3.61		0.8	U		

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				WRD (Intermediate)		WRD (Intermediate)		WRD (Intermediate)		WRD (Intermediate)		WRD (Intermediate)		WRD (NW)		WRD (NW)		WRD (NW)		WRD (NW)		WRD (NW)		WRD (NW)		WRI	
Sample ID				CH14-106-TP912-SOB		CH14-106-TP012-SOC		CH14-106-TP016-SOCOMP		CH14-106-TP017-SOCOMPA		CH14-106-TP017-SOCOMPB		CH13-108-TP002-SOA		CH13-108-TP006-SOA		CH13-108-TP009-SOA		CH13-108-TP011-SOA		CH13-108-TP015-SOA		CH14-015-MW004-SOA		CH14-01 S	
Sample Interval (mbgs)				4.1 - 4.1		5 - 5		1.3 - 5.1		1.5 - 5.5		1.5 - 5.5		0 - 5		0 - 5		0 - 5		0 - 5		0 - 5		0.76 - 1.37		0.76	
Sample Date	12x Median Soil Content [a]	10x Crustal Abundance [b]		7/20/2014		7/20/2014		7/20/2014		7/22/2014		7/22/2014		7/12/2013		7/13/2013		7/13/2013		7/13/2013		7/15/2013		8/10/2014		8/1(	
Geological Unit				WR		WR		WR		WR		WR												WR			
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**
Aluminum	mg/kg	**852,000**	823,000	4,680		8,230		19,700		12,000		12,000		30,100		39,500		35,900		35,300		32,800		10,200		10,200	
Antimony	mg/kg	**60**	2	31.8		15.9		2.04		17.6		19.8		1.07		0.47		0.4		0.35		0.83		1.32	J	0.74	
Arsenic	mg/kg	**72**	18	619	J	531		153	J	449		222		13.7		7.71		15.1		8.1		54.7		20.5	J	36.0	
Barium	mg/kg	**6,000**	4,250	48.5	J	144		230		90.8		87.3		320		332		352		177		262		267		224	
Beryllium	mg/kg	**72**	30	1.93		1.55		4.02		1.50		1.51		1.9		2.17		2.11		2.69		1.80		1.64		1.57	
Bismuth	mg/kg	-	**0.085**	2.40	J	2.01		3.63	J	2.30		1.18		0.2	U	9.8		0.33		0.23		3.19		1.4	J	6.7	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	
Cadmium	mg/kg	**4.2**	1.5	8.75	J	2.91		9.59	J	7.19		6.80		0.725		9.87		0.965		0.262		1.87		0.848	J	2.04	
Calcium	mg/kg	180,000	**415,000**	3,050	J	6,670		14,000		7,170		7,040		39,300		43,200		36,400		51,500		29,300		3,540		3,710	
Chromium	mg/kg	840	**1,020**	26		22		118		38		35.2		109		66.6		74.5		57.3		207		28.4		27.7	
Cobalt	mg/kg	96	**250**	20.2	J	22.2		32.6		35.1		45.5		23.1		24.5		27.8		22.3		43.2		23.9		26.6	
Copper	mg/kg	360	**600**	667	J	400		99.7		552		559		41.9		253		50.3		32.5		83.6		67.2		112	
Iron	mg/kg	480,000	**563,000**	102,000		71,500		67,200		90,800		98,900		41,600		48,600		50,000		37,700		65,100		67,000		68,300	
Lead	mg/kg	**420**	140	5,440		2,390		540		3,040		4,510		343		460		148		73.4		437		312		278	
Lithium	mg/kg	**300**	200	12.1		33.7		39		24.9		24.5		41.6		68.6		51.8		49.9		57.4		21.6		22.4	
Magnesium	mg/kg	60,000	**233,000**	2,640		2,650		17,000		9,980		10,700		15,900		17,200		19,900		14,200		28,500		8,300		8,580	
Manganese	mg/kg	**12,000**	9,500	421		340		905		835		829		794		1,220		859		757		840		941		984	
Mercury	mg/kg	0.72	**0.85**	10.6	J	1.97	J	0.187		2.16		1.89		0.277		0.06		0.038		0.034		0.022		0.091		0.061	
Molybdenum	mg/kg	**24**	12	2.85		1.8		1.96		2.05		2.18		0.52		0.5	U	1.54		0.5	U	1.76		0.69		0.65	
Nickel	mg/kg	600	**840**	37.3	J	32.2		113		48.4		57.4		77.4		51		62.7		45.6		220		45.6		50.8	
Phosphorus	mg/kg	9,600	**10,500**	374		287		691		605		489		494		479		853		429		1,020		535		577	
Potassium	mg/kg	168,000	**208,500**	1,280		2,160		2,760		2,180		1,900		2,070		7,770		6,490		3,550		5,660		2,460		2,390	
Selenium	mg/kg	**4.8**	0.5	1.14		0.76		0.96		0.91		0.94		0.2	U	1.34		0.6		0.22		1.22		0.26		0.42	
Silver	mg/kg	-	**0.75**	13.8		5.85		1.95		6.36		7.88		0.55		2.09		0.28		0.13		1.39		1.01		1.53	
Sodium	mg/kg	60,000	**235,500**	100	U	110		130		100		100	U	260		1,500		370		860		300		100	U	100	
Strontium	mg/kg	3,000	**3,700**	33.4		46.3		48.1		30.7		32.2		179		163		150		199		80.2		16.8		16	
Sulphur	mg/kg	**8,400**	3,500	43,600	J	34,600		8,600		40,700		63,000		1,600		1,000		1,700		1,200		7,100		2,500		4,100	
Thallium	mg/kg	**108**	8.5	3.52		3.11		0.626		3.69		4.98		0.205		0.318		0.39		0.167		0.739		1.23		1.05	
Tin	mg/kg	**48**	23	3.1		5.2		2.5		2.4		2.7		2	U	4.5		2	U	2	U	3		2	U	2	
Titanium	mg/kg	-	**56,500**	20.5	J	27.5		162		116		124		83		805		324		156		341		147		159	
Uranium	mg/kg	24	**27**	4.06	J	7.77		1.82		3.78		4.19		1.12		1.46		1.65		1.28		1.61		1.01		0.982	
Vanadium	mg/kg	1,080	**1,200**	25.5		22.8		68.6		35.3		33		51.5		65.3		86.4		46.7		109		33		32.8	
Zinc	mg/kg	**1,080**	700	7,130	J	2,550		1,760		4,100		3,680		609		710		264		144		353		355		437	
Moisture	percent	-	-	9.77	J	13.2	J	8.38	J	8.81	J	9.51	J	8.66		3.94		3.62		5.4		3.86		4.22	J	4.70	
pH (1:2 soil:water)	pH Units	-	-	5.69		3.17		7.77		3.91		4.04		8.58		8.61		8.09		8.59		8.20		7.47		7.60	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.86		0.12		0.16		0.96		1.37		1.14		1.15		0.62		0.44		0.35	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	0.8	U	7.19		0.98		1.30		7.96		11.40		9.54		9.55		5.14		3.65		2.9	

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				**D (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**		**WRD (NW)**	
Sample ID				**5-MW904-OA**		**CH14-015-MW004-SOD**		**CH14-015-MW004-SOF**		**CH14-015-MW904-SOF**		**CH14-015-MW004-SOI**		**CH14-015-MW004-SOJ**		**CH14-015-MW004-SOL**		**CH14-015-MW004-SOM**		**CH14-015-MW004-SOP**		**CH14-015-MW004-SOS**		**CH14-106-TP013-SOCOMP**		**CH14-106-TP014-SOCOMP**	
Sample Interval (mbgs)				**- 1.37**		**5.18 - 5.49**		**8.23 - 8.53**		**8.23 - 8.53**		**12.8 - 13.11**		**14.94 - 15.24**		**17.68 - 17.98**		**20.12 - 20.42**		**28.35 - 28.65**		**35.05 - 35.36**		**1.5 - 5.4**		**1.7 - 5.8**			
Sample Date	**12x Median**	**10x Crustal**		**0/2014**		**8/10/2014**		**8/10/2014**		**8/10/2014**		**8/10/2014**		**8/10/2014**		**8/10/2014**		**8/10/2014**		**8/11/2014**		**8/11/2014**		**7/18/2014**		**7/18/2014**			
Geological Unit	**Soil Content [a]**	**Abundance [b]**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**Till**		**WR**		**WR**			
Analyte	**Unit**			**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000		10,300		3,300		3,100		12,700		15,100		5,730		5,510		18,900		25,800		9,560		7,020			
Antimony	mg/kg	**60**	2	J	0.44		31.2		26.8		0.30		0.48		10.20		1.71		0.18		0.21		0.40		1.79			
Arsenic	mg/kg	**72**	18	J	17.5		40.4		28.0		9.18		161		31.0		15.1		34.9		4.78		4.58		2.99			
Barium	mg/kg	**6,000**	4,250		218		64.4		59.6		153		152		145		275		136		114		426		279			
Beryllium	mg/kg	**72**	30		2.04		0.43		0.44		1.8		1.54		1.42		1.26		1.5		0.78		1.58		1.12			
Bismuth	mg/kg	-	**0.085**	J	1.16		6		5.27		0.84		0.93		2.91		1.28		0.32		0.2	U	0.36		0.97			
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U		
Cadmium	mg/kg	**4.2**	1.5	J	1.36		4.5	J	7.86	J	6.54		0.245		7.79		0.944		0.061		0.517		0.537		1.31			
Calcium	mg/kg	180,000	**415,000**		2,980		3,460		3,050		4,250		4,990		5,540		6,060		3,650		34,100		5,710		8,780			
Chromium	mg/kg	840	**1,020**		30.0		16.4		16.7		27.5		32.6		19.4		15.9		45.2		97.5		2.83		2.82			
Cobalt	mg/kg	96	**250**		25.5		26.2		34.8		27.4		31.5		44.9		21.6		21.9		25.7		7.03		8.17			
Copper	mg/kg	360	**600**		110		459		703		36.1		32.1		367		81.9		27.3		44.1		32.1		104			
Iron	mg/kg	480,000	**563,000**		67,000		145,000		165,000		54,500		60,400		86,800		53,500		56,000		46,600		35,300		32,100			
Lead	mg/kg	**420**	140		254		13,200		12,800		150		165		4,770		906		70		10.1		239		1,570			
Lithium	mg/kg	**300**	200		19		5	U	5	U	27.8		38.2		8.70		8.60		51.9		30.8		15		10.4			
Magnesium	mg/kg	60,000	**233,000**		6,320		1,210		1,030		10,400		13,200		7,050		7,310		12,300		16,100		3,890		3,190			
Manganese	mg/kg	**12,000**	9,500		867		109		124		900		1,040		630		807		639		785		684		556			
Mercury	mg/kg	0.72	**0.85**		0.058		9.76		9.17		0.01		0.012		2.24		0.151		0.007		0.005	U	0.113		0.441			
Molybdenum	mg/kg	**24**	12		1.03		8.27	J	28.8	J	1.17		0.55		4.03		1.11		0.5	U	1.17		5.09		1.9			
Nickel	mg/kg	600	**840**		49.6		13		17.4		47.9		58.6		33.5		29.7		43.6		68.7		3.3		3.42			
Phosphorus	mg/kg	9,600	**10,500**		465		406		381		559		425		648		427		493		427		590		562			
Potassium	mg/kg	168,000	**208,500**		3,370		1,190		1,150		2,560		2,070		1,730		1,710		4,600		3,810		3,100		1,600			
Selenium	mg/kg	**4.8**	0.5		0.34		1.8		1.46		0.23		0.2		0.98		0.47		0.2	U	0.2	U	0.2	U	0.22			
Silver	mg/kg	-	**0.75**		0.92		26.5		20.3		0.45		0.53		9		1.93		0.21		0.1	U	0.43		2.4			
Sodium	mg/kg	60,000	**235,500**	U	100	U	190		110		100	U	100	U	100	U	100	U	140		1,800		240		130			
Strontium	mg/kg	3,000	**3,700**		13.4		29.7	J	14.6	J	10.7		14.7		26.8		22.2		10.7		84.8		24.7		34.1			
Sulphur	mg/kg	**8,400**	3,500		3,200		61,100		66,700		12,000		13,600		35,500		10,200		6,000		1,500		2,600		6,500			
Thallium	mg/kg	**108**	8.5		1.23		24.6		21.1		0.567		0.277		2.5		0.992		0.308		0.128		0.353		0.732			
Tin	mg/kg	**48**	23	U	2	U	4		3.6		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U		
Titanium	mg/kg	-	**56,500**		250		14.2	J	7	J	266		216		36.1		45.5		585		1,430		729		123			
Uranium	mg/kg	24	**27**		1.01		1.39		1.43		1.2		0.82		3.05		0.741		0.913		1.12		3.62		1.7			
Vanadium	mg/kg	1,080	**1,200**		38.8		32.5		29.9		27.2		28.6		27.3		27.8		40.5		78.6		49.5		34.8			
Zinc	mg/kg	**1,080**	700		634		4,110		5,760		1,580		1,890		4,660		499		124		568		261		820			
Moisture	percent	-	-	J	6.41	J	11.7	J	12.6	J	5.52	J	5.05	J	10.0	J	6.77	J	3.79	J	9.59	J	9.06	J	8.98	J		
pH (1:2 soil:water)	pH Units	-	-		7.14		2.51		2.52		6.06		6.32		7.4		8.05		7		7.86		7.95		7.15			
Organic Matter	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT			
Total Organic Carbon	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT			
Total Inorganic Carbon	percent	-	-		0.23		0.1	U	0.1	U	0.28		0.26		0.35		0.59		0.25		0.72		0.14		0.26			
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-		1.91		0.8	U	0.8	U	2.30		2.2		2.95		4.93		2.04		5.98		1.14		2.15			

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				WRD (NE)		WRD (NE)		WRD (NE)		WRD (NE)		WRD (NE)		WRD (NE)		WRD (Toe of NE)		WRD (Toe of NE)		WRD (Toe of NE)		WRD (Toe of NE)		WRD (To
Sample ID				CH14-015-MW006-SOB		CH14-015-MW006-SOC		CH14-015-MW006-SOE		CH14-015-MW006-SOF		CH14-015-MW006-SOI		CH14-106-TP018-SOCOMP		CH14-106-TP019-SOCOMP		CH14-106-TP020-SOA		CH14-106-TP023-SOA		CH14-106-TP024-SOA		CH14-106-TP025-SOA		CH14-10 SC
Sample Interval (mbgs)				3.35 - 3.66		7.62 - 7.92		14.02 - 14.33		18.29 - 18.59		26.82 - 27.12		1.5 - 5.2		1.5 - 5.1		1.5 - 1.5		0.5 - 0.5		0.5 - 0.5		0.5 - 0.5		0.5
Sample Date	12x Median	10x Crustal		8/14/2014		8/15/2014		8/15/2014		8/15/2014		8/15/2014		7/22/2014		7/22/2014		7/21/2014		7/21/2014		7/21/2014		7/21/2014		7/21/
Geological Unit	Soil Content [a]	Abundance [b]		WR		WR		WR		WR		WR		WR		WR		Colluvium		Colluvium		Colluvium		Colluvium		Collu
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**
Aluminum	mg/kg	**852,000**	823,000	17,200		16,900		25,400		15,100		22,800		28,200		11,800		16,600		15,000		15,300		17,700		16,300
Antimony	mg/kg	**60**	2	3.65		0.36		0.37		0.53		1.93		0.37		0.68		0.28		0.54		0.70		0.39		0.42
Arsenic	mg/kg	**72**	18	19.9		13.3		15.2		48.5		183		6.56		18.5		6.90		5.58		8.38		5.60		6.02
Barium	mg/kg	**6,000**	4,250	808		115		397		180		224		170		199		115		192		203		201		225
Beryllium	mg/kg	**72**	30	0.81		1.59		1.35		1.36		2.02		1.32		1.85		0.74		0.74		0.72		0.83		0.76
Bismuth	mg/kg	-	**0.085**	0.63		0.53		0.54		1.26		0.29		2.87		1.44		0.43		0.33		1.72		0.40		0.38
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10
Cadmium	mg/kg	**4.2**	1.5	0.547		0.145		0.337		0.82		0.554		1.86		1.06		0.295		0.886		0.79		0.382		0.377
Calcium	mg/kg	180,000	**415,000**	11,400		2,870		21,300		1,330		37,200		49,600		3,700		3,620		4,050		3,370		4,300		4,640
Chromium	mg/kg	840	**1,020**	45.5		41.9		63.7		32.0		285		59.4		39.2		38.9		31		30.8		37.1		30.6
Cobalt	mg/kg	96	**250**	14.9		24.4		18.9		19.7		43.2		19.8		24.5		15.7		12		11.3		14.7		13.9
Copper	mg/kg	360	**600**	38.6		39.9		25.9		103		42.9		49.1		190		32.2		63.8		35.6		49.2		47.2
Iron	mg/kg	480,000	**563,000**	32,500		63,400		38,200		46,200		51,400		39,600		61,100		32,100		29,400		25,600		32,400		29,800
Lead	mg/kg	**420**	140	1,560		52.7		74.0		174		71.9		591		231		11.7		28.5		105		23.9		21.1
Lithium	mg/kg	**300**	200	27.8		33.8		58.5		38.6		43.6		43.6		23.4		30.5		27.8		23.7		30.4		28.1
Magnesium	mg/kg	60,000	**233,000**	8,680		10,600		13,900		5,840		24,800		16,000		7,240		7,150		6,030		5,330		6,100		5,700
Manganese	mg/kg	**12,000**	9,500	450		783		460		266		848		851		582		374		473		385		461		433
Mercury	mg/kg	0.72	**0.85**	1.72		0.059		0.016		0.151		0.083		0.065		0.435		0.017		0.031		0.11		0.018		0.021
Molybdenum	mg/kg	**24**	12	1.78		0.59		1.61		1.16		0.58		0.5	U	1.12		1.03		1.25		1.18		2.26		1.83
Nickel	mg/kg	600	**840**	46.3		51.7		47.2		34.1		423		42.9		48.9		36		29.9		28.6		29.8		27.3
Phosphorus	mg/kg	9,600	**10,500**	687		247		543		370		487		539		415		693		594		614		604		744
Potassium	mg/kg	168,000	**208,500**	3,140		6,490		7,210		3,600		4,950		3,300		3,750		3,410		1,340		1,600		2,280		1,660
Selenium	mg/kg	**4.8**	0.5	0.55		0.2	U	0.38		0.25		0.33		0.4		0.38		0.23		0.23		0.27		0.2		0.23
Silver	mg/kg	-	**0.75**	2.14		0.25		0.16		0.97		0.2		1.09		0.71		0.1	U	0.23		0.39		0.21		0.23
Sodium	mg/kg	60,000	**235,500**	350		140		1,130		100	U	390		1,070		170		280		200		260		250		250
Strontium	mg/kg	3,000	**3,700**	64.1		12.4		77.3		13.4		77.4		144		27.9		35.8		32.2		31.1		32.6		33.5
Sulphur	mg/kg	**8,400**	3,500	1,700		2,100		1,700		1,800		2,900		1,700		2,500		500	U	500	U	600		500	U	500
Thallium	mg/kg	**108**	8.5	0.41		0.647		0.505		0.538		0.386		0.274		0.453		0.294		0.176		0.22		0.248		0.208
Tin	mg/kg	**48**	23	2	U	2	U	3		2	U	2	U	2.6		2	U	2	U	2	U	2	U	2	U	2
Titanium	mg/kg	-	**56,500**	530		768		1,750		473		559		1,110		489		706		413		494		581		464
Uranium	mg/kg	24	**27**	1.29		0.76		3.18		1.02		2		1.2		3.03		0.993		2.03		2.13		1.78		1.87
Vanadium	mg/kg	1,080	**1,200**	44.9		39.7		57.7		30.2		65.1		61		38.1		43.9		37.6		38.8		46		41.8
Zinc	mg/kg	**1,080**	700	163		125		155		682		165		627		454		111		263		316		116		95.9
Moisture	percent	-	-	6.53	J	12.7		10.9		9.11		6.27		5.62	J	9.42	J	6.76	J					11.5	J	14.9
pH (1:2 soil:water)	pH Units	-	-	8.07		8.46		8.24		6.55		7.92		8.23		5.89		7.13		6.5		4.99		6.4		6.39
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		0.75		2.13		1.99		1.68		2.51
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		0.4		1.2		1.2		1.0		1.5
Total Inorganic Carbon	percent	-	-	0.25		0.38		0.29		0.1	U	1.39		1.1		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	2.12		3.17		2.43		0.8	U	11.6		9.14		0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				**e of NE)**		**WRD (Toe of NE)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		**WRD (Stockpiles)**		
Sample ID				**6-TP925-0A**		**CH14-106-TP026-SOA**		**CH14-104-MW008-SOB**		**CH14-104-MW008-SOD**		**CH14-104-MW908-SOD**		**CH14-104-MW008-SOE**		**CH14-104-MW008-SOG**		**CH14-104-MW008-SOI**		**CH14-104-MW008-SOL**		**CH14-104-TP001-SOA**		**CH14-104-TP001-SOB**		**CH14-104-TP001-SOC**			
Sample Interval (mbgs)				**- 0.5**		**1.4 - 1.4**		**3.66 - 3.96**		**10.36 - 10.67**		**10.36 - 10.67**		**12.50 - 12.80**		**16.46 - 16.76**		**20.88 - 21.18**		**26.52 - 26.82**		**1.2 - 1.2**		**3.5 - 3.5**		**5.8 - 5.8**			
Sample Date	**12x Median**	**10x Crustal**		**/2014**		**7/21/2014**		**8/12/2014**		**8/12/2014**		**8/12/2014**		**8/12/2014**		**8/13/2014**		**8/13/2014**		**8/13/2014**		**7/17/2014**		**7/17/2014**		**7/17/2014**			
Geological Unit	**Soil Content [a]**	**Abundance [b]**		**vium**		**Colluvium**		**WR**		**WR**		**WR**		**WR**		**WR**		**WR**		**Org**		**WR**		**WR**		**WR**			
Analyte	**Unit**			**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		
Aluminum	mg/kg	**852,000**	823,000		20,300		1,970		8,770		7,740		2,880		22,900		24,600		12,600		2,540		2,970		5,540					
Antimony	mg/kg	**60**	2		0.62		40.9		7.9		5.05	J	16.0		0.49		1.14		0.78		47.2		56.3		72.3					
Arsenic	mg/kg	**72**	18		8.52		250		143	J	37.1	J	202		19.0		13.8		2.87		253		368		422					
Barium	mg/kg	**6,000**	4,250		167		48.3		162.0		147.0		70.8		371.0		286.0		153.0		19.7		26		7.2					
Beryllium	mg/kg	**72**	30		1.03		0.35		1.12		1.20		0.63		1.28		1.26		1.51		0.55		0.52		0.72					
Bismuth	mg/kg	-	**0.085**		1.27		2.04		0.56		0.52		0.27		0.58		0.2	U	0.2	U	2.07		1.97		1.98					
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U				
Cadmium	mg/kg	**4.2**	1.5		0.225		47.6		4.03		3.75		5.89		2.27		0.668		0.499		63.9		40.5		45.5					
Calcium	mg/kg	180,000	**415,000**		3,760		1,590		6,160		5,890		2,630		23,800		18,600		6,530		2,060		2,060		3,100					
Chromium	mg/kg	840	**1,020**		51.0		7.7		24.7		23.4		9.72		98.7		125		29.5		8.85		11.8		22.7					
Cobalt	mg/kg	96	**250**		18.6		69.5		34.9		34.4		79.4		22.5		29.7		17.6		76.1		83.2		68.7					
Copper	mg/kg	360	**600**		60.8		1,080		646	J	239	J	968		40.3		61.1		39.9		1,330		1,280		1,260					
Iron	mg/kg	480,000	**563,000**		39,500		206,000		68,600		68,100		99,200		48,300		46,900		49,700		212,000		252,000		189,000					
Lead	mg/kg	**420**	140		14.9		7,970		1,880		1,210		4,040		160		104		191		17,700		8,900		16,700					
Lithium	mg/kg	**300**	200		38.3		5	U	14.6		13.5		5	U	34.6		33.1		21.6		5	U	5	U	5.7					
Magnesium	mg/kg	60,000	**233,000**		7,930		3,000		9,010		8,840		2,020		19,400		20,600		11,700		2,870		2,430		3,300					
Manganese	mg/kg	**12,000**	9,500		514		1,150		566		542		459		786		624		312		924		1,200		1,380					
Mercury	mg/kg	0.72	**0.85**		0.024		22		0.954		0.975		2.22		0.008		0.115		0.154		26.2		20.4		18	J				
Molybdenum	mg/kg	**24**	12		3.1		4.67		3.7		4.02		11.7		1.55		1.18		0.5	U	5.21		6.37		6.52					
Nickel	mg/kg	600	**840**		48.3		17.8		38.3		43.3		33.0		85.1		102		38.8		20.2		21.1		34.1					
Phosphorus	mg/kg	9,600	**10,500**		808		240		346		465		332		491		793		699		332		643		1,100					
Potassium	mg/kg	168,000	**208,500**		3,780		550		2,290		2,000		1,130		6,460		3,690		3,970		670		480		1,040					
Selenium	mg/kg	**4.8**	0.5		0.33		1.5		0.66		0.6		1.75		0.46		0.31		0.22		1.54		1.95		1.68					
Silver	mg/kg	-	**0.75**		0.17		23.8		5.96	J	3.06	J	6.18		0.34		0.36		0.38		26.3		30.8		32.5					
Sodium	mg/kg	60,000	**235,500**		240		100	U	190		180		100	U	460		410		140		100	U	100	U	100	U				
Strontium	mg/kg	3,000	**3,700**		34.8		10.5		24.5		23.5		7.29		98.4		104		26.1		13.1		25.2		37.6					
Sulphur	mg/kg	**8,400**	3,500	U	500	U	242,000		25,200		26,300		52,500		6,600		9,800		7,300		204,000		262,000		204,000					
Thallium	mg/kg	**108**	8.5		0.302		7.76		2.44		2.39		11.7		0.48		0.829		0.773		9.12		9.63		11.4					
Tin	mg/kg	**48**	23	U	2	U	5		2	U	2	U	2	U	2	U	2	U	2	U	5		6		6.2					
Titanium	mg/kg	-	**56,500**		794		29.9		135		110		40.9		535		302		485		25.4		28		64.6					
Uranium	mg/kg	24	**27**		1.18		2.03		1.77		1.77		2.46		0.963		0.961		1.1		2.63		3.03		3.14					
Vanadium	mg/kg	1,080	**1,200**		53.7		13.3		31.1		31.3		22.8		58.9		87.5		22.7		15.2		23.5		34.7					
Zinc	mg/kg	**1,080**	700		98		36,800		3,240		3,070		5,170		298		275		471		37,000		32,900		30,300					
Moisture	percent	-	-	J	8.71	J	7.41	J	5.74	J	4.68	J	5.7	J	6.32	J	12.3	J	7.61	J	8.53	J	9.1	J	5.05	J				
pH (1:2 soil:water)	pH Units	-	-		6.73		3.66		7.24		6.89		2.52		8.05		7.95		7.84		3.11		3.02		3.77					
Organic Matter	percent	-	-		0.7	U	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT					
Total Organic Carbon	percent	-	-		0.4	U	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT					
Total Inorganic Carbon	percent	-	-	U	0.1	U	0.16		0.41		0.35		0.1	U	0.47		0.55		0.44		0.1	U	0.1	U	0.1	U				
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	U	0.8	U	1.31		3.43		2.93		0.8	U	3.9		4.59		3.64		0.8	U	0.8	U	0.8	U				

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

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Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				**one II Pit)**		**WRD (Zone II Pit)**		**WRD (Zone II Pit)**		**WRD (Zone II Pit)**		**WRD (Zone II Pit)**		**WRD (Zone II Pit)**		**WRD (Zone II Pit)**		**WRD (Zone II Outwash)**		**WRD (Zone II Outwash)**		**WRD (Zone II Outwash)**		**WRD (Zone II Outwash)**							
Sample ID				**4-MW005-OE**		**CH12-014-MW005-SOF**		**CH12-014-MW905-SOF**		**CH12-014-MW005-SOG**		**CH12-014-MW005-SOH**		**CH12-014-MW005-SOI**		**CH12-014-MW005-SOJ**		**CH12-014-MW005-SOK**		**CH14-107-TP001-SOA**		**CH14-107-TP001-SOB**		**CH14-107-TP001-SOC**		**CH14-107-TP901-SOC**							
Sample Interval (mbgs)				**- 15.2**		**25 - 25.4**		**25 - 25.4**		**29 - 31**		**35 - 35.4**		**39.2 - 40.3**		**36.4 - 36.7**		**37.2 - 37.45**		**1.6 - 1.6**		**3 - 3**		**5.5 - 5.5**		**5.5 - 5.5**							
Sample Date	**12x Median Soil Content [a]**	**10x Crustal Abundance [b]**		**5/2012**		**6/26/2012**		**6/26/2012**		**6/26/2012**		**6/26/2012**		**6/26/2012**		**6/27/2012**		**6/27/2012**		**7/22/2014**		**7/22/2014**		**7/22/2014**		**7/22/2014**							
Geological Unit				**WR**		**WR**		**WR**		**WR**		**WR**		**Alluv**		**WR**		**Alluv**		**WR**		**WR**		**WR**		**WR**							
Analyte	**Unit**			**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**						
Aluminum	mg/kg	**852,000**	823,000		8,810	J	15,900	J	3,760		9,070		11,300		12,900		9,530		36,900		20,900		13,800		15,300							
Antimony	mg/kg	**60**	2		0.93	J	0.55	J	0.65		3.12		0.14		2.27		9.64		0.24		6.85		2.03		3.02							
Arsenic	mg/kg	**72**	18		165	J	1,100	J	20.5		82.6		10.9		51.2		306		3.62		43.1		75.5	J	32.2	J						
Barium	mg/kg	**6,000**	4,250		124		99		110		195		449		260		17.5		347		354		116		185							
Beryllium	mg/kg	**72**	30		1.26		1.3		1.65		2.07		2.05		1.05		0.72		3.98		2.60		2.49		2.62							
Bismuth	mg/kg	-	**0.085**		0.26	J	3.54	J	5.94		1.41		1.41		1.51		1.71		14.80		4.53		5.34	J	3.07	J						
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U						
Cadmium	mg/kg	**4.2**	1.5		0.346	J	0.17	J	7.97		11.8		0.06		2.39		16.5		35.4		4.12		0.856	J	1.52	J						
Calcium	mg/kg	180,000	**415,000**		4,190		3,610		2,870		4,770		2,310		3,960		6,400		43,600		10,000		7,330		7,680							
Chromium	mg/kg	840	**1,020**		28.6		36.4		14.3		26.8		41.2		37.9		29.8		127		57.9		35.3		39.4							
Cobalt	mg/kg	96	**250**		39.6		38.3		48.1		42		26.7		23.9		83.6		29.4		28.5		32.1		30.9							
Copper	mg/kg	360	**600**		405	J	170	J	385		337		67.3		264		667		810		345		85.2		75.4							
Iron	mg/kg	480,000	**563,000**		60,900		68,900		88,700		59,100		59,800		45,700		201,000		65,700		62,400		71,400		73,600							
Lead	mg/kg	**420**	140		96.1	J	247	J	488		1,410		13.7		781		6,430		783		1,720		106	J	382	J						
Lithium	mg/kg	**300**	200		21		30.6		5.1		13.5		23.7		20.9		14.1		66.4		44.1		30.9		35.5							
Magnesium	mg/kg	60,000	**233,000**		9,230		9,710		4,410		4,800		10,400		6,810		5,390		24,500		12,800		12,700		13,300							
Manganese	mg/kg	**12,000**	9,500		566		576		449		479		488		415		611		1,460		829		970		1,020							
Mercury	mg/kg	0.72	**0.85**		0.133	J	0.019	J	0.274		0.658		0.015		0.864		5.27		0.009		0.929		0.04	J	0.383	J						
Molybdenum	mg/kg	**24**	12		1.72		1.42		2.02		2.05		0.5	U	2.46		2.62		2.54		1.16		0.5	U	0.57							
Nickel	mg/kg	600	**840**		57.1		49.7		17.8		42.1		41.7		36.3		35.1		93.6		65.7		64.2		62.1							
Phosphorus	mg/kg	9,600	**10,500**		594		395		419		446		314		518		364		813		536		383		513							
Potassium	mg/kg	168,000	**208,500**		2,380	J	4,200	J	1,120		2,080		6,460		2,750		1,900		4,310		4,720		4,150		4,480							
Selenium	mg/kg	**4.8**	0.5		0.53		0.44		0.73		0.75		0.2	U	0.56		1.21		6.17		1.09		0.37		0.35							
Silver	mg/kg	-	**0.75**		0.75	J	1.65	J	2.04		3.33		0.46		2.84		6.5		5.5		3.55		0.96		1.48							
Sodium	mg/kg	60,000	**235,500**		100	U	190		100	U	110		160		190		190		410		210		120		130							
Strontium	mg/kg	3,000	**3,700**		14.1		13.2		29.6		23.4		38.9		34.7		26.4		118		40.1		31.7		31.7							
Sulphur	mg/kg	**8,400**	3,500		23,800		32,000		19,000		16,700		3,400		9,100		88,000		3,600		14,500		6,300		6,000							
Thallium	mg/kg	**108**	8.5		1.34	J	0.52	J	1.01		1.7		0.425		0.898		1.88		0.459		1.11		0.499		0.562							
Tin	mg/kg	**48**	23	U	2	U	2	U	2	U	2	U	2	U	2	U	3.4		19.1		2.8		2	U	2	U						
Titanium	mg/kg	-	**56,500**		171		283		39.1		276		797		470		294		202		388		392		419							
Uranium	mg/kg	24	**27**		1.17		0.648		8.12		3.32		1		1.83		1.43		1.9		1.1		0.736		0.82							
Vanadium	mg/kg	1,080	**1,200**		31.3		29.8		29.7		28.9		41.8		47.3		28.8		116		47.3		33.4		37.2							
Zinc	mg/kg	**1,080**	700		243	J	98.0	J	2,910		3,330		89.7		1,330		12,200		1,880		1,540		201	J	554	J						
Moisture	percent	-	-		4.9		NT		12		14.4		6.25		18.4		11.7		8.96	J	9.03	J	6.83	J	5.55	J						
pH (1:2 soil:water)	pH Units	-	-		7.71		7.73		6		6.89		8.28		6.07		6.86		8.42		8.16		8.1		8.01							
Organic Matter	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT							
Total Organic Carbon	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT							
Total Inorganic Carbon	percent	-	-		0.75		0.75		0.77		0.41		0.86		0.30		0.26		1.09		0.46		0.62		0.57							
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-		6.21		6.29		6.43		3.41		7.19		2.51		2.19		9.07		3.86		5.17		4.78							

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD Out
Remediation Unit (RU)																								
Sample ID				CH15-107-TP012_Soa		CH15-107-TP013_SOa		CH15-107-TP014_SOa		CH15-107-TP015_SOa		CH15-107-TP016_SOa		CH14-107-MW001-SOA		CH14-107-MW001-SOB		CH14-107-MW001-SOC		CH14-107-MW901-SOC		CH14-107-MW001-SOD		CH14-107-MW001-SOE		CH14-10 S
Sample Interval (mbgs)				2 - 2.2		2 - 2.2		2 - 2.2		2 - 2.2		0.5 - 0.7		3.048 - 3.3528		6.4008 - 6.7056		8.2296 - 8.5344		8.2296 - 8.5344		11.2776 - 11.5824		17.6784 - 17.9832		19.507
Sample Date	**12x Median Soil Content** [a]	**10x Crustal Abundance** [b]		7/27/2015		7/27/2015		7/27/2015		7/27/2015		7/27/2015		9/8/2014		9/8/2014		9/8/2014		9/8/2014		9/8/2014		9/9/2014		9/9
Geological Unit														Alluv		Alluv		Alluv		Alluv		Alluv		Alluv		
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**
Aluminum	mg/kg	**852,000**	823,000	11,700		8,530		10,600		15,300		13,800		20,100		9,280		17,800		15,100		10,600		10,200		31,400
Antimony	mg/kg	**60**	2	0.52		3.12		3.75		0.85		2.58		0.86		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1
Arsenic	mg/kg	**72**	18	6.47		18.1		56.2		9.69		27.6		10.7		6.35		6.71	J	3.92	J	2.22		2.38		6.74
Barium	mg/kg	**6,000**	4,250	201		174		247		275		548		257		47.2		87.6		69.9		52.0		66.2		333
Beryllium	mg/kg	**72**	30	0.55		0.58		0.88		0.74		0.9		0.78		0.61		1.22		1.14		0.94		0.70		1.43
Bismuth	mg/kg	-	**0.085**	0.26		0.43		1.75		0.33		1.15		0.35		0.63		0.57		0.48		0.27		0.46		0.37
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	10	U	10	U	10	U	10	U	10	U	10	U	10
Cadmium	mg/kg	**4.2**	1.5	0.33		0.59		0.37		0.33		0.77		0.426		0.078		0.203		0.26		0.091		0.138		0.05
Calcium	mg/kg	180,000	**415,000**	4,170		2,270		1,390		5,930		3,700		11,500		3,430		3,640		2,930		1,620		1,900		3,170
Chromium	mg/kg	840	**1,020**	22.1		19		38.4		33.2		31.4		50.7		14.5		33.8		34.7		22.7		24		62.9
Cobalt	mg/kg	96	**250**	6.71		5.73		10.7		11.6		14		15.2		6.1		10.9		10.2		5.53		7.1		30.2
Copper	mg/kg	360	**600**	23.1		82.5		143		32.4		56.1		35.9		18.0		25.5		26.8		15.2		22.9		83.9
Iron	mg/kg	480,000	**563,000**	14,600		19,300		60,100		26,600		33,800		33,700		28,200		24,100		22,800		15,100		17,600		79,600
Lead	mg/kg	**420**	140	13.2		238		478		15.9		688		14.9		8.97		16.9		14.2		8.21		11.4		7.86
Lithium	mg/kg	**300**	200	25		16.8		16.4		28.2		25.5		28.6		25.8		28.3		26.6		22.1		28.4		46
Magnesium	mg/kg	60,000	**233,000**	4,270		2,860		3,830		5,720		5,190		9,840		3,640		5,300		5,020		3,820		4,070		14,200
Manganese	mg/kg	**12,000**	9,500	158		124		206		403		501		455		184		338		305		137		223		517
Mercury	mg/kg	0.72	**0.85**	0.03		0.17		0.7		0.04		0.51		0.049	J	0.009	J	0.013	J	0.014	J	0.01	J	0.008	J	0.005
Molybdenum	mg/kg	**24**	12	0.67		0.85		1.4		1.17		1.46		1.33		0.79		0.5	U	0.5	U	0.5	U	0.82		0.54
Nickel	mg/kg	600	**840**	17.7		13.5		21.8		36.4		30		50.5		12.9		25.4		24.5		15.6		16.8		56.1
Phosphorus	mg/kg	9,600	**10,500**	814		584		401		765		673		666		466		533		489		466		503		833
Potassium	mg/kg	168,000	**208,500**	1,370		990		2,310		2,040		2,460		3,160		1,570		3,030		2,680		1,890		2,650		17,100
Selenium	mg/kg	**4.8**	0.5	0.31		0.41		0.32		0.36		0.38		0.35		0.25		0.2	U	0.2	U	0.2	U	0.2	U	0.2
Silver	mg/kg	-	**0.75**	0.17		0.58		1.61		0.2		1.15		0.18		0.2		0.11		0.1	U	0.1	U	0.1		0.14
Sodium	mg/kg	60,000	**235,500**	212		208		139		226		208		320		260		430		340		100	U	150		410
Strontium	mg/kg	3,000	**3,700**	31.8		23.1		21.3		49.4		34.5		65.4		25.0		38.8		33.9		7.98		11.6		7.32
Sulphur	mg/kg	**8,400**	3,500	900		1,800		800		3,400		1,100		500		500		900		500	U	700		500	U	5,800
Thallium	mg/kg	**108**	8.5	0.19		0.24		0.6		0.21		0.61		0.256		0.159		0.209		0.194		0.14		0.21		0.524
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2.90		2	U	2	U	2	U	2.4
Titanium	mg/kg	-	**56,500**	529		319		352		541		538		632		357		735		602		563		613		2,430
Uranium	mg/kg	24	**27**	2.25		5.75		1.44		1.71		2.51		1.11		2.13		1.06		0.918		0.642		0.889		1
Vanadium	mg/kg	1,080	**1,200**	31.7		23.9		26.8		39.9		38.5		53		20.6		34.9		31.2		26.9		22.8		89.3
Zinc	mg/kg	**1,080**	700	82.7		189		592		73.8		423		86.7		355		544		529		258		307		133
Moisture	percent	-	-	NT		NT		NT		NT		NT		14.5	J	6.32	J	11.6	J	11.1	J	9.45	J	14.2	J	12.8
pH (1:2 soil:water)	pH Units	-	-	5.92		3.82		6.26		6.59		5.62		8.29		7.3		6.35		6.21		5.84		6.68		5.75
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	NT		NT		NT		NT		NT		NT		NT
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	NT		NT		NT		NT		NT		NT		NT

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				(Zone II wash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)	
Sample ID				7-MW001-OF		CH14-107-MW002-SOA		CH14-107-MW002-SOB		CH14-107-MW002-SOC		CH14-107-MW002-SOD		CH14-107-MW003-SOA		CH14-107-MW003-SOD		CH14-107-MW003-SOF		CH14-107-MW003-SOH		CH14-107-MW003-SOI		CH14-107-MW003-SOK		CH14-107-MW003-SOM	
Sample Interval (mbgs)				2 - 19.812		4.2672 - 4.572		6.7056 - 7.0104		9.7536 - 10.0584		11.2776 - 11.5824		1.83 - 2.13		11.89 - 12.19		18.90 - 19.20		24.99 - 25.30		28.35 - 28.65		34.75 - 35.05		39.93 - 40.23	
Sample Date		12x Median	10x Crustal	/2014		9/8/2014		9/8/2014		9/8/2014		9/8/2014		8/21/2014		8/21/2014		8/21/2014		8/21/2014		8/21/2014		8/22/2014		8/22/2014	
Geological Unit		Soil Content [a]	Abundance [b]	BR		Alluv		Alluv		Alluv		Alluv		Alluv		Fault Zone?		Fault Zone?		Fault Zone?		Fault Zone?		Alluv		BR	
Analyte	**Unit**			Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	mg/kg	**852,000**	823,000		11,400		17,800		11,100		15,700		13,100		6,140		4,830		2,770		5,070		19,500		28,100	
Antimony	mg/kg	**60**	2	U	0.1	U	0.76		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Arsenic	mg/kg	**72**	18		13.2		10.2		14.3		13.6		21.3		14.7		1.58		3.12		4.89		24.7		28.0	
Barium	mg/kg	**6,000**	4,250		88.4		121		55.3		110		216		230		159		83.3		54.7		132		212	
Beryllium	mg/kg	**72**	30		0.81		1.15		0.95		1.28		0.97		0.89		0.91		0.65		0.60		0.75		1.44	
Bismuth	mg/kg	-	**0.085**		0.27		0.60		0.24		0.42		6.51		0.22		0.28		0.72		2.32		0.38		0.41	
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	U	0.145		0.255		0.141		0.194		1.92		0.076		0.05	U	0.07		0.093		0.05	U	0.066	
Calcium	mg/kg	180,000	**415,000**		3,650		4,330		1,470		2,190		1,480		2,980		1,910		2,280		2,110		2,820		2,710	
Chromium	mg/kg	840	**1,020**		21.7		21.9		18.1		38.3		25.5		19.7		16.7		0.5	U	0.5	U	40.4		54.8	
Cobalt	mg/kg	96	**250**		9.83		6.41		4.48		9.04		20.2		22.7		22.1		7.39		7.3		33.9		38.6	
Copper	mg/kg	360	**600**		12.7		22.6		16.7		49.8		66.3		26.6	J	15.1		28		19.2		63.6		57.1	
Iron	mg/kg	480,000	**563,000**		33,700		26,400		25,500		34,400		55,700		56,300		57,800		29,300		27,000		81,200		72,500	
Lead	mg/kg	**420**	140		13.9		14.2		9.95		28.4		380		20.1		7.59		15.3		46.7		16.8		11.1	
Lithium	mg/kg	**300**	200		35.4		37.2		22.9		56		21.9		9.2		7.2		5	U	5	U	52.4		76	
Magnesium	mg/kg	60,000	**233,000**		4,320		4,640		3,550		6,240		4,710		9,390		10,100		1,330		3,650		12,100		12,600	
Manganese	mg/kg	**12,000**	9,500		303		202		153		273		511		889		1,380		781		507		721		464	
Mercury	mg/kg	0.72	**0.85**	UJ	0.012	J	0.025	J	0.015	J	0.01	J	0.077		0.011		0.011		0.006		0.041		0.005	U	0.005	U
Molybdenum	mg/kg	**24**	12		3.03		1.28		1.14		1.1		1.31		0.88		0.5	U	0.5	U	0.85		0.5	U	0.5	U
Nickel	mg/kg	600	**840**		22.1		19.8		15.3		20.7		27.2		42.4		48.1		4.14		3.39		54.3		52.5	
Phosphorus	mg/kg	9,600	**10,500**		1,040		543		358		513		492		853		306		512		564		667		628	
Potassium	mg/kg	168,000	**208,500**		2,640		2,480		1,500		5,660		1,770		2,000		1,610		1,580		2,310		5,100		11,500	
Selenium	mg/kg	**4.8**	0.5	U	0.38		0.44		0.32		0.30		0.39		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**		0.1	U	0.19		0.13		0.12		0.45		0.21		0.1	U	0.29		1.71		0.33		0.14	
Sodium	mg/kg	60,000	**235,500**		180		230		100	U	300		110	U	100	U	100	U	100	U	100	U	130	U	280	U
Strontium	mg/kg	3,000	**3,700**		27.8		35.3		12.9		15.3		19.2		16.00		19.6		10.2		8.68		12.6		10.2	
Sulphur	mg/kg	**8,400**	3,500		500	U	500	U	500	U	500	U	1,000		1,500		700		1,000		800		6,300		6,100	
Thallium	mg/kg	**108**	8.5		0.254		0.306		0.121		0.458		0.498		0.252		0.161		0.088		0.146		0.238		0.416	
Tin	mg/kg	**48**	23		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**		496		471		301		1,180		227		12.7		11.9		1		2.6		495		1,040	
Uranium	mg/kg	24	**27**		3.48		2.42		1.28		6.43		2.71		1.71		1.42		0.952		0.868		0.676		0.549	
Vanadium	mg/kg	1,080	**1,200**		29.8		39.1		21.7		35.5		26.7		25.6		21.8		7.56		26.5		61.1		87.7	
Zinc	mg/kg	**1,080**	700		508		487		310		308		1,170		1,000		616		956		343		490		310	
Moisture	percent	-	-	J	12.1	J	10.8	J	7.83	J	11.5	J	13.2	J	11.2	J	3.94	J	8.22	J	6.19	J	3.45	J	2	J
pH (1:2 soil:water)	pH Units	-	-		6.1		6.25		5.74		6.9		6.03		7.6		7.75		6.84		7.77		6.23		6.05	
Organic Matter	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-		NT		NT		NT		NT		0.1	UJ	0.99	J	1.28	J	0.58	J	0.51	J	0.92		0.46	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-		NT		NT		NT		NT		0.8	UJ	8.27	J	10.7	J	4.82	J	4.24	J	7.69	J	3.81	J

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD Out	
Remediation Unit (RU)																							
Sample ID				CH14-107-MW004-SOB		CH14-107-MW004-SOD		CH14-107-MW004-SOG		CH14-107-MW004-SOI		CH14-107-MW004-SOK		CH14-107-MW904-SOK		CH14-107-MW004-SOL		CH14-107-MW005B-SOA		CH14-107-MW905B-SOA		CH14-107-MW005B-SOC		CH14-107-MW006B-SOA		CH1 MW9	
Sample Interval (mbgs)				2.44 - 2.74		8.84 - 9.14		18.59 - 18.90		25.60 - 25.91		29.26 - 29.57		29.26 - 29.57		34.44 - 34.75		0.91 - 1.22		0.91 - 1.22		5.18 - 5.49		0.61 - 0.91		0.61	
Sample Date		12x Median	10x Crustal	8/28/2014		8/28/2014		8/28/2014		8/28/2014		8/28/2014		8/28/2014		8/28/2014		8/23/2014		8/23/2014		8/23/2014		8/23/2014		8/2	
Geological Unit		Soil Content [a]	Abundance [b]	Alluv		Alluv		Alluv		Alluv		Alluv		Alluv		Alluv		Alluv		Alluv		Alluv		Alluv		A	
Analyte	**Unit**			Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	
Aluminum	mg/kg	**852,000**	823,000	11,300		19,600		14,600		2,570		15,900		21,500		27,800		11,500		11,800		14,800		11,500		11,600	
Antimony	mg/kg	**60**	2	0.69		0.56		0.23		0.70		0.53		0.37		0.15		13.1	J	9.96		1.32		2.88		4.23	
Arsenic	mg/kg	**72**	18	11.5		14.3		5.31		0.49		7.64	J	1.09	J	1.71		77.8		73.9		20.1		48.9		47.8	
Barium	mg/kg	**6,000**	4,250	153		147		749		83.9		246		230		299		333		385		135		304		284	
Beryllium	mg/kg	**72**	30	0.60		1.24		1.32		0.44		0.64		0.63		0.60		0.68		0.75		0.90		0.67		0.64	
Bismuth	mg/kg	-	**0.085**	10.90		0.68		0.30		0.65		0.33		0.30		0.2	U	1.99		1.39		2.45		2.90	J	1.64	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	
Cadmium	mg/kg	**4.2**	1.5	1.34		0.334		0.473		0.05	U	0.192		0.298		0.211		0.388		0.389		0.173		0.307		0.281	
Calcium	mg/kg	180,000	**415,000**	3,700		2,370		2,480		637		2,850		2,620		3,630		1,050		995		3,260		1,220		875	
Chromium	mg/kg	840	**1,020**	22.0		32.1		32.2		7.03		2.79		2.37		4.86		26.3		25.9		26.7		27.8		27.2	
Cobalt	mg/kg	96	**250**	9.51		12.1		27.4		12.7		9.46		7.98		10.4		10.2		11		9.08		11.6		10.4	
Copper	mg/kg	360	**600**	18.5		29.9		17.5		23		15		9.84		0.50	U	172		165		30.4		95.7		85.5	
Iron	mg/kg	480,000	**563,000**	18,100		52,800		80,000		24,400		30,600		27,400		32,500		55,900		56,300		28,000		49,100		45,600	
Lead	mg/kg	**420**	140	46.5		15.8		7.16		7.55		10.4	J	18.5	J	21.8		4,990		4,480		158		1,120		950	
Lithium	mg/kg	**300**	200	23.8		41.8		39.9		9.00		10.5		15.2		26.3		17.1		16.9		32.2		18.2		19.3	
Magnesium	mg/kg	60,000	**233,000**	4,440		6,720		12,800		3,960		4,900		5,440		7,310		3,950		3,930		5,560		4,720		4,410	
Manganese	mg/kg	**12,000**	9,500	218		327		1,470		550		611		567		663		195		219		259		234		278	
Mercury	mg/kg	0.72	**0.85**	0.032	J	0.013	J	0.009	J	0.011	J	0.012	J	0.007	J	0.005	UJ	3.8		3.24		0.069		0.573		0.639	
Molybdenum	mg/kg	**24**	12	1.18		2.95		0.5	U	0.5	U	0.97		0.98		1.35		2.22		1.91		1.99		1.33		1.22	
Nickel	mg/kg	600	**840**	23.3		27		55.4		26.7		5.63		4.89		8.23		22		22.2		25.8		28.1		22.2	
Phosphorus	mg/kg	9,600	**10,500**	620		459		347		50	U	676		632		605		634		635		653		608		450	
Potassium	mg/kg	168,000	**208,500**	1,270		4,690		2,040		660		4,070		5,300		5,270		4,360		4,380		2,550		3,430		3,520	
Selenium	mg/kg	**4.8**	0.5	0.68		0.41		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.61		0.52		0.23		0.35		0.31	
Silver	mg/kg	-	**0.75**	0.18		0.12		0.1	U	0.1	U	0.12		0.11		0.13		8.32		6.94		0.41		2.23		2.1	
Sodium	mg/kg	60,000	**235,500**	170		340		100	U	100	U	200		230		780		280		270		180		170		150	
Strontium	mg/kg	3,000	**3,700**	33		20.1		24.8		6.72		14.9		13.9		27.9		28.8		30.4		28.5		18		17.1	
Sulphur	mg/kg	**8,400**	3,500	1,300		900		1,900		1,900		2,600		2,300		6,400		8,400		7,400		1,400		2,700		3,200	
Thallium	mg/kg	**108**	8.5	0.175		0.318		0.273		0.158		0.369		0.422		0.329		2.47		2.38		0.376		0.96		0.953	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2.2		2	U	2	U	2	U	2	U	2	U	2	
Titanium	mg/kg	-	**56,500**	417		762		208		8.1	U	416		668		804		459		472		551		408		419	
Uranium	mg/kg	24	**27**	3.92		4.87		1.95		0.749		1.83		2.03		1.41		1.15		1.26		1.93		1.17		1.33	
Vanadium	mg/kg	1,080	**1,200**	31.4		38.5		36.3		6.88		48.3		53.8		63.4		37.1		37.3		39		32.3		30.6	
Zinc	mg/kg	**1,080**	700	511		629		3,260		748		979		754		1,230		663		694		256		533		464	
Moisture	percent	-	-	24.9	J	11.4	J	4.47	J	10.8	J	7.15	J	6.69	J	8.97	J	6.15	J	6.17	J	8.79	J	4.26	J	4.69	
pH (1:2 soil:water)	pH Units	-	-	5.88		7.2		6.73		6.83		7.22		7.42		7.14		3.22		3.2		6.92		3.31		3.27	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	0.8	U	7.41		3.95		2.37		2.58		1.66		0.8	UJ	0.8	UJ	0.8	UJ	0.8	UJ	0.8	

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				(Zone II wash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (Zone II Outwash)		WRD (S-Wells)		WRD (S-Wells)		WRD (S-Wells)							
Sample ID				4-107-06B-SOA		CH14-107-MW006B-SOC		CH14-107-TP002-SOA		CH14-107-TP002-SOB		CH14-107-TP003-SOA		CH14-107-TP003-SOB		CH14-107-TP004-SOA		CH14-107-TP004-SOB		CH14-107-TP004-SOC		CH14-107-MW007B-SOA		CH14-107-MW007B-SOB		CH14-107-MW007B-SOD							
Sample Interval (mbgs)				. - 0.91		4.88 - 5.18		1.7 - 1.7		4 - 4		1.6 - 1.6		5 - 5		1.2 - 1.2		2.5 - 2.5		5.2 - 5.2		3.96 - 4.27		6.71 - 7.01		15.85 - 16.15							
Sample Date		12x Median	10x Crustal	3/2014		8/23/2014		7/21/2014		7/21/2014		7/21/2014		7/21/2014		7/22/2014		7/22/2014		7/22/2014		9/2/2014		9/2/2014		9/2/2014							
Geological Unit		Soil Content [a]	Abundance [b]	lluv		Alluv		WR		WR		WR		WR		WR		WR		WR		Alluv		Alluv		Alluv							
Analyte	**Unit**			Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier						
Aluminum	mg/kg	**852,000**	823,000		13,900		10,500		10,700		11,400		13,200		13,800		13,600		14,000		13,600		11,600		15,300							
Antimony	mg/kg	**60**	2		0.87		3.56	J	0.73		2.97		2.10		1.91		2.55		1.66		0.61		0.78		0.93							
Arsenic	mg/kg	**72**	18		14.0		34.1		11.8		49.3		22.3		34.1		29.0		18.5		5.9		7.07		5.70							
Barium	mg/kg	**6,000**	4,250		87.8		287		105		263		226		290		397		112		117		80.1		113							
Beryllium	mg/kg	**72**	30		3.40		0.98		0.64		0.88		1.06		0.58		1.45		1.35		0.64		1.71		1.11							
Bismuth	mg/kg	-	**0.085**	J	0.30		1.67	J	1.12		1.63		3.77		5.47		4.29		6.25		0.58		0.36		0.31							
Boron	mg/kg	-	**100**	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U						
Cadmium	mg/kg	**4.2**	1.5		0.233		0.674		2.03		0.525		1.4		0.556		1.22		3.75		0.848		0.088		0.293							
Calcium	mg/kg	180,000	**415,000**		2,360		1,280		2,810		1,410		1,150		3,010		1,930		1,660		4,500		3,050		3,510							
Chromium	mg/kg	840	**1,020**		23.3		24.2		22.0		23.9		23.9		32.1		27.8		27.8		31.2		35.9		41.0							
Cobalt	mg/kg	96	**250**		6.98		16.3		12.9		16.2		21.7		18.6		20.8		90.1		10.2		6.45		9.94							
Copper	mg/kg	360	**600**		23.2		91.2		36.8		88.3		70.1		81.1		92		84.1		30		17.9		23.5							
Iron	mg/kg	480,000	**563,000**		65,000		46,300		25,600		47,000		44,900		47,800		50,500		44,300		19,100		20,800		24,900							
Lead	mg/kg	**420**	140		11		878	J	133		787		812		667		844		956		13.7		14.1		11.8							
Lithium	mg/kg	**300**	200		24.1		15.8		19.4		16.2		21		21.1		20.5		27		24.3		26.9		30.0							
Magnesium	mg/kg	60,000	**233,000**		4,710		3,790		4,260		4,000		4,830		5,570		4,330		5,360		6,160		5,280		6,830							
Manganese	mg/kg	**12,000**	9,500		233		365		782		338		699		462		360		2,400		231		176		241							
Mercury	mg/kg	0.72	**0.85**		0.03		0.41	J	0.044		0.472		0.24		0.248		0.22		0.115		0.026		0.009		0.023							
Molybdenum	mg/kg	**24**	12		2.74		1.21		0.85		1.44		1.37		1.66		1.66		2.33		0.77		1.18		1.79							
Nickel	mg/kg	600	**840**		20.5		27.5		24.3		29.4		28.4		28.8		37.1		30.3		32.4		27.9		32.3							
Phosphorus	mg/kg	9,600	**10,500**		647		479		695		581		508		842		760		637		666		722		842							
Potassium	mg/kg	168,000	**208,500**		2,080		2,770		1,430		2,720		2,430		2,140		1,990		1,640		1,860		1,780		2,370							
Selenium	mg/kg	**4.8**	0.5		0.72		0.42		0.26		0.4		0.32		0.49		0.58		0.5		0.84		0.38		0.42							
Silver	mg/kg	-	**0.75**		0.18		1.49		0.25		4.23		0.89		1.15		1.54		1.61		0.2		0.15		0.24							
Sodium	mg/kg	60,000	**235,500**		100	U	160		200		150		140		220		100		100	U	310		190		310							
Strontium	mg/kg	3,000	**3,700**		29.5		26.2		32.8		21.3		20.2		29.7		26.3		15.6		43		24.8		32.3							
Sulphur	mg/kg	**8,400**	3,500		1,000		1,200		800		1,900		1,600		3,900		2,000		700		600		500	U	500	U						
Thallium	mg/kg	**108**	8.5		0.17		0.801	J	0.377		0.774		0.85		0.925		1.17		1.06		0.511		0.222		0.174							
Tin	mg/kg	**48**	23	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U						
Titanium	mg/kg	-	**56,500**		394		352		334		353		263		382		275		286		469		501		455							
Uranium	mg/kg	24	**27**		3.45		2.08		1.8		1.74		1.64		1.26		2.74		1.86		1.33		1.18		1.93							
Vanadium	mg/kg	1,080	**1,200**		35.3		30.9		27.9		30.2		28.3		41.7		37.1		35.8		35.9		31.3		40.4							
Zinc	mg/kg	**1,080**	700		816		661		688		617		991		822		1,380		1,140		406		398		208							
Moisture	percent	-	-	J	9.78	J	4.83	J	6.53	J	5.54	J	6.48	J	11.5	J	12.1	J	10.8	J	10.2	J	12.1	J	11.9	J						
pH (1:2 soil:water)	pH Units	-	-		6.68		4.58		5.63		4.14		4.68		2.73		3.94		6.56		6.34		6.4		6.87							
Organic Matter	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT							
Total Organic Carbon	percent	-	-		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT							
Total Inorganic Carbon	percent	-	-	UJ	0.1	UJ	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	NT		0.1	U						
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	UJ	0.8	UJ	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	NT		0.8	U						

Table 3-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**		**WRD (S-Wells)**	
Sample ID				**CH14-107-MW008B-SOA**		**CH14-107-MW008B-SOB**		**CH14-107-MW008B-SOC**		**CH14-107-MW010-SOA**		**CH14-107-MW010-SOC**		**CH14-107-MW010-SOE**		**CH14-107-MW010-SOG**		**CH14-107-MW010-SOI**		**CH14-107-MW910-SOI**		**CH14-107-MW010-SOK**	
Sample Interval (mbgs)				**2.13 - 2.44**		**5.18 - 5.49**		**8.23 - 8.53**		**1.22 - 1.52**		**3.35 - 3.66**		**7.62 - 7.92**		**11.28 - 11.58**		**15.54 - 15.85**		**15.54 - 15.85**		**0 - 0**	
Sample Date		**12x Median Soil Content** [a]	**10x Crustal Abundance** [b]	**9/9/2014**		**9/9/2014**		**9/9/2014**		**8/30/2014**		**8/30/2014**		**8/30/2014**		**8/30/2014**		**8/30/2014**		**8/30/2014**		**8/30/2014**	
Geological Unit				**Alluv**		**Alluv**		**Alluv**		**Fill**		**Soil**		**Alluv**		**Alluv**		**Alluv**		**Alluv**			
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	9,070		6,310		12,000		12,400		11,900		15,300		13,500		8,780		8,230		5,980	
Antimony	mg/kg	**60**	2	0.1	U	0.1	U	0.1	U	0.45		0.51		0.53		0.70		0.42		0.66		0.38	
Arsenic	mg/kg	**72**	18	7.88		8.08		8.31		8.56		4.43		7.43		153		3.24	J	5.84	J	6.83	
Barium	mg/kg	**6,000**	4,250	131		74.1	J	66.9		131		131		137		65.9		43.6		36.4		86.6	
Beryllium	mg/kg	**72**	30	0.45		0.29		0.73		0.60		0.60		1.57		3.97		0.68		0.82		1.14	
Bismuth	mg/kg	-	**0.085**	0.26		0.2	U	0.32		0.29		0.35		1.80		2.14		0.2	UJ	1.69	J	0.2	U
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.325		0.134		0.100		0.772		0.744		0.071		0.075		0.159		0.264		0.05	U
Calcium	mg/kg	180,000	**415,000**	3,670		2,130		3,040		3,780	J	3,490		5,220		2,650		2,600		1,740		3,080	
Chromium	mg/kg	840	**1,020**	18.0		12.9		24.2		23.7	J	28.9		36.5		25.9		18.3		19.5		24.3	
Cobalt	mg/kg	96	**250**	7.12		5.96		7.60		7.98		7.56		10.5		8.42		5.12		5.22		24.7	
Copper	mg/kg	360	**600**	12.2		7.89		25.1		22.9		31.8		27.1		22.1		10.3		9.69		12.1	
Iron	mg/kg	480,000	**563,000**	14,800		15,100		26,300		19,900		15,200		36,000		59,400		15,200		14,800		63,400	
Lead	mg/kg	**420**	140	21.6		6.62		25.5		14.7		16.3		11.2		12.3		8.27		11.1		7.61	
Lithium	mg/kg	**300**	200	19.2		14.5		30.8		24.2		24.9		32.8		27.4		18.4		19.2		10.6	
Magnesium	mg/kg	60,000	**233,000**	3,650		3,160		4,960		5,030		5,750		5,880		5,620		4,010		3,950		10,600	
Manganese	mg/kg	**12,000**	9,500	271		142		221		368		227		276		187		143		142		1,090	
Mercury	mg/kg	0.72	**0.85**	0.022	J	0.01	J	0.013	J	0.029		0.027		0.009		0.013		0.04	J	0.008	J	0.008	
Molybdenum	mg/kg	**24**	12	0.90		1.32		1.98		0.68		0.5	U	2.33		3.66		0.64		0.67		0.94	
Nickel	mg/kg	600	**840**	17.3		14.8		17.9		29.7		39.1		22.4		24.1		16.7		16.7		48.9	
Phosphorus	mg/kg	9,600	**10,500**	651		580	J	430		587		510		638		808		849	J	455	J	541	
Potassium	mg/kg	168,000	**208,500**	920		910		2,180		1,570		1,540		3,410		2,090		1,260		1,240		1,830	
Selenium	mg/kg	**4.8**	0.5	0.37		0.2	U	0.21		0.27		0.69		0.25		0.68		0.2	UJ	1.6	J	0.2	U
Silver	mg/kg	-	**0.75**	0.13		0.1	U	0.15		0.21		0.19		2.43		0.16		0.13		0.21		0.1	U
Sodium	mg/kg	60,000	**235,500**	160		110		330		260		220		360		200		120		150		100	U
Strontium	mg/kg	3,000	**3,700**	29.5		22.1		45.2		43.4		34.5		63.1		25.1		25.4		15.9		17	
Sulphur	mg/kg	**8,400**	3,500	800		500	U	700		500	U	900		600		1,100		500	U	500	U	1,400	
Thallium	mg/kg	**108**	8.5	0.154		0.097		0.269		0.194		0.168		0.3		0.162		0.095	J	1.54	J	0.102	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	325		182		520		393		394		850		411		281		290		19.9	
Uranium	mg/kg	24	**27**	2.25		1.07		2.07		1.65		2.66		1.37		2.17		0.95		0.908		1.55	
Vanadium	mg/kg	1,080	**1,200**	23.8		22		33.5		29.3		30.1		35.8		29.9		23.2		21.2		28	
Zinc	mg/kg	**1,080**	700	80.3		83.5		146		915		1,220		277		575		240		207		630	
Moisture	percent	-	-	24.1	J	13.3	J	12.1	J	7.57	J	11.5	J	19.1	J	7.34	J	9.72	J	8.48	J	8.1	J
pH (1:2 soil:water)	pH Units	-	-	6.06		6.77		7.39		6.17		6.16		7.14		6.72		6.58		6.66		7.67	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1	U	NT		0.1	U	NT		0.1	U	0.1	U	1.4	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	0.8	U	0.8	U	0.8	U	NT		0.8	U	NT		0.8	U	0.8	U	11.6	

Table 3-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:

Laboratory data has been validated by CH2M HILL prior to importing to EquIS. This summary table has been through QA/QC.

Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.

Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.

Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content***and*** 10x the crustal abundance.

[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London

[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).

12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

Alluv = Alluvium
BR - PHY = phyllitic bedrock
$CaCO_3$ = calcium carbonate
J = This analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NT = not tested
QA/QC = Quality Assurance and Quality Control
R = Data rejected
U = This analyte was analyzed for but not detected at the specified detection limit
WR = Waste Rock

Table 3-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential							Neutralization Potential						
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP:AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH12-014-MW003-SOA	**WRD (Main)**	surface		7/29/2012	6.09		5,920		0.42		27,100		47.7	73		730	81		15.3
CH12-014-MW003-SOJ	**WRD (Main)**	2.44	2.44	7/29/2012	6.13	J	842		1.11		199,000		*622*	69		690	NT		1.1
CH12-014-MW003-SOB	**WRD (Main)**	5.18	5.18	7/29/2012	6.72		1,460		0.04		35,600		104	59		590	66		5.7
CH12-014-MW003-SOC	**WRD (Main)**	11.6	11.6	7/30/2012	6.85		1,190		0.01	U	6,500		18.1	34		340	38		18.8
CH12-014-MW003-SOK	**WRD (Main)**	14.0	14.0	7/30/2012	7.02	J	796		0.01	U	13,100		*40.9*	58		580	NT		14.2
CH12-014-MW003-SOL	**WRD (Main)**	14.9	14.9	7/30/2012	7.11	J	894		0.01	U	8,500		*26.6*	58		580	NT		21.8
CH12-014-MW003-SOD	**WRD (Main)**	16.5	16.5	7/30/2012	6.88		1,230		0.01	U	5,600		15.2	54		540	61		35.6
CH12-014-MW003-SOE	**WRD (Main)**	19.8	19.8	7/30/2012	6.99		874		0.01	U	1,800		5.6	38		380	43		67.6
CH12-014-MW003-SOF	**WRD (Main)**	23.5	23.5	7/30/2012	7.64		687		0.01	U	3,700	J	11.6	41		410	46		35.5
CH12-014-MW903-SOF	**WRD (Main)**	23.5	23.5	7/30/2012	NT		1,125		0.01		8,800	J	27.5	NT		NC	NT		NC
CH12-014-MW003-SOG	**WRD (Main)**	25.9	25.9	7/30/2012	7.45		1,025		0.01	U	5,400		15.6	48		480	54		30.8
CH12-014-MW003-SOH	**WRD (Main)**	29.0	29.0	7/30/2012	7.66		670		0.01	U	4,000		10.6	42		420	47		39.6
CH12-014-MW003-SOI	**WRD (Main)**	29.9	29.9	7/30/2012	7.55		351		0.03		2,100		4.95	48		480	53		97.0
CH14-106-MW009-SOA	**WRD (Main)**	2.4	2.7	8/16/2014	7.68		1,795		0.01	U	15,800		47.1	35		350	NT		7.4
CH14-106-MW009-SOD	**WRD (Main)**	13.1	13.4	8/17/2014	7.27		1,260		0.05		4,200		10.4	26		260	NT		25.1
CH14-106-MW009-SOI	**WRD (Main)**	28.0	28.4	8/17/2014	7.31		1,090		0.02		4,800		13.4	16		160	NT		11.9
CH14-106-MW009-SOK	**WRD (Main)**	32.9	33.2	8/17/2014	7.12		1,410		0.16		4,000		6.07	11		110	NT		18.1
CH14-106-MW909-SOK	**WRD (Main)**	32.9	33.2	8/17/2014	7.1		1,370		0.11		5,200		11.5	12		120	NT		10.5
CH14-106-MW009-SOM	**WRD (Main)**	40.8	41.2	8/17/2014	7.4		1,095		0.01		2,100		5.28	14		140	NT		26.5
CH14-106-MW009-SOP	**WRD (Main)**	48.5	48.8	8/19/2014	5.27		4,410		0.22		14,200		32.1	14		140	NT		4.4
CH14-106-MW009-SOT	**WRD (Main)**	60.1	60.4	8/19/2014	7.54		456		0.01		1,200		2.94	44		440	NT		150
CH14-106-TP001-SOA	**WRD (Main)**	1.3	1.3	7/18/2014	3.8		3,410		1.06		53,300		127.5	12		120	NT		0.9
CH14-106-TP001-SOC	**WRD (Main)**	5	5	7/18/2014	7.28		815		0.36		5,500		*17*	44		440	NT		25.6
CH14-106-TP901-SOC	**WRD (Main)**	5	5	7/18/2014	7.33		750		0.36		5,000		*16*	69		690	NT		44.2
CH14-106-TP002-SOA	**WRD (Main)**	2.5	2.5	7/18/2014	7.29		4,920		0.19		8,300		13.5	31		310	NT		22.9
CH14-106-TP002-SOC	**WRD (Main)**	5	5	7/18/2014	7.21		2,750		0.23		12,100		27.6	24		240	NT		8.7
CH14-106-TP003-SOA	**WRD (Main)**	1.4	1.4	7/19/2014	7.27		1,770		0.18		22,100		59.3	47		470	NT		7.9
CH14-106-TP003-SOB	**WRD (Main)**	4.1	4.1	7/19/2014	7.38		2,620		0.16		13,300		31.8	54		540	NT		17.0
CH14-106-TP003-SOC	**WRD (Main)**	5.3	5.3	7/19/2014	7.22		1,975		0.69		36,100		80.1	28		280	NT		3.5
CH14-106-TP004-SOA	**WRD (Main)**	1.8	1.8	7/19/2014	1.8		2,270		2.48		75,000		150	1	U	10	NT		0.1
CH14-106-TP004-SOC	**WRD (Main)**	5.1	5.1	7/19/2014	6.38		2,620		0.5		45,800		116	27		270	NT		2.3
CH14-106-TP005-SOA	**WRD (Main)**	2.3	2.3	7/19/2014	7.06		855		0.13		7,100		17.2	109		1,090	NT		63.4
CH14-106-TP005-SOC	**WRD (Main)**	5.4	5.4	7/19/2014	7.15		1,425		0.22		5,000		6.59	72		720	NT		109
CH14-106-TP006-SOA	**WRD (Main)**	1.6	1.6	7/19/2014	1.94		2,050		2.86		26,200		*82*	1	U	10	NT		0.1
CH14-106-TP006-SOC	**WRD (Main)**	5.3	5.3	7/19/2014	2.6		2,400		3.18		90,500		170	1	U	10	NT		0.1
CH14-106-TP008-SOA	**WRD (Main)**	2	2	7/19/2014	7.14		1,665		0.22		9,500		21.1	31		310	NT		14.7
CH14-106-TP008-SOB	**WRD (Main)**	3.5	3.5	7/19/2014	7.3		1,490		0.26		7,400		13.1	85		850	NT		65.0
CH14-106-TP008-SOC	**WRD (Main)**	5.2	5.2	7/19/2014	7.31		2,080		0.16		7,800		17.1	85		850	NT		49.7
CH14-106-TP015-SOCOMP	**WRD (Main)**	1.5	5.5	7/19/2014	6.74		1,060		0.02		3,000		5.50	38		380	NT		69.1
CH12-014-MW007-SOA	**WRD (Intermediate)**	1.82	1.82	7/31/2012	7.2		776		0.01	U	2,900		7.38	29		290	32		39.3
CH12-014-MW007-SOM	**WRD (Intermediate)**	Surface		7/31/2012	7.04	J	810		0.01	U	5,000		*15.6*	66*		660*	NT		42.2
CH12-014-MW007-SON	**WRD (Intermediate)**	3.05	3.05	7/31/2012	6.96	J	1,400		0.01		8,200		*25.6*	25		250	NT		9.8
CH12-014-MW007-SOO	**WRD (Intermediate)**	5.49	5.49	7/31/2012	7	J	1,590		0.01		9,100		*28.4*	18		180	NT		6.3
CH12-014-MW007-SOB	**WRD (Intermediate)**	10.4	10.4	7/31/2012	6.51		1,125		0.02		15,000		43.0	12*		120*	31		2.8
CH12-014-MW007-SOC	**WRD (Intermediate)**	14	14	7/31/2012	7.28		1,380		0.08		15,900		43.7	67		670	75		15.3
CH12-014-MW007-SOP	**WRD (Intermediate)**	15.85	15.85	7/31/2012	6.5	J	1,440		0.11		21,100		*65.9*	13		130	NT		2.0
CH12-014-MW007-SOD	**WRD (Intermediate)**	20.1	20.1	7/31/2012	7.1		857		0.01	U	8,800		26.5	14*		140*	36		5.3

Table 3-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential							Neutralization Potential						
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP:AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH12-014-MW007-SOQ	**WRD (Intermediate)**	22.86	22.86	7/31/2012	6.69	J	1,560		0.01	U	14,600		*45.6*	20		200	NT		4.4
CH12-014-MW007-SOE	**WRD (Intermediate)**	25	25	7/31/2012	7.08		1,585		0.03		15,900		45.9	17*		170*	48		3.7
CH12-014-MW007-SOF	**WRD (Intermediate)**	28	28	7/31/2012	7.23		1,155		0.01	U	5,300		15.0	34*		340*	35		22.7
CH12-014-MW907-SOF	**WRD (Intermediate)**	28	28	7/31/2012	6.25		1,770		0.02		7,100		19.6	NT		NC	NT		NC
CH12-014-MW007-SOG	**WRD (Intermediate)**	36.9	36.9	7/31/2012	6.25		3,060		0.06		16,700		46.2	37		370	NT		8.0
CH12-014-MW007-SOH	**WRD (Intermediate)**	40.5	40.5	7/31/2012	6.38		2,570		0.05		12,200		30.4	45		450	NT		14.8
CH12-014-MW007-SOI	**WRD (Intermediate)**	44.5	44.5	7/31/2012	5.7		4,300		0.15		43,100		114	3		30	NT		0.3
CH12-014-MW007-SOJ	**WRD (Intermediate)**	47.9	47.9	8/1/2012	5.58		1,095		0.01	U	3,900		7.65	6		60	NT		7.8
CH12-014-MW007-SOK	**WRD (Intermediate)**	50.3	50.3	8/1/2012	6.28		891		0.01	U	2,100		2.03	5		50	NT		24.7
CH12-014-MW007-SOL	**WRD (Intermediate)**	54.9	54.9	8/1/2012	6.37		NT		NT		2,000		*5.73*	4		40	NT		7.0
CH14-106-TP007-SOA	**WRD (Intermediate)**	1.4	1.4	7/20/2014	3.76		9,970		1.37		131,000		333	9	J	90	NT		0.3
CH14-106-TP907-SOA	**WRD (Intermediate)**	1.4	1.4	7/20/2014	3.95		10,000	J	1.06		138,000		367	16	J	160	NT		0.4
CH14-106-TP007-SOC	**WRD (Intermediate)**	5.5	5.5	7/20/2014	6.96		5,200		1.02		37,800		73.9	52		520	NT		7.0
CH14-106-TP009-SOA	**WRD (Intermediate)**	1.5	1.5	7/20/2014	7.15		1,535		0.03		5,400		12.6	67		670	NT		53.1
CH14-106-TP009-SOC	**WRD (Intermediate)**	5.5	5.5	7/20/2014	7.4		1,545		0.02		5,500		14.8	97		970	NT		65.4
CH14-106-TP010-SOA	**WRD (Intermediate)**	1.5	1.5	7/20/2014	1.91		4,060		3.79		238,000		616	1	U	10	NT		0.02
CH14-106-TP010-SOB	**WRD (Intermediate)**	3.9	3.9	7/20/2014	2.25		2,920		3.87		57,600		51.2	3		30	NT		0.6
CH14-106-TP010-SOC	**WRD (Intermediate)**	5.5	5.5	7/20/2014	3.82		1,055		4.93		17,300		*54*	103		1,030	NT		19.1
CH14-106-TP011-SOA	**WRD (Intermediate)**	1.5	1.5	7/20/2014	3.65		9,130		1.58		55,900		103	6		60	NT		0.6
CH14-106-TP011-SOC	**WRD (Intermediate)**	5	5	7/20/2014	4.46		3,310		1.53		70,100		158	28		280	NT		1.8
CH14-106-TP012-SOA	**WRD (Intermediate)**	1.8	1.8	7/20/2014	7.25		2,540		0.08		19,400		54.5	57		570	NT		10.5
CH14-106-TP012-SOB	**WRD (Intermediate)**	4.1	4.1	7/20/2014	4.42		1,650		0.18	J	18,200	J	44.7	10		100	NT		2.2
CH14-106-TP912-SOB	**WRD (Intermediate)**	4.1	4.1	7/20/2014	4.11		1,745		0.34	J	43,600	J	111	5		50	NT		0.5
CH14-106-TP012-SOC	**WRD (Intermediate)**	5	5	7/20/2014	2.9		1,840		1.28		34,600		61.7	1	U	10	NT		0.2
CH14-106-TP016-SOCOMP	**WRD (Intermediate)**	1.3	5.1	7/20/2014	6.78		1,090		0.08		8,600		20.6	76		760	NT		36.9
CH14-106-TP017-SOCOMPA	**WRD (Intermediate)**	1.5	5.5	7/22/2014	3.95		3,450		0.74		40,700		93.8	8		80	NT		0.9
CH14-106-TP017-SOCOMPB	**WRD (Intermediate)**	1.5	5.5	7/22/2014	3.92		2,610		0.69		63,000		166	7		70	NT		0.4
CH13-108-TP002-SOA	**WRD (UPL)**	0	5	7/12/2013	7.76		667		0.01	U	1,600		3.59	120		1,200	NT		334
CH13-108-TP006-SOA	**WRD (NW)**	0	5	7/13/2013	7.71		NT		NT		1,000		3.13	116		1,160	NT		371
CH13-108-TP009-SOA	**WRD (NW)**	0	5	7/13/2013	7.46		998		0.03		1,700		3.9	105		1,050	NT		269
CH13-108-TP011-SOA	**WRD (NW)**	0	5	7/13/2013	7.75		NT		NT		1,200		*3.75*	142		1,420	NT		379
CH13-108-TP015-SOA	**WRD (NW)**	0	5	7/15/2013	6.84		1,185		0.01		7,100		21.12	63		630	NT		29.8
CH14-015-MW004-SOA	**WRD (NW)**	0.76	1.37	8/10/2014	6.72	J	NT		NT		2,500		*7.8*	16		160	NT		20.5
CH14-015-MW904-SOA	**WRD (NW)**	0.8	1.4	8/10/2014	6.84	J	NT		NT		4,100		*12.8*	18		180	NT		14.0
CH14-015-MW004-SOD	**WRD (NW)**	5.2	5.5	8/10/2014	4.67		NT		NT		3,200		*10.0*	8		80	NT		8.0
CH14-015-MW004-SOF	**WRD (NW)**	8.2	8.5	8/10/2014	2.49		NT		NT		61,100		*191*	1	U	10	NT		0.1
CH14-015-MW904-SOF	**WRD (NW)**	8.2	8.5	8/10/2014	2.52		NT		NT		66,700		*208*	1	U	10	NT		0.0
CH14-015-MW004-SOI	**WRD (NW)**	12.8	13.1	8/10/2014	4.47		NT		NT		12,000		*37.5*	9		90	NT		2.4
CH14-015-MW004-SOJ	**WRD (NW)**	14.9	15.2	8/10/2014	4.43		NT		NT		13,600		*42.5*	NT		NC	NT		NC
CH14-015-MW004-SOL	**WRD (NW)**	17.7	18.0	8/10/2014	5.66		NT		NT		35,500		*110.9*	20		200	NT		1.8
CH14-015-MW004-SOM	**WRD (NW)**	20.1	20.4	8/10/2014	6.47		NT		NT		10,200		*31.9*	23		230	NT		7.2
CH14-015-MW004-SOP	**WRD (NW)**	28.4	28.7	8/11/2014	5.84		NT		NT		6,000		*18.8*	NT		NC	NT		NC
CH14-015-MW004-SOS	**WRD (NW)**	35.1	35.4	8/11/2014	6.88		NT		NT		1,500		*4.69*	94		940	NT		201
CH14-106-TP013-SOCOMP	**WRD (NW)**	1.5	5.4	7/18/2014	6.61		982		0.06		2,600		5.02	14		140	NT		27.9
CH14-106-TP014-SOCOMP	**WRD (NW)**	1.7	5.8	7/18/2014	7.14		1,280		0.22		6,500		10.5	18		180	NT		17.2
CH14-015-MW006-SOB	**WRD (NE)**	3.4	3.7	8/14/2014	6.91		NT		NT		1,700		*5.31*	23		230	NT		43.3
CH14-015-MW006-SOC	**WRD (NE)**	7.6	7.9	8/15/2014	6.45		NT		NT		2,100		*6.56*	11		110	NT		16.8

Table 3-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential							Neutralization Potential						
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP:AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH14-015-MW006-SOE	**WRD (NE)**	14.0	14.3	8/15/2014	7.1		NT		NT		1,700		*5.31*	28		280	NT		52.7
CH14-015-MW006-SOF	**WRD (NE)**	18.3	18.6	8/15/2014	4.47		NT		NT		1,800		*5.63*	NT		NC	NT		NC
CH14-015-MW006-SOI	**WRD (NE)**	26.8	27.1	8/15/2014	7.05		NT		NT		2,900		*9.06*	120		1,200	NT		132
CH14-106-TP018-SOCOMP	**WRD (NE)**	1.5	5.2	7/22/2014	7.03		582		0.02		1,700		3.02	105		1,050	NT		348
CH14-106-TP019-SOCOMP	**WRD (NE)**	1.5	5.1	7/22/2014	4.2		2,380		0.15		2,500		0.580	8		80	NT		138
CH14-106-TP020-SOA	**WRD (Toe of NE)**	1.5	1.5	7/21/2014	5.08		760		0.01	U	500	U	0.519	9		90	NT		173
CH14-106-TP023-SOA	**WRD (Toe of NE)**	0.5	0.5	7/21/2014	4.68		946		0.01	U	500	U	0.143	8		80	NT		561
CH14-106-TP024-SOA	**WRD (Toe of NE)**	0.5	0.5	7/21/2014	4.14		915		0.02		600		0.0469	8		80	NT		1,704
CH14-106-TP025-SOA	**WRD (Toe of NE)**	0.5	0.5	7/21/2014	4.47		952		0.01	U	500	U	0.366	9		90	NT		246
CH14-106-TP925-SOA	**WRD (Toe of NE)**	0.5	0.5	7/21/2014	4.43		935		0.01	U	500	U	0.410	9		90	NT		219
CH14-106-TP026-SOA	**WRD (Toe of NE)**	1.4	1.4	7/21/2014	4.38		912		0.01	U	500	U	0.427	8		80	NT		187
CH12-014-MW005-SOA	**WRD (Zone II)**	0	0.2	6/25/2012	7.28		748		0.01	U	5,100		14.7	34		340	38		23.2
CH12-014-MW005-SOB	**WRD (Zone II)**	4.5	6.1	6/25/2012	7.23		787		0.01	U	4,100		11.7	42		420	46		35.9
CH12-014-MW005-SOC	**WRD (Zone II)**	10	10.5	6/25/2012	6.85		8,330		0.39		57,800		156	20		200	22		1.3
CH12-014-MW005-SOD	**WRD (Zone II)**	19.6	19.8	6/26/2012	7.42		1,190		0.01		11,100		32.8	67		670	75		20.4
CH12-014-MW005-SOE	**WRD (Zone II)**	15	15.2	6/26/2012	7.11		1,590		0.01	U	15,000		45.3	32		320	36		7.1
CH12-014-MW005-SOF	**WRD (Zone II)**	25	25.4	6/26/2012	7.39		1,030		0.01	U	23,800		73.0	41		410	46		5.6
CH12-014-MW905-SOF	**WRD (Zone II)**	25	25.4	6/26/2012	7.56		804		0.01	U	32,000		99.0	59		590	66		6.0
CH12-014-MW005-SOG	**WRD (Zone II)**	29	31	6/26/2012	6.86		1,730		0.01		19,000		53.1	34		340	38		6.4
CH12-014-MW005-SOH	**WRD (Zone II)**	35	35.4	6/26/2012	7.23		1,420		0.18		16,700		39.7	47		470	52		11.8
CH12-014-MW005-SOI	**WRD (Zone II)**	39.2	40.3	6/26/2012	7.58		2,160		0.01	U	3,400		8.75	25		250	28		28.6
CH12-014-MW005-SOJ	**WRD (Zone II)**	36.4	36.7	6/27/2012	6.31		1,295		0.19		9,100		19.1	30		300	33		15.7
CH12-014-MW005-SOK	**WRD (Zone II)**	37.2	37.45	6/27/2012	7.03		2,200		0.19		88,000		246	31		310	34		1.3
CH14-107-MW001-SOA	**WRD (Zone II)**	3.0	3.4	9/8/2014	7.28		NT		NT		500		*1.56*	33		330	NT		211
CH14-107-MW001-SOB	**WRD (Zone II)**	6.4	6.7	9/8/2014	4.81		NT		NT		500		*1.56*	8		80	NT		51.2
CH14-107-MW001-SOC	**WRD (Zone II)**	8.2	8.5	9/8/2014	4.44		NT		NT		900		*2.81*	6		60	NT		21.3
CH14-107-MW901-SOC	**WRD (Zone II)**	8.2	8.5	9/8/2014	4.22		NT		NT		500	U	*1.56*	7		70	NT		44.8
CH14-107-MW001-SOD	**WRD (Zone II)**	11.3	11.6	9/8/2014	4.16		NT		NT		700		*2.19*	4		40	NT		18.3
CH14-107-MW001-SOE	**WRD (Zone II)**	17.7	18.0	9/9/2014	4.46		NT		NT		500	U	*1.56*	6		60	NT		38.4
CH14-107-MW001-SOF	**WRD (Zone II)**	19.5	19.8	9/9/2014	4.16		NT		NT		5,800		*18.1*	13		130	NT		7.2
CH14-107-MW002-SOA	**WRD (Zone II)**	4.3	4.6	9/8/2014	4.37		NT		NT		500	U	*1.56*	5		50	NT		32.0
CH14-107-MW002-SOB	**WRD (Zone II)**	6.7	7.0	9/8/2014	4.09		NT		NT		500	U	*1.56*	7		70	NT		44.8
CH14-107-MW002-SOC	**WRD (Zone II)**	9.8	10.1	9/8/2014	4.06		NT		NT		500	U	*1.56*	3		30	NT		19.2
CH14-107-MW002-SOD	**WRD (Zone II)**	11.3	11.6	9/8/2014	4.22		NT		NT		500	U	*1.56*	6		60	NT		38.4
CH14-107-MW003-SOA	**WRD (Zone II)**	1.8	2.1	8/21/2014	4.38	J	NT		NT		1,000		*3.13*	3		30	NT		9.6
CH14-107-MW003-SOD	**WRD (Zone II)**	11.9	12.2	8/21/2014	6.73	J	NT		NT		1,500		*4.69*	10		10	NT		2.1
CH14-107-MW003-SOF	**WRD (Zone II)**	18.9	19.2	8/21/2014	7.22	J	NT		NT		700		*2.19*	22		220	NT		101
CH14-107-MW003-SOH	**WRD (Zone II)**	25.0	25.3	8/21/2014	4.54	J	NT		NT		1,000		*3.13*	8		80	NT		25.6
CH14-107-MW003-SOI	**WRD (Zone II)**	28.4	28.7	8/21/2014	6.27	J	NT		NT		800		*2.50*	10		100	NT		40.0
CH14-107-MW003-SOK	**WRD (Zone II)**	34.8	35.1	8/22/2014	4.54	J	NT		NT		6,300		*19.7*	12		120	NT		6.1
CH14-107-MW003-SOM	**WRD (Zone II)**	39.9	40.2	8/22/2014	4.24	J	NT		NT		6,100		*19.1*	10		100	NT		5.2
CH14-107-MW004-SOB	**WRD (Zone II)**	2.4	2.7	8/28/2014	4.45		NT		NT		1,300		*4.06*	7		70	NT		17.2
CH14-107-MW004-SOD	**WRD (Zone II)**	8.8	9.1	8/28/2014	4.52		NT		NT		900		*2.81*	5		50	NT		17.8
CH14-107-MW004-SOG	**WRD (Zone II)**	18.6	18.9	8/28/2014	6.42		NT		NT		1,900		*5.94*	22		220	NT		37.1
CH14-107-MW004-SOI	**WRD (Zone II)**	25.6	25.9	8/28/2014	4.21		NT		NT		1,900		*5.94*	12		120	NT		20.2
CH14-107-MW004-SOK	**WRD (Zone II)**	29.3	29.6	8/28/2014	5.4		NT		NT		2,600		*8.13*	19		190	NT		23.4
CH14-107-MW904-SOK	**WRD (Zone II)**	29.3	29.6	8/28/2014	4.35		NT		NT		2,300		*7.19*	21		210	NT		29.2

Table 3-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential							Neutralization Potential						
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP:AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH14-107-MW004-SOL	**WRD (Zone II)**	34.4	34.8	8/28/2014	5.33		NT		NT		6,400		*20.0*	14		140	NT		7.0
CH14-107-MW005B-SOA	**WRD (Zone II)**	0.9	1.2	8/23/2014	3.21	J	NT		NT		8,400		*26.3*	2		20	NT		0.8
CH14-107-MW905B-SOA	**WRD (Zone II)**	0.9	1.2	8/23/2014	3.22	J	NT		NT		7,400		*23.1*	1		10	NT		0.4
CH14-107-MW005B-SOC	**WRD (Zone II)**	5.2	5.5	8/23/2014	4.4	J	NT		NT		1,400		*4.38*	9		90	NT		20.6
CH14-107-MW006B-SOA	**WRD (Zone II)**	0.6	0.9	8/23/2014	3.08	J	NT		NT		2,700		*8.44*	1		10	NT		1.2
CH14-107-MW906B-SOA	**WRD (Zone II)**	0.6	0.9	8/23/2014	3.55		NT		NT		3,200		*10.0*	1		10	NT		1.0
CH14-107-MW006B-SOC	**WRD (Zone II)**	4.9	5.2	8/23/2014	4.6		NT		NT		1,000		*3.13*	6		60	NT		19.2
CH14-107-TP001-SOA	**WRD (Zone II)**	1.6	1.6	7/22/2014	7.66		973		0.02		3,600		6.65	73		730	NT		110
CH14-107-TP001-SOB	**WRD (Zone II)**	3	3	7/22/2014	7.4		2,900		0.01	U	14,500		39.7	50		500	NT		12.6
CH14-107-TP001-SOC	**WRD (Zone II)**	5.5	5.5	7/22/2014	7.3		910		0.01	U	6,300		18.4	44		440	NT		24.0
CH14-107-TP901-SOC	**WRD (Zone II)**	5.5	5.5	7/22/2014	7.15		921		0.01		6,000		16.7	36		360	NT		21.5
CH14-107-TP002-SOA	**WRD (Zone II)**	1.7	1.7	7/21/2014	4.1		1,510		0.03		1,200		0.272	3		30	NT		110
CH14-107-TP002-SOB	**WRD (Zone II)**	4	4	7/21/2014	4.19		1,090		0.01		800		0.273	5		50	NT		183
CH14-107-TP003-SOA	**WRD (Zone II)**	1.6	1.6	7/21/2014	3.93		1,420		0.03		1,900		2.64	4		40	NT		15.2
CH14-107-TP003-SOB	**WRD (Zone II)**	5	5	7/21/2014	4.06		1,185		0.03		1,600		1.29	3		30	NT		23.3
CH14-107-TP004-SOA	**WRD (Zone II)**	1.2	1.2	7/22/2014	2.61		1,620		0.28		3,900		0.672	1	U	10	NT		14.9
CH14-107-TP004-SOB	**WRD (Zone II)**	2.5	2.5	7/22/2014	3.79		1,950		0.11		2,000		6	1		10	NT		1.6
CH14-107-TP004-SOC	**WRD (Zone II)**	5.2	5.2	7/22/2014	4.48		1,260		0.01		700		2	4		40	NT		18.3
CH15-107-TP012_Soa	**WRD (Zone II)**	2	2.2	7/27/2015	6.24		968		0.01		900		1.66	10		100	NT		60.2
CH15-107-TP013_SOa	**WRD (Zone II)**	2	2.2	7/27/2015	3.63		1,020		0.01		1,800		4.16	3		30	NT		7.2
CH15-107-TP014_SOa	**WRD (Zone II)**	2	2.2	7/27/2015	6.38		877		0.01		800		0.41	11		110	NT		269.1
CH15-107-TP015_SOa	**WRD (Zone II)**	2	2.2	7/27/2015	6.4		2,200		0.01		3,400		8.6	6		60	NT		7.0
CH15-107-TP016_SOa	**WRD (Zone II)**	0.5	0.7	7/27/2015	5.55		1,420		0.01		1,100		1.11	10		100	NT		90.3
CH14-104-MW008-SOB	**WRD (Stockpiles)**	3.7	4.0	8/12/2014	3.76		10,000	J	2.63		242,000		606	2		20	NT		0.0
CH14-104-MW008-SOD	**WRD (Stockpiles)**	10.4	10.7	8/12/2014	7.23		1,630		0.25		25,200		63.9	20		200	NT		3.1
CH14-104-MW908-SOD	**WRD (Stockpiles)**	10.4	10.7	8/12/2014	7.05		1,800		0.38		26,300		63.7	16		160	NT		2.5
CH14-104-MW008-SOE	**WRD (Stockpiles)**	12.5	12.8	8/12/2014	2.49		2,210		2.4		52,500		77.6	1	U	10	NT		0.1
CH14-104-MW008-SOG	**WRD (Stockpiles)**	16.5	16.8	8/13/2014	6.96		2,000		0.34		6,600		8.01	42		420	NT		52.5
CH14-104-MW008-SOI	**WRD (Stockpiles)**	20.9	21.2	8/13/2014	7.13		2,140		0.44		9,800		14.8	60		600	NT		40.4
CH14-104-MW008-SOL	**WRD (Stockpiles)**	26.5	26.8	8/13/2014	7.05		NT		NT		7,300		*22.8*	26		260	NT		11.4
CH14-104-SS001-SOA	**WRD (Stockpiles)**	0	0.2	7/24/2014	1.77		NT		NT		110,000		*344*	1	U	10	NT		0.0
CH14-104-SS002-SOA	**WRD (Stockpiles)**	0	0.1	7/24/2014	1.71		NT		NT		99,900		*312*	1	U	10	NT		0.0
CH14-104-TP001-SOA	**WRD (Stockpiles)**	1.2	1.2	7/17/2014	3.03		10,000	J	1.46		204,000		519	3		30	NT		0.1
CH14-104-TP001-SOB	**WRD (Stockpiles)**	3.5	3.5	7/17/2014	2.94		10,000	J	1.45		262,000		711	4		40	NT		0.1
CH14-104-TP001-SOC	**WRD (Stockpiles)**	5.8	5.8	7/17/2014	3.82		10,000	J	1.27		204,000		536	16		160	NT		0.3
CH14-104-TP002-SOA	**WRD (Stockpiles)**	0.6	0.6	7/17/2014	3.11		10,000	J	1.42		236,000		645	1	U	10	NT		0.0
CH14-104-TP002-SOB	**WRD (Stockpiles)**	3	3	7/17/2014	4.5		10,000	J	0.61		250,000		696	14		140	NT		0.2
CH14-104-TP002-SOC	**WRD (Stockpiles)**	4.8	4.8	7/17/2014	3.5		10,000	J	1.18		225,000		618	13		130	NT		0.2
CH14-104-TP003-SOA	**WRD (Stockpiles)**	2	2	7/18/2014	1.8		897		1.36		316,000		940	1	U	10	NT		0.0
CH14-104-TP003-SOB	**WRD (Stockpiles)**	4.8	4.8	7/18/2014	2.17		1,520		1.6		118,000		301	1	U	10	NT		0.0
CH14-104-TP003-SOC	**WRD (Stockpiles)**	6	6	7/18/2014	2.35		10,000	J	1.55		88,800		205	1	U	10	NT		0.0
CH14-104-TP903-SOC	**WRD (Stockpiles)**	6	6	7/18/2014	2.27		10,000	J	1.75		89,800		206	1	U	10	NT		0.0
CH14-107-MW007B-SOA	**WRD (S-Wells)**	4.0	4.3	9/2/2014	5		NT		NT		600		*1.88*	8		80	NT		42.7
CH14-107-MW007B-SOB	**WRD (S-Wells)**	6.7	7.0	9/2/2014	4.4		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH14-107-MW007B-SOD	**WRD (S-Wells)**	15.9	16.2	9/2/2014	4.44		NT		NT		500	U	*1.56*	5		50	NT		32.0
CH14-107-MW008B-SOA	**WRD (S-Wells)**	2.1	2.4	9/9/2014	4.88		NT		NT		800		*2.50*	9		90	NT		36.0
CH14-107-MW008B-SOB	**WRD (S-Wells)**	5.2	5.5	9/9/2014	5.29		NT		NT		500	U	*1.56*	4		40	NT		25.6

Table 3-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential							Neutralization Potential						
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP:AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH14-107-MW008B-SOC	**WRD (S-Wells)**	8.2	8.5	9/9/2014	5.36		NT		NT		700		*2.19*	7		70	NT		32.0
CH14-107-MW010-SOA	**WRD (S-Wells)**	1.2	1.5	8/30/2014	4.58		NT		NT		500	U	*1.56*	8		80	NT		51.2
CH14-107-MW010-SOC	**WRD (S-Wells)**	3.4	3.7	8/30/2014	4.82		NT		NT		900		*2.81*	NT		NC	NT		NC
CH14-107-MW010-SOE	**WRD (S-Wells)**	7.6	7.9	8/30/2014	6.41		NT		NT		600		*1.88*	8		80	NT		42.7
CH14-107-MW010-SOG	**WRD (S-Wells)**	11.3	11.6	8/30/2014	4.46		NT		NT		1,100		*3.44*	NT		NC	NT		NC
CH14-107-MW010-SOI	**WRD (S-Wells)**	15.5	15.9	8/30/2014	4.46		NT		NT		500	U	*1.56*	5		50	NT		32.0
CH14-107-MW910-SOI	**WRD (S-Wells)**	15.5	15.9	8/30/2014	4.48		NT		NT		500	U	*1.56*	4		40	NT		25.6
CH14-107-MW010-SOK	**WRD (S-Wells)**	25.3	25.6	8/30/2014	6.8		NT		NT		1,400		*4.38*	19		190	NT		43.4

Notes:

Laboratory data has been validated by CH2M HILL prior to importing to EquIS. This summary table has been through QA/QC.

* Some neutralization potential analyses were completed at a later date on sample splits of the original stored sample; these samples are indicated using "*". All analytical results for neutralization potential followed the MOD-SOBEK-3.2.3 method.

$CaCO_3$ = calcium carbonate

CaO = calcium oxide

J = Analyte was present but the reported value may not be accurate or precise.

kg = kilogram

mg/kg = milligram per kilogram

NC = not calculated

NP:AP = nuetralization potential divided by acid potential

ppm = parts per million

QA/QC = Quality Assurance and Quality Control

U = This analyte was analyzed for but not detected at the specified detection limit.

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)
Sample ID			CH12-014-MW003-SOA	CH12-014-MW003-SOJ	CH12-014-MW003-SOB	CH12-014-MW003-SOC	CH12-014-MW003-SOK	CH12-014-MW003-SOL	CH12-014-MW003-SOD	CH12-014-MW003-SOE	CH12-014-MW003-SOF	CH12-014-MW003-SOG	CH12-014-MW003-SOH	CH12-014-MW003-SOI	CH14-106-MW009-SOA	CH14-106-MW009-SOD	CH14-106-MW009-SOI	CH14-106-MW009-SOK
Depth From (mbgs)				2.44	5.2	11.6	14.0	14.9	16.5	19.8	23.5	25.9	29.0	29.9	2.4	13.1	28.0	32.9
Depth From (mbgs)				2.44	5.2	11.6	14.0	14.9	16.5	19.8	23.5	25.9	29.0	29.9	2.7	13.4	28.4	33.2
Sample Date			7/29/2012	7/29/2012	7/29/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	8/16/2014	8/17/2014	8/17/2014	8/17/2014
pH	**Result (pH units)**	6.5-9.0	6.58	7.01	7.38	7.53	7.8	8.1	7.52	8.07	7.88	7.71	8.6	8.61	7.54	7.46	7.11	7.29
	Result Qualifier			J			J	J										
Acidity	**Result (mg/L)**	-	119	38	1.8	1.8	2.8	1	2.7	1.8	1.4	1.1	1	1	1	1	2.3	2
	Result Qualifier			J			J	R					U	U	U	U		
Total Alkalinity	**Result (mg/L)**	-	12	127	166	189	206	129	190	87.4	104	145	46	47.6	274	231	288	172
	Result Qualifier			J			J	J										
Specific Conductance	**Result (µS/cm)**	-	2490	2880	1580	882	777	478	761	525	597	677	312	217	NT	NT	NT	NT
	Result Qualifier			J			J	J										
ORP Leachable	**Result (mV)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	305	323	297	269
	Result Qualifier																	
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.05	0.025	0.025	0.01	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.0056	0.0069	0.0082	0.0084
	Result Qualifier		U	UJ	U	U	U	U	U	U	U	U	U	U				
Antimony	**Result (mg/L)**	1.6	0.001	0.0005	0.0005	0.00056	0.0001	0.0001	0.00143	0.00869	0.00087	0.00062	0.00256	0.00228	0.00022	0.00017	0.0002	0.00029
	Result Qualifier		U	UJ	U		U	U										
Arsenic	**Result (mg/L)**	0.005	0.01	0.005	0.005	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.0043	0.013	0.001	0.0013	0.0022	0.001
	Result Qualifier		U	UJ	U	U	UJ	UJ	U	U	U	U			U			U
Barium	**Result (mg/L)**	2.3	0.01	0.005	0.005	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0761	0.0403	0.0452	0.0277
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U				
Beryllium	**Result (mg/L)**	0.0053	0.005	0.0025	0.0025	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	UJ	U	U	UJ	UJ	U	U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.1	0.05	0.05	0.026	0.01	0.01	0.023	0.013	0.013	0.017	0.013	0.01	0.018	0.026	0.042	0.039
	Result Qualifier		U	UJ	U		U	U						U				
Bromide	**Result (mg/L)**	-	1	NT	1	0.5	NT	NT	0.25	0.05	0.05	0.05	0.05	0.05	NT	NT	NT	NT
	Result Qualifier		U		U	U			U	U	U	U	U	U				
Cadmium	**Result (mg/L)**	Variable[c]	0.318	0.117	0.00025	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000056	0.000067	0.00005	0.000138
	Result Qualifier			J	U	U	U	UJ	U	U	U	U	U	U			U	
Calcium	**Result (mg/L)**	-	549	608	241	101	75.5	42.7	75.9	56.6	54.8	69.1	24.3	18.2	53.7	82	72.8	159
	Result Qualifier			J			J	J										
Chloride	**Result (mg/L)**	120	10	NT	10	5	NT	NT	2.5	0.5	0.5	0.5	0.5	0.5	NT	NT	NT	NT
	Result Qualifier		U		U	U			U	U	U	U	U	U				
Chromium	**Result (mg/L)**	0.0089	0.005	0.0025	0.0025	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	UJ	U	U	UJ	UJ	U	U	U	U	U	U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.0571	0.106	0.0005	0.0002	0.0001	0.0001	0.0023	0.0001	0.0001	0.0001	0.0001	0.0001	0.00042	0.00051	0.00184	0.00106
	Result Qualifier			J	U	U	U	U		U	U	U	U	U				
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.01	0.005	0.005	0.002	0.001	0.001	0.001	0.001	0.0015	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier		U	UJ	U	U	UJ	UJ	U	U	U	U	U	U	U	U	U	U
Fluoride	**Result (mg/L)**	0.12	1.35	NT	0.93	0.62	NT	NT	0.65	0.626	0.503	0.68	0.456	0.305	NT	NT	NT	NT
	Result Qualifier																	
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier		U	UJ	U	U	UJ	UJ	U	U	U	U	U	U	U	U	U	U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)
Sample ID			CH12-014-MW003-SOA	CH12-014-MW003-SOJ	CH12-014-MW003-SOB	CH12-014-MW003-SOC	CH12-014-MW003-SOK	CH12-014-MW003-SOL	CH12-014-MW003-SOD	CH12-014-MW003-SOE	CH12-014-MW003-SOF	CH12-014-MW003-SOG	CH12-014-MW003-SOH	CH12-014-MW003-SOI	CH14-106-MW009-SOA	CH14-106-MW009-SOD	CH14-106-MW009-SOI	CH14-106-MW009-SOK
Depth From (mbgs)				2.44	5.2	11.6	14.0	14.9	16.5	19.8	23.5	25.9	29.0	29.9	2.4	13.1	28.0	32.9
Depth From (mbgs)				2.44	5.2	11.6	14.0	14.9	16.5	19.8	23.5	25.9	29.0	29.9	2.7	13.4	28.4	33.2
Sample Date			7/29/2012	7/29/2012	7/29/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	8/16/2014	8/17/2014	8/17/2014	8/17/2014
Lead	**Result (mg/L)**	0.001	0.001	0.0005	0.0005	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00169	0.00021	0.00035	0.00058
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U				
Lithium	**Result (mg/L)**	-	0.089	0.109	0.12	0.058	0.0504	0.0294	0.0583	0.0243	0.0056	0.0393	0.012	0.0057	0.0617	0.0829	0.0616	0.0503
	Result Qualifier			J			J	J										
Magnesium	**Result (mg/L)**	-	93.4	105	105	55.8	44.9	23.1	46.1	23.8	30.8	35.7	12.3	4.74	53.9	61.5	73	85.2
	Result Qualifier			J			J	J										
Manganese	**Result (mg/L)**	-	2.36	6.77	0.84	0.001	0.0005	0.0005	0.244	0.0005	0.0005	0.0005	0.0005	0.0005	0.0577	0.0899	0.221	0.21
	Result Qualifier			J		U	U	U		U	U	U	U	U				
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	R	U	U	R	R	U	U	U	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.001	0.0005	0.0005	0.0002	0.0001	0.0205	0.00499	0.021	0.0255	0.00576	0.016	0.00506	0.00963	0.00165	0.00029	0.00209
	Result Qualifier		U	UJ	U	U	U	J										
Nickel	**Result (mg/L)**	0.025	0.005	0.179	0.0025	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00191	0.00205	0.0032	0.00407
	Result Qualifier		U	J	U	U	U	U	U	U	U	U	U	U				
Nitrate	**Result (mg/L)**	13	0.1	NT	0.1	0.05	NT	NT	0.025	0.005	0.005	0.005	0.0076	0.005	NT	NT	NT	NT
	Result Qualifier		U		U	U			U	U	U	U		U				
Nitrite	**Result (mg/L)**	0.06	0.02	NT	0.02	0.01	NT	NT	0.005	0.001	0.001	0.001	0.001	0.001	NT	NT	NT	NT
	Result Qualifier		U		U	U			U	U	U	U	U	U				
Potassium	**Result (mg/L)**	-	14.4	27.3	26.4	33.1	31.2	23.6	43.5	24.8	36.6	46.3	15.9	7.3	30.4	43.3	58.1	54
	Result Qualifier			J			J	J										
Selenium	**Result (mg/L)**	0.001	0.005	0.0036	0.0025	0.001	0.0005	0.0005	0.00079	0.0005	0.0005	0.0005	0.0005	0.0005	0.00133	0.00076	0.00085	0.00059
	Result Qualifier		U	J	U	U	UJ	UJ		U	U	U	U	U				
Silicon	**Result (mg/L)**	-	0.05	0.05	0.05	4.26	0.05	0.05	4.21	0.05	0.05	0.05	4.58	0.05	3.61	4.25	6.54	4.79
	Result Qualifier		U	U	U		U	U		U	U	U		U				
Silver	**Result (mg/L)**	0.0001	0.0005	0.00025	0.00025	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000077	0.00005
	Result Qualifier		U	UJ	U	U	UJ	UJ	U	U	U	U	U	U	U	U		U
Sodium	**Result (mg/L)**	-	2	2	11.8	10.1	2	2	8	7.8	7.1	8	10.8	15.6	5.5	6.6	8.1	10.3
	Result Qualifier		U	U			U	U										
Strontium	**Result (mg/L)**	-	1.13	1.49	1.37	0.532	0.528	0.333	0.434	0.234	0.27	0.231	0.165	0.194	0.84	0.603	0.267	0.591
	Result Qualifier			J			J	J										
Sulphate	**Result (mg/L)**	100	1840	1750	883	331	203	110	241	185	204	221	107	59.1	136	311	274	669
	Result Qualifier			J			J	J										
Sulphur	**Result (mg/L)**	-	624	689	295	112	70.2	38.2	77.6	62.4	69.5	74	35.8	19.8	44.8	96	99.9	208
	Result Qualifier			J			J	J										
Thallium	**Result (mg/L)**	0.0008	0.0034	0.00572	0.0005	0.0002	0.0001	0.0001	0.00019	0.0001	0.0001	0.00018	0.0001	0.0001	0.00013	0.0001	0.00028	0.0002
	Result Qualifier			J	U	U	U	UJ		U	U		U	U				
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		U	U	U	U	UJ	UJ	U	U	U	U	U	U	U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.0001	0.00005	0.00445	0.00399	0.00544	0.00247	0.00274	0.00166	0.00215	0.00247	0.00001	0.00001	0.0138	0.00338	0.00074	0.00586
	Result Qualifier		U	U			J	J					U	U				

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)
Sample ID			CH12-014-MW003-SOA	CH12-014-MW003-SOJ	CH12-014-MW003-SOB	CH12-014-MW003-SOC	CH12-014-MW003-SOK	CH12-014-MW003-SOL	CH12-014-MW003-SOD	CH12-014-MW003-SOE	CH12-014-MW003-SOF	CH12-014-MW003-SOG	CH12-014-MW003-SOH	CH12-014-MW003-SOI	CH14-106-MW009-SOA	CH14-106-MW009-SOD	CH14-106-MW009-SOI	CH14-106-MW009-SOK
Depth From (mbgs)				2.44	5.2	11.6	14.0	14.9	16.5	19.8	23.5	25.9	29.0	29.9	2.4	13.1	28.0	32.9
Depth From (mbgs)				2.44	5.2	11.6	14.0	14.9	16.5	19.8	23.5	25.9	29.0	29.9	2.7	13.4	28.4	33.2
Sample Date			7/29/2012	7/29/2012	7/29/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	7/30/2012	8/16/2014	8/17/2014	8/17/2014	8/17/2014
Vanadium	**Result (mg/L)**	-	0.01	0.005	0.005	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier		U	UJ	U	U	UJ	UJ	U	U	U	U	U	U	U	U	U	U
Zinc	**Result (mg/L)**	0.03	70.7	20.7	0.05	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier			J	U	U	UJ	UJ	U	U	U	U	U	U	U	U	U	U

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or precise

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection limit

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)
Sample ID			CH14-106-MW909-SOK	CH14-106-MW009-SOM	CH14-106-MW009-SOP	CH14-106-MW009-SOT	CH14-106-TP001-SOA	CH14-106-TP001-SOC	CH14-106-TP901-SOC	CH14-106-TP002-SOA	CH14-106-TP002-SOC	CH14-106-TP003-SOA	CH14-106-TP003-SOB	CH14-106-TP003-SOC	CH14-106-TP004-SOA	CH14-106-TP004-SOC	CH14-106-TP005-SOA	CH14-106-TP005-SOC
Depth From (mbgs)			32.9	40.8	48.5	60.1	1.3	5	5	2.5	5	1.4	4.1	5.3	1.8	5.1	2.3	5.4
Depth From (mbgs)			33.2	41.2	48.8	60.4	1.3	5	5	2.5	5	1.4	4.1	5.3	1.8	5.1	2.3	5.4
Sample Date			8/17/2014	8/17/2014	8/19/2014	8/19/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014
pH	**Result (pH units)**	6.5-9.0	7.2	7.87	6.49	8.02	5.41	7.22	7.31	6.98	7.17	7.29	7.44	6.89	2.03	6.4	7.48	7.33
	Result Qualifier																	
Acidity	**Result (mg/L)**	-	1.9	1	7.1	1	51.7	8.1	7.2	9	6.6	6.6	4.3	21.1	2700	58.4	4.4	3.6
	Result Qualifier			U		U	J											
Total Alkalinity	**Result (mg/L)**	-	183	132	98.4	91.3	47.9	146	139	263	199	204	208	178	1	148	93.6	120
	Result Qualifier						J								U			
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																	
ORP Leachable	**Result (mV)**	-	316	301	333	289	123	264	265	272	248	261	275	284	503	288	269	278
	Result Qualifier																	
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.0091	0.0341	0.005	0.0076	0.028	0.01	0.01	0.0061	0.005	0.005	0.005	0.182	53.6	0.017	0.0146	0.0113
	Result Qualifier				U			U	U		U	U	U					
Antimony	**Result (mg/L)**	1.6	0.00036	0.00033	0.00049	0.00021	0.0002	0.0002	0.0002	0.00046	0.00102	0.00151	0.00057	0.00067	0.00127	0.00027	0.00022	0.00016
	Result Qualifier						U	U	U									
Arsenic	**Result (mg/L)**	0.005	0.001	0.001	0.0033	0.001	0.002	0.002	0.002	0.001	0.025	0.0104	0.001	0.0034	0.372	0.0064	0.0036	0.0013
	Result Qualifier		U	U		U	U	U	U	U			U					
Barium	**Result (mg/L)**	2.3	0.03	0.0886	0.0166	0.0133	0.016	0.0323	0.0302	0.0214	0.0254	0.0266	0.0278	0.0269	0.0147	0.0226	0.0331	0.0301
	Result Qualifier																	
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.0005	0.0005	0.0005	0.0005	0.001	0.0152	0.001	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U		U	U	U
Boron	**Result (mg/L)**	1.5	0.042	0.026	0.02	0.023	0.02	0.025	0.021	0.035	0.015	0.014	0.014	0.02	0.02	0.02	0.011	0.018
	Result Qualifier						U							U	U	U		
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																	
Cadmium	**Result (mg/L)**	Variable[c]	0.000184	0.00005	0.0183	0.00005	0.055	0.00919	0.00686	0.00476	0.000859	0.0037	0.00119	0.05	0.162	0.0631	0.00005	0.000397
	Result Qualifier			U		U											U	
Calcium	**Result (mg/L)**	-	161	47.1	176	48.1	572	540	522	157	247	278	192	557	566	579	184	239
	Result Qualifier																	
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																	
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.001	0.0005	0.0005	0.0005	0.0005	0.001	0.0977	0.001	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U		U	U	U
Cobalt	**Result (mg/L)**	-	0.00129	0.0001	0.0554	0.00011	0.548	0.00274	0.00116	0.0116	0.00418	0.00701	0.00221	0.0705	0.896	0.198	0.00221	0.00342
	Result Qualifier			U				J	J									
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.0426	13.6	0.0021	0.001	0.001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U				U	U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																	
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03	1.48	0.03	0.03	0.03	0.03	0.03	0.03	0.03	545	0.03	0.03	0.03
	Result Qualifier		U	U	U	U		U	U	U	U	U	U	U		U	U	U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)
Sample ID			CH14-106-MW909-SOK	CH14-106-MW009-SOM	CH14-106-MW009-SOP	CH14-106-MW009-SOT	CH14-106-TP001-SOA	CH14-106-TP001-SOC	CH14-106-TP901-SOC	CH14-106-TP002-SOA	CH14-106-TP002-SOC	CH14-106-TP003-SOA	CH14-106-TP003-SOB	CH14-106-TP003-SOC	CH14-106-TP004-SOA	CH14-106-TP004-SOC	CH14-106-TP005-SOA	CH14-106-TP005-SOC
Depth From (mbgs)			32.9	40.8	48.5	60.1	1.3	5	5	2.5	5	1.4	4.1	5.3	1.8	5.1	2.3	5.4
Depth From (mbgs)			33.2	41.2	48.8	60.4	1.3	5	5	2.5	5	1.4	4.1	5.3	1.8	5.1	2.3	5.4
Sample Date			8/17/2014	8/17/2014	8/19/2014	8/19/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014
Lead	**Result (mg/L)**	0.001	0.00078	0.00016	0.104	0.0001	0.129	0.00072	0.00025	0.0697	0.00658	0.0561	0.00825	0.216	2.24	0.127	0.0001	0.0001
	Result Qualifier					U		J	J								U	U
Lithium	**Result (mg/L)**	-	0.0573	0.0514	0.131	0.0151	0.146	0.062	0.058	0.0679	0.0679	0.0666	0.103	0.123	0.042	0.095	0.0457	0.0947
	Result Qualifier																	
Magnesium	**Result (mg/L)**	-	83.6	25.5	132	7.71	145	233	243	111	107	107	99.4	172	37.1	138	42.2	56.2
	Result Qualifier																	
Manganese	**Result (mg/L)**	-	0.27	0.0239	10.9	0.0135	23	2.35	1.43	1.93	0.479	1.15	0.568	8.19	10	15	0.209	0.66
	Result Qualifier																	
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.00249	0.00811	0.00012	0.0141	0.0002	0.00027	0.00029	0.0003	0.0002	0.00023	0.00048	0.0002	0.0002	0.0002	0.00369	0.00238
	Result Qualifier						U							U	U	U		
Nickel	**Result (mg/L)**	0.025	0.00517	0.0005	0.0795	0.0005	0.463	0.0321	0.0254	0.0169	0.0312	0.00837	0.00518	0.0765	0.628	0.163	0.0282	0.0206
	Result Qualifier			U		U												
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																	
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																	
Potassium	**Result (mg/L)**	-	52.6	59	50.1	8.6	51.4	19.9	20.4	36.5	40	39.5	28.2	40.1	4	39.6	32.6	40.1
	Result Qualifier														U			
Selenium	**Result (mg/L)**	0.001	0.00072	0.00094	0.00097	0.0005	0.0031	0.001	0.001	0.0005	0.00097	0.00078	0.0016	0.0032	0.001	0.0016	0.00058	0.00092
	Result Qualifier					U		U	U	U					U			
Silicon	**Result (mg/L)**	-	4.71	3.89	7.69	5.01	9.37	2.98	3.22	4.64	4.58	4.23	3.42	4.78	29.3	5.95	4.45	4.34
	Result Qualifier																	
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.0001	0.0001	0.00005	0.00005	0.00005	0.00005	0.0001	0.00052	0.0001	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U		U	U	U
Sodium	**Result (mg/L)**	-	9.5	14.5	8.2	5	5.2	7.7	8	4.2	6	4.6	9	8.6	4	2.7	4.6	6.9
	Result Qualifier														U			
Strontium	**Result (mg/L)**	-	0.616	0.389	0.217	0.946	0.979	1.94	2.3	0.341	0.476	0.878	1.19	3.04	0.221	0.585	0.726	0.841
	Result Qualifier																	
Sulphate	**Result (mg/L)**	100	656	189	979	78	2240	2390	2400	677	961	1060	762	2180	4400	2030	584	778
	Result Qualifier																	
Sulphur	**Result (mg/L)**	-	208	63.4	329	25.6	681	707	720	211	296	321	241	672	1340	665	191	254
	Result Qualifier																	
Thallium	**Result (mg/L)**	0.0008	0.00028	0.0001	0.00163	0.0001	0.00036	0.0002	0.0002	0.00041	0.00047	0.00088	0.0007	0.00134	0.00079	0.00154	0.00043	0.0002
	Result Qualifier			U		U		U	U									
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.021	0.02	0.02	0.01	0.014	0.015	0.012	0.021	0.02	0.016	0.017	0.017
	Result Qualifier		U	U	U	U				U					U			
Uranium	**Result (mg/L)**	0.015	0.00586	0.00946	0.000228	0.00359	0.000136	0.00821	0.00801	0.00318	0.0116	0.00486	0.00738	0.00687	0.0279	0.0018	0.00528	0.00872
	Result Qualifier																	

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)
Sample ID			CH14-106-MW909-SOK	CH14-106-MW009-SOM	CH14-106-MW009-SOP	CH14-106-MW009-SOT	CH14-106-TP001-SOA	CH14-106-TP001-SOC	CH14-106-TP901-SOC	CH14-106-TP002-SOA	CH14-106-TP002-SOC	CH14-106-TP003-SOA	CH14-106-TP003-SOB	CH14-106-TP003-SOC	CH14-106-TP004-SOA	CH14-106-TP004-SOC	CH14-106-TP005-SOA	CH14-106-TP005-SOC
Depth From (mbgs)			32.9	40.8	48.5	60.1	1.3	5	5	2.5	5	1.4	4.1	5.3	1.8	5.1	2.3	5.4
Depth From (mbgs)			33.2	41.2	48.8	60.4	1.3	5	5	2.5	5	1.4	4.1	5.3	1.8	5.1	2.3	5.4
Sample Date			8/17/2014	8/17/2014	8/19/2014	8/19/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014
Vanadium	**Result (mg/L)**	-	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.0296	0.002	0.001	0.001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U		U	U	U
Zinc	**Result (mg/L)**	0.03	0.01	0.01	1.02	0.01	11.4	2.14	1.89	0.279	0.011	0.245	0.101	8.73	115	17.1	0.01	0.018
	Result Qualifier		U	U		U											U	

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)
Sample ID			CH14-106-TP006-SOA	CH14-106-TP006-SOC	CH14-106-TP008-SOA	CH14-106-TP008-SOB	CH14-106-TP008-SOC	CH14-106-TP015-SOCOMP	CH12-014-MW007-SOM	CH12-014-MW007-SOA	CH12-014-MW007-SON	CH12-014-MW007-SOO	CH12-014-MW007-SOB	CH12-014-MW007-SOC	CH12-014-MW007-SOP	CH12-014-MW007-SOD
Depth From (mbgs)			1.6	5.3	2	3.5	5.2	1.5	0	2	3.0	5.5	10	14	15.8	20.1
Depth From (mbgs)			1.6	5.3	2	3.5	5.2	5.5	0	2	3.0	5.5	10	14	15.8	20.1
Sample Date			7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012
pH	**Result (pH units)**	6.5-9.0	2.03	2.82	7.11	7.21	7.3	7.59	8.01	7.86	7.58	7.54	6.24	6.2	6.53	7.03
	Result Qualifier								J		J	J			J	
Acidity	**Result (mg/L)**	-	5190	6300	10.4	4	5.1	2	1.4	1	5	4.4	14.8	17.4	19.6	8.2
	Result Qualifier								J	U	J	J			J	
Total Alkalinity	**Result (mg/L)**	-	1	1	170	192	203	197	103	170	163	150	61.6	77.8	109	147
	Result Qualifier		U	U					J		J	J			J	
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	NT	485	611	1240	1210	1920	2490	2530	1730
	Result Qualifier								J		J	J			J	
ORP Leachable	**Result (mV)**	-	406	368	261	268	272	284	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	77	646	0.0122	0.0082	0.0075	0.0076	0.005	0.005	0.005	0.005	0.015	0.015	0.01	0.015
	Result Qualifier								U	U	UJ	UJ	U	U	UJ	U
Antimony	**Result (mg/L)**	1.6	0.00193	0.002	0.0001	0.00026	0.0004	0.00048	0.00465	0.00047	0.0001	0.0001	0.0003	0.0003	0.0002	0.0003
	Result Qualifier			U	U				J		U	U	U	U	UJ	U
Arsenic	**Result (mg/L)**	0.005	0.167	6.28	0.001	0.0036	0.001	0.0011	0.001	0.001	0.001	0.001	0.0111	0.003	0.002	0.003
	Result Qualifier				U		U		U	U	UJ	UJ		U	U	U
Barium	**Result (mg/L)**	2.3	0.0157	0.025	0.0357	0.0281	0.0327	0.0603	0.001	0.001	0.001	0.001	0.003	0.003	0.002	0.003
	Result Qualifier								U	U	U	U	U	U	U	U
Beryllium	**Result (mg/L)**	0.0053	0.0298	0.063	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0015	0.0015	0.001	0.0015
	Result Qualifier				U	U	U	U	UJ	U	UJ	UJ	U	U	UJ	U
Boron	**Result (mg/L)**	1.5	0.04	0.2	0.019	0.017	0.016	0.013	0.01	0.026	0.01	0.01	0.03	0.03	0.02	0.03
	Result Qualifier		U	U					U		U	U	U	U	U	U
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	0.05	NT	NT	1	1	NT	1
	Result Qualifier									U			U	U		U
Cadmium	**Result (mg/L)**	Variable[c]	0.585	1.56	0.000754	0.000115	0.000054	0.000315	0.00005	0.00005	0.00173	0.00005	0.00773	0.00743	0.00337	0.0014
	Result Qualifier								U	U	J	U			J	
Calcium	**Result (mg/L)**	-	477	492	280	212	151	89.1	60.7	56.4	149	143	213	308	315	233
	Result Qualifier								J		J	J			J	
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	0.5	NT	NT	10	10	NT	10
	Result Qualifier									U			U	U		U
Chromium	**Result (mg/L)**	0.0089	0.152	0.683	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0015	0.0015	0.001	0.0015
	Result Qualifier				U	U	U	U	UJ	U	UJ	UJ	U	U	UJ	U
Cobalt	**Result (mg/L)**	-	1.72	3.39	0.00175	0.00243	0.0014	0.00047	0.0001	0.0001	0.0001	0.0001	0.0625	0.0587	0.0372	0.0003
	Result Qualifier								U	U	U	U			J	U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	34.9	99.2	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.003	0.002	0.003
	Result Qualifier				U	U	U	U	UJ	U	UJ	UJ	U	U	UJ	U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	1.58	NT	NT	0.4	0.4	NT	0.5
	Result Qualifier												U	U		
Iron	**Result (mg/L)**	0.3	1250	182	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier				U	U	U	U	UJ	U	UJ	UJ	U	U	U	U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)
Sample ID			CH14-106-TP006-SOA	CH14-106-TP006-SOC	CH14-106-TP008-SOA	CH14-106-TP008-SOB	CH14-106-TP008-SOC	CH14-106-TP015-SOCOMP	CH12-014-MW007-SOM	CH12-014-MW007-SOA	CH12-014-MW007-SON	CH12-014-MW007-SOO	CH12-014-MW007-SOB	CH12-014-MW007-SOC	CH12-014-MW007-SOP	CH12-014-MW007-SOD
Depth From (mbgs)			1.6	5.3	2	3.5	5.2	1.5	0	2	3.0	5.5	10	14	15.8	20.1
Depth From (mbgs)			1.6	5.3	2	3.5	5.2	5.5	0	2	3.0	5.5	10	14	15.8	20.1
Sample Date			7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012
Lead	**Result (mg/L)**	0.001	2.32	2.06	0.0006	0.00022	0.0001	0.00039	0.0001	0.0001	0.0001	0.0001	0.0003	0.0003	0.0002	0.0003
	Result Qualifier						U		U	U	U	U	U	U	U	U
Lithium	**Result (mg/L)**	-	0.045	0.82	0.0742	0.0892	0.122	0.0262	0.005	0.0548	0.0883	0.0728	0.123	0.14	0.148	0.105
	Result Qualifier								U		J	J			J	
Magnesium	**Result (mg/L)**	-	84.6	328	118	116	94.1	28.8	14.5	42	64.4	72	183	236	199	130
	Result Qualifier								J		J	J			J	
Manganese	**Result (mg/L)**	-	27.1	36.3	0.274	0.246	0.142	0.2	0.0005	0.0005	0.0005	0.0005	9.76	14	10.8	0.966
	Result Qualifier								U	U	U	U			J	
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	R	U	R	R	U	U	R	U
Molybdenum	**Result (mg/L)**	0.073	0.0004	0.002	0.00256	0.00264	0.00191	0.00058	0.0001	0.0119	0.0001	0.0001	0.0003	0.0003	0.0002	0.0003
	Result Qualifier		U	U					U		U	U	U	U	UJ	U
Nickel	**Result (mg/L)**	0.025	1.52	4.96	0.0047	0.0223	0.0126	0.00244	0.0005	0.0005	0.0005	0.0005	0.122	0.124	0.064	0.0015
	Result Qualifier								U	U	U	U			J	U
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	0.005	NT	NT	0.1	0.1	NT	0.1
	Result Qualifier									U			U	U		U
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	0.0022	NT	NT	0.02	0.02	NT	0.02
	Result Qualifier												U	U		U
Potassium	**Result (mg/L)**	-	4	6	37.2	33	36.6	26	21.1	28.3	48.6	40.9	54.9	58.3	60.4	49.8
	Result Qualifier		U	U					J		J	J			J	
Selenium	**Result (mg/L)**	0.001	0.002	0.01	0.00233	0.00178	0.00157	0.0005	0.0005	0.0005	0.00173	0.00139	0.0046	0.0034	0.001	0.0015
	Result Qualifier		U	U				U	UJ	U	J	J			UJ	U
Silicon	**Result (mg/L)**	-	36.3	33.9	3.99	4.72	4.12	3.4	0.05	0.05	0.05	0.05	7.2	5.82	0.05	5.35
	Result Qualifier								U	U	U	U			U	
Silver	**Result (mg/L)**	0.0001	0.00077	0.001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00015	0.00015	0.0001	0.00015
	Result Qualifier			U	U	U	U	U	UJ	U	UJ	UJ	U	U	UJ	U
Sodium	**Result (mg/L)**	-	4	6	6	7.5	7.3	4.2	2	7.3	2	2	9.5	8.2	2	2
	Result Qualifier		U	U					U		U	U			U	U
Strontium	**Result (mg/L)**	-	0.253	0.544	0.741	1.14	1.07	0.351	0.463	0.425	0.762	0.479	0.45	0.425	0.427	0.458
	Result Qualifier								J		J	J			J	
Sulphate	**Result (mg/L)**	100	5980	8110	1090	876	632	200	139	170	531	533	1270	1730	1540	1000
	Result Qualifier								J		J	J			J	
Sulphur	**Result (mg/L)**	-	1880	2670	351	283	203	63.6	46.7	58.2	180	182	415	562	519	327
	Result Qualifier								J		J	J			J	
Thallium	**Result (mg/L)**	0.0008	0.00045	0.002	0.00015	0.00036	0.00029	0.00018	0.0001	0.0001	0.0001	0.0001	0.00089	0.00102	0.0002	0.00046
	Result Qualifier			U					UJ	U	U	U			U	
Titanium	**Result (mg/L)**	0.1	0.036	0.052	0.019	0.017	0.016	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier							U	UJ	U	U	U	U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.174	0.147	0.021	0.0119	0.013	0.00506	0.00228	0.00705	0.00301	0.00236	0.00003	0.00003	0.00002	0.00224
	Result Qualifier								J		J	J		U	U	

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Main)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)
Sample ID			CH14-106-TP006-SOA	CH14-106-TP006-SOC	CH14-106-TP008-SOA	CH14-106-TP008-SOB	CH14-106-TP008-SOC	CH14-106-TP015-SOCOMP	CH12-014-MW007-SOM	CH12-014-MW007-SOA	CH12-014-MW007-SON	CH12-014-MW007-SOO	CH12-014-MW007-SOB	CH12-014-MW007-SOC	CH12-014-MW007-SOP	CH12-014-MW007-SOD
Depth From (mbgs)			1.6	5.3	2	3.5	5.2	1.5	0	2	3.0	5.5	10	14	15.8	20.1
Depth From (mbgs)			1.6	5.3	2	3.5	5.2	5.5	0	2	3.0	5.5	10	14	15.8	20.1
Sample Date			7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/19/2014	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012	7/31/2012
Vanadium	**Result (mg/L)**	-	0.222	0.02	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.003	0.002	0.003
	Result Qualifier			U	U	U	U	U	UJ	U	UJ	UJ	U	U	UJ	U
Zinc	**Result (mg/L)**	0.03	421	918	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.03	0.02	0.03
	Result Qualifier				U	U	U	U	UJ	U	U	UJ	U	U	U	U

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)
Sample ID			CH12-014-MW007-SOQ	CH12-014-MW007-SOE	CH12-014-MW007-SOF	CH12-014-MW007-SOL	CH14-106-TP007-SOA	CH14-106-TP907-SOA	CH14-106-TP007-SOC	CH14-106-TP009-SOA	CH14-106-TP009-SOC	CH14-106-TP010-SOA	CH14-106-TP010-SOB	CH14-106-TP010-SOC	CH14-106-TP011-SOA
Depth From (mbgs)			22.9	25	28	54.9	1.4	1.4	5.5	1.5	5.5	1.5	3.9	5.5	1.5
Depth From (mbgs)			22.9	25	28	54.9	1.4	1.4	5.5	1.5	5.5	1.5	3.9	5.5	1.5
Sample Date			7/31/2012	7/31/2012	7/31/2012	8/1/2012	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014
pH	**Result (pH units)**	6.5-9.0	7.85	7.04	7.44	7.57	4.87	5.18	6.46	7.63	8.15	2.29	2.93	5.79	4.87
	Result Qualifier		J												
Acidity	**Result (mg/L)**	-	11.6	6.6	3.9	2.8	789	491	18.3	1	1	4390	4220	519	564
	Result Qualifier		J							U	U				
Total Alkalinity	**Result (mg/L)**	-	182	129	151	11.2	11.8	12.8	209	152	146	1	1	132	21.7
	Result Qualifier		J									U	U		
Specific Conductance	**Result (µS/cm)**	-	2050	2040	1280	209	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier		J												
ORP Leachable	**Result (mV)**	-	NT	NT	NT	NT	110	104	251	277	268	370	363	229	69
	Result Qualifier														
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.005	0.015	0.01	0.005	0.068	0.057	0.014	0.016	0.0256	137	271	0.086	0.277
	Result Qualifier		UJ	U	U	U									
Antimony	**Result (mg/L)**	1.6	0.0001	0.0003	0.0002	0.0001	0.00023	0.00022	0.00057	0.00092	0.00451	0.0119	0.00109	0.0004	0.0002
	Result Qualifier		U	U	U	U								U	U
Arsenic	**Result (mg/L)**	0.005	0.001	0.003	0.002	0.001	0.0041	0.0032	0.002	0.001	0.003	0.0878	0.0398	0.004	0.0067
	Result Qualifier		U	U	U	U			U	U				U	
Barium	**Result (mg/L)**	2.3	0.001	0.003	0.002	0.001	0.0107	0.0116	0.0209	0.0547	0.0999	0.0164	0.0248	0.027	0.0134
	Result Qualifier		U	U	U	U									
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0015	0.001	0.0005	0.001	0.001	0.001	0.0005	0.0005	0.0252	0.0707	0.002	0.0029
	Result Qualifier		UJ	U	U	U	U	U	U	U	U			U	
Boron	**Result (mg/L)**	1.5	0.01	0.03	0.024	0.015	0.02	0.02	0.02	0.031	0.027	0.04	0.04	0.056	0.024
	Result Qualifier		U	U			U	U	U			U	U		
Bromide	**Result (mg/L)**	-	NT	1	0.5	0.05	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier			U	U	U									
Cadmium	**Result (mg/L)**	Variable[c]	0.00468	0.00486	0.0001	0.00005	0.487	0.483	0.0269	0.000372	0.000058	0.289	0.884	0.425	0.47
	Result Qualifier		J		U	U									
Calcium	**Result (mg/L)**	-	252	305	136	12.9	523	522	582	68.2	27.6	500	494	516	541
	Result Qualifier		J												
Chloride	**Result (mg/L)**	120	NT	10	5	0.5	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier			U	U	U									
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0015	0.001	0.0005	0.001	0.001	0.001	0.0005	0.0005	0.337	0.0985	0.002	0.001
	Result Qualifier		UJ	U	U	U	U	U	U	U	U			U	U
Cobalt	**Result (mg/L)**	-	0.0144	0.00924	0.0002	0.0001	0.547	0.499	0.0735	0.00104	0.0002	1	1.44	1.83	0.366
	Result Qualifier		J		U	U									
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.003	0.002	0.001	0.002	0.002	0.002	0.001	0.001	8.34	13.3	0.046	0.002
	Result Qualifier		UJ	U	U	U	U	U	U	U	U				U
Fluoride	**Result (mg/L)**	0.12	NT	1.44	1.01	1.23	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier														
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03	231	93.9	0.03	0.03	0.03	1080	544	0.06	139
	Result Qualifier		UJ	U	U	U	J	J	U	U	U			U	

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)
Sample ID			CH12-014-MW007-SOQ	CH12-014-MW007-SOE	CH12-014-MW007-SOF	CH12-014-MW007-SOL	CH14-106-TP007-SOA	CH14-106-TP907-SOA	CH14-106-TP007-SOC	CH14-106-TP009-SOA	CH14-106-TP009-SOC	CH14-106-TP010-SOA	CH14-106-TP010-SOB	CH14-106-TP010-SOC	CH14-106-TP011-SOA
Depth From (mbgs)			22.9	25	28	54.9	1.4	1.4	5.5	1.5	5.5	1.5	3.9	5.5	1.5
Depth From (mbgs)			22.9	25	28	54.9	1.4	1.4	5.5	1.5	5.5	1.5	3.9	5.5	1.5
Sample Date			7/31/2012	7/31/2012	7/31/2012	8/1/2012	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014
Lead	**Result (mg/L)**	0.001	0.0001	0.0003	0.0002	0.0001	2.95	2.66	0.235	0.00446	0.00067	3	0.17	0.00548	2.36
	Result Qualifier		U	U	U	U									
Lithium	**Result (mg/L)**	-	0.111	0.085	0.059	0.0424	0.13	0.116	0.138	0.0502	0.0316	0.267	0.725	0.384	0.698
	Result Qualifier		J												
Magnesium	**Result (mg/L)**	-	155	146	100	5.21	229	215	167	40.2	22.7	103	215	383	254
	Result Qualifier		J												
Manganese	**Result (mg/L)**	-	2.41	1.28	0.001	0.0005	45.9	45.8	12.6	0.131	0.0153	17.8	25.8	78	29.6
	Result Qualifier		J		U	U									
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000349	0.00005	0.00005	0.00005
	Result Qualifier		R	U	U	U	U	U	U	U	U		U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.0001	0.0003	0.0002	0.0001	0.00022	0.00029	0.0002	0.0231	0.0376	0.0004	0.0004	0.00041	0.0002
	Result Qualifier		U	U	U	U			U			U	U		U
Nickel	**Result (mg/L)**	0.025	0.0005	0.0015	0.001	0.0005	0.95	1.07	0.0955	0.00289	0.00142	0.484	1.96	2.2	0.628
	Result Qualifier		U	U	U	U									
Nitrate	**Result (mg/L)**	13	NT	0.1	0.05	0.0538	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier			U	U										
Nitrite	**Result (mg/L)**	0.06	NT	0.02	0.01	0.0096	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier			U	U										
Potassium	**Result (mg/L)**	-	47.8	36.9	39.4	17.6	30.2	28.6	37.6	30.4	22.3	4	4	41.2	38
	Result Qualifier		J									U	U		
Selenium	**Result (mg/L)**	0.001	0.00136	0.0015	0.001	0.00599	0.0107	0.0079	0.001	0.00052	0.00057	0.002	0.002	0.0021	0.0042
	Result Qualifier		J	U	U							U	U		
Silicon	**Result (mg/L)**	-	0.05	4.49	4.32	5.36	6.92	5.26	8.12	3.75	4.06	74.4	71.7	6.18	11.5
	Result Qualifier		U												
Silver	**Result (mg/L)**	0.0001	0.00005	0.00015	0.0001	0.00005	0.00013	0.00019	0.0001	0.00005	0.00005	0.00194	0.0004	0.0002	0.00011
	Result Qualifier		UJ	U	U	U			U	U	U			U	
Sodium	**Result (mg/L)**	-	2	2	9.3	7.5	4	8.2	5.8	11.7	40.2	4.2	4.2	8.5	3.6
	Result Qualifier		U	U			U								
Strontium	**Result (mg/L)**	-	0.594	0.644	0.44	0.0711	0.134	0.189	2.27	1	0.435	0.352	1.74	5.29	0.605
	Result Qualifier		J												
Sulphate	**Result (mg/L)**	100	1100	1290	646	68.7	3100	2780	2190	237	126	5340	5710	3420	2870
	Result Qualifier		J												
Sulphur	**Result (mg/L)**	-	371	409	210	32.1	1000	883	660	75.3	40.5	1630	1770	1110	924
	Result Qualifier		J												
Thallium	**Result (mg/L)**	0.0008	0.0001	0.00042	0.0002	0.0001	0.00099	0.00117	0.00099	0.00026	0.0002	0.00095	0.00054	0.0004	0.00447
	Result Qualifier		U		U	U									
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.037	0.022	0.016	0.01	0.01	0.071	0.037	0.038	0.024
	Result Qualifier		U	U	U	U				U	U				
Uranium	**Result (mg/L)**	0.015	0.00469	0.0059	0.00345	0.00001	0.00177	0.000958	0.00223	0.00887	0.00335	0.0224	0.0539	0.000823	0.00664
	Result Qualifier		J			U	J	J							

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)
Sample ID			CH12-014-MW007-SOQ	CH12-014-MW007-SOE	CH12-014-MW007-SOF	CH12-014-MW007-SOL	CH14-106-TP007-SOA	CH14-106-TP907-SOA	CH14-106-TP007-SOC	CH14-106-TP009-SOA	CH14-106-TP009-SOC	CH14-106-TP010-SOA	CH14-106-TP010-SOB	CH14-106-TP010-SOC	CH14-106-TP011-SOA
Depth From (mbgs)			22.9	25	28	54.9	1.4	1.4	5.5	1.5	5.5	1.5	3.9	5.5	1.5
Depth From (mbgs)			22.9	25	28	54.9	1.4	1.4	5.5	1.5	5.5	1.5	3.9	5.5	1.5
Sample Date			7/31/2012	7/31/2012	7/31/2012	8/1/2012	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014
Vanadium	**Result (mg/L)**	-	0.001	0.003	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.99	0.0088	0.004	0.002
	Result Qualifier		UJ	U	U	U	U	U	U	U	U			U	U
Zinc	**Result (mg/L)**	0.03	0.01	0.03	0.02	0.01	188	166	4.13	0.01	0.01	154	482	323	161
	Result Qualifier		U	U	U	U					U				

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)
Sample ID			CH14-106-TP011-SOC	CH14-106-TP012-SOA	CH14-106-TP012-SOB	CH14-106-TP912-SOB	CH14-106-TP012-SOC	CH14-106-TP016-SOCOMP	CH14-106-TP017-SOCOMPA	CH14-106-TP017-SOCOMPB	CH14-015-MW004-SOF	CH14-015-MW904-SOF	CH14-015-MW004-SOI	CH14-015-MW004-SOJ	CH14-015-MW004-SOL
Depth From (mbgs)			5	1.8	4.1	4.1	5	1.3	1.5	1.5	8.2	8.2	12.8	14.9	17.7
Depth From (mbgs)			5	1.8	4.1	4.1	5	5.1	5.5	5.5	8.5	8.5	13.1	15.2	18.0
Sample Date			7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/22/2014	7/22/2014	8/10/2014	8/10/2014	8/10/2014	8/10/2014	8/10/2014
pH	**Result (pH units)**	6.5-9.0	6	7.63	6.45	5.81	4.09	7.28	5.26	5.21	3.38	3.7	6.2	6.49	6.61
	Result Qualifier														
Acidity	**Result (mg/L)**	-	282	1	4.6	18.1	404	5.3	589	588	825	1010	118	NT	19.5
	Result Qualifier			U	J	J									
Total Alkalinity	**Result (mg/L)**	-	93	221	111	47.2	1	209	40.5	35.6	1	1	52.9	NT	233
	Result Qualifier				J	J	U				U	U			
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier														
ORP Leachable	**Result (mV)**	-	248	229	285	309	328	260	326	341	297	277	213	NT	203
	Result Qualifier														
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.024	0.008	0.0072	0.0907	26.7	0.0052	0.495	0.482	10.9	3.6	0.005	0.0075	0.01
	Result Qualifier			U	J	J					J	J	U		U
Antimony	**Result (mg/L)**	1.6	0.00044	0.0006	0.00037	0.00023	0.0002	0.00028	0.0002	0.0002	0.00043	0.0003	0.0001	0.0001	0.00052
	Result Qualifier						U		U	U			U	U	
Arsenic	**Result (mg/L)**	0.005	0.0042	0.001	0.0249	0.0225	0.0321	0.0011	0.0125	0.0084	0.0036	0.003	0.0043	0.0061	0.002
	Result Qualifier			U		J								J	U
Barium	**Result (mg/L)**	2.3	0.025	0.0753	0.0288	0.0195	0.0137	0.0281	0.0195	0.0178	0.0036	0.0025	0.0203	0.0221	0.0209
	Result Qualifier														
Beryllium	**Result (mg/L)**	0.0053	0.001	0.0005	0.0005	0.00219	0.0306	0.0005	0.0016	0.0017	0.007	0.0033	0.0005	0.0005	0.001
	Result Qualifier		U	U	UJ	J		U			J	J	U	U	U
Boron	**Result (mg/L)**	1.5	0.02	0.024	0.016	0.016	0.02	0.013	0.02	0.02	0.02	0.02	0.02	0.02	0.025
	Result Qualifier		U				U		U	U	U	U			
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier														
Cadmium	**Result (mg/L)**	Variable[c]	0.348	0.00098	0.0123	0.057	0.174	0.00461	0.811	0.82	0.264	0.287	0.539	0.00835	0.0336
	Result Qualifier				J	J									
Calcium	**Result (mg/L)**	-	562	60	162	235	531	245	490	488	512	491	340	399	444
	Result Qualifier														
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier														
Chromium	**Result (mg/L)**	0.0089	0.001	0.0005	0.0005	0.0005	0.001	0.0005	0.001	0.001	0.0042	0.001	0.0005	0.0005	0.001
	Result Qualifier		U	U	U	U	U	U	U	U	J	J	U	U	U
Cobalt	**Result (mg/L)**	-	1.26	0.00083	0.0299	0.101	0.385	0.00432	1.65	1.58	0.522	0.534	1.15	0.62	0.0305
	Result Qualifier				J	J									
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.002	0.001	0.001	0.0014	0.386	0.001	0.0146	0.017	0.136	0.0024	0.001	0.001	0.002
	Result Qualifier		U	U	U			U			J	J	U	U	U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier														
Iron	**Result (mg/L)**	0.3	0.03	0.052	0.03	0.03	7.89	0.03	0.938	0.73	377	489	0.03	0.03	0.06
	Result Qualifier		U		U	U		U					U	U	U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)
Sample ID			CH14-106-TP011-SOC	CH14-106-TP012-SOA	CH14-106-TP012-SOB	CH14-106-TP912-SOB	CH14-106-TP012-SOC	CH14-106-TP016-SOCOMP	CH14-106-TP017-SOCOMPA	CH14-106-TP017-SOCOMPB	CH14-015-MW004-SOF	CH14-015-MW904-SOF	CH14-015-MW004-SOI	CH14-015-MW004-SOJ	CH14-015-MW004-SOL
Depth From (mbgs)			5	1.8	4.1	4.1	5	1.3	1.5	1.5	8.2	8.2	12.8	14.9	17.7
Depth From (mbgs)			5	1.8	4.1	4.1	5	5.1	5.5	5.5	8.5	8.5	13.1	15.2	18.0
Sample Date			7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/22/2014	7/22/2014	8/10/2014	8/10/2014	8/10/2014	8/10/2014	8/10/2014
Lead	**Result (mg/L)**	0.001	0.82	0.0135	0.24	2.19	2.36	0.00522	0.772	1.25	3.03	3.02	0.0198	0.0213	0.393
	Result Qualifier				J	J									
Lithium	**Result (mg/L)**	-	0.289	0.053	0.0766	0.0759	0.167	0.0872	0.35	0.336	0.096	0.094	0.185	0.194	0.13
	Result Qualifier														
Magnesium	**Result (mg/L)**	-	275	40.8	74.9	93.6	195	111	482	488	246	236	303	297	594
	Result Qualifier														
Manganese	**Result (mg/L)**	-	50.9	0.147	5.11	13.1	20	0.566	80.5	82	9.88	12.8	60.5	56.3	4.55
	Result Qualifier				J	J									
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	UJ	U
Molybdenum	**Result (mg/L)**	0.073	0.00024	0.001	0.0001	0.0001	0.0002	0.00082	0.00037	0.00037	0.0002	0.0002	0.00025	0.00018	0.0002
	Result Qualifier				U	U	U				U	U			U
Nickel	**Result (mg/L)**	0.025	1.9	0.00301	0.0273	0.133	0.517	0.0193	2.46	2.27	0.275	0.272	0.713	0.492	0.0397
	Result Qualifier				J	J									
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier														
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier														
Potassium	**Result (mg/L)**	-	72.1	25.4	26.8	29.9	24.5	34.8	42.3	42.1	17.2	18.1	66.5	58.4	80.9
	Result Qualifier														
Selenium	**Result (mg/L)**	0.001	0.0017	0.0005	0.0005	0.00064	0.0018	0.00181	0.0082	0.0073	0.0012	0.001	0.00097	0.00149	0.0047
	Result Qualifier			U	U							U			
Silicon	**Result (mg/L)**	-	10.3	2.85	3.28	4.93	13	3.27	8.97	9.03	26.7	22.1	10.8	9.25	6.61
	Result Qualifier														
Silver	**Result (mg/L)**	0.0001	0.0001	0.00005	0.00005	0.00005	0.0001	0.00005	0.00015	0.00014	0.0001	0.0001	0.00005	0.00005	0.0001
	Result Qualifier		U	U	U	U	U	U			U	U	U	U	U
Sodium	**Result (mg/L)**	-	6.5	4.3	2	2.6	3.6	3.8	4.3	4.3	4	4	8.8	7.3	5.7
	Result Qualifier										U	U			
Strontium	**Result (mg/L)**	-	1.33	0.425	1.19	1.56	0.783	1.17	1.42	1.46	0.0795	0.0552	0.56	0.972	1.82
	Result Qualifier														
Sulphate	**Result (mg/L)**	100	2760	129	648	990	2510	986	3920	4000	3290	3470	2390	NT	3310
	Result Qualifier														
Sulphur	**Result (mg/L)**	-	927	42.1	217	335	780	304	1220	1240	1080	1090	759	808	1130
	Result Qualifier														
Thallium	**Result (mg/L)**	0.0008	0.00315	0.00042	0.00212	0.00215	0.00246	0.00039	0.00118	0.00162	0.0115	0.00844	0.00044	0.00042	0.00808
	Result Qualifier														
Titanium	**Result (mg/L)**	0.1	0.024	0.01	0.018	0.019	0.023	0.014	0.02	0.02	0.038	0.02	0.018	0.028	0.037
	Result Qualifier			U					U	U		U			
Uranium	**Result (mg/L)**	0.015	0.00139	0.00509	0.00041	0.000314	0.0906	0.0062	0.00424	0.00466	0.0171	0.00776	0.000303	0.000424	0.00769
	Result Qualifier										J	J			

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (Intermediate)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)
Sample ID			CH14-106-TP011-SOC	CH14-106-TP012-SOA	CH14-106-TP012-SOB	CH14-106-TP912-SOB	CH14-106-TP012-SOC	CH14-106-TP016-SOCOMP	CH14-106-TP017-SOCOMPA	CH14-106-TP017-SOCOMPB	CH14-015-MW004-SOF	CH14-015-MW904-SOF	CH14-015-MW004-SOI	CH14-015-MW004-SOJ	CH14-015-MW004-SOL
Depth From (mbgs)			5	1.8	4.1	4.1	5	1.3	1.5	1.5	8.2	8.2	12.8	14.9	17.7
Depth From (mbgs)			5	1.8	4.1	4.1	5	5.1	5.5	5.5	8.5	8.5	13.1	15.2	18.0
Sample Date			7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/20/2014	7/22/2014	7/22/2014	8/10/2014	8/10/2014	8/10/2014	8/10/2014	8/10/2014
Vanadium	**Result (mg/L)**	-	0.002	0.001	0.001	0.001	0.002	0.001	0.002	0.002	0.0026	0.002	0.001	0.001	0.002
	Result Qualifier		U	U	U	U	U	U	U	U		U	U	U	U
Zinc	**Result (mg/L)**	0.03	170	0.625	0.418	4.6	74.9	0.301	333	334	127	128	66.4	68.9	0.766
	Result Qualifier				J	J									

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)
Sample ID			CH14-015-MW004-SOM	CH14-015-MW004-SOS	CH13-108-TP015-SOA	CH14-015-MW004-SOA	CH14-015-MW904-SOA	CH14-015-MW004-SOD	CH14-106-TP013-SOCOMP	CH14-106-TP014-SOCOMP	CH14-015-MW006-SOB	CH14-015-MW006-SOC	CH14-015-MW006-SOE	CH14-015-MW006-SOI	CH14-106-TP018-SOCOMP	CH14-106-TP019-SOCOMP
Depth From (mbgs)			20.1	35.1	0	0.8	0.8	5.2	1.5	1.7	3.4	7.6	14.0	26.8	1.5	1.5
Depth From (mbgs)			20.4	35.4	5	1.4	1.4	5.5	5.4	5.8	3.7	7.9	14.3	27.1	5.2	5.1
Sample Date			8/10/2014	8/11/2014	7/15/2013	8/10/2014	8/10/2014	8/10/2014	7/18/2014	7/18/2014	8/14/2014	8/15/2014	8/15/2014	8/15/2014	7/22/2014	7/22/2014
pH	**Result (pH units)**	6.5-9.0	6.99	7.87	7.95	7.03	6.94	6.8	7.78	6.96	7.92	7.57	8.19	7.31	8.42	6.32
	Result Qualifier															
Acidity	**Result (mg/L)**	-	7.9	2.4	3	5.1	4.8	4.2	1.9	11.9	1	1.1	1	4.2	1	7.7
	Result Qualifier										U		U		U	
Total Alkalinity	**Result (mg/L)**	-	255	52.6	88.3	244	230	110	90.8	197	119	232	70.8	244	55.4	48.9
	Result Qualifier															
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
ORP Leachable	**Result (mV)**	-	334	252	345	295	317	289	480	245	243	258	262	266	279	261
	Result Qualifier															
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.0053	0.0362	0.0175	0.005	0.005	0.005	0.016	0.014	0.0166	0.0166	0.0482	0.005	0.108	0.0089
	Result Qualifier					U	U	U						U		
Antimony	**Result (mg/L)**	1.6	0.0007	0.00064	0.00046	0.00012	0.0001	0.0001	0.00023	0.00068	0.00253	0.00083	0.00088	0.00252	0.00089	0.0001
	Result Qualifier						U									U
Arsenic	**Result (mg/L)**	0.005	0.001	0.0015	0.001	0.0055	0.0017	0.001	0.001	0.002	0.0012	0.001	0.001	0.0134	0.0012	0.001
	Result Qualifier		U		U	J	J	U	U	U		U	U			U
Barium	**Result (mg/L)**	2.3	0.0178	0.0467	0.0819	0.0259	0.0249	0.0192	0.0847	0.0213	0.164	0.0636	0.0355	0.0281	0.0731	0.0344
	Result Qualifier															
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.024	0.013	0.016	0.015	0.014	0.018	0.01	0.02	0.013	0.02	0.021	0.022	0.015	0.016
	Result Qualifier								U	U						
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Cadmium	**Result (mg/L)**	Variable[c]	0.00189	0.000094	0.000057	0.000436	0.000701	0.00553	0.000063	0.00939	0.000097	0.00005	0.00006	0.00005	0.00005	0.0185
	Result Qualifier											U	U	U	U	
Calcium	**Result (mg/L)**	-	235	238	66.3	136	168	142	59.1	417	65.2	41.7	57.8	206	19.2	227
	Result Qualifier															
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.00428	0.00058	0.00036	0.00278	0.00335	0.00885	0.0001	0.0054	0.0003	0.00098	0.00011	0.00657	0.0001	0.17
	Result Qualifier								U						U	
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.0023
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)
Sample ID			CH14-015-MW004-SOM	CH14-015-MW004-SOS	CH13-108-TP015-SOA	CH14-015-MW004-SOA	CH14-015-MW904-SOA	CH14-015-MW004-SOD	CH14-106-TP013-SOCOMP	CH14-106-TP014-SOCOMP	CH14-015-MW006-SOB	CH14-015-MW006-SOC	CH14-015-MW006-SOE	CH14-015-MW006-SOI	CH14-106-TP018-SOCOMP	CH14-106-TP019-SOCOMP
Depth From (mbgs)			20.1	35.1	0	0.8	0.8	5.2	1.5	1.7	3.4	7.6	14.0	26.8	1.5	1.5
Depth From (mbgs)			20.4	35.4	5	1.4	1.4	5.5	5.4	5.8	3.7	7.9	14.3	27.1	5.2	5.1
Sample Date			8/10/2014	8/11/2014	7/15/2013	8/10/2014	8/10/2014	8/10/2014	7/18/2014	7/18/2014	8/14/2014	8/15/2014	8/15/2014	8/15/2014	7/22/2014	7/22/2014
Lead	**Result (mg/L)**	0.001	0.0273	0.00047	0.00026	0.00045	0.00089	0.00542	0.00057	0.0136	0.0469	0.00029	0.0001	0.00018	0.00101	0.00679
	Result Qualifier					J	J						U			
Lithium	**Result (mg/L)**	-	0.0785	0.0229	0.0166	0.0649	0.0671	0.119	0.0188	0.063	0.0112	0.0578	0.0572	0.0658	0.0132	0.0662
	Result Qualifier															
Magnesium	**Result (mg/L)**	-	259	47.2	13.7	84.9	91.6	145	11.3	90.5	9.48	36.6	20.9	113	5.43	61.7
	Result Qualifier															
Manganese	**Result (mg/L)**	-	1.35	0.293	0.0593	0.765	1.02	6.21	0.0132	4.74	0.218	0.131	0.0364	0.19	0.00901	10.1
	Result Qualifier															
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.00063	0.0406	0.0105	0.00011	0.0001	0.00017	0.0302	0.00058	0.0155	0.00504	0.0699	0.0015	0.00835	0.0001
	Result Qualifier						U									
Nickel	**Result (mg/L)**	0.025	0.00868	0.00156	0.00094	0.00839	0.00871	0.0145	0.0005	0.0037	0.00094	0.00189	0.00054	0.203	0.0005	0.118
	Result Qualifier								U						U	
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Potassium	**Result (mg/L)**	-	55.7	35	13.6	52.9	53.5	43.8	10.3	15.8	10.8	56	39.5	36.5	7.7	33.6
	Result Qualifier															
Selenium	**Result (mg/L)**	0.001	0.00191	0.0005	0.00158	0.00303	0.00355	0.00134	0.0005	0.001	0.00126	0.0005	0.00122	0.00178	0.00064	0.0005
	Result Qualifier			U					U	U		U				U
Silicon	**Result (mg/L)**	-	5.33	4.15	3.15	5.49	5.84	6.19	4.69	11.2	6.27	4.15	4.36	5.89	3.44	7.41
	Result Qualifier															
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U
Sodium	**Result (mg/L)**	-	6.2	38.9	2.1	4.3	4.1	3.4	4.8	3.5	5.6	7.8	25.8	9.7	8	4.8
	Result Qualifier															
Strontium	**Result (mg/L)**	-	0.364	0.643	1.05	0.287	0.328	0.348	0.18	1.43	0.237	0.185	0.229	0.925	0.152	0.374
	Result Qualifier															
Sulphate	**Result (mg/L)**	100	1440	864	140	503	605	901	120	1340	91.4	95.4	247	753	41.5	904
	Result Qualifier															
Sulphur	**Result (mg/L)**	-	455	282	48.3	162	195	284	39.5	421	31	31.9	80.4	236	13.4	275
	Result Qualifier															
Thallium	**Result (mg/L)**	0.0008	0.00079	0.0001	0.0001	0.00033	0.00036	0.00026	0.0001	0.00079	0.0001	0.0001	0.00014	0.00033	0.0001	0.00018
	Result Qualifier			U	U				U		U				U	
Titanium	**Result (mg/L)**	0.1	0.015	0.018	0.01	0.01	0.012	0.011	0.01	0.019	0.01	0.01	0.01	0.015	0.01	0.014
	Result Qualifier				U				U		U	U	U		U	
Uranium	**Result (mg/L)**	0.015	0.0019	0.000879	0.0016	0.000755	0.00074	0.000313	0.00469	0.00535	0.00511	0.0013	0.0101	0.0243	0.000745	0.000379
	Result Qualifier												J			

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NW)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)	WRD (NE)
Sample ID			CH14-015-MW004-SOM	CH14-015-MW004-SOS	CH13-108-TP015-SOA	CH14-015-MW004-SOA	CH14-015-MW904-SOA	CH14-015-MW004-SOD	CH14-106-TP013-SOCOMP	CH14-106-TP014-SOCOMP	CH14-015-MW006-SOB	CH14-015-MW006-SOC	CH14-015-MW006-SOE	CH14-015-MW006-SOI	CH14-106-TP018-SOCOMP	CH14-106-TP019-SOCOMP
Depth From (mbgs)			20.1	35.1	0	0.8	0.8	5.2	1.5	1.7	3.4	7.6	14.0	26.8	1.5	1.5
Depth From (mbgs)			20.4	35.4	5	1.4	1.4	5.5	5.4	5.8	3.7	7.9	14.3	27.1	5.2	5.1
Sample Date			8/10/2014	8/11/2014	7/15/2013	8/10/2014	8/10/2014	8/10/2014	7/18/2014	7/18/2014	8/14/2014	8/15/2014	8/15/2014	8/15/2014	7/22/2014	7/22/2014
Vanadium	**Result (mg/L)**	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.0014	0.001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U		U
Zinc	**Result (mg/L)**	0.03	0.045	0.011	0.01	0.01	0.01	0.222	0.01	1.1	0.01	0.01	0.01	0.01	0.01	0.341
	Result Qualifier				U	U	U		U		U	U	U	U	U	

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	Perimeter (East)	Perimeter (East)	Perimeter (East)	Perimeter (East)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-106-TP020-SOA	CH14-106-TP025-SOA	CH14-106-TP925-SOA	CH14-106-TP026-SOA	CH14-107-MW001-SOA	CH14-107-MW001-SOB	CH14-107-MW001-SOC	CH14-107-MW901-SOC	CH14-107-MW001-SOD	CH14-107-MW001-SOE	CH14-107-MW001-SOF	CH14-107-MW002-SOA	CH14-107-MW002-SOB	CH14-107-MW002-SOC
Depth From (mbgs)			1.5	0.5	0.5	1.4	3.0	6.4	8.2	8.2	11.3	17.7	19.5	4.3	6.7	9.8
Depth From (mbgs)			1.5	0.5	0.5	1.4	3.4	6.7	8.5	8.5	11.6	18.0	19.8	4.6	7.0	10.1
Sample Date			7/21/2014	7/21/2014	7/21/2014	7/21/2014	9/8/2014	9/8/2014	9/8/2014	9/8/2014	9/8/2014	9/9/2014	9/9/2014	9/8/2014	9/8/2014	9/8/2014
pH	**Result (pH units)**	6.5-9.0	7.55	6.79	6.69	7.44	7.87	7.41	6.65	6.39	6.82	6.71	5.97	7.26	7.01	7.55
	Result Qualifier		J	J	J	J							J			
Acidity	**Result (mg/L)**	-	5.6	5.3	5.5	5.3	1.5	2.5	3.1	4.3	2.5	2.6	8.1	3.9	3.1	2.5
	Result Qualifier		J	J	J	J							J			
Total Alkalinity	**Result (mg/L)**	-	24	15	10.2	15	122	37.4	10.6	8.1	4.4	13.3	16.1	23.8	7.2	20.6
	Result Qualifier		J	J	J	J							J			
Specific Conductance	**Result (µS/cm)**	-	71.8	98.4	111	48.2	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
ORP Leachable	**Result (mV)**	-	246	275	320	286	316	345	381	385	377	377	162	365	381	379
	Result Qualifier		J	J	J	J							J			
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	43.7	8.45	8.16	63.8	0.005	0.117	0.005	0.005	0.241	0.005	0.005	15.6	2.58	10.3
	Result Qualifier		J	J	J	J	U		U	U	J	U	U			
Antimony	**Result (mg/L)**	1.6	0.00178	0.00085	0.00081	0.00366	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U	U	U	U
Arsenic	**Result (mg/L)**	0.005	0.0342	0.0101	0.0098	0.0443	0.001	0.001	0.001	0.001	0.001	0.001	0.0057	0.0458	0.012	0.0227
	Result Qualifier		J	J	J	J	U	U	U	U	U	U				
Barium	**Result (mg/L)**	2.3	0.489	0.166	0.16	0.714	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U	U	U	U
Beryllium	**Result (mg/L)**	0.0053	0.0021	0.00059	0.00051	0.00343	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00227	0.0007	0.0014
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U			
Boron	**Result (mg/L)**	1.5	0.021	0.01	0.01	0.036	0.01	0.024	0.022	0.016	0.014	0.014	0.015	0.03	0.024	0.033
	Result Qualifier		J	J	UJ	J	U									
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Cadmium	**Result (mg/L)**	Variable[c]	0.000732	0.000323	0.000291	0.00072	0.00005	0.00005	0.00039	0.00112	0.000194	0.00011	0.000084	0.000329	0.000173	0.000088
	Result Qualifier		J	J	J	J	U	U	J	J						
Calcium	**Result (mg/L)**	-	6.58	11.2	12.5	6.56	40	19	8.87	10.4	3.26	4.78	18.1	4.67	6.78	0.05
	Result Qualifier		J	J	J	J										U
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Chromium	**Result (mg/L)**	0.0089	0.0553	0.0126	0.0121	0.0908	0.0005	0.0005	0.0005	0.0005	0.00053	0.0005	0.0005	0.0292	0.00414	0.0118
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U			
Cobalt	**Result (mg/L)**	-	0.0339	0.00663	0.00615	0.0346	0.0001	0.0001	0.0207	0.0527	0.00351	0.00903	0.074	0.0176	0.00292	0.00304
	Result Qualifier		J	J	J	J	U	U	J	J	J					
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.149	0.0575	0.0581	0.249	0.001	0.001	0.001	0.001	0.0019	0.001	0.001	0.0358	0.0159	0.0182
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U			
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Iron	**Result (mg/L)**	0.3	69.5	22	18.1	88.4	0.03	0.03	0.03	0.03	0.03	0.03	0.03	76.9	14.4	19.5
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U			

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	Perimeter (East)	Perimeter (East)	Perimeter (East)	Perimeter (East)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-106-TP020-SOA	CH14-106-TP025-SOA	CH14-106-TP925-SOA	CH14-106-TP026-SOA	CH14-107-MW001-SOA	CH14-107-MW001-SOB	CH14-107-MW001-SOC	CH14-107-MW901-SOC	CH14-107-MW001-SOD	CH14-107-MW001-SOE	CH14-107-MW001-SOF	CH14-107-MW002-SOA	CH14-107-MW002-SOB	CH14-107-MW002-SOC
Depth From (mbgs)			1.5	0.5	0.5	1.4	3.0	6.4	8.2	8.2	11.3	17.7	19.5	4.3	6.7	9.8
Depth From (mbgs)			1.5	0.5	0.5	1.4	3.4	6.7	8.5	8.5	11.6	18.0	19.8	4.6	7.0	10.1
Sample Date			7/21/2014	7/21/2014	7/21/2014	7/21/2014	9/8/2014	9/8/2014	9/8/2014	9/8/2014	9/8/2014	9/9/2014	9/9/2014	9/8/2014	9/8/2014	9/8/2014
Lead	**Result (mg/L)**	0.001	0.0479	0.0329	0.0284	0.0488	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0481	0.0001	0.0001
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U		U	U
Lithium	**Result (mg/L)**	-	0.0601	0.0083	0.0082	0.0877	0.005	0.0458	0.0511	0.0638	0.0277	0.0479	0.0704	0.031	0.0248	0.0197
	Result Qualifier		J	J	J	J	U									
Magnesium	**Result (mg/L)**	-	7.78	1.8	1.79	7.91	5.72	5.97	3.51	4.03	1.5	1.97	13.4	2.93	2.49	1.99
	Result Qualifier		J	J	J	J										
Manganese	**Result (mg/L)**	-	1.04	0.428	0.392	1.08	0.0005	0.0005	0.0005	0.579	0.0005	0.0005	1.14	0.875	0.0005	0.0005
	Result Qualifier		J	J	J	J	U	U	U		U	U			U	U
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.000146	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000053	0.00005	0.00005
	Result Qualifier		R	R	R	J	U	U	U	U	U	U	UJ		U	U
Molybdenum	**Result (mg/L)**	0.073	0.00707	0.0043	0.00455	0.0197	0.00122	0.00265	0.0001	0.0001	0.00044	0.0021	0.0001	0.0167	0.00204	0.00305
	Result Qualifier		J	J	J	J			U	U	J		U			
Nickel	**Result (mg/L)**	0.025	0.113	0.0157	0.0191	0.153	0.0005	0.0005	0.0319	0.0728	0.00659	0.014	0.139	0.0299	0.00852	0.00989
	Result Qualifier		J	J	J	J	U	U	J	J	J					
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Potassium	**Result (mg/L)**	-	9.3	3.7	4.1	13.1	4.4	15.8	11.7	12.7	9.8	11.8	59.2	14.6	11.4	14.3
	Result Qualifier		J	J	J	J										
Selenium	**Result (mg/L)**	0.001	0.00092	0.0005	0.0005	0.00122	0.0005	0.00082	0.00083	0.00099	0.0005	0.0005	0.00069	0.00154	0.00113	0.00071
	Result Qualifier		J	UJ	UJ	J	U				U	U				
Silicon	**Result (mg/L)**	-	75	27.2	25.1	105	5.63	8.4	9.52	9.59	9.44	6.3	9.99	34.6	16.2	22.6
	Result Qualifier		J	J	J	J										
Silver	**Result (mg/L)**	0.0001	0.000564	0.000272	0.000264	0.00127	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000374	0.000081	0.000195
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U			
Sodium	**Result (mg/L)**	-	6.1	5.5	5.3	5	3.3	13	9	8.3	6.6	6.3	8.3	11.6	11.6	11.9
	Result Qualifier		J	J	J	J										
Strontium	**Result (mg/L)**	-	0.0672	0.0646	0.0744	0.0731	0.0317	0.1	0.0803	0.093	0.0235	0.0354	0.0765	0.0491	0.0542	0.0284
	Result Qualifier		J	J	J	J										
Sulphate	**Result (mg/L)**	100	8.74	24.1	33.8	9.21	10.5	79	61	69.5	35.8	34.7	176	26.6	52.9	27.8
	Result Qualifier		J	J	J	J							J			
Sulphur	**Result (mg/L)**	-	2.77	8.06	11.4	3.31	3.48	25.4	19.5	22.6	11.2	10.9	56.6	8.37	16.9	8.77
	Result Qualifier		J	J	J	J										
Thallium	**Result (mg/L)**	0.0008	0.00037	0.00013	0.00012	0.00056	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00022	0.0001	0.00014
	Result Qualifier		J	J	J	J	U	U	U	U	U	U	U		U	
Titanium	**Result (mg/L)**	0.1	0.875	0.328	0.27	1.29	0.01	0.01	0.01	0.01	0.019	0.01	0.01	0.515	0.152	0.269
	Result Qualifier		J	J	J	J	U	U	U	U	J	U	U			
Uranium	**Result (mg/L)**	0.015	0.00174	0.00116	0.00111	0.00285	0.00104	0.000369	0.000025	0.000033	0.000069	0.000013	0.000116	0.0105	0.00161	0.00157
	Result Qualifier		J	J	J	J					J					

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	Perimeter (East)	Perimeter (East)	Perimeter (East)	Perimeter (East)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-106-TP020-SOA	CH14-106-TP025-SOA	CH14-106-TP925-SOA	CH14-106-TP026-SOA	CH14-107-MW001-SOA	CH14-107-MW001-SOB	CH14-107-MW001-SOC	CH14-107-MW901-SOC	CH14-107-MW001-SOD	CH14-107-MW001-SOE	CH14-107-MW001-SOF	CH14-107-MW002-SOA	CH14-107-MW002-SOB	CH14-107-MW002-SOC
Depth From (mbgs)			1.5	0.5	0.5	1.4	3.0	6.4	8.2	8.2	11.3	17.7	19.5	4.3	6.7	9.8
Depth From (mbgs)			1.5	0.5	0.5	1.4	3.4	6.7	8.5	8.5	11.6	18.0	19.8	4.6	7.0	10.1
Sample Date			7/21/2014	7/21/2014	7/21/2014	7/21/2014	9/8/2014	9/8/2014	9/8/2014	9/8/2014	9/8/2014	9/9/2014	9/9/2014	9/8/2014	9/8/2014	9/8/2014
Vanadium	**Result (mg/L)**	-	0.0893	0.0289	0.0272	0.139	0.001	0.001	0.001	0.001	0.0025	0.001	0.001	0.0343	0.0121	0.025
	Result Qualifier		J	J	J	J	U	U	U	U		U	U			
Zinc	**Result (mg/L)**	0.03	0.266	0.077	0.077	0.25	0.01	0.01	0.289	0.943	0.062	0.089	0.325	1.04	0.349	0.311
	Result Qualifier		J	J	J	J	U	U	J	J			J			

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-107-MW002-SOD	CH14-107-MW003-SOA	CH14-107-MW003-SOD	CH14-107-MW003-SOF	CH14-107-MW003-SOH	CH14-107-MW003-SOI	CH14-107-MW003-SOK	CH14-107-MW003-SOM	CH14-107-MW004-SOB	CH14-107-MW004-SOD	CH14-107-MW004-SOG	CH14-107-MW004-SOI	CH14-107-MW004-SOK	CH14-107-MW904-SOK
Depth From (mbgs)			11.3	1.8	11.9	18.9	25.0	28.4	34.8	39.9	2.4	8.8	18.6	25.6	29.3	29.3
Depth From (mbgs)			11.6	2.1	12.2	19.2	25.3	28.7	35.1	40.2	2.7	9.1	18.9	25.9	29.6	29.6
Sample Date			9/8/2014	8/21/2014	8/21/2014	8/21/2014	8/21/2014	8/21/2014	8/22/2014	8/22/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014
pH	**Result (pH units)**	6.5-9.0	7.2	6.16	6.67	6.89	6.53	6.86	6.4	6.26	5.64	6.98	6.62	6.58	6.87	6.77
	Result Qualifier			J	J	J	J	J								
Acidity	**Result (mg/L)**	-	2.6	3.6	3.9	3.6	2.9	2.5	6.4	4.5	7.7	3.8	6.2	6	3.5	3.8
	Result Qualifier			J	J	J	J	J								
Total Alkalinity	**Result (mg/L)**	-	25.3	6.8	121	184	25.9	87.4	85.4	40.1	6.2	32.2	178	71.5	61.7	56.5
	Result Qualifier			J	J	J	J	J								
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
ORP Leachable	**Result (mV)**	-	434	220	195	182	219	217	232	243	309	288	314	349	214	244
	Result Qualifier															
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	2.32	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Antimony	**Result (mg/L)**	1.6	0.0001	0.0001	0.0156	0.0001	0.0001	0.0001	0.00216	0.0001	0.00189	0.0001	0.0001	0.00239	0.0001	0.0001
	Result Qualifier		U	U		U	U	U		U		U	U		U	U
Arsenic	**Result (mg/L)**	0.005	0.0136	0.001	0.0319	0.001	0.0062	0.0047	0.0107	0.0022	0.0137	0.001	0.0026	0.001	0.001	0.001
	Result Qualifier			U		U						U		U	U	U
Barium	**Result (mg/L)**	2.3	0.001	0.0573	0.235	0.179	0.128	0.0352	0.0731	0.0539	0.198	0.001	0.2	0.001	0.218	0.238
	Result Qualifier		U									U		U		
Beryllium	**Result (mg/L)**	0.0053	0.0009	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.025	0.02	0.058	0.06	0.067	0.057	0.027	0.026	0.027	0.025	0.022	0.066	0.016	0.019
	Result Qualifier															
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Cadmium	**Result (mg/L)**	Variable[c]	0.000167	0.00472	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000439	0.00005	0.00005	0.00019	0.00005	0.00005
	Result Qualifier				U	U	U	U	U	U		U	U		U	U
Calcium	**Result (mg/L)**	-	5.16	13.9	15.4	18.4	3.79	6.73	26.1	25.6	40.7	0.05	21.4	17.1	11.2	13
	Result Qualifier											U				
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Chromium	**Result (mg/L)**	0.0089	0.00592	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00059	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.00251	0.0142	0.0962	0.0632	0.00848	0.00467	0.0732	0.0285	0.0279	0.0001	0.135	0.138	0.00974	0.0103
	Result Qualifier											U				
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.0212	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Iron	**Result (mg/L)**	0.3	16.7	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-107-MW002-SOD	CH14-107-MW003-SOA	CH14-107-MW003-SOD	CH14-107-MW003-SOF	CH14-107-MW003-SOH	CH14-107-MW003-SOI	CH14-107-MW003-SOK	CH14-107-MW003-SOM	CH14-107-MW004-SOB	CH14-107-MW004-SOD	CH14-107-MW004-SOG	CH14-107-MW004-SOI	CH14-107-MW004-SOK	CH14-107-MW904-SOK
Depth From (mbgs)			11.3	1.8	11.9	18.9	25.0	28.4	34.8	39.9	2.4	8.8	18.6	25.6	29.3	29.3
Depth From (mbgs)			11.6	2.1	12.2	19.2	25.3	28.7	35.1	40.2	2.7	9.1	18.9	25.9	29.6	29.6
Sample Date			9/8/2014	8/21/2014	8/21/2014	8/21/2014	8/21/2014	8/21/2014	8/22/2014	8/22/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014
Lead	**Result (mg/L)**	0.001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U
Lithium	**Result (mg/L)**	-	0.0481	0.0452	0.0926	0.0863	0.0574	0.0342	0.0974	0.117	0.0534	0.0526	0.11	0.222	0.0492	0.0488
	Result Qualifier															
Magnesium	**Result (mg/L)**	-	3.62	5.67	11.9	18.8	1.49	4.55	30.2	21	8.97	3.95	18.5	7.23	4.21	4.62
	Result Qualifier															
Manganese	**Result (mg/L)**	-	0.0005	1.85	0.671	0.608	0.12	0.203	1.42	0.773	1.48	0.0005	2.49	0.73	0.0005	0.0005
	Result Qualifier		U									U			U	U
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.00278	0.0001	0.00675	0.00053	0.00089	0.00576	0.0003	0.0001	0.00259	0.0033	0.0001	0.0001	0.00772	0.00873
	Result Qualifier			U						U	U		U	U		
Nickel	**Result (mg/L)**	0.025	0.0074	0.00948	0.128	0.0582	0.00304	0.00086	0.095	0.0516	0.0255	0.0005	0.137	0.181	0.0005	0.0005
	Result Qualifier											U			U	U
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Potassium	**Result (mg/L)**	-	28	25.1	44.7	48.4	19.2	39.8	56.3	63.9	5.8	24.1	37.6	25.7	17.6	18.1
	Result Qualifier															
Selenium	**Result (mg/L)**	0.001	0.00097	0.0005	0.00061	0.0005	0.0005	0.0005	0.00093	0.00073	0.00084	0.00127	0.00059	0.00117	0.0005	0.0005
	Result Qualifier			U		U	U	U							U	U
Silicon	**Result (mg/L)**	-	11.3	7.7	9.64	8.2	8.96	9.58	11.5	10.7	0.05	0.05	0.05	0.05	0.05	0.05
	Result Qualifier										U	U	U	U	U	U
Silver	**Result (mg/L)**	0.0001	0.000057	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Sodium	**Result (mg/L)**	-	15	2	2	2	2	2	2	2	3.8	14.4	7.2	7.2	11.6	11.8
	Result Qualifier			U	U	U	U	U	U	U						
Strontium	**Result (mg/L)**	-	0.0405	0.101	0.13	0.176	0.0308	0.0433	0.16	0.162	0.249	0.0878	0.215	0.149	0.101	0.111
	Result Qualifier															
Sulphate	**Result (mg/L)**	100	65.5	100	49.8	21.8	22	10.6	146	185	147	66.9	24.9	64.5	29.7	46.4
	Result Qualifier			J	J	J	J	J	J	J						
Sulphur	**Result (mg/L)**	-	21.2	33	16.6	31.4	8.7	3.59	119	108	49.2	22.4	26.5	21.6	20.3	18.5
	Result Qualifier															
Thallium	**Result (mg/L)**	0.0008	0.0001	0.00012	0.00022	0.00013	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U				U	U	U	U	U	U	U	U	U	U
Titanium	**Result (mg/L)**	0.1	0.106	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.00111	0.000027	0.000112	0.000025	0.000131	0.00003	0.000014	0.000018	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001
	Result Qualifier										U	U	U	U	U	U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-107-MW002-SOD	CH14-107-MW003-SOA	CH14-107-MW003-SOD	CH14-107-MW003-SOF	CH14-107-MW003-SOH	CH14-107-MW003-SOI	CH14-107-MW003-SOK	CH14-107-MW003-SOM	CH14-107-MW004-SOB	CH14-107-MW004-SOD	CH14-107-MW004-SOG	CH14-107-MW004-SOI	CH14-107-MW004-SOK	CH14-107-MW904-SOK
Depth From (mbgs)			11.3	1.8	11.9	18.9	25.0	28.4	34.8	39.9	2.4	8.8	18.6	25.6	29.3	29.3
Depth From (mbgs)			11.6	2.1	12.2	19.2	25.3	28.7	35.1	40.2	2.7	9.1	18.9	25.9	29.6	29.6
Sample Date			9/8/2014	8/21/2014	8/21/2014	8/21/2014	8/21/2014	8/21/2014	8/22/2014	8/22/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014	8/28/2014
Vanadium	**Result (mg/L)**	-	0.0055	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Zinc	**Result (mg/L)**	0.03	0.188	0.59	0.266	0.141	0.333	0.038	0.397	0.168	1.1	0.01	1.78	1.93	0.01	0.01
	Result Qualifier											U			U	U

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-107-MW004-SOL	CH14-107-MW005B-SOA	CH14-107-MW905B-SOA	CH14-107-MW005B-SOC	CH14-107-MW006B-SOA	CH14-107-MW906B-SOA	CH14-107-MW006B-SOC	CH14-107-TP002-SOA	CH14-107-TP002-SOB	CH14-107-TP003-SOA	CH14-107-TP003-SOB	CH14-107-TP004-SOA	CH14-107-TP004-SOB	CH14-107-TP004-SOC
Depth From (mbgs)			34.4	0.9	0.9	5.2	0.6	0.6	4.9	1.7	4	1.6	5	1.2	2.5	5.2
Depth From (mbgs)			34.8	1.2	1.2	5.5	0.9	0.9	5.2	1.7	4	1.6	5	1.2	2.5	5.2
Sample Date			8/28/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	7/21/2014	7/21/2014	7/21/2014	7/21/2014	7/22/2014	7/22/2014	7/22/2014
pH	**Result (pH units)**	6.5-9.0	6.82	3.91	3.97	7.27	4.26	4.31	6.78	5.27	7.29	4.97	5.39	3.06	4.14	7.08
	Result Qualifier															
Acidity	**Result (mg/L)**	-	3.7	35.3	34.8	4.9	23.1	20.8	4.7	5.3	3	7.2	6	308	110	4
	Result Qualifier															
Total Alkalinity	**Result (mg/L)**	-	55.7	1	1	20.1	1	1	29.6	1	9.4	1	1	1	1	14.2
	Result Qualifier			U	U		U	U		U		U	U	U	U	
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
ORP Leachable	**Result (mV)**	-	223	357	366	269	328	331	477	553	400	575	453	554	470	356
	Result Qualifier															
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.041	3.35	0.105	0.0333	32.9	10.7	0.612
	Result Qualifier		U	U	U	U	U	U	U							
Antimony	**Result (mg/L)**	1.6	0.0001	0.0001	0.0001	0.00354	0.0001	0.0001	0.0001	0.0001	0.00095	0.0001	0.0001	0.0001	0.00031	0.00072
	Result Qualifier		U	U	U		U	U	U	U			U			
Arsenic	**Result (mg/L)**	0.005	0.001	0.001	0.001	0.0504	0.001	0.001	0.001	0.001	0.0084	0.001	0.001	0.0023	0.0024	0.0033
	Result Qualifier		U	U	U		U	U	U	U		U	U			
Barium	**Result (mg/L)**	2.3	0.192	0.001	0.001	0.001	0.001	0.001	0.001	0.0766	0.0782	0.0747	0.0736	0.02	0.0553	0.0415
	Result Qualifier			U	U	U	U	U	U							
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.00198	0.00203	0.00066	0.00098	0.00077	0.0005	0.0005	0.0005	0.0005	0.0005	0.00858	0.0127	0.0005
	Result Qualifier		U						U	U	U	U	U			U
Boron	**Result (mg/L)**	1.5	0.016	0.029	0.031	0.019	0.034	0.035	0.017	0.034	0.031	0.032	0.027	0.016	0.037	0.017
	Result Qualifier															
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.00679	0.00705	0.000254	0.0032	0.00334	0.00005	0.00179	0.00157	0.00242	0.00872	0.036	0.0708	0.00068
	Result Qualifier		U						U							
Calcium	**Result (mg/L)**	-	13.8	0.05	0.05	0.05	0.05	0.05	10.3	1.73	2.76	2.23	5.14	337	133	4.4
	Result Qualifier			U	U	U	U	U								
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.00746	0.0005	0.0005	0.0005	0.0005	0.00552	0.0005	0.0005	0.0163	0.00053	0.00299
	Result Qualifier		U	U	U		U	U	U	U		U	U			
Cobalt	**Result (mg/L)**	-	0.00557	0.0418	0.0358	0.00537	0.0653	0.0624	0.0001	0.0208	0.00336	0.048	0.0125	0.466	0.658	0.0119
	Result Qualifier								U							
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0038	0.0173	0.0068	0.0021	0.915	0.362	0.0142
	Result Qualifier		U	U	U	U	U	U	U							
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	23.7	0.03	0.03	0.03	0.03	7.23	0.03	0.03	4.02	0.03	4.19
	Result Qualifier		U	U	U		U	U	U	U		U	U		U	

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-107-MW004-SOL	CH14-107-MW005B-SOA	CH14-107-MW905B-SOA	CH14-107-MW005B-SOC	CH14-107-MW006B-SOA	CH14-107-MW906B-SOA	CH14-107-MW006B-SOC	CH14-107-TP002-SOA	CH14-107-TP002-SOB	CH14-107-TP003-SOA	CH14-107-TP003-SOB	CH14-107-TP004-SOA	CH14-107-TP004-SOB	CH14-107-TP004-SOC
Depth From (mbgs)			34.4	0.9	0.9	5.2	0.6	0.6	4.9	1.7	4	1.6	5	1.2	2.5	5.2
Depth From (mbgs)			34.8	1.2	1.2	5.5	0.9	0.9	5.2	1.7	4	1.6	5	1.2	2.5	5.2
Sample Date			8/28/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	7/21/2014	7/21/2014	7/21/2014	7/21/2014	7/22/2014	7/22/2014	7/22/2014
Lead	**Result (mg/L)**	0.001	0.0001	5.37	5.29	0.27	0.0366	0.057	0.0001	0.037	0.0483	0.298	0.0116	0.0128	2.45	0.185
	Result Qualifier		U						U							
Lithium	**Result (mg/L)**	-	0.0261	0.139	0.141	0.005	0.117	0.111	0.0375	0.032	0.0124	0.0476	0.0245	0.14	0.216	0.0076
	Result Qualifier					U										
Magnesium	**Result (mg/L)**	-	7.24	6.63	7.24	0.1	5.57	5.03	0.1	0.96	1.79	1.78	1.82	15.3	13.8	1.17
	Result Qualifier					U			U							
Manganese	**Result (mg/L)**	-	0.0005	2.19	1.09	0.0005	2.84	3.05	0.0005	0.749	0.336	1.74	2.18	11.1	11.2	0.321
	Result Qualifier		U	J	J	U			U							
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.000061	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	UJ	UJ	J	UJ	UJ	UJ	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.0195	0.0001	0.0001	0.0129	0.0001	0.0001	0.0001	0.0001	0.00511	0.0001	0.0001	0.0001	0.0001	0.00303
	Result Qualifier			U	U		U	U	U	U		U	U	U	U	
Nickel	**Result (mg/L)**	0.025	0.0005	0.0428	0.0439	0.016	0.039	0.0321	0.0005	0.00776	0.00658	0.0139	0.0182	0.128	0.163	0.00306
	Result Qualifier		U						U							
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Potassium	**Result (mg/L)**	-	26.1	43	47.2	2	40.2	40.7	7.4	18	12.3	27.1	24.2	11.5	35.1	10.7
	Result Qualifier					U										
Selenium	**Result (mg/L)**	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00114	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U		U	U	U	U	U	U	U
Silicon	**Result (mg/L)**	-	0.05	37.7	40.4	0.05	37.6	34.7	0.05	17.5	15.7	23.1	19.9	39.6	23.1	9.15
	Result Qualifier		U			U			U							
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.000341	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00122	0.000083
	Result Qualifier		U	U	U		U	U	U	U	U	U	U	U		
Sodium	**Result (mg/L)**	-	20.8	6.4	7.1	5.5	6.3	7.3	6.6	4.1	9.5	4.6	5.4	4.3	4.4	5.2
	Result Qualifier															
Strontium	**Result (mg/L)**	-	0.119	0.207	0.214	0.0005	0.119	0.119	0.0658	0.0259	0.024	0.0388	0.055	0.601	0.488	0.0303
	Result Qualifier					U										
Sulphate	**Result (mg/L)**	100	64.7	147	152	15.4	123	120	35.2	44.1	32.9	60.6	66.2	1250	553	23.7
	Result Qualifier			J	J	J	J	J	J							
Sulphur	**Result (mg/L)**	-	74.7	49	51.2	5.24	41	40.1	11.5	15.6	11.4	21.2	22.7	395	182	8.25
	Result Qualifier															
Thallium	**Result (mg/L)**	0.0008	0.0001	0.00109	0.00118	0.0001	0.00044	0.00043	0.0001	0.00023	0.00024	0.00033	0.0004	0.00039	0.00116	0.00018
	Result Qualifier		U			U			U							
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.106	0.01	0.01	0.01	0.015	0.018
	Result Qualifier		U	U	U	U	U	U	U	U		U	U	U		
Uranium	**Result (mg/L)**	0.015	0.00001	0.000687	0.000654	0.0031	0.00001	0.00001	0.00001	0.000031	0.000925	0.000104	0.000019	0.00847	0.00414	0.000279
	Result Qualifier		U				U	U	U							

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH14-107-MW004-SOL	CH14-107-MW005B-SOA	CH14-107-MW905B-SOA	CH14-107-MW005B-SOC	CH14-107-MW006B-SOA	CH14-107-MW906B-SOA	CH14-107-MW006B-SOC	CH14-107-TP002-SOA	CH14-107-TP002-SOB	CH14-107-TP003-SOA	CH14-107-TP003-SOB	CH14-107-TP004-SOA	CH14-107-TP004-SOB	CH14-107-TP004-SOC
Depth From (mbgs)			34.4	0.9	0.9	5.2	0.6	0.6	4.9	1.7	4	1.6	5	1.2	2.5	5.2
Depth From (mbgs)			34.8	1.2	1.2	5.5	0.9	0.9	5.2	1.7	4	1.6	5	1.2	2.5	5.2
Sample Date			8/28/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	8/23/2014	7/21/2014	7/21/2014	7/21/2014	7/21/2014	7/22/2014	7/22/2014	7/22/2014
Vanadium	**Result (mg/L)**	-	0.001	0.001	0.001	0.0246	0.001	0.001	0.001	0.001	0.0097	0.001	0.001	0.001	0.001	0.0027
	Result Qualifier		U	U	U		U	U	U	U		U	U	U	U	
Zinc	**Result (mg/L)**	0.03	0.01	1.87	1.94	0.01	1.03	0.928	0.01	0.345	0.273	0.434	0.923	12.8	16.8	0.16
	Result Qualifier		U			U			U							

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH15-107-TP012_Soa	CH15-107-TP013_SOa	CH15-107-TP014_SOa	CH15-107-TP015_SOa	CH15-107-TP016_SOa	CH12-014-MW005-SOA	CH12-014-MW005-SOB	CH12-014-MW005-SOC	CH12-014-MW005-SOD	CH12-014-MW005-SOE	CH12-014-MW005-SOF	CH12-014-MW905-SOF	CH12-014-MW005-SOG	CH12-014-MW005-SOH
Depth From (mbgs)			2	2	2	2	0.5	0	4.5	10	19.6	15	25	25	29	35
Depth From (mbgs)			2.2	2.2	2.2	2.2	0.7	0.2	6.1	10.5	19.8	15.2	25.4	25.4	31	35.4
Sample Date			7/27/2015	7/27/2015	7/27/2015	7/27/2015	7/27/2015	6/25/2012	6/25/2012	6/25/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012
pH	**Result (pH units)**	6.5-9.0	6.07	3.79	5.88	6.4	5.58	7.14	7.24	5.14	7.63	6.7	7.48	7.43	6.16	5.37
	Result Qualifier						J									
Acidity	**Result (mg/L)**	-	6.2	111	3.6	5.2	11.3	2.6	5.6	382	3.5	7	3	2.2	22	406
	Result Qualifier															
Total Alkalinity	**Result (mg/L)**	-	13.5	1	4.2	21.3	5	227	219	27.3	124	141	88.6	105	123	12.2
	Result Qualifier			U												
Specific Conductance	**Result (µS/cm)**	-	99.4	902	66.6	66.3	155	924	1390	4280	2090	1940	1330	1260	2310	2990
	Result Qualifier															
ORP Leachable	**Result (mV)**	-	427	538	440	407	496	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	4.25	13.7	0.0052	47.9	4.5	0.01	0.005	0.05	0.025	0.025	0.019	0.025	0.025	0.122
	Result Qualifier							U	U	U	U	U		U	U	
Antimony	**Result (mg/L)**	1.6	0.00728	0.00065	0.0001	0.00348	0.00153	0.00049	0.00014	0.001	0.00167	0.0005	0.0002	0.0005	0.0005	0.001
	Result Qualifier				U					U		U	U	U	U	U
Arsenic	**Result (mg/L)**	0.005	0.0082	0.0013	0.001	0.02	0.01	0.0426	0.0222	0.038	0.005	0.005	0.002	0.005	0.005	0.01
	Result Qualifier				U						U	U	U	U	U	U
Barium	**Result (mg/L)**	2.3	0.23	0.04	0.1	0.83	0.2	0.0366	0.0402	0.01	0.0321	0.0264	0.0334	0.0346	0.0461	0.027
	Result Qualifier									U						
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.01	0.0005	0.00185	0.0005	0.001	0.0005	0.005	0.0025	0.0025	0.001	0.0025	0.0025	0.005
	Result Qualifier		U		U		U	U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.02	0.01	0.01	0.03	0.01	0.02	0.01	0.1	0.05	0.05	0.02	0.05	0.05	0.1
	Result Qualifier				U			U	U	U	U	U	U	U	U	U
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	0.5	0.5	1	1	1	0.5	0.5	1	1
	Result Qualifier							U	U	U	U	U	U	U	U	U
Cadmium	**Result (mg/L)**	Variable[c]	0.000201	0.05	0.000202	0.000906	0.00145	0.00019	0.000597	0.265	0.00025	0.00092	0.0001	0.00025	0.00308	0.858
	Result Qualifier										U		U	U		
Calcium	**Result (mg/L)**	-	13.5	139	6.54	15.6	20	51.2	102	499	247	246	141	150	256	510
	Result Qualifier															
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	5	5	10	10	10	5	5	10	10
	Result Qualifier							U	U	U	U	U	U	U	U	U
Chromium	**Result (mg/L)**	0.0089	0.00551	0.00209	0.0005	0.07	0.00566	0.001	0.0005	0.005	0.0025	0.0025	0.001	0.0025	0.0025	0.005
	Result Qualifier				U			U	U	U	U	U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.00154	0.07	0.0009	0.02	0.00297	0.00108	0.00414	0.661	0.00492	0.0128	0.0002	0.0005	0.0114	3.26
	Result Qualifier												U	U		
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.01	0.76	0.001	0.09	0.02	0.002	0.001	0.01	0.005	0.005	0.002	0.005	0.005	0.31
	Result Qualifier				U			U	U	U	U	U	U	U	U	
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	0.49	0.43	0.4	2.09	0.4	1.13	0.85	0.4	0.4
	Result Qualifier									U		U			U	U
Iron	**Result (mg/L)**	0.3	3.27	0.14	0.03	44.4	7.16	0.03	0.03	105	0.03	0.03	0.03	0.03	7.02	0.402
	Result Qualifier				U			U	U		U	U	U	U		U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH15-107-TP012_Soa	CH15-107-TP013_SOa	CH15-107-TP014_SOa	CH15-107-TP015_SOa	CH15-107-TP016_SOa	CH12-014-MW005-SOA	CH12-014-MW005-SOB	CH12-014-MW005-SOC	CH12-014-MW005-SOD	CH12-014-MW005-SOE	CH12-014-MW005-SOF	CH12-014-MW905-SOF	CH12-014-MW005-SOG	CH12-014-MW005-SOH
Depth From (mbgs)			2	2	2	2	0.5	0	4.5	10	19.6	15	25	25	29	35
Depth From (mbgs)			2.2	2.2	2.2	2.2	0.7	0.2	6.1	10.5	19.8	15.2	25.4	25.4	31	35.4
Sample Date			7/27/2015	7/27/2015	7/27/2015	7/27/2015	7/27/2015	6/25/2012	6/25/2012	6/25/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012
Lead	**Result (mg/L)**	0.001	0.00647	0.01	0.00118	0.02	0.21	0.0002	0.0001	1.78	0.0005	0.0005	0.0002	0.0005	0.0005	1.52
	Result Qualifier							U	U		U	U	U	U	U	
Lithium	**Result (mg/L)**	-	0.0094	0.08	0.0096	0.05	0.01	0.081	0.129	0.337	0.061	0.096	0.02	0.033	0.189	0.14
	Result Qualifier															
Magnesium	**Result (mg/L)**	-	2.12	4.99	1.43	6.4	3.39	100	142	461	216	172	85.8	75.1	250	137
	Result Qualifier															
Manganese	**Result (mg/L)**	-	0.27	0.64	0.15	0.69	0.24	0.195	0.79	42.1	0.135	1.38	0.177	0.158	5.05	29
	Result Qualifier															
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.000248	0.00039	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U			U	U	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.01	0.0001	0.0001	0.00641	0.00081	0.0002	0.0001	0.001	0.033	0.0005	0.0148	0.0005	0.0005	0.001
	Result Qualifier			U	U			U	U	U		U	J	U	U	U
Nickel	**Result (mg/L)**	0.025	0.00529	0.13	0.00203	0.09	0.01	0.0036	0.0167	0.913	0.156	0.0484	0.001	0.0025	0.0193	1.78
	Result Qualifier												U	U		
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	0.05	0.05	0.14	0.23	0.76	0.871	0.429	0.1	0.1
	Result Qualifier							U	U				J	J	U	U
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	0.01	NT	0.02	0.02	0.034	0.01	0.01	0.02	0.033
	Result Qualifier							U		U	U			U	U	
Potassium	**Result (mg/L)**	-	3	2	2	9.4	3.8	46.6	57.5	45.3	38.7	44.2	73.9	71	36.4	54.3
	Result Qualifier			U	U											
Selenium	**Result (mg/L)**	0.001	0.00058	0.0005	0.0005	0.00134	0.0005	0.001	0.00098	0.0067	0.0027	0.0035	0.0016	0.0025	0.0025	0.005
	Result Qualifier			U	U		U	U						U	U	U
Silicon	**Result (mg/L)**	-	11.1	11.9	3.6	66.2	13.7	4.26	5.06	7.23	5.75	5.23	4.75	4.29	5.28	13.4
	Result Qualifier															
Silver	**Result (mg/L)**	0.0001	0.000116	0.000107	0.00005	0.00131	0.000774	0.0001	0.00005	0.0005	0.00025	0.00025	0.00034	0.00025	0.00025	0.0005
	Result Qualifier				U			U	U	U	U	U		U	U	U
Sodium	**Result (mg/L)**	-	NT	NT	NT	NT	NT	4.5	6.6	4	7.3	7.2	15.3	14.8	8.6	7.8
	Result Qualifier									U						
Strontium	**Result (mg/L)**	-	0.08	0.4	0.06	0.1	0.12	0.262	0.695	0.789	1.04	0.545	0.236	0.287	0.393	0.999
	Result Qualifier															
Sulphate	**Result (mg/L)**	100	26.8	474	21.9	11.6	58.3	325	646	3540	1280	1170	673	631	1550	2270
	Result Qualifier															
Sulphur	**Result (mg/L)**	-	9.03	158	6.9	4.37	19	111	217	1150	495	386	250	232	508	759
	Result Qualifier															
Thallium	**Result (mg/L)**	0.0008	0.0001	0.0001	0.0001	0.00042	0.00022	0.0003	0.00031	0.0015	0.00136	0.00233	0.00055	0.0005	0.0005	0.0032
	Result Qualifier		U		U									U	U	
Titanium	**Result (mg/L)**	0.1	0.09	0.01	0.01	0.64	0.08	0.01	0.01	0.03	0.013	0.012	0.01	0.01	0.013	0.014
	Result Qualifier			U	U			U	U				U			
Uranium	**Result (mg/L)**	0.015	0.0008	0.01	0.00001	0.00168	0.000625	0.000475	0.00114	0.00072	0.00207	0.000901	0.000673	0.00057	0.00229	0.00038
	Result Qualifier				U											

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)
Sample ID			CH15-107-TP012_Soa	CH15-107-TP013_SOa	CH15-107-TP014_SOa	CH15-107-TP015_SOa	CH15-107-TP016_SOa	CH12-014-MW005-SOA	CH12-014-MW005-SOB	CH12-014-MW005-SOC	CH12-014-MW005-SOD	CH12-014-MW005-SOE	CH12-014-MW005-SOF	CH12-014-MW905-SOF	CH12-014-MW005-SOG	CH12-014-MW005-SOH
Depth From (mbgs)			2	2	2	2	0.5	0	4.5	10	19.6	15	25	25	29	35
Depth From (mbgs)			2.2	2.2	2.2	2.2	0.7	0.2	6.1	10.5	19.8	15.2	25.4	25.4	31	35.4
Sample Date			7/27/2015	7/27/2015	7/27/2015	7/27/2015	7/27/2015	6/25/2012	6/25/2012	6/25/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012	6/26/2012
Vanadium	**Result (mg/L)**	-	0.02	0.001	0.001	0.12	0.01	0.002	0.001	0.01	0.005	0.005	0.002	0.005	0.005	0.01
	Result Qualifier			U	U			U	U	U	U	U	U	U	U	U
Zinc	**Result (mg/L)**	0.03	0.03	6.8	0.07	0.15	0.47	0.02	0.01	101	0.05	0.05	0.02	0.05	0.227	224
	Result Qualifier							U	U		U	U	U	U		

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)
Sample ID			CH12-014-MW005-SOI	CH12-014-MW005-SOJ	CH12-014-MW005-SOK	CH14-107-TP001-SOA	CH14-107-TP001-SOB	CH14-107-TP001-SOC	CH14-107-TP901-SOC	CH14-104-MW008-SOB	CH14-104-MW008-SOD	CH14-104-MW908-SOD	CH14-104-MW008-SOE	CH14-104-MW008-SOG	CH14-104-MW008-SOI	CH14-104-MW008-SOL	CH14-104-TP001-SOA
Depth From (mbgs)			39.2	36.4	37	1.6	3	5.5	5.5	3.7	10.4	10.4	12.5	16.5	20.9	26.5	1.2
Depth From (mbgs)			40.3	36.7	37	1.6	3	5.5	5.5	4.0	10.7	10.7	12.8	16.8	21.2	26.8	1.2
Sample Date			6/26/2012	6/27/2012	6/27/2012	7/22/2014	7/22/2014	7/22/2014	7/22/2014	8/12/2014	8/12/2014	8/12/2014	8/12/2014	8/13/2014	8/13/2014	8/13/2014	7/17/2014
pH	**Result (pH units)**	6.5-9.0	7.27	4.48	6.3	8.23	7.54	7.41	7.38	5.03	6.84	6.81	3.16	7.53	6.99	7.4	4.82
	Result Qualifier																
Acidity	**Result (mg/L)**	-	1.1	269	38.4	1	3.5	4.5	5.3	1	7.7	10.7	6160	4.5	7.8	1	5830
	Result Qualifier					U				U						U	
Total Alkalinity	**Result (mg/L)**	-	146	1	45.5	164	201	235	223	1	234	245	1	148	208	193	1
	Result Qualifier			U						U			U				U
Specific Conductance	**Result (µS/cm)**	-	596	3240	2650	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
ORP Leachable	**Result (mV)**	-	NT	NT	NT	265	239	247	279	119	194	139	311	173	258	259	226
	Result Qualifier																
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.01	2.77	0.05	0.0197	0.0086	0.0087	0.0116	0.28	0.008	0.0131	65.7	0.0145	0.0076	0.0151	0.26
	Result Qualifier		U		U												
Antimony	**Result (mg/L)**	1.6	0.0002	0.001	0.001	0.00026	0.00202	0.00065	0.00114	0.004	0.00116	0.0014	0.00078	0.00055	0.00065	0.00203	0.002
	Result Qualifier		U	U	U			J	J	U							U
Arsenic	**Result (mg/L)**	0.005	0.002	0.01	0.01	0.001	0.001	0.001	0.001	0.04	0.0011	0.0013	0.0476	0.0013	0.001	0.001	0.02
	Result Qualifier		U	U	U	U	U	U	U	U					U	U	U
Barium	**Result (mg/L)**	2.3	0.0721	0.021	0.026	0.213	0.0532	0.0434	0.0378	0.04	0.0247	0.0225	0.0145	0.0259	0.0229	0.0579	0.02
	Result Qualifier									U							U
Beryllium	**Result (mg/L)**	0.0053	0.001	0.005	0.005	0.0005	0.0005	0.0005	0.0005	0.02	0.0005	0.0005	0.0762	0.0005	0.0005	0.0005	0.01
	Result Qualifier		U	U	U	U	U	U	U	U	U	U		U	U	U	U
Boron	**Result (mg/L)**	1.5	0.02	0.1	0.1	0.036	0.02	0.018	0.019	0.4	0.031	0.04	0.04	0.031	0.02	0.03	0.2
	Result Qualifier		U	U	U					U			U				U
Bromide	**Result (mg/L)**	-	0.05	1	1	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier		U	U	U												
Cadmium	**Result (mg/L)**	Variable[c]	0.0001	0.223	0.0988	0.000737	0.00113	0.000209	0.000258	0.785	0.00381	0.00328	0.97	0.000296	0.00202	0.000053	1.98
	Result Qualifier		U														
Calcium	**Result (mg/L)**	-	47.7	424	599	23.3	61.1	85.2	89.9	344	263	270	482	219	511	73.1	440
	Result Qualifier																
Chloride	**Result (mg/L)**	120	0.5	10	10	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier		U	U	U												
Chromium	**Result (mg/L)**	0.0089	0.001	0.005	0.005	0.0005	0.0005	0.0005	0.0005	0.02	0.0005	0.0005	0.0218	0.0005	0.0005	0.0005	0.01
	Result Qualifier		U	U	U	U	U	U	U	U	U	U		U	U	U	U
Cobalt	**Result (mg/L)**	-	0.00869	1.67	0.115	0.00027	0.00318	0.00074	0.00083	0.206	0.0339	0.0311	7.03	0.0022	0.0176	0.00242	0.692
	Result Qualifier																
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.002	0.948	0.01	0.001	0.001	0.001	0.001	0.04	0.001	0.001	3.15	0.001	0.001	0.001	0.02
	Result Qualifier		U		U	U	U	U	U	U	U	U		U	U	U	U
Fluoride	**Result (mg/L)**	0.12	1.52	0.88	0.4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier				U												
Iron	**Result (mg/L)**	0.3	0.03	30.8	0.03	0.03	0.03	0.03	0.03	555	0.03	0.03	2040	0.03	0.03	0.03	846
	Result Qualifier		U		U	U	U	U	U		U	U		U	U	U	

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)
Sample ID			CH12-014-MW005-SOI	CH12-014-MW005-SOJ	CH12-014-MW005-SOK	CH14-107-TP001-SOA	CH14-107-TP001-SOB	CH14-107-TP001-SOC	CH14-107-TP901-SOC	CH14-104-MW008-SOB	CH14-104-MW008-SOD	CH14-104-MW908-SOD	CH14-104-MW008-SOE	CH14-104-MW008-SOG	CH14-104-MW008-SOI	CH14-104-MW008-SOL	CH14-104-TP001-SOA
Depth From (mbgs)			39.2	36.4	37	1.6	3	5.5	5.5	3.7	10.4	10.4	12.5	16.5	20.9	26.5	1.2
Depth From (mbgs)			40.3	36.7	37	1.6	3	5.5	5.5	4.0	10.7	10.7	12.8	16.8	21.2	26.8	1.2
Sample Date			6/26/2012	6/27/2012	6/27/2012	7/22/2014	7/22/2014	7/22/2014	7/22/2014	8/12/2014	8/12/2014	8/12/2014	8/12/2014	8/13/2014	8/13/2014	8/13/2014	7/17/2014
Lead	**Result (mg/L)**	0.001	0.0002	1.81	3.89	0.0142	0.0184	0.0001	0.0001	2.74	0.0467	0.048	3.1	0.00285	0.0014	0.00023	2.89
	Result Qualifier		U					U	U								
Lithium	**Result (mg/L)**	-	0.053	0.231	0.119	0.0421	0.077	0.0847	0.0768	0.2	0.103	0.131	0.202	0.0602	0.102	0.0321	0.1
	Result Qualifier									U							U
Magnesium	**Result (mg/L)**	-	38	274	78.3	35	39.2	55.3	55.1	545	198	207	401	241	373	63.6	526
	Result Qualifier																
Manganese	**Result (mg/L)**	-	0.241	31.1	28.6	0.0242	0.365	0.159	0.181	149	1.78	1.88	83.7	0.294	1.71	0.178	142
	Result Qualifier																
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.0002	0.001	0.001	0.0512	0.00248	0.0006	0.00057	0.004	0.00032	0.00046	0.0004	0.0147	0.00152	0.00355	0.002
	Result Qualifier		U	U	U					U			U				U
Nickel	**Result (mg/L)**	0.025	0.0097	1.54	0.166	0.0005	0.00308	0.00176	0.00207	0.512	0.0216	0.0225	3.09	0.0136	0.063	0.00252	0.673
	Result Qualifier					U											
Nitrate	**Result (mg/L)**	13	0.0196	0.11	0.15	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
Nitrite	**Result (mg/L)**	0.06	0.0014	0.025	0.02	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier				U												
Potassium	**Result (mg/L)**	-	41.7	48.9	51.7	13.4	25.7	39.2	39.3	17	48.2	55.1	12	40.4	41.6	47.3	12
	Result Qualifier																
Selenium	**Result (mg/L)**	0.001	0.0013	0.005	0.005	0.00654	0.00102	0.001	0.00092	0.02	0.00247	0.00262	0.002	0.00383	0.00396	0.00053	0.01
	Result Qualifier			U	U					U			U				U
Silicon	**Result (mg/L)**	-	4.33	19.1	9.61	2.74	3.03	3.97	3.87	11	6.15	6.5	50	4	4.6	4.86	10.5
	Result Qualifier																
Silver	**Result (mg/L)**	0.0001	0.0001	0.00145	0.0005	0.000174	0.00015	0.00005	0.00005	0.002	0.00005	0.00005	0.00027	0.00006	0.00005	0.00005	0.0012
	Result Qualifier		U		U			U	U	U	U	U			U	U	
Sodium	**Result (mg/L)**	-	6.3	9.2	11.4	5.2	6.2	8.8	8.8	10	6.1	6.8	10	16	24.5	9.9	10
	Result Qualifier									U			U				U
Strontium	**Result (mg/L)**	-	0.184	0.752	0.911	0.626	0.628	0.646	0.603	0.069	0.699	0.846	0.333	4.63	8.07	0.404	0.063
	Result Qualifier																
Sulphate	**Result (mg/L)**	100	167	2470	1850	48.3	136	258	273	8580	1280	1380	8800	1540	3020	355	9000
	Result Qualifier																
Sulphur	**Result (mg/L)**	-	57.4	833	676	23.5	47.4	88.2	94.2	2720	504	506	2600	467	868	108	2920
	Result Qualifier																
Thallium	**Result (mg/L)**	0.0008	0.0002	0.0014	0.0017	0.0003	0.00055	0.00012	0.00014	0.004	0.00164	0.00168	0.0102	0.00035	0.00209	0.00011	0.002
	Result Qualifier		U							U							U
Titanium	**Result (mg/L)**	0.1	0.01	0.014	0.013	0.01	0.01	0.01	0.01	0.054	0.021	0.01	0.05	0.01	0.01	0.01	0.055
	Result Qualifier		U			U	U	U	U			U	U	U	U	U	
Uranium	**Result (mg/L)**	0.015	0.000315	0.00075	0.00027	0.00129	0.00122	0.0028	0.003	0.011	0.00342	0.00493	0.283	0.00632	0.0167	0.00391	0.0221
	Result Qualifier																

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Zone II)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)
Sample ID			CH12-014-MW005-SOI	CH12-014-MW005-SOJ	CH12-014-MW005-SOK	CH14-107-TP001-SOA	CH14-107-TP001-SOB	CH14-107-TP001-SOC	CH14-107-TP901-SOC	CH14-104-MW008-SOB	CH14-104-MW008-SOD	CH14-104-MW908-SOD	CH14-104-MW008-SOE	CH14-104-MW008-SOG	CH14-104-MW008-SOI	CH14-104-MW008-SOL	CH14-104-TP001-SOA
Depth From (mbgs)			39.2	36.4	37	1.6	3	5.5	5.5	3.7	10.4	10.4	12.5	16.5	20.9	26.5	1.2
Depth From (mbgs)			40.3	36.7	37	1.6	3	5.5	5.5	4.0	10.7	10.7	12.8	16.8	21.2	26.8	1.2
Sample Date			6/26/2012	6/27/2012	6/27/2012	7/22/2014	7/22/2014	7/22/2014	7/22/2014	8/12/2014	8/12/2014	8/12/2014	8/12/2014	8/13/2014	8/13/2014	8/13/2014	7/17/2014
Vanadium	**Result (mg/L)**	-	0.002	0.01	0.01	0.001	0.001	0.001	0.001	0.04	0.001	0.001	0.0313	0.001	0.001	0.001	0.02
	Result Qualifier		U	U	U	U	U	U	U	U	U	U		U	U	U	U
Zinc	**Result (mg/L)**	0.03	0.02	100	19.6	0.013	0.045	0.01	0.01	2340	0.63	0.545	709	0.01	0.07	0.01	2290
	Result Qualifier		U					U	U					U		U	

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)
Sample ID			CH14-104-TP001-SOB	CH14-104-TP001-SOC	CH14-104-TP002-SOA	CH14-104-TP002-SOB	CH14-104-TP002-SOC	CH14-104-TP003-SOA	CH14-104-TP003-SOB	CH14-104-TP003-SOC	CH14-104-TP903-SOC	CH14-107-MW008B-SOA	CH14-107-MW008B-SOB	CH14-107-MW008B-SOC	CH14-107-MW010-SOA	CH14-107-MW010-SOC
Depth From (mbgs)			3.5	5.8	0.6	3	4.8	2	4.8	6	6	2.1	5.2	8.2	1.2	3.4
Depth From (mbgs)			3.5	5.8	0.6	3	4.8	2	4.8	6	6	2.4	5.5	8.5	1.5	3.7
Sample Date			7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	9/9/2014	9/9/2014	9/9/2014	8/30/2014	8/30/2014
pH	**Result (pH units)**	6.5-9.0	4.61	5.12	3.71	5.89	4.79	1.88	2.78	2.53	2.6	6.14	7.24	7.99	6.62	6.42
	Result Qualifier															
Acidity	**Result (mg/L)**	-	7100	2060	2740	1410	1650	7920	5980	9030	8300	8.8	5.2	2.2	3.5	10.4
	Result Qualifier															
Total Alkalinity	**Result (mg/L)**	-	1	10.4	1	22.1	1.5	1	1	1	1	16.1	14.5	35.4	5.9	7.5
	Result Qualifier		U		U			U	U	U	U					
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
ORP Leachable	**Result (mV)**	-	242	102	329	76	171	427	368	385	364	245	521	202	470	512
	Result Qualifier															
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.42	0.16	177	0.17	1.93	15.2	40.7	131	112	0.404	19.5	3.49	0.318	0.0373
	Result Qualifier															
Antimony	**Result (mg/L)**	1.6	0.002	0.002	0.0132	0.0139	0.0144	0.0076	0.0024	0.0021	0.0025	0.0001	0.0001	0.0001	0.00035	0.0124
	Result Qualifier		U	U								U	U	U		
Arsenic	**Result (mg/L)**	0.005	0.028	0.02	0.177	0.038	0.119	0.554	0.194	0.149	0.175	0.0073	0.0837	0.0072	0.0018	0.0107
	Result Qualifier			U												
Barium	**Result (mg/L)**	2.3	0.02	0.02	0.02	0.021	0.02	0.02	0.02	0.02	0.02	0.001	0.459	0.001	0.0845	0.0762
	Result Qualifier		U	U	U		U	U	U	U	U	U		U		
Beryllium	**Result (mg/L)**	0.0053	0.01	0.01	0.019	0.01	0.01	0.01	0.013	0.052	0.047	0.0005	0.00172	0.00055	0.0005	0.0005
	Result Qualifier		U	U		U	U	U				U			U	U
Boron	**Result (mg/L)**	1.5	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.034	0.019	0.047	0.026	0.029
	Result Qualifier		U	U	U	U	U	U	U	U	U					
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Cadmium	**Result (mg/L)**	Variable[c]	1.53	1.19	3.59	0.298	2.68	0.407	0.809	2.01	1.85	0.000135	0.000843	0.00005	0.000933	0.00128
	Result Qualifier				J									U		J
Calcium	**Result (mg/L)**	-	351	307	503	236	499	58	314	476	459	29.1	4.88	5.7	10.8	33.2
	Result Qualifier															
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Chromium	**Result (mg/L)**	0.0089	0.01	0.01	0.016	0.01	0.01	0.15	0.079	0.25	0.212	0.00122	0.0578	0.00565	0.00061	0.0005
	Result Qualifier		U	U		U	U					U				U
Cobalt	**Result (mg/L)**	-	0.602	0.985	1.22	2.34	2.2	2.88	1.92	3.21	2.94	0.00556	0.0166	0.00406	0.00079	0.0061
	Result Qualifier															
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.02	0.02	21.3	0.02	0.02	58.7	38.2	213	180	0.0053	0.0455	0.0146	0.008	0.0051
	Result Qualifier		U	U		U	U					U				
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Iron	**Result (mg/L)**	0.3	1430	160	181	14.9	165	2880	2130	2560	2190	3.09	71.7	13.7	1.16	0.039
	Result Qualifier															

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)
Sample ID			CH14-104-TP001-SOB	CH14-104-TP001-SOC	CH14-104-TP002-SOA	CH14-104-TP002-SOB	CH14-104-TP002-SOC	CH14-104-TP003-SOA	CH14-104-TP003-SOB	CH14-104-TP003-SOC	CH14-104-TP903-SOC	CH14-107-MW008B-SOA	CH14-107-MW008B-SOB	CH14-107-MW008B-SOC	CH14-107-MW010-SOA	CH14-107-MW010-SOC
Depth From (mbgs)			3.5	5.8	0.6	3	4.8	2	4.8	6	6	2.1	5.2	8.2	1.2	3.4
Depth From (mbgs)			3.5	5.8	0.6	3	4.8	2	4.8	6	6	2.4	5.5	8.5	1.5	3.7
Sample Date			7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	9/9/2014	9/9/2014	9/9/2014	8/30/2014	8/30/2014
Lead	**Result (mg/L)**	0.001	2.9	2.71	2.43	4.48	2.66	2.92	3.09	0.195	1.87	0.0001	0.0723	0.0259	0.00218	0.00068
	Result Qualifier									J	J	U				
Lithium	**Result (mg/L)**	-	0.1	0.1	0.32	0.1	0.21	0.1	0.1	0.1	0.1	0.0118	0.0288	0.02	0.0541	0.0691
	Result Qualifier		U	U		U		U	U	U	U					
Magnesium	**Result (mg/L)**	-	461	307	96.8	167	181	27.6	32.7	109	97.6	4.64	4.17	1.91	15	52.7
	Result Qualifier															
Manganese	**Result (mg/L)**	-	158	133	104	189	204	23.7	23.5	66.3	60.1	1.94	0.794	0.0005	0.442	2.9
	Result Qualifier													U		
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.000053	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000065	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U		U	U	U	U	U	U		U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.00401	0.0239	0.0198	0.00106	0.0269
	Result Qualifier		U	U	U	U	U	U	U	U	U					
Nickel	**Result (mg/L)**	0.025	0.69	1.48	0.511	0.961	0.931	0.304	0.542	1.22	1.11	0.00808	0.0647	0.00674	0.0225	0.0558
	Result Qualifier															
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Potassium	**Result (mg/L)**	-	10	22	6	10.7	6	6	6	10	6	4.4	6.2	5	11	13.1
	Result Qualifier		U		U		U	U	U	U	U					
Selenium	**Result (mg/L)**	0.001	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0009	0.00121	0.0005	0.0005	0.00287
	Result Qualifier		U	U	U	U	U	U	U	U	U			U	U	
Silicon	**Result (mg/L)**	-	10.7	9.52	27.4	10.9	16	10.6	25.1	29.9	25.8	10.1	39.2	18.2	15.2	13.4
	Result Qualifier															
Silver	**Result (mg/L)**	0.0001	0.0014	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.00005	0.000746	0.000088	0.000167	0.00005
	Result Qualifier			U	U	U	U	U	U	U	U	U				U
Sodium	**Result (mg/L)**	-	10	6	6	6	6	6	6	10	6	4.6	2.8	12.9	6.9	7.3
	Result Qualifier		U	U	U	U	U	U	U	U	U					
Strontium	**Result (mg/L)**	-	0.049	0.079	0.172	0.276	0.147	0.073	0.022	0.249	0.303	0.0005	0.0005	0.0005	0.0906	0.187
	Result Qualifier											U	U	U		
Sulphate	**Result (mg/L)**	100	9840	4540	4800	3030	4060	8420	6340	10500	9020	86.4	3.19	11.7	112	316
	Result Qualifier															
Sulphur	**Result (mg/L)**	-	3140	1480	1520	1110	1330	2600	1970	3220	2850	28.9	1.33	3.9	37	106
	Result Qualifier															
Thallium	**Result (mg/L)**	0.0008	0.002	0.002	0.0112	0.0063	0.0056	0.002	0.002	0.002	0.002	0.0001	0.00025	0.0001	0.0001	0.0001
	Result Qualifier		U	U				U	U	U	U	U		U	U	U
Titanium	**Result (mg/L)**	0.1	0.05	0.038	0.048	0.032	0.048	0.03	0.04	0.061	0.047	0.036	0.625	0.142	0.011	0.01
	Result Qualifier		U					U								U
Uranium	**Result (mg/L)**	0.015	0.0298	0.00572	0.265	0.0009	0.00676	0.01	0.0432	0.126	0.0963	0.000463	0.00724	0.00188	0.000141	0.000124
	Result Qualifier															

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (Stockpiles)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)
Sample ID			CH14-104-TP001-SOB	CH14-104-TP001-SOC	CH14-104-TP002-SOA	CH14-104-TP002-SOB	CH14-104-TP002-SOC	CH14-104-TP003-SOA	CH14-104-TP003-SOB	CH14-104-TP003-SOC	CH14-104-TP903-SOC	CH14-107-MW008B-SOA	CH14-107-MW008B-SOB	CH14-107-MW008B-SOC	CH14-107-MW010-SOA	CH14-107-MW010-SOC
Depth From (mbgs)			3.5	5.8	0.6	3	4.8	2	4.8	6	6	2.1	5.2	8.2	1.2	3.4
Depth From (mbgs)			3.5	5.8	0.6	3	4.8	2	4.8	6	6	2.4	5.5	8.5	1.5	3.7
Sample Date			7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/17/2014	7/18/2014	7/18/2014	7/18/2014	7/18/2014	9/9/2014	9/9/2014	9/9/2014	8/30/2014	8/30/2014
Vanadium	**Result (mg/L)**	-	0.02	0.02	0.02	0.02	0.02	0.77	0.075	0.398	0.437	0.0076	0.0686	0.0088	0.0016	0.0377
	Result Qualifier		U	U	U	U	U									
Zinc	**Result (mg/L)**	0.03	2360	1170	838	855	845	299	553	1360	1240	0.01	0.398	0.075	1.57	5.8
	Result Qualifier											U				

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)
Sample ID			CH14-107-MW010-SOE	CH14-107-MW010-SOG	CH14-107-MW010-SOI	CH14-107-MW910-SOI	CH14-107-MW010-SOK
Depth From (mbgs)			7.6	11.3	15.5	15.5	
Depth From (mbgs)			7.9	11.6	15.9	15.9	
Sample Date			8/30/2014	8/30/2014	8/30/2014	8/30/2014	8/30/2014
pH	**Result (pH units)**	6.5-9.0	7.49	7.02	7.24	7.28	6.92
	Result Qualifier						
Acidity	**Result (mg/L)**	-	1.5	1.7	1.7	1.5	2.2
	Result Qualifier						
Total Alkalinity	**Result (mg/L)**	-	36	13.4	5.5	6.3	105
	Result Qualifier						
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT
	Result Qualifier						
ORP Leachable	**Result (mV)**	-	414	430	411	402	401
	Result Qualifier						
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.0059	0.0141	0.0193	0.0304	0.005
	Result Qualifier				J	J	U
Antimony	**Result (mg/L)**	1.6	0.00018	0.00023	0.00112	0.00112	0.00171
	Result Qualifier						
Arsenic	**Result (mg/L)**	0.005	0.001	0.0021	0.0019	0.002	0.0076
	Result Qualifier		U				
Barium	**Result (mg/L)**	2.3	0.0573	0.0314	0.0157	0.0183	0.0896
	Result Qualifier						
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.01	0.021	0.013	0.015	0.024
	Result Qualifier		U				
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT
	Result Qualifier						
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.00005	0.000204	0.000103	0.00005
	Result Qualifier		U	U	J	J	U
Calcium	**Result (mg/L)**	-	18.5	12.2	6.26	6.31	13.6
	Result Qualifier						
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT
	Result Qualifier						
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.00031	0.00034	0.00072	0.00056	0.0911
	Result Qualifier						
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.001	0.0011	0.001	0.001
	Result Qualifier		U	U			U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT
	Result Qualifier						
Iron	**Result (mg/L)**	0.3	0.03	0.089	0.033	0.067	0.03
	Result Qualifier		U				U

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)
Sample ID			CH14-107-MW010-SOE	CH14-107-MW010-SOG	CH14-107-MW010-SOI	CH14-107-MW910-SOI	CH14-107-MW010-SOK
Depth From (mbgs)			7.6	11.3	15.5	15.5	
Depth From (mbgs)			7.9	11.6	15.9	15.9	
Sample Date			8/30/2014	8/30/2014	8/30/2014	8/30/2014	8/30/2014
Lead	**Result (mg/L)**	0.001	0.0001	0.0001	0.00015	0.00022	0.0001
	Result Qualifier		U	U			U
Lithium	**Result (mg/L)**	-	0.0315	0.0502	0.038	0.039	0.0552
	Result Qualifier						
Magnesium	**Result (mg/L)**	-	5.54	5.78	10.4	10.4	12.5
	Result Qualifier						
Manganese	**Result (mg/L)**	-	0.163	0.0277	0.293	0.255	0.755
	Result Qualifier						
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.0029	0.00201	0.00344	0.00388	0.00201
	Result Qualifier						
Nickel	**Result (mg/L)**	0.025	0.00148	0.00136	0.00115	0.00106	0.169
	Result Qualifier						
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT
	Result Qualifier						
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT
	Result Qualifier						
Potassium	**Result (mg/L)**	-	6.4	15.3	10.6	11	35.8
	Result Qualifier						
Selenium	**Result (mg/L)**	0.001	0.00068	0.00202	0.0005	0.0005	0.00051
	Result Qualifier				U	U	
Silicon	**Result (mg/L)**	-	4.84	10.3	9.29	9	7.31
	Result Qualifier						
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U
Sodium	**Result (mg/L)**	-	3.5	8.6	5.8	6.4	6.2
	Result Qualifier						
Strontium	**Result (mg/L)**	-	0.106	0.0782	0.0492	0.0508	0.094
	Result Qualifier						
Sulphate	**Result (mg/L)**	100	47.6	75.6	75.2	76.1	40.7
	Result Qualifier						
Sulphur	**Result (mg/L)**	-	15.6	24.8	24.8	24.8	17.8
	Result Qualifier						
Thallium	**Result (mg/L)**	0.0008	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U	U
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		U	U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.000048	0.000037	0.000016	0.000019	0.000063
	Result Qualifier						

Table 3-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)	WRD (S-Wells)
Sample ID			CH14-107-MW010-SOE	CH14-107-MW010-SOG	CH14-107-MW010-SOI	CH14-107-MW910-SOI	CH14-107-MW010-SOK
Depth From (mbgs)			7.6	11.3	15.5	15.5	
Depth From (mbgs)			7.9	11.6	15.9	15.9	
Sample Date			8/30/2014	8/30/2014	8/30/2014	8/30/2014	8/30/2014
Vanadium	**Result (mg/L)**	-	0.001	0.001	0.0024	0.0024	0.001
	Result Qualifier		U	U			U
Zinc	**Result (mg/L)**	0.03	0.01	0.01	0.04	0.029	0.097
	Result Qualifier		U	U			

Notes:

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or pr

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection l

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW003															CH12-014-MW003														
Sample ID	CH12-014-MW003_SOA															CH12-014-MW003_SOF														
Sample Interval (mbgs)																23.46 - 23.46														
Sample Date	7/29/2012															7/30/2012														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	**186**		**523**		**192**		**186**		**17500**		**18687**	**22600**		100	U	**69**		**634**		**67**		**248**		**22600**		**23718**	**21700**	
Antimony	0.2	U	**0.19**		**8.98**		**0.95**		**0.8**		**6.61**		**17.7**	**24.1**		0.2	U	0.1	U	**0.11**		0.1	U	0.1	U	**0.39**		**1.00**	**0.39**	
Arsenic	0.1	U	**0.163**		**37.7**		**15.1**		**13.8**		**130**		**197**	**163**		0.1	U	**0.185**		**5.28**		**0.662**		**4.9**		**36.3**	J	**47.4**	**10.1**	
Barium	**10.1**		**20**		**32.5**		**30.5**		**12.4**		**212**		**318**	**169**		**12.6**		**16**		**4.3**		**3.8**		**7.1**		**171**		**215**	**202**	
Beryllium	0.4	U	0.2	U	**0.33**		0.2	U	0.2	U	**0.8**		**2.13**	**1.74**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.69**		**1.89**	**0.87**	
Bismuth	0.4	U	0.2	U	**1.06**		0.2	U	0.2	U	**0.55**		**2.61**	**2.52**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.79**		**1.99**	**0.43**	
Cadmium	**1.99**		**2.4**		**1.35**		**0.695**		0.05	U	**5.43**		**11.9**	**11.5**		0.1	U	**0.1**		0.05	U	**0.056**		0.05	U	**0.324**		**0.728**	**0.292**	
Calcium	**2250**		**67**		50	U	**253**				**3100**		**5720**	**4910**		**830**		**3810**		50	U	**520**				**5970**		**11180**	**10100**	
Chromium	10	U	5	U	5	U	5	U	5	U	**46.7**		**76.7**	**69.3**		10	U	5	U	5	U	5	U	5	U	**39.7**		**69.7**	**42.1**	
Cobalt	**0.22**		**1.58**		**7.2**		**0.15**		**1.78**		**23.2**		**34.1**	**31.9**		**0.23**		**1.44**		**3.04**		**0.16**		**1.03**		**20**		**25.9**	**21.6**	
Copper	1	U	**43.3**		**80**		**6.69**		**1.21**		**343**		**475**	**485**		1	U	**1.4**		**6.49**		**1.46**		**1.17**		**66.2**		**77.7**	**51.8**	J
Iron	100	U	**231**		**14200**		**380**		**8560**		**57600**		**81071**	**70800**		100	U	**148**		**4430**		**117**		**4580**		**38900**		**48275**	**41100**	
Lead	**33.7**		**2050**		**258**		**1960**		**21.6**		**1270**		**5593**	**9580**		1	U	**39**		**29**		**27.7**		**1.96**		**207**		**306**	**149**	
Lithium	10	U	5	U	5	U	5	U	5	U	**33.1**		**63.1**	**44.2**		10	U	5	U	5	U	5	U	5	U	**37.6**		**67.6**	**39**	
Manganese	**11**		**55.1**		**390**		**14.6**		**39.6**		**441**		**951**	**1040**		**10**		**67.1**		**53.7**		**5.4**		**14.5**		**262**		**413**	**379**	
Molybdenum	1	U	0.5	U	**0.62**		0.5	U	0.5	U	**3.69**		**6.81**	**5.44**		1	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.05**		**4.05**	**2.08**	
Nickel	4	U	**5.5**		**10.4**		2	U	4.5		**30.9**		**57.3**	**66.9**		4	U	2	U	**4.2**		2	U	**2.6**		**40.5**		**55.3**	**36.8**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**577**		NT		NT		NT		NT		NT		NT		NT	**618**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**3750**		200	U	NT		NT		NT		NT		NT		200	**7390**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.46**		**1.96**	**0.99**		0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.48**		**1.98**	**0.33**	
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**7.78**		**8.38**	**13.1**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.95**		**1.55**	**0.52**	
Sodium	200	U	NT		NT		NT		NT		NT		200	280	U	200	U	NT		NT		NT		NT		NT		200	730	U
Strontium	10	U	5	U	5	U	5	U	5	U	**30.8**		**60.8**	**47.3**		10	U	**7.1**		5	U	5	U	5	U	**45**		**77.1**	**51.2**	
Thallium	0.1	U	**0.105**		**0.127**		**0.057**		2	U	**2.29**		**4.68**	**3.49**		0.1	U	0.05	U	0.05	U	0.05	U	2	U	**1.13**		**3.38**	**0.934**	J
Tin	4	U	2	U	2	U	2	U	2	U	2	U	14	**4.2**		4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U
Titanium	10	U	5	U	**5.8**		**5.4**		5	U	**521**		**552**	**372**		10	U	5	U	**12.4**		**5**		**6.8**		**1040**		**1079**	**916**	
Uranium	0.1	U	**0.487**		**0.553**		0.05	U	**0.115**		**1.09**		**2.40**	**3.04**		0.1	U	**0.315**		**0.236**		0.05	U	**0.086**		**0.632**		**1.42**	**1.22**	
Vanadium	0.4	U	0.2	U	**6.14**		**0.37**		**2.48**		**38.8**		**48.4**	**57.2**		0.4	U	0.2	U	**2.8**		0.2	U	**1.97**		**50.9**		**56.5**	**57.8**	
Zinc	**408**		**2140**		**1610**		**63.8**		**240**		**3310**		**7772**	**9700**		2	U	**31.7**	**J**	**76.7**		**4.7**		50	U	**291**		**456**	**262**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW003															CH12-014-MW005														
Sample ID	CH12-014-MW903_SOF															CH12-014-MW005_SOH														
Sample Interval (mbgs)	23.46 - 23.46															35 - 35.4														
Sample Date	7/30/2012															6/26/2012														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - ZONE II PIT														
Geologic Unit	ALLUVIUM															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	**72**		**692**		**92**		**229**		**20200**		**21385**	**21600**		100	U	**75**		**1180**		**94**		**400**		**7650**		**9499**	**9070**	
Antimony	0.2	U	0.1	U	**0.13**		0.1	U	0.1	U	**0.41**		**1.04**	**0.34**		0.2	U	0.1	U	**1.2**		**0.13**		**0.11**		**5.25**		**6.99**	**3.12**	
Arsenic	0.1	U	**0.204**		**6.91**		**0.623**		**3.9**		**16.1**	J	**27.8**	**16.6**		**0.12**		**0.341**		**40.4**		**8.61**		**15**		**246**		**310**	**82.6**	
Barium	**12.9**		**16.7**		**4.7**		**4.2**		**8.5**		**155**		**202**	**191**		**8.2**		**15**		**14.9**		**12.8**		**37.1**		**155**		**243**	**195**	
Beryllium	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.64**		**1.84**	**0.85**		0.4	U	**0.34**		**0.55**		0.2	U	**0.23**		**0.75**		**2.47**	**2.07**	
Bismuth	0.4	U	0.2	U	**0.2**		0.2	U	0.2	U	**0.64**		**1.86**	**0.67**		0.4	U	0.2	U	**0.62**		0.2	U	0.2	U	**2.01**		**3.63**	**1.41**	
Cadmium	0.1	U	**0.098**		**0.051**		**0.061**		0.05	U	**0.292**		**0.652**	**0.488**	J	**5.96**		**1.1**		**0.33**		**0.335**		0.05	U	**2.01**		**9.79**	**11.8**	
Calcium	**1000**		**4290**		50	U	**556**		NT		**5610**		**11506**	**9750**		**2670**		**154**		50	U	**318**		NT		**1500**		**4692**	**4770**	
Chromium	10	U	5	U	5	U	5	U	5	U	**37.5**		**67.5**	**42.1**		10	U	5	U	5	U	5	U	5	U	**17.7**		**47.7**	**26.8**	
Cobalt	0.2	U	**2.4**		**4.36**		**0.15**		**1**		**17.8**		**25.9**	**24.5**		**18.5**		**1.72**		**2.55**		**0.23**		**2.27**		**13.7**		**39.0**	**42**	
Copper	1	U	**1.7**		**8.08**		**1.44**		**0.88**		**75.6**		**88.7**	**65.4**		**8.7**		**45.1**		**98**		**14**		**1.64**		**282**		**449**	**337**	
Iron	100	U	**136**		**5080**		**124**		**4510**		**36700**		**46650**	**41700**		100	U	**222**		**10900**		**422**		**10100**		**26200**		**47944**	**59100**	
Lead	1	U	**43**		**31.3**		**25.8**		**1.94**		**225**		**328**	**187**		**188**		**488**		**133**		**206**		**5.93**		**572**		**1593**	**1410**	
Lithium	10	U	5	U	5	U	5	U	5	U	**39.6**		**69.6**	**39.5**		10	U	5	U	5	U	5	U	5	U	**13.2**		**43.2**	**13.5**	
Manganese	10	U	**83.9**		**66.4**		**5.9**		**12.2**		**251**		**429**	**410**		**149**		**6.8**		**51.4**		**7.2**		**23.5**		**205**		**443**	**479**	
Molybdenum	1	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.94**		**3.94**	**1.39**		1	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.73**		**3.73**	**2.05**	
Nickel	4	U	2	U	**5.7**		2	U	**2.9**		**36.4**		**53.0**	**41.2**		**11.5**		2	U	**3.7**		2	U	**4.9**		**18**		**42.1**	**42.1**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**693**		NT		NT		NT		NT		NT		NT		NT	**446**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**7320**		200	U	NT		NT		NT		NT		NT		200	**2080**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.47**		**1.97**	**0.44**		0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.38**		**1.88**	**0.75**	
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.8**		**1.40**	**0.47**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**4.23**		**4.83**	**3.33**	
Sodium	200	U	NT		NT		NT		NT		NT		200	680	U	200	U	NT		NT		NT		NT		NT		200	**110**	
Strontium	10	U	**8.1**		5	U	5	U	5	U	**42.5**		**75.6**	**49**		10	U	5	U	5	U	5	U	5	U	**14.4**		**44.4**	**23.4**	
Thallium	0.1	U	0.05	U	0.05	U	0.05	U	2	U	**1.07**		**3.32**	**0.664**		**0.15**		**0.112**		**0.074**		**0.054**		2	U	**1.46**		**3.85**	**1.7**	
Tin	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U
Titanium	10	U	5	U	**13.0**		5	U	**8.1**		**950**		**991**	**963**		10	U	5	U	**7.8**		**5.5**		5	U	**256**		**289**	**276**	
Uranium	0.1	U	**0.35**		**0.255**		0.05	U	**0.082**		**0.596**		**1.43**	**1.32**		0.1	U	**1.35**		**0.778**		**0.091**		**0.354**		**0.874**		**3.55**	**3.32**	
Vanadium	0.4	U	0.2	U	**3**		0.2	U	**1.83**		**47.7**		**53.3**	**54.2**		0.4	U	0.2	U	**5.58**		**0.31**		**4.61**		**16.3**		**27.4**	**28.9**	
Zinc	2	U	**17.8**	J	**71**		**3.8**		50	U	**251**		**396**	**326**		**1480**		**276**		**337**		**34.1**		**78**		**1140**		**3345**	**3330**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW005															CH12-014-MW007													
Sample ID	CH12-014-MW005_SOK															CH12-014-MW007_SOI													
Sample Interval (mbgs)	37.2 - 37.45															44.5 - 44.5													
Sample Date	6/27/2012															7/31/2012													
General Location	WASTE ROCK DUMP - ZONE II PIT															WASTE ROCK DUMP - INTERMEDIATE DUMP													
Geologic Unit	ALLUVIUM															WASTE ROCK													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	50	U	**424**		**204**		**302**		**13600**		**14680**	**9530**		100	U	**78**		**338**		**51**		**70**		**6930**		**7567**	**12600**	
Antimony	0.2	U	0.1	U	**2.1**		**0.19**		**0.15**		**4.72**		**7.46**	**9.64**		0.2	U	**0.36**		**2.93**		**0.5**		**0.16**		**13.4**		**17.6**	**13.9**	
Arsenic	0.1	U	**0.086**		**9.06**		**3.09**		**3.23**		**154**		**170**	**306**		0.1	U	**0.113**		**12**		**2.85**		**1.5**		**126**		**143**	**87.7**	
Barium	**5.2**		**27.4**		**26.1**		**34.2**		**47.8**		**65.8**		**207**	**17.5**		**16.7**		**18.8**		**27.1**		**12.5**		**49.3**		**195**		**319**	**173**	
Beryllium	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.56**		**1.76**	**0.72**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.27**		**1.47**	**1.2**	
Bismuth	0.4	U	0.2	U	**0.32**		0.2	U	0.2	U	**0.56**		**1.88**	**1.71**		0.4	U	0.2	U	**0.26**		0.2	U	0.2	U	**1.12**		**2.38**	**3.66**	
Cadmium	**1.2**		**0.654**		**0.115**		**0.203**		0.05	U	**9**		**11.2**	**16.5**		**0.6**		**1.156**		**0.089**		**0.135**		0.05	U	**17.6**		**19.6**	**11.9**	
Calcium	**5250**		**251**		50	U	**592**		NT		**2380**		**8523**	**6400**		**590**		50	U	50	U	**344**		NT		**1230**		**2264**	**6650**	
Chromium	10	U	5	U	5	U	5	U	5	U	**35.3**		**65.3**	**29.8**		10	U	5	U	5	U	5	U	5	U	**73**		**103**	**41.5**	
Cobalt	**0.82**		**0.58**		**2.37**		0.1	U	**1.9**		**55.8**		**61.6**	**83.6**		**1.4**		**0.24**		**1.13**		**0.37**		**0.59**		**36.2**		**39.9**	**24**	
Copper	1	U	**8.7**		**27.4**		**7.86**		**0.95**		**431**		**477**	**667**		1	U	**0.6**		**11**		**4.26**		**0.52**		**298**		**315**	**346**	
Iron	100	U	**65**		**6940**		**306**		**10600**		**123000**		**141011**	**201000**		**100**		**112**		**6790**		**292**		**2660**		**48700**		**58654**	**75400**	
Lead	**495**		**1540**		**138**		**429**		**1.35**		**1500**		**4103**	**6430**		**1020**		**1010**		**208**		**453**		**1.72**		**4470**		**7163**	**3850**	
Lithium	10	U	5	U	5	U	5	U	5	U	**22.9**		**52.9**	**14.1**		10	U	5	U	5	U	5	U	5	U	**9.9**		**39.9**	**20.1**	
Manganese	**122**		**29.1**		**72.8**		**7.9**		**38.8**		**232**		**503**	**611**		**21**		5	U	**27.6**		5	U	**8.6**		**170**		**237**	**431**	
Molybdenum	1	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.51**		**4.51**	**2.62**		1	U	0.5	U	0.5	U	0.5	U	0.5	U	**6.94**		**9.94**	**4.66**	
Nickel	4	U	2	U	**5.9**		2	U	**5.8**		**26.4**		**46.1**	**35.1**		4	U	2	U	**3.6**		2	U	2	U	**66.1**		**79.7**	**50.7**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**364**		NT		NT		NT		NT		NT		NT		NT	**898**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**1900**		200	U	NT		NT		NT		NT		NT		200	**2900**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.73**		**2.23**	**1.21**		0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.48**		**2.98**	**0.99**	
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**5.97**		**6.57**	**6.5**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**14.1**		**14.7**	**8.41**	
Sodium	200	U	NT		NT		NT		NT		NT		200	**190**		200	U	NT		NT		NT		NT		NT		200	140	U
Strontium	10	U	5	U	5	U	5	U	5	U	**21.5**		**51.5**	**26.4**		10	U	5	U	5	U	5	U	5	U	**12.5**		**42.5**	**29**	
Thallium	0.1	U	**0.057**		0.05	U	0.05	U	2	U	**1.57**		**3.83**	**1.88**		0.1	U	**0.051**		**0.082**		0.05	U	2	U	**2.87**		**5.15**	**3.58**	
Tin	4	U	2	U	2	U	2	U	2	U	**2**		**14.0**	**3.4**		4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U
Titanium	10	U	5	U	**7.1**		**5.3**		**6.4**		**442**		**476**	**294**		10	U	5	U	5.0	U	5	U	5	U	**173**		**203**	**269**	
Uranium	0.1	U	**0.362**		**0.253**		0.05	U	**0.185**		**0.735**		**1.69**	**1.43**		0.1	U	**0.228**		**0.313**		0.05	U	**0.1**		**1.52**		**2.31**	**2.83**	
Vanadium	0.4	U	0.2	U	**4.24**		**0.4**		**4.17**		**30.5**		**39.9**	**28.8**		0.4	U	0.2	U	**3.28**		0.2	U	**0.97**		**14.9**		**20.0**	**39.4**	
Zinc	**143**		**162**		**551**		**40.4**		**159**		**6710**		**7765**	**12200**		**158**		**55**		**194**		**25.9**		50	U	**12900**		**13383**	**7220**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW007															CH14-015-MW004														
Sample ID	CH12-014-MW007_SOJ															CH14_015_MW004_Soa														
Sample Interval (mbgs)	47.85 - 47.85															0.76 - 1.37														
Sample Date	8/1/2012															8/10/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - NORTHWEST DUMP														
Geologic Unit	ALLUVIUM															WR														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	**66**		**318**		**66**		**295**		**17200**		**18045**	**15200**		50	U	50	U	**218**		**74**		**150**		**16900**		**17442**	**10200**	
Antimony	0.2	U	0.1	U	**0.13**		0.1	U	0.1	U	**0.58**		**1.21**	**0.58**		0.1	U	0.1	U	**0.34**		0.1	U	0.1	U	**0.31**		**1.05**	**1.32**	J
Arsenic	0.1	U	0.05	U	**0.87**		**0.257**		**0.85**		**12.9**		**15.0**	**6.07**		0.05	U	**0.075**		**5.49**		**1.27**	J	**4.75**		**22**		**33.6**	**20.5**	J
Barium	**22.4**		**35.2**		**11.9**		**8.5**		**13.2**		**99.2**		**190**	**181**		**17**		**30.7**		**19.6**		**12.2**		**15.9**	J	**248**		**343**	**267**	
Beryllium	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.53**		**1.73**	**0.82**		0.2	U	0.2	U	**0.33**		0.2	U	**0.24**		**1.15**		**2.32**	**1.64**	
Bismuth	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.68**		**1.88**	**1.44**		0.2	U	**0.24**		**0.57**		0.2	U	0.2	U	**4.25**	J	**5.66**	**1.4**	J
Cadmium	**0.27**		**0.261**		0.05	U	**0.071**		0.05	U	**1.34**		**2.04**	**4.08**		0.05	U	**0.325**		**0.093**		**0.213**		0.05	U	**0.476**		**1.21**	**0.848**	J
Calcium	**380**		**438**		50	U	**331**		NT		**1100**		**2299**	**2290**		**940**		**323**		50	U	**522**		NT		**2040**		**3875**	**3540**	
Chromium	10	U	5	U	5	U	5	U	5	U	**316**		**346**	**29.9**		5	U	5	U	5	U	5	U	5	U	**30.5**		**55.5**	**28.4**	
Cobalt	**0.64**		**0.78**		**0.68**		0.1	U	**0.71**		**9.4**		**12.3**	**11.3**		0.1	U	**1.95**		**8.84**		0.1	U	**5.66**		**9.61**		**26.3**	**23.9**	
Copper	1	U	0.5	U	**3.52**		**0.63**		**0.81**		**33.4**		**39.9**	**54.7**		0.5	U	**1.67**		**20.3**		**1.4**		0.5	U	**49.1**	J	**73.5**	**67.2**	
Iron	100	U	**70**		**1710**		**76**		**5560**		**27700**		**35216**	**36200**		50	U	**147**		**12400**		**183**		**8870**		**47300**		**68950**	**67000**	
Lead	1	U	**70.8**		**22.1**		**15.9**		**2.27**		**332**		**444**	**309**		0.5	U	**82.9**		**33.4**		**29.8**		**1.35**		**769**	J	**917**	**312**	
Lithium	10	U	5	U	5	U	5	U	5	U	**39.4**		**69.4**	**31.8**		5	U	5	U	5	U	5	U	5	U	**27.5**		**52.5**	**21.6**	
Manganese	**36**		**19.4**		**13**		5	U	**8.8**		**214**		**296**	**298**		5	U	**90**		**198**		**16.7**		**63.5**		**673**		**1046**	**941**	
Molybdenum	1	U	0.5	U	0.5	U	0.5	U	0.5	U	**9.18**		**12.2**	**1.42**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	**0.69**	
Nickel	4	U	2	U	**4.3**		2	U	**2.4**		**151**		**166**	**22.6**		2	U	**3**		**15.5**		2	U	**11.6**		**21.2**		**55.3**	**45.6**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**433**		50	U	50	U	**75**		NT		NT		NT		**175**	**535**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**4390**		**100**		NT		NT		NT		NT		NT		**100**	**2460**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.21**		**1.71**	**0.28**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.79**		**2.09**	**0.26**	
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.14**		**1.74**	**0.56**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**2.57**	J	**3.07**	**1.01**	
Sodium	200	U	NT		NT		NT		NT		NT		200	160	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	10	U	5	U	5	U	5	U	5	U	**5.8**		**35.8**	**10.8**		5	U	5	U	5	U	5	U	5	U	**11.8**		**36.8**	**16.8**	
Thallium	0.1	U	0.05	U	0.05	U	0.05	U	2	U	**0.513**		**2.76**	**0.419**		0.05	U	0.05	U	**0.084**		0.05	U	2	U	**1.26**		**3.49**	**1.23**	
Tin	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	10	U	5	U	**6.1**		5	U	5	U	**648**		**679**	**758**		5	U	5	U	5	U	5	U	5	U	**325**		**350**	**147**	
Uranium	0.1	U	**0.133**		**0.126**		0.05	U	**0.162**		**0.414**		**0.985**	**1.03**		0.05	U	**0.141**		**0.148**		0.05	U	**0.123**		**0.673**		**1.19**	**1.01**	
Vanadium	0.4	U	0.2	U	**1.16**		0.2	U	**1.49**		**36.5**		**40.0**	**37.3**		0.2	U	0.2	U	**4.43**		0.2	U	**2.81**		**34**		**41.8**	**33**	
Zinc	**88.8**		**219**		**119**		**9.2**		**71**		**878**		**1385**	**2240**		1	U	**13.4**		**127**		**3.2**		**77**		**116**		**338**	**355**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW004															CH14-015-MW004														
Sample ID	CH14_015_MW904_Soa															CH14_015_MW004_Sod														
Sample Interval (mbgs)	0.76 - 1.37															5.18 - 5.49														
Sample Date	8/10/2014															8/10/2014														
General Location	WASTE ROCK DUMP - NORTHWEST DUMP															WASTE ROCK DUMP - NORTHWEST DUMP														
Geologic Unit	WR															WR														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**182**		**63**		**133**		**14900**		**15378**	**10200**		50	U	50	U	**180**		**152**		**377**		**17700**		**18509**	**10300**	
Antimony	0.1	U	0.1	U	**0.29**		0.1	U	0.1	U	**0.32**		**1.01**	**0.74**	J	0.1	U	0.1	U	**0.13**		0.1	U	0.1	U	**0.26**		**0.79**	**0.44**	
Arsenic	0.05	U	**0.06**		**4.79**		**0.973**	J	**3.72**		**35.9**		**45.5**	**36**	J	0.05	U	0.05	U	**2.33**		**0.568**		**5.41**		**9.15**		**17.6**	**17.5**	
Barium	**16.3**		**26.6**		**16.6**		**10.8**		**22.6**	J	**168**		**261**	**224**		**9.4**		**24.9**		**19.1**		**12.7**		**17.3**		**242**		**325**	**218**	
Beryllium	0.2	U	0.2	U	**0.3**		0.2	U	**0.21**		**1.03**		**2.14**	**1.57**		0.2	U	0.2	U	**0.29**		0.2	U	**0.52**		**1.28**		**2.69**	**2.04**	
Bismuth	0.2	U	0.2	U	**0.35**		0.2	U	0.2	U	**0.92**	J	**2.07**	**6.7**	J	0.2	U	**0.24**		**0.37**		0.2	U	0.2	U	**1.09**		**2.30**	**1.16**	
Cadmium	0.05	U	**0.279**		**0.083**		**0.196**		0.05	U	**0.452**		**1.11**	**2.04**	J	**0.085**		**0.373**		**0.081**		**0.17**		0.05	U	**0.977**		**1.74**	**1.36**	
Calcium	**856**		**232**		50	U	**477**		NT		**1940**		**3555**	**3710**		**1440**		50	U	50	U	**359**		NT		**1590**		**3489**	**2980**	
Chromium	5	U	5	U	5	U	5	U	5	U	**28.3**		**53.3**	**27.7**		5	U	5	U	5	U	5	U	5	U	**29.3**		**54.3**	**30**	
Cobalt	0.1	U	**1.91**		**7.07**		0.1	U	**4.96**		**14.2**		**28.3**	**26.6**		**0.12**		**0.66**		**3.58**		0.1	U	**8.07**		**9.32**		**21.9**	**25.5**	
Copper	0.5	U	**1.24**		**16.7**		**1.32**		0.5	U	**32.7**	J	**53.0**	**112**		0.5	U	**1.63**		**11.3**		**1.29**		0.5	U	**38.8**		**54.0**	**110**	
Iron	50	U	**137**		**11000**		**149**		**8050**		**46400**		**65786**	**68300**		50	U	**82**		**7290**		**171**		**17700**		**37700**		**62993**	**67000**	
Lead	0.5	U	**83.3**		**34.2**		**30**		**0.63**		**244**	J	**393**	**278**		0.5	U	**67.4**		**27.2**		**21.6**		**1.28**		**172**		**290**	**254**	
Lithium	5	U	5	U	5	U	5	U	5	U	**23.6**		**48.6**	**22.4**		5	U	5	U	5	U	5	U	5	U	**23.1**		**48.1**	**19**	
Manganese	5	U	**82.6**		**161**		**14.6**		**58.1**		**630**		**951**	**984**		**24.9**		**64.6**		**174**		**15.1**		**104**		**481**		**864**	**867**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	**0.65**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	**1.03**	
Nickel	2	U	**2.5**		**12.6**		2	U	**10.4**		**21.7**		**51.2**	**50.8**		2	U	2	U	**6.1**		2	U	**17.4**		**19.9**		**49.4**	**49.6**	
Phosphorus	50	U	50	U	**77**		NT		NT		NT		**177**	**577**		50	U	50	U	**84**		NT		NT		NT		**184**	**465**	
Potassium	**110**		NT		NT		NT		NT		NT		**110**	**2390**		**110**		NT		NT		NT		NT		NT		**110**	**3370**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	**0.42**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.27**		**1.57**	**0.34**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.04**	J	**1.54**	**1.53**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.66**		**1.16**	**0.92**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	5	U	5	U	**10.1**		**35.1**	**16**		5	U	5	U	5	U	5	U	5	U	**8.1**		**33.1**	**13.4**	
Thallium	0.05	U	0.05	U	**0.107**		0.05	U	2	U	**1.22**		**3.48**	**1.05**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.42**		**3.62**	**1.23**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**324**		**349**	**159**		5	U	5	U	5	U	5	U	5	U	**431**		**456**	**250**	
Uranium	0.05	U	**0.131**		**0.128**		0.05	U	**0.109**		**0.67**		**1.14**	**0.982**		0.05	U	**0.104**		**0.106**		0.05	U	**0.24**		**0.716**		**1.27**	**1.01**	
Vanadium	0.2	U	0.2	U	**3.88**		0.2	U	**2.53**		**30.7**		**37.7**	**32.8**		0.2	U	0.2	U	**3.85**		**0.24**		**7.54**		**34.8**		**46.8**	**38.8**	
Zinc	1	U	**15**		**115**		**2.8**		**64**		**122**		**320**	**437**		**14.4**		**99.6**		**168**		**8**		**166**		**319**		**775**	**634**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW004															CH14-015-MW004														
Sample ID	CH14_015_MW004_Sof															CH14_015_MW904_Sof														
Sample Interval (mbgs)	8.23 - 8.53															8.23 - 8.53														
Sample Date	8/10/2014															8/10/2014														
General Location	WASTE ROCK DUMP - NORTHWEST DUMP															WASTE ROCK DUMP - NORTHWEST DUMP														
Geologic Unit	WR															WR														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**176**		50	U	**62**		**74**		**285**		**2690**		**3337**	**3300**		**199**		50	U	**75**		**68**		**307**		**2800**		**3499**	**3100**	
Antimony	0.1	U	0.1	U	**3.41**		**0.83**		**0.95**	J	**18.2**		**23.59**	**31.2**		0.1	U	0.1	U	**2.87**		**0.74**		**4.52**	J	**17.4**		**25.7**	**26.8**	
Arsenic	0.05	U	0.05	U	**0.518**		**2.13**		**9.11**		**16.5**		**28.4**	**40.4**		0.05	U	0.05	U	**0.346**		**1.35**		**8.93**		**13.8**		**24.5**	**28**	
Barium	2	U	**4.6**		**4.6**		**2.7**		**166**		**157**		**337**	**64.4**		2	U	**4**		**4.4**		**2.5**		**156**		**150**		**319**	**59.6**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.26**		**1.26**	**0.43**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.26**		**1.26**	**0.44**	
Bismuth	0.2	U	0.2	U	**0.72**		0.2	U	0.2	U	**4.28**		**5.80**	**6**		0.2	U	0.2	U	**0.84**		0.2	U	0.2	U	**5.39**		**7.03**	**5.27**	
Cadmium	**1.97**		**0.121**		0.05	U	0.05	U	0.05	U	**3.9**		**6.14**	**4.5**	**J**	**2.68**		**0.144**		0.05	U	0.05	U	0.05	U	**6.19**		**9.16**	**7.86**	**J**
Calcium	**3140**		50	U	50	U	50	U	NT		**214**		**3504**	**3460**		**2630**		50	U	50	U	50	U	NT		**246**		**3026**	**3050**	
Chromium	5	U	5	U	5	U	5	U	**6.7**		**6.8**		**33.5**	**16.4**		5	U	5	U	5	U	5	U	**6.3**		**6.6**		**32.9**	**16.7**	
Cobalt	**3.79**		**0.13**		**0.16**		0.1	U	**1.91**		**35.4**	J	**41.5**	**26.2**		**5.17**		**0.16**		**0.18**		0.1	U	**1.83**		**18.9**	J	**26.3**	**34.8**	
Copper	**76**	J	**1.47**	J	**17.9**	J	**3.39**	J	0.5	U	**469**		**568.3**	**459**		**150**	J	**3.19**	J	**30.4**	J	**6.12**	J	0.5	U	**538**		**728**	**703**	
Iron	**1840**		**90**		**7420**		**619**		**67600**		**51400**		**128969**	**145000**		**1920**		**86**		**7510**		**642**		**71300**		**57900**		**139358**	**165000**	
Lead	**491**		**2140**		**334**		**40.1**	J	**3.31**		**8070**		**11078**	**13200**		**504**		**2820**		**395**		**90.1**	J	**2.56**		**9690**		**13502**	**12800**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30	5	U	5	U	5	U	5	U	5	U	5	U	5	U	30	5	U
Manganese	**50.6**		5	U	5	U	5	U	**22.6**		**46.2**		**134**	**109**		**58.2**		5	U	5	U	5	U	**21.7**		**65.3**		**160**	**124**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**12.8**		**15.3**	**8.27**	**J**	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**20.9**		**23.4**	**28.8**	**J**
Nickel	**2.6**		2	U	2	U	2	U	2	U	**9.9**		**20.5**	**13**		**2.9**		2	U	2	U	2	U	2	U	**10.3**		**21.2**	**17.4**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		**150**	**406**		50	U	50	U	50	U	NT		NT		NT		150	**381**	
Potassium	100	U	NT		NT		NT		NT		NT		**100**	**1190**		100	U	NT		NT		NT		NT		NT		100	**1150**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.25**		**2.55**	**1.8**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.25**		**2.55**	**1.46**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**18.4**		**18.90**	**26.5**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**18.8**		**19.3**	**20.3**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**190**		100	U	NT		NT		NT		NT		NT		100	**110**	
Strontium	5	U	**5.9**		5	U	5	U	5	U	**7.3**		**33.2**	**29.7**	**J**	5	U	**5.1**		5	U	5	U	5	U	**7.7**		**32.8**	**14.6**	**J**
Thallium	**0.18**		**0.111**		**0.216**		**0.189**		2	U	**23.4**		**26.1**	**24.6**		**0.132**		**0.08**		**0.211**		**0.172**		2	U	**19.5**		**22.1**	**21.1**	
Tin	2	U	2	U	2	U	2	U	2	U	**2.7**		**12.7**	4		2	U	2	U	2	U	2	U	2	U	**2.7**		**12.7**	**3.6**	
Titanium	5	U	5	U	5	U	5	U	5	U	**8.3**		**33.3**	**14.2**	**J**	5	U	5	U	5	U	5	U	5	U	**12.8**		**37.8**	**7**	**J**
Uranium	**0.202**		0.05	U	0.05	U	0.05	U	**0.468**		**0.725**		**1.55**	**1.39**		**0.307**		0.05	U	0.05	U	0.05	U	**0.457**		**0.749**		**1.66**	**1.43**	
Vanadium	0.2	U	0.2	U	**4.79**		0.2	U	**14.7**		**8.54**		**28.6**	**32.5**		0.2	U	0.2	U	**5.22**		0.2	U	**14.7**		**9.46**		**30.0**	**29.9**	
Zinc	**942**		**26**		**34.7**		**7.5**		**65**		**3650**		**4725**	**4110**		**1220**		**34.4**		**40.6**		**9.3**		50	U	**4690**		**6044**	**5760**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW004															CH14-015-MW004														
Sample ID	CH14_015_MW004_Soi															CH14_015_MW004_Sol														
Sample Interval (mbgs)	12.8 - 13.11															17.68 - 17.98														
Sample Date	8/10/2014															8/10/2014														
General Location	WASTE ROCK DUMP - NORTHWEST DUMP															WASTE ROCK DUMP - NORTHWEST DUMP														
Geologic Unit	WR															WR														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**95**		**237**		**65**		**69**		**18400**		**18916**	**12700**		50	U	50	U	**157**		50	U	**154**		**4970**		**5431**	**5730**	
Antimony	0.1	U	0.1	U	**0.12**		0.1	U	0.1	U	0.1	U	**0.62**	**0.3**		0.1	U	0.1	U	**2.19**		0.1	U	**0.35**		**10.4**		**13.2**	**10.2**	
Arsenic	0.05	U	**0.075**		**4.88**		**0.289**		**0.91**		**4.13**		**10.3**	**9.18**		0.05	U	0.05	U	**1.3**		**1.42**		**2.83**		**27.5**		**33.2**	**31**	
Barium	**6.9**		**18.6**		**23.9**		**17.1**		**13.5**		**141**		**221**	**153**		**7.8**		**11.6**		**19**		**9.1**		**57.4**		**152**		**257**	**145**	
Beryllium	0.2	U	0.2	U	**0.43**		0.2	U	0.2	U	**1.41**		**2.64**	**1.8**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.79**		**1.79**	**1.42**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.34**		**1.34**	**0.84**		0.2	U	**0.46**		**1.31**		0.2	U	0.2	U	**4.5**		**6.87**	**2.91**	
Cadmium	**2.53**		**1.76**		**0.12**		**0.574**		0.05	U	**0.88**		**5.91**	**6.54**		**0.436**		**0.502**		**0.203**		**0.244**		0.05	U	**7.74**		**9.18**	**7.79**	
Calcium	**1770**		**86**		50	U	**640**		NT		**2000**		**4546**	**4250**		**1980**		**218**		50	U	**420**		NT		**1610**		**4278**	**5540**	
Chromium	5	U	5	U	5	U	5	U	5	U	**33.1**		**58.1**	**27.5**		5	U	5	U	5	U	5	U	5	U	**11.9**		**36.9**	**19.4**	
Cobalt	**4.39**		**1.66**		**6.78**		**0.25**		**1.39**		**14.7**		**29.2**	**27.4**		**0.5**		**0.78**		**4.13**		0.1	U	**4.76**		**30.6**		**40.9**	**44.9**	
Copper	**0.86**		**0.59**		**4.06**		**1.83**		0.5	U	**34.1**		**41.9**	**36.1**		0.5	U	**5.99**		**48**		**5.72**		0.5	U	**373**		**433.7**	**367**	
Iron	50	U	**395**		**10100**		**156**		**2970**		**45000**		**58671**	**54500**		50	U	**154**		**11400**		**146**		**20100**		**58600**		**90450**	**86800**	
Lead	**0.94**		**59.3**		**17.4**		**33**		**0.53**		**53.2**		**164**	**150**		**353**		**2380**		**401**		**360**		**0.83**		**2870**		**6365**	**4770**	
Lithium	5	U	5	U	5	U	5	U	5	U	**31.6**		57	**27.8**		5	U	5	U	5	U	5	U	5	U	**7.6**		**32.6**	**8.7**	
Manganese	**288**		**38.6**		**176**		**13.1**		**35.8**		**398**		**950**	**900**		**12.5**		**17.4**		**79.8**		**6.7**		**56.4**		**381**		**554**	**630**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.99**		**3.5**	**1.17**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**6.12**		**8.62**	**4.03**	
Nickel	**3.1**		**3.3**		**13.5**		2	U	**2.5**		**30.4**		**54.8**	**47.9**		2	U	2	U	**6.1**		2	U	**4.5**		**20.2**		**36.8**	**33.5**	
Phosphorus	50	U	50	U	**117**		NT		NT		NT		**217**	**559**		50	U	50	U	50	U	NT		NT		NT		**150**	**648**	
Potassium	**130**		NT		NT		NT		NT		NT		**130**	**2560**		**180**		NT		NT		NT		NT		NT		**180**	**1730**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	**0.23**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.35**		**2.65**	**0.98**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.43**		**0.93**	**0.45**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**13.7**		**14.2**	**9**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	5	U	5	U	**6.2**		**31.2**	**10.7**		**10.6**		**6.8**		5	U	5	U	5	U	**10.1**		**42.5**	**26.8**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.746**		**2.95**	**0.567**		**0.165**		**0.069**		**0.236**		**0.136**		2	U	**3.72**		**6.33**	**2.5**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**466**		**491**	**266**		5	U	5	U	5	U	5	U	5	U	**24.1**		**49.1**	**36.1**	
Uranium	0.05	U	**0.132**		**0.19**		0.05	U	0.05	U	**0.701**		**1.17**	**1.2**		0.05	U	**1.5**		**0.807**		**0.054**		**0.408**		**0.845**		**3.66**	**3.05**	
Vanadium	0.2	U	0.2	U	**2.5**		0.2	U	**0.63**		**31.4**		**35.1**	**27.2**		0.2	U	0.2	U	**3.5**		0.2	U	**4.98**		**15.2**		**24.3**	**27.3**	
Zinc	**535**		**634**		**311**		**10.4**		50	U	**125**		**1665**	**1580**		**38.8**		**85.8**		**339**		**21.2**		**146**		**4920**		**5551**	**4660**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW004															CH14-015-MW004														
Sample ID	CH14_015_MW004_Som															CH14_015_MW004_Sop														
Sample Interval (mbgs)	20.12 - 20.42															28.35 - 28.65														
Sample Date	8/10/2014															8/11/2014														
General Location	WASTE ROCK DUMP - NORTHWEST DUMP															WASTE ROCK DUMP - NORTHWEST DUMP														
Geologic Unit	WR															WR														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**126**		**111**		**95**		**12100**		**12532**	**5510**		50	U	**72**		**183**		50	U	**61**		**22600**		**23016**	**18900**	
Antimony	0.1	U	0.1	U	**0.55**		0.1	U	**0.17**		**1.18**		**2.20**	**1.71**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.6	**0.18**	
Arsenic	0.05	U	**0.052**		**5.37**		**0.624**		**1.84**		**6.92**		**14.9**	**15.1**		0.05	U	**0.107**		**8.32**		**0.954**		**1.39**		**29.4**		**40.2**	**34.9**	
Barium	**8.7**		**47.4**		**26.4**		**22.8**		**18.2**		**349**		**473**	**275**		**10.1**		**19.7**		**4.6**		**3**		**2.5**		**105**		**145**	**136**	
Beryllium	0.2	U	0.2	U	**0.24**		0.2	U	0.2	U	**1.03**		**2.07**	**1.26**		0.2	U	0.2	U	**0.28**		0.2	U	0.2	U	**1.02**		**2.10**	**1.5**	
Bismuth	0.2	U	0.2	U	**0.38**		0.2	U	0.2	U	**0.82**		**2.00**	**1.28**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.31**		**1.31**	**0.32**	
Cadmium	0.05	U	**0.333**		0.05	U	**0.089**		0.05	U	**0.44**		**1.01**	**0.944**		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.3	**0.061**	
Calcium	**1300**		**1690**		50	U	**693**		NT		**2550**		**6283**	**6060**		**1050**		**335**		50	U	**493**		NT		**1560**		**3488**	**3650**	
Chromium	5	U	5	U	5	U	5	U	5	U	**16.8**		**41.8**	**15.9**		5	U	5	U	5	U	5	U	5	U	**45.9**		**70.9**	**45.2**	
Cobalt	0.1	U	**0.6**		**7.28**		**0.13**		**3.69**		**11.2**		**23.0**	**21.6**		**0.14**		**0.79**		**5.49**		**0.12**		**1.57**		**12.9**		**21.0**	**21.9**	
Copper	0.5	U	**8.01**		**23**		**4.77**		0.5	U	**90**		**127**	**81.9**		0.5	U	0.5	U	**3.12**		**0.81**		0.5	U	**18**		**23.4**	**27.3**	
Iron	50	U	**521**		**9210**		**172**		**4510**		**42900**		**57363**	**53500**		50	U	**280**		**6360**		**125**		**2020**		**46400**		**55235**	**56000**	
Lead	**0.6**		**439**		**47.2**		**112**		**1.5**		**429**		**1029**	**906**		0.5	U	**9.07**		**5.97**		**6.93**		0.5	U	**23.3**		**46.3**	**70**	
Lithium	5	U	5	U	5	U	5	U	5	U	**15**		**40**	**8.6**		5	U	5	U	5	U	5	U	5	U	**50.5**		**75.5**	**51.9**	
Manganese	5	U	**48.8**		**163**		**14.5**		**52.8**		**600**		**884**	**807**		5	U	**33.1**		**133**		**11.7**		**39.8**		**399**		**622**	**639**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.07**		**3.57**	**1.11**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	0.5	U
Nickel	2	U	2	U	**10.7**		2	U	**5.7**		**15.1**		**37.5**	**29.7**		2	U	2	U	**9.6**		2	U	**2.6**		**27.7**		**45.9**	**43.6**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**427**		50	U	50	U	**66**		NT		NT		NT		**166**	**493**	
Potassium	**130**		NT		NT		NT		NT		NT		**130**	**1710**		**150**		NT		NT		NT		NT		NT		**150**	**4600**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.26**		**1.56**	**0.47**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**3.51**		**4.01**	**1.93**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.17**		**0.67**	**0.21**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**140**	
Strontium	5	U	6.2		5	U	5	U	5	U	**15**		**41.2**	**22.2**		5	U	5	U	5	U	5	U	5	U	**5.6**		**30.6**	**10.7**	
Thallium	0.05	U	0.05	U	**0.058**		0.05	U	2	U	**1.37**		**3.58**	**0.992**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.343**		**2.54**	**0.308**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**198**		**223**	**45.5**		5	U	5	U	5	U	5	U	5	U	**735**		**760**	**585**	
Uranium	0.05	U	**0.108**		**0.082**		0.05	U	**0.051**		**0.681**		**1.02**	**0.741**		0.05	U	**0.108**		**0.136**		0.05	U	0.05	U	**0.564**		**0.958**	**0.913**	
Vanadium	0.2	U	0.2	U	**4.51**		**0.22**		**2.29**		**27.2**		**34.6**	**27.8**		0.2	U	0.2	U	**1.35**		0.2	U	**0.46**		**40.4**		**42.8**	**40.5**	
Zinc	1	U	**47.9**		**153**		**5.5**		**54**		**257**		**518**	**499**		1	U	**4.7**		**35.9**		1	U	50	U	**67.2**		**160**	**124**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW006															CH14-015-MW006														
Sample ID	CH14_015_MW006_Sob															CH14_015_MW006_Soc														
Sample Interval (mbgs)	3.35 - 3.66															7.62 - 7.92														
Sample Date	8/14/2014															8/15/2014														
General Location	WASTE ROCK DUMP - NORTHEAST DUMP															WASTE ROCK DUMP - NORTHEAST DUMP														
Geologic Unit	WR															WR														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**58**		**357**		**184**		**313**		**17700**		**18662**	**17200**		50	U	**70**		**229**		50	U	**67**		**18300**		**18766**	**16900**	
Antimony	0.1	U	**0.11**		**1.15**		0.1	U	**0.17**		**0.85**		**2.48**	**3.65**		0.1	U	0.1	U	**0.23**		0.1	U	0.1	U	**0.22**		**0.85**	**0.36**	
Arsenic	0.05	U	**0.105**		**4.66**		**0.842**		**2.14**		**5.34**		**13.1**	**19.9**		0.05	U	**0.076**		**7.38**		**0.452**		0.5	U	**29.1**		**37.6**	**13.3**	
Barium	**70.7**		**66.6**		**18.6**		**27.1**		**8.5**		**657**		**849**	**808**		**8**		**16.7**		**5.3**		**2.8**		**3.1**		**96.9**		**133**	**115**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.52**		**1.52**	**0.81**		0.2	U	0.2	U	**0.4**		0.2	U	0.2	U	**1.12**		**2.32**	**1.59**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.24**		**1.24**	**0.63**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.25**		**1.25**	**0.53**	
Cadmium	0.05	U	**0.226**		0.05	U	0.05	U	0.05	U	**0.199**		**0.625**	**0.547**		0.05	U	**0.119**		0.05	U	0.05	U	0.05	U	0.05	U	0.369	**0.145**	
Calcium	**1300**		**6940**		50	U	**325**		NT		**3330**		**11945**	**11400**		**303**		**805**		50	U	**584**		NT		**1600**		**3342**	**2870**	
Chromium	5	U	5	U	5	U	5	U	5	U	**43.1**		**68.1**	**45.5**		5	U	5	U	5	U	5	U	5	U	**43.5**		**68.5**	**41.9**	
Cobalt	0.1	U	**1.48**		**1.58**		0.1	U	**2.17**		**7.39**		**12.8**	**14.9**		**0.13**		**1.46**		**9.09**		**0.11**		**0.61**		**13.6**		**25.0**	**24.4**	
Copper	0.5	U	**2.71**		**7.1**		**0.72**		0.5	U	**20.1**		**31.6**	**38.6**		0.5	U	**2.11**		**6.85**		**0.89**		0.5	U	**27.2**		**38.1**	**39.9**	
Iron	50	U	**138**		**2520**		**164**		**5720**		**19700**		**28292**	**32500**		50	U	**317**		**9390**		**153**		**1280**		**54500**		**65690**	**63400**	
Lead	**0.9**		**765**		**87.7**		**210**		**4.89**		**233**		**1301**	**1560**		0.5	U	**20.9**		**5.99**		**14.9**		0.5	U	**19.1**	**J**	**61.9**	**52.7**	
Lithium	5	U	5	U	5	U	5	U	5	U	**25**		**50**	**27.8**		5	U	5	U	5	U	5	U	5	U	**33.8**		**58.8**	**33.8**	
Manganese	**13.9**		**122**		**46**		**5.4**		**33.6**		**179**		**400**	**450**		5	U	**17.1**		**135**		**9.8**		**18**		**636**		**821**	**783**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.7**		0.5	U	**3.2**	**1.78**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.55**		**3.05**	**0.59**	
Nickel	2	U	2	U	**3.7**		2	U	**7.4**		**24.5**		**41.6**	**46.3**		2	U	**3.1**		**17**		2	U	2	U	**28.1**		**54.2**	**51.7**	
Phosphorus	50	U	50	U	**214**		NT		NT		NT		**314**	**687**		50	U	50	U	**75**		NT		NT		NT		**175**	**247**	
Potassium	**120**		NT		NT		NT		NT		NT		**120**	**3140**		**150**		NT		NT		NT		NT		NT		**150**	**6490**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.23**		**1.53**	**0.55**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.76**		**2.26**	**2.14**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.25**	**J**	**0.75**	**0.25**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**350**		100	U	NT		NT		NT		NT		NT		100	**140**	
Strontium	**5.6**		**22.1**		5	U	5	U	5	U	**36.2**		**78.9**	**64.1**		5	U	5	U	5	U	5	U	5	U	**7.7**		**32.7**	**12.4**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.475**		**2.68**	**0.41**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.625**		**2.83**	**0.647**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	**5.7**		5	U	**10**		**806**		**837**	**530**		5	U	5	U	5	U	5	U	5	U	**844**		**869**	**768**	
Uranium	0.05	U	**0.247**		**0.116**		0.05	U	**0.163**		**0.904**		**1.53**	**1.29**		0.05	U	**0.147**		**0.123**		0.05	U	0.05	U	**0.514**		**0.934**	**0.756**	
Vanadium	0.2	U	0.2	U	**3.05**		**0.42**		**3.39**		**42.6**		**49.9**	**44.9**		0.2	U	0.2	U	**3.3**		0.2	U	**0.45**		**39.7**		**44.1**	**39.7**	
Zinc	1	U	**4.3**		**14.9**		**1.5**		50	U	**82.9**		**155**	**163**		1	U	**11.2**		**69.6**		**1.3**		50	U	**51.2**		**184**	**125**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW006															CH14-015-MW006														
Sample ID	CH14_015_MW006_Sof															CH14_015_MW006_Soi														
Sample Interval (mbgs)	18.29 - 18.59															26.82 - 27.13														
Sample Date	8/15/2014															8/15/2014														
General Location	WASTE ROCK DUMP - NORTHEAST DUMP															WASTE ROCK DUMP - NORTHEAST DUMP														
Geologic Unit	WR															WR														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**160**		**937**		**107**		**344**		**13900**		**15498**	**15100**		50	U	**52**		**307**		**908**		**142**		**28800**		**30259**	**22800**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.43**		**0.93**	**0.53**		0.1	U	0.1	U	**0.75**		**0.12**		**0.16**		**0.53**		**1.76**	**1.93**	
Arsenic	**0.107**		**0.479**		**17.8**		**3.31**		**6.96**		**16.4**		**45.1**	**48.5**		**0.179**		**1.97**		**114**		**16.8**		**20.2**		**41.5**		**195**	**183**	
Barium	**42.9**		**20.5**		**9.5**		**6.4**		**16.2**		**84.2**		**180**	**180**		**14.7**		**46.4**		**13.6**		**26.4**		**15.8**		**265**		**382**	**224**	
Beryllium	0.2	U	**0.34**		**0.38**		0.2	U	0.2	U	**0.48**		**1.80**	**1.36**		0.2	U	**0.3**		**0.28**		0.2	U	**0.29**		**1.19**		**2.46**	**2.02**	
Bismuth	0.2	U	0.2	U	**0.34**		0.2	U	0.2	U	**0.84**		**1.98**	**1.26**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.31**		**1.31**	**0.29**	
Cadmium	**0.317**		**0.186**		0.05	U	0.05	U	0.05	U	**0.258**		**0.911**	**0.82**		0.05	U	**0.297**		0.05	U	0.05	U	0.05	U	**0.2**		**0.697**	**0.554**	
Calcium	**360**		50	U	50	U	**189**		NT		**1080**		**1729**	**1330**		**2720**		**21600**		50	U	**326**		NT		**7310**		**32006**	**37200**	
Chromium	5	U	5	U	5	U	5	U	5	U	**27.9**		**52.9**	**32**		5	U	5	U	**7.1**		5	U	5	U	**368**		**395**	**285**	
Cobalt	**2.04**		**0.95**		**1.88**		**0.14**		**3.82**		**10.4**		**19.2**	**19.7**		**0.19**		**3.59**		**14.2**		**0.85**		**4.03**		**23.1**		**46.0**	**43.2**	
Copper	**0.9**		**14.3**		**22.5**		**2.2**		0.5	U	**57.6**		**98.0**	**103**		0.5	U	**1.7**		**8.26**		**1.21**		0.5	U	**34.6**		**46.8**	**42.9**	
Iron	50	U	**157**		**3850**		**344**		**11200**		**28500**		**44101**	**46200**		50	U	**609**		**11100**		**515**		**2760**		**41400**		**56434**	**51400**	
Lead	**2.36**		**41.4**		**29.1**		**7.74**		**1.31**		**110**		**192**	**174**		0.5	U	**21.9**		**2.2**		**19.4**		0.5	U	**41.9**		**86.4**	**71.9**	
Lithium	5	U	5	U	5	U	5	U	5	U	**33.7**		**58.7**	**38.6**		5	U	5	U	5	U	5	U	5	U	**46.1**		**71.1**	**43.6**	
Manganese	**23.5**		5	U	**10.9**		5	U	**30.6**		**219**		**294**	**266**		5	U	**298**		**107**		**18.6**		**30.6**		**383**		**842**	**848**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	**1.16**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.59**		**3.09**	**0.58**	
Nickel	**3**		2	U	**2.8**		2	U	**7.3**		**19.5**		**36.6**	**34.1**		**3.8**		**49.7**		**180**		**14.8**		**41.3**		**155**		**445**	**423**	
Phosphorus	50	U	50	U	**79**		NT		NT		NT		**179**	**370**		50	U	50	U	**57**		NT		NT		NT		**157**	**487**	
Potassium	**150**		NT		NT		NT		NT		NT		**150**	**3600**		**200**		NT		NT		NT		NT		NT		**200**	**4950**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	**0.25**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.25**		1.55	**0.33**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.47**		**0.97**	**0.97**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.24**		**0.74**	**0.2**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**390**	
Strontium	5	U	5	U	5	U	5	U	5	U	**8.4**		**33.4**	**13.4**		**13.5**		**24.3**		5	U	5	U	5	U	**31.1**		**83.9**	**77.4**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.649**		**2.85**	**0.538**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.461**		**2.66**	**0.386**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**505**		**530**	**473**		5	U	5	U	5	U	**5.3**		5	U	**839**		**864**	**559**	
Uranium	0.05	U	**0.246**		**0.133**		0.05	U	**0.203**		**0.51**		**1.19**	**1.02**		**0.102**		**0.876**		**0.463**		0.05	U	**0.111**		**0.546**		**2.15**	**2**	
Vanadium	0.2	U	0.2	U	**2.6**		**0.33**		**4.05**		**23.4**		**30.8**	**30.2**		0.2	U	0.2	U	**4.03**		**1.94**		**1.07**		**74.1**		**81.5**	**65.1**	
Zinc	**131**		**87**		**126**		**11.6**		**83**		**235**		**674**	**682**		1	U	**12.4**		**52.9**		**3.9**		50	U	**96.3**		**217**	**165**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-104-MW008															CH14-104-MW008														
Sample ID	CH14-104-MW008-SOB															CH14-104-MW008-SOD														
Sample Interval (mbgs)	3.66 - 3.96															10.30 - 10.67														
Sample Date	8/12/2014															8/12/2014														
General Location	WASTE ROCK DUMP - OXSP															WASTE ROCK DUMP - OXSP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**120**		**107**		**230**		**1670**		**2227**	**1970**		50	U	**127**		**258**		**82**		**114**		**7870**		**8501**	**8770**	
Antimony	0.1	U	**0.21**		**5.01**		**1.26**		**0.31**		**31.4**		**38.3**	**40.9**		0.1	U	0.1	U	**0.77**		**0.1**		**0.23**		**4.39**		**5.69**	**7.9**	
Arsenic	**0.102**		**0.123**		**3.38**		**7.17**		**6.6**		**292**		**309**	**250**		0.05	U	0.05	U	**4.1**		**1.44**		**2.56**		**33.6**		**41.8**	**143**	J
Barium	2	U	**3.6**		**16.1**		**11.4**		**309**		**71.6**		**414**	**48.3**		**9.3**		**26.8**		**24.5**		**24.4**		**37.9**		**129**		**252**	**162**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.35**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.9**		**1.90**	**1.12**	
Bismuth	0.2	U	0.2	U	**0.26**		0.2	U	0.2	U	**1.49**		**2.55**	**2.04**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.32**		**1.32**	**0.56**	
Cadmium	**13.8**		**1.6**		**0.785**		**0.596**		0.05	U	**32.3**		**49.1**	**47.6**		**0.113**		**0.454**		0.05	U	**0.113**		0.05	U	**3.46**		**4.24**	**4.03**	
Calcium	**1320**		50	U	50	U	**74**		NT		**384**		**1878**	**1590**		**1830**		**675**		50	U	**979**		NT		**3320**		**6854**	**6160**	
Chromium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	**7.68**		5	U	5	U	5	U	5	U	5	U	**22.8**		**47.8**	**24.7**	
Cobalt	**7.7**		**0.21**		**0.39**		**0.14**		**0.93**		**70.6**		**80.0**	**69.5**		0.48		**2.68**		**4.83**		**0.15**		**2.47**		**26.6**		**37.2**	**34.9**	
Copper	**29.3**		**8.22**		**74.3**		**15.2**		0.5	U	**834**		**962**	**1080**		0.5	U	**11**		**14.9**		**3.81**		0.5	U	**297**		**328**	**646**	J
Iron	**333**		**96**		**6970**		**627**		**30800**		**182000**		**220826**	**206000**		50	U	**494**		**6190**		**196**		**5650**		**59200**		**71780**	**68600**	
Lead	**192**		**3640**		**327**		**1670**		**9.02**		**1470**		**7308**	**7970**		**1.94**		**530**		**80.1**		**138**		**0.54**		**791**		**1542**	**1880**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U	5	U	5	U	5	U	5	U	5	U	**13.3**		**38.3**	**14.6**	
Manganese	**999**		**5.9**		**14**		5	U	**30.7**		**291**		**1346**	**1150**		**10.1**		**30.5**		**54.7**		**8**		**21.9**		**442**		**567**	**566**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**5.21**		**7.71**	**4.67**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**3.91**		**6.41**	**3.7**	
Nickel	7.9		2	U	2	U	2	U	2	U	**13.8**		**29.7**	**17.8**		2	U	**2.4**		**8.9**		2	U	**3.6**		**29.2**		**48.1**	**38.3**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**240**		50	U	50	U	50	U	NT		NT		NT		150	**346**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**550**		**150**		NT		NT		NT		NT		NT		**150**	**2290**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	1.50	**1.5**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.53**		**1.83**	**0.66**	
Silver	0.1	U	0.1	U	0.1	U	**0.16**		0.1	U	**24.6**		**25.2**	**23.8**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**4.09**		**4.59**	**5.96**	J
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**190**	
Strontium	5	U	5	U	5	U	5	U	5	U	**8**		**33.0**	**10.5**		**6.7**		5	U	5	U	5	U	5	U	**13.1**		**39.8**	**24.5**	
Thallium	**0.084**		**0.075**		**0.329**		**0.267**		2	U	**7.57**		**10.3**	**7.76**		0.05	U	0.054	U	**0.071**		**0.056**		2	U	**2.83**		**5.06**	**2.44**	
Tin	2	U	2	U	2	U	2	U	2	U	**3.6**		**13.6**	**5.3**		2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**35.3**		**60.3**	**29.9**		5	U	5	U	5	U	5	U	5	U	**131**		**156**	**135**	
Uranium	**0.591**		**0.173**		**0.109**		0.05	U	**0.192**		**0.632**		**1.75**	**2.03**		0.05	U	**0.358**		**0.202**		0.05	U	**0.16**		**1.14**		**1.96**	**1.77**	
Vanadium	0.2	U	0.2	U	**1.93**		**0.34**		**5.36**		**4.74**		**12.8**	**13.3**		0.2	U	0.2	U	**2.56**		0.3		**1.13**		**27.5**		**31.9**	**31.1**	
Zinc	**21900**		**153**		**505**		**78.4**		50	U	**21100**		**43786**	**36800**		**29.4**		**314**		**181**		**13.7**		50	U	**2750**		**3338**	**3240**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-104-MW008															CH14-104-MW008														
Sample ID	CH14-104-MW908-SOD															CH14-104-MW008-SOE														
Sample Interval (mbgs)	10.30 - 10.67															12.5 - 12.8														
Sample Date	8/12/2014															8/12/2014														
General Location	WASTE ROCK DUMP - OXSP															WASTE ROCK DUMP - OXSP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**109**		**285**		**66**		**104**		**8790**		**9404**	**7740**		**366**		50	U	50	U	**139**		**104**		**1860**		**2569**	**2880**	
Antimony	0.1	U	0.1	U	0.8	U	0.1	U	0.22	U	**3.37**		**4.69**	**5.05**		0.1	U	0.1	U	**1.82**		**0.62**		**1.65**		**11.3**		**15.6**	**16**	
Arsenic	0.05	U	0.05	U	**5.01**		**1.45**		**2.31**		**46.2**		**55.1**	**37.1**	J	**0.731**		**0.121**		**3.56**		**14.7**		**57.2**		**92.8**		**169**	**202**	
Barium	**9.5**		**27.8**		**26.2**		**22.1**		**35.4**		**152**		**273**	**147**		2	U	**2.5**		2	U	2	U	**51.8**		**55.2**		**116**	**70.8**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.96**		**1.96**	**1.2**		**0.35**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.35**	**0.63**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.3**		**1.30**	**0.52**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.29**		**1.29**	**0.27**	
Cadmium	**0.141**		**0.409**		0.05	U	**0.11**		0.05	U	**3.51**		**4.27**	**3.75**		**3.46**		**0.092**		0.05	U	0.05	U	0.05	U	**2.27**		**5.97**	**5.89**	
Calcium	**1620**		**457**		50	U	**908**		NT		**3220**		**6255**	**5890**		**2130**		50	U	50	U	**135**		NT		**328**		**2693**	**2630**	
Chromium	5	U	5	U	5	U	5	U	5	U	**23.6**		**48.6**	**23.4**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	**9.72**	
Cobalt	**0.6**		**2.44**		**5.9**		**0.16**		**2.1**		**24.6**		**35.8**	**34.4**		**30.6**		**0.35**		**0.36**		0.1	U	**3.85**		**67.5**		**103**	**79.4**	
Copper	0.5	U	**9.09**		**16.9**		**4.06**		0.5	U	**378**		**409**	**239**	J	**298**		**3.65**		**30.5**		**7.93**		0.5	U	**582**		**923**	**968**	
Iron	50	U	**468**		**7240**		**192**		**5410**		**57600**		**70960**	**68100**		**6790**		**312**		**7580**		**609**		**39300**		**38100**		**92691**	**99200**	
Lead	**3.18**		**523**		75.2		**130**		0.5	U	**666**		**1398**	**1210**		**111**		**508**		**163**		**26.1**		**2.63**		**3550**		**4361**	**4040**	
Lithium	5	U	5	U	5	U	5	U	5	U	**13.2**		**38.2**	**13.5**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U
Manganese	**11.1**		**24.1**		**63.4**		**7.7**		**20**		**449**		**575**	**542**		**285**		5	U	5	U	5	U	**33.9**		**71.8**		**406**	**459**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**3.41**		**5.91**	**4.02**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**11.7**		**14.2**	**11.7**	
Nickel	2	U	**2.2**		**10.5**		2	U	**3.2**		**26.4**		**46.3**	**43.3**		**13.1**		2	U	2	U	2	U	2	U	**17**		**38.1**	**33**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**465**		50	U	50	U	50	U	NT		NT		NT		150	**332**	
Potassium	**150**		NT		NT		NT		NT		NT		**150**	**2000**		100	U	NT		NT		NT		NT		NT		100	**1130**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.63**		**1.93**	**0.6**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.73**		**3.03**	**1.75**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**3.19**		**3.69**	**3.06**	J	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**6.49**		**6.99**	**6.18**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**180**		100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	**6.2**		5	U	5	U	5	U	5	U	**13.7**		**39.9**	**23.5**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	**7.29**	
Thallium	0.05	U	**0.055**		**0.08**		**0.058**		2	U	**2.2**		**4.44**	**2.39**		0.05	U	0.05	U	**0.391**		**0.314**		2	U	**13.2**		**16.0**	**11.7**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**146**		**171**	**110**		5	U	5	U	5	U	5	U	5	U	**23.3**		**48**	**40.9**	
Uranium	0.05	U	**0.35**		**0.227**		0.05	U	**0.158**		**1.2**		**2.04**	**1.77**		**1.17**		0.05	U	0.05	U	0.05	U	**0.353**		**0.839**		**2.51**	**2.46**	
Vanadium	0.2	U	0.2	U	**2.88**		**0.25**		**1.06**		**29**		**33.6**	**31.3**		0.2	U	0.2	U	**3.24**		**0.48**		**7.06**		**7.89**		**19.1**	**22.8**	
Zinc	**36.8**		**289**		**207**		**13.3**		50	U	**2670**		**3266**	**3070**		**2560**		**28.4**		**27.1**		**6.2**		50	U	**2210**		**4882**	**5170**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-104-MW008															CH14-104-MW008														
Sample ID	CH14-104-MW008-SOG															CH14-104-MW008-SOI														
Sample Interval (mbgs)	16.46 - 16.76															20.88 - 21.18														
Sample Date	8/13/2014															8/13/2014														
General Location	WASTE ROCK DUMP - OXSP															WASTE ROCK DUMP - OXSP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**81**		**342**		**1270**		**135**		**21700**		**23578**	**22900**		50	U	**65**		**321**		**1830**		**18**		**28100**		**30384**	**24600**	
Antimony	0.1	U	0.1	U	**0.23**		0.1	U	0.1	U	**0.15**		**0.780**	**0.49**		0.1	U	0.1	U	**0.78**		**0.12**		**0.48**		**0.99**		**2.57**	**1.14**	
Arsenic	0.05	U	**0.245**		**9.39**		**0.552**		0.5	U	**7.72**	J	**18**	**19**		0.05	U	**0.179**		**8.71**		**1.56**		**1.23**		**8.2**		**19.9**	**13.8**	
Barium	**10.3**		**57.9**		**27.6**		**37.2**		**13.8**		**368**		**515**	**371**		**7.3**		**38.4**		**16.6**		**29.7**		**22.6**		**328**		**443**	**286**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.83**		**1.83**	**1.28**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.29**		**2.29**	**1.26**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.4**	J	**1.40**	**0.58**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U
Cadmium	0.05	U	**0.409**		0.05	U	**0.052**		0.05	U	**1.21**	J	**1.82**	**2.27**		0.05	U	**0.436**		0.05	U	**0.069**		0.05	U	**0.206**		**0.861**	**0.668**	
Calcium	**2060**		**12500**		50	U	**521**		NT		**3900**		**19031**	**23800**		**4060**		**9910**		50	U	**348**		NT		**5970**		**20338**	**18600**	
Chromium	5	U	5	U	5	U	5	U	5	U	**96.9**		**122**	**98.7**		5	U	5	U	5	U	5	U	5	U	**118**		**143**	**125**	
Cobalt	0.1	U	**1.47**		**6.65**		**0.27**		**1**		**12.2**		**21.7**	**22.5**		**0.15**		**2.51**		**6.58**		**0.55**		**3.66**		**26.4**		**39.9**	**29.7**	
Copper	0.5	U	**2.9**		**7.39**		**0.85**		0.5	U	**37.2**		**49.3**	**40.3**		0.5	U	**6.59**		**14**		**2.26**		0.5	U	**53.1**		**77.0**	**61.1**	
Iron	50	U	**448**		**3930**		**409**		**912**		**43900**		**49649**	**48300**		50	U	**393**		**4110**		**551**		**2900**		**52300**		**60304**	**46900**	
Lead	0.5	U	**85.1**		**5.49**		**15.6**		0.5	U	**106**	J	**213**	**160**		0.5	U	**68.8**		**7.47**		**25.2**		**1.01**		**113**		**216**	**104**	
Lithium	5	U	5	U	5	U	5	U	5	U	**30.7**		**55.7**	**34.6**		5	U	5	U	5	U	5	U	5	U	**38.7**		**63.7**	**33.1**	
Manganese	5	U	**213**		**51.5**		**8.6**		**8.4**		**369**		**656**	**786**		**6.5**		**231**		**70.9**		**18.9**		**26**		**360**		**713**	**624**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.44**		**3.94**	**1.55**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.23**		**3.73**	**1.18**	
Nickel	2	U	**5.5**		**25.5**		2	U	**5**		**43.5**		**83.5**	**85.1**		2	U	**6**		**18.7**		**3.2**		**10.9**		**68.5**		**109**	**102**	
Phosphorus	50	U	50	U	**123**		NT		NT		NT		**223**	**491**		50	U	50	U	**68**		NT		NT		NT		**168**	**793**	
Potassium	**160**		NT		NT		NT		NT		NT		**160**	**6460**		**190**		NT		NT		NT		NT		NT		**190**	**3690**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.4**		**1.70**	**0.46**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.38**		**1.68**	**0.31**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.45**	J	**0.950**	**0.34**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.45**		**0.950**	**0.36**	
Sodium	100	U	NT		NT		NT		NT		NT		**100**	**460**		100	U	NT		NT		NT		NT		NT		100	**410**	
Strontium	**42.4**		**15.9**		5	U	5	U	5	U	**24.7**		**98.0**	**98.4**		**80.1**		**19**		5	U	5	U	5	U	**23.9**		**138**	**104**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.455**		**2.66**	**0.48**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.38**		**3.58**	**0.829**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	**6.8**		5	U	**559**		**586**	**535**		5	U	5	U	5	U	**6.9**		5	U	**381**		**408**	**302**	
Uranium	0.05	U	**0.148**		**0.12**		0.05	U	0.05	U	**0.974**		**1.39**	**0.963**		0.05	U	**0.411**		**0.14**		0.05	U	**0.065**		**0.577**		**1.29**	**0.961**	
Vanadium	0.2	U	0.2	U	**2.48**		**1.88**		**0.52**		**57.2**		**62.5**	**58.9**		0.2	U	0.2	U	**4.18**		**6.67**		**1.59**		**104**		**117**	**87.5**	
Zinc	1	U	**35.4**		**58.3**		**3.5**		50	U	**168**	J	**316**	**298**		1	U	**78**		**98**		**12.5**		50	U	**128**		**368**	**275**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-104-SS001															CH14-104-SS002														
Sample ID	CH14-104-SS001-SOA															CH14-104-SS002-SOA														
Sample Interval (mbgs)	0 - 0.2															0 - 0.1														
Sample Date	7/24/2014															7/24/2014														
General Location	WASTE ROCK DUMP - LGSPC															WASTE ROCK DUMP - LGSPC														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**298**		50	U	50	U	**140**		**78**		**2470**		**3086**	**2870**		**632**		50	U	**50**	**U**	**87**		**119**		**2860**		**3798**	**3390**	
Antimony	0.1	U	**0.28**		**8.32**		**4.41**		**2.65**		**20.4**		**36.2**	**46.9**		0.1	U	**0.23**		**6.05**		**7.24**		**6.35**		**32.2**		**52.2**	**60**	
Arsenic	**43.3**		**0.337**		**21.8**		**75.1**		**67**		**189**		**397**	**509**		**6.2**		**0.232**		**2.94**		**74**		**110**		**154**		**347**	**443**	
Barium	2	U	**5.1**		**34.2**		**32.8**		**294**		**50.8**		**419**	**25.2**		2	U	**3.6**		**42.3**		**41.6**		**413**		**49.4**		**552**	**34.5**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.2**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.22**		**1.22**	**0.23**	
Bismuth	0.2	U	0.2	U	**0.48**		0.2	U	0.2	U	**3.04**		**4.32**	**4.27**		0.2	U	0.2	U	**0.21**		0.2	U	0.2	U	**2.69**		**3.70**	**2.69**	
Cadmium	**0.168**		0.05	U	0.05	U	0.05	U	0.05	U	**0.088**		**0.456**	**0.214**		**2.01**		0.05	U	0.05	U	0.05	U	0.05	U	**0.143**		**2.35**	**0.839**	
Calcium	**118**		50	U	50	U	50	U	NT		**143**		**411**	**224**		**361**		50	U	50	U	50	U	NT		**314**		**825**	**645**	
Chromium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	**55.4**		5	U	5	U	5	U	5	U	5	U	**8.7**		**33.7**	**15**	
Cobalt	**7.58**		0.1	U	0.1	U	0.1	U	**0.44**		**83**		**91.3**	**72.8**		**4.13**		0.1	U	0.1	U	0.1	U	**0.87**		**33.1**		**38.4**	**44.3**	
Copper	**38.7**		0.5	U	**7.97**		**3.78**		0.5	U	**580**		**631**	**917**		**46.3**		0.5	U	**10.3**		**6.08**		0.5	U	**563**		**627**	**814**	
Iron	**12200**		**229**		**6120**		**1530**		**23800**		**105000**		**148879**	**156000**		**8790**		**98**		**8560**		**2480**		**43800**		**85700**		**149428**	**154000**	
Lead	**379**		**5600**		**486**		**574**		7.17		**9580**		**16626**	**16200**		**375**		**7950**		**354**		**891**		**4.14**		**16300**		**25874**	**23400**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U	5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U
Manganese	**18.7**		5	U	5	U	5	U	**9.4**		**20.7**		**63.8**	**46.8**		**84.1**		5	U	5	U	5	U	**40.2**		**54.8**		**194**	**127**	
Molybdenum	0.5	U	0.5	U	**0.87**		0.5	U	0.5	U	**4.94**		**7.81**	**6.87**		0.5	U	0.5	U	**0.54**		0.64		0.5	U	**4.71**		**7.39**	**7.47**	
Nickel	**12.1**		2	U	2	U	2	U	**2.4**		**21.2**		**41.7**	**26.9**		**2.8**		2	U	2	U	2	U	2	U	**3.7**		**14.5**	**10.1**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**307**		**63**		50	U	50	U	NT		NT		NT		**163**	**588**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1150**		100	U	NT		NT		NT		NT		NT		100	**1440**	
Selenium	0.2	U	0.2	U	0.2	U	**0.26**		0.5	U	**1.48**		**2.84**	**2.8**		0.2	U	0.2	U	0.2	U	**0.27**		0.5	U	**1.8**		**3.17**	**2.59**	
Silver	0.1	U	0.1	U	0.1	U	0.65	U	0.1	U	**28.8**		**29.9**	**28.4**		0.1	U	0.1	U	0.1	U	**0.56**		0.1	U	**37.2**		**38.2**	**38.83**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	**6.6**		5	U	5	U	**5.6**		**21.3**		**48.5**	**29.9**		5	U	**8.3**		5	U	5	U	5	U	**21.5**		**49.8**	**30.8**	
Thallium	0.05	U	0.05	U	**0.172**		**0.132**		2	U	**8.45**		**10.9**	**8.52**		0.05	U	0.05	U	**0.098**		0.108		2	U	**10.9**		**13.2**	**10.7**	
Tin	2	U	2	U	2	U	2	U	2	U	**2.8**		**12.8**	**6.2**		2	U	2	U	2	U	2	U	2	U	**4.6**		**14.6**	**8.2**	
Titanium	5	U	5	U	5	U	13.6		**10.1**		**32.5**		**71.2**	**37.6**		5	U	5	U	5	U	**12.7**		**14.3**		**39.8**		**81.8**	**50.9**	
Uranium	**0.067**		0.05	U	0.05	U	0.05	U	**0.062**		**0.474**		**0.753**	**0.769**		**0.124**		0.05	U	0.05	U	0.05	U	**0.097**		**0.5**		**0.871**	**0.632**	
Vanadium	0.2	U	0.2	U	**5.6**		**0.98**		**3.43**		**5.89**		**16.3**	**24.4**		0.2	U	0.2	U	**8.78**		**1.37**		**10.6**		**6.53**		**27.7**	**35.1**	
Zinc	**159**		**1.1**		**14.1**		**13.3**		**90**		**297**		**575**	**872**		**1070**		**4.8**		**25.7**		**26.7**		**70**		**910**		**2107**	**1820**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-104-TP003															CH14-104-TP003														
Sample ID	CH14-104-TP03-SOA															CH14-104-TP03-SOB														
Sample Interval (mbgs)	2 - 2															4.8 - 4.8														
Sample Date	7/18/2014															7/18/2014														
General Location	WASTE ROCK DUMP - LGSPC															WASTE ROCK DUMP - LGSPC														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**62**		50	U	50	U	**83**		50	U	**811**		**1106**	**745**		**129**		50	U	50	U	**109**		50	U	**1130**		**1518**	**1620**	
Antimony	0.1	U	**0.14**		**4.83**		**0.94**		**0.16**		**9.49**		**15.7**	**20.2**		0.1	U	**0.17**		**2.61**		**2.36**		**6.56**		**26.6**		**38.4**	**47.4**	
Arsenic	**10.4**		**1.96**		**36.4**		**86.4**		**108**		**731**		**974**	**982**		**13.9**		**0.384**		**6.29**		**102**		**352**		**586**		**1061**	**1240**	
Barium	2	U	**2.8**		**3.9**		**3.2**		**78.7**		**23.7**		**114**	**4.46**		2	U	2	U	2	U	2	U	**73.4**		**59.6**		**141**	**17.2**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.22**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**2.12**		**3.12**	**3.09**		0.2	U	0.2	U	**0.25**		0.2	U	0.2	U	**2.86**		**3.91**	**3.42**	
Cadmium	**1.82**		0.05	U	0.05	U	0.05	U	0.05	U	**1.14**		**3.16**	**1.11**		**6.48**		**0.108**		0.05	U	0.05	U	0.05	U	**1.96**		**8.70**	**6.81**	
Calcium	**212**		50	U	50	U	50	U	50	U	50	U	**462**	**262**		**1310**		50	U	50	U	50	U	NT		**128**		**1588**	**1560**	
Chromium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	**9.56**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	**8.77**	
Cobalt	**9.32**		0.1	U	0.1	U	0.1	U	**0.34**		**396**		**406**	**384**		**10.8**		**0.1**		0.1	U	0.1	U	**0.35**		**128**		**139**	**140**	
Copper	**241**		**0.96**		**28.9**		**7.95**		0.5	U	**1210**		**1489**	**1680**		**323**		**2.17**		**24.8**		**5.17**		0.5	U	**1080**		**1436**	**1450**	
Iron	**6260**		**171**		**6370**		**850**		**39700**		**292000**		**345351**	**330000**		**6760**		**341**		**9510**		**859**		**49900**		**142000**		**209370**	**219000**	
Lead	**318**		**572**		**459**		**66.2**		**3.46**		**7830**		**9249**	**5310**		**365**		**1380**		**464**		**139**		**8.88**		**14000**		**16357**	**16300**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U	5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U
Manganese	**112**		5	U	5	U	5	U	**17.9**		**89.1**		**234**	**151**		**119**		5	U	5	U	5	U	**18.2**		**54.5**		**207**	**174**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.05**		**3.55**	**1.1**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**3.78**		**6.28**	**4.91**	
Nickel	2	U	2	U	2	U	2	U	2	U	2	U	12.0	**18.1**		**5.1**		2	U	2	U	2	U	2	U	**10.6**		23.7	**17.3**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**94**		50	U	50	U	50	U	NT		NT		NT		150	**242**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**380**		100	U	NT		NT		NT		NT		NT		100	**690**	
Selenium	0.2	U	0.2	U	0.2	U	**0.24**		0.5	U	**4.48**		**5.82**	**4.62**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**3.19**		**4.49**	**3.66**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**17.5**		**18.0**	**18.5**		0.1	U	0.1	U	0.1	U	**0.22**		0.1	U	**28.3**		**28.9**	**30.56**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	5	U	5	U	**11.9**		**36.9**	**14.3**		5	U	5	U	5	U	5	U	5	U	**11.3**		**36.3**	**15.2**	
Thallium	0.05	U	0.05	U	**0.092**		**0.082**		2	U	**5.11**		**7.38**	**5.41**		0.05	U	0.05	U	0.137		**0.125**		2	U	**6.95**		**9.31**	**7.34**	
Tin	2	U	2	U	2	U	2	U	2	U	**3.5**		**13.5**	**5.9**		2	U	2	U	2	U	2	U	2	U	**4.9**		**14.9**	**7.3**	
Titanium	5	U	5	U	5	U	5	U	5	U	**9.3**		**34.3**	**4.9**		5	U	5	U	5	U	5	U	5	U	**9.1**		**34.1**	**11.7**	
Uranium	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	**0.157**		**0.407**	**0.214**		**0.274**		0.05	U	0.05	U	0.05	U	**0.051**		**0.384**		**0.859**	**0.628**	
Vanadium	0.2	U	0.2	U	**4.46**		**0.68**		**6.93**		**2.6**		**15.1**	**17.7**		0.2	U	0.2	U	**3.27**		**0.44**		**5.44**		**6.33**		**15.9**	**17.3**	
Zinc	**1280**		**3**		**14.1**		**4.3**		50	U	**1090**		**2441**	**1460**		**4460**		**31.8**		**25.5**		**5.4**		50	U	**1910**		**6483**	**5600**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-104-TP003															CH14-106-MW009														
Sample ID	CH14-104-TP03-SOC															CH14-106-MW009-SOA														
Sample Interval (mbgs)	6 - 6															2.44 - 2.74														
Sample Date	7/18/2014															8/16/2014														
General Location	WASTE ROCK DUMP - LGSPC															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**439**		50	U	**53**		**67**		**694**		**1610**		**2913**	**3530**		50	U	50	U	**84**		**827**		**75**		**19200**		**20286**	**16800**	
Antimony	0.1	U	**0.21**		**2.18**		**0.69**		**2.26**		**16.7**		**22.1**	**26**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.34**		**0.840**	**0.35**	
Arsenic	**6.22**		**0.729**		**10.8**		**22.6**		**109**		**238**		**387**	**353**		0.05	U	**0.086**		**0.166**		**0.614**		**0.67**		**13.7**		**15.3**	**8.05**	
Barium	2	U	**2.5**		**11.4**		**9.5**		**428**		**83**		**536**	**55.4**		**41.9**		**64.3**		**14.1**		**21.5**		**17.8**		**185**		**345**	**229**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.25**		**1.25**	**0.71**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.19**		**2.19**	**1.55**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.85**		**1.85**	**1.15**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.45**		**1.45**	**0.69**	
Cadmium	**7.75**		**0.166**		0.05	U	0.05	U	0.05	U	**3.73**		**11.8**	**10.4**		0.05	U	**0.516**		0.05	U	0.05	U	0.05	U	**0.71**		**1.43**	**0.901**	
Calcium	**6220**		**73**		50	U	**269**		NT		**896**		**7508**	**7520**		**871**		**7310**		50	U	**376**		NT		**4080**		**12687**	**11100**	
Chromium	5	U	5	U	5	U	5	U	**6.1**		**5.2**		**31.3**	**16.1**		5	U	5	U	5	U	5	U	5	U	**48.5**		**73.5**	**43.6**	
Cobalt	**12.6**		**0.12**		0.1	U	0.1	U	**0.62**		**25.8**		**39.3**	**39.1**	**J**	0.1	U	**2.49**		**1.18**		**0.12**		**3.11**		**18.2**		**25.2**	**26.2**	
Copper	**1140**		**15.3**		**27.4**		**5.05**		**0.89**		**901**		**2090**	**1870**		0.5	U	**2.42**		**6.91**		**1**		0.5	U	**58.9**		**70.2**	**51.5**	
Iron	**7930**		**889**		**6600**		**327**		**56200**		**55200**		**127146**	**140000**		50	U	**417**		**2190**		**260**		**4380**		**54100**		**61397**	**53200**	
Lead	**2.99**		**121**		**83.6**		**103**		**12.7**		**7190**		**7513**	**7250**		0.5	U	**122**		**9.78**		**22.8**		0.5	U	**202**		**358**	**142**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U	5	U	5	U	5	U	5	U	5	U	**34**		**59.0**	**30.1**	
Manganese	**255**		5	U	5	U	5	U	**16.9**		**63.1**		**350**	**349**		5	U	**137**		**28**		**5.9**		**19.8**		**400**		**596**	**572**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**1.47**		**9.16**		**12.6**	**10.7**		0.5	U	0.5	U	0.5	U	0.5	U	**1.59**		**3.4**		**6.99**	**5.45**	
Nickel	**6.4**		2	U	2	U	2	U	2	U	**18.7**		**33.1**	**24.6**		2	U	**2.7**		**4.7**		2	U	**10.2**		**44.4**		**66.0**	**50.1**	
Phosphorus	**170**		50	U	**283**		NT		NT		NT		**503**	**2120**		50	U	50	U	50	U	NT		NT		NT		150	**509**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**940**		**120**		NT		NT		NT		NT		NT		**120**	**4100**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**2.4**		**3.70**	**2.38**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.56**		**1.86**	**0.52**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**12.8**		**13.3**	**13.8**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.45**		**0.95**	**0.34**	
Sodium	100	U	NT		NT		NT		NT		NT		**100**	100	U	100	U	NT		NT		NT		NT		NT		**100**	100	U
Strontium	5	U	5	U	5	U	5	U	**14.5**		**24.9**		**59.4**	**33.1**		**19.7**		**11.9**		5	U	5	U	5	U	**9.4**		**56.0**	**37.7**	
Thallium	0.05	U	0.05	U	**0.133**		0.097		2	U	**7**		**9.33**	**8.28**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.422**		**2.62**	**0.335**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	**2.6**		2	U	2	U	2	U	2	U	2	U	**3.1**		**13.1**	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	**9.2**	**J**	5	U	5	U	5	U	5	U	5	U	**438**		**463**	**349**	
Uranium	**0.964**		0.05	U	**0.072**		0.05	U	**0.798**		**1.04**		**2.97**	**2.88**		**0.052**		**0.859**		**0.246**		0.05	U	**0.207**		**1.51**		**2.92**	**2.68**	
Vanadium	**0.32**		0.2	U	**5.17**		**0.35**		**19.1**		**12.9**		**38.0**	**46.8**		0.2	U	**0.25**		**1.39**		**1.08**		**1.85**		**43.2**		**48.0**	**41.6**	
Zinc	**5100**		**54.3**		**34.1**		**8.1**		**226**		**3390**		**8813**	**8760**		1	U	**35.9**		**49.3**		**6.9**		**53**		**415**		**561**	**413**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-MW009															CH14-106-MW009														
Sample ID	CH14-106-MW009-SOD															CH14-106-MW009-SOI														
Sample Interval (mbgs)	13.11 - 13.41															28.04 - 28.35														
Sample Date	8/17/2014															8/17/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**66**		**100**		**77**		**75**		**15700**		**16068**	**13900**		50	U	199		251		65		301		6340		**7206**	**6080**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.29**		**0.790**	**0.34**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.34		**0.8**	**0.29**	
Arsenic	0.05	U	**0.153**		**0.994**		**2.3**		**2.78**		**36.7**		**43.0**	**48.9**		0.05	U	0.089		0.535		0.94		1.45		20.8		**24**	**30.1**	
Barium	**16.2**		**40.4**		**9.7**		**9.2**		**17**		**95.4**		**188**	**156**		15.4		28.9		5.7		3.1		7.8		59.8		**121**	**109**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.19**		**2.19**	**1.41**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.82		**1.82**	**1.05**	
Bismuth	0.2	U	**0.25**		0.2	U	0.2	U	0.2	U	**0.61**		**1.66**	**0.87**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.26		**1.26**	**0.26**	
Cadmium	0.05	U	**0.273**		0.05	U	0.05	U	0.05	U	**0.158**		**0.631**	**1.27**		0.05	U	0.073		0.05	U	0.05	U	0.05	U	0.073		**0.3**	**0.123**	
Calcium	**931**		**3000**		50	U	**459**		NT		**2860**		**7300**	**6960**		439		206		50	U	180		NT		2050		**2925**	**2730**	
Chromium	5	U	5	U	5	U	5	U	5	U	**39.9**		**64.9**	**37.2**		5	U	5	U	5	U	5	U	5	U	18.2		**43.2**	**20.3**	
Cobalt	0.1	U	**0.52**		**2.8**		**0.21**		**8.39**		**15.6**		**27.6**	**24.1**		0.1	U	**1.04**		**1.29**		**0.12**		**10.5**		**10.7**		**23.8**	**25.1**	
Copper	0.5	U	**2.05**		**7.94**		**0.91**		0.5	U	**60.1**		**72.0**	**57.6**		0.5	U	**2.32**		**4.03**		**0.6**		0.5	U	**64.7**		**72.7**	**55.4**	
Iron	50	U	**497**		**2860**		**168**		**4840**		**58800**		**67215**	**56500**		50	U	**711**		**3230**		**179**		**4860**		**57200**		**66230**	**63100**	
Lead	0.5	U	**16**		**3.95**		**2.13**		0.5	U	**18.4**		**41.5**	**43.2**		0.5	U	**6.11**		**1.2**		**0.55**		0.5	U	**14.4**		**23.3**	**16.6**	
Lithium	5	U	5	U	5	U	5	U	5	U	**32.6**		**57.6**	**30.5**		5	U	5	U	5	U	5	U	5	U	**11.6**		**36.6**	**12.4**	
Manganese	5	U	**43.4**		**33.2**		**7.1**		**49.1**		**641**		**779**	**630**		5	U	**15.3**		**28.7**		**6.3**		**42**		**635**		**732**	**673**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	0.5	U
Nickel	2	U	2	U	**6.1**		2	U	**13.6**		33.4		**59.1**	**47.8**		2	U	2	U	**2.5**		2	U	**15.7**		**16.8**		**41.0**	**38.1**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**417**		50	U	50	U	50	U	NT		NT		NT		150	**294**	
Potassium	**140**		NT		NT		NT		NT		NT		**140**	**4580**		**250**		NT		NT		NT		NT		NT		**250**	**1750**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.33**		**0.830**	**0.29**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.24**		**0.740**	**0.16**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**180**		100	U	NT		NT		NT		NT		NT		**100**	100	U
Strontium	**8.7**		**7.4**		5	U	5	U	5	U	**12.5**		**43.6**	**33.2**		5	U	5	U	5	U	5	U	5	U	**9**		**34.0**	**12.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.423**		**2.62**	**0.302**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.305**		**2.51**	**0.191**	
Tin	2	U	2	U	2	U	2	U	2	U	**2.4**		**12.4**	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**590**		**615**	**517**		5	U	5	U	5	U	5	U	5	U	**39.5**		**64.5**	**43.6**	
Uranium	0.05	U	**0.214**		**0.083**		0.05	U	**0.058**		**0.518**		**0.973**	**0.798**		0.05	U	**0.072**		0.05	U	0.05	U	0.05	U	**0.576**		**0.848**	**0.61**	
Vanadium	0.2	U	**0.25**		**1.17**		0.2	U	**1.5**		**32.7**		**36.0**	**30.1**		0.2	U	**0.34**		**0.76**		**0.24**		**2.64**		**18.6**		**22.8**	**21.3**	
Zinc	1	U	**4.8**		**15.4**		**1.5**		50	U	**73.9**		**147**	**160**		1	U	**5**		**6.2**		1	U	50	U	**58.5**		**122**	**88.8**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-MW009															CH14-106-MW009														
Sample ID	CH14-106-MW009-SOK															CH14-106-MW909-SOK														
Sample Interval (mbgs)	32.92 - 33.22															32.92 - 33.22														
Sample Date	8/17/2014															8/17/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	68		107		50	U	74		13900		**14249**	**13200**		50	U	72		104		57		94		15500		**15877**	**13600**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.14		**0.6**	**0.17**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.18**		**0.7**	**0.3**	
Arsenic	0.05	U	0.092		1.13		1.32		1.53		92.3		**96**	**11.3**	J	0.05	U	0.088		1.17		1.07		1.46		56.9		**61**	**49.4**	J
Barium	15.7		45.3		19.4		13.1		31.3		98		**223**	**208**		14.5		43.8		21.2		14.1		39.2		131		**264**	**188**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.02		**2.02**	**1.4**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.13		**2.13**	**1.38**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.36		**1.36**	**0.27**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.23		1.23	**0.39**	
Cadmium	0.05	U	0.12		0.05	U	0.05	U	0.05	U	0.1		**0.4**	**0.227**		0.05	U	**0.146**		0.05	U	0.05	U	0.05	U	**0.093**		**0.439**	**0.212**	
Calcium	1140		963		50	U	314		NT		2180		**4647**	**4550**		**1460**		**1170**		50	U	**374**		NT		**2170**		**5224**	**4740**	
Chromium	5	U	5	U	5	U	5	U	5	U	30.4		**55.4**	**30.6**		5	U	5	U	5	U	5	U	5	U	**34.1**		**59.1**	**30.7**	
Cobalt	0.1	U	**1.04**		**1.56**		0.1	U	**5**		**13.6**		**21.4**	**18.5**		0.1	U	**1.15**		**1.41**		**0.1**		**5.22**		**14.4**		**22.4**	**20.9**	
Copper	0.5	U	**1.83**		**4.96**		**0.51**		0.5	U	**23.9**		**32.2**	**29**		0.5	U	**1.79**		**5.06**		**0.6**		0.5	U	**28**		**36.5**	**34.6**	
Iron	50	U	**450**		**2570**		**111**		**3580**		**51200**		**57961**	**55100**		50	U	**485**		**2460**		**123**		**3740**		**52200**		**59058**	**55500**	
Lead	0.5	U	**65.5**		**17.7**		**9.29**		0.5	U	117	J	**210**	**103**		0.5	U	**62**		**19.7**		**8.34**		0.5	U	**50.3**	J	**141**	**132**	
Lithium	5	U	5	U	5	U	5	U	5	U	**27.9**		**52.9**	**30.1**		5	U	5	U	5	U	5	U	5	U	**33.9**		**58.9**	**32.4**	
Manganese	5	U	**34.2**		**26.2**		5	U	**30.6**		**505**		**606**	**548**		5	U	**37.4**		**25.2**		**5**		**32.8**		**516**		**621**	**564**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.69**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.67**	
Nickel	2	U	**2.2**		**4.6**		2	U	10.7		**27.1**		**48.6**	**40.2**		2	U	**2.9**		**4.7**		2	U	**11.6**		**29.5**		**52.7**	**44**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**391**		50	U	50	U	50	U	NT		NT		NT		150	**431**	
Potassium	**140**		NT		NT		NT		NT		NT		**140**	**2420**		**140**		NT		NT		NT		NT		NT		**140**	**2110**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	**1.50**	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	**1.50**	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.31**		**0.810**	**0.17**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.25**		**0.750**	**0.23**	
Sodium	100	U	NT		NT		NT		NT		NT		**100**	100	U	100	U	NT		NT		NT		NT		NT		**100**	100	U
Strontium	**6.2**		5	U	5	U	5	U	5	U	**5.9**		**32.1**	**18.8**		**7.5**		5	U	5	U	5	U	5	U	**6.8**		**34.3**	**19.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.375**		**2.58**	**0.318**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.479**		**2.68**	**0.358**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**243**		**268**	**267**		5	U	5	U	5	U	5	U	5	U	**241**		**266**	**222**	
Uranium	0.05	U	**0.207**		**0.1**		0.05	U	**0.077**		**0.608**		**1.09**	**1.03**		0.05	U	**0.243**		**0.104**		0.05	U	**0.084**		**0.77**		**1.30**	**1.1**	
Vanadium	0.2	U	0.2	U	**0.82**		0.2	U	**0.83**		**25.9**		**28.2**	**26.5**		0.2	U	0.2	U	**0.81**		0.2	U	**0.83**		**29.3**		**31.5**	**26.3**	
Zinc	1	U	**10.8**		**24.8**		**3.6**		50	U	**143**		**233**	**227**		1	U	**14.1**		**28.5**		**2.2**		50	U	**134**		**230**	**188**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-MW009															CH14-106-MW009														
Sample ID	CH14-106-MW009-SOM															CH14-106-MW009-SOP														
Sample Interval (mbgs)	40.84 - 41.15															48.5 - 48.8														
Sample Date	8/17/2014															8/19/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**244**		**312**		**84**		**182**		**31900**		**32772**	**32900**		50	U	50	U	**111**		**70**		**237**		**8140**		**8658**	**7940**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.600	0.1	U	0.1	U	0.1	U	**0.16**		0.1	U	0.1	U	**1.77**		**2.33**	**3.02**	
Arsenic	0.05	U	**0.054**		0.05	U	0.05	U	0.5	U	**0.78**		**1.48**	**0.503**		0.05	U	**0.113**		**0.247**		**2.82**		**2.9**		**77.2**		**83.3**	**48.8**	
Barium	**15.1**		**31.3**		**4.5**		**3.2**		**4.2**		**268**		**326**	**319**		**10.2**		**28.6**		**30.3**		**18.6**		**96.1**		**379**		**563**	**301**	
Beryllium	0.2	U	**0.37**		0.2	U	0.2	U	0.2	U	**1.25**		**2.42**	**2.22**		0.2	U	0.2	U	0.2	U	0.2	U	**0.46**		**1.06**		**2.32**	**2.06**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.74**		**1.74**	**2.86**	
Cadmium	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.300	0.05	U	**0.073**		**0.347**		**0.075**		**0.068**		0.05	U	**1**		**1.61**	**1.41**	
Calcium	**1210**		**2720**		50	U	**493**		NT		**743**		**5216**	**4570**		**1030**		50	U	50	U	**70**		NT		**2080**		**3280**	**3080**	
Chromium	5	U	5	U	5	U	5	U	5	U	**49.9**		**74.9**	**49.3**		5	U	5	U	5	U	5	U	5	U	**26.1**		**51.1**	**30.8**	
Cobalt	0.1	U	**0.89**		**0.45**		0.1	U	**0.5**		**16.2**		**18.2**	**15.5**		**0.17**		**0.65**		**1.44**		0.1	U	**14.1**		**22.5**		**39.0**	**36.4**	
Copper	0.5	U	**1.92**		**1.85**		0.5	U	0.5	U	**33.3**		**38.6**	**26.3**		0.5	U	**4.42**		**13.6**		**2.22**		0.5	U	**196**		**217**	**207**	
Iron	50	U	**698**		**1930**		**181**		**1800**		**47300**		**51959**	**52100**		50	U	**280**		**3170**		**174**		**16900**		**52300**		**72874**	**71100**	
Lead	0.5	U	**3.29**		**0.99**		0.5	U	0.5	U	**3.81**		**9.59**	**7.57**		**0.72**		**213**		**56.2**		**15.7**		**0.55**		**277**		**563**	**722**	
Lithium	5	U	5	U	5	U	5	U	5	U	**50.9**		**75.9**	**58.7**		5	U	5	U	5	U	5	U	5	U	**12.7**		**37.7**	**14.1**	
Manganese	5	U	**30.9**		**15.8**		5	U	**12.7**		**157**		**226**	**209**		**19.4**		**41.1**		**63.3**		**14.4**		**187**		**571**		**896**	**772**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.57**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.71**	
Nickel	2	U	**2.3**		2	U	2	U	2	U	**40.3**		**50.6**	**39.9**		2	U	2	U	**2.4**		2	U	**20.1**		**31.7**		**60.2**	**55.4**	
Phosphorus	50	U	50	U	**70**		NT		NT		NT		**170**	**334**		50	U	50	U	50	U	NT		NT		NT		150	**589**	
Potassium	**390**		NT		NT		NT		NT		NT		**390**	**14400**		**150**		NT		NT		NT		NT		NT		**150**	**2630**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.29**		**1.59**	**0.29**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.29**		**1.59**	**0.59**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.600**	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.65**		**2.15**	**2.34**	
Sodium	100	U	NT		NT		NT		NT		NT		**100**	**400**		100	U	NT		NT		NT		NT		NT		**100**	100	U
Strontium	**9.7**		**5.6**		5	U	5	U	5	U	5	U	35.3	**19.4**		5	U	5	U	5	U	5	U	5	U	**7.5**		**32.5**	**10.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.612**		**2.81**	**0.567**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.03**		**3.23**	**1.24**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**1590**		**1615**	**1590**		5	U	5	U	5	U	5	U	5	U	**261**		**286**	**217**	
Uranium	0.05	U	**0.336**		**0.103**		0.05	U	0.05	U	**0.6**		**1.19**	**1.06**		0.05	U	**0.16**		**0.082**		0.05	U	**0.299**		**0.764**		**1.41**	**1.37**	
Vanadium	0.2	U	**0.33**		**0.39**		0.2	U	**0.2**		**50.2**		**51.5**	**49.2**		0.2	U	0.2	U	**1.06**		0.2	U	**5.7**		**23.8**		**31.2**	**29.9**	
Zinc	1	U	**9.7**		**3.8**		1	U	50	U	**101**		**167**	**107**		**5.6**		**51.5**		**72.5**		**9.7**		**252**		**712**		**1103**	**1200**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-MW009															CH14-106-TP001													
Sample ID	CH14-106-MW009-SOT															CH14-106-TP001-SOA													
Sample Interval (mbgs)	60 - 60.4															1.3 - 1.3													
Sample Date	8/19/2014															7/18/2014													
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP													
Geologic Unit	WASTE ROCK															WASTE ROCK													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**118**		**348**		**3820**		**603**		**43000**		**47939**	**41900**		**134**		50	U	**224**		**382**		**399**		**12000**		**13189**	**13800**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.600	0.1	U	0.1	U	0.1	U	**0.26**		**0.48**		**0.4**		**3.29**		**4.63**	**5.32**	
Arsenic	0.05	U	**0.269**		**0.169**		**0.237**		0.5	U	**0.77**		**2.00**	**1.88**		**0.063**		0.05	U	**0.481**		**13.4**		**33.4**		**75.8**		**123**	**135**	
Barium	**15.7**		**21.3**		**2.2**		**5.3**		**4.6**		**157**		**206**	**222**		**3.3**		**4.1**		**7.3**		**6**		**105**		**65.9**		**192**	**80.1**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.26**		**2.26**	**1.83**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.49**		**1.49**	**0.98**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U	0.2	U	0.2	U	**0.25**		0.2	U	0.2	U	**1.23**		**2.28**	**1.63**	
Cadmium	0.05	U	**0.054**		0.05	U	0.05	U	0.05	U	0.05	U	**0.304**	**0.081**		**0.571**		**0.07**		0.05	U	0.05	U	0.05	U	**0.323**		**1.11**	**1.12**	
Calcium	**7840**		**4300**	J	50	U	**735**		NT		**1280**		**14205**	**17900**		**3860**		**175**		50	U	**79**		NT		**1380**		**5544**	**5280**	
Chromium	5	U	5	U	5	U	5	U	5	U	**77.6**		**103**	**78.1**		5	U	5	U	5	U	5	U	**5.4**		**28.5**		**53.9**	**39.9**	
Cobalt	0.1	U	**1.3**		**2.08**	J	**0.35**		**1.23**		**10.8**		**15.9**	**15.6**		4.08		**0.48**		**0.65**		**0.19**		**4.49**		**28.2**		**38.1**	**38.6**	
Copper	0.5	U	**0.64**		**1.73**		**1.4**		0.5	U	**12.4**		**17.2**	**21.2**		**3.97**		**0.72**		**11.8**		**4.74**		0.5	U	**310**		**332**	**332**	
Iron	50	U	**80**		**724**		**1270**		**3350**		**41200**		**46674**	**46300**		50	U	**155**		**9120**		**1920**		**35500**		**61500**		**108245**	**115000**	
Lead	0.5	U	**4.74**	J	**2.81**		**1.56**		0.5	U	**8.89**		**19.0**	**18.3**		**65**		**352**		**87.2**		**20**		**3.54**		**1970**		**2498**	**3170**	
Lithium	5	U	5	U	5	U	5	U	5	U	**40.6**		**65.6**	**44.4**		5	U	5	U	5	U	5	U	5	U	**20.4**		**45.4**	**20.7**	
Manganese	5	U	**48.7**		**18.7**		5	U	**6.3**		**368**		**452**	**500**		**122**		**13**		**12.6**		5	U	**53.2**		**153**		**359**	**416**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.75**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.14**		**3.6**	**1.68**	
Nickel	2	U	2	U	2	U	2	U	**6**		**29.4**		**43.4**	**38.2**		**4.7**		2	U	2	U	2	U	**10.6**		**19.6**		**40.9**	**43.5**	
Phosphorus	50	U	50	U	**54**		NT		NT		NT		**154**	**479**		50	U	50	U	50	U	NT		NT		NT		150	**403**	
Potassium	**590**		NT		NT		NT		NT		NT		**590**	**8580**		100	U	NT		NT		NT		NT		NT		100	**5580**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.46**		**1.76**	**0.73**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.6	0.1	U	0.1	U	0.1	U	0.1	U	**0.12**		0.1	U	**2.71**		**3.23**	**2.85**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**150**		100	U	NT		NT		NT		NT		NT		100	**310**	
Strontium	**175**		**14**		5	U	5	U	5	U	**11.1**		**215**	**195**		5	U	5	U	5	U	5	U	**10**		**11.3**		**41.3**	**30.2**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.221**		**2.42**	**0.223**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.29**		**3.49**	**1.2**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	**9.2**		5	U	**888**		**917**	**643**		5	U	5	U	5	U	**18.4**		**38.2**		**652**		**724**	**635**	
Uranium	0.05	U	**0.553**		**0.228**		**0.074**		**0.16**		**0.318**		**1.38**	**1.35**		**0.151**		**0.067**		0.05	U	0.05	U	**0.202**		**0.461**		**0.981**	**0.92**	
Vanadium	0.2	U	0.2	U	**0.63**		**2.17**		**0.98**		**54.6**		**58.8**	**51.6**		0.2	U	0.2	U	**4.65**		**0.97**		**10.9**		**25**		**41.9**	**42.4**	
Zinc	1	U	**1.9**		**4.1**		**4.3**		50	U	**100**		**161**	**100**		**231**		**18.8**		**75.8**		**30.4**		**404**		**348**		**1108**	**1250**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP001															CH14-106-TP001														
Sample ID	CH14-106-TP001-SOC															CH14-106-TP901-SOC														
Sample Interval (mbgs)	5 - 5															5 - 5														
Sample Date	7/18/2014															7/18/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**288**		**687**	J	**3550**		**385**		**24800**		**29760**	**22000**		50	U	**193**		**116**	J	**2700**		**435**		**27200**		**30694**	**24200**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.13**		**0.630**	**0.33**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.16**		**0.660**	**0.39**	
Arsenic	0.05	U	**0.326**		**0.895**	J	**0.65**		0.5	U	**2.99**		**5.41**	**8.98**	J	0.05	U	**0.267**		**0.168**	J	**0.51**		0.5	U	**2.62**		**4.12**	**4.58**	J
Barium	**5**		**14.9**		**11**	J	**16.7**	J	**14.7**		**157**		**219**	**105**		**6.1**		**16.3**		2	UJ	**8.2**	J	**18.7**		**160**		**211**	**120**	
Beryllium	0.2	U	**0.32**		**0.32**		0.2	U	**0.28**		**1.28**		**2.60**	**2.07**		0.2	U	**0.28**		0.2	U	0.2	U	**0.34**		**1.54**		**2.76**	**2.16**	
Bismuth	0.2	U	0.2	U	**0.36**		0.2	U	0.2	U	**1.62**	J	**2.78**	**0.63**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ	**1.20**	0.2	U
Cadmium	**0.397**		**6.16**		**0.345**	J	**0.481**		0.05	U	**4.85**	J	**12.3**	**7.9**		**0.329**		**4.21**		0.05	UJ	**0.345**		0.05	U	**0.755**	J	**5.74**	**6.72**	
Calcium	**17500**		**12000**		50	U	**471**		NT		**3230**		**33251**	**30600**		**15500**		**13800**		50	U	**541**		NT		**4210**		**34101**	**29800**	
Chromium	5	U	5	U	5	U	5	U	5	U	**46.1**		**71.1**	**41.7**		5	U	5	U	5	U	5	U	5	U	**49.5**		**74.5**	**44.8**	
Cobalt	0.1	U	**0.85**		**17.1**	J	**0.6**	J	1.76	J	**16.2**		**36.6**	**45.4**		0.1	U	**1**		**1.98**	J	**1.02**	J	**17.2**	J	**17.3**		**38.6**	**46.7**	
Copper	0.5	U	**14.5**		**5.89**	J	**1.84**		0.5	U	**19**		**42.2**	**43.4**		0.5	U	**9.2**		**1.94**	J	**2.38**		0.5	U	**23.1**		**37.6**	**43.2**	
Iron	50	U	**233**		**3770**	J	**1250**		**3690**		**37200**		**46193**	**42800**		50	U	**239**		**558**	J	**1000**		**4530**		**40000**		**46377**	**44000**	
Lead	0.5	U	**55**	J	**24.4**	J	**29.6**	J	**1.41**		**355**	J	**466**	**197**	J	0.5	U	**14.2**	J	**1.08**	J	**3.94**	J	**0.8**		**35.8**	J	**56.3**	**64.3**	J
Lithium	5	U	5	U	5	U	5	U	5	U	**40.1**		**65.1**	**37.2**		5	U	5	U	5	U	5	U	5	U	**41.4**		**66.4**	**39.3**	
Manganese	5	U	**508**		**974**	J	**54.4**	J	**38.5**	J	**305**		**1885**	**1750**		5	U	**477**		84.9	J	**133**	J	**518**	J	**393**		**1611**	**1660**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.0	**0.58**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.71**		**3.21**	**0.57**	
Nickel	2	U	**20.1**		**6.8**		2	U	**3.8**		**29**		**63.7**	**61.8**		2	U	**16.1**		**2.2**		**3**		**9.3**		**31.6**		**64.2**	**58.2**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**606**		50	U	50	U	50	U	NT		NT		NT		150	**622**	
Potassium	**120**		NT		NT		NT		NT		NT		**120**	**1090**		**140**		NT		NT		NT		NT		NT		**140**	**1240**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.58**		**1.88**	**0.29**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.87**	J	**1.37**	**0.35**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.11**	J	**0.610**	**0.17**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**120**		100	U	NT		NT		NT		NT		NT		100	**140**	
Strontium	**63.9**		**14.8**		5	U	5	U	5	U	**18.2**		**112**	**86.1**		**66.4**		**14.9**		5	U	5	U	5	U	**19.5**		**116**	**89.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.222**		**2.42**	**0.125**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.192**		**2.39**	**0.151**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	**10.3**		5	U	**50.6**		**80.9**	**29**		5	U	5	U	5	U	**9.2**		**5.2**		**40.1**		**69.5**	**32.1**	
Uranium	0.05	U	**0.553**		**0.224**		0.05	U	**0.069**		**0.305**		**1.25**	**1.12**		0.05	U	**0.432**		0.05	U	**0.055**		**0.123**		**0.439**		**1.15**	**1.18**	
Vanadium	0.2	U	0.2	U	**3.2**	J	**6.52**		**4.95**		**66.9**		**82.0**	**65**		0.2	U	0.2	U	**0.5**	J	**5.15**		**6.66**		**69.1**		**81.8**	**68.7**	
Zinc	**54**		**4200**		**438**	J	**123**	J	**88**		**557**		**5460**	**5790**		**45.7**		**3010**		**225**	J	**341**	J	**254**		**586**		**4462**	**4760**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP002															CH14-106-TP002														
Sample ID	CH14-106-TP002-SOA															CH14-106-TP002-SOC														
Sample Interval (mbgs)	2.5 - 2.5															5 - 5														
Sample Date	7/18/2014															7/18/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**119**		**109**		50	U	**3660**		**4038**	**2850**		50	U	50	U	**138**		**237**		50	U	**8810**		**9335**	**8130**	
Antimony	0.1	U	0.1	U	**1.74**		0.1	U	**0.22**		**1.57**		**3.83**	**4.62**		0.1	U	0.1	U	**1.08**		**0.1**		**0.22**		**2.38**		**3.98**	**9.39**	
Arsenic	0.05	U	**0.057**		**7.44**		**1.56**		**2.07**		**20.1**		**31.3**	**42.9**		0.05	U	**0.162**		**5.57**		**5.44**		**5.83**		**467**		**484**	**66.2**	
Barium	**11.8**		**44.1**		**32.5**		**18.8**		**25.1**		**350**		**482**	**170**		**10.7**		**33.3**		**23.8**		**19.9**		**31.8**		**209**		**329**	**182**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.06**		**2.06**	**1.33**		0.2	U	0.2	U	**0.23**		0.2	U	0.2	U	**1.32**		**2.35**	**1.59**	
Bismuth	0.2	U	0.2	U	**0.42**		0.2	U	0.2	U	**0.77**		**1.99**	**2.72**		0.2	U	0.2	U	**0.28**		0.2	U	0.2	U	**0.97**		**2.05**	**0.92**	
Cadmium	**0.081**		**0.723**		**0.085**		**0.145**		0.05	U	**1.45**		**2.53**	**2.46**		0.05	U	**0.252**		**0.055**		**0.121**		0.05	U	**0.887**		**1.42**	**0.764**	
Calcium	**1640**		**402**		50	U	**329**		NT		**3000**		**5421**	**4760**		**2870**		**1240**		50	U	**654**		NT		**2870**		**7684**	**7240**	
Chromium	5	U	5	U	5	U	5	U	5	U	**19.6**		**44.6**	**20.8**		5	U	5	U	5	U	5	U	5	U	**23**		**48.0**	**24**	
Cobalt	0.1	U	**2.36**		**11.3**		**0.18**		**3.32**		**9.15**		**26.4**	**29.2**		0.1	U	**1.05**		**6.97**		**0.28**		**3.99**		**15.6**		**28.0**	**22.9**	
Copper	0.5	U	**7.15**		**22.9**		**1.72**		0.5	U	**62.6**		**95.4**	**308**		0.5	U	**4.4**		**26.5**		**2.43**		0.5	U	**118**		**152**	**122**	
Iron	50	U	**458**		**8930**		**201**		**3570**		**70200**		**83409**	**86000**		50	U	**245**		**8380**		**307**		**5580**		**57500**		**72062**	**62400**	
Lead	**1.11**		**487**		**77.6**		**74**		0.5	U	**272**		**912**	**1040**		0.5	U	**252**		**43.8**		**46.7**		0.5	U	**872**		**1216**	**841**	
Lithium	5	U	5	U	5	U	5	U	5	U	**6.8**		**31.8**	**5.8**		5	U	5	U	5	U	5	U	5	U	**20.1**		**45.1**	**19**	
Manganese	5	U	**66.4**		**143**		**11.3**		**49.5**		**1240**		**1515**	**1400**		5	U	**58.5**		**93.1**		**11.4**		**53.1**		**716**		**937**	**864**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.59**		**3.09**	**2.03**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.73**	
Nickel	2	U	2	U	**25**		2	U	**5.9**		**16.4**		**53.3**	**50.5**		2	U	2	U	**14.8**		2	U	**6.5**		**30.6**		**57.9**	**44.6**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**340**		50	U	50	U	50	U	NT		NT		NT		150	**449**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**890**		100	U	NT		NT		NT		NT		NT		100	**1580**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	**0.49**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.32**		**1.62**	**0.21**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**2.1**		**2.60**	**3.27**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**2.9**		**3.40**	**2.78**	
Sodium	100	U	NT		NT		NT		NT		NT		**100**	100	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	5	U	5	U	**13.8**		**38.8**	**18.1**		**5.6**		5	U	5	U	5	U	5	U	**11.4**		**37.0**	**22.3**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.811**		**3.01**	**0.73**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.18**		**3.38**	**1.01**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**15.5**		**40.5**	**12.1**		5	U	5	U	5	U	5	U	5	U	**113**		**138**	**101**	
Uranium	0.05	U	**0.498**		**0.179**		0.05	U	**0.072**		**1.43**		**2.28**	**1.97**		0.05	U	**0.987**		**0.499**		0.05	U	**0.181**		**1.27**		**3.04**	**2.69**	
Vanadium	0.2	U	0.2	U	**3.95**		**0.25**		**1.51**		**23.8**		**29.9**	**26.1**		0.2	U	0.2	U	**3.56**		**0.42**		**1.57**		**23.9**		**29.9**	**27.2**	
Zinc	**8.1**		**178**		**321**		**8.5**		50	U	**763**		**1329**	**1540**		1	U	**26.3**		**118**		**5.6**		50	U	**352**		**553**	**400**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP003															CH14-106-TP003														
Sample ID	CH14-106-TP003-SOA															CH14-106-TP003-SOB														
Sample Interval (mbgs)	1.4 - 1.4															4.1 - 4.1														
Sample Date	7/19/2014															7/19/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**75**		**586**		**143**		**541**		**10600**		**11995**	**9080**		50	U	50	U	**167**		**1010**		**80**		**14800**		**16157**	**12800**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	**0.17**		**0.76**		**1.33**	**8.27**		0.1	U	0.1	U	**0.59**		0.1	U	**0.13**		**0.98**		**2.00**	**1.84**	
Arsenic	0.05	U	0.05	U	**0.943**		**0.354**		**2.9**		**8.49**		**12.8**	**2080**		0.05	U	**0.105**		**4.03**		**1.43**		**1.28**		**41.3**		**48.2**	**22.1**	
Barium	**8.2**		**8.1**		**3.5**		**2.1**		**8.8**		**93.3**		**124**	**164**		**20.3**		**59.2**		**28.5**		**32.6**		**34.3**		**483**		**658**	**337**	
Beryllium	0.2	U	0.2	U	**0.25**		0.2	U	0.2	U	**0.57**		**1.62**	**1.14**		0.2	U	0.2	U	**0.22**		0.2	U	0.2	U	**1.09**		**2.11**	**1.6**	
Bismuth	0.2	U	**0.68**		**4.13**		0.2	U	0.2	U	**7.89**		**13.3**	**1.79**		0.2	U	**0.59**		**0.58**		0.2	U	0.2	U	**1.68**		**3.45**	**3.05**	
Cadmium	**0.392**		**1.37**		**0.483**		**0.117**		0.05	U	**0.731**		**3.14**	**2.2**		0.05	U	**0.976**		**0.06**		**0.159**		0.05	U	**5.59**		**6.89**	**8.29**	
Calcium	**538**		50	U	50	U	**66**		NT		**987**		**1691**	**11100**		**2430**		**6970**		50	U	**787**		NT		**3930**		**14167**	**14500**	
Chromium	5	U	5	U	5	U	5	U	5	U	**20.1**		**45.1**	**20.9**		5	U	5	U	5	U	5	U	5	U	**40.1**		**65.1**	**38.3**	
Cobalt	0.1	U	**0.14**		**61.5**		**0.27**		**3.63**		**7.44**		**73.1**	**21.7**		0.1	U	**1.25**		**3.75**		**0.16**		**1.69**		**11.7**		**18.7**	**21.1**	
Copper	0.5	U	**3.26**		**7.6**		**0.97**		0.5	U	**58.2**		**71.0**	**250**		0.5	U	**4.52**		**21.8**		**1.85**		0.5	U	**110**		**139**	**86.9**	
Iron	50	U	50	U	**990**		**195**		**11300**		**23600**		**36185**	**66600**		50	U	**299**		**7870**		**414**		**3520**		**45100**		**57253**	**53300**	
Lead	**0.63**		**104**		**373**		**32.2**		**6.24**		**247**		**763**	**1990**		0.5	U	**453**		**44.9**		**102**		**0.59**		**499**		**1100**	**774**	
Lithium	5	U	5	U	5	U	5	U	5	U	**21.5**		46.5	**17.7**		5	U	5	U	5	U	5	U	5	U	**27.8**		**52.8**	**25.6**	
Manganese	**9.8**		**31**		**1670**		**37.3**		**44.1**		**138**		**1930**	**994**		5	U	**158**		**106**		**18**		**41.7**		**639**		**968**	**918**	
Molybdenum	0.5	U	0.5	U	**0.69**		0.5	U	**0.78**		0.5	U	**3.47**	**1.38**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.75**		**3.25**	**0.99**	
Nickel	2	U	2	U	2	U	2	U	**7.5**		**17.4**		**32.9**	**40.3**		2	U	2	U	**10.9**		2	U	**4.2**		**25.3**		**46.4**	**46.7**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**456**		50	U	50	U	50	U	NT		NT		NT		150	**581**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2130**		**150**		NT		NT		NT		NT		NT		**150**	**2390**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.3**		**1.60**	**0.41**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.06**		**2.36**	**0.7**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.62**		**1.12**	**6.83**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**2.01**		**2.51**	**1.62**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**140**	
Strontium	5	U	5	U	5	U	5	U	5	U	**10.8**		**35.8**	**34.2**		**17.2**		**17.6**		5	U	5	U	5	U	**20.3**		**70.1**	**56.7**	
Thallium	0.05	U	**0.054**		**0.265**		0.05	U	2	U	**0.457**		**2.88**	**1.83**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.688**		**2.89**	**0.905**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	**2.2**	
Titanium	5	U	5	U	**6.6**		**7.8**		**5.4**		**210**		240	**126**		5	U	5	U	5	U	5	U	5	U	**155**		**180**	**118**	
Uranium	0.05	U	**0.124**		**0.11**		0.05	U	**0.517**		**1.24**		**2.09**	**1.19**		0.05	U	**0.399**		**0.19**		0.05	U	**0.061**		**0.772**		**1.52**	**1.51**	
Vanadium	0.2	U	0.2	U	**0.82**		**0.25**		**5.76**		**22.5**		**29.7**	**37.4**		0.2	U	0.2	U	**6.7**		**2.28**		**2.33**		**51.8**		**63.5**	**56.8**	
Zinc	**24.9**		**64.1**		**60.8**		**10.1**		**290**		**524**		**974**	**1210**		**1.1**		**179**		**298**		**18.2**		**50**		**893**		**1439**	**1640**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP003															CH14-106-TP004														
Sample ID	CH14-106-TP003-SOC															CH14-106-TP004-SOA														
Sample Interval (mbgs)	5.3 - 5.3															1.8 - 1.8														
Sample Date	7/19/2014															7/19/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**57**		**155**		**903**		**63**		**15800**		**17028**	**14800**		**157**		50	U	50	U	**52**		**126**		**938**		**1373**	**1540**	
Antimony	0.1	U	**0.13**		**2.2**		**0.25**		**0.35**		**3.63**		**6.66**	**8.82**		0.1	U	0.1	U	**1.78**		**1.33**		**0.38**		**8.86**		**12.6**	**16.9**	
Arsenic	0.05	U	**0.246**		**16.8**		**4.87**		**6.45**		**96.5**		**125**	**112**		**14.2**		**0.529**		**12.5**		**166**		**430**		**303**		**926**	**1130**	
Barium	**8.9**		**22.7**		**18.5**		**21.7**		**31.5**		**122**		**225**	**122**		2	U	2	U	2	U	2	U	**75.9**		**179**		**263**	**92.2**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.95**		**1.95**	**1.56**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.24**	
Bismuth	0.2	U	**0.27**		**0.46**		0.2	U	0.2	U	**0.8**		**2.13**	**1.37**		0.2	U	0.2	U	**0.35**		0.2	U	0.2	U	**4.58**		**5.73**	**5.33**	
Cadmium	**0.452**		**3.06**		**0.162**		**0.412**		0.05	U	**4.97**		**9.11**	**8.76**		**0.734**		0.05	U	0.05	U	0.05	U	0.05	U	**0.059**		**0.993**	**1.23**	
Calcium	**5840**		**5420**		50	U	**1060**		NT		**3220**		**15590**	**18200**		**3760**		50	U	50	U	50	U	NT		**146**		**4056**	**4350**	
Chromium	5	U	5	U	5	U	5	U	5	U	**60.3**		**85.3**	**57.7**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	**5.82**	
Cobalt	**0.12**		**3.01**		**3.73**		**0.17**		**1.11**		**19.2**		**27.3**	**24.4**		**5.27**		0.1	U	0.1	U	0.1	U	**4.32**		**6.71**		**16.6**	**60.5**	**J**
Copper	0.5	U	**19.4**		**28.1**		**3.67**		0.5	U	**175**		**227**	**220**		**72.3**		**0.62**		**12.5**		**4.49**		0.5	U	**556**		**646**	**654**	**J**
Iron	50	U	**304**		**7840**		**413**		**4600**		**63000**		**76207**	**70600**		**6190**		**116**		**8720**		**1390**		**61800**		**14600**		**92816**	**114000**	
Lead	**3.14**		**857**		**109**		**178**		**1.27**		**1490**		**2638**	**3410**		**376**		**398**	J	**214**		**22.8**		5.04	J	**4830**		**5846**	**5650**	
Lithium	5	U	5	U	5	U	5	U	5	U	**32.5**		**57.5**	**32.2**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U
Manganese	**7.8**		**237**		**99.6**		**16.8**		**32.1**		**566**		**959**	**1020**		**52.5**		5	U	5	U	5	U	**99.9**		**56.9**		**224**	**197**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.77**		**4.27**	**2.09**		0.5	U	0.5	U	0.5	U	0.5	U	**1.13**		**0.54**		**3.67**	**3.12**	
Nickel	2	U	**6.1**		**11.3**		2	U	**3.4**		**46.5**		**71.3**	**63.4**		**4.1**		2	U	2	U	2	U	**4.2**		2		**16.3**	**22.4**	**J**
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**950**		50	U	50	U	50	U	NT		NT		NT		150	**398**	
Potassium	**120**		NT		NT		NT		NT		NT		**120**	**2170**		100	U	NT		NT		NT		NT		NT		100	**1370**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.58**		**1.88**	**0.75**		0.2	U	0.2	U	0.2	U	**0.21**		0.5	U	**1.09**		**2.40**	**2.07**	
Silver	0.1	U	0.1	U	0.1	U	**0.13**		0.1	U	**3.3**		**3.83**	**3.59**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**11.3**		**11.8**	**12.5**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**100**		100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	**28.6**		**12**		5	U	5	U	5	U	**13.3**		**68.9**	**59.4**		5	U	5	U	5	U	5	U	**6.1**		**15.1**		**41.2**	**24.6**	
Thallium	**0.067**		**0.065**		**0.061**		0.05	U	2	U	**1.34**		**3.58**	**1.62**		0.05	U	0.05	U	0.05	U	**0.064**		2	U	**5.76**		**7.97**	**6.08**	
Tin	2	U	2	U	2	U	2	U	2	U	**2.2**		**12.2**	**2.9**		2	U	2	U	2	U	2	U	2	U	2	U	12	**2.1**	
Titanium	5	U	5	U	5	U	5	U	5	U	**148**		**173**	**148**		5	U	5	U	5	U	5	U	5	U	**9.1**		**34.1**	**14.9**	
Uranium	0.05	U	**0.69**		**0.272**		0.05	U	**0.083**		**0.92**		**2.07**	**2.11**		**0.132**		0.05	U	0.05	U	0.05	U	**0.188**		**0.446**		**0.916**	**0.771**	
Vanadium	0.2	U	0.2	U	**5.58**		**2.05**		**3.16**		**52.5**		**63.7**	**58**		0.2	U	0.2	U	**3.58**		**0.23**		**6.51**		**1.55**		**12.3**	**13.3**	
Zinc	**75.1**		**1790**		**588**		**49.6**		**87**		**3230**		**5820**	**5240**		**523**		**3.7**		**13.8**		**9**		**504**		**384**		**1438**	**1830**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP004															CH14-106-TP005														
Sample ID	CH14-106-TP004-SOC															CH14-106-TP005-SOA														
Sample Interval (mbgs)	5.1 - 5.1															2.3 - 2.3														
Sample Date	7/19/2014															7/19/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**100**		**186**		**128**		**130**		**6410**		**7004**	**3880**		50	U	**86**		**346**		**477**		**182**		**32000**		**33141**	**27800**	
Antimony	0.1	U	**0.17**		**1.47**		**0.24**		**0.76**		**3.62**		**6.36**	**6.76**		0.1	U	0.1	U	**0.13**		0.1	U	0.1	U	**0.14**		**0.670**	**0.29**	
Arsenic	0.05	U	**0.238**		**1.21**		**7.66**		**25.8**		**207**		**242**	**204**	J	0.05	U	**1.24**		**34.6**		**3.68**		**3.16**		**45.9**		**88.6**	**43.6**	J
Barium	**6.1**		**14.1**		**19.6**		**14.9**		**78.2**		**185**		**318**	**97.5**		**13**		**46.7**		**13.6**		**21.4**		**11.7**		**225**		**331**	**201**	
Beryllium	0.2	U	**0.22**		0.2	U	0.2	U	0.2	U	**1.09**		**2.11**	**1.57**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.73**		**1.73**	**1.23**	
Bismuth	0.2	U	**0.5**		**0.46**		0.2	U	0.2	U	**1.12**		**2.68**	**1.58**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.31**		**1.31**	**0.21**	
Cadmium	**0.438**		**1.7**		**0.258**		**0.272**		0.05	U	**3.76**		**6.48**	**6.92**		0.05	U	**0.196**		0.05	U	0.05	U	0.05	U	**0.09**		**0.486**	**0.283**	
Calcium	**3910**		**257**		50	U	**526**		NT		**3060**		**7803**	**7510**		**3940**		**24600**		50	U	**274**		NT		**4340**		**33204**	**39000**	
Chromium	5	U	5	U	5	U	5	U	5	U	**12.6**		**37.6**	**14.8**		5	U	5	U	5	U	5	U	5	U	**328**		**353**	**279**	
Cobalt	**0.16**		**2.84**		**5.94**		**0.14**		**1.93**		**20.8**		**31.8**	**33.1**		0.1	U	**8.65**		**10.9**		**0.67**		**2.86**		**27.8**		**51.0**	**53.5**	
Copper	0.5	U	**35.6**		**49.4**		**4.73**		0.5	U	**206**		**297**	**253**		0.5	U	**6.6**		**14.3**		**1.41**		0.5	U	**43.4**		**66.7**	**109**	
Iron	50	U	**581**		**8780**		**357**		**12500**		**61100**		**83368**	**80700**		50	U	**709**		**7670**		**345**		**2200**		**47000**		**57974**	**62000**	
Lead	**2.11**		**887**		**264**		**184**		**4.43**		**1490**		**2832**	**3220**		0.5	U	**23.2**		**6.72**		**12.9**		0.5	U	**38.2**		**82.0**	**41.2**	
Lithium	5	U	5	U	5	U	5	U	5	U	**6.3**		**31.3**	**6**		5	U	5	U	5	U	5	U	5	U	**46.6**		**71.6**	**42.8**	
Manganese	**5.5**		**146**		**231**		**18.8**		**44.3**		**588**		**1034**	**1000**		5	U	**448**		**90.3**		**11.1**		**15.5**		**315**		**885**	**937**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.59**		**0.79**		**3.38**	**1.55**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.81**	
Nickel	2	U	**7**		**6.4**		2	U	**3.8**		**18.4**		**39.6**	**39.3**		2	U	**37**		**72.2**		**12.2**		**27.4**		**212**		**363**	**330**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**382**		50	U	50	U	**93**		NT		NT		NT		**193**	**673**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1300**		**210**		NT		NT		NT		NT		NT		**210**	**4870**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.4**		**1.70**	**0.53**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.26**		**1.56**	**0.54**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**4.2**		**4.70**	**3.68**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.31**		**0.810**	**0.32**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**390**	
Strontium	5	U	5	U	5	U	5	U	5	U	**15.5**		**40.5**	**21**		**16.4**		**18.6**		5	U	5	U	5	U	**21.5**		**71.5**	**58.1**	
Thallium	**0.052**		**0.068**		**0.126**		**0.06**		2	U	**2.04**		**4.35**	**3.12**		0.05	U	**0.074**		0.05	U	0.05	U	2	U	**0.82**		**3.04**	**0.883**	
Tin	2	U	2	U	2	U	2	U	**4.2**		**3.1**		**15.3**	2	U	2	U	2	U	2	U	**2.6**		**3.5**		**6**		**18.1**	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**165**		**190**	**54.5**		5	U	5	U	5	U	5	U	5	U	**1170**		**1195**	**960**	
Uranium	0.05	U	**0.594**		**0.253**		0.05	U	**0.118**		**1.04**		**2.11**	**2.13**		0.05	U	**0.326**		**0.184**		0.05	U	0.05	U	**0.397**		**1.06**	**1.21**	
Vanadium	0.2	U	0.2	U	**4.34**		**0.35**		**3.46**		**19**		**27.6**	**26.2**		0.2	U	0.2	U	**4.92**		**1.09**		**1.27**		**81.4**		**89.1**	**81.8**	
Zinc	**99.4**		**1250**		**687**		**47.4**		**440**		**2680**		**5204**	**5430**		1	U	**29.5**		**60.8**		**2.8**		50	U	**106**		**250**	**183**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP005															CH14-106-TP006														
Sample ID	CH14-106-TP005-SOC															CH14-106-TP006-SOA														
Sample Interval (mbgs)	5.4 - 5.4															1.6 - 1.6														
Sample Date	7/19/2014															7/18/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**86**		**270**		**405**		**124**		**29400**		**30335**	**26500**		**142**		50	U	50	U	50	U	**66**		**2650**		**3008**	**1050**	
Antimony	0.1	U	0.1	U	**0.12**		0.1	U	0.1	U	**0.22**		**0.740**	**0.49**		0.1	U	**0.14**		**1.15**		**1.5**		**0.73**		**24**		**27.6**	**30.4**	
Arsenic	0.05	U	**0.544**		**18.1**		**4.52**		**3.92**		**253**		**280**	**61.8**	J	**7.65**		**0.417**		**0.993**		**42.4**		**164**		**159**		**374**	**429**	J
Barium	**13.3**		**49.3**		**17.4**		**21.9**		**29.2**		**253**		**384**	**241**		2	U	2	U	2	U	2	U	**53**		**353**		**414**	**108**	
Beryllium	0.2	U	**0.25**		**0.26**		0.2	U	0.2	U	**1.24**		**2.35**	**1.62**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.26**		**1.26**	**0.28**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.33**		**1.33**	**0.62**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**4.72**		**5.72**	**7.62**	
Cadmium	0.05	U	**1.23**		**0.173**		**0.212**		0.05	U	**0.719**		**2.43**	**1.91**		**2.93**		**0.062**		0.05	U	0.05	U	0.05	U	**0.163**		**3.31**	**2.6**	
Calcium	**3270**		**16000**		50	U	**643**		NT		**4820**		**24783**	**25200**		**2570**		**69**		50	U	50	U	NT		**408**		**3147**	**2460**	
Chromium	5	U	5	U	5	U	5	U	5	U	**175**		**200**	**153**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	**4.77**	
Cobalt	0.1	U	**6.7**		**8.47**		**0.44**		**2.4**		**19.8**		**37.9**	**36**		**9.62**		**0.1**		0.1	U	**0.1**		**2.72**		**7.6**		**20.2**	**20.3**	
Copper	0.5	U	**3.91**		**9.65**		**1.01**		0.5	U	**38.4**		**54.0**	**83.2**		**162**		**2.78**		**15.9**		**3.3**		0.5	U	**648**		**832**	**2700**	
Iron	50	U	**636**		**7630**		**270**		**3030**		**47400**		**59016**	**56100**		**7820**		**1140**		**11000**		**1120**		**66100**		**18200**		**105380**	**109000**	
Lead	0.5	U	**23.1**		**9.07**		**11.3**		0.5	U	**44.8**		**89.3**	**194**		**240**		**921**		**171**		**60.4**		**6.42**		**9710**		**11109**	**7900**	
Lithium	5	U	5	U	5	U	5	U	5	U	**52.2**		**77.2**	**50**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U
Manganese	5	U	**344**		**115**		**16.4**		**27.8**		**537**		**1045**	**918**		**115**		5	U	5	U	5	U	**59.3**		**27**		**216**	**214**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.72**		0.5	U	0.5	U	0.5	U	**0.95**		**2.7**		**4.62**		**9.77**	**9.25**	
Nickel	2	U	**23.8**		**39.9**		**5.3**		**15**		**112**		**198**	**177**		**9.1**		2	U	2	U	2	U	**3.2**		**8**		**26.3**	**18.8**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		**150**	**527**		**65**		50	U	50	U	NT		NT		NT		**165**	**639**	
Potassium	**140**		NT		NT		NT		NT		NT		**140**	**5900**		100	U	NT		NT		NT		NT		NT		100	**730**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.23**		**1.53**	**0.42**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**2.52**		**3.82**	**2.67**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.3**		**0.800**	**0.48**		0.1	U	0.1	U	0.1	U	**0.16**		0.1	U	**27.1**		**27.7**	**20**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**530**		100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	**12.6**		**14.3**		5	U	5	U	5	U	**30.4**		**72.3**	**56.8**		5	U	5	U	5	U	5	U	**5.2**		**33.9**		**59.1**	**29.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.654**		**2.85**	**0.702**		0.05	U	0.05	U	**0.131**		**0.145**		2	U	**7.84**		**10.2**	**6.25**	
Tin	2	U	2	U	2	U	2	U	2	U	**4**		**14.0**	2	U	2	U	2	U	2	U	2	U	2	U	**3.2**		**13.2**	**2.1**	
Titanium	5	U	5	U	5	U	5	U	5	U	**983**		**1008**	**808**		5	U	5	U	5	U	5	U	5	U	**42.2**		**67.2**	**3.8**	
Uranium	0.05	U	**0.442**		**0.224**		0.05	U	**0.066**		**0.617**		**1.45**	**1.33**		**0.758**		0.05	U	0.05	U	0.05	U	**0.258**		**0.938**		**2.10**	**1.83**	
Vanadium	0.2	U	0.2	U	**3.35**		**0.68**		**1.04**		**65.3**		**70.8**	**64**		0.2	U	0.2	U	**4.27**		**0.23**		**9.77**		**12.7**		**27.4**	**22.4**	
Zinc	1	U	**141**		**313**		**15.8**		50	U	**261**		**782**	**669**		**2110**		**19.8**		**23.8**		**5.3**		**305**		**688**		**3152**	**2800**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP006															CH14-106-TP007														
Sample ID	CH14-106-TP006-SOC															CH14-106-TP007-SOA														
Sample Interval (mbgs)	5.3 - 5.3															1.4 - 1.4														
Sample Date	7/19/2014															7/20/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**2800**		**107**		**357**		**129**		**700**		**6890**		**10983**	**10000**		**110**		50	U	**115**		**334**		**299**		**7840**		**8748**	**5630**	
Antimony	0.1	U	0.1	U	**0.89**		**1.02**		**0.32**		**7.34**		**9.77**	**13.6**		0.1	U	**0.17**		**2.16**	J	**1.65**	J	**0.78**	J	**22.9**		**27.8**	**33.8**	
Arsenic	**2.15**		**2.34**		**9.54**		**97.5**		**192**		**294**		**598**	**906**	J	**0.211**		**0.128**		**0.896**	J	**9.98**	J	**20.3**	J	**127**		**159**	**183**	J
Barium	2	U	**2.2**		**5**		**3.9**		**221**		**162**		**396**	**81.7**		**2.7**		**3.4**		**14.9**		**9.3**		**189**		**304**	J	**523**	**28.9**	J
Beryllium	**0.27**		0.2	U	0.2	U	0.2	U	0.2	U	**0.28**		**1.35**	**0.68**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.34**		**1.34**	**0.85**	
Bismuth	0.2	U	**0.66**		**1.88**		0.2	U	0.2	U	**15.4**		**18.5**	**18.6**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**2.12**		**3.12**	**1.55**	
Cadmium	**6.26**		**0.115**		0.05	U	0.05	U	0.05	U	**1.83**		**8.36**	**12.3**		**6.78**		**0.172**	J	0.05	U	0.05	U	0.05	U	**7.53**	J	**14.6**	**21.9**	
Calcium	**7620**		**181**		50	U	50	U	NT		**792**		**8693**	**8500**		**2910**		**54**		50	U	**52**		NT		**777**		**3843**	**4090**	
Chromium	5	U	5	U	**6.2**		5	U	**11.1**		**27.1**		**59.4**	**55.6**		5	U	5	U	5	U	5	U	**6.7**		**22.6**		**49.3**	**33.1**	
Cobalt	**13.6**		**0.14**		**0.14**		0.1	U	**1.59**		**28.2**		**43.8**	**41.1**		**6.16**		**0.1**		**0.14**		0.1	U	**2.4**		**31.9**	J	**40.8**	**51.5**	
Copper	**430**		**18.6**		**45.5**		**13**		0.5	U	**713**		**1221**	**1410**		**34.9**	J	**3.23**	J	**31**	J	**5.11**		0.5	U	**502**		**577**	**580**	
Iron	**263**		**883**		**8880**		**1670**		**48400**		**51800**		**111896**	**117000**		**169**		**539**	J	**9460**	J	**877**		**39000**		**73400**		**123445**	**140000**	
Lead	**64.6**		**519**		**102**		**30.8**		**2.84**		**4350**		**5069**	**3980**		**465**		**3580**		**237**		**113**	J	**3.09**		**8340**		**12738**	**11700**	
Lithium	5	U	5	U	5	U	5	U	5	U	**7.3**		**32.3**	**13.1**		5	U	5	U	5	U	5	U	5	U	**6.7**		**31.7**	**8**	
Manganese	**141**		5	U	5	U	5	U	**29.1**		**74.4**		**260**	**248**		**276**		5	U	5	U	5	U	**35.7**		**94.2**	J	**421**	**558**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.22**		**3.72**	**1.75**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**3.24**		**5.74**	**3.34**	
Nickel	**19.9**		2	U	2	U	2	U	**3.2**		**14.7**		**43.8**	**44.1**		**10.2**		2	U	2	U	2	U	**6.9**		**20.5**	J	**43.6**	**59.7**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**587**		50	U	50	U	50	U	NT		NT		NT		150	**490**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**3070**		100	U	NT		NT		NT		NT		NT		100	**1200**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.08**		**2.38**	**1.22**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.43**		**2.73**	**1.72**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**8.63**		**9.13**	**7.7**		0.1	U	0.1	U	0.1	U	**0.2**		0.1	U	**23.3**		**23.9**	**20.3**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**400**		100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	5	U	**15.4**		**18.8**		**54.2**	**34.3**		5	U	5	U	5	U	5	U	5	U	**21.2**		**46.2**	**27.9**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**3.76**		**5.96**	**3.76**		**0.06**		**0.05**		**0.067**		**0.065**		2	U	**4.39**		**6.63**	**3.49**	
Tin	2	U	2	U	2	U	2	U	2	U	**4**		**14.0**	**2.3**		2	U	2	U	2	U	2	U	2	U	**6**		**16.0**	**4.3**	
Titanium	5	U	5	U	5	U	**15**		**32.2**		**289**		**351**	**320**		5	U	5	U	5	U	5	U	**5.1**		**135**	J	**160**	**62.5**	
Uranium	**0.586**		0.05	U	0.05	U	0.05	U	**0.118**		**0.404**		**1.26**	**1.3**		**0.508**	J	**0.065**		**0.053**		0.05	U	**0.29**		**0.893**		**1.86**	**2.33**	
Vanadium	0.2	U	0.2	U	**5.82**		**0.58**		**7.77**		**13.1**		**27.7**	**27.9**		0.2	U	0.2	U	**5.15**	J	**1.12**		**14.4**		**13.8**		**34.9**	**34.2**	
Zinc	**3380**		**40.1**		**46.3**		**22.5**		**141**		**1550**		**5180**	**6150**		**2830**	J	**60.1**	J	**126**		**32**	J	**275**		**6100**	J	**9423**	**13500**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP007															CH14-106-TP007														
Sample ID	CH14-106-TP907-SOA															CH14-106-TP007-SOC														
Sample Interval (mbgs)	1.4 - 1.4															5.5 - 5.5														
Sample Date	7/20/2014															7/20/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**76**		**311**		**291**		**5650**		**6428**	**6420**		50	U	**86**		**232**		**865**		**185**		**18400**		**19818**	**15700**	
Antimony	0.1	U	**0.11**		**0.4**	J	**0.75**	J	**0.28**	J	**23**		**24.6**	**29.8**		0.1	U	**0.15**		**1.52**		**0.5**		**0.43**		**6.72**		**9.42**	**11.6**	
Arsenic	**0.084**		**0.071**		**0.113**	J	**3.76**	J	**6.99**	J	**193**		**204**	**144**	J	0.05	U	**0.174**		**1.77**		**6.38**		**8.07**		**134**	J	**150**	**67**	J
Barium	**2.6**		**3.7**		**20.4**		**13.4**		**286**		**30.2**	J	**356**	**53.9**	J	**4.4**		**18.8**		**21.6**		**19.6**		**86.1**		**297**		**448**	**96.6**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.41**		**1.41**	**0.83**		0.2	U	**0.22**		0.2	U	0.2	U	0.2	U	**0.75**		**1.77**	**1.1**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.55**		**2.55**	**1.37**	J	0.2	U	**1.12**		**1.19**		0.2	U	0.2	U	**3.31**		**6.22**	**6.24**	
Cadmium	**4.46**		**0.392**	J	**0.057**		**0.073**		0.05	U	**21.2**	J	**26.2**	**19.7**	J	**0.403**		**1.23**		**0.274**		**0.239**		0.05	U	**5.51**		**7.71**	**5.85**	
Calcium	**3470**		50	U	50	U	50	U	NT		**1150**		**4770**	**3680**	J	**7690**		**5930**		50	U	**693**		NT		**2640**		**17003**	**13100**	
Chromium	5	U	5	U	5	U	5	U	**6.4**		**27.5**		**53.9**	**42.1**		5	U	5	U	5	U	5	U	5	U	**75.4**		**100**	**63.2**	
Cobalt	**4.16**		**0.2**		**0.32**		0.1	U	**1.74**		**58.5**	J	**65.0**	**48**	J	**0.19**		**3.32**		**3.61**		**0.19**		**3.36**		**25.9**		**36.6**	**30.3**	
Copper	**6.84**	J	**5.67**	J	**18.5**	J	**7**		0.5	U	**679**		**718**	**609**	J	0.5	U	**16.2**		**25.3**		**4.69**		0.5	U	**282**		**329**	**232**	
Iron	**129**		**261**	J	**3550**	J	**569**		**27100**		**121000**		**152609**	**124000**		50	U	**439**		**8130**		**762**		**17500**		**69100**		**95981**	**79500**	
Lead	**678**		**4170**		**210**		**207**	J	**2.68**		**6310**		**11578**	**11000**		**7.83**		**1650**		**310**		**247**		**1.91**		**3080**	J	**5297**	**4250**	
Lithium	5	U	5	U	5	U	5	U	5	U	**7.1**		**32.1**	**8.1**		5	U	5	U	5	U	5	U	5	U	**35.6**		**60.6**	**34.1**	
Manganese	**204**		**8.6**		**7.2**		5	U	**35.2**		**334**	J	**594**	**548**		**10**		**190**		**135**		**18**		**78.6**		**355**		**787**	**738**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**3.47**		**5.97**	**3.43**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.84**		**4.34**	**2.05**	
Nickel	**7.1**		2	U	2	U	2	U	**5.7**		**38.4**	J	**57.2**	**84.3**	J	2	U	**8.7**		**10.7**		2	U	**12.2**		**44.5**		**80.1**	**88.3**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**540**		50	U	50	U	50	U	NT		NT		NT		150	**559**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1310**		**110**		NT		NT		NT		NT		NT		**110**	**2650**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.29**		**2.59**	**1.4**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.04**		**2.34**	**1.24**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**19.6**		**20.1**	**16**		0.1	U	0.1	U	0.1	U	**0.25**		0.1	U	**9.55**		**10.2**	**8.33**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**250**	
Strontium	**5**	U	5	U	5	U	5	U	5	U	**18.6**		**43.6**	**23.7**		**23.5**		**17.9**		5	U	5	U	5	U	**22.9**		**79.3**	**55.8**	
Thallium	0.108		**0.103**		**0.051**		**0.07**		2	U	**3.54**		**5.87**	**4.27**		0.05	U	**0.054**		0.05	U	0.05	U	2	U	**1.7**		**3.90**	**1.74**	
Tin	2	U	2	U	2	U	2	U	**3.1**		**11.3**		**22.4**	**4.3**		2	U	2	U	2	U	2	U	2	U	**3.8**		**13.8**	**3.1**	
Titanium	5	U	5	U	5	U	5	U	5	U	**80.1**	J	**105**	**59.9**		5	U	5	U	5	U	**5**		5	U	**342**		**367**	**244**	
Uranium	**0.2**	J	**0.221**		**0.067**		0.05	U	**0.269**		**1.25**		**2.06**	**2.21**	J	0.05	U	**0.448**		**0.207**		0.05	U	**0.178**		**0.996**		**1.93**	**1.89**	
Vanadium	0.2	U	0.2	U	**0.2**	UJ	**1.15**		**13.3**		**15.2**		**30.3**	**34.6**		0.2	U	0.2	U	**5.86**		**1.87**		**8.21**		**41.4**		**57.7**	**52.6**	
Zinc	**1090**	J	**102**	J	**137**		**57**	J	**160**		**15900**	J	**17446**	**12100**	J	**80.7**		**907**		**540**		**71.9**		**367**		**3490**		**5457**	**4240**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP008															CH14-106-TP008														
Sample ID	CH14-106-TP008-SOA															CH14-106-TP008-SOB														
Sample Interval (mbgs)	2 - 2															3.5 - 3.5														
Sample Date	7/19/2014															7/19/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**137**		**249**		**74**		**18500**		**19060**	**14200**		50	U	**75**		**211**		**589**		**102**		**35100**		**36127**	**29300**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.29**		**0.790**	**0.42**		0.1	U	0.1	U	**0.14**		0.1	U	0.1	U	**0.25**		**0.790**	**0.67**	
Arsenic	0.05	U	**0.091**		**1.45**		**2.64**		**3.29**		**145**		**153**	**101**		0.05	U	**0.388**		**7.2**		**4.49**		**4.8**		**64.6**		**81.5**	**34.4**	J
Barium	**14.4**		**31.4**		**11.3**		**12.8**		**14.8**		**126**		**211**	**161**		**11.8**		**40.4**		**16.9**		**24.9**		**23**		**333**		**450**	**310**	
Beryllium	0.2	U	**0.25**		0.2	U	0.2	U	0.2	U	**1.07**		**2.12**	**1.51**		0.2	U	**0.21**		0.2	U	0.2	U	0.2	U	**1**		**2.01**	**1.41**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.22**		**1.22**	**0.28**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U
Cadmium	0.05	U	**0.506**		0.05	U	**0.127**		0.05	U	**1.19**		**1.97**	**1.16**		0.05	U	**0.495**		0.05	U	**0.07**		0.05	U	**0.469**		**1.18**	**1.32**	
Calcium	**2350**		**2620**		50	U	**302**		NT		**4690**		**10012**	**11500**		**3460**		**15400**		50	U	**360**		NT		**3860**		**23130**	**23000**	
Chromium	5	U	5	U	5	U	5	U	5	U	**56.9**		**81.9**	**58.7**		5	U	5	U	5	U	5	U	5	U	**207**		**232**	**191**	
Cobalt	0.1	U	**3.3**		**4.89**		**0.12**		**3.59**		**17.5**		**29.5**	**28.3**		0.1	U	**5.24**		**6.54**		**0.42**		**3.87**		**25**		**41.2**	**36.8**	
Copper	0.5	U	**1.62**		**12.7**		**0.91**		0.5	U	**42.5**		**58.7**	**40.6**		0.5	U	**2.81**		**11.1**		**0.92**		0.5	U	**30.4**		**46.2**	**36.8**	
Iron	50	U	**1050**		**7810**		**221**		**4620**		**55100**		**68851**	**61700**		50	U	**631**		**8370**		**451**		**4370**		**58600**		**72472**	**65500**	
Lead	0.5	U	**91.3**		**5.89**		**26.1**		0.5	U	**123**		**247**	**146**		0.5	U	**62.2**		**7.79**		**26.5**		0.5	U	**82.6**		**180**	**227**	
Lithium	5	U	5	U	5	U	5	U	5	U	**35.7**		**60.7**	**37**		5	U	5	U	5	U	5	U	5	U	**59.9**		**84.9**	**58**	
Manganese	5	U	**136**		**73**		**11**		**39.5**		**490**		**755**	**683**		5	U	**271**		**75.1**		**14.4**		**30.4**		**481**		**877**	**788**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.89**		**1.3**		**4.19**	**3.68**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.98**		**3.48**	**1.81**	
Nickel	2	U	**2.6**		**20.1**		2	U	**11.8**		**49.4**		**87.9**	**80**		2	U	**15.2**		**38.9**		**4.5**		**22.8**		**118**		**201**	**182**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**614**		50	U	50	U	50	U	NT		NT		NT		150	**798**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1700**		**130**		NT		NT		NT		NT		NT		**130**	**2380**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.58**		**1.88**	**0.69**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.4**		**1.70**	**0.42**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.33**		**0.830**	**0.3**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.23**		**0.730**	**0.37**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**150**	
Strontium	**9.7**		**6.9**		5	U	5	U	5	U	**15**		**46.6**	**39.9**		**20.5**		**39.4**		5	U	5	U	5	U	**13.1**		**88.0**	**53.3**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.434**		**2.63**	**0.373**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.455**		**2.66**	**0.445**	
Tin	2	U	2	U	2	U	2	U	**4.3**		**5.1**		**17.4**	2	U	2	U	2	U	2	U	2	U	2	U	**2.9**		**12.9**	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**216**		**241**	**115**		5	U	5	U	5	U	5	U	5	U	**548**		**573**	**433**	
Uranium	0.05	U	**0.831**		**0.342**		0.05	U	**0.116**		**1.23**		**2.62**	**2.78**		0.05	U	**0.608**		**0.283**		0.05	U	**0.099**		**0.972**		**2.06**	**1.76**	
Vanadium	0.2	U	**0.92**		**6.1**		**1.18**		**2.74**		**62.3**		**73.4**	**71.8**		0.2	U	**0.26**		**7.11**		**1.55**		**2.62**		**97.7**		**109**	**92**	
Zinc	1	U	**16.5**		**95.6**		**3.7**		50	U	**199**		**366**	**259**		1	U	**49.6**		**120**		**9.8**		50	U	**286**		**516**	**479**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP008															CH14-106-TP009														
Sample ID	CH14-106-TP008-SOC															CH14-106-TP009-SOA														
Sample Interval (mbgs)	5.2 - 5.2															1.5 - 1.5														
Sample Date	7/19/2014															7/20/2014														
General Location	WASTE ROCK DUMP - MAIN DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**78**		**216**		**876**		**110**		**36900**		**38230**	**33000**		50	U	**90**		**159**		**1140**		**197**		**32200**		**33836**	**29400**	
Antimony	0.1	U	0.1	U	**0.24**		0.1	U	0.1	U	**0.29**		**0.930**	**0.74**		0.1	U	0.1	U	**0.34**		**0.11**		0.1	U	**1.68**		**2.43**	**1.73**	
Arsenic	0.05	U	**0.584**		**8.41**		**6.76**		**6.45**		**14**		**36.3**	**42.4**	J	0.05	U	**0.236**		**2.09**		**3.91**		**0.97**		**32.4**		**39.7**	**32.3**	J
Barium	**18.9**		**55.1**		**22.5**		**30.3**		**29.5**		**474**		**630**	**407**		**53**		**75.1**		**41.1**		**60.6**		**37**		**236**		**503**	**323**	
Beryllium	0.2	U	**0.33**		0.2	U	0.2	U	**0.25**		**1.26**		**2.44**	**1.98**		0.2	U	**0.49**		0.2	U	0.2	U	**0.55**		**2.76**		**4.40**	**4.21**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.25**		**1.25**	0.2	U	0.2	U	**0.54**		**0.6**		0.2	U	0.2	U	**1.49**		**3.23**	**1.93**	
Cadmium	0.05	U	**0.486**		0.05	U	**0.052**		0.05	U	**0.634**		**1.32**	**0.938**		0.05	U	**2.49**		**0.128**		**0.155**		0.05	U	**2.13**		**5.00**	**3.92**	
Calcium	**2920**		**19400**		50	U	**435**		NT		**4430**		**27235**	**27400**		**2220**		**14400**		50	U	**304**		NT		**2870**		**19844**	**21400**	
Chromium	5	U	5	U	5	U	5	U	5	U	**189**		**214**	**182**		5	U	5	U	5	U	5	U	5	U	**152**		**177**	**134**	
Cobalt	0.1	U	**6.56**		**5.2**		**0.39**		**3.25**		**25.4**		**40.9**	**39.8**		0.1	U	**11**		**3.15**		**0.29**		**3.37**		**20.6**		**38.5**	**34.4**	
Copper	0.5	U	**2.48**		**10.5**		**0.93**		0.5	U	**35.7**		**50.6**	**40.7**		0.5	U	**14.7**		**14.5**		**2.64**		0.5	U	**91.7**		**125**	**117**	
Iron	50	U	**658**		**8860**		**567**		**4140**		**54300**		**68575**	**70900**		50	U	**357**		**2060**		**370**		**6690**		**58400**		**67927**	**61600**	
Lead	0.5	U	**76.3**		**8.27**		**24.9**		0.5	U	**266**		**376**	**119**		0.5	U	**283**		**64.3**		**87.2**		0.5	U	**391**		**827**	**670**	
Lithium	5	U	5	U	5	U	5	U	5	U	**68.5**		**93.5**	**63.6**		5	U	5	U	5	U	5	U	5	U	**47.7**		**72.7**	**51.7**	
Manganese	5	U	**320**		**54.4**		**11.9**		**21.2**		**442**		**855**	**864**		5	U	**269**		**34.6**		**6.1**		**21.7**		**303**		**639**	**634**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.08**		**3.58**	**1.69**		0.5	U	0.5	U	0.5	U	0.5	U	**1.71**		**1.18**		**4.89**	**3.42**	
Nickel	2	U	**15.2**		**43.6**		**3.8**		**24.5**		**104**		**193**	**214**		2	U	**15.9**		**12.3**		**3.4**		**25.5**		**75.5**		**135**	**127**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**875**		50	U	50	U	50	U	NT		NT		NT		150	**731**	
Potassium	**200**		NT		NT		NT		NT		NT		**200**	**6640**		**260**		NT		NT		NT		NT		NT		**260**	**7110**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.62**		**1.92**	**0.52**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.46**		**1.76**	**0.54**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.27**		**0.770**	**0.19**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.5**		**2.00**	**1.52**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**340**		100	U	NT		NT		NT		NT		NT		100	**350**	
Strontium	**23**		**30.3**		5	U	5	U	5	U	**17.5**		**85.8**	**73.4**		**43.3**		**44.8**		5	U	**7.1**		5	U	**18.5**		**124**	**102**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.703**		**2.90**	**0.678**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.23**		**3.43**	**1.07**	
Tin	2	U	2	U	2	U	2	U	**2.4**		**4.9**		**15.3**	**2.3**		2	U	2	U	2	U	2	U	2	U	**6.7**		**16.7**	**5.3**	
Titanium	5	U	5	U	5	U	5	U	5	U	**831**		**856**	**762**		5	U	5	U	5	U	5	U	5	U	**661**		**686**	**533**	
Uranium	**0.05**		**0.757**		**0.353**		0.05	U	**0.098**		**1.01**		**2.32**	**2.35**		**0.068**		**1.04**		**0.252**		0.05	U	**0.485**		**0.883**		**2.78**	**2.66**	
Vanadium	0.2	U	**0.41**		**7.87**		**1.86**		**2.76**		**100**		**113**	**105**		0.2	U	0.2	U	**1.94**		**2.47**		**3.71**		**93.5**		**102**	**90.5**	
Zinc	1	U	**28.4**		**83.4**		**7.4**		50	U	**272**		**442**	**456**		1	U	**362**		**161**		**36.1**		**116**		**626**		**1302**	**1230**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP009															CH14-106-TP010														
Sample ID	CH14-106-TP009-SOC															CH14-106-TP010-SOA														
Sample Interval (mbgs)	5.5 - 5.5															1.5 - 1.5														
Sample Date	7/20/2014															7/20/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**69**		**139**		559		**242**		**35600**		**36659**	**31900**		**1320**		50	U	50	U	**93**		**81**		**3910**		**5504**	**7170**	
Antimony	0.1	U	0.1	U	**0.14**		0.1	U	0.1	U	**0.9**		**1.44**	**1.24**		0.1	U	**0.22**		**0.87**		**3.33**		**0.41**		**24.8**		**29.7**	**22.8**	
Arsenic	0.05	U	**0.323**		**1.78**		**5.68**		**2.6**		**32.1**		**42.5**	**49.3**	J	**5.94**		**0.761**		**0.582**		**82.6**		**99.2**		**277**		**466**	**660**	J
Barium	**102**		**109**		**25.4**		**42.2**		**34.9**		**378**		**692**	**636**		2	U	**4.2**		**8.7**		**6.7**		**150**		**38.1**		**210**	**8.21**	
Beryllium	0.2	U	**0.32**		0.2	U	0.2	U	**0.5**		**2.14**		**3.56**	**3.15**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.21**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.01**		**2.01**	**1.02**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**2.7**		**3.70**	**2.11**	
Cadmium	0.05	U	**1.08**		0.05	U	**0.061**		0.05	U	**0.979**		**2.27**	**1.63**		**0.917**		0.05	U	0.05	U	0.05	U	0.05	U	**0.14**		**1.26**	**1.15**	
Calcium	**2090**		**22200**		50	U	**293**		NT		**7270**		**31903**	**31900**		**5860**		**77**		50	U	50	U	NT		**302**		**6339**	**8110**	
Chromium	5	U	5	U	5	U	5	U	5	U	**322**		**347**	**286**		5	U	5	U	5	U	5	U	5	U	**16.2**		**41.2**	**29.8**	
Cobalt	0.1	U	**6.98**		**1.53**		**0.31**		**7.34**		**21.7**		**38.0**	**35.6**		**5.94**		0.1	U	0.1	U	0.1	U	**0.56**		**58.6**		**65.4**	**56.6**	
Copper	0.5	U	**4.63**		**6.06**		**1.26**		0.5	U	**47.3**		**60.3**	**53.3**		**40.6**		0.5	U	**5.34**		**5.41**		0.5	U	**848**		**900**	**789**	
Iron	50	U	**516**		**1670**		**296**		**6310**		**49700**		**58542**	**57000**		**5740**		**517**		**4040**		**1970**		**53800**		**108000**		**174067**	**182000**	
Lead	0.5	U	**55.5**		**3.73**		**11.5**		0.5	U	**64.2**		**136**	**75.2**		**355**		**2900**		**152**		**211**		**1.53**		**13300**		**16920**	**8970**	
Lithium	5	U	5	U	5	U	5	U	5	U	**54**		**79.0**	**56.6**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	**11.6**	
Manganese	5	U	**343**		**34.8**		**7.7**		**24.7**		**308**		**723**	**707**		**58.7**		5	U	5	U	5	U	**18.1**		**44.2**		**136**	**104**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.73**		**0.87**		**3.60**	**1.97**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**2.09**		**4.59**	**3.21**	
Nickel	2	U	**10.4**		**12.3**		**4**		**62.8**		**153**		**245**	**234**		**4**		2	U	2	U	2	U	2	U	**5.1**		**17.1**	**12**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**676**		50	U	50	U	50	U	NT		NT		NT		150	**261**	
Potassium	**270**		NT		NT		NT		NT		NT		**270**	**6580**		100	U	NT		NT		NT		NT		NT		100	**3150**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.27**		**1.57**	**0.25**		0.2	U	0.2	U	0.2	U	**0.22**		0.5	U	**1.63**		**2.95**	**1.54**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.54**		**1.04**	**0.41**		0.1	U	0.1	U	0.1	U	**0.2**		0.1	U	**23.8**		**24.4**	**12.4**	
Sodium	**210**		NT		NT		NT		NT		NT		**210**	**580**		100	U	NT		NT		NT		NT		NT		100	**490**	
Strontium	**44.4**		**46.7**		5	U	**7.9**		5	U	**34.3**		**143**	**147**		5	U	5	U	5	U	5	U	**17.5**		**8.1**		**45.6**	**32.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.841**		**3.04**	**1.05**		0.05	U	0.05	U	0.05	U	**0.054**		2	U	**5.6**		**7.80**	**3.96**	
Tin	2	U	2	U	2	U	2	U	2	U	**5.5**		**15.5**	**4.8**		2	U	2	U	2	U	**2.2**		2	U	**9.2**		**19.4**	**5.3**	
Titanium	5	U	5	U	5	U	5	U	5	U	**711**		**736**	**544**		5	U	5	U	5	U	**35.7**		**56.1**		**248**		**355**	**342**	
Uranium	**0.059**		**0.49**		**0.118**		0.05	U	**0.278**		**0.661**		**1.66**	**1.55**		**0.069**		0.05	U	0.05	U	0.05	U	0.05	U	**0.242**		**0.511**	**0.415**	
Vanadium	0.2	U	**0.25**		**1.73**		**1.29**		**5.18**		**98**		**107**	**97.7**		0.2	U	0.2	U	**2.62**		**2.51**		**16.4**		**8.79**		**30.7**	**43.2**	
Zinc	1	U	**60**		**34**		**8**		50	U	**324**		**477**	**367**		**529**		**4.8**		**7.3**		**11.7**		**97**		**442**		**1092**	**1340**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP010															CH14-106-TP010														
Sample ID	CH14-106-TP010-SOB															CH14-106-TP010-SOC														
Sample Interval (mbgs)	3.9 - 3.9															5.5 - 5.5														
Sample Date	7/20/2014															7/20/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**1510**		50	U	**92**		**416**		**135**		**11500**		**13703**	**12400**		50	U	**1850**		**1700**		**580**		**2430**		**16700**		**23310**	**18700**	
Antimony	0.1	U	0.1	U	**0.13**		**1.26**		**0.18**		**10.4**		**12.2**	**9.64**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.18**		**1.68**	**1.95**	
Arsenic	**0.797**		**0.494**		**0.502**		**63.3**		**161**		**218**		**444**	**668**	J	**0.115**		**0.352**		**2.44**		**4.53**		**25**		**69.6**		**102**	**118**	J
Barium	2	U	**2.6**		**3**		**4.9**		**268**		**121**		**402**	**73.9**		**3.1**		2	U	**4.1**		**3.6**		**61.1**		**252**		**326**	**129**	
Beryllium	**0.29**		0.2	U	0.2	U	0.2	U	0.2	U	**0.27**		**1.36**	**0.7**		0.2	U	**1.15**		0.2	U	**0.29**		**0.44**		**0.87**		**3.15**	**2.43**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**2.71**		**3.71**	**7.48**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.21**		**2.21**	**1.01**	
Cadmium	**3.03**		**0.078**		0.05	U	0.05	U	0.05	U	**0.204**		**3.46**	**3.39**		**2.86**		**3.51**		0.05	U	**0.068**		0.05	U	**4.27**		**10.8**	**16.5**	
Calcium	**14800**		**570**		50	U	50	U	NT		**853**		**16323**	**24800**		**18500**		**15200**		**135**		**365**		NT		**10500**		**44700**	**45100**	
Chromium	5	U	5	U	5	U	5	U	5	U	**47.4**		**72.4**	**54.6**		5	U	5	U	5	U	5	U	**13.2**		**75.7**		**109**	**103**	
Cobalt	**6.79**		0.1	U	0.1	U	0.1	U	**0.67**		**29.2**		**37.0**	**23.1**		**5.72**		**11.3**		**1.83**		**0.11**		**5.2**		**12.9**		**37.1**	**42.3**	
Copper	**72.5**		**1.64**		**5.45**		**4.99**		0.5	U	**385**		**470**	**488**		**3.48**		**167**		**73.8**		**19.7**		0.5	U	**276**		**540**	**483**	
Iron	**1430**		**791**		**5020**		**3090**		**57000**		**59500**		**126831**	**149000**		50	U	**1070**		**3690**		**462**		**28300**		**34600**		**68172**	**70800**	
Lead	**92**		**406**		**7.79**		**35.7**		**1.54**		**5420**		**5963**	**5140**		**1.62**		**52.2**		**2.05**		**1.44**		0.5	U	**278**		**336**	**386**	
Lithium	5	U	5	U	5	U	5	U	5	U	**16.6**		**41.6**	**20.2**		5	U	5	U	5	U	5	U	5	U	**26.5**		**51.5**	**27.5**	
Manganese	**105**		5	U	5	U	5	U	**10.9**		**101**		**232**	**222**		**347**		**165**		**25.3**		**6.8**		**74.3**		**504**		**1122**	**1270**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.22**		**3.72**	**1.65**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.72**		**3.22**	**1.14**	
Nickel	**9.4**		2	U	2	U	2	U	2	U	**14.4**		**31.8**	**24.5**		**6.7**		**44.3**		**7.8**		2	U	**17.8**		**46.1**		**125**	**142**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**576**		50	U	50	U	50	U	NT		NT		NT		150	**591**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**4150**		100	U	NT		NT		NT		NT		NT		100	**1520**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.79**		**2.09**	**1.58**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.46**		**1.76**	**0.36**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**10**		**10.5**	**8**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.96**		**1.46**	**0.69**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**490**		100	U	NT		NT		NT		NT		NT		100	**180**	
Strontium	**15.4**		5	U	5	U	5	U	**24.9**		**8**		**63.3**	**70.2**		**77.1**		**49.7**		5	U	**7.9**		**40.9**		**33.7**		**214**	**190**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**2.7**		**4.90**	**2.08**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.392**		**2.59**	**0.358**	
Tin	2	U	2	U	2	U	2	U	2	U	**3.2**		**13.2**	**3.9**		2	U	2	U	2	U	2	U	2	U	**3.1**		**13.1**	**3.3**	
Titanium	5	U	5	U	5	U	**18.5**		**23.9**		**487**		**544**	**377**		5	U	5	U	5	U	5	U	**5.7**		**104**		**130**	**92.5**	
Uranium	**0.226**		0.05	U	0.05	U	0.05	U	0.05	U	**0.305**		**0.731**	**0.492**		0.05	U	**2.15**		**0.162**		**0.062**		**0.345**		**0.549**		**3.32**	**3.07**	
Vanadium	0.2	U	0.2	U	0.2	U	**1.85**		**14.6**		**23.7**		**40.8**	**50.7**		0.2	U	0.2	U	**0.29**		**0.4**		**7.79**		**49.6**		**58.5**	**48.4**	
Zinc	**1610**		**20.3**		**6.1**		**12.1**		**123**		**335**		**2107**	**2100**		**2010**		**5090**		**492**		**385**		**778**		**1600**		**10355**	**12400**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP011															CH14-106-TP011														
Sample ID	CH14-106-TP011-SOA															CH14-106-TP011-SOC														
Sample Interval (mbgs)	1.5 - 1.5															5 - 5														
Sample Date	7/20/2014															7/20/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**164**		**146**		**503**		**469**		**1300**		10100		12682	12000		50	U	**352**		**270**		**534**		**214**		21500		22920	18800	
Antimony	0.1	U	0.1	U	**0.48**		**0.71**		0.1	U	**26.6**		**28.1**	**30.1**		0.1	U	**0.1**		**0.47**		**0.33**		0.1	U	**5.21**		**6.31**	**7.1**	
Arsenic	**0.207**		**0.211**		**3.25**		**8.42**		**17.9**		**248**		**278**	**281**	J	0.05	U	**0.459**		**1.12**		**10.7**		**1.56**		**120**		**134**	**297**	J
Barium	2	U	**2.5**		**9.7**		**18.8**		**233**		**112**		**378**	**57.4**		**4.3**		**9.5**		**12.8**		**17.4**		**61**		**175**		**280**	**155**	
Beryllium	**0.73**		0.69		0.2	U	**0.31**		**0.62**		**0.58**		**3.13**	**3.52**		0.2	U	**0.24**		0.2	U	0.2	U	0.2	U	**0.98**		**2.02**	**1.45**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.3**		**2.30**	**1.87**		0.2	U	**0.57**		0.2	U	0.2	U	0.2	U	**7.53**		**8.90**	**1.75**	
Cadmium	**4.43**		**0.16**		0.05	U	0.05	U	0.05	U	**8.9**		**13.6**	**13.8**		**1.74**		**2.75**		**0.181**		**0.281**		0.05	U	**4.43**		**9.43**	**8.66**	
Calcium	**8450**		**136**		50	U	50	U	NT		**1200**		**9886**	**9260**		**13100**		**428**		50	U	**235**		NT		**4670**		**18483**	**14200**	
Chromium	5	U	5	U	5	U	**6.6**		**9.3**		**75.8**		**107**	**87.4**		5	U	5	U	5	U	5	U	5	U	**169**		**194**	**144**	
Cobalt	**3.9**		**0.11**		0.1	U	0.1	U	**1.59**		**30.1**		**35.9**	**32.6**		**2.27**		**8.87**		**6.6**		**0.49**		**8.23**		**39.4**		**65.9**	**54**	
Copper	**47.4**		**18.7**		**34.1**		**12.1**		0.5	U	**803**		**916**	**794**		0.5	U	**46.4**		**23.5**		**4.79**		0.5	U	**341**		**417**	**258**	
Iron	50	U	**761**		**5150**		**1360**		**35200**		**54200**		**96721**	**102000**		50	U	**962**		**3580**		**699**		**9440**		**75400**		**90131**	**78800**	
Lead	**292**		**2220**		**21.8**		**55**		**1.63**		**3240**		**5830**	**6150**		**10.3**		**953**		**33.5**		**102**		**0.68**		**1180**		**2279**	**1710**	
Lithium	5	U	5	U	5	U	5	U	5	U	**17.8**		**42.8**	**22.3**		5	U	5	U	5	U	5	U	5	U	**36.9**		**61.9**	**35.6**	
Manganese	**222**		5	U	5	U	5	U	**18**		**264**		**519**	**552**		**142**		**216**		**112**		**22.8**		**122**		**533**		**1148**	**1110**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**3.53**		**6.03**	**3.32**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.71**		**4.21**	**2.45**	
Nickel	**12**		2	U	2	U	2	U	**7.2**		**44.8**		**70.0**	**74.8**		**2.9**		**46.8**		**16.4**		**3**		**34.9**		**89**		**193**	**177**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**539**		50	U	50	U	50	U	NT		NT		NT		150	**575**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2110**		**150**		NT		NT		NT		NT		NT		**150**	**5320**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	**0.5**		**0.99**		**2.29**	**1.08**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.71**		**2.01**	**0.59**	
Silver	0.1	U	0.1	U	0.1	U	**0.1**		0.1	U	**11.3**		**11.8**	**10.9**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**3.53**		**4.03**	**3.26**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**370**	
Strontium	**6.1**		**11.9**		5	U	5	U	**6.1**		**26.3**		**60.4**	**42.8**		**18.8**		5	U	5	U	5	U	5	U	**30.5**		**69.3**	**50.2**	
Thallium	**0.19**		**0.27**		**0.107**		**0.106**		2	U	**5.05**		**7.72**	**5.44**		0.05	U	**0.067**		0.05	U	0.05	U	2	U	**1.33**		**3.55**	**1.47**	
Tin	2	U	2	U	2	U	2	U	2	U	**3.3**		**13.3**	**2.3**		2	U	2	U	2	U	2	U	2	U	**3.2**		**13.2**	**3.1**	
Titanium	5	U	5	U	5	U	5	U	**7.5**		**151**		**179**	**144**		5	U	5	U	5	U	5	U	5	U	**609**		**634**	**517**	
Uranium	**1.39**		**0.713**		**0.206**		**0.096**		**1.17**		**1.03**		**4.61**	**5.75**		0.05	U	**1.08**		**0.166**		0.05	U	**0.189**		**1.11**		**2.65**	**2.5**	
Vanadium	0.2	U	0.2	U	**0.33**		**1.69**		**13.9**		**24.9**		**41.2**	**41.9**		0.2	U	0.2	U	0.2	U	**1.52**		**6.44**		**68.8**		**77.4**	**76.7**	
Zinc	**1710**		**62.8**		**49.4**		**42.6**		**310**		**6040**		**8215**	**8560**		**542**		**3330**		**499**		**103**		**180**		**3070**		**7724**	**6690**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP012															CH14-106-TP012														
Sample ID	CH14-106-TP012-SOA															CH14-106-TP012-SOB														
Sample Interval (mbgs)	1.8 - 1.8															4.1 - 4.1														
Sample Date	7/20/2014															7/20/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**86**		**307**		**40200**		**18200**		**58893**	**12200**		50	U	50	U	**55**		**127**		**116**		**4000**		**4398**	**4170**	
Antimony	0.1	U	0.1	U	**0.34**		0.1	U	**2.16**		**3.33**		**6.13**	**3.66**		0.1	U	**0.11**		**1.37**		**0.21**		**0.34**		**20.3**		**22.4**	**23.2**	
Arsenic	0.05	U	**0.203**		**0.192**		**3.2**		**42.5**		**124**		**170**	**29.8**	J	0.05	U	**0.199**		**2.34**		**12.8**		**6.25**		**212**		**234**	**427**	
Barium	**86.1**		**97.5**		**47.1**		**69.6**		**302**		**231**		**833**	**234**		**19.9**		**26.1**		**34.4**		**21.4**		**33.3**		**61.2**		**196**	**171**	J
Beryllium	0.2	U	**0.33**		0.2	U	0.2	U	**3.53**		**1.68**		**6.14**	**2.3**		0.2	U	**0.29**		0.2	U	0.2	U	**0.29**		**1.22**		**2.40**	**2.19**	
Bismuth	0.2	U	**0.61**		0.2	U	0.2	U	**1.87**		**2.31**		**5.39**	**2.34**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.73**		**1.73**	**2.11**	
Cadmium	0.05	U	**1.25**		**0.065**		**0.138**		**2.73**		**1.68**		**5.91**	**1.86**		**0.206**		**0.485**		**0.292**		**0.147**		0.05	U	**2.22**		**3.40**	**2.92**	J
Calcium	**1160**		**6510**		50	U	**498**		NT		**3710**		**11928**	**10100**		**1840**		**68**		50	U	50	U	NT		**1120**		**3128**	**3080**	
Chromium	5	U	5	U	5	U	5	U	**194**		**76.4**		**290**	**49.8**		5	U	5	U	5	U	5	U	**5.2**		**15.7**		**41**	**25.1**	
Cobalt	0.1	U	**5.16**		**0.9**		**0.13**		**26.9**		**16.8**		**50.0**	**22.6**		0.1	U	**0.22**		**1.72**		0.1	U	**6.3**		**17.2**		**25.6**	**27**	
Copper	0.5	U	**8.08**		**16**		**3.12**		**118**		**188**		**334**	**138**		0.5	U	**9.49**		**21.1**		**4.97**		0.5	U	**471**		**508**	**726**	
Iron	50	U	**473**		**2690**		**190**		**72700**		**53300**		**129403**	**53000**		50	U	**74**		**2000**		**172**		**19800**		**43900**		**65996**	**69600**	
Lead	0.5	U	**495**		**30.8**		**79.6**		**502**		**653**		**1761**	**746**		**18.1**		**1160**		**210**		**80.6**		**0.61**		**2120**	J	**3589**	**4020**	
Lithium	5	U	5	U	5	U	5	U	**61.1**		**36.9**		**118**	**34.8**		5	U	5	U	5	U	5	U	5	U	**9.6**		**34.6**	**8.1**	
Manganese	5	U	**191**		**25.9**		**6.3**		**380**		**404**		**1012**	**504**		**5**		**18.3**		**172**		**8.3**		**130**		**253**		**587**	**625**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**1.52**		**0.88**		**4.40**	**1.24**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.1**		**3.60**	**1.58**	
Nickel	2	U	**4.3**		**3.7**		**3.1**		**97.1**		**50.8**		**161**	**51.1**		2	U	2	U	2	U	2	U	**12**		**21.5**		**41.5**	**38.6**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**393**		50	U	50	U	50	U	NT		NT		NT		150	**528**	
Potassium	**140**		NT		NT		NT		NT		NT		140	**3050**		100	U	NT		NT		NT		NT		NT		100	**1310**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	**0.63**		**0.43**		**1.86**	**0.56**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.54**		**1.84**	**0.79**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	**1.96**		**2.42**		**4.78**	**1.98**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**7.87**		**8.37**	**8.82**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	**11.6**		**13.9**		5	U	**6**		**23.7**		**12**		**72.2**	**39.9**		**10**		5	U	5	U	5	U	5	U	**8.3**		**38.3**	**27.4**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.29**		**3.49**	**1.17**		0.05	U	0.05	U	**0.119**		0.05	U	2	U	**2.81**		**5.08**	**2.55**	
Tin	2	U	2	U	2	U	2	U	**8.6**		**3.2**		**19.8**	**3.7**		2	U	2	U	2	U	2	U	2	U	2	U	12.0	**2.2**	
Titanium	5	U	5	U	5	U	5	U	**835**		**263**		**1118**	**126**		5	U	5	U	5	U	5	U	5	U	**16.3**		**41.3**	**5.9**	J
Uranium	0.05	U	**1.12**		**0.273**		**0.051**		**1.11**		**1.86**		**4.46**	**4.63**		0.05	U	**0.657**		**0.249**		**0.065**		**0.678**		**1.73**		**3.43**	**3.51**	
Vanadium	**0.2**		0.2	U	**0.41**		**0.53**		**119**		**42.3**		**163**	**32.9**		0.2	U	0.2	U	**1.24**		**0.3**		**7.7**		**15.6**		**25.2**	**26.7**	
Zinc	**1.3**		**116**		**89.5**		**17.3**		**807**		**1020**		**2051**	**923**		**18.6**		**69.3**		**89.4**		**21**		**527**		**1500**		**2225**	**2220**	J

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP012															CH14-106-TP012														
Sample ID	CH14-106-TP912-SOB															CH14-106-TP012-SOC														
Sample Interval (mbgs)	4.1 - 4.1															5 - 5														
Sample Date	7/20/2014															7/20/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**60**		**177**		**137**		**4050**		**4524**	**4680**		**448**		50	U	50	U	**1440**		**192**		**6300**		**8480**	**8230**	
Antimony	0.1	U	**0.11**		**1.48**		**0.22**		**0.28**		**19.3**		**21.5**	**31.8**		0.1	U	0.1	U	**0.26**		**1.19**		0.1	U	**17.4**		**19.2**	**15.9**	
Arsenic	0.05	U	**0.195**		**2.23**		**13.3**		**7.77**		**313**		**337**	**619**	**J**	**1.57**		**0.404**		**0.467**		**31.2**		**26.8**	**J**	**502**		**562**	**531**	
Barium	**19.6**		**23.7**		**35**		**21.1**		**44.1**		**56.2**		**200**	**48.5**	**J**	2	U	**3.6**		**19.5**		**21.6**		**215**		**92**		**354**	**144**	
Beryllium	0.2	U	**0.28**		0.2	U	0.2	U	**0.36**		**1.19**		**2.43**	**1.93**		**0.52**		0.2	U	0.2	U	0.2	U	0.2	U	**0.64**		**1.96**	**1.55**	
Bismuth	0.2	U	0.2	U	**0.21**		0.2	U	0.2	U	**0.7**		**1.71**	**2.4**	**J**	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**2.11**		**3.11**	**2.01**	
Cadmium	**0.222**		**0.454**		**0.251**		**0.132**		0.05	U	**2.43**		**3.54**	**8.75**	**J**	**1.75**		**0.057**		0.05	U	0.05	U	0.05	U	**0.527**	**J**	**2.48**	**2.91**	
Calcium	**1920**		50	U	50	U	50	U	NT		**1060**		**3130**	**3050**	**J**	**6170**		**112**		50	U	50	U	NT		**448**		**6830**	**6670**	
Chromium	5	U	5	U	5	U	5	U	**6.3**		**14.5**		**40.8**	**25.5**		5	U	5	U	5	U	5	U	**5.4**		**12.9**		**38.3**	**22.1**	
Cobalt	0.1	U	**0.25**		**1.25**		0.1	U	**7.21**		**19.1**		**28.0**	**20.2**	**J**	**4.62**		0.1	U	0.1	U	0.1	U	**3.8**		**11.5**		**20.2**	**22.2**	
Copper	0.5	U	**8.29**		**20.5**		**5.39**		0.5	U	**506**		**541**	**667**	**J**	**95.3**		**2.21**		**7.47**		**4.65**		0.5	U	**513**		**623**	**400**	
Iron	50	U	**66**		**2160**		**187**		**24400**		**46500**		**73363**	**102000**		**1690**		**337**		**3830**		**1160**		**42600**		**20100**		**69717**	**71500**	
Lead	**28.9**		**834**		**270**		**58.9**		**1.53**		**1250**	**J**	**2443**	**5440**		**297**		**1080**	**J**	**61.7**	**J**	**31.3**	**J**	**1.21**		**4510**	**J**	**5981**	**2390**	
Lithium	5	U	5	U	5	U	5	U	5	U	**10.4**		**35.4**	**12.1**		5	U	5	U	5	U	5	U	5	U	**36.4**		**61.4**	**33.7**	
Manganese	**5.4**		**19.2**		**136**		**7.6**		**167**		**226**		**561**	**421**		**142**		5	U	5	U	5	U	**68.1**		**66.1**		**291**	**340**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.56**		**0.97**		**3.53**	**2.85**		0.5	U	0.5	U	0.5	U	0.5	U	**0.77**		**0.83**		**3.60**	**1.8**	
Nickel	2	U	2	U	2	U	2	U	**14**		**21.1**		**43.1**	**37.3**	**J**	**7**		2	U	2	U	2	U	**8.6**		**7.1**		**28.7**	**32.2**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**374**		50	U	50	U	50	U	NT		NT		NT		150	**287**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1280**		100	U	NT		NT		NT		NT		NT		100	**2160**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.54**		**1.84**	**1.14**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.79**		**2.09**	**0.76**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**7.39**		**7.89**	**13.8**		0.1	U	0.1	U	0.1	U	**0.1**		0.1	U	**10.1**		**10.6**	**5.85**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**110**	
Strontium	**10.5**		5	U	5	U	5	U	5	U	**7.7**		**38.2**	**33.4**		**10.6**		**8.3**		5	U	5	U	**14.1**		**6.4**		**49.4**	**46.3**	
Thallium	0.05	U	0.05	U	**0.097**		0.05	U	2	U	**2.93**		**5.18**	**3.52**		0.05	U	0.05	U	0.05	U	**0.074**		2	U	**3.89**		**6.11**	**3.11**	
Tin	2	U	2	U	**2.5**		2	U	**2.2**		**3.2**		13.9	**3.1**		2	U	2	U	2	U	2	U	2	U	**6.1**		**16.1**	**5.2**	
Titanium	5	U	5	U	5	U	5	U	5	U	**11.4**		**36.4**	**20.5**	**J**	5	U	5	U	5	U	5	U	**5.5**		**42.9**	**J**	**68.4**	**27.5**	
Uranium	0.05	U	**0.594**		**0.272**		**0.066**		**0.765**		**1.66**		**3.41**	**4.06**	**J**	**2.17**		**0.095**		**0.163**		**0.105**		**0.784**		**2.36**		**5.68**	**7.77**	
Vanadium	0.2	U	0.2	U	**1.35**		**0.43**		**9.19**		**14.3**		**25.7**	**25.5**		0.2	U	0.2	U	**0.49**		**1.38**		**11.5**		**7.8**		**21.6**	**22.8**	
Zinc	**17.6**		**55.8**		**83.2**		**18.6**		**722**		**1460**		**2357**	**7130**	**J**	**865**		**14.6**		**10.1**		**11.1**		**247**		**808**	**J**	**1956**	**2550**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP013															CH14-106-TP015														
Sample ID	CH14-106-TP013-SOCOMP															CH14-106-TP015-SOCOMP														
Sample Interval (mbgs)	1.5 - 5.4															1.5 - 5.5														
Sample Date	7/18/2014															7/19/2014														
General Location	WASTE ROCK DUMP - NWU															WASTE ROCK DUMP - MAIN DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**77**		**1020**		**304**		**8530**		**10031**	**9560**		50	U	50	U	**83**		**1150**		**233**		**24300**		**25866**	**27400**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.36**		**0.860**	**0.4**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.63**		**1.13**	**0.52**	
Arsenic	0.05	U	**0.053**		**0.068**		**0.327**		0.5	U	**3.78**		**4.78**	**4.58**		0.05	U	**0.072**		**0.081**		**2.82**		**0.87**		**16.4**		**20.3**	**22.4**	
Barium	**59.7**		**44.3**		**28.4**		**14.7**		**36.2**		**233**		**416**	**426**		**32.4**		**47.4**		**9.1**		**18.7**		**61**		**332**		**501**	**431**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	**0.42**		**0.65**		**1.87**	**1.58**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.24**		**2.24**	**1.69**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.6**		**1.60**	**0.36**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.85**		**2.85**	**0.9**	
Cadmium	0.05	U	**0.187**		0.05	U	0.05	U	0.05	U	**0.272**		**0.659**	**0.537**		0.05	U	**0.683**		0.05	U	**0.157**		0.05	U	**1.52**		**2.51**	**2.28**	
Calcium	**1940**		**1790**		50	U	**235**		NT		**2090**		**6105**	**5710**		**1930**		**4900**		50	U	**973**		NT		**5450**		**13303**	**13600**	
Chromium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	**2.83**		5	U	5	U	5	U	5	U	5	U	**67.6**		**92.6**	**66.8**	
Cobalt	0.1	U	**0.11**		**1.81**		0.1	U	**1.54**		**2.52**		**6.18**	**7.03**		0.1	U	**2.36**		**2.25**		**0.6**		**7.74**		**13.2**		**26.3**	**32**	
Copper	0.5	U	**1.08**		**1.76**		**0.62**		0.5	U	**29.8**		**34.3**	**32.1**		0.5	U	**1.25**		**1.94**		**1.3**		0.5	U	**36.9**		**42.4**	**44.9**	
Iron	50	U	**56**		**530**		**313**		**13800**		**12900**		**27649**	**35300**		50	U	**138**		**839**		**696**		**10400**		**47300**		**59423**	**61300**	
Lead	0.5	U	**112**		**33.9**		**13.8**		0.5	U	**108**		**269**	**239**		0.5	U	**93.5**		**3.33**		**16.6**		0.5	U	**352**		**466**	**177**	
Lithium	5	U	5	U	5	U	5	U	5	U	**11.2**		**36.2**	**15**		5	U	5	U	5	U	5	U	5	U	**36.6**		**61.6**	**39.3**	
Manganese	5	U	**50.1**		**224**		**15.9**		**95.8**		**189**		**580**	**684**		5	U	**175**		**62**		**24.5**		**98.1**		**538**		**903**	**887**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**2.6**		**1.58**		**6.18**	**5.09**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.53**		**3.03**	**0.91**	
Nickel	2	U	2	U	2	U	2	U	2	U	2	U	12.0	**3.3**		2	U	**2.6**		**2.6**		2	U	**18.1**		**39.6**		**66.9**	**88.7**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**590**		50	U	50	U	50	U	NT		NT		NT		150	**518**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**3100**		**170**		NT		NT		NT		NT		NT		**170**	**4480**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.77**		**2.07**	**0.41**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.29**		**0.790**	**0.43**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.26**		**1.76**	**0.7**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**240**		100	U	NT		NT		NT		NT		NT		100	**680**	
Strontium	**8.4**		**5.9**		5	U	5	U	5	U	**10.5**		**39.8**	**24.7**		**11.1**		**8.4**		5	U	5	U	5	U	**41.3**		**75.8**	**98.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.381**		**2.58**	**0.353**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.497**		**2.70**	**0.408**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	**2.8**		**2.6**		**4.9**		**16.3**	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**505**		**530**	**729**		5	U	5	U	5	U	5	U	5	U	**419**		**444**	**459**	
Uranium	0.05	U	**0.262**		**0.104**		0.05	U	**0.457**		**0.887**		**1.81**	**3.62**		0.05	U	**0.387**		**0.073**		0.05	U	**0.289**		**0.843**		**1.69**	**1.75**	
Vanadium	0.2	U	0.2	U	**1.02**		**1.61**		**12.5**		**26**		**41.5**	**49.5**		0.2	U	0.2	U	0.2	U	**2.44**		**5.41**		**53.2**		**61.7**	**61.7**	
Zinc	1	U	**21.6**		**13.7**		**5.3**		**55**		**143**		**240**	**261**		1	U	**74**		**38.4**		**28.2**		**80**		**805**		**1027**	**1560**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP017															CH14-106-TP017														
Sample ID	CH14-106-TP017-SOCOMPA															CH14-106-TP017-SOCOMPB														
Sample Interval (mbgs)	1.5 - 5.5															1.5 - 5.5														
Sample Date	7/22/2014															7/22/2014														
General Location	WASTE ROCK DUMP - INTERMEDIATE DUMP															WASTE ROCK DUMP - INTERMEDIATE DUMP														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**152**		**552**		**408**		**10300**		**11512**	**12000**		50	U	50	U	**145**		**549**		**391**		**10500**		**11685**	**12000**	
Antimony	0.1	U	0.1	U	**0.22**		**1.17**		**0.27**		**14.4**		**16.3**	**17.6**		0.1	U	0.1	U	**0.14**		**1.3**		**0.21**		**16.9**		**18.8**	**19.8**	
Arsenic	**0.232**		**0.181**		**0.414**		**13.7**		**28.2**		**230**		**273**	**449**		**0.22**		**0.158**		**0.29**		**13.4**		**15.9**		**196**		**226**	**222**	
Barium	**3.3**		**5.4**		**8.8**		**13.6**		**205**		**145**		**381**	**90.8**		**3.7**		**5.3**		**8.6**		**15**		**208**		**199**		**440**	**87.3**	
Beryllium	0.2	U	**0.22**		0.2	U	0.2	U	**0.23**		**0.65**		**1.70**	**1.5**		0.2	U	**0.23**		0.2	U	0.2	U	**0.22**		**0.76**		**1.81**	**1.51**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**2.17**		**3.17**	**2.3**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**2.2**		**3.20**	**1.18**	
Cadmium	**4.33**		**0.326**		**5.98**		0.05	U	0.05	U	**5.07**		**15.8**	**7.19**		**4.05**		**0.393**		0.05	U	**0.056**		0.05	U	**4.21**		**8.81**	**6.8**	
Calcium	**6350**		**169**		50	U	50	U	NT		**1450**		**8069**	**7170**		**5370**		**116**		50	U	**60**		NT		**1960**		**7556**	**7040**	
Chromium	5	U	5	U	**9.3**		5	U	5	U	**25.9**		**55.2**	**38**		5	U	5	U	5	U	5	U	5	U	**27**		**52.0**	**35.2**	
Cobalt	**6.85**		**0.32**		**0.24**		**0.11**		**3.33**		**24.4**		**35.3**	**35.1**		**6.73**		**0.41**		**0.26**		**0.11**		**3.38**		**20.4**		**31.3**	**45.5**	
Copper	**6.99**		**6.93**		**29.6**		**6.86**		0.5	U	**441**		**492**	**552**		**3.61**		**5.92**		**12.5**		**5.98**		0.5	U	**393**		**422**	**559**	
Iron	50	U	**111**		**2390**		**1260**		**29800**		**55700**		**89311**	**90800**		50	U	**93**		**1740**		**1110**		**28200**		**52600**		**83793**	**98900**	
Lead	**184**		**481**		**22**		**41.8**		**3.18**		**3270**		**4002**	**3040**		**138**		**438**		**9.29**		**40.2**		**3.86**		**3400**		**4029**	**4510**	
Lithium	5	U	5	U	5	U	5	U	5	U	**21.3**		**46.3**	**24.9**		5	U	5	U	5	U	5	U	5	U	**21.6**		**46.6**	**24.5**	
Manganese	**376**		**10.4**		**5.4**		5	U	**51.7**		**343**		**792**	**835**		**377**		**10.1**		5	U	5	U	**51.5**		**382**		**831**	**829**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.64**		**4.14**	**2.05**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.6**		**4.10**	**2.18**	
Nickel	**9.5**		2	U	**4**		2	U	**7.9**		**25.2**		**50.6**	**48.4**		**9**		2	U	2	U	2	U	**8.2**		**22.5**		**45.7**	**57.4**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**605**		50	U	50	U	50	U	NT		NT		NT		150	**489**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2180**		100	U	NT		NT		NT		NT		NT		100	**1900**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.07**		**2.37**	**0.91**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.94**		**2.24**	**0.94**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**7.14**		**7.64**	**6.36**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**7.05**		**7.55**	**7.88**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**100**		100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	**11**		5	U	5	U	5	U	**5.6**		**11**		**42.6**	**30.7**		**9.6**		5	U	5	U	5	U	**5.9**		**16.1**		**46.6**	**32.2**	
Thallium	**0.051**		**0.057**		0.05	U	0.05	U	2	U	**3.74**		**5.95**	**3.69**		0.05	U	**0.054**		0.05	U	0.05	U	2	U	**4.22**		**6.42**	**4.98**	
Tin	2	U	2	U	2	U	2	U	**2.7**		**5.5**		**16.2**	**2.4**		2	U	2	U	2	U	2	U	2	U	**2.4**		**12.4**	**2.7**	
Titanium	5	U	5	U	5	U	5	U	**6.7**		**133**		**160**	**116**		5	U	5	U	5	U	5	U	**7.6**		**123**		**151**	**124**	
Uranium	**0.403**		**0.9**		**0.192**		**0.098**		**0.644**		**1.78**		**4.02**	**3.78**		**0.226**		**1.04**		**0.205**		**0.09**		**0.656**		**1.53**		**3.75**	**4.19**	
Vanadium	0.2	U	0.2	U	0.2	U	**1.32**		**9.31**		**20.9**		**32.1**	**35.3**		0.2	U	0.2	U	0.2	U	**1.26**		**9.03**		**24.8**		**35.7**	**33**	
Zinc	**1460**		**143**		**124**		**49.8**		**209**		**2140**		**4126**	**4100**		**1340**		**167**		**77.8**		**53.7**		**231**		**2910**		**4780**	**3680**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-106-TP019															CH14-107-MW003														
Sample ID	CH14-106-TP019-SOCOMP															CH14-107-MW003-SOA														
Sample Interval (mbgs)	1.5 - 5.1															1.83 - 2.13														
Sample Date	7/22/2014															8/21/2014														
General Location	WASTE ROCK DUMP - NEU															ZONE II OUTWASH														
Geologic Unit	WASTE ROCK															COLLUVIUM/ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**165**		**206**		**501**		**11400**		**12372**	**11800**		50	U	**99**		**309**		**192**		**966**		**12200**		**13816**	**13100**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.56**		**1.06**	**0.68**		0.1	U	0.1	U	0.1	U	0.1	U	**0.14**		**0.93**		**1.47**	1.43	U
Arsenic	0.05	U	0.05	U	**0.06**		**1.1**		**1.08**		**9.69**		**12.0**	**18.5**		0.05	U	**0.068**		**0.12**		**2.06**		**5.05**		**13.7**		**21.0**	**21.3**	
Barium	**18.6**		**18.9**		**10.8**		**5.8**		**24.1**		**222**		**300**	**199**		**32**		**24.6**		**3.8**		**5.7**		**43.6**		**153**		**263**	**216**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	**0.38**		**1**		**2.18**	**1.85**		0.2	U	0.2	U	0.2	U	0.2	U	**0.28**		**0.62**		**1.70**	**0.97**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.1**		**2.10**	**1.44**		0.2	U	0.2	U	0.2	U	**0.27**		**0.34**		**9.35**		**10.6**	**6.51**	
Cadmium	**0.069**		**0.258**		**0.061**		**0.057**		0.05	U	**0.682**		**1.18**	**1.06**		**0.3**		**0.544**		**0.055**		**0.091**		0.05	U	**1.04**		**2.08**	**1.92**	
Calcium	**1290**		**85**		50	U	50	U	NT		**1700**		**3175**	**3700**		**423**		50	U	50	U	50	U	NT		**1180**		**1753**	**1480**	
Chromium	5	U	5	U	5	U	5	U	**5.1**		**28.9**		**54.0**	**39.2**		5	U	5	U	5	U	5	U	5	U	**24.1**		**49.1**	**25.5**	
Cobalt	0.1	U	**0.87**		**4.31**		**0.18**		**5.45**		**9.92**		**20.8**	**24.5**		0.1	U	**0.18**		**2.17**		**0.41**		**8.54**		**9.45**		**20.9**	**20.2**	
Copper	0.5	U	**5.4**		**10.7**		**3.93**		0.5	U	**134**		**155**	**190**		0.5	U	**3.27**		**5.29**		**2.16**		**1.21**		**62.3**		**74.7**	**66.3**	
Iron	50	U	**50**		**951**		**419**		**16000**		**33000**		**50470**	**61100**		50	U	**238**		**1720**		**1140**		**22400**		**30700**		**56248**	**55700**	
Lead	0.5	U	**32.5**		**8.4**		**6.5**		0.5	U	**143**		**191**	**231**		0.5	U	**25**		**1.82**		**10.6**		**9.66**		**324**		**372**	**380**	
Lithium	5	U	5	U	5	U	5	U	5	U	**24.5**		**49.5**	**23.4**		5	U	5	U	5	U	5	U	5	U	**23.2**		**48.2**	**21.9**	
Manganese	5	U	**27.3**		**66.6**		**10.3**		**90**		**310**		**509**	**582**		**5.7**		**18.7**		**53.3**		**30.7**		**231**		**202**		**541**	**511**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.61**		**3.11**	**1.12**		0.5	U	0.5	U	0.5	U	0.5	U	**0.75**		0.5	U	**3.25**	**1.31**	
Nickel	2	U	2	U	**2.4**		2	U	**10.9**		**26.1**		**45.4**	**48.9**		2	U	2	U	2	U	2	U	**7.4**		**21.4**		**36.8**	**27.2**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**415**		50	U	50	U	50	U	NT		NT		NT		150	**492**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**3750**		100	U	NT		NT		NT		NT		NT		100	**1770**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.26**		**1.56**	**0.38**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.29**		**1.59**	**0.39**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.6**		**1.10**	**0.71**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.46**		**0.960**	**0.45**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**170**		100	U	NT		NT		NT		NT		NT		100	110	U
Strontium	5	U	5	U	5	U	5	U	5	U	**24.3**		**49.3**	**27.9**		5	U	5	U	5	U	5	U	5	U	**13.4**		**38.4**	**19.2**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.498**		**2.70**	**0.453**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.499**		**2.70**	**0.498**	
Tin	2	U	2	U	2	U	2	U	2	U	**2.2**		**12.2**	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	**8.8**		**574**		**603**	**489**		5	U	5	U	5	U	5	U	**6.3**		**276**		**302**	**227**	
Uranium	0.05	U	**0.762**		**0.275**		**0.1**		**0.805**		**0.984**		**2.98**	**3.03**		0.05	U	**0.864**		**0.227**		**0.16**		**0.72**		**0.853**		**2.87**	**2.71**	
Vanadium	0.2	U	0.2	U	0.2	U	**0.54**		**8.65**		**26.8**		**36.6**	**38.1**		0.2	U	0.2	U	0.2	U	**0.31**		**5.58**		**25.4**		**31.9**	**26.7**	
Zinc	**3.7**		**17.9**		**17**		**6.9**		**68**		**257**		**371**	**454**		**75.3**		**73.8**		**36**		**19.5**		**314**		**743**		**1262**	**1170**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-MW003															CH14-107-MW003														
Sample ID	CH14-107-MW003-SOD															CH14-107-MW003-SOH														
Sample Interval (mbgs)	11.89 - 12.19															24.99 - 25.3														
Sample Date	8/21/2014															8/21/2014														
General Location	ZONE II OUTWASH															ZONE II OUTWASH														
Geologic Unit	COLLUVIUM/ALLUVIUM															COLLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**86**		**161**		**55**		**200**		**3110**		**3662**	**6140**		50	U	50	U	**81**		50	U	**96**		**3090**		**3417**	**2770**	
Antimony	0.1	U	**0.18**		**0.73**		0.1	U	**0.12**		**0.96**		**2.19**	1.82	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.39**		**0.890**	0.35	U
Arsenic	**0.094**		**0.942**		**5.45**		**2.06**		**1.25**		**5.27**		**15.1**	**14.7**		0.05	U	0.05	U	**0.209**		**0.104**		0.5	U	**1.52**		**2.43**	**3.12**	
Barium	**33**		**55.4**		**16.7**		**6.1**		**20.2**		**39.4**		**171**	**230**		**20.1**		**21.2**		**2.1**		2	U	**2.2**		**21.2**		**68.8**	**83.3**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.61**		**1.61**	**0.89**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.54**		**1.54**	**0.65**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.53**		**1.53**	**0.22**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.56**		**1.56**	**0.72**	
Cadmium	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	**0.06**		**0.310**	**0.076**		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.300	**0.07**	
Calcium	**237**		50	U	50	U	50	U	NT		**2140**		**2527**	**2980**		**609**		50	U	50	U	50	U	NT		**2010**		**2769**	**2280**	
Chromium	5	U	5	U	5	U	5	U	5	U	**16.1**		**41.1**	**19.7**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	1.96	U
Cobalt	**2.96**		**6.31**		**4.21**		**0.22**		**2.19**		**6.43**		**22.3**	**22.7**		**0.66**		**0.34**		**0.26**		0.1	U	**0.56**		**6.56**		**8.48**	**7.39**	
Copper	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**36.6**		**39.1**	**26.6**	**J**	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**26.9**		**29.4**	**28**	
Iron	50	U	**188**		**1290**		**164**		**2700**		**57000**		**61392**	**56300**		50	U	**173**		**1260**		**153**		**3680**		**35000**		**40316**	**29300**	
Lead	0.5	U	**2.26**		**0.88**		0.5	U	0.5	U	**26.4**		**31.0**	**20.1**		0.5	U	**1.05**		0.5	U	0.5	U	0.5	U	**13**		**16.1**	**15.3**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	**9.2**		5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U
Manganese	**11**		**9.5**		**24.1**		**10.2**		**63.3**		**774**		**892**	**889**		**35.3**		**7.4**		**13.9**		**7.1**		**88.2**		**823**		**975**	**781**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.92**		**3.42**	**0.88**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	0.5	U
Nickel	2	U	**10.2**		**14.4**		2	U	**6.4**		**9.8**		**44.8**	**42.4**		2	U	2	U	2	U	2	U	2	U	**3.4**		**13.4**	**4.14**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**853**		50	U	50	U	50	U	NT		NT		NT		150	**512**	
Potassium	**170**		NT		NT		NT		NT		NT		**170**	**2000**		**230**		NT		NT		NT		NT		NT		**230**	**1580**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.39**		**0.890**	**0.21**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.29**		**0.790**	**0.29**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	5	U	5	U	**10**		**35.0**	**16**		5	U	5	U	5	U	5	U	5	U	**7.9**		**32.9**	**10.2**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.27**		**2.47**	**0.252**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.178**		**2.38**	**0.088**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**9.9**		**34.9**	**12.7**		5	U	5	U	5	U	5	U	5	U	5	U	30	**1**	
Uranium	0.05	U	**0.239**		**0.077**		0.05	U	**0.085**		**1.03**		**1.53**	**1.71**		0.05	U	**0.102**		**0.052**		0.05	U	**0.075**		**0.793**		**1.12**	**0.952**	
Vanadium	0.2	U	0.2	U	**0.34**		**0.24**		**1.13**		**20.4**		**22.5**	**25.6**		0.2	U	0.2	U	**0.25**		0.2	U	**0.82**		**9.93**		**11.6**	**7.56**	
Zinc	**23.6**		**82.1**		**128**		**35.6**		**148**		**668**		**1085**	**1000**		**54.7**		**64.3**		**67.9**		**22.2**		**170**		**692**		**1071**	**956**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-MW004														CH14-107-MW004													
Sample ID	CH14-107-MW004-SOG														CH14-107-MW004-SOI													
Sample Interval (mbgs)	18.59 - 18.9														25.3 - 25.6													
Sample Date	8/28/2014														8/28/2014													
General Location	ZONE II OUTWASH														ZONE II OUTWASH													
Geologic Unit	COLLUVIUM														COLLUVIUM													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total			NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	**55**		**57**		50	U	**58**		**12400**		**12670**	**14600**			50	U	50	U	**100**		50	U	**57**		**3220**		**3527**	**2570**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.16**		**0.660**	**0.23**			0.1	U	0.1	U	**0.33**		0.1	U	0.1	U	**0.21**		**0.940**	**0.7**	
Arsenic	0.05	U	0.05	U	**0.102**		**0.429**		**0.52**		**3.09**		**4.24**	**5.31**			0.05	U	0.05	U	**0.246**		0.05	U	0.5	U	0.5	U	**1.40**	**0.49**	
Barium	**56.2**		**63.4**		**25.9**		**14.3**		**12.7**		**542**		**715**	**749**			**21.2**		**30**		**8.7**		**2.6**		**3.1**		**12.7**		**78.3**	**83.9**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.28**		**2.28**	**1.32**			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.33**		**1.33**	**0.44**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.34**		**1.34**	**0.3**			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.34**		**1.34**	**0.65**	
Cadmium	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	**0.368**		**0.618**	**0.473**			0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.300	0.05	U
Calcium	**193**		50	U	50	U	50	U	NT		**2380**		**2723**	**2480**			**331**		50	U	50	U	**93**		NT		**208**		**732**	**637**	
Chromium	5	U	5	U	5	U	5	U	5	U	**30.1**		**55.1**	**32.2**			5	U	5	U	5	U	5	U	5	U	5	U	30.0	**7.03**	
Cobalt	**1.6**		**5.88**		**1.66**		**0.16**		**2.34**		**17.3**		**28.9**	**27.4**			**4.47**		**1.1**		**1.22**		0.1	U	**0.19**		**4.06**		**11.1**	**12.7**	
Copper	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**24.1**		**26.6**	**17.5**			0.5	U	**1.06**		**0.56**		0.5	U	0.5	U	**13.4**		**16.5**	**23**	
Iron	50	U	**197**		**1600**		**193**		**3180**		**76800**		**82020**	**80000**			50	U	**68**		**4670**		**75**		**841**		**16500**		**22204**	**24400**	
Lead	0.5	U	**0.57**		0.5	U	0.5	U	0.5	U	**8.66**		**11.2**	**7.16**			0.5	U	**1.56**		**2.15**		**0.73**		0.5	U	**3.95**		**9.39**	**7.55**	
Lithium	5	U	5	U	5	U	5	U	5	U	**37.2**		**62.2**	**39.9**			5	U	5	U	5	U	5	U	5	U	**12.3**		**37.3**	**9**	
Manganese	**20.6**		**21.5**		**33.1**		**13.1**		**59.4**		**1280**		**1428**	**1470**			**23.2**		5	U	**116**		5	U	**18.2**		**341**		**508**	**550**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	0.5	U		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	0.5	U
Nickel	2	U	**15.8**		**4.5**		2	U	**4.8**		**31**		**60.1**	**55.4**			**6**		**5.3**		**3.9**		2	U	2	U	**9.1**		**28.3**	**26.7**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**347**			50	U	50	U	50	U	NT		NT		NT		150	50	U
Potassium	100	U	NT		NT		NT		NT		NT		100	**2040**			100	U	NT		NT		NT		NT		NT		100	**660**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.13**		**0.630**	0.1	U		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.600	0.1	U
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U		100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	**5**		5	U	**21.5**		**46.5**	**24.8**			5	U	5	U	5	U	5	U	5	U	5	U	30.0	**6.72**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.277**		**2.48**	**0.273**			0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.194**		**2.39**	**0.158**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U		2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**194**		**219**	**208**			5	U	5	U	5	U	5	U	5	U	**10.4**		**35.4**	8.1	U
Uranium	0.05	U	**0.442**		**0.147**		0.05	U	**0.162**		**0.985**		**1.84**	**1.95**			0.05	U	**0.142**		**0.098**		0.05	U	0.05	U	**0.328**		**0.718**	**0.749**	
Vanadium	0.2	U	0.2	U	0.2	U	**0.29**		**1.91**		**33.5**		**36.3**	**36.3**			0.2	U	0.2	U	**1.35**		0.2	U	0.2	U	**4.09**		**6.24**	**6.88**	
Zinc	**65.7**		**361**		**378**		**85.6**		**228**		**1990**		**3108**	**3260**			**104**		**79.8**		**338**		**6.3**		50	U	**79**		**657**	**748**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-MW005B														CH14-107-MW005B													
Sample ID	CH14-107-MW005B-SOA														CH14-107-MW905B-SOA													
Sample Interval (mbgs)	0.91 - 1.22														0.91 - 1.22													
Sample Date	8/23/2014														8/23/2014													
General Location	ZONE II OUTWASH														ZONE II OUTWASH													
Geologic Unit	COLLUVIUM/ALLUVIUM														COLLUVIUM/ALLUVIUM													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total			NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**156**		50	U	**117**		**255**		**363**		**11000**		**11941**	**11500**			**160**		50	U	**135**		**316**		**405**		**10900**		**11966**	**11800**	
Antimony	0.1	U	0.1	U	**2.48**		**0.67**		**0.1**		**7.81**		**11.3**	**13.1**	J		0.1	U	**0.11**		**2.86**		**0.65**		0.1	U	**7.75**		**11.6**	**9.96**	
Arsenic	0.05	U	0.05	U	**13.3**		**8.94**		**4.98**		**38.8**		**66.1**	**77.8**			0.05	U	0.05	U	**15.1**		**7.86**		**3.48**		**37.3**		**63.8**	**73.9**	
Barium	**25.6**		**11.3**		**16.9**		**7.4**		**149**		**570**		**780**	**333**			**24.7**		**9.8**		**19.9**		**8.5**		**169**		**580**		**812**	**385**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.49**		**1.49**	**0.68**			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.47**		**1.47**	**0.75**	
Bismuth	0.2	U	0.2	U	**0.24**		0.2	U	0.2	U	**1.69**		**2.73**	**1.99**			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.22**		**2.22**	**1.39**	
Cadmium	**0.071**		0.05	U	0.05	U	0.05	U	0.05	U	**0.308**		**0.579**	**0.388**			**0.099**		0.05	U	0.05	U	0.05	U	0.05	U	**0.392**		**0.691**	**0.389**	
Calcium	**84**		50	U	50	U	**123**		NT		**949**		**1256**	**1050**			**92**		50	U	50	U	**146**		NT		**808**		**1146**	**995**	
Chromium	5	U	5	U	5	U	5	U	5	U	**21.1**		**46.1**	**26.3**			5	U	5	U	5	U	5	U	5	U	**21.5**		**46.5**	**25.9**	
Cobalt	**0.19**		0.1	U	0.1	U	0.1	U	**3.59**		**5.88**		**9.96**	**10.2**			**0.22**		0.1	U	0.1	U	0.1	U	**3.86**		**6.08**		**10.46**	**11**	
Copper	**1.33**		0.5	U	**5.26**		**1.64**		0.5	U	**158**		**167**	**172**			**1.13**		0.5	U	**5.89**		**1.65**		0.5	U	**145**		**155**	**165**	
Iron	50	U	50	U	**3550**		**474**		**24600**		**21400**		**50124**	**55900**			50	U	**74**		**3510**		**468**		**25700**		**20900**		**50702**	**56300**	
Lead	**1130**		**323**		**170**		**56.7**		**2.27**		**3410**		**5092**	**4990**			**1180**		**374**		**169**		**56.6**		**2.7**		**3660**		**5442**	**4480**	
Lithium	5	U	5	U	5	U	5	U	5	U	**15.5**		**40.5**	**17.1**			5	U	5	U	5	U	5	U	5	U	**16**		**41.0**	**16.9**	
Manganese	**8.1**		5	U	5	U	5	U	**43.2**		**149**		**215**	**195**			**7.7**		5	U	5	U	5	U	**50.7**		**141**		**214**	**219**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.84**		0.5	U	**3.34**	**2.22**			0.5	U	0.5	U	0.5	U	0.5	U	**0.8**		**0.57**		**3.37**	**1.91**	
Nickel	2	U	2	U	2	U	2	U	**7**		**13.4**		**28.4**	**22**			2	U	2	U	2	U	2	U	**8.1**		**13.3**		**29.4**	**22.2**	
Phosphorus	50	U	50	U	**97**		NT		NT		NT		**197**	**634**			50	U	50	U	**131**		NT		NT		NT		**231**	**635**	
Potassium	**120**		NT		NT		NT		NT		NT		**120**	**4360**			100	U	NT		NT		NT		NT		NT		100	**4380**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.45**		**1.75**	**0.61**			0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.4**		**1.70**	**0.52**	
Silver	0.1	U	0.1	U	0.1	U	**0.2**		0.1	U	**7.62**		**8.22**	**8.32**			0.1	U	0.1	U	0.1	U	**0.28**		0.1	U	**8.31**		**8.99**	**6.94**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**280**			100	U	NT		NT		NT		NT		NT		100	**270**	
Strontium	5	U	5	U	5	U	5	U	**11.2**		**15.1**		**46.3**	**28.8**			5	U	5	U	5	U	5	U	**11.5**		**18.4**		**49.9**	**30.4**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**2.08**		**4.28**	**2.47**			0.05	U	0.05	U	0.05	U	0.05	U	2	U	**2.29**		**4.49**	**2.38**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U		2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	**12.8**		**11.5**		**9.9**		**453**		**497**	**459**			5	U	5	U	**15.1**		**12.1**		**10.9**		**438**		**486**	**472**	
Uranium	0.05	U	0.05	U	0.05	U	0.05	U	**0.358**		**0.604**		**1.16**	**1.15**			0.05	U	0.05	U	0.05	U	0.05	U	**0.401**		**0.584**		**1.19**	**1.26**	
Vanadium	0.2	U	0.2	U	**4.32**		**0.48**		**8.28**		**22**		**35.5**	**37.1**			0.2	U	0.2	U	**4.74**		**0.54**		**8.98**		**21.7**		**36.4**	**37.3**	
Zinc	**22.9**		**1.1**		**7.5**		**2.8**		**215**		**345**		**594**	**663**			**34.8**		**1.5**		**8.9**		**3.1**		**213**		**378**		**639**	**694**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-MW006B															CH14-107-MW010														
Sample ID	CH14-107-MW006B-SOC															CH14-107-MW010-SOA														
Sample Interval (mbgs)	4.88 - 5.18															1.22 - 1.52														
Sample Date	8/23/2014															8/30/2014														
General Location	ZONE II OUTWASH															S-WELLS														
Geologic Unit	ALLUVIUM															FILL														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**403**		**156**		**2420**		**13800**		**16879**	**13900**		50	U	50	U	**358**		**342**		**248**		**10800**		**11848**	**12400**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.54**		**1.04**	**0.87**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.29**		**0.790**	**0.45**	
Arsenic	0.05	U	0.05	U	**0.198**		**0.48**		**5.51**		**4.21**		**10.5**	**14**		0.05	U	0.05	U	**2.57**		**0.802**		**1.87**		**3.75**		**9.09**	**8.56**	
Barium	**9.7**		**9.1**		2	U	2	U	**5.5**		**74.3**		**103**	**87.8**		**37.2**		**9.7**		**4**		**4.6**		**4**		**43.6**		**103**	**131**	
Beryllium	0.2	U	**0.47**		**1.18**		0.2	U	**1.48**		**0.8**		**4.33**	**3.4**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.37**		**1.37**	**0.6**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.35**		**1.35**	**0.3**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.29**	
Cadmium	0.05	U	**0.073**		0.05	U	0.05	U	0.05	U	**0.163**		**0.436**	**0.233**		**0.139**		**0.242**		**0.079**		**0.06**		0.05	U	**0.231**		**0.801**	**0.772**	
Calcium	**534**		50	U	50	U	**122**		NT		**2070**		**2826**	**2360**		**482**		**65**		50	U	**225**		NT		**2610**		**3432**	**3780**	**J**
Chromium	5	U	5	U	5	U	5	U	5	U	**22.6**		**47.6**	**23.3**		5	U	5	U	5	U	5	U	5	U	**21.4**		**46.4**	**23.7**	**J**
Cobalt	**0.11**		**0.19**		**0.35**		0.1	U	**2.07**		**4.95**		**7.77**	**6.98**		0.1	U	0.1	U	**1.47**		**0.11**		**1.1**		**4.6**		**7.48**	**7.98**	
Copper	0.5	U	0.5	U	**0.94**		0.5	U	0.5	U	**22.7**		**25.6**	**23.2**		0.5	U	**1.15**		**9.38**		**1**		**0.54**		**9.82**		**22.4**	**22.9**	
Iron	50	U	50	U	**3350**		**1040**		**49200**		**18400**		**72090**	**65000**		50	U	50	U	**1650**		**524**		**4030**		**13500**		**19804**	**19900**	
Lead	0.5	U	0.5	U	**2.11**		0.5	U	**0.92**		**10.7**		**15.2**	**11**		0.5	U	0.5	U	**4.65**		1.28		0.5	U	**8.31**		**15.7**	**14.7**	
Lithium	5	U	5	U	5	U	5	U	5	U	**32.2**		**57.2**	**24.1**		5	U	5	U	5	U	5	U	5	U	**22**		**47.0**	**24.2**	
Manganese	**10**		**8.2**		**13.9**		5	U	**63.8**		**159**		**260**	**233**		5	U	**10.1**		**129**		**9**		**27.1**		**130**		**310**	**368**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**2.27**		0.5	U	**4.77**	**2.74**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.68**	
Nickel	2	U	2	U	2	U	2	U	5.8		**15.3**		**29.1**	**20.5**		**3.4**		2	U	**3.3**		2	U	**3.8**		**17.1**		**31.6**	**29.7**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**647**		50	U	50	U	**114**		NT		NT		NT		**214**	**587**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2080**		100	U	NT		NT		NT		NT		NT		100	**1570**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.57**		**1.87**	**0.72**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	**0.27**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.21**		**0.710**	**0.18**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.17**		**0.670**	**0.21**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT		NT		NT		NT		NT		100	**260**	
Strontium	5	U	5	U	5	U	5	U	5	U	**14.8**		**39.8**	**29.5**		5	U	5	U	5	U	5	U	5	U	**29.7**		**54.7**	**43.4**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.244**		**2.44**	**0.17**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.209**		**2.41**	**0.194**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	**26.1**		**500**		**546**	**394**		5	U	5	U	**6.1**		**5.8**		5	U	**346**		**373**	**393**	
Uranium	0.05	U	**0.716**		**0.694**		**0.104**		**1.78**		**0.575**		**3.92**	**3.45**		0.05	U	**0.438**		**0.372**		0.05	U	**0.148**		**0.784**		**1.84**	**1.65**	
Vanadium	0.2	U	0.2	U	**0.56**		0.2	U	**5.88**		**31.8**		**38.8**	**35.3**		0.2	U	0.2	U	**1.88**		**0.75**		**2.75**		**23.2**		**29.0**	**29.3**	
Zinc	**24.2**		**65**		**94.2**		**13.7**		**482**		**207**		**886**	**816**		**210**		**138**		**118**		**23.9**		50	U	**308**		**848**	**915**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-MW010															CH14-107-MW010														
Sample ID	CH14-107-MW010-SOC															CH14-107-MW010-SOK														
Sample Interval (mbgs)	3.35 - 3.66															25.3 - 25.6														
Sample Date	8/30/2014															8/30/2014														
General Location	S-WELLS															S-WELLS														
Geologic Unit	NATIVE SOIL															BEDROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**361**		**359**		**153**		**11200**		**12173**	**11900**		50	U	**84**		**330**		**62**		**166**		**5730**		**6422**	**5980**	
Antimony	0.1	U	0.1	U	**0.13**		0.1	U	0.1	U	**0.16**		**0.690**	**0.51**		0.1	U	0.1	U	**0.19**		0.1	U	0.1	U	**0.28**		**0.870**	**0.38**	
Arsenic	**0.051**		**0.363**		**1.2**		**0.505**		**0.55**		**1.43**		**4.10**	**4.43**		0.05	U	**0.274**		**5.47**		**0.363**		0.5	U	**3.22**		**9.88**	**6.83**	
Barium	**22.7**		**24**		**12.5**		**10.9**		**7.6**		**42.3**		**120**	**131**		**8.7**		**10.2**		**2.1**		**2.8**		**2.6**		**38.8**		**65.2**	**86.6**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.34**		**1.34**	**0.6**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.85**		**1.85**	**1.14**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.35**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.2**		**1.20**	0.2	U
Cadmium	**0.221**		**0.264**		0.05	U	**0.053**		0.05	U	**0.114**		**0.752**	**0.744**		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.300	0.05	U
Calcium	**930**		**94**		50	U	**297**		NT		**2590**		**3961**	**3490**		**185**		50	U	50	U	**425**		NT		**2340**		**3050**	**3080**	
Chromium	5	U	5	U	5	U	5	U	5	U	**22.2**		**47.2**	**28.9**		5	U	5	U	5	U	5	U	5	U	**19**		**44.0**	**24.3**	
Cobalt	0.1	U	0.1	U	**1.27**		**0.12**		**0.38**		**5.88**		**7.85**	**7.56**		**1.67**		**5.5**		**6.86**		**0.29**		**0.84**		**7.06**		**22.2**	**24.7**	
Copper	0.5	U	**1.43**		**20**		**0.72**		0.5	U	**7.71**		**30.9**	**31.8**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**11.5**	**J**	**14.0**	**12.1**	
Iron	50	U	50	U	**202**		**281**		**1020**		**13200**		**14803**	**15200**		50	U	**208**		**9870**		444	J	**2630**		**50900**		**64102**	**63400**	
Lead	0.5	U	**3.63**		**4.76**		**2.64**		0.5	U	**4.21**		**16.2**	**16.3**		0.5	U	**0.84**		0.5	U	**0.84**		0.5	U	**3.93**	**J**	**7.11**	**7.61**	
Lithium	5	U	5	U	5	U	5	U	5	U	**20.6**		**45.6**	**24.9**		5	U	5	U	5	U	5	U	5	U	**7.2**		**32.2**	**10.6**	
Manganese	**21.1**		**11.6**		**56.1**		**5.2**		5	U	**119**		**218**	**227**		**12.5**		**16.3**		**248**		**18.4**		**65.8**		**815**		**1176**	**1090**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.84**		**3.34**	**0.94**	
Nickel	**6.7**		2	U	**6.1**		2	U	2	U	**22**		**40.8**	**39.1**		2	U	**8.6**		**20.1**		2	U	**2.6**		**11.2**		**46.5**	**48.9**	
Phosphorus	50	U	50	U	**126**		NT		NT		NT		**226**	**510**		50	U	50	U	**96**		NT		NT		NT		**196**	**541**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1540**		**180**		NT		NT		NT		NT		NT		**180**	**1830**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.22**		1.52	**0.69**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.12**		**0.620**	**0.19**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.11**		**0.610**	0.1	U
Sodium	100	U	NT		NT		NT		NT		NT		100	**220**		100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	**5.8**		5	U	5	U	5	U	5	U	**33.7**		**59.5**	**34.5**		5	U	5	U	5	U	5	U	5	U	**12.9**		**37.9**	**17**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.193**		**2.39**	**0.168**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.163**		**2.36**	**0.102**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	**9.6**		**8.1**		5	U	**354**		**387**	**394**		5	U	5	U	5	U	5	U	5	U	**73.3**	**J**	**98.3**	**19.9**	
Uranium	0.05	U	**0.871**		**0.951**		**0.076**		0.05	U	**0.428**		**2.43**	**2.66**		0.05	U	**0.135**		**0.225**		0.05	U	**0.066**		**1.19**		**1.72**	**1.55**	
Vanadium	0.2	U	0.2	U	**3.79**		**0.89**		**0.99**		**23.5**		**29.6**	**30.1**		0.2	U	0.2	U	**3.45**		**0.26**		**0.89**		**22.8**		**27.8**	**28**	
Zinc	**414**		**161**		**123**		**21.2**		50	U	**328**		**1097**	**1220**		**6.8**		**46.1**		**431**		**15.5**		50	U	**204**		**753**	**630**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-TP001															CH14-107-TP001														
Sample ID	CH14-107-TP001-SOA															CH14-107-TP001-SOB														
Sample Interval (mbgs)	1.6 - 1.6															3 - 3														
Sample Date	7/22/2014															7/22/2014														
General Location	WASTE ROCK DUMP - ZONE II															WASTE ROCK DUMP - ZONE II														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**93**		**1360**		**190**		**40400**		**42143**	**36900**		50	U	**55**		**75**		**136**		**171**		**20800**		**21287**	**20900**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.16**		**0.660**	**0.24**		0.1	U	**0.15**		**0.46**		**0.27**		0.1	U	**4.67**		**5.75**	**6.85**	
Arsenic	0.05	U	**0.335**		0.05	U	**0.704**		0.5	U	**3.74**		**5.38**	**3.62**		0.05	U	**0.094**		**0.136**		**3.94**		**1.34**		**179**		**185**	**43.1**	
Barium	**109**		**104**		**2.7**		**7.1**		**14.3**		**125**		**362**	**347**		**47.7**		**79.1**		**25.9**		**31.1**		**80.5**		**347**		**611**	**354**	
Beryllium	0.2	U	**0.52**		0.2	U	**0.28**		**0.61**		**2.22**		**4.03**	**3.98**		0.2	U	**0.25**		0.2	U	0.2	U	**0.26**		**2.17**		**3.28**	**2.6**	
Bismuth	0.2	U	**1.63**		0.2	U	**0.52**		0.2	U	**13.6**		**16.4**	**14.8**		0.2	U	**0.3**		0.2	U	0.2	U	0.2	U	**3.13**		**4.23**	**4.53**	
Cadmium	**0.681**		**15.1**		**0.27**		**0.66**		0.05	U	**29.9**		**46.7**	**35.4**		0.05	U	**1.05**		**0.055**		**0.13**		0.05	U	**2.33**		**3.67**	**4.12**	
Calcium	**1630**		**28300**		50	U	**329**		NT		**12300**	J	42609	**43600**		**873**		**4550**		50	U	**638**		NT		**3460**		**9571**	**10000**	
Chromium	5	U	5	U	5	U	5	U	5	U	**164**		**189**	**127**		5	U	5	U	5	U	5	U	5	U	**62.3**		**87.3**	**57.9**	
Cobalt	0.1	U	**4.66**		**0.74**		**0.27**		**2.63**		**23.6**		**32.0**	**29.4**		0.1	U	**5.93**		**0.99**		**0.23**		**3.41**		**21.7**		**32.4**	**28.5**	
Copper	0.5	U	**38.1**		**29.6**		**8.51**		**0.7**		**792**		**869**	**810**		0.5	U	**5.7**		**5.51**		**1.62**		0.5	U	**128**		**142**	**345**	
Iron	50	U	**489**		**803**		**502**		**4370**		**63200**		**69414**	**65700**		50	U	**219**		**1020**		**333**		**4760**		**66800**		**73182**	**62400**	
Lead	0.5	U	**250**		**5.83**		**42.2**		0.5	U	**504**		**803**	**783**		0.5	U	**374**		**28.7**		**72.1**		**0.52**		**988**		**1464**	**1720**	
Lithium	5	U	5	U	5	U	5	U	5	U	**65.2**		**90.2**	**66.4**		5	U	5	U	5	U	5	U	5	U	**43.6**		**68.6**	**44.1**	
Manganese	**5**	U	**322**		**18.1**		**8.8**		**13.1**		**1140**		**1507**	**1460**		5	U	**138**		**18.2**		**6.9**		**23**		**730**		**921**	**829**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.65**		**1.14**		**3.79**	**2.54**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.92**		**3.42**	**1.16**	
Nickel	**2**	U	**3.1**		**3.6**		2	U	**11.3**		**86.4**		**108**	**93.6**		2	U	**4.8**		**3.3**		2	U	**11.5**		**44.4**		**68.0**	**65.7**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**813**		50	U	50	U	50	U	NT		NT		NT		150	**536**	
Potassium	**190**		NT		NT		NT		NT		NT		**190**	**4310**		150	U	NT		NT		NT		NT		NT		150	**4720**	
Selenium	0.2	U	0.2	U	0.2	U	**0.54**		0.5	U	**5.44**		**7.08**	**6.17**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.32**		**2.62**	**1.09**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**6.94**		**7.44**	**5.5**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**3.11**		**3.61**	**3.55**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**410**		100	U	NT		NT		NT		NT		NT		100	**210**	
Strontium	**51.5**		**44.5**		5	U	5	U	5	U	**27.8**		**139**	**118**		**12.8**		**13.3**		5	U	5	U	5	U	**17**		**58.1**	**40.1**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.594**		**2.79**	**0.459**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.27**		**3.47**	**1.11**	
Tin	2	U	2	U	2	U	2	U	2	U	**18.7**		**28.7**	**19.1**		2	U	2	U	2	U	2	U	2	U	**2**		**12.0**	**2.8**	
Titanium	5	U	5	U	5	U	5	U	5	U	**340**		**365**	**202**		5	U	5	U	5	U	5	U	5	U	**507**		**532**	**388**	
Uranium	0.05	U	**0.827**		**0.192**		**0.056**		**0.164**		**0.643**		**1.93**	**1.9**		0.05	U	**0.288**		0.05	U	0.05	U	**0.079**		**0.616**		**1.13**	**1.06**	
Vanadium	0.2	U	0.2	U	**0.2**	U	**2.43**		**5.09**		**117**		**125**	**116**		0.2	U	0.2	U	0.2	U	**0.54**		**2.43**		**45.7**		**49.3**	**47.3**	
Zinc	**1.5**		**368**		**129**		**62.5**		**98**		**1570**		**2229**	**1880**		**1.2**		**220**		**70.7**		**27**		**52**		**1060**		**1431**	**1540**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-TP001															CH14-107-TP001														
Sample ID	CH14-107-TP001-SOC															CH14-107-TP901-SOC														
Sample Interval (mbgs)	5.5 - 5.5															5.5 - 5.5														
Sample Date	7/22/2014															7/22/2014														
General Location	WASTE ROCK DUMP - ZONE II															WASTE ROCK DUMP - ZONE II														
Geologic Unit	WASTE ROCK															WASTE ROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	50	U	**112**		**61**		**12900**		**13223**	**13800**		50	U	50	U	50	U	**88**		**70**		**14300**		**14608**	**15300**	
Antimony	0.1	U	0.1	U	**0.11**		0.1	U	0.1	U	**0.8**	**J**	**1.31**	**2.03**		0.1	U	0.1	U	**0.31**		**0.12**		**0.16**		**1.49**	**J**	**2.28**	**3.02**	
Arsenic	0.05	U	**0.097**		**0.257**		**3.38**		**4.18**		**36.3**		**44.3**	**75.5**	**J**	0.05	U	**0.085**		**0.259**		**3.55**		**3.7**		**40.5**		**48.1**	**32.2**	**J**
Barium	**12.1**		**31.9**		**4.8**		**5.6**		**9.3**	**J**	**86.7**		**150**	**116**		**14.4**		**41.7**		**9.7**		**9.4**		**19.9**	**J**	**114**		**209**	**185**	
Beryllium	0.2	U	**0.22**		0.2	U	0.2	U	0.2	U	**2.14**		**3.16**	**2.49**		0.2	U	**0.23**		0.2	U	0.2	U	0.2	U	**2.07**	**J**	**3.10**	**2.62**	
Bismuth	0.2	U	**0.47**	**J**	0.2	U	0.2	U	0.2	U	**2.08**	**J**	**3.35**	**5.34**	J	0.2	U	**1.77**	**J**	0.2	U	0.2	U	0.2	U	**6.19**	**J**	**8.76**	**3.07**	**J**
Cadmium	0.05	U	**0.44**		0.05	U	0.05	U	0.05	U	**0.268**	**J**	**0.908**	**0.856**	**J**	0.05	U	**0.551**		0.05	U	**0.052**		0.05	U	**0.973**	**J**	**1.726**	**1.52**	**J**
Calcium	**915**		**2440**		50	U	**568**		NT		**3680**		**7653**	**7330**		**1070**		**1900**		50	U	**530**		NT		**3340**		**6890**	**7680**	
Chromium	5	U	5	U	5	U	5	U	5	U	**34.8**		**59.8**	**35.3**		5	U	5	U	5	U	5	U	5	U	**37.6**		**62.6**	**39.4**	
Cobalt	0.1	U	**1.93**		**0.64**		**0.38**		**9.48**		**13.4**		**25.9**	**32.1**		0.1	U	**2.44**		**0.75**		**0.28**		**10.3**		**14.9**		**28.8**	**30.9**	
Copper	0.5	U	**1.93**		**2.45**		**1.21**		0.5	U	**78.3**		**84.9**	**85.2**		0.5	U	**2.82**		**3.31**		**1.16**		0.5	U	**76**		**84.3**	**75.4**	
Iron	50	U	**229**		**907**		**194**		**3770**		**64900**		**70050**	**71400**		50	U	**192**		**906**		**169**		**4110**		**68500**	**J**	**73927**	**73600**	
Lead	0.5	U	**25.6**	**J**	**2.59**	**J**	**3.81**	**J**	0.5	U	**41**	**J**	**74.0**	**106**	**J**	0.5	U	**117**	**J**	**8.35**	**J**	**15.1**	**J**	0.5	U	**363**	**J**	**504.5**	**382**	**J**
Lithium	5	U	5	U	5	U	5	U	5	U	**30.4**		**55.4**	**30.9**		5	U	5	U	5	U	5	U	5	U	**33.4**		**58.4**	**35.5**	
Manganese	5	U	**67**		**17.3**		**7.2**		**27.3**		**861**		**985**	**970**		5	U	**62.4**		**16.7**		**5.9**		**29.4**		**840**		**959**	**1020**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.57**	
Nickel	2	U	2	U	**2.1**		2	U	**16.9**		**30.3**		**55.3**	**64.2**		2	U	**2.2**		**2.3**		2	U	**17.9**		**32.9**		**59.3**	**62.1**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**383**		50	U	50	U	50	U	NT		NT		NT		150	**513**	
Potassium	**110**		NT		NT		NT		NT		NT		**110**	**4150**		**120**		NT		NT		NT		NT		NT		**120**	**4480**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	**1.50**	**0.37**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.74		**2.04**	**0.35**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.64**	**J**	**1.14**	**0.96**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.64**	**J**	**2.14**	**1.48**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**120**		100	U	NT		NT		NT		NT		NT		100	**130**	
Strontium	**7.9**		**8.3**		5	U	5	U	5	U	**12.3**		**43.5**	**31.7**		**8.9**		**6.4**		5	U	5	U	5	U	**11.4**		**41.7**	**31.7**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.405**		**2.61**	**0.499**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.534**		**2.73**	**0.562**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**355**		**380**	**392**		5	U	5	U	5	U	5	U	5	U	**396**		**421**	**419**	
Uranium	0.05	U	**0.18**		0.05	U	0.05	U	0.05	U	**0.611**		**0.991**	**0.736**		0.05	U	**0.215**		0.05	U	0.05	U	**0.056**		**0.625**		**1.046**	**0.82**	
Vanadium	0.2	U	0.2	U	0.2	U	**0.33**		**1.33**		**30.8**		**33.1**	**33.4**		0.2	U	0.2	U	0.2	U	**0.3**		**1.56**		**34.1**		**36.6**	**37.2**	
Zinc	1	U	**13.4**	**J**	**7.6**	**J**	**3.7**		50	U	**135**	**J**	**211**	**201**	**J**	1	U	**31.7**	**J**	**14.8**	**J**	**4.6**		50	U	**339**	**J**	**441**	**554**	**J**

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-TP002															CH14-107-TP002														
Sample ID	CH14-107-TP002-SOA															CH14-107-TP002-SOB														
Sample Interval (mbgs)	1.7 - 1.7															4 - 4														
Sample Date	7/21/2014															7/21/2014														
General Location	ZONE II OUTWASH															ZONE II OUTWASH														
Geologic Unit	COLLUVIUM/ALLUVIUM															COLLUVIUM/ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**89**		50	U	**99**		**152**		**402**		**9880**		**10672**	**10500**		50	U	50	U	**122**		**107**		**277**		**8790**		**9396**	**10700**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	**0.12**		**2.61**		**3.13**	**3.56**	J	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.47**		**0.970**	**0.73**	
Arsenic	0.05	U	**0.055**		**0.19**		**1.43**		**2.49**		**23.6**		**27.8**	**34.1**		0.05	U	0.05	U	**0.318**		**0.995**		**1.77**		**5.53**		**8.71**	**11.8**	
Barium	**34.1**		**15.1**		**9.7**		**5.8**		**35.5**		**246**		**346**	**287**		**20.2**		**6.8**		**3.6**		**2.1**		**11.2**		**70.9**		**115**	**105**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.7**		**1.70**	**0.98**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.39**		**1.39**	**0.64**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.33**		**2.33**	**1.67**	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.08**		**2.08**	**1.12**	
Cadmium	**0.137**		0.05	U	0.05	U	0.05	U	0.05	U	**0.414**		**0.751**	**0.674**		**0.314**		**0.469**		**0.285**		**0.133**		0.05	U	**0.684**		**1.94**	**2.03**	
Calcium	**163**		50	U	50	U	50	U	NT		**1120**		**1433**	**1280**		**273**		50	U	50	U	50	U	NT		**2200**		**2623**	**2810**	
Chromium	5	U	5	U	5	U	5	U	5	U	**20.4**		**45.4**	**24.2**		5	U	5	U	5	U	5	U	5	U	**17.4**		**42.4**	**22**	
Cobalt	**0.39**		**0.41**		**1.77**		0.1	U	**4.34**		**9.09**		**16.1**	**16.3**		0.1	U	0.1	U	**1.8**		**0.12**		**3.68**		**5.32**		**11.1**	**12.9**	
Copper	**2.88**		**2.07**		**4.21**		**1.33**		0.5	U	**80.4**		**91.4**	**91.2**		0.5	U	**3.03**		**6**		**0.95**		0.5	U	**21.9**		**32.9**	**36.8**	
Iron	50	U	50	U	**854**		**357**		**16200**		**27900**		**45411**	**46300**		50	U	50	U	**634**		**299**		**6690**		**15000**		**22723**	**25600**	
Lead	**84.4**		**93.7**		**53.6**		**15.1**		**1.56**		**730**		**978**	**878**	J	0.5	U	**5.89**		**11.4**		**5.23**		**1.27**		**95.6**		**120**	**133**	
Lithium	5	U	5	U	5	U	5	U	5	U	**15.2**		**40.2**	**15.8**		5	U	5	U	5	U	5	U	5	U	**18.1**		**43.1**	**19.4**	
Manganese	**13.4**		**14.1**		**56.9**		**6.6**		**85.1**		**184**		**360**	**365**		**6.2**		**8.9**		**297**		**25.7**		**199**		**150**		**687**	**782**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.66**		**0.53**		**3.19**	**1.21**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.85**	
Nickel	2	U	2	U	2	U	2	U	**6.8**		**20.3**		**35.1**	**27.5**		2	U	2	U	2	U	2	U	**4.5**		**14.9**		**27.4**	**24.3**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**479**		50	U	50	U	50	U	NT		NT		NT		150	**695**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2770**		100	U	NT		NT		NT		NT		NT		100	**1430**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.4**		**1.70**	**0.42**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	**0.26**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**2.16**		**2.66**	**1.49**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.2**		**0.700**	**0.25**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**160**		100	U	NT		NT		NT		NT		NT		100	**200**	
Strontium	5	U	5	U	5	U	5	U	5	U	**21.4**		**46.4**	**26.2**		5	U	5	U	5	U	5	U	5	U	**22.3**		**47.3**	**32.8**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.761**		**2.96**	**0.801**	J	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.297**		**2.50**	**0.377**	
Tin	2	U	2	U	2	U	2	U	2	U	**2.8**		**12.8**	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	**7.5**		**328**		**356**	**352**		5	U	5	U	5	U	5	U	**5.9**		**279**		**305**	**334**	
Uranium	0.05	U	**0.299**		**0.12**		**0.067**		**0.494**		**0.967**		**2.00**	**2.08**		0.05	U	**0.432**		**0.162**		**0.084**		**0.273**		**0.578**		**1.58**	**1.8**	
Vanadium	0.2	U	0.2	U	**0.36**		**0.33**		**6.36**		**24.5**		**32.0**	**30.9**		0.2	U	0.2	U	**0.36**		**0.43**		**3.43**		**19.2**		**23.8**	**27.9**	
Zinc	**32.7**		**4.6**		**6.1**		**5**		**131**		**448**		**627**	**661**		**72.3**		**41.7**		**42.4**		**9.8**		**89**		**373**		**628**	**688**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-TP003														CH14-107-TP003													
Sample ID	CH14-107-TP003-SOA														CH14-107-TP003-SOB													
Sample Interval (mbgs)	1.6 - 1.6														5 - 5													
Sample Date	7/21/2014														7/21/2014													
General Location	ZONE II OUTWASH														ZONE II OUTWASH													
Geologic Unit	COLLUVIUM/ALLUVIUM														COLLUVIUM/ALLUVIUM													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total			NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**188**		50	U	**101**		**173**		**455**		**11100**		**12067**	**11400**			**77**		**71**		**176**		**133**		**494**		**13800**		**14751**	**13200**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	**0.18**		**2.64**		**3.22**	**2.97**			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.5**		**2.00**	**2.1**	
Arsenic	0.05	U	0.05	U	**0.309**		**2.45**		**3.89**		**39.4**		**46.1**	**49.3**			0.05	U	0.05	U	**0.196**		**1.34**		**2.32**		**21.4**		**25.4**	**22.3**	
Barium	**35.8**		**12.3**		**9.7**		**6**		**49.1**		**195**		**308**	**263**			**56.5**		**14.6**		**9.2**		**6.1**		**43.4**		**222**		**352**	**226**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	**0.2**		**0.65**		**1.65**	**0.88**			0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.7**		**1.70**	**1.06**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.7**		**2.70**	**1.63**			0.2	U	**0.29**		**0.34**		0.2	U	0.2	U	**5.22**		**6.45**	**3.77**	
Cadmium	**0.079**		0.05	U	0.05	U	0.05	U	0.05	U	**0.38**		**0.659**	**0.525**			**0.427**		**0.175**		**0.113**		**0.061**		0.05	U	**0.905**		**1.73**	**1.4**	
Calcium	**77**		50	U	50	U	50	U	NT		**1320**		**1547**	**1410**			**259**		50	U	50	U	50	U	NT		**1250**		**1659**	**1150**	
Chromium	5	U	5	U	5	U	5	U	5	U	**22.1**		**47.1**	**23.9**			5	U	5	U	5	U	5	U	5	U	**31.3**		**56.3**	**23.9**	
Cobalt	**0.39**		**0.22**		**1.28**		0.1	U	**4.4**		**8.61**		**15.0**	**16.2**			**0.2**		**0.18**		**4.64**		**0.16**		**6.61**		**9.63**		**21.4**	**21.7**	
Copper	**2.73**		**1.21**		**3.21**		**1.28**		0.5	U	**80.1**		**89.0**	**88.3**			**1.07**		**1.76**		**4.27**		**1.13**		0.5	U	**68.1**		**76.8**	**70.1**	
Iron	50	U	**52**		**887**		**385**		**16600**		**27400**		**45374**	**47000**			50	U	50	U	**594**		**325**		**14400**		**30100**		**45519**	**44900**	
Lead	**178**		**121**		**41.7**		**10.7**		**1.18**		**511**		**864**	**787**			**17.5**		**54.8**		**50.7**		**15.8**		**1.39**		**521**		**661**	**812**	
Lithium	5	U	5	U	5	U	5	U	5	U	**16.4**		41.4	**16.2**			5	U	5	U	5	U	5	U	5	U	**20.7**		**45.7**	**21**	
Manganese	**11.7**		**7.9**		**45.6**		**6.2**		**77.5**		**180**		**329**	**338**			**26.8**		**17.5**		**209**		**22.2**		**224**		**233**		**733**	**699**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.6**		**0.56**		**3.16**	**1.44**			0.5	U	0.5	U	0.5	U	0.5	U	**0.69**		**0.51**		**3.20**	**1.37**	
Nickel	2	U	2	U	2	U	2	U	**7.3**		**19.8**		**35.1**	**29.4**			2	U	2	U	2	U	2	U	**7.1**		**24.1**		**39.2**	**28.4**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**581**			50	U	50	U	50	U	NT		NT		NT		150	**508**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2720**			100	U	NT		NT		NT		NT		NT		100	**2430**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.35**		**1.65**	**0.4**			0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.3**		**1.60**	**0.32**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.61**		**2.11**	**4.23**			0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.91**		**1.41**	**0.89**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**150**			100	U	NT		NT		NT		NT		NT		100	**140**	
Strontium	5	U	5	U	5	U	5	U	5	U	**17**		**42.0**	**21.3**			5	U	5	U	5	U	5	U	5	U	**16.3**		**41.3**	**20.2**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.896**		**3.10**	**0.774**			0.05	U	0.05	U	**0.052**		0.05	U	2	U	**0.97**		**3.17**	**0.85**	
Tin	2	U	2	U	2	U	2	U	2	U	**3.4**		**13.4**	2	U		2	U	2	U	2	U	**3.4**		**2.6**		**4.1**		**16.1**	2	U
Titanium	5	U	5	U	5	U	5	U	**9.4**		**374**		**403**	**353**			5	U	5	U	5	U	5	U	**6.9**		**382**		**409**	**263**	
Uranium	0.05	U	**0.289**		**0.115**		**0.059**		**0.478**		**0.924**		**1.915**	**1.74**			0.05	U	**0.25**		**0.104**		**0.063**		**0.439**		**0.862**		**1.77**	**1.64**	
Vanadium	0.2	U	0.2	U	**0.41**		**0.41**		**7.03**		**24.2**		**32.5**	**30.2**			0.2	U	0.2	U	**0.32**		**0.33**		**6.12**		**28.1**		**35.3**	**28.3**	
Zinc	**18.2**		**2**		**4.2**		**4.7**		**66**		**518**		**613**	**617**			**60.2**		**10.2**		**17.7**		**8.4**		**164**		**858**		**1119**	**991**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-TP004															CH14-107-TP004														
Sample ID	CH14-107-TP004-SOA															CH14-107-TP004-SOB														
Sample Interval (mbgs)	1.2 - 1.2															2.5 - 2.5														
Sample Date	7/22/2014															7/22/2014														
General Location	ZONE II OUTWASH															ZONE II OUTWASH														
Geologic Unit	COLLUVIUM/ALLUVIUM															COLLUVIUM/ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**249**		50	U	**60**		**758**		**426**		**11900**		**13443**	**13800**		**274**		**132**		**195**		**369**		**695**		**11000**		**12665**	**13600**	
Antimony	0.1	U	0.1	U	0.1	U	**0.15**		**0.17**		**1.56**		**2.18**	**1.91**		0.1	U	0.1	U	0.1	U	0.1	U	**0.14**		**2.4**		**2.94**	**2.55**	
Arsenic	0.05	U	0.05	U	**0.497**		**6.79**		**3.82**		**18**		**29.2**	**34.1**		0.05	U	0.05	U	**0.201**		**1.23**		**1.86**		**19**		**22.4**	**29**	
Barium	**10.1**		**4.9**		**7.7**		**20.5**		**123**		**296**		**462**	**290**		**13.9**		**11**		**9.7**		**12.1**		**88.6**		**368**		**503**	**397**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.44**		**1.44**	**0.58**		0.2	U	0.2	U	0.2	U	0.2	U	**0.25**		**0.73**		**1.78**	**1.45**	
Bismuth	0.2	U	0.2	U	0.2	U	**0.39**		0.2	U	**4.35**		**5.54**	**5.47**		0.2	U	0.2	U	**0.29**		0.2	U	0.2	U	**3.11**		**4.20**	**4.29**	
Cadmium	**0.162**		0.05	U	0.05	U	0.05	U	0.05	U	**0.345**		**0.707**	**0.556**		**0.355**		**0.072**		0.05	U	0.05	U	0.05	U	**0.814**		**1.39**	**1.22**	
Calcium	**1700**		50	U	50	U	50	U	NT		**1760**		**3610**	**3010**		**800**		50	U	50	U	50	U	NT		**1170**		**2120**	**1930**	
Chromium	5	U	5	U	5	U	5	U	5	U	**24.7**		**49.7**	**32.1**		5	U	5	U	5	U	5	U	5	U	**19.9**		**44.9**	**27.8**	
Cobalt	**0.94**		0.1	U	**0.28**		**0.5**		**6.35**		**7.49**		**15.7**	**18.6**		**0.85**		**0.14**		**1.93**		**0.17**		**5.23**		**10.3**		**18.6**	**20.8**	
Copper	**6.91**		**0.82**		**4.22**		**3.7**		**0.96**		**59.6**		**76.2**	**81.1**		**5.05**		**3.99**		**8.1**		**2.93**		0.5	U	**71.8**		**92.4**	**92**	
Iron	**72**		**487**		**2340**		**2150**		**16200**		**22000**		**43249**	**47800**		50	U	50	U	**506**		**638**		**17100**		**28600**		**46944**	**50500**	
Lead	**4.04**		**2.19**		**1.22**		**9.22**		**9.18**		**612**		**638**	**667**		**102**		**81**		**53.3**		**27.2**		**2.26**		**576**		**842**	**844**	
Lithium	5	U	5	U	5	U	5	U	5	U	**18.1**		**43.1**	**21.1**		5	U	5	U	5	U	5	U	5	U	**17.4**		**42.4**	**20.5**	
Manganese	**17.6**		5	U	**5.7**		**17.6**		**177**		**172**		**395**	**462**		**19.2**		5	U	**36.9**		**8.7**		**74.8**		**188**		**333**	**360**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.85**		0.5	U	**3.35**	**1.66**		0.5	U	0.5	U	0.5	U	0.5	U	**0.87**		**0.53**		**3.40**	**1.66**	
Nickel	2	U	2	U	2	U	2	U	**4.2**		**19.6**		**31.8**	**28.8**		2	U	2	U	2	U	2	U	**9.6**		**24.1**		**41.7**	**37.1**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**842**		50	U	50	U	50	U	NT		NT		NT		150	**760**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2140**		100	U	NT		NT		NT		NT		NT		100	**1990**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.33**		**1.63**	**0.49**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.51**		**1.81**	**0.58**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**1.19**		**1.69**	**1.15**		0.1	U	0.1	U	0.1	U	**0.18**		0.1	U	**1.17**		**1.75**	**1.54**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**220**		100	U	NT		NT		NT		NT		NT		100	**100**	
Strontium	5	U	5	U	5	U	5	U	**8.9**		**21.8**		**50.7**	**29.7**		5	U	5	U	5	U	5	U	5	U	**20.8**		**45.8**	**26.3**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.739**		**2.94**	**0.925**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**1.03**		**3.23**	**1.17**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	**23.3**		**16.1**		**400**		**454**	**382**		5	U	5	U	5	U	5	U	**8**		**214**		**242**	**275**	
Uranium	**0.07**		**0.138**		**0.099**		**0.122**		**0.227**		**0.786**		**1.44**	**1.26**		0.05	U	**0.544**		**0.209**		**0.132**		**0.684**		**1.15**		**2.77**	**2.74**	
Vanadium	0.2	U	0.2	U	0.2	U	**2.47**		**9.76**		**28.2**		**41.0**	**41.7**		0.2	U	0.2	U	**0.42**		**0.74**		**9.41**		**24.7**		**35.7**	**37.1**	
Zinc	**48.5**		**2.3**		**2.6**		**18.7**		**169**		**563**		**804**	**822**		**84.7**		**7**		**11**		**16.6**		**355**		**890**		**1364**	**1380**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-107-TP004														
Sample ID	CH14-107-TP004-SOC														
Sample Interval (mbgs)	5.2 - 5.2														
Sample Date	7/22/2014														
General Location	ZONE II OUTWASH														
Geologic Unit	COLLUVIUM/ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**217**		**113**		**718**		**11000**		**12148**	**14000**	
Antimony	**0.1**		**0.1**		**0.1**		**0.1**		**0.12**		**0.92**		**1.44**	**1.66**	
Arsenic	0.05	U	0.05	U	**0.051**		**0.375**		**1.98**		**9.84**		**12.3**	**18.5**	
Barium	**7.5**		**7.7**		**3**		2	U	**28.3**		**145**		**194**	**112**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	**0.31**		**0.51**		**1.62**	**1.35**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**5.46**		**6.46**	**6.25**	
Cadmium	**0.291**		**1.08**		**0.292**		**0.155**		0.05	U	**0.964**		**2.83**	**3.75**	
Calcium	**476**		50	U	50	U	50	U	NT		**974**		**1600**	**1660**	
Chromium	5	U	5	U	5	U	5	U	5	U	**20.5**		**45.5**	**27.8**	
Cobalt	0.1	U	0.1	U	**20.6**		**0.83**		**26.9**		**7.46**		**56.0**	**90.1**	
Copper	0.5	U	**2.33**		**4.72**		**0.97**		0.5	U	**56.4**		**65.4**	**84.1**	
Iron	50	U	50	U	**227**		**101**		**13000**		**21700**		**35128**	**44300**	
Lead	0.5	U	**74.2**		**82.4**		**40.4**		**1.14**		**397**		**596**	**956**	
Lithium	5	U	5	U	5	U	5	U	5	U	**21.9**		**46.9**	**27**	
Manganese	5	U	**12.3**		**539**		**62.4**		**665**		**151**		**1435**	**2400**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**1.04**		0.5	U	**3.54**	**2.33**	
Nickel	2	U	2	U	2	U	2	U	**9.6**		**16.7**		**34.3**	**30.3**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		150	**637**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1640**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.33**		**1.63**	**0.5**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.68**		**1.18**	**1.61**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U
Strontium	5	U	5	U	5	U	5	U	5	U	**11.5**		**36.5**	**15.6**	
Thallium	0.05	U	0.05	U	**0.115**		**0.062**		2	U	**0.499**		**2.78**	**1.06**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	**6.8**		**209**		**236**	**286**	
Uranium	0.05	U	**0.103**		0.05	U	**0.055**		**0.639**		**0.857**		**1.75**	**1.86**	
Vanadium	0.2	U	0.2	U	0.2	U	0.2	U	**6.91**		**22**		**29.7**	**35.8**	
Zinc	**21.1**		**47.7**		**36.3**		**12**		**324**		**482**		**923**	**1140**	

Table 3-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:

Laboratory data has been validated by CH2M HILL prior to importing to EquIS. This summary table has been through QA/QC

The six individual extraction steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.

Bold indicates the analyte was detected

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
NT = not tested
PYRO - Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLY = Bound to crystalline oxide

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW003															CH12-014-MW003														
Sample ID	CH12-014-MW003_SOA															CH12-014-MW003_SOF														
Sample Interval (mbgs)																23.46 - 23.46														
Sample Date	7/29/2012															7/30/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.5%	U	**1.0%**		**2.8%**		**1.0%**		**1.0%**		**93.6%**		**83%**	**22600**		0.4%	U	**0.3%**		**2.7%**		**0.3%**		**1.0%**		**95.3%**		**109%**	**21700**	
Antimony	1.1%	U	**1.1%**		**50.8%**		**5.4%**		**4.3%**		**37.4%**		**73%**	**24.1**		20.0%	U	10.0%	U	**11.0%**		10.0%	U	10.0%	U	**39.0%**		**256%**	**0.39**	
Arsenic	0.1%	U	**0.1%**		**19.2%**		**7.7%**		**7.0%**		**66.0%**		**121%**	**163**		0.2%	U	**0.4%**		**11.1%**		**1.4%**		**10.3%**		**76.6%**	J	**469%**	**10.1**	
Barium	**3.2%**		**6.3%**		**10.2%**		**9.6%**		**3.9%**		**66.8%**		**188%**	**169**		**5.9%**		**7.6%**		**2.0%**		**1.8%**		**3.3%**		**79.5%**		**106%**	**202**	
Beryllium	18.8%	U	9.4%	U	**15.5%**		9.4%	U	9.4%	U	**37.6%**		**122%**	**1.74**		21.2%	U	10.6%	U	10.6%	U	10.6%	U	10.6%	U	**36.5%**		**217%**	**0.87**	
Bismuth	15.3%	U	7.7%	U	**40.6%**		7.7%	U	7.7%	U	**21.1%**		**104%**	**2.52**		20.1%	U	10.1%	U	10.1%	U	10.1%	U	10.1%	U	**39.7%**		**463%**	**0.43**	
Cadmium	**16.7%**		**20.1%**		**11.3%**		**5.8%**		0.4%	U	**45.6%**		**104%**	**11.5**		13.7%	U	**20.3%**		6.9%	U	**7.7%**		6.9%	U	**44.5%**		**249%**	**0.292**	
Calcium	**39.3%**		**1.2%**		0.9%	U	**4.4%**				**54.2%**		**116%**	**4910**		**7.4%**		**34.1%**		0.4%	U	**4.7%**				**53.4%**		**111%**	**10100**	
Chromium	13.0%	U	6.5%	U	6.5%	U	6.5%	U	6.5%	U	**60.9%**		**111%**	**69.3**		14.3%	U	7.2%	U	7.2%	U	7.2%	U	7.2%	U	**57.0%**		**166%**	**42.1**	
Cobalt	**0.6%**		**4.6%**		**21.1%**		**0.4%**		**5.2%**		**68.0%**		**107%**	**31.9**		**0.9%**		**5.6%**		**11.7%**		**0.6%**		**4.0%**		**77.2%**		**120%**	**21.6**	
Copper	0.2%	U	**9.1%**		**16.8%**		**1.4%**		**0.3%**		**72.2%**		**98%**	**485**		1.3%	U	**1.8%**		**8.4%**		**1.9%**		**1.5%**		**85.2%**		**150%**	**51.8**	J
Iron	0.1%	U	**0.3%**		**17.5%**		**0.5%**		**10.6%**		**71.0%**		**115%**	**70800**		0.2%	U	**0.3%**		**9.2%**		**0.2%**		**9.5%**		**80.6%**		**117%**	**41100**	
Lead	**0.6%**		**36.7%**		**4.6%**		**35.0%**		**0.4%**		**22.7%**		**58%**	**9580**		0.3%	U	**12.9%**		**9.5%**		**9.1%**		**0.6%**		**67.6%**		**205%**	**149**	
Lithium	15.8%	U	7.9%	U	7.9%	U	7.9%	U	7.9%	U	**52.5%**		**143%**	**44.2**		14.8%	U	7.4%	U	7.4%	U	7.4%	U	7.4%	U	**55.6%**		**173%**	**39**	
Manganese	**1.2%**		**5.8%**		**41.0%**		**1.5%**		**4.2%**		**46.4%**		**91%**	**1040**		**2.4%**		**16.3%**		**13.0%**		**1.3%**		**3.5%**		**63.5%**		**109%**	**379**	
Molybdenum	14.7%	U	7.3%	U	**9.1%**		7.3%	U	7.3%	U	**54.2%**		**125%**	**5.44**		24.7%	U	12.3%	U	12.3%	U	12.3%	U	12.3%	U	**25.9%**		**195%**	**2.08**	
Nickel	7.0%	U	**9.6%**		**18.2%**		3.5%	U	7.9%		**53.9%**		**86%**	**66.9**		7.2%	U	3.6%	U	**7.6%**		3.6%	U	**4.7%**		**73.2%**		**150%**	**36.8**	
Phosphorus														**577**															**618**	
Potassium	100.0%	U											5%	**3750**		100.0%	U											3%	**7390**	
Selenium	20.4%	U	10.2%	U	10.2%	U	10.2%	U	25.5%	U	**23.5%**		**198%**	**0.99**		20.2%	U	10.1%	U	10.1%	U	10.1%	U	25.3%	U	**24.2%**		**600%**	**0.33**	
Silver	2.4%	U	1.2%	U	1.2%	U	1.2%	U	1.2%	U	**92.8%**		**64%**	**13.1**		12.9%	U	6.5%	U	6.5%	U	6.5%	U	6.5%	U	**61.3%**		**298%**	**0.52**	
Sodium	100.0%	U											71%	280	U	100.0%	U											27%	730	U
Strontium	16.4%	U	8.2%	U	8.2%	U	8.2%	U	8.2%	U	**50.7%**		**129%**	**47.3**		13.0%	U	**9.2%**		6.5%	U	6.5%	U	6.5%	U	**58.4%**		**151%**	**51.2**	
Thallium	2.1%	U	**2.2%**		**2.7%**		**1.2%**		42.7%	U	**48.9%**		**134%**	**3.49**		3.0%	U	1.5%	U	1.5%	U	1.5%	U	59.2%	U	**33.4%**		**362%**	**0.934**	J
Tin	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	333%	**4.2**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U
Titanium	1.8%	U	0.9%	U	**1.1%**		**1.0%**		0.9%	U	**94.3%**		**148%**	**372**		0.9%	U	0.5%	U	**1.1%**		**0.5%**		**0.6%**		**96.4%**		**118%**	**916**	
Uranium	4.2%	U	**20.3%**		**23.1%**		2.1%	U	**4.8%**		**45.5%**		**79%**	**3.04**		7.0%	U	**22.2%**		**16.6%**		3.5%	U	**6.1%**		**44.5%**		**116%**	**1.22**	
Vanadium	0.8%	U	0.4%	U	**12.7%**		**0.8%**		**5.1%**		**80.2%**		**85%**	**57.2**		0.7%	U	0.4%	U	**5.0%**		0.4%	U	**3.5%**		**90.1%**		**98%**	**57.8**	
Zinc	**5.2%**		**27.5%**		**20.7%**		**0.8%**		**3.1%**		**42.6%**		**80%**	**9700**		0.4%	U	**7.0%**	**J**	**16.8%**		**1.0%**		11.0%	U	**63.8%**		**174%**	**262**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW003															CH12-014-MW005														
Sample ID	CH12-014-MW903_SOF															CH12-014-MW005_SOH														
Sample Interval (mbgs)	23.46 - 23.46															35 - 35.4														
Sample Date	7/30/2012															6/26/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.5%	U	**0.3%**		**3.2%**		**0.4%**		**1.1%**		**94.5%**		**99%**	**21600**		1.1%	U	**0.8%**		**12.4%**		**1.0%**		**4.2%**		**80.5%**		**105%**	**9070**	
Antimony	19.2%	U	9.6%	U	**12.5%**		9.6%	U	9.6%	U	**39.4%**		**306%**	**0.34**		2.9%	U	1.4%	U	**17.2%**		**1.9%**		**1.6%**		**75.1%**		**224%**	**3.12**	
Arsenic	0.4%	U	**0.7%**		**24.8%**		**2.2%**		**14.0%**		**57.8%**	J	**168%**	**16.6**		**0.0%**		**0.1%**		**13.0%**		**2.8%**		**4.8%**		**79.2%**		**376%**	**82.6**	
Barium	**6.4%**		**8.3%**		**2.3%**		**2.1%**		**4.2%**		**76.7%**		**106%**	**191**		**3.4%**		**6.3%**		**6.1%**		**5.3%**		**15.2%**		**63.7%**		**125%**	**195**	
Beryllium	21.7%	U	10.9%	U	10.9%	U	10.9%	U	10.9%	U	**34.8%**		**216%**	**0.85**		16.2%	U	**13.8%**		**22.3%**		8.1%	U	**9.3%**		**30.4%**		**119%**	**2.07**	
Bismuth	21.5%	U	10.8%	U	**11.8%**		10.8%	U	10.8%	U	**34.4%**		**278%**	**0.67**		11.0%	U	5.5%	U	**17.1%**		5.5%	U	5.5%	U	**55.4%**		**257%**	**1.41**	
Cadmium	15.3%	U	**15.0%**		**7.8%**		**9.4%**		7.7%	U	**44.8%**		**134%**	**0.488**	J	**60.9%**		**11.2%**		**3.4%**		**3.4%**		0.5%	U	**20.5%**		**83%**	**11.8**	
Calcium	**8.7%**		**37.3%**		0.4%	U	**4.8%**				**48.8%**		**118%**	**9750**		**56.9%**		**3.3%**		1.1%	U	**6.8%**				**32.0%**		**98%**	**4770**	
Chromium	14.8%	U	7.4%	U	7.4%	U	7.4%	U	7.4%	U	**55.6%**		**160%**	**42.1**		21.0%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**37.1%**		**178%**	**26.8**	
Cobalt	0.8%	U	**9.3%**		**16.8%**		**0.6%**		**3.9%**		**68.7%**		**106%**	**24.5**		**47.5%**		**4.4%**		**6.5%**		**0.6%**		**5.8%**		**35.2%**		**93%**	**42**	
Copper	1.1%	U	**1.9%**		**9.1%**		**1.6%**		**1.0%**		**85.2%**		**136%**	**65.4**		**1.9%**		**10.0%**		**21.8%**		**3.1%**		**0.4%**		**62.7%**		**133%**	**337**	
Iron	0.2%	U	**0.3%**		**10.9%**		**0.3%**		**9.7%**		**78.7%**		**112%**	**41700**		0.2%	U	**0.5%**		**22.7%**		**0.9%**		**21.1%**		**54.6%**		**81%**	**59100**	
Lead	0.3%	U	**13.1%**		**9.5%**		**7.9%**		**0.6%**		**68.6%**		**175%**	**187**		**11.8%**		**30.6%**		**8.3%**		**12.9%**		**0.4%**		**35.9%**		**113%**	**1410**	
Lithium	14.4%	U	7.2%	U	7.2%	U	7.2%	U	7.2%	U	**56.9%**		**176%**	**39.5**		23.1%	U	11.6%	U	11.6%	U	11.6%	U	11.6%	U	**30.6%**		**320%**	**13.5**	
Manganese	2.3%	U	**19.5%**		**15.5%**		**1.4%**		**2.8%**		**58.5%**		**105%**	**410**		**33.6%**		**1.5%**		**11.6%**		**1.6%**		**5.3%**		**46.3%**		**92%**	**479**	
Molybdenum	25.4%	U	12.7%	U	12.7%	U	12.7%	U	12.7%	U	**23.9%**		**283%**	**1.39**		26.8%	U	13.4%	U	13.4%	U	13.4%	U	13.4%	U	**19.6%**		**182%**	**2.05**	
Nickel	7.5%	U	3.8%	U	**10.8%**		3.8%	U	**5.5%**		**68.7%**		**129%**	**41.2**		**27.3%**		4.8%	U	**8.8%**		4.8%	U	**11.6%**		**42.8%**		**100%**	**42.1**	
Phosphorus														**693**															**446**	
Potassium	100.0%	U											3%	**7320**		100.0%	U											10%	**2080**	
Selenium	20.3%	U	10.2%	U	10.2%	U	10.2%	U	25.4%	U	**23.9%**		**448%**	**0.44**		21.3%	U	10.6%	U	10.6%	U	10.6%	U	26.6%	U	**20.2%**		**251%**	**0.75**	
Silver	14.3%	U	7.1%	U	7.1%	U	7.1%	U	7.1%	U	**57.1%**		**298%**	**0.47**		4.1%	U	2.1%	U	2.1%	U	2.1%	U	2.1%	U	**87.6%**		**145%**	**3.33**	
Sodium	100.0%	U											29%	680	U	100.0%	U											182%	**110**	
Strontium	13.2%	U	**10.7%**		6.6%	U	6.6%	U	6.6%	U	**56.2%**		**154%**	**49**		22.5%	U	11.3%	U	11.3%	U	11.3%	U	11.3%	U	**32.4%**		**190%**	**23.4**	
Thallium	3.0%	U	1.5%	U	1.5%	U	1.5%	U	60.2%	U	**32.2%**		**500%**	**0.664**		**3.9%**		**2.9%**		**1.9%**		**1.4%**		51.9%	U	**37.9%**		**226%**	**1.7**	
Tin	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U
Titanium	1.0%	U	0.5%	U	**1.3%**		0.5%	U	**0.8%**		**95.9%**		**103%**	**963**		3.5%	U	1.7%	U	**2.7%**		**1.9%**		1.7%	U	**88.5%**		**105%**	**276**	
Uranium	7.0%	U	**24.4%**		**17.8%**		3.5%	U	**5.7%**		**41.6%**		**109%**	**1.32**		2.8%	U	**38.1%**		**21.9%**		**2.6%**		**10.0%**		**24.6%**		**107%**	**3.32**	
Vanadium	0.8%	U	0.4%	U	**5.6%**		0.4%	U	**3.4%**		**89.4%**		**98%**	**54.2**		1.5%	U	0.7%	U	**20.4%**		**1.1%**		**16.8%**		**59.5%**		**95%**	**28.9**	
Zinc	0.5%	U	**4.5%**	J	**17.9%**		**1.0%**		12.6%	U	**63.4%**		**121%**	**326**		**44.2%**		**8.3%**		**10.1%**		**1.0%**		**2.3%**		**34.1%**		**100%**	**3330**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW005															CH12-014-MW007														
Sample ID	CH12-014-MW005_SOK															CH12-014-MW007_SOI														
Sample Interval (mbgs)	37.2 - 37.45															44.5 - 44.5														
Sample Date	6/27/2012															7/31/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.7%	U	0.3%	U	**2.9%**		**1.4%**		**2.1%**		**92.6%**		**154%**	**9530**		1.3%	U	**1.0%**		**4.5%**		**0.7%**		**0.9%**		**91.6%**		**60%**	**12600**	
Antimony	2.7%	U	1.3%	U	**28.2%**		**2.5%**		**2.0%**		**63.3%**		**77%**	**9.64**		1.1%	U	**2.1%**		**16.7%**		**2.8%**		**0.9%**		**76.4%**		**126%**	**13.9**	
Arsenic	0.1%	U	**0.1%**		**5.3%**		**1.8%**		**1.9%**		**90.8%**		**55%**	**306**		0.1%	U	**0.1%**		**8.4%**		**2.0%**		**1.1%**		**88.4%**		**163%**	**87.7**	
Barium	**2.5%**		**13.3%**		**12.6%**		**16.6%**		**23.1%**		**31.9%**		**1180%**	**17.5**		**5.2%**		**5.9%**		**8.5%**		**3.9%**		**15.4%**		**61.1%**		**185%**	**173**	
Beryllium	22.7%	U	11.4%	U	11.4%	U	11.4%	U	11.4%	U	**31.8%**		**244%**	**0.72**		27.2%	U	13.6%	U	13.6%	U	13.6%	U	13.6%	U	**18.4%**		**123%**	**1.2**	
Bismuth	21.3%	U	10.6%	U	**17.0%**		10.6%	U	10.6%	U	**29.8%**		**110%**	**1.71**		16.8%	U	8.4%	U	**10.9%**		8.4%	U	8.4%	U	**47.1%**		**65%**	**3.66**	
Cadmium	**10.7%**		**5.8%**		**1.0%**		**1.8%**		0.4%	U	**80.2%**		**68%**	**16.5**		**3.1%**		**5.9%**		**0.5%**		**0.7%**		0.3%	U	**89.7%**		**165%**	**11.9**	
Calcium	**61.6%**		**2.9%**		0.6%	U	**6.9%**				**27.9%**		**133%**	**6400**		**26.1%**		2.2%	U	2.2%	U	**15.2%**				**54.3%**		**34%**	**6650**	
Chromium	15.3%	U	7.7%	U	7.7%	U	7.7%	U	7.7%	U	**54.1%**		**219%**	**29.8**		9.7%	U	4.9%	U	4.9%	U	4.9%	U	4.9%	U	**70.9%**		**248%**	**41.5**	
Cobalt	**1.3%**		**0.9%**		**3.8%**		0.2%	U	**3.1%**		**90.6%**		**74%**	**83.6**		**3.5%**		**0.6%**		**2.8%**		**0.9%**		**1.5%**		**90.7%**		**166%**	**24**	
Copper	0.2%	U	**1.8%**		**5.7%**		**1.6%**		**0.2%**		**90.4%**		**71%**	**667**		0.3%	U	**0.2%**		**3.5%**		**1.4%**		**0.2%**		**94.5%**		**91%**	**346**	
Iron	0.1%	U	**0.0%**		**4.9%**		**0.2%**		**7.5%**		**87.2%**		**70%**	**201000**		**0.2%**		**0.2%**		**11.6%**		**0.5%**		**4.5%**		**83.0%**		**78%**	**75400**	
Lead	**12.1%**		**37.5%**		**3.4%**		**10.5%**		**0.0%**		**36.6%**		**64%**	**6430**		**14.2%**		**14.1%**		**2.9%**		**6.3%**		**0.0%**		**62.4%**		**186%**	**3850**	
Lithium	18.9%	U	9.5%	U	9.5%	U	9.5%	U	9.5%	U	**43.3%**		**375%**	**14.1**		25.1%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	**24.8%**		**199%**	**20.1**	
Manganese	**24.3%**		**5.8%**		**14.5%**		**1.6%**		**7.7%**		**46.2%**		**82%**	**611**		**8.9%**		2.1%	U	**11.6%**		2.1%	U	**3.6%**		**71.7%**		**55%**	**431**	
Molybdenum	22.2%	U	11.1%	U	11.1%	U	11.1%	U	11.1%	U	**33.5%**		**172%**	**2.62**		10.1%	U	5.0%	U	5.0%	U	5.0%	U	5.0%	U	**69.8%**		**213%**	**4.66**	
Nickel	8.7%	U	4.3%	U	**12.8%**		4.3%	U	**12.6%**		**57.3%**		**131%**	**35.1**		5.0%	U	2.5%	U	**4.5%**		2.5%	U	2.5%	U	**82.9%**		**157%**	**50.7**	
Phosphorus														**364**															**898**	
Potassium	100.0%	U											11%	**1900**		100.0%	U											7%	**2900**	
Selenium	17.9%	U	9.0%	U	9.0%	U	9.0%	U	22.4%	U	**32.7%**		**184%**	**1.21**		13.4%	U	6.7%	U	6.7%	U	6.7%	U	16.8%	U	**49.7%**		**301%**	**0.99**	
Silver	3.0%	U	1.5%	U	1.5%	U	1.5%	U	1.5%	U	**90.9%**		**101%**	**6.5**		1.4%	U	0.7%	U	0.7%	U	0.7%	U	0.7%	U	**95.9%**		**175%**	**8.41**	
Sodium	100.0%	U											105%	**190**		100.0%	U											143%	140	U
Strontium	19.4%	U	9.7%	U	9.7%	U	9.7%	U	9.7%	U	**41.7%**		**195%**	**26.4**		23.5%	U	11.8%	U	11.8%	U	11.8%	U	11.8%	U	**29.4%**		**147%**	**29**	
Thallium	2.6%	U	**1.5%**		1.3%	U	1.3%	U	52.3%	U	**41.0%**		**204%**	**1.88**		1.9%	U	**1.0%**		**1.6%**		1.0%	U	38.8%	U	**55.7%**		**144%**	**3.58**	
Tin	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**14.3%**		**412%**	**3.4**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U
Titanium	2.1%	U	1.1%	U	**1.5%**		**1.1%**		**1.3%**		**92.9%**		**162%**	**294**		4.9%	U	2.5%	U	2.5%	U	2.5%	U	2.5%	U	**85.2%**		**75%**	**269**	
Uranium	5.9%	U	**21.5%**		**15.0%**		3.0%	U	**11.0%**		**43.6%**		**118%**	**1.43**		4.3%	U	**9.9%**		**13.5%**		2.2%	U	**4.3%**		**65.8%**		**82%**	**2.83**	
Vanadium	1.0%	U	0.5%	U	**10.6%**		**1.0%**		**10.4%**		**76.4%**		**139%**	**28.8**		2.0%	U	1.0%	U	**16.4%**		1.0%	U	**4.9%**		**74.7%**		**51%**	**39.4**	
Zinc	**1.8%**		**2.1%**		**7.1%**		**0.5%**		**2.0%**		**86.4%**		**64%**	**12200**		**1.2%**		**0.4%**		**1.4%**		**0.2%**		0.4%	U	**96.4%**		**185%**	**7220**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW007															CH14-015-MW004														
Sample ID	CH12-014-MW007_SOJ															CH14_015_MW004_Soa														
Sample Interval (mbgs)	47.85 - 47.85															0.76 - 1.37														
Sample Date	8/1/2012															8/10/2014														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.6%	U	**0.4%**		**1.8%**		**0.4%**		**1.6%**		**95.3%**		**119%**	**15200**		0.6%	U	0.3%	U	**2%**		**0.3%**		**1%**		**85%**		**92%**	**10200**	
Antimony	16.5%	U	8.3%	U	**10.7%**		8.3%	U	8.3%	U	**47.9%**		**209%**	**0.58**		19%	U	10%	U	**15%**		10%	U	10%	U	**16%**		**86%**	**1.32**	J
Arsenic	0.7%	U	0.3%	U	**5.8%**		**1.7%**		**5.7%**		**85.8%**		**248%**	**6.07**		0.3%	U	**1%**		**11%**		**1%**	J	**1%**		**32%**		**67%**	**20.5**	J
Barium	**11.8%**		**18.5%**		**6.3%**		**4.5%**		**6.9%**		**52.1%**		**105%**	**181**		**6%**		**9%**		**1%**		**3%**		**1%**	J	**16%**		**58%**	**267**	
Beryllium	23.1%	U	11.6%	U	11.6%	U	11.6%	U	11.6%	U	**30.6%**		**211%**	**0.82**		17%	U	9%	U	**9%**		9%	U	**9%**		**9%**		**326%**	**1.64**	
Bismuth	21.3%	U	10.6%	U	10.6%	U	10.6%	U	10.6%	U	**36.2%**		**131%**	**1.44**		7%	U	**4%**		**4%**		4%	U	4%	U	**4%**	J	**667%**	**1.4**	J
Cadmium	**13.2%**		**12.8%**		2.4%	U	**3.5%**		2.4%	U	**65.6%**		**50%**	**4.08**		8%	U	**6%**		**4%**		**4%**		4%	U	**14%**		**103%**	**0.848**	J
Calcium	**16.5%**		**19.1%**		2.2%	U	**14.4%**		#VALUE!		**47.8%**		**100%**	**2290**		**20%**		**454%**		1%	U	**7%**				**221%**		**144%**	**3540**	
Chromium	2.9%	U	1.4%	U	1.4%	U	1.4%	U	1.4%	U	**91.3%**		**1157%**	**29.9**		18%	U	9%	U	9%	U	9%	U	9%	U	**54%**		**168%**	**28.4**	
Cobalt	**5.2%**		**6.3%**		**5.5%**		0.8%	U	**5.8%**		**76.4%**		**109%**	**11.3**		0.8%	U	**6%**		**4%**		0.4%	U	**1%**		**35%**		**80%**	**23.9**	
Copper	2.5%	U	1.3%	U	**8.8%**		**1.6%**		**2.0%**		**83.8%**		**73%**	**54.7**		1%	U	**1%**		**4%**		**1%**		1%	U	**22%**	J	**70%**	**67.2**	
Iron	0.3%	U	**0.2%**		**4.9%**		**0.2%**		**15.8%**		**78.7%**		**97%**	**36200**		0.1%	U	**0.8%**		**5%**		**0.1%**		**1%**		**38%**		**91%**	**67000**	
Lead	0.2%	U	**15.9%**		**5.0%**		**3.6%**		**0.5%**		**74.8%**		**144%**	**309**		0.1%	U	**1%**		**0%**		**1%**		**0.1%**		**1%**	J	**48%**	**312**	
Lithium	14.4%	U	7.2%	U	7.2%	U	7.2%	U	7.2%	U	**56.8%**		**218%**	**31.8**		19%	U	10%	U	10%	U	10%	U	10%	U	**55%**		**191%**	**21.6**	
Manganese	**12.2%**		**6.5%**		**4.4%**		1.7%	U	**3.0%**		**72.2%**		**99%**	**298**		1.0%	U	**18%**		**4%**		**1%**		**1%**		**22%**		**99%**	**941**	
Molybdenum	8.2%	U	4.1%	U	4.1%	U	4.1%	U	4.1%	U	**75.4%**		**858%**	**1.42**		33%	U	17%	U	18%	U	17%	U	17%	U	32%	U	237%	**0.69**	
Nickel	2.4%	U	1.2%	U	**2.6%**		1.2%	U	**1.4%**		**91.1%**		**733%**	**22.6**		7%	U	**4%**		**7%**		4%	U	**4%**		**45%**		**93%**	**45.6**	
Phosphorus														**433**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**535**	
Potassium	100.0%	U											5%	**4390**		**200%**												**17%**	**2460**	
Selenium	23.4%	U	11.7%	U	11.7%	U	11.7%	U	29.2%	U	**12.3%**		**611%**	**0.28**		19%	U	10%	U	10%	U	10%	U	24%	U	**14%**		**667%**	**0.26**	
Silver	11.5%	U	5.7%	U	5.7%	U	5.7%	U	5.7%	U	**65.5%**		**311%**	**0.56**		7%	U	3%	U	3%	U	3%	U	3%	U	**3%**	J	**304%**	**1.01**	
Sodium	100.0%	U											125%	160	U	200%	U											182%	100	U
Strontium	27.9%	U	14.0%	U	14.0%	U	14.0%	U	14.0%	U	**16.2%**		**331%**	**10.8**		27%	U	156%	U	14%	U	17%	U	14%	U	**73%**		**153%**	**16.8**	
Thallium	3.6%	U	1.8%	U	1.8%	U	1.8%	U	72.4%	U	**18.6%**		**659%**	**0.419**		3%	U	1%	U	**1%**		1%	U	57%	U	**4%**		**1652%**	**1.23**	
Tin	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U	33%	U	17%	U	17%	U	17%	U	17%	U	17%	U	700%	2	U
Titanium	1.5%	U	0.7%	U	**0.9%**		0.7%	U	0.7%	U	**95.4%**		**90%**	**758**		3%	U	1%	U	1%	U	1%	U	1%	U	**71%**		**142%**	**147**	
Uranium	10.2%	U	**13.5%**		**12.8%**		5.1%	U	**16.4%**		**42.0%**		**96%**	**1.03**		8%	U	**13%**		**14%**		4%	U	**4%**		**55%**		**87%**	**1.01**	
Vanadium	1.0%	U	0.5%	U	**2.9%**		0.5%	U	**3.7%**		**91.4%**		**107%**	**37.3**		1.0%	U	0.5%	U	**4%**		0.5%	U	**1%**		**55%**		**75%**	**33**	
Zinc	**6.4%**		**15.8%**		**8.6%**		**0.7%**		**5.1%**		**63.4%**		**62%**	**2240**		0.6%	U	**1%**		**3%**		**0%**		**15%**		**21%**		**106%**	**355**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW004															CH14-015-MW004													
Sample ID	CH14_015_MW904_Soa															CH14_015_MW004_Sod													
Sample Interval (mbgs)	0.76 - 1.37															5.18 - 5.49													
Sample Date	8/10/2014															8/10/2014													
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	T
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result
Aluminum	0.7%	U	0.3%	U	**2%**		**0.3%**		**1%**		**92%**		**102%**	**10200**		0.5%	U	0.3%	U	**3%**		**0%**		**2%**		**82%**		**111%**	**10300**
Antimony	20%	U	10%	U	**27%**		10%	U	10%	U	**24%**		**194%**	**0.74**	J	25%	U	13%	U	**28%**		13%	U	13%	U	**28%**		**157%**	**0.44**
Arsenic	0.2%	U	**0.7%**		**48%**		**2%**	J	**4%**		**44%**		**126%**	**36**	J	0.6%	U	0.7%	U	**35%**		**3%**		**11%**		**304%**		**480%**	**17.5**
Barium	**9%**		**15%**		**2%**		**5%**		**3%**	J	**31%**		**95%**	**224**		**12%**		**15%**		**3%**		**3%**		**3%**		**31%**		**101%**	**218**
Beryllium	19%	U	9%	U	**9%**		9%	U	**9%**		**13%**		**306%**	**1.57**		15%	U	7%	U	**7%**		7%	U	**7%**		**10%**		**302%**	**2.04**
Bismuth	19%	U	10%	U	**10%**		10%	U	10%	U	**10%**	J	**700%**	**6.7**	J	17%	U	**9%**		**9%**		9%	U	9%	U	**9%**		**609%**	**1.16**
Cadmium	9%	U	**8%**		**5%**		**5%**		5%	U	**6%**		**223%**	**2.04**	J	**6%**		**9%**		**3%**		**3%**		3%	U	**7%**		**149%**	**1.36**
Calcium	**27%**		**193%**		1%	U	**8%**				**360%**		**83%**	**3710**		**38%**		222%	U	1%	U	**8%**				**72%**		**78%**	**2980**
Chromium	19%	U	9%	U	9%	U	9%	U	9%	U	**231%**		**133%**	**27.7**		18%	U	9%	U	9%	U	9%	U	9%	U	**76%**		**171%**	**30**
Cobalt	0.7%	U	**15%**		**14%**		0.4%	U	**3%**		**1%**		**54%**	**26.6**		**1%**		**6%**		**11%**		0.5%	U	**5%**		**30%**		**99%**	**25.5**
Copper	2%	U	**3%**		**14%**		**1%**		1%	U	**20%**	J	**106%**	**112**		2%	U	**4%**		**18%**		**1%**		1%	U	**19%**		**94%**	**110**
Iron	0.2%	U	**0.6%**		**8%**		**0.1%**		**2%**		**41%**		**95%**	**68300**		0.2%	U	**0%**		**5%**		**0%**		**4%**		**33%**		**102%**	**67000**
Lead	0.3%	U	**1%**		**0%**		**1%**		**0.1%**		**1%**	J	**99%**	**278**		0.3%	U	**1%**		**1%**		**1%**		**0.2%**		**2%**		**88%**	**254**
Lithium	21%	U	10%	U	10%	U	10%	U	10%	U	**48%**		**202%**	**22.4**		21%	U	10%	U	10%	U	10%	U	10%	U	**60%**		**223%**	**19**
Manganese	1%	U	**11%**		**5%**		**1%**		**2%**		**34%**		**94%**	**984**		**1%**		**14%**		**5%**		**1%**		**2%**		**25%**		**97%**	**867**
Molybdenum	33%	U	17%	U	19%	U	17%	U	17%	U	21%	U	252%	**0.65**		33%	U	17%	U	17%	U	17%	U	17%	U	17%	U	327%	**1.03**
Nickel	8%	U	**17%**		**55%**		4%	U	**12%**		**131%**		**110%**	**50.8**		8%	U	4%	U	**14%**		4%	U	**8%**		**49%**		**112%**	**49.6**
Phosphorus	#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**577**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**465**
Potassium	**182%**												**19%**	**2390**		**182%**												**12%**	**3370**
Selenium	27%	U	13%	U	13%	U	13%	U	33%	U	13%	U	531%	**0.42**		25%	U	13%	U	13%	U	13%	U	32%	U	**15%**		**422%**	**0.34**
Silver	13%	U	6%	U	6%	U	6%	U	6%	U	**6%**	J	**636%**	**1.53**		17%	U	9%	U	9%	U	9%	U	9%	U	**9%**		**473%**	**0.92**
Sodium	200%	U											143%	100	U	200%	U										105%	100
Strontium	28%	U	58%	U	14%	U	21%	U	14%	U	**127%**		**103%**	**16**		30%	U	74%	U	15%	U	15%	U	15%	U	**48%**		**119%**	**13.4**
Thallium	3%	U	1%	U	**1%**		1%	U	58%	U	**5%**		**2182%**	**1.05**		3%	U	1%	U	1%	U	1%	U	55%	U	**5%**		**1970%**	**1.23**
Tin	33%	U	17%	U	17%	U	17%	U	17%	U	17%	U	700%	2	U	33%	U	17%	U	17%	U	17%	U	17%	U	17%	U	700%	2
Titanium	3%	U	1%	U	2%	U	1%	U	1%	U	**60%**		**121%**	**159**		2%	U	1%	U	2%	U	1%	U	1%	U	**78%**		**113%**	**250**
Uranium	9%	U	**24%**		**37%**		4%	U	**5%**		**57%**		**103%**	**0.982**		8%	U	**18%**		**16%**		4%	U	**7%**		**53%**		**111%**	**1.01**
Vanadium	1%	U	1%	U	**10%**		1%	U	**2%**		**80%**		**94%**	**32.8**		0.9%	U	0.4%	U	**7%**		**1%**		**3%**		**66%**		**101%**	**38.8**
Zinc	0.6%	U	**1%**		**5%**		**0%**		**16%**		**15%**		**169%**	**437**		**0%**		**0%**		**2%**		**0%**		**6%**		**8%**		**167%**	**634**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID		CH14-015-MW004															CH14-015-MW004												
Sample ID		CH14_015_MW004_Sof															CH14_015_MW904_Sof												
Sample Interval (mbgs)		8.23 - 8.53															8.23 - 8.53												
Sample Date		8/10/2014															8/10/2014												
Analyte	otal	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total
(Percentage, %)	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	
Aluminum		**3%**		2%	U	**15%**		**4%**		**10%**		**438%**		**171%**	**3300**		**3%**		1%	U	**8%**		**1%**		**3%**		**386%**		**79%**
Antimony		0.8%	U	0.4%	U	**1%**		**0%**		**1%**	J	**2%**		**154%**	**31.2**		0.8%	U	0.4%	U	**0%**		**0%**		**0%**	J	**0%**		**92%**
Arsenic		0.4%	U	0.4%	U	**20%**		**5%**		**22%**		**26%**		**148%**	**40.4**		0.4%	U	0.4%	U	**9%**		**1%**		**4%**		**8%**		**43%**
Barium		14%	U	**13%**		**3%**		**4%**		**7%**		**43%**		**216%**	**64.4**		5%	U	**5%**		**1%**		**3%**		**1%**		**16%**		**58%**
Beryllium		32%	U	16%	U	16%	U	16%	U	16%	U	**21%**		**490%**	**0.43**		32%	U	16%	U	16%	U	16%	U	16%	U	**17%**		**309%**
Bismuth		7%	U	3%	U	**3%**		3%	U	3%	U	**3%**		**171%**	**6**		6%	U	3%	U	**3%**		3%	U	3%	U	**3%**		**700%**
Cadmium		**2%**		**2%**		1%	U	1%	U	1%	U	**3%**		**214%**	**4.5**	**J**	**1%**		**1%**		1%	U	1%	U	1%	U	**1%**		**100%**
Calcium		**38%**		94%	U	1%	U	21%	U			**54%**		**89%**	**3460**		**27%**		1210%	U	2%	U	8%	U			**1183%**		**178%**
Chromium		30%	U	15%	U	15%	U	15%	U	**15%**		**147%**		**248%**	**16.4**		30%	U	15%	U	15%	U	15%	U	**15%**		**67%**		**80%**
Cobalt		**0%**		**1.8%**		**7.7%**		0.2%	U	**4%**		**15%**	J	**152%**	**26.2**		**1%**		**1%**		**6%**		0.4%	U	**3%**		**29%**	J	**75%**
Copper		**0%**	J	**0.1%**	J	**1%**	J	**0%**	J	0.1%	U	**4%**		**139%**	**459**		**0%**	J	**0.1%**	J	**0%**	J	**0%**	J	0.1%	U	**1%**		**50%**
Iron		**0%**		**0.0%**		**1%**		**0.3%**		**4%**		**15%**		**140%**	**145000**		**0%**		**0.6%**		**2%**		**0%**		**1%**		**18%**		**83%**
Lead		**0%**		**0%**		**0%**		**0.2%**	J	**0.0%**		**0%**		**165%**	**13200**		**0%**		**0%**		**0%**		**0%**	J	**0.0%**		**0%**		**54%**
Lithium		33%	U	17%	U	17%	U	17%	U	17%	U	86%	U	289%	5	U	33%	U	17%	U	17%	U	17%	U	17%	U	90%	U	174%
Manganese		**7%**		50%	U	110%	U	7%	U	**20%**		**141%**		**151%**	**109**		**6%**		159%	U	29%	U	5%	U	**9%**		**259%**		**132%**
Molybdenum		7%	U	3%	U	3%	U	3%	U	4%	U	**3%**		**377%**	**8.27**	**J**	4%	U	2%	U	2%	U	2%	U	2%	U	**2%**		**310%**
Nickel		**20%**		10%	U	17%	U	10%	U	34%	U	**161%**		**169%**	**13**		**19%**		9%	U	17%	U	9%	U	9%	U	**84%**		**71%**
Phosphorus		#VALUE!	U	#VALUE!	U	#VALUE!	U							**#VALUE!**	**406**		#VALUE!	U	#VALUE!	U	#VALUE!	U							#VALUE!
Potassium		200%	U											**24%**	**1190**		200%	U											19%
Selenium		16%	U	8%	U	8%	U	8%	U	20%	U	**8%**		**850%**	**1.8**		16%	U	8%	U	8%	U	8%	U	20%	U	**8%**		**486%**
Silver		1%	U	1%	U	1%	U	1%	U	1%	U	**1%**		**456%**	**26.5**		1%	U	1%	U	1%	U	1%	U	1%	U	**1%**		**467%**
Sodium	U	200%	U											200%	**190**		200%	U											200%
Strontium		30%	U	**31%**		15%	U	15%	U	15%	U	**39%**		**153%**	**29.7**	**J**	30%	U	**263%**		15%	U	34%	U	15%	U	**39%**		**103%**
Thallium		**0%**		**0.2%**		**0%**		**0%**		8%	U	**1%**		**2237%**	**24.6**		**0%**		**0.2%**		**0%**		**0%**		9%	U	**1%**		**1581%**
Tin	U	31%	U	16%	U	16%	U	16%	U	16%	U	**16%**		**700%**	4		31%	U	16%	U	16%	U	16%	U	16%	U	**16%**		**700%**
Titanium		30%	U	15%	U	26%	U	15%	U	17%	U	**1033%**		**182%**	**14.2**	**J**	26%	U	13%	U	13%	U	13%	U	13%	U	**505%**		**120%**
Uranium		**6%**		9%	U	8%	U	3%	U	**11%**		**27%**		**128%**	**1.39**		**6%**		8%	U	10%	U	3%	U	**3%**		**19%**		**70%**
Vanadium		1%	U	1%	U	**6%**		1%	U	**10%**		**94%**		**143%**	**32.5**		1%	U	1%	U	**4%**		1%	U	**1%**		**54%**		**58%**
Zinc		**0%**		**0%**		**0%**		**0.1%**		**1%**		**2%**		**175%**	**4110**		**0%**		**0%**		**0%**		**0%**		1%	U	**1%**		**109%**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID			CH14-015-MW004															CH14-015-MW004											
Sample ID			CH14_015_MW004_Soi															CH14_015_MW004_Sol											
Sample Interval (mbgs)			12.8 - 13.11															17.68 - 17.98											
Sample Date			8/10/2014															8/10/2014											
Analyte	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**3100**		0.5%	U	**0%**		**1%**		**0.3%**		**0.5%**		**75%**		**89%**	**12700**		1.8%	U	1%	U	**1%**		1%	U	**1%**		**48%**	
Antimony	**26.8**		32%	U	16%	U	**16%**		16%	U	16%	U	19%	U	**109%**	**0.3**		2%	U	2%	U	**66%**		11%	U	**16%**		**505%**	
Arsenic	**28**		1.0%	U	**1%**		**19%**		**2%**		**8%**		**17%**		**37%**	**9.18**		0.3%	U	0.6%	U	**34%**		**37%**		**42%**		**3620%**	
Barium	**59.6**		**8%**		**6%**		**2%**		**5%**		**2%**		**39%**		**84%**	**153**		**4%**		**4%**		**25%**		**34%**		**121%**		**6%**	
Beryllium	**0.44**		15%	U	8%	U	**8%**		8%	U	8%	U	**11%**		**313%**	**1.8**		22%	U	11%	U	11%	U	11%	U	11%	U	**22%**	
Bismuth	**5.27**		30%	U	15%	U	15%	U	15%	U	15%	U	**15%**		**700%**	**0.84**		6%	U	**3%**		**4%**		3%	U	3%	U	**74%**	
Cadmium	**7.86**	J	**2%**		**1%**		**1%**		**1%**		1%	U	**1%**		**161%**	**6.54**		**11%**		**10%**		**2%**		**4%**		1%	U	**438%**	
Calcium	**3050**		**17%**		**823%**		1%	U	**5%**				**860%**		**195%**	**4250**		**52%**		**24%**		1%	U	**24%**				**262%**	
Chromium	**16.7**		17%	U	9%	U	9%	U	9%	U	9%	U	**99%**		**175%**	**27.5**		27%	U	14%	U	14%	U	14%	U	14%	U	**27%**	
Cobalt	**34.8**		**1%**		**1%**		**5%**		**0%**		**2%**		**33%**		**84%**	**27.4**		**5%**		**1%**		**3%**		2.0%	U	**1%**		**548%**	
Copper	**703**		**2%**		**2%**		**7%**		**1%**		1%	U	**28%**		**72%**	**36.1**		0.2%	U	**0%**		**2%**		**1%**		0.1%	U	**390%**	
Iron	**165000**		0.2%	U	**2%**		**5%**		**0.1%**		**2%**		**44%**		**92%**	**54500**		0.5%	U	**0.6%**		**13%**		**1.1%**		**12%**		**197%**	
Lead	**12800**		**1%**		**2%**		**0%**		**1%**		**0.3%**		**4%**		**47%**	**150**		**9%**		**36%**		**3%**		**24%**		**0.1%**		**383%**	
Lithium	5	U	18%	U	9%	U	9%	U	9%	U	9%	U	**41%**		187%	**27.8**		31%	U	15%	U	15%	U	15%	U	15%	U	**31%**	
Manganese	**124**		**1%**		**25%**		**4%**		**1%**		**1%**		**45%**		**148%**	**900**		**46%**		**46%**		**127%**		**10%**		**19%**		**1475%**	
Molybdenum	**28.8**	J	29%	U	14%	U	14%	U	14%	U	14%	U	**14%**		**215%**	**1.17**		12%	U	6%	U	6%	U	6%	U	6%	U	**30%**	
Nickel	**17.4**		**7%**		**4%**		**8%**		4%	U	**4%**		**79%**		**117%**	**47.9**		11%	U	5%	U	**5%**		5%	U	**5%**		**42%**	
Phosphorus	**381**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**559**		#VALUE!	U	#VALUE!	U	#VALUE!	U						
Potassium	**1150**		**154%**												**18%**	**2560**		**111%**											
Selenium	**1.46**		27%	U	13%	U	13%	U	13%	U	33%	U	13%	U	447%	**0.23**		15%	U	8%	U	8%	U	8%	U	19%	U	**94%**	
Silver	**20.3**		22%	U	11%	U	11%	U	11%	U	11%	U	**11%**		**636%**	**0.45**		1%	U	1%	U	1%	U	1%	U	1%	U	**296%**	
Sodium	**110**		200%	U											182%	100	U	200%	U										
Strontium	**14.6**	J	32%	U	258%	U	16%	U	40%	U	16%	U	**369%**		**200%**	**10.7**		**24%**		**61%**		12%	U	28%	U	18%	U	**233%**	
Thallium	**21.1**		3%	U	2%	U	2%	U	2%	U	68%	U	**4%**		**275%**	**0.567**		**2%**		**3%**		**2%**		**4%**		32%	U	**226%**	
Tin	**3.6**		33%	U	17%	U	17%	U	17%	U	17%	U	17%	U	700%	2	U	33%	U	17%	U	17%	U	17%	U	17%	U	33%	U
Titanium	**7**	J	2%	U	1%	U	1%	U	1%	U	1%	U	**18%**		**67%**	**266**		20%	U	10%	U	10%	U	10%	U	10%	U	**31%**	
Uranium	**1.43**		9%	U	**10%**		**12%**		4%	U	4%	U	**22%**		**54%**	**1.2**		3%	U	**2%**		**2%**		**1%**		**1%**		**20%**	
Vanadium	**29.9**		1%	U	1%	U	**4%**		1%	U	**1%**		**47%**		**68%**	**27.2**		2%	U	1%	U	**2%**		1%	U	**1%**		**35%**	
Zinc	**5760**		**0%**		**0%**		**0%**		**0%**		3%	U	**3%**		**113%**	**1580**		**4%**		**4%**		**11%**		**1.0%**		**1%**		**492%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-015-MW004															CH14-015-MW004											
Sample ID				CH14_015_MW004_Som															CH14_015_MW004_Sop											
Sample Interval (mbgs)				20.12 - 20.42															28.35 - 28.65											
Sample Date				8/10/2014															8/11/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**95%**	**5730**		0.8%	U	0.4%	U	**5%**		**2%**		**3%**		**107%**		**113%**	**5510**		0.2%	U	**0.2%**		**1%**		0.2%	U	**1.6%**		**60%**	
Antimony	**90%**	**10.2**		9%	U	46%	U	**185%**		15%	U	**10%**		**459%**		**41%**	**1.71**		17%	U	17%	U	17%	U	17%	U	32%	U	23%	U
Arsenic	**224%**	**31**		0.7%	U	**3.4%**		**160%**		**27%**		**43%**		**531%**		**57%**	**15.1**		0.1%	U	**0.1%**		**5%**		**2%**		**9%**		**6%**	
Barium	**10837%**	**145**		**11%**		**22%**		**10%**		**16%**		**3%**		**59%**		**1134%**	**275**		**13%**		**13%**		**5%**		**5%**		**7%**		**81%**	
Beryllium	**800%**	**1.42**		19%	U	10%	U	**10%**		10%	U	10%	U	**13%**		**332%**	**1.26**		10%	U	10%	U	**10%**		10%	U	10%	U	**20%**	
Bismuth	**117%**	**2.91**		20%	U	10%	U	**10%**		10%	U	10%	U	**11%**		**271%**	**1.28**		15%	U	15%	U	15%	U	15%	U	15%	U	**15%**	
Cadmium	**95%**	**7.79**		162%	U	**245%**		22%	U	**31%**		5%	U	**539%**		**38%**	**0.944**		17%	U	38%	U	17%	U	17%	U	17%	U	32%	U
Calcium	**135%**	**5540**		**25%**		**15%**		1%	U	**9%**				**20%**		**88%**	**6060**		**31%**		**292%**		1%	U	**25%**				**82%**	
Chromium	**418%**	**19.4**		24%	U	12%	U	13%	U	12%	U	12%	U	**178%**		**141%**	**15.9**		7%	U	7%	U	7%	U	7%	U	7%	U	**51%**	
Cobalt	**96%**	**44.9**		7.1%	U	**18%**		**36%**		**2%**		**9%**		**61%**		**72%**	**21.6**		**0%**		**8%**		**14%**		**0%**		**9%**		**31%**	
Copper	**76%**	**367**		0.8%	U	**53%**		**57%**		**5%**		0.7%	U	**278%**		**96%**	**81.9**		2%	U	2%	U	**8%**		**5%**		10%	U	**97%**	
Iron	**94%**	**86800**		0.2%	U	**0%**		**9%**		**0.8%**		**7%**		**58%**		**72%**	**53500**		0.1%	U	**0%**		**2%**		**1%**		**14%**		**33%**	
Lead	**204%**	**4770**		**2.6%**		**145%**		**11%**		**40%**		**0.3%**		**146%**		**33%**	**906**		1%	U	**30%**		**19%**		**28%**		8%	U	**89%**	
Lithium	**800%**	**8.7**		25%	U	13%	U	13%	U	13%	U	13%	U	**56%**		**273%**	**8.6**		7%	U	7%	U	7%	U	7%	U	7%	U	**36%**	
Manganese	**99%**	**630**		9%	U	**14%**		**16%**		**2%**		**3%**		**27%**		**119%**	**807**		1%	U	**18%**		**#VALUE!**		**1%**		**7%**		**26%**	
Molybdenum	**272%**	**4.03**		28%	U	14%	U	14%	U	14%	U	14%	U	**25%**		**141%**	**1.11**		17%	U	17%	U	17%	U	17%	U	32%	U	17%	U
Nickel	**131%**	**33.5**		11%	U	6%	U	**24%**		5%	U	**17%**		**128%**		**91%**	**29.7**		4%	U	4%	U	**6%**		4%	U	**22%**		**47%**	
Phosphorus	**#VALUE!**	**648**		#VALUE!	U	#VALUE!	U	#VALUE!	U							#VALUE!	**427**		30%	U	30%	U	**122%**							
Potassium	**111%**	**1730**		**154%**												**28%**	**1710**		**67%**											
Selenium	**131%**	**0.98**		26%	U	13%	U	13%	U	13%	U	32%	U	**13%**		**447%**	**0.47**		13%	U	13%	U	13%	U	13%	U	33%	U	13%	U
Silver	**97%**	**9**		5%	U	2%	U	2%	U	2%	U	2%	U	**139%**		**42%**	**1.93**		15%	U	15%	U	15%	U	15%	U	15%	U	**28%**	
Sodium	200%	100	U	200%	U											200%	100	U	100%	U										
Strontium	**172%**	**26.8**		24%	U	12%		12%	U	12%	U	12%	U	**34%**		**122%**	**22.2**		16%	U	98%	U	16%	U	16%	U	16%	U	**99%**	
Thallium	**114%**	**2.5**		3%	U	3%	U	**3%**		2%	U	56%	U	**45%**		**64%**	**0.992**		2%	U	2%	U	2%	U	2%	U	79%	U	**12%**	
Tin	640%	2	U	33%	U	17%	U	17%	U	17%	U	17%	U	17%	U	700%	2	U	17%	U	17%	U	17%	U	17%	U	17%	U	17%	U
Titanium	**354%**	**36.1**		4%	U	2%	U	9%	U	4%	U	2%	U	**109%**		**151%**	**45.5**		1%	U	1%	U	1%	U	1%	U	1%	U	**61%**	
Uranium	**140%**	**3.05**		10%	U	**20%**		**14%**		5%	U	**9%**		**46%**		**92%**	**0.741**		5%	U	**6%**		**9%**		5%	U	18%	U	**53%**	
Vanadium	**99%**	**27.3**		1%	U	1%	U	**16%**		**2%**		**7%**		**79%**		**111%**	**27.8**		0.5%	U	0.5%	U	**3%**		0.5%	U	**12%**		**68%**	
Zinc	**86%**	**4660**		14.3%	U	**47%**		**37%**		**2%**		**10%**		**606%**		**33%**	**499**		1%	U	**1%**		**3%**		3%	U	40%	U	**46%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-015-MW006															CH14-015-MW006											
Sample ID				CH14_015_MW006_Sob															CH14_015_MW006_Soc											
Sample Interval (mbgs)				3.35 - 3.66															7.62 - 7.92											
Sample Date				8/14/2014															8/15/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**100%**	**18900**		0.3%	U	**0.3%**		**1%**		**0%**		**0%**		**164%**		**103%**	**17200**		0.3%	U	**0.3%**		**1%**		0.3%	U	**2.2%**		**108%**	
Antimony	114%	**0.18**		4%	U	**4%**		**6%**		4%	U	**4%**		**19%**		**161%**	**3.65**		12%	U	12%	U	**12%**		12%	U	24%	U	**29%**	
Arsenic	**77%**	**34.9**		0.4%	U	**1%**		**12%**		**1%**		**4%**		**87%**		**93%**	**19.9**		0.1%	U	**0.2%**		**12%**		**6%**		60%	U	**21%**	
Barium	**95%**	**136**		**0%**		**0%**		**0%**		**0%**		**0%**		**1%**		**124%**	**808**		**32%**		**35%**		**18%**		**13%**		**18%**		**45%**	
Beryllium	**220%**	**1.5**		13%	U	13%	U	13%	U	13%	U	13%	U	**16%**		**253%**	**0.81**		9%	U	9%	U	**9%**		9%	U	9%	U	**23%**	
Bismuth	**462%**	**0.32**		16%	U	16%	U	16%	U	16%	U	16%	U	**16%**		**600%**	**0.63**		16%	U	16%	U	16%	U	16%	U	16%	U	**16%**	
Cadmium	126%	**0.061**		8%	U	**8%**		8%	U	8%	U	8%	U	**11%**		**321%**	**0.547**		14%	U	**23%**		14%	U	17%	U	18%	U	22%	U
Calcium	**96%**	**3650**		**5%**		**131%**		0.4%	U	**2%**				**92%**		**80%**	**11400**		**37%**		**21%**		1%	U	**18%**				**144%**	
Chromium	**152%**	**45.2**		7%	U	7%	U	7%	U	7%	U	7%	U	**471%**		**110%**	**45.5**		7%	U	7%	U	7%	U	7%	U	7%	U	**196%**	
Cobalt	**87%**	**21.9**		1%	U	**5%**		**9%**		1%	U	**2%**		**321%**		**98%**	**14.9**		**0%**		**0%**		**17%**		**0.4%**		**22%**		**45%**	
Copper	**88%**	**27.3**		2%	U	**4%**		**6%**		**2%**		2%	U	**420%**		**91%**	**38.6**		1%	U	**2%**		**9%**		**2%**		2%	U	**72%**	
Iron	**91%**	**56000**		0.2%	U	**1.9%**		**10%**		**0%**		**2%**		**217%**		**101%**	**32500**		0.1%	U	**0.1%**		**5%**		**0.6%**		**23%**		**39%**	
Lead	**84%**	**70**		**0.0%**		**0%**		**0%**		**0%**		**0.0%**		**0%**		**130%**	**1560**		1%	U	**1%**		**5%**		**2%**		5%	U	**18%**	**J**
Lithium	**187%**	**51.9**		10%	U	10%	U	10%	U	10%	U	10%	U	**100%**		**167%**	**27.8**		9%	U	9%	U	9%	U	9%	U	9%	U	**66%**	
Manganese	**74%**	**639**		**2%**		**39%**		**#VALUE!**		**2%**		**4%**		**110%**		**80%**	**450**		1%	U	**4%**		**#VALUE!**		**2%**		**10%**		**29%**	
Molybdenum	250%	0.5	U	16%	U	16%	U	16%	U	16%	U	**16%**		42%	U	**255%**	**1.78**		16%	U	16%	U	21%	U	16%	U	44%	U	**16%**	
Nickel	**100%**	**43.6**		5%	U	6%	U	**11%**		5%	U	**5%**		**399%**		**91%**	**46.3**		4%	U	**4%**		**12%**		4%	U	39%	U	**95%**	
Phosphorus	**42%**	**493**		16%	U	16%	U	**34%**								**21%**	**687**		29%	U	29%	U	**69%**							
Potassium	**4%**	**4600**		**83%**												**26%**	**3140**		**67%**											
Selenium	750%	0.2	U	13%	U	13%	U	13%	U	13%	U	33%	U	**20%**		**596%**	**0.55**		13%	U	13%	U	13%	U	13%	U	33%	U	13%	U
Silver	**300%**	**0.21**		4%	U	4%	U	4%	U	4%	U	4%	U	**4%**		**600%**	**2.14**		13%	U	13%	U	13%	U	13%	U	13%	U	**#VALUE!**	**J**
Sodium	32%	**140**		100%	U											77%	**350**		100%	U										
Strontium	**105%**	**10.7**		**6%**		**102%**		6%	U	13%	U	6%	U	**69%**		**89%**	**64.1**		18%	U	15%	U	15%	U	15%	U	15%	U	**150%**	
Thallium	**913%**	**0.308**		2%	U	2%	U	2%	U	2%	U	75%	U	**5%**		**4678%**	**0.41**		2%	U	2%	U	2%	U	2%	U	71%	U	**9%**	
Tin	600%	2	U	17%	U	17%	U	17%	U	17%	U	17%	U	17%	U	600%	2	U	17%	U	17%	U	17%	U	17%	U	17%	U	17%	U
Titanium	**87%**	**585**		1%	U	1%	U	**1%**		1%	U	**1%**		**20%**		**87%**	**530**		1%	U	1%	U	1%	U	1%	U	1%	U	**52%**	
Uranium	**91%**	**0.913**		5%	U	**42%**		**14%**		3%	U	**4%**		**14%**		**124%**	**1.29**		5%	U	**11%**		**9%**		5%	U	18%	U	**54%**	
Vanadium	**98%**	**40.5**		0.4%	U	0.7%	U	**9%**		**0%**		**1%**		**265%**		**99%**	**44.9**		0.5%	U	0.5%	U	**3%**		0%	U	**9%**		**87%**	
Zinc	**92%**	**124**		1%	U	**1%**		**2%**		**1%**		32%	U	**44%**		**169%**	**163**		1%	U	**1%**		**2%**		**1%**		27%	U	**38%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-015-MW006															CH14-015-MW006											
Sample ID				CH14_015_MW006_Sof															CH14_015_MW006_Soi											
Sample Interval (mbgs)				18.29 - 18.59															26.82 - 27.13											
Sample Date				8/15/2014															8/15/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**85%**	**16900**		0.3%	U	**0%**		**4%**		**2%**		**7%**		**137%**		**100%**	**15100**		4.2%	U	**0.2%**		**0%**		**0%**		**0.2%**		**4%**	
Antimony	**109%**	**0.36**		11%	U	14%	U	43%	U	11%	U	37%	U	**39%**		**116%**	**0.53**		22%	U	29%	U	**55%**		**177%**		**195%**		**2818%**	
Arsenic	**77%**	**13.3**		**0.1%**		**0%**		**3%**		**1%**		**7%**		**12%**		**104%**	**48.5**		**28.7%**		**1%**		**4%**		**1%**		**4%**		**87%**	
Barium	**72%**	**115**		**19%**		**34%**		**4%**		**10%**		**18%**		**63%**		**112%**	**180**		**1%**		**1%**		**1%**		**1%**		**2%**		**2%**	
Beryllium	**168%**	**1.59**		11%	U	**11%**		**14%**		11%	U	13%	U	**34%**		**156%**	**1.36**		11%	U	**8%**		**8%**		8%	U	**8%**		**8%**	
Bismuth	**400%**	**0.53**		10%	U	10%	U	**10%**		10%	U	10%	U	**16%**		**259%**	**1.26**		15%	U	15%	U	15%	U	15%	U	15%	U	**15%**	
Cadmium	88%	**0.145**		**5%**		**37%**		5%	U	5%	U	5%	U	**31%**		**105%**	**0.82**		7%	U	**7%**		7%	U	7%	U	7%	U	**7%**	
Calcium	**90%**	**2870**		**104%**		381%	U	3%	U	**23%**				**139%**		**73%**	**1330**		**2%**		**0%**		0.2%	U	**0%**				**0%**	
Chromium	**214%**	**41.9**		9%	U	9%	U	9%	U	9%	U	9%	U	**130%**		**141%**	**32**		1%	U	1%	U	**1%**		1%	U	1%	U	**1%**	
Cobalt	**84%**	**24.4**		**1%**		**8%**		**16%**		**1%**		**22%**		**64%**		**117%**	**19.7**		**14.0%**		**0%**		**0%**		**0%**		**0%**		**5%**	
Copper	**78%**	**39.9**		**1%**		**5%**		**11%**		**4%**		3%	U	**30%**		**110%**	**103**		3%	U	**1%**		**2%**		**1%**		1%	U	**9%**	
Iron	**86%**	**63400**		0%	U	**0.8%**		**11%**		**1%**		**21%**		**70%**		**120%**	**46200**		50.7%	U	**1%**		**1%**		**0%**		**8%**		**123%**	
Lead	**63%**	**52.7**		**0%**		**25%**		**1%**		**7%**		**2%**		**17%**		**107%**	**174**		1%	U	**1%**		**1%**		**1%**		1%	U	**8%**	
Lithium	**151%**	**33.8**		9%	U	9%	U	9%	U	9%	U	9%	U	**75%**		**155%**	**38.6**		7%	U	7%	U	7%	U	7%	U	7%	U	**7%**	
Manganese	**44%**	**783**		**10%**		39%	U	**#VALUE!**		7%	U	**27%**		**93%**		**82%**	**266**		2%	U	**1%**		**#VALUE!**		**1%**		**1%**		**1%**	
Molybdenum	**167%**	**0.59**		17%	U	17%	U	17%	U	17%	U	33%	U	46%	U	240%	**1.16**		16%	U	16%	U	16%	U	16%	U	19%	U	**16%**	
Nickel	**113%**	**51.7**		**5%**		14%	U	**25%**		5%	U	**38%**		**107%**		**119%**	**34.1**		**4%**		**0%**		**0%**		**0%**		**0%**		**2%**	
Phosphorus	**29%**	**247**		28%	U	28%	U	**264%**								**72%**	**370**		84%	U	32%	U	**32%**							
Potassium	**4%**	**6490**		**80%**												**4%**	**3600**		**50%**											
Selenium	600%	0.2	U	13%	U	13%	U	13%	U	13%	U	33%	U	25%	U	224%	**0.25**		13%	U	13%	U	13%	U	13%	U	32%	U	**65%**	
Silver	**294%**	**0.25**		10%	U	10%	U	10%	U	10%	U	10%	U	**34%**		**237%**	**0.97**		14%	U	14%	U	14%	U	14%	U	24%	U	**114%**	
Sodium	14%	**140**		100%	U											31%	100	U	100%	U										
Strontium	**114%**	**12.4**		23%	U	60%	U	15%	U	22%	U	25%	U	**75%**		**104%**	**13.4**		**6%**		**6%**		6%	U	6%	U	6%	U	**6%**	
Thallium	**893%**	**0.647**		2%	U	2%	U	2%	U	2%	U	70%	U	**15%**		**852%**	**0.538**		26%	U	12%	U	16%	U	10%	U	75%	U	**332%**	
Tin	600%	2	U	17%	U	17%	U	17%	U	17%	U	17%	U	17%	U	600%	2	U	17%	U	17%	U	17%	U	17%	U	17%	U	17%	U
Titanium	**83%**	**768**		1%	U	1%	U	2%	U	2%	U	7%	U	**117%**		**99%**	**473**		1%	U	1%	U	1%	U	**1%**		1%	U	**1%**	
Uranium	**105%**	**0.756**		12%	U	**39%**		**31%**		4%	U	**18%**		**91%**		**98%**	**1.02**		**16%**		**2%**		**2%**		2%	U	**2%**		**4%**	
Vanadium	**90%**	**39.7**		1%	U	1%	U	**21%**		**2%**		**22%**		**163%**		**110%**	**30.2**		1.9%	U	0.2%	U	**0%**		**0%**		**0%**		**3%**	
Zinc	**105%**	**125**		**0%**		**1%**		**5%**		**1%**		**7%**		**18%**		**114%**	**682**		24.7%	U	**0%**		**0%**		**0%**		23%	U	**0%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-104-MW008															CH14-104-MW008											
Sample ID				CH14-104-MW008-SOB															CH14-104-MW008-SOD											
Sample Interval (mbgs)				3.66 - 3.96															10.30 - 10.67											
Sample Date				8/12/2014															8/12/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**97%**	**22800**		2.2%	U	2.3%	U	**19.8%**		**2.9%**		**13.2%**		**543.3%**		**91%**	**1970**		0.6%	U	**0.6%**		**8.9%**		**1.5%**		**3.2%**		**211.7%**	
Antimony	**85%**	**1.93**		0.3%	U	**0.3%**		**2.0%**		**0.3%**		**1.1%**		**1.9%**		**91%**	**40.9**		1.8%	U	1.8%	U	**3.9%**		**1.8%**		**2.5%**		**3.3%**	
Arsenic	**91%**	**183**		**0.0%**		**0.0%**		**0.9%**		**0.1%**		**1.0%**		**1.7%**		**86%**	**250**		0.1%	U	0.4%	U	**9.4%**		**3.0%**		**8.9%**		**7.1%**	
Barium	**144%**	**224**		6.7%	U	**7.1%**		**1.8%**		**3.5%**		**4.2%**		**63.6%**		**109%**	**48.3**		**15.5%**		**8.2%**		**1.1%**		**3.3%**		**5.4%**		**30.3%**	
Beryllium	**341%**	**2.02**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	25.0%	U	217%	**0.35**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**30.0%**	
Bismuth	**600%**	**0.29**		7.8%	U	7.8%	U	**7.8%**		7.8%	U	7.8%	U	**7.8%**		**364%**	**2.04**		15.2%	U	15.2%	U	15.2%	U	15.2%	U	15.2%	U	**15.2%**	
Cadmium	**600%**	**0.554**		**0.1%**		**1.0%**		**0.1%**		**0.1%**		0.1%	U	**0.7%**		**102%**	**47.6**		**1.2%**		**3.1%**		1.2%	U	**1.2%**		1.2%	U	**4.2%**	
Calcium	**106%**	**37200**		**64.4%**		482.4%	U	2.7%	U	**15.9%**				**240.7%**		**85%**	**1590**		**11.7%**		**1.9%**		0.7%	U	**7.9%**				**57.5%**	
Chromium	**300%**	**285**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	129.7%	U	143%	**7.68**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**82.0%**	
Cobalt	**143%**	**43.2**		**0.1%**		**1.2%**		**3.8%**		**0.2%**		**4.0%**		**9.6%**		**91%**	**69.5**		0.3%		**0.5%**		**7.7%**		**0.5%**		**6.7%**		**29.0%**	
Copper	**112%**	**42.9**		**0.1%**		**0.5%**		**1.0%**		**0.2%**		0.1%	U	**2.2%**		**90%**	**1080**		0.2%	U	**1.3%**		**3.7%**		**0.5%**		0.3%	U	**7.0%**	
Iron	**123%**	**51400**		**0.0%**		**0.3%**		**2.0%**		**0.0%**		**2.8%**		**8.2%**		**89%**	**206000**		0.1%	U	**0.0%**		**0.0%**		**0.0%**		**0.0%**		**0.0%**	
Lead	**108%**	**71.9**		**0.0%**		**0.1%**		**0.0%**		**0.0%**		**0.0%**		**0.1%**		**79%**	**7970**		**0.0%**		**0.3%**		**0.0%**		**0.2%**		**0.0%**		**0.5%**	
Lithium	**600%**	**43.6**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	70.7%	U	186%	5	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**112.0%**	
Manganese	**295%**	**848**		**2.0%**		**15.2%**		**#VALUE!**		0.8%	U	**3.2%**		**13.6%**		**67%**	**1150**		**0.9%**		**0.9%**		**#VALUE!**		**0.9%**		**8.8%**		**38.1%**	
Molybdenum	**155%**	**0.58**		6.5%	U	6.5%	U	6.5%	U	6.5%	U	22.2%	U	**7.0%**		**138%**	**4.67**		7.8%	U	7.8%	U	8.4%	U	7.8%	U	10.0%	U	**7.8%**	
Nickel	**168%**	**423**		6.7%		9.4%	U	23.9%	U	6.7%	U	38.7%	U	**93.9%**		**102%**	**17.8**		4.2%	U	**4.2%**		**22.0%**		4.2%	U	**17.9%**		**91.9%**	
Phosphorus	**294%**	**487**		33.3%	U	33.3%	U	306.0%	U							49%	**240**		33.3%	U	33.3%	U	200.7%	U						
Potassium	**6%**	**4950**		100.0%	U											5%	**550**		**66.7%**											
Selenium	196%	**0.33**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	40.7%	U	174%	**1.5**		10.9%	U	10.9%	U	10.9%	U	10.9%	U	27.3%	U	**10.9%**	
Silver	**112%**	**0.2**		0.4%	U	0.4%	U	0.4%	U	**0.4%**		0.4%	U	**1.0%**		**231%**	**23.8**		2.2%	U	2.2%	U	2.2%	U	2.2%	U	2.2%	U	**2.4%**	
Sodium	100%	**390**		100.0%	U											53%	100	U	100.0%	U										
Strontium	**457%**	**77.4**		15.2%	U	63.0%	U	15.2%	U	23.6%	U	15.2%	U	**81.8%**		**112%**	**10.5**		**12.6%**		12.6%	U	12.6%	U	12.6%	U	12.6%	U	**83.4%**	
Thallium	**127%**	**0.386**		**0.5%**		**0.5%**		**0.5%**		**0.5%**		19.4%	U	**2.6%**		**1098%**	**7.76**		1.0%	U	1.0%	U	**1.0%**		**1.0%**		39.5%	U	**8.3%**	
Tin	600%	2	U	14.7%	U	14.7%	U	14.7%	U	14.7%	U	14.7%	U	**14.7%**		**600%**	**5.3**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**500%**	**559**		8.3%	U	8.3%	U	15.1%	U	8.3%	U	20.2%	U	**792.7%**		**101%**	**29.9**		3.2%	U	3.2%	U	8.2%	U	5.1%	U	4.0%	U	**534.6%**	
Uranium	**132%**	**2**		**6.0%**		**21.7%**		**17.6%**		2.9%	U	**8.0%**		**49.0%**		**103%**	**2.03**		2.6%	U	**20.8%**		**12.7%**		2.6%	U	**4.6%**		**28.0%**	
Vanadium	**102%**	**65.1**		1.6%	U	1.6%	U	**42.0%**		**2.4%**		**38.9%**		**286.6%**		**95%**	**13.3**		0.6%	U	0.8%	U	**17.5%**		1.8%		**10.0%**		**117.9%**	
Zinc	**234%**	**165**		**0.0%**		**0.0%**		**0.0%**		**0.0%**		0.1%	U	**0.2%**		**111%**	**36800**		**0.0%**		**0.1%**		**0.3%**		**0.1%**		1.5%	U	**2.7%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-104-MW008															CH14-104-MW008											
Sample ID				CH14-104-MW908-SOD															CH14-104-MW008-SOE											
Sample Interval (mbgs)				10.30 - 10.67															12.5 - 12.8											
Sample Date				8/12/2014															8/12/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**93%**	**8770**		0.5%	U	**0.5%**		**5.4%**		**0.5%**		**2.4%**		**117.0%**		**103%**	**7740**		**1.9%**		1.9%	U	15.3%	U	**5.9%**		**10.5%**		**537.2%**	
Antimony	**125%**	**7.9**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	2.8%	U	**5.3%**		**166%**	**5.05**		0.6%	U	0.7%	U	**4.7%**		**0.6%**		**0.6%**		**1.4%**	
Arsenic	**67%**	**143**	J	0.1%	U	0.1%	U	**3.8%**		**0.6%**		**4.1%**		**5.2%**		**122%**	**37.1**	J	**0.0%**		**0.2%**		**2.9%**		**0.2%**		**0.4%**		**1.4%**	
Barium	**85%**	**162**		**12.0%**		**4.0%**		**0.9%**		**1.0%**		**1.5%**		**14.1%**		**96%**	**147**		32.6%	U	**24.9%**		5.5%	U	15.9%	U	**12.1%**		**170.6%**	
Beryllium	**173%**	**1.12**		10.2%	U	10.2%	U	10.2%	U	10.2%	U	10.2%	U	**20.4%**		**241%**	**1.2**		**14.8%**		14.8%	U	14.8%	U	14.8%	U	14.8%	U	30.4%	U
Bismuth	**324%**	**0.56**		15.4%	U	15.4%	U	15.4%	U	15.4%	U	15.4%	U	**15.4%**		**197%**	**0.52**		15.5%	U	15.5%	U	15.5%	U	15.5%	U	15.5%	U	**17.1%**	
Cadmium	**107%**	**4.03**		**1.2%**		**3.9%**		1.6%	U	**1.2%**		1.2%	U	**2.6%**		**81%**	**3.75**		**0.8%**		**7.2%**		0.8%	U	0.8%	U	0.8%	U	**2.5%**	
Calcium	**90%**	**6160**		**10.2%**		**1.6%**		0.8%	U	**3.2%**				**52.9%**		**126%**	**5890**		**66.1%**		275.9%	U	1.9%	U	**13.3%**				**113.6%**	
Chromium	**131%**	**24.7**		10.3%	U	10.3%	U	10.3%	U	10.3%	U	10.3%	U	**46.9%**		**155%**	**23.4**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	98.7%	U
Cobalt	**88%**	**34.9**		**0.3%**		**0.3%**		**5.5%**		**0.3%**		**2.9%**		**13.2%**		**96%**	**34.4**		**0.2%**		**1.6%**		**3.1%**		0.2%	U	**0.9%**		**6.6%**	
Copper	**88%**	**646**	J	0.1%	U	**0.5%**		**2.1%**		**0.1%**		0.2%	U	**2.5%**		**66%**	**239**	J	**0.1%**		**0.4%**		**0.9%**		**0.2%**		0.1%	U	**1.1%**	
Iron	**0%**	**68600**		0.1%	U	**0.1%**		**2.0%**		**0.2%**		**4.2%**		**17.3%**		**92%**	**68100**		**0.1%**		**0.8%**		**5.4%**		**0.2%**		**1.8%**		**19.1%**	
Lead	**81%**	**1880**		**0.0%**		**0.1%**		0.2%		**0.1%**		0.1%	U	**0.3%**		**74%**	**1210**		**0.0%**		**0.1%**		**0.0%**		**0.2%**		**0.0%**		**0.2%**	
Lithium	**192%**	**14.6**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**63.6%**		**214%**	**13.5**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	101.7%	U
Manganese	**88%**	**566**		**0.9%**		**2.9%**		**#VALUE!**		**0.9%**		**2.4%**		**18.3%**		**63%**	**542**		**8.2%**		37.0%	U	#VALUE!	U	3.7%	U	**4.3%**		**48.3%**	
Molybdenum	**167%**	**3.7**		8.5%	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	**8.5%**		**278%**	**4.02**		3.5%	U	3.5%	U	5.6%	U	3.5%	U	3.5%	U	**3.5%**	
Nickel	**91%**	**38.3**		4.3%	U	**4.3%**		**4.3%**		4.3%	U	**8.0%**		**35.4%**		**104%**	**43.3**		**5.2%**		12.3%	U	18.6%	U	5.2%	U	7.6%	U	**50.9%**	
Phosphorus	50%	**346**		33.3%	U	33.3%	U	52.0%	U							31%	**465**		33.3%	U	33.3%	U	264.7%	U						
Potassium	**5%**	**2290**		**66.7%**												**11%**	**2000**		100.0%	U										
Selenium	**250%**	**0.66**		10.4%	U	10.4%	U	10.4%	U	10.4%	U	25.9%	U	**10.4%**		**517%**	**0.6**		6.6%	U	6.6%	U	6.6%	U	6.6%	U	16.5%	U	**16.8%**	
Silver	**359%**	**5.96**	J	2.7%	U	2.7%	U	2.7%	U	2.7%	U	2.7%	U	**2.7%**		**545%**	**3.06**	J	1.4%	U	1.4%	U	1.4%	U	1.4%	U	1.4%	U	**2.6%**	
Sodium	17%	**190**		100.0%	U											48%	**180**		100.0%	U										
Strontium	**102%**	**24.5**		**12.5%**		12.5%	U	12.5%	U	12.5%	U	12.5%	U	**96.7%**		**216%**	**23.5**		19.7%	U	71.7%	U	16.7%	U	22.3%	U	16.7%	U	89.0%	U
Thallium	**871%**	**2.44**		1.1%	U	**1.1%**		**1.1%**		**1.1%**		45.0%	U	**3.3%**		**1878%**	**2.39**		0.3%	U	0.3%	U	**0.3%**		**0.3%**		12.5%	U	**2.1%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**128%**	**135**		2.9%	U	2.9%	U	3.1%	U	2.9%	U	2.9%	U	**167.3%**		**90%**	**110**		10.4%	U	10.4%	U	31.7%	U	19.0%	U	13.7%	U	**1470.0%**	
Uranium	**103%**	**1.77**		2.5%	U	**20.1%**		**11.2%**		2.5%	U	**2.8%**		**23.5%**		**97%**	**1.77**		**6.6%**		23.1%	U	11.9%	U	2.0%	U	**2.0%**		**29.7%**	
Vanadium	**95%**	**31.1**		0.6%	U	0.6%	U	**5.1%**		**0.6%**		**5.9%**		**59.2%**		**96%**	**31.3**		1.0%	U	2.0%	U	**37.3%**		**1.7%**		**6.4%**		**182.0%**	
Zinc	**130%**	**3240**		**0.0%**		**0.3%**		**0.6%**		**0.1%**		1.5%	U	**3.0%**		**94%**	**3070**		**0.0%**		**0.6%**		**0.5%**		**0.1%**		1.0%	U	**1.3%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-104-MW008															CH14-104-MW008											
Sample ID				CH14-104-MW008-SOG															CH14-104-MW008-SOI											
Sample Interval (mbgs)				16.46 - 16.76															20.88 - 21.18											
Sample Date				8/13/2014															8/13/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**101%**	**2880**		0.2%	U	**0.2%**		**1.8%**		**0.6%**		**1.0%**		**58.5%**		**107%**	**22900**		0.2%	U	**0.2%**		**0.8%**		**0.2%**		**0.8%**		**45.4%**	
Antimony	**105%**	**16**		12.8%	U	17.9%	U	**83.3%**		12.8%	U	12.8%	U	**26.9%**		**110%**	**0.49**		3.9%	U	3.9%	U	**3.9%**		**3.9%**		**3.9%**		**7.8%**	
Arsenic	**81%**	**202**		0.3%	U	**2.1%**		**28.0%**		**1.8%**		2.8%	U	**12.2%**	**J**	**94%**	**19**		0.3%	U	**0.4%**		**15.9%**		**4.4%**		**8.0%**		**9.5%**	
Barium	**93%**	**70.8**		**6.9%**		**5.3%**		**1.6%**		**3.7%**		**2.8%**		**39.8%**		**108%**	**371**		**3.6%**		**4.0%**		**1.0%**		**1.1%**		**1.4%**		**19.7%**	
Beryllium	**207%**	**0.63**		10.9%	U	10.9%	U	10.9%	U	10.9%	U	10.9%	U	**21.9%**		**222%**	**1.28**		8.7%	U	8.7%	U	8.7%	U	8.7%	U	8.7%	U	**19.7%**	
Bismuth	**305%**	**0.27**		14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**15.7%**	**J**	**349%**	**0.58**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Cadmium	**101%**	**5.89**		2.7%	U	**21.9%**		2.7%	U	**2.7%**		2.7%	U	**8.9%**	**J**	**111%**	**2.27**		5.8%	U	**12.7%**		5.8%	U	**5.8%**		5.8%	U	**10.1%**	
Calcium	**75%**	**2630**		**8.6%**		**35.9%**		0.3%	U	**2.0%**				**15.8%**		**85%**	**23800**		**6.0%**		**68.8%**		0.2%	U	**4.2%**				**19.1%**	
Chromium	151%	**9.72**		4.1%	U	4.1%	U	4.1%	U	4.1%	U	4.1%	U	**25.3%**		**178%**	**98.7**		3.5%	U	3.5%	U	3.5%	U	3.5%	U	3.5%	U	**28.1%**	
Cobalt	**94%**	**79.4**		0.7%	U	**7.6%**		**15.4%**		**1.5%**		**4.3%**		**32.7%**		**113%**	**22.5**		**0.3%**		**4.3%**		**3.7%**		**0.3%**		**5.0%**		**16.1%**	
Copper	**86%**	**968**		1.0%	U	**5.7%**		**18.3%**		**5.1%**		2.0%	U	**23.3%**		**99%**	**40.3**		0.6%	U	**1.4%**		**7.6%**		**1.7%**		1.4%	U	**17.8%**	
Iron	**89%**	**99200**		0.1%	U	**1.8%**		**9.5%**		**0.4%**		**3.1%**		**37.3%**		**102%**	**48300**		0.1%	U	**0.2%**		**4.0%**		**0.5%**		**6.2%**		**26.4%**	
Lead	**89%**	**4040**		0.2%	U	**2.1%**		**0.2%**		**3.3%**		0.3%	U	**3.1%**	**J**	**96%**	**160**		0.2%	U	**0.9%**		**2.3%**		**1.8%**		**0.3%**		**3.6%**	
Lithium	177%	5	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**54.4%**		**186%**	**34.6**		7.8%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**43.2%**	
Manganese	**74%**	**459**		3.1%	U	**23.6%**		**#VALUE!**		**2.4%**		**2.7%**		**29.7%**		**84%**	**786**		**0.7%**		**23.0%**		**#VALUE!**		**0.7%**		**2.9%**		**18.8%**	
Molybdenum	**253%**	**11.7**		12.7%	U	12.7%	U	14.0%	U	12.7%	U	12.7%	U	**12.7%**		**223%**	**1.55**		13.4%	U	13.4%	U	13.4%	U	13.4%	U	13.4%	U	**13.4%**	
Nickel	**102%**	**33**		2.4%	U	**5.6%**		**9.1%**		2.4%	U	**3.5%**		**24.3%**		**120%**	**85.1**		1.8%	U	**1.8%**		**2.6%**		**1.8%**		**7.5%**		**23.2%**	
Phosphorus	52%	**332**		22.4%	U	22.4%	U	**226.0%**								**75%**	**491**		29.8%	U	29.8%	U	**70.2%**							
Potassium	3%	**1130**		**62.5%**												**4%**	**6460**		**52.6%**											
Selenium	**323%**	**1.75**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	**12.9%**		**276%**	**0.46**		11.9%	U	11.9%	U	11.9%	U	11.9%	U	29.8%	U	**23.8%**	
Silver	**283%**	**6.18**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**17.9%**	**J**	**291%**	**0.34**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**10.5%**	
Sodium	38%	100	U	100.0%	U											**42%**	**460**		100.0%	U										
Strontium	104%	**7.29**		**5.6%**		**20.3%**		5.1%	U	7.7%	U	5.1%	U	**28.4%**		**115%**	**98.4**		**3.6%**		**23.0%**		3.6%	U	3.6%	U	3.6%	U	**27.3%**	
Thallium	**955%**	**11.7**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	75.3%	U	**12.6%**		**994%**	**0.48**		1.4%	U	1.4%	U	1.4%	U	1.4%	U	55.9%	U	**5.4%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**90%**	**40.9**		0.9%	U	0.9%	U	3.0%	U	**1.6%**		0.9%	U	**125.5%**		**98%**	**535**		1.2%	U	1.2%	U	1.2%	U	**1.2%**		1.2%	U	**97.1%**	
Uranium	**107%**	**2.46**		10.8%	U	**36.3%**		**18.8%**		3.6%	U	3.6%	U	**55.5%**		**106%**	**0.963**		3.9%	U	**4.2%**		**3.9%**		3.9%	U	**8.2%**		**43.2%**	
Vanadium	**90%**	**22.8**		0.3%	U	1.0%	U	**12.6%**		**0.5%**		**1.8%**		**55.7%**		**101%**	**58.9**		0.2%	U	0.2%	U	**2.3%**		**0.2%**		**2.1%**		**24.0%**	
Zinc	**111%**	**5170**		0.3%	U	**8.3%**		**8.3%**		**1.1%**		15.8%	U	**21.8%**	**J**	**136%**	**298**		0.3%	U	**0.5%**		**1.8%**		**0.4%**		13.6%	U	**14.8%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-104-SS001															CH14-104-SS002											
Sample ID				CH14-104-SS001-SOA															CH14-104-SS002-SOA											
Sample Interval (mbgs)				0 - 0.2															0 - 0.1											
Sample Date				7/24/2014															7/24/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**109%**	**24600**		**1.6%**		1.6%	U	4.0%	U	**1.6%**		**2.0%**		**92.7%**		**82%**	**2870**		**1.3%**		1.3%	U	**2.7%**	**U**	**1.3%**		**1.3%**		**58.7%**	
Antimony	**101%**	**1.14**		0.3%	U	**0.3%**		**44.2%**		**4.8%**		**31.8%**		**38.4%**		**99%**	**46.9**		0.2%	U	**0.2%**		**28.9%**		**3.0%**		**8.5%**		**34.7%**	
Arsenic	**94%**	**13.8**		**0.0%**		**0.0%**		**3.0%**		**7.6%**		**5.1%**		**89.3%**		**76%**	**509**		**0.0%**		**0.1%**		**7.5%**		**8.6%**		**2.0%**		**134.2%**	
Barium	**89%**	**286**		0.5%	U	**0.5%**		**3.9%**		**6.2%**		**45.1%**		**1.1%**		**54%**	**25.2**		0.4%	U	**0.7%**		**4.2%**		**3.8%**		**24.1%**		**0.8%**	
Beryllium	**230%**	**1.26**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	44.2%	U	247%	**0.2**		16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**32.0%**	
Bismuth	600%	0.2	U	4.6%	U	4.6%	U	**4.6%**		4.6%	U	4.6%	U	**24.1%**		**149%**	**4.27**		5.4%	U	5.4%	U	**33.2%**		5.4%	U	5.4%	U	**16.8%**	
Cadmium	**115%**	**0.668**		**462.7%**		230.3%	U	199.1%	U	342.1%	U	11.0%	U	**3136.0%**		**86%**	**0.214**		**55.7%**		28.7%	U	35.9%	U	45.5%	U	2.1%	U	**527.0%**	
Calcium	**107%**	**18600**		**742.1%**		33.6%	U	12.2%	U	82.7%	U			**372.3%**		**104%**	**224**		**335.8%**		7.6%	U	6.1%	U	44.4%	U	#VALUE!		**166.1%**	
Chromium	**142%**	**125**		16.7%	U	16.7%	U	28.7%	U	16.7%	U	16.7%	U	59.0%	U	139%	**55.4**		14.8%	U	14.8%	U	22.6%	U	14.8%	U	14.8%	U	**31.5%**	
Cobalt	**91%**	**29.7**		**2.4%**		0.3%	U	0.5%	U	0.7%	U	**0.1%**		**100.9%**		**86%**	**72.8**		**4.8%**		0.8%	U	1.3%	U	1.8%	U	**0.3%**		**263.0%**	
Copper	**81%**	**61.1**		**0.3%**		10.8%	U	**36.4%**		**27.4%**		0.2%	U	**177.4%**		**82%**	**917**		**0.9%**		10.4%	U	**28.9%**		**17.1%**		0.1%	U	**194.7%**	
Iron	**98%**	**46900**		**0.5%**		**0.0%**		**10.1%**		**1.4%**		**4.6%**		**163.2%**		**86%**	**156000**		**0.1%**		**0.0%**		**9.7%**		**1.3%**		**2.4%**		**163.3%**	
Lead	**87%**	**104**		**4.9%**		**34.2%**		**1.3%**		**13.5%**		0.2%		**4.3%**		**134%**	**16200**		**4.2%**		**8.2%**		**1.2%**		**5.1%**		**0.0%**		**2.2%**	
Lithium	**216%**	**33.1**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Manganese	**85%**	**624**		**230.4%**		46.2%	U	170.8%	U	40.0%	U	**63.2%**		**1802.5%**		**91%**	**46.8**		**36.4%**		9.3%	U	65.9%	U	10.0%	U	**16.1%**		**507.5%**	
Molybdenum	**390%**	**1.18**		6.4%	U	6.4%	U	**6.4%**		6.4%	U	8.3%	U	**42.0%**		**149%**	**6.87**		6.8%	U	6.8%	U	**10.7%**		6.8%		6.8%	U	**36.1%**	
Nickel	**93%**	**102**		**16.3%**		4.8%	U	5.3%	U	4.8%	U	**4.8%**		**50.6%**		**112%**	**26.9**		**28.3%**		13.8%	U	14.5%	U	13.8%	U	13.8%	U	**173.1%**	
Phosphorus	**27%**	**793**		33.3%	U	33.3%	U	33.3%	U							33%	**307**		**30.7%**		30.7%	U	32.5%	U						
Potassium	**6%**	**3690**		100.0%	U											15%	**1150**		100.0%	U										
Selenium	**125%**	**0.31**		7.0%	U	7.0%	U	7.0%	U	**7.0%**		17.6%	U	**22.2%**		**160%**	**2.8**		6.3%	U	6.3%	U	6.3%	U	**6.3%**		15.8%	U	**25.9%**	
Silver	**545%**	**0.36**		0.3%	U	0.3%	U	0.3%	U	1.8%	U	2.0%	U	**61.0%**		**105%**	**28.4**		0.3%	U	0.3%	U	0.3%	U	**0.7%**		0.9%	U	**39.8%**	
Sodium	29%	**410**		100.0%	U											100%	100	U	100.0%	U										
Strontium	**120%**	**104**		10.3%	U	**10.3%**		10.3%	U	10.3%	U	**10.3%**		**58.4%**		**176%**	**29.9**		10.0%	U	**10.0%**		10.0%	U	10.0%	U	10.0%	U	**41.2%**	
Thallium	**1663%**	**0.829**		6.4%	U	2.7%	U	**1.0%**		**3.1%**		18.4%	U	**47.5%**		**137%**	**8.52**		4.4%	U	1.7%	U	**0.6%**		2.1%		15.1%	U	**41.5%**	
Tin	600%	2	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	**31.3%**		**171%**	**6.2**		13.7%	U	13.7%	U	13.7%	U	13.7%	U	13.7%	U	**21.2%**	
Titanium	**103%**	**302**		7.0%	U	7.0%	U	7.0%	U	7.0%		**7.0%**		**28.7%**		**101%**	**37.6**		6.1%	U	6.1%	U	6.1%	U	**6.1%**		**6.1%**		**22.5%**	
Uranium	**98%**	**0.961**		**6.6%**		25.4%	U	31.1%	U	6.6%	U	**7.6%**		**361.2%**		**112%**	**0.769**		**5.7%**		15.3%	U	24.6%	U	5.7%	U	**5.7%**		**249.1%**	
Vanadium	**97%**	**87.5**		1.2%	U	1.2%	U	**14.5%**		**2.3%**		**11.7%**		**174.2%**		**102%**	**24.4**		0.7%	U	0.7%	U	**9.8%**		**0.9%**		**2.8%**		**71.5%**	
Zinc	**140%**	**275**		**231.5%**		**124.3%**		**233.2%**		**91.2%**		**27.7%**		**1738.9%**		**82%**	**872**		**38.2%**		**23.1%**		**64.1%**		**15.5%**		**2.7%**		**403.4%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-104-TP003															CH14-104-TP003											
Sample ID				CH14-104-TP03-SOA															CH14-104-TP03-SOB											
Sample Interval (mbgs)				2 - 2															4.8 - 4.8											
Sample Date				7/18/2014															7/18/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**94%**	**3390**		**48.2%**		4.5%	U	84.0%	U	**6.4%**		45.7%	U	**401.4%**		**115%**	**745**		**3.3%**		3.3%	U	10.4%	U	**3.3%**		3.9%	U	**92.9%**	
Antimony	**96%**	**60**		0.6%	U	**0.6%**		**53.0%**		**24.4%**		**20.1%**		**144.3%**		**91%**	**20.2**		0.3%	U	**0.3%**		**13.6%**		**4.0%**		**11.2%**		**34.9%**	
Arsenic	**94%**	**443**		**0.1%**		**0.0%**		**1.9%**		**6.3%**		**13.8%**		**51.9%**		**76%**	**982**		**0.0%**		**0.0%**		**1.0%**		**3.8%**		**1.7%**		**78.4%**	
Barium	**36%**	**34.5**		1.7%	U	**1.7%**		**5.3%**		**8.5%**		**254.6%**		**3.8%**		**93%**	**4.46**		1.4%	U	3.0%	U	15.4%	U	10.0%	U	**101.4%**		**1.7%**	
Beryllium	**262%**	**0.23**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	226%	0.2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Bismuth	**169%**	**2.69**		6.4%	U	6.4%	U	11.2%	U	6.4%	U	6.4%	U	**21.5%**		**150%**	**3.09**		5.1%	U	5.1%	U	**7.9%**		5.1%	U	5.1%	U	**6.9%**	
Cadmium	**110%**	**0.839**		**658.2%**		15.8%	U	8.1%	U	10.7%	U	1.6%	U	**295.9%**		**152%**	**1.11**		**22.6%**		**5.5%**		3.3%	U	5.4%	U	0.6%	U	**148.3%**	
Calcium	**127%**	**645**		**2337.7%**		29.9%	U	10.8%	U	65.2%	U	#VALUE!	U	98.1%	U	**147%**	**262**		**177.0%**		11.0%	U	3.1%	U	56.9%	U			**62.6%**	
Chromium	**182%**	**15**		16.7%	U	16.7%	U	17.3%	U	16.7%	U	17.0%	U	63.7%	U	191%	**9.56**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	17.3%	U
Cobalt	**107%**	**44.3**		**6.0%**		0.2%	U	0.3%	U	0.2%	U	**0.1%**		**18.5%**		**92%**	**384**		**0.6%**		**0.2%**		0.4%	U	0.4%	U	**0.1%**		**140.6%**	
Copper	**113%**	**814**		**6.2%**		**2.1%**		**12.1%**		**4.7%**		0.0%	U	**77.2%**		**109%**	**1680**		**0.2%**		**2.3%**		**8.7%**		**4.5%**		0.0%	U	**134.4%**	
Iron	**102%**	**154000**		**0.8%**		**0.0%**		**4.0%**		**0.6%**		**7.8%**		**41.4%**		**89%**	**330000**		**0.3%**		**0.0%**		**6.0%**		**0.5%**		**3.8%**		**147.6%**	
Lead	**110%**	**23400**		**2.4%**		**23.9%**		**3.3%**		**7.9%**		**0.0%**		**37.7%**		**140%**	**5310**		**4.4%**		**10.9%**		**1.4%**		**3.4%**		**0.0%**		**4.1%**	
Lithium	600%	5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	18.7%	U	567%	5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Manganese	**115%**	**127**		**491.5%**		26.2%	U	61.1%	U	21.5%	U	**19.5%**		**208.5%**		**108%**	**151**		**399.6%**		28.1%	U	240.9%	U	21.6%	U	**24.2%**		**740.2%**	
Molybdenum	**134%**	**7.47**		14.1%	U	14.1%	U	14.1%	U	14.1%	U	20.8%	U	**174.9%**		**141%**	**1.1**		8.0%	U	8.0%	U	8.0%	U	8.0%	U	8.0%	U	**47.1%**	
Nickel	**117%**	**10.1**		114.2%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	140.8%	U	142%	**18.1**		**12.7%**		8.4%	U	8.4%	U	8.4%	U	8.4%	U	**62.9%**	
Phosphorus	**44%**	**588**		33.3%	U	33.3%	U	33.3%	U							49%	**94**		33.3%	U	33.3%	U	33.3%	U						
Potassium	23%	**1440**		100.0%	U											15%	**380**		100.0%	U										
Selenium	**202%**	**2.59**		3.4%	U	3.4%	U	3.4%	U	**3.4%**		8.6%	U	**10.7%**		**229%**	**4.62**		4.5%	U	4.5%	U	4.5%	U	4.5%	U	11.1%	U	**21.4%**	
Silver	**106%**	**38.83**		0.6%	U	0.6%	U	0.6%	U	0.6%	U	0.6%	U	**90.0%**		**139%**	**18.5**		0.3%	U	0.3%	U	0.3%	U	**0.3%**		0.3%	U	**29.8%**	
Sodium	100%	100	U	100.0%	U											100%	100	U	100.0%	U										
Strontium	**201%**	**30.8**		31.2%	U	61.8%	U	13.6%	U	13.6%	U	24.9%	U	**55.8%**		**238%**	**14.3**		13.8%	U	13.8%	U	13.8%	U	17.6%	U	13.8%	U	**23.1%**	
Thallium	**130%**	**10.7**		1.4%	U	1.4%	U	**2.3%**		**6.4%**		27.1%	U	**98.9%**		**170%**	**5.41**		2.0%	U	1.2%	U	0.7%		**2.3%**		21.5%	U	**37.5%**	
Tin	**243%**	**8.2**		14.8%	U	14.8%	U	14.8%	U	14.8%	U	14.8%	U	**22.2%**		**351%**	**5.9**		13.4%	U	13.4%	U	13.4%	U	13.4%	U	13.4%	U	**15.4%**	
Titanium	**157%**	**50.9**		14.6%	U	14.6%	U	14.6%	U	14.6%	U	14.6%	U	**172.3%**		**171%**	**4.9**		14.7%	U	14.7%	U	14.7%	U	14.7%	U	14.7%	U	**56.9%**	
Uranium	**122%**	**0.632**		282.6%	U	187.5%	U	112.0%	U	17.9%	U	47.4%	U	**452.1%**		**112%**	**0.214**		**5.8%**		10.9%	U	19.6%	U	5.8%	U	**5.8%**		**129.2%**	
Vanadium	**113%**	**35.1**		1.3%	U	1.3%	U	**30.7%**		**2.3%**		**30.8%**		**113.5%**		**133%**	**17.7**		1.3%	U	1.3%	U	**11.5%**		**1.3%**		**4.8%**		**46.8%**	
Zinc	**109%**	**1820**		**160.6%**		**4.8%**		**19.0%**		**6.1%**		2.4%	U	**271.6%**		**129%**	**1460**		**8.3%**		**3.5%**		**12.0%**		**2.8%**		1.0%	U	**141.0%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-104-TP003															CH14-106-MW009											
Sample ID				CH14-104-TP03-SOC															CH14-106-009-SOA											
Sample Interval (mbgs)				6 - 6															2.44 - 2.74											
Sample Date				7/18/2014															8/16/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**76%**	**1620**		**1.7%**		1.7%	U	**5.6%**		**3.9%**		**1.7%**		**71.7%**		**85%**	**3530**		0.2%	U	0.2%	U	**4.7%**		**0.2%**		**0.5%**		**9.4%**	
Antimony	**78%**	**47.4**		0.5%	U	**1.6%**		**71.4%**		**8.7%**		**16.2%**		**67.3%**		**71%**	**26**		11.9%	U	26.2%	U	185.7%	U	19.0%	U	11.9%	U	**198.8%**	
Arsenic	**94%**	**1240**		**0.0%**		**0.1%**		**6.7%**		**7.5%**		**1.3%**		**134.2%**		**105%**	**353**		0.3%	U	**1.8%**		**15.6%**		**6.9%**		**0.3%**		**168.1%**	
Barium	**26%**	**17.2**		0.6%	U	**1.4%**		**7.2%**		**7.4%**		**39.3%**		**0.5%**		**69%**	**55.4**		**9.3%**		**9.0%**		**15.8%**		**19.6%**		**20.9%**		**21.8%**	
Beryllium	444%	**0.22**		16.0%	U	16.0%	U	16.0%	U	16.0%	U	16.0%	U	**24.0%**		**250%**	**0.71**		9.1%	U	9.1%	U	9.1%	U	9.1%	U	9.1%	U	**9.1%**	
Bismuth	**177%**	**3.42**		10.8%	U	10.8%	U	51.9%	U	10.8%	U	10.8%	U	**15.1%**		**232%**	**1.15**		13.8%	U	13.8%	U	13.8%	U	13.8%	U	13.8%	U	**13.8%**	
Cadmium	**100%**	**6.81**		**7.1%**		**3.5%**		3.5%	U	5.2%	U	0.4%	U	**70.0%**		**127%**	**10.4**		3.5%	U	**3.5%**		3.5%	U	3.5%	U	3.5%	U	**52.9%**	
Calcium	**75%**	**1560**		**30.9%**		**1.2%**		0.7%	U	**6.6%**				**13.2%**		**111%**	**7520**		**21.5%**		**2.5%**		0.4%	U	**4.7%**				**7.4%**	
Chromium	210%	**8.77**		16.0%	U	16.0%	U	36.7%	U	16.0%	U	**16.0%**		**75.1%**		**167%**	**16.1**		6.8%	U	6.8%	U	6.8%	U	6.8%	U	6.8%	U	**8.3%**	
Cobalt	**110%**	**140**		**3.2%**		**1.0%**		1.4%	U	1.7%	U	**0.3%**		**325.4%**		**125%**	**39.1**	**J**	0.5%	U	**0.4%**		**1.3%**		**0.4%**		**0.4%**		**25.1%**	
Copper	**92%**	**1450**		**0.1%**		**2.4%**		**7.0%**		**4.7%**		**0.0%**		**67.5%**		**141%**	**1870**		0.7%	U	**0.7%**		**20.6%**		**3.0%**		0.7%	U	**105.8%**	
Iron	**100%**	**219000**		**0.1%**		**0.0%**		**10.9%**		**1.2%**		**3.2%**		**216.3%**		**111%**	**140000**		0.1%	U	**0.1%**		**2.8%**		**0.4%**		**0.8%**		**26.1%**	
Lead	**84%**	**16300**		**20.1%**		**29.8%**		**4.0%**		**22.1%**		**0.0%**		**9.1%**		**147%**	**7250**		0.5%	U	**16.8%**		**10.5%**		**53.7%**		0.3%	U	**32.7%**	
Lithium	600%	5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	5	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	**8.5%**	
Manganese	**83%**	**174**		**16.1%**		3.3%	U	52.6%	U	4.0%	U	**13.1%**		**227.7%**		**103%**	**349**		5.8%	U	**1.1%**		**3.7%**		**2.2%**		**1.1%**		**11.2%**	
Molybdenum	**124%**	**4.91**		4.0%	U	4.0%	U	7.8%	U	4.0%	U	**4.0%**		**15.0%**		**121%**	**10.7**		7.2%	U	7.2%	U	7.2%	U	7.2%	U	**7.2%**		**7.2%**	
Nickel	126%	**17.3**		**14.8%**		6.0%	U	11.2%	U	6.3%	U	6.0%	U	**113.3%**		**71%**	**24.6**		3.0%	U	**3.0%**		**4.2%**		3.0%	U	**3.0%**		**10.3%**	
Phosphorus	84%	**242**		**9.9%**		9.9%	U	**15.3%**								**35%**	**2120**		33.3%	U	33.3%	U	117.3%	U						
Potassium	34%	**690**		100.0%	U											25%	**940**		**83.3%**											
Selenium	**195%**	**3.66**		5.4%	U	5.4%	U	5.4%	U	6.5%	U	13.5%	U	**24.9%**		**233%**	**2.38**		10.8%	U	10.8%	U	10.8%	U	10.8%	U	26.9%	U	**10.8%**	
Silver	**83%**	**30.56**		0.8%	U	0.8%	U	0.8%	U	1.2%	U	1.3%	U	**98.5%**		**93%**	**13.8**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**100.0%**	
Sodium	100%	100	U	100.0%	U											**100%**	100	U	100.0%	U										
Strontium	**111%**	**15.2**		8.4%	U	8.4%	U	8.4%	U	8.4%	U	**8.4%**		**25.8%**		**184%**	**33.1**		**17.0%**		**8.9%**		8.9%	U	8.9%	U	8.9%	U	**20.5%**	
Thallium	**139%**	**7.34**		4.5%	U	1.8%	U	**0.6%**		2.5%		21.4%	U	**44.7%**		**92%**	**8.28**		1.9%	U	1.9%	U	2.2%	U	1.9%	U	76.3%	U	**20.6%**	
Tin	**293%**	**7.3**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	26.7%	U	300%	**2.6**		15.3%	U	15.3%	U	15.3%	U	15.3%	U	15.3%	U	**15.3%**	
Titanium	**159%**	**11.7**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	103.7%	U	135%	**9.2**	**J**	1.1%	U	1.1%	U	11.7%	U	3.8%	U	1.1%	U	**34.8%**	
Uranium	**81%**	**0.628**		**1.7%**		4.0%	U	**7.5%**		1.7%	U	**1.7%**		**64.6%**		**111%**	**2.88**		**1.7%**		**1.8%**		**9.3%**		1.7%	U	**1.7%**		**6.9%**	
Vanadium	**82%**	**17.3**		**0.5%**		0.5%	U	**7.1%**		**1.6%**		**2.2%**		**36.8%**		**94%**	**46.8**		0.4%	U	**0.4%**		**5.6%**		**0.5%**		**0.4%**		**22.7%**	
Zinc	**99%**	**5600**		**4.8%**		**3.7%**		**10.0%**		**2.5%**		**0.6%**		**65.0%**		**124%**	**8760**		1.4%	U	**2.7%**		**7.0%**		**1.2%**		**8.9%**		**89.5%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-MW009														CH14-106-MW009											
Sample ID				CH14-106-009-SOD														CH14-106-009-SOI											
Sample Interval (mbgs)				13.11 - 13.41														28.04 - 28.35											
Sample Date				8/17/2014														8/17/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**61%**	**16800**		0.3%	U	**0.3%**		**9.6%**		**0.4%**		**1.4%**		**117.0%**		**99%**	**13900**		0.7%	U	0.7%		4.8%		0.7%		1.4%		208.2%	
Antimony	**107%**	**0.35**		12.7%	U	12.7%	U	15.2%	U	12.7%	U	12.7%	U	**15.2%**		**145%**	**0.34**		11.9%	U	11.9%	U	32.1%	U	11.9%	U	11.9%	U	47.6%	
Arsenic	**110%**	**8.05**		0.1%	U	**0.1%**		**6.4%**		**0.9%**		**4.1%**		**7.2%**		**91%**	**48.9**		0.2%	U	0.2%		12.8%		2.9%		4.4%		37.4%	
Barium	**141%**	**229**		**14.1%**		**8.4%**		**3.1%**		**4.9%**		**5.3%**		**38.0%**		**96%**	**156**		56.3%		44.6%		15.4%		17.1%		18.9%		206.3%	
Beryllium	**600%**	**1.55**		9.1%	U	9.1%	U	9.1%	U	9.1%	U	9.1%	U	**25.1%**		**204%**	**1.41**		11.0%	U	11.0%	U	11.0%	U	11.0%	U	11.0%	U	24.2%	
Bismuth	**600%**	**0.69**		12.0%	U	**12.0%**		13.9%	U	12.0%	U	12.0%	U	**42.2%**		**577%**	**0.87**		15.9%	U	15.9%	U	17.5%	U	15.9%	U	15.9%	U	41.3%	
Cadmium	**133%**	**0.901**		7.9%	U	**10.3%**		7.9%	U	7.9%	U	7.9%	U	**26.8%**		**140%**	**1.27**		14.5%	U	19.1%		14.5%	U	14.5%	U	14.5%	U	64.2%	
Calcium	**101%**	**11100**		**10.9%**		**1.9%**		0.7%	U	**5.6%**				**67.0%**		**96%**	**6960**		24.7%		55.0%		1.7%	U	20.4%				138.1%	
Chromium	**249%**	**43.6**		7.7%	U	7.7%	U	7.7%	U	7.7%	U	7.7%	U	**49.5%**		**167%**	**37.2**		11.6%	U	11.6%	U	11.6%	U	11.6%	U	11.6%	U	75.0%	
Cobalt	**98%**	**26.2**		0.4%	U	**0.7%**		**6.4%**		**0.5%**		**6.3%**		**32.2%**		**96%**	**24.1**		0.4%	U	**1.4%**		**8.6%**		**0.4%**		**4.3%**		**33.8%**	
Copper	**118%**	**51.5**		0.7%	U	**0.8%**		**7.2%**		**1.2%**		0.7%	U	**26.1%**		**102%**	**57.6**		0.7%	U	**1.1%**		**9.6%**		**1.6%**		0.7%	U	**39.2%**	
Iron	**99%**	**53200**		0.1%	U	**0.1%**		**4.7%**		**0.2%**		**5.9%**		**30.8%**		**99%**	**56500**		0.1%	U	**0.2%**		**5.5%**		**0.2%**		**4.2%**		**33.8%**	
Lead	**117%**	**142**		1.2%	U	**5.6%**		**21.9%**		**15.7%**		1.2%	U	**32.1%**		**106%**	**43.2**		2.1%	U	**61.5%**		**39.9%**		**56.3%**		2.1%	U	**135.4%**	
Lithium	**600%**	**30.1**		8.7%	U	8.7%	U	8.7%	U	8.7%	U	8.7%	U	**75.2%**		**156%**	**30.5**		13.7%	U	13.7%	U	13.7%	U	13.7%	U	13.7%	U	**82.5%**	
Manganese	**91%**	**572**		6.6%	U	**2.4%**		**4.9%**		**0.8%**		**3.1%**		**25.6%**		**101%**	**630**		1.8%	U	**4.2%**		**7.1%**		**0.8%**		**3.1%**		**26.5%**	
Molybdenum	**600%**	**5.45**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	297%	0.5	U	16.7%	U	16.7%	U	24.3%	U	16.7%	U	16.7%	U	22.0%	U
Nickel	**131%**	**50.1**		3.4%	U	3.4%	U	**6.4%**		3.4%	U	**11.3%**		43.5%		**108%**	**47.8**		4.9%	U	4.9%	U	**12.9%**		4.9%	U	**9.0%**		**50.2%**	
Phosphorus	59%	**509**		33.3%	U	33.3%	U	123.3%	U							53%	**417**		33.3%	U	33.3%	U	92.0%	U						
Potassium	**13%**	**4100**		**71.4%**												**5%**	**4580**		**44.0%**											
Selenium	**750%**	**0.52**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U	517%	0.2	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	20.7%	U
Silver	**153%**	**0.34**		12.0%	U	12.0%	U	12.0%	U	12.0%	U	12.0%	U	**16.9%**		**337%**	**0.29**		13.5%	U	13.5%	U	13.5%	U	13.5%	U	13.5%	U	**41.9%**	
Sodium	**18%**	100	U	100.0%	U											13%	**180**		100.0%	U										
Strontium	**147%**	**37.7**		**11.5%**		**11.5%**		11.5%	U	11.5%	U	11.5%	U	**170.9%**		**105%**	**33.2**		14.7%	U	15.0%	U	14.7%	U	14.7%	U	14.7%	U	**122.4%**	
Thallium	**532%**	**0.335**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	76.2%	U	**8.3%**		**1227%**	**0.302**		2.0%	U	2.0%	U	2.0%	U	2.0%	U	79.8%	U	**12.3%**	
Tin	**600%**	2	U	16.1%	U	16.1%	U	16.1%	U	16.1%	U	16.1%	U	**16.1%**		**600%**	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**86%**	**349**		0.8%	U	0.8%	U	1.2%	U	0.8%	U	0.8%	U	**82.6%**		**101%**	**517**		7.8%	U	7.8%	U	8.4%	U	7.8%	U	7.8%	U	**911.6%**	
Uranium	**110%**	**2.68**		5.1%	U	**13.2%**		**18.4%**		5.1%	U	**11.6%**		**58.7%**		**110%**	**0.798**		5.9%	U	**7.9%**		17.3%	U	5.9%	U	11.3%	U	**112.0%**	
Vanadium	**78%**	**41.6**		0.6%	U	**0.6%**		**10.8%**		0.6%	U	**8.2%**		**86.9%**		**105%**	**30.1**		0.9%	U	**0.9%**		**12.4%**		**0.9%**		**7.0%**		**212.0%**	
Zinc	**122%**	**413**		0.7%	U	**0.7%**		**4.2%**		**0.8%**		34.1%	U	**59.1%**		**127%**	**160**		0.8%	U	**3.1%**		**12.3%**		0.8%	U	41.1%	U	**117.5%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-MW009															CH14-106-MW009											
Sample ID				CH14-106-009-SOK															CH14-106-909-SOK											
Sample Interval (mbgs)				32.92 - 33.22															32.92 - 33.22											
Sample Date				8/17/2014															8/17/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**115%**	**6080**		0.4%	U	0.4%		2.3%		0.4%	U	1.0%		232.3%		**113%**	**13200**		0.3%	U	0.3%		2.0%		0.3%		1.1%		95.7%	
Antimony	**141%**	**0.29**		15.6%	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	21.9%		**139%**	**0.17**		14.7%	U	14.7%	U	50.0%	U	14.7%	U	14.7%	U	**39.7%**	
Arsenic	**97%**	**30.1**		0.1%	U	0.1%		3.5%		0.5%		3.0%		4.0%		**92%**	**11.3**	J	0.1%	U	0.1%		7.5%		1.7%		5.8%		9.9%	
Barium	**118%**	**109**		10.8%		10.0%		0.9%		1.6%		1.5%		57.9%		**120%**	**208**		5.8%		4.9%		1.0%		1.3%		1.5%		26.0%	
Beryllium	**262%**	**1.05**		9.9%	U	9.9%	U	9.9%	U	9.9%	U	9.9%	U	41.6%		**233%**	**1.4**		9.4%	U	9.4%	U	9.4%	U	9.4%	U	9.4%	U	22.5%	
Bismuth	**405%**	**0.26**		14.7%	U	14.7%	U	14.7%	U	14.7%	U	14.7%	U	14.7%		**600%**	**0.27**		16.3%	U	16.3%	U	16.3%	U	16.3%	U	16.3%	U	16.3%	
Cadmium	**146%**	**0.123**		11.9%	U	14.5%		11.9%	U	11.9%	U	11.9%	U	22.1%		**192%**	**0.227**		11.4%	U	**11.4%**		11.4%	U	11.4%	U	11.4%	U	**46.5%**	
Calcium	**111%**	**2730**		43.9%		275.4%		1.1%	U	5.7%				454.1%		**122%**	**4550**		**19.3%**		**102.6%**		1.0%	U	**18.0%**				**82.1%**	
Chromium	**159%**	**20.3**		9.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	90.1%		**174%**	**30.6**		8.5%	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	**70.9%**	
Cobalt	**104%**	**25.1**		0.5%	U	**1.7%**		**10.0%**		0.5%	U	**10.5%**		**50.5%**		**91%**	**18.5**		0.4%	U	**1.3%**		**9.2%**		**0.4%**		**9.4%**		**37.8%**	
Copper	**99%**	**55.4**		1.6%	U	**1.6%**		**9.5%**		**1.6%**		1.6%	U	**49.1%**		**46%**	**29**		1.4%	U	**3.5%**		**28.5%**		**3.0%**		1.4%	U	**81.5%**	
Iron	**107%**	**63100**		0.1%	U	**0.1%**		**3.5%**		**0.1%**		**6.7%**		**56.8%**		**107%**	**55100**		0.1%	U	**0.1%**		**5.5%**		**0.3%**		**10.0%**		**34.0%**	
Lead	**99%**	**16.6**		0.2%	U	**0.2%**		**0.7%**		**0.5%**		0.2%	U	3.6%	J	**114%**	**103**		0.4%	U	**0.6%**		**3.2%**		**2.2%**		0.4%	U	**9.3%**	J
Lithium	**202%**	**12.4**		9.5%	U	9.5%	U	9.5%	U	9.5%	U	9.5%	U	**70.7%**		**174%**	**30.1**		8.5%	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	**42.1%**	
Manganese	**98%**	**673**		4.0%	U	**20.5%**		**5.7%**		1.0%	U	**3.3%**		**60.4%**		**119%**	**548**		2.3%	U	**8.0%**		**5.5%**		**1.0%**		**3.8%**		**28.6%**	
Molybdenum	161%	0.5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	370%	**0.69**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	43.3%	U	28.3%	U
Nickel	**120%**	**38.1**		4.1%	U	**4.1%**		**7.0%**		4.1%	U	12.8%		**53.7%**		**105%**	**40.2**		3.8%	U	**3.8%**		**10.1%**		3.8%	U	**18.2%**		**58.8%**	
Phosphorus	46%	**294**		33.3%	U	33.3%	U	70.7%	U							33%	**391**		33.3%	U	33.3%	U	67.3%	U						
Potassium	**5%**	**1750**		**164.3%**												**5%**	**2420**		**71.4%**											
Selenium	447%	0.2	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U	**517%**	0.2	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	22.0%	U
Silver	**231%**	**0.16**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	12.3%	U	**12.3%**		**429%**	**0.17**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	**25.3%**	
Sodium	**29%**	100	U	100.0%	U											**8%**	100	U	100.0%	U										
Strontium	**152%**	**12.5**		**32.1%**		44.9%	U	15.6%	U	15.6%	U	15.6%	U	**266.0%**		**134%**	**18.8**		**14.6%**		48.4%	U	14.6%	U	14.6%	U	14.6%	U	**101.5%**	
Thallium	**976%**	**0.191**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	77.7%	U	**19.2%**		**792%**	**0.318**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	74.7%	U	**8.4%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**108%**	**43.6**		1.9%	U	1.9%	U	2.2%	U	1.9%	U	3.3%	U	**380.6%**		**122%**	**267**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	1.9%	U	**132.3%**	
Uranium	**96%**	**0.61**		4.6%	U	**14.7%**		**20.2%**		4.6%	U	**9.2%**		**39.2%**		**133%**	**1.03**		3.8%	U	**7.8%**		**14.7%**		3.8%	U	**14.4%**		**64.6%**	
Vanadium	**109%**	**21.3**		0.7%	U	0.7%	U	**7.1%**		0.7%	U	**5.4%**		**196.1%**		**93%**	**26.5**		0.6%	U	0.6%	U	**7.8%**		0.7%	U	**11.0%**		**118.9%**	
Zinc	**132%**	**88.8**		0.4%	U	**0.4%**		**1.2%**		**0.4%**		21.4%	U	**32.5%**		**169%**	**227**		0.4%	U	**0.4%**		**3.9%**		**0.7%**		21.8%	U	**31.2%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-MW009															CH14-106-MW009											
Sample ID				CH14-106-009-SOM															CH14-106-009-SOP											
Sample Interval (mbgs)				40.84 - 41.15															48.5 - 48.8											
Sample Date				8/17/2014															8/19/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**99%**	**13600**		0.2%	U	**0.2%**		**1.1%**		**0.2%**		**0.9%**		**46.1%**		**88%**	**32900**		0.6%	U	0.6%	U	**10.3%**		**0.6%**		**1.6%**		**251.8%**	
Antimony	**99%**	**0.3**		16.7%	U	16.7%	U	61.7%	U	16.7%	U	16.7%	U	36.7%	U	84%	0.1	U	4.3%	U	4.3%	U	**5.6%**		4.3%	U	4.3%	U	**5.6%**	
Arsenic	**76%**	**49.4**	J	3.4%	U	**3.4%**		289.1%	U	86.9%	U	271.6%	U	**246.0%**		**73%**	**0.503**		0.1%	U	**0.1%**		**2.3%**		**0.2%**		**0.6%**		**2.7%**	
Barium	**97%**	**188**		**4.7%**		**3.7%**		**0.9%**		**1.1%**		**1.4%**		**20.2%**		**83%**	**319**		**6.1%**		**5.6%**		**0.5%**		**1.3%**		**0.7%**		**9.2%**	
Beryllium	**208%**	**1.38**		8.3%	U	**8.3%**		8.3%	U	8.3%	U	8.3%	U	**19.4%**		**191%**	**2.22**		8.6%	U	8.6%	U	9.1%	U	8.6%	U	**8.6%**		**56.9%**	
Bismuth	364%	**0.39**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	300%	0.2	U	11.5%	U	11.5%	U	14.9%	U	11.5%	U	11.5%	U	**89.7%**	
Cadmium	**134%**	**0.212**		16.7%	U	111.0%	U	16.7%	U	44.3%	U	16.7%	U	68.0%	U	125%	0.05	U	**3.1%**		**3.8%**		**3.1%**		**3.1%**		3.1%	U	**5.9%**	
Calcium	**94%**	**4740**		**20.9%**		**18.7%**		1.0%	U	**13.7%**				**73.8%**		**92%**	**4570**		**30.5%**		281.7%	U	1.5%	U	**9.0%**				**329.3%**	
Chromium	**193%**	**30.7**		6.7%	U	6.7%	U	6.7%	U	6.7%	U	6.7%	U	**45.8%**		**149%**	**49.3**		9.8%	U	9.8%	U	9.8%	U	9.8%	U	9.8%	U	**95.5%**	
Cobalt	**94%**	**20.9**		1.3%	U	**5.2%**		**16.4%**		1.0%	U	**15.2%**		**39.9%**		**91%**	**15.5**		**0.3%**		**0.6%**		**4.3%**		0.4%	U	**1.9%**		**30.3%**	
Copper	**87%**	**34.6**		1.3%	U	**5.7%**		**32.4%**		4.0%	U	1.3%	U	**73.4%**		**96%**	**26.3**		0.2%	U	**0.2%**		**1.4%**		**0.4%**		0.2%	U	**15.7%**	
Iron	**94%**	**55500**		0.1%	U	**0.1%**		**4.5%**		**0.5%**		**12.2%**		**34.8%**		**91%**	**52100**		0.1%	U	**0.1%**		**5.1%**		**0.1%**		**1.9%**		**33.2%**	
Lead	**77%**	**132**		5.2%	U	**17.0%**		**60.3%**		56.2%	U	6.2%	U	**176.2%**		**87%**	**7.57**		**0.1%**		**0.2%**		**0.1%**		**0.4%**		**0.1%**		**1.0%**	
Lithium	**195%**	**32.4**		6.6%	U	6.6%	U	6.6%	U	6.6%	U	6.6%	U	**45.2%**		**196%**	**58.7**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	**98.4%**	
Manganese	**91%**	**564**		19.1%	U	**20.8%**		**30.3%**		4.6%	U	**16.9%**		**75.5%**		**94%**	**209**		**0.7%**		**6.1%**		**6.8%**		**1.1%**		**1.4%**		**25.4%**	
Molybdenum	153%	**0.67**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	34.7%	U	16.7%	U	201%	**0.57**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	46.7%	U
Nickel	**114%**	**44**		4.0%	U	**4.0%**		10.9%	U	4.0%	U	21.5%	U	**51.0%**		**98%**	**39.9**		3.3%	U	3.3%	U	**9.8%**		3.3%	U	**4.3%**		**70.4%**	
Phosphorus	34%	**431**		29.4%	U	29.4%	U	**112.4%**								**33%**	**334**		33.3%	U	33.3%	U	201.3%	U						
Potassium	**5%**	**2110**		**25.6%**												**4%**	**14400**		**140.0%**											
Selenium	**388%**	0.2	U	12.6%	U	12.6%	U	12.6%	U	12.6%	U	31.4%	U	**13.8%**		**490%**	**0.29**		12.6%	U	12.6%	U	12.6%	U	12.6%	U	31.4%	U	**21.4%**	
Silver	**363%**	**0.23**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	33.3%	U	**304%**	0.1	U	4.7%	U	4.7%	U	4.7%	U	4.7%	U	4.7%	U	**4.7%**	
Sodium	**22%**	100	U	100.0%	U											**20%**	**400**		100.0%	U										
Strontium	**130%**	**19.5**		**14.2%**		**14.2%**		14.2%	U	14.2%	U	14.2%	U	101.1%	U	123%	**19.4**		19.4%	U	96.6%	U	15.4%	U	22.5%	U	15.4%	U	**430.8%**	
Thallium	**1144%**	**0.358**		1.8%	U	1.8%	U	1.8%	U	1.8%	U	71.1%	U	**11.4%**		**920%**	**0.567**		1.5%	U	1.5%	U	1.5%	U	1.5%	U	61.9%	U	**7.8%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**92%**	**222**		0.3%	U	0.3%	U	0.3%	U	0.3%	U	0.3%	U	**25.8%**		**79%**	**1590**		1.7%	U	1.7%	U	3.4%	U	1.7%	U	1.7%	U	**200.7%**	
Uranium	**108%**	**1.1**		4.2%	U	**10.4%**		**10.9%**		4.2%	U	11.6%	U	**44.2%**		**81%**	**1.06**		5.1%	U	**12.7%**		**17.5%**		3.6%	U	**3.6%**		**83.3%**	
Vanadium	**101%**	**26.3**		0.4%	U	**0.4%**		**5.4%**		0.6%	U	**8.2%**		**65.8%**		**88%**	**49.2**		0.6%	U	0.6%	U	**11.2%**		0.7%	U	**2.5%**		**122.3%**	
Zinc	**119%**	**188**		0.6%	U	**0.7%**		**4.0%**		1.1%	U	30.0%	U	**40.3%**		**119%**	**107**		**0.1%**		**0.1%**		**0.6%**		**0.1%**		**4.5%**		**4.9%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-MW009														CH14-106-TP001											
Sample ID				CH14-106-009-SOT														CH14-106-TP001-SOA											
Sample Interval (mbgs)				60 - 60.4														1.3 - 1.3											
Sample Date				8/19/2014														7/18/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**96%**	**7940**		0.1%	U	**0.1%**		**0.4%**		**0.1%**		**0.1%**		**35.9%**		**98%**	**41900**		**1.2%**		0.4%	U	**0.4%**		**0.4%**		**0.7%**		**1.1%**	
Antimony	**183%**	**3.02**		16.7%	U	16.7%	U	23.3%	U	16.7%	U	16.7%	U	40.0%	U	126%	0.1	U	2.2%	U	7.3%	U	**165.9%**		**25.1%**		**11.4%**		**820.7%**	
Arsenic	**88%**	**48.8**		3.4%	U	**3.3%**		**108.3%**		**14.8%**		25.1%	U	**641.6%**		**129%**	**1.88**		**0.6%**		1.0%	U	**57.2%**		**29.8%**		**105.5%**		**526.8%**	
Barium	**99%**	**301**		**4.9%**		**4.8%**		**1.0%**		**1.4%**		**1.0%**		**26.4%**		**94%**	**222**		**2.9%**		**4.8%**		**8.3%**		**6.6%**		**226.0%**		**2.1%**	
Beryllium	**140%**	**2.06**		8.8%	U	8.8%	U	8.8%	U	8.8%	U	8.8%	U	**17.7%**		**250%**	**1.83**		13.4%	U	13.4%	U	13.4%	U	13.4%	U	13.4%	U	**13.4%**	
Bismuth	**130%**	**2.86**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	0.2	U	8.8%	U	8.8%	U	**8.8%**		8.8%	U	8.8%	U	**27.2%**	
Cadmium	**182%**	**1.41**		16.4%	U	**16.4%**		16.4%	U	16.4%	U	16.4%	U	76.3%	U	**317%**	**0.081**		**702.9%**		**17.6%**		9.6%	U	5.4%	U	4.5%	U	**1041.3%**	
Calcium	**94%**	**3080**		**4.7%**		**71.1%**	J	0.4%	U	**2.0%**				**79.5%**		**112%**	**17900**		**8.8%**		**0.9%**		0.9%	U	**1.6%**				**5.4%**	
Chromium	**126%**	**30.8**		4.9%	U	4.9%	U	4.9%	U	4.9%	U	4.9%	U	**53.0%**		**95%**	**78.1**		9.3%	U	9.3%	U	9.3%	U	9.3%	U	**9.3%**		**9.3%**	
Cobalt	**104%**	**36.4**		0.6%	U	**2.0%**		**6.9%**	J	**0.6%**		**3.0%**		**88.3%**		**105%**	**15.6**		7.8%		**0.3%**		**0.3%**		**0.3%**		**1.1%**		**409.6%**	
Copper	**129%**	**207**		2.9%	U	**2.9%**		**7.5%**		**2.9%**		2.9%	U	**113.0%**		**70%**	**21.2**		**66.6%**		**1.5%**		**15.1%**		**3.3%**		0.2%	U	**325.6%**	
Iron	**97%**	**71100**		0.1%	U	**0.1%**		**4.0%**		**0.1%**		**1.6%**		**57.6%**		**92%**	**46300**		2.2%	U	**0.3%**		**4.9%**		**0.5%**		**28.0%**		**308.6%**	
Lead	**102%**	**722**		2.6%	U	**6.4%**	J	**2.6%**		**9.7%**		2.6%	U	**43.3%**		**125%**	**18.3**		**3.3%**		**6.9%**		**8.6%**		**3.7%**		**0.0%**		**145.3%**	
Lithium	**162%**	**14.1**		7.6%	U	7.6%	U	7.6%	U	7.6%	U	7.6%	U	**55.5%**		**170%**	**44.4**		11.0%	U	11.0%	U	11.0%	U	11.0%	U	11.0%	U	**11.0%**	
Manganese	**96%**	**772**		1.3%	U	**15.3%**		**8.2%**		1.5%	U	**1.7%**		**58.2%**		**94%**	**500**		**23.0%**		**1.4%**		**2.5%**		1.4%	U	**6.0%**		**54.6%**	
Molybdenum	192%	**0.71**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	32.7%	U	400%	**0.75**		13.7%	U	13.7%	U	13.7%	U	13.7%	U	13.7%	U	**71.2%**	
Nickel	**109%**	**55.4**		4.6%	U	4.6%	U	12.2%	U	4.6%	U	**4.6%**		**86.9%**		**99%**	**38.2**		**6.4%**		4.9%	U	4.9%	U	4.9%	U	**4.9%**		**24.2%**	
Phosphorus	64%	**589**		32.5%	U	32.5%	U	**70.1%**								**31%**	**479**		33.3%	U	33.3%	U	34.7%	U						
Potassium	**8%**	**2630**		**22.0%**												**6%**	**8580**		100.0%	U										
Selenium	**400%**	**0.59**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	30.7%	U	489%	0.2	U	11.4%	U	11.4%	U	11.4%	U	11.4%	U	28.4%	U	**36.9%**	
Silver	**600%**	**2.34**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	0.1	U	3.1%	U	3.1%	U	3.1%	U	**3.1%**		3.1%	U	**563.5%**	
Sodium	**11%**	100	U	100.0%	U											37%	**150**		100.0%	U										
Strontium	**115%**	**10.5**		**2.3%**		**12.3%**		2.3%	U	2.3%	U	2.3%	U	**21.9%**		**121%**	**195**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	**12.1%**		**12.1%**	
Thallium	**1232%**	**1.24**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	82.6%	U	**8.3%**		**1284%**	**0.223**		1.4%	U	1.4%	U	5.3%	U	3.2%	U	57.3%	U	**161.0%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	28.3%	U
Titanium	**95%**	**217**		0.5%	U	0.5%	U	0.5%	U	**0.8%**		0.5%	U	**37.3%**		**84%**	**643**		0.7%	U	0.7%	U	0.7%	U	**0.7%**		**0.7%**		**0.7%**	
Uranium	**101%**	**1.37**		3.6%	U	**7.2%**		**10.1%**		**3.6%**		**3.6%**		**56.0%**		**114%**	**1.35**		**31.3%**		**5.1%**		5.1%	U	5.1%	U	**12.8%**		**34.5%**	
Vanadium	**93%**	**29.9**		0.3%	U	0.3%	U	**2.0%**		**0.3%**		**0.7%**		**68.4%**		**88%**	**51.6**		0.5%	U	0.5%	U	**6.1%**		**0.5%**		**10.2%**		**2.6%**	
Zinc	**166%**	**1200**		0.6%	U	**0.6%**		**1.5%**		**0.6%**		31.0%	U	**42.0%**		**219%**	**100**		**254.5%**		**3.1%**		**7.3%**		**2.2%**		**4.5%**		**694.9%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP001															CH14-106-TP001											
Sample ID				CH14-106-TP001-SOC															CH14-106-TP901-SOC											
Sample Interval (mbgs)				5 - 5															5 - 5											
Sample Date				7/18/2014															7/18/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**117%**	**13800**		0.2%	U	**0.2%**		**0.2%**	**J**	**0.2%**		**0.2%**		**3.1%**		**134%**	**22000**		0.3%	U	**0.2%**		**1.7%**	**J**	**1.2%**		**0.8%**		**44.6%**	
Antimony	**90%**	**5.32**		15.9%	U	22.2%	U	1039.7%	U	287.3%	U	127.0%	U	**3047.6%**		**86%**	**0.33**		15.2%	U	15.2%	U	128.8%	U	36.4%	U	15.2%	U	**98.5%**	
Arsenic	**88%**	**135**		1.2%	U	**1.6%**		**57.1%**	**J**	**301.2%**		71.9%	U	**6948.8%**		**101%**	**8.98**	**J**	1.6%	U	**2.7%**		**57.6%**	**J**	**17.2%**		16.0%	U	**59.8%**	
Barium	**276%**	**80.1**		**1.7%**		**2.7%**		**8.0%**	**J**	**4.1%**	**J**	**24.3%**		**4.7%**		**517%**	**105**		**12.5%**		**7.3%**		8.3%	UJ	**7.3%**	**J**	**5.9%**		**24.9%**	
Beryllium	**600%**	**0.98**		7.7%	U	**7.7%**		**7.7%**		7.7%	U	**7.7%**		**10.4%**		**410%**	**2.07**		7.2%	U	**7.2%**		7.2%	U	7.2%	U	**7.2%**		**16.3%**	
Bismuth	**191%**	**1.63**		7.2%	U	7.2%	U	**7.2%**		7.2%	U	7.2%	U	**7.2%**	**J**	**500%**	**0.63**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	UJ
Cadmium	**97%**	**1.12**		**9.4%**		**0.8%**		**0.9%**	**J**	**0.7%**		0.4%	U	**219.8%**	**J**	**113%**	**7.9**		**4.8%**		**1.6%**		0.9%	UJ	**0.9%**		0.9%	U	**2.1%**	**J**
Calcium	**111%**	**5280**		**1.5%**		**0.2%**		0.2%	U	**0.2%**				**4.5%**		**106%**	**30600**		**4.9%**		**0.3%**		0.1%	U	**0.5%**				**9.1%**	
Chromium	**498%**	**39.9**		7.0%	U	7.0%	U	7.0%	U	7.0%	U	7.0%	U	**9.1%**		**333%**	**41.7**		6.7%	U	6.7%	U	6.7%	U	6.7%	U	6.7%	U	**38.4%**	
Cobalt	**104%**	**38.6**		4.7%	U	**0.3%**		**0.9%**	**J**	**0.8%**	**J**	0.3%	J	**295.0%**		**97%**	**45.4**		6.1%	U	**0.4%**		**0.6%**	**J**	**0.3%**	**J**	**2.1%**	**J**	**16.5%**	
Copper	**88%**	**332**		18.9%	U	**23.9%**		**160.5%**	**J**	**37.4%**		1.2%	U	**2237.7%**		**98%**	**43.4**		5.5%	U	**9.2%**		**49.2%**	**J**	**2.8%**		1.7%	U	**32.2%**	
Iron	**101%**	**115000**		0.2%	U	**0.9%**		**22.1%**	**J**	**2.6%**		**5.2%**		**645.1%**		**101%**	**42800**		0.2%	U	**1.2%**		**10.8%**	**J**	**1.0%**		**5.3%**		**34.5%**	
Lead	**122%**	**3170**		384.2%	U	**172.4%**	**J**	**83.3%**	**J**	**33.1%**	**J**	**0.2%**		**177.9%**	**J**	**92%**	**197**	**J**	3.3%	U	**28.2%**	**J**	**21.1%**	**J**	**7.4%**	**J**	**1.6%**		**19.7%**	**J**
Lithium	**600%**	**20.7**		7.7%	U	7.7%	U	7.7%	U	7.7%	U	7.7%	U	**7.7%**		**600%**	**37.2**		7.5%	U	7.5%	U	7.5%	U	7.5%	U	7.5%	U	**45.0%**	
Manganese	**101%**	**416**		6.7%	U	**0.3%**		**1.4%**	**J**	**0.3%**	**J**	**0.8%**	**J**	**30.4%**		**107%**	**1750**		3.9%	U	**0.3%**		0.3%	J	**0.3%**	**J**	**0.6%**	**J**	**8.5%**	
Molybdenum	**216%**	**1.68**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	95.7%	U	178%	**0.58**		15.6%	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	**15.6%**	
Nickel	**154%**	**43.5**		5.0%	U	**3.1%**		**3.1%**		3.1%	U	**3.1%**		**44.7%**		**120%**	**61.8**		8.6%	U	**3.1%**		**3.1%**		**3.1%**		**3.4%**		**29.1%**	
Phosphorus	62%	**403**		33.3%	U	33.3%	U	33.3%	U							45%	**606**		33.3%	U	33.3%	U	80.7%	U						
Potassium	100%	**5580**		**83.3%**												**40%**	**1090**		**71.4%**											
Selenium	**300%**	**0.73**		10.6%	U	10.6%	U	10.6%	U	10.6%	U	26.6%	U	**29.8%**		**262%**	**0.29**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U
Silver	**103%**	**2.85**		7.3%	U	7.3%	U	7.3%	U	7.3%	U	7.3%	U	**1153.3%**	**J**	**97%**	**0.35**		16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**24.6%**	**J**
Sodium	100%	**310**		100.0%	U											100%	**120**		100.0%	U										
Strontium	**397%**	**30.2**		**4.5%**		**4.5%**		4.5%	U	4.5%	U	4.5%	U	**4.5%**		**561%**	**86.1**		**4.8%**		**4.3%**		4.3%	U	4.3%	U	4.3%	U	**24.8%**	
Thallium	**136%**	**1.2**		36.0%	U	7.2%	U	4.3%	U	7.7%	U	82.6%	U	**393.5%**		**109%**	**0.125**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	83.6%	U	**9.4%**	
Tin	258%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	26.7%	U	300%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**556%**	**635**		6.2%	U	6.2%	U	6.2%	U	**6.2%**		6.2%	U	**22.5%**		**257%**	**29**		7.2%	U	7.2%	U	16.8%	U	**20.9%**		**7.2%**		**695.0%**	
Uranium	**101%**	**0.92**		4.0%	U	**5.0%**		**5.7%**		4.0%	U	**4.0%**		**67.1%**		**103%**	**1.12**		4.4%	U	**232.4%**		114.0%	U	**11.4%**		**7.6%**		**43.5%**	
Vanadium	**92%**	**42.4**		0.2%	U	0.2%	U	**2.2%**	**J**	**0.5%**		**0.8%**		**16.2%**		**106%**	**65**		0.2%	U	0.2%	U	**4.4%**	**J**	**0.8%**		**2.1%**		**29.7%**	
Zinc	**94%**	**1250**		**9.5%**		**0.9%**		**4.2%**	**J**	**1.0%**	**J**	**0.9%**		**322.3%**		**114%**	**5790**		**11.4%**		**1.1%**		**0.8%**	**J**	**0.2%**	**J**	**1.1%**		**3.5%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP002														CH14-106-TP002											
Sample ID				CH14-106-TP002-SOA														CH14-106-TP002-SOC											
Sample Interval (mbgs)				2.5 - 2.5														5 - 5											
Sample Date				7/18/2014														7/18/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**101%**	**24200**		1.2%	U	1.5%	U	**14.0%**		**3.1%**		4.6%	U	**386.3%**		**95%**	**2850**		0.5%	U	0.5%	U	**4.0%**		**0.9%**		1.5%	U	**156.4%**	
Antimony	**135%**	**0.39**		2.6%	U	2.6%	U	**5.7%**		2.6%	U	**2.6%**		**4.7%**		**140%**	**4.62**		2.5%	U	2.5%	U	**3.8%**		**2.5%**		**2.5%**		**3.8%**	
Arsenic	**95%**	**4.58**	**J**	0.2%	U	**0.2%**		**5.7%**		**1.1%**		**4.0%**		**7.9%**		**96%**	**42.9**		0.0%	U	**0.0%**		**0.3%**		**0.1%**		**0.2%**		**0.4%**	
Barium	**112%**	**120**		**9.1%**		**2.5%**		**0.4%**		**0.8%**		**0.9%**		**9.3%**		**93%**	**170**		**8.2%**		**3.0%**		**0.8%**		**1.0%**		**1.5%**		**17.9%**	
Beryllium	**196%**	**2.16**		9.7%	U	9.7%	U	9.7%	U	9.7%	U	9.7%	U	**23.8%**		**210%**	**1.33**		8.5%	U	8.5%	U	**8.5%**		8.5%	U	8.5%	U	**18.7%**	
Bismuth	**222%**	0.2	U	10.1%	U	10.1%	U	**10.1%**		10.1%	U	10.1%	U	**10.1%**		**261%**	**2.72**		9.8%	U	9.8%	U	**9.8%**		9.8%	U	9.8%	U	**9.8%**	
Cadmium	**129%**	**6.72**		**5.8%**		**3.6%**		**2.0%**		**2.0%**		2.0%	U	**14.2%**		**116%**	**2.46**		7.9%	U	**5.9%**		**3.5%**		**3.5%**		3.5%	U	**46.4%**	
Calcium	**115%**	**29800**		**9.2%**		**0.9%**		0.9%	U	**5.3%**				**85.0%**		**85%**	**4760**		**5.1%**		**1.4%**		0.7%	U	**3.7%**				**67.2%**	
Chromium	**164%**	**44.8**		11.2%	U	11.2%	U	11.2%	U	11.2%	U	11.2%	U	**66.4%**		**146%**	**20.8**		10.4%	U	10.4%	U	10.4%	U	10.4%	U	10.4%	U	**56.3%**	
Cobalt	**100%**	**46.7**		1.4%	U	**0.6%**		**2.5%**		**0.4%**		**4.1%**		**25.3%**		**96%**	**29.2**		0.8%	U	**0.4%**		**1.5%**		**0.4%**		**2.9%**		**21.9%**	
Copper	**100%**	**43.2**		0.5%	U	**2.1%**		**3.9%**		**0.5%**		0.5%	U	**11.0%**		**85%**	**308**		0.3%	U	**1.0%**		**1.5%**		**0.3%**		0.3%	U	**6.3%**	
Iron	**98%**	**44000**		0.1%	U	**0.3%**		**3.0%**		**0.2%**		**3.8%**		**22.2%**		**96%**	**86000**		0.1%	U	**0.4%**		**3.5%**		**0.2%**		**3.6%**		**25.0%**	
Lead	**93%**	**64.3**	**J**	**0.1%**		**1.1%**		**0.7%**		**0.3%**		0.1%	U	**1.5%**		**104%**	**1040**		0.0%	U	**0.4%**		**0.4%**		**0.1%**		0.0%	U	**0.8%**	
Lithium	**187%**	**39.3**		15.7%	U	15.7%	U	15.7%	U	15.7%	U	15.7%	U	**97.5%**		**168%**	**5.8**		11.1%	U	11.1%	U	11.1%	U	11.1%	U	11.1%	U	**62.7%**	
Manganese	**107%**	**1660**		1.5%	U	**0.3%**		**0.8%**		**0.3%**		**1.0%**		**11.2%**		**99%**	**1400**		1.8%	U	**0.5%**		**1.0%**		**0.5%**		**1.5%**		**19.4%**	
Molybdenum	**441%**	**0.57**		16.2%	U	16.2%	U	16.2%	U	16.2%	U	16.2%	U	**16.2%**		**313%**	**2.03**		16.7%	U	16.7%	U	18.0%	U	16.7%	U	16.7%	U	16.7%	U
Nickel	**120%**	**58.2**		3.8%	U	3.8%	U	**3.8%**		3.8%	U	**5.6%**		**37.7%**		**110%**	**50.5**		3.5%	U	3.5%	U	**3.5%**		3.5%	U	**3.8%**		**30.1%**	
Phosphorus	38%	**622**		33.3%	U	33.3%	U	102.0%	U							29%	**340**		33.3%	U	33.3%	U	82.7%	U						
Potassium	**7%**	**1240**		100.0%	U											5%	**890**		100.0%	U										
Selenium	417%	0.2	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U	750%	**0.49**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	30.9%	U	**12.3%**	
Silver	**310%**	**0.17**		3.8%	U	3.8%	U	3.8%	U	3.8%	U	3.8%	U	**4.2%**		**555%**	**3.27**		2.9%	U	2.9%	U	2.9%	U	2.9%	U	2.9%	U	**3.2%**	
Sodium	26%	**140**		100.0%	U											**16%**	100	U	100.0%	U										
Strontium	**151%**	**89.5**		12.9%	U	12.9%	U	12.9%	U	12.9%	U	12.9%	U	**104.4%**		**119%**	**18.1**		**13.5%**		13.5%	U	13.5%	U	13.5%	U	13.5%	U	**124.1%**	
Thallium	**1212%**	**0.151**		1.7%	U	1.7%	U	1.7%	U	1.7%	U	66.4%	U	**6.1%**		**1324%**	**0.73**		1.5%	U	1.5%	U	1.5%	U	1.5%	U	59.2%	U	**5.0%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	343%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**109%**	**32.1**		12.3%	U	12.3%	U	19.8%	U	12.3%	U	12.3%	U	**1459.3%**		**107%**	**12.1**		3.6%	U	3.6%	U	4.6%	U	3.6%	U	3.6%	U	**414.5%**	
Uranium	**106%**	**1.18**		2.2%	U	**7.9%**		**5.4%**		2.2%	U	**6.3%**		**26.5%**		**96%**	**1.97**		1.6%	U	**5.6%**		**3.8%**		1.6%	U	**4.1%**		**18.6%**	
Vanadium	**97%**	**68.7**		0.7%	U	0.7%	U	**5.6%**		**0.8%**		**5.9%**		**96.0%**		**97%**	**26.1**		0.7%	U	0.7%	U	**3.4%**		**0.7%**		**4.4%**		**95.8%**	
Zinc	**120%**	**4760**		**2.7%**		**1.3%**		**3.2%**		**0.4%**		3.8%	U	**13.0%**		**101%**	**1540**		6.2%	U	**2.4%**		**5.1%**		**0.6%**		9.0%	U	**28.2%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP003														CH14-106-TP003											
Sample ID				CH14-106-TP003-SOA														CH14-106-TP003-SOB											
Sample Interval (mbgs)				1.4 - 1.4														4.1 - 4.1											
Sample Date				7/19/2014														7/19/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**106%**	**8130**		0.8%	U	**0.4%**		**1.7%**		**1.2%**		**2.1%**		**97.5%**		**95%**	**9080**		0.3%	U	0.3%	U	**0.9%**		**0.3%**		**1.1%**		**60.7%**	
Antimony	**200%**	**9.39**		7.5%	U	7.5%	U	7.5%	U	7.5%	U	**7.5%**		**22.6%**		**121%**	**8.27**		5.0%	U	5.0%	U	**5.0%**		5.0%	U	**5.0%**		**12.0%**	
Arsenic	**93%**	**66.2**		0.4%	U	0.4%	U	**17.0%**		**4.6%**		**15.1%**		**34.4%**		**66%**	**2080**		0.1%	U	**0.1%**		**3.1%**		**0.7%**		**4.3%**		**7.9%**	
Barium	**109%**	**182**		**17.4%**		**13.5%**		**1.9%**		**3.2%**		**4.6%**		**42.3%**		**90%**	**164**		**2.8%**		**1.2%**		**0.3%**		**0.3%**		**0.5%**		**5.7%**	
Beryllium	**262%**	**1.59**		12.3%	U	12.3%	U	**12.3%**		12.3%	U	12.3%	U	**29.6%**		**197%**	**1.14**		9.5%	U	9.5%	U	**9.5%**		9.5%	U	9.5%	U	**19.9%**	
Bismuth	**400%**	**0.92**		1.5%	U	**1.5%**		**1.5%**		1.5%	U	1.5%	U	**2.1%**		**261%**	**1.79**		5.8%	U	**5.8%**		**5.8%**		5.8%	U	5.8%	U	**9.9%**	
Cadmium	**201%**	**0.764**		**2.1%**		**1.6%**		**1.6%**		**1.6%**		1.6%	U	**6.2%**		**138%**	**2.2**		0.7%	U	**0.7%**		**0.7%**		**0.7%**		0.7%	U	**2.3%**	
Calcium	**118%**	**7240**		**45.4%**		3.0%	U	3.0%	U	**29.7%**				**172.7%**		**108%**	**11100**		**2.4%**		**0.4%**		0.4%	U	**1.6%**				**20.6%**	
Chromium	**188%**	**24**		11.1%	U	11.1%	U	11.1%	U	11.1%	U	11.1%	U	**57.9%**		**169%**	**20.9**		7.7%	U	7.7%	U	7.7%	U	7.7%	U	7.7%	U	**28.9%**	
Cobalt	**99%**	**22.9**		0.5%	U	**0.1%**		**0.3%**		**0.1%**		**2.7%**		**7.7%**		**91%**	**21.7**		1.7%	U	**0.5%**		**0.7%**		**0.5%**		**6.8%**		**24.7%**	
Copper	**101%**	**122**		2.7%	U	**0.7%**		**2.4%**		**0.9%**		0.7%	U	**30.0%**		**81%**	**250**		1.5%	U	**0.6%**		**1.6%**		**0.4%**		0.4%	U	**12.5%**	
Iron	**107%**	**62400**		0.2%	U	0.6%	U	**6.1%**		**0.7%**		**19.2%**		**39.5%**		**88%**	**66600**		0.1%	U	**0.2%**		**3.2%**		**0.2%**		**8.6%**		**23.9%**	
Lead	**109%**	**841**		**0.4%**		**0.5%**		**0.6%**		**0.4%**		**0.1%**		**3.6%**		**76%**	**1990**		0.2%	U	**0.4%**		**0.5%**		**0.1%**		**0.0%**		**1.5%**	
Lithium	**207%**	**19**		10.8%	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U	**51.0%**		200%	**17.7**		9.5%	U	9.5%	U	9.5%	U	9.5%	U	9.5%	U	**40.7%**	
Manganese	**112%**	**864**		**1.4%**		**0.3%**		**0.9%**		**0.3%**		**1.5%**		**7.1%**		**99%**	**994**		2.5%	U	**0.5%**		**0.8%**		**0.5%**		**2.1%**		**12.4%**	
Molybdenum	342%	**0.73**		14.4%	U	14.4%	U	**14.4%**		14.4%	U	**15.0%**		14.4%	U	**351%**	**1.38**		15.4%	U	15.4%	U	15.4%	U	15.4%	U	15.4%	U	**15.4%**	
Nickel	**137%**	**44.6**		6.1%	U	6.1%	U	6.1%	U	6.1%	U	**18.5%**		**60.2%**		**109%**	**40.3**		4.3%	U	4.3%	U	**4.3%**		4.3%	U	**9.1%**		**34.9%**	
Phosphorus	43%	**449**		33.3%	U	33.3%	U	144.0%	U							41%	**456**		33.3%	U	33.3%	U	72.0%	U						
Potassium	5%	**1580**		100.0%	U											5%	**2130**		**66.7%**											
Selenium	**750%**	**0.21**		12.5%	U	12.5%	U	12.5%	U	12.5%	U	31.3%	U	**12.5%**		**750%**	**0.41**		8.5%	U	8.5%	U	8.5%	U	8.5%	U	21.2%	U	**8.5%**	
Silver	**610%**	**2.78**		8.9%	U	8.9%	U	8.9%	U	8.9%	U	8.9%	U	**12.5%**		**278%**	**6.83**		4.0%	U	4.0%	U	4.0%	U	4.0%	U	4.0%	U	**5.2%**	
Sodium	19%	100	U	100.0%	U											31%	100	U	100.0%	U										
Strontium	**166%**	**22.3**		14.0%	U	14.0%	U	14.0%	U	14.0%	U	14.0%	U	**78.8%**		**159%**	**34.2**		**7.1%**		**7.1%**		7.1%	U	7.1%	U	7.1%	U	**41.1%**	
Thallium	**1519%**	**1.01**		1.7%	U	**1.7%**		**1.7%**		1.7%	U	69.5%	U	**10.4%**		**922%**	**1.83**		1.7%	U	1.7%	U	1.7%	U	1.7%	U	69.3%	U	**7.9%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**107%**	**101**		2.1%	U	2.1%	U	**2.1%**		**2.1%**		**3.1%**		**221.4%**		95%	**126**		2.8%	U	2.8%	U	2.8%	U	2.8%	U	2.8%	U	**193.9%**	
Uranium	**114%**	**2.69**		10.2%	U	**16.4%**		**14.2%**		2.4%	U	**19.3%**		**33.7%**		**92%**	**1.19**		5.8%	U	**18.3%**		**13.1%**		3.3%	U	**21.0%**		**40.1%**	
Vanadium	**104%**	**27.2**		0.7%	U	0.7%	U	**5.4%**		**1.1%**		**15.6%**		**84.1%**		**91%**	**37.4**		0.3%	U	0.3%	U	**1.6%**		**0.3%**		**5.1%**		**31.6%**	
Zinc	**124%**	**400**		**6.2%**		**0.4%**		**0.9%**		**0.4%**		**5.1%**		**16.0%**		**89%**	**1210**		**3.6%**		**0.4%**		**0.7%**		**0.1%**		**3.5%**		**9.6%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP003															CH14-106-TP004											
Sample ID				CH14-106-TP003-SOC															CH14-106-TP004-SOA											
Sample Interval (mbgs)				5.3 - 5.3															1.8 - 1.8											
Sample Date				7/19/2014															7/19/2014											
Analyte (Percentage, %)	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**87%**	**12800**		0.3%	U	**0.3%**		**1.3%**		**0.4%**		**0.9%**		**99.2%**		**171%**	**14800**		**3.6%**		3.6%	U	13.3%	U	**4.6%**		**9.7%**		**1085.2%**	
Antimony	**157%**	**1.84**		1.5%	U	**1.5%**		**5.1%**		**1.5%**		**1.5%**		**4.7%**		**80%**	**8.82**		0.8%	U	0.8%	U	**2.3%**		**0.8%**		**0.8%**		**2.5%**	
Arsenic	**84%**	**22.1**		0.0%	U	**0.1%**		**4.4%**		**1.0%**		**3.8%**		**17.6%**		**164%**	**112**		**0.0%**		**0.0%**		**0.5%**		**0.1%**		**0.4%**		**3.9%**	
Barium	**69%**	**337**		**7.5%**		**13.6%**		**8.7%**		**5.4%**		**7.1%**		**110.1%**		**129%**	**122**		6.2%	U	10.1%	U	6.3%	U	4.1%	U	**8.6%**		**63.9%**	
Beryllium	**241%**	**1.6**		10.3%	U	10.3%	U	16.9%	U	10.3%	U	12.3%	U	**59.0%**		**141%**	**1.56**		16.7%	U	16.7%	U	25.0%	U	16.7%	U	17.5%	U	85.8%	U
Bismuth	**285%**	**3.05**		9.4%	U	**11.3%**		**26.8%**		9.4%	U	9.4%	U	**199.5%**		**404%**	**1.37**		3.5%	U	3.5%	U	**6.1%**		3.5%	U	3.5%	U	**16.1%**	
Cadmium	**160%**	**8.29**		**0.5%**		**3.6%**		**1.0%**		**2.3%**		0.5%	U	**5.2%**		**142%**	**8.76**		**5.0%**		28.1%	U	8.4%	U	19.7%	U	5.0%	U	**45.5%**	
Calcium	**95%**	**14500**		**6.0%**		**2.1%**		0.3%	U	**3.3%**				**13.1%**		**109%**	**18200**		**21.1%**		5.7%	U	1.2%	U	11.8%	U			**47.8%**	
Chromium	**196%**	**38.3**		5.9%	U	5.9%	U	5.9%	U	5.9%	U	5.9%	U	**35.8%**		**195%**	**57.7**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	94.3%	U
Cobalt	**91%**	**21.1**		**0.4%**		**7.1%**		**32.3%**		**0.4%**		**20.7%**		**35.1%**		**110%**	**24.4**		**0.6%**		11.5%	U	42.6%	U	0.6%	U	**29.9%**		**85.5%**	
Copper	**92%**	**86.9**		0.2%	U	**0.7%**		**8.9%**		**0.6%**		0.2%	U	**21.6%**		**109%**	**220**		**0.1%**		**0.2%**		**2.6%**		**0.2%**		0.1%	U	**5.1%**	
Iron	**94%**	**53300**		0.1%	U	**0.2%**		**16.3%**		**0.2%**		**11.6%**		**62.1%**		**103%**	**70600**		**0.1%**		**0.1%**		**11.9%**		**0.2%**		**8.7%**		**50.0%**	
Lead	**86%**	**774**		**0.0%**		**3.1%**		**1.3%**		**1.1%**		**0.1%**		**29.1%**		**294%**	**3410**		**0.0%**		**1.4%**	J	**0.6%**		**0.5%**		0.0%	J	**4.2%**	
Lithium	**203%**	**25.6**		8.7%	U	8.7%	U	8.7%	U	8.7%	U	8.7%	U	**47.8%**		**243%**	**32.2**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	78.7%	U
Manganese	**96%**	**918**		**0.5%**		**9.4%**		**20.6%**		**1.7%**		**6.6%**		**70.2%**		**111%**	**1020**		**2.2%**		36.8%	U	71.8%	U	6.5%	U	**25.9%**		**280.9%**	
Molybdenum	**536%**	**0.99**		11.7%	U	11.7%	U	11.7%	U	11.7%	U	11.7%	U	**11.7%**		**435%**	**2.09**		13.6%	U	13.6%	U	13.6%	U	13.6%	U	**13.6%**		**13.6%**	
Nickel	**118%**	**46.7**		2.8%	U	**4.2%**		**21.7%**		2.8%	U	**16.3%**		**29.7%**		**121%**	**63.4**		**12.3%**		15.3%	U	77.3%	U	12.3%	U	**63.8%**		133.1%	
Phosphorus	31%	**581**		33.3%	U	33.3%	U	50.0%	U							33%	**950**		33.3%	U	33.3%	U	51.3%	U						
Potassium	**6%**	**2390**		**83.3%**												**4%**	**2170**		110.0%	U										
Selenium	**750%**	**0.7**		10.6%	U	10.6%	U	10.6%	U	10.6%	U	26.6%	U	**42.0%**		**804%**	**0.75**		8.3%	U	8.3%	U	8.3%	U	**8.3%**		20.8%	U	**8.3%**	
Silver	**420%**	**1.62**		2.6%	U	2.6%	U	2.6%	U	**2.6%**		2.6%	U	**67.1%**		**304%**	**3.59**		0.8%	U	0.8%	U	0.8%	U	0.8%	U	0.8%	U	**8.8%**	
Sodium	26%	**140**		100.0%	U											100%	**100**		100.0%	U	#VALUE!									
Strontium	**136%**	**56.7**		**7.3%**		**7.3%**		7.3%	U	7.3%	U	7.3%	U	**17.1%**		**219%**	**59.4**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	**12.1%**		**24.5%**	
Thallium	**1179%**	**0.905**		**1.4%**		**1.4%**		**2.3%**		1.4%	U	55.8%	U	**35.2%**		**284%**	**1.62**		0.6%	U	0.6%	U	1.3%	U	**0.6%**		25.1%	U	**15.3%**	
Tin	600%	**2.2**		16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**16.4%**		**600%**	**2.9**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**93%**	**118**		2.9%	U	2.9%	U	2.9%	U	2.9%	U	2.9%	U	**187.9%**		**238%**	**148**		14.7%	U	14.7%	U	14.7%	U	14.7%	U	14.7%	U	**950.1%**	
Uranium	**93%**	**1.51**		2.4%	U	**6.8%**		**7.2%**		2.4%	U	**6.0%**		**32.6%**		**117%**	**2.11**		**5.5%**		14.3%	U	14.0%	U	5.5%	U	**11.9%**		**73.1%**	
Vanadium	**94%**	**56.8**		0.3%	U	0.3%	U	**7.0%**		**0.3%**		**4.4%**		**53.4%**		**127%**	**58**		1.6%	U	1.6%	U	**31.6%**		**1.6%**		**20.6%**		**250.2%**	
Zinc	**92%**	**1640**		**0.0%**		**0.2%**		**2.2%**		**0.1%**		**1.3%**		**2.0%**		**95%**	**5240**		**0.1%**		**1.0%**		**8.0%**		**0.2%**		**4.5%**		**8.5%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP004															CH14-106-TP005											
Sample ID				CH14-106-TP004-SOC															CH14-106-TP005-SOA											
Sample Interval (mbgs)				5.1 - 5.1															2.3 - 2.3											
Sample Date				7/19/2014															7/19/2014											
Analyte (Percentage, %)	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**151%**	**1540**		0.7%	U	**0.7%**		**2.6%**		**2.2%**		**5.4%**		**252.7%**		**180%**	**3880**		0.5%	U	**0.2%**		**0.2%**		**0.2%**		**0.9%**		**8.1%**	
Antimony	**136%**	**16.9**		1.6%	U	**1.6%**		**2.0%**		**1.6%**		**1.6%**		**4.1%**		**180%**	**6.76**		14.9%	U	14.9%	U	**509.0%**		123.9%	U	141.8%	U	**2716.4%**	
Arsenic	**126%**	**1130**		0.0%	U	**0.0%**		**1.0%**		**0.2%**		**2.2%**		**3.8%**		**100%**	**204**	J	0.1%	U	**0.1%**		**0.6%**		**2.4%**		**10.3%**		**18.6%**	
Barium	**116%**	**92.2**		**3.0%**		**7.8%**		**6.0%**		**4.0%**		**5.4%**		**76.1%**		**149%**	**97.5**		**0.6%**		**1.4%**		**1.4%**		**0.8%**		**50.1%**		**47.4%**	
Beryllium	136%	**0.24**		9.5%	U	**9.5%**		13.7%	U	9.5%	U	24.6%	U	**60.7%**		**132%**	**1.57**		11.6%	U	11.6%	U	11.6%	U	11.6%	U	11.6%	U	**15.0%**	
Bismuth	**31%**	**5.33**		7.5%	U	**9.0%**		**13.8%**		7.5%	U	7.5%	U	**40.7%**		**198%**	**1.58**		15.3%	U	15.3%	U	55.0%	U	15.3%	U	15.3%	U	**326.7%**	
Cadmium	**54%**	**1.23**		**1.3%**		**5.8%**		**1.3%**		**2.6%**		0.8%	U	**15.1%**		**128%**	**6.92**		405.3%	U	**24.9%**		10.3%	U	10.3%	U	10.3%	U	**802.5%**	
Calcium	**96%**	**4350**		**18.5%**		**0.6%**		0.6%	U	**4.6%**				**20.4%**		**117%**	**7510**		**9.5%**		**0.2%**		0.2%	U	**0.2%**				**0.6%**	
Chromium	192%	**5.82**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	**77.9%**		**181%**	**14.8**		1.4%	U	1.4%	U	1.4%	U	1.4%	U	1.9%	U	**1.9%**	
Cobalt	**107%**	**60.5**	J	**0.4%**		**2.1%**		**11.3%**		**0.3%**		**25.4%**		**29.3%**		**86%**	**33.1**		7.4%	U	**0.3%**		**0.3%**		**0.2%**		**3.7%**		**69.4%**	
Copper	**47%**	**654**	J	0.2%	U	**0.5%**		**3.8%**		**0.4%**		0.2%	U	**13.1%**		**49%**	**253**		113.9%	U	**2.2%**		**26.8%**		**5.1%**		0.7%	U	**703.0%**	
Iron	**96%**	**114000**		0.1%	U	**0.1%**		**8.7%**		**0.2%**		**21.2%**		**45.2%**		**94%**	**80700**		3.2%	U	**0.2%**		**12.8%**		**1.1%**		**116.6%**		**88.7%**	
Lead	**141%**	**5650**		**0.0%**		**2.4%**		**1.0%**		**0.8%**		**0.0%**		**6.1%**		**114%**	**3220**		598.6%	U	**2609.1%**		**407.2%**		**48.9%**		4.0%	U	**9839.1%**	
Lithium	217%	5	U	16.0%	U	16.0%	U	16.0%	U	16.0%	U	16.0%	U	**73.8%**		**253%**	**6**		7.0%	U	7.0%	U	7.0%	U	7.0%	U	7.0%	U	**7.0%**	
Manganese	**97%**	**197**		**2.4%**		**6.3%**		**16.8%**		**1.5%**		**10.1%**		**46.5%**		**100%**	**1000**		5.7%	U	**0.6%**		**0.6%**		**0.6%**		**2.6%**		**5.2%**	
Molybdenum	**462%**	**3.12**		14.8%	U	14.8%	U	14.8%	U	14.8%	U	**14.8%**		**14.8%**		**291%**	**1.55**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	426.7%	U
Nickel	**101%**	**22.4**	J	5.1%	U	**5.1%**		**15.4%**		5.1%	U	**43.9%**		**50.3%**		**100%**	**39.3**		0.7%	U	**0.6%**		**0.6%**		**0.6%**		**0.6%**		**2.7%**	
Phosphorus	31%	**398**		33.3%	U	33.3%	U	56.0%	U							40%	**382**		25.9%	U	25.9%	U	**25.9%**							
Potassium	5%	**1370**		110.0%	U											3%	**1300**		**47.6%**											
Selenium	**357%**	**2.07**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	**15.9%**		**462%**	**0.53**		12.8%	U	12.8%	U	12.8%	U	12.8%	U	32.1%	U	**80.1%**	
Silver	**101%**	**12.5**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	2.1%	U	**14.0%**		**126%**	**3.68**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	12.3%	U	**2271.6%**	
Sodium	100%	100	U	100.0%	U											100%	100	U	100.0%	U										
Strontium	**219%**	**24.6**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	12.3%	U	**20.0%**		**247%**	**21**		**7.0%**		**8.3%**		7.0%	U	7.0%	U	7.0%	U	**10.2%**	
Thallium	**331%**	**6.08**		**1.2%**		**1.2%**		**1.2%**		**1.2%**		46.0%	U	**32.7%**		**294%**	**3.12**		5.9%	U	**3.6%**		7.1%	U	6.2%	U	65.7%	U	**768.7%**	
Tin	600%	**2.1**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	**13.1%**		**13.1%**		**600%**	2	U	11.0%	U	11.0%	U	11.0%	U	**11.0%**		**11.0%**		**14.9%**	
Titanium	**219%**	**14.9**		2.6%	U	2.6%	U	2.6%	U	2.6%	U	2.6%	U	**226.8%**		**182%**	**54.5**		0.4%	U	0.4%	U	0.4%	U	0.4%	U	0.4%	U	**0.7%**	
Uranium	**116%**	**0.771**		2.4%	U	**4.9%**		**5.0%**		2.4%	U	**11.4%**		**34.0%**		**125%**	**2.13**		19.1%	U	**4.7%**		**4.7%**		4.7%	U	44.3%	U	**68.6%**	
Vanadium	**115%**	**13.3**		0.7%	U	0.7%	U	**14.0%**		**0.9%**		**27.4%**		**126.3%**		**121%**	**26.2**		0.2%	U	0.2%	U	**5.4%**		**0.2%**		**16.5%**		**9.6%**	
Zinc	**73%**	**1830**		**0.3%**		**1.9%**		**3.2%**		**0.2%**		**3.2%**		**6.1%**		**122%**	**5430**		376.6%	U	**10.4%**		**13.9%**		**3.0%**		26.0%	U	**1459.4%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP005															CH14-106-TP006											
Sample ID				CH14-106-TP005-SOC															CH14-106-TP006-SOA											
Sample Interval (mbgs)				5.4 - 5.4															1.6 - 1.6											
Sample Date				7/19/2014															7/18/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**101%**	**27800**		0.7%	U	**0.2%**		**0.2%**		**0.2%**		**1.0%**		**9.2%**		**113%**	**26500**		**1.7%**		3.2%	U	7.9%	U	2.2%	U	**2.3%**		**611.7%**	
Antimony	**76%**	**0.29**		13.5%	U	13.5%	U	**387.8%**		100.0%	U	610.8%	U	**2351.4%**		**96%**	**0.49**		0.4%	U	**0.4%**		**0.4%**		**0.4%**		**0.4%**		**0.4%**	
Arsenic	**70%**	**43.6**	J	0.0%	U	**0.0%**		**0.1%**		**0.5%**		**3.2%**		**4.9%**		**88%**	**61.8**	J	**0.0%**		**0.0%**		**1.3%**		**0.1%**		**0.2%**		**1.1%**	
Barium	**523%**	**201**		**0.5%**		**1.0%**		**1.1%**		**0.7%**		**40.6%**		**39.1%**		**535%**	**241**		1.7%	U	4.5%	U	5.8%	U	4.1%	U	**3.3%**		**34.1%**	
Beryllium	**293%**	**1.23**		8.5%	U	**8.5%**		**8.5%**		8.5%	U	8.5%	U	**11.1%**		**286%**	**1.62**		15.9%	U	15.9%	U	34.1%	U	15.9%	U	15.9%	U	**111.9%**	
Bismuth	**97%**	**0.21**		15.0%	U	15.0%	U	63.2%	U	15.0%	U	15.0%	U	**405.3%**		**133%**	**0.62**		3.5%	U	3.5%	U	3.5%	U	3.5%	U	3.5%	U	**5.9%**	
Cadmium	**136%**	**0.283**		110.1%	U	**5.9%**		**2.1%**		**2.1%**		2.1%	U	**254.3%**		**117%**	**1.91**		**76.6%**		**53.3%**		3.6%	U	17.4%	U	1.5%	U	**26.6%**	
Calcium	**101%**	**39000**		**10.6%**		**0.2%**		0.2%	U	**0.2%**				**1.0%**		**99%**	**25200**		**56.2%**		**2.7%**		1.6%	U	20.3%	U			**63.6%**	
Chromium	**204%**	**279**		2.5%	U	2.5%	U	2.5%	U	2.5%	U	3.2%	U	**3.3%**		**197%**	**153**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	110.3%	U
Cobalt	**158%**	**53.5**		13.6%	U	**0.4%**		**0.5%**		**0.3%**		**4.8%**		**49.9%**		**76%**	**36**		**21.7%**		**8.2%**		33.5%	U	**1.2%**		**6.9%**		**72.6%**	
Copper	**124%**	**109**		277.9%	U	**5.9%**		**56.3%**		**11.3%**		0.9%	U	**996.9%**		**104%**	**83.2**		**0.1%**		**0.1%**		**0.5%**		**0.2%**		0.1%	U	**4.1%**	
Iron	**89%**	**62000**		3.3%	U	**0.1%**		**12.7%**		**1.1%**		**120.8%**		**98.1%**		**84%**	**56100**		**0.0%**		**0.4%**		**9.6%**		**0.1%**		**2.8%**		**42.7%**	
Lead	**84%**	**41.2**		564.6%	U	**3159.0%**		**442.5%**		**100.9%**		2.9%	U	**10854.7%**		**105%**	**194**		**0.0%**		**0.5%**		**0.2%**		**0.3%**		**0.0%**		**0.5%**	
Lithium	**600%**	**42.8**		6.5%	U	6.5%	U	6.5%	U	6.5%	U	6.5%	U	**6.5%**		**600%**	**50**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	105.3%	U
Manganese	**123%**	**937**		5.6%	U	**0.5%**		**0.5%**		**0.5%**		**2.1%**		**6.2%**		**129%**	**918**		**133.1%**		17.8%	U	81.4%	U	6.1%	U	**16.6%**		**184.0%**	
Molybdenum	185%	**0.81**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	696.7%	U	81%	**0.72**		5.1%	U	5.1%	U	5.1%	U	**5.1%**		**5.1%**		**10.1%**	
Nickel	**158%**	**330**		1.5%	U	**1.0%**		**1.0%**		**1.0%**		**1.0%**		**5.2%**		**122%**	**177**		**11.8%**		12.5%	U	51.3%	U	7.6%	U	**9.5%**		**115.6%**	
Phosphorus	**37%**	**673**		33.3%	U	33.3%	U	33.3%	U							**39%**	**527**		**30.3%**		30.3%	U	70.9%	U						
Potassium	**8%**	**4870**		**71.4%**												**9%**	**5900**		130.0%	U										
Selenium	**142%**	**0.54**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	32.7%	U	**81.7%**		**175%**	**0.42**		5.2%	U	5.2%	U	5.2%	U	5.2%	U	13.1%	U	**5.2%**	
Silver	**71%**	**0.32**		12.5%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	**2350.0%**		**95%**	**0.48**		0.4%	U	0.4%	U	0.4%	U	**0.4%**		0.4%	U	**1.6%**	
Sodium	53%	**390**		100.0%	U											91%	**530**		100.0%	U										
Strontium	**112%**	**58.1**		**6.9%**		**7.1%**		6.9%	U	6.9%	U	6.9%	U	**10.7%**		**225%**	**56.8**		8.5%	U	8.5%	U	8.5%	U	8.5%	U	**8.5%**		**10.5%**	
Thallium	**106%**	**0.883**		4.6%	U	2.8%	U	7.4%	U	6.0%	U	70.1%	U	**683.3%**		**105%**	**0.702**		0.5%	U	0.5%	U	**0.5%**		**0.5%**		19.6%	U	**7.3%**	
Tin	**318%**	2	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**19.3%**		**353%**	2	U	15.2%	U	15.2%	U	15.2%	U	15.2%	U	15.2%	U	**15.2%**	
Titanium	**235%**	**960**		0.5%	U	0.5%	U	0.5%	U	0.5%	U	0.5%	U	**1.3%**		**540%**	**808**		7.4%	U	7.4%	U	7.4%	U	7.4%	U	7.4%	U	**693.5%**	
Uranium	**111%**	**1.21**		21.2%	U	**3.5%**		**3.5%**		3.5%	U	**31.5%**		**51.7%**		**116%**	**1.33**		**2.4%**		6.3%	U	9.0%	U	2.4%	U	**2.4%**		**33.3%**	
Vanadium	**88%**	**81.8**		0.3%	U	0.3%	U	**7.4%**		**0.3%**		**20.8%**		**13.4%**		**100%**	**64**		0.7%	U	0.7%	U	**9.1%**		**0.7%**		**2.3%**		**114.7%**	
Zinc	**115%**	**183**		156.1%	U	**4.4%**		**5.2%**		**1.2%**		6.4%	U	**599.9%**		**105%**	**669**		**17.0%**		**20.1%**		**9.9%**		**0.3%**		**1.6%**		**4.0%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP006														CH14-106-TP007											
Sample ID				CH14-106-TP006-SOC														CH14-106-TP007-SOA											
Sample Interval (mbgs)				5.3 - 5.3														1.4 - 1.4											
Sample Date				7/19/2014														7/20/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**149%**	**1050**		**0.5%**		**0.5%**		**1.4%**		**0.5%**		**1.4%**		**45.3%**		**95%**	**10000**		**0.6%**		0.6%	U	**1.4%**		**1.3%**		**1.1%**		**138.3%**	
Antimony	**207%**	**30.4**		1.0%	U	1.0%	U	**22.4%**		**1.0%**		**3.6%**		**106.4%**		**130%**	**13.6**		0.4%	U	**0.4%**		**2.0%**	J	**0.4%**	J	**0.6%**	J	**4.3%**	
Arsenic	**113%**	**429**	J	**0.0%**		**0.0%**		**0.2%**		**0.2%**		**0.5%**		**4.6%**		**107%**	**906**	J	**0.0%**		**0.0%**		**3.4%**	J	**0.4%**	J	**1.2%**	J	**4.4%**	
Barium	**144%**	**108**		2.0%	U	**2.9%**		**4.8%**		**2.3%**		**14.5%**		**38.4%**		**177%**	**81.7**		**1.7%**		**9.1%**		**5.0%**		**4.4%**		**3.5%**		**66.7%**	J
Beryllium	**147%**	**0.28**		**14.8%**		14.8%	U	14.8%	U	14.8%	U	14.8%	U	**58.5%**		**126%**	**0.68**		14.9%	U	14.9%	U	17.9%	U	14.9%	U	14.9%	U	**76.9%**	
Bismuth	**160%**	**7.62**		1.1%	U	**2.5%**		**7.1%**		1.1%	U	1.1%	U	**24.3%**		**236%**	**18.6**		6.4%	U	6.4%	U	12.2%	U	6.4%	U	6.4%	U	**26.3%**	
Cadmium	**90%**	**2.6**		**5.2%**		**6.0%**		2.4%	U	2.9%	U	0.6%	U	**92.6%**		**118%**	**12.3**		**0.3%**		**2.3%**	J	0.3%	U	0.6%	U	0.3%	U	**3.0%**	J
Calcium	**107%**	**2460**		**22.8%**		**2.5%**		0.6%	U	4.8%	U			**18.5%**		**77%**	**8500**		**33.8%**		**44.0%**		1.3%	U	**18.0%**				**66.4%**	
Chromium	211%	**4.77**		8.4%	U	8.4%	U	**8.4%**		8.4%	U	**8.4%**		**20.0%**		**190%**	**55.6**		10.1%	U	10.1%	U	10.1%	U	10.1%	U	**10.1%**		**34.1%**	
Cobalt	**106%**	**20.3**		**1.1%**		**1.8%**		**9.4%**		0.2%	U	**10.9%**		**69.9%**		**91%**	**41.1**		**0.2%**		**1.5%**		**17.8%**		0.3%	U	**9.0%**		**27.5%**	J
Copper	**116%**	**2700**		**0.0%**		**0.5%**		**3.9%**		**0.5%**		0.0%	U	**30.6%**		**118%**	**1410**		**0.1%**	J	**1.4%**	J	**4.0%**	J	**0.8%**		0.1%	U	**15.6%**	
Iron	**108%**	**109000**		**0.0%**		**0.1%**		**10.2%**		**0.1%**		**18.0%**		**52.4%**		**104%**	**117000**		**0.0%**		**0.4%**	J	**7.5%**	J	**0.1%**		**3.7%**		**34.8%**	
Lead	**110%**	**7900**		**7.0%**		**46.9%**		**7.9%**		**7.1%**		**0.0%**		**56.6%**		**133%**	**3980**		**0.0%**		**3.4%**		**0.4%**		**0.9%**	J	**0.0%**		**3.4%**	
Lithium	204%	5	U	15.5%	U	15.5%	U	15.5%	U	15.5%	U	15.5%	U	**23.5%**		**375%**	**13.1**		15.8%	U	15.8%	U	15.8%	U	15.8%	U	15.8%	U	**47.3%**	
Manganese	**106%**	**214**		**4.8%**		6.7%	U	30.8%	U	2.6%	U	**21.7%**		**146.8%**		**88%**	**248**		**1.2%**		11.6%	U	38.7%	U	3.4%	U	**12.5%**		**142.6%**	J
Molybdenum	**298%**	**9.25**		13.4%	U	13.4%	U	13.4%	U	13.4%	U	13.4%	U	**164.5%**		**214%**	**1.75**		8.7%	U	8.7%	U	8.7%	U	8.7%	U	8.7%	U	**18.6%**	
Nickel	**114%**	**18.8**		**4.6%**		4.6%	U	13.9%	U	4.6%	U	**10.3%**		**46.1%**		**110%**	**44.1**		**4.6%**		4.6%	U	24.5%	U	4.6%	U	**13.1%**		**34.6%**	J
Phosphorus	**39%**	**639**		33.3%	U	33.3%	U	33.3%	U							23%	**587**		33.3%	U	33.3%	U	33.3%	U						
Potassium	5%	**730**		180.0%	U											10%	**3070**		130.0%	U										
Selenium	**652%**	**2.67**		8.4%	U	8.4%	U	8.4%	U	8.4%	U	21.0%	U	**56.7%**		**270%**	**1.22**		7.3%	U	7.3%	U	7.3%	U	7.3%	U	18.3%	U	**9.5%**	
Silver	**207%**	**20**		1.1%	U	1.1%	U	1.1%	U	1.1%	U	1.1%	U	**150.1%**		**158%**	**7.7**		0.4%	U	0.4%	U	0.4%	U	**0.4%**		0.4%	U	**14.7%**	
Sodium	100%	100	U	100.0%	U											100%	**400**		100.0%	U										
Strontium	**292%**	**29.5**		19.6%	U	12.5%	U	9.2%	U	9.2%	U	**9.2%**		**18.6%**		**159%**	**34.3**		10.8%	U	13.4%	U	10.8%	U	10.8%	U	10.8%	U	**32.5%**	
Thallium	**520%**	**6.25**		2.8%	U	1.2%	U	4.0%	U	2.3%	U	33.6%	U	**62.4%**		**253%**	**3.76**		**0.8%**		**0.8%**		**0.9%**		**0.8%**		30.2%	U	**20.7%**	
Tin	**600%**	**2.1**		14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**14.3%**		**600%**	**2.3**		12.5%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	**12.5%**	
Titanium	**185%**	**3.8**		1.4%	U	1.4%	U	1.4%	U	**1.4%**		**1.4%**		**6.9%**		**136%**	**320**		3.1%	U	3.1%	U	3.1%	U	3.1%	U	**3.1%**		**123.7%**	J
Uranium	**98%**	**1.83**		**4.0%**		119.2%	U	64.1%	U	4.3%	U	**32.4%**		**67.2%**		**120%**	**1.3**		**2.7%**	J	**5.8%**		**4.4%**		2.7%	U	**2.7%**		**36.6%**	
Vanadium	**129%**	**22.4**		0.7%	U	0.7%	U	**12.6%**		**0.7%**		**18.0%**		**54.9%**		**89%**	**27.9**		0.6%	U	0.6%	U	**12.9%**	J	**0.6%**		**6.6%**		**78.0%**	
Zinc	**105%**	**2800**		**0.7%**		**1.7%**		**6.5%**		**0.4%**		**2.8%**		**95.0%**		**119%**	**6150**		**0.0%**	J	**0.5%**	J	**1.6%**		**0.1%**	J	**0.6%**		**2.7%**	J

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP007														CH14-106-TP007											
Sample ID				CH14-106-TP907-SOA														CH14-106-TP007-SOC											
Sample Interval (mbgs)				1.4 - 1.4														5.5 - 5.5											
Sample Date				7/20/2014														7/20/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**227%**	**5630**		0.8%	U	1.1%	U	**2.8%**		**0.8%**		**0.9%**		**351.6%**		**122%**	**6420**		0.3%	U	**0.3%**		**1.8%**		**0.9%**		**1.6%**		**89.3%**	
Antimony	**129%**	**33.8**		0.4%	U	**0.4%**		**0.4%**	J	**0.4%**	J	**0.4%**	J	**0.4%**		**333%**	**29.8**		1.1%	U	**1.2%**		**12.2%**		**1.1%**		**1.8%**		**9.0%**	
Arsenic	**98%**	**183**	J	**0.0%**		**0.1%**		**4.1%**	J	**0.5%**	J	**0.7%**	J	**14.4%**		**115%**	**144**	J	0.0%	U	**0.1%**		**3.1%**		**0.6%**		**1.4%**		**3.5%**	J
Barium	**172%**	**28.9**	J	**2.8%**		**5.5%**		**1.3%**		**0.8%**		**0.7%**		**29.5%**	J	**107%**	**53.9**	J	**15.8%**		**14.9%**		**4.2%**		**6.1%**		**1.9%**		**146.8%**	
Beryllium	**164%**	**0.85**		14.2%	U	14.2%	U	19.9%	U	14.2%	U	14.2%	U	**72.3%**		**140%**	**0.83**		11.3%	U	**11.3%**		11.3%	U	11.3%	U	11.3%	U	**29.4%**	
Bismuth	**156%**	**1.55**		7.8%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**12.2%**		**409%**	**1.37**	J	3.2%	U	**3.2%**		**3.2%**		3.2%	U	3.2%	U	**3.9%**	
Cadmium	**107%**	**21.9**		**0.2%**		**0.2%**	J	**0.2%**		**0.2%**		0.2%	U	**0.2%**	J	**492%**	**19.7**	J	**0.6%**		**2.9%**		**0.6%**		**0.6%**		0.6%	U	**2.6%**	
Calcium	**104%**	**4090**		**22.0%**		7.0%	U	1.0%	U	10.3%	U			**32.7%**		**96%**	**3680**	J	**7.6%**		**40.8%**		0.3%	U	**1.9%**				**19.6%**	
Chromium	**263%**	**33.1**		9.3%	U	9.3%	U	9.3%	U	9.3%	U	**9.3%**		**85.2%**		**157%**	**42.1**		5.0%	U	5.0%	U	5.0%	U	5.0%	U	5.0%	U	**42.9%**	
Cobalt	**106%**	**51.5**		**0.2%**		**1.2%**		**8.4%**		0.2%	U	**2.4%**		**19.8%**	J	**96%**	**48**	J	**0.3%**		**4.0%**		**4.3%**		**0.3%**		**5.9%**		**20.2%**	
Copper	**155%**	**580**		**0.1%**	J	**0.1%**	J	**0.4%**	J	**0.1%**		0.1%	U	**2.5%**		**86%**	**609**	J	0.2%	U	**0.8%**		**2.2%**		**0.2%**		0.2%	U	**6.1%**	
Iron	**107%**	**140000**		**0.0%**		**0.2%**	J	**4.2%**	J	**0.1%**		**1.3%**		**30.4%**		**99%**	**124000**		0.1%	U	**0.1%**		**2.6%**		**0.2%**		**6.0%**		**20.5%**	
Lead	**114%**	**11700**		**0.0%**		**0.1%**		**0.1%**		**0.1%**	J	**0.0%**		**0.2%**		**66%**	**11000**		**0.0%**		**14.4%**		**1.7%**		**4.0%**		**0.1%**		**4.4%**	J
Lithium	**465%**	**8**		15.6%	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	**157.3%**		**145%**	**8.1**		8.3%	U	8.3%	U	8.3%	U	8.3%	U	8.3%	U	**41.3%**	
Manganese	**110%**	**558**		**0.8%**		**5.6%**		**22.4%**		2.0%	U	**6.7%**		**67.2%**	J	**97%**	**548**		**1.8%**		**15.5%**		**5.8%**		**0.7%**		**4.3%**		**22.8%**	
Molybdenum	**322%**	**3.34**		8.4%	U	8.4%	U	8.4%	U	8.4%	U	8.4%	U	**8.4%**		**600%**	**3.43**		11.5%	U	11.5%	U	11.5%	U	11.5%	U	16.1%	U	**11.5%**	
Nickel	**126%**	**59.7**		**3.5%**		3.5%	U	16.8%	U	3.5%	U	**4.5%**		**48.4%**	J	**105%**	**84.3**	J	2.5%	U	**2.5%**		**4.6%**		2.5%	U	**9.2%**		**30.6%**	
Phosphorus	35%	**490**		33.3%	U	33.3%	U	44.0%	U							34%	**540**		33.3%	U	33.3%	U	142.7%	U						
Potassium	8%	**1200**		150.0%	U											3%	**1310**		**109.1%**											
Selenium	**332%**	**1.72**		7.7%	U	7.7%	U	7.7%	U	7.7%	U	19.3%	U	**7.7%**		**750%**	**1.4**		8.5%	U	8.5%	U	8.5%	U	8.5%	U	21.4%	U	**9.8%**	
Silver	**208%**	**20.3**		0.5%	U	0.5%	U	0.5%	U	0.5%	U	0.5%	U	**0.8%**		**319%**	**16**		1.0%	U	1.0%	U	1.0%	U	**1.0%**		1.0%	U	**17.3%**	
Sodium	100%	100	U	100.0%	U											71%	100	U	100.0%	U										
Strontium	**186%**	**27.9**		**11.5%**	U	11.5%	U	11.5%	U	11.5%	U	11.5%	U	**12.8%**		**286%**	**23.7**		**7.1%**		**27.9%**		6.3%	U	6.3%	U	6.3%	U	**45.6%**	
Thallium	**361%**	**3.49**		0.9%		**0.9%**		**0.9%**		**0.9%**		34.1%	U	**5.8%**		**826%**	**4.27**		1.3%	U	**1.3%**		1.3%	U	1.3%	U	51.2%	U	**12.2%**	
Tin	**600%**	**4.3**		8.9%	U	8.9%	U	8.9%	U	8.9%	U	**8.9%**		**8.9%**		**600%**	**4.3**		14.5%	U	14.5%	U	14.5%	U	14.5%	U	14.5%	U	**14.5%**	
Titanium	**490%**	**62.5**		4.8%	U	4.8%	U	4.8%	U	4.8%	U	4.8%	U	**699.3%**	J	**130%**	**59.9**		1.4%	U	1.4%	U	1.6%	U	**1.4%**		2.7%	U	**219.6%**	
Uranium	**138%**	**2.33**		**2.4%**	J	**5.3%**		**6.6%**		2.4%	U	**2.4%**		**27.4%**		**105%**	**2.21**	J	2.6%	U	**12.8%**		**6.0%**		2.6%	U	**8.4%**		**46.9%**	
Vanadium	**125%**	**34.2**		0.7%	U	0.7%	U	**4.5%**	UJ	**0.7%**		**1.5%**		**133.6%**		**106%**	**34.6**		0.3%	U	0.3%	U	**5.3%**		**0.7%**		**5.9%**		**73.8%**	
Zinc	**104%**	**13500**		**0.0%**	J	**0.0%**	J	**0.2%**		**0.0%**	J	**0.3%**		**0.4%**	J	**129%**	**12100**	J	**0.0%**		**0.1%**		**0.3%**		**0.0%**		**0.9%**		**1.5%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP008														CH14-106-TP008											
Sample ID				CH14-106-TP008-SOA														CH14-106-TP008-SOB											
Sample Interval (mbgs)				2 - 2														3.5 - 3.5											
Sample Date				7/19/2014														7/19/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**109%**	**15700**		0.3%	U	0.4%	U	**1.2%**		**0.3%**		**0.4%**		**96.0%**		**111%**	**14200**		0.1%	U	**0.4%**		**2.6%**		**0.3%**		**1.0%**		**38.5%**	
Antimony	**68%**	**11.6**		12.7%	U	12.7%	U	29.1%	U	12.7%	U	12.7%	U	**27.8%**		**236%**	**0.42**		12.7%	U	12.7%	U	**12.7%**		12.7%	U	12.7%	U	**54.4%**	
Arsenic	**66%**	**67**	J	0.0%	U	**0.0%**		**4.8%**		**0.3%**		**0.3%**		**19.1%**		**282%**	**101**		0.1%	U	**0.6%**		**21.8%**		**4.1%**		**8.5%**		**20.1%**	
Barium	**105%**	**96.6**		**3.8%**		**7.9%**		**2.5%**		**1.3%**		**1.5%**		**46.0%**		**115%**	**161**		**9.5%**		**4.6%**		**2.1%**		**1.4%**		**3.6%**		**18.7%**	
Beryllium	**188%**	**1.1**		9.4%	U	**9.4%**		18.9%	U	9.4%	U	9.4%	U	**52.8%**		**146%**	**1.51**		10.0%	U	**16.9%**		18.9%	U	10.0%	U	10.0%	U	**23.9%**	
Bismuth	**197%**	**6.24**		16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**20.5%**		**236%**	**0.28**		16.7%	U	16.7%	U	28.3%	U	16.7%	U	16.7%	U	70.0%	U
Cadmium	**114%**	**5.85**		2.5%	U	**6.0%**		2.5%	U	**2.5%**		2.5%	U	**2.5%**		**254%**	**1.16**		26.8%	U	**15.7%**		4.2%	U	**4.2%**		4.2%	U	**21.8%**	
Calcium	**105%**	**13100**		**3.0%**		**8.0%**		0.5%	U	**5.8%**				**16.0%**		**116%**	**11500**		**1.6%**		**0.2%**		0.2%	U	**0.8%**				**4.7%**	
Chromium	**150%**	**63.2**		6.1%	U	6.1%	U	6.1%	U	6.1%	U	6.1%	U	**53.1%**		**163%**	**58.7**		2.2%	U	2.2%	U	2.2%	U	2.2%	U	2.2%	U	**12.0%**	
Cobalt	**86%**	**30.3**		0.4%	U	**4.9%**		**30.8%**		**0.4%**		**2.1%**		**46.1%**		**102%**	**28.3**		5.0%	U	**2.3%**		**4.6%**		**0.3%**		**9.3%**		**25.3%**	
Copper	**82%**	**232**		0.9%	U	**3.6%**		**11.7%**		**1.5%**		0.9%	U	**46.3%**		**95%**	**40.6**		1.9%	U	**30.9%**		**48.7%**		**4.8%**		1.1%	U	**124.6%**	
Iron	**87%**	**79500**		0.1%	U	**0.5%**		**13.6%**		**0.2%**		**1.9%**		**79.2%**		**104%**	**61700**		0.1%	U	**0.2%**		**5.3%**		**0.5%**		**15.5%**		**39.3%**	
Lead	**83%**	**4250**		0.2%	U	**8.5%**		**2.4%**		**6.0%**		0.2%	U	**7.7%**		**117%**	**146**		1.3%	U	**23.0%**		**16.2%**		**4.3%**		0.7%	U	**61.1%**	
Lithium	**180%**	**34.1**		8.2%	U	8.2%	U	8.2%	U	8.2%	U	8.2%	U	**55.7%**		**174%**	**37**		5.9%	U	5.9%	U	5.9%	U	5.9%	U	5.9%	U	**39.7%**	
Manganese	**89%**	**738**		0.7%	U	**2.3%**		**17.9%**		**1.3%**		**2.4%**		**84.3%**		**105%**	**683**		2.7%	U	**0.6%**		**1.2%**		**0.6%**		**3.5%**		**25.0%**	
Molybdenum	**180%**	**2.05**		11.9%	U	11.9%	U	11.9%	U	11.9%	U	**11.9%**		**13.1%**		**517%**	**3.68**		14.4%	U	14.4%	U	14.4%	U	14.4%	U	14.4%	U	**14.4%**	
Nickel	**90%**	**88.3**		2.3%	U	**3.5%**		**19.3%**		2.3%	U	**2.3%**		**32.0%**		**105%**	**80**		1.5%	U	**1.0%**		**1.4%**		**1.0%**		**3.6%**		**9.7%**	
Phosphorus	46%	**559**		33.3%	U	33.3%	U	50.0%	U							71%	**614**		33.3%	U	33.3%	U	52.7%	U						
Potassium	**4%**	**2650**		150.0%	U											2%	**1700**		**115.4%**											
Selenium	**278%**	**1.24**		10.6%	U	10.6%	U	10.6%	U	10.6%	U	26.6%	U	**10.6%**		**750%**	**0.69**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	**11.8%**	
Silver	**106%**	**8.33**		12.0%	U	12.0%	U	12.0%	U	12.0%	U	12.0%	U	**30.1%**		**300%**	**0.3**		13.7%	U	13.7%	U	13.7%	U	13.7%	U	13.7%	U	**64.4%**	
Sodium	29%	**250**		100.0%	U											71%	100	U	100.0%	U										
Strontium	**123%**	**55.8**		**10.7%**		**10.7%**		10.7%	U	10.7%	U	10.7%	U	**16.5%**		**264%**	**39.9**		**5.7%**		**5.7%**		5.7%	U	5.7%	U	5.7%	U	**9.5%**	
Thallium	**652%**	**1.74**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	75.9%	U	**23.7%**		**437%**	**0.373**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	75.3%	U	**24.4%**	
Tin	**600%**	**3.1**		11.5%	U	11.5%	U	11.5%	U	11.5%	U	**11.5%**		**11.5%**		**600%**	2	U	15.5%	U	15.5%	U	15.5%	U	15.5%	U	15.5%	U	**15.5%**	
Titanium	**158%**	**244**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	2.1%	U	**350.2%**		**113%**	**115**		0.9%	U	0.9%	U	0.9%	U	0.9%	U	0.9%	U	**88.1%**	
Uranium	**119%**	**1.89**		1.9%	U	**5.6%**		**4.7%**		1.9%	U	**1.9%**		**19.6%**		**124%**	**2.78**		2.4%	U	**11.9%**		**6.5%**		2.4%	U	**9.8%**		**24.7%**	
Vanadium	**111%**	**52.6**		0.3%	U	**0.3%**		**4.5%**		**0.3%**		**0.6%**		**54.1%**		**111%**	**71.8**		0.2%	U	**0.2%**		**2.4%**		**0.3%**		**3.7%**		**21.4%**	
Zinc	**95%**	**4240**		0.3%	U	**3.1%**		**19.0%**		**0.4%**		13.7%	U	**14.0%**		**147%**	**259**		25.4%	U	**16.8%**		**24.4%**		**2.2%**		16.1%	U	**45.5%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP008															CH14-106-TP009											
Sample ID				CH14-106-TP008-SOC															CH14-106-TP009-SOA											
Sample Interval (mbgs)				5.2 - 5.2															1.5 - 1.5											
Sample Date				7/19/2014															7/20/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**103%**	**29300**		0.1%	U	**0.1%**		**0.8%**		**2.4%**		**0.4%**		**75.3%**		**133%**	**33000**		0.1%	U	**0.1%**		**0.4%**		**0.3%**		**0.7%**		**4.9%**	
Antimony	**175%**	**0.67**		10.8%	U	10.8%	U	**80.6%**		12.9%	U	17.2%	U	**57.0%**		**91%**	**0.74**		4.1%	U	8.6%	U	**206.2%**		**51.9%**		12.8%	U	**1292.2%**	
Arsenic	**93%**	**34.4**	J	0.5%	U	**5.4%**		**314.4%**		**46.3%**		**55.7%**		**114.5%**		**106%**	**42.4**	J	0.3%	U	**0.3%**		**8.5%**		**18.1%**		**16.6%**		**736.3%**	
Barium	**100%**	**310**		**2.3%**		**7.4%**		**2.2%**		**4.2%**		**2.5%**		**42.0%**		**170%**	**407**		**0.4%**		**0.7%**		**3.2%**		**2.3%**		**61.5%**		**14.2%**	
Beryllium	**132%**	**1.41**		8.2%	U	**12.3%**		11.5%	U	8.2%	U	**11.9%**		**48.8%**		**122%**	**1.98**		4.5%	U	**4.5%**		4.5%	U	4.5%	U	**4.5%**		**4.5%**	
Bismuth	157%	0.2	U	16.0%	U	16.0%	U	16.0%	U	16.0%	U	16.0%	U	**24.8%**		**452%**	0.2	U	6.2%	U	**6.2%**		**8.0%**		6.2%	U	6.2%	U	**46.1%**	
Cadmium	**111%**	**1.32**		3.8%	U	**22.5%**		3.8%	U	**3.8%**		3.8%	U	**15.1%**		**126%**	**0.938**		275.8%	U	**32.0%**		**15.7%**		**11.9%**		1.0%	U	**645.6%**	
Calcium	**130%**	**23000**		**10.0%**		**79.3%**		0.2%	U	**1.2%**				**26.8%**		**86%**	**27400**		**6.7%**		**0.3%**		0.3%	U	**0.4%**				**1.9%**	
Chromium	**165%**	**191**		2.3%	U	2.3%	U	3.3%	U	2.3%	U	2.3%	U	**172.0%**		**139%**	**182**		2.8%	U	2.8%	U	2.8%	U	2.8%	U	2.8%	U	**2.8%**	
Cobalt	**98%**	**36.8**		0.5%	U	**8.8%**		**34.7%**		**2.1%**		**9.9%**		**56.5%**		**106%**	**39.8**		20.0%	U	**0.5%**		**1.0%**		**0.4%**		**2.4%**		**183.3%**	
Copper	**95%**	**36.8**		1.0%	U	**3.4%**		**16.3%**		**2.4%**		1.0%	U	**68.4%**		**109%**	**40.7**		23.5%	U	**6.6%**		**59.7%**		**12.2%**		0.4%	U	**669.7%**	
Iron	**95%**	**65500**		0.1%	U	**0.9%**		**16.2%**		**0.8%**		**4.0%**		**60.4%**		**110%**	**70900**		0.5%	U	**0.1%**		**10.3%**		**0.9%**		**45.3%**		**267.9%**	
Lead	**110%**	**227**		0.1%	U	**5.8%**		**0.6%**		**5.2%**		0.1%	U	**11.1%**		**120%**	**119**		23.2%	U	**440.4%**		**39.6%**		**202.1%**		1.1%	U	**177.9%**	
Lithium	**152%**	**58**		5.3%	U	5.3%	U	5.3%	U	5.3%	U	5.3%	U	**49.3%**		**163%**	**63.6**		6.9%	U	6.9%	U	6.9%	U	6.9%	U	6.9%	U	**6.9%**	
Manganese	**111%**	**788**		0.6%	U	**34.9%**		**12.5%**		**2.2%**		**3.6%**		**44.8%**		**99%**	**864**		156.2%	U	**0.9%**		**2.2%**		**0.8%**		**4.8%**		**45.5%**	
Molybdenum	**259%**	**1.81**		14.0%	U	14.0%	U	14.0%	U	14.0%	U	14.0%	U	**16.5%**		**533%**	**1.69**		10.2%	U	10.2%	U	10.2%	U	10.2%	U	**10.2%**		**106.5%**	
Nickel	**107%**	**182**		2.0%	U	**25.7%**		**93.2%**		**7.7%**		**21.4%**		**80.3%**		**105%**	**214**		5.9%	U	**1.5%**		**1.5%**		**1.5%**		**1.5%**		**10.3%**	
Phosphorus	48%	**798**		33.3%	U	33.3%	U	38.0%	U							32%	**875**		33.3%	U	33.3%	U	33.3%	U						
Potassium	**4%**	**2380**		**100.0%**												**4%**	**6640**		**38.5%**											
Selenium	**600%**	**0.42**		10.4%	U	10.4%	U	10.4%	U	10.4%	U	26.0%	U	**13.0%**		**470%**	**0.52**		11.4%	U	11.4%	U	11.4%	U	11.4%	U	11.4%	U	**28.4%**	
Silver	**100%**	**0.37**		13.0%	U	13.0%	U	13.0%	U	13.0%	U	13.0%	U	**31.2%**		**370%**	**0.19**		5.0%	U	5.0%	U	5.0%	U	8.0%	U	5.0%	U	**1230.0%**	
Sodium	100%	**150**		100.0%	U											26%	**340**		100.0%	U										
Strontium	**249%**	**53.3**		**15.7%**		**28.3%**		5.8%	U	5.8%	U	5.8%	U	**36.2%**		**108%**	**73.4**		**4.0%**		**4.0%**		4.0%	U	**4.0%**		4.0%	U	**6.5%**	
Thallium	**530%**	**0.445**		1.7%	U	1.7%	U	1.7%	U	1.7%	U	68.9%	U	**15.9%**		**689%**	**0.678**		2.4%	U	2.2%	U	9.6%	U	7.8%	U	58.3%	U	**220.7%**	
Tin	**600%**	2	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**13.1%**		**13.1%**		**600%**	**2.3**		12.0%	U	12.0%	U	12.0%	U	12.0%	U	12.0%	U	**21.6%**	
Titanium	**112%**	**433**		0.6%	U	0.6%	U	0.6%	U	0.6%	U	0.6%	U	**98.0%**		**155%**	**762**		0.7%	U	0.7%	U	0.7%	U	0.7%	U	0.7%	U	**5.1%**	
Uranium	**117%**	**1.76**		**4.4%**		**37.8%**		**20.0%**		2.2%	U	**4.8%**		**23.6%**		**107%**	**2.35**		**21.3%**		**6.2%**		**3.9%**		1.8%	U	**6.9%**		**22.8%**	
Vanadium	**102%**	**92**		0.2%	U	**0.2%**		**3.6%**		**1.7%**		**0.9%**		**65.5%**		**125%**	**105**		0.2%	U	0.2%	U	**1.9%**		**0.3%**		**5.3%**		**4.6%**	
Zinc	**99%**	**479**		0.2%	U	**2.8%**		**12.0%**		**0.9%**		11.3%	U	**21.8%**		**131%**	**456**		1681.9%	U	**11.8%**		**38.8%**		**6.0%**		**3.8%**		**1620.5%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP009														CH14-106-TP010											
Sample ID				CH14-106-TP009-SOC														CH14-106-TP010-SOA											
Sample Interval (mbgs)				5.5 - 5.5														1.5 - 1.5											
Sample Date				7/20/2014														7/20/2014											
Analyte (Percentage, %)	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**113%**	**29400**		0.1%	U	**0.3%**		**0.7%**		**0.2%**		**0.3%**		**21.5%**		**97%**	**31900**		**0.9%**		2.0%	U	5.2%	U	**1.2%**		**1.9%**		**159.7%**	
Antimony	**94%**	**1.73**		6.9%	U	6.9%	U	**53.5%**		6.9%	U	16.0%	U	**304.9%**		**72%**	**1.24**		0.3%	U	**0.3%**		**2.7%**		**0.3%**		**0.7%**		**11.3%**	
Arsenic	**124%**	**32.3**	J	0.1%	U	**0.1%**		**9.6%**		**3.4%**		**6.0%**		**79.0%**		**29%**	**49.3**	J	**0.0%**		**0.0%**		**1.1%**		**0.3%**		**0.5%**		**9.9%**	
Barium	**857%**	**323**		**1.3%**		**3.9%**		**3.5%**		**3.5%**		**5.5%**		**18.7%**		**155%**	**636**		4.5%	U	**13.3%**		**12.5%**		**10.5%**		**16.9%**		**72.5%**	
Beryllium	**343%**	**4.21**		5.6%	U	**5.6%**		5.6%	U	5.6%	U	**5.6%**		**25.3%**		**170%**	**3.15**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	80.0%	U
Bismuth	**125%**	**1.93**		10.0%	U	10.0%	U	10.0%	U	10.0%	U	10.0%	U	**15.9%**		**236%**	**1.02**		5.4%	U	5.4%	U	5.4%	U	5.4%	U	5.4%	U	**8.1%**	
Cadmium	**103%**	**3.92**		5.0%	U	**20.0%**		2.2%	U	**5.0%**		2.2%	U	**152.4%**		**105%**	**1.63**		**11.2%**		32.5%	U	4.0%	U	8.8%	U	4.0%	U	**279.2%**	
Calcium	**118%**	**21400**		**5.7%**		**2.1%**		0.2%	U	**3.1%**				**10.4%**		**111%**	**31900**		**25.6%**		**7.2%**		0.8%	U	14.3%	U			**50.8%**	
Chromium	**391%**	**134**		1.4%	U	1.4%	U	1.4%	U	1.4%	U	1.4%	U	**6.6%**		**194%**	**286**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	12.1%	U	**57.3%**	
Cobalt	**115%**	**34.4**		1.3%	U	**7.1%**		**12.7%**		**0.4%**		**6.5%**		**70.1%**		**107%**	**35.6**		**0.9%**		3.7%	U	9.0%	U	0.2%	U	**3.2%**		**37.6%**	
Copper	**89%**	**117**		0.8%	U	**18.3%**		**24.7%**		**6.3%**		0.8%	U	**492.9%**		**51%**	**53.3**		**0.1%**		1.0%	U	**1.9%**		**0.5%**		0.1%	U	**42.0%**	
Iron	**107%**	**61600**		0.1%	U	**0.8%**		**10.6%**		**0.3%**		**9.7%**		**101.1%**		**105%**	**57000**		**0.0%**		**0.3%**		**4.2%**		**0.1%**		**3.1%**		**33.1%**	
Lead	**92%**	**670**		1.4%	U	**389.9%**		**58.9%**		**101.5%**		0.4%	U	**581.9%**		**82%**	**75.2**		**0.0%**		**3.1%**		**0.4%**		**0.8%**		**0.0%**		**3.9%**	
Lithium	**600%**	**51.7**		6.3%	U	6.3%	U	6.3%	U	6.3%	U	6.3%	U	**16.8%**		**262%**	**56.6**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	44.0%	U
Manganese	**117%**	**634**		1.4%	U	**4.2%**		**7.6%**		**1.1%**		**3.0%**		**61.1%**		**100%**	**707**		**8.2%**		17.7%	U	46.6%	U	5.7%	U	**14.7%**		**330.1%**	
Molybdenum	**165%**	**3.42**		13.9%	U	13.9%	U	13.9%	U	13.9%	U	**13.9%**		**108.6%**		**173%**	**1.97**		10.9%	U	10.9%	U	10.9%	U	10.9%	U	10.9%	U	**74.3%**	
Nickel	**167%**	**127**		0.8%	U	**1.0%**		**3.6%**		**0.8%**		**1.5%**		**11.9%**		**126%**	**234**		**11.7%**		12.9%	U	61.4%	U	11.7%	U	18.7%	U	**154.4%**	
Phosphorus	63%	**731**		33.3%	U	33.3%	U	33.3%	U							43%	**676**		33.3%	U	33.3%	U	33.3%	U						
Potassium	**18%**	**7110**		**55.6%**												**7%**	**6580**		150.0%	U										
Selenium	**100%**	**0.54**		12.7%	U	12.7%	U	12.7%	U	12.7%	U	31.8%	U	**33.8%**		**277%**	**0.25**		6.8%	U	6.8%	U	6.8%	U	**6.8%**		16.9%	U	**21.4%**	
Silver	**106%**	**1.52**		9.6%	U	9.6%	U	9.6%	U	9.6%	U	9.6%	U	**393.3%**		**77%**	**0.41**		0.4%	U	0.4%	U	0.4%	U	**0.4%**		0.4%	U	**13.1%**	
Sodium	100%	**350**		**47.6%**												**53%**	**580**		100.0%	U										
Strontium	**314%**	**102**		**4.7%**		**3.5%**		3.5%	U	**3.5%**		3.5%	U	**9.1%**		**162%**	**147**		13.6%	U	11.0%	U	11.0%	U	11.0%	U	**11.0%**		**30.0%**	
Thallium	**133%**	**1.07**		1.6%	U	1.8%	U	2.3%	U	1.8%	U	65.8%	U	**93.1%**		**207%**	**1.05**		0.6%	U	0.7%	U	1.0%	U	**0.7%**		25.6%	U	**28.2%**	
Tin	**257%**	**5.3**		12.9%	U	12.9%	U	12.9%	U	12.9%	U	12.9%	U	**12.9%**		**600%**	**4.8**		10.3%	U	10.3%	U	10.3%	U	**10.3%**		10.3%	U	**10.3%**	
Titanium	**202%**	**533**		0.7%	U	0.7%	U	0.7%	U	0.7%	U	0.7%	U	**17.8%**		**116%**	**544**		1.4%	U	1.4%	U	1.4%	U	**1.4%**		**1.4%**		**41.1%**	
Uranium	**86%**	**2.66**		**3.0%**		**21.6%**		**12.2%**		3.0%	U	**9.7%**		**68.8%**		**111%**	**1.55**		**9.8%**		68.5%	U	44.4%	U	9.8%	U	30.9%	U	**234.8%**	
Vanadium	**96%**	**90.5**		0.2%	U	**0.2%**		**2.4%**		**0.3%**		**1.1%**		**25.8%**		**103%**	**97.7**		0.7%	U	0.7%	U	**9.4%**		**0.8%**		**3.5%**		**94.4%**	
Zinc	**119%**	**1230**		6.2%	U	**65.8%**		**37.9%**		**2.9%**		10.5%	U	**576.5%**		**103%**	**367**		**3.4%**		**26.5%**		**19.0%**		**1.2%**		**4.6%**		**244.6%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP010														CH14-106-TP010											
Sample ID				CH14-106-TP010-SOB														CH14-106-TP010-SOC											
Sample Interval (mbgs)				3.9 - 3.9														5.5 - 5.5											
Sample Date				7/20/2014														7/20/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**121%**	**7170**		**2.7%**		0.4%	U	**0.4%**		**1.0%**		**0.8%**		**13.6%**		**89%**	**12400**		0.2%	U	**0.3%**		**1.5%**		**5.4%**		**0.6%**		**93.1%**	
Antimony	**93%**	**22.8**		0.8%	U	0.8%	U	**15.0%**		**5.1%**		**13.6%**		**92.9%**		**97%**	**9.64**		6.0%	U	6.0%	U	13.7%	U	6.0%	U	6.0%	U	**8.9%**	
Arsenic	**148%**	**660**	J	**0.2%**		**0.0%**		**0.8%**		**3.3%**		**12.9%**		**20.9%**		**84%**	**668**	J	**0.0%**		**0.2%**		**9.2%**		**0.5%**		**0.5%**		**7.6%**	
Barium	**186%**	**8.21**		0.5%	U	**0.6%**		**0.5%**		**0.5%**		**12.9%**		**13.7%**		**163%**	**73.9**		**3.2%**		17.8%	U	**8.5%**		**11.4%**		**4.2%**		**112.9%**	
Beryllium	163%	**0.21**		**25.7%**		14.7%	U	14.7%	U	14.7%	U	14.7%	U	**14.7%**		**214%**	**0.7**		6.3%	U	**6.3%**		6.3%	U	**6.3%**		**6.3%**		**26.3%**	
Bismuth	**250%**	**2.11**		5.4%	U	5.4%	U	5.4%	U	5.4%	U	5.4%	U	**7.8%**		**478%**	**7.48**		9.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**18.1%**	
Cadmium	**114%**	**1.15**		**99.9%**		**2.7%**		1.4%	U	1.4%	U	1.4%	U	**65.6%**		**101%**	**3.39**		**0.5%**		**3.8%**		0.5%	U	**0.5%**		0.5%	U	**11.2%**	
Calcium	**106%**	**8110**		**13.0%**		**0.3%**		0.3%	U	0.8%	U			**2.0%**		**102%**	**24800**		**4.6%**		**28.0%**		**0.1%**		**1.2%**				**8.7%**	
Chromium	**208%**	**29.8**		6.9%	U	6.9%	U	6.9%	U	6.9%	U	6.9%	U	**6.9%**		**309%**	**54.6**		4.6%	U	4.6%	U	4.6%	U	4.6%	U	**4.6%**		**89.0%**	
Cobalt	**104%**	**56.6**		**82.8%**		0.9%	U	1.0%	U	0.3%	U	**10.4%**		**182.6%**		**129%**	**23.1**		**0.3%**		**4.0%**		**17.9%**		**0.7%**		**2.7%**		**32.9%**	
Copper	**171%**	**789**		**63.4%**		**0.8%**		**6.5%**		**1.7%**		0.1%	U	**123.8%**		**95%**	**488**		**0.1%**		**0.5%**		**1.4%**		**0.2%**		0.1%	U	**6.9%**	
Iron	**104%**	**182000**		**5.4%**		**0.2%**		**6.0%**		**0.5%**		**31.0%**		**30.0%**		**93%**	**149000**		0.1%	U	**0.7%**		**5.8%**		**0.6%**		**1.3%**		**64.4%**	
Lead	**116%**	**8970**		**1.9%**		**8.5%**		**2.7%**		**0.4%**		**0.0%**		**59.5%**		**108%**	**5140**		**0.1%**		**25.3%**		**1.6%**		**4.6%**		0.1%	U	**31.6%**	
Lithium	283%	**11.6**		12.0%	U	12.0%	U	12.0%	U	12.0%	U	12.0%	U	**12.0%**		**600%**	**20.2**		9.7%	U	9.7%	U	9.7%	U	9.7%	U	9.7%	U	**59.6%**	
Manganese	**106%**	**104**		**122.9%**		2.2%	U	2.2%	U	2.2%	U	**14.6%**		**31.0%**		**88%**	**222**		**0.4%**		**19.0%**		**4.6%**		**0.8%**		**0.7%**		**32.9%**	
Molybdenum	**147%**	**3.21**		13.4%	U	13.4%	U	13.4%	U	13.4%	U	13.4%	U	**314.5%**		**121%**	**1.65**		15.5%	U	15.5%	U	15.5%	U	15.5%	U	15.5%	U	**44.7%**	
Nickel	**107%**	**12**		**41.2%**		6.3%	U	6.3%	U	6.3%	U	6.3%	U	**53.5%**		**115%**	**24.5**		**1.6%**		**4.4%**		**20.4%**		1.6%	U	**4.0%**		**34.9%**	
Phosphorus	32%	**261**		33.3%	U	33.3%	U	33.3%	U							45%	**576**		33.3%	U	33.3%	U	82.0%	U						
Potassium	8%	**3150**		100.0%	U											9%	**4150**		160.0%	U										
Selenium	**322%**	**1.54**		9.6%	U	9.6%	U	9.6%	U	9.6%	U	23.9%	U	**82.8%**		**173%**	**1.58**		11.4%	U	11.4%	U	11.4%	U	11.4%	U	28.4%	U	**22.7%**	
Silver	**121%**	**12.4**		1.0%	U	1.0%	U	1.0%	U	1.0%	U	1.0%	U	**61.8%**		**113%**	**8**		6.8%	U	6.8%	U	6.8%	U	6.8%	U	6.8%	U	**30.8%**	
Sodium	56%	**490**		100.0%	U											100%	**490**		100.0%	U										
Strontium	**170%**	**32.5**		**7.9%**		7.9%	U	7.9%	U	7.9%	U	**7.9%**		**7.9%**		**412%**	**70.2**		**19.8%**		**7.4%**		2.3%	U	**2.3%**		**2.3%**		**11.5%**	
Thallium	**186%**	**3.96**		1.0%	U	1.0%	U	8.0%	U	6.4%	U	40.8%	U	**269.4%**		**137%**	**2.08**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	77.2%	U	**17.6%**	
Tin	**600%**	**5.3**		15.2%	U	15.2%	U	15.2%	U	15.2%	U	15.2%	U	**15.2%**		**600%**	**3.9**		15.3%	U	15.3%	U	15.3%	U	15.3%	U	15.3%	U	**15.3%**	
Titanium	**155%**	**342**		0.9%	U	0.9%	U	0.9%	U	**0.9%**		**0.9%**		**4.3%**		**118%**	**377**		3.9%	U	3.9%	U	3.9%	U	5.2%	U	**3.9%**		**431.0%**	
Uranium	**115%**	**0.415**		**160.1%**		6.8%	U	6.8%	U	6.8%	U	48.3%	U	**114.8%**		**102%**	**0.492**		1.5%	U	**4.5%**		**3.6%**		**1.5%**		**1.5%**		**29.4%**	
Vanadium	**107%**	**43.2**		0.5%	U	0.5%	U	8.0%	U	**1.2%**		**17.3%**		**19.4%**		**84%**	**50.7**		0.3%	U	0.3%	U	**4.2%**		**3.2%**		**0.9%**		**97.8%**	
Zinc	**106%**	**1340**		**121.5%**		**1.3%**		**1.3%**		**0.3%**		**2.4%**		**104.9%**		**94%**	**2100**		**0.0%**		**0.3%**		**0.6%**		**0.0%**		**0.5%**		**1.6%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP011														CH14-106-TP011											
Sample ID				CH14-106-TP011-SOA														CH14-106-TP011-SOC											
Sample Interval (mbgs)				1.5 - 1.5														5 - 5											
Sample Date				7/20/2014														7/20/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**103%**	**18700**		**0.4%**		**0.5%**		**2.5%**		**14.4%**		**0.1%**		**221.6%**		**124%**	**12000**		1.3%	U	**0.2%**		**0.2%**		**0.6%**		**0.3%**		**10.8%**	
Antimony	**159%**	**1.95**		0.4%	U	0.4%	U	**2.8%**		**0.4%**		1.7%	U	**3.5%**		**225%**	**30.1**		1.6%	U	**4.4%**		**131.9%**		**69.9%**		42.0%	U	**323.3%**	
Arsenic	**97%**	**118**	J	**0.0%**		**0.1%**		**3.1%**		**0.6%**		**0.4%**		**2.9%**		**144%**	**281**	J	32.3%	U	**0.3%**		**16.3%**		**56.1%**		**50.0%**		**141.2%**	
Barium	**139%**	**129**		1.9%	U	**10.2%**		**4.4%**		**7.9%**		**6.0%**		**86.8%**		**155%**	**57.4**		**0.7%**		**1.8%**		**12.2%**		**11.7%**		**105.0%**		**18.1%**	
Beryllium	**143%**	**2.43**		**6.4%**		6.4%		6.4%	U	**6.4%**		**6.4%**		**41.2%**		**182%**	**3.52**		9.9%	U	**9.9%**		9.9%	U	9.9%	U	9.9%	U	**9.9%**	
Bismuth	**241%**	**1.01**		8.7%	U	8.7%	U	8.7%	U	8.7%	U	8.7%	U	**8.7%**		**600%**	**1.87**		2.2%	U	**2.2%**		5.4%	U	2.2%	U	2.2%	U	**34.2%**	
Cadmium	**80%**	**16.5**		**0.4%**		**3.2%**		0.4%	U	0.5%	U	0.4%	U	**1.5%**		**129%**	**13.8**		**1.8%**		**0.5%**		**0.5%**		**0.5%**		0.5%	U	**0.9%**	
Calcium	**80%**	**45100**		**41.1%**		**100.2%**		0.5%	U	3.5%	U			**60.4%**		**109%**	**9260**		**0.6%**		**0.3%**		0.3%	U	**0.3%**				**0.8%**	
Chromium	**124%**	**103**		4.7%	U	4.7%	U	4.7%	U	**4.7%**		**4.7%**		**110.6%**		**114%**	**87.4**		2.6%	U	2.6%	U	2.6%	U	2.6%	U	2.6%	U	**2.6%**	
Cobalt	**96%**	**42.3**		**0.4%**		**7.0%**		18.3%	U	1.5%	U	**10.2%**		**73.5%**		**134%**	**32.6**		**11.5%**		**0.2%**		**0.2%**		**0.2%**		**0.7%**		**126.0%**	
Copper	**122%**	**483**		**0.1%**		**0.7%**		**1.5%**		**0.2%**		0.1%	U	**5.8%**		**126%**	**794**		9.3%	U	**0.1%**		**1.9%**		**0.9%**		0.1%	U	**139.2%**	
Iron	**103%**	**70800**		0.1%	U	**0.4%**		**4.2%**		**0.6%**		**3.0%**		**54.1%**		**129%**	**102000**		13.5%	U	**0.3%**		**6.8%**		**1.7%**		**26.4%**		**116.5%**	
Lead	**133%**	**386**		**0.0%**		**1.2%**		**0.1%**		**0.4%**		**0.0%**		**1.9%**		**208%**	**6150**		**16.6%**		**245.7%**		**21.3%**		**25.2%**		**0.3%**		**420.3%**	
Lithium	**161%**	**27.5**		11.7%	U	11.7%	U	11.7%	U	11.7%	U	11.7%	U	**90.4%**		**192%**	**22.3**		8.1%	U	8.1%	U	8.1%	U	8.1%	U	8.1%	U	**8.1%**	
Manganese	**83%**	**1270**		**1.3%**		44.5%	U	13.7%	U	3.6%	U	**5.0%**		**69.4%**		**114%**	**552**		**1.6%**		**0.4%**		**0.4%**		**0.4%**		**0.8%**		**1.8%**	
Molybdenum	**254%**	**1.14**		8.3%	U	8.3%	U	8.3%	U	8.3%	U	8.3%	U	**20.4%**		**316%**	**3.32**		11.9%	U	11.9%	U	20.7%	U	11.9%	U	11.9%	U	**117.3%**	
Nickel	**98%**	**142**		**2.9%**		8.6%	U	26.7%	U	4.6%	U	**15.6%**		**97.9%**		**107%**	**74.8**		**6.3%**		**1.0%**		**1.0%**		**1.0%**		**1.2%**		**11.0%**	
Phosphorus	45%	**591**		33.3%	U	33.3%	U	45.3%	U							21%	**539**		33.3%	U	33.3%	U	33.3%	U						
Potassium	2%	**1520**		190.0%	U											5%	**2110**		**66.7%**											
Selenium	**370%**	**0.36**		8.7%	U	8.7%	U	8.7%	U	8.7%	U	**21.8%**		**16.6%**		**542%**	**1.08**		10.0%	U	10.0%	U	10.0%	U	12.9%	U	24.9%	U	**73.6%**	
Silver	**279%**	**0.69**		0.8%	U	0.8%	U	0.8%	U	**0.8%**		0.8%	U	**3.8%**		**264%**	**10.9**		2.5%	U	2.5%	U	2.5%	U	16.1%	U	2.5%	U	**714.6%**	
Sodium	22%	**180**		100.0%	U											24%	100	U	100.0%	U										
Strontium	**100%**	**190**		**132.6%**		**31.5%**		8.3%	U	8.3%	U	**8.3%**		**39.6%**		**133%**	**42.8**		**7.2%**		9.5%	U	7.2%	U	7.2%	U	8.1%	U	**30.7%**	
Thallium	**553%**	**0.358**		**0.6%**		**0.6%**		**0.6%**		**0.6%**		25.9%	U	**17.9%**		**432%**	**5.44**		1.4%	U	**1.4%**		4.8%	U	3.7%	U	56.4%	U	**238.2%**	
Tin	**600%**	**3.3**		15.0%	U	15.0%	U	15.0%	U	15.0%	U	15.0%	U	**15.0%**		**600%**	**2.3**		15.2%	U	15.2%	U	15.2%	U	15.2%	U	15.2%	U	**21.2%**	
Titanium	**109%**	**92.5**		2.8%	U	2.8%	U	2.8%	U	3.9%	U	**2.8%**		**213.4%**		**135%**	**144**		0.8%	U	0.8%	U	0.8%	U	2.1%	U	1.6%	U	**5.1%**	
Uranium	**145%**	**3.07**		**1.1%**		**8.9%**		**3.0%**		**1.1%**		**1.4%**		**12.5%**		**135%**	**5.75**		2.5%	U	**1.9%**		**1.9%**		1.9%	U	**2.3%**		**17.9%**	
Vanadium	**106%**	**48.4**		0.5%	U	0.5%	U	**10.1%**		**16.2%**		**3.9%**		**252.3%**		**134%**	**41.9**		0.3%	U	0.3%	U	7.2%	U	**1.3%**		**4.4%**		**7.6%**	
Zinc	**106%**	**12400**		**0.0%**		**0.9%**		**1.2%**		**0.2%**		**0.6%**		**1.6%**		**134%**	**8560**		**2.1%**		**0.0%**		**0.2%**		**0.2%**		**1.2%**		**3.8%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP012														CH14-106-TP012											
Sample ID				CH14-106-TP012-SOA														CH14-106-TP012-SOB											
Sample Interval (mbgs)				1.8 - 1.8														4.1 - 4.1											
Sample Date				7/20/2014														7/20/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**108%**	**18800**		1.1%	U	0.1%	U	**0.1%**		**0.1%**		**0.2%**		**4.9%**		**112%**	**12200**		1.4%	U	1.1%	U	**1.1%**		**1.9%**		**1.1%**		**18.4%**	
Antimony	**77%**	**7.1**		1.6%	U	3.8%	U	**98.7%**		118.1%	U	**103.6%**		**525.3%**		**87%**	**3.66**		0.4%	U	**0.6%**		**21.5%**		**4.2%**		**0.7%**		**42.3%**	
Arsenic	**78%**	**297**	J	3.6%	U	**0.1%**		**1.7%**		**43.5%**		**64.7%**		**90.5%**		**78%**	**29.8**	J	4.5%	U	**0.8%**		**15.6%**		**37.0%**		**46.2%**		**312.9%**	
Barium	**1662%**	**155**		**0.2%**		**0.4%**		**5.1%**		**5.0%**		**49.6%**		**5.9%**		**1600%**	**234**		**1.0%**		**1.4%**		**2.0%**		**1.6%**		**40.1%**		**12.1%**	
Beryllium	**600%**	**1.45**		3.3%	U	**3.3%**		3.3%	U	3.3%	U	**3.3%**		**3.6%**		**530%**	**2.3**		8.3%	U	**8.3%**		8.3%	U	8.3%	U	**8.3%**		**8.3%**	
Bismuth	**101%**	**1.75**		3.7%	U	**3.7%**		3.9%	U	3.7%	U	**3.7%**		**49.9%**		**138%**	**2.34**		11.6%	U	11.6%	U	11.6%	U	11.6%	U	11.6%	U	**122.5%**	
Cadmium	**213%**	**8.66**		34.0%	U	**0.8%**		**0.8%**		**0.8%**		**0.8%**		**2.4%**		**280%**	**1.86**		**53.5%**		**1.5%**		**1.5%**		**1.5%**		1.5%	U	**33.5%**	
Calcium	**183%**	**14200**		**3.0%**		**0.4%**		0.4%	U	**0.4%**				**2.6%**		**128%**	**10100**		**6.8%**		**1.6%**		1.6%	U	1.6%	U			**1.6%**	
Chromium	**54%**	**144**		1.7%	U	1.7%	U	1.7%	U	1.7%	U	**1.7%**		**3.0%**		**225%**	**49.8**		12.2%	U	12.2%	U	12.2%	U	12.2%	U	**12.2%**		**12.2%**	
Cobalt	**125%**	**54**		8.3%	U	**0.2%**		**0.2%**		**0.2%**		**1.7%**		**66.2%**		**87%**	**22.6**		36.3%	U	**0.4%**		**0.4%**		0.4%	U	**1.3%**		**1544.5%**	
Copper	**69%**	**258**		13.9%	U	**0.1%**		**3.1%**		**1.8%**		**0.1%**		**168.7%**		**77%**	**138**		47.5%	U	**0.2%**		**5.7%**		**1.6%**		0.1%	U	**238.4%**	
Iron	**95%**	**78800**		6.8%	U	**0.1%**		**6.6%**		**1.9%**		**33.8%**		**66.2%**		**97%**	**53000**		9.5%	U	**0.3%**		**9.7%**		**1.3%**		**60.2%**		**442.5%**	
Lead	**103%**	**1710**		21.3%	U	**451.5%**		**20.1%**		**50.6%**		**0.2%**		**925.7%**		**111%**	**746**		**8.9%**		**15.9%**		**12.8%**		**1.8%**		**0.1%**		**218.1%**	J
Lithium	**600%**	**35.6**		4.2%	U	4.2%	U	4.2%	U	4.2%	U	**4.2%**		**4.2%**		**600%**	**34.8**		14.5%	U	14.5%	U	14.5%	U	14.5%	U	14.5%	U	**14.5%**	
Manganese	**136%**	**1110**		8.3%	U	**0.5%**		**0.5%**		**0.5%**		**4.0%**		**5.4%**		**153%**	**504**		**19.1%**		**0.9%**		**0.9%**		**0.9%**		**3.1%**		**15.2%**	
Molybdenum	**114%**	**2.45**		11.4%	U	11.4%	U	12.3%	U	14.5%	U	**11.4%**		**107.0%**		**99%**	**1.24**		13.9%	U	13.9%	U	13.9%	U	13.9%	U	13.9%	U	**29.2%**	
Nickel	**155%**	**177**		1.7%	U	**1.2%**		**1.2%**		**1.2%**		**1.2%**		**2.3%**		**144%**	**51.1**		4.8%	U	4.8%	U	4.8%	U	4.8%	U	**4.8%**		**4.8%**	
Phosphorus	49%	**575**		42.0%	U	33.3%	U	33.3%	U							28%	**393**		33.3%	U	33.3%	U	33.3%	U						
Potassium	**9%**	**5320**		**71.4%**												7%	**3050**		100.0%	U										
Selenium	**101%**	**0.59**		10.8%	U	10.8%	U	10.8%	U	14.5%	U	**26.9%**		**96.8%**		**122%**	**0.56**		10.9%	U	10.9%	U	10.9%	U	13.0%	U	27.2%	U	**243.5%**	
Silver	**105%**	**3.26**		2.1%	U	2.1%	U	2.1%	U	11.7%	U	**2.1%**		**778.2%**		**98%**	**1.98**		1.2%	U	1.2%	U	1.2%	U	1.2%	U	1.2%	U	**209.1%**	
Sodium	100%	**370**		100.0%	U											100%	100	U	100.0%	U										
Strontium	**162%**	**50.2**		**6.9%**		**11.5%**		6.9%	U	**6.9%**		**6.9%**		**29.8%**		**162%**	**39.9**		**13.1%**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	**31.1%**	
Thallium	**127%**	**1.47**		1.4%	U	1.4%	U	2.8%	U	3.1%	U	57.3%	U	**312.3%**		**123%**	**1.17**		1.0%	U	1.0%	U	**1.8%**		1.6%	U	39.4%	U	**100.6%**	
Tin	**206%**	**3.1**		10.1%	U	10.1%	U	10.1%	U	10.1%	U	**10.1%**		**23.2%**		**178%**	**3.7**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	29.2%	U
Titanium	**189%**	**517**		0.4%	U	0.4%	U	0.4%	U	1.1%	U	**1.3%**		**3.6%**		**161%**	**126**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	12.1%	U	**22.5%**	
Uranium	**98%**	**2.5**		2.8%	U	**1.1%**		**1.1%**		**1.1%**		**2.2%**		**11.2%**		**138%**	**4.63**		1.5%	U	**1.5%**		**1.5%**		**1.5%**		**1.5%**		**4.6%**	
Vanadium	**67%**	**76.7**		**0.1%**		0.1%	U	**5.4%**		**0.8%**		**6.5%**		**4.0%**		**79%**	**32.9**		0.8%	U	0.8%	U	**17.7%**		**2.7%**		**27.5%**		**10.3%**	
Zinc	**66%**	**6690**		**52.2%**		**0.2%**		**1.3%**		**1.3%**		**3.4%**		**44.4%**		**116%**	**923**		**57.5%**		**0.1%**		**0.6%**		**0.2%**		**2.2%**		**49.0%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP012														CH14-106-TP012											
Sample ID				CH14-106-TP912-SOB														CH14-106-TP012-SOC											
Sample Interval (mbgs)				4.1 - 4.1														5 - 5											
Sample Date				7/20/2014														7/20/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**148%**	**4170**		2.9%	U	1.1%	U	**1.1%**		**2.4%**		**1.1%**		**25.0%**		**94%**	**4680**		**5.2%**		0.6%	U	0.6%	U	**0.8%**		**8.2%**		**19.0%**	
Antimony	**78%**	**23.2**		0.5%	U	**0.8%**		**12.1%**		**11.0%**		**30.5%**		**123.8%**		**81%**	**31.8**		0.5%	U	1.1%	U	**11.4%**		**3.6%**		11.8%	U	**87.2%**	
Arsenic	**99%**	**427**		4.1%	U	**0.1%**		**1.9%**		**30.3%**		**104.6%**		**174.1%**		**86%**	**619**	**J**	**1.1%**		**0.1%**		**1.9%**		**4.0%**		**19.4%**	**J**	**42.3%**	
Barium	**2563%**	**171**	**J**	**1.0%**		**1.0%**		**1.0%**		**1.0%**		**36.8%**		**29.8%**		**820%**	**48.5**	**J**	0.6%	U	**0.7%**		**3.2%**		**2.7%**		**121.0%**		**23.5%**	
Beryllium	**600%**	**2.19**		8.2%	U	**8.2%**		8.2%	U	8.2%	U	**8.2%**		**8.2%**		**545%**	**1.93**		**10.2%**		10.2%	U	10.2%	U	10.2%	U	10.2%	U	**12.8%**	
Bismuth	**101%**	**2.11**		11.7%	U	11.7%	U	**14.6%**		11.7%	U	11.7%	U	**167.3%**		**114%**	**2.4**	**J**	6.4%	U	6.4%	U	6.4%	U	6.4%	U	6.4%	U	**27.3%**	
Cadmium	**285%**	**2.92**	**J**	**183.1%**		**3.1%**		**1.4%**		**1.4%**		1.4%	U	**55.4%**		**128%**	**8.75**	**J**	**312.0%**		**6.7%**		2.0%	U	2.0%	U	2.0%	U	**150.2%**	**J**
Calcium	**176%**	**3080**		**41.9%**		1.6%	U	1.6%	U	1.6%	U			**4.1%**		**102%**	**3050**	**J**	**91.1%**		**1.1%**		0.7%	U	3.9%	U			**13.1%**	
Chromium	**314%**	**25.1**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	**12.3%**		**12.3%**		**342%**	**25.5**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	**15.9%**		**13.6%**	
Cobalt	**106%**	**27**		38.6%	U	**0.4%**		**0.4%**		0.4%	U	**1.2%**		**457.0%**		**100%**	**20.2**	**J**	**62.3%**		0.6%	U	0.5%	U	0.5%	U	**3.1%**		**127.6%**	
Copper	**89%**	**726**		59.7%	U	**0.4%**		**4.6%**		**1.0%**		0.1%	U	**199.6%**		**99%**	**667**	**J**	**182.9%**		**2.5%**		**4.4%**		**0.8%**		0.1%	U	**144.6%**	
Iron	**105%**	**69600**		9.2%	U	**0.5%**		**13.0%**		**1.2%**		**68.0%**		**193.6%**		**96%**	**102000**		**11.4%**		**1.3%**		**9.5%**		**0.5%**		**80.6%**		**79.2%**	
Lead	**174%**	**4020**		**14.9%**		**56.5%**		**19.0%**		**5.7%**		**0.4%**		**573.0%**	**J**	**100%**	**5440**		**0.0%**		**2.0%**	**J**	**1.4%**	**J**	**1.7%**	**J**	**0.2%**		**120.2%**	**J**
Lithium	**600%**	**8.1**		14.1%	U	14.1%	U	14.1%	U	14.1%	U	14.1%	U	**14.1%**		**600%**	**12.1**		8.1%	U	8.1%	U	8.1%	U	8.1%	U	8.1%	U	**8.1%**	
Manganese	**155%**	**625**		**21.2%**		**0.9%**		**0.9%**		**0.9%**		**3.2%**		**9.7%**		**119%**	**421**		**87.6%**		1.7%	U	1.7%	U	1.7%	U	**5.8%**		**21.7%**	
Molybdenum	**323%**	**1.58**		14.2%	U	14.2%	U	14.2%	U	14.2%	U	**14.2%**		**107.1%**		**128%**	**2.85**		13.9%	U	13.9%	U	13.9%	U	13.9%	U	**40.8%**		**254.4%**	
Nickel	**66%**	**38.6**		11.8%	U	4.6%	U	4.6%	U	4.6%	U	**4.6%**		**24.6%**		**137%**	**37.3**	**J**	**22.3%**		7.0%	U	7.0%	U	7.0%	U	**7.0%**		**65.2%**	
Phosphorus	160%	**528**		33.3%	U	33.3%	U	33.3%	U							62%	**374**		113.3%	U	33.3%	U	188.7%	U						
Potassium	26%	**1310**		100.0%	U											14%	**1280**		100.0%	U										
Selenium	**126%**	**0.79**		10.9%	U	10.9%	U	10.9%	U	10.9%	U	27.2%	U	**173.4%**		**123%**	**1.14**		9.6%	U	9.6%	U	9.6%	U	9.6%	U	23.9%	U	**114.8%**	
Silver	**97%**	**8.82**		1.3%	U	1.3%	U	1.3%	U	2.8%	U	1.3%	U	**358.7%**		**95%**	**13.8**		0.9%	U	0.9%	U	0.9%	U	**0.9%**		0.9%	U	**120.8%**	
Sodium	100%	100	U	100.0%	U											100%	100	U	100.0%	U										
Strontium	**258%**	**27.4**		**13.1%**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	**29.6%**		**239%**	**33.4**		**10.1%**		**10.1%**		10.1%	U	10.1%	U	**29.4%**		**50.4%**	
Thallium	**136%**	**2.55**		1.0%	U	1.0%	U	**2.6%**		2.4%	U	38.6%	U	**134.2%**		**127%**	**3.52**		0.8%	U	0.8%	U	2.2%	U	**1.6%**		32.7%	U	**114.5%**	
Tin	229%	**2.2**		14.4%	U	14.4%	U	**14.4%**		14.4%	U	**14.4%**		**35.3%**		204%	**3.1**		12.4%	U	12.4%	U	12.4%	U	12.4%	U	12.4%	U	**12.4%**	
Titanium	**700%**	**5.9**	**J**	13.7%	U	13.7%	U	13.7%	U	13.7%	U	13.7%	U	**25.0%**		**291%**	**20.5**	**J**	7.3%	U	7.3%	U	7.3%	U	7.3%	U	**7.3%**		**7.3%**	**J**
Uranium	**190%**	**3.51**		8.0%	U	**1.5%**		**1.5%**		**1.5%**		**1.5%**		**11.3%**		**137%**	**4.06**	**J**	**17.0%**		**0.9%**		**1.3%**		**0.9%**		**14.1%**		**18.3%**	
Vanadium	**85%**	**26.7**		0.8%	U	0.8%	U	**12.7%**		**1.7%**		**21.2%**		**24.7%**		**92%**	**25.5**		1.5%	U	0.9%	U	**24.0%**		**1.6%**		**88.5%**		**59.8%**	
Zinc	**167%**	**2220**	**J**	**189.2%**		**1.3%**		**1.1%**		**0.2%**		**2.1%**		**81.0%**		**116%**	**7130**	**J**	**260.8%**		**2.8%**		**1.7%**		**0.4%**		**11.6%**		**173.3%**	**J**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP013														CH14-106-TP015											
Sample ID				CH14-106-TP013-SOCOMP														CH14-106-TP015-SOCOMP											
Sample Interval (mbgs)				1.5 - 5.4														1.5 - 5.5											
Sample Date				7/18/2014														7/19/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**83%**	**8230**		0.5%	U	0.5%	U	**0.8%**		**8.2%**		**0.7%**		**191.4%**		**121%**	**9560**		0.2%	U	0.3%	U	**0.4%**		**0.3%**		**0.3%**		**60.7%**	
Antimony	**85%**	**15.9**		11.6%	U	11.6%	U	11.6%	U	11.6%	U	11.6%	U	**39.5%**		**240%**	**0.4**		8.8%	U	8.8%	U	8.8%	U	8.8%	U	8.8%	U	**25.7%**	
Arsenic	**110%**	**531**		1.0%	U	**1.8%**		**3.5%**		**12.9%**		14.0%	U	**286.7%**		**190%**	**4.58**		0.2%	U	**0.8%**		**4.9%**		**11.3%**		**13.7%**		**180.9%**	
Barium	**968%**	**144**		**10.1%**		**15.4%**		**3.4%**		**5.2%**		**4.3%**		**44.4%**		**150%**	**426**		**3.2%**		**8.1%**		**1.9%**		**1.8%**		**3.4%**		**19.1%**	
Beryllium	**176%**	**1.55**		10.7%	U	10.7%	U	10.7%	U	10.7%	U	**10.7%**		**63.6%**		**141%**	**1.58**		8.9%	U	8.9%	U	8.9%	U	8.9%	U	8.9%	U	**53.1%**	
Bismuth	**161%**	**2.01**		12.5%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	**28.1%**		**210%**	**0.36**		7.0%	U	8.8%	U	7.0%	U	7.0%	U	7.0%	U	**21.4%**	
Cadmium	**113%**	**2.91**		7.6%	U	**78.3%**		7.6%	U	7.6%	U	7.6%	U	**107.7%**		**158%**	**0.537**		2.0%	U	**10.9%**		2.0%	U	**2.0%**		2.0%	U	**6.3%**	
Calcium	**100%**	**6670**		**14.3%**		**119.7%**		0.8%	U	**6.2%**				**66.8%**		**114%**	**5710**		**7.0%**		**22.6%**		0.4%	U	**3.5%**				**21.5%**	
Chromium	**194%**	**22.1**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	161.7%	U	169%	**2.83**		5.4%	U	5.4%	U	5.4%	U	5.4%	U	5.4%	U	**43.1%**	
Cobalt	**101%**	**22.2**		1.6%	U	**40.3%**		**19.1%**		1.9%	U	**50.3%**		**294.5%**		**96%**	**7.03**		0.4%	U	**2.0%**		**10.7%**		**0.8%**		**32.0%**		**59.4%**	
Copper	**112%**	**400**		1.5%	U	**7.1%**		**20.2%**		**2.9%**		1.5%	U	**171.9%**		**136%**	**32.1**		1.2%	U	**4.8%**		**18.7%**		**2.1%**		1.2%	U	**141.8%**	
Iron	**91%**	**71500**		0.2%	U	**1.5%**		**7.9%**		**0.9%**		**15.8%**		**195.7%**		**115%**	**35300**		0.1%	U	**0.8%**		**4.8%**		**0.3%**		**8.1%**		**99.0%**	
Lead	**104%**	**2390**		0.2%	U	**45.4%**		**3.6%**		**8.5%**		0.2%	U	**75.2%**		**252%**	**239**		0.1%	U	**3.4%**		**0.8%**		**0.5%**		0.1%	U	**3.9%**	
Lithium	**600%**	**33.7**		13.8%	U	13.8%	U	13.8%	U	13.8%	U	13.8%	U	**93.9%**		**196%**	**15**		8.1%	U	8.1%	U	8.1%	U	8.1%	U	8.1%	U	**52.9%**	
Manganese	**100%**	**340**		0.9%	U	**23.6%**		**4.8%**		**1.0%**		**3.4%**		**69.0%**		**104%**	**684**		0.6%	U	**4.8%**		**3.7%**		**0.8%**		**5.4%**		**71.0%**	
Molybdenum	**118%**	**1.8**		8.1%	U	8.1%	U	8.1%	U	8.1%	U	**25.7%**		**55.0%**		**128%**	**5.09**		16.5%	U	16.5%	U	16.5%	U	16.5%	U	16.5%	U	**16.5%**	
Nickel	**135%**	**32.2**		16.7%	U	22.5%	U	39.2%	U	16.7%	U	85.0%	U	370.0%	U	132%	**3.3**		3.0%	U	**3.0%**		**9.1%**		3.0%	U	**20.3%**		**49.9%**	
Phosphorus	24%	**287**		33.3%	U	33.3%	U	33.3%	U							29%	**590**		33.3%	U	33.3%	U	33.3%	U						
Potassium	11%	**2160**		120.0%	U											3%	**3100**		**82.4%**											
Selenium	**155%**	**0.76**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	37.3%	U	358%	0.2	U	9.7%	U	9.7%	U	9.7%	U	9.7%	U	24.2%	U	**9.7%**	
Silver	**96%**	**5.85**		12.7%	U	12.7%	U	12.7%	U	12.7%	U	12.7%	U	**57.0%**		**279%**	**0.43**		5.7%	U	5.7%	U	5.7%	U	5.7%	U	5.7%	U	**18.8%**	
Sodium	100%	**110**		100.0%	U											100%	**240**		100.0%	U										
Strontium	**179%**	**46.3**		**49.5%**		**29.9%**		12.6%	U	12.6%	U	12.6%	U	**23.6%**		**149%**	**24.7**		**11.5%**		**9.8%**		6.6%	U	6.6%	U	6.6%	U	**16.5%**	
Thallium	**113%**	**3.11**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	77.5%	U	**16.4%**		**783%**	**0.353**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	74.2%	U	**15.7%**	
Tin	**462%**	**5.2**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	25.8%	U	655%	2	U	12.3%	U	12.3%	U	12.3%	U	**12.3%**		**12.3%**		**14.7%**	
Titanium	**326%**	**27.5**		0.9%	U	0.9%	U	0.9%	U	0.9%	U	0.9%	U	**82.6%**		**133%**	**729**		1.1%	U	1.1%	U	1.1%	U	1.1%	U	1.1%	U	**132.9%**	
Uranium	**103%**	**7.77**		2.9%	U	**47.5%**		**13.6%**		2.8%	U	**11.4%**		**83.4%**		**109%**	**3.62**		3.0%	U	**12.6%**		**4.9%**		3.0%	U	**3.4%**		**30.6%**	
Vanadium	**81%**	**22.8**		0.5%	U	0.6%	U	**3.3%**		**2.6%**		**4.5%**		**104.0%**		**115%**	**49.5**		0.3%	U	0.4%	U	1.9%	U	**0.3%**		**2.4%**		**53.0%**	
Zinc	**101%**	**2550**		0.4%	U	**15.0%**		**20.6%**		**2.9%**		**22.1%**		**173.2%**		**136%**	**261**		0.1%	U	**0.5%**		**1.5%**		**0.1%**		**4.9%**		**7.2%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP017														CH14-106-TP017											
Sample ID				CH14-106-TP017-SOCOMPA														CH14-106-TP017-SOCOMPB											
Sample Interval (mbgs)				1.5 - 5.5														1.5 - 5.5											
Sample Date				7/22/2014														7/22/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**116%**	**27400**		0.4%	U	1.7%	U	**2.2%**		**0.6%**		**2.6%**		**55.1%**		**119%**	**12000**		0.4%	U	0.6%	U	**0.9%**		**0.4%**		**0.6%**		**119.0%**	
Antimony	**232%**	**0.52**		0.6%	U	0.6%	U	**0.6%**		**0.6%**		**0.6%**		**2.1%**		**290%**	**17.6**		0.5%	U	0.5%	U	**0.5%**		**0.5%**		**0.5%**		**0.7%**	
Arsenic	**88%**	**22.4**		**0.0%**		**0.0%**		**0.2%**		**0.3%**		**0.5%**		**7.6%**		**79%**	**449**		**0.0%**		**0.0%**		**0.5%**		**0.6%**		**0.7%**		**40.8%**	
Barium	**120%**	**431**		**4.0%**		**7.6%**		**1.5%**		**0.8%**		**2.0%**		**15.7%**		**111%**	**90.8**		**3.6%**		**10.3%**		**4.4%**		**3.0%**		**7.1%**		**22.3%**	
Beryllium	**155%**	**1.69**		11.8%	U	**11.8%**		11.8%	U	11.8%	U	**11.8%**		**48.2%**		**173%**	**1.5**		11.0%	U	**11.0%**		11.0%	U	11.0%	U	**11.0%**		**56.4%**	
Bismuth	**191%**	**0.9**		6.3%	U	6.3%	U	6.3%	U	6.3%	U	6.3%	U	**8.2%**		**485%**	**2.3**		6.3%	U	6.3%	U	6.3%	U	6.3%	U	6.3%	U	**11.3%**	
Cadmium	**50%**	**2.28**		**0.3%**		**0.5%**		**0.3%**		0.3%	U	0.3%	U	**0.5%**		**281%**	**7.19**		**0.6%**		**1.4%**		0.6%	U	**0.6%**		0.6%	U	**1.1%**	
Calcium	**105%**	**13600**		**5.4%**		**2.6%**		0.6%	U	2.2%	U			**25.4%**		**107%**	**7170**		**15.1%**		**12.7%**		0.7%	U	**4.2%**				**28.9%**	
Chromium	**174%**	**66.8**		9.1%	U	9.1%	U	**9.1%**		9.1%	U	9.1%	U	**33.0%**		**213%**	**38**		9.6%	U	9.6%	U	9.6%	U	9.6%	U	9.6%	U	**58.5%**	
Cobalt	**115%**	**32**		**0.3%**		**3.0%**		**3.7%**		**0.3%**		**29.8%**		**30.4%**		**95%**	**35.1**		**0.3%**		**3.3%**		**5.0%**		**0.3%**		**16.0%**		**43.5%**	
Copper	**125%**	**44.9**		**0.1%**		**0.5%**		**0.8%**		**0.1%**		0.1%	U	**13.2%**		**131%**	**552**		**0.1%**		**0.4%**		**1.2%**		**0.1%**		0.1%	U	**5.7%**	
Iron	**119%**	**61300**		0.1%	U	**0.8%**		**3.6%**		**0.2%**		**5.4%**		**64.0%**		**105%**	**90800**		0.1%	U	**0.5%**		**3.1%**		**0.1%**		**4.3%**		**61.1%**	
Lead	**96%**	**177**		**0.0%**		**0.2%**		**0.0%**		**0.0%**		**0.0%**		**0.4%**		**140%**	**3040**		**0.0%**		**1.6%**		**0.4%**		**0.2%**		**0.0%**		**2.9%**	
Lithium	**189%**	**39.3**		10.8%	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U	**25.1%**		**295%**	**24.9**		10.7%	U	10.7%	U	10.7%	U	10.7%	U	10.7%	U	**59.9%**	
Manganese	**124%**	**887**		**0.6%**		**1.9%**		**3.6%**		0.8%	U	**5.3%**		**80.2%**		**109%**	**835**		**0.6%**		**4.1%**		3.2%	U	0.6%	U	**3.7%**		**60.8%**	
Molybdenum	**600%**	**0.91**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	12.1%	U	**12.1%**		**600%**	**2.05**		12.2%	U	12.2%	U	12.2%	U	12.2%	U	12.2%	U	**12.2%**	
Nickel	**124%**	**88.7**		**4.0%**		4.0%	U	**4.9%**		4.0%	U	**31.0%**		**33.2%**		**108%**	**48.4**		**4.4%**		4.8%	U	10.1%	U	4.4%	U	**23.4%**		**59.3%**	
Phosphorus	36%	**518**		33.3%	U	33.3%	U	33.3%	U							51%	**605**		33.3%	U	33.3%	U	33.3%	U						
Potassium	**3%**	**4480**		250.0%	U											14%	**2180**		140.0%	U										
Selenium	**750%**	**0.41**		8.4%	U	8.4%	U	8.4%	U	8.4%	U	21.1%	U	**8.4%**		**750%**	**0.91**		8.9%	U	8.9%	U	8.9%	U	8.9%	U	22.3%	U	**8.9%**	
Silver	**286%**	**0.7**		1.3%	U	1.3%	U	1.3%	U	1.3%	U	1.3%	U	**3.1%**		**463%**	**6.36**		1.3%	U	1.3%	U	1.3%	U	1.3%	U	1.3%	U	**4.1%**	
Sodium	56%	**680**		100.0%	U											100%	**100**		100.0%	U										
Strontium	**131%**	**98.5**		**11.7%**		11.7%	U	11.7%	U	11.7%	U	**11.7%**		**21.1%**		**272%**	**30.7**		**13.3%**		10.7%	U	10.7%	U	10.7%	U	**10.7%**		**12.7%**	
Thallium	**869%**	**0.408**		**0.8%**		**0.8%**		0.8%	U	0.8%	U	33.6%	U	**5.1%**		**1312%**	**3.69**		0.8%	U	**0.8%**		0.8%	U	0.8%	U	31.1%	U	**5.8%**	
Tin	**620%**	2	U	12.3%	U	12.3%	U	12.3%	U	12.3%	U	**12.3%**		**12.3%**		**600%**	**2.4**		16.1%	U	16.1%	U	16.1%	U	16.1%	U	16.1%	U	**16.1%**	
Titanium	**119%**	**459**		3.1%	U	3.1%	U	3.1%	U	3.1%	U	**3.1%**		**24.7%**		**148%**	**116**		3.3%	U	3.3%	U	3.3%	U	3.3%	U	**3.3%**		**161.4%**	
Uranium	**122%**	**1.75**		**1.2%**		**1.8%**		**1.2%**		**1.2%**		**1.2%**		**14.3%**		**139%**	**3.78**		**1.3%**		**5.5%**		**2.7%**		**1.3%**		**2.1%**		**16.2%**	
Vanadium	**120%**	**61.7**		0.6%	U	1.1%	U	2.4%	U	**0.7%**		**8.2%**		**57.9%**		**107%**	**35.3**		0.6%	U	0.6%	U	2.3%	U	**0.6%**		**2.3%**		**72.6%**	
Zinc	**92%**	**1560**		**0.0%**		**0.1%**		**0.2%**		**0.0%**		**1.2%**		**1.4%**		**137%**	**4100**		**0.0%**		**0.2%**		**0.5%**		**0.1%**		**1.0%**		**3.0%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-106-TP019														CH14-107-MW003											
Sample ID				CH14-106-TP019-SOCOMP														CH14-107-MW003-SOA											
Sample Interval (mbgs)				1.5 - 5.1														1.83 - 2.13											
Sample Date				7/22/2014														8/21/2014											
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**108%**	**12000**		0.4%	U	0.6%	U	**0.8%**		**0.5%**		**0.8%**		**125.3%**		**117%**	**11800**		0.4%	U	**1.8%**		**2.3%**		**0.6%**		**1.3%**		**230.9%**	
Antimony	**376%**	**19.8**		9.4%	U	9.4%	U	9.4%	U	9.4%	U	9.4%	U	**17.0%**		**227%**	**0.68**		6.8%	U	6.8%	U	6.8%	U	6.8%	U	**6.8%**		**6.8%**	
Arsenic	**853%**	**222**		0.4%	U	0.7%	U	**9.7%**		**8.9%**		**12.1%**		**473.0%**		**123%**	**18.5**		0.2%	U	**0.3%**		**0.2%**		**0.2%**		**2.4%**		**3.7%**	
Barium	**107%**	**87.3**		**4.8%**		**14.6%**		**7.1%**		**4.7%**		**13.1%**		**43.6%**		**140%**	**199**		**5.7%**		**11.9%**		**1.7%**		**1.2%**		**1.6%**		**102.0%**	
Beryllium	**144%**	**1.51**		9.2%	U	9.2%	U	9.2%	U	9.2%	U	**9.2%**		**51.8%**		**154%**	**1.85**		11.8%	U	21.8%	U	11.8%	U	11.8%	U	**11.8%**		**73.5%**	
Bismuth	**504%**	**1.18**		9.5%	U	9.5%	U	9.5%	U	9.5%	U	9.5%	U	**11.0%**		**315%**	**1.44**		1.9%	U	1.9%	U	1.9%	U	**1.9%**		**1.9%**		**1.9%**	
Cadmium	**185%**	**6.8**		**4.2%**		**12.4%**		**4.2%**		**4.2%**		4.2%	U	**7.9%**		**207%**	**1.06**		**2.4%**		**2.4%**		**2.4%**		**2.4%**		2.4%	U	**2.4%**	
Calcium	**102%**	**7040**		**46.0%**		**36.9%**		1.6%	U	11.8%	U			**68.3%**		**110%**	**3700**		**69.0%**		155.2%	U	2.9%	U	28.1%	U			**42.4%**	
Chromium	**181%**	**35.2**		9.3%	U	9.3%	U	9.3%	U	9.3%	U	**9.3%**		**63.1%**		**193%**	**39.2**		10.2%	U	10.2%	U	10.2%	U	10.2%	U	10.2%	U	**101.6%**	
Cobalt	**116%**	**45.5**		0.5%	U	**5.5%**		**6.8%**		**0.5%**		**25.1%**		**69.1%**		**107%**	**24.5**		0.5%	U	**4.3%**		**2.2%**		**0.5%**		**2.4%**		**77.7%**	
Copper	**111%**	**559**		0.3%	U	**1.2%**		**3.3%**		**0.4%**		0.3%	U	**18.1%**		**105%**	**190**		0.7%	U	**2.6%**		**2.5%**		**0.7%**		**0.7%**		**44.6%**	
Iron	**105%**	**98900**		0.1%	U	**1.0%**		**4.9%**		**0.2%**		**7.4%**		**103.4%**		**106%**	**61100**		0.1%	U	**1.2%**		**3.4%**		**0.3%**		**3.2%**		**84.1%**	
Lead	**204%**	**4510**		0.3%	U	**32.4%**		**10.3%**		**4.4%**		0.3%	U	**26.3%**		**107%**	**231**		0.1%	U	**0.9%**		**0.3%**		**0.1%**		**0.1%**		**1.0%**	
Lithium	**176%**	**24.5**		10.1%	U	10.1%	U	10.1%	U	10.1%	U	10.1%	U	**68.5%**		**182%**	**23.4**		10.4%	U	10.4%	U	10.4%	U	10.4%	U	10.4%	U	**105.6%**	
Manganese	**111%**	**829**		1.0%	U	**7.3%**		**4.9%**		**1.0%**		**6.4%**		**101.3%**		**110%**	**582**		**0.9%**		**5.7%**		**2.9%**		**0.9%**		**2.3%**		**29.0%**	
Molybdenum	**435%**	**2.18**		16.1%	U	16.1%	U	16.1%	U	16.1%	U	16.1%	U	**16.1%**		**448%**	**1.12**		15.4%	U	15.4%	U	15.4%	U	15.4%	U	**15.4%**		15.4%	U
Nickel	**121%**	**57.4**		4.4%	U	6.4%	U	**10.4%**		4.4%	U	**25.6%**		**65.0%**		**120%**	**48.9**		5.4%	U	6.3%	U	5.4%	U	5.4%	U	**5.4%**		**109.5%**	
Phosphorus	38%	**489**		33.3%	U	33.3%	U	33.3%	U							35%	**415**		33.3%	U	33.3%	U	46.7%	U						
Potassium	6%	**1900**		140.0%	U											7%	**3750**		390.0%	U										
Selenium	**750%**	**0.94**		12.8%	U	12.8%	U	12.8%	U	12.8%	U	32.1%	U	**12.8%**		**750%**	**0.38**		12.6%	U	12.6%	U	12.6%	U	12.6%	U	31.4%	U	**18.2%**	
Silver	**476%**	**7.88**		9.1%	U	9.1%	U	9.1%	U	9.1%	U	9.1%	U	**22.7%**		**326%**	**0.71**		10.4%	U	10.4%	U	10.4%	U	10.4%	U	10.4%	U	**10.4%**	
Sodium	100%	100	U	100.0%	U											100%	**170**		100.0%	U										
Strontium	**171%**	**32.2**		15.2%	U	10.1%	U	10.1%	U	10.1%	U	10.1%	U	**13.8%**		**176%**	**27.9**		25.3%	U	14.6%	U	13.0%	U	13.0%	U	13.0%	U	**13.0%**	
Thallium	**810%**	**4.98**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	74.1%	U	**17.8%**		**748%**	**0.453**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	74.1%	U	**22.7%**	
Tin	**600%**	**2.7**		16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**16.4%**		**600%**	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**100%**	**124**		0.8%	U	0.8%	U	0.8%	U	0.8%	U	**0.8%**		**40.0%**		**120%**	**489**		1.7%	U	1.7%	U	1.7%	U	1.7%	U	**1.7%**		**526.0%**	
Uranium	**106%**	**4.19**		1.7%	U	**8.2%**		**3.5%**		**1.7%**		**2.8%**		**25.9%**		**118%**	**3.03**		1.7%	U	**11.7%**		**3.6%**		**1.7%**		**1.7%**		**20.9%**	
Vanadium	**106%**	**33**		0.5%	U	0.5%	U	2.2%	U	**0.5%**		**2.3%**		**80.1%**		**120%**	**38.1**		0.6%	U	1.0%	U	1.2%	U	**0.6%**		**0.6%**		**157.4%**	
Zinc	**103%**	**3680**		**0.3%**		**3.8%**		**7.7%**		**0.6%**		**13.5%**		**36.2%**		**122%**	**454**		**0.1%**		**0.8%**		**0.3%**		**0.1%**		**4.0%**		**8.0%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-107-MW003															CH14-107-MW003											
Sample ID				CH14-107-MW003-SOD															CH14-107-MW003-SOH											
Sample Interval (mbgs)				11.89 - 12.19															24.99 - 25.3											
Sample Date				8/21/2014															8/21/2014											
Analyte (Percentage, %)	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES	
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	**100%**	**13100**		1.4%	U	**1.4%**		**3.0%**		**1.9%**		**6.5%**		**222.3%**		**109%**	**6140**		1.5%	U	3.5%	U	**10.2%**		111.8%	U	**17.6%**		**1258.4%**	
Antimony	**600%**	1.43	U	4.6%	U	**4.6%**		**7.3%**		4.6%	U	**4.6%**		**80.8%**		**77%**	1.82	U	11.2%	U	11.2%	U	11.2%	U	11.2%	U	11.2%	U	**11.2%**	
Arsenic	**295%**	**21.3**		**0.3%**		**0.8%**		**1.6%**		**18.7%**		**19.2%**		**512.4%**		**171%**	**14.7**		2.1%	U	11.1%	U	**6.9%**		**9.7%**		20.6%	U	**31.6%**	
Barium	**102%**	**216**		**6.0%**		**16.7%**		**17.7%**		**10.9%**		**56.3%**		**221.9%**		**187%**	**230**		**22.8%**		**31.0%**		**3.2%**		7.7%	U	**6.7%**		**228.2%**	
Beryllium	**109%**	**0.97**		12.4%	U	12.4%	U	12.4%	U	12.4%	U	28.6%	U	**65.8%**		**113%**	**0.89**		13.0%	U	13.0%	U	13.0%	U	13.0%	U	13.0%	U	**81.8%**	
Bismuth	**600%**	**6.51**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**48.4%**		**61%**	**0.22**		12.8%	U	12.8%	U	12.8%	U	12.8%	U	12.8%	U	**12.8%**	
Cadmium	**600%**	**1.92**		23.5%	U	111.9%	U	24.2%	U	21.9%	U	16.1%	U	**322.6%**		**114%**	**0.076**		16.7%	U	18.0%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Calcium	**114%**	**1480**		**40.8%**		2.0%	U	2.0%	U	2.8%	U			**82.3%**		**106%**	**2980**		**283.1%**		155.3%	U	1.8%	U	26.5%	U			**46.2%**	
Chromium	**152%**	**25.5**		12.2%	U	12.2%	U	12.2%	U	12.2%	U	12.2%	U	**63.5%**		**166%**	**19.7**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	258.7%	U
Cobalt	**118%**	**20.2**		**0.8%**		**2.9%**		**6.5%**		**0.4%**		**63.2%**		**100.8%**		**107%**	**22.7**		**1.2%**		**15.3%**		**24.5%**		4.1%	U	**14.5%**		**127.4%**	
Copper	**147%**	**66.3**		1.3%	U	11.3%	U	34.8%	U	5.7%	U	1.3%	U	**501.3%**		**105%**	**26.6**	J	1.7%	U	2.2%	U	5.9%	U	4.8%	U	1.7%	U	**42.2%**	
Iron	**100%**	**55700**		0.1%	U	**0.5%**		**5.2%**		**0.3%**		**27.5%**		**85.2%**		**102%**	**56300**		0.1%	U	**0.2%**		**1.8%**		**3.2%**		**8.3%**		**102.2%**	
Lead	**127%**	**380**		2.3%	U	**686.2%**		**181.1%**		50.6%	U	1.8%	U	**892.4%**		**78%**	**20.1**		3.1%	U	**29.5%**		17.5%	U	9.7%	U	3.1%	U	**55.4%**	
Lithium	**129%**	**21.9**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	42.3%	U	267%	**9.2**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	135.3%	U
Manganese	**108%**	**511**		**2.2%**		**4.6%**		**7.1%**		**1.6%**		**21.0%**		**64.0%**		**116%**	**889**		**0.5%**		**5.0%**		**1.9%**		**0.5%**		**0.6%**		**37.7%**	
Molybdenum	**526%**	**1.31**		14.6%	U	14.6%	U	14.6%	U	14.6%	U	14.6%	U	**14.6%**		**423%**	**0.88**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Nickel	**127%**	**27.2**		4.5%	U	**4.5%**		**5.4%**		4.5%	U	**44.9%**		**70.8%**		**109%**	**42.4**		14.9%	U	14.9%	U	14.9%	U	14.9%	U	44.8%	U	**219.4%**	
Phosphorus	51%	**492**		33.3%	U	33.3%	U	33.3%	U							25%	**853**		33.3%	U	33.3%	U	36.0%	U						
Potassium	3%	**1770**		**88.2%**												**6%**	**2000**		**256.5%**											
Selenium	**548%**	**0.39**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	19.3%	U	269%	0.2	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U
Silver	**600%**	**0.45**		11.2%	U	11.2%	U	11.2%	U	11.2%	U	11.2%	U	**185.4%**		**92%**	**0.21**		12.7%	U	12.7%	U	12.7%	U	12.7%	U	12.7%	U	**12.7%**	
Sodium	25%	110	U	100.0%	U											100%	100	U	100.0%	U										
Strontium	**182%**	**19.2**		14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**21.4%**		**310%**	**16**		531.9%	U	42.6%	U	15.2%	U	15.2%	U	15.2%	U	**33.7%**	
Thallium	**496%**	**0.498**		2.0%	U	2.0%	U	2.0%	U	2.0%	U	81.0%	U	**41.7%**		**260%**	**0.252**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	84.1%	U	**9.3%**	
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium	**102%**	**227**		14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**747.9%**		**132%**	**12.7**		16.7%	U	16.7%	U	16.7%	U	30.7%	U	16.7%	U	2960.0%	U
Uranium	**112%**	**2.71**		3.3%	U	**10.5%**		**5.4%**		3.3%	U	**19.5%**		**49.9%**		**103%**	**1.71**		4.5%	U	**49.3%**		**20.3%**		6.6%	U	**14.3%**		**28.3%**	
Vanadium	**105%**	**26.7**		0.9%	U	0.9%	U	**4.7%**		**0.9%**		**25.3%**		**105.7%**		**104%**	**25.6**		1.7%	U	1.7%	U	**5.4%**		18.7%	U	**8.4%**		**470.7%**	
Zinc	**156%**	**1170**		**0.5%**		**4.7%**		**6.7%**		**0.9%**		**23.2%**		**65.6%**		**92%**	**1000**		**0.1%**		**0.2%**		**0.4%**		**0.4%**		**4.7%**		**9.3%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID				CH14-107-MW004															CH14-107-MW004										
Sample ID				CH14-107-MW004-SOG															CH14-107-MW004-SOI										
Sample Interval (mbgs)				18.59 - 18.9															25.3 - 25.6										
Sample Date				8/28/2014															8/28/2014										
Analyte	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		R
(Percentage, %)		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum	**114%**	**2770**		1.1%	U	**0.4%**		**1.8%**		3.0%	U	**3.1%**		**94.7%**		**96%**	**14600**		1.4%	U	8.2%	U	**19.5%**		100.7%	U	**10.9%**		**703.1%**
Antimony	**600%**	0.35	U	15.2%	U	15.2%	U	39.4%	U	72.7%	U	60.6%	U	**498.5%**		**87%**	**0.23**		10.6%	U	10.6%	U	**10.6%**		10.6%	U	10.6%	U	**13.8%**
Arsenic	**106%**	**3.12**		1.5%	U	1.2%	U	**11.3%**		**316.0%**		**787.6%**		**1787.3%**		**91%**	**5.31**		3.6%	U	23.4%	U	**64.1%**		46.6%	U	35.8%	U	214.2%
Barium	**93%**	**83.3**		**0.5%**		**0.6%**		**1.0%**		**0.8%**		**14.7%**		**9.2%**		**239%**	**749**		**6.4%**		**19.0%**		**14.0%**		**21.3%**		**18.8%**		**200.5%**
Beryllium	**123%**	**0.65**		8.8%	U	8.8%	U	8.8%	U	8.8%	U	8.8%	U	**21.5%**		**152%**	**1.32**		15.0%	U	24.1%	U	24.1%	U	15.0%	U	21.1%	U	**96.2%**
Bismuth	**600%**	**0.72**		14.9%	U	14.9%	U	18.7%	U	14.9%	U	14.9%	U	**91.8%**		**140%**	**0.3**		14.9%	U	14.9%	U	26.9%	U	14.9%	U	14.9%	U	**120.9%**
Cadmium	375%	**0.07**		92.4%	U	11.3%	U	8.1%	U	8.1%	U	8.1%	U	**52.3%**		**99%**	**0.473**		132.3%	U	2053.3%	U	115.0%	U	160.3%	U	16.7%	U	1616.7%
Calcium	**79%**	**2280**		**141.8%**		6.4%	U	1.8%	U	2.9%	U			**50.7%**		**105%**	**2480**		**2390.7%**		1639.3%	U	6.8%	U	**64.3%**				**441.3%**
Chromium	131%	1.96	U	9.1%	U	9.1%	U	9.1%	U	9.1%	U	9.8%	U	**51.7%**		**135%**	**32.2**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	153.7%
Cobalt	**102%**	**7.39**		**14.1%**		**1.7%**		**2.2%**		**0.7%**		**15.5%**		**97.4%**		**99%**	**27.4**		**0.9%**		**7.6%**		**153.5%**		5.4%	U	**15.8%**		**145.4%**
Copper	**81%**	**28**		14.9%	U	2.7%	U	44.4%	U	17.8%	U	1.9%	U	**1165.4%**		**100%**	**17.5**		3.0%	U	**87.8%**		**35.7%**		11.1%	U	3.0%	U	**115.0%**
Iron	**101%**	**29300**		0.1%	U	**0.2%**		**11.1%**		**2.3%**		**43.3%**		**75.0%**		**94%**	**80000**		0.2%	U	**1.0%**		**17.0%**		**5.6%**		**16.6%**		**167.5%**
Lead	**104%**	**15.3**		578.8%	U	**3134.5%**		776.5%	U	178.1%	U	31.5%	U	**17542.3%**		**79%**	**7.16**		5.3%	U	**585.7%**		**259.9%**		**315.2%**		15.0%	U	**3780.6%**
Lithium	148%	5	U	8.0%	U	8.0%	U	8.0%	U	8.0%	U	8.0%	U	**32.8%**		**219%**	**39.9**		13.4%	U	13.4%	U	13.4%	U	13.4%	U	13.4%	U	**107.5%**
Manganese	**90%**	**781**		**8.5%**		**0.9%**		**0.9%**		**0.4%**		**3.7%**		**10.7%**		**86%**	**1470**		**1.0%**		99.9%	U	**191.6%**		10.7%	U	**7.6%**		**60.0%**
Molybdenum	400%	0.5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	38.0%	U	217%	0.5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%
Nickel	**114%**	**4.14**		7.8%	U	**3.3%**		**3.3%**		3.3%	U	**17.6%**		**32.6%**		**94%**	**55.4**		**7.1%**		**71.0%**		**24.0%**		7.1%	U	13.4%	U	**102.5%**
Phosphorus	32%	**512**		33.3%	U	33.3%	U	33.3%	U							37%	**347**		33.3%	U	33.3%	U	33.3%	U					
Potassium	**7%**	**1580**		100.0%	U											2%	**2040**		120.0%	U									
Selenium	750%	0.2	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	30.7%	U	241%	0.2	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	38.7%
Silver	**600%**	**0.29**		15.9%	U	15.9%	U	15.9%	U	19.0%	U	15.9%	U	**430.2%**		**113%**	0.1	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	145.0%
Sodium	67%	100	U	100.0%	U											32%	100	U	100.0%	U									
Strontium	**110%**	**10.2**		10.8%	U	10.8%	U	10.8%	U	**10.8%**		21.5%	U	**24.3%**		**137%**	**24.8**		213.0%	U	49.3%	U	16.7%	U	16.7%	U	16.7%	U	60.7%
Thallium	**1086%**	**0.088**		2.0%	U	2.0%	U	2.0%	U	2.0%	U	80.7%	U	**52.1%**		**291%**	**0.273**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	83.5%	U	**9.3%**
Tin	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%
Titanium	143%	**1**		2.3%	U	2.3%	U	2.3%	U	8.4%	U	17.4%	U	**297.7%**		**114%**	**208**		14.1%	U	14.1%	U	14.1%	U	29.1%	U	14.1%	U	**142.9%**
Uranium	**102%**	**0.952**		8.2%	U	**3.6%**		**2.7%**		2.7%	U	**11.0%**		**25.1%**		**107%**	**1.95**		7.0%	U	**77.0%**		**31.2%**		7.0%	U	9.6%	U	**42.5%**
Vanadium	**114%**	**7.56**		0.6%	U	0.6%	U	12.8%	U	**2.7%**		**30.0%**		**68.9%**		**99%**	**36.3**		3.2%	U	3.2%	U	**51.3%**		104.5%	U	79.3%	U	**1072.1%**
Zinc	**161%**	**956**		**7.4%**		**0.6%**		**2.4%**		**1.0%**		**13.0%**		**11.2%**		**89%**	**3260**		**8.2%**		**639.2%**		**66.7%**		**18.7%**		13.4%	U	**84.8%**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID					CH14-107-MW005B														CH14-107-MW005B											
Sample ID					CH14-107-MW005B-SOA														CH14-107-MW905B-SOA											
Sample Interval (mbgs)					0.91 - 1.22														0.91 - 1.22											
Sample Date					8/23/2014														8/23/2014											
Analyte	ES	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	NSE		AS		AMPH		PYRO		XLN		I	
(Percentage, %)	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum		**135%**	**2570**		**0.4%**		1.6%	U	**1.0%**		**22.6%**		**3.6%**		**227.8%**		**127%**	**11500**	**0.4%**		0.4%	U	**1.0%**		**0.9%**		**0.4%**		**30.6%**	
Antimony		**191%**	**0.7**		0.9%	U	0.9%	U	**0.9%**		**0.9%**		**0.9%**		**1.4%**		**169%**	**13.1**	J	0.9%	U	**0.9%**		**15.0%**		**0.9%**		1.9%	U	**13.6%**	
Arsenic	U	**60%**	**0.49**		0.1%	U	0.4%	U	**0.3%**		**0.8%**		**0.8%**		**4.0%**		**90%**	**77.8**		0.1%	U	0.1%	U	**11.7%**		**2.4%**		**3.2%**		**31.5%**	
Barium		**209%**	**83.9**		**0.8%**		**2.1%**		**0.3%**		**1.1%**		**2.4%**		**20.5%**		**176%**	**333**		**1.5%**		**5.4%**		**4.0%**		**2.3%**		**3.1%**		**43.1%**	
Beryllium		**126%**	**0.44**		13.4%	U	18.8%	U	13.4%	U	13.4%	U	22.8%	U	**103.4%**		**128%**	**0.68**		13.6%	U	13.6%	U	13.6%	U	13.6%	U	13.6%	U	**72.1%**	
Bismuth		**441%**	**0.65**		7.3%	U	7.3%	U	**7.3%**		7.3%	U	7.3%	U	**7.3%**		**600%**	**1.99**		9.0%	U	9.0%	U	18.9%	U	9.0%	U	9.0%	U	**34.7%**	
Cadmium	U	155%	0.05	U	**56.8%**		727.1%	U	8.6%	U	59.6%	U	8.6%	U	**130.4%**		**85%**	**0.388**		**11.7%**		104.6%	U	12.3%	U	21.0%	U	7.2%	U	**209.8%**	
Calcium		**109%**	**637**		**1234.1%**		1098.7%	U	4.0%	U	**43.1%**				**335.2%**		**114%**	**1050**		**143.1%**		35.1%	U	4.4%	U	**28.7%**				**261.8%**	
Chromium	U	171%	**7.03**		10.8%	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U	**107.4%**		**166%**	**26.3**		10.8%	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U	**42.2%**	
Cobalt		**81%**	**12.7**		**1.0%**		10.0%	U	19.9%	U	10.2%	U	**172.7%**		**173.7%**		**83%**	**10.2**		**1.0%**		22.6%	U	108.0%	U	1.7%	U	**31.7%**		**87.5%**	
Copper		**97%**	**23**		**0.3%**		5.5%	U	**1.2%**		**1.4%**		0.3%	U	**13.8%**		**87%**	**172**		**0.3%**		4.6%	U	**14.8%**		**1.1%**		0.3%	U	**40.5%**	
Iron		**108%**	**24400**		0.1%	U	0.5%	U	**1.1%**		**2.0%**		**9.0%**		**79.8%**		**105%**	**55900**		0.1%	U	**0.9%**		**17.6%**		**0.4%**		**7.0%**		**138.5%**	
Lead		**237%**	**7.55**		**0.0%**		**0.3%**		**0.0%**		**0.1%**		**0.0%**		**0.7%**		**88%**	**4990**		**0.0%**		**8.9%**		**1.4%**		**1.4%**		**0.0%**		**5.0%**	
Lithium		**175%**	**9**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	12.3%	U	**102.2%**		**169%**	**17.1**		12.2%	U	12.2%	U	12.2%	U	12.2%	U	12.2%	U	**16.6%**	
Manganese		**108%**	**550**		**2.3%**		221.6%	U	39.4%	U	61.8%	U	**240.6%**		**182.5%**		**97%**	**195**		**2.3%**		31.0%	U	66.7%	U	5.3%	U	**23.1%**		**578.4%**	
Molybdenum	U	517%	0.5	U	15.0%	U	15.0%	U	15.0%	U	15.0%	U	**15.0%**		21.3%	U	**563%**	**2.22**		14.8%	U	14.8%	U	14.8%	U	14.8%	U	**14.8%**		**17.5%**	
Nickel		**103%**	**26.7**		7.0%	U	56.7%	U	7.7%	U	10.6%	U	**32.7%**		**111.3%**		**110%**	**22**		6.8%	U	6.8%	U	85.0%	U	6.8%	U	**20.1%**		**55.8%**	
Phosphorus		25%	50	U	25.4%	U	25.4%	U	**25.4%**								**24%**	**634**		21.6%	U	21.6%	U	**21.6%**							
Potassium		11%	**660**		**116.7%**												**11%**	**4360**		100.0%	U										
Selenium	U	648%	0.2	U	11.4%	U	11.4%	U	11.4%	U	11.4%	U	28.6%	U	**11.4%**		**750%**	**0.61**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	**11.8%**	
Silver	U	391%	0.1	U	1.2%	U	1.2%	U	1.2%	U	**1.2%**		1.2%	U	**1.3%**		**359%**	**8.32**		1.1%	U	1.1%	U	1.1%	U	**1.1%**		1.1%	U	**23.4%**	
Sodium		83%	100	U	100.0%	U											71%	**280**		100.0%	U										
Strontium	U	130%	**6.72**		143.4%	U	32.2%	U	10.8%	U	10.8%	U	**10.8%**		**42.1%**		**129%**	**28.8**		10.0%	U	10.0%	U	10.0%	U	10.0%	U	**10.0%**		**27.7%**	
Thallium		**1938%**	**0.158**		1.2%	U	1.2%	U	1.2%	U	1.2%	U	46.7%	U	**4.5%**		**1584%**	**2.47**		1.1%	U	1.1%	U	1.1%	U	1.1%	U	44.5%	U	**18.1%**	
Tin	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	
Titanium		**279%**	8.1	U	1.0%	U	1.0%	U	**1.0%**		**1.9%**		**1.0%**		**8.1%**		**217%**	**459**		1.0%	U	1.0%	U	**1.0%**		**1.0%**		**1.0%**		**3.2%**	
Uranium		**112%**	**0.749**		4.3%	U	37.2%	U	4.3%	U	4.7%	U	**10.6%**		**37.8%**		**97%**	**1.15**		4.2%	U	42.0%	U	15.1%	U	4.2%	U	**6.1%**		**120.7%**	
Vanadium		**126%**	**6.88**		0.6%	U	0.6%	U	**1.4%**		**14.5%**		**18.8%**		**194.8%**		**119%**	**37.1**		0.6%	U	0.6%	U	**10.9%**		**0.7%**		**4.2%**		**65.5%**	
Zinc		**94%**	**748**		**7.7%**		**506.5%**		**37.9%**		**57.4%**		**42.7%**		**98.6%**		**94%**	**663**		**1.3%**		**27.8%**		**50.2%**		**1.3%**		**7.8%**		**119.3%**	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID					CH14-107-MW006B														CH14-107-MW010									
Sample ID					CH14-107-MW006B-SOC														CH14-107-MW010-SOA									
Sample Interval (mbgs)					4.88 - 5.18														1.22 - 1.52									
Sample Date					8/23/2014														8/30/2014									
Analyte	RES	Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	NSE		AS		AMPH		PYRO		XLN	
(Percentage, %)	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum		**142%**	**11800**		0.002962261	U	0.3%	U	**0.8%**		**1.4%**		**0.3%**		**52.2%**		**115%**	**13900**	0.4%	U	0.6%	U	**4.9%**		**1.2%**		**4.6%**	
Antimony		**83%**	**9.96**		9.6%	U	9.6%	U	103.8%	U	9.6%	U	21.2%	U	**228.8%**		**42%**	**0.87**	12.7%	U	12.7%	U	12.7%	U	12.7%	U	21.5%	U
Arsenic		**73%**	**73.9**		0.5%	U	1.5%	U	**53.1%**		**51.8%**		**55.5%**		**4448.5%**		**731%**	**14**	0.5%	U	0.5%	U	**10.4%**		**3.9%**		**31.9%**	
Barium		**284%**	**385**		**10.4%**		**32.5%**		23.2%	U	19.4%	U	**31.0%**		**203.7%**		**180%**	**87.8**	**8.0%**		**7.9%**		**3.4%**		**2.0%**		**8.5%**	
Beryllium		**155%**	**0.75**		4.6%	U	**4.6%**		**5.3%**		4.6%	U	**4.6%**		**30.5%**		**148%**	**3.4**	14.6%	U	14.6%	U	18.2%	U	14.6%	U	14.6%	U
Bismuth		**73%**	**1.39**		14.8%	U	14.8%	U	20.7%	U	14.8%	U	14.8%	U	**71.9%**		**223%**	**0.3**	16.7%	U	56.7%	U	344.2%	U	16.7%	U	16.7%	U
Cadmium		**103%**	**0.389**		11.5%	U	**57.8%**		12.6%	U	27.8%	U	11.5%	U	**203.4%**		**185%**	**0.233**	**48.9%**		**171.0%**		**60.3%**		**14.6%**		6.2%	U
Calcium		**114%**	**995**		**101.6%**		43.9%	U	1.8%	U	**23.1%**				**101.6%**		**106%**	**2360**	**15.7%**		**1.5%**		1.5%	U	**1.9%**			
Chromium		**214%**	**25.9**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**48.3%**		**200%**	**23.3**	10.8%	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U
Cobalt		**90%**	**11**		**1.3%**		**13.5%**		**89.7%**		3.6%	U	**51.4%**		**200.8%**		**122%**	**6.98**	1.3%	U	1.9%	U	**822.2%**		**3.6%**		**48.5%**	
Copper		**31%**	**165**		2.0%	U	17.2%	U	**103.4%**		9.5%	U	2.0%	U	**460.2%**		**125%**	**23.2**	2.2%	U	**14.6%**		**33.9%**		**4.3%**		**2.2%**	
Iron		**97%**	**56300**		0.1%	U	0.3%	U	**11.6%**		**0.4%**		**7.7%**		**79.8%**		**115%**	**65000**	0.3%	U	0.3%	U	**5.0%**		**1.0%**		**57.1%**	
Lead		**88%**	**4480**		3.3%	U	1654.6%	U	**287.6%**		306.6%	U	**3.3%**		**5725.5%**		**145%**	**11**	4.0%	U	660.7%	U	**2369.8%**		204.6%		39.6%	U
Lithium		**548%**	**16.9**		8.7%	U	8.7%	U	8.7%	U	8.7%	U	8.7%	U	**35.1%**		**237%**	**24.1**	10.6%	U	10.6%	U	10.6%	U	10.6%	U	10.6%	U
Manganese		**108%**	**219**		**1.9%**		**22.5%**		**35.8%**		4.4%	U	**20.4%**		**275.5%**		**108%**	**233**	3.2%	U	**10.0%**		**538.4%**		**12.0%**		**14.2%**	
Molybdenum		**152%**	**1.91**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	**10.5%**		10.5%	U	**411%**	**2.74**	16.7%	U	16.7%	U	23.0%	U	16.7%	U	26.0%	U
Nickel		**106%**	**22.2**		6.9%	U	6.9%	U	50.9%	U	6.9%	U	22.3%		**105.2%**		**130%**	**20.5**	**6.3%**		6.3%	U	**6.3%**		6.3%	U	**23.7%**	
Phosphorus		**44%**	**635**		33.3%	U	33.3%	U	33.3%	U							33%	**647**	23.4%	U	23.4%	U	**23.4%**					
Potassium		11%	**4380**		100.0%	U											6%	**2080**	100.0%	U								
Selenium		**306%**	**0.52**		10.7%	U	10.7%	U	10.7%	U	10.7%	U	26.7%	U	**17.1%**		**771%**	**0.72**	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U
Silver		**80%**	**6.94**		14.1%	U	14.1%	U	14.1%	U	14.1%	U	14.1%	U	**408.5%**		**122%**	**0.18**	14.9%	U	14.9%	U	14.9%	U	14.9%	U	14.9%	U
Sodium		100%	**270**		100.0%	U											100%	100	U	100.0%	U							
Strontium		**214%**	**30.4**		14.1%	U	12.6%	U	12.6%	U	12.6%	U	12.6%	U	**28.6%**		**166%**	**29.5**	9.1%	U	9.1%	U	9.1%	U	9.1%	U	9.1%	U
Thallium		**412%**	**2.38**		2.0%	U	2.0%	U	2.0%	U	2.0%	U	81.8%	U	**48.3%**		**335%**	**0.17**	2.1%	U	2.2%	U	11.0%	U	2.1%	U	83.0%	U
Tin	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U
Titanium		**335%**	**472**		0.9%	U	0.9%	U	0.9%	U	0.9%	U	**0.9%**		**20.7%**		**137%**	**394**	1.3%	U	1.3%	U	**1.8%**		**2.1%**		1.4%	U
Uranium		**116%**	**1.26**		1.3%	U	**25.2%**		**12.7%**		**1.3%**		**4.6%**		**32.4%**		**113%**	**3.45**	2.7%	U	**6.7%**		**6.0%**		2.7%	U	**28.1%**	
Vanadium		**115%**	**37.3**		0.5%	U	0.5%	U	**9.2%**		1.1%	U	**4.0%**		**61.5%**		**110%**	**35.3**	0.7%	U	0.7%	U	**2.8%**		**0.9%**		**19.9%**	
Zinc		**86%**	**694**		**0.1%**		**3.0%**		**13.3%**		**0.6%**		**5.6%**		**39.7%**		**138%**	**816**	**2.9%**		**7.6%**		**7.2%**		**1.2%**		34.2%	U

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID						CH14-107-MW010														CH14-107-MW010								
Sample ID						CH14-107-MW010-SOC														CH14-107-MW010-SOK								
Sample Interval (mbgs)						3.35 - 3.66														25.3 - 25.6								
Sample Date						8/30/2014														8/30/2014								
Analyte	RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		)
(Percentage, %)	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum	**89.5%**		**132%**	**12400**		0.4%	U	0.4%	U	**1.4%**		**8.3%**		**0.7%**		**121.6%**		**126%**	**11900**		0.8%	U	**0.9%**		**2.4%**		**14.1%**		**1.0%**
Antimony	**96.2%**		**16%**	**0.45**		14.5%	U	14.5%	U	**85.5%**		14.5%	U	18.8%	U	**142.0%**		**109%**	**0.51**		11.5%	U	14.9%	U	**252.9%**		28.7%	U	40.2%
Arsenic	**93.4%**		**1%**	**8.56**		**1.2%**		**2.6%**		**98.3%**		**34.9%**		**31.2%**		**1007.6%**		**218%**	**4.43**		0.5%	U	**2.5%**		**170.1%**		**49.3%**		65.3%
Barium	**90.5%**		**76%**	**131**		**16.9%**		**49.3%**		**23.8%**		**27.2%**		**28.6%**		**402.5%**		**195%**	**131**		**13.7%**		**34.8%**		**28.4%**		**33.3%**		**48.3%**
Beryllium	**41.6%**		**142%**	**0.6**		14.9%	U	14.9%	U	16.4%	U	14.9%	U	14.9%	U	**81.3%**		**132%**	**0.6**		10.8%	U	10.8%	U	10.8%	U	10.8%	U	10.8%
Bismuth	657.5%	U	743%	**0.29**		16.7%	U	49.2%	U	48.3%	U	16.7%	U	16.7%	U	140.0%	U	113%	**0.35**		16.7%	U	22.5%	U	38.3%	U	16.7%	U	16.7%
Cadmium	**91.3%**		**143%**	**0.772**		**6.6%**		**129.8%**		8.0%	U	**21.1%**		6.6%	U	**743.4%**		**83%**	**0.744**		150.7%	U	1020.0%	U	54.0%	U	137.3%	U	16.7%
Calcium	**28.8%**		**15%**	**3780**	**J**	**61.3%**		**176.0%**		1.3%	U	**19.9%**				**99.2%**		**98%**	**3490**		**191.5%**		177.7%	U	1.6%	U	**34.8%**		
Chromium	**43.3%**		**216%**	**23.7**	**J**	10.6%	U	10.6%	U	10.6%	U	10.6%	U	10.6%	U	**85.0%**		**170%**	**28.9**		11.4%	U	11.4%	U	11.4%	U	11.4%	U	11.4%
Cobalt	**99.5%**		**337%**	**7.98**		1.3%	U	15.9%	U	**47.8%**		**2.0%**		**21.5%**		**149.0%**		**88%**	**7.56**		**0.5%**		**13.5%**		**16.8%**		**0.8%**		**5.0%**
Copper	**259.9%**		**28%**	**22.9**		1.6%	U	**14.6%**		**70.6%**		**6.0%**		1.6%	U	**356.4%**		**160%**	**31.8**		3.6%	U	138.6%	U	200.7%	U	26.2%	U	3.6%
Iron	**119.2%**		**54%**	**19900**		0.3%	U	2.0%	U	**53.2%**		**2.8%**		**23.8%**		**304.7%**		**107%**	**15200**		0.1%	U	**0.5%**		**12.2%**		0.6%	J	**7.2%**
Lead	**1569.3%**		**38%**	**14.7**		3.1%	U	**2789.4%**		**276.5%**		**628.1%**		3.6%	U	**3072.7%**		**142%**	**16.3**		44.2%	U	**12053.4%**		1533.1%	U	**2503.5%**		17.9%
Lithium	**45.7%**		**263%**	**24.2**		11.0%	U	11.0%	U	11.0%	U	11.0%	U	11.0%	U	**61.0%**		**206%**	**24.9**		15.5%	U	15.5%	U	15.5%	U	15.5%	U	15.5%
Manganese	**44.5%**		**194%**	**368**		**2.3%**		**72.5%**		**48.6%**		**8.3%**		19.1%	U	**293.1%**		**105%**	**227**		**0.7%**		**20.2%**		**8.5%**		**1.4%**		**2.7%**
Molybdenum	16.7%	U	251%	**0.68**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	25.0%	U	328%	0.5	U	15.0%	U	15.0%	U	15.0%	U	15.0%	U	15.0%
Nickel	**55.1%**		**82%**	**29.7**		**4.9%**		4.9%	U	**26.7%**		4.9%	U	10.3%	U	**62.0%**		**99%**	**39.1**		4.3%	U	**13.1%**		**24.3%**		4.3%	U	**7.3%**
Phosphorus			**33%**	**587**		22.1%	U	22.1%	U	**22.1%**								**26%**	**510**		25.5%	U	25.5%	U	**25.5%**				
Potassium			5%	**1570**		150.0%	U											6%	**1540**		**66.7%**								
Selenium	20.0%	U	390%	**0.27**		13.2%	U	13.2%	U	13.2%	U	13.2%	U	32.9%	U	**69.7%**		337%	**0.69**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%
Silver	**92.5%**		**16%**	**0.21**		16.1%	U	16.1%	U	16.1%	U	16.1%	U	16.1%	U	**324.2%**		**155%**	**0.19**		16.4%	U	16.4%	U	16.4%	U	21.3%	U	16.4%
Sodium			100%	**260**		100.0%	U											71%	**220**		100.0%	U							
Strontium	**19.7%**		**105%**	**43.4**		**28.9%**		29.6%	U	8.4%	U	8.4%	U	8.4%	U	**34.1%**		**124%**	**34.5**		75.5%	U	31.7%	U	13.2%	U	13.2%	U	13.2%
Thallium	**19.0%**		**157%**	**0.194**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	83.6%	U	**28.8%**		**319%**	**0.168**		2.8%	U	2.8%	U	2.6%	U	2.1%	U	84.6%
Tin	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	545%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%
Titanium	**56.3%**		**190%**	**393**		1.3%	U	1.3%	U	**1.3%**		**1.3%**		1.3%	U	**40.1%**		**153%**	**394**		5.1%	U	5.1%	U	5.1%	U	5.1%	U	5.1%
Uranium	**67.3%**		**176%**	**1.65**		2.1%	U	**16.4%**		**7.8%**		**2.1%**		2.5%	U	**31.8%**		**101%**	**2.66**		2.9%	U	**40.2%**		**15.9%**		2.9%	U	**4.8%**
Vanadium	**77.6%**		**79%**	**29.3**		0.7%	U	0.7%	U	**22.7%**		**7.7%**		**7.9%**		**175.2%**		**112%**	**30.1**		0.7%	U	0.7%	U	**20.1%**		**7.4%**		**11.4%**
Zinc	**61.8%**		**80%**	**915**		**0.1%**		**16.3%**		**27.2%**		**1.7%**		4.6%	U	**81.4%**		**88%**	**1220**		**10.0%**		**237.6%**		**78.0%**		**6.6%**		11.5%

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID							CH14-107-TP001														CH14-107-TP001								
Sample ID							CH14-107-TP001-SOA														CH14-107-TP001-SOB								
Sample Interval (mbgs)							1.6 - 1.6														3 - 3								
Sample Date							7/22/2014														7/22/2014								
Analyte	XLN	RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		
(Percentage, %)	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum		**246.0%**		**115%**	**5980**		0.4%	U	0.1%	U	**0.1%**		**0.1%**		**0.3%**		**2.2%**		**89%**	**36900**		0.2%	U	**0.5%**		**0.9%**		**0.6%**		**0.6%**
Antimony	U	**417.2%**		**76%**	**0.38**		15.2%	U	15.2%	U	269.7%	U	201.5%	U	57.6%	U	**1342.4%**		**74%**	**0.24**		1.7%	U	**3.0%**		**25.6%**		**4.2%**		13.2%
Arsenic	U	**977.0%**		**112%**	**6.83**		264.0%	U	**9.8%**		232.4%	U	**3086.1%**		7994.1%	U	**5633.0%**		**82%**	**3.62**		0.0%	U	**0.1%**		**0.7%**		**4.2%**		**14.0%**
Barium		**187.1%**		**185%**	**86.6**		**0.6%**		**0.6%**		**0.6%**		**0.6%**		**21.0%**		**49.4%**		**285%**	**347**		**1.0%**		**2.3%**		**3.2%**		**2.4%**		**12.8%**
Beryllium	U	**51.4%**		**125%**	**1.14**		5.0%	U	**5.0%**		5.0%	U	**5.0%**		**5.0%**		**5.0%**		**500%**	**3.98**		6.1%	U	**6.7%**		6.1%	U	6.1%	U	**6.1%**
Bismuth	U	**66.7%**		**155%**	0.2	U	1.2%	U	**1.2%**		2.1%	U	**1.2%**		1.2%	U	**28.0%**		**108%**	**14.8**		4.7%	U	**11.8%**		10.9%	U	4.7%	U	4.7%
Cadmium	U	1656.7%	U	104%	0.05	U	**1.6%**		**0.1%**		**0.1%**		**0.1%**		0.1%	U	**0.1%**		**81%**	**35.4**		12.0%	U	**46.4%**		**7.0%**		**7.4%**		1.4%
Calcium		**105.6%**		**86%**	**3080**		**8.8%**		**0.1%**		0.1%	U	**0.1%**				**0.3%**	J	**93%**	**43600**		**40.9%**		**2.7%**		0.5%	U	**5.5%**		
Chromium	U	**137.0%**		**148%**	**24.3**		2.6%	U	2.6%	U	2.6%	U	2.6%	U	2.6%	U	**2.6%**		**515%**	**127**		5.7%	U	5.7%	U	5.7%	U	5.7%	U	5.7%
Cobalt		**86.4%**		**112%**	**24.7**		16.5%	U	**0.3%**		**0.3%**		**0.3%**		**13.5%**		**21.0%**		**27%**	**29.4**		0.5%	U	**8.8%**		**18.4%**		**0.4%**		**6.0%**
Copper	U	**1250.0%**	J	**103%**	**12.1**		8.3%	U	**0.1%**		**1.4%**		**0.5%**		**0.1%**		**64.0%**		**99%**	**810**		0.4%	U	**25.1%**		**34.8%**		**3.3%**		0.4%
Iron		**98.3%**		**108%**	**63400**		8.9%	U	**0.2%**		**12.6%**		**2.0%**		**89.0%**		**21.0%**		**81%**	**65700**		0.1%	U	**0.8%**		**12.0%**		**0.5%**		**17.1%**
Lead	U	**20956.4%**	J	**77%**	**7.61**		46.8%	U	**49.6%**		**26.6%**		**2.8%**		0.6%	U	**601.5%**		**103%**	**783**		0.1%	U	**60.6%**		**18.0%**		**12.6%**		**0.3%**
Lithium	U	**100.9%**		**179%**	**10.6**		5.5%	U	5.5%	U	5.5%	U	5.5%	U	5.5%	U	**5.5%**		**600%**	**66.4**		7.3%	U	7.3%	U	7.3%	U	7.3%	U	7.3%
Manganese		**48.1%**		**94%**	**1090**		**3.5%**	U	**0.3%**		**0.3%**		**0.3%**		**6.6%**		**3.8%**		**114%**	**1460**		0.6%	U	**15.9%**		**25.1%**		**2.0%**		**4.8%**
Molybdenum	U	**53.0%**		**204%**	**0.94**		13.2%	U	13.2%	U	13.2%	U	13.2%	U	**29.8%**		**14.2%**		**118%**	**2.54**		14.6%	U	14.6%	U	14.6%	U	14.6%	U	17.3%
Nickel		**100.0%**		**112%**	**48.9**		**3.8%**	U	**1.8%**		**1.8%**		1.8%	U	**3.9%**		**1.8%**		**73%**	**93.6**		2.9%	U	**10.3%**		**9.4%**		2.9%	U	**5.6%**
Phosphorus				**16%**	**541**		33.3%	U	33.3%	U	33.3%	U							38%	**813**		33.3%	U	33.3%	U	33.3%	U			
Potassium				**6%**	**1830**		**52.6%**												**7%**	**4310**		66.7%	U							
Selenium	U	38.7%	U	251%	0.2	U	2.8%	U	2.8%	U	2.8%	U	**3.0%**		7.1%	U	**15.4%**		**116%**	**6.17**		7.6%	U	7.6%	U	7.6%	U	7.6%	U	19.1%
Silver	U	**541.0%**		**107%**	0.1	U	1.3%	U	1.3%	U	1.3%	U	1.3%	U	1.3%	U	**151.9%**		**94%**	**5.5**		2.8%	U	2.8%	U	2.8%	U	2.8%	U	2.8%
Sodium				100%	100	U	100.0%	U											100%	**410**		100.0%	U							
Strontium	U	**35.1%**		**116%**	**17**		**3.6%**		**3.6%**		3.6%	U	3.6%	U	4.4%	U	**10.9%**		**167%**	**118**		**8.6%**		**8.6%**		8.6%	U	8.6%	U	8.6%
Thallium	U	**56.7%**		**221%**	**0.102**		1.8%	U	1.8%	U	1.8%	U	2.3%	U	71.6%	U	**206.2%**		**131%**	**0.459**		1.5%	U	2.0%	U	3.6%	U	1.7%	U	57.6%
Tin	U	18.3%	U	421%	2	U	7.0%	U	7.0%	U	7.0%	U	7.0%	U	7.0%	U	**7.0%**		**571%**	**19.1**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	35.0%
Titanium	U	**150.6%**	J	**117%**	**19.9**		1.4%	U	1.4%	U	1.4%	U	1.4%	U	1.4%	U	**2.5%**		**229%**	**202**		0.9%	U	0.9%	U	0.9%	U	0.9%	U	0.9%
Uranium		**53.6%**		**98%**	**1.55**		6.8%	U	**2.6%**		**2.6%**		**2.6%**		**9.7%**		**23.1%**		**119%**	**1.9**		4.4%	U	**52.4%**		22.3%	U	4.4%	U	**10.4%**
Vanadium		**188.8%**		**110%**	**28**		0.2%	U	0.2%	U	**2.9%**	U	**0.2%**		**5.2%**		**1.2%**		**92%**	**116**		0.4%	U	0.4%	U	8.8%	U	**0.7%**		**7.0%**
Zinc	U	**428.7%**		**111%**	**630**		**23.5%**		**0.2%**		**0.6%**		**0.4%**		**22.6%**		**17.2%**		**79%**	**1880**		**6.9%**		**87.4%**		**48.0%**		**3.3%**		**30.7%**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID							CH14-107-TP001														CH14-107-TP001									
Sample ID							CH14-107-TP001-SOC														CH14-107-TP901-SOC									
Sample Interval (mbgs)							5.5 - 5.5														5.5 - 5.5									
Sample Date							7/22/2014														7/22/2014									
Analyte	XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total			NSE		AS		AMPH		PYRO		
(Percentage, %)	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum		**30.1%**		**181%**	**20900**		0.4%	U	0.7%	U	2.6%	U	**3.6%**		**1.4%**		**242.0%**		**119%**	**13800**		0.3%	U	0.6%	U	1.8%	U	**2.8%**		**0.8%**	
Antimony	U	**63.0%**		**94%**	**6.85**		7.6%	U	7.6%	U	**9.9%**		7.6%	U	7.6%	U	**10.7%**	**J**	**231%**	**2.03**		4.4%	U	4.4%	U	**5.3%**		**4.4%**		**4.4%**	
Arsenic		**112.2%**		**119%**	**43.1**		0.1%	U	**2.8%**		**78.2%**		**8.3%**		**7.1%**		**103.7%**		**203%**	**75.5**	**J**	0.1%	U	**1.1%**		**37.6%**		**9.4%**		**8.1%**	
Barium		**30.3%**		**326%**	**354**		**8.6%**		**31.1%**		**9.0%**		**14.2%**		**7.8%**	**J**	**149.6%**		**165%**	**116**		**6.4%**		**23.6%**		**8.3%**		**10.5%**		**14.0%**	
Beryllium		**33.2%**		**134%**	**2.6**		6.3%	U	**6.3%**		6.3%	U	6.3%	U	6.3%	U	**23.1%**		**141%**	**2.49**		6.5%	U	**8.1%**		8.4%	U	6.5%	U	6.5%	
Bismuth	U	**26.5%**		**170%**	**4.53**		6.0%	U	**6.0%**	**J**	6.0%	U	6.0%	U	6.0%	U	**9.3%**	**J**	**624%**	**5.34**	J	2.3%	U	**2.3%**	**J**	2.3%	U	2.3%	U	2.3%	
Cadmium	U	**102.6%**		**94%**	**4.12**		5.5%	U	**21.6%**		5.5%	U	5.5%	U	5.5%	U	**9.9%**	**J**	**172%**	**0.856**	**J**	2.9%	U	**71.3%**		10.0%	U	**12.3%**		2.9%	
Calcium		**32.0%**		**104%**	**10000**		**51.5%**		**321.4%**		0.7%	U	**3.6%**				**56.7%**		**85%**	**7330**		**47.5%**		**232.2%**		0.7%	U	**9.3%**			
Chromium	U	**14.4%**		**254%**	**57.9**		8.4%	U	8.4%	U	8.4%	U	8.4%	U	8.4%	U	**548.5%**		**127%**	**35.3**		8.0%	U	8.0%	U	8.0%	U	8.0%	U	8.0%	
Cobalt		**64.3%**		**96%**	**28.5**		0.4%	U	**33.4%**		**42.0%**		**2.6%**		**11.0%**		**107.2%**		**95%**	**32.1**		0.3%	U	**23.3%**		**29.4%**		**1.5%**		**8.3%**	
Copper	U	**145.2%**		**117%**	**345**		0.6%	U	**7.8%**		**16.8%**		**1.7%**		0.6%	U	**51.1%**		**61%**	**85.2**		0.6%	U	**4.6%**		**11.4%**		**1.2%**		0.6%	
Iron		**83.5%**		**103%**	**62400**		0.1%	U	**1.0%**		**10.9%**		**0.5%**		**3.1%**		**67.1%**		**94%**	**71400**		0.1%	U	**0.9%**		**10.3%**		**0.4%**		**4.1%**	
Lead		**101.8%**		**88%**	**1720**		0.7%	U	**31.4%**	**J**	**9.1%**	**J**	**17.4%**	**J**	0.7%	U	**51.6%**	**J**	**199%**	**106**	**J**	0.1%	U	**4.6%**	**J**	**1.8%**	**J**	**2.2%**	**J**	0.1%	
Lithium	U	**9.2%**		**522%**	**44.1**		9.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**84.1%**		**167%**	**30.9**		8.6%	U	8.6%	U	8.6%	U	8.6%	U	8.6%	
Manganese		**63.8%**		**103%**	**829**		0.5%	U	**45.5%**		**9.2%**		**1.1%**		**1.6%**		**32.0%**		**94%**	**970**		0.5%	U	**35.9%**		**12.0%**		**1.7%**		**2.9%**	
Molybdenum	U	**23.1%**		**218%**	**1.16**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	370%	0.5	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	
Nickel		**27.1%**		**101%**	**65.7**		3.6%	U	66.9%	U	**130.6%**		22.1%	U	**49.5%**		**383.4%**		**110%**	**64.2**		3.4%	U	**40.1%**		**67.3%**		8.9%	U	**25.3%**	
Phosphorus				39%	**536**		33.3%	U	33.3%	U	62.0%	U							29%	**383**		33.3%	U	33.3%	U	33.3%	U				
Potassium				8%	**4720**		**190.9%**												**4%**	**4150**		**116.7%**									
Selenium	U	**15.3%**		**321%**	**1.09**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	17.3%	U	**289%**	**0.37**		9.8%	U	9.8%	U	9.8%	U	9.8%	U	24.5%	
Silver	U	**116.3%**		**128%**	**3.55**		8.8%	U	8.8%	U	8.8%	U	8.8%	U	8.8%	U	**27.2%**	**J**	**253%**	**0.96**		4.7%	U	4.7%	U	4.7%	U	4.7%	U	4.7%	
Sodium				100%	**210**		100.0%	U											26%	**120**		100.0%	U								
Strontium	U	**26.7%**		**193%**	**40.1**		**37.7%**		**42.8%**		11.5%	U	11.5%	U	11.5%	U	**49.4%**		**123%**	**31.7**		**30.2%**		**34.3%**		12.0%	U	12.0%	U	12.0%	
Thallium	U	**58.8%**		**139%**	**1.11**		1.9%	U	2.8%	U	1.9%	U	1.9%	U	76.8%	U	**31.5%**		**345%**	**0.499**		1.8%	U	1.8%	U	1.8%	U	1.8%	U	73.2%	
Tin	U	**25.8%**		**765%**	**2.8**		16.7%	U	16.7%	U	16.7%	U	21.7%	U	29.2%	U	50.0%	U	905%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	
Titanium	U	**31.0%**		**349%**	**388**		1.3%	U	1.3%	U	1.3%	U	1.3%	U	1.3%	U	**307.9%**		**124%**	**392**		1.2%	U	1.2%	U	1.2%	U	1.2%	U	1.2%	
Uranium		**91.8%**		**99%**	**1.06**		5.0%	U	**32.9%**		18.6%	U	5.0%	U	5.0%	U	**40.1%**		**87%**	**0.736**		4.8%	U	**42.3%**		21.4%	U	4.8%	U	**6.3%**	
Vanadium		**38.6%**		**105%**	**47.3**		0.6%	U	0.6%	U	14.9%	U	**3.3%**		**3.8%**		**246.2%**		**109%**	**33.4**		0.5%	U	0.5%	U	9.2%	U	**1.9%**		**2.8%**	
Zinc		**187.3%**		**96%**	**1540**		0.5%	U	**14.0%**	**J**	**28.9%**	**J**	**1.3%**		23.7%	U	**50.3%**	**J**	**137%**	**201**	**J**	0.2%	U	**32.0%**	**J**	**71.0%**	**J**	**3.6%**		11.3%	

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID							CH14-107-TP002														CH14-107-TP002									
Sample ID							CH14-107-TP0020-SOA														CH14-107-002-SOB									
Sample Interval (mbgs)							1.7 - 1.7														4 - 4									
Sample Date							7/21/2014														7/21/2014									
Analyte	XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		X
(Percentage, %)	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum		**201.3%**		**114%**	**15300**		**1.3%**		0.5%	U	**0.5%**		**0.5%**		**0.6%**		**24.8%**		**286%**	**10500**		29.8%	U	1.1%	U	**3.8%**		**1.4%**		**7.4%**
Antimony		**9.6%**	J	**151%**	**3.02**		3.2%	U	4.5%	U	36.7%	U	47.9%	U	**23.3%**		**766.8%**		**91%**	**3.56**	J	10.3%	U	10.3%	U	91.8%	U	105.2%	U	33.0%
Arsenic		**525.5%**		**453%**	**32.2**	J	27.5%	U	**1.5%**		**3.6%**		**152.4%**		**589.6%**		**571.6%**		**87%**	**34.1**		24.7%	U	26.9%	U	**109.5%**		**1119.0%**		**2203.6%**
Barium	J	**121.0%**		**159%**	**185**		**0.6%**		**0.6%**		**0.6%**		**0.6%**		**15.3%**		**102.0%**		**383%**	**287**		**1.7%**		**1.9%**		**4.4%**		**3.4%**		**192.5%**
Beryllium	U	**40.0%**	J	**145%**	**2.62**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	11.8%	U	**15.3%**		**450%**	**0.98**		19.4%	U	14.4%	U	14.4%	U	14.4%	U	14.4%
Bismuth	U	**3.8%**	J	**215%**	**3.07**	J	8.6%	U	8.6%	U	8.6%	U	8.6%	U	8.6%	U	**202.6%**		**75%**	**1.67**	J	9.6%	U	31.7%	U	90.4%	U	9.6%	U	9.6%
Cadmium	U	**41.7%**	J	**127%**	**1.52**	J	**390.1%**		8.3%	U	6.7%	U	6.7%	U	6.7%	U	**21.7%**		**127%**	**0.674**		**323.5%**		**5.9%**		**2.6%**		**2.6%**		2.6%
Calcium		**70.0%**		**98%**	**7680**		**179.3%**		4.8%	U	3.5%	U	3.5%	U			**28.5%**		**128%**	**1280**		**290.5%**		6.9%	U	1.9%	U	1.9%	U	
Chromium	U	**279.6%**		**131%**	**39.4**		11.0%	U	11.0%	U	11.0%	U	11.0%	U	11.0%	U	**11.0%**		**629%**	**24.2**		11.8%	U	11.8%	U	14.6%	U	11.8%	U	26.2%
Cobalt		**68.8%**		**105%**	**30.9**		**59.8%**		**0.6%**		**0.6%**		0.6%	U	**16.9%**		**47.2%**		**100%**	**16.3**		122.3%	U	1.3%	U	**1.3%**		**0.9%**		**14.3%**
Copper	U	**45.6%**		**65%**	**75.4**		**177.3%**		**3.0%**		**17.4%**		**3.6%**		0.5%	U	**709.0%**		**31%**	**91.2**		1307.8%	U	**56.6%**		**138.4%**		**39.5%**		1.5%
Iron		**64.1%**	J	**105%**	**73600**		17.2%	U	2.5%	U	**24.2%**		**2.5%**		**145.6%**		**40.1%**		**97%**	**46300**		1.2%	U	3.9%	U	**39.1%**		**7.3%**		**213.0%**
Lead	U	**8.9%**	J	**46%**	**382**	J	**24.5%**		**94.1%**		**17.5%**		**6.2%**		**0.7%**		**992.5%**		**141%**	**878**	J	53.9%	U	**432.9%**		**85.1%**		**25.7%**		**2.4%**
Lithium	U	**89.4%**		**154%**	**35.5**		12.4%	U	12.4%	U	12.4%	U	12.4%	U	12.4%	U	**12.4%**		**600%**	**15.8**		11.6%	U	11.6%	U	11.6%	U	11.6%	U	11.6%
Manganese		**56.0%**		**114%**	**1020**		**31.9%**		**1.4%**		**1.4%**		**1.4%**		**16.5%**		**7.5%**		**101%**	**365**		**20.5%**		**0.7%**		**0.7%**		**0.7%**		**4.2%**
Molybdenum	U	16.7%	U	417%	**0.57**		15.7%	U	15.7%	U	15.7%	U	29.8%	U	**84.6%**		**144.8%**		**106%**	**1.21**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%
Nickel		**188.9%**		**112%**	**62.1**		25.9%	U	5.7%	U	5.7%	U	5.7%	U	**9.1%**		**22.8%**		**140%**	**27.5**		72.6%	U	7.3%	U	7.3%	U	7.3%	U	**11.7%**
Phosphorus				28%	**513**		43.3%	U	33.3%	U	33.3%	U							26%	**479**		33.3%	U	33.3%	U	33.3%	U			
Potassium				**2%**	**4480**		100.0%	U											14%	**2770**		100.0%	U							
Selenium	U	11.3%		**364%**	**0.35**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	**148.2%**		**143%**	**0.42**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%
Silver	U	**14.0%**	J	**167%**	**1.48**		3.8%	U	3.8%	U	3.8%	U	6.0%	U	3.8%	U	**1018.8%**		**138%**	**1.49**		14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%
Sodium				19%	**130**		100.0%	U											100%	**160**		100.0%	U							
Strontium	U	**72.9%**		**127%**	**31.7**		10.8%	U	10.8%	U	10.8%	U	10.8%	U	11.2%	U	**73.1%**		**200%**	**26.2**		10.6%	U	10.6%	U	10.6%	U	10.6%	U	32.6%
Thallium	U	**23.9%**		**407%**	**0.562**		1.7%	U	1.7%	U	4.4%	U	4.9%	U	67.5%	U	**264.8%**		**163%**	**0.801**	J	2.0%	U	2.0%	U	2.0%	U	2.0%	U	80.1%
Tin	U	33.3%	U	700%	2	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	**25.0%**		**629%**	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%
Titanium	U	**233.5%**		**125%**	**419**		1.4%	U	1.4%	U	1.4%	U	1.4%	U	**1.4%**		**11.9%**		**1768%**	**352**		1.6%	U	1.6%	U	1.6%	U	4.9%	U	**10.6%**
Uranium		**59.0%**		**109%**	**0.82**		38.0%	U	**2.5%**		**2.5%**		**2.5%**		**12.9%**		**47.0%**		**115%**	**2.08**		37.1%	U	**3.2%**		**3.2%**		**3.2%**		**7.5%**
Vanadium		**178.6%**		**111%**	**37.2**		0.6%	U	0.6%	U	**13.4%**		**0.7%**		**30.6%**		**39.7%**		**122%**	**30.9**		0.8%	U	0.8%	U	**24.4%**		**2.4%**		**32.6%**
Zinc	U	**59.2%**	J	**117%**	**554**	J	**336.3%**		**3.2%**		**3.8%**		**0.8%**		**48.6%**		**109.7%**		**113%**	**661**		**538.0%**		**6.4%**		**7.4%**		**3.6%**		**22.4%**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID							CH14-107-TP003														CH14-107-TP003									
Sample ID							CH14-107-TP003-SOA														CH14-107-TP003-SOB									
Sample Interval (mbgs)							1.6 - 1.6														5 - 5									
Sample Date							7/21/2014														7/21/2014									
Analyte	LN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		
(Percentage, %)	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum		**73.3%**		**110%**	**10700**		**0.9%**		0.4%	U	**1.0%**		**2.8%**		**2.5%**		**65.0%**		**155%**	**11400**		**0.3%**		**0.3%**		**0.5%**		**2.1%**		**2.0%**
Antimony	U	**756.7%**		**72%**	**0.73**		3.1%	U	5.3%	U	67.1%	U	51.2%	U	**24.2%**		**711.2%**		**82%**	**2.97**		5.0%	U	5.5%	U	20.0%	U	37.5%	U	14.0%
Arsenic		**3374.3%**		**66%**	**11.8**		0.5%	U	0.3%	U	**1.9%**		**21.6%**		**44.0%**		**275.2%**		**87%**	**49.3**		0.3%	U	0.3%	U	**0.4%**		**14.8%**		**27.6%**
Barium		**141.1%**		**485%**	**105**		**0.9%**		**1.1%**		**4.8%**		**3.0%**		**61.4%**		**98.7%**		**1811%**	**263**		**0.7%**		**1.1%**		**5.8%**		**3.8%**		**81.3%**
Beryllium	U	**20.1%**		**199%**	**0.64**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	**12.1%**		**20.6%**		**158%**	**0.88**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	11.8%
Bismuth	U	**740.4%**		**100%**	**1.12**		7.4%	U	7.4%	U	7.4%	U	7.4%	U	7.4%	U	**78.5%**		**201%**	**1.63**		3.1%	U	**3.1%**		**3.1%**		3.1%	U	3.1%
Cadmium	U	**94.6%**		**68%**	**2.03**		**1028.8%**		26.1%	U	7.6%	U	7.6%	U	7.6%	U	**1142.6%**		**67%**	**0.525**		**257.7%**		**22.6%**		**3.3%**		**4.2%**		2.9%
Calcium		**30.2%**		**102%**	**2810**		**188.1%**		3.5%	U	3.2%	U	3.4%	U			**50.2%**		**94%**	**1410**		**209.2%**		3.0%	U	3.0%	U	3.0%	U	
Chromium	U	**63.9%**		**107%**	**22**		10.6%	U	10.6%	U	10.6%	U	10.6%	U	14.2%	U	**48.0%**		**149%**	**23.9**		8.9%	U	8.9%	U	8.9%	U	8.9%	U	11.4%
Cobalt		**253.6%**		**106%**	**12.9**		**41.1%**		**0.7%**		**0.9%**		0.7%	U	**16.0%**		**212.7%**		**79%**	**16.2**		**19.4%**		**0.9%**		**1.5%**		**0.5%**		**8.1%**
Copper	U	**2168.5%**		**87%**	**36.8**		**39.2%**		**3.6%**		**34.8%**		**5.7%**		0.6%	U	**563.9%**		**99%**	**88.3**		**8.9%**		**7.4%**		**24.1%**		**9.1%**		0.7%
Iron		**228.0%**		**96%**	**25600**		0.4%	U	**1.2%**		**20.8%**		**1.9%**		**86.0%**		**161.8%**		**88%**	**47000**		0.3%	U	0.6%	U	**7.8%**		**1.3%**		**59.5%**
Lead		**3628.3%**		**127%**	**133**		**53.8%**		**414.6%**		**27.4%**		**13.1%**		**0.4%**		**965.7%**		**109%**	**787**		**102.5%**		**630.7%**		**31.8%**		**31.3%**		**0.4%**
Lithium	U	**16.9%**		**247%**	**19.4**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	12.1%	U	**16.2%**		396%	**16.2**		10.9%	U	10.9%	U	10.9%	U	10.9%	U	10.9%
Manganese		**10.8%**		**105%**	**782**		**83.9%**		**1.5%**		**1.5%**		**1.5%**		**10.9%**		**28.6%**		**75%**	**338**		**27.8%**		**1.2%**		**1.0%**		**0.7%**		**4.8%**
Molybdenum	U	40.7%	U	213%	**0.85**		15.8%	U	15.8%	U	15.8%	U	15.8%	U	**15.8%**		**102.5%**		**172%**	**1.44**		15.6%	U	15.6%	U	15.6%	U	15.6%	U	**15.6%**
Nickel		**53.6%**		**99%**	**24.3**		29.1%	U	5.7%	U	5.7%	U	5.7%	U	**19.7%**		**58.4%**		**73%**	**29.4**		18.1%	U	5.1%	U	5.1%	U	5.1%	U	**14.5%**
Phosphorus				26%	**695**		33.3%	U	33.3%	U	33.3%	U							31%	**581**		33.3%	U	33.3%	U	33.3%	U			
Potassium				3%	**1430**		100.0%	U											8%	**2720**		100.0%	U							
Selenium	U	72.0%	U	195%	**0.26**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	30.3%	U	**86.7%**		**159%**	**0.4**		12.5%	U	12.5%	U	12.5%	U	12.5%	U	31.3%
Silver	U	**1232.9%**		**119%**	**0.25**		4.7%	U	4.7%	U	4.7%	U	9.5%	U	4.7%	U	**1104.3%**		**118%**	**4.23**		7.1%	U	7.1%	U	7.1%	U	7.1%	U	7.1%
Sodium				25%	**200**		100.0%	U											100%	**150**		100.0%	U							
Strontium	U	**39.7%**		**158%**	**32.8**		11.9%	U	11.9%	U	11.9%	U	11.9%	U	11.9%	U	**50.5%**		**166%**	**21.3**		12.1%	U	12.1%	U	12.1%	U	12.1%	U	12.1%
Thallium	U	**150.6%**		**159%**	**0.377**		1.9%	U	1.6%	U	2.2%	U	2.1%	U	64.6%	U	**141.8%**		**190%**	**0.774**		3.4%	U	3.2%	U	**1.6%**		2.2%	U	63.1%
Tin	U	33.3%	U	609%	2	U	14.9%	U	14.9%	U	14.9%	U	14.9%	U	14.9%	U	**44.8%**		**372%**	2	U	12.4%	U	12.4%	U	12.4%	U	**12.4%**		**19.3%**
Titanium		**94.8%**		**110%**	**334**		1.2%	U	1.2%	U	1.2%	U	1.2%	U	**1.3%**		**33.5%**		**256%**	**353**		1.2%	U	1.2%	U	1.2%	U	1.2%	U	**1.2%**
Uranium		**25.6%**		**97%**	**1.8**		26.5%	U	**3.4%**		**2.8%**		**2.6%**		**15.1%**		**46.6%**		**80%**	**1.74**		11.3%	U	**12.5%**		**3.8%**		**2.8%**		**15.2%**
Vanadium		**55.0%**		**99%**	**27.9**		0.6%	U	0.6%	U	**15.9%**		**3.5%**		**44.4%**		**42.5%**		**102%**	**30.2**		0.6%	U	0.6%	U	**0.6%**		**3.3%**		**37.7%**
Zinc		**246.7%**		**84%**	**688**		**461.6%**		**9.8%**		**20.6%**		**5.2%**		**44.9%**		**994.9%**		**70%**	**617**		**97.5%**		**9.1%**		**12.2%**		**5.1%**		**14.3%**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID							CH14-107-TP004														CH14-107-TP004									
Sample ID							CH14-107-TP004-SOA														CH14-107-TP004-SOB									
Sample Interval (mbgs)							1.2 - 1.2														2.5 - 2.5									
Sample Date							7/22/2014														7/22/2014									
Analyte	XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		)
(Percentage, %)	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result
Aluminum		**38.3%**		**100%**	**13200**		**0.4%**		0.6%	U	**1.7%**		**6.4%**		**1.4%**		**136.9%**		**126%**	**13800**		**0.4%**		**0.4%**		**1.1%**		**2.0%**		**0.6%**
Antimony	U	**1150.0%**		**83%**	**2.1**		4.6%	U	6.9%	U	69.7%	U	**22.9%**		**19.7%**		**308.3%**		**81%**	**1.91**		3.4%	U	3.4%	U	3.4%	U	3.4%	U	**3.4%**
Arsenic		**761.2%**		**142%**	**22.3**		0.2%	U	0.6%	U	**6.1%**		**21.8%**		**27.6%**		**458.8%**		**225%**	**34.1**		0.2%	U	0.4%	U	**6.5%**		**11.8%**		**14.7%**
Barium		**8.6%**		**661%**	**226**		**1.0%**		**4.1%**		**4.7%**		**4.2%**		**18.6%**		**64.3%**		**463%**	**290**		**2.9%**		**6.2%**		**2.2%**		**2.5%**		**2.9%**
Beryllium	U	**24.1%**		**170%**	**1.06**		13.9%	U	15.3%	U	13.9%	U	13.9%	U	13.9%	U	**52.1%**		**161%**	**0.58**		11.2%	U	14.0%	U	11.2%	U	11.2%	U	**11.2%**
Bismuth	U	**24.0%**		**186%**	**3.77**		3.6%	U	20.2%	U	21.5%	U	**3.6%**		3.6%	U	**59.7%**		**100%**	**5.47**		4.8%	U	4.8%	U	**4.8%**		4.8%	U	4.8%
Cadmium	U	**1224.7%**		**133%**	**1.4**		**57.0%**		174.0%	U	38.8%	U	33.8%	U	7.1%	U	**779.3%**		**132%**	**0.556**		**3.6%**		**36.4%**		3.6%	U	9.1%	U	3.6%
Calcium		**69.3%**		**130%**	**1150**		**213.0%**		164.3%	U	1.4%	U	19.2%	U			**73.1%**		**130%**	**3010**		**110.8%**		123.6%	U	2.4%	U	14.2%	U	
Chromium	U	**48.8%**		**128%**	**23.9**		10.1%	U	10.1%	U	10.1%	U	10.1%	U	10.1%	U	**151.7%**		**159%**	**32.1**		11.1%	U	11.1%	U	11.1%	U	11.1%	U	11.1%
Cobalt		**273.1%**		**135%**	**21.7**		**1.2%**		21.2%	U	**23.1%**		**1.2%**		**21.5%**		**165.4%**		**121%**	**18.6**		**0.5%**		**17.7%**		**26.3%**		**0.6%**		**19.3%**
Copper	U	**883.8%**		**118%**	**70.1**		**0.7%**		**21.3%**		**33.2%**		**6.2%**		**0.7%**		**370.0%**		**142%**	**81.1**		**0.5%**		**1.8%**		**13.7%**		**1.0%**		0.5%
Iron		**265.8%**		**123%**	**44900**		**0.1%**		**1.0%**		**18.8%**		**1.8%**		**40.5%**		**159.8%**		**121%**	**47800**		0.1%	U	2.2%	U	**16.6%**		**0.5%**		**9.8%**
Lead		**954.3%**		**105%**	**812**		**1.2%**		**258.7%**		**48.6%**		**38.7%**		**0.3%**		**482.9%**		**125%**	**667**		**0.1%**		**10.8%**		**0.7%**		**3.1%**		**0.1%**
Lithium	U	**15.5%**		**396%**	**21**		11.6%	U	11.6%	U	11.6%	U	11.6%	U	11.6%	U	**82.6%**		**178%**	**21.1**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	11.8%
Manganese		**45.6%**		**108%**	**699**		**2.5%**		48.1%	U	**34.2%**		**4.6%**		**19.9%**		**89.9%**		**107%**	**462**		**1.5%**		40.9%	U	**21.9%**		**3.3%**		**11.9%**
Molybdenum		**108.4%**		**174%**	**1.37**		14.9%	U	14.9%	U	14.9%	U	14.9%	U	**14.9%**		54.9%	U	**212%**	**1.66**		14.7%	U	14.7%	U	14.7%	U	14.7%	U	**26.2%**
Nickel		**98.0%**		**68%**	**28.4**		6.3%	U	27.4%	U	33.6%	U	6.3%	U	**38.4%**		**139.9%**		**91%**	**28.8**		4.8%	U	6.2%	U	48.2%	U	4.8%	U	**28.3%**
Phosphorus				28%	**508**		33.3%	U	33.3%	U	33.3%	U							27%	**842**		33.3%	U	33.3%	U	33.3%	U			
Potassium				8%	**2430**		110.0%	U											4%	**2140**		100.0%	U							
Selenium	U	**80.6%**		**185%**	**0.32**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	30.7%	U	**63.8%**		**189%**	**0.49**		11.0%	U	11.0%	U	11.0%	U	11.0%	U	27.6%
Silver	U	**1390.1%**		**126%**	**0.89**		5.9%	U	5.9%	U	5.9%	U	14.8%	U	5.9%	U	**565.1%**		**122%**	**1.15**		5.7%	U	5.7%	U	5.7%	U	**5.7%**		5.7%
Sodium				100%	**140**		100.0%	U											40%	**220**		100.0%	U							
Strontium	U	**45.0%**		**184%**	**20.2**		46.4%	U	35.3%	U	9.9%	U	9.9%	U	**9.9%**		**45.2%**		**142%**	**29.7**		21.2%	U	15.1%	U	10.9%	U	10.9%	U	10.9%
Thallium	U	**111.6%**		**138%**	**0.85**		1.7%	U	1.8%	U	1.7%	U	1.7%	U	68.1%	U	**57.8%**		**224%**	**0.925**		1.5%	U	1.5%	U	1.5%	U	1.5%	U	61.9%
Tin		**70.2%**		**521%**	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	31.7%	U	445%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	35.8%
Titanium		**19.6%**		**175%**	**263**		1.1%	U	1.1%	U	1.1%	U	**1.1%**		**1.1%**		**75.3%**		**150%**	**382**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	**2.1%**
Uranium		**70.7%**		**93%**	**1.64**		**3.5%**		**31.1%**		**14.4%**		**3.5%**		**12.3%**		**69.1%**		**102%**	**1.26**		1.8%	U	**30.0%**		**12.4%**		**1.8%**		**4.2%**
Vanadium		**43.1%**		**87%**	**28.3**		0.5%	U	0.5%	U	14.3%	U	**4.6%**		**20.0%**		**100.9%**		**110%**	**41.7**		0.6%	U	2.6%	U	**17.1%**		**3.3%**		**7.7%**
Zinc		**1421.5%**		**144%**	**991**		**10.0%**		**112.8%**		**67.2%**		**8.9%**		**45.6%**		**434.0%**		**129%**	**822**		**0.1%**		**1.2%**		**7.0%**		**0.3%**		**3.7%**

Table 3-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID							CH14-107-TP004													
Sample ID							CH14-107-TP004-SOC													
Sample Interval (mbgs)							5.2 - 5.2													
Sample Date							7/22/2014													
Analyte	XLN	RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum		**146.1%**		**134%**	**13600**		0.4%	U	0.6%	U	**1.7%**		**4.8%**		**0.8%**		**288.9%**		**123%**	**14000**	
Antimony		**9.9%**		**188%**	**2.55**		**6.9%**		**6.9%**		**9.7%**		**6.9%**		**6.9%**		**17.4%**		**118%**	**1.66**	
Arsenic		**647.6%**		**151%**	**29**		0.4%	U	3.1%	U	**58.3%**		**36.4%**		**38.9%**		**523.2%**		**237%**	**18.5**	
Barium		**25.0%**		**131%**	**397**		**6.1%**		**20.9%**		**8.7%**		12.9%	U	**11.9%**		**172.1%**		**145%**	**112**	
Beryllium		**60.1%**		**140%**	**1.45**		12.3%	U	13.0%	U	12.3%	U	12.3%	U	**12.3%**		**61.7%**		**143%**	**1.35**	
Bismuth	U	**5.2%**		**436%**	**4.29**		3.1%	U	3.1%	U	3.1%	U	3.1%	U	3.1%	U	**3.1%**		**600%**	**6.25**	
Cadmium	U	**85.5%**		**170%**	**1.22**		**1.8%**		**17.5%**		**1.8%**		**2.5%**		1.8%	U	**16.6%**		**90%**	**3.75**	
Calcium		**221.2%**		**87%**	**1930**		**216.3%**		962.5%	U	3.1%	U	22.5%	U	#VALUE!		**241.3%**		**101%**	**1660**	
Chromium	U	**126.7%**		**140%**	**27.8**		11.0%	U	11.0%	U	11.0%	U	11.0%	U	11.0%	U	**454.9%**		**121%**	**27.8**	
Cobalt		**94.0%**		**104%**	**20.8**		0.2%	U	9.4%	U	**11.7%**		**0.8%**		**6.9%**		**44.7%**		**112%**	**90.1**	
Copper	U	**46.0%**		**145%**	**92**		0.8%	U	**4.3%**		**17.0%**		**1.4%**		0.8%	U	**46.5%**		**126%**	**84.1**	
Iron		**117.4%**		**112%**	**50500**		0.1%	U	1.8%	U	**23.8%**		**1.3%**		**12.4%**		**166.8%**		**111%**	**44300**	
Lead		**14.6%**		**169%**	**844**		0.1%	U	**10.4%**		**1.3%**		**4.4%**		**0.1%**		**13.9%**		**79%**	**956**	
Lithium	U	**84.2%**		**164%**	**20.5**		10.7%	U	10.7%	U	10.7%	U	10.7%	U	10.7%	U	**127.7%**		**146%**	**27**	
Manganese		**147.3%**		**110%**	**360**		0.3%	U	**18.9%**		**5.2%**		**1.0%**		**2.1%**		**33.5%**		**111%**	**2400**	
Molybdenum		**38.2%**		**114%**	**1.66**		14.1%	U	14.1%	U	14.1%	U	14.1%	U	**14.1%**		27.7%	U	**192%**	**2.33**	
Nickel		**118.5%**		**110%**	**37.1**		5.8%	U	44.3%	U	113.4%	U	13.1%	U	**66.5%**		**344.0%**		**111%**	**30.3**	
Phosphorus				24%	**760**		33.3%	U	33.3%	U	33.3%	U							19%	**637**	
Potassium				6%	**1990**		130.0%	U											5%	**1640**	
Selenium	U	**32.0%**		**272%**	**0.58**		12.3%	U	12.3%	U	12.3%	U	12.3%	U	30.7%	U	**24.5%**		**405%**	**0.5**	
Silver	U	**18.9%**		**277%**	**1.54**		8.5%	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	**19.5%**		**197%**	**1.61**	
Sodium				100%	**100**		100.0%	U											67%	100	U
Strontium	U	**32.8%**		**117%**	**26.3**		56.2%	U	107.9%	U	13.7%	U	13.7%	U	13.7%	U	**35.9%**		**165%**	**15.6**	
Thallium	U	**13.4%**		**706%**	**1.17**		1.8%	U	1.8%	U	**1.8%**		**1.8%**		72.0%	U	**16.4%**		**597%**	**1.06**	
Tin	U	42.5%	U	870%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	24.2%	U	645%	2	U
Titanium		**89.3%**		**210%**	**275**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	**2.1%**		**232.4%**		**132%**	**286**	
Uranium		**44.4%**		**94%**	**2.74**		2.9%	U	**34.7%**		16.1%	U	**2.9%**		**5.6%**		**55.4%**		**117%**	**1.86**	
Vanadium		**174.7%**		**102%**	**37.1**		0.7%	U	0.9%	U	23.9%	U	5.2%	U	**8.8%**		**328.8%**		**119%**	**35.8**	
Zinc		**14.6%**		**141%**	**1380**		**0.1%**		**5.4%**		**13.0%**		**1.1%**		**5.4%**		**31.0%**		**108%**	**1140**	

Table 3-5. Sequential Extraction Results –
Percentage of Total (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Notes:
Laboratory data has been validated by CH2M HILL prior to importing to EquIS. This summary table has been through QA/QC

The six individual steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.

Bold indicates the analyte was detected

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
PYRO - Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLY = Bound to crystalline oxide

Table 3-6. 2015 Seeps - Mann Kendall Results

Faro Mine Remediation Project

Location	General Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
SRK-FD16	NW WRD					70.0% (-)		
SRK-FD17	NW WRD					67.6% (-)		
SRK-FD18	NW WRD	94.1% (+)	58.7% (+)	81.7% (+)	75.6% (-)	72.7% (-)	55.6% (+)	97.4% (sig -)
SRK-FD19	NW WRD	81.1% (-)	98.9% (sig +)	100.0% (sig +)	99.7% (sig -)	99.0% (sig -)	100.0% (sig +)	100.0% (sig +)
CH-FD-75	NW WRD							
CH-FD-66	Stockpiles							
SRK-FD38	Stockpiles		99.2% (sig +)	93.8% (+)		50.0% (.)	99.2% (sig +)	99.2% (sig +)
CH-FD-67	Stockpiles					70.3% (+)		
SRK-FD37	Stockpiles		91.0% (+)	76.2% (+)		81.0% (-)	87.0% (+)	50.0% (.)
SRK-FD04	Stockpiles					63.7% (-)		
CH-FD-58	Stockpiles							
CH-FD-57	Main WRD							
SRK-FD09	Main WRD	90.6% (-)	50.0% (-)	80.9% (-)	59.2% (-)	80.9% (-)	80.9% (-)	61.4% (-)
SRK-FD10	Main WRD					50.0% (+)		
SRK-FD12	Main WRD	99.7% (sig -)	97.1% (sig +)	99.8% (sig +)	96.2% (sig -)	99.7% (sig -)	97.8% (sig +)	99.8% (sig +)
SRK-FD30	Main WRD	86.4% (+)	86.4% (-)	64.0% (-)	83.3% (-)	50.0% (-)	64.0% (-)	50.0% (-)
SRK-FD31	Main WRD	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	99.7% (sig -)	100.0% (sig +)	100.0% (sig +)
SRK-FD53	Main WRD					83.3% (-)		
X23	Main WRD	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	70.4% (+)	100.0% (sig +)
CH-FD-56	Intermediate WRD		64.0% (+)	86.4% (+)	75.8% (-)	50.0% (.)	50.0% (-)	86.4% (-)
CH-FD-72	Intermediate WRD							
CH-FD-73	Intermediate WRD							
SRK-FD08	Intermediate WRD							
SRK-FD13	Intermediate WRD		98.8% (sig +)	82.1% (+)		54.0% (-)	96.2% (sig +)	76.2% (+)
SRK-FD44	Intermediate WRD							
SRK-FD47	Intermediate WRD							
SRK-FD48	Intermediate WRD							
SRK-FD49	Intermediate WRD					59.2% (+)		
SRK-FD52	Intermediate WRD					59.2% (-)		
SRK-FD54	Intermediate WRD	99.7% (sig -)	96.5% (sig +)	94.6% (+)	95.8% (sig -)	100.0% (sig -)	91.1% (+)	94.6% (+)
SRK-FD55	Intermediate WRD					50.0% (.)		
CH-FD-59	NE WRD					86.2% (+)		
CH-FD-60	NE WRD					54.8% (-)		
CH-FD-61	NE WRD					76.2% (-)		
CH-FD-62	NE WRD					97.2% (sig -)		
CH-FD-63	NE WRD					64.0% (+)		
CH-FD-68	NE WRD					99.9% (sig +)		
CH-FD-69	NE WRD							
CH-FD-70	NE WRD	50.0% (.)	50.0% (.)	59.2% (+)	50.0% (+)	55.7% (+)	50.0% (.)	59.2% (+)
CH-FD-76	NE WRD							
CH-FD-77	NE WRD							
CH-FD-78	NE WRD							
FP08	NE WRD							
NE1	NE WRD	64.6% (+)	50.0% (+)	77.3% (+)	53.6% (+)	98.5% (sig -)	50.0% (-)	97.1% (sig -)
NE2	NE WRD	80.9% (+)	72.0% (-)	100.0% (sig +)	84.5% (+)	59.5% (-)	59.2% (+)	98.7% (sig +)
SRK-FD05	NE WRD	50.0% (+)	68.0% (+)	99.7% (sig +)	70.4% (-)	50.0% (+)	98.4% (sig +)	99.5% (sig +)

Location	General Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
SRK-FD16	NW WRD	ND	ND	ND	ND	NT	ND	ND
SRK-FD17	NW WRD	ND	ND	ND	ND	NT	ND	ND
SRK-FD18	NW WRD	NT	NT	NT	NT	NT	NT	↓
SRK-FD19	NW WRD	NT	↑	↑	↓	↓	↑	↑
CH-FD-75	NW WRD	ND	ND	ND	ND	ND	ND	ND
CH-FD-66	Stockpiles	ND	ND	ND	ND	ND	ND	ND
SRK-FD38	Stockpiles	ND	↑	NT	ND	NT	↑	↑
CH-FD-67	Stockpiles	ND	ND	ND	ND	NT	ND	ND
SRK-FD37	Stockpiles	ND	NT	NT	ND	NT	NT	NT
SRK-FD04	Stockpiles	ND	ND	ND	ND	NT	ND	ND
CH-FD-58	Stockpiles	ND	ND	ND	ND	NT	ND	ND
CH-FD-57	Main WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD09	Main WRD	NT	NT	NT	NT	NT	NT	NT
SRK-FD10	Main WRD	ND	ND	ND	ND	NT	ND	ND
SRK-FD12	Main WRD	↓	↑	↑	↓	↓	↑	↑
SRK-FD30	Main WRD	NT	NT	NT	NT	NT	NT	NT
SRK-FD31	Main WRD	↓	↑	↑	↓	↓	↑	↑
SRK-FD53	Main WRD	ND	ND	ND	ND	NT	ND	ND
X23	Main WRD	↓	↑	↑	↓	↓	NT	↑
CH-FD-56	Intermediate WRD	ND	NT	NT	NT	NT	NT	NT
CH-FD-72	Intermediate WRD	ND	ND	ND	ND	ND	ND	ND
CH-FD-73	Intermediate WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD08	Intermediate WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD13	Intermediate WRD	ND	↑	NT	ND	NT	↑	NT
SRK-FD44	Intermediate WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD47	Intermediate WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD48	Intermediate WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD49	Intermediate WRD	ND	ND	ND	ND	NT	ND	ND
SRK-FD52	Intermediate WRD	ND	ND	ND	ND	NT	ND	ND
SRK-FD54	Intermediate WRD	↓	↑	NT	↓	↓	NT	NT
SRK-FD55	Intermediate WRD	ND	ND	ND	ND	NT	ND	ND
CH-FD-59	NE WRD	ND	ND	ND	ND	NT	ND	ND
CH-FD-60	NE WRD	ND	ND	ND	ND	NT	ND	ND
CH-FD-61	NE WRD	ND	ND	ND	ND	NT	ND	ND
CH-FD-62	NE WRD	ND	ND	ND	ND	↓	ND	ND
CH-FD-63	NE WRD	ND	ND	ND	ND	NT	ND	ND
CH-FD-68	NE WRD	ND	ND	ND	ND	↑	ND	ND
CH-FD-69	NE WRD	ND	ND	ND	ND	ND	ND	ND
CH-FD-70	NE WRD	NT	NT	NT	NT	NT	NT	NT
CH-FD-76	NE WRD	ND	ND	ND	ND	ND	ND	ND
CH-FD-77	NE WRD	ND	ND	ND	ND	ND	ND	ND
CH-FD-78	NE WRD	ND	ND	ND	ND	ND	ND	ND
FP08	NE WRD	ND	ND	ND	ND	ND	ND	ND
NE1	NE WRD	NT	NT	NT	NT	↓	NT	↓
NE2	NE WRD	NT	NT	↑	NT	NT	NT	↑
SRK-FD05	NE WRD	NT	NT	↑	NT	NT	↑	↑

Table 3-6. 2015 Seeps - Mann Kendall Results

Faro Mine Remediation Project

Location	General Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
SRK-FD06	NE WRD	50.0% (-)	50.0% (.)	89.2% (+)	54.8% (+)	87.5% (+)	81.0% (+)	89.2% (+)
SRK-FD21	NE WRD					75.8% (+)		
SRK-FD22	NE WRD							
SRK-FD23	NE WRD		86.4% (+)	86.4% (+)		94.6% (-)	86.4% (+)	86.4% (+)
SRK-FD24	NE WRD	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	99.9% (sig +)	99.8% (sig +)
SRK-FD26	NE WRD	91.0% (-)	54.0% (-)	98.8% (sig -)	75.8% (+)	69.4% (-)	99.4% (sig -)	86.5% (-)
SRK-FD27	NE WRD							
SRK-FD51	NE WRD					54.0% (-)		
SRK-FD07	Other - Zone II WRD							
SRK-FD50	Other - Zone II WRD							
CH-FD-74	Other - Zone II WRD							
CH-FD-65	Other - Parking Lot					50.0% (-)		
SRK-FD01	Other - Parking Lot	55.8% (-)	63.1% (+)	100.0% (sig +)	99.8% (sig -)	98.6% (sig -)	100.0% (sig +)	100.0% (sig +)
SRK-FD02	Other - Parking Lot							
SRK-FD14	Other - Ramp Zone WRD	83.8% (+)	78.7% (+)	95.2% (sig +)	98.2% (sig -)	81.8% (-)	88.4% (+)	64.8% (+)
SRK-FD20	Other - FCD					91.0% (+)		

Location	General Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
SRK-FD06	NE WRD	NT	NT	NT	NT	NT	NT	NT
SRK-FD21	NE WRD	ND	ND	ND	ND	NT	ND	ND
SRK-FD22	NE WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD23	NE WRD	ND	NT	NT	ND	NT	NT	NT
SRK-FD24	NE WRD	↓	↑	↑	↓	↓	↑	↑
SRK-FD26	NE WRD	NT	NT	↓	NT	NT	↓	NT
SRK-FD27	NE WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD51	NE WRD	ND	ND	ND	ND	NT	ND	ND
SRK-FD07	Other - Zone II WRD	ND	ND	ND	ND	ND	ND	ND
SRK-FD50	Other - Zone II WRD	ND	ND	ND	ND	ND	ND	ND
CH-FD-74	Other - Zone II WRD	ND	ND	ND	ND	ND	ND	ND
CH-FD-65	Other - Parking Lot	ND	ND	ND	ND	NT	ND	ND
SRK-FD01	Other - Parking Lot	NT	NT	↑	↓	↓	↑	↑
SRK-FD02	Other - Parking Lot	ND	ND	ND	ND	ND	ND	ND
SRK-FD14	Other - Ramp Zone WRD	NT	ND	↑	NT	NT	NT	NT
SRK-FD20	Other - FCD	ND	ND	ND	ND	NT	ND	ND

Notes:

Mann Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Non-detectable concentrations were reduced to half the non-detectable limit.

Duplicate measurements were removed.

↑ - Significant increasing trend

↓ - Significant decreasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Table 3-7. Spring 2015 - Waste Rock Dump Groundwater Analytical Results

Faro Mine Remediation Project

				CH12-014-MW003_060515	CH12-014-MW007_060415	CH12-014-MW011_060315	CH12-014-MW911_GW0615	CH12-014-MW012_060515	CH12-014-MW013_060315	CH14-015-MW006_060215
				Main WRD	Intermediate WRD	Grum WRD	Grum WRD	Grum WRD	Vangorda WRD	NE WRD
				5-Jun-15	4-Jun-15	3-Jun-15	3-Jun-15	5-Jun-15	3-Jun-15	2-Jun-15
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							
General Chemistry										
pH, Field	pH Units	6.5	6.5 - 9.0	**6.66**	**5.67**	**6.62**		**7.5**	**6.32**	**4.93**
Temperature, Field	deg C	-	-	**6.9**	**13.67**	**6.38**		**7.82**	**12.72**	**4.75**
Hardness (as CaCO3)	mg/L	-	-	**2280**	**5410**	**2710**	**2710**	**1280**	**4250**	**2930**
Total Suspended Solids	mg/L	15	-	**133**	**22.7**	**11**	**2**	**81.2**	**20.4**	**84.3**
Total dissolved solids	mg/L	-	-	**3310**	**9390**	**3670**	**3700**	**1650**	**5910**	**4720**
Turbidity, Field	NTU	-	-	**275.5**	**-3.8**	**-3.2**		**433.5**	**7.6**	**147.3**
Anions and Nutrients										
Acidity, hot peroxide	mg/L	-	-	**225**	**1140**	25 U	25 U	25 U	25 U	**522**
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	**626**	**149**	**690**	**714**	**407**	**1250**	**21.4**
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	20 U	2 U	20 U	20 U	2 U	20 U	2 U
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	20 U	2 U	20 U	20 U	2 U	20 U	2 U
Alkalinity, Total (as CaCO3)	mg/L	-	-	**626**	**149**	**690**	**714**	**407**	**1250**	**21.4**
Ammonia	mg/L	1.3	Variable[a]	**0.0358**	**0.521**	**0.274**	**0.268**	**0.049**	**0.0413**	**0.977**
Chloride (Cl)	mg/L	-	120	**16**	10 U	10 U	10 U	2.5 U	10 U	10 U
Fluoride	mg/L	-	0.12	0.4 U	**1.69**	0.4 U	**0.78**	**0.25**	**0.7**	**3.91**
Nitrate (as N)	mg/L	-	13	0.1 U	0.1 U	**8.53**	**8.54**	0.025 U	0.1 U	**2.46**
Nitrite (as N)	mg/L	-	0.06	**0.041**	0.02 U	**0.065**	**0.063**	0.005 U	0.02 U	**0.042**
Sulfate	mg/L	-	100	**1970**	**6970**	**2120**	**2130**	**892**	**3350**	**3060**
Carbon, dissolved organic (DOC)	mg/L	-	-	**2.83**	**6.18**	**3.31**	**3.48**	**1.4**	**12.4**	**4.41**
Dissolved Metals										
Aluminum, dissolved	mg/L	-	0.005 to 0.1[b]	0.005 U	**0.636**	**0.0048**	**0.0035**	**0.0012**	**0.0056**	**25.3**
Antimony (Sb)-Dissolved	mg/L	0.1	1.6	0.0005 U	0.005 U	0.0002 U	0.0002 U	0.0001 U	0.0005 U	0.001 U
Arsenic (As)-Dissolved	mg/L	0.05	0.005	0.0005 U	**0.0082**	**0.00041**	**0.00037**	**0.0151**	**0.00181**	**0.0213**
Barium (Ba)-Dissolved	mg/L	1	2.3	**0.0211**	**0.0254**	**0.018**	**0.0189**	**0.0335**	**0.016**	**0.0712**
Beryllium (Be)-Dissolved	mg/L	-	0.0053	0.0005 U	**0.0067**	0.0002 U	0.0002 U	0.0001 U	0.0005 U	**0.0115**
Boron (B)-Dissolved	mg/L	-	1.5	0.05 U	0.5 U	0.02 U	0.02 U	0.01 U	0.05 U	0.1 U
Cadmium (Cd)-Dissolved	mg/L	0.02	Variable[c]	**0.00031**	**0.234**	**0.000304**	**0.000276**	0.000005 U	**0.00254**	**0.108**
Calcium, dissolved	mg/L	-	-	**689**	**400**	**477**	**474**	**313**	**649**	**296**
Chromium (Cr)-Dissolved	mg/L	-	0.0089	0.0005 U	0.005 U	0.0002 U	0.0002 U	0.0001 U	0.0005 U	0.001 U
Cobalt (Co)-Dissolved	mg/L	-	-	**0.00967**	**1.38**	**0.00149**	**0.0015**	**0.00026**	**0.0392**	**0.865**
Copper (Cu)-Dissolved	mg/L	0.2	0.002 to 0.004[d]	0.001 U	0.01 U	**0.00199**	**0.00204**	0.0002 U	**0.0022**	**1.17**
Iron, dissolved	mg/L	-	0.3	**2.16**	**154**	**0.051**	**0.052**	**6.93**	**5.51**	**77.2**
Ferrous Iron, dissolved	mg/L	-	-	**2.32**	**175**	**0.058**	**0.069**	**6.14**	**7.53**	**86.1**
Lead (Pb)-Dissolved	mg/L	0.2	0.001[e]	**0.00033**	**0.0308**	0.0001 U	0.0001 U	0.00005 U	**0.00589**	**0.0107**
Lithium, dissolved	mg/L	-	-	**0.0663**	**0.306**	**0.0401**	**0.0392**	**0.0166**	**0.0313**	**0.205**
Magnesium, dissolved	mg/L	-	-	**137**	**1070**	**368**	**371**	**122**	**638**	**533**
Manganese, dissolved	mg/L	-	-	**3.32**	**105**	**0.922**	**0.985**	**0.251**	**11.2**	**27.5**
Mercury, dissolved	mg/L	0.005	0.000026	0.000005 U	**0.0000064**	0.000025 U	0.000025 U	0.000005 U	0.000025 U	0.000025 U

Table 3-7. Spring 2015 - Waste Rock Dump Groundwater Analytical Results

Faro Mine Remediation Project

				CH12-014-MW003_060515	CH12-014-MW007_060415	CH12-014-MW011_060315	CH12-014-MW911_GW0615	CH12-014-MW012_060515	CH12-014-MW013_060315	CH14-015-MW006_060215
				Main WRD	Intermediate WRD	Grum WRD	Grum WRD	Grum WRD	Vangorda WRD	NE WRD
				5-Jun-15	4-Jun-15	3-Jun-15	3-Jun-15	5-Jun-15	3-Jun-15	2-Jun-15
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							
Molybdenum (Mo)-Dissolved	mg/L	0.5	0.073	**0.0003**	0.0025 U	**0.00048**	**0.00056**	**0.00143**	**0.00149**	0.0005 U
Nickel (Ni)-Dissolved	mg/L	0.5	0.025[f]	**0.0686**	**2.25**	**0.0882**	**0.0918**	**0.00056**	**0.108**	**0.786**
Phosphorus, dissolved	mg/L	-	0.004 to 0.10[g]	0.3 U	0.6 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Potassium, dissolved	mg/L	-	-	**10.2**	**13.6**	**7.29**	**7.4**	**3.32**	**3.19**	**5.8**
Selenium (Se)-Dissolved	mg/L	0.05	0.001	0.00025 U	0.0025 U	**0.00044**	**0.00042**	0.00005 U	0.00025 U	**0.00052**
Silica, Dissolved	mg/L	-	-	**20.3**	**31.9**	**9.61**	**9.55**	**11.7**	**24.2**	**25.9**
Silicon, dissolved	mg/L	-	-	**9.48**	**14.9**	**4.49**	**4.47**	**5.48**	**11.3**	**12.1**
Silver (Ag)-Dissolved	mg/L	0.1	0.0001	0.00005 U	0.0005 U	0.00002 U	0.00002 U	0.00001 U	0.00005 U	0.0001 U
Sodium (Na)-Dissolved	mg/L	-	-	**30.6**	**25.4**	**11**	**11.6**	**7.91**	**17.4**	**19.9**
Strontium, dissolved	mg/L	-	-	**2.12**	**2.56**	**1.1**	**1.12**	**1.76**	**1.94**	**1.17**
Sulfur, dissolved	mg/L	-	-	**524**	**1970**	**644**	**641**	**267**	**974**	**984**
Thallium (Tl)-Dissolved	mg/L	-	0.0008	0.00005 U	**0.00114**	**0.000028**	**0.000029**	0.00001 U	**0.000123**	**0.00021**
Titanium, dissolved	mg/L	-	0.1	0.0015 U	0.015 U	0.0006 U	0.0006 U	0.0003 U	0.0015 U	0.003 U
Uranium (U)-Dissolved	mg/L	-	0.015	**0.0135**	**0.0153**	**0.0561**	**0.056**	**0.0308**	**0.0873**	**0.0536**
Vanadium (V)-Dissolved	mg/L	-	-	0.0025 U	0.025 U	0.001 U	0.001 U	0.0005 U	0.0025 U	0.005 U
Zinc (Zn)-Dissolved	mg/L	0.5	0.03	0.711	488	0.886	0.908	0.001 U	5.72	81.6

Notes:

Bold indicates the analyte was detected

Concentration exceeds CCME Guideline

Concentration exceeds FMC discharge criteria and CCME Guideline

Detection limit exceeds CCME Guideline

J - analyte was present but the reported value may not be accurate or precise

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection limit

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-8. Fall 2015 - Groundwater Analytical Results

Faro Mine Remediation Project

				CH12-014-MW003_100315	CH12-014-MW007_100215	CH12-014-MW907_GW1015	CH12-014-MW011_100815	CH12-014-MW012_100715	CH12-014-MW013_100815	CH14-015-MW006_100315
				Main WRD	Intermediate WRD	Intermediate WRD	Grum WRD	Grum WRD	Vancorda WRD	NE WRD
				3-Oct-15	2-Oct-15	2-Oct-15	8-Oct-15	7-Oct-15	8-Oct-15	3-Oct-15
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							
General Chemistry										
pH, Field	pH Units	6.5	6.5 - 9.0	**6.62**	**6.36**		**7.05**	**8.08**	**6.72**	**5.08**
Temperature, Field	deg C	-	-	**4.42**	**18.78**		**8.46**	**4.98**	**13.62**	**7.49**
Hardness (as CaCO3)	mg/L	-	-	**2340**	**4000**	**4080**	**2530**	**1220**	**4750**	**2540**
Total Suspended Solids	mg/L	15	-	**55.6**	**44.7**	**40.7**	**8.8**	**41.2**	**18.8**	**99.7**
Total dissolved solids	mg/L	-	-	**3210**	**7280**	**7220**	**3340**	**1600**	**6400**	**4470**
Turbidity, Field	NTU	-	-	**134.5**	**4.6**		**72.2**	**30.4**	**18.6**	**112.1**
Anions and Nutrients										
Acidity, hot peroxide	mg/L	-	-	25 UJ	**575 J**	**573 J**	25 UJ		25 UJ	**1380 J**
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	**652**	**240**	**231**	**691**	**391**	**1260**	**18.8**
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	20 U	2 U	2 U	20 U	2 U	20 U	2 U
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	20 U	2 U	2 U	20 U	2 U	20 U	2 U
Alkalinity, Total (as CaCO3)	mg/L	-	-	**652**	**240**	**231**	**691**	**391**	**1260**	**18.8**
Ammonia	mg/L	1.3	Variable[a]	**0.04**	**0.53**	**0.47**	**0.32**	**0.02**	**0.04**	**0.98**
Chloride (Cl)	mg/L	-	120	**13.2**	10 U	10 U	5 U	2.5 U	10 U	10 U
Fluoride	mg/L	-	0.12	0.2 U	**0.77**	**0.74**	0.2 U	**0.19**	0.4 U	**5.61**
Nitrate (as N)	mg/L	-	13	0.05 U	**0.23**	0.1 U	**1.72 J**	0.025 U	0.1 UJ	**2.72**
Nitrite (as N)	mg/L	-	0.06	**0.01**	0.02 U	0.02 U	**0.01 J**	0.005 U	0.02 UJ	0.02 U
ortho-Phosphate (as P)	mg/L	-	-							
Sulfate	mg/L	-	100	**1580**	**3960**	**3850**	**1760**	**829**	**3620**	**3280**
Carbon, dissolved organic (DOC)	mg/L	-	-	**2.66**	**7.1**	**5.34**	**3.32**	**1.44**	**12**	**3.35**
Dissolved Metals										
Aluminum, dissolved	mg/L		0.005 to 0.1[b]	**0.0053**	**0.33**	**0.34**	**0.0044**	**0.0026**	**0.0074**	**16.7**
Antimony (Sb)-Dissolved	mg/L	0.05	1.6	0.0005 U	0.005 U	0.005 U	0.0002 U	0.0001 U	0.0005 U	0.001 U
Arsenic (As)-Dissolved	mg/L	1	0.005	0.0005 U	0.005 U	**0.005**	**0.00023**	**0.01**	**0.00135**	**0.02**
Barium (Ba)-Dissolved	mg/L	-	2.3	**0.02**	**0.02**	**0.02**	**0.01**	**0.03**	**0.01**	**0.05**
Beryllium (Be)-Dissolved	mg/L	-	0.0053	0.0005 U	0.005 U	0.005 U	0.0002 U	0.0001 U	0.0005 U	**0.0082**
Boron (B)-Dissolved	mg/L	-	1.5	0.05 U	0.5 U	0.5 U	0.02 U	0.01 U	0.05 U	0.1 U
Cadmium (Cd)-Dissolved	mg/L	0.02	Variable[c]	**0.000329**	**0.1**	**0.11**	**0.000459**	0.000005 U	**0.00514**	**0.08**
Calcium, dissolved	mg/L	-	-	**698**	**389**	**398**	**444**	**298**	**695**	**277**
Chromium (Cr)-Dissolved	mg/L	-	0.0089	0.0005 U	0.005 U	0.005 U	**0.00202**	0.0001 U	**0.00177**	**0.0014**
Cobalt (Co)-Dissolved	mg/L	-	-	**0.00981**	**0.78**	**0.82**	**0.00216**	**0.00022**	**0.04**	**0.76**
Copper (Cu)-Dissolved	mg/L	0.2	0.002 to 0.004[d]	0.001 U	0.01 U	0.01 U	**0.00157**	**0.00101**	**0.0071**	**0.81**
Iron, dissolved	mg/L	-	0.3	**3.81**	**121**	**123**	**0.73**	**7.01**	**4.95**	**80.7**
Ferrous Iron, dissolved (Fe^{2+})	mg/L	-	-	**3.94**	**135**	**135**	**0.84**	**6.62**	**5.05**	**77.3**
Lead (Pb)-Dissolved	mg/L	0.2	0.001[e]	**0.00053**	**0.02**	**0.02**	**0.00014**	**0.000071**	**0.01**	**0.01**
Lithium, dissolved	mg/L	-	-	**0.06**	**0.19**	**0.18**	**0.03**	**0.01**	**0.03**	**0.17**
Magnesium, dissolved	mg/L	-	-	**146**	**735**	**749**	**346**	**116**	**731**	**449**
Manganese, dissolved	mg/L	-	-	**3.24**	**56.9**	**58.5**	**1.79**	**0.27**	**11.7**	**22.4**
Mercury, dissolved	mg/L	0.005	0.000026	**0.0000114**	0.000005 U	0.000005 U	0.000005 U	0.000005 U	**0.0000154**	**0.0000088**

Table 3-8. Fall 2015 - Groundwater Analytical Results

Faro Mine Remediation Project

				CH12-014-MW003_100315	CH12-014-MW007_100215	CH12-014-MW907_GW1015	CH12-014-MW011_100815	CH12-014-MW012_100715	CH12-014-MW013_100815	CH14-015-MW006_100315
				Main WRD	Intermediate WRD	Intermediate WRD	Grum WRD	Grum WRD	Vancorda WRD	NE WRD
				3-Oct-15	2-Oct-15	2-Oct-15	8-Oct-15	7-Oct-15	8-Oct-15	3-Oct-15
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							
Molybdenum (Mo)-Dissolved	mg/L	0.5	0.073	**0.00031**	0.0025 U	0.0025 U	**0.00125**	**0.00137**	**0.00181**	**0.00061**
Nickel (Ni)-Dissolved	mg/L	0.5	0.025[f]	**0.07**	**1.26**	**1.32**	**0.08**	**0.00065**	**0.11**	**0.69**
Phosphorus, dissolved	mg/L	-	0.004 to 0.10[g]	0.3 U	0.6 U	0.6 U	0.3 U	0.3 U	0.6 U	0.3 U
Potassium, dissolved	mg/L	-	-	**11.6**	**11.5**	**12.1**	**7.3**	**3.47**	**3.35**	**5.97**
Selenium (Se)-Dissolved	mg/L	0.05	0.001	0.00025 U	0.0025 U	0.0025 U	0.0001 U	0.00005 U	0.00025 U	0.0005 U
Silica, Dissolved (Si)	mg/L	-	-	**20.5**	**30.9**	**31.4**	**9.76**	**11.6**	**25.8**	**24.4**
Silicon, dissolved (SiO_2)	mg/L	-	-	**9.6**	**14.4**	**14.7**	**4.56**	**5.44**	**12.1**	**11.4**
Silver (Ag)-Dissolved	mg/L	0.1	0.0001	0.00005 U	0.0005 U	0.0005 U	0.00002 U	0.00001 U	0.00005 U	0.0001 U
Sodium (Na)-Dissolved	mg/L	-	-	**30.4**	**19**	**19.9**	**11.2**	**8.12**	**16.3**	**15.4**
Strontium, dissolved	mg/L	-	-	**2.24**	**1.73**	**1.83**	**1.12**	**1.68**	**2**	**1.12**
Sulfur, dissolved	mg/L	-	-	**592**	**1480**	**1490**	**605**	**262**	**1120**	**941**
Thallium (Tl)-Dissolved	mg/L	-	0.0008	0.00005 U	**0.0008**	**0.00082**	0.00002 U	0.00001 U	**0.000172**	**0.00021**
Titanium, dissolved	mg/L	-	0.1	0.0015 U	0.015 U	0.015 U	0.0006 U	0.0003 U	0.0015 U	0.003 U
Uranium (U)-Dissolved	mg/L	-	0.015	**0.01**	**0.01**	**0.01**	**0.04**	**0.02**	**0.08**	**0.04**
Vanadium (V)-Dissolved	mg/L	-	-	0.0025 U	0.025 U	0.025 U	0.001 U	0.0005 U	0.0025 U	0.005 U
Zinc (Zn)-Dissolved	mg/L	0.5	0.03	**0.56**	**266**	**277**	**0.81**	**0.0047**	**5.57**	**69.5**

Notes:

Bold indicates the analyte was detected

Concentration exceeds FMC discharge criteria

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or precise

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection limit

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465}$ * 0.2 / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-9. Winter 2016 - Groundwater Analytical Results

Faro Mine Remediation Project

			Location ID	CH12-014-MW003	CH12-014-MW007	CH12-014-MW011	CH12-014-MW012	CH12-014-MW013	CH14-015-MW006
			Date	2/20/2016	2/17/2016	2/21/2016	2/22/2016	2/22/2016	2/20/2016
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**						
General Chemistry									
pH, Field	pH Units	6.5	6.5 - 9.0	**6.51**	**6.35**	**7.19**	**7.59**	**6.49**	**4.79**
Temperature, Field	deg C	-	-	**6.61**	**18.85**	**9.81**	**2.68**	**16.02**	**6.67**
Hardness (as $CaCO_3$)	mg/L	-	-	**2380**	**4580**		**1190**	**4060**	**3280**
Total Suspended Solids	mg/L	15	-	**95.2**	**35**	**5.8**	**266**	**31.6**	**83.6**
Total Dissolved Solids	mg/L	-	-	**3520**	**7020**	**3380**	**1600**	**6230**	**5800**
Turbidity, Field	NTU	-	-	90.8	5.8	8.6	223.6	13.9	46.1
Anions and Nutrients		-							
Acidity, Hot Peroxide	mg/L	-	-	25 U	25 U	25 U	25 U	25 U	**549**
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	-	-	**620**	**621**	**686**	**394**	**1180**	**11.1**
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	-	-	20 U	20 U	20 U	2 U	20 U	2 U
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	-	-	20 U	20 U	20 U	2 U	20 U	2 U
Alkalinity, Total (as $CaCO_3$)	mg/L	-	-	**620**	**621**	**686**	**394**	**1180**	**11.1**
Ammonia	mg/L	1.3	Variable[a]	**0.0416**	**0.28**	**0.197**	**0.0624**	**0.0537**	**1.04**
Chloride (Cl)	mg/L	-	120	**15**	**16**	5 U	1 U	10 U	10 U
Fluoride	mg/L	-	0.12	0.4 U	**0.9**	0.2 U	**0.163**	0.4 U	**7.4**
Nitrate (as N)	mg/L	-	13	**1.22**	0.1 U	**2.67**	0.01 U	0.1 U	**2.45**
Nitrite (as N)	mg/L	-	0.06	**0.102**	0.02 U	**0.022**	0.002 U	0.02 U	**0.075**
ortho-Phosphate (as P)	mg/l		-						
Phosphorus	mg/L			0.02 U	0.02 U	0.02 U	0.382	0.0239	0.02 U
Sulphate	#N/A		100	**1970**	**4680**	**1980**	**873**	**3780**	**3880**
Dissolved Organic Carbon	mg/L		-	**3.61**	**7.25**	**3.03**	**2.38**	**11.8**	**6.78**
Dissolved Metals									
Aluminum, Dissolved	mg/L		0.005 to 0.1[b]	**0.0054**	**0.147**	**0.0121 J**	**0.0038**	**0.0328**	**47**
Antimony (Sb), Dissolved	mg/L	0.05	1.6	0.0005 U	0.002 U	0.0002 U	0.0002 U	0.0005 U	0.002 U
Arsenic (As), Dissolved	mg/L	1	0.005	0.0005 U	0.002 U	0.0002 U	**0.0154**	**0.00169**	**0.0267**
Barium (Ba), Dissolved	mg/L	-	2.3	**0.0247**	**0.0203**	**0.0176**	**0.0352**	**0.0161**	**0.069**
Beryllium (Be), Dissolved	mg/L	-	0.0053	0.0005 U	0.002 U	0.0002 U	0.0002 U	0.0005 U	**0.0185**
Boron (B), Dissolved	mg/L	-	1.5	0.05 U	0.2 U	0.02 U	0.02 U	0.05 U	0.2 U
Cadmium (Cd), Dissolved	mg/L	0.02	Variable[c]	**0.000941**	**0.187**	**0.000232**	0.00001 U	**0.00428**	**0.144**
Calcium, Dissolved	mg/L	-	-	**678**	**551**	**446**	**302**	**644**	**313**
Chromium (Cr), Dissolved	mg/L	-	0.0089	**0.00191**	**0.002**	**0.00398**	0.0002 U	**0.00305**	**0.004**
Cobalt (Co), Dissolved	mg/L	-	-	**0.0289**	**0.683**	**0.00272**	**0.00032**	**0.0617**	**1.07**
Copper (Cu), Dissolved	mg/L	0.2	0.002 to 0.004[d]	**0.0018**	0.004 U	**0.00142**	0.0004 U	**0.0063**	**1.4**
Iron, Dissolved	mg/L	-	0.3	**0.534**	**2.38**	**0.221**	**6.69**	**5.57**	**87.9**
Ferrous Iron, Dissolved (Fe2+)	mg/l	-	-	**0.2**	**2.54**	**0.261 J**	**7.2**	**6.5**	**95.3**
Lead (Pb), Dissolved	mg/L	0.2	0.001[e]	**0.00068**	**0.0114**	**0.00165**	0.0001 U	**0.0174**	**0.0395**
Lithium	mg/L	-							
Lithium, Dissolved	mg/L	-	-	**0.1**	**0.112**	**0.0341**	**0.0156**	**0.0308**	**0.242**
Magnesium, Dissolved	mg/L	-	-	**167**	**779**	**318**	**106**	**596**	**607**
Manganese, Dissolved	mg/L		-	**3.96**	**48.7**	**1.65**	**0.267**	**12.2**	**31.3**
Mercury, Dissolved	mg/L	0.005	0.000026	0.000005 U	0.000005 U	0.000005 U	0.000005 U	**0.0000121**	**0.0000089**
Molybdenum (Mo), Dissolved	mg/L	0.5	0.073	**0.00233**	**0.0017**	**0.00138**	**0.00141**	**0.00188**	0.001 U
Nickel (Ni), Dissolved	mg/L	0.5	0.025[f]	**0.144**	**1.11**	**0.0615**	0.001 U	**0.109**	**0.966**
Phosphorus, Dissolved	mg/L	-	0.004 to 0.10[g]	0.3 U	0.6 U	0.3 U	0.3 U	0.3 U	0.6 U
Potassium, Dissolved	mg/L	-	-	**12.9**	**10.5**	**6.62**	**3.61**	**3.15**	**5.2**
Selenium (Se), Dissolved	mg/L	0.05	0.001	0.00025 U	0.001 U	0.0001 U	0.0001 U	0.00025 U	0.001 U
Silica, Dissolved (Si)	mg/L	-	-	**20.2**	**28.1**	**9.81**	**10.9**	**22.4**	**30.7**
Silicon, Dissolved (SiO_2)	mg/L	-	-	**9.46**	**13.2**	**4.59**	**5.1**	**10.5**	**14.3**
Silver (Ag), Dissolved	mg/L	0.1	0.0001	0.00005 U	0.0002 U	0.00002 U	0.00002 U	0.00005 U	0.0002 U
Sodium (Na), Dissolved	mg/L	-	-	**36.9**	**17.5**	**11.6**	**8.02**	**15.8**	**17.6**
Strontium, Dissolved	mg/L	-	-	**2.31**	**1.28**	**1.07**	**1.72**	**1.95**	**1.29**

Table 3-9. Winter 2016 - Groundwater Analytical Results

Faro Mine Remediation Project

			Location ID	CH12-014-MW003	CH12-014-MW007	CH12-014-MW011	CH12-014-MW012	CH12-014-MW013	CH14-015-MW006
			Date	2/20/2016	2/17/2016	2/21/2016	2/22/2016	2/22/2016	2/20/2016
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**						
Sulphur, Dissolved	#N/A	-	-	**585**	**1410**	**560**	**253**	**912**	**1260**
Thallium (Tl), Dissolved	mg/L	-	0.0008	0.00005 U	**0.00022**	0.00002 U	0.00002 U	**0.000173**	**0.00026**
Titanium, Dissolved	mg/L	-	0.1	0.0015 U	0.006 U	0.0006 U	0.0006 U	0.0015 U	0.006 U
Uranium (U), Dissolved	mg/L	-	0.015	**0.0194**	**0.0623**	**0.0441**	**0.0315**	**0.0841**	**0.0837**
Vanadium (V), Dissolved	mg/L	-	-	0.0025 U	0.01 U	0.001 U	0.001 U	0.0025 U	0.01 U
Zinc (Zn), Dissolved	mg/L	0.5	0.03	**2.6**	**142**	**0.568**	**0.0059**	**6.21**	**104**
Conductivity, Field	mS/cm/deg C			**3.876**	**5.6**	**3.534**	**1.956**	**5.676**	**5.294**
DO, Field	mg/L			**7.27**	**0.44**	**0.27**	**0.15**	**0.3**	**1.79**
ORP, Field	mV			**41.6**	**38.3**	**52**	**-134.3**	**-14.6**	**188.6**
pH	Ph			**6.82**	**6.31**	**7.15**	**7.66**	**6.71**	**4.53**

Notes:

Bold indicates the analyte was detected

Concentration exceeds FMC discharge criteria

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or precise

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection limit

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$/ 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-10. Spring 2016 - Groundwater Analytical Results

Faro Mine Remediation Project

			Location ID	CH12-014-MW003	CH12-014-MW007	CH12-014-MW011	CH12-014-MW012	CH12-014-MW013	CH14-015-MW006	CH14-104-MW008
			Date	6/2/2016	6/1/2016	6/4/2016	6/3/2016	6/4/2016	6/1/2016	6/6/2016
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							
General Chemistry										
pH, Field	pH Units	6.5	6.5 - 9.0	**6.47**	**6.02**	**6.59**	**7.5**	**6.21**	**5.91**	**6.56**
Temperature, Field	deg C	-	-	**7.7**	**17.09**	**6.93**	**13.43**	**13.9**	**3.88**	**7.19**
Hardness (as $CaCO_3$)	mg/L	-	-	**2200**	**4700**	**2390**	**1230**	**4810**	**1380**	**15600**
Total Suspended Solids	mg/L	15	-	**6**	**261**	**33.2**	**328**	**57.6**	**182**	**69.2 J**
Total Dissolved Solids	mg/L	-	-	**3310**	**7930**	**3530**	**1640**	**6750**	**2250**	**19900**
Turbidity, Field	NTU	-	-	2.7		21	60.6	62	48.1	824.4
Anions and Nutrients		-								
Acidity, Hot Peroxide	mg/L	-	-	25 U	25 U	25 U	25 U	25 U	**68**	25 U
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	-	-	**579**	**517**	**688**	**396**	**1160**	**77.7**	**1560**
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	-	-	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	-	-	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Alkalinity, Total (as $CaCO_3$)	mg/L	-	-	**579**	**517**	**688**	**396**	**1160**	**77.7**	**1560**
Ammonia	mg/L	1.3	Variable[a]	**0.0266**	**0.31**	**0.459**	**0.0645**	**0.0637**	**1.16**	
Chloride (Cl)	mg/L	-	120	**13.7**	**14**	5 U	2.5 U	10 U	**2.8**	10 U
Fluoride	mg/L	-	0.12	0.2 U	**0.92**	0.2 U	**0.18**	0.4 U	**1.75**	**0.6**
Nitrate (as N)	mg/L	-	13	**0.239 J**	0.1 U	**3.86**	0.025 U	0.1 U	**0.901**	0.1 U
Nitrite (as N)	mg/L	-	0.06	0.01 UJ	0.02 U	0.01 U	0.005 U	0.02 U	**0.0256**	0.02 U
ortho-Phosphate (as P)	mg/l		-							
Phosphorus	mg/L			0.02 U	0.02 U	0.02 U	0.409	0.02 U	0.2 U	
Sulfate	mg/L		100	**1740**	**4820**	**1560**	**841**	**3450**	**1370**	**13500**
Dissolved Organic Carbon	mg/L		-	**4.48**	**7.47**	**4.36**	**3.32**	**13.1**	**5.68**	
Dissolved Metals										
Aluminum, Dissolved	mg/L		0.005 to 0.1[b]	0.005 U	**0.177**	0.0036 U	0.002 U	0.0065 U	**2**	**0.025**
Antimony (Sb), Dissolved	mg/L	0.05	1.6	0.0005 U	0.005 U	0.0002 U	0.0002 U	0.0005 U	0.0005 U	0.002 U
Arsenic (As), Dissolved	mg/L	1	0.005	0.0005 U	0.005 U	**0.00044**	**0.0145**	**0.00136**	**0.0402**	0.002 U
Barium (Ba), Dissolved	mg/L	-	2.3	**0.022**	**0.0233**	**0.021**	**0.0358**	**0.0158**	**0.0849**	**0.0425**
Beryllium (Be), Dissolved	mg/L	-	0.0053	0.0005 U	0.005 U	0.0002 U	0.0002 U	0.0005 U	**0.00186**	0.002 U
Boron (B), Dissolved	mg/L	-	1.5	0.05 U	0.5 U	0.02 U	0.02 U	0.05 U	0.05 U	0.2 U
Cadmium (Cd), Dissolved	mg/L	0.02	Variable[c]	**0.000713**	**0.316**	**0.000325**	0.00001 U	**0.00518**	**0.0316**	**0.00258**
Calcium, Dissolved	mg/L	-	-	**639**	**515**	**400**	**302**	**738**	**159**	**467**

Table 3-10. Spring 2016 - Groundwater Analytical Results

Faro Mine Remediation Project

			Location ID	CH12-014-MW003	CH12-014-MW007	CH12-014-MW011	CH12-014-MW012	CH12-014-MW013	CH14-015-MW006	CH14-104-MW008
			Date	6/2/2016	6/1/2016	6/4/2016	6/3/2016	6/4/2016	6/1/2016	6/6/2016
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							
Chromium (Cr), Dissolved	mg/L	-	0.0089	0.0005 U	0.005 U	**0.00116**	0.0002 U	**0.00115**	**0.00102**	0.002 U
Cobalt (Co), Dissolved	mg/L	-	-	**0.00925**	**0.969**	**0.00466**	**0.00025**	**0.0583**	**0.397**	**0.0294**
Copper (Cu), Dissolved	mg/L	0.2	0.002 to 0.004[d]	0.001 U	0.01 U	**0.00105**	0.0004 U	**0.0041**	**0.0995**	**0.0194**
Iron, Dissolved	mg/L	-	0.3	**0.628**	**1.86**	**2.94**	**6.96**	**6.8**	**86.9**	0.15 U
Ferrous Iron, Dissolved (Fe2+)	mg/l	-	-	**0.644**	**2**	**3.67**	**8.03**	**6.05**	**97.2**	0.02 U
Lead (Pb), Dissolved	mg/L	0.2	0.001[e]	0.00025 U	**0.0096**	**0.00161**	0.0001 U	**0.0173**	**0.0014**	**0.0233**
Lithium	mg/L	-								
Lithium, Dissolved	mg/L	-	-	**0.077**	**0.117**	**0.0373**	**0.0152**	**0.0339**	**0.0866**	**0.082**
Magnesium, Dissolved	mg/L	-	-	**147**	**830**	**337**	**116**	**719**	**238**	**3500**
Manganese, Dissolved	mg/L		-	**3.1**	**70.4**	**2.44**	**0.255**	**14**	**16.1**	**26.7**
Mercury, Dissolved	mg/L	0.005	0.000026	0.000005 U	0.000005 U	0.000005 U	0.000005 U	0.000005 U	0.000005 U	0.000005 U
Molybdenum (Mo), Dissolved	mg/L	0.5	0.073	0.00025 U	0.0025 U	**0.00143**	**0.00137**	**0.00173**	**0.00078**	**0.0022**
Nickel (Ni), Dissolved	mg/L	0.5	0.025[f]	**0.0951**	**1.63**	**0.0713**	0.001 U	**0.122**	**0.28**	**0.354**
Phosphorus, Dissolved	mg/L	-	0.004 to 0.10[g]	0.3 U	0.6 U	0.3 U	0.3 U	0.6 U	0.3 U	1.5 U
Potassium, Dissolved	mg/L	-	-	**11.6**	**12.5**	**6.81**	**3.35**	**3.15**	**5.26**	**28.6**
Selenium (Se), Dissolved	mg/L	0.05	0.001	0.00025 U	0.0025 U	**0.0001**	0.0001 U	0.00025 U	0.00025 U	0.001 U
Silica, Dissolved (Si)	mg/L	-	-	**19.5**	**26.8**	**10.1**	**11**	**26.2**	**21.3**	**17.5**
Silicon, Dissolved (SiO_2)	mg/L	-	-	**9.09**	**12.5**	**4.72**	**5.14**	**12.3**	**9.94**	**8.18**
Silver (Ag), Dissolved	mg/L	0.1	0.0001	0.00005 U	0.0005 U	0.00002 U	0.00002 U	0.00005 U	0.00005 U	0.0002 U
Sodium (Na), Dissolved	mg/L	-	-	**32.5**	**23.8**	**10**	**7.49**	**16.4**	**12**	**57.6**
Strontium, Dissolved	mg/L	-	-	**2.23**	**1.43**	**1.05**	**1.75**	**2.11**	**0.746**	**12.5**
Sulfur, Dissolved	mg/L	-	-	**529**	**1500**	**533**	**266**	**1210**	**463**	**4740**
Thallium (Tl), Dissolved	mg/L	-	0.0008	0.00005 U	0.0005 U	**0.000021**	0.00002 U	**0.000183**	0.00005 U	0.0002 U
Titanium, Dissolved	mg/L	-	0.1	0.0015 U	0.015 U	0.0006 U	0.0006 U	0.0015 U	0.0015 U	0.006 U
Uranium (U), Dissolved	mg/L	-	0.015	**0.0167**	**0.0648**	**0.0476**	**0.0321**	**0.0935**	**0.00463**	**0.113**
Vanadium (V), Dissolved	mg/L	-	-	0.0025 U	0.025 U	0.001 U	0.001 U	0.0025 U	0.0025 U	0.01 U
Zinc (Zn), Dissolved	mg/L	0.5	0.03	**1.68**	**234**	**0.684**	0.002 U	**7.85**	**36.8**	**3.08**
Conductivity, Field	mS/cm/deg C			**3.086**	**6.06**	**3.415**	**1.893**	**5.628**	**2.121**	**14.24**
DO, Field	mg/L			**2.35**	**1.58**	**1.8**	**-1.16**	**1.58**	**1.56**	**4.12**
ORP, Field	mV			**67.3**	**88.5**	**-6.3**	**-143.2**	**-5.7**	**47.8**	**288.5**

Table 3-10. Spring 2016 - Groundwater Analytical Results

Faro Mine Remediation Project

			Location ID	CH12-014-MW003	CH12-014-MW007	CH12-014-MW011	CH12-014-MW012	CH12-014-MW013	CH14-015-MW006	CH14-104-MW008
			Date	6/2/2016	6/1/2016	6/4/2016	6/3/2016	6/4/2016	6/1/2016	6/6/2016
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							

Notes:

Bold indicates the analyte was detected

Concentration exceeds FMC discharge criteria

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

J - analyte was present but the reported value may not be accurate or precise

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection limit

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465}$ * 0.2 / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Table 3-11. 2015 WRD Groundwater - Mann Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH12-014-MW003	87.5% (+)	63.1% (+)	87.5% (-)	86.2% (-)	67.6% (+)	97.8% (sig -)	81.0% (+)
CH14-015-MW006	86.4% (+)	50.0% (+)	86.4% (-)	50.0% (.)	88.3% (+)	50.0% (-)	97.2% (sig -)
CH12-014-MW007	77.0% (-)	68.1% (+)	96.9% (sig -)	93.2% (-)	89.2% (+)	87.5% (-)	81.0% (-)

CH12-014-MW003	NT	NT	NT	NT	NT	↓	NT
CH14-015-MW006	NT	NT	NT	NT	NT	NT	↓
CH12-014-MW007	NT	NT	↓	NT	NT	NT	NT

Notes:

Mann Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Non-detectable concentrations were reduced to half the non-detectable limit.

Duplicate measurements were removed.

↑ - Significant increasing trend

↓ - Significant decreasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Table 4-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA	
Sample ID				CH12-101-BH001-SOA		CH12-101-BH001-SOB		CH12-101-BH001-SOC		CH12-101-BH002-SOA		CH12-101-BH002-SOB		CH12-101-BH902-SOB		CH12-101-BH002-SOC		CH12-101-BH003-SOA		CH12-101-BH003-SOB		CH12-101-BH003-SOC	
Sample Interval (mbgs)				0.2 - 0.3		1.9 - 2.3		3.45 - 3.75		0 - 0.3		1.5 - 2.1		1.5 - 2.1		3 - 3.6		0.1 - 0.3		1.8 - 2		5.2 - 5.4	
Sample Date				6/21/2012		6/21/2012		6/21/2012		6/19/2012		6/19/2012		6/19/2012		6/19/2012		6/21/2012		6/21/2012		6/21/2012	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]																				
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	22,400		34,900		42,300		13,900		11,600		12,000		25,000		25,800		20,400		29,800	
Antimony	mg/kg	**60**	2	1.76		0.19		0.1	U	1.29		0.76		0.88		0.18		0.87		0.42		0.26	
Arsenic	mg/kg	**72**	18	22.2		10.7		2.82		50.4		8.15	J	49.5	J	12.4		8.75		7.96		4.52	
Barium	mg/kg	**6,000**	4,250	310		112		19.4		224		483	J	115	J	183		0.14		184		141	
Beryllium	mg/kg	**72**	30	0.86		0.68		0.36		0.69		0.47		0.63		0.82		0.75		0.63		0.67	
Bismuth	mg/kg	-	**0.085**	1.32		0.2	U	0.25		0.84		0.2	UJ	1.42	J	0.2	U	0.28		0.25		0.2	U
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	2.64		0.085		0.05	U	1.22		0.87		1.05		0.10		0.317		0.342		0.05	U
Calcium	mg/kg	180,000	**415,000**	27,700		29,900		5,420		4,640		28,300	J	3,310	J	48,500		20,500		21,100		42,400	
Chromium	mg/kg	840	**1,020**	48.6		61.9		47.1		37.7		23.7		28.5		48.3		50.0		42		46.6	
Cobalt	mg/kg	96	**250**	17.8		18.9		14.3		17.2		6.86	J	15.30	J	21.0		18.7		13.6		20.9	
Copper	mg/kg	360	**600**	79.0		11.9		0.68		119		27.8	J	113	J	29.1		38.9		28		24.5	
Iron	mg/kg	480,000	**563,000**	40,500		37,500		36,400		31,800		17,700		29,200		42,600		37,900		28,000		41,100	
Lead	mg/kg	**420**	140	647		10.1		5.03		413		29.2	J	240	J	17.7		586		20		10.2	
Lithium	mg/kg	**300**	200	36.7		73.1		103		27.1		10.3	J	24.4	J	35.1		46.6		28.8		47.3	
Magnesium	mg/kg	60,000	**233,000**	15,100		34,400		51,900		7,360		4,530		5,840		15,700		16,700		10,000		17,900	
Manganese	mg/kg	**12,000**	9,500	598		254		78.4		354		436		310		607		405		377		397	
Mercury	mg/kg	0.72	**0.85**	0.446		0.010		0.005	U	0.298		0.120		0.165		0.010		0.083		0.028		0.005	U
Molybdenum	mg/kg	**24**	12	1.18		0.81		0.5	U	1.94		1.24		1.84		1.07		0.69		1.15		0.6	
Nickel	mg/kg	600	**840**	39.7		54.6		28.6		35.4		24.4		29.3		45		45.2		37.8		48.3	
Phosphorus	mg/kg	9,600	**10,500**	525		533		335		579		1,220	J	424	J	552		506		654		379	
Potassium	mg/kg	168,000	**208,500**	2,670		2,530		730		2,720		580	J	2,710	J	6,460		2,600		3,360		7,900	
Selenium	mg/kg	**4.8**	0.5	0.34		0.2	U	0.2	U	0.34		1.74	J	0.24	J	0.2	U	0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	1.05		0.1	U	0.1	U	0.81		0.38	J	1.08	J	0.1	U	0.61		0.13		0.2	U
Sodium	mg/kg	60,000	**235,500**	750		200		100	U	350		160		240		200		730		590		750	
Strontium	mg/kg	3,000	**3,700**	91.3		81.5		19.1		36.1		120	J	25.4	J	116		77.3		82.7		143	
Sulphur	mg/kg	**8,400**	3,500	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Thallium	mg/kg	**108**	8.5	0.386		0.131		0.05	U	0.482		0.113	J	0.425	J	0.256		0.223		0.214		0.291	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	469		240		65.7		462		260		386		301		423		442		403	
Uranium	mg/kg	24	**27**	1.0		0.738		0.683		1.080		2.8	J	0.975	J	0.683		0.744		0.818		0.775	
Vanadium	mg/kg	1,080	**1,200**	43.1		38.6		29.2		34.8		24.4		30.4		48.8		40.3		36.3		36.6	
Zinc	mg/kg	**1,080**	700	1,070		68.5		50.2		709		37.6	J	519	J	111		209		83.5		98.3	
Moisture	percent	-	-	10.3	J	7.39	J	2.82	J	7.44	J	52.1	J	6.02	J	19.5	J	6.69	J	7.29	J	2.57	J
pH (1:2 soil:water)	pH Units	-	-	8.05		8.47		8.82		7.01		6.25		7.76		7.91		7.94		8.35		8.66	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 4-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA	
Sample ID				CH12-101-BH004-SOA		CH12-101-BH004-SOB		CH12-101-BH004-SOC		CH12-101-BH904-SOC		CH12-101-BH005-SOA		CH12-101-BH005-SOB		CH12-101-BH005-SOC		CH12-101-BH006-SOA		CH12-101-BH906-SOA		CH12-101-BH006-SOB	
Sample Interval (mbgs)				0 - 0.3		1.5 - 2		2.4 - 2.6		2.4 - 2.6		0.1 - 0.3		1.22 - 1.52		4 - 4.5		0 - 0.3		0 - 0.3		0.5 - 0.9	
Sample Date				6/20/2012		6/20/2012		6/20/2012		6/20/2012		6/24/2012		6/24/2012		6/24/2012		6/22/2012		6/22/2012		6/22/2012	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]																				
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	17,300		22,300		24,400		22,400		19,600		16,000		16,200		33,200		42,700		43,500	
Antimony	mg/kg	**60**	2	5.99		0.39		0.19		0.25		0.41		0.58		0.76		0.23	J	0.13	J	0.13	
Arsenic	mg/kg	**72**	18	53.2		18.9		11.8		19		8.99		6.88		10.8		9.19		6.43		8.80	
Barium	mg/kg	**6,000**	4,250	288		45.1		49.8		45		245		201		233		205		244		246	
Beryllium	mg/kg	**72**	30	0.74		0.75		0.77		0.88		0.64		0.49		0.61		0.87		0.89		0.86	
Bismuth	mg/kg	-	**0.085**	1.29		0.21		0.22		0.25		0.25		0.2	U	0.29		0.38		0.39		0.31	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	2.79		0.207		0.262		0.21		0.257		0.568		0.501		0.062		0.05	U	0.05	U
Calcium	mg/kg	180,000	**415,000**	11,700		90,800		49,000		52,100		5,440		7,100		16,600		6,880	J	13,100	J	16,800	
Chromium	mg/kg	840	**1,020**	39.2		34.7		44.8		38.2		41.8		29.6		44.8		56.5		54		55.1	
Cobalt	mg/kg	96	**250**	21.1		19.6		17.9		22.2		13.8		9.85		14.1		20.8		18.6		21.4	
Copper	mg/kg	360	**600**	156		29.9		31		34.0		25.7		25		33.8		29.6		36.5		42.2	
Iron	mg/kg	480,000	**563,000**	45,200		38,100		40,800		38,400		28,100		20,200		30,400		43,000		43,600		42,900	
Lead	mg/kg	**420**	140	2,800		18.1		16.6		16.4		19.5		215		17.2		14.2		12.2		15.8	
Lithium	mg/kg	**300**	200	26.8		50.4		52.9		49.6		23.5		17.9		25.8		44		47.4		46.2	
Magnesium	mg/kg	60,000	**233,000**	9,430		17,200		19,200		16,500		8,670		6,680		9,710		19,300		22,600		23,300	
Manganese	mg/kg	**12,000**	9,500	500		706		512		456		314		303		573		443		714		771	
Mercury	mg/kg	0.72	**0.85**	2.20		0.008		0.005	U	0.005	U	0.029		0.104		0.031		0.011	J	0.006	J	0.01	U
Molybdenum	mg/kg	**24**	12	2.26		0.5	U	0.5	U	0.5	U	1.02		0.66		2.18		0.5	U	0.5	U	0.5	U
Nickel	mg/kg	600	**840**	39.9		40		39.5		44.9		35.1		25		42.5		51.7		49.5		57.6	
Phosphorus	mg/kg	9,600	**10,500**	629		308		347		324		916		483		814		504		463		573	
Potassium	mg/kg	168,000	**208,500**	3,000		1,980		2,190		1,910		1,630		1,230		2,060		2,850	J	4,850	J	6,570	
Selenium	mg/kg	**4.8**	0.5	0.51		0.2	U	0.2	U	0.2	U	0.38		0.21		0.2	U	0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	3.97		0.62		0.9		0.78		0.13		0.34		0.16		0.1	U	0.1	U	0.1	U
Sodium	mg/kg	60,000	**235,500**	620		190		200		210		780		930		290		830	J	1,660	J	2,000	
Strontium	mg/kg	3,000	**3,700**	63.9		311		186		210		43		45.5		67.8		53.6	J	102	J	116	
Sulphur	mg/kg	**8,400**	3,500	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Thallium	mg/kg	**108**	8.5	0.866		0.102		0.087		0.101		0.174		0.172		0.183		0.239		0.385		0.393	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	466		46.9		51.1		65.2		532		450		507		605		823		921	
Uranium	mg/kg	24	**27**	1.17		0.503		0.458		0.509		1.69		0.728		1.93		0.85		0.779		0.651	
Vanadium	mg/kg	1,080	**1,200**	39.3		29.9		33.9		28.3		45.4		32.7		48.8		44.1		48.2		48	
Zinc	mg/kg	**1,080**	700	1,990		73.4		80.9		95.7		68.6		367		94.3		121		75.4		75.2	
Moisture	percent	-	-	14.9	J	0.90	J	1.29	J	1.22	J	26.3		28.9		12.8		11	J	11.9	J	12.1	J
pH (1:2 soil:water)	pH Units	-	-	7.43		8.74		8.91		8.74		6.04		7.03		8.04		6.66		6.43		7.62	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 4-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA	
Sample ID				CH12-101-BH007-SOA		CH12-101-BH007-SOB		CH12-101-BH008-SOA		CH12-101-BH008-SOB		CH12-101-PZ001-SOA		CH12-101-PZ001-SOB		CH12-101-PZ001-SOC		CH12-101-PZ002-SOA		CH12-101-PZ002-SOB		CH12-101-PZ902-SOB	
Sample Interval (mbgs)				0.1 - 0.2		0.4 - 0.6		0 - 0.3		1.524 - 1.934		0.1 - 0.2		3.45 - 3.75		4 - 4.5		0 - 0.3		1.1 - 1.5		1.52 - 2.15	
Sample Date				6/25/2012		6/25/2012		6/23/2012		6/23/2012		6/22/2012		6/22/2012		6/22/2012		6/24/2012		6/24/2012		6/24/2012	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]																				
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	19,200		38,300		9,340		34,700		19,400		18,300		32,700		28,400		27,100		21,500	
Antimony	mg/kg	**60**	2	0.48		0.23		1.25		0.14		0.97		0.39		0.24		1.43		0.54		0.62	
Arsenic	mg/kg	**72**	18	11.0		11.9		9.75		9.71		16.2		7.26		11.3		10.8		10.4		12.8	
Barium	mg/kg	**6,000**	4,250	159		285		298		215		226		127		172		241		138		286	
Beryllium	mg/kg	**72**	30	0.61		0.78		0.37		0.62		0.63		0.55		0.76		0.72		0.83		0.77	
Bismuth	mg/kg	-	**0.085**	1.26		0.22		0.2	U	0.28		0.44		0.23		0.23		0.35		0.39		0.35	
Boron	mg/kg	-	**100**	10	U	10	U	16		10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.435		0.072		0.825		0.058		0.885		0.282		0.1		1.55		0.478		0.307	
Calcium	mg/kg	180,000	**415,000**	5,220		17,600		11,900		42,300		13,200		20,000		37,300		23,100		29,400		9,960	
Chromium	mg/kg	840	**1,020**	38.5		58.6		21.2		45.5		47		40.2		52.7		43.4		45.4		51.0	
Cobalt	mg/kg	96	**250**	12.9		18.5		7.58		19.5		14		12.9		20.9		17.9		16.9		16.2	
Copper	mg/kg	360	**600**	41.4		25.1		26.7		36.1		55.5		28.1		25.8		58.1		37.3		36.2	
Iron	mg/kg	480,000	**563,000**	28,000		40,300		16,600		39,200		29,600		26,600		41,700		36,700		34,300		32,100	
Lead	mg/kg	**420**	140	143		17.2		266		13.3		386		18.8		14.5		980		205		33.4	
Lithium	mg/kg	**300**	200	25.7		63.9		11.3		38.1		31.5		28.1		43.9		45.9		47.8		30.6	
Magnesium	mg/kg	60,000	**233,000**	9,700		21,300		7,590		17,500		9,530		10,400		20,100		19,700		13,200		10,500	
Manganese	mg/kg	**12,000**	9,500	332		618		264		583		335		340		501		385		387		534	
Mercury	mg/kg	0.72	**0.85**	0.08		0.009		0.242		0.005	U	0.241		0.023		0.009		0.798		0.109		0.041	
Molybdenum	mg/kg	**24**	12	1.01		0.64		1.16		0.5	U	1.18		1.04		0.54		0.85		1.12		1.08	
Nickel	mg/kg	600	**840**	33.5		40.5		23.6		43		32.7		39.3		46.5		40.8		39.1		46.9	
Phosphorus	mg/kg	9,600	**10,500**	331		360		898		343		497		629		408		663		503		627	
Potassium	mg/kg	168,000	**208,500**	1,990		7,460		1,060		7,530		2,650		2,590		7,240		2,910		3,660		2,240	
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.2	U	0.34		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.21		0.42	
Silver	mg/kg	-	**0.75**	0.23		0.1	U	0.48		0.1	U	0.56		0.1	U	0.1	U	1.08		0.28		0.19	
Sodium	mg/kg	60,000	**235,500**	550		1,270		330		1,580		570		450		920		670		890		570	
Strontium	mg/kg	3,000	**3,700**	41.1		89.6		78.3		201		67.5		85.3		129		91.1		143		62.4	
Sulphur	mg/kg	**8,400**	3,500	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Thallium	mg/kg	**108**	8.5	0.241		0.337		0.169		0.341		0.361		0.186		0.289		0.364		0.244		0.221	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	506		842		385		969		453		412		540		417		596		623	
Uranium	mg/kg	24	**27**	0.836		0.743		0.772		0.889		0.71		0.915		0.906		0.711		1.06		1.48	
Vanadium	mg/kg	1,080	**1,200**	40.6		51.8		31.3		41.6		37.1		33.4		45.1		38.5		41.2		48.1	
Zinc	mg/kg	**1,080**	700	215		71		361		85.8		537		78.4		111		1,110		264		92.5	
Moisture	percent	-	-	10.7		7.26		12.6		9.85		12	J	9.43	J	5.61	J	19.8		5.61		11.9	
pH (1:2 soil:water)	pH Units	-	-	7.36		8.02		8.18		8.28		8.36		8.50		8.45		8.15		8.16		7.43	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 4-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA		Mill/ETA	
Sample ID				CH12-101-PZ002-SOC		CH14-105-BH003-SOA		CH14-105-BH903-SOA		CH14-105-BH003-SOD		CH14-105-BH003-SOD-B		CH14-105-BH003-SOE		CH14-105-BH003-SOF		CH14-105-BH003-SOG	
Sample Interval (mbgs)				1.52 - 2.12		0.0 - 0.46		0.0 - 0.46		2.29 - 2.74		2.29 - 2.74		3.15 - 3.50		3.81 - 4.27		4.27 - 4.72	
Sample Date				6/24/2012		8/2/2014		8/2/2014		8/2/2014		8/2/2014		8/2/2014		8/2/2014		8/2/2014	
Geological Unit						Tailings		Tailings		Tailings		Tailings		Alluv		Alluv		Alluv	
Analyte	**Unit**	**12x Median Soil Content [a]**	**10x Crustal Abundance[b]**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	20,000		277		364		2,140		5,490		11,600		NT		16,500	
Antimony	mg/kg	**60**	2	0.61		16.7		17.6		43.4		30.7		1.9		NT		2.26	
Arsenic	mg/kg	**72**	18	11.4		269		287		360		222		22		NT		27.1	
Barium	mg/kg	**6,000**	4,250	292		1.38	U	15.2	J	6.46		14.7		116	J	NT		121	
Beryllium	mg/kg	**72**	30	0.73		0.2	U	0.2	U	0.49		0.82		0.53		NT		0.91	
Bismuth	mg/kg	-	**0.085**	0.30		2.21		2.32		1.35		0.96		0.26		NT		0.58	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	NT		10	U
Cadmium	mg/kg	**4.2**	1.5	0.307		1.06		0.658		27.4		27.1		7.68	J	NT		3.38	
Calcium	mg/kg	180,000	**415,000**	9,670		522		471		2,310		3,640		5,830	J	NT		4,930	
Chromium	mg/kg	840	**1,020**	47.5		0.6		0.76		10.7		16		27.2		NT		54.2	
Cobalt	mg/kg	96	**250**	14.8		143		142		110		72.3		11.5		NT		17	
Copper	mg/kg	360	**600**	34.9		446		415		1,900		1,750		110		NT		102	
Iron	mg/kg	480,000	**563,000**	29,900		217,000		223,000		272,000		206,000		31,000		NT		37,900	
Lead	mg/kg	**420**	140	30.1		4,010		5,280		8,000		9,830		337		NT		580	
Lithium	mg/kg	**300**	200	28.4		5	U	5	U	5	U	8.5		21.4		NT		40.4	
Magnesium	mg/kg	60,000	**233,000**	9,480		26		32		3,300		3,710		5,540		NT		7,330	
Manganese	mg/kg	**12,000**	9,500	597		7		6.6		1,560		1,150		191		NT		273	
Mercury	mg/kg	0.72	**0.85**	0.045		7.8		7.91		8.96		8.36		0.539		NT		0.593	
Molybdenum	mg/kg	**24**	12	0.95		6.67		6.52		7.18		6.46		0.7		NT		0.58	
Nickel	mg/kg	600	**840**	44.6		9.05		8.39		37.7		20.4		20.7		NT		34.7	
Phosphorus	mg/kg	9,600	**10,500**	613		50	U	50	U	346		444		1,520	J	NT		569	
Potassium	mg/kg	168,000	**208,500**	1,970		210		210		350		600		990		NT		1,310	
Selenium	mg/kg	**4.8**	0.5	0.47		1.5		1.58		0.77		0.6		0.2	U	NT		0.2	U
Silver	mg/kg	-	**0.75**	0.21		12.5		12.2		30.8		22		0.96		NT		1.5	
Sodium	mg/kg	60,000	**235,500**	560		100	U	100	U	100	U	100	U	340		NT		320	
Strontium	mg/kg	3,000	**3,700**	56.9		6.28		7.68		7.44		9.96		68.3	J	NT		36.5	
Sulphur	mg/kg	**8,400**	3,500	NT		228,000		261,000		244,000		37,300		9,600		NT		22,700	
Thallium	mg/kg	**108**	8.5	0.19		4.81		5.15		10		6.89		0.355		NT		0.618	
Tin	mg/kg	**48**	23	2	U	2.2		2.1		8.5		7.3		2	U	NT		2	U
Titanium	mg/kg	-	**56,500**	572		12.6		12.9		22.3		120		297		NT		523	
Uranium	mg/kg	24	**27**	1.51		0.142		0.143		2.56		7.8		1.72	J	NT		2.99	
Vanadium	mg/kg	1,080	**1,200**	47.8		1.26		1.75		16.3		20.7		26		NT		36.1	
Zinc	mg/kg	**1,080**	700	82.8		808		525		23,800		27,600		1,860		NT		2,880	
Moisture	percent	-	-	12.9		3.42	J			14.2	J	35.6	J	NT		15		NT	
pH (1:2 soil:water)	pH Units	-	-	7.34		2.05		2.35		5.85		4.98		4.82		NT		NT	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		0.1	U	0.1	U	0.25		0.1	R	NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		0.8	U	0.8	U	2.12		0.8	R	NT		NT		NT	

Table 4-1. Total Metals Analysis and General Chemical Parameter
Results (2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Notes:

[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London

[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).

12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.

Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.

Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content ***and*** 10x the crustal abundance.

$CaCO_3$ = calcium carbonate
ETA = Emergency Tailings Area
J = This analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NT = not tested
QA/QC = Quality Assurance and Quality Control
R = Data rejected
U = This analyte was analyzed for but not detected at the specified detection limit

Table 4-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential						Neutralization Potential					
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH14-105-BH003-SOA	Mill Area/ETA	0	0.5	8/2/2014	1.77		1,670		0.56		228,000		691	1	U	10	NT		0.014
CH14-105-BH903-SOA	Mill Area/ETA	0	0.5	8/2/2014	1.78		2,020		0.58		261,000		793	1	U	10	NT		0.013
CH14-105-BH003-SOD	Mill Area/ETA	2.3	2.7	8/2/2014	4.74		8,580		0.66		244,000		695	35		350	NT		0.5
CH14-105-BH003-SOD-B	Mill Area/ETA	2.3	2.7	8/2/2014	NT		2,370		0.42		37,300		55	1	U	10	NT		0.2
CH14-105-BH003-SOE	Mill Area/ETA	3.2	204	8/2/2014	NT		NT		NT		9,600		*30*	NT		NC	NT		NC
CH14-105-BH003-SOG	Mill Area/ETA	4.3	4.7	8/2/2014	NT		NT		NT		22,700		*70.9*	NT		NC	NT		NC

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Analytical results for neutralization potential by the AOAC 955.01 and MOD-SOBEK-3.2.3 methods are reported; results by the MOD-SOBEK-3.2.3 method are indicated using "*".

AOAC 955.01 is the preferred analytical method for neutralization potential; however, MOD-SOBEK-3.2.3 was applied to some samples collected in 2012 due to miscommunication.

Analytical results by the AOAC 955.01 method should be considered in future analysis and decision-making process.

Calculated values of acid potential presented italics were calculated based on total sulphur content, and represent conservative estimates of the acid generation potential

$CaCO_3$ = calcium carbonate

CaO = calcium oxide

ETA = Emergency Tailings Area

J = Analyte was present but the reported value may not be accurate or precise.

kg = kilogram

LMB =

mg/kg = milligram per kilogram

NC = not calculated

NP/AP = nuetralization potential divided by acid potential

NT = not tested

ppm = parts per million

QA/QC = Quality Assurance and Quality Control

U = This analyte was analyzed for but not detected at the specified detection limit.

Table 4-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	Mill / ETA	Mill / ETA	Mill / ETA
Sample ID			**CH14-105-BH003-SOA**	**CH14-105-BH003-SOD**	**CH14-105-BH003-SOD-B**
Depth From (mbgs)			0	2.3	2.3
Depth From (mbgs)			0.5	2.7	2.7
Sample Date			8/2/2014	8/2/2014	8/2/2014
pH	Result (pH units)	6.5-9.0	2.16	5.52	4.41
	Result Qualifier		J	J	J
Acidity	Result (mg/L)	-	2350	684	3210
	Result Qualifier		J	J	J
Total Alkalinity	Result (mg/L)	-	1	9.8	1
	Result Qualifier		R	J	R
Specific Conductance	Result (µS/cm)	-	5710	1990	4880
	Result Qualifier				
ORP Leachable	Result (mV)	-	397	19	224
	Result Qualifier		J	J	J
Aluminum	Result (mg/L)	0.005 to 0.1[b]	19.9	0.072	6.16
	Result Qualifier		J	J	J
Antimony	Result (mg/L)	1.6	0.172	0.001	0.0029
	Result Qualifier		J	UJ	J
Arsenic	Result (mg/L)	0.005	0.564	0.01	0.023
	Result Qualifier		J	UJ	J
Barium	Result (mg/L)	2.3	0.0085	0.016	0.02
	Result Qualifier		J	J	UJ
Beryllium	Result (mg/L)	0.0053	0.0015	0.005	0.01
	Result Qualifier		J	UJ	UJ
Boron	Result (mg/L)	1.5	0.02	0.1	0.2
	Result Qualifier		UJ	UJ	UJ
Bromide	Result (mg/L)	-	NT	NT	NT
	Result Qualifier				
Cadmium	Result (mg/L)	Variable[c]	0.0148	0.0155	0.334
	Result Qualifier		J	J	J
Calcium	Result (mg/L)	-	179	140	240
	Result Qualifier				
Chloride	Result (mg/L)	120	NT	NT	NT
	Result Qualifier				
Chromium	Result (mg/L)	0.0089	0.0608	0.005	0.01
	Result Qualifier		J	UJ	UJ
Cobalt	Result (mg/L)	-	0.329	1.68	1.28
	Result Qualifier		J	J	J
Copper	Result (mg/L)	.002 to 0.004	2.04	0.01	0.035
	Result Qualifier		J	UJ	J
Fluoride	Result (mg/L)	0.12	NT	NT	NT
	Result Qualifier				
Iron	Result (mg/L)	0.3	1000	35.6	209
	Result Qualifier				
Lead	Result (mg/L)	0.001	2.49	4.41	2.91

Table 4-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	Mill / ETA	Mill / ETA	Mill / ETA
Sample ID			CH14-105-BH003-SOA	CH14-105-BH003-SOD	CH14-105-BH003-SOD-B
~~Lead~~	Result Qualifier		J	J	J
Lithium	Result (mg/L)	-	0.021	0.214	0.18
	Result Qualifier		J	J	J
Magnesium	Result (mg/L)	-	2.04	70.4	83.9
	Result Qualifier				
Manganese	Result (mg/L)	-	0.297	49.6	27.1
	Result Qualifier		J	J	J
Mercury	Result (mg/L)	0.000026	0.000106	0.00005	0.00005
	Result Qualifier		J	R	R
Molybdenum	Result (mg/L)	0.073	0.00111	0.001	0.002
	Result Qualifier		J	UJ	UJ
Nickel	Result (mg/L)	0.025	0.114	1.98	0.997
	Result Qualifier		J	J	J
Nitrate	Result (mg/L)	13	NT	NT	NT
	Result Qualifier				
Nitrite	Result (mg/L)	0.06	NT	NT	NT
	Result Qualifier				
Potassium	Result (mg/L)	-	6.7	3.8	10
	Result Qualifier				U
Selenium	Result (mg/L)	0.001	0.0073	0.005	0.01
	Result Qualifier		J	UJ	UJ
Silicon	Result (mg/L)	-	15.9	2.88	8.45
	Result Qualifier				
Silver	Result (mg/L)	0.0001	0.00129	0.0005	0.001
	Result Qualifier		J	UJ	UJ
Sodium	Result (mg/L)	-	2	2	10
	Result Qualifier		U	U	U
Strontium	Result (mg/L)	-	0.073	0.0421	0.098
	Result Qualifier		J	J	J
Sulphate	Result (mg/L)	100	3130	1340	4190
	Result Qualifier		J	J	J
Sulphur	Result (mg/L)	-	982	583	1630
	Result Qualifier				
Thallium	Result (mg/L)	0.0008	0.0427	0.0032	0.0265
	Result Qualifier		J	J	J
Titanium	Result (mg/L)	0.1	0.135	0.013	0.05
	Result Qualifier				U
Uranium	Result (mg/L)	0.015	0.00512	0.00474	0.00061
	Result Qualifier		J	J	J
Vanadium	Result (mg/L)	-	0.114	0.01	0.02
	Result Qualifier		J	UJ	UJ
Zinc	Result (mg/L)	0.03	18.3	350	1730
	Result Qualifier		J	J	J

Table 4-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit	Screening Level	Mill / ETA	Mill / ETA	Mill / ETA
Sample ID		CH14-105-BH003-SOA	CH14-105-BH003-SOD	CH14-105-BH003-SOD-B

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$/ 1000 mg/L

[d]CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f]CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

> = greater
≥ = greater than or equal to
< = less than
≤ = less than or equal to
°C = degrees Celsius
µg/L = micrograms per litre
µS/cm = micro-Siemens per centimetre
CCME = Canadian Council of Ministers of the Environment
CWQG = Canadian Water Quality Guidelines
ETA = Emergency Tailings Area
FIGQG =
J - analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/L = milligrams per litre
mV = millivolt
NTU = Nephelometric Tubidity Unit
ORP = Oxidation-reduction Potential
R = result has been rejected for use
U = analyte was analyzed for but not detected at the specified detection limit
UJ = analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the a

Table 4-4a. Mill Area Seep Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH-FD-64							
CH-FD-71							
CH-MILL-01					88.3% (-)		
CH-MILL-02					54.0% (+)		
CH-MILL-03		50.0% (.)	59.2% (+)	64.0% (+)	54.0% (-)	50.0% (.)	59.2% (+)
CH-MILL-04					80.1% (+)		
SRK-FD32							
SRK-FD33		86.4% (+)	50.0% (+)	98.2% (sig -)	99.9% (sig -)	86.4% (+)	64.0% (+)
SRK-FD34							
SRK-FD35							
SRK-FD46							

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH-FD-64	ND	ND	ND	ND	ND	ND	ND
CH-FD-71	ND	ND	ND	ND	ND	ND	ND
CH-MILL-01	ND	ND	ND	ND	NT	ND	ND
CH-MILL-02	ND	ND	ND	ND	NT	ND	ND
CH-MILL-03	ND	NT	NT	NT	NT	NT	NT
CH-MILL-04	ND	ND	ND	ND	NT	ND	ND
SRK-FD32	ND	ND	ND	ND	ND	ND	ND
SRK-FD33	ND	NT	NT	↓	↓	NT	NT
SRK-FD34	ND	ND	ND	ND	ND	ND	ND
SRK-FD35	ND	ND	ND	ND	ND	ND	ND
SRK-FD46	ND	ND	ND	ND	ND	ND	ND

Table 4-4b. Emergency Tailings Area Seep Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH-ETA-01					96.5% (sig -)		
CH-ETA-02					63.7% (-)		
CH-ETA-03							
FCS-2		86.4% (-)	86.4% (-)		50.0% (+)	86.4% (-)	86.4% (-)
FCS-3					70.3% (+)		
FCS-4	57.8% (-)	61.3% (+)	97.0% (sig +)	55.8% (-)	100.0% (sig -)	86.4% (-)	99.4% (sig +)

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH-ETA-01	ND	ND	ND	ND	↓	ND	ND
CH-ETA-02	ND	ND	ND	ND	NT	ND	ND
CH-ETA-03	ND	ND	ND	ND	ND	ND	ND
FCS-2	ND	NT	NT	ND	NT	NT	NT
FCS-3	ND	ND	ND	ND	NT	ND	ND
FCS-4	NT	NT	↑	NT	↓	NT	↑

Notes:

Mann-Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Non-detectable concentrations were reduced to half the non-detectable limit.

Duplicate measurements were removed.

↓ - Significant decreasing trend

↑ - Significant increasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Table 5-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA	
Sample ID				CH13-204-MW016C-SOA		CH13-204-MW916C-SOA		CH13-204-MW016E-SOA		CH13-204-MW016E-SOB		CH13-204-MW016E-SOC		CH13-204-MW016E-SOD		CH13-204-MW016E-SOE		CH13-204-MW016E-SOF		CH13-204-MW016E-SOG		CH13-204-MW016E-SOH	
Sample Interval (mbgs)				6.5 - 7		6.5 - 7		0.5 - 1		3 - 3.5		9.5 - 10		10 - 10.5		11.5 - 12		12.5 - 13		18.5 - 19		21.5 - 22	
Sample Date				8/15/2013		8/15/2013		8/12/2013		8/12/2013		8/12/2013		8/12/2013		8/12/2013		8/12/2013		8/13/2013		8/13/2013	
Geological Unit				Tailings		Tailings		Tailings		Tailings		Org + Tailings		Alluv		Alluv		Alluv		Alluv		Alluv	
Analyte	**Unit**	**12x Median Soil Content [a]**	**10x Crustal Abundance [b]**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	3,920	J	2,700	J	5,660	J	2,340	J	2,950	J	5,110	J	21,000	J	13,600	J	29,900	J	16,000	J
Antimony	mg/kg	**60**	2	43.7	J	40.9	J	41.8	J	31.6	J	51.4	J	3.56	J	0.44	J	0.76	J	0.46	J	1.02	J
Arsenic	mg/kg	**72**	18	546	J	562	J	953	J	959	J	552	J	26.8	J	8.91	J	14.3	J	11.7	J	19.9	J
Barium	mg/kg	**6,000**	4,250	445	J	514	J	338	J	709	J	439	J	236	J	144	J	366	J	153	J	110	J
Beryllium	mg/kg	**72**	30	0.62	J	0.53	J	0.53	J	0.27	J	0.52	J	0.2	UJ	0.76	J	0.55	J	0.79	J	0.71	J
Bismuth	mg/kg	-	**0.085**	1.37	J	1.57	J	1.21	J	0.78	J	0.88	J	0.2	UJ	0.30	J	0.38	J	0.2	UJ	0.33	J
Boron	mg/kg	-	**100**	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ
Cadmium	mg/kg	**4.2**	1.5	23.3	J	14.8	J	20.6	J	16.2	J	8.35	J	0.755	J	0.311	J	0.335	J	0.184	J	0.338	J
Calcium	mg/kg	180,000	**415,000**	4,910	J	3,640	J	8,010	J	6,600	J	3,550	J	4,570	J	6,540	J	6,330	J	29,700	J	12,400	J
Chromium	mg/kg	840	**1,020**	33.3	J	21	J	23.3	J	14.4	J	33	J	12.5	J	34.2	J	36.1	J	43.1	J	34.6	J
Cobalt	mg/kg	96	**250**	111	J	97.8	J	112	J	181	J	105	J	7.24	J	13.3	J	11.2	J	17.4	J	13.9	J
Copper	mg/kg	360	**600**	1,950	J	1,400	J	1,400	J	2,340	J	1,210	J	78.1	J	25.8	J	38.9	J	45.8	J	49.7	J
Iron	mg/kg	480,000	**563,000**	310,000	J	259,000	J	212,000	J	330,000	J	266,000	J	18,800	J	28,300	J	27,300	J	36,400	J	31,500	J
Lead	mg/kg	**420**	140	7,260	J	4,900	J	4,980	J	4,710	J	4,350	J	351	J	30.5	J	69.8	J	10.2	J	29.5	J
Lithium	mg/kg	**300**	200	5	UJ	5	UJ	5.4	J	5	UJ	5	UJ	5	UJ	43.9	J	27.3	J	35.8	J	25.6	J
Magnesium	mg/kg	60,000	**233,000**	3,900	J	2,730	J	3,190	J	3,790	J	3,730	J	2,350	J	7,940	J	7,020	J	15,500	J	8,720	J
Manganese	mg/kg	**12,000**	9,500	1,650	J	1,090	J	1,800	J	3,640	J	1,080	J	163	J	334	J	324	J	483	J	335	J
Mercury	mg/kg	0.72	**0.85**	6.55	J	5.03	J	5.59	J	4.56	J	3.19	J	0.267	J	0.04	J	0.057	J	0.008	J	0.033	J
Molybdenum	mg/kg	**24**	12	3.97	J	4.06	J	6.33	J	4.41	J	4.02	J	0.5	UJ	1.01	J	2.11	J	0.81	J	2.71	J
Nickel	mg/kg	600	**840**	32.1	J	31.9	J	27.1	J	20.6	J	73.5	J	13.4	J	39.0	J	29.6	J	39.9	J	45.6	J
Phosphorus	mg/kg	9,600	**10,500**	454	J	346	J	308	J	179	J	503	J	471	J	534	J	519	J	624	J	598	J
Potassium	mg/kg	168,000	**208,500**	670	J	430	J	670	J	290	J	400	J	760	J	1,850	J	2,330	J	5,040	J	2,190	J
Selenium	mg/kg	**4.8**	0.5	1.21	J	1.05	J	0.84	J	1.16	J	0.97	J	0.2	UJ	0.29	J	0.36	J	0.29	J	0.42	J
Silver	mg/kg	-	**0.75**	18.7	J	15.2	J	12.0	J	11	J	14.7	J	0.95	J	0.19	J	0.35	J	0.14	J	0.19	J
Sodium	mg/kg	60,000	**235,500**	100	UJ	100	UJ	100	UJ	100	UJ	100	UJ	560	J	800	J	350	J	1,260	J	460	J
Strontium	mg/kg	3,000	**3,700**	30.2	J	22.6	J	31.1	J	31.4	J	21.9	J	27.8	J	95.1	J	44	J	93.4	J	54.9	J
Sulphur	mg/kg	**8,400**	3,500	217,000	J	191,000	J	217,000	J	307,000	J	269,000	J	44,700	J	41,900	J	4,600	J	2,500	J	1,400	J
Thallium	mg/kg	**108**	8.5	6.26	J	6.64	J	5.96	J	4.37	J	7.66	J	0.517	J	0.197	J	0.257	J	0.34	J	0.212	J
Tin	mg/kg	**48**	23	8.2	J	5.4	J	3.7	J	4.2	J	4.4	J	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ
Titanium	mg/kg	-	**56,500**	44.9	J	27.7	J	49.3	J	27.9	J	41.5	J	287	J	529	J	568	J	862	J	412	J
Uranium	mg/kg	24	**27**	2.96	J	2.19	J	4	J	1.89	J	2.17	J	0.618	J	0.992	J	1.41	J	0.757	J	1.32	J
Vanadium	mg/kg	1,080	**1,200**	32.9	J	21.1	J	20.4	J	13	J	19.7	J	18.6	J	36.8	J	49	J	63.5	J	43.4	J
Zinc	mg/kg	**1,080**	700	17,100	J	10,600	J	8,810	J	11,000	J	6,150	J	511	J	115	J	162	J	77.7	J	113	J
Moisture	percent	-	-	25.4	J	21.6	J	14.8	J	12	J	22.9	J	32.3	J	7.65	J	11.2	J	3.12	J	11.4	J
pH (1:2 soil:water)	pH Units	-	-	5.17	J	6.35	J	3.20	J	4.63	J	5.24	J	6.23	J	7.30	J	8.17	J	8.32	J	8.35	J
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.85	J	0.63	J	0.2	J	0.3	J	0.39	J	0.5	J	0.18	J	0.26	J	0.62	J	0.45	J
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	7.07	J	5.23	J	1.69	J	2.48	J	3.21	J	4.18	J	1.48	J	2.15	J	5.15	J	3.77	J

Table 5-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA	
Sample ID				CH13-204-MW016E-SOI		CH13-204-MW016E-SOJ		CH13-204-MW016E-SOK		CH14-015-MW001A-SOA		CH14-015-MW901A-SOA		CH14-015-MW001C-SOA		CH14-015-MW001C-SOF		CH14-015-MW001C-SOG		CH14-015-MW001C-SOH		CH14-015-MW001C-SOI	
Sample Interval (mbgs)				26 - 26.5		29 - 29.5		34.5 - 35		13.71 - 14.02		13.71 - 14.02		2.13 - 2.44		16.46 - 16.76		19.2 - 19.5		20.42 - 20.73		21.64 - 21.95	
Sample Date				8/13/2013		8/13/2013		8/13/2013		9/6/2014		9/6/2014		9/3/2014		9/3/2014		9/4/2014		9/4/2014		9/4/2014	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]	Lacust or Till		Lacust or Till		weathered BR		Tailings		Tailings		Tailings		Tailings		Alluv		Alluv		Alluv	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	18,000	J	23,900	J	18,000	J	14,500		14,300		470		884		14,800		17,400		14,400	
Antimony	mg/kg	**60**	2	1.18	J	0.36	J	0.62	J	27.9		32.9		53.1		33.1		1.51		0.57		0.35	
Arsenic	mg/kg	**72**	18	18.2	J	5.72	J	12.3	J	194		201		1,010		394		6.71		6.18		5.16	
Barium	mg/kg	**6,000**	4,250	125	J	133	J	86.5	J	405		366		174		19.3		125		119		97.7	
Beryllium	mg/kg	**72**	30	0.77	J	1.67	J	0.56	J	1.10		0.88		0.2	U	0.31		0.74		0.71		0.55	
Bismuth	mg/kg	-	**0.085**	0.40	J	2.02	J	0.2	UJ	0.54		0.81		0.85		0.24		0.54		0.46		0.3	
Boron	mg/kg	-	**100**	10	UJ	10	UJ	10	UJ	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.655	J	0.196	J	0.152	J	16.1		16.2		20.5		25.3		0.496		0.644		0.498	
Calcium	mg/kg	180,000	**415,000**	7,230	J	22,800	J	20,000	J	15,100		21,300		882		2,030		4,450		6,470		5,100	
Chromium	mg/kg	840	**1,020**	39.7	J	58.4	J	83.4	J	65.5		75.2		6.03		9.46		32.6		37.3		27.6	
Cobalt	mg/kg	96	**250**	15.9	J	14.1	J	15.3	J	71.1		77.3		153		114		10.1		9.38		7.87	
Copper	mg/kg	360	**600**	47.2	J	30.7	J	32.6	J	938		1,080		1,550		1,070		37.8		20.7		14.7	
Iron	mg/kg	480,000	**563,000**	29,800	J	30,500	J	32,400	J	177,000		186,000		368,000		308,000		25,000		25,800		21,900	
Lead	mg/kg	**420**	140	35.2	J	9.63	J	10.2	J	4,660		5,940		3,440		4,320		49.1		32.2		20.2	
Lithium	mg/kg	**300**	200	30.3	J	38.3	J	36.2	J	25.3		23		5	U	5	U	29.3		33.4		25.7	
Magnesium	mg/kg	60,000	**233,000**	8,950	J	12,200	J	14,200	J	16,700		18,800		214		2,290		6,200		7,860		6,170	
Manganese	mg/kg	**12,000**	9,500	401	J	386	J	414	J	1,370		1,470		317		700		210		232		207	
Mercury	mg/kg	0.72	**0.85**	0.044	J	0.012	J	0.006	J	7.02	J	6.45	J	8.64	J	9.65	J	0.051	J	0.013	J	0.008	J
Molybdenum	mg/kg	**24**	12	1.76	J	2.03	J	0.87	J	5.68		6.55		2.36		3.01		0.68		0.96		0.89	
Nickel	mg/kg	600	**840**	49.4	J	52.0	J	51.7	J	76.9		96.3		13.3		33		27.1		28.2		20.2	
Phosphorus	mg/kg	9,600	**10,500**	872	J	633	J	661	J	601	J	1,160	J	246		336		588		886		521	
Potassium	mg/kg	168,000	**208,500**	2,480	J	2,720	J	2,340	J	2,020		1,920		100	U	250		1,420		1,910		1,850	
Selenium	mg/kg	**4.8**	0.5	0.31	J	0.41	J	0.36	J	0.55		1.07		0.65		0.71		0.36		0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.23	J	0.10	J	0.1	UJ	14		15.7		18.2		16.8		0.21		0.11		0.1	U
Sodium	mg/kg	60,000	**235,500**	490	J	930	J	270	J	100	U	100		100	U	100	U	380		640		530	
Strontium	mg/kg	3,000	**3,700**	49.5	J	170	J	77.5	J	28.1		44.7		7.55		5.35		35.9		55		42.6	
Sulphur	mg/kg	**8,400**	3,500	1,200	J	2,700	J	2,300	J	117,000	J	11,000	J	393,000		320,000		12,400		7,100		1,900	
Thallium	mg/kg	**108**	8.5	0.274	J	0.199	J	0.187	J	4.06		4.43		5.89		11.8		0.2		0.18		0.156	
Tin	mg/kg	**48**	23	2	UJ	2	UJ	2	UJ	4.90		5.9		5.2		4.4		2	U	3.5		2	U
Titanium	mg/kg	-	**56,500**	557	J	637	J	439	J	177		158		5.4		16.8		481		576		560	
Uranium	mg/kg	24	**27**	1.26	J	1.74	J	1.02	J	1.59		2.6		0.91		1.09		4.49		1.2		0.945	
Vanadium	mg/kg	1,080	**1,200**	47.2	J	46.4	J	48	J	48.6		59.2		9.26		15.6		31.5		33.8		30.3	
Zinc	mg/kg	**1,080**	700	107	J	68.6	J	56.3	J	10,800		10,100		11,400		16,300		669		319		229	
Moisture	percent	-	-	9.34	J	3.64	J	7.12	J	11.9	J	11.2	J	9.74	J	12.9	J	24	J	12.4	J	6.04	J
pH (1:2 soil:water)	pH Units	-	-	7.95	J	8.48	J	8.56	J	6.35		6.28		2.68		5.62		4.19		5.16		5	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.16	J	0.88	J	0.73	J	0.98	J	0.1	UJ	0.1	UJ	0.33	J	0.1	UJ	0.1	UJ	0.1	UJ
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.32	J	7.35	J	6.06	J	8.13	J	0.8	UJ	0.8	UJ	2.71	J	0.8	UJ	0.8	UJ	0.8	UJ

Table 5-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA	
Sample ID				CH14-015-MW001C-SOJ		CH14-015-MW001C-SOK		CH14-015-MW002C-SOB		CH14-015-MW002C-SOD		CH14-201-TH001-SOF		CH14-201-TH001-SOG		CH14-201-TH001-SOJ		CH14-201-TH002-SOB		CH14-201-TH002-SOH		CH14-201-TH002-SOJ	
Sample Interval (mbgs)				23.77 - 24.08		25.60 - 25.91		6.71 - 7.01		12.8 - 13.11		4.75 - 5.029		6.10 - 6.55		9.75 - 10.21		0.61 - 1.07		9.14 - 9.60		12.19 - 12.65	
Sample Date				9/4/2014		9/4/2014		9/6/2014		9/6/2014		8/17/2014		8/17/2014		8/17/2014		8/14/2014		8/14/2014		8/15/2014	
Geological Unit				Alluv		Alluv		Tailings		Tailings		Tailings		Tailings		Tailings		Tailings		Tailings		Tailings	
Analyte	**Unit**	**12x Median Soil Content [a]**	**10x Crustal Abundance [b]**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	13,100		11,800		196		325		3,490		704		930		1,930		428		1,050	
Antimony	mg/kg	**60**	2	0.66		0.47		49.0		61.2		48.2		24.7		20.9		32.5		18.6		52.1	
Arsenic	mg/kg	**72**	18	13.9		9.27		752		432		866		396		566		882		558		489	
Barium	mg/kg	**6,000**	4,250	114		103		70.3		125		134		50.0		11.3		61.6		13.8		35.8	
Beryllium	mg/kg	**72**	30	0.75		0.59		0.2	U	0.25		0.32		0.24		0.30		0.20	U	0.20		0.39	
Bismuth	mg/kg	-	**0.085**	0.49		0.47		0.81		1.07		0.95		0.58		0.43		0.97		0.28		1.34	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.335		0.257		19.9		32.4		17.9		10.3		11.2		9.15		10.7		13.8	
Calcium	mg/kg	180,000	**415,000**	3,960		3,790		1,430		1,340		7,670		1,140		2,000		4,080		919		2,400	
Chromium	mg/kg	840	**1,020**	30.2		22.4		2.51		3.56		22		6.62		14.4		13.2		8.65		12	
Cobalt	mg/kg	96	**250**	9.26		7.15		160		156		72.7		96.5		139		104		164		125	
Copper	mg/kg	360	**600**	32.8		25.7		1,100		1,280		1,410		1,050		1,630		978		1,460		1,650	
Iron	mg/kg	480,000	**563,000**	27,200		22,100		371,000		349,000		187,000		228,000		294,000		212,000		294,000		272,000	
Lead	mg/kg	**420**	140	55.6		35.5		3,320		3,180		6,710		4,120		2,400		4,000		1,990		3,120	
Lithium	mg/kg	**300**	200	24.4		22.9		5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Magnesium	mg/kg	60,000	**233,000**	5,480		5,180		1,280		1,830		4,550		1,270		1,870		2,540		1,370		2,070	
Manganese	mg/kg	**12,000**	9,500	223		190		1,200		1,160		3,670		567		1,110		2,310		884		894	
Mercury	mg/kg	0.72	**0.85**	0.024	J	0.019	J	7.77	J	13.2	J	6.92	J	4.03	J	3.51	J	3.51	J	3.4	J	4.99	J
Molybdenum	mg/kg	**24**	12	0.86		0.56		2.4		2.88		6.03		2.85		2.23		3.71		2.38		4.30	
Nickel	mg/kg	600	**840**	31.1		24.1		10		21		26.00		17.3		18.6		25.3		15.2		20.9	
Phosphorus	mg/kg	9,600	**10,500**	763		675		193		239		249		171		159		218		103		273	
Potassium	mg/kg	168,000	**208,500**	2,180		1,750		100	U	100	U	490		130		160		230		100	U	150	
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.2	U	0.84		1.1		0.72		0.9		1.09		0.89		1.08		1.73	
Silver	mg/kg	-	**0.75**	0.23		0.15		17.9		29.6		18.7		12.3		9.68		10.2		9.44		33.2	
Sodium	mg/kg	60,000	**235,500**	320		390		100	U	100	U	100	U	100	U	110		100	U	100	U	100	U
Strontium	mg/kg	3,000	**3,700**	33.5		39.5		8.22		6.71		32.7		7.68		10.1		21.2		5.02		11.5	
Sulphur	mg/kg	**8,400**	3,500	2,100		1,000		403,000		374,000		210,000		278,000		335,000		253,000		408,000		305,000	
Thallium	mg/kg	**108**	8.5	0.271		0.206		5.86		10.5		7.1		4.33		3.53		4.79		3.36		7.22	
Tin	mg/kg	**48**	23	2	U	2	U	5.1		6.5		3.8		2.7		4		2.3		3		6.6	
Titanium	mg/kg	-	**56,500**	591		402		3.8		8.6		35.2		8.1		14.3		21.5		7.2		8.5	
Uranium	mg/kg	24	**27**	2.18		1.67		1.09		1.11		2.16		0.904		1.16		1.62		0.691		1.99	
Vanadium	mg/kg	1,080	**1,200**	35.1		26.5		4.78		6.77		18.6		9.7		10.3		11.4		7.25		16.2	
Zinc	mg/kg	**1,080**	700	319		280		13,100		20,900		11,700		7,660		8,200		7,210		7,890		9,700	
Moisture	percent	-	-	16.9	J	12	J	4.21	J	10.1	J	NT		NT		20.8	J	NT		13.4	J	12.9	J
pH (1:2 soil:water)	pH Units	-	-	3.68		4.34	J	4.55		6.21		6.6		6.32		6.74		4.29	J	5.95	J	6.29	J
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	UJ	0.1	UJ	0.17	J	0.35	J	NT		0.48	J	0.71	J	0.46	J	0.42	J	0.65	J
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	UJ	0.8	UJ	1.38	J	2.92	J	NT		4	J	5.91	J	3.8	J	3.49	J	5.4	J

Table 5-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA		RCTA	
Sample ID				CH14-201-TH002-SOM		CH14-201-TH002-SON		CH14-201-TH002-SOP		CH14-201-TH002-SOP-B		CH14-201-TH003-SOD-B		CH14-201-TH004-SOE		CH14-201-TH004-SOF		CH14-201-TH006-SOA		CH14-201-TH006-SOE		CH15-201-MW010_SOh	
Sample Interval (mbgs)				15.85 - 16.31		16.76 - 17.22		19.81 - 20.27		19.81 - 20.27		3.05 - 3.51		4.57 - 5.03		6.10 - 6.55		0 - 0.46		5.18 - 5.64		5.72 - 7.01	
Sample Date				8/15/2014		8/16/2014		8/16/2014		8/16/2014		8/13/2014		8/13/2014		8/13/2014		8/11/2014		8/11/2014		11/14/2015	
Geological Unit		12x Median Soil Content [a]	10x Crustal Abundance [b]	Tailings		Tailings		Org		Silt		Till		Tailings		BR		Tailings		Alluv		native soil	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	609		570		15,400		3,130		20,500		775		28,600		2,660		13,500		15,400	
Antimony	mg/kg	**60**	2	15.0		15.8		4.35		55.6		1.71		25.1		8.05		38.4		2.33		0.48	
Arsenic	mg/kg	**72**	18	785		752		32.5		460		34.2		427		137		1,630		76.8		8.54	
Barium	mg/kg	**6,000**	4,250	19.8		15.1		77.6		59.6		278		38.5	J	39.4		68.1		260		92.6	
Beryllium	mg/kg	**72**	30	0.25		0.26		0.53		0.45		0.43		0.27		0.32		0.20	U	0.53		0.68	
Bismuth	mg/kg	-	**0.085**	0.51		0.54		0.23		1.28		0.2	U	0.77		0.33		0.75		0.26		0.23	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5	U
Cadmium	mg/kg	**4.2**	1.5	10.4		13.3		1.59		41.6		0.657		9.89		3.38		5.35		0.769		0.24	
Calcium	mg/kg	180,000	**415,000**	1,330		1,170		10,800		2,680		5,710		1,320		9,050		5,380		13,100		19,300	
Chromium	mg/kg	840	**1,020**	7.08		5.63		79.7		14		69.6		10.6		438		28		38.2		40.1	
Cobalt	mg/kg	96	**250**	149		146		23.5		105		15.5		96.1		54.6		82.2		13.3		13.9	
Copper	mg/kg	360	**600**	958		970		110		1,420		50.2		959		287		1,130		68.3		28.2	
Iron	mg/kg	480,000	**563,000**	286,000		281,000		38,300		233,000		43,000		263,000		105,000		178,000		30,700		30,500	
Lead	mg/kg	**420**	140	2,800		3,060		603		5,510		198		3,010		1,090		4,990		219		8.88	
Lithium	mg/kg	**300**	200	5	U	5	U	19.30		5	U	28.5		5	U	32.6		5	U	18.2		34.6	
Magnesium	mg/kg	60,000	**233,000**	1,380		1,300		10,600		1,910		13,400		1,730		29,500		881		7,790		9,320	
Manganese	mg/kg	**12,000**	9,500	821		758		359		1,340		409		852		823		237		295		409	
Mercury	mg/kg	0.72	**0.85**	3.86	J	4.8	J	0.407	J	16.9	J	0.237	J	3.61	J	1.12	J	5.22	J	0.216	J	0.01	
Molybdenum	mg/kg	**24**	12	2.21		2.25		1.97		7.13		0.88		3.57		2.24		4.83		0.83		1.64	
Nickel	mg/kg	600	**840**	21.8		19.3		70.4		31.9		51		20		124		18.2		31.5		37.6	
Phosphorus	mg/kg	9,600	**10,500**	129		132		710		758		438		184		1,050		465		595		1610	
Potassium	mg/kg	168,000	**208,500**	120		110		900		460		1,390		120		330		460		880		2,540	
Selenium	mg/kg	**4.8**	0.5	1.04		1.1		0.6		1.21		0.2	U	0.77		0.26		0.93		0.25		0.68	
Silver	mg/kg	-	**0.75**	6.66		6.81		1.09		22.80		0.55		10.2		3.18		15.3		0.67		0.12	
Sodium	mg/kg	60,000	**235,500**	100	U	100	U	410		100	U	650		100	U	120		100	U	490		288	
Strontium	mg/kg	3,000	**3,700**	5.52		4.92		17.4		18.9		38.1		8.95		38.8		14.8		95.7		55.7	
Sulphur	mg/kg	**8,400**	3,500	337,000		285,000		57,000		226,000		14,200		324,000		29,700		250,000		39,900		600	
Thallium	mg/kg	**108**	8.5	2.98		3.01		0.539		7.54		0.319		4.620		1.16		7.51		0.372		0.21	
Tin	mg/kg	**48**	23	2.8		2.6		2	U	6.2		2	U	3		2	U	2.9		2	U	2	U
Titanium	mg/kg	-	**56,500**	10		9.9		236		38.4		460		9.1		1,080		30.8		294		373	
Uranium	mg/kg	24	**27**	0.772		0.818		2.2		2.65		0.593		0.958		0.675		0.844		0.725		1.02	
Vanadium	mg/kg	1,080	**1,200**	5.08		5.02		40		24.1		34.6		9.38		141		21.2		27.7		42.1	
Zinc	mg/kg	**1,080**	700	7,640		9,590		1,200		27,500		1,690		7,400		2,220		3,700		383		68.9	
Moisture	percent	-	-	14.1	J	16.7	J	NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	6.2	J	6.08		6.74		6.17		3.15	J	4.57	J	7.17	J	2.87	J	7.05	J	8.33	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.4	J	0.35	J	0.19	J	0.63	J	0.1	UJ	0.45	J	NT		NT		0.38	J	NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	3.35	J	2.9	J	1.6	J	5.28	J	0.8	UJ	3.76	J	NT		NT		3.17	J	NT	

Table 5-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				RCTA		RCTA		RCTA	
Sample ID				CH15-201-MW010_SOn		CH15-201-MW010_SOw		CH15-201-MW910_SOw	
Sample Interval (mbgs)				10.24 - 11.58		19.2 - 20.73		19.2 - 20.73	
Sample Date		12x Median Soil Content [a]	10x Crustal Abundance [b]	11/14/2015		11/15/2015		11/15/2015	
Geological Unit				native soil		native soil		native soil	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	15,900		17,800		15,900	
Antimony	mg/kg	**60**	2	0.51		0.17		0.26	
Arsenic	mg/kg	**72**	18	9.08		9.47		8.31	
Barium	mg/kg	**6,000**	4,250	87.6		36.4		50.6	
Beryllium	mg/kg	**72**	30	0.73		0.88	J	0.47	J
Bismuth	mg/kg	-	**0.085**	0.23		0.2	U	0.2	U
Boron	mg/kg	-	**100**	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.26		0.15		0.14	
Calcium	mg/kg	180,000	**415,000**	16,000		30,900		24,900	
Chromium	mg/kg	840	**1,020**	34.8		37.5		32.4	
Cobalt	mg/kg	96	**250**	15.3		14.7		12.2	
Copper	mg/kg	360	**600**	40.4		17.2		18.3	
Iron	mg/kg	480,000	**563,000**	33,800		30,600		28,500	
Lead	mg/kg	**420**	140	11.3		7.76		7.74	
Lithium	mg/kg	**300**	200	33.9		44.2		39.5	
Magnesium	mg/kg	60,000	**233,000**	9,280		12,200		10,900	
Manganese	mg/kg	**12,000**	9,500	610		489		444	
Mercury	mg/kg	0.72	**0.85**	0.01		0.01		0.01	
Molybdenum	mg/kg	**24**	12	2.81		1.41		1.33	
Nickel	mg/kg	600	**840**	41.9		27.9		23.8	
Phosphorus	mg/kg	9,600	**10,500**	493		488		580	
Potassium	mg/kg	168,000	**208,500**	1,910		1,490		1,700	
Selenium	mg/kg	**4.8**	0.5	1.03		0.21		0.25	
Silver	mg/kg	-	**0.75**	0.13		0.1	U	0.1	U
Sodium	mg/kg	60,000	**235,500**	265		248		209	
Strontium	mg/kg	3,000	**3,700**	69.2		95.1		83.1	
Sulphur	mg/kg	**8,400**	3,500	1,200		600		700	
Thallium	mg/kg	**108**	8.5	0.17		0.14		0.15	
Tin	mg/kg	**48**	23	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	360		269		322	
Uranium	mg/kg	24	**27**	1.8		0.79		0.75	
Vanadium	mg/kg	1,080	**1,200**	40		55.3		48.8	
Zinc	mg/kg	**1,080**	700	79.8		52.7		52.7	
Moisture	percent	-	-	NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	8.16		8.56		8.55	
Organic Matter	percent	-	-	NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT	

Table 5-1. Total Metals Analysis and General Chemical Parameter
Results (2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Notes:

[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London

[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).

12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.

Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.

Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content ***and*** 10x the crustal abundance.

$CaCO_3$ = calcium carbonate
J = This analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NT = not tested
QA/QC = Quality Assurance and Quality Control
R = Data rejected
RCTA = Rose Creek Tailings Area
U = This analyte was analyzed for but not detected at the specified detection limit

Table 5-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Paste pH		Acid Potential								Neutralization Potential						Neutralization Potential Ratio (NP/AP)
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		
					Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/ tonne)		Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	
CH13-204-MW016C-SOA	RCTA	6.5	7	8/15/2013	5.39	J	9,930	J	0.75	J	217,000	J	625		26		260		NT		0.4
CH13-204-MW916C-SOA	RCTA	6.5	7	8/15/2013	5.45	J	9,930	J	0.83	J	NT		NC		29		290		NT		NC
CH13-204-MW016E-SOA	RCTA	0.5	1	8/12/2013	3.71	J	10,000	J	1.9	J	217,000	J	603		1		10		NT		0.02
CH13-204-MW016E-SOB	RCTA	3	3.5	8/12/2013	5.44	J	10,000	J	0.64	J	307,000	J	920		26		260		NT		0.3
CH13-204-MW016E-SOC	RCTA	9.5	10	8/12/2013	6.06	J	10,000	J	0.66	J	269,000	J	808		22		220		NT		0.3
CH13-204-MW016E-SOD	RCTA	10	10.5	8/12/2013	7.04	J	1,880	J	0.02	J	44,700	J	138		12		120		NT		0.9
CH13-204-MW016E-SOE	RCTA	11.5	12	8/12/2013	7.01	J	842	J	0.01	UJ	41,900	J	130		8		80		NT		0.6
CH13-204-MW016E-SOF	RCTA	12.5	13	8/12/2013	7.41	J	1,965	J	0.05	J	4,600	J	12.5		30		300		NT		23.9
CH13-204-MW016E-SOG	RCTA	18.5	19	8/13/2013	7.57	J	1,145	J	0.01	UJ	2,500	J	7.38		90		900		NT		122
CH13-204-MW016E-SOH	RCTA	21.5	22	8/13/2013	7.55	J	1,000	J	0.01	UJ	1,400	J	3.88		62		620		NT		160
CH13-204-MW016E-SOI	RCTA	26	26.5	8/13/2013	7.43	J	787	J	0.01	J	1,200	J	3.26		15		150		NT		46.0
CH13-204-MW016E-SOJ	RCTA	29	29.5	8/13/2013	7.74	J	742	J	0.01	J	2,700	J	8.02		91		910		NT		113
CH13-204-MW016E-SOK	RCTA	34.5	35	8/13/2013	7.66	J	842	J	0.01	UJ	2,300	J	6.78		74		740		NT		109
CH14-015-MW001A-SOA	RCTA	13.7	14.0	9/6/2014	6.36	J	10,000	J	0.69		117,000	J	318		6	J	60		NT		0.2
CH14-015-MW901A-SOA	RCTA	13.7	14.0	9/6/2014	6.58	J	10,000	J	0.81		11,000	J	*2*		30	J	300		NT		192.3
CH14-015-MW001C-SOA	RCTA	2.1	2.4	9/3/2014	2.37	J	10,000	J	1.37		393,000		1159		1	U	10		NT		0.0
CH14-015-MW001C-SOF	RCTA	16.5	16.8	9/3/2014	5.13	J	5,340		0.23		320,000		962		24		240		NT		0.2
CH14-015-MW001C-SOG	RCTA	19.2	19.5	9/4/2014	4.06	J	792		0.08		12,400		34.6		6		60		NT		1.7
CH14-015-MW001C-SOH	RCTA	20.4	20.7	9/4/2014	4.32	J	766		0.04		7,100		19.9		6		60		NT		3.0
CH14-015-MW001C-SOI	RCTA	21.6	22.0	9/4/2014	4.09	J	1,045		0.01	U	1,900		4.50		7		70		NT		15.6
CH14-015-MW001C-SOJ	RCTA	23.8	24.1	9/4/2014	3.64	J	743		0.12		2,100		1.75		5		50		NT		28.5
CH14-015-MW001C-SOK	RCTA	25.6	25.9	9/4/2014	3.72	J	808		0.01		1,000		1.78		5		50		NT		28.1
CH14-015-MW002A-SOB	RCTA	6.7	7.1	9/6/2014	4.49	J	10,000	J	0.74		403,000		1207		80		800		NT		0.7
CH14-015-MW002A-SOD	RCTA	12.8	13.1	9/6/2014	5.72	J	10,000	J	0.6		374,000		1109		25		250		NT		0.2
CH14-201-TH001-SOF	RCTA	4.6	5.0	8/17/2014	NT		NT		NT		210,000		*656*		27		270		NT		0.4
CH14-201-TH001-SOG	RCTA	6.1	6.6	8/17/2014	NT		NT		NT		278,000		*869*		43		430		NT		0.5
CH14-201-TH001-SOJ	RCTA	9.8	10.2	8/17/2014	4.36	J	9,230		0.31		335,000		1017		24		240		NT		0.2
CH14-201-TH002-SOB	RCTA	0.6	1.1	8/14/2014	4.29	J	10,000	J	0.93		253,000		741		24		240		NT		0.3
CH14-201-TH002-SOH	RCTA	9.1	9.6	8/14/2014	5.5	J	5,770		0.21		408,000		1251		21		210		NT		0.2
CH14-201-TH002-SOJ	RCTA	12.2	12.7	8/15/2014	5.93	J	10,000	J	0.64		305,000		909		27		270		NT		0.3
CH14-201-TH002-SOM	RCTA	15.9	16.3	8/15/2014	5.99	J	9,870		0.25		337,000		1025		20		200		NT		0.2
CH14-201-TH002-SON	RCTA	16.8	17.2	8/16/2014	6.07	J	7,220		0.15		285,000		864		17		170		NT		0.2
CH14-201-TH002-SOP	RCTA	19.8	20.3	8/16/2014			NT		NT		57,000		*178*		17		170		NT		1.0
CH14-201-TH002-SOP-B	RCTA	19.8	20.3	8/16/2014	5.01	J	NT		NT		226,000		*706*		22		220		NT		0.3
CH14-201-TH003-SOD-B	RCTA	3.1	3.5	8/13/2014	NT		NT		NT		14,200		*44.4*		NT		NC		NT		NC
CH14-201-TH004-SOE	RCTA	4.6	5.0	8/13/2014	NT		NT		NT		324,000		*1,013*		24		240		NT		0.2
CH14-201-TH004-SOF	RCTA	6.1	6.6	8/13/2014	NT		NT		NT		29,700		*92.8*		32		320		NT		3.4
CH14-201-TH006-SOA	RCTA	0	0.5	8/11/2014	NT		NT		NT		250,000		*781*		NT		NC		NT		NC
CH14-201-TH006-SOE	RCTA	5.2	5.6	8/11/2014	NT		NT		NT		39,900		*125*		NT		NC		NT		NC
CH15-201-MW010_SOh	RCTA	5.7	7.0	11/14/2015	7.82		NT		NT		600		*1.88*		67		670		NT		357
CH15-201-MW010_SOn	RCTA	10.2	11.6	11/14/2015	7.94		NT		NT		1,200		*3.75*		57		570		NT		152
CH15-201-MW010_SOw	RCTA	19.2	20.7	11/15/2015	8.03		NT		NT		600		*1.88*		108		1,080		NT		576
CH15-201-MW910_SOw	RCTA	19.2	20.7	11/15/2015	8		NT		NT		700		*2.19*		103		1,030		NT		471

Table 5-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Paste pH		Acid Potential							Neutralization Potential					Neutralization Potential Ratio (NP/AP)
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		
					Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/ tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	

Notes:
Laboratory data has been validated by CH2M HILL prior to importing to EquIS. This summary table has been through QA/QC.
Analytical results for neutralization potential by the AOAC 955.01 and MOD-SOBEK-3.2.3 methods are reported; results by the MOD-SOBEK-3.2.3 method are indicated using "*".
AOAC 955.01 is the preferred analytical method for neutralization potential; however, MOD-SOBEK-3.2.3 was applied to some samples collected in 2012 due to miscommunication.
Analytical results by the AOAC 955.01 method should be considered in future analysis and decision-making process.
Calculated values of acid potential (AP) presented italics were calculated based on total sulphur content, and represent conservative estimates of the acid generation potential

$CaCO_3$ = calcium carbonate
CaO = calcium oxide
J = Analyte was present but the reported value may not be accurate or precise.
kg = kilogram
LMB =
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NC = not calculated
NP/AP = nuetralization potential divided by acid potential
NT = not tested
ppm = parts per million
QA/QC = Quality Assurance and Quality Control
RCTA = Rose Creek Tailings Area
U = This analyte was analyzed for but not detected at the specified detection limit.

Table 5-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex

Faro Mine Remediation Project

	Remediation Unit		RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA
	Sample ID		CH13-204-MW016C-SOA	CH13-204-MW916C-SOA	CH13-204-MW016E-SOA	CH13-204-MW016E-SOB	CH13-204-MW016E-SOC	CH13-204-MW016E-SOD	CH13-204-MW016E-SOE	CH13-204-MW016E-SOF	CH13-204-MW016E-SOG	CH13-204-MW016E-SOH	CH13-204-MW016E-SOI	CH13-204-MW016E-SOJ	CH13-204-MW016E-SOK	CH14-015-MW001A-SOA	CH14-015-MW901A-SOA
	Depth From (mbgs)		6.5	6.5	0.5	3	9.5	10	11.5	12.5	18.5	21.5	26	29	34.5	13.7	13.7
	Depth From (mbgs)		7	7	1	3.5	10	10.5	12	13	19	22	26.5	29.5	35	14.0	14.0
	Sample Date	Screening Level	8/15/2013	8/15/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/13/2013	8/13/2013	8/13/2013	8/13/2013	8/13/2013	9/6/2014	9/6/2014
pH	Result (pH units)	6.5-9.0	7.15	7.25	4.8	5.39	5.79	6.11	7.3	7.97	8.46	8.34	8.18	8.22	8.41	7.32	7.31
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Acidity	Result (mg/L)	-	6.9	5.8	2780	1400	377	15	5.3	1.9	1	1	1.4	1	1	21	20.2
	Result Qualifier		J	J	J	J	J	J	J	J	UJ	UJ	J	UJ	UJ		
Total Alkalinity	Result (mg/L)	-	253	209	2.5	4.3	22.4	6.7	50.4	85.2	71.8	87.5	69.4	106	90.9	246	192
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Specific Conductance	Result (µS/cm)	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
ORP Leachable	Result (mV)	-	200	201	249	220	240	446	181	239	236	242	253	240	229	154	137
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Aluminum	Result (mg/L)	0.005 to 0.1[b]	0.005	0.005	1.44	0.077	0.1	0.331	2.66	0.0609	0.152	0.0804	0.0632	0.076	0.173	0.005	0.005
	Result Qualifier		UJ	UJ	J	J	UJ	J	J	J	J	J	J	J	J	U	U
Antimony	Result (mg/L)	1.6	0.01	0.0143	0.001	0.0005	0.002	0.031	0.00119	0.00558	0.00119	0.00198	0.00609	0.00564	0.00637	0.00429	0.00468
	Result Qualifier		J	J	UJ	UJ	UJ	J	J	J	J	J	J	J	J		
Arsenic	Result (mg/L)	0.005	0.001	0.001	0.084	0.005	0.02	0.0042	0.0088	0.0013	0.0021	0.0016	0.0018	0.0031	0.01	0.0013	0.001
	Result Qualifier		UJ	UJ	J	UJ	UJ	J	J	J	J	J	J	J	J		U
Barium	Result (mg/L)	2.3	0.0204	0.0255	0.01	0.009	0.02	0.148	0.0842	0.128	0.0253	0.0267	0.109	0.107	0.0334	0.0168	0.0162
	Result Qualifier		J	J	UJ	J	UJ	J	J	J	J	J	J	J	J		
Beryllium	Result (mg/L)	0.0053	0.0005	0.0005	0.005	0.0025	0.01	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	U
Boron	Result (mg/L)	1.5	0.01	0.01	0.1	0.05	0.2	0.02	0.01	0.022	0.015	0.013	0.014	0.023	0.016	0.02	0.02
	Result Qualifier		J	UJ	UJ	UJ	UJ	J	J	J	J	J	J	J	J		
Bromide	Result (mg/L)	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
Cadmium	Result (mg/L)	Variable[c]	0.00005	0.000078	4.45	0.00129	0.208	0.000309	0.00033	0.000051	0.00005	0.00005	0.000072	0.00005	0.00005	0.00106	0.00174
	Result Qualifier		UJ	J	J	J	J	J	J	J	UJ	UJ	J	UJ	UJ		
Calcium	Result (mg/L)	-	232	185	482	563	561	119	12.4	36.9	17.2	25.9	23.3	29.8	19.7	697	654
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Chloride	Result (mg/L)	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
Chromium	Result (mg/L)	0.0089	0.0005	0.0005	0.005	0.0025	0.01	0.0005	0.00643	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	UJ	J	UJ	UJ	UJ	UJ	UJ	UJ	U	U
Cobalt	Result (mg/L)	-	0.00049	0.00034	4.75	0.00143	0.564	0.00508	0.00257	0.00059	0.00018	0.00069	0.00033	0.0001	0.0001	0.00526	0.0084
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	UJ	UJ		
Copper	Result (mg/L)	0.002 to 0.004[d]	0.0045	0.0059	0.01	0.005	0.02	0.0071	0.0227	0.0011	0.001	0.0013	0.0017	0.001	0.001	0.0083	0.0122
	Result Qualifier		J	J	UJ	UJ	UJ	J	J	J	UJ	J	J	UJ	UJ		
Fluoride	Result (mg/L)	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
Iron	Result (mg/L)	0.3	0.114	0.03	1330	833	0.06	0.331	9.44	0.03	0.03	0.031	0.066	0.03	0.03	0.06	0.06
	Result Qualifier		J	UJ	J	J	UJ	J	J	UJ	UJ	J	J	UJ	UJ	U	U
Lead	Result (mg/L)	0.001	0.335	0.429	2.66	0.926	5.58	0.0227	0.0329	0.00022	0.0001	0.0001	0.00027	0.0001	0.0001	0.379	0.483
	Result Qualifier		J	J	J	J	J	J	J	J	UJ	UJ	J	UJ	UJ		
Lithium	Result (mg/L)	-	0.018	0.011	0.265	0.046	0.1	0.0183	0.005	0.022	0.0079	0.0122	0.0161	0.0177	0.0112	0.0675	0.0467
	Result Qualifier		J	J	J	J	UJ	J	UJ	J	J	J	J	J	J		
Magnesium	Result (mg/L)	-	91.8	54.2	286	194	44.9	28.6	1.88	5.46	2.87	4.84	4.6	8.59	6.21	104	90.7
	Result Qualifier			J	J	J	J	J	J	J	J	J	J	J	J		
Manganese	Result (mg/L)	-	0.419	0.499	295	192	23.2	1.51	0.469	0.076	0.00447	0.0192	0.0969	0.0212	0.00772	3.12	5.12
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Mercury	Result (mg/L)	0.000026	0.00005	0.00005	0.00005	0.00005	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	UJ	U	U
Molybdenum	Result (mg/L)	0.073	0.00152	0.00397	0.0019	0.00082	0.002	0.00184	0.0128	0.0337	0.0169	0.0286	0.016	0.0151	0.00324	0.00336	0.00148
	Result Qualifier		J	J	J	J	UJ	J	J	J	J	J	J	J	J	J	J

Table 5-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex

Faro Mine Remediation Project

	Remediation Unit		RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA
	Sample ID		CH13-204-MW016C-SOA	CH13-204-MW916C-SOA	CH13-204-MW016E-SOA	CH13-204-MW016E-SOB	CH13-204-MW016E-SOC	CH13-204-MW016E-SOD	CH13-204-MW016E-SOE	CH13-204-MW016E-SOF	CH13-204-MW016E-SOG	CH13-204-MW016E-SOH	CH13-204-MW016E-SOI	CH13-204-MW016E-SOJ	CH13-204-MW016E-SOK	CH14-015-MW001A-SOA	CH14-015-MW901A-SOA
	Depth From (mbgs)		6.5	6.5	0.5	3	9.5	10	11.5	12.5	18.5	21.5	26	29	34.5	13.7	13.7
	Depth From (mbgs)		7	7	1	3.5	10	10.5	12	13	19	22	26.5	29.5	35	14.0	14.0
	Sample Date	Screening Level	8/15/2013	8/15/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/13/2013	8/13/2013	8/13/2013	8/13/2013	8/13/2013	9/6/2014	9/6/2014
Nickel	Result (mg/L)	0.025	0.00085	0.00146	2.16	0.137	1.83	0.00702	0.01	0.00058	0.0005	0.0005	0.00075	0.0005	0.0005	0.0441	0.0752
	Result Qualifier		J	J	J	J	J	J	J	J	UJ	UJ	J	UJ	UJ	J	J
Nitrate	Result (mg/L)	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
Nitrite	Result (mg/L)	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																
Potassium	Result (mg/L)	-	5.1	3.8	6	5.5	7.2	12.1	9.7	16.7	13.1	10.7	10.2	23.6	25.8	47.3	23.6
	Result Qualifier		J	J	UJ	J	J	J	J	J	J	J	J	J	J	J	J
Selenium	Result (mg/L)	0.001	0.0005	0.0005	0.005	0.0025	0.01	0.0005	0.00102	0.00158	0.0005	0.0005	0.0005	0.00195	0.00062	0.0005	0.0005
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	UJ	J	J	UJ	UJ	UJ	J	J	U	U
Silicon	Result (mg/L)	-	2.95	2.69	11.5	15.2	3.1	10.9	10.2	5.22	3.76	4.24	4.98	3.91	2.57	5.74	5.18
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Silver	Result (mg/L)	0.0001	0.0008	0.000704	0.0005	0.00025	0.001	0.000078	0.000231	0.00005	0.00005	0.00005	0.00005	0.000172	0.00005	0.000056	0.000726
	Result Qualifier		J	J	UJ	UJ	UJ	J	J	UJ	UJ	UJ	UJ	J	UJ	J	J
Sodium	Result (mg/L)	-	3.7	2.9	6	4	4	10.2	13.6	11.9	8	6.4	6.5	13	7.6	10.5	9.4
	Result Qualifier		J	J	UJ	UJ	UJ	J	J	J	J	J	J	J	J		
Strontium	Result (mg/L)	-	0.245	0.19	0.738	1.72	0.08	0.407	0.0584	0.147	0.0718	0.0984	0.105	0.217	0.149	0.33	0.417
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Sulphate	Result (mg/L)	100	475	296	4970	3840	1260	392	17	64	15.5	16.6	31.4	27.9	13	1790	1720
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Sulphur	Result (mg/L)	-	868	663	1930	1180	1070	146	9.48	24	5.53	6.12	11.7	35.6	26	1340	1030
	Result Qualifier		J	J	J	J	J	J	J	J	J	J	J	J	J		
Thallium	Result (mg/L)	0.0008	0.00082	0.00092	0.0073	0.00208	0.0284	0.00073	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00067	0.00185
	Result Qualifier		J	J	J	J	J	J	UJ	UJ	UJ	UJ	UJ	UJ	UJ	J	J
Titanium	Result (mg/L)	0.1	0.013	0.012	0.03	0.02	0.022	0.018	0.087	0.01	0.01	0.01	0.01	0.01	0.01	0.055	0.055
	Result Qualifier		J	J	UJ	UJ	J	J	J	UJ	UJ	UJ	UJ	UJ	UJ		
Uranium	Result (mg/L)	0.015	0.00625	0.00552	0.0203	0.000923	0.0002	0.000056	0.000698	0.00276	0.000569	0.00366	0.00226	0.00496	0.000675	0.00297	0.00238
	Result Qualifier		J	J	J	J	UJ	J	J	J	J	J	J	J	J		
Vanadium	Result (mg/L)	-	0.001	0.001	0.01	0.005	0.02	0.0017	0.0138	0.0011	0.0018	0.001	0.0012	0.0028	0.0015	0.001	0.001
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	J	J	J	J	J	J	J	J	U	U
Zinc	Result (mg/L)	0.03	0.275	0.221	682	42.3	182	0.244	0.026	0.01	0.01	0.01	0.01	0.01	0.01	0.474	2.06
	Result Qualifier		J	J	J	J	J	J	J	UJ	UJ	UJ	UJ	UJ	UJ	J	J

Table 5-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex

Faro Mine Remediation Project

	Remediation Unit		RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA
	Sample ID		CH14-015-MW001C-SOA	CH14-015-MW001C-SOF	CH14-015-MW001C-SOG	CH14-015-MW001C-SOH	CH14-015-MW001C-SOI	CH14-015-MW001C-SOJ	CH14-015-MW001C-SOK	CH14-015-MW002A-SOB	CH14-015-MW002A-SOD	CH14-201-TH001-SOJ	CH14-201-TH002-SOH	CH14-201-TH002-SOJ	CH14-201-TH002-SOM	CH14-201-TH002-SON
	Depth From (mbgs)		2.1	16.5		20.4	21.6	23.8	25.6			9.8	9.1	12.2	15.9	16.8
	Depth From (mbgs)		2.4	16.8		20.7	22.0	24.1	25.91			10.2	9.6	12.7	16.3	17.2
	Sample Date	Screening Level	9/3/2014	9/3/2014	9/4/2014	9/4/2014	9/4/2014	9/4/2014	9/4/2014	9/6/2014	9/6/2014	8/17/2014	8/14/2014	8/15/2014	8/15/2014	8/16/2014
pH	Result (pH units)	6.5-9.0	3.03	5.97	4.52	6.58	7.53	3.88	4.74	5.06	5.62	7	5.79	6.78	5.99	5.85
	Result Qualifier											J	J	J	J	J
Acidity	Result (mg/L)	-	5670	140	173	3.7	2.1	329	46.8	448	228	9.1	86.2	8.6	54.5	67.2
	Result Qualifier											J	J	J	J	J
Total Alkalinity	Result (mg/L)	-	1	22	1	13.8	45.9	1	1	20.4	10.7	171	15.3	117	20.3	9.1
	Result Qualifier		U		U	J		U	U			J	J	J	J	J
Specific Conductance	Result (µS/cm)	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
ORP Leachable	Result (mV)	-	325	50	256	197	177	294	237	76	63	151	50	103	49	52
	Result Qualifier											J	J	J	J	J
Aluminum	Result (mg/L)	0.005 to 0.1[b]	53.3	0.0061	0.69	0.0248	0.143	2.34	0.271	0.01	0.01	0.005	0.0249	0.005	0.005	0.0373
	Result Qualifier									U	U	U	J	U	U	
Antimony	Result (mg/L)	1.6	0.002	0.00032	0.00025	0.00059	0.00069	0.0001	0.0001	0.0003	0.0003	0.00513	0.00024	0.00622	0.00069	0.00053
	Result Qualifier		U					U	U							
Arsenic	Result (mg/L)	0.005	0.068	0.001	0.0075	0.001	0.001	0.001	0.001	0.0049	0.002	0.001	0.001	0.001	0.001	0.0011
	Result Qualifier			U		U	U	U	U		U		U	U	U	
Barium	Result (mg/L)	2.3	0.02	0.0932	0.0512	0.0659	0.0546	0.0268	0.0469	0.0159	0.145	0.0535	0.164	0.15	0.001	0.142
	Result Qualifier		U												U	
Beryllium	Result (mg/L)	0.0053	0.014	0.0005	0.00133	0.0005	0.0005	0.00792	0.00077	0.001	0.001	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier			U		U	U			U	U	U	U	U	U	U
Boron	Result (mg/L)	1.5	0.2	0.01	0.156	0.043	0.076	0.015	0.02	0.023	0.02	0.04	0.01	0.01	0.01	0.01
	Result Qualifier		U	U							U		U	U	U	U
Bromide	Result (mg/L)	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Cadmium	Result (mg/L)	Variable[c]	2.6	0.0228	0.0035	0.000927	0.000055	0.00978	0.00418	0.136	0.0653	0.000354	0.0124	0.000412	0.0185	0.0349
	Result Qualifier					J							J			
Calcium	Result (mg/L)	-	174	67.9	168	21.2	20.2	145	53.1	245	33.7	210	81.7	160	83.6	68.9
	Result Qualifier															
Chloride	Result (mg/L)	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Chromium	Result (mg/L)	0.0089	0.101	0.0005	0.00054	0.0005	0.0005	0.00054	0.0005	0.001	0.001	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier			U		U	U		U	U	U	U	U	U	U	U
Cobalt	Result (mg/L)	-	1.06	0.079	0.225	0.00229	0.00015	0.0625	0.0545	0.17	0.197	0.00027	0.0357	0.00069	0.061	0.0868
	Result Qualifier					J							J			
Copper	Result (mg/L)	0.002 to 0.004[d]	28.8	0.001	0.0092	0.0037	0.0014	0.166	0.0264	0.002	0.002	0.0142	0.0565	0.0137	0.001	0.001
	Result Qualifier									U	U		J		U	U
Fluoride	Result (mg/L)	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Iron	Result (mg/L)	0.3	1740	33.6	53.6	0.03	0.037	153	11.2	105	17.3	0.06	11.7	0.06	3.94	8.72
	Result Qualifier					U						U	J	U		
Lead	Result (mg/L)	0.001	2.23	11.3	0.0295	0.0001	0.00015	0.0719	0.00451	2.96	18	0.807	12.4	1.18	4.65	9.56
	Result Qualifier					U							J			
Lithium	Result (mg/L)	-	0.1	0.0116	0.145	0.0387	0.0208	0.103	0.0842	0.023	0.01	0.0115	0.0089	0.0115	0.0063	0.0064
	Result Qualifier		U								U					
Magnesium	Result (mg/L)	-	43.9	25.8	40.1	8.48	6.69	27.4	15.6	77.2	13.4	12.3	10.3	9.17	10.1	9.57
	Result Qualifier															
Manganese	Result (mg/L)	-	31.1	11.7	7.99	0.695	0.0715	5.86	3.46	77.9	9	1.97	7.79	1.93	5.98	4.72
	Result Qualifier															
Mercury	Result (mg/L)	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	UJ	UJ	UJ	UJ	UJ
Molybdenum	Result (mg/L)	0.073	0.002	0.0001	0.0001	0.00145	0.00901	0.0001	0.0001	0.0002	0.0002	0.00056	0.0001	0.00033	0.0001	0.0001
	Result Qualifier		U	U	U	J		U	U	U	U		U		U	U

Table 5-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex

Faro Mine Remediation Project

	Remediation Unit		RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA	RCTA
	Sample ID		CH14-015-MW001C-SOA	CH14-015-MW001C-SOF	CH14-015-MW001C-SOG	CH14-015-MW001C-SOH	CH14-015-MW001C-SOI	CH14-015-MW001C-SOJ	CH14-015-MW001C-SOK	CH14-015-MW002A-SOB	CH14-015-MW002A-SOD	CH14-201-TH001-SOJ	CH14-201-TH002-SOH	CH14-201-TH002-SOJ	CH14-201-TH002-SOM	CH14-201-TH002-SON
	Depth From (mbgs)		2.1	16.5		20.4	21.6	23.8	25.6			9.8	9.1	12.2	15.9	16.8
	Depth From (mbgs)		2.4	16.8		20.7	22.0	24.1	25.91			10.2	9.6	12.7	16.3	17.2
	Sample Date	Screening Level	9/3/2014	9/3/2014	9/4/2014	9/4/2014	9/4/2014	9/4/2014	9/4/2014	9/6/2014	9/6/2014	8/17/2014	8/14/2014	8/15/2014	8/15/2014	8/16/2014
Nickel	Result (mg/L)	0.025	0.718	0.523	0.283	0.00415	0.0005	0.123	0.101	0.239	0.439	0.0295	0.594	0.0192	0.473	0.375
	Result Qualifier					J	U									
Nitrate	Result (mg/L)	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Nitrite	Result (mg/L)	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Potassium	Result (mg/L)	-	4	3.7	16.4	23.2	22.3	16.2	20.6	2	3.4	4	2	4	2.2	2.9
	Result Qualifier		U							U		U	U	U		
Selenium	Result (mg/L)	0.001	0.01	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.001	0.001	0.0005	0.00067	0.0005	0.00062	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U		U		U
Silicon	Result (mg/L)	-	5.18	4	22.9	15.4	7.48	25.2	29.9	4.09	2.86	2.19	2.78	1.7	4.37	5.32
	Result Qualifier															
Silver	Result (mg/L)	0.0001	0.001	0.000271	0.00005	0.00005	0.00005	0.00005	0.00005	0.00028	0.00157	0.00142	0.00074	0.00279	0.000585	0.000322
	Result Qualifier		U		U	U	U	U	U							
Sodium	Result (mg/L)	-	4	2	7.6	22.5	19.5	6.5	8.6	2	7.5	29.2	3.2	4	7.5	2.9
	Result Qualifier		U	U						U				U		
Strontium	Result (mg/L)	-	0.217	0.041	0.41	0.124	0.103	0.339	0.228	0.0727	0.0628	0.413	0.146	0.309	0.147	0.0924
	Result Qualifier															
Sulphate	Result (mg/L)	100	5870	326	814	153	100	836	275	1490	273	184	180	61.4	208	193
	Result Qualifier											J	J	J	J	J
Sulphur	Result (mg/L)	-	1770	243	262	50.8	35.8	272	92.8	487	296	1960	413	1450	269	226
	Result Qualifier															
Thallium	Result (mg/L)	0.0008	0.0075	0.0285	0.00031	0.00012	0.0001	0.00019	0.00014	0.0274	0.0191	0.00202	0.0118	0.00303	0.00866	0.0107
	Result Qualifier						U									
Titanium	Result (mg/L)	0.1	0.03	0.01	0.02	0.01	0.01	0.017	0.01	0.024	0.01	0.022	0.013	0.02	0.013	0.012
	Result Qualifier					U	U		U		U			U		
Uranium	Result (mg/L)	0.015	0.0801	0.000055	0.000599	0.000021	0.000173	0.0112	0.00117	0.000274	0.000053	0.00102	0.000032	0.000528	0.000015	0.000026
	Result Qualifier			J												
Vanadium	Result (mg/L)	-	0.045	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Zinc	Result (mg/L)	0.03	890	31.1	42.4	0.064	0.01	13.9	6.21	129	116	1.78	31.3	1.9	20.8	25.1
	Result Qualifier					J	U									

Table 5-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex

Faro Mine Remediation Project

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

< = less than
≤ = less than or equal to
°C = degrees Celsius
µg/L = micrograms per litre
µS/cm = micro-Siemens per centimetre
CCME = Canadian Council of Ministers of the Environment
CWQG = Canadian Water Quality Guidelines
FIGQG =
J - analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/L = milligrams per litre
mV = millivolt
NTU = Nephelometric Tubidity Unit
ORP = Oxidation-reduction Potential
R = result has been rejected for use
RCTA = Rose Creek Tailings Area
U = analyte was analyzed for but not detected at the specified detection limit
UJ = analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016C														CH13-204-MW016C												
Sample ID	CH13-204-MW016C_SOA														CH13-204-MW916C_SOA												
Sample Interval (mbgs)	6.5 - 7														6.5 - 7												
Sample Date	8/15/2013														8/15/2013												
General Location	INTERMEDIATE TAILINGS														INTERMEDIATE TAILINGS												
Geologic Unit	TAILINGS														TAILINGS												
Analyte (mg/kg)	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
	Result	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	50	UJ	50	UJ	**123**	**J**	50	UJ	**62**	**J**	**2860**	**J**	**3195**	**3920**	**J**	50	UJ	50	UJ	**103**	**J**	50	UJ	50	UJ	**2230**	**J**	**2533**	**2700**	**J**
Antimony	0.1	UJ	0.1	UJ	**16**	**J**	**1.72**	**J**	**11.5**	**J**	**13.9**	**J**	**43.3**	**43.7**	**J**	0.1	UJ	**0.12**	**J**	**15.1**	**J**	**1.58**	**J**	**4.45**	**J**	**18.1**	**J**	**39.5**	**40.9**	**J**
Arsenic	**0.056**	**J**	**0.189**	**J**	**11.9**	**J**	**30.3**	**J**	**20.2**	**J**	**354**	**J**	**417**	**546**	**J**	**0.066**	**J**	**0.222**	**J**	**26**	**J**	**30**	**J**	**7.11**	**J**	**466**	**J**	**529**	**562**	**J**
Barium	2	UJ	2	UJ	**16.3**	**J**	**26**	**J**	**189**	**J**	**4.4**	**J**	**240**	**445**	**J**	2	UJ	**3.8**	**J**	**23**	**J**	**20.8**	**J**	**133**	**J**	**4.5**	**J**	**187**	**514**	**J**
Beryllium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.53**	**J**	**1.53**	**0.62**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.39**	**J**	**1.39**	**0.53**	**J**
Bismuth	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**1.04**	**J**	**2.04**	**1.37**	**J**	0.2	UJ	0.2	UJ	**1.23**	**J**	0.2	UJ	0.2	UJ	**0.62**	**J**	**2.65**	**1.57**	**J**
Cadmium	**2.11**	**J**	**1.05**	**J**	**0.908**	**J**	**1.56**	**J**	0.05	UJ	**14.3**	**J**	**20.0**	**23.3**	**J**	**1.31**	**J**	**0.675**	**J**	**0.844**	**J**	**1.07**	**J**	0.05	UJ	**12.4**	**J**	**16.3**	**14.8**	**J**
Calcium	**3050**	**J**	**138**	**J**	50	UJ	**340**	**J**	NT		**1530**	**J**	**5108**	**4910**	**J**	**2770**	**J**	**63**	**J**	50	UJ	**366**	**J**	NT		**1370**	**J**	**4619**	**3640**	**J**
Chromium	5	UJ	5	UJ	**8.6**	**J**	5	UJ	5	UJ	**17.7**	**J**	**46.3**	**33.3**	**J**	5	UJ	5	UJ	**7.6**	**J**	5	UJ	5	UJ	**10.6**	**J**	**38.2**	**21**	**J**
Cobalt	**2.18**	**J**	**0.31**	**J**	**0.45**	**J**	**0.61**	**J**	0.1	UJ	**92.1**	**J**	**95.8**	**111**	**J**	**1.83**	**J**	**0.31**	**J**	**0.49**	**J**	**0.71**	**J**	0.1	UJ	**101**	**J**	**104**	**97.8**	**J**
Copper	**1.69**	**J**	**68**	**J**	**230**	**J**	**173**	**J**	**1.13**	**J**	**1120**	**J**	**1594**	**1950**	**J**	**5.71**	**J**	**64.9**	**J**	**181**	**J**	**107**	**J**	0.5	UJ	**1220**	**J**	**1579**	**1400**	**J**
Iron	**717**	**J**	50	UJ	**15100**	**J**	**2100**	**J**	**6910**	**J**	**243000**	**J**	**267877**	**310000**	**J**	**117**	**J**	50	UJ	**14500**	**J**	**1940**	**J**	**3520**	**J**	**244000**	**J**	**264127**	**259000**	**J**
Lead	**811**	**J**	**5690**	**J**	**213**	**J**	**2240**	**J**	**26.9**	**J**	**714**	**J**	**9695**	**7260**	**J**	**1080**	**J**	**2120**	**J**	**301**	**J**	**1320**	**J**	**7.26**	**J**	**563**	**J**	**5391**	**4900**	**J**
Lithium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	30.0	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	U	30.0	5	UJ
Manganese	**147**	**J**	**29.5**	**J**	**109**	**J**	**25.5**	**J**	**40.3**	**J**	**1150**	**J**	**1501**	**1650**	**J**	**70.7**	**J**	**18**	**J**	**128**	**J**	**19.5**	**J**	**31.2**	**J**	**985**	**J**	**1252**	**1090**	**J**
Molybdenum	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	**0.65**	**J**	**3.28**	**J**	**5.93**	**3.97**	**J**	0.5	UJ	0.5	UJ	**0.79**	**J**	0.5	UJ	0.5	UJ	**2.67**	**J**	**5.46**	**4.06**	**J**
Nickel	**6.8**	**J**	2	UJ	**2.2**	**J**	2	UJ	2	UJ	**21.1**	**J**	**36.1**	**32.1**	**J**	**4.1**	**J**	2	UJ	**2.1**	**J**	2	UJ	2	UJ	**25.1**	**J**	**37.3**	**31.9**	**J**
Phosphorus	50	UJ	50	UJ	50	UJ	NT		NT		NT		150	**454**	**J**	50	UJ	50	UJ	**53**	**J**	NT		NT		NT		**153**	**346**	**J**
Potassium	100	UJ	NT		NT		NT		NT		NT		100	**670**	**J**	100	UJ	NT		NT		NT		NT		NT		100	**430**	**J**
Selenium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.63**	**J**	**1.93**	**1.21**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.82**	**J**	**2.12**	**1.05**	**J**
Silver	0.1	UJ	0.1	UJ	0.1	UJ	**0.55**	**J**	**0.59**	**J**	**18.2**	**J**	**19.6**	**18.7**	**J**	0.1	UJ	0.1	UJ	0.1	UJ	**0.28**	**J**	**0.36**	**J**	**15.2**	**J**	**16.1**	**15.2**	**J**
Sodium	100	UJ	NT		NT		NT		NT		NT		100	100	UJ	100	UJ	NT		NT		NT		NT		NT		100	100	UJ
Strontium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**28.3**	**J**	**53.3**	**30.2**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**20.5**	**J**	**45.5**	**22.6**	**J**
Thallium	**0.697**	**J**	**0.288**	**J**	**0.106**	**J**	**0.334**	**J**	2	UJ	**5.16**	**J**	**8.59**	**6.26**	**J**	**0.583**	**J**	**0.219**	**J**	**0.077**	**J**	**0.274**	**J**	2	UJ	**5.48**	**J**	**8.63**	**6.64**	**J**
Tin	2	UJ	2	UJ	2	UJ	2	UJ	2	**J**	**4**	**J**	**14.0**	**8.2**	**J**	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	3.1	**J**	**13.1**	**5.4**	**J**
Titanium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**20.4**	**J**	**45.4**	**44.9**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**18.4**	**J**	**43.4**	**27.7**	**J**
Uranium	0.05	UJ	**0.191**	**J**	**0.234**	**J**	0.05	UJ	**0.057**	**J**	**2.72**	**J**	**3.30**	**2.96**	**J**	0.05	UJ	**0.133**	**J**	**0.214**	**J**	0.05	UJ	0.05	UJ	**2.17**	**J**	**2.67**	**2.19**	**J**
Vanadium	0.2	UJ	0.2	UJ	**2.36**	**J**	**0.38**	**J**	**1.91**	**J**	**28.4**	**J**	**33.5**	**32.9**	**J**	0.2	UJ	0.2	UJ	**2.72**	**J**	**0.25**	**J**	**0.77**	**J**	**19.8**	**J**	**23.9**	**21.1**	**J**
Zinc	**1330**	**J**	**714**	**J**	**1340**	**J**	**524**	**J**	**159**	**J**	**9990**	**J**	**14057**	**17100**	**J**	**806**	**J**	**487**	**J**	**1350**	**J**	**327**	**J**	**57**	**J**	**8500**	**J**	**11527**	**10600**	**J**

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOA														CH13-204-MW016E_SOB													
Sample Interval (mbgs)	0.5 - 1														3 - 3.5													
Sample Date	8/12/2013														8/12/2013													
General Location	INTERMEDIATE TAILINGS														INTERMEDIATE TAILINGS													
Geologic Unit	FILL														TAILINGS													
Analyte (mg/kg)	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
	Result	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	**533**	**J**	50	UJ	**929**	**J**	**71**	**J**	**505**	**J**	**4440**	**J**	**6528**	**5660**	**J**	50	UJ	50	UJ	**158**	**J**	50	UJ	**59**	**J**	**1410**	**J**	**1777**	**2340**	**J**
Antimony	0.1	UJ	0.1	UJ	**8.3**	**J**	**3.82**	**J**	**3.14**	**J**	**22.6**	**J**	**38.1**	**41.8**	**J**	0.1	UJ	0.1	UJ	**5.23**	**J**	**1.52**	**J**	**4.3**	**J**	**13.4**	**J**	**24.7**	**31.6**	**J**
Arsenic	**0.629**	**J**	**0.248**	**J**	**18.6**	**J**	**61**	**J**	**134**	**J**	**506**	**J**	**720**	**953**	**J**	**0.098**	**J**	**0.3**	**J**	**10.7**	**J**	**40.6**	**J**	**17.6**	**J**	**831**	**J**	**900**	**959**	**J**
Barium	2	UJ	2	UJ	**6.1**	**J**	**9.7**	**J**	**291**	**J**	**4.4**	**J**	**315**	**338**	**J**	**2**	UJ	**4.3**	**J**	**21.7**	**J**	**14.1**	**J**	**143**	**J**	**2.4**	**J**	**188**	**709**	**J**
Beryllium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	**0.53**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	**0.27**	**J**
Bismuth	0.2	UJ	0.2	UJ	**0.35**	**J**	0.2	UJ	0.2	UJ	**0.67**	**J**	**1.82**	**1.21**	**J**	0.2	UJ	0.2	UJ	**0.31**	**J**	0.2	UJ	0.2	UJ	**0.27**	**J**	**1.38**	**0.78**	**J**
Cadmium	**20.8**	**J**	**0.5**	**J**	**0.257**	**J**	**0.338**	**J**	0.05	UJ	**9.35**	**J**	**31.3**	**20.6**	**J**	**1.97**	**J**	**0.476**	**J**	**0.287**	**J**	**0.472**	**J**	0.05	UJ	**12.9**	**J**	**16.2**	**16.2**	**J**
Calcium	**10800**	**J**	**138**	**J**	50	UJ	**301**	**J**	NT		**453**	**J**	**11742**	**8010**	**J**	**2810**	**J**	**175**	**J**	50	UJ	**904**	**J**	NT		**994**	**J**	**4933**	**6600**	**J**
Chromium	5	UJ	5	UJ	**5.2**	**J**	5	UJ	**5.1**	**J**	**19.1**	**J**	**44.4**	**23.3**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**5.2**	**J**	**30.2**	**14.4**	**J**
Cobalt	**24.2**	**J**	**0.86**	**J**	**1.13**	**J**	**0.62**	**J**	**0.43**	**J**	**75.3**	**J**	**103**	**112**	**J**	**0.81**	**J**	**0.21**	**J**	**0.61**	**J**	**0.58**	**J**	**0.12**	**J**	**196**	**J**	**198**	**181**	**J**
Copper	**92.4**	**J**	**31.7**	**J**	**180**	**J**	**69.3**	**J**	0.5	UJ	**1150**	**J**	**1524**	**1400**	**J**	**2.22**	**J**	**32.9**	**J**	**125**	**J**	**64.3**	**J**	0.5	J	**1930**	**J**	**2155**	**2340**	**J**
Iron	**2930**	**J**	50	UJ	**13900**	**J**	**1930**	**J**	**26900**	**J**	**143000**	**J**	**188710**	**212000**	**J**	**647**	**J**	50	UJ	**12500**	**J**	**1040**	**J**	**7960**	**J**	**309000**	**J**	**331197**	**330000**	**J**
Lead	**224**	**J**	**2210**	**J**	**306**	**J**	**730**	**J**	**4.07**	**J**	**3490**	**J**	**6964**	**4980**	**J**	**717**	**J**	**1790**	**J**	**227**	**J**	**548**	**J**	**6.53**	**J**	**670**	**J**	**3959**	**4710**	**J**
Lithium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**5.6**	**J**	**30.6**	**5.4**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	30.0	5	UJ
Manganese	**1150**	**J**	**61.4**	**J**	**143**	**J**	**50.2**	**J**	**45.6**	**J**	**488**	**J**	**1938**	**1800**	**J**	**826**	**J**	**58.1**	**J**	**498**	**J**	**44.6**	**J**	**50.1**	**J**	**1530**	**J**	**3007**	**3640**	**J**
Molybdenum	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	**0.74**	**J**	**6.21**	**J**	**8.95**	**6.33**	**J**	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	**2.96**	**J**	**5.46**	**4.41**	**J**
Nickel	**13.7**	**J**	2	UJ	2	UJ	2	UJ	2	UJ	**16.9**	**J**	**38.6**	**27.1**	**J**	**3**	**J**	2	UJ	2	UJ	2	UJ	2	UJ	**14.9**	**J**	**25.9**	**20.6**	**J**
Phosphorus	50	UJ	50	UJ	50	UJ	NT		NT		NT		150	**308**	**J**	50	UJ	50	UJ	50	UJ	NT		NT		NT		150	**179**	**J**
Potassium	100	UJ	NT		NT		NT		NT		NT		100	**670**	**J**	100	UJ	NT		NT		NT		NT		NT		100	**290**	**J**
Selenium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.62**	**J**	**1.92**	**0.84**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.96**	**J**	**2.26**	**1.16**	**J**
Silver	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**16.2**	**J**	**16.7**	**12**	**J**	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**8.61**	**J**	**9.1**	**11**	**J**
Sodium	100	UJ	NT		NT		NT		NT		NT		100	100	UJ	100	UJ	NT		NT		NT		NT		NT		100	100	UJ
Strontium	**11.5**	**J**	**22.8**	**J**	5	UJ	5	UJ	**9.2**	**J**	**20.6**	**J**	**74.1**	**31.1**	**J**	5	UJ	5	UJ	5	UJ	**6.4**	**J**	5	UJ	**8.4**	**J**	**34.8**	**31.4**	**J**
Thallium	**0.104**	**J**	**0.107**	**J**	**0.173**	**J**	**0.471**	**J**	2	UJ	**7.3**	**J**	**10.16**	**5.96**	**J**	**0.188**	**J**	**0.112**	**J**	**0.066**	**J**	**0.217**	**J**	2	UJ	**3.49**	**J**	**6.07**	**4.37**	**J**
Tin	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	**3**	**J**	**13.0**	**3.7**	**J**	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	**2.3**	**J**	**12.3**	**4.2**	**J**
Titanium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**59.1**	**J**	**84.1**	**49.3**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**19.4**	**J**	**44.4**	**27.9**	**J**
Uranium	**1.15**	**J**	**0.763**	**J**	**0.456**	**J**	**0.073**	**J**	**0.193**	**J**	**1.84**	**J**	**4.48**	**4**	**J**	0.05	UJ	**0.094**	**J**	**0.168**	**J**	0.05	UJ	0.05	UJ	**1.11**	**J**	**1.52**	**1.89**	**J**
Vanadium	0.2	UJ	0.2	UJ	**4.63**	**J**	**0.34**	**J**	**4.64**	**J**	**17.1**	**J**	**27.1**	**20.4**	**J**	0.2	UJ	0.2	UJ	**1.83**	**J**	0.2	UJ	**0.77**	**J**	**7.43**	**J**	**10.6**	**13**	**J**
Zinc	**3920**	**J**	**117**	**J**	**463**	**J**	**149**	**J**	**58**	**J**	**6630**	**J**	**11337**	**8810**	**J**	**537**	**J**	**227**	**J**	**781**	**J**	**181**	**J**	**68**	**J**	**9140**	**J**	**10934**	**11000**	**J**

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOC														CH13-204-MW016E_SOD													
Sample Interval (mbgs)	9.5 - 10														10 - 10.5													
Sample Date	8/12/2013														8/12/2013													
General Location	INTERMEDIATE TAILINGS														INTERMEDIATE TAILINGS													
Geologic Unit	NATIVE SOIL														ALLUVIUM													
Analyte (mg/kg)	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	UJ	50	UJ	**164**	**J**	**113**	**J**	50	UJ	**2090**	**J**	**2517**	**2950**	**J**	50	UJ	50	UJ	**952**	**J**	50	UJ	**105**	**J**	**1910**	**J**	**3117**	**5110**	**J**
Antimony	0.1	UJ	**0.35**	**J**	**15.8**	**J**	**1.93**	**J**	**3.59**	**J**	**14.9**	**J**	**36.7**	**51.4**	**J**	0.1	UJ	**0.22**	**J**	**1.56**	**J**	**0.16**	**J**	0.1	UJ	**1.67**	**J**	**3.81**	**3.56**	**J**
Arsenic	0.05	UJ	**0.326**	**J**	**26.1**	**J**	**29.2**	**J**	**4.98**	**J**	**520**	**J**	**581**	**552**	**J**	0.05	UJ	**0.271**	**J**	**2.39**	**J**	**1.05**	**J**	0.05	UJ	**25.7**	**J**	**29.5**	**26.8**	**J**
Barium	**3.4**	**J**	**7.6**	**J**	**38.8**	**J**	**39.6**	**J**	**211**	**J**	**2.5**	**J**	**303**	**439**	**J**	**32.1**	**J**	**30.9**	**J**	**54.5**	**J**	**67.6**	**J**	**72**	**J**	**75.2**	**J**	**332**	**236**	**J**
Beryllium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.3**	**J**	**1.30**	**0.52**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	0.2	UJ
Bismuth	0.2	UJ	0.2	UJ	**0.96**	**J**	0.2	UJ	0.2	UJ	**0.28**	**J**	**2.04**	**0.88**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	0.2	UJ
Cadmium	**0.833**	**J**	**0.416**	**J**	**0.418**	**J**	**0.608**	**J**	0.05	UJ	**8.26**	**J**	**10.6**	**8.35**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	**0.755**	**J**	**1.01**	**0.755**	**J**
Calcium	**2320**	**J**	**91**	**J**	50	UJ	**493**	**J**	NT		**993**	**J**	**3947**	**3550**	**J**	**2730**	**J**	**316**	**J**	50	UJ	**598**	**J**	NT		**935**	**J**	**4629**	**4570**	**J**
Chromium	5	UJ	5	UJ	**11.5**	**J**	5	UJ	5	UJ	**23.5**	**J**	**55.0**	**33**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**6.1**	**J**	**31.1**	**12.5**	**J**
Cobalt	**1.27**	**J**	**0.39**	**J**	**0.57**	**J**	**0.66**	**J**	0.1	UJ	**128**	**J**	**131**	**105**	**J**	**0.13**	**J**	0.1	UJ	**0.34**	**J**	0.1	UJ	**0.11**	**J**	**6.33**	**J**	**7.11**	**7.24**	**J**
Copper	**2.31**	**J**	**50.2**	**J**	**146**	**J**	**98.9**	**J**	0.5	UJ	**1410**	**J**	**1708**	**1210**	**J**	0.5	UJ	0.5	UJ	**14.5**	**J**	**2.11**	**J**	0.5	UJ	**74.3**	**J**	**92.4**	**78.1**	**J**
Iron	**97**	**J**	50	UJ	**13900**	**J**	**1490**	**J**	**4130**	**J**	**275000**	**J**	**294667**	**266000**	**J**	50	UJ	50	UJ	**1730**	**J**	**267**	**J**	**485**	**J**	**16000**	**J**	**18582**	**18800**	**J**
Lead	**1510**	**J**	**2240**	**J**	**302**	**J**	**1660**	**J**	**2.1**	**J**	**682**	**J**	**6396**	**4350**	**J**	**1.62**	**J**	**60.2**	**J**	**37.4**	**J**	**192**	**J**	**1.09**	**J**	**117**	**J**	**409**	**351**	**J**
Lithium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	30.0	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	30.0	5	UJ
Manganese	**56.3**	**J**	**11.6**	**J**	**184**	**J**	**14**	**J**	**46**	**J**	**797**	**J**	**1109**	**1080**	**J**	**34.8**	**J**	**6.3**	**J**	**21.8**	**J**	**13**	**J**	**6.6**	**J**	**66.6**	**J**	**149**	**163**	**J**
Molybdenum	0.5	UJ	0.5	UJ	**0.99**	**J**	0.5	UJ	0.5	UJ	**1.89**	**J**	**4.88**	**4.02**	**J**	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	3.00	0.5	UJ
Nickel	**4.9**	**J**	2	UJ	**3.7**	**J**	**2.1**	**J**	2	UJ	**37.5**	**J**	**52.2**	**73.5**	**J**	2	UJ	2	UJ	**2.8**	**J**	2	UJ	2	UJ	**6.8**	**J**	**17.6**	**13.4**	**J**
Phosphorus	50	UJ	50	UJ	**77**	**J**	NT		NT		NT		**177**	**503**	**J**	50	UJ	50	UJ	**176**	**J**	NT		NT		NT		**276**	**471**	**J**
Potassium	100	UJ	NT		NT		NT		NT		NT		100	**400**	**J**	100	UJ	NT		NT		NT		NT		NT		100	**760**	**J**
Selenium	0.2	UJ	0.2	UJ	0.2	UJ	**0.24**	**J**	0.5	UJ	**0.92**	**J**	**2.26**	**0.97**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	0.2	UJ	1.50	0.2	UJ
Silver	0.1	UJ	0.1	UJ	0.1	UJ	**0.16**	**J**	**0.17**	**J**	**13.1**	**J**	**13.7**	**14.7**	**J**	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**0.95**	**J**	**1.45**	**0.95**	**J**
Sodium	100	UJ	NT		NT		NT		NT		NT		100	100	UJ	100	UJ	NT		NT		NT		NT		NT		100	**560**	**J**
Strontium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**15.3**	**J**	**40.3**	**21.9**	**J**	**9.5**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	**11.5**	**J**	**41.0**	**27.8**	**J**
Thallium	**0.424**	**J**	**0.165**	**J**	**0.059**	**J**	**0.23**	**J**	2	UJ	**4.17**	**J**	**7.05**	**7.66**	**J**	0.05	UJ	0.05	UJ	**0.058**	**J**	0.05	UJ	2	UJ	**0.541**	**J**	**2.75**	**0.517**	**J**
Tin	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	**3.2**	**J**	**13.2**	**4.4**	**J**	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ
Titanium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**31.1**	**J**	**56.1**	**41.5**	**J**	5	UJ	5	UJ	**54.1**	**J**	**17.8**	**J**	5	UJ	**161**	**J**	**248**	**287**	**J**
Uranium	0.05	UJ	**0.12**	**J**	**0.223**	**J**	0.05	UJ	0.05	UJ	**1.92**	**J**	**2.41**	**2.17**	**J**	0.05	UJ	**0.054**	**J**	**0.271**	**J**	0.05	UJ	0.05	UJ	**0.202**	**J**	**0.677**	**0.618**	**J**
Vanadium	0.2	UJ	0.2	UJ	**2.71**	**J**	**0.62**	**J**	**0.85**	**J**	**14**	**J**	**18.6**	**19.7**	**J**	0.2	UJ	0.2	UJ	**2.7**	**J**	**0.26**	**J**	**0.21**	**J**	**10.9**	**J**	**14.5**	**18.6**	**J**
Zinc	**419**	**J**	**329**	**J**	**885**	**J**	**222**	**J**	50	UJ	**5730**	**J**	**7635**	**6150**	**J**	**7.6**	**J**	**15.3**	**J**	**39**	**J**	**7**	**J**	50	UJ	**502**	**J**	**621**	**511**	**J**

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E															CH13-204-MW016E														
Sample ID	CH13-204-MW016E_SOE															CH13-204-MW016E_SOF														
Sample Interval (mbgs)	11.5 - 12															12.5 - 13														
Sample Date	8/12/2013															8/12/2013														
General Location	INTERMEDIATE TAILINGS															INTERMEDIATE TAILINGS														
Geologic Unit	ALLUVIUM															ALLUVIUM														
Analyte (mg/kg)	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	UJ	50	UJ	**1540**	**J**	**72**	**J**	**230**	**J**	**18800**	**J**	**20742**	**21000**	**J**	50	UJ	50	UJ	**348**	**J**	50	UJ	**103**	**J**	**15000**	**J**	**15601**	**13600**	**J**
Antimony	0.1	UJ	0.1	UJ	**0.12**	**J**	0.1	UJ	0.1	UJ	**0.12**	**J**	**0.640**	**0.44**	**J**	0.1	UJ	0.1	UJ	**0.27**	**J**	0.1	UJ	0.1	UJ	**0.4**	**J**	**1.07**	**0.76**	**J**
Arsenic	0.05	UJ	**0.054**	**J**	**2.77**	**J**	**0.397**	**J**	**1.78**	**J**	**3.08**	**J**	**8.13**	**8.91**	**J**	0.05	UJ	0.05	UJ	**3.06**	**J**	**0.683**	**J**	**1.04**	**J**	**8.93**	**J**	**13.8**	**14.3**	**J**
Barium	**26.5**	**J**	**15.8**	**J**	**5.9**	**J**	**9.2**	**J**	**10**	**J**	**71.4**	**J**	**139**	**144**	**J**	**68**	**J**	**53.8**	**J**	**18.6**	**J**	**20.6**	**J**	**22.8**	**J**	**249**	**J**	**433**	**366**	**J**
Beryllium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.55**	**J**	**1.55**	**0.76**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.44**	**J**	**1.44**	**0.55**	**J**
Bismuth	0.2	UJ	0.2	UJ	**0.23**	**J**	0.2	UJ	0.2	UJ	**0.7**	**J**	**1.73**	**0.3**	**J**	0.2	UJ	0.2	UJ	**0.22**	**J**	0.2	UJ	0.2	UJ	**0.52**	**J**	**1.54**	**0.38**	**J**
Cadmium	0.05	UJ	**0.065**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	**0.169**	**J**	**0.434**	**0.311**	**J**	0.05	UJ	**0.066**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	**0.222**	**J**	**0.488**	**0.335**	**J**
Calcium	**798**	**J**	**139**	**J**	50	UJ	**410**	**J**	NT		**4890**	**J**	**6287**	**6540**	**J**	**723**	**J**	**1610**	**J**	50	UJ	**597**	**J**	NT		**4040**	**J**	**7020**	**6330**	**J**
Chromium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**32.1**	**J**	**57.1**	**34.2**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**32.4**	**J**	**57.4**	**36.1**	**J**
Cobalt	0.1	UJ	**0.18**	**J**	**1.77**	**J**	**0.13**	**J**	**1.75**	**J**	**8.88**	**J**	**12.8**	**13.3**	**J**	0.1	UJ	**0.33**	**J**	**2.04**	**J**	0.1	UJ	**1.03**	**J**	**8.03**	**J**	**11.6**	**11.2**	**J**
Copper	0.5	UJ	**0.59**	**J**	**5.17**	**J**	**0.88**	**J**	0.5	UJ	**18.8**	**J**	**26.4**	**25.8**	**J**	0.5	UJ	**0.79**	**J**	**6.96**	**J**	**1.17**	**J**	0.5	UJ	**28.5**	**J**	**38.4**	**38.9**	**J**
Iron	50	UJ	50	UJ	**3150**	**J**	**158**	**J**	**3990**	**J**	**20700**	**J**	**28098**	**28300**	**J**	50	UJ	**129**	**J**	**3610**	**J**	**140**	**J**	**2750**	**J**	**22400**	**J**	**29079**	**27300**	**J**
Lead	0.5	UJ	**2.33**	**J**	**9.07**	**J**	**6.51**	**J**	0.5	UJ	**13.3**	**J**	**32.2**	**30.5**	**J**	0.5	UJ	**14.3**	**J**	**9.29**	**J**	**13.1**	**J**	0.5	UJ	**31.5**	**J**	**69.2**	**69.8**	**J**
Lithium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**43.3**	**J**	**68.3**	**43.9**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**30.2**	**J**	**55.2**	**27.3**	**J**
Manganese	**51.6**	**J**	**19**	**J**	**38.1**	**J**	**6.1**	**J**	**24.5**	**J**	**199**	**J**	**338**	**334**	**J**	**13.1**	**J**	**30.9**	**J**	**52.2**	**J**	**5.7**	**J**	**23**	**J**	**194**	**J**	**319**	**324**	**J**
Molybdenum	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	3.00	**1.01**	**J**	0.5	UJ	0.5	UJ	**0.73**	**J**	0.5	UJ	0.5	UJ	**0.66**	**J**	**3.39**	**2.11**	**J**
Nickel	2	UJ	2	UJ	**3.8**	**J**	2	UJ	**6.7**	**J**	**25.7**	**J**	**42.2**	**39**	**J**	2	UJ	2	UJ	**5.3**	**J**	2	UJ	**3.7**	**J**	**20.6**	**J**	**35.6**	**29.6**	**J**
Phosphorus	50	UJ	50	UJ	**185**	**J**	NT		NT		NT		**285**	**534**	**J**	50	UJ	50	UJ	**138**	**J**	NT		NT		NT		**238**	**519**	**J**
Potassium	100	UJ	NT		NT		NT		NT		NT		100	**1850**	**J**	**110**	**J**	NT		NT		NT		NT		NT		**110**	**2330**	**J**
Selenium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	0.2	UJ	1.50	**0.29**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.31**	**J**	**1.61**	**0.36**	**J**
Silver	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**0.14**	**J**	**0.640**	**0.19**	**J**	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**0.31**	**J**	**0.810**	**0.35**	**J**
Sodium	100	UJ	NT		NT		NT		NT		NT		100	**800**	**J**	100	UJ	NT		NT		NT		NT		NT		100	**350**	**J**
Strontium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**74.5**	**J**	**99.5**	**95.1**	**J**	5	UJ	**5.1**	**J**	5	UJ	5	UJ	5	UJ	**41.6**	**J**	**66.7**	**44**	**J**
Thallium	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	2	UJ	**0.217**	**J**	**2.42**	**0.197**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	2	UJ	**0.309**	**J**	**2.51**	**0.257**	**J**
Tin	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ
Titanium	5	UJ	5	UJ	**7.4**	**J**	5	UJ	5	UJ	**508**	**J**	**535**	**529**	**J**	5	UJ	5	UJ	**5.4**	**J**	5	UJ	5	UJ	**588**	**J**	**613**	**568**	**J**
Uranium	0.05	UJ	**0.128**	**J**	**0.179**	**J**	0.05	UJ	**0.113**	**J**	**0.571**	**J**	**1.09**	**0.992**	**J**	0.05	UJ	**0.067**	**J**	**0.147**	**J**	0.05	UJ	**0.096**	**J**	**0.95**	**J**	**1.36**	**1.41**	**J**
Vanadium	0.2	UJ	0.2	UJ	**3.89**	**J**	**0.22**	**J**	**2.94**	**J**	**31.3**	**J**	**38.8**	**36.8**	**J**	0.2	UJ	0.2	UJ	**2.82**	**J**	0.2	UJ	**1.59**	**J**	**48.3**	**J**	**53.3**	**49**	**J**
Zinc	1	UJ	1	UJ	**6.1**	**J**	**1.2**	**J**	50	UJ	**86.7**	**J**	**146**	**115**	**J**	1	UJ	**3.8**	**J**	**15**	**J**	1	UJ	50	UJ	**143**	**J**	**214**	**162**	**J**

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOG														CH13-204-MW016E_SOH													
Sample Interval (mbgs)	18.5 - 19														21.5 - 22													
Sample Date	8/13/2013														8/13/2013													
General Location	INTERMEDIATE TAILINGS														INTERMEDIATE TAILINGS													
Geologic Unit	ALLUVIUM														ALLUVIUM													
Analyte (mg/kg)	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
	Result	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	50	UJ	50	UJ	**333**	**UJ**	50	UJ	**141**	**J**	**33100**	**J**	**33724**	**29900**	**J**	50	UJ	50	UJ	**317**	**J**	**54**	**J**	**175**	**J**	**15200**	**J**	**15846**	**16000**	**J**
Antimony	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**0.1**	**J**	**0.14**	**J**	**0.640**	**0.46**	**J**	0.1	UJ	0.1	UJ	**0.34**	**J**	0.1	UJ	0.1	UJ	**0.27**	**J**	**1.01**	**1.02**	**J**
Arsenic	0.05	UJ	0.05	UJ	**3.42**	**J**	**0.51**	**J**	**2.93**	**J**	**3.81**	**J**	**10.8**	**11.7**	**J**	0.05	UJ	0.05	UJ	**4.57**	**J**	**1.01**	**J**	**3.5**	**J**	**6.03**	**J**	**15.2**	**19.9**	**J**
Barium	**24.1**	**J**	**22.3**	**J**	2	UJ	**3.6**	**J**	**3.3**	**J**	**129**	**J**	**184**	**153**	**J**	**15.2**	**J**	**12.8**	**J**	**2.6**	**J**	**3.5**	**J**	**3.9**	**J**	**68.5**	**J**	**107**	**110**	**J**
Beryllium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.84**	**J**	**1.84**	**0.79**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.48**	**J**	**1.48**	**0.71**	**J**
Bismuth	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	**0.33**	**J**
Cadmium	0.05	UJ	**0.061**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	**0.093**	**J**	**0.354**	**0.184**	**J**	0.05	UJ	**0.05**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	**0.204**	**J**	**0.454**	**0.338**	**J**
Calcium	**2040**	**J**	**12800**	**J**	50	UJ	**265**	**J**	NT		**21100**	**J**	**36255**	**29700**	**J**	**1010**	**J**	**5360**	**J**	50	UJ	**942**	**J**	NT		**4290**	**J**	**11652**	**12400**	**J**
Chromium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**49.9**	**J**	**74.9**	**43.1**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**41.9**	**J**	**66.9**	**34.6**	**J**
Cobalt	0.1	UJ	**0.36**	**J**	**2.14**	**J**	0.1	UJ	**2.25**	**J**	**10.8**	**J**	**15.8**	**17.4**	**J**	0.1	UJ	**0.29**	**J**	**2.06**	**J**	0.1	UJ	**2.1**	**J**	**8.46**	**J**	**13.1**	**13.9**	**J**
Copper	0.5	UJ	0.5	UJ	**3.05**	**J**	0.5	UJ	0.5	UJ	**15.8**	**J**	**20.9**	**45.8**	**J**	0.5	UJ	**1.29**	**J**	**10.4**	**J**	**1.09**	**J**	0.5	UJ	**29.7**	**J**	**43.5**	**49.7**	**J**
Iron	50	UJ	50	UJ	**2030**	**J**	50	UJ	**3880**	**J**	**32900**	**J**	**38960**	**36400**	**J**	50	UJ	50	UJ	**3240**	**J**	**179**	**J**	**5890**	**J**	**20100**	**J**	**29509**	**31500**	**J**
Lead	0.5	UJ	0.5	UJ	**1.45**	**J**	**0.99**	**J**	0.5	UJ	**7.66**	**J**	**11.6**	**10.2**	**J**	0.5	UJ	**0.83**	**J**	**4.5**	**J**	**3.18**	**J**	0.5	UJ	**13.2**	**J**	**22.7**	**29.5**	**J**
Lithium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**37.4**	**J**	**62.4**	**35.8**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**24.8**	**J**	**49.8**	**25.6**	**J**
Manganese	**24.1**	**J**	**124**	**J**	**34.6**	**J**	**6.1**	**J**	**20.1**	**J**	**366**	**J**	**575**	**483**	**J**	**14.4**	**J**	**49.7**	**J**	**34.3**	**J**	**6.1**	**J**	**23.9**	**J**	**178**	**J**	**306**	**335**	**J**
Molybdenum	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	3.00	**0.81**	**J**	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	**1.3**	**J**	**0.85**	**J**	**4.15**	**2.71**	**J**
Nickel	2	UJ	2	UJ	**3.4**	**J**	2	UJ	**6.2**	**J**	**26.1**	**J**	**41.7**	**39.9**	**J**	2	UJ	2	UJ	**5.3**	**J**	2	UJ	**9.6**	**J**	**31**	**J**	**51.9**	**45.6**	**J**
Phosphorus	50	UJ	50	UJ	**106**	**J**	NT		NT		NT		**206**	**624**	**J**	50	UJ	50	UJ	**101**	**J**	NT		NT		NT		**201**	**598**	**J**
Potassium	**230**	**J**	NT		NT		NT		NT		NT		**230**	**5040**	**J**	100	UJ	NT		NT		NT		NT		NT		100	**2190**	**J**
Selenium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	0.2	UJ	1.50	**0.29**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.33**	**J**	**1.63**	**0.42**	**J**
Silver	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.600	**0.14**	**J**	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**0.19**	**J**	**0.690**	**0.19**	**J**
Sodium	100	UJ	NT		NT		NT		NT		NT		100	**1260**	**J**	100	UJ	NT		NT		NT		NT		NT		100	**460**	**J**
Strontium	**10.3**	**J**	**14.4**	**J**	5	UJ	5	UJ	5	UJ	**85.4**	**J**	**125**	**93.4**	**J**	5	UJ	**16.6**	**J**	5	UJ	5	UJ	5	UJ	**34.8**	**J**	**71.4**	**54.9**	**J**
Thallium	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	2	UJ	**0.494**	**J**	**2.69**	**0.34**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	2	UJ	**0.226**	**J**	**2.43**	**0.212**	**J**
Tin	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ
Titanium	5	UJ	5	UJ	**5.9**	**J**	5	UJ	**8.8**	**J**	**1020**	**J**	**1050**	**862**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**352**	**J**	**377**	**412**	**J**
Uranium	0.05	UJ	**0.16**	**J**	**0.221**	**J**	0.05	UJ	**0.101**	**J**	**0.428**	**J**	**1.01**	**0.757**	**J**	0.05	UJ	**0.102**	**J**	**0.191**	**J**	0.05	UJ	**0.187**	**J**	**0.84**	**J**	**1.42**	**1.32**	**J**
Vanadium	0.2	UJ	0.2	UJ	**1.99**	**J**	0.2	UJ	**1.51**	**J**	**55.2**	**J**	**59.3**	**63.5**	**J**	0.2	UJ	0.2	UJ	**2.45**	**J**	**0.22**	**J**	**3.48**	**J**	**37.5**	**J**	**44.1**	**43.4**	**J**
Zinc	1	UJ	1	UJ	**2.7**	**J**	1	UJ	50	UJ	**75.8**	**J**	**132**	**77.7**	**J**	1	UJ	1	UJ	**9**	**J**	**1.5**	**J**	50	UJ	**71.6**	**J**	**134**	**113**	**J**

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOI														CH13-204-MW016E_SOJ													
Sample Interval (mbgs)	26 - 26.5														29 - 29.5													
Sample Date	8/13/2013														8/13/2013													
General Location	INTERMEDIATE TAILINGS														INTERMEDIATE TAILINGS													
Geologic Unit	TILL?														TILL?													
Analyte (mg/kg)	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	UJ	50	J	**358**	**J**	**59**	**J**	**287**	**J**	**15100**	**J**	**15904**	**18000**	**J**	50	UJ	50	UJ	**894**	**J**	50	UJ	**141**	**J**	**21800**	**J**	**22985**	**23900**	**J**
Antimony	0.1	UJ	0.1	UJ	**0.37**	**J**	0.1	UJ	**0.1**	**J**	**0.22**	**J**	**0.990**	**1.18**	**J**	0.1	UJ	0.1	UJ	**0.13**	**J**	0.1	UJ	0.1	UJ	**0.13**	**J**	**0.660**	**0.36**	**J**
Arsenic	0.05	UJ	0.05	J	**4.29**	**J**	**1.29**	**J**	**4.03**	**J**	**3.65**	**J**	**13.4**	**18.2**	**J**	0.05	UJ	0.05	UJ	**1.95**	**J**	**0.194**	**J**	0.5	UJ	**2.29**	**J**	**5.03**	**5.72**	**J**
Barium	**15.3**	**J**	**12.1**	**J**	**2.8**	**J**	**3.6**	**J**	**4.5**	**J**	**65.9**	**J**	**104**	**125**	**J**	**34.5**	**J**	**31.4**	**J**	**2.8**	**J**	**7.5**	**J**	**3.9**	**J**	**51.8**	**J**	**132**	**133**	**J**
Beryllium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.47**	**J**	**1.47**	**0.77**	**J**	0.2	UJ	0.2	UJ	**0.21**	**J**	0.2	UJ	0.2	UJ	**1.32**	**J**	**2.33**	**1.67**	**J**
Bismuth	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	**0.4**	**J**	0.2	UJ	0.2	UJ	**0.26**	**J**	0.2	UJ	0.2	UJ	**1.56**	**J**	**2.62**	**2.02**	**J**
Cadmium	0.05	UJ	**0.333**	**J**	0.05	UJ	**0.133**	**J**	0.05	UJ	**0.204**	**J**	**0.820**	**0.655**	**J**	0.05	UJ	**0.061**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	**0.095**	**J**	**0.356**	**0.196**	**J**
Calcium	**1090**	**J**	**977**	**J**	50	UJ	**715**	**J**	NT		**3850**	**J**	**6682**	**7230**	**J**	**1000**	**J**	**9240**	**J**	50	UJ	**296**	**J**	NT		**10800**	**J**	**21386**	**22800**	**J**
Chromium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**34.3**	**J**	**59.3**	**39.7**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**48.8**	**J**	**73.8**	**58.4**	**J**
Cobalt	**0.24**	**J**	**0.95**	**J**	**3**	**J**	**0.18**	**J**	**2.77**	**J**	**7.28**	**J**	**14.4**	**15.9**	**J**	0.1	UJ	**0.25**	**J**	**1.68**	**J**	**0.15**	**J**	**0.73**	**J**	**11.8**	**J**	**14.7**	**14.1**	**J**
Copper	0.5	UJ	**2.21**	**J**	**12.5**	**J**	**1.53**	**J**	0.5	UJ	**28.3**	**J**	**45.5**	**47.2**	**J**	0.5	UJ	0.5	UJ	**3.13**	**J**	**0.78**	**J**	0.5	UJ	**34.1**	**J**	**39.5**	**30.7**	**J**
Iron	50	UJ	50	UJ	**2360**	**J**	**279**	**J**	**6350**	**J**	**18100**	**J**	**27189**	**29800**	**J**	50	UJ	50	UJ	**3720**	**J**	**100**	**J**	**1350**	**J**	**24200**	**J**	**29470**	**30500**	**J**
Lead	0.5	UJ	**1.63**	**J**	**5.78**	**J**	**5.39**	**J**	**0.59**	**J**	**16.9**	**J**	**30.8**	**35.2**	**J**	0.5	UJ	**0.9**	**J**	0.5	UJ	**1.98**	**J**	0.5	UJ	**5.4**	**J**	**9.8**	**9.63**	**J**
Lithium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**34.3**	**J**	**59.3**	**30.3**	**J**	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**37.1**	**J**	**62.1**	**38.3**	**J**
Manganese	**43.3**	**J**	**47**	**J**	**68.6**	**J**	**10.4**	**J**	**38.2**	**J**	**171**	**J**	**379**	**401**	**J**	**6.2**	**J**	**54.3**	**J**	**60.6**	**J**	**9.6**	**J**	**12.8**	**J**	**228**	**J**	**372**	**386**	**J**
Molybdenum	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	**1.04**	**J**	0.5	UJ	**3.54**	**1.76**	**J**	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	**1.4**	**J**	**3.90**	**2.03**	**J**
Nickel	2	UJ	2	UJ	**5.5**	**J**	2	UJ	**10.9**	**J**	**25.8**	**J**	**48.2**	**49.4**	**J**	2	UJ	2	UJ	**5.9**	**J**	2	UJ	**2.6**	**J**	**42.4**	**J**	**56.9**	**52**	**J**
Phosphorus	50	UJ	50	UJ	**191**	**J**	NT		NT		NT		**291**	**872**	**J**	50	UJ	50	UJ	**302**	**J**	NT		NT		NT		**402**	**633**	**J**
Potassium	100	UJ	NT		NT		NT		NT		NT		100	**2480**	**J**	**210**	**J**	NT		NT		NT		NT		NT		**210**	**2720**	**J**
Selenium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.22**	**J**	**1.52**	**0.31**	**J**	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.34**	**J**	**1.64**	**0.41**	**J**
Silver	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	**0.2**	**J**	**0.700**	**0.23**	**J**	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	U	0.600	**0.1**	**J**
Sodium	100	UJ	NT		NT		NT		NT		NT		100	**490**	**J**	100	UJ	NT		NT		NT		NT		NT		100	**930**	**J**
Strontium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**35.7**	**J**	**60.7**	**49.5**	**J**	**6.3**	**J**	**31.4**	**J**	5	UJ	**7.3**	**J**	5	UJ	**140**	**J**	**195**	**170**	**J**
Thallium	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	2	UJ	**0.321**	**J**	**2.52**	**0.274**	**J**	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	2	UJ	**0.252**	**J**	**2.45**	**0.199**	**J**
Tin	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ
Titanium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**417**	**J**	**442**	**557**	**J**	5	UJ	5	UJ	**9.7**	**J**	5	UJ	5	UJ	**574**	**J**	**604**	**637**	**J**
Uranium	0.05	UJ	**0.124**	**J**	**0.13**	**J**	0.05	UJ	**0.138**	**J**	**0.525**	**J**	**1.02**	**1.26**	**J**	**0.071**	**J**	**0.179**	**J**	**0.246**	**J**	0.05	UJ	0.05	UJ	**1.17**	**J**	**1.77**	**1.74**	**J**
Vanadium	0.2	UJ	0.2	UJ	**2.8**	**J**	**0.33**	**J**	**4.22**	**J**	**33.9**	**J**	**41.7**	**47.2**	**J**	0.2	UJ	0.2	UJ	**3.49**	**J**	**0.21**	**J**	**0.77**	**J**	**38.1**	**J**	**43.0**	**46.4**	**J**
Zinc	1	UJ	**1.1**	**J**	**6.7**	**J**	**1.9**	**J**	50	UJ	**67.1**	**J**	**128**	**107**	**J**	1	UJ	1	UJ	**6.6**	**J**	1	UJ	50	UJ	**54.1**	**J**	**114**	**68.6**	**J**

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E															CH14-015-MW001C													
Sample ID	CH13-204-MW016E_SOK															CH14_015_MW001C_SOa													
Sample Interval (mbgs)	34.5 - 35															2.1 - 2.4													
Sample Date	8/13/2013															9/3/2014													
General Location	INTERMEDIATE TAILINGS																												
Geologic Unit	WEATHERED BEDROCK																												
Analyte (mg/kg)	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
	Result	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	50	UJ	50	UJ	**189**	**J**	50	UJ	**63**	**J**	**17200**	**J**	**17602**	**18000**	**J**	**162**		50	U	50	U	50	U	**88**		**151**		**551**	**470**	
Antimony	0.1	UJ	0.1	UJ	**0.14**	**J**	0.1	UJ	0.1	UJ	**0.24**	**J**	**0.780**	**0.62**	**J**	0.1	U	**0.34**		**7.68**		**1.16**		**0.53**		**38**		**47.8**	**53.1**	
Arsenic	**0.067**	**J**	**0.066**	**J**	**2.16**	**J**	**0.295**	**J**	**0.5**	**J**	**12.8**	**J**	**15.9**	**12.3**	**J**	**0.769**		**1.21**		**70.5**		**36.7**		**130**		**649**		**888**	**1010**	
Barium	**10.2**	**J**	**9.8**	**J**	2	UJ	**2.9**	**J**	2	UJ	**54.5**	**J**	**81.4**	**86.5**	**J**	**5.5**		**9.2**		**15.9**		**12.7**		**433**		**4.1**		**480**	**174**	
Beryllium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	**0.4**	**J**	**1.40**	**0.56**	**J**	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.2	0.2	U
Bismuth	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	1.20	0.2	UJ	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.62**		**1.62**	**0.85**	
Cadmium	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	**0.232**	**J**	**0.482**	**0.152**	**J**	**7.83**		**0.196**		**0.107**		**0.06**		0.05	U	**11.6**		**19.8**	**20.5**	
Calcium	**667**	**J**	**10100**	**J**	50	UJ	**281**	**J**	NT		**11300**	**J**	**22398**	**20000**	**J**	**489**		50	U	50	U	**90**		NT		**299**		**978**	**882**	
Chromium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**54.4**	**J**	**79.4**	**83.4**	**J**	5	U	5	U	5	U	5	U	5	U	5	U	30	**6.03**	
Cobalt	0.1	UJ	**0.32**	**J**	**1.1**	**J**	**0.1**	**J**	**0.48**	**J**	**14**	**J**	**16.1**	**15.3**	**J**	**2.96**		0.1	U	0.1	U	0.1	U	**0.4**		**156**		**160**	**153**	
Copper	0.5	UJ	0.5	UJ	**1.29**	**J**	0.5	UJ	0.5	UJ	**19.4**	**J**	**22.7**	**32.6**	**J**	**221**		**4.96**		**50.1**		**11.1**		0.5	U	**1080**		**1368**	**1550**	
Iron	50	UJ	50	UJ	**1870**	**J**	**69**	**J**	**764**	**J**	**26900**	**J**	**29703**	**32400**	**J**	**2400**		**313**		**5300**		**546**		**30300**		**334000**		**372859**	**368000**	
Lead	0.5	UJ	**1.21**	**J**	0.5	UJ	**1.84**	**J**	0.5	UJ	**8.22**	**J**	**12.8**	**10.2**	**J**	**82.8**		**172**		**214**		**92.4**		**0.88**		**3630**		**4192**	**3440**	
Lithium	5	UJ	5	UJ	5	UJ	5	UJ	5	UJ	**36.4**	**J**	**61.4**	**36.2**	**J**	5	U	5	U	5	U	5	U	5	U	5	U	30	5	U
Manganese	**5.7**	**J**	**69**	**J**	**36.9**	**J**	**7**	**J**	**7.8**	**J**	**263**	**J**	**389**	**414**	**J**	**82.5**		5	U	**9**		5	U	**21.5**		**196**		**319**	**317**	
Molybdenum	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	**0.98**	**J**	**3.48**	**0.87**	**J**	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**2.59**		**5.09**	**2.36**	
Nickel	2	UJ	2	UJ	**5.3**	**J**	2	UJ	2	UJ	**37.7**	**J**	**51.0**	**51.7**	**J**	**2.6**		2	U	2	U	2	U	2	U	**9.9**		**20.5**	**13.3**	
Phosphorus	50	UJ	50	UJ	**108**	**J**	NT		NT		NT		**208**	**661**	**J**	50	U	50	U	**52**		NT		NT		NT		**152**	**246**	
Potassium	**130**	**J**	NT		NT		NT		NT		NT		**130**	**2340**	**J**	100	U	NT		NT		NT		NT		NT		**100**	100	U
Selenium	0.2	UJ	0.2	UJ	0.2	UJ	0.2	UJ	0.5	UJ	**0.46**	**J**	**1.76**	**0.36**	**J**	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.65**		**1.95**	**0.65**	
Silver	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.600	0.1	UJ	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**18.2**		**18.7**	**18.2**	
Sodium	100	UJ	NT		NT		NT		NT		NT		100	**270**	**J**	100	U	NT		NT		NT		NT		NT		**100**	100	U
Strontium	5	UJ	**26.4**	**J**	5	UJ	5	UJ	5	UJ	**47.1**	**J**	**93.5**	**77.5**	**J**	5	U	5	U	5	U	5	U	5	U	5	U	30	**7.55**	
Thallium	0.05	UJ	0.05	UJ	0.05	UJ	0.05	UJ	2	UJ	**0.202**	**J**	**2.40**	**0.187**	**J**	0.05	U	0.05	U	**0.185**		**0.111**		2	U	**5.62**		**8.02**	**5.89**	
Tin	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	2	UJ	12.0	2	UJ	2	U	2	U	2	U	2	U	2	U	**3.4**		**13.4**	**5.2**	
Titanium	5	UJ	5	UJ	5	UJ	7	UJ	5	UJ	**342**	**J**	**369**	**439**	**J**	5	U	5	U	5	U	5	U	5	U	5	U	30	**5.4**	
Uranium	0.05	UJ	**0.1**	**J**	**0.14**	**J**	0.05	UJ	0.05	UJ	**0.775**	**J**	**1.17**	**1.02**	**J**	**0.307**		0.05	U	0.05	U	0.05	U	**0.126**		**0.338**		**0.92**	**0.91**	
Vanadium	0.2	UJ	0.2	UJ	**1.2**	**J**	0.2	UJ	**0.4**	**J**	**40.2**	**J**	**42.4**	**48**	**J**	0.2	U	0.2	U	**2.54**		0.2	U	**4.26**		**1.1**		**8.5**	**9.26**	
Zinc	1	UJ	1	UJ	**2.4**	**J**	1	UJ	50	UJ	**67.7**	**J**	**123**	**56.3**	**J**	**2820**		**34.3**		**81.1**		**24.8**		50	U	**7700**		**10710**	**11400**	

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW001C															CH14-015-MW001C													
Sample ID	CH14_015_MW001C_Sof															CH14_015_MW001C_Sog													
Sample Interval (mbgs)	16.5 - 16.8															19.2 - 19.5													
Sample Date	9/3/2014															9/4/2014													
General Location																													
Geologic Unit																													
Analyte (mg/kg)	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
	Result	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	50	U	50	U	50	U	50	U	50	U	**936**		**1186**	**884**		**79**		50	U	**524**		**377**		**233**		**13700**		**14963**	**14800**	
Antimony	0.1	U	**0.14**		**6.55**		**1.81**		0.8	J	**19.2**		**28.6**	**33.1**		0.1	U	0.1	U	**0.85**		**0.24**		**0.1**		**0.65**		**2.04**	**1.51**	
Arsenic	**0.064**		**0.085**		3.09	J	**16.3**		**3.89**		**376**		**399**	**394**		**0.065**		**0.111**		**2.37**		**0.709**		**0.66**		**2.46**		**6.4**	**6.71**	
Barium	**3.7**		**5.9**		**17.5**		**8.9**		**53.3**		**10.4**		**100**	**19.3**		**26.5**		**15.4**		**17.6**		**15.5**		**12.5**		**52.7**		**140**	**125**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.27**		**1.27**	**0.31**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.45**		**1.45**	**0.74**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.2	**0.24**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.2	**0.54**	
Cadmium	**1.16**		**0.094**		**0.108**		**0.088**		0.05	U	**27**		**28.5**	**25.3**		**0.276**		**0.09**		0.05	U	0.05	U	0.05	U	**0.122**		**0.638**	**0.496**	
Calcium	**486**		50	U	50	U	**71**				**1490**		**2147**	**2030**		**1680**		**107**		50	U	**179**		NT		**3090**		**5106**	**4450**	
Chromium	5	U	5	U	5	U	5	U	5	U	**6.5**		**32**	**9.46**		5	U	5	U	5	U	5	U	5	U	**28.6**		**53.6**	**32.6**	
Cobalt	**1.72**		0.1	U	**0.34**		**0.29**		0.1	U	**108**		**111**	**114**		**2.37**		**0.16**		**0.25**		**0.13**		**0.82**		**6.35**		**10.1**	**10.1**	
Copper	**8**		**10.1**	J	**67.8**		**15.8**		0.5	U	**945**		**1047**	**1070**		**2.06**		**3.46**		**18.5**		**1.05**		**0.65**		**12.1**		**37.8**	**37.8**	
Iron	**113**		**412**		**10200**		**1210**		**2390**		**298000**		**312325**	**308000**		**105**		**549**		**5020**		**467**		**2460**		**16000**		**24601**	**25000**	
Lead	**1790**		**803**		388	J	**154**	J	**0.73**		**829**		**3965**	**4320**		**1.86**		**15.9**		**11.9**		**4.19**		**0.88**		**11.1**		**45.8**	**49.1**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30	5	U	5	U	5	U	5	U	5	U	5	U	**29.9**		**54.9**	**29.3**	
Manganese	**127**		**5.7**		**27.1**		**5.1**		**14.2**		**573**		**752**	**700**		**62.4**		5	U	5	U	5	U	**10.4**		**137**		**225**	**210**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**2.87**		**5.37**	**3.01**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	**0.68**	
Nickel	**3.2**		2	U	2	U	2	U	2	U	**28.5**		**39.7**	**33**		**5.5**		2	U	2	U	2	U	**2.2**		**18.7**		**32.4**	**27.1**	
Phosphorus	50	U	50	U	50	U	NT		NT		NT		**150**	**336**		50	U	50	U	**121**		NT		NT		NT		**221**	**588**	
Potassium	100	U	NT		NT		NT		NT		NT		**100**	**250**		100	U	NT		NT		NT		NT		NT		100	**1420**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.56**		**1.86**	**0.71**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	**0.36**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**15.8**		**16.3**	**16.8**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.15**		**0.65**	**0.21**	
Sodium	100	U	NT		NT		NT		NT		NT		**100**	100	U	100	U	NT		NT		NT		NT		NT		100	**380**	
Strontium	5	U	5	U	5	U	5	U	5	U	5	U	30	**5.35**		**5.6**		5	U	5	U	5	U	5	U	**28.7**		**54.3**	**35.9**	
Thallium	**0.871**		**0.174**		**0.105**		**0.186**		2	U	**9.53**		**12.9**	**11.8**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.224**		**2.42**	**0.2**	
Tin	2	U	2	U	2	U	2	U	2	U	**3.2**		**13.2**	**4.4**		2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**18.2**		**43.2**	**16.8**		5	U	5	U	**11.7**		**14.5**		5	U	**483**		**524**	**481**	
Uranium	0.05	U	**0.063**		**0.071**		0.05	U	0.05	U	**0.839**		**1.12**	**1.09**		0.05	U	**2.67**		**1.31**		**0.131**		**0.087**		**0.5**		**4.75**	**4.49**	
Vanadium	0.2	U	0.2	U	**1.77**		**0.38**		**0.64**		**13.3**		**16.5**	**15.6**		0.2	U	0.2	U	**3.6**		**0.68**		**1.73**		**24.3**		**30.7**	**31.5**	
Zinc	**516**		**50**	J	**232**		**53.9**		50	U	**17600**		**18502**	**16300**		**507**		**48.3**		**35.6**		**10**		50	U	**154**		**805**	**669**	

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW001C													CH14-015-MW001C												
Sample ID	CH14_015_MW001C_Soh													CH14_015_MW001C_Soi												
Sample Interval (mbgs)	20.4 - 20.7													21.6 - 21.9												
Sample Date	9/4/2014													9/3/2014												
General Location																										
Geologic Unit																										
Analyte (mg/kg)	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
	Result	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	50	U	**60**		**566**		**126**		**186**		**15600**		**16588**	**17400**		50	U	50	U	**370**		**80**		**137**		**14600**		**15287**	**14400**	
Antimony	0.1	U	0.1	U	**0.22**		0.1	U	0.1	U	**0.18**		**0.8**	**0.57**		0.1	U	0.1	U	**0.15**		0.1	U	0.1	U	**0.15**		**0.70**	**0.35**	
Arsenic	0.05	U	0.05	U	**1.77**		0.347		**1.24**		**2.46**		**5.92**	**6.18**		0.05	U	0.05	U	**1.27**		**0.243**		**1.06**		**2.15**		**4.82**	**5.16**	
Barium	**44.1**		**12.1**		**2.1**		**3.7**		**4.3**		**44.7**		**111**	**119**		**26.8**		**9.8**		**2.6**		**3.4**		**4.9**		**58.9**		**106**	**97.7**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.49**		**1.49**	**0.71**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.44**		**1.44**	**0.55**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.2	**0.46**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.2	**0.3**	
Cadmium	**0.147**		**0.09**		0.05	U	0.05	U	0.05	U	**0.36**		**0.747**	**0.644**		**0.112**		**0.083**		0.05	U	0.05	U	0.05	U	**0.656**		**1.001**	**0.498**	
Calcium	**497**		50	U	50	U	**289**		NT		**4610**		**5496**	**6470**		**390**		**110**		50	U	**288**		NT		**5160**		**5998**	**5100**	
Chromium	5	U	5	U	5	U	5	U	5	U	**29.6**		**54.6**	**37.3**		5	U	5	U	5	U	5	U	5	U	**27**		**52.0**	**27.6**	
Cobalt	**0.36**		**0.16**		**0.67**		0.1	U	**1.07**		**6.68**		**9.04**	**9.38**		**0.23**		0.1	U	**0.42**		0.1	U	**0.8**		**6.14**		**7.79**	**7.87**	
Copper	0.5	U	**1.97**		**3.68**		0.5	U	0.5	U	**10.5**		**17.7**	**20.7**		0.5	U	**1.56**		**2.21**		0.5	U	0.5	U	**9.53**		**14.8**	**14.7**	
Iron	50	U	**246**		**2500**		**204**		**3140**		**18500**		**24640**	**25800**		50	U	**283**		**2520**		**125**		**2560**		**18000**		**23538**	**21900**	
Lead	0.5	U	**10.2**		**6.36**		**2.47**		0.5	U	**13.6**		**33.6**	**32.2**		0.5	U	**4.75**		**4.79**		**1.71**		0.5	U	**9.68**		**21.9**	**20.2**	
Lithium	5	U	5	U	5	U	5	U	5	U	**31**		**56**	**33.4**		5	U	5	U	5	U	5	U	5	U	**28.3**		**53.3**	**25.7**	
Manganese	**22.3**		5	U	12		5	U	**15.6**		**170**		**230**	**232**		**16.7**		5	U	**9.8**		5	U	**13.8**		**182**		**232**	**207**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	**0.96**		0.5	U	0.5	U	**0.54**		0.5	U	0.5	U	0.5	U	3	**0.89**	
Nickel	2	U	2	U	2	U	2	U	**3**		**20.1**		**31.1**	**28.2**		2	U	2	U	2	U	2	U	**2.2**		**17.4**		**27.6**	**20.2**	
Phosphorus	50	U	50	U	**153**		NT		NT		NT		**253**	**886**		50	U	50	U	**124**		NT		NT		NT		**224**	**521**	
Potassium	**100**		NT		NT		NT		NT		NT		**100**	**1910**		100	U	NT		NT		NT		NT		NT		**100**	**1850**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.11**		**0.61**	**0.11**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.11**		**0.61**	0.1	U
Sodium	100	U	NT		NT		NT		NT		NT		100	**640**		100	U	NT		NT		NT		NT		NT		100	**530**	
Strontium	5	U	5	U	5	U	5	U	5	U	**40.5**		**65.5**	**55**		5	U	5	U	5	U	5	U	5	U	**45.9**		**70.9**	**42.6**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.184**		**2.38**	**0.18**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.169**		**2.37**	**0.156**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12	**3.5**		2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	**8**		5	U	5	U	**591**		**619**	**576**		5	U	5	U	**6.3**		5	U	5	U	**572**		**598**	**560**	
Uranium	0.05	U	**0.18**		**0.123**		0.05	U	**0.143**		**0.605**		**1.15**	**1.2**		0.05	U	**0.17**		**0.114**		0.05	U	**0.126**		**0.566**		**1.08**	**0.945**	
Vanadium	0.2	U	0.2	U	**1.67**		**0.24**		**1.76**		**28.7**		**32.8**	**33.8**		0.2	U	0.2	U	**1.01**		0.2	U	**1.32**		**28.6**		**31.5**	**30.3**	
Zinc	**36.2**		**16.7**		**42.6**		**5**		50	U	**173**		**324**	**319**		**34.3**		**13.1**		**28.1**		**3.3**		50	U	**156**		**285**	**229**	

Tabler 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW001C															CH14-015-MW001C														
Sample ID	CH14_015_MW001C_Soj															CH14_015_MW001C_Sok														
Sample Interval (mbgs)	23.8 - 24.1															25.6 - 25.9														
Sample Date	9/4/2014															9/4/2014														
General Location																														
Geologic Unit																														
Analyte (mg/kg)	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
	Result	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	**97**		50	U	**205**		**147**		**257**		**11700**		**12456**	**13100**		50	U	50	U	**145**		**56**		**177**		**9810**		**10288**	**11800**	
Antimony	0.1	U	0.1	U	**0.1**	**U**	0.1	U	0.1	U	**0.3**		**0.8**	**0.66**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.24**		**0.74**	**0.47**	
Arsenic	**0.051**		0.05	U	**2.17**		**0.583**		**1.93**		**4.4**		**9.18**	**13.9**		0.05	U	0.05	U	**1.5**		**0.339**		**2.07**		**3.8**		**7.81**	**9.27**	
Barium	**21.6**		**16.7**		**2.4**		**4**		**5.7**		**52.4**		**103**	**114**		**18.5**		**7.6**		2	U	2	U	**3.3**		**37.5**		**71**	**103**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.48**		**1.48**	**0.75**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.42**		**1.42**	**0.59**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.28**		**1.28**	**0.49**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.34**		**1.34**	**0.47**	
Cadmium	**0.066**		0.05	U	0.05	U	0.05	U	0.05	U	**0.195**		**0.461**	**0.335**		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	**0.16**		**0.41**	**0.257**	
Calcium	**767**		50	U	50	U	**502**		NT		**2920**		**4289**	**3960**		**342**		50	U	50	U	**227**		NT		**2920**		**3589**	**3790**	
Chromium	5	U	5	U	5	U	5	U	5	U	**26.1**		**51.1**	**30.2**		5	U	5	U	5	U	5	U	5	U	**18.8**		**43.8**	**22.4**	
Cobalt	**0.39**		0.1	U	**0.2**		0.1	U	**1.97**		**5.65**		**8.41**	**9.26**		**0.32**		0.1	U	**0.13**		0.1	U	**1.27**		**4.61**		**6.53**	**7.15**	
Copper	**1.9**		**0.51**		**1.71**		**0.63**		0.5	U	**21.3**		**26.6**	**32.8**		**2.02**		**0.88**		**2.23**		0.5	U	0.5	U	**17.4**		**23.5**	**25.7**	
Iron	**72**		**209**		**2190**		**253**		**6940**		**14300**		**23964**	**27200**		50	U	**111**		**1810**		**122**		**4910**		**13700**		**20703**	**22100**	
Lead	**3.14**		**3.57**		**4.72**		**2.96**		0.5	U	**27.4**		**42.3**	**55.6**		**2.67**		**4.32**		**5.67**		**1.31**		0.5	U	**16**		**30.5**	**35.5**	
Lithium	5	U	5	U	5	U	5	U	5	U	**23.7**		**48.7**	**24.4**		5	U	5	U	5	U	5	U	5	U	**21.5**		**46.5**	**22.9**	
Manganese	**26.1**		5	U	**17.6**		5	U	**29.9**		**137**		**221**	**223**		**24**		5	U	**8**		5	U	**20**		**120**		**182**	**190**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.52**		0.5	U	**3.02**	**0.86**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3	**0.56**	
Nickel	2	U	2	U	2	U	2	U	**6.1**		**19.8**		**33.9**	**31.1**		2	U	2	U	2	U	2	U	**4.2**		**16.2**		**28.4**	**24.1**	
Phosphorus	50	U	50	U	**216**		NT		NT		NT		**316**	**763**		50	U	50	U	**108**		NT		NT		NT		**208**	**675**	
Potassium	100	U	NT		NT		NT		NT		NT		**100**	**2180**		100	U	NT		NT		NT		NT		NT		**100**	**1750**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.5	0.2	U
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.14		**0.64**	**0.23**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.13		**0.63**	**0.15**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**320**		100	U	NT		NT		NT		NT		NT		100	**390**	
Strontium	5	U	5	U	5	U	5	U	5	U	**28.2**		**53.2**	**33.5**		5	U	5	U	5	U	5	U	5	U	**28.8**		**53.8**	**39.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.298**		**2.50**	**0.271**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.228**		**2.43**	**0.206**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12	2	U
Titanium	5	U	5	U	5	U	5	U	**7.5**		**531**		**559**	**591**		5	U	5	U	5	U	5	U	5	U	**349**		**374**	**402**	
Uranium	**0.213**		**0.343**		**0.297**		0.05	U	**0.404**		**0.704**		**2.01**	**2.18**		**0.089**		**0.279**		**0.2**		0.05	U	**0.319**		**0.61**		**1.55**	**1.67**	
Vanadium	0.2	U	0.2	U	**1.61**		**0.34**		**4.65**		**25**		**32.0**	**35.1**		0.2	U	0.2	U	**1.02**		0.2	U	**3.27**		**20.1**		**25.0**	**26.5**	
Zinc	**60.4**		**4.1**		**8.3**		**3.6**		50	U	**156**		**282**	**319**		**51.5**		**5.1**		**10.1**		**2**		50	U	**138**		**257**	**280**	

Table 5-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:
Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC
The six individual extraction steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.
Bold indicates the analyte was detected

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
NT = not tested
PYRO - Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLN = Bound to crystalline oxide

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW001B															CH12-204-MW001B														
Sample ID	CH12-204-MW001B_SOB															CH12-204-MW001B_SOH														
Sample Interval (mbgs)	4.75 - 5.03															36.4 - 36.6														
Sample Date	6/28/2012															6/30/2012														
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.7%	U	1.3%	U	**3.6%**		**1.3%**		**1.3%**		**119.8%**		**83%**	**14600**		0.3%	U	0.2%	U	**2.0%**		0.2%	U	**0.8%**		**73.0%**		**109%**	**30000**	
Antimony	27.4%	U	26.0%	U	1230.1%	U	130.1%	U	**104.1%**		**905.5%**		**73%**	**0.64**		19.4%	U	9.7%	U	**10.7%**		9.7%	U	9.7%	U	**37.9%**		**256%**	**0.64**	
Arsenic	1.1%	U	**1.8%**		**409.3%**		**163.9%**		**149.8%**		**1411.4%**		**121%**	**12**		0.7%	U	**1.3%**		**38.4%**		**4.8%**		35.5%	U	**264.3%**		**469%**	**14.7**	
Barium	**5.6%**		**11.1%**		**18.1%**		**17.0%**		**6.9%**		**118.0%**		**188%**	**190**		**50.2%**		**64.9%**		17.1%	U	15.1%	U	28.3%	U	**681.3%**		**106%**	**20.2**	
Beryllium	28.4%	U	14.2%	U	23.4%	U	14.2%	U	14.2%	U	**56.7%**		**122%**	**0.64**		32.3%	U	16.1%	U	16.1%	U	16.1%	U	16.1%	U	**55.6%**		**217%**	**0.49**	
Bismuth	33.3%	U	16.7%	U	88.3%	U	16.7%	U	16.7%	U	45.8%	U	104%	**0.26**		33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	65.8%	U	463%	0.2	U
Cadmium	484.2%	U	**583.9%**		328.5%	U	169.1%	U	12.2%	U	**1321.2%**		**104%**	**0.325**		31.2%	U	46.1%	U	15.6%	U	17.4%	U	15.6%	U	**100.9%**		**249%**	**0.1**	
Calcium	**14.9%**		**0.4%**		0.3%	U	**1.7%**				**20.6%**		**116%**	**15700**		**3.0%**		**13.9%**		0.2%	U	**1.9%**				**21.7%**		**111%**	**34400**	
Chromium	16.3%	U	8.2%	U	8.2%	U	8.2%	U	8.2%	U	**76.3%**		**111%**	**40.3**		2.9%	U	1.4%	U	1.4%	U	1.4%	U	1.4%	U	**11.5%**		**166%**	**315**	
Cobalt	1.7%	U	**12.1%**		**55.0%**		1.1%	U	**13.6%**		**177.1%**		**107%**	**15.1**		0.5%	U	**3.3%**		**7.0%**		0.4%	U	**2.4%**		**46.2%**		**120%**	**44.1**	
Copper	3.4%	U	**149.0%**		**275.2%**		**23.0%**		**4.2%**		**1179.9%**		**98%**	**33.2**		0.7%	U	**1.0%**		**4.7%**		**1.1%**		0.9%	U	**48.1%**		**150%**	**151**	
Iron	0.4%	U	**0.8%**		**51.5%**		**1.4%**		**31.0%**		**208.7%**		**115%**	**30300**		0.2%	U	**0.2%**		**6.8%**		**0.2%**		**7.0%**		**59.5%**		**117%**	**64700**	
Lead	41.4%	U	**2520.9%**		**317.3%**		**2410.2%**		**26.6%**		**1561.7%**		**58%**	**96.9**		13.8%	U	**545.0%**		401.1%	U	**383.1%**		27.1%	U	**2863.1%**		**205%**	**5.57**	
Lithium	19.2%	U	9.6%	U	9.6%	U	9.6%	U	9.6%	U	**63.4%**		**143%**	**27.9**		13.3%	U	6.7%	U	6.7%	U	6.7%	U	6.7%	U	**50.1%**		**173%**	**45**	
Manganese	**3.4%**		**16.9%**				**4.5%**		**12.1%**		**135.0%**		**91%**	**439**		**1.6%**		**10.8%**				**0.9%**		**2.3%**		**42.0%**		**109%**	**779**	
Molybdenum	29.0%	U	14.5%	U	18.0%	U	14.5%	U	**14.5%**		107.0%	U	**125%**	**1.38**		26.1%	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**27.4%**		**195%**	**1.5**	
Nickel	9.8%	U	13.5%	U	**25.6%**		4.9%	U	**11.1%**		**75.9%**		**86%**	**40.7**		2.2%	U	**1.1%**		**2.3%**		1.1%	U	1.5%	U	**22.6%**		**150%**	**198**	
Phosphorus	#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**725**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**986**	
Potassium	200.0%	U											5%	**2570**		200.0%	U											3%	**390**	
Selenium	26.7%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	30.7%	U	198%	**0.2**		24.8%	U	12.4%	U	12.4%	U	12.4%	U	31.1%	U	**29.8%**		**600%**	**0.27**	
Silver	29.0%	U	14.5%	U	14.5%	U	14.5%	U	14.5%	U	**1127.5%**		**64%**	**0.23**		33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	158.3%	U	298%	0.1	U
Sodium	200.0%	U											71%	**310**		200.0%	U											27%	**130**	
Strontium	12.5%	U	**6.2%**		6.2%	U	6.2%	U	6.2%	U	**38.4%**		**129%**	**76.5**		6.2%	U	**4.4%**		3.1%	U	**3.1%**		3.1%	U	**28.1%**		**131%**	**180**	
Thallium	4.0%	U	4.2%	U	5.1%	U	2.3%	U	80.2%	U	**91.9%**		**134%**	**0.273**		4.3%	U	2.1%	U	2.1%	U	2.1%	U	85.5%	U	**48.3%**		**362%**	0.05	U
Tin	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	333%	2	U	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U
Titanium	2.1%	U	1.0%	U	1.2%	U	1.1%	U	**1.0%**		**107.0%**		**148%**	**558**		5.3%	U	2.6%	U	6.5%	U	2.6%	U	3.6%	U	**547.4%**		**118%**	**219**	
Uranium	10.9%	U	**52.9%**		**60.0%**		5.4%	U	**12.5%**		**118.3%**		**79%**	**1.01**		**8.0%**		**25.2%**		**18.9%**		4.0%	U	**6.9%**		**50.5%**		**116%**	**1.01**	
Vanadium	1.1%	U	0.6%	U	**17.0%**		**1.0%**		**6.9%**		**107.3%**		**85%**	**37**		0.3%	U	**0.1%**		**2.0%**		0.1%	U	**1.4%**		**36.9%**		**98%**	**139**	
Zinc	272.4%	U	**1428.6%**		**1074.8%**		**42.6%**		**160.2%**		**2209.6%**		**80%**	**162**		1.6%	U	**25.6%**		**62.0%**		3.8%	U	40.4%	U	**235.1%**		**174%**	**73.1**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW002B														CH12-204-MW002B													
Sample ID	CH12-204-MW002B_SOB														CH12-204-MW002B_SOC													
Sample Interval (mbgs)	4.6 - 6.1														9.3 - 10													
Sample Date	7/6/2012														7/6/2012													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.5%	U	0.3%	U	**3.3%**		0.4%	U	**1.1%**		**95.6%**		**99%**	**24800**		0.4%	U	0.3%	U	**5.1%**		**0.4%**		**1.7%**		**32.9%**		**105%**	**23200**	
Antimony	23.5%	U	11.8%	U	15.3%	U	11.8%	U	**11.8%**		**48.2%**		**306%**	**0.78**		14.0%	U	**7.0%**		**83.9%**		9.1%	U	**7.7%**		**367.1%**		**224%**	**1.23**	
Arsenic	0.3%	U	**0.6%**		**18.7%**		**1.7%**		**10.6%**		**43.6%**		**168%**	**48.1**		1.1%	U	**3.2%**		**382.1%**		**81.4%**		**141.9%**		**2326.5%**		**376%**	**10.2**	
Barium	**6.1%**		**7.8%**		**2.2%**		**2.0%**		**4.0%**		**72.8%**		**106%**	**294**		**3.1%**		**5.8%**		**5.6%**		**4.8%**		**14.0%**		**58.6%**		**125%**	**237**	
Beryllium	26.1%	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**41.8%**		**216%**	**0.91**		23.7%	U	20.1%	U	**32.5%**		11.8%	U	**13.6%**		**44.4%**		**119%**	**1.08**	
Bismuth	33.3%	U	16.7%	U	18.3%	U	16.7%	U	16.7%	U	53.3%	U	278%	**0.3**		30.3%	U	15.2%	U	47.0%	U	15.2%	U	15.2%	U	**152.3%**		**257%**	**0.51**	
Cadmium	25.3%	U	**24.8%**		12.9%	U	**15.4%**		**12.7%**		**73.9%**		**134%**	**0.45**		729.5%	U	**134.6%**		40.4%	U	41.0%	U	6.1%	U	**246.0%**		**83%**	**0.781**	
Calcium	**13.5%**		**58.0%**		0.7%	U	**7.5%**				**75.9%**		**118%**	**8230**		**23.7%**		**1.4%**		0.4%	U	**2.8%**				**13.3%**		**98%**	**15300**	
Chromium	6.3%	U	3.1%	U	3.1%	U	3.1%	U	3.1%	U	**23.6%**		**160%**	**74.2**		10.6%	U	5.3%	U	5.3%	U	5.3%	U	5.3%	U	**18.8%**		**178%**	**66.8**	
Cobalt	0.9%	U	11.3%	U	**20.5%**		0.7%	U	**4.7%**		**83.6%**		**106%**	**25.4**		**84.9%**		**7.9%**		**11.7%**		**1.1%**		**10.4%**		**62.8%**		**93%**	**18.6**	
Copper	3.0%	U	**5.2%**		**24.3%**		**4.3%**		**2.6%**		**227.2%**		**136%**	**42.8**		16.9%	U	**87.4%**		**190.0%**		**27.1%**		**3.2%**		**546.7%**		**133%**	**46.9**	
Iron	0.2%	U	0.3%	U	**11.5%**		**0.3%**		**10.2%**		**83.0%**		**112%**	**51200**		0.2%	U	**0.5%**		**23.9%**		**0.9%**		**22.1%**		**57.3%**		**81%**	**38100**	
Lead	5.2%	U	222.7%	U	**162.1%**		**133.6%**		**10.0%**		**1165.2%**		**175%**	**30.6**		185.3%	U	**481.0%**		**131.1%**		**203.1%**		**5.8%**		**563.8%**		**113%**	**95.2**	
Lithium	15.6%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**61.9%**		**176%**	**42.5**		14.5%	U	7.3%	U	7.3%	U	7.3%	U	7.3%	U	**19.2%**		**320%**	**44.5**	
Manganese	2.7%	U	**22.9%**				**1.6%**		**3.3%**		**68.6%**		**105%**	**827**		**28.8%**		**1.3%**				**1.4%**		**4.5%**		**39.6%**		**92%**	**628**	
Molybdenum	25.2%	U	12.6%	U	**12.6%**		12.6%	U	**12.6%**		23.7%	U	**283%**	**2.38**		22.9%	U	11.4%	U	11.4%	U	11.4%	U	**11.4%**		**16.7%**		**182%**	**1.82**	
Nickel	4.7%	U	2.3%	U	**6.7%**		2.3%	U	**3.4%**		**42.7%**		**129%**	**75.6**		16.1%	U	**2.8%**		**5.2%**		2.8%	U	**6.8%**		**25.1%**		**100%**	**60**	
Phosphorus	#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**753**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**800**	
Potassium	200.0%	U											3%	**2790**		**166.7%**												**10%**	**3350**	
Selenium	26.7%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	31.3%	U	448%	**0.25**		23.8%	U	11.9%	U	11.9%	U	11.9%	U	29.8%	U	**22.6%**		**251%**	**0.75**	
Silver	40.0%	U	20.0%	U	20.0%	U	20.0%	U	20.0%	U	**160.0%**		**298%**	**0.17**		24.1%	U	12.0%	U	12.0%	U	12.0%	U	12.0%	U	**509.6%**		**145%**	**0.35**	
Sodium	200.0%	U											29%	**710**		200.0%	U											182%	**320**	
Strontium	**13.3%**		10.8%	U	6.6%	U	6.6%	U	6.6%	U	**56.5%**		**154%**	**66.2**		**13.5%**		**6.8%**		6.8%	U	**6.8%**		**6.8%**		**19.5%**		**190%**	**71.4**	
Thallium	4.1%	U	2.0%	U	2.0%	U	2.0%	U	81.5%	U	**43.6%**		**500%**	**0.275**		5.7%	U	4.3%	U	2.8%	U	2.1%	U	76.5%	U	**55.8%**		**226%**	**0.307**	
Tin	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U
Titanium	2.1%	U	1.1%	U	2.7%	U	1.1%	U	1.7%	U	**200.8%**		**103%**	**568**		1.4%	U	0.7%	U	**1.1%**		**0.8%**		**0.7%**		**37.0%**		**105%**	**701**	
Uranium	10.4%	U	**36.3%**		**26.5%**		5.2%	U	**8.5%**		**61.8%**		**109%**	**0.921**		**4.3%**		**58.2%**		**33.5%**		**3.9%**		**15.3%**		**37.7%**		**107%**	**2.36**	
Vanadium	0.9%	U	0.5%	U	**6.8%**		0.5%	U	**4.1%**		**108.2%**		**98%**	**49.2**		0.6%	U	0.3%		**8.6%**		**0.5%**		**7.1%**		**25.3%**		**95%**	**58.6**	
Zinc	1.6%	U	14.1%	U	**56.3%**		3.0%	U	39.7%	U	**199.2%**		**121%**	**120**		676.1%	U	**126.1%**		**154.0%**		**15.6%**		35.6%	U	**520.8%**		**100%**	**192**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW002B															CH12-204-MW003B													
Sample ID	CH12-204-MW002B_SOF															CH12-204-MW003B_SOC													
Sample Interval (mbgs)	26 - 27															9.6 - 10.4													
Sample Date	7/6/2012															7/4/2012													
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**3.5%**		1.7%	U	14.8%	U	**7.1%**		10.6%	U	**475.5%**		**154%**	**2950**		0.8%	U	**0.6%**		**2.6%**		**0.4%**		**0.5%**		**53.3%**		**60%**	**14300**	
Antimony	**0.3%**		**0.2%**		**3.6%**		**0.3%**		**0.3%**		**8.1%**		**77%**	**68.3**		8.9%	U	**16.1%**		**130.8%**		22.3%	U	**7.1%**		**598.2%**		**126%**	**2.47**	
Arsenic	**0.0%**		**0.0%**		**3.7%**		**1.3%**		**1.3%**		**63.3%**		**55%**	**268**		0.9%	U	**1.0%**		**104.0%**		**24.7%**		**13.0%**		**1091.7%**		**163%**	**13.4**	
Barium	20.5%	U	107.9%	U	102.8%	U	134.6%	U	**188.2%**		**259.1%**		**1180%**	**17.7**		**4.6%**		**5.2%**		**7.5%**		**3.5%**		**13.7%**		**54.3%**		**185%**	**329**	
Beryllium	**31.7%**		15.9%	U	15.9%	U	15.9%	U	15.9%	U	44.4%	U	**244%**	**0.37**		30.8%	U	15.4%	U	15.4%	U	15.4%	U	15.4%	U	**20.8%**		**123%**	**0.6**	
Bismuth	33.3%	U	16.7%	U	26.7%	U	16.7%	U	16.7%	U	46.7%	U	110%	0.2	U	33.3%	U	16.7%	U	21.7%	U	16.7%	U	16.7%	U	93.3%	U	65%	**0.33**	
Cadmium	400.0%	U	218.0%	U	38.3%	U	67.7%	U	16.7%	U	3000.0%	U	68%	0.05	U	58.4%	U	**112.6%**		8.7%	U	13.1%	U	4.9%	U	**1713.7%**		**165%**	**1.01**	
Calcium	**648.9%**		31.0%	U	6.2%	U	73.2%	U			294.2%	U	**133%**	**765**		**3.9%**		**0.3%**		0.3%	U	**2.3%**				**8.1%**		**34%**	**17900**	
Chromium	**32.4%**		16.2%	U	16.2%	U	16.2%	U	16.2%	U	114.2%	U	**219%**	**10.3**		15.6%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**114.2%**		**248%**	**44.7**	
Cobalt	**8.9%**		6.3%	U	25.6%	U	1.1%	U	20.5%	U	**603.2%**		**74%**	**6.45**		9.3%	U	**1.6%**		**7.5%**		**2.5%**		**3.9%**		**240.1%**		**166%**	**16.6**	
Copper	**12.1%**		104.8%	U	**330.5%**		94.8%	U	11.5%	U	**5199.0%**		**71%**	**7.38**		2.6%	U	**1.7%**		**28.5%**		**11.1%**		1.3%	U	**773.4%**		**91%**	**42.7**	
Iron	**0.1%**		**0.1%**		**6.7%**		**0.3%**		**10.2%**		**118.3%**		**70%**	**84700**		0.3%	U	**0.4%**		**23.0%**		**1.0%**		**9.0%**		**164.9%**		**78%**	**33200**	
Lead	5124.2%	U	15942.0%	U	**1428.6%**		4441.0%	U	14.0%	U	**15528.0%**		**64%**	**8.93**		6166.9%	U	**6106.4%**		1257.6%	U	**2738.8%**		10.4%	U	**27025.4%**		**186%**	**20.9**	
Lithium	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	76.3%	U	375%	5	U	21.6%	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U	**21.4%**		**199%**	**24.8**	
Manganese	**366.4%**		87.4%	U			23.7%	U	116.5%	U	696.7%	U	**82%**	**11.3**		**4.5%**		**1.1%**				**1.1%**		**1.8%**		**36.3%**		**55%**	**701**	
Molybdenum	32.4%	U	16.2%	U	16.2%	U	16.2%	U	**16.2%**		48.9%	U	**172%**	**2**		23.5%	U	11.8%	U	11.8%	U	11.8%	U	**11.8%**		**163.3%**		**213%**	**3.09**	
Nickel	**11.8%**		5.9%	U	17.4%	U	5.9%	U	17.1%	U	**77.6%**		**131%**	**20.2**		7.5%	U	**3.8%**		**6.8%**		3.8%	U	**3.8%**		**124.0%**		**157%**	**52.5**	
Phosphorus	**#VALUE!**		#VALUE!	U	#VALUE!	U							**#VALUE!**	**79**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**1140**	
Potassium	200.0%	U											11%	**1710**		200.0%	U											7%	**1950**	
Selenium	17.3%	U	8.7%	U	8.7%	U	8.7%	U	21.6%	U	**31.6%**		**184%**	**1.18**		20.9%	U	10.5%	U	10.5%	U	10.5%	U	26.2%	U	**77.5%**		**301%**	**1.1**	
Silver	14.1%	U	7.0%	U	7.0%	U	7.0%	U	**7.0%**		**420.4%**		**101%**	**1.27**		27.0%	U	13.5%	U	13.5%	U	13.5%	U	13.5%	U	**1905.4%**		**175%**	**0.32**	
Sodium	200.0%	U											105%	100	U	200.0%	U											143%	**190**	
Strontium	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	71.7%	U	**195%**	**6.56**		14.2%	U	**7.1%**		7.1%	U	**7.1%**		7.1%	U	**17.7%**		**147%**	**63.1**	
Thallium	**0.8%**		**0.5%**		**0.4%**		**0.4%**		15.9%	U	**12.5%**		**204%**	**9.87**		4.0%	U	2.1%	U	3.3%	U	2.0%	U	81.0%	U	**116.2%**		**144%**	**0.225**	
Tin	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	412%	2	U	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U
Titanium	33.3%	U	16.7%	U	23.7%	U	17.7%	U	21.3%	U	1473.3%	U	162%	**6**		1.9%	U	1.0%	U	**1.0%**		1.0%	U	**1.0%**		**33.6%**		**75%**	**511**	
Uranium	**16.1%**		58.4%	U	40.8%	U	8.1%	U	29.8%	U	**118.5%**		**118%**	**0.471**		**5.4%**		**12.4%**		**17.0%**		2.7%	U	**5.4%**		**82.8%**		**82%**	**1.79**	
Vanadium	**8.6%**		4.3%	U	**91.4%**		8.6%	U	**89.9%**		**657.3%**		**139%**	**4.57**		0.8%	U	0.4%	U	**6.9%**		**0.4%**		**2.0%**		**31.3%**		**51%**	**50.3**	
Zinc	**133.0%**		150.7%	U	512.6%	U	37.6%	U	147.9%	U	6241.9%	U	**64%**	**45.9**		99.5%	U	**34.4%**		**122.2%**		**16.3%**		31.5%	U	**8123.4%**		**185%**	**143**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW004B															CH12-204-MW005B													
Sample ID	CH12-204-MW004B_SOB															CH12-204-MW005B_SOB													
Sample Interval (mbgs)	4.6 - 7.6															1.8 - 2.2													
Sample Date	7/2/2012															7/8/2012													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.5%	U	0.3%	U	**1.7%**		**0.3%**		**1.5%**		**89.3%**		**119%**	**20800**		0.8%	U	**0.5%**		**2.3%**		0.4%	U	**0.9%**		**124.5%**		**92%**	**11500**	
Antimony	23.5%	U	11.8%	U	**15.3%**		11.8%	U	**11.8%**		**68.2%**		**209%**	**0.68**		25.6%	U	12.8%	U	20.5%	U	12.8%	U	**12.8%**		**21.8%**		**86%**	**0.47**	
Arsenic	0.8%	U	**0.4%**		**7.2%**		**2.1%**		**7.0%**		**106.6%**		**248%**	**18**		1.3%	U	**2.3%**		**46.2%**		**2.7%**		**6.5%**		**139.3%**		**67%**	**6.28**	
Barium	**13.9%**		**21.9%**		**7.4%**		**5.3%**		**8.2%**		**61.8%**		**105%**	**188**		**22.8%**		**33.4%**		**5.3%**		**9.6%**		**4.9%**		**60.3%**		**58%**	**95.2**	
Beryllium	25.5%	U	12.7%	U	12.7%	U	12.7%	U	12.7%	U	**33.8%**		**211%**	**0.91**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**14.3%**		**326%**	**0.58**	
Bismuth	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	56.7%	U	131%	**0.37**		33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	667%	**0.61**	
Cadmium	53.1%	U	**51.4%**		9.8%	U	**14.0%**		9.8%	U	**263.8%**		50%	**0.476**		20.2%	U	**14.7%**		**10.1%**		10.1%	U	10.1%	U	**35.4%**		103%	**0.612**	
Calcium	**7.0%**		**8.0%**		0.9%	U	**6.1%**				**20.1%**		**100%**	**6050**		**17.9%**		**409.1%**		1.2%	U	**5.9%**				**199.2%**		**144%**	**3410**	
Chromium	15.6%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**492.2%**		**1157%**	**49**		20.9%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**62.6%**		**168%**	**30.8**	
Cobalt	3.8%	U	**4.7%**		**4.1%**		**0.6%**		**4.3%**		**56.5%**		**109%**	**19**		2.5%	U	18.5%	U	**12.6%**		1.2%	U	**4.2%**		**116.1%**		**80%**	**8.39**	
Copper	2.4%	U	**1.2%**		**8.3%**		**1.5%**		**1.9%**		**78.8%**		**73%**	**48.4**		4.4%	U	**4.5%**		**12.0%**		2.2%	U	**2.2%**		**72.3%**		**70%**	**34.4**	
Iron	150.4%	U	**105.2%**		**2571.0%**		**114.3%**		**8359.6%**		**41647.9%**		**97.28%**	**47100**		0.6%	U	3.2%	U	**18.6%**		**0.4%**		**3.9%**		**156.2%**		**91%**	**18500**	
Lead	6.0%	U	**428.1%**		133.6%	U	**96.1%**		13.7%	U	**2007.3%**		**144%**	**20.5**		8.2%	U	**61.9%**		**6.4%**		**47.1%**		**4.1%**		**83.2%**		**48%**	**16.4**	
Lithium	14.7%	U	7.4%	U	7.4%	U	7.4%	U	7.4%	U	**58.0%**		**218%**	**35.4**		20.3%	U	10.1%	U	10.1%	U	10.1%	U	10.1%	U	**59.0%**		**191%**	**23**	
Manganese	12.8%	U	**6.9%**				1.8%	U	**3.1%**		**76.1%**		**99%**	**318**		6.9%	U	**128.2%**				3.9%	U	**7.3%**		**160.6%**		**99%**	**232**	
Molybdenum	31.4%	U	15.7%	U	**15.7%**		15.7%	U	**15.7%**		288.7%	U	**858%**	**1.9**		33.3%	U	16.7%	U	17.7%	U	16.7%	U	16.7%	U	32.3%	U	237%	**1.08**	
Nickel	5.8%	U	2.9%	U	**6.2%**		2.9%	U	**3.5%**		**217.6%**		**733%**	**76.1**		14.2%	U	7.8%	U	12.8%	U	7.1%	U	**7.1%**		**88.3%**		**93%**	**26.9**	
Phosphorus	#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**796**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**571**	
Potassium	200.0%	U											5%	**2040**		200.0%	U											17%	**950**	
Selenium	26.7%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	14.0%	U	611%	**0.6**		26.7%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	20.0%	U	667%	**0.29**	
Silver	32.8%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**186.9%**		**311%**	**0.17**		33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	304%	**0.11**	
Sodium	200.0%	U											125%	**590**		200.0%	U											182%	**210**	
Strontium	17.2%	U	8.6%	U	8.6%	U	8.6%	U	8.6%	U	**10.0%**		**331%**	**57.2**		15.7%	U	90.4%	U	7.9%	U	9.7%	U	7.9%	U	**42.0%**		**153%**	**29.5**	
Thallium	3.8%	U	1.9%	U	1.9%	U	1.9%	U	76.3%	U	**19.6%**		**659%**	**0.301**		4.3%	U	2.1%	U	2.1%	U	2.1%	U	85.2%	U	**6.2%**		**1652%**	**0.125**	
Tin	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U
Titanium	1.1%	U	0.6%	U	**0.7%**		**0.6%**		**0.6%**		**74.4%**		**90%**	**683**		3.2%	U	1.6%	U	**1.6%**		1.6%	U	1.6%	U	**80.0%**		**142%**	**345**	
Uranium	7.2%	U	**9.5%**		**9.0%**		3.6%	U	**11.6%**		**29.7%**		**96%**	**1.36**		7.9%	U	**12.3%**		**13.2%**		3.9%	U	**3.9%**		**51.5%**		**87%**	**1.31**	
Vanadium	0.8%	U	**0.4%**		**2.4%**		**0.4%**		**3.1%**		**77.0%**		**107%**	**49.9**		1.7%	U	0.8%	U	**6.5%**		0.8%	U	**1.3%**		**94.7%**		**75%**	**25.2**	
Zinc	56.7%	U	**139.8%**		**75.9%**		**5.9%**		45.3%	U	**560.3%**		**62%**	**121**		1.1%	U	**2.4%**		**6.1%**		**0.5%**		27.4%	U	**38.6%**		**106.1%**	**195**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW005B														CH12-204-MW005B												
Sample ID	CH12-204-MW005B_SOD														CH12-204-MW905B_SOD												
Sample Interval (mbgs)	5.7 - 6.1														5.7 - 6.1												
Sample Date	7/8/2012														7/8/2012												
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.7%	U	0.3%	U	**2.5%**		**0.3%**		**1.5%**		**95.8%**		**102%**	**14500**		0.7%	U	0.3%	U	**4.3%**		**0.5%**		**2.1%**		**102.7%**		**111%**	**13700**	
Antimony	14.6%	U	**7.3%**		**19.7%**		7.3%	U	7.3%	U	**17.5%**		**194%**	**1.31**		15.4%	U	**7.7%**		**16.9%**		7.7%	U	7.7%	U	**16.9%**		**157%**	**1.18**	
Arsenic	1.2%	U	**3.7%**		**255.3%**		**10.4%**		**21.1%**		**234.2%**		**126%**	**10.5**		1.2%	U	**1.4%**		**71.1%**		**6.7%**		**22.9%**		**614.4%**		**480%**	**9.2**	
Barium	**8.2%**		**13.2%**		**2.1%**		**3.9%**		**2.5%**		**26.5%**		**95%**	**326**		**12.7%**		**15.8%**		**2.9%**		**3.5%**		**3.2%**		**32.7%**		**101%**	**287**	
Beryllium	28.4%	U	14.2%	U	14.2%	U	14.2%	U	14.2%	U	**19.1%**		**306%**	**0.68**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**20.0%**		**302%**	**0.63**	
Bismuth	32.8%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**16.4%**		**700%**	**0.4**		32.8%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**16.4%**		**609%**	**0.35**	
Cadmium	12.8%	U	**11.2%**		6.4%	U	6.4%	U	6.4%	U	**8.5%**		**223%**	**0.774**		13.1%	U	**21.2%**		6.6%	U	6.6%	U	6.6%	U	**16.7%**		**149%**	**0.683**	
Calcium	**7.7%**		**54.0%**		0.4%	U	**2.3%**				**101.0%**		**83%**	**16800**		**11.2%**		**65.2%**		0.4%	U	**2.3%**				**21.0%**		**78%**	**14000**	
Chromium	18.3%	U	9.2%	U	9.2%	U	9.2%	U	9.2%	U	**225.3%**		**133%**	**36.2**		17.9%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**74.0%**		**171%**	**31.4**	
Cobalt	**1.6%**		**33.2%**		**30.0%**		**0.8%**		**7.5%**		**2.6%**		**54%**	**13.7**		**1.5%**		**9.9%**		**17.6%**		**0.7%**		**8.8%**		**49.4%**		**99%**	**11.9**	
Copper	3.8%	U	**6.2%**		**27.4%**		**2.8%**		**1.9%**		**40.9%**		**106%**	**30.5**		3.7%	U	**7.3%**		**35.9%**		**1.8%**		**1.8%**		**36.9%**		**94%**	**27.7**	
Iron	0.4%	U	**1.7%**		**20.6%**		**0.3%**		**5.9%**		**106.1%**		**95%**	**28400**		0.4%	U	**0.5%**		**11.7%**		**0.3%**		**10.2%**		**79.6%**		**102%**	**25500**	
Lead	4.9%	U	**11.6%**		**2.5%**		**11.0%**		**2.5%**		**18.2%**		**99%**	**22.9**		5.1%	U	**16.1%**		7.4%	U	**9.5%**		**3.3%**		**32.6%**		**88%**	**20.5**	
Lithium	18.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**42.2%**		**202%**	**31.3**		18.1%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**52.3%**		**223%**	**29.8**	
Manganese	**2.4%**		**25.0%**				**1.6%**		**3.5%**		**78.0%**		**94%**	**554**		**2.5%**		**30.0%**				**1.2%**		**4.6%**		**54.3%**		**97%**	**479**	
Molybdenum	30.4%	U	15.2%	U	**17.0%**		15.2%	U	15.2%	U	19.5%	U	**252%**	**1.3**		32.8%	U	16.4%	U	**16.4%**		16.4%	U	16.4%	U	16.4%	U	**327%**	**1.37**	
Nickel	10.5%	U	**22.8%**		**74.0%**		5.2%	U	**16.3%**		**176.4%**		**110%**	**37.2**		10.1%	U	**5.3%**		**17.0%**		5.1%	U	**10.1%**		**60.8%**		**112%**	**32.8**	
Phosphorus	#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**956**		#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**807**	
Potassium	200.0%	U											19%	**2870**		200.0%	U											12%	**2750**	
Selenium	22.1%	U	11.0%	U	11.0%	U	11.0%	U	27.6%	U	**11.0%**		**531%**	**0.56**		26.3%	U	13.2%	U	13.2%	U	13.2%	U	32.9%	U	**15.1%**		**422%**	**0.55**	
Silver	29.4%	U	14.7%	U	14.7%	U	14.7%	U	14.7%	U	**14.7%**		**636%**	**0.24**		29.9%	U	14.9%	U	14.9%	U	14.9%	U	14.9%	U	**16.4%**		473%	**0.23**	
Sodium	200.0%	U											143%	**260**		200.0%	U											105%	**240**	
Strontium	**14.1%**		**28.5%**		7.1%	U	**10.3%**		7.1%	U	**63.1%**		**103%**	**67.9**		**14.1%**		**34.8%**		7.1%	U	**7.1%**		7.1%	U	**22.6%**		**119%**	**61.7**	
Thallium	4.0%	U	2.0%	U	2.0%	U	2.0%	U	79.0%	U	**6.8%**		**2182%**	**0.265**		3.9%	U	2.0%	U	2.0%	U	2.0%	U	78.9%	U	**7.6%**		**1970%**	**0.255**	
Tin	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U
Titanium	1.3%	U	0.7%	U	**0.9%**		**0.7%**		**0.7%**		**28.1%**		**121%**	**831**		1.3%	U	0.6%	U	**1.2%**		**0.7%**		**0.7%**		**45.9%**		**113%**	**791**	
Uranium	**5.3%**		**14.7%**		**22.2%**		2.6%	U	2.9%	U	**34.5%**		**103%**	**1.77**		**5.6%**		**12.8%**		**11.1%**		2.8%	U	4.8%	U	**37.7%**		**111%**	**1.69**	
Vanadium	0.9%	U	**0.5%**	**J**	**8.3%**		**0.5%**		**1.6%**		**68.9%**		**94%**	**49.1**		0.9%	U	**0.4%**	**J**	**7.2%**		**0.6%**		**3.5%**		**68.7%**		**101%**	**44.6**	
Zinc	1.2%	U	**2.1%**		**9.3%**		**0.6%**		28.9%	U	**27.6%**		**169%**	**156**		1.1%	U	**1.4%**		**7.3%**		**0.6%**		28.4%	U	**33.3%**		**167%**	**129**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-PZ001															CH13-204-MW016C													
Sample ID	CH12-204-PZ001_SOC															CH13-204-MW016C_SOA													
Sample Interval (mbgs)	9.15 - 9.6															6.5 - 7													
Sample Date	6/25/2012															8/15/2013													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.7%	U	0.5%	U	**3.5%**		**0.9%**		**2.2%**		**101.0%**		**171%**	**13200**		3.1%	UJ	1.6%	UJ	**8.4%**	**J**	1.6%	UJ	**2.8%**	**J**	**422.5%**	**J**	**79%**	**3920**	**J**
Antimony	28.6%	U	14.3%	U	**18.6%**		14.3%	U	**20.0%**		**60.0%**		**154%**	**0.69**		0.5%	UJ	0.2%	UJ	**0.2%**	**J**	**0.2%**	**J**	**0.2%**	**J**	**0.2%**	**J**	**92%**	**43.7**	**J**
Arsenic	1.3%	U	**1.5%**		**72.9%**		**19.6%**		**80.6%**		**95.5%**		**148%**	**8.17**		**0.0%**	**J**	**0.0%**	**J**	**0.5%**	**J**	**0.0%**	**J**	**0.2%**	**J**	**0.4%**	**J**	**43%**	**546**	**J**
Barium	**34.4%**		**32.2%**		**8.5%**		**8.9%**		**16.3%**		**106.9%**		**216%**	**154**		7.1%	UJ	6.3%	UJ	**1.0%**	**J**	**3.8%**	**J**	**1.8%**	**J**	**21.1%**	**J**	**58%**	**445**	**J**
Beryllium	27.6%	U	13.8%	U	13.8%	U	13.8%	U	13.8%	U	**18.6%**		**490%**	**0.63**		26.1%	UJ	13.1%	UJ	13.1%	UJ	13.1%	UJ	13.1%	UJ	**14.4%**	**J**	**309%**	**0.62**	**J**
Bismuth	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	171%	0.2	U	19.6%	UJ	9.8%	UJ	9.8%	UJ	9.8%	UJ	9.8%	UJ	**9.8%**	**J**	**700%**	**1.37**	**J**
Cadmium	25.3%	U	**37.6%**		12.6%	U	17.9%	U	12.6%	U	**46.0%**		**214%**	**0.345**		**0.5%**	**J**	**0.3%**	**J**	**0.3%**	**J**	**0.3%**	**J**	0.3%	UJ	**0.3%**	**J**	**100%**	**23.3**	**J**
Calcium	**6.6%**		**16.5%**		0.2%	U	**3.6%**				**9.4%**		**89%**	**18700**		**16.2%**	**J**	**716.5%**	**J**	1.0%	UJ	**4.8%**	**J**			**700.9%**	**J**	**178%**	**4910**	**J**
Chromium	15.3%	U	7.7%	U	7.7%	U	7.7%	U	7.7%	U	**75.6%**		**248%**	**45.9**		21.6%	UJ	10.8%	UJ	**10.8%**	**J**	10.8%	UJ	10.8%	UJ	**47.3%**	**J**	**80%**	**33.3**	**J**
Cobalt	1.7%	U	**6.5%**		**27.2%**		0.8%	U	**13.7%**		**54.5%**		**152%**	**13**		**0.2%**	**J**	**0.4%**	**J**	**1.6%**	**J**	**0.1%**	**J**	0.7%	UJ	**8.0%**	**J**	**75%**	**111**	**J**
Copper	4.3%	U	**2.8%**		**16.6%**		**4.7%**		**2.3%**		**87.7%**		**139%**	**28.9**		**0.1%**	**J**	**0.0%**	**J**	**0.2%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0.5%**	**J**	**50%**	**1950**	**J**
Iron	0.4%	U	**0.3%**		**7.2%**		**1.5%**		**22.5%**		**86.3%**		**140%**	**23000**		**0.0%**	**J**	0.3%	UJ	**1.2%**	**J**	**0.0%**	**J**	**0.4%**	**J**	**9.1%**	**J**	**83%**	**310000**	**J**
Lead	5.1%	U	**92.1%**		**79.7%**		**91.0%**		**14.1%**		**208.3%**		**165%**	**22.4**		**0.0%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0.1%**	**J**	**54%**	**7260**	**J**
Lithium	19.0%	U	9.5%	U	9.5%	U	9.5%	U	9.5%	U	**49.0%**		**289%**	**24.3**		33.3%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	90.3%	UJ	174%	5	UJ
Manganese	3.0%	U	**20.3%**				2.8%	U	**8.1%**		**57.5%**		**151%**	**388**		**0.7%**	**J**	**16.9%**	**J**	**3.1%**	**J**	**0.5%**	**J**	**1.0%**	**J**	**27.6%**	**J**	**132%**	**1650**	**J**
Molybdenum	33.3%	U	16.7%	U	16.7%	U	16.7%	U	20.7%	U	16.7%	U	377%	**0.77**		16.9%	UJ	8.4%	UJ	8.4%	UJ	8.4%	UJ	**8.4%**	**J**	**8.4%**	**J**	**310%**	**3.97**	**J**
Nickel	9.4%	U	4.7%	U	**8.0%**		4.7%	U	**16.5%**		**78.1%**		**169%**	**45.6**		**11.1%**	**J**	5.5%	UJ	**10.2%**	**J**	5.5%	UJ	5.5%	UJ	**49.3%**	**J**	**71%**	**32.1**	**J**
Phosphorus	#VALUE!	U	#VALUE!	U	**#VALUE!**								**#VALUE!**	**816**		#VALUE!	UJ	#VALUE!	UJ	#VALUE!	UJ							#VALUE!	**454**	**J**
Potassium	200.0%	U											24%	**1650**		200.0%	UJ											19%	**670**	**J**
Selenium	23.5%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	**11.8%**		**850%**	**1.36**		20.7%	UJ	10.4%	UJ	10.4%	UJ	10.4%	UJ	25.9%	UJ	**10.4%**	**J**	**486%**	**1.21**	**J**
Silver	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	**36.7%**		456%	**0.11**		1.0%	UJ	0.5%	UJ	0.5%	UJ	**0.5%**	**J**	**0.5%**	**J**	**0.5%**	**J**	**467%**	**18.7**	**J**
Sodium	200.0%	U											200%	**340**		200.0%	UJ											200%	100	UJ
Strontium	11.2%	U	**11.6%**		5.6%	U	5.6%	U	5.6%	U	**14.3%**		**153%**	**74.8**		18.8%	UJ	161.7%	UJ	9.4%	UJ	21.0%	UJ	9.4%	UJ	**24.0%**	**J**	**103%**	**30.2**	**J**
Thallium	4.2%	U	2.1%	U	2.1%	U	2.1%	U	83.5%	U	**7.8%**		**2237%**	**0.144**		**1.2%**	**J**	**0.6%**	**J**	**0.6%**	**J**	**0.6%**	**J**	23.3%	UJ	**1.4%**	**J**	**1581%**	**6.26**	**J**
Tin	33.3%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	700%	2	U	28.6%	UJ	14.3%	UJ	14.3%	UJ	14.3%	UJ	14.3%	**J**	**14.3%**	**J**	**700%**	**8.2**	**J**
Titanium	2.4%	U	1.2%	U	2.1%	U	1.2%	U	1.3%	U	**81.7%**		**182%**	**407**		22.0%	UJ	11.0%	UJ	11.0%	UJ	11.0%	UJ	11.0%	UJ	**420.7%**	**J**	**120%**	**44.9**	**J**
Uranium	11.5%	U	**16.6%**		14.9%	U	5.8%	U	**19.2%**		**48.5%**		**128%**	**0.889**		3.0%	UJ	**3.9%**	**J**	**5.3%**	**J**	1.5%	UJ	**1.5%**	**J**	**9.5%**	**J**	**70%**	**2.96**	**J**
Vanadium	1.2%	U	0.6%	U	**5.3%**		**1.2%**		**8.9%**		**79.6%**		**143%**	**34.8**		1.2%	UJ	0.6%	UJ	**3.9%**	**J**	**0.6%**	**J**	**1.0%**	**J**	**48.7%**	**J**	**58%**	**32.9**	**J**
Zinc	1.7%	U	**2.3%**		**8.9%**		**2.8%**		43.4%	U	**78.0%**		**175%**	**82**		**0.0%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0.4%**	**J**	**0.4%**	**J**	**109%**	**17100**	**J**

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016C															CH13-204-MW016E													
Sample ID	CH13-204-MW916C_SOA															CH13-204-MW016E_SOA													
Sample Interval (mbgs)	6.5 - 7															0.5 - 1													
Sample Date	8/15/2013															8/12/2013													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	3.9%	UJ	2.0%	UJ	**9.4%**	J	2.0%	UJ	3.6%	UJ	**560.6%**	J	**89%**	**2700**	J	**1.5%**	J	0.8%	UJ	**1.0%**	J	**0.8%**	J	**0.8%**	J	**40.0%**	J	**95%**	**5660**	J
Antimony	0.5%	UJ	**0.3%**	J	**0.3%**	J	**0.3%**	J	**0.3%**	J	**0.3%**	J	**109%**	**40.9**	J	0.5%	UJ	0.7%	UJ	**22.9%**	J	**3.9%**	J	**5.4%**	J	**175.8%**	J	**90%**	**41.8**	J
Arsenic	**0.0%**	J	**0.0%**	J	**0.4%**	J	**0.0%**	J	**0.1%**	J	**0.3%**	J	**37%**	**562**	J	**0.0%**	J	**0.0%**	J	**1.6%**	J	**1.7%**	J	**1.9%**	J	**166.6%**	J	**224%**	**953**	J
Barium	9.1%	UJ	**7.6%**	J	**2.0%**	J	**6.4%**	J	**2.4%**	J	**46.0%**	J	**84%**	**514**	J	3.0%	UJ	3.3%	UJ	**20.7%**	J	**27.9%**	J	**99.0%**	J	**4.5%**	J	**10837%**	**338**	J
Beryllium	28.8%	UJ	14.4%	UJ	14.4%	UJ	14.4%	UJ	14.4%	UJ	**21.6%**	J	**313%**	**0.53**	J	33.3%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	33.3%	UJ	800%	**0.53**	J
Bismuth	15.1%	UJ	7.5%	UJ	**7.5%**	J	7.5%	UJ	7.5%	UJ	**7.5%**	J	**700%**	**1.57**	J	22.0%	UJ	11.0%	UJ	**16.5%**	J	11.0%	UJ	11.0%	UJ	**277.5%**	J	**117%**	**1.21**	J
Cadmium	**0.6%**	J	**0.3%**	J	**0.3%**	J	**0.3%**	J	0.3%	UJ	**0.5%**	J	**161%**	**14.8**	J	**3.1%**	J	**2.9%**	J	**0.6%**	J	**1.1%**	J	0.2%	UJ	**128.5%**	J	**95%**	**20.6**	J
Calcium	**16.5%**	J	**809.7%**	J	1.1%	UJ	**5.2%**	J			**846.5%**	J	**195%**	**3640**	J	**19.1%**	J	**8.9%**	J	0.4%	UJ	**8.8%**	J			**95.4%**	J	**135%**	**8010**	J
Chromium	26.2%	UJ	13.1%	UJ	**13.1%**	J	13.1%	UJ	13.1%	UJ	**150.3%**	J	**175%**	**21**	J	22.5%	UJ	11.3%	UJ	**11.3%**	J	11.3%	UJ	**11.3%**	J	**22.5%**	J	**418%**	**23.3**	J
Cobalt	**0.2%**	J	**0.4%**	J	**1.3%**	J	**0.1%**	J	0.6%	UJ	**9.2%**	J	**84%**	**97.8**	J	**2.0%**	J	**0.5%**	J	**1.1%**	J	**0.8%**	J	**0.4%**	J	**218.5%**	J	**96%**	**112**	J
Copper	**0.1%**	J	**0.1%**	J	**0.2%**	J	**0.0%**	J	0.0%	UJ	**0.7%**	J	**72%**	**1400**	J	**0.1%**	J	**0.0%**	J	**0.5%**	J	**0.3%**	J	0.0%	UJ	**110.9%**	J	**76%**	**1400**	J
Iron	**0.0%**	J	0.3%	UJ	**1.2%**	J	**0.0%**	J	**0.3%**	J	**9.7%**	J	**92%**	**259000**	J	**0.3%**	J	0.3%	UJ	**6.3%**	J	**0.6%**	J	**5.9%**	J	**94.3%**	J	**94%**	**212000**	J
Lead	**0.0%**	J	**0.1%**	J	**0.0%**	J	**0.0%**	J	**0.0%**	J	**0.1%**	J	**47%**	**4900**	J	**8.0%**	J	**33.3%**	J	**2.8%**	J	**21.7%**	J	**0.1%**	J	**350.4%**	J	**204%**	**4980**	J
Lithium	33.3%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	77.0%	U	187%	5	UJ	32.7%	UJ	16.3%	UJ	16.3%	UJ	16.3%	UJ	16.3%	UJ	**32.7%**	J	**800%**	**5.4**	J
Manganese	**0.8%**	J	**18.9%**	J	**3.3%**	J	**0.5%**	J	**1.0%**	J	**33.9%**	J	**148%**	**1090**	J	**13.1%**	J	**13.1%**	J	**36.3%**	J	**2.9%**	J	**5.5%**	J	**421.5%**	J	**99%**	**1800**	J
Molybdenum	18.3%	UJ	9.2%	UJ	**9.2%**	J	9.2%	UJ	9.2%	UJ	**9.2%**	J	**215%**	**4.06**	J	11.2%	UJ	5.6%	UJ	5.6%	UJ	5.6%	UJ	**5.6%**	J	**29.1%**	J	**272%**	**6.33**	J
Nickel	**10.7%**	J	5.4%	UJ	**12.1%**	J	5.4%	UJ	6.2%	UJ	**116.1%**	J	**117%**	**31.9**	J	**10.4%**	J	5.2%	UJ	5.2%	UJ	5.2%	UJ	5.2%	UJ	**40.4%**	J	**131%**	**27.1**	J
Phosphorus	#VALUE!	UJ	#VALUE!	UJ	**#VALUE!**	J							**#VALUE!**	**346**	J	#VALUE!	UJ	#VALUE!	UJ	#VALUE!	UJ							#VALUE!	**308**	J
Potassium	200.0%	UJ											18%	**430**	J	200.0%	UJ											111%	**670**	J
Selenium	18.9%	UJ	9.4%	UJ	9.4%	UJ	9.4%	UJ	23.6%	UJ	**9.4%**	J	**447%**	**1.05**	J	20.8%	UJ	10.4%	UJ	10.4%	UJ	10.4%	UJ	26.0%	UJ	**130.2%**	J	**131%**	**0.84**	J
Silver	1.2%	UJ	0.6%	UJ	0.6%	UJ	**0.6%**	J	**0.6%**	J	**0.6%**	J	**636%**	**15.2**	J	1.2%	UJ	0.6%	UJ	0.6%	UJ	0.6%	UJ	0.6%	UJ	**251.5%**	J	**97%**	**12**	J
Sodium	200.0%	UJ											182%	100	UJ	200.0%	UJ											200%	100	UJ
Strontium	22.0%	UJ	176.7%	UJ	11.0%	UJ	27.5%	UJ	11.0%	UJ	**252.7%**	J	**200%**	**22.6**	J	**13.5%**	J	**35.1%**	J	6.7%	UJ	15.8%	UJ	**10.1%**	J	**133.6%**	J	**172%**	**31.1**	J
Thallium	**1.2%**	J	**0.6%**	J	**0.6%**	J	**0.6%**	J	23.2%	UJ	**1.3%**	J	**275%**	**6.64**	J	**1.0%**	J	**1.8%**	J	**1.1%**	J	**2.2%**	J	19.7%	UJ	**140.8%**	J	**114%**	**5.96**	J
Tin	30.5%	UJ	15.3%	UJ	15.3%	UJ	15.3%	UJ	15.3%	UJ	15.3%	J	**700%**	**5.4**	J	30.8%	UJ	15.4%	UJ	15.4%	UJ	15.4%	UJ	15.4%	UJ	**30.8%**	J	**640%**	**3.7**	J
Titanium	23.0%	UJ	11.5%	UJ	11.5%	UJ	11.5%	UJ	11.5%	UJ	**199.8%**	J	**67%**	**27.7**	J	11.9%	UJ	5.9%	UJ	5.9%	UJ	5.9%	UJ	5.9%	UJ	**17.8%**	J	**354%**	**49.3**	J
Uranium	3.7%	UJ	**4.5%**	J	**5.4%**	J	1.9%	UJ	1.9%	UJ	**9.7%**	J	**54%**	**2.19**	J	**2.2%**	J	**1.5%**	J	**1.9%**	J	**1.1%**	J	**1.1%**	J	**16.8%**	J	**140%**	**4**	J
Vanadium	1.7%	UJ	0.8%	UJ	**5.7%**	J	**0.8%**	J	**1.6%**	J	**68.5%**	J	**68%**	**21.1**	J	1.5%	UJ	0.7%	UJ	**1.9%**	J	**0.7%**	J	**0.8%**	J	**31.4%**	J	**99%**	**20.4**	J
Zinc	**0.0%**	J	**0.0%**	J	**0.1%**	J	**0.0%**	J	**0.4%**	J	**0.5%**	J	**113%**	**10600**	J	**1.9%**	J	**1.9%**	J	**5.5%**	J	**0.5%**	J	**0.4%**	J	**240.8%**	J	**86%**	**8810**	J

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOB														CH13-204-MW016E_SOC													
Sample Interval (mbgs)	3 - 3.5														9.5 - 10													
Sample Date	8/12/2013														8/12/2013													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	5.6%	UJ	2.8%	UJ	**38.3%**	J	11.3%	UJ	**17.9%**	J	**754.1%**	J	**113%**	**2340**	J	2.0%	UJ	2.0%	UJ	**7.6%**	J	**2.1%**	J	14.2%	UJ	**552.2%**	J	**100%**	**2950**	J
Antimony	0.8%	UJ	4.1%	UJ	**16.5%**	J	**1.4%**	J	**0.9%**	J	**41.0%**	J	**41%**	**31.6**	J	0.3%	UJ	**0.3%**	J	**0.3%**	J	**0.3%**	J	**0.5%**	J	**0.4%**	J	**114%**	**51.4**	J
Arsenic	**0.0%**	J	**0.1%**	J	**2.6%**	J	**0.4%**	J	**0.7%**	J	**8.8%**	J	**57%**	**959**	J	0.0%	UJ	**0.0%**	J	**0.4%**	J	**0.1%**	J	**0.7%**	J	**0.4%**	J	**77%**	**552**	J
Barium	**28.6%**	UJ	**56.5%**	J	**26.3%**	J	**41.2%**	J	**7.6%**	J	**148.3%**	J	**1134%**	**709**	J	**6.0%**	J	**6.3%**	J	**2.3%**	J	**2.3%**	J	**3.4%**	J	**39.0%**	J	**95%**	**439**	J
Beryllium	33.3%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	21.7%	UJ	332%	**0.27**	J	15.4%	UJ	15.4%	UJ	15.4%	UJ	15.4%	UJ	15.4%	UJ	**31.5%**	J	**220%**	**0.52**	J
Bismuth	29.0%	UJ	14.5%	UJ	**14.5%**	J	14.5%	UJ	14.5%	UJ	**15.2%**	J	**271%**	**0.78**	J	9.8%	UJ	9.8%	UJ	**9.8%**	J	9.8%	UJ	9.8%	UJ	**9.8%**	J	**462%**	**0.88**	J
Cadmium	**10.2%**	J	**15.4%**	J	**1.4%**	J	**2.0%**	J	0.3%	UJ	**33.7%**	J	**38%**	**16.2**	J	**0.5%**	J	**1.1%**	J	**0.5%**	J	**0.5%**	J	0.5%	UJ	**0.9%**	J	**126%**	**8.35**	J
Calcium	**31.2%**	J	**19.7%**	J	1.0%	UJ	**11.0%**	J			**25.9%**	J	**88%**	**6600**	J	**27.6%**	J	**258.4%**	J	1.3%	UJ	**22.3%**	J			**72.5%**	J	**96%**	**3550**	J
Chromium	33.1%	UJ	16.6%	UJ	18.2%	UJ	16.6%	UJ	16.6%	UJ	**246.0%**	J	**141%**	**14.4**	J	9.1%	UJ	9.1%	UJ	**9.1%**	J	9.1%	UJ	9.1%	UJ	**65.8%**	J	**152%**	**33**	J
Cobalt	**0.8%**	J	**2.1%**	J	**4.1%**	J	**0.2%**	J	**1.0%**	J	**7.1%**	J	**72%**	**181**	J	**0.1%**	J	**1.2%**	J	**2.2%**	J	**0.1%**	J	1.4%	UJ	**5.0%**	J	**87%**	**105**	J
Copper	**0.0%**	J	**3.1%**	J	**3.3%**	J	**0.3%**	J	0.0%	J	**16.4%**	J	**96%**	**2340**	J	**0.0%**	J	**0.0%**	J	**0.1%**	J	**0.1%**	J	0.1%	UJ	**1.3%**	J	**88%**	**1210**	J
Iron	**0.0%**	J	0.1%	UJ	**1.6%**	J	**0.1%**	J	**1.2%**	J	**10.1%**	J	**72%**	**330000**	J	**0.0%**	J	0.0%	UJ	**0.4%**	J	**0.1%**	J	**2.6%**	J	**6.2%**	J	**91%**	**266000**	J
Lead	**0.7%**	J	**37.6%**	J	**2.9%**	J	**10.5%**	J	**0.1%**	J	**37.9%**	J	**33%**	**4710**	J	**0.0%**	J	**0.2%**	J	**0.1%**	J	**0.2%**	J	**0.1%**	J	**0.6%**	J	**84%**	**4350**	J
Lithium	33.3%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	75.0%	UJ	273%	5	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	90.7%	UJ	187%	5	UJ
Manganese	**2.6%**	J	**4.1%**	J	**4.8%**	J	**0.5%**	J	**0.9%**	J	**8.1%**	J	**119%**	**3640**	J	**0.5%**	J	**10.2%**	J	**#VALUE!**	J	**0.6%**	J	**3.9%**	J	**14.3%**	J	**74%**	**1080**	J
Molybdenum	18.3%	UJ	9.2%	UJ	9.2%	UJ	9.2%	UJ	9.2%	UJ	**16.7%**	J	**141%**	**4.41**	J	10.2%	UJ	10.2%	UJ	**10.2%**	J	10.2%	UJ	19.5%	UJ	**10.2%**	J	**250%**	**4.02**	J
Nickel	**15.4%**	J	8.9%	UJ	34.4%	UJ	7.7%	UJ	25.1%	UJ	**185.3%**	J	**91%**	**20.6**	J	**3.8%**	J	3.8%	UJ	**5.2%**	J	**3.8%**	J	19.5%	UJ	**41.8%**	J	**100%**	**73.5**	J
Phosphorus	#VALUE!	UJ	#VALUE!	UJ	#VALUE!	UJ							#VALUE!	**179**	J	28.2%	UJ	28.2%	UJ	**114.7%**	J							**42%**	**503**	J
Potassium	200.0%	UJ											28%	**290**	J	100.0%	UJ											4%	**400**	J
Selenium	17.7%	UJ	8.8%	UJ	8.8%	UJ	8.8%	UJ	22.1%	UJ	**8.8%**	J	**447%**	**1.16**	J	8.8%	UJ	8.8%	UJ	8.8%	UJ	**8.8%**	J	22.1%	UJ	**8.8%**	J	**750%**	**0.97**	J
Silver	2.2%	UJ	1.1%	UJ	1.1%	UJ	1.1%	UJ	1.1%	UJ	**61.0%**	J	**42%**	**11**	J	0.7%	UJ	0.7%	UJ	0.7%	UJ	**0.7%**	J	**0.7%**	J	**1.4%**	J	**300%**	**14.7**	J
Sodium	200.0%	UJ											200%	100	UJ	100.0%	UJ											32%	100	UJ
Strontium	28.7%	UJ	14.4%	UJ	14.4%	UJ	**14.4%**	J	14.4%	UJ	**39.9%**	J	**122%**	**31.4**	J	12.4%	UJ	74.7%	UJ	12.4%	UJ	12.4%	UJ	12.4%	UJ	**74.9%**	J	**105%**	**21.9**	J
Thallium	**1.6%**	J	**1.5%**	J	**1.7%**	J	**1.0%**	J	32.9%	UJ	**26.3%**	J	**64%**	**4.37**	J	**0.7%**	J	**0.7%**	J	**0.7%**	J	**0.7%**	J	28.4%	UJ	**4.2%**	J	**913%**	**7.66**	J
Tin	32.5%	UJ	16.3%	UJ	16.3%	UJ	16.3%	UJ	16.3%	UJ	**16.3%**	J	**700%**	**4.2**	J	15.2%	UJ	15.2%	UJ	15.2%	UJ	15.2%	UJ	15.2%	UJ	**15.2%**	J	**600%**	**4.4**	J
Titanium	22.5%	UJ	11.3%	UJ	45.3%	UJ	20.0%	UJ	11.3%	UJ	**549.5%**	J	**151%**	**27.9**	J	8.9%	UJ	8.9%	UJ	8.9%	UJ	8.9%	UJ	12.7%	UJ	**820.0%**	J	**87%**	**41.5**	J
Uranium	6.6%	UJ	**13.5%**	J	**9.5%**	J	3.3%	UJ	6.2%	UJ	**31.1%**	J	**92%**	**1.89**	J	2.1%	UJ	**2.4%**	J	**3.5%**	J	2.1%	UJ	7.0%	UJ	**21.1%**	J	**91%**	**2.17**	J
Vanadium	3.8%	UJ	1.9%	UJ	**52.8%**	J	5.5%	UJ	**22.9%**	J	**258.7%**	J	**111%**	**13**	J	1.1%	UJ	1.1%	UJ	**6.8%**	J	**1.2%**	J	**27.3%**	J	**157.2%**	J	**98%**	**19.7**	J
Zinc	**0.7%**	J	**2.2%**	J	**1.7%**	J	**0.1%**	J	**0.5%**	J	**28.7%**	J	**33%**	**11000**	J	**0.0%**	J	**0.0%**	J	**0.1%**	J	**0.1%**	J	0.8%	UJ	**1.0%**	J	**92%**	**6150**	J

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOD														CH13-204-MW016E_SOE													
Sample Interval (mbgs)	10 - 10.5														11.5 - 12													
Sample Date	8/12/2013														8/12/2013													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	1.6%	UJ	1.6%	UJ	**4.8%**	**J**	1.6%	UJ	**2.1%**	**J**	**981.7%**	**J**	**103%**	**5110**	**J**	0.2%	UJ	0.2%	UJ	**1.2%**	**J**	**0.2%**	**J**	**2.0%**	**J**	**97.9%**	**J**	**85%**	**21000**	**J**
Antimony	2.6%	UJ	**2.6%**	**J**	**4.2%**	**J**	**2.6%**	**J**	2.6%	UJ	**12.3%**	**J**	**161%**	**3.56**	**J**	15.6%	UJ	15.6%	UJ	**15.6%**	**J**	15.6%	UJ	31.3%	UJ	**39.1%**	**J**	**109%**	**0.44**	**J**
Arsenic	0.2%	UJ	**0.3%**	**J**	**5.2%**	**J**	**0.6%**	**J**	1.7%	UJ	**38.6%**	**J**	**93%**	**26.8**	**J**	0.6%	UJ	**0.7%**	**J**	**56.1%**	**J**	**26.3%**	**J**	**275.5%**	**J**	**95.1%**	**J**	**77%**	**8.91**	**J**
Barium	**1.1%**	**J**	**0.9%**	**J**	**0.6%**	**J**	**0.6%**	**J**	**0.6%**	**J**	**3.7%**	**J**	**124%**	**236**	**J**	**30.4%**	**J**	**33.9%**	**J**	**16.8%**	**J**	**12.8%**	**J**	**16.9%**	**J**	**42.7%**	**J**	**72%**	**144**	**J**
Beryllium	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	20.0%	UJ	253%	0.2	UJ	12.9%	UJ	12.9%	UJ	12.9%	UJ	12.9%	UJ	12.9%	UJ	**34.2%**	**J**	**168%**	**0.76**	**J**
Bismuth	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	0.2	UJ	11.6%	UJ	11.6%	UJ	**11.6%**	**J**	11.6%	UJ	11.6%	UJ	**11.6%**	**J**	**400%**	**0.3**	**J**
Cadmium	5.0%	UJ	5.0%	UJ	5.0%	UJ	5.0%	UJ	5.0%	UJ	**7.1%**	**J**	**321%**	**0.755**	**J**	11.5%	UJ	**19.8%**	**J**	11.5%	UJ	14.3%	UJ	15.0%	UJ	**18.9%**	**J**	**88%**	**0.311**	**J**
Calcium	**12.5%**	**J**	**337.0%**	**J**	1.1%	UJ	**4.8%**	**J**			**237.6%**	**J**	**80%**	**4570**	**J**	**19.6%**	**J**	**11.2%**	**J**	0.8%	UJ	**9.7%**	**J**			**76.3%**	**J**	**90%**	**6540**	**J**
Chromium	16.1%	UJ	16.1%	UJ	16.1%	UJ	16.1%	UJ	16.1%	UJ	**1032.2%**	**J**	**110%**	**12.5**	**J**	8.8%	UJ	8.8%	UJ	8.8%	UJ	8.8%	UJ	8.8%	UJ	**234.7%**	**J**	**214%**	**34.2**	**J**
Cobalt	**1.4%**	**J**	9.3%	UJ	**16.3%**	**J**	1.4%	UJ	**3.0%**	**J**	**578.1%**	**J**	**98%**	**7.24**	**J**	0.8%	UJ	**0.8%**	**J**	**32.6%**	**J**	**0.8%**	**J**	**43.9%**	**J**	**87.4%**	**J**	**84%**	**13.3**	**J**
Copper	0.5%	UJ	1.3%	UJ	**1.9%**	**J**	**0.6%**	**J**	0.5%	UJ	**143.9%**	**J**	**91%**	**78.1**	**J**	1.9%	UJ	**2.4%**	**J**	**12.4%**	**J**	**2.2%**	**J**	3.3%	UJ	**103.6%**	**J**	**78%**	**25.8**	**J**
Iron	0.3%	UJ	2.8%	UJ	**16.0%**	**J**	**0.4%**	**J**	**2.3%**	**J**	**329.9%**	**J**	**101%**	**18800**	**J**	0.2%	UJ	0.2%	UJ	**10.9%**	**J**	**1.3%**	**J**	**52.7%**	**J**	**92.2%**	**J**	**86%**	**28300**	**J**
Lead	**0.1%**	**J**	**0.2%**	**J**	**0.1%**	**J**	**0.2%**	**J**	**0.1%**	**J**	**1.0%**	**J**	**130%**	**351**	**J**	1.6%	UJ	**1.6%**	**J**	**9.7%**	**J**	**3.3%**	**J**	9.0%	UJ	**34.8%**	**J**	**63%**	**30.5**	**J**
Lithium	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	167.0%	UJ	167%	5	UJ	7.3%	UJ	7.3%	UJ	7.3%	UJ	7.3%	UJ	7.3%	UJ	**57.1%**	**J**	**151%**	**43.9**	**J**
Manganese	**4.0%**	**J**	**103.3%**	**J**	**#VALUE!**	**J**	**6.0%**	**J**	**10.0%**	**J**	**295.1%**	**J**	**80%**	**163**	**J**	**1.5%**	**J**	**9.8%**	**J**	**#VALUE!**	**J**	**4.6%**	**J**	**23.1%**	**J**	**69.2%**	**J**	**44%**	**334**	**J**
Molybdenum	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	44.3%	UJ	255%	0.5	UJ	16.7%	UJ	16.7%	UJ	21.0%	UJ	16.7%	UJ	44.7%	UJ	16.7%	UJ	167%	**1.01**	**J**
Nickel	11.4%	UJ	15.3%	UJ	**25.6%**	**J**	11.4%	UJ	11.4%	UJ	**943.2%**	**J**	**91%**	**13.4**	**J**	4.7%	UJ	4.7%	UJ	**15.4%**	**J**	4.7%	UJ	**50.2%**	**J**	**122.3%**	**J**	**113%**	**39**	**J**
Phosphorus	18.1%	UJ	18.1%	UJ	**39.1%**	**J**							**21%**	**471**	**J**	17.5%	UJ	17.5%	UJ	**42.1%**	**J**							**29%**	**534**	**J**
Potassium	100.0%	UJ											26%	**760**	**J**	100.0%	UJ											4%	**1850**	**J**
Selenium	13.3%	UJ	13.3%	UJ	13.3%	UJ	13.3%	UJ	33.3%	UJ	20.7%	UJ	596%	0.2	UJ	13.3%	UJ	13.3%	UJ	13.3%	UJ	13.3%	UJ	33.3%	UJ	13.3%	UJ	600%	**0.29**	**J**
Silver	6.9%	UJ	6.9%	UJ	6.9%	UJ	6.9%	UJ	6.9%	UJ	**6.9%**	**J**	**600%**	**0.95**	**J**	15.6%	UJ	15.6%	UJ	15.6%	UJ	15.6%	UJ	15.6%	UJ	**#VALUE!**	**J**	**294%**	**0.19**	**J**
Sodium	100.0%	UJ											77%	**560**	**J**	100.0%	UJ											14%	**800**	**J**
Strontium	**12.2%**	**J**	196.6%	UJ	12.2%	UJ	24.6%	UJ	12.2%	UJ	**132.7%**	**J**	**89%**	**27.8**	**J**	6.0%	UJ	5.0%	UJ	5.0%	UJ	5.0%	UJ	5.0%	UJ	**49.4%**	**J**	**114%**	**95.1**	**J**
Thallium	1.8%	UJ	1.8%	UJ	**1.8%**	**J**	1.8%	UJ	72.8%	UJ	**5.1%**	**J**	**4678%**	**0.517**	**J**	2.1%	UJ	2.1%	UJ	2.1%	UJ	2.1%	UJ	82.7%	UJ	**10.6%**	**J**	**893%**	**0.197**	**J**
Tin	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ
Titanium	2.0%	UJ	2.0%	UJ	**2.0%**	**J**	**2.0%**	**J**	2.0%	UJ	**66.6%**	**J**	**87%**	**287**	**J**	0.9%	UJ	0.9%	UJ	**0.9%**	**J**	0.9%	UJ	0.9%	UJ	**83.7%**	**J**	**83%**	**529**	**J**
Uranium	12.1%	UJ	**94.4%**	**J**	**30.9%**	**J**	7.4%	UJ	8.3%	UJ	**31.8%**	**J**	**124%**	**0.618**	**J**	4.6%	UJ	**9.6%**	**J**	**7.4%**	**J**	4.6%	UJ	**15.6%**	**J**	**46.6%**	**J**	**105%**	**0.992**	**J**
Vanadium	1.4%	UJ	2.5%	UJ	**30.3%**	**J**	**1.4%**	**J**	**4.8%**	**J**	**912.2%**	**J**	**99%**	**18.6**	**J**	0.5%	UJ	0.5%	UJ	**3.3%**	**J**	**0.5%**	**J**	**10.3%**	**J**	**98.6%**	**J**	**90%**	**36.8**	**J**
Zinc	**0.2%**	**J**	**0.3%**	**J**	**0.4%**	**J**	**0.2%**	**J**	8.1%	UJ	**10.8%**	**J**	**169%**	**511**	**J**	0.7%	UJ	0.7%	UJ	**2.5%**	**J**	**0.7%**	**J**	34.2%	UJ	**47.5%**	**J**	**105%**	**115**	**J**

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOF														CH13-204-MW016E_SOG													
Sample Interval (mbgs)	12.5 - 13														18.5 - 19													
Sample Date	8/12/2013														8/13/2013													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.3%	UJ	0.3%	UJ	**4.1%**	**J**	1.9%	UJ	**6.7%**	**J**	**135.9%**	**J**	**100%**	**13600**	**J**	3.8%	UJ	0.1%	UJ	**0.1%**	**UJ**	0.3%	UJ	**0.1%**	**J**	**4.0%**	**J**	**97%**	**29900**	**J**
Antimony	9.3%	UJ	12.1%	UJ	**37.4%**	**J**	9.3%	UJ	31.8%	UJ	**33.6%**	**J**	**116%**	**0.76**	**J**	59.4%	UJ	79.7%	UJ	151.6%	UJ	487.5%	UJ	**537.5%**	**J**	**7750.0%**	**J**	**85%**	**0.46**	**J**
Arsenic	0.4%	UJ	0.9%	UJ	**10.7%**	**J**	**3.6%**	**J**	**22.0%**	**J**	**38.9%**	**J**	**104%**	**14.3**	**J**	519.0%	UJ	12.4%	UJ	**68.5%**	**J**	**18.4%**	**J**	**73.0%**	**J**	**1569.2%**	**J**	**91%**	**11.7**	**J**
Barium	**7.7%**	**J**	**14.2%**	**J**	**1.6%**	**J**	**4.0%**	**J**	**7.5%**	**J**	**26.1%**	**J**	**112%**	**366**	**J**	**1.1%**	**J**	**1.1%**	**J**	1.1%	UJ	**1.1%**	**J**	**5.0%**	**J**	**4.4%**	**J**	**144%**	**153**	**J**
Beryllium	13.9%	UJ	13.9%	UJ	17.4%	UJ	13.9%	UJ	16.0%	UJ	**42.4%**	**J**	**156%**	**0.55**	**J**	14.1%	UJ	10.9%	UJ	10.9%	UJ	10.9%	UJ	10.9%	UJ	**10.9%**	**J**	**341%**	**0.79**	**J**
Bismuth	13.0%	UJ	13.0%	UJ	**13.0%**	**J**	13.0%	UJ	13.0%	UJ	**20.8%**	**J**	**259%**	**0.38**	**J**	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	0.2	UJ
Cadmium	10.2%	UJ	**68.2%**	**J**	10.2%	UJ	10.2%	UJ	10.2%	UJ	**58.2%**	**J**	**105%**	**0.335**	**J**	14.1%	UJ	**14.1%**	**J**	14.1%	UJ	14.1%	UJ	14.1%	UJ	**14.1%**	**J**	**600%**	**0.184**	**J**
Calcium	**25.6%**	**J**	**93.9%**	**J**	0.7%	UJ	**5.7%**	**J**			**34.2%**	**J**	**73%**	**6330**	**J**	**1.7%**	**J**	**0.1%**	**J**	0.1%	UJ	**0.1%**	**J**			**0.1%**	**J**	**106%**	**29700**	**J**
Chromium	8.7%	UJ	8.7%	UJ	8.7%	UJ	8.7%	UJ	8.7%	UJ	**120.2%**	**J**	**141%**	**36.1**	**J**	7.9%	UJ	6.7%	UJ	6.7%	UJ	6.7%	UJ	6.7%	UJ	**6.7%**	**J**	**300%**	**43.1**	**J**
Cobalt	2.1%	UJ	**13.1%**	**J**	**26.1%**	**J**	2.4%	UJ	**37.1%**	**J**	**106.6%**	**J**	**117%**	**11.2**	**J**	40.9%	UJ	**0.6%**	**J**	**0.6%**	**J**	0.6%	UJ	**0.6%**	**J**	**15.3%**	**J**	**143%**	**17.4**	**J**
Copper	1.3%	UJ	**13.6%**	**J**	**26.8%**	**J**	**9.6%**	**J**	7.3%	UJ	**75.7%**	**J**	**110%**	**38.9**	**J**	6.8%	UJ	2.4%	UJ	**4.7%**	**J**	2.4%	UJ	2.4%	UJ	**21.1%**	**J**	**112%**	**45.8**	**J**
Iron	0.2%	UJ	**1.3%**	**J**	**16.8%**	**J**	**1.4%**	**J**	**31.6%**	**J**	**105.9%**	**J**	**120%**	**27300**	**J**	73.4%	UJ	1.0%	UJ	**1.9%**	**J**	0.4%	UJ	**11.6%**	**J**	**178.6%**	**J**	**123%**	**36400**	**J**
Lead	0.7%	UJ	**68.9%**	**J**	**3.0%**	**J**	**20.5%**	**J**	5.1%	UJ	**48.4%**	**J**	**107%**	**69.8**	**J**	4.3%	UJ	4.3%	UJ	**6.8%**	**J**	**4.3%**	**J**	4.3%	UJ	**59.2%**	**J**	**108%**	**10.2**	**J**
Lithium	9.1%	UJ	9.1%	UJ	9.1%	UJ	9.1%	UJ	9.1%	UJ	**79.3%**	**J**	**155%**	**27.3**	**J**	8.0%	UJ	8.0%	UJ	8.0%	UJ	8.0%	UJ	8.0%	UJ	**8.0%**	**J**	**600%**	**35.8**	**J**
Manganese	**9.5%**	**J**	**36.4%**	**J**	**#VALUE!**	**J**	**6.6%**	**J**	**24.6%**	**J**	**85.3%**	**J**	**82%**	**324**	**J**	**2.3%**	**J**	**0.9%**	**J**	**#VALUE!**	**J**	**0.9%**	**J**	**0.9%**	**J**	**0.9%**	**J**	**295%**	**483**	**J**
Molybdenum	14.7%	UJ	14.7%	UJ	**14.7%**	**J**	14.7%	UJ	28.9%	UJ	**41.0%**	**J**	**240%**	**2.11**	**J**	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	19.7%	UJ	16.7%	UJ	155%	**0.81**	**J**
Nickel	5.6%	UJ	14.9%	UJ	**26.1%**	**J**	5.6%	UJ	**39.3%**	**J**	**109.6%**	**J**	**119%**	**29.6**	**J**	41.0%	UJ	4.8%	UJ	**4.8%**	**J**	4.8%	UJ	**4.8%**	**J**	**21.3%**	**J**	**168%**	**39.9**	**J**
Phosphorus	21.0%	UJ	21.0%	UJ	**198.3%**	**J**							**72%**	**519**	**J**	64.1%	UJ	24.3%	UJ	**24.3%**	**J**							**294%**	**624**	**J**
Potassium	**109.1%**	**J**											**4%**	**2330**	**J**	**43.5%**	**J**											**6%**	**5040**	**J**
Selenium	12.4%	UJ	12.4%	UJ	12.4%	UJ	12.4%	UJ	31.1%	UJ	**23.6%**	**J**	**224%**	**0.36**	**J**	13.3%	UJ	13.3%	UJ	13.3%	UJ	13.3%	UJ	33.3%	UJ	67.3%	UJ	196%	**0.29**	**J**
Silver	12.3%	UJ	12.3%	UJ	12.3%	UJ	12.3%	UJ	12.3%	UJ	**40.7%**	**J**	**237%**	**0.35**	**J**	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	30.0%	UJ	140.0%	UJ	112%	**0.14**	**J**
Sodium	100.0%	UJ											31%	**350**	**J**	100.0%	UJ											100%	**1260**	**J**
Strontium	11.5%	UJ	**30.3%**	**J**	7.5%	UJ	11.2%	UJ	12.6%	UJ	**37.8%**	**J**	**104%**	**44**	**J**	**4.0%**	**J**	**4.0%**	**J**	4.0%	UJ	4.0%	UJ	4.0%	UJ	**4.0%**	**J**	**457%**	**93.4**	**J**
Thallium	2.0%	UJ	2.0%	UJ	2.0%	UJ	2.0%	UJ	79.7%	UJ	**16.6%**	**J**	**852%**	**0.257**	**J**	25.9%	UJ	12.0%	UJ	15.6%	UJ	10.2%	UJ	74.2%	UJ	**328.1%**	**J**	**127%**	**0.34**	**J**
Tin	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ
Titanium	0.8%	UJ	0.8%	UJ	**1.7%**	**J**	2.0%	UJ	6.0%	UJ	**101.4%**	**J**	**99%**	**568**	**J**	0.5%	UJ	0.5%	UJ	**0.5%**	**J**	0.5%	UJ	**0.5%**	**J**	**0.5%**	**J**	**500%**	**862**	**J**
Uranium	10.4%	UJ	**33.8%**	**J**	**27.5%**	**J**	3.8%	UJ	**15.8%**	**J**	**79.4%**	**J**	**98%**	**1.41**	**J**	33.7%	UJ	**5.0%**	**J**	**5.0%**	**J**	5.0%	UJ	**5.0%**	**J**	**7.9%**	**J**	**132%**	**0.757**	**J**
Vanadium	0.4%	UJ	0.4%	UJ	**12.0%**	**J**	1.4%	UJ	**12.7%**	**J**	**94.2%**	**J**	**110%**	**49**	**J**	2.6%	UJ	0.3%	UJ	**0.3%**	**J**	0.3%	UJ	**0.6%**	**J**	**3.6%**	**J**	**102%**	**63.5**	**J**
Zinc	0.5%	UJ	**4.5%**	**J**	**15.5%**	**J**	2.0%	UJ	23.4%	UJ	**56.6%**	**J**	**114%**	**162**	**J**	40.7%	UJ	0.8%	UJ	**0.8%**	**J**	0.8%	UJ	38.0%	UJ	**0.8%**	**J**	**234%**	**77.7**	**J**

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOH														CH13-204-MW016E_SOI													
Sample Interval (mbgs)	21.5 - 22														26 - 26.5													
Sample Date	8/13/2013														8/13/2013													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.3%	UJ	0.3%	UJ	**2.8%**	**J**	**0.4%**	**J**	**1.9%**	**J**	**76.4%**	**J**	**91%**	**16000**	**J**	0.3%	UJ	0.3%	J	**4.8%**	**J**	**0.8%**	**J**	**1.7%**	**J**	**113.2%**	**J**	**93%**	**18000**	**J**
Antimony	9.9%	UJ	12.9%	UJ	**74.3%**	**J**	9.9%	UJ	41.6%	UJ	**73.3%**	**J**	**91%**	**1.02**	**J**	10.1%	UJ	10.1%	UJ	**22.2%**	**J**	10.1%	UJ	**14.1%**	**J**	**19.2%**	**J**	**125%**	**1.18**	**J**
Arsenic	0.3%	UJ	0.9%	UJ	**17.6%**	**J**	**2.2%**	**J**	**19.6%**	**J**	**35.2%**	**J**	**86%**	**19.9**	**J**	0.4%	UJ	1.3%	J	**29.5%**	**J**	**9.3%**	**J**	**28.0%**	**J**	**22.1%**	**J**	**67%**	**18.2**	**J**
Barium	**25.9%**	**J**	**27.4%**	**J**	**7.0%**	**J**	**13.7%**	**J**	**16.2%**	**J**	**246.9%**	**J**	**109%**	**110**	**J**	**37.5%**	**J**	**19.8%**	**J**	**2.7%**	**J**	**8.1%**	**J**	**13.0%**	**J**	**73.1%**	**J**	**85%**	**125**	**J**
Beryllium	13.5%	UJ	13.5%	UJ	13.5%	UJ	13.5%	UJ	13.5%	UJ	**20.3%**	**J**	**217%**	**0.71**	**J**	13.6%	UJ	13.6%	UJ	13.6%	UJ	13.6%	UJ	13.6%	UJ	**38.8%**	**J**	**173%**	**0.77**	**J**
Bismuth	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	364%	**0.33**	**J**	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	324%	**0.4**	**J**
Cadmium	11.0%	UJ	**106.8%**	**J**	11.0%	UJ	11.0%	UJ	11.0%	UJ	**75.3%**	**J**	**102%**	**0.338**	**J**	6.1%	UJ	**16.1%**	**J**	6.1%	UJ	**6.1%**	**J**	6.1%	UJ	**21.5%**	**J**	**107%**	**0.655**	**J**
Calcium	**10.4%**	**J**	**77.8%**	**J**	0.4%	UJ	**2.6%**	**J**			**38.8%**	**J**	**85%**	**12400**	**J**	**12.0%**	**J**	**2.0%**	**J**	0.7%	UJ	**8.1%**	**J**			**59.0%**	**J**	**90%**	**7230**	**J**
Chromium	7.5%	UJ	7.5%	UJ	7.5%	UJ	7.5%	UJ	7.5%	UJ	**58.1%**	**J**	**143%**	**34.6**	**J**	8.4%	UJ	8.4%	UJ	8.4%	UJ	8.4%	UJ	8.4%	UJ	**66.1%**	**J**	**131%**	**39.7**	**J**
Cobalt	0.8%	UJ	**7.2%**	**J**	**23.0%**	**J**	0.9%	UJ	**24.4%**	**J**	**58.7%**	**J**	**91%**	**13.9**	**J**	**0.7%**	**J**	**1.3%**	**J**	**20.0%**	**J**	**1.2%**	**J**	**17.3%**	**J**	**74.9%**	**J**	**88%**	**15.9**	**J**
Copper	1.1%	UJ	**10.2%**	**J**	**22.3%**	**J**	**5.5%**	**J**	1.1%	UJ	**48.3%**	**J**	**90%**	**49.7**	**J**	1.1%	UJ	**9.2%**	**J**	**26.6%**	**J**	**3.4%**	**J**	2.1%	UJ	**50.7%**	**J**	**88%**	**47.2**	**J**
Iron	0.2%	UJ	2.3%	UJ	**14.9%**	**J**	**0.3%**	**J**	**21.0%**	**J**	**61.3%**	**J**	**89%**	**31500**	**J**	0.2%	UJ	0.0%	UJ	**0.0%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0.0%**	**J**	**0%**	**29800**	**J**
Lead	2.2%	UJ	**17.2%**	**J**	**2.2%**	**J**	**12.1%**	**J**	2.2%	UJ	**36.9%**	**J**	**79%**	**29.5**	**J**	1.6%	UJ	**12.7%**	**J**	**1.6%**	**J**	**8.9%**	**J**	**1.6%**	**J**	**27.2%**	**J**	**81%**	**35.2**	**J**
Lithium	10.0%	UJ	10.0%	UJ	10.0%	UJ	10.0%	UJ	10.0%	UJ	**42.6%**	**J**	**186%**	**25.6**	**J**	8.4%	UJ	8.4%	UJ	8.4%	UJ	8.4%	UJ	8.4%	UJ	**72.3%**	**J**	**192%**	**30.3**	**J**
Manganese	**8.8%**	**J**	**66.9%**	**J**	**#VALUE!**	**J**	**3.7%**	**J**	**13.9%**	**J**	**59.7%**	**J**	**67%**	**335**	**J**	**1.3%**	**J**	**1.4%**	**J**	**#VALUE!**	**J**	**1.3%**	**J**	**13.2%**	**J**	**57.1%**	**J**	**88%**	**401**	**J**
Molybdenum	12.0%	UJ	12.0%	UJ	12.0%	UJ	12.0%	UJ	**41.2%**	**J**	**13.0%**	**J**	**138%**	**2.71**	**J**	14.1%	UJ	14.1%	UJ	15.3%	UJ	14.1%	UJ	**18.1%**	**J**	14.1%	UJ	**167%**	**1.76**	**J**
Nickel	3.9%	UJ	5.4%	UJ	**13.7%**	**J**	3.9%	UJ	**22.2%**	**J**	**53.8%**	**J**	**102%**	**45.6**	**J**	4.1%	UJ	4.1%	UJ	**22.0%**	**J**	4.1%	UJ	**17.8%**	**J**	**91.7%**	**J**	**91%**	**49.4**	**J**
Phosphorus	24.9%	UJ	24.9%	UJ	**228.4%**	**J**							**49%**	**598**	**J**	17.2%	UJ	17.2%	UJ	**103.4%**	**J**							**50%**	**872**	**J**
Potassium	100.0%	UJ											5%	**2190**	**J**	100.0%	UJ											5%	**2480**	**J**
Selenium	12.3%	UJ	12.3%	UJ	12.3%	UJ	12.3%	UJ	30.7%	UJ	**37.4%**	**J**	**174%**	**0.42**	**J**	13.2%	UJ	13.2%	UJ	13.2%	UJ	13.2%	UJ	32.9%	UJ	**13.2%**	**J**	**250%**	**0.31**	**J**
Silver	14.5%	UJ	14.5%	UJ	14.5%	UJ	14.5%	UJ	14.5%	UJ	**34.8%**	**J**	**231%**	**0.19**	**J**	14.3%	UJ	14.3%	UJ	14.3%	UJ	14.3%	UJ	14.3%	UJ	**15.7%**	**J**	**359%**	**0.23**	**J**
Sodium	100.0%	UJ											53%	**460**	**J**	100.0%	UJ											17%	**490**	**J**
Strontium	7.0%	UJ	**29.1%**	**J**	7.0%	UJ	10.9%	UJ	7.0%	UJ	**37.8%**	**J**	**112%**	**54.9**	**J**	8.2%	UJ	8.2%	UJ	8.2%	UJ	8.2%	UJ	8.2%	UJ	**54.7%**	**J**	**102%**	**49.5**	**J**
Thallium	2.1%	UJ	2.1%	UJ	2.1%	UJ	2.1%	UJ	82.4%	UJ	**11.1%**	**J**	**1098%**	**0.212**	**J**	2.0%	UJ	2.0%	UJ	2.0%	UJ	2.0%	UJ	79.3%	UJ	**16.7%**	**J**	**871%**	**0.274**	**J**
Tin	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ
Titanium	1.3%	UJ	1.3%	UJ	2.4%	UJ	1.3%	UJ	3.2%	UJ	**126.8%**	**J**	**101%**	**412**	**J**	1.1%	UJ	1.1%	UJ	2.9%	UJ	1.8%	UJ	1.4%	UJ	**188.7%**	**J**	**128%**	**557**	**J**
Uranium	7.4%	UJ	**26.7%**	**J**	**21.6%**	**J**	3.5%	UJ	**9.8%**	**J**	**60.3%**	**J**	**103%**	**1.32**	**J**	4.9%	UJ	**40.1%**	**J**	**24.4%**	**J**	4.9%	UJ	**8.8%**	**J**	**53.9%**	**J**	**103%**	**1.26**	**J**
Vanadium	0.5%	UJ	0.5%	UJ	**12.2%**	**J**	**0.7%**	**J**	**11.3%**	**J**	**83.1%**	**J**	**95%**	**43.4**	**J**	0.5%	UJ	0.6%	UJ	**13.4%**	**J**	**1.4%**	**J**	**7.7%**	**J**	**90.3%**	**J**	**95%**	**47.2**	**J**
Zinc	0.7%	UJ	9.6%	UJ	**14.2%**	**J**	**1.3%**	**J**	37.3%	UJ	**55.3%**	**J**	**111%**	**113**	**J**	0.8%	UJ	**1.7%**	**J**	**8.8%**	**J**	**2.3%**	**J**	39.1%	UJ	**69.9%**	**J**	**130%**	**107**	**J**

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH13-204-MW016E														CH13-204-MW016E													
Sample ID	CH13-204-MW016E_SOJ														CH13-204-MW016E_SOK													
Sample Interval (mbgs)	29 - 29.5														34.5 - 35													
Sample Date	8/13/2013														8/13/2013													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.2%	UJ	0.2%	UJ	**2.2%**	**J**	0.2%	UJ	**1.0%**	**J**	**47.9%**	**J**	**103%**	**23900**	**J**	0.3%	UJ	0.3%	UJ	**2.2%**	**J**	0.9%	UJ	**1.5%**	**J**	**78.4%**	**J**	**101%**	**18000**	**J**
Antimony	15.2%	UJ	15.2%	UJ	**15.2%**	**J**	15.2%	UJ	19.7%	UJ	**37.9%**	**J**	**166%**	**0.36**	**J**	12.8%	UJ	14.1%	UJ	**94.9%**	**J**	12.8%	UJ	12.8%	UJ	**28.2%**	**J**	**105%**	**0.62**	**J**
Arsenic	1.0%	UJ	1.2%	UJ	**41.9%**	**J**	**6.4%**	**J**	45.3%	UJ	**56.8%**	**J**	**122%**	**5.72**	**J**	**0.3%**	**J**	**2.0%**	**J**	**30.6%**	**J**	**2.1%**	**J**	**3.8%**	**J**	**15.0%**	**J**	**81%**	**12.3**	**J**
Barium	**24.8%**	**J**	**8.3%**	**J**	**1.8%**	**J**	**2.0%**	**J**	**3.1%**	**J**	**29.3%**	**J**	**96%**	**133**	**J**	**46.2%**	**J**	**35.4%**	**J**	7.7%	UJ	**22.6%**	**J**	17.2%	UJ	**242.0%**	**J**	**93%**	**86.5**	**J**
Beryllium	8.6%	UJ	8.6%	UJ	**8.6%**	**J**	8.6%	UJ	8.6%	UJ	**17.2%**	**J**	**241%**	**1.67**	**J**	14.3%	UJ	14.3%	UJ	14.3%	UJ	14.3%	UJ	14.3%	UJ	**29.3%**	**J**	**207%**	**0.56**	**J**
Bismuth	7.6%	UJ	7.6%	UJ	**7.6%**	**J**	7.6%	UJ	7.6%	UJ	**7.6%**	**J**	**197%**	**2.02**	**J**	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	18.3%	UJ	305%	0.2	UJ
Cadmium	14.0%	UJ	**46.9%**	**J**	19.4%	UJ	14.0%	UJ	14.0%	UJ	**30.6%**	**J**	**81%**	**0.196**	**J**	10.4%	UJ	89.6%	UJ	10.4%	UJ	10.4%	UJ	10.4%	UJ	**30.5%**	**J**	**101%**	**0.152**	**J**
Calcium	**3.0%**	**J**	**0.5%**	**J**	0.2%	UJ	**0.9%**	**J**			**15.5%**	**J**	**126%**	**22800**	**J**	**7.9%**	**J**	**33.2%**	**J**	0.2%	UJ	**1.6%**	**J**			**13.7%**	**J**	**75%**	**20000**	**J**
Chromium	6.8%	UJ	6.8%	UJ	6.8%	UJ	6.8%	UJ	6.8%	UJ	**30.9%**	**J**	**155%**	**58.4**	**J**	6.3%	UJ	6.3%	UJ	6.3%	UJ	6.3%	UJ	6.3%	UJ	**37.3%**	**J**	**151%**	**83.4**	**J**
Cobalt	0.7%	UJ	**0.7%**	**J**	**13.3%**	**J**	**0.7%**	**J**	**7.1%**	**J**	**32.1%**	**J**	**96%**	**14.1**	**J**	1.0%	UJ	**10.2%**	**J**	**19.5%**	**J**	**1.6%**	**J**	**5.8%**	**J**	**41.9%**	**J**	**94%**	**15.3**	**J**
Copper	1.3%	UJ	5.6%	UJ	**21.4%**	**J**	**1.3%**	**J**	2.3%	UJ	**25.6%**	**J**	**66%**	**30.7**	**J**	2.2%	UJ	15.6%	UJ	**37.2%**	**J**	10.1%	UJ	4.5%	UJ	**46.7%**	**J**	**86%**	**32.6**	**J**
Iron	0.2%	UJ	0.2%	UJ	**4.9%**	**J**	**0.5%**	**J**	**10.1%**	**J**	**41.7%**	**J**	**92%**	**30500**	**J**	0.2%	UJ	2.5%	UJ	**16.9%**	**J**	**0.7%**	**J**	**5.5%**	**J**	**59.6%**	**J**	**89%**	**32400**	**J**
Lead	5.1%	UJ	**19.0%**	**J**	33.4%	UJ	**10.5%**	**J**	7.2%	UJ	**48.9%**	**J**	**74%**	**9.63**	**J**	3.9%	UJ	**28.4%**	**J**	4.2%	UJ	**62.3%**	**J**	5.2%	UJ	**55.3%**	**J**	**89%**	**10.2**	**J**
Lithium	8.1%	UJ	8.1%	UJ	8.1%	UJ	8.1%	UJ	8.1%	UJ	**39.1%**	**J**	**214%**	**38.3**	**J**	8.1%	UJ	8.1%	UJ	8.1%	UJ	8.1%	UJ	8.1%	UJ	**49.7%**	**J**	**177%**	**36.2**	**J**
Manganese	**1.3%**	**J**	**4.4%**	**J**	**#VALUE!**	**J**	**1.3%**	**J**	**3.7%**	**J**	**28.3%**	**J**	**63%**	**386**	**J**	**8.5%**	**J**	**38.5%**	**J**	**#VALUE!**	**J**	**3.8%**	**J**	**4.5%**	**J**	**50.3%**	**J**	**74%**	**414**	**J**
Molybdenum	12.8%	UJ	12.8%	UJ	12.8%	UJ	12.8%	UJ	12.8%	UJ	**12.8%**	**J**	**278%**	**2.03**	**J**	14.4%	UJ	14.4%	UJ	22.7%	UJ	14.4%	UJ	14.4%	UJ	**14.4%**	**J**	**253%**	**0.87**	**J**
Nickel	3.5%	UJ	3.5%	UJ	**3.5%**	**J**	3.5%	UJ	**6.5%**	**J**	**28.8%**	**J**	**104%**	**52**	**J**	3.9%	UJ	9.2%	UJ	**13.9%**	**J**	3.9%	UJ	5.7%	UJ	**38.0%**	**J**	**102%**	**51.7**	**J**
Phosphorus	12.4%	UJ	12.4%	UJ	**19.4%**	**J**							**31%**	**633**	**J**	24.0%	UJ	24.0%	UJ	**190.9%**	**J**							**52%**	**661**	**J**
Potassium	**47.6%**	**J**											**11%**	**2720**	**J**	**76.9%**	**J**											**3%**	**2340**	**J**
Selenium	12.2%	UJ	12.2%	UJ	12.2%	UJ	12.2%	UJ	30.5%	UJ	**12.2%**	**J**	**517%**	**0.41**	**J**	11.4%	UJ	11.4%	UJ	11.4%	UJ	11.4%	UJ	28.4%	UJ	**29.0%**	**J**	**323%**	**0.36**	**J**
Silver	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	U	545%	**0.1**	**J**	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	30.0%	UJ	283%	0.1	UJ
Sodium	100.0%	UJ											48%	**930**	**J**	100.0%	UJ											38%	**270**	**J**
Strontium	**2.6%**	**J**	**2.6%**	**J**	2.6%	UJ	**2.6%**	**J**	2.6%	UJ	**19.8%**	**J**	**216%**	**170**	**J**	6.3%	UJ	**23.0%**	**J**	5.3%	UJ	7.2%	UJ	5.3%	UJ	**28.6%**	**J**	**104%**	**77.5**	**J**
Thallium	2.0%	UJ	2.0%	UJ	2.0%	UJ	2.0%	UJ	81.6%	UJ	**6.0%**	**J**	**1878%**	**0.199**	**J**	2.1%	UJ	2.1%	UJ	2.1%	UJ	2.1%	UJ	83.3%	UJ	**13.8%**	**J**	**955%**	**0.187**	**J**
Tin	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	16.7%	UJ	600%	2	UJ
Titanium	0.8%	UJ	0.8%	UJ	**0.9%**	**J**	0.8%	UJ	0.8%	UJ	**47.4%**	**J**	**90%**	**637**	**J**	1.4%	UJ	1.4%	UJ	4.1%	UJ	2.5%	UJ	1.8%	UJ	**192.4%**	**J**	**90%**	**439**	**J**
Uranium	**2.8%**	**J**	**23.2%**	**J**	**12.9%**	**J**	2.8%	UJ	3.2%	UJ	**27.1%**	**J**	**97%**	**1.74**	**J**	14.3%	UJ	**49.8%**	**J**	**25.7%**	**J**	4.3%	UJ	4.3%	UJ	**64.1%**	**J**	**107%**	**1.02**	**J**
Vanadium	0.5%	UJ	0.5%	UJ	**4.0%**	**J**	**0.5%**	**J**	**4.6%**	**J**	**46.3%**	**J**	**96%**	**46.4**	**J**	0.5%	UJ	0.9%	UJ	**16.8%**	**J**	0.8%	UJ	**2.9%**	**J**	**81.8%**	**J**	**90%**	**48**	**J**
Zinc	0.9%	UJ	8.3%	UJ	**18.0%**	**J**	2.5%	UJ	44.0%	UJ	**87.2%**	**J**	**94%**	**68.6**	**J**	0.8%	UJ	22.4%	UJ	**20.8%**	**J**	2.8%	UJ	40.6%	UJ	**53.4%**	**J**	**111%**	**56.3**	**J**

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW001C														CH14-015-MW001C													
Sample ID	CH14_015_MW001C_SOa														CH14_015_MW001C_Sof													
Sample Interval (mbgs)	2.1 - 2.4														16.5 - 16.8													
Sample Date	9/3/2014														9/3/2014													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	**9%**		9%	U	78%	U	24%	U	**44%**		**2505%**		**107%**	**470**		4%	U	4%	U	20%	U	6%	U	21%	U	**1164%**		**109%**	**884**	
Antimony	0.2%	U	**0%**		**1%**		**0%**		**0%**		**0%**		**110%**	**53.1**		0.3%	U	**0.3%**		**0%**		**0%**		0%	J	**1%**		**101%**	**33.1**	
Arsenic	**0.0%**		**0%**		**1%**		**0%**		**0%**		**0%**		**94%**	**1010**		**0.01%**		**0.0%**		1%	J	**0%**		**0%**		**0%**		**94%**	**394**	
Barium	**7%**		**6%**		**2%**		**4%**		**3%**		**43%**		**108%**	**174**		**16.1%**		**18%**		**4%**		**5%**		**6%**		**88%**		**89%**	**19.3**	
Beryllium	17%	U	17%	U	17%	U	17%	U	17%	U	33%	U	222%	0.2	U	16%	U	16%	U	16%	U	16%	U	16%	U	**35%**		**230%**	**0.31**	
Bismuth	12%	U	12%	U	12%	U	12%	U	12%	U	**14%**		**349%**	**0.85**		17%	U	17%	U	17%	U	17%	U	17%	U	17%	U	600%	**0.24**	
Cadmium	**0%**		**2%**		**0%**		**0.3%**		0.3%	U	**1%**		**111%**	**20.5**		**0%**		**0.4%**		**0.2%**		**0.2%**		0.2%	U	**0%**		**115%**	**25.3**	
Calcium	**168%**		698%	U	5%	U	**38%**				**308%**		**85%**	**882**		**57%**		652%	U	2%	U	**40%**		#VALUE!		**181%**		**107%**	**2030**	
Chromium	17%	U	17%	U	17%	U	17%	U	17%	U	103%	U	178%	**6.03**		16%	U	16%	U	16%	U	16%	U	16%	U	**128%**		**142%**	**9.46**	
Cobalt	**0%**		1.0%	U	2%	U	0%	U	**1%**		**4%**		**113%**	**153**		**0%**		1.5%	U	**1.3%**		**0.1%**		2%	U	**6%**		**91%**	**114**	
Copper	**0%**		**0.2%**		**1%**		**0%**		0%	U	**1%**		**99%**	**1550**		**0.0%**		**0%**	J	**1%**		**0%**		0%	U	**1%**		**81%**	**1070**	
Iron	**0%**		**0.2%**		**1%**		**0.1%**		**0%**		**5%**		**102%**	**368000**		**0.0%**		**0.0%**		**1%**		**0%**		**1%**		**5%**		**98%**	**308000**	
Lead	**0%**		**0%**		**0%**		**0%**		**0.02%**		**0%**		**96%**	**3440**		**0%**		**0%**		0%	J	**0%**	J	**0%**		**0%**		**87%**	**4320**	
Lithium	17%	U	17%	U	17%	U	17%	U	17%	U	101%	U	186%	5	U	17%	U	17%	U	17%	U	17%	U	17%	U	92%	U	216%	5	U
Manganese	**6%**		49%	U	**#VALUE!**		5%	U	**5%**		**61%**		**84%**	**317**		**1%**		**22%**		**#VALUE!**		**1%**		**3%**		**18%**		**85%**	**700**	
Molybdenum	10%	U	10%	U	11%	U	10%	U	10%	U	**10%**		**223%**	**2.36**		9%	U	9%	U	9%	U	9%	U	9%	U	**9%**		**390%**	**3.01**	
Nickel	**10%**		23%	U	37%	U	10%	U	14%	U	**99%**		**120%**	**13.3**		**5%**		5%	U	7%	U	5%	U	21%	U	**64%**		**93%**	**33**	
Phosphorus	33%	U	33%	U	**332%**								**75%**	**246**		33%	U	33%	U	79%	U							**27%**	**336**	
Potassium	100%	U											**4%**	100	U	100%	U											**6%**	**250**	
Selenium	10%	U	10%	U	10%	U	10%	U	26%	U	**11%**		**276%**	**0.65**		11%	U	11%	U	11%	U	11%	U	27%	U	**22%**		**125%**	**0.71**	
Silver	1%	U	1%	U	1%	U	1%	U	1%	U	**1%**		**291%**	**18.2**		0.6%	U	1%	U	1%	U	1%	U	1%	U	**1%**		**545%**	**16.8**	
Sodium	100%	U											**42%**	100	U	100%	U											**29%**	100	U
Strontium	18%	U	66%	U	17%	U	25%	U	17%	U	93%	U	115%	**7.55**		17%	U	106%	U	17%	U	17%	U	17%	U	126%	U	120%	**5.35**	
Thallium	1%	U	1%	U	**1%**		**1%**		25%	U	**4%**		**994%**	**5.89**		**0%**		**0%**		**0%**		**0%**		16%	U	**2%**		**1663%**	**11.8**	
Tin	15%	U	15%	U	15%	U	15%	U	15%	U	**15%**		**600%**	**5.2**		15%	U	15%	U	15%	U	15%	U	15%	U	**15%**		**600%**	**4.4**	
Titanium	17%	U	17%	U	58%	U	31%	U	18%	U	2450%	U	98%	**5.4**		12%	U	12%	U	12%	U	12%	U	12%	U	**917%**		**103%**	**16.8**	
Uranium	**16%**		55%	U	28%	U	5%	U	**5%**		**84%**		**106%**	**0.91**		4%	U	**5%**		**4%**		4%	U	9%	U	**50%**		**98%**	**1.09**	
Vanadium	2%	U	8%	U	**93%**		4%	U	**13%**		**409%**		**101%**	**9.26**		1%	U	1%	U	**16%**		**2%**		**15%**		**170%**		**97%**	**15.6**	
Zinc	**0%**		**0.2%**		**0%**		**0.0%**		0.5%	U	**1%**		**136%**	**11400**		**0%**		**0.0%**	J	**0%**		**0.0%**		0.3%	U	**0%**		**140%**	**16300**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW001C														CH14-015-MW001C													
Sample ID	CH14_015_MW001C_Sog														CH14_015_MW001C_Soh													
Sample Interval (mbgs)	19.2 - 19.5														20.4 - 20.7													
Sample Date	9/4/2014														9/4/2014													
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	**0%**		0.3%	U	**1%**		**0%**		**0%**		**19%**		**82%**	**14800**		0.3%	U	**0.3%**		**1%**		**0%**		**0%**		**13%**		**94%**	**17400**	
Antimony	5%	U	5%	U	**784%**		**84%**		**564%**		**681%**		**99%**	**1.51**		13%	U	15%	U	**1888%**		198%	U	556%	U	**2263%**		**96%**	**0.57**	
Arsenic	**1%**		**3%**		**187%**		**475%**		**317%**		**5553%**		**76%**	**6.71**		1%	U	4%	U	**439%**		507%		**120%**		**7876%**		**94%**	**6.18**	
Barium	**1%**		**1%**		**12%**		**19%**		**135%**		**3%**		**54%**	**125**		**2%**		**3%**		**21%**		**19%**		**120%**		**4%**		**36%**	**119**	
Beryllium	14%	U	14%	U	14%	U	14%	U	14%	U	**37%**		**247%**	**0.74**		13%	U	13%	U	13%	U	13%	U	13%	U	**26%**		**262%**	**0.71**	
Bismuth	17%	U	17%	U	17%	U	17%	U	17%	U	87%	U	149%	**0.54**		17%	U	17%	U	103%	U	17%	U	17%	U	52%	U	169%	**0.46**	
Cadmium	**331%**		**165%**		142%	U	245%	U	8%	U	**2241%**		**86%**	**0.496**		**175%**		**90%**		113%	U	143%	U	7%	U	**1660%**		**110%**	**0.644**	
Calcium	**60%**		**3%**		1%	U	**7%**				**30%**		**104%**	**4450**		**50%**		1%	U	1%	U	**7%**				**25%**		**127%**	**6470**	
Chromium	9%	U	9%	U	16%	U	9%	U	9%	U	**33%**		**139%**	**32.6**		9%	U	9%	U	14%	U	9%	U	9%	U	**19%**		**182%**	**37.3**	
Cobalt	**22%**		**3%**		**4%**		**6%**		**1%**		**914%**		**86%**	**10.1**		**20%**		**3%**		**5%**		8%	U	**1%**		**1117%**		**107%**	**9.38**	
Copper	**4%**		**180%**		**608%**		**457%**		**3%**		**2961%**		**82%**	**37.8**		32%	U	**368%**		**1025%**		606%	U	3%	U	**6912%**		**113%**	**20.7**	
Iron	**2.9%**		**0%**		**61%**		**9%**		**28%**		**988%**		**86%**	**25000**		0.5%	U	**0%**		**59%**		**8%**		**14%**		**990%**		**102%**	**25800**	
Lead	**1770%**		**12415%**		**465%**		**4888%**		**59%**		**1558%**		**134%**	**49.1**		3211%	U	**6304%**		**895%**		**3925%**		22%	U	**1674%**		**110%**	**32.2**	
Lithium	9%	U	9%	U	9%	U	9%	U	9%	U	**9%**		**600%**	**29.3**		9%	U	9%	U	9%	U	9%	U	9%	U	**9%**		**600%**	**33.4**	
Manganese	**65%**		13%	U	48%	U	11%	U	**18%**		**512%**		**91%**	**210**		**31%**		8%	U	56%		8%	U	**14%**		**428%**		**115%**	**232**	
Molybdenum	17%	U	17%	U	17%	U	17%	U	22%	U	109%	U	149%	**0.68**		17%	U	17%	U	26%	U	17%	U	17%	U	89%	U	134%	**0.96**	
Nickel	**21%**		6%	U	7%	U	6%	U	**6%**		**65%**		**112%**	**27.1**		13%	U	6%	U	7%	U	6%	U	**6%**		**81%**		**117%**	**28.2**	
Phosphorus	23%	U	23%	U	**23%**								**33%**	**588**		20%	U	20%	U	**21%**								**44%**	**886**	
Potassium	100%	U											15%	**1420**		**100%**												**23%**	**1910**	
Selenium	13%	U	13%	U	13%	U	13%	U	33%	U	42%	U	160%	**0.36**		13%	U	13%	U	13%	U	13%	U	33%	U	55%	U	202%	0.2	U
Silver	15%	U	15%	U	15%	U	85%	U	91%	U	**2800%**		**105%**	**0.21**		16%	U	16%	U	16%	U	46%	U	59%	U	**2492%**		**106%**	**0.11**	
Sodium	100%	U											100%	**380**		100%	U											100%	**640**	
Strontium	**9%**		9%	U	9%	U	9%	U	9%	U	**52%**		**176%**	**35.9**		8%	U	8%	U	8%	U	8%	U	8%	U	**31%**		**201%**	**55**	
Thallium	29%	U	12%	U	4%	U	14%	U	83%	U	**213%**		**137%**	**0.2**		24%	U	9%	U	3%	U	11%	U	84%	U	**230%**		**130%**	**0.18**	
Tin	17%	U	17%	U	17%	U	17%	U	17%	U	33%	U	171%	2	U	17%	U	17%	U	17%	U	17%	U	17%	U	26%	U	243%	**3.5**	
Titanium	1%	U	1%	U	**1%**		**1%**		1%	U	**4%**		**101%**	**481**		1%	U	1%	U	**1%**		1%	U	1%	U	**3%**		**157%**	**576**	
Uranium	1%	U	**4%**		**5%**		**1%**		**1%**		**57%**		**112%**	**4.49**		4%	U	**12%**		**19%**		4%	U	**4%**		**189%**		**122%**	**1.2**	
Vanadium	1%	U	1%	U	**8%**		**1%**		**6%**		**92%**		**102%**	**31.5**		1%	U	1%	U	**8%**		**1%**		**2%**		**60%**		**113%**	**33.8**	
Zinc	**165%**		**89%**		**166%**		**65%**		20%	U	**1241%**		**82%**	**669**		**249%**		**151%**		**417%**		**101%**		18%	U	**2628%**		**109%**	**319**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW001C															CH14-015-MW001C														
Sample ID	CH14_015_MW001C_Soi															CH14_015_MW001C_Soj														
Sample Interval (mbgs)	21.6 - 21.9															23.8 - 24.1														
Sample Date	9/3/2014															9/4/2014														
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**		**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	3.5%	U	0.3%	U	**6%**		**0%**		**3%**		**29%**		**115%**	**14400**		**0%**		0.4%	U	**1%**		**0%**		**0%**		**11%**		**76%**	**13100**	
Antimony	14%	U	14%	U	**1186%**		546%	U	449%	U	**3229%**		**91%**	**0.35**		13%	U	13%	U	**654%**	**U**	190%	U	538%	U	**1675%**		**78%**	**0.66**	
Arsenic	13%	U	5%	U	**386%**		**1265%**		**2778%**		**10491%**		**76%**	**5.16**		**1%**		3%	U	**117%**		**442%**		**192%**		**9048%**		**94%**	**13.9**	
Barium	**2%**		**2%**		**6%**		**9%**		**273%**		**4%**		**93%**	**97.7**		**2%**		**4%**		**21%**		**14%**		**139%**		**2%**		**26%**	**114**	
Beryllium	14%	U	14%	U	14%	U	14%	U	14%	U	**14%**		**226%**	**0.55**		14%	U	14%	U	14%	U	14%	U	14%	U	**14%**		**444%**	**0.75**	
Bismuth	17%	U	17%	U	29%	U	17%	U	17%	U	56%	U	150%	**0.3**		16%	U	16%	U	24%	U	16%	U	16%	U	**21%**		**177%**	**0.49**	
Cadmium	**2078%**		**50%**		26%	U	34%	U	5%	U	**934%**		**152%**	**0.498**		**427%**		103%	U	62%	U	102%	U	11%	U	**2798%**		**100%**	**0.335**	
Calcium	**180%**		**2%**		1%	U	**5%**				**8%**		**147%**	**5100**		**66%**		4%	U	1%	U	**21%**				**23%**		**75%**	**3960**	
Chromium	10%	U	10%	U	10%	U	10%	U	10%	U	**37%**		**191%**	**27.6**		10%	U	10%	U	10%	U	10%	U	10%	U	**10%**		**210%**	**30.2**	
Cobalt	**311%**		11%	U	**15%**		8%	U	**6%**		**967%**		**92%**	**7.87**		**10%**		2%	U	**7%**		7%	U	**1%**		**2331%**		**110%**	**9.26**	
Copper	624%	U	**214%**		**1216%**		468%	U	3%	U	**7770%**		**109%**	**14.7**		**8%**		**124%**		**471%**		**242%**		2%	U	**7269%**		**92%**	**32.8**	
Iron	12.4%	U	**0%**		**59%**		**8%**		**114%**		**608%**		**89%**	**21900**		**2.7%**		**0%**		**52%**		**4%**		**33%**		**1289%**		**100%**	**27200**	
Lead	1021%	U	**10078%**		**1395%**		**3329%**		19%	U	**15914%**		**140%**	**20.2**		**1695%**		**4233%**		**537%**		**1296%**		15%	U	**1584%**		**84%**	**55.6**	
Lithium	9%	U	9%	U	9%	U	9%	U	9%	U	**11%**		**567%**	**25.7**		10%	U	10%	U	10%	U	10%	U	10%	U	**10%**		**600%**	**24.4**	
Manganese	**495%**		26%	U	**62%**		22%	U	**20%**		**210%**		**108%**	**207**		**374%**		26%	U	**226%**		20%	U	**23%**		**694%**		**83%**	**223**	
Molybdenum	16%	U	16%	U	**16%**		16%	U	24%	U	204%	U	141%	**0.89**		17%	U	17%	U	17%	U	17%	U	**17%**		98%	U	**124%**	**0.86**	
Nickel	50%	U	7%	U	7%	U	7%	U	**7%**		**61%**		**142%**	**20.2**		9%	U	6%	U	6%	U	6%	U	**6%**		**44%**		**126%**	**31.1**	
Phosphorus	22%	U	22%	U	**22%**								**49%**	**521**		16%	U	16%	U	**16%**								**84%**	**763**	
Potassium	100%	U											**15%**	**1850**		100%	U											**34%**	**2180**	
Selenium	13%	U	13%	U	13%	U	13%	U	33%	U	41%	U	229%	0.2	U	13%	U	13%	U	13%	U	13%	U	33%	U	64%	U	195%	0.2	U
Silver	16%	U	16%	U	16%	U	16%	U	16%	U	**2656%**		**139%**	0.1	U	16%	U	16%	U	16%	U	16%	U	16%	U	1345%		**83%**	**0.23**	
Sodium	100%	U											100%	**530**		100%	U											100%	**320**	
Strontium	16%	U	32%	U	7%	U	7%	U	13%	U	**29%**		**238%**	**42.6**		9%	U	9%	U	9%	U	12%	U	9%	U	**16%**		**111%**	**33.5**	
Thallium	4%	U	5%	U	7%	U	20%	U	84%	U	**308%**		**170%**	**0.156**		8%	U	4%	U	3%	U	9%	U	80%	U	**140%**		**139%**	**0.271**	
Tin	17%	U	17%	U	17%	U	17%	U	17%	U	25%	U	351%	2	U	17%	U	17%	U	17%	U	17%	U	17%	U	19%	U	293%	2	U
Titanium	1%	U	1%	U	**1%**		1%	U	1%	U	**10%**		**171%**	**560**		1%	U	1%	U	1%	U	1%	U	**1%**		**3%**		**159%**	**591**	
Uranium	107%	U	**71%**		**42%**		7%	U	**18%**		**171%**		**112%**	**0.945**		**2%**		**5%**		**8%**		2%	U	**2%**		**55%**		**81%**	**2.18**	
Vanadium	1%	U	1%	U	**15%**		1%	U	**15%**		**54%**		**133%**	**30.3**		1%	U	1%	U	**6%**		**1%**		**2%**		**23%**		**82%**	**35.1**	
Zinc	**1376%**		**41%**		**163%**		**52%**		20%	U	**2328%**		**129%**	**229**		**190%**		**80%**		**277%**		**64%**		24%	U	**3237%**		**99%**	**319**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH14-015-MW001C														
Sample ID	CH14_015_MW001C_Sok														
Sample Interval (mbgs)	25.6 - 25.9														
Sample Date	9/4/2014														
Analyte	**NSE**		**AS**		**AMPH**		**PYRO**		**XLN**		**RES**		**Σ - total**	**Total**	
(Percentage, %)	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**		**Result**	**Qualifier**
Aluminum	0.5%	U	0.5%	U	**2%**		**1%**		**0%**		**20%**		**85%**	**11800**	
Antimony	14%	U	47%	U	2135%	U	261%	U	485%	U	**2014%**		**71%**	**0.47**	
Arsenic	1%	U	4%	U	**334%**		**374%**		**64%**		**6659%**		**105%**	**9.27**	
Barium	**5%**		**11%**		55%	U	56%	U	**298%**		**4%**		**69%**	**103**	
Beryllium	14%	U	14%	U	14%	U	14%	U	14%	U	**21%**		**250%**	**0.59**	
Bismuth	15%	U	15%	U	72%	U	15%	U	15%	U	**21%**		**232%**	**0.47**	
Cadmium	203%	U	101%	U	102%	U	148%	U	12%	U	**2015%**		**127%**	**0.257**	
Calcium	**65%**		3%	U	1%	U	**14%**				**28%**		**111%**	**3790**	
Chromium	11%	U	11%	U	26%	U	11%	U	11%	U	**54%**		**167%**	**22.4**	
Cobalt	**19%**		6%	U	**9%**		10%	U	**2%**		**1960%**		**125%**	**7.15**	
Copper	**10%**		**213%**		**620%**		420%	U	2%	U	**5992%**		**141%**	**25.7**	
Iron	0.5%	U	**0%**		**67%**		**7%**		**20%**		**1328%**		**111%**	**22100**	
Lead	**4956%**		**7351%**		**991%**		**5448%**		7%	U	**2238%**		**147%**	**35.5**	
Lithium	11%	U	11%	U	11%	U	11%	U	11%	U	**11%**		**600%**	**22.9**	
Manganese	**31%**		6%	U	**101%**		8%	U	**25%**		**438%**		**103%**	**190**	
Molybdenum	17%	U	17%	U	33%	U	17%	U	17%	U	63%	U	121%	**0.56**	
Nickel	17%	U	7%	U	13%	U	7%	U	**7%**		**132%**		**71%**	**24.1**	
Phosphorus	24%	U	24%	U	**37%**								**35%**	**675**	
Potassium	100%	U											**25%**	**1750**	
Selenium	13%	U	13%	U	13%	U	16%	U	33%	U	61%	U	233%	0.2	U
Silver	16%	U	16%	U	16%	U	25%	U	27%	U	2079%		**93%**	**0.15**	
Sodium	100%	U											100%	**390**	
Strontium	9%	U	9%	U	9%	U	9%	U	9%	U	**28%**		**184%**	**39.5**	
Thallium	17%	U	7%	U	2%	U	9%	U	82%	U	**172%**		**92%**	**0.206**	
Tin	17%	U	17%	U	17%	U	17%	U	17%	U	27%	U	300%	2	U
Titanium	1%	U	1%	U	1%	U	1%	U	1%	U	**8%**		**135%**	**402**	
Uranium	**3%**		**8%**		**14%**		3%	U	**3%**		**124%**		**111%**	**1.67**	
Vanadium	1%	U	1%	U	**11%**		2%	U	**3%**		**56%**		**94%**	**26.5**	
Zinc	**163%**		**128%**		**345%**		**86%**		19%	U	**2232%**		**124%**	**280**	

Table 5-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC

The six individual steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.

Bold indicates the analyte was detected

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
PYRO - Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLN = Bound to crystalline oxide

Table 5-6. Rose Creek Tailings Area Seeps Mann Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH-RCTA-01							
CH-RCTA-02							
CH-RCTA-04					55.7% (-)		
CH-RCTA-05					64.0% (-)		
CH-RCTA-06					50.0% (-)		
CH-RCTA-03		97.2% (sig -)	86.4% (-)		93.2% (-)	70.3% (-)	86.4% (-)
CH-RCTA-07	61.4% (+)	98.5% (sig -)	93.2% (-)	59.2% (-)	50.0% (+)	98.5% (sig -)	98.5% (sig -)
CH-RCTA-08					93.2% (+)		
CH-RCTA-09							
GDHSCK					59.2% (-)		
FCS-5		86.4% (-)	86.4% (-)		97.8% (sig +)	86.4% (-)	86.4% (-)

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH-RCTA-01	ND	ND	ND	ND	ND	ND	ND
CH-RCTA-02	ND	ND	ND	ND	ND	ND	ND
CH-RCTA-04	ND	ND	ND	ND	NT	ND	ND
CH-RCTA-05	ND	ND	ND	ND	NT	ND	ND
CH-RCTA-06	ND	ND	ND	ND	NT	ND	ND
CH-RCTA-03	ND	↓	NT	ND	NT	NT	NT
CH-RCTA-07	NT	↓	NT	NT	NT	↓	↓
CH-RCTA-08	ND	ND	ND	ND	NT	ND	ND
CH-RCTA-09	ND	ND	ND	ND	ND	ND	ND
GDHSCK	ND	ND	ND	ND	NT	ND	ND
FCS-5	ND	NT	NT	ND	↑	NT	NT

Notes:
Mann Kendall trend statistics calculated only for dataset with 5 or more detectable data points.
Level of significance tested is 95%.
Non-detectable concentrations were reduced to half the non-detectable limit.
Duplicate measurements were removed.
↑ - Significant increasing trend
↓ - Significant decreasing trend
ND - Less than the required number of data points with detections.
NT - No significant trend observed.

Table 5-7. Rose Creek Tailings Area Groundwater Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
P03-01-02	96.8% (sig +)	99.2% (sig +)	87.2% (+)	97.8% (sig -)	86.4% (-)	95.7% (sig -)	99.9% (sig +)
P03-01-04	100.0% (sig -)	92.4% (+)	99.0% (sig -)	99.9% (sig -)	99.7% (sig -)	67.5% (-)	100.0% (sig +)
P03-01-06	93.5% (-)	100.0% (sig +)	99.6% (sig +)	100.0% (sig -)	99.9% (sig -)	99.9% (sig +)	99.9% (sig +)
P03-01-08	82.8% (-)	74.5% (+)	93.1% (+)	98.7% (sig -)	87.9% (-)	83.9% (+)	62.9% (-)
P03-01-09	50.0% (.)	98.9% (sig +)	99.9% (sig +)	62.6% (-)	81.0% (-)	89.9% (+)	73.6% (+)
P03-03-02	83.8% (-)	100.0% (sig +)	51.5% (-)	99.6% (sig -)	68.7% (-)	99.6% (sig +)	67.5% (+)
P03-03-04	95.2% (sig -)	100.0% (sig +)	100.0% (sig +)	99.0% (sig -)	73.6% (-)	100.0% (sig +)	100.0% (sig +)
P03-03-06	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	99.9% (sig -)	100.0% (sig +)	94.0% (-)
P03-03-08	92.4% (-)	93.6% (+)	66.2% (+)	56.0% (-)	99.9% (sig -)	94.9% (+)	87.4% (-)
P03-03-09	91.8% (-)	98.0% (sig +)	85.9% (-)	90.4% (-)	64.0% (+)	99.9% (sig +)	85.9% (+)
P03-04-02	100.0% (sig +)	87.4% (-)	99.9% (sig +)	95.2% (sig -)	81.3% (+)	99.6% (sig +)	66.3% (+)
P03-04-04	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	93.1% (-)	54.6% (-)	100.0% (sig +)	99.6% (sig -)
P03-04-06	98.6% (sig -)	99.9% (sig -)	82.9% (-)	62.4% (+)	73.6% (+)	99.9% (sig -)	100.0% (sig -)
P03-04-08	99.6% (sig -)	89.4% (-)	100.0% (sig +)	95.0% (sig -)	90.4% (-)	66.3% (-)	86.5% (+)
P03-05-02	99.8% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	99.6% (sig -)	100.0% (sig +)	100.0% (sig +)
P03-05-04	99.7% (sig -)	100.0% (sig +)	100.0% (sig +)	99.7% (sig -)	99.0% (sig -)	100.0% (sig +)	99.1% (sig +)
P03-05-05	87.4% (-)	97.0% (sig +)	96.2% (sig +)	99.9% (sig -)	72.7% (-)	93.6% (+)	81.5% (+)
P03-05-06	99.7% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	97.1% (sig -)	100.0% (sig +)	72.1% (-)
P03-05-08	98.8% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	93.6% (-)	100.0% (sig +)	94.8% (+)
P03-06-01	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)
P03-06-02	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)
P03-06-03	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)
P03-06-04	99.7% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)
P03-06-05	71.4% (-)	91.5% (+)	95.9% (sig +)	99.8% (sig -)	53.9% (-)	98.9% (sig +)	94.6% (+)
P03-06-06	92.9% (-)	100.0% (sig +)	52.7% (+)	95.7% (sig -)	96.3% (sig -)	67.6% (+)	58.0% (+)
P03-08-02	97.5% (sig +)	83.4% (-)	99.4% (sig +)	64.5% (+)	87.8% (+)	83.2% (+)	99.8% (sig -)
P03-08-04	79.9% (+)	99.9% (sig +)	99.1% (sig -)	95.4% (sig -)	79.3% (-)	93.6% (-)	87.5% (-)
P03-08-06	96.0% (sig +)	50.0% (+)	100.0% (sig -)	97.1% (sig +)	99.6% (sig +)	100.0% (sig -)	87.4% (-)
P03-08-07	99.0% (sig +)	75.2% (-)	100.0% (sig -)	63.3% (+)	62.6% (+)	100.0% (sig -)	98.1% (sig -)
P03-08-08	67.6% (-)	57.1% (+)	78.2% (-)	78.2% (-)	67.6% (-)	100.0% (sig -)	66.9% (-)
X21-96A	100.0% (sig -)	100.0% (sig +)	98.5% (sig -)	97.7% (sig -)	99.9% (sig -)	100.0% (sig +)	99.2% (sig +)
X21-96B	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	100.0% (sig +)	100.0% (sig +)

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
P03-01-02	↑	↑	NT	↓	NT	↓	↑
P03-01-04	↓	NT	↓	↓	↓	NT	↑
P03-01-06	NT	↑	↑	↓	↓	↑	↑
P03-01-08	NT	NT	NT	↓	NT	NT	NT
P03-01-09	NT	↑	↑	NT	NT	NT	NT
P03-03-02	NT	↑	NT	↓	NT	↑	NT
P03-03-04	↓	↑	↑	↓	NT	↑	↑
P03-03-06	↓	↑	↑	↓	↓	↑	NT
P03-03-08	NT	NT	NT	NT	↓	NT	NT
P03-03-09	NT	↑	NT	NT	NT	↑	NT
P03-04-02	↑	NT	↑	↓	NT	↑	NT
P03-04-04	↑	↑	↑	NT	NT	↑	↓
P03-04-06	↓	↓	NT	NT	NT	↓	↓
P03-04-08	↓	NT	↑	↓	NT	NT	NT
P03-05-02	↓	↑	↑	↓	↓	↑	↑
P03-05-04	↓	↑	↑	↓	↓	↑	↑
P03-05-05	NT	↑	↑	↓	NT	NT	NT
P03-05-06	↓	↑	↑	↓	↓	↑	NT
P03-05-08	↓	↑	↑	↓	NT	↑	NT
P03-06-01	↓	↑	↑	↓	↓	↑	↑
P03-06-02	↓	↑	↑	↓	↓	↑	↑
P03-06-03	↓	↑	↑	↓	↓	↑	↑
P03-06-04	↓	↑	↑	↓	↓	↑	↑
P03-06-05	NT	NT	↑	↓	NT	↑	↑
P03-06-06	NT	↑	NT	↓	↓	NT	NT

Table 5-7. Rose Creek Tailings Area Groundwater Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
P03-08-02	↑	NT	↑	NT	NT	NT	↓
P03-08-04	NT	↑	↓	↓	NT	NT	NT
P03-08-06	↑	NT	↓	↓	↑	↓	NT
P03-08-07	↑	NT	↓	NT	NT	↓	↓
P03-08-08	NT	NT	NT	NT	NT	↓	NT
X21-96A	↓	↑	↓	↓	↓	↑	↑
X21-96B	↓	↑	↑	↓	↓	↑	↑

Notes:

Mann-Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Nondetectable concentrations were reduced to half the nondetectable limit.

Duplicate measurements were removed.

↑ - Significant increasing trend

↓ - Significant decreasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond	
Sample ID				CH12-204-MW001B-SOA		CH12-204-MW001B-SOB		CH12-204-MW001B-SOC		CH12-204-MW001B-SOD		CH12-204-MW001B-SOE		CH12-204-MW001B-SOF		CH12-204-MW001B-SOG		CH12-204-MW901B-SOG		CH12-204-MW001B-SOH		CH12-204-MW002B-SOA		CH12-204-MW002B-SOB		CH12-204-MW002B-SOC		CH12-204-MW002B-SOD			
Sample Interval (mbgs)		**12x Median Soil Content** [a]		**0 - 0.15**		**4.75 - 5.03**		**9.15 - 9.6**		**13.72 - 14.2**		**18.29 - 18.75**		**22.9 - 23.5**		**29.8 - 30**		**29.8 - 30**		**36.4 - 36.6**		**0 - 1.5**		**4.6 - 6.1**		**9.3 - 10**		**15 - 15.4**			
Sample Date			**10x Crustal Abundance** [b]	**6/28/2012**		**6/28/2012**		**6/28/2012**		**6/29/2012**		**6/29/2012**		**6/29/2012**		**6/30/2012**		**6/30/2012**		**6/30/2012**		**7/6/2012**		**7/6/2012**		**7/6/2012**		**7/6/2012**			
Geological Unit																															
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	14,500		14,600		15,700		11,300		9,800		8,330		8,540		7,970		30,000		14,400		24,800		23,200		15,300			
Antimony	mg/kg	**60**	2	0.72		0.64		0.40		0.28		0.27		0.19		0.22		0.19		0.64		0.4		0.78		1.23		0.52			
Arsenic	mg/kg	**72**	18	16.2		12		5.95		4.80		4.5		9.87		18.4	J	7.82	J	14.7		11		48.1		10.2		9.1	J		
Barium	mg/kg	**6,000**	4,250	126		190		103		56.6		47.5		57.8		43.8		46.2		20.2		119		294		237		108			
Beryllium	mg/kg	**72**	30	0.56		0.64		0.64		0.42		0.36		0.27		0.36		0.26		0.49		0.55		0.91		1.08		0.56			
Bismuth	mg/kg	-	**0.085**	0.32		0.26		0.24		0.2	U	0.2	U	0.23		0.2	U	0.23		0.2	U	0.39		0.3		0.51		0.2	U		
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U		
Cadmium	mg/kg	**4.2**	1.5	0.407		0.325		0.193		0.213		0.284		0.092		0.123		0.103		0.1		0.232		0.45		0.781		0.332			
Calcium	mg/kg	180,000	**415,000**	17,300		15,700		25,800		25,700		12,100		8,450		4,860		7,880		34,400		6,150		8,230		15,300		18,900			
Chromium	mg/kg	840	**1,020**	33.8		40.3		49.5		24.7		21.2		15.6		30.9	J	15.2	J	315		25.7		74.2		66.8		40			
Cobalt	mg/kg	96	**250**	14.8		15.1		11.5		7.77		7.81		6.3		6.3		6.15		44.1		9.93		25.4		18.6		14.3	J		
Copper	mg/kg	360	**600**	38.1		33.2		27.3		12.7		11.2		8.51		10.3		7.63		151		18.8		42.8		46.9		25.6	J		
Iron	mg/kg	480,000	**563,000**	28,200		30,300		26,100		18,900		17,900		14,300		16,600		13,100		64,700		22,200		51,200		38,100		26,500			
Ferrous Iron	mg/kg																														
Lead	mg/kg	**420**	140	46.4		96.9		14.7		10.5		9.58		6.33		7.49		6.49		5.57		15.8		30.6		95.2		30.2	J		
Lithium	mg/kg	**300**	200	25.4		27.9		26.9		24.3		20.3		29.6		25.3		22.7		45		24.1		42.5		44.5		27.8			
Magnesium	mg/kg	60,000	**233,000**	8,180		7,970		10,300		7,730		6,930		4,630		5,080		4,670		38,700		6,240		14,100		13,700		10,600			
Manganese	mg/kg	**12,000**	9,500	406		439		385		429		207		208		194		171		779		584		827		628		403			
Mercury	mg/kg	0.72	**0.85**	0.035		0.221		0.014		0.015		0.009		0.006		0.006		0.005		0.005	U	0.016		0.046		0.083		0.031			
Molybdenum	mg/kg	**24**	12	1.23		1.38		1.16		1.24		0.64		1.79		3.7	J	0.5	U	1.50		1.01		2.38		1.82		1.22			
Nickel	mg/kg	600	**840**	40.7		40.7		37.3		21.2		21.3		18.3		18.0		15.4		198		24.1		75.6		60.0		42.2			
Phosphorus	mg/kg	9,600	**10,500**	621		725		576		451		948		483		346	J	650	J	986		699		753		800		598	J		
Potassium	mg/kg	168,000	**208,500**	2,120		2,570		2,260		1,490		1,080		2,080		1,650		1,350		390		1,500		2,790		3,350		2,190			
Selenium	mg/kg	**4.8**	0.5	0.33		0.2		0.54		0.43		0.2	U	0.2	U	0.2	U	0.2	U	0.27		0.2	U	0.25		0.75		0.38			
Silver	mg/kg	-	**0.75**	0.15		0.23		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.17		0.35		0.15			
Sodium	mg/kg	60,000	**235,500**	390		310		540		300		260		250		230		200		130		300		710		320		350			
Strontium	mg/kg	3,000	**3,700**	76.7		76.5		111		116		52.8		40.3		31.6		36.4		180		45.5		66.2		71.4		75.5			
Sulphur	mg/kg	**8,400**	3,500	500	U	1,100		2,500		1,400		2,800		2,800		3,100		3,100		11,100		1,000		700		2,600		2,100			
Thallium	mg/kg	**108**	8.5	0.236		0.273		0.174		0.125		0.114		0.212		0.139		0.121		0.05	U	0.176		0.275		0.307		0.179			
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U		
Titanium	mg/kg	-	**56,500**	406		558		447		327		241		445		408		318		219		435		568		701		471	J		
Uranium	mg/kg	24	**27**	1.13		1.01		0.89		0.8		0.99		0.97		1.02		1.14		1.01		1.11		0.921		2.36		2.03			
Vanadium	mg/kg	1,080	**1,200**	34.4		37		35.1		27		23.9		17.9		22.6		19.5		139		32.9		49.2		58.6		35.6			
Zinc	mg/kg	**1,080**	700	121		162		68.5		47.9		47.4		36.9		40		60.4		73.1		65.2		120		192		81.4			
Moisture	percent	-	-	4.98		28.2		11.8		18.5		21.1		6.99		11.5				16.1		7.02		13.7		22.8		5.56			
pH (1:2 soil:water)	pH Units	-	-	8.58		8.09		8.55		8.43		8.47		8.26		8.46		8.51		8.74		7.99		7.72		7.85		8.3			
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		0.7	U	0.7	U	NT		NT		NT		NT		NT			
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		0.4	U	0.4	U	NT		NT		NT		NT		NT			
Total Inorganic Carbon	percent	-	-	0.63		0.49		0.76		0.69		0.66		0.28		0.25		0.24		1.24		0.1	U	0.1	U	0.39		0.64			
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	5.25		4.08		6.31		5.76		5.54		2.35		2.09		1.97		10.4		0.7	U	0.7	U	3.24		5.36			

Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond	
Sample ID				CH12-204-MW902B-SOD		CH12-204-MW002B-SOE		CH12-204-MW002B-SOF		CH12-204-MW002B-SOG		CH12-204-MW003B-SOA		CH12-204-MW003B-SOB		CH12-204-MW003B-SOC		CH12-204-MW003B-SOD		CH12-204-MW003B-SOE		CH12-204-MW003B-SOF		CH12-204-MW003B-SOG		CH12-204-MW003B-SOH		CH12-204-MW903B-SOH	
Sample Interval (mbgs)		12x Median Soil Content [a]		15 - 15.4		19.8 - 20		26 - 27		29.6 - 30.2		0 - 0.6		4 - 4.6		9.6 - 10.4		15 - 15.3		20 - 20.3		25 - 25.95		30.5 - 32		34 - 34.5		34 - 34.5	
Sample Date				7/6/2012		7/6/2012		7/6/2012		7/6/2012		7/4/2012		7/4/2012		7/4/2012		7/5/2012		7/5/2012		7/5/2012		7/5/2012		7/5/2012		7/5/2012	
Geological Unit			10x Crustal Abundance [b]																								
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	11,400		10,700		2,950		3,840		10,700		10,400		14,300		13,100		14,700		17,800		19,800		16,100		17,300	
Antimony	mg/kg	**60**	2	0.49		0.34		68.3		5.34		1.94		0.57		2.47		0.41		0.65		0.47		0.45		0.27		1.25	
Arsenic	mg/kg	**72**	18	3.91	J	3.55		268		58.2		16.7		11.5		13.4		10.1		14.5		16		6.30		3.03		3.8	
Barium	mg/kg	**6,000**	4,250	73.4		59.3		17.7		29.8		613		85.6		329		55.9		139		135		116		131		122	
Beryllium	mg/kg	**72**	30	0.51		0.43		0.37		0.82		0.45		0.44		0.60		0.4		0.59		0.62		0.67		0.87		1.01	
Bismuth	mg/kg	-	**0.085**	0.2	U	0.2	U	0.2	U	0.2	U	0.22		0.36		0.33		0.2	U	0.31		0.26		0.2	U	0.39		0.33	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.332		0.202		0.05	U	0.058		0.86		0.168		1.01		0.137		0.211		0.246		0.216		0.13		0.112	
Calcium	mg/kg	180,000	**415,000**	19,000		14,000		765		24,700		5,730		3,660		17,900		9,780		11,400		19,900		19,400		4,130		4,080	
Chromium	mg/kg	840	**1,020**	27.2		24.9		10.3		15.4		36.9		26		44.7		26.7		34.2		40.8		43.8		35.5		37.7	
Cobalt	mg/kg	96	**250**	8.16	J	8.49		6.45		13.3		12.9		9.09		16.6		9.20		11.1		12.8		14.9		10		10.5	
Copper	mg/kg	360	**600**	44.1	J	27.9		7.38		21.0		37.8		21		42.7		15.9		23.9		31.3		32.8		20.3		21.3	
Iron	mg/kg	480,000	**563,000**	19,200		20,300		84,700		32,900		27,700		21,600		33,200		20,600		26,400		29,000		28,800		21,600		23,000	
Ferrous Iron	mg/kg																												
Lead	mg/kg	**420**	140	15.7	J	12		8.93		37.9		75.3		27.8		20.9		8.32		13.6		27.7		8.76		9.38		10.3	
Lithium	mg/kg	**300**	200	19.0		20.9		5	U	5	U	15		21		24.8		24.9		28.4		26.8		33.1		41.7		42.1	
Magnesium	mg/kg	60,000	**233,000**	8,740		7,610		320		8,840		7,120		5,760		11,200		6,860		7,670		9,380		11,700		6,990		7,730	
Manganese	mg/kg	**12,000**	9,500	321		302		11.3		681		566		243		701		279		498		531		375		203		218	
Mercury	mg/kg	0.72	**0.85**	0.023		0.022		3.3		0.059		0.088		0.016		0.053		0.027		0.016		0.024		0.01		0.009		0.007	
Molybdenum	mg/kg	**24**	12	0.86		1.1		2		2.16		2.84		0.5	U	3.09		0.5	U	0.5	U	0.5	U	2.43		2.05		1.3	
Nickel	mg/kg	600	**840**	28.1		27.3		20.2		30.9		41.7		26.6		52.5		25.3		33.6		35.2		40.7		25.7		27.8	
Phosphorus	mg/kg	9,600	**10,500**	1,220	J	528		79		386		807		552		1,140		570		659		490		666		641		541	
Potassium	mg/kg	168,000	**208,500**	1,470		1,440		1,710		2,380		890		1,350		1,950		1,400		1,990		1,910		2,740		3,270		3,740	
Selenium	mg/kg	**4.8**	0.5	0.74		0.38		1.18				0.87		0.2	U	1.1		0.2	U	0.2	U	0.41		0.51		0.22		0.21	
Silver	mg/kg	-	**0.75**	0.14		0.11		1.27		0.31		0.41		0.11		0.32		0.1	U	0.14		0.14		0.14		0.13		0.14	
Sodium	mg/kg	60,000	**235,500**	290		260		100	U	100	U	190		270		190		340		360		610		670		430		540	
Strontium	mg/kg	3,000	**3,700**	72.6		56.9		6.56		44.6		37.0		32.5		63.1		47.3		59.5		76.7		76.7		32.4		29.1	
Sulphur	mg/kg	**8,400**	3,500	1,500		3,100		135,000		9,200		1,700		900		1,500		500	U	500	U	500	U	2,300		1,100		NT	
Thallium	mg/kg	**108**	8.5	0.128		0.12		9.87		0.346		0.164		0.138		0.225		0.12		0.199		0.193		0.196		0.317		0.279	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	223	J	299		6		8.4		333		360		511		421		451		462		608		655		626	
Uranium	mg/kg	24	**27**	1.62		1.28		0.471		1.06		1.48		0.693		1.79		0.618		0.736		0.621		1.92		1.07		0.983	
Vanadium	mg/kg	1,080	**1,200**	29.7		26.7		4.57		10.3		38.3		25.4		50.3		28.1		31.2		39.4		53.4		42.2		40.4	
Zinc	mg/kg	**1,080**	700	59.7		60.7		45.9		52.7		137		94.8		143		58.7		75.1		110		57.1		67.3		66.7	
Moisture	percent	-	-			11.8		8.63		19.6		14.7		11.9		22.8		11.5		11.7		9.29		2.85		10.4		NT	
pH (1:2 soil:water)	pH Units	-	-	8.28		8.42		3.41		8.80		7.01		7.63		8.09		8.47		8.38		8.34		8.69		8.44		8.35	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.83		0.4		0.1	U	1.23		0.1	U	0.1	U	0.57		0.17		0.19		0.29		0.52		0.12		0.1	U
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	6.93		3.34		0.7	U	10.3		0.7	U	0.7	U	4.71		1.40		1.61		2.39		4.36		0.96		0.7	U

Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond	
Sample ID				CH12-204-MW003B-SOI		CH12-204-MW003B-SOJ		CH12-204-MW003B-SOL		CH12-204-MW004B-SOA		CH12-204-MW004B-SOB		CH12-204-MW004B-SOC		CH12-204-MW004B-SOD		CH12-204-MW004B-SOE		CH12-204-MW004B-SOF		CH12-204-MW904B-SOF		CH12-204-MW004B-SOG		CH12-204-MW004B-SOH		CH12-204-MW004B-SOI	
Sample Interval (mbgs)		12x Median Soil Content [a]		40 - 41		46.32 - 48.8				0 - 1		4.6 - 7.6		7.62 - 10.6		14.8 - 15.2		19.8 - 20.6		22.86 - 25.9		22.86 - 25.9		27.6 - 28.1		34 - 35		40 - 41	
Sample Date			10x Crustal Abundance [b]	7/13/2012		7/14/2012		7/13/2012		7/2/2012		7/2/2012		7/2/2012		7/2/2012		7/3/2012		7/3/2012		7/3/2012		7/3/2012		7/4/2012		7/4/2012	
Geological Unit																											
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	11,500		9,540		NT		17,100		20,800		10,400		11,800		15,900		15,900		15,800		21,000		15,900		13,900	
Antimony	mg/kg	**60**	2	0.4		0.32		NT		0.64		0.68		0.42		0.51		0.63		0.7	J	0.38	J	0.39		0.6		0.48	
Arsenic	mg/kg	**72**	18	12.7		10.3		NT		14.5		18.0		8.82		11.1		23.7		8.42	J	18.3	J	10.8		10.9		7.68	
Barium	mg/kg	**6,000**	4,250	41.7		14.3		NT		156		188		64.1		93.9		82.4		79.7		87.7		113		158		171	
Beryllium	mg/kg	**72**	30	0.42		0.65		NT		0.72		0.91		0.45		0.57		0.66		0.67		0.57		0.77		0.62		0.64	
Bismuth	mg/kg	-	**0.085**	0.2	U	0.50		NT		0.36		0.37		0.2	U	0.27		0.29		0.24		0.27		0.31		0.24		0.2	U
Boron	mg/kg	-	**100**	10	U	10	U	NT		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.118		0.05	U	NT		0.342		0.476		0.218		0.291		0.311		0.189		0.222		0.097		0.297		0.311	
Calcium	mg/kg	180,000	**415,000**	12,900		86,000		NT		15,900		6,050		3,040		11,500		26,400		20,600		23,600		29,600		23,700		15,100	
Chromium	mg/kg	840	**1,020**	28.1		16.6		NT		39.1		49.0		40		35.0		39.1		34.4		39		40.6		56.2		44	
Cobalt	mg/kg	96	**250**	11		8.53		NT		13		19.0		8.94		11.9		11.7		11.2		14.1		22.8		16.5		13.6	
Copper	mg/kg	360	**600**	49.1		5.66		NT		29.4		48.4		24.5		33.9		32.1		26.1		33.4		55.5		35.7		26.6	
Iron	mg/kg	480,000	**563,000**	21,900		26,900		NT		27,600		47,100		21,200		27,400		35,200		25,800		29,300		37,700		32,600		30,100	
Ferrous Iron	mg/kg																												
Lead	mg/kg	**420**	140	8.52		6.86		NT		31		20.5		9.1		12.9		32.5		8.31		9.24		9.95		14.4		10.4	
Lithium	mg/kg	**300**	200	23.4		17.4		NT		33.4		35.4		19.3		21.4		26.6		29.5		28		39.4		26.9		27.8	
Magnesium	mg/kg	60,000	**233,000**	9,150		12,500		NT		8,860		10,900		6,470		7,870		9,870		10,000		13,100		13,600		12,300		10,500	
Manganese	mg/kg	**12,000**	9,500	262		648		NT		417		318		402		566		366		350		420		411		461		414	
Mercury	mg/kg	0.72	**0.85**	0.005	U	0.005	U	NT		0.037		0.019		0.012		0.022		0.029		0.013		0.011		0.012		0.023		0.017	
Molybdenum	mg/kg	**24**	12	0.96		0.5	U	NT		1.79		1.9		0.5	U	0.5	U	1.93		1.91		1.75		0.5	U	1.5		1.23	
Nickel	mg/kg	600	**840**	29.2		20.4		NT		36		76.1		30.8		37		37.8		31.6		44.3		52.3		55.5		42.2	
Phosphorus	mg/kg	9,600	**10,500**	653		290		NT		803		796		459		734		761		421		601		485		751		812	
Potassium	mg/kg	168,000	**208,500**	1,330		420		NT		2,750		2,040		1,110		1,460		1,780		2,090		2,320		3,330		2,650		2,090	
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.2	U	NT		0.35		0.6		0.2	U	0.26		1.37		0.3		0.36		2.30		0.48		0.37	
Silver	mg/kg	-	**0.75**	0.1	U	0.18		NT		0.16		0.17		0.1		0.11		0.13		0.1	U	0.1	U	0.11		0.13		0.1	U
Sodium	mg/kg	60,000	**235,500**	370		100	U	NT		500		590		210		210		450		420		460		510		280		240	
Strontium	mg/kg	3,000	**3,700**	45.6		253		NT		73.7		57.2		29.2		57.7		101		81.2		84.4		96.1		105		64.3	
Sulphur	mg/kg	**8,400**	3,500	NT		1,100		5,300		500		500	U	500	U	500	U	500	U	1,600		2,300		1,600		1,700		1,300	
Thallium	mg/kg	**108**	8.5	0.118		0.05	U	NT		0.268		0.301		0.161		0.175		0.16		0.187		0.243		0.465		0.208		0.195	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	200		10.8		NT		552		683		278		315		333		343		412		403		494		479	
Uranium	mg/kg	24	**27**	1.14		0.752		NT		1.41		1.36		0.866		0.844		0.893		1.07		1.09		1.45		1.33		2.18	
Vanadium	mg/kg	1,080	**1,200**	26.6		10.4		NT		39.5		49.9		27.9		29.6		36.9		30.7		37.5		42.0		42.1		37.3	
Zinc	mg/kg	**1,080**	700	51.4		40.2		NT		95.7		121		53.6		61.9		97.1		55.9		63.0		71.7		70		79.0	
Moisture	percent	-	-	12.7	J	NT		NT		6.13		13.9		13.7		12.1		12.2		9.62		10.5		12.2		12.2		12.2	
pH (1:2 soil:water)	pH Units	-	-	NT		NT		NT		8.42		7.56		7.68		8.5		8.64		8.78		8.87		8.69		8.67		8.8	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.66		3.3		NT		0.34		0.16		0.12		0.65		0.88		0.74		0.75		1.18		0.76		0.57	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		2.83		1.37		0.99		5.42		7.35		6.19		6.26		9.86		6.33		4.77	

Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

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Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond	
Sample ID				CH15-201-MW008_SOh		CH15-201-MW908_SOh		CH15-201-MW008_Sol		CH15-201-MW009_SOd		CH15-201-MW009_SOh		CH15-201-MW009_SOj		CH15-201-MW011_Rkd		CH15-201-MW011_SOf		CH15-201-MW011_SOl		CH16-201-BH005B_SOA1		CH16-201-BH006A_SOA1		CH16-201-BH006A_SOA3		CH16-201-BH007_SOA1		CH16-201-BH007_SOE2	
Sample Interval (mbgs)	**12x Median Soil Content** [a]			5.49 - 7.01		5.49 - 7.01		8.53 - 10.36		2.74 - 4.27		5.79 - 7.32		7.32 - 8.84		11.89-13.41		4.72 - 5.79		9.3 - 10.36		9.45 - 9.9		13.4 - 13.88		13.98 - 14.04		7.05 - 7.55		14.8 - 15.8	
Sample Date		**10x Crustal Abundance** [b]		11/7/2015		11/7/2015		11/8/2015		11/6/2015		11/6/2015		11/6/2015		11/11/2015		11/8/2015		11/8/2015		3/12/2016		3/10/2016		3/10/2016		3/8/2016		3/8/2016	
Geological Unit																															
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	18,000		18,400		20,300		19,800		16,200		17,600		37500		17,300		16,200		######		######		######		12,200		16,300	
Antimony	mg/kg	**60**	2	0.67		0.65		0.66		5.32		0.78		0.69		0.25		0.46		0.38		4.58		1.85		3.13		0.59		0.38	
Arsenic	mg/kg	**72**	18	32		30.6		22.9		39.2		28.5		25.6		24.6		10.2		12.1		13.9		28.1		36.5		7.52		15.5	J
Barium	mg/kg	**6,000**	4,250	134		125		212		112		184		125		248		106		89.8		365		553		320		190		106	
Beryllium	mg/kg	**72**	30	0.7		0.65		0.7		0.77		0.65		0.6		0.87		0.65		0.6		0.45		0.57		0.59		0.49		0.7	
Bismuth	mg/kg	-	**0.085**	0.22		0.2	U	0.26		0.2	U	3		0.2	U	0.2	U	0.22		0.2	U	0.33		0.31		1.12		0.22		0.26	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.3		0.27		0.22		0.16		0.28		0.16		0.037		0.18		0.19		0.7		0.509		0.331		0.511		0.313	J
Calcium	mg/kg	180,000	**415,000**	20,100		19,300		24,300		24,100		29,000		35,100		59400		11,600		37,800		20,900		6,430		4,900		19,200		6,100	
Chromium	mg/kg	840	**1,020**	42		49.8		49.2		106		45.1		42.9		52.2		41.9		35.3		27.4		29.2		32.7		48		95.9	J
Cobalt	mg/kg	96	**250**	14		13.8		15		20.2		14.6		11.2		15.7		12.7		11.9		16.8		11.7		12.9		13.4		13.3	J
Copper	mg/kg	360	**600**	30.8		31.1		29.1		34.2		34.2		23.7		28.3		24.1		29.1		57.7		50.5		102		32.8		34.9	J
Iron	mg/kg	480,000	**563,000**	30,300		30,100		31,800		35,500		29,400		28,000		38100		29,100		27,900		24,400		25,700		35,800		23,100		30,100	
Ferrous Iron	mg/kg																														
Lead	mg/kg	**420**	140	24.3		24.5		21.7		16.7		27.9		20.9		11.5		10.8		13.4		137		270		711		37.7		15.3	J
Lithium	mg/kg	**300**	200	30.4		30.5		32.5		35.7		33.2		34.4		61		35.3		33		22		23.4		22.8		20.9		23.7	
Magnesium	mg/kg	60,000	**233,000**	10,500		10,200		10,700		16,600		10,200		12,100		15600		10,000		10,100		6,380		5,340		5,060		7,070		7,770	
Manganese	mg/kg	**12,000**	9,500	488		434		356		548		373		404		695		362		592		760		535		585		580		458	J
Mercury	mg/kg	0.72	**0.85**	0.02		0.02		0.03		0.02		0.04		0.03		0.005	U	0.01		0.01		0.112		0.247		0.656		0.0401		0.0226	
Molybdenum	mg/kg	**24**	12	1.49		1.43		1.39		0.77		1.31		0.88		0.26		1.41		1.79		3.18		1.16		1.35		1.52		1.49	
Nickel	mg/kg	600	**840**	43.1		44.8		46.2		99		43.9		34.8		36.3		36.4		32.5		40.5		26.1		26.8		39		58.2	
Phosphorus	mg/kg	9,600	**10,500**	658		691		539		551		507		494		330		603		574		518		694		707		531		701	
Potassium	mg/kg	168,000	**208,500**	2,640		2,540		3,550		1,920		2,490		3,340		7650		2,080		2,210		1,410		1,200		1,900		1,600		1,840	
Selenium	mg/kg	**4.8**	0.5	0.21		0.24		0.3		0.2	U	0.25		0.22		0.2	U	0.23		0.31		0.37		0.3		0.38		0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.13		0.12		0.12		0.11		0.12		0.1	U	0.1	U	0.1	U	0.1	U	0.3		0.59		1.52		0.14		0.11	
Sodium	mg/kg	60,000	**235,500**	531		521		650		364		328		494		1560		350		486		380		252		234		306		562	J
Strontium	mg/kg	3,000	**3,700**	82.7		67.5		85.9		81.9		91.2		89		169		59.5		120		83.6		40.3		35.8		75.2		58.9	
Sulphur	mg/kg	**8,400**	3,500	500		500		500	U	500	U	700		600		800		600		700		6,200		6,200		10,300		1,100		900	
Thallium	mg/kg	**108**	8.5	0.2		0.19		0.19		0.21		0.18		0.21		0.251		0.18		0.17		0.257		0.306		0.705		0.15		0.18	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	518		479		526		326		382		335		952		443		446		329		446		514		341		480	
Uranium	mg/kg	24	**27**	0.78		0.86		0.8		0.71		0.84		0.78		0.919		0.93		1.2		0.987		1.53		1.46		0.901		1.57	
Vanadium	mg/kg	1,080	**1,200**	43.6		42.1		38.3		45.6		39.7		37.4		38.4		41.2		39.5		27.4		29.4		34.9		28.9		36.5	
Zinc	mg/kg	**1,080**	700	87.4		86.2		83		69.8		94.3		71.5		79.9		64.3		59.8		488		236		300		121		67.6	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	8.09		8.09		8.25		8.04		8.07		8.33		8.6		8.26		8.25		8.04		7.55		6.99		8.22		8.13	J
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond	
Sample ID				CH16-201-BH008_SOA1		CH16-201-BH008_SOA2		CH16-201-BH008_SOA3		CH16-201-BH008_SOB1		CH16-201-BH009_SOA2		CH16-201-BH009_SOB2		CH16-201-BH010A_SOA1		CH16-201-BH010A_SOA2		CH16-201-BH010A_SOB2		CH16-201-BH010A_SOB4		CH16-201-BH011_SOA1		CH16-201-BH011_SOA2		CH16-201-BH011A_SOA		CH16-201-BH011A_SOB	
Sample Interval (mbgs)		12x Median Soil Content [a]		15.3 - 15.92		15.92 - 16.64		16.64 - 17.01		17.3-18.26		9.65 - 11.4		11.4 - 13.4		15.8 - 16.7		16.7 - 17.75		17.93 - 18.16		18.24-19.15		8.55 - 8.7		8.7 - 8.9		7.5 - 7.5		8 - 8	
Sample Date			10x Crustal Abundance [b]	3/10/2016		3/10/2016		3/10/2016		3/10/2016		3/9/2016		3/9/2016		3/10/2016		3/10/2016		3/10/2016		3/10/2016		3/11/2016		3/11/2016		3/12/2016		3/12/2016	
Geological Unit																													
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	29,800		19,000		14,200				13,100		14,400		16,600		12,900		10,400				10,300		17,600		3,460		2,190	
Antimony	mg/kg	**60**	2	2.51		1.67		0.76				0.49		0.45		1.08		0.46		0.99				1.7		2.42		0.49		0.77	
Arsenic	mg/kg	**72**	18	31.2		27.1		16				8.15		11.2		21.9		13.7		44.6				22.7		40.7		9.03		9.75	
Barium	mg/kg	**6,000**	4,250	642		485		316				128		80.9		303		188		299				304		171		70.2		202	
Beryllium	mg/kg	**72**	30	1.33		0.81		0.67				0.51		0.58		0.7		0.57		0.59				0.51		0.71		0.38		0.14	
Bismuth	mg/kg	-	**0.085**	0.66		0.39		0.32				0.39		0.3		0.34		0.25		0.31				0.2	U	0.29		0.2	U	0.2	U
Boron	mg/kg	-	**100**	5	U	5	U	5	U			5	U	5	U	5	U	5	U	5	U			5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.916		0.65		0.691				0.195		0.305		0.681		0.45		0.77				23		0.811		29.9		29.6	
Calcium	mg/kg	180,000	**415,000**	15,900		13,000	J	8,220				3,510		4,580		8,470		6,090		120,000				71,800		15,900		49,300		126,000	
Chromium	mg/kg	840	**1,020**	135		79		45.5				27.1		38.5		49.4		36.5		27.7				29.5		53.3		13.4		30.7	
Cobalt	mg/kg	96	**250**	33.4		23.4		12.6				8.62		10.8		24.4		9.03		18.5				101		18.1		152		159	
Copper	mg/kg	360	**600**	105		62.7		38.5				20.6		21.5		51.9		27.8		32.7				100		39		292		109	
Iron	mg/kg	480,000	**563,000**	56,600		40,000		23,400		15,000		18,700		23,400		23,300		17,100		26,800		25,400		30,100		34,500		69,000		24,700	
Ferrous Iron	mg/kg					811	J			38.5	J					816	J					174	J								
Lead	mg/kg	**420**	140	144		84.7		44.6				18.8		24.8		66.7		19.4		47.5				197		32.3		783		164	
Lithium	mg/kg	**300**	200	50.2		28.6		24.4				21.1		22.2		29.9		24.3		20.9				19.3		36.6		2.5		2.1	
Magnesium	mg/kg	60,000	**233,000**	18,800		12,100		7,370				5,080		6,600		7,810		6,040		6,490				43,100		11,100		93,500		105,000	
Manganese	mg/kg	**12,000**	9,500	850		719		767				264		357		762		449		611				20,800		939		32,800		44,900	
Mercury	mg/kg	0.72	**0.85**	0.135		0.0935		0.0545				0.0158		0.0214		0.0721		0.0396		0.0532				0.0759		0.0364		0.0373		0.0437	
Molybdenum	mg/kg	**24**	12	2.28		2.01		1.64				1.01		0.75		2.93		1.8		3.11				1.9		1.41		3.02		10.2	
Nickel	mg/kg	600	**840**	136		87.7		47.4				25		32.1		50.3		30		32.4				147		62.9		166		186	
Phosphorus	mg/kg	9,600	**10,500**	686		611		629				565		604		653		802		553				395		702		84		99	
Potassium	mg/kg	168,000	**208,500**	2,920		1,460		1,040				1,230		1,360		1,360		1,190		1,510				1,110		2,470		330		250	
Selenium	mg/kg	**4.8**	0.5	0.79		1.02		1.76				0.21		0.24		2.07		1.92		2.76				0.43		0.27		0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.49		0.32		0.2				0.1	U	0.1	U	0.26		0.15		0.21				0.21		0.16		0.11		0.1	
Sodium	mg/kg	60,000	**235,500**	402		291		232				309		299		329		256		228				316		405		490		308	
Strontium	mg/kg	3,000	**3,700**	60.4		50.3		42.4				35.6		33.6		43.7		37.6		217				152		64.1		111		251	
Sulphur	mg/kg	**8,400**	3,500	3,500		3,600		2,200				1,500		1,300		5,000		5,400		3,700				3,300		2,500		18,000		4,400	
Thallium	mg/kg	**108**	8.5	0.404		0.242		0.19				0.143		0.152		0.264		0.155		0.2				0.772		0.256		0.359		1.36	
Tin	mg/kg	**48**	23	2	U	2	U	2	U			2	U	2	U	2	U	2	U	2	U			2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	571		388	J	392				412		480		493		445		462				306		553		57.7		64.4	
Uranium	mg/kg	24	**27**	1.57		3.28	J	4.39				0.95		0.96		5.51		3.81		6.69				4.28		0.961		5.64		4.39	
Vanadium	mg/kg	1,080	**1,200**	72.2		43.6		33.1				31.9		33.9		40.4		31.2		32.7				31.7		44.9		22.6		17.8	
Zinc	mg/kg	**1,080**	700	407		261		167				75.1		81.9		257		105		259				31600		602		46600		45400	
Moisture	percent	-	-	NT		NT		NT				NT		NT		NT		NT		NT				NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	7.54		7.39		6.8				7.79		7.52		6.52		6.11		7.45				9.06		8.57		NT		NT	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		1.00	U	9.20		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit				ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond		ID, CVD, CVD Pond	
Sample ID				CH16-201-BH012_SOB		CH16-201-BH012A_SOA1		CH16-201-BH012A_SOA2		CH16-201-BH012A_SOA4		CH16-201-BH907_SOE2		CH16-201-BH908_SOA2		CH16-201-CP016_SOA		CH16-201-CP017_SOA		CH16-201-CP018_SOA		CH16-201-CP916_SOA		CH16-201-GS001_SOA	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance [b]	15.13 - 15.63		14 - 14.5		14 - 14.5		14.5 - 15.1		14.8 - 15.8		15.92 - 16.64		0 - 0		0 - 0		0 - 0		0 - 0		2.99 - 2.99	
Sample Date				3/11/2016		3/12/2016		3/12/2016		3/12/2016		3/8/2016		3/10/2016		3/15/2016		3/14/2016		3/13/2016		3/15/2016		3/13/2016	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	11,600		12,000		11,600		14,900		11,800		18,200		6,460		2,630		9,080		6,560		7,100	
Antimony	mg/kg	**60**	2	0.61		0.88		0.53		0.67		0.25		1.91		58.6		39.7		55.7		58.6		0.98	
Arsenic	mg/kg	**72**	18	10.7		14		10.3		12.7		7.87	J	20.2		1100		1070		939		1100		18	
Barium	mg/kg	**6,000**	4,250	168		233		111		170		65.2		329		344		359		316		372		182	
Beryllium	mg/kg	**72**	30	0.46		0.54		0.42		0.56		0.46		0.73		0.38		0.2		0.45		0.35		0.48	
Bismuth	mg/kg	-	**0.085**	0.22		0.26		0.27		0.28		0.44		0.32		0.87		0.64		0.98		0.82		0.2	U
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.514		0.455		0.314		0.377		0.167	J	0.454		22.1		9.47		25.7		20.7		21.7	
Calcium	mg/kg	180,000	**415,000**	8,110		7,860		5,230		6,220		4,000		7,630	J	8,260		7,740		7,910		8,170		153,000	
Chromium	mg/kg	840	**1,020**	29.9		26.6		26.1		29.4		39.3	J	123		36.7		14.9		41.9		36.6		19.1	
Cobalt	mg/kg	96	**250**	10.6		12.4		9.62		11.6		7.96	J	25.2		90.4		105		77.8		89.2		127	
Copper	mg/kg	360	**600**	37.3		35.3		21.7		30.9		19.7	J	54.6		1340		851		1180		1290		151	
Iron	mg/kg	480,000	**563,000**	19,700		24,200		21,300		24,500		21,300		42,600		173,000		234,000		168,000		169,000		66,800	
Ferrous Iron	mg/kg																								
Lead	mg/kg	**420**	140	33.1		57.8		27.5		34.7		8.75	J	48.3	J	6680		4050		6310		6400		377	
Lithium	mg/kg	**300**	200	21.6		20.2		23.3		25.5		21.1		25.4		5.5		2		12.3		4.7		10.9	
Magnesium	mg/kg	60,000	**233,000**	5,740		5,860		5,800		7,240		6,110		14,000		6,090		3,570		7,420		5,950		21,700	
Manganese	mg/kg	**12,000**	9,500	769		705		470		607		272	J	596		5,150		3,180		4,220		5,110		30,200	
Mercury	mg/kg	0.72	**0.85**	0.0371		0.054		0.0255		0.028		0.013		0.0537	J	7.77		4.07		0.0855		7.41		0.064	
Molybdenum	mg/kg	**24**	12	2.43		1.35		0.87		1.21		1.06		1.48		8.96		4.93		9.53		8.71		0.78	
Nickel	mg/kg	600	**840**	27.9		30.9		24.9		32.1		28.2	J	131		48.1		29.7		45.7		44.9		132	
Phosphorus	mg/kg	9,600	**10,500**	728		579		519		783		420	J	530		358		262		367		351		234	
Potassium	mg/kg	168,000	**208,500**	990		1,040		990		1,240		1,220		890		880		290		930		920		830	
Selenium	mg/kg	**4.8**	0.5	0.95		0.26		0.2	U	0.22		0.2	U	0.61		0.78		0.89		0.8		0.79		0.21	
Silver	mg/kg	-	**0.75**	0.14		0.16		0.1	U	0.12		0.1		0.23		16.8		11.8		15.7		16.4		0.15	
Sodium	mg/kg	60,000	**235,500**	257		203		185		237		317	J	191		81		50	U	89		79		535	
Strontium	mg/kg	3,000	**3,700**	39.3		34.2		26.9		34.8		35.7		35		48.1		42		43.1		51.1		251	
Sulphur	mg/kg	**8,400**	3,500	11,400		1,800		2,000		1,800		700		2,000	J	180,000		281,000		110,000		174,000		2,100	
Thallium	mg/kg	**108**	8.5	0.133		0.172		0.129		0.172		0.113		0.17		7.88		5.49		6.67		7.62		0.509	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	4.4		2.3		4		4.4		2	U
Titanium	mg/kg	-	**56,500**	338		336		325		423		335		179	J	65.5		27.9		77.6		76.9		196	
Uranium	mg/kg	24	**27**	1.26		1.07		0.817		1.06		1.02		1.49	J	3.04		1.49		3.49		2.95		4.63	
Vanadium	mg/kg	1,080	**1,200**	29.1		30		24		33.5		29.1		38.7		29.1		13.7		30.1		29.7		25.8	
Zinc	mg/kg	**1,080**	700	138		189		109		131		47.5		167		15400		5880		15500		14700		31100	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	7.26		7.69		7.88		7.82		8.23	J	7.46		6.29		7.21		6.2		6.24		NT	
Organic Matter	percent	-	-	12.00		1.70		1.00	U	NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 6-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.

Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.

Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content ***and*** 10x the crustal abundance.

[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London

[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).

12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

$CaCO_3$ = calcium carbonate
CVD = Cross Valley Dam
ID = Intermediate Dam
J = This analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NT = not tested
QA/QC = Quality Assurance and Quality Control
R = Data rejected
U = This analyte was analyzed for but not detected at the specified detection limit

Table 6-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential							Neutralization Potential						
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	
CH12-204-MW001B-SOA	**CVD/ID/CVD Pond**	0	0.15	6/28/2012	7.76		NT		0.02		500	U	*1.56*	23		230		25		147
CH12-204-MW001B-SOB	**CVD/ID/CVD Pond**	4.8	5.0	6/28/2012	7.55		937		0.01	U	1,100		2.83	NT		NC		NT		NC
CH12-204-MW001B-SOC	**CVD/ID/CVD Pond**	9.2	9.6	6/28/2012	7.61		NT		NT		2,500		*7.81*	NT		NC		NT		NC
CH12-204-MW001B-SOD	**CVD/ID/CVD Pond**	13.7	14.2	6/29/2012	7.61		NT		NT		1,400		*4.38*	NT		NC		NT		NC
CH12-204-MW001B-SOE	**CVD/ID/CVD Pond**	18.3	18.8	6/29/2012	7.64		NT		NT		2,800		*8.75*	NT		NC		NT		NC
CH12-204-MW001B-SOF	**CVD/ID/CVD Pond**	22.9	23.5	6/29/2012	7.64		NT		NT		2,800		*8.75*	NT		NC		NT		NC
CH12-204-MW001B-SOG	**CVD/ID/CVD Pond**	29.8	30	6/30/2012	7.73		NT		NT		3,100		*9.69*	NT		NC		NT		NC
CH12-204-MW901B-SOG	**CVD/ID/CVD Pond**	29.8	30	6/30/2012	7.65		NT		NT		3,100		*9.69*	NT		NC		NT		NC
CH12-204-MW001B-SOH	**CVD/ID/CVD Pond**	36.4	36.6	6/30/2012	7.78		865		0.01	U	11,100		34.3	30		300		33		8.8
CH12-204-MW002B-SOA	**CVD/ID/CVD Pond**	0	1.5	7/6/2012	7.14		NT		NT		1,000		*3.13*	NT		NC		NT		NC
CH12-204-MW002B-SOB	**CVD/ID/CVD Pond**	4.6	6.1	7/6/2012	6.93		535		NT		700		*2.19*	21		210		24		95.9
CH12-204-MW002B-SOC	**CVD/ID/CVD Pond**	9.3	10	7/6/2012	6.88		1,085		0.04		2,600		6.53	NT		NC		NT		NC
CH12-204-MW002B-SOD	**CVD/ID/CVD Pond**	15	15.4	7/6/2012	7.04		NT		NT		2,100		*6.56*	24		240		27		36.6
CH12-204-MW902B-SOD	**CVD/ID/CVD Pond**	15	15.4	7/6/2012	6.78		NT		NT		1,500		*4.69*	NT		NC		NT		NC
CH12-204-MW002B-SOE	**CVD/ID/CVD Pond**	19.8	20	7/6/2012	7.16		NT		NT		3,100		*9.69*	26		260		29		26.8
CH12-204-MW002B-SOF	**CVD/ID/CVD Pond**	26	27	7/6/2012	3.36		141		0.48		135,000		407	NT		NC		NT		NC
CH12-204-MW002B-SOG	**CVD/ID/CVD Pond**	29.6	30.2	7/6/2012	7.09		NT		NT		9,200		*28.75*	31		310		34		10.8
CH12-204-MW003B-SOA	**CVD/ID/CVD Pond**	0	0.6	7/4/2012	6.59		NT		NT		1,700		*5.31*	NT		NC		NT		NC
CH12-204-MW003B-SOB	**CVD/ID/CVD Pond**	4	4.6	7/4/2012	6.65		NT		NT		900		*2.81*	NT		NC		NT		NC
CH12-204-MW003B-SOC	**CVD/ID/CVD Pond**	9.6	10.4	7/4/2012	7.1		1,280		0.03		1,500		3.52	28		280		32		79.5
CH12-204-MW003B-SOD	**CVD/ID/CVD Pond**	15	15.3	7/5/2012	6.99		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH12-204-MW003B-SOE	**CVD/ID/CVD Pond**	20	20.3	7/5/2012	6.98		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH12-204-MW003B-SOF	**CVD/ID/CVD Pond**	25	25.95	7/5/2012	7.01		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH12-204-MW003B-SOG	**CVD/ID/CVD Pond**	30.5	32	7/5/2012	7.29		NT		NT		2,300		*7.19*	NT		NC		NT		NC
CH12-204-MW003B-SOH	**CVD/ID/CVD Pond**	34	34.5	7/5/2012	7.34		NT		NT		1,100		*3.44*	NT		NC		NT		NC
CH12-204-MW903B-SOH	**CVD/ID/CVD Pond**	34	34.5	7/5/2012	7.17		NT		NT		NT		NC	NT		NC		NT		NC
CH12-204-MW003B-SOI	**CVD/ID/CVD Pond**	40	41	7/13/2012	7.21	J	NT		NT		NT		NC	NT		NC		NT		NC
CH12-204-MW003B-SOJ	**CVD/ID/CVD Pond**	46.32	48.8	7/14/2012	7.5		NT		NT		1,100		*3.44*	43		430		48		125
CH12-204-MW003B-SOL	**CVD/ID/CVD Pond**			7/13/2012	NT		NT		NT		5,300		*16.56*	NT		NC		NT		NC
CH12-204-MW004B-SOA	**CVD/ID/CVD Pond**	0	1	7/2/2012	7.95		NT		NT		500		*1.56*	NT		NC		NT		NC
CH12-204-MW004B-SOB	**CVD/ID/CVD Pond**	4.6	7.6	7/2/2012	7.01		775		0.02		500	U	0.74	26		260		29		351
CH12-204-MW004B-SOC	**CVD/ID/CVD Pond**	7.6	10.6	7/2/2012	7.42		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH12-204-MW004B-SOD	**CVD/ID/CVD Pond**	14.8	15.2	7/2/2012	7.76		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH12-204-MW004B-SOE	**CVD/ID/CVD Pond**	19.8	20.6	7/3/2012	6.98		NT		NT		500	U	*1.56*	NT		NC		NT		NC
CH12-204-MW004B-SOF	**CVD/ID/CVD Pond**	22.9	25.9	7/3/2012	6.97		NT		NT		1,600		*5*	25		250		28		50.0
CH12-204-MW904B-SOF	**CVD/ID/CVD Pond**	22.9	25.9	7/3/2012	7.04		NT		NT		2,300		*7.19*	27		270		30		37.6
CH12-204-MW004B-SOG	**CVD/ID/CVD Pond**	27.6	28.1	7/3/2012	7.13		NT		NT		1,600		*5*	NT		NC		NT		NC
CH12-204-MW004B-SOH	**CVD/ID/CVD Pond**	34	35	7/4/2012	7.14		NT		NT		1,700		*5.31*	NT		NC		NT		NC
CH12-204-MW004B-SOI	**CVD/ID/CVD Pond**	40	41	7/4/2012	7.23		NT		NT		1,300		*4.06*	22		220		24		54.2
CH12-204-MW004B-SOJ	**CVD/ID/CVD Pond**	44.8	45.2	7/7/2012	7.22		NT		NT		1,500		*4.69*	NT		NC		NT		NC
CH12-204-PZ001-SOB	**CVD/ID/CVD Pond**	4.6	5.1	6/25/2012	7.48		NT		NT		600		*1.88*	NT		NC		NT		NC
CH12-204-PZ001-SOC	**CVD/ID/CVD Pond**	9.2	9.6	6/25/2012	7.51		813		0.01		1,400		3.93	NT		NC		NT		NC
CH12-204-PZ001-SOD	**CVD/ID/CVD Pond**	16	18.2	6/26/2012	7.52		NT		NT		900		*2.81*	24		240		27		85.4
CH12-204-PZ001-SOE	**CVD/ID/CVD Pond**	20	21	6/26/2012	7.43		NT		NT		1,200		*3.75*	NT		NC		NT		NC
CH12-204-PZ001-SOF	**CVD/ID/CVD Pond**	25	26	6/26/2012	7.52		NT		NT		1,400		*4.38*	NT		NC		NT		NC

Table 6-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Acid Potential								Neutralization Potential					
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	
CH13-204-MW007-SOA	**CVD/ID/CVD Pond**	0	0.15	7/18/2013	NT		NT		NT		NT		NC	55		550		NT		NC
CH13-204-MW907-SOA	**CVD/ID/CVD Pond**	0	0.15	7/18/2013	NT		NT		NT		191,000	J	*597*	60		600		NT		1.0
CH13-204-MW007-SOB	**CVD/ID/CVD Pond**	7.5	8.5	7/18/2013	NT		NT		NT		NT		NC	12		120		NT		NC
CH13-204-MW007-SOC	**CVD/ID/CVD Pond**	15.5	16.5	7/18/2013	NT		NT		NT		NT		NC	11		110		NT		NC
CH13-204-MW007-SOD	**CVD/ID/CVD Pond**	24.5	25.5	7/18/2013	NT		NT		NT		NT		NC	142		1,420		NT		NC
CH13-204-MW007-SOE	**CVD/ID/CVD Pond**	31.5	32.5	7/18/2013	NT		NT		NT		NT		NC	120		1,200		NT		NC
CH13-204-MW007-SOF	**CVD/ID/CVD Pond**	39.5	40.5	7/19/2013	NT		NT		NT		NT		NC	73		730		NT		NC
CH13-204-MW007-SOG	**CVD/ID/CVD Pond**	47.5	48.5	7/19/2013	NT		NT		NT		NT		NC	107		1,070		NT		NC
CH13-204-MW007-SOH	**CVD/ID/CVD Pond**	50.5	51.5	7/19/2013	NT		NT		NT		NT		NC	211		2,110		NT		NC
CH14-201-BH003-SOA	**CVD/ID/CVD Pond**	0	0.5	8/6/2014	NT		NT		NT		1,100		*3.44*	37		370		NT		108
CH14-201-BH004-SOA	**CVD/ID/CVD Pond**	1.5	2.0	8/6/2014	7.11	J	1,050		0.01	U	1,200		2.52	32		320		NT		127
CH14-201-BH004-SOB	**CVD/ID/CVD Pond**	3.1	3.5	8/6/2014	NT		NT		NT		1,000		*3.13*	NT		NC		NT		NC
CH14-201-BH004-SOD	**CVD/ID/CVD Pond**	7.6	8.1	8/6/2014	NT		NT		NT		1,700		*5.31*	72		720		NT		136
CH15-201-MW007_SOb	**CVD/ID/CVD Pond**	0.2	2.7	11/11/2015	8.17		NT		NT		700		*2.19*	50		500		NT		229
CH15-201-MW007_Sof	**CVD/ID/CVD Pond**	4.7	5.8	11/11/2015	7.68		NT		NT		600		*1.88*	143		1,430		NT		763
CH15-201-MW007_Rkc	**CVD/ID/CVD Pond**	17.0	18.0	11/11/2015			NT		NT		800		*2.50*	179		1,790		NT		716
CH15-201-MW008_SOd	**CVD/ID/CVD Pond**	2.4	4.0	11/7/2015	7.75		NT		NT		500	U	*1.56*	48		480		NT		307
CH15-201-MW008_SOh	**CVD/ID/CVD Pond**	5.5	7.0	11/7/2015	7.68		NT		NT		500		*1.56*	74		740		NT		474
CH15-201-MW908_SOh	**CVD/ID/CVD Pond**	5.5	7.0	11/7/2015	7.7		NT		NT		500		*1.56*	80		800		NT		512
CH15-201-MW008_SOl	**CVD/ID/CVD Pond**	8.5	10.4	11/8/2015	7.79		NT		NT		500	U	*1.56*	128		1,280		NT		819
CH15-201-MW009_SOd	**CVD/ID/CVD Pond**	2.7	4.3	11/6/2015	7.75		NT		NT		500	U	*1.56*	100		1,000		NT		640
CH15-201-MW009_SOh	**CVD/ID/CVD Pond**	5.8	7.3	11/6/2015	7.85		NT		NT		700		*2.19*	80		800		NT		366
CH15-201-MW009_SOj	**CVD/ID/CVD Pond**	7.3	8.8	11/6/2015	7.88		NT		NT		600		*1.88*	125		1,250		NT		667
CH15-201-MW011_SOf	**CVD/ID/CVD Pond**	4.7	5.8	11/8/2015	7.93		NT		NT		600		*1.88*	56		560		NT		299
CH15-201-MW011_SOl	**CVD/ID/CVD Pond**	9.3	10.4	11/8/2015	7.86		NT		NT		700		*2.19*	128		1,280		NT		585
CH15-201-MW011_Rkd	**CVD/ID/CVD Pond**	11.9	13.4	11/8/2015			NT		NT		800		*2.50*	189		1,890		NT		756

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Analytical results for neutralization potential by the AOAC 955.01 and MOD-SOBEK-3.2.3 methods are reported; results by the MOD-SOBEK-3.2.3 method are indicated using "*".
AOAC 955.01 is the preferred analytical method for neutralization potential; however, MOD-SOBEK-3.2.3 was applied to some samples collected in 2012 due to miscommunication.
Analytical results by the AOAC 955.01 method should be considered in future analysis and decision-making process.

Calculated values of acid potential presented italics were calculated based on total sulphur content, and represent conservative estimates of the acid generation potential.

$CaCO_3$ = calcium carbonate
CaO = calcium oxide
J = Analyte was present but the reported value may not be accurate or precise.
kg = kilogram
LMB =
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NC = not calculated
NP/AP = nuetralization potential divided by acid potential
NT = not tested
ppm = parts per million
QA/QC = Quality Assurance and Quality Control
U = This analyte was analyzed for but not detected at the specified detection limit.

Table 6-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond
Sample ID			CH12-204-MW001B-SOA	CH12-204-MW001B-SOB	CH12-204-MW001B-SOH	CH12-204-MW002B-SOB	CH12-204-MW002B-SOC	CH12-204-MW002B-SOF	CH12-204-MW002B-SOG	CH12-204-MW003B-SOA	CH12-204-MW003B-SOC	CH12-204-MW003B-SOF	CH12-204-MW003B-SOJ	CH12-204-MW004B-SOB	CH12-204-MW004B-SOE	CH12-204-MW004B-SOF	CH12-204-MW904B-SOF	CH12-204-MW004B-SOI	CH12-204-PZ001-SOB	CH12-204-PZ001-SOC	CH12-204-PZ001-SOE	CH14-201-BH004-SOA
Depth From (mbgs)			0	4.8	36.4	4.6	9.3	26	29.6	0	9.6	25	46.32	4.6	19.8	22.86	22.86	40	4.6	9.15	20	1.5
Depth From (mbgs)			0.15	5.0	36.6	6.1	10	27	30.2	0.6	10.4	25.95	48.8	7.6	20.6	25.9	25.9	41	5.05	9.6	21	2.0
Sample Date			6/28/2012	6/28/2012	6/30/2012	7/6/2012	7/6/2012	7/6/2012	7/6/2012	7/4/2012	7/4/2012	7/5/2012	7/14/2012	7/2/2012	7/3/2012	7/3/2012	7/3/2012	7/4/2012	6/25/2012	6/25/2012	6/26/2012	8/6/2014
pH	**Result (pH units)**	6.5-9.0	8.17	8.01	8.07	7.96	7.29	1.72	8.03	6.13	7.27	8.24	8.36	7.38	8.36	8.09	8.11	7.81	8.35	8.11	8.18	8.38
	Result Qualifier																					
Acidity	**Result (mg/L)**	-	1.3	2.2	1	1	2.3	13600	6.4	7.3	4.5	2.5	1	4.4	1.4	3.4	1	1.6	1.5	2.2	2.4	1
	Result Qualifier				U	U							U				U					U
Total Alkalinity	**Result (mg/L)**	-	71.6	58.9	98.8	38.8	139	1	147	26.8	134	53.9	103	28.7	61.6	67.8	89.9	77.5	59.4	48.1	50.3	81
	Result Qualifier							U														
Specific Conductance	**Result (µS/cm)**	-	139	375	413	141	710	19700	548	2300	658	251	289	125	217	420	407	359	257	386	509	NT
	Result Qualifier																					
ORP Leachable	**Result (mV)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	266
	Result Qualifier																					
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.005	0.005	0.005	0.005	0.005	343	0.005	0.025	0.005	0.0649	0.245	1.06	0.0847	0.0998	0.0819	0.011	0.005	0.005	0.005	0.005
	Result Qualifier		U	U	U	U	U		U	U	U								U	U	U	U
Antimony	**Result (mg/L)**	1.6	0.00112	0.00043	0.0015	0.00019	0.00562	0.13	0.0432	0.00098	0.00589	0.00086	0.00296	0.00244	0.00074	0.00217	0.00394	0.00374	0.00076	0.00024	0.00207	0.00052
	Result Qualifier															J	J					
Arsenic	**Result (mg/L)**	0.005	0.0035	0.001	0.001	0.001	0.0018	19.7	0.0271	0.005	0.001	0.0023	0.007	0.011	0.0029	0.0017	0.0023	0.0013	0.003	0.001	0.0015	0.0012
	Result Qualifier			U	U	U				U	U									U		
Barium	**Result (mg/L)**	2.3	0.047	0.0439	0.0322	0.0637	0.0696	0.05	0.0179	0.0297	0.0641	0.0543	0.0071	0.0657	0.0395	0.046	0.052	0.0707	0.0881	0.0436	0.0422	0.0726
	Result Qualifier							U														
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005	0.0005	0.072	0.0005	0.0025	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.01	0.01	0.01	0.01	0.01	0.5	0.018	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.018
	Result Qualifier		U	U	U		U	U		U	U	U	U	U	U	U	U	U	U	U	U	
Bromide	**Result (mg/L)**	-	0.05	0.05	0.05	0.05	0.5	5	0.05	1	0.25	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	NT
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.00005	0.00005	0.00005	0.000802	0.0075	0.00005	0.00664	0.000654	0.00005	0.00005	0.000208	0.00005	0.00005	0.00008	0.000088	0.000107	0.000066	0.00005	0.00005
	Result Qualifier		U	U	U	U			U			U	U		U	U	U				U	U
Calcium	**Result (mg/L)**	-	19.9	58.9	41.1	36.3	127	182	46.4	576	130	31	19.4	10.1	21.8	44.5	41.4	47.4	32.4	60.1	77.2	33.2
	Result Qualifier																					
Chloride	**Result (mg/L)**	120	0.5	0.76	0.5	0.5	5	50	0.5	10	2.5	0.5	0.76	2.14	0.5	1.61	0.5	0.5	0.5	0.5	0.69	NT
	Result Qualifier		U		U	U	U	U	U	U	U	U			U		U	U	U	U		
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.0005	0.0005	1.54	0.0005	0.0025	0.0005	0.0005	0.0005	0.0034	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U		U	U	U	U	U		U	U	U	U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.0001	0.00043	0.0001	0.0001	0.00366	1.32	0.0008	0.0015	0.00066	0.0001	0.0001	0.00156	0.0001	0.0001	0.0001	0.00047	0.0001	0.00176	0.0001	0.0001
	Result Qualifier		U		U	U						U	U		U	U	U		U		U	U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.001	0.001	0.001	0.0011	0.05	0.001	0.0061	0.001	0.001	0.001	0.0183	0.001	0.001	0.001	0.001	0.0016	0.001	0.001	0.001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U		U	U	U	U		U	U	U
Fluoride	**Result (mg/L)**	0.12	0.634	0.881	1.03	0.764	0.45	13.3	2.28	0.4	0.17	0.714	1.31	0.459	0.727	0.793	0.717	0.666	0.745	0.538	0.826	NT
	Result Qualifier									U												
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03	0.03	7480	0.03	0.03	0.03	0.03	0.03	11	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier		U	U	U	U	U		U	U	U	U	U		U	U	U	U	U	U	U	U
Lead	**Result (mg/L)**	0.001	0.0001	0.0001	0.00282	0.0001	0.0001	0.005	0.0001	0.0005	0.0001	0.0001	0.0001	0.01	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U		U	U	U	U	U	U	U	U		U	U	U	U	U	U	U	U
Lithium	**Result (mg/L)**	-	0.0063	0.0118	0.0132	0.0147	0.0261	0.25	0.012	0.025	0.0067	0.0179	0.0093	0.0054	0.0112	0.0113	0.0105	0.0085	0.0155	0.0081	0.0244	0.0128
	Result Qualifier							U		U												
Magnesium	**Result (mg/L)**	-	1.92	8.93	25.1	6.24	20.3	54.3	19.7	47.4	12.5	5.32	11	2.62	5.53	15.4	13.2	13.1	5.06	9.22	12.5	6.15
	Result Qualifier																					
Manganese	**Result (mg/L)**	-	0.0005	0.0005	0.0005	0.0005	1.78	2.04	0.0977	1.13	1.78	0.0136	0.00377	0.0453	0.00318	0.0122	0.0166	0.309	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U													U	U	U	U
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.000106	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U		U	U	U	U	U	U	U	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.0191	0.0157	0.00982	0.0259	0.00519	0.0878	0.0547	0.0005	0.0138	0.0145	0.0001	0.00913	0.0317	0.0258	0.0756	0.0169	0.0292	0.00914	0.0134	0.0225
	Result Qualifier									U			U			J	J					
Nickel	**Result (mg/L)**	0.025	0.0005	0.0005	0.0005	0.0005	0.0225	4.02	0.00201	0.0673	0.00471	0.0005	0.0005	0.00671	0.0005	0.0005	0.0005	0.00318	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U						U	U		U	U	U		U	U	U	U

Table 6-3. De-ionized Water Leach Test Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond	CVD, ID, CVD Pond
Sample ID			CH12-204-MW001B-SOA	CH12-204-MW001B-SOB	CH12-204-MW001B-SOH	CH12-204-MW002B-SOB	CH12-204-MW002B-SOC	CH12-204-MW002B-SOF	CH12-204-MW002B-SOG	CH12-204-MW003B-SOA	CH12-204-MW003B-SOC	CH12-204-MW003B-SOF	CH12-204-MW003B-SOJ	CH12-204-MW004B-SOB	CH12-204-MW004B-SOE	CH12-204-MW004B-SOF	CH12-204-MW904B-SOF	CH12-204-MW004B-SOI	CH12-204-PZ001-SOB	CH12-204-PZ001-SOC	CH12-204-PZ001-SOE	CH14-201-BH004-SOA
Depth From (mbgs)			0	4.8	36.4	4.6	9.3	26	29.6	0	9.6	25	46.32	4.6	19.8	22.86	22.86	40	4.6	9.15	20	1.5
Depth From (mbgs)			0.15	5.0	36.6	6.1	10	27	30.2	0.6	10.4	25.95	48.8	7.6	20.6	25.9	25.9	41	5.05	9.6	21	2.0
Sample Date			6/28/2012	6/28/2012	6/30/2012	7/6/2012	7/6/2012	7/6/2012	7/6/2012	7/4/2012	7/4/2012	7/5/2012	7/14/2012	7/2/2012	7/3/2012	7/3/2012	7/3/2012	7/4/2012	6/25/2012	6/25/2012	6/26/2012	8/6/2014
Nitrate	**Result (mg/L)**	13	0.0132	0.005	0.005	0.629	0.05	0.5	0.005	1.9	0.025	0.143	0.005	0.131	0.0203	0.0104	0.006	0.0061	0.0083	0.0229	0.0339	NT
	Result Qualifier			U	U		U	U	U		U		U			J	J					
Nitrite	**Result (mg/L)**	0.06	0.0014	0.001	0.001	0.0011	0.01	0.19	0.0016	0.038	0.0057	0.001	0.0021	0.0023	0.0014	0.001	0.001	0.001	0.001	0.0014	0.001	NT
	Result Qualifier			U	U		U					U				U	U	U	U		U	
Potassium	**Result (mg/L)**	-	10.2	9.5	6.9	9.1	9.7	20	63.5	20.4	6.9	9.7	24.6	8.2	15.4	22.9	26.2	10.7	13.4	6.4	16.4	12.7
	Result Qualifier							U														
Selenium	**Result (mg/L)**	0.001	0.0005	0.0005	0.0005	0.0005	0.0101	0.025	0.0031	0.0025	0.00772	0.00504	0.00117	0.00271	0.0023	0.00463	0.0012	0.00323	0.0005	0.00068	0.00958	0.0005
	Result Qualifier		U	U	U	U		U		U						J	J		U			U
Silicon	**Result (mg/L)**	-	3.51	3.52	2.21	4.39	2.36	12	2.45	13.9	2.34	3.93	1.81	8.03	3.72	2.9	3.11	1.79	3.67	3.97	3.2	5.45
	Result Qualifier																					
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.0025	0.000207	0.00025	0.00005	0.00005	0.00005	0.000109	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U		U	U	U	U		U	U	U	U	U	U	U	U
Sodium	**Result (mg/L)**	-	2.9	5.5	12.1	7.4	7.9	20	10.1	10.7	4.8	8.8	14.1	8.7	7.7	10.2	10.7	4.4	6.8	5.5	6.1	6.3
	Result Qualifier							U														
Strontium	**Result (mg/L)**	-	0.0618	0.154	0.46	0.136	0.409	0.632	0.285	1.04	0.267	0.131	0.201	0.0403	0.112	0.193	0.201	0.162	0.106	0.164	0.207	0.124
	Result Qualifier																					
Sulphate	**Result (mg/L)**	100	3.67	134	111	90.4	276	18400	107	1630	248	71.6	48.1	35.2	48.4	142	118	108	66.4	147	210	46.2
	Result Qualifier																					
Sulphur	**Result (mg/L)**	-	1.25	44.6	54.7	29.7	91.5	5820	55.3	527	80.6	23	15.7	11.8	15.8	46.8	38.7	35.7	21.8	48.6	70.1	15.5
	Result Qualifier																					
Thallium	**Result (mg/L)**	0.0008	0.0001	0.0001	0.0001	0.0001	NT	0.0642	0.00011	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U				U	U	U	U	U	U	U	U	U	U	U	U	U
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.01	0.1	0.01	0.015	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		U	U	U	U	U	U	U			U	U		U	U	U	U	U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.00317	0.00158	0.00444	0.00032	0.0143	0.0858	0.023	0.000075	0.00887	0.000732	0.00165	0.000503	0.000499	0.00358	0.00404	0.0273	0.00176	0.000428	0.00823	0.00419
	Result Qualifier																					
Vanadium	**Result (mg/L)**	-	0.001	0.001	0.001	0.001	0.001	0.522	0.001	0.005	0.001	0.001	0.001	0.0094	0.001	0.0013	0.0011	0.001	0.001	0.001	0.0012	0.001
	Result Qualifier			U	U	U	U		U	U	U	U	U		U			U	U	U		U
Zinc	**Result (mg/L)**	0.03	0.01	0.01	0.01	0.01	0.01	10	0.01	0.215	0.01	0.01	0.01	0.019	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		U	U	U	U	U		U		U	U	U		U	U	U	U	U	U	U	U

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1,000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness > 180 mg/L, the CWQG is 4 µg/L; At hardness ≥ 82 to ≤ 180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465}$ * 0.2 / 1,000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness > 180 mg/L, the CWQG is 7 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1,000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness > 180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1,000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

> = greater

≥ = greater than or equal to

< = less than

≤ = less than or equal to

°C = degrees Celsius

µg/L = micrograms per litre

µS/cm = micro-Siemens per centimetre

CCME = Canadian Council of Ministers of the Environment

CWQG = Canadian Water Quality Guidelines

CVD = Cross Valley Dam

FIGQG =

ID = Intermediate Dam

J - analyte was present but the reported value may not be accurate or precise

mbgs = metre below ground surface

mg/L = milligrams per litre

mV = millivolt

NTU = Nephelometric Tubidity Unit

ORP = Oxidation-reduction Potential

R = result has been rejected for use

U = analyte was analyzed for but not detected at the specified detection limit

UJ = analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Table 6-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW001B															CH12-204-MW001B														
Sample ID	CH12-204-MW001B_SOB															CH12-204-MW001B_SOH														
Sample Interval (mbgs)	4.75 - 5.03															36.4 - 36.6														
Sample Date	6/28/2012															6/30/2012														
General Location	CROSS VALLEY DAM - DOWNGRADIENT															CROSS VALLEY DAM - DOWNGRADIENT														
Geologic Unit	ALLUVIUM															BEDROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**192**		**53**		**357**		**13900**		**14602**	**14600**		50	U	50	U	**150**		50	U	**64**		**30600**		**30964**	**30000**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	**0.19**		**0.14**		**0.730**	**0.64**		0.1	U	0.1	U	**0.16**		0.1	U	0.1	U	**0.47**		**1.03**	**0.64**	
Arsenic	0.05	U	**0.05**		**2.07**		**0.791**		**3.79**		**2.46**		**9.21**	**12**		0.05	U	**0.089**		**1.52**		**0.176**		0.5	U	**11.4**		**13.7**	**14.7**	
Barium	**18.2**		**19**		**7**		**7**		**10.3**		**118**		**180**	**190**		**3.8**		**3.1**		2	U	2	U	2	U	**12.2**		**25.1**	**20.2**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.41**		**1.41**	**0.64**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.24**		**1.24**	**0.49**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.26**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U
Cadmium	0.05	U	**0.115**		0.05	U	0.05	U	0.05	U	**0.096**		**0.411**	**0.325**		0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	**0.071**		**0.321**	**0.1**	
Calcium	**1090**		**10200**		50	U	**882**		NT		**2860**		**15082**	**15700**		**579**		**15600**		50	U	**220**		NT		**11000**		**27449**	**34400**	
Chromium	5	U	5	U	5	U	5	U	5	U	**36.2**		**61.2**	**40.3**		5	U	5	U	5	U	5	U	5	U	**321**		**346**	**315**	
Cobalt	0.1	U	**1.62**		**2.9**		0.1	U	**1.86**		**6.52**		**13.1**	**15.1**		0.1	U	**0.66**		**1.16**		0.1	U	**0.21**		**41.1**		**43.3**	**44.1**	
Copper	0.5	U	**0.5**		**1.86**		**1.2**		**2.28**		**22.7**		**29.1**	**33.2**		0.5	U	**1.2**		**1.74**		**0.54**		0.5	U	**133**		**138**	**151**	
Iron	50	U	**82**		**1150**		**401**		**7610**		**18300**		**27593**	**30300**		50	U	**525**		**2970**		**73**		**432**		**61300**		**65350**	**64700**	
Lead	0.5	U	**13.7**		**8.87**		**13.1**		**3.85**		**41.3**		**81.3**	**96.9**		0.5	U	**0.89**		0.5	U	**0.69**		0.5	U	**4.15**		**7.23**	**5.57**	
Lithium	5	U	5	U	5	U	5	U	5	U	**27.2**		**52.2**	**27.9**		5	U	5	U	5	U	5	U	5	U	**50.1**		**75.1**	**45**	
Manganese	**5.1**		**113**				**6.7**		**42.9**		**159**		**327**	**439**		**6**		**154**				**8.9**		**14.9**		**440**		**624**	**779**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.95**		0.5	U	**3.45**	**1.38**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	**1.33**		**3.83**	**1.5**	
Nickel	2	U	2	U	**2.7**		2	U	**10.2**		**21.8**		**40.7**	**40.7**		2	U	**2.7**		**4.5**		2	U	2	U	**166**		**179**	**198**	
Phosphorus	50	U	50	U	**203**		NT		NT		NT		**303**	**725**		50	U	50	U	**108**		NT		NT		NT		**208**	**986**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2570**		100	U	NT		NT		NT		NT		NT		100	**390**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	**0.2**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.31**		**1.61**	**0.27**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.19**		**0.690**	**0.23**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.600	0.1	U
Sodium	100	U	NT		NT		NT		NT		NT		100	**310**		100	U	NT		NT		NT		NT		NT		100	**130**	
Strontium	5	U	**30.1**		5	U	5	U	5	U	**30.2**		**80.3**	**76.5**		5	U	**80.6**		5	U	**10.1**		5	U	**54.4**		**160**	**180**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.293**		**2.49**	**0.273**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.139**		**2.34**	0.05	U
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	**7.1**		**460**		**487**	**558**		5	U	5	U	5	U	5	U	5	U	**165**		**190**	**219**	
Uranium	0.05	U	**0.057**		**0.084**		0.05	U	**0.17**		**0.51**		**0.921**	**1.01**		**0.082**		**0.639**		**0.209**		0.05	U	**0.06**		**0.215**		**1.25**	**1.01**	
Vanadium	0.2	U	0.2	U	**1.26**		**0.23**		**5.07**		**29.2**		**36.2**	**37**		0.2	U	**0.36**		**4.39**		0.2	U	**0.7**		**132**		**138**	**139**	
Zinc	1	U	**2.2**		**4.8**		**4.3**		**64**		**73.5**		**150**	**162**		1	U	**2.1**		**2.4**		1	U	50	U	**67.3**		**124**	**73.1**	

Table 6-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW002B															CH12-204-MW002B														
Sample ID	CH12-204-MW002B_SOB															CH12-204-MW002B_SOC														
Sample Interval (mbgs)	4.6 - 6.1															9.3 - 10														
Sample Date	7/6/2012															7/6/2012														
General Location	CROSS VALLEY DAM - DOWNGRADIENT															CROSS VALLEY DAM - DOWNGRADIENT														
Geologic Unit	ALLUVIUM															ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**257**		50	U	**421**		**20300**		**21128**	**24800**		50	U	50	U	**639**		**295**		**1040**		**21200**		**23274**	**23200**	
Antimony	0.1	U	0.1	U	0.1	U	0.1	U	**0.2**		**0.25**		**0.850**	**0.78**		0.1	U	**0.13**		**0.4**		0.1	U	**0.34**		**0.36**		**1.43**	**1.23**	
Arsenic	0.05	U	**0.057**		**4.56**		**2.14**		**22.4**		**7.73**		**36.9**	**48.1**		0.05	U	**0.128**		**1.48**		**0.496**		**3.0**		**5.38**		**10.6**	**10.2**	
Barium	**42.2**		**47.0**		**23.3**		**17.8**		**23.4**		**59.2**		**213**	**294**		**33.5**		**61.5**		**7**		**17.1**		**32.4**		**113**		**265**	**237**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.53**		**1.53**	**0.91**		0.2	U	0.2	U	**0.25**		0.2	U	**0.23**		**0.61**		**1.69**	**1.08**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.3**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.32**		**1.32**	**0.51**	
Cadmium	0.05	U	**0.086**		0.05	U	**0.062**		**0.065**		**0.082**		**0.395**	**0.45**		0.05	U	**0.333**		0.05	U	0.05	U	0.05	U	**0.284**		**0.817**	**0.781**	
Calcium	**1230**		**702**		50	U	**611**		NT		**4800**		**7393**	**8230**		**1800**		**6590**		50	U	**403**		NT		**2400**		**11243**	**15300**	
Chromium	5	U	5	U	5	U	5	U	5	U	**134**		**159**	**74.2**		5	U	5	U	5	U	5	U	5	U	**69**		**94.0**	**66.8**	
Cobalt	0.1	U	0.1	U	**4.18**		0.1	U	**5.62**		**11.2**		**21.3**	**25.4**		**0.24**		**1.52**		**3.04**		**0.28**		**4.32**		**12.4**		**21.8**	**18.6**	
Copper	0.5	U	**0.63**		**3.29**		**0.58**		**0.88**		**27.4**		**33.3**	**42.8**		0.5	U	**5.21**		**10.3**		**3.68**		**2.79**		**29.1**		**51.6**	**46.9**	
Iron	50	U	50	U	**3070**		**368**		**14800**		**25900**		**44238**	**51200**		50	U	**365**		**4880**		**413**		**9190**		**30800**		**45698**	**38100**	
Lead	0.5	U	0.5	U	**3.14**		**1.06**		**2.91**		**11.2**		**19.3**	**30.6**		0.5	U	**47.7**		**2.05**		**14.2**		**3.5**		**33.5**		**101**	**95.2**	
Lithium	5	U	5	U	5	U	5	U	5	U	**39**		**64.0**	**42.5**		5	U	5	U	5	U	5	U	5	U	**43.8**		**68.8**	**44.5**	
Manganese	5	U	**33**				**15.5**		**78.3**		**234**		**366**	**827**		**30.2**		**116**				**21.2**		**78.4**		**272**		**518**	**628**	
Molybdenum	0.5	U	0.5	U	**0.63**		0.5	U	**1.34**		0.5	U	**3.97**	**2.38**		0.5	U	0.5	U	0.5	U	0.5	U	**0.98**		**1.39**		**4.37**	**1.82**	
Nickel	2	U	2	U	**6.5**		2	U	**21.2**		**51.6**		**85.3**	**75.6**		2	U	**5.3**		**9.3**		2	U	**14**		**39**		**71.6**	**60**	
Phosphorus	50	U	50	U	**120**		NT		NT		NT		**220**	**753**		50	U	50	U	**472**		NT		NT		NT		**572**	**800**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2790**		**120**		NT		NT		NT		NT		NT		**120**	**3350**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	**0.25**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.38**		**1.68**	**0.75**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	NT		**0.500**	**0.17**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.33**		**0.830**	**0.35**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**710**		100	U	NT		NT		NT		NT		NT		100	**320**	
Strontium	**6**		5	U	5	U	5	U	5	U	**49.2**		**75.2**	**66.2**		**7.7**		**20.2**		5	U	**7.5**		**8.4**		**25.2**		**74.0**	**71.4**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.255**		**2.46**	**0.275**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.416**		**2.62**	**0.307**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**448**		**473**	**568**		5	U	5	U	**10.5**		**12**		**36.7**		**622**		**691**	**701**	
Uranium	0.050	U	**0.105**		**0.081**		0.05	U	**0.17**		**0.508**		**0.964**	**0.921**		**0.141**		**0.459**		**0.374**		**0.052**		**0.22**		**1.08**		**2.32**	**2.36**	
Vanadium	0.2	U	0.2	U	**1.29**		0.2	U	**4.01**		**38.2**		**44.1**	**49.2**		0.2	U	0.22		**6.38**		**0.76**		**6.79**		**50.2**		**64.6**	**58.6**	
Zinc	1	U	1.0	U	**3.7**		1	U	50	U	**69.3**		**126**	**120**		1	U	**9.6**		**33.1**		**4.2**		50	U	**121**		**219**	**192**	

Table 6-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW002B															CH12-204-MW003B														
Sample ID	CH12-204-MW002B_SOF															CH12-204-MW003B_SOC														
Sample Interval (mbgs)	26 - 27															9.6 - 10.4														
Sample Date	7/6/2012															7/4/2012														
General Location	CROSS VALLEY DAM - DOWNGRADIENT															CROSS VALLEY DAM - DOWNGRADIENT														
Geologic Unit	ALLUVIUM															ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**1280**		50	U	50	U	**90**		50	U	**1340**		**2860**	**2950**		50	U	**52**		**441**		**64**		**295**		**12100**		**13002**	**14300**	
Antimony	**0.38**		**0.51**		**0.97**		**3.12**		**3.44**		**49.60**		**58.0**	**68.3**		0.1	U	**0.13**		**0.75**		0.1	U	**0.42**		**0.74**		**2.24**	**2.47**	
Arsenic	**55.9**		**1.34**		**7.38**		**1.98**		**7.86**		**169**		**243**	**268**		0.05	U	**0.142**		**2.67**		**0.34**		**2.98**		**5.36**		**11.5**	**13.4**	
Barium	2	U	2	U	2	U	2	U	**9.3**		**8.1**		**25.4**	**17.7**		**27.6**		**29.2**		**7.5**		**14.6**		**17.3**		**263**		**359**	**329**	
Beryllium	**0.26**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**1.26**	**0.37**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.3**		**1.30**	**0.6**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.33**	
Cadmium	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.300	0.05	U	0.05	U	**0.485**		0.05	U	0.05	U	0.05	U	**0.342**		**1.03**	**1.01**	
Calcium	**609**		50	U	50	U	50	U	NT		50	U	**809**	**765**		**1210**		**9060**		50	U	**299**		NT		**4520**		**15139**	**17900**	
Chromium	**5.9**		5	U	5	U	5	U	5	U	5	U	**30.9**	**10.3**		5	U	5	U	5	U	5	U	5	U	**38.9**		**63.9**	**44.7**	
Cobalt	**6.44**		0.1	U	0.1	U	0.1	U	0.1	U	**2.41**		**9.25**	**6.45**		0.1	U	**0.95**		**3.01**		**0.12**		**3.2**		**7.7**		**15.1**	**16.6**	
Copper	**1.42**		0.5	U	**0.97**		0.5	U	0.5	U	**4.4**		**8.29**	**7.38**		0.5	U	**4.45**		**9.71**		**2.37**		0.5	U	**21**		**38.5**	**42.7**	
Iron	**28600**		**377**		**741**		**147**		**4530**		**69600**		**103995**	**84700**		50	U	**687**		**4390**		**98**		**6210**		**18100**		**29535**	**33200**	
Lead	0.5	U	0.5	U	**0.79**		0.5	U	0.5	U	**6.87**		**9.66**	**8.93**		0.5	U	**3.9**		0.5	U	**2.75**		0.5	U	**8.39**		**16.5**	**20.9**	
Lithium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	5	U	5	U	5	U	5	U	5	U	5	U	**21.2**		**46.2**	**24.8**	
Manganese	**13.3**		5	U			5	U	5	U	5	U	**33.3**	**11.3**		**26.9**		**205**				**11.2**		**42.7**		**183**		**469**	**701**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	**0.59**		0.5	U	**3.09**	**2**		0.5	U	0.5	U	0.5	U	0.5	U	**1.71**		**0.54**		**4.25**	**3.09**	
Nickel	**17.1**		2	U	2	U	2	U	2	U	**8.9**		**34.0**	**20.2**		2	U	**2.8**		**7.1**		2	U	**11.5**		**27.9**		**53.3**	**52.5**	
Phosphorus	**132**		50	U	50	U	NT		NT		NT		**232**	**79**		50	U	50	U	**459**		NT		NT		NT		**559**	**1140**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1710**		100	U	NT		NT		NT		NT		NT		100	**1950**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**1.01**		**2.31**	**1.18**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.61**		**1.91**	**1.1**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	**0.18**		**0.84**		**1.42**	**1.27**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.24**		**0.740**	**0.32**	
Sodium	100	U	NT		NT		NT		NT		NT		100	100	U	100	U	NT	NT	NT		NT		NT		NT		100	**190**	
Strontium	5	U	5	U	5	U	5	U	5	U	5	U	**30.0**	**6.56**		5	U	**20.8**		5	u	**7.8**		5	U	**27**		**70.6**	**63.1**	
Thallium	**0.699**		**0.324**		**0.419**		**0.276**		2	U	**8.84**		**12.6**	**9.87**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.27**		**2.47**	**0.225**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	5	U	30.0	**6**		5	U	5	U	**9.1**		5	U	**12.2**		**478**		**514**	**511**	
Uranium	**0.34**		0.05	U	0.05	U	0.05	U	0.05	U	**0.08**		**0.620**	**0.471**		**0.11**		**0.379**		**0.307**		0.05	U	**0.139**		**0.856**		**1.84**	**1.79**	
Vanadium	**1.56**		0.2	U	**0.2**		0.2	U	**0.34**		**2.14**		**4.64**	**4.57**		0.2	U	0.2	U	**5.36**		**0.31**		**4.97**		**36.6**		**47.6**	**50.3**	
Zinc	**53.5**		1	U	1	U	1	U	50	U	1	U	**108**	**45.9**		1	U	**12.9**		**19**		**1.8**		50	U	**74.1**		**159**	**143**	

Table 6-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW004B															CH12-204-MW005B													
Sample ID	CH12-204-MW004B_SOB															CH12-204-MW005B_SOB													
Sample Interval (mbgs)	4.6 - 7.6															1.8 - 2.2													
Sample Date	7/2/2012															7/8/2012													
General Location	CROSS VALLEY DAM - DOWNGRADIENT															CROSS VALLEY DAM - DOWNGRADIENT NEAR X14													
Geologic Unit	ALLUVIUM															ALLUVIUM													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**756**		**129**		**271**		**18000**		**19256**	**20800**		50	U	**51**		**507**		50	U	**227**		**11000**		**11885**	**11500**	
Antimony	0.1	U	0.1	U	**0.22**		0.1	U	**0.14**		**0.19**		**0.850**	**0.68**		0.1	U	0.1	U	0.1	U	0.1	U	**0.13**		**0.25**		**0.780**	**0.47**	
Arsenic	0.05	U	**0.178**		**3.94**		**1.24**		**3.74**		**2.95**		**12.1**	**18**		0.05	U	**0.059**		**2.11**		**0.321**		**2.28**		**2.86**		**7.68**	**6.28**	
Barium	**39.1**		**20.6**		**2.8**		**8.4**		**13.5**		**76.2**		**161**	**188**		**32.7**		**11.0**		**2.4**		**2.6**		**4.1**		**38.6**		**91.4**	**95.2**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.57**		**1.57**	**0.91**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.4**		**1.40**	**0.58**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.37**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	**0.61**	
Cadmium	0.05	U	**0.132**		0.05	U	**0.05**		0.05	U	**0.176**		0.508	**0.476**		0.05	U	**0.167**		**0.069**		0.05	U	0.05	U	**0.109**		0.495	**0.612**	
Calcium	**799**		**131**		50	U	**544**		NT		**3940**		**5464**	**6050**		**637**		**103**		50	U	**202**		NT		**3310**		**4302**	**3410**	
Chromium	5	U	5	U	5	U	5	U	5	U	**39.2**		**64.2**	**49**		5	U	5	U	5	U	5	U	5	U	**22.8**		**47.8**	**30.8**	
Cobalt	0.1	U	**0.19**		**2.88**		**0.18**		**2.5**		**10.8**		**16.6**	**19**		0.1	U	0.1	U	**1.96**		0.1	U	**1.04**		**4.72**		**8.02**	**8.39**	
Copper	0.5	U	**4.21**		**12.1**		**1.54**		**0.96**		**23.1**		**42.4**	**48.4**		0.5	U	**2.23**		**8.45**		0.5	U	**0.89**		**10.1**		**22.7**	**34.4**	
Iron	50	U	**3.82**		**2.52**		**1.84**		**1.33**		**7**		**66.5**	**47100**		50	U	50	U	**1450**		**142**		**2970**		**12300**		**16962**	**18500**	
Lead	0.5	U	**3.9**		0.5	U	**2.75**		0.5	U	**8.39**		**16.5**	**20.5**		0.5	U	**1.9**		**3.27**		**1.03**		**0.7**		**4.78**		**12.1**	**16.4**	
Lithium	5	U	5	U	5	U	5	U	5	U	**42.9**		**67.9**	**35.4**		5	U	5	U	5	U	5	U	5	U	**24.3**		**49.3**	**23**	
Manganese	5	U	**5.2**				5	U	**49.9**		**216**		**281**	**318**		5	U	**16.5**				5	U	**13.6**		**105**		**145**	**232**	
Molybdenum	0.5	U	0.5	U	**0.54**		0.5	U	**0.64**		0.5	U	**3.18**	**1.9**		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**1.08**	
Nickel	2	U	2	U	**10.6**		2	U	**8.6**		**44.2**		**69.4**	**76.1**		2	U	2	U	2	U	2	U	**3.7**		**16.4**		**28.1**	**26.9**	
Phosphorus	50	U	50	U	**301**		NT		NT		NT		**401**	**796**		50	U	50	U	**78**		NT		NT		NT		**178**	**571**	
Potassium	100	U	NT	NT	NT		NT		NT		NT		100	**2040**		100	U	NT		NT		NT		NT		NT		100	**950**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	**0.6**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.50	**0.29**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.11**		**0.610**	**0.17**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.600	**0.11**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**590**		100	U	NT		NT		NT		NT		NT		100	**210**	
Strontium	5	U	5	U	5	U	5	U	5	U	**33.2**		**58.2**	**57.2**		5	U	5	U	5	U	5	U	5	U	**38.6**		**63.6**	**29.5**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.421**		**2.62**	**0.301**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.148**		**2.35**	**0.125**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	**12.8**		**8**		**6.2**		**834**		**871**	**683**		5	U	5	U	**5.3**		5	U	5	U	**286**		**311**	**345**	
Uranium	0.05	U	**0.408**		**0.248**		0.05	U	**0.09**		**0.548**		**1.39**	**1.36**		0.05	U	**0.41**		**0.227**		0.05	U	**0.057**		**0.479**		**1.27**	**1.31**	
Vanadium	0.2	U	**0.25**		**5.58**		**0.58**		**3.19**		**37.6**		**47.4**	**49.9**		0.2	U	0.2	U	**1.72**		0.2	U	**1.97**		**19.9**		**24.2**	**25.2**	
Zinc	1	U	**2.2**		**11.3**		**2.9**		50	U	**89.3**		**157**	**121**		1	U	**9.4**		**20.5**		**2.8**		50	U	**99.1**		**183**	**195**	

Table 6-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW005B															CH12-204-MW005B														
Sample ID	CH12-204-MW005B_SOD															CH12-204-MW905B_SOD														
Sample Interval (mbgs)	5.7 - 6.1															5.7 - 6.1														
Sample Date	7/8/2012															7/8/2012														
General Location	CROSS VALLEY DAM - DOWNGRADIENT NEAR X14															CROSS VALLEY DAM - DOWNGRADIENT NEAR X14														
Geologic Unit	ALLUVIUM															ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**393**		**151**		**270**		**13800**		**14714**	**14500**		50	U	50	U	**432**		**132**		**242**		**13800**		**14706**	**13700**	
Antimony	0.1	U	**0.11**		**0.74**		0.1	U	0.1	U	**0.22**		**1.37**	**1.31**		0.1	U	**0.14**		**0.65**		0.1	U	0.1	U	**0.21**		**1.30**	**1.18**	
Arsenic	0.05	U	**0.319**		**4.86**		**0.33**		**0.6**		**2.38**		**8.54**	**10.5**		0.05	U	**0.392**		**5.16**		**0.33**		**0.5**		**2.25**		**8.69**	**9.2**	
Barium	**37.6**		**28.8**		**6.3**		**18.4**		**14**		**197**		**302**	**326**		**35.6**		**27.3**		**8**		**19.2**		**14.2**		**205**		**309**	**287**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.41**		**1.41**	**0.68**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.4**		**1.40**	**0.63**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.22**		**1.22**	**0.4**		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.22**		**1.22**	**0.35**	
Cadmium	0.05	U	**0.432**		0.05	U	0.05	U	0.05	U	**0.147**		**0.779**	**0.774**		0.05	U	**0.399**		0.05	U	0.05	U	0.05	U	**0.162**		**0.761**	**0.683**	
Calcium	**1780**		**7430**		50	U	**358**		NT		**3060**		**12678**	**16800**		**1640**		**6830**		50	U	**375**		NT		**3010**		**11905**	**14000**	
Chromium	5	U	5	U	5	U	5	U	5	U	**29.6**		**54.6**	**36.2**		5	U	5	U	5	U	5	U	5	U	**30.8**		**55.8**	**31.4**	
Cobalt	**0.16**		**1.65**		**3.14**		**0.25**		**0.93**		**6.75**		**12.9**	**13.7**		**0.15**		**1.64**		**3.33**		**0.33**		**0.93**		**7.1**		**13.5**	**11.9**	
Copper	0.5	U	**3.53**		**8.43**		**2.3**		**1.02**		**10.6**		**26.4**	**30.5**		0.5	U	**2.82**		**9.04**		**2.5**		**0.99**		**11.5**		**27.4**	**27.7**	
Iron	50	U	**747**		**5030**		**194**		**1640**		**17700**		**25361**	**28400**		50	U	**879**		**4710**		**188**		**1560**		**18500**		**25887**	**25500**	
Lead	0.5	U	**3.63**		**0.54**		**7.96**		**0.67**		**7.06**		**20.4**	**22.9**		0.5	U	**4.41**		0.5	U	**6.98**		**0.65**		**6.63**		**19.7**	**20.5**	
Lithium	5	U	5	U	5	U	5	U	5	U	**30.5**		**55.5**	**31.3**		5	U	5	U	5	U	5	U	5	U	**30.3**		**55.3**	**29.8**	
Manganese	**33.1**		**150**				**14.9**		**17.4**		**196**		**411**	**554**		**20.3**		**155**				**15.7**		**17.5**		**195**		**404**	**479**	
Molybdenum	0.5	U	0.5	U	**0.79**		0.5	U	0.5	U	0.5	U	**3.29**	**1.3**		0.5	U	0.5	U	**0.55**		0.5	U	0.5	U	0.5	U	**3.05**	**1.37**	
Nickel	2	U	**4.7**		**7.1**		2	U	**2.9**		**19.4**		**38.1**	**37.2**		2	U	**4.7**		**7.6**		2	U	**2.9**		**20.3**		**39.5**	**32.8**	
Phosphorus	50	U	50	U	**397**		NT		NT		NT		**497**	**956**		50	U	50	U	**504**		NT		NT		NT		**604**	**807**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**2870**		100	U	NT		NT		NT		NT		NT		100	**2750**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.51**		**1.81**	**0.56**		0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.22**		**1.52**	**0.55**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.18**		**0.680**	**0.24**		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.17**		0.670	**0.23**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**260**		100	U	NT		NT		NT		NT		NT		100	**240**	
Strontium	**5.9**		**21.5**		5	U	**6.7**		5	U	**26.7**		**70.8**	**67.9**		**5.5**		**19.9**		5	U	**7.5**		5	U	**27.8**		**70.7**	**61.7**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.331**		**2.53**	**0.265**		0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.334**		**2.53**	**0.255**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	**15.3**		**9.2**		**6.6**		**710**		**751**	**831**		5	U	5	U	**17.5**		**9.2**		**5.3**		**735**		**777**	**791**	
Uranium	**0.167**		**0.58**		**0.299**		0.05	U	0.05	U	**0.747**		**1.89**	**1.77**		**0.150**		**0.505**		**0.262**		0.05	U	0.05	U	**0.773**		**1.79**	**1.69**	
Vanadium	0.2	U	**0.38**	**J**	**7.12**		**0.33**		**1.23**		**34.7**		**44.0**	**49.1**		0.2	U	**0.64**	**J**	**7.89**		**0.31**		**1.11**		**34.8**		**45.0**	**44.6**	
Zinc	1	U	**27.6**		**25.6**		**3.4**		50	U	**65.7**		**173**	**156**		1	U	**26.3**		**26.1**		**3.5**		50	U	**68.9**		**176**	**129**	

Table 6-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-PZ001														
Sample ID	CH12-204-PZ001_SOC														
Sample Interval (mbgs)	9.15 - 9.6														
Sample Date	6/25/2012														
General Location	CROSS VALLEY DAM - DOWNGRADIENT														
Geologic Unit	ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	50	U	50	U	**236**		**70**		**244**		**13800**		**14450**	**13200**	
Antimony	0.1	U	0.1	U	**0.1**		0.1	U	**0.1**		**0.20**		**0.700**	**0.69**	
Arsenic	0.05	U	**0.077**		**3.16**		**0.88**		**1.60**		**1.9**		**7.67**	**8.17**	
Barium	**16.1**		**17.8**		**4.3**		**4.7**		**6.3**		**87.4**		**137**	**154**	
Beryllium	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.45**		**1.45**	**0.63**	
Bismuth	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.20	0.2	U
Cadmium	0.05	U	**0.109**		0.05	U	0.05	U	0.05	U	**0.087**		**0.396**	**0.345**	
Calcium	**1220**		**14000**		50	U	**857**		NT		**3890**		**20017**	**18700**	
Chromium	5	U	5	U	5	U	5	U	5	U	**40.2**		**65.2**	**45.9**	
Cobalt	0.1	U	**1.70**		**1.46**		0.1	U	**2.01**		**6.41**		**11.8**	**13**	
Copper	0.5	U	**1.05**		**5.84**		**1.3**		**1.09**		**13.7**		**23.5**	**28.9**	
Iron	50	U	**130**		**2430**		**316**		**3760**		**15900**		**22586**	**23000**	
Lead	0.5	U	**1.84**		**4.9**		**3.87**		**0.64**		**7.69**		**19.4**	**22.4**	
Lithium	5	U	5	U	5	U	5	U	5	U	**27.5**		**52.5**	**24.3**	
Manganese	5	U	**164**				5	U	**20.7**		**134**		**329**	**388**	
Molybdenum	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.00	**0.77**	
Nickel	2	U	2	U	**2.8**		2	U	**8.2**		**25.4**		**42.4**	**45.6**	
Phosphorus	50	U	50	U	**118**		NT		NT		NT		**218**	**816**	
Potassium	100	U	NT		NT		NT		NT		NT		100	**1650**	
Selenium	0.2	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.4**		**1.70**	**1.36**	
Silver	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.1**		0.600	**0.11**	
Sodium	100	U	NT		NT		NT		NT		NT		100	**340**	
Strontium	5	U	**31.8**		5	U	5	U	5	U	**37.7**		**89.5**	**74.8**	
Thallium	0.05	U	0.05	U	0.05	U	0.05	U	2	U	**0.195**		**2.40**	**0.144**	
Tin	2	U	2	U	2	U	2	U	2	U	2	U	12.0	2	U
Titanium	5	U	5	U	5	U	5	U	5	U	**396**		**421**	**407**	
Uranium	0.05	U	**0.054**		0.05	U	0.05	U	**0.106**		**0.558**		**0.868**	**0.889**	
Vanadium	0.2	U	0.20	U	**2.68**		**0.25**		**2.48**		**28**		**33.8**	**34.8**	
Zinc	1	U	**1.7**		**6.7**		**1.5**		50	U	**54.3**		**115**	**82**	

Table 6-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:
Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC

The six individual extraction steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.

Bold indicates the analyte was detected

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
NT = not tested
PYRO = Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLN = Bound to crystalline oxide

Table 6-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW001B															CH12-204-MW001B													
Sample ID	CH12-204-MW001B_SOB															CH12-204-MW001B_SOH													
Sample Interval (mbgs)	4.75 - 5.03															36.4 - 36.6													
Sample Date	6/28/2012															6/30/2012													
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.3%	U	0.3%	U	**1.3%**		**0.4%**		**2.4%**		**95.2%**		**100%**	**14600**		0.2%	U	0.2%	U	**0.5%**		0.2%	U	**0.2%**		**98.8%**		**103%**	**30000**	
Antimony	13.7%	U	13.7%	U	13.7%	U	13.7%	U	**26.0%**		**19.2%**		**114%**	**0.64**		9.7%	U	9.7%	U	**15.5%**		9.7%	U	9.7%	U	**45.6%**		**161%**	**0.64**	
Arsenic	0.5%	U	**0.5%**		**22.5%**		**8.6%**		**41.1%**		**26.7%**		**77%**	**12**		0.4%	U	**0.6%**		**11.1%**		**1.3%**		3.6%	U	**83.0%**		**93%**	**14.7**	
Barium	**10.1%**		**10.7%**		**3.9%**		**3.9%**		**5.7%**		**65.7%**		**95%**	**190**		**15.1%**		**12.4%**		8.0%	U	8.0%	U	8.0%	U	**48.6%**		**124%**	**20.2**	
Beryllium	14.2%	U	14.2%	U	14.2%	U	14.2%	U	14.2%	U	**29.1%**		**220%**	**0.64**		16.1%	U	16.1%	U	16.1%	U	16.1%	U	16.1%	U	**19.4%**		**253%**	**0.49**	
Bismuth	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	462%	**0.26**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	0.2	U
Cadmium	12.2%	U	**28.0%**		12.2%	U	12.2%	U	12.2%	U	**23.4%**		**126%**	**0.325**		15.6%	U	15.6%	U	15.6%	U	15.6%	U	15.6%	U	**22.1%**		**321%**	**0.1**	
Calcium	**7.2%**		**67.6%**		0.3%	U	**5.8%**				**19.0%**		**96%**	**15700**		**2.1%**		**56.8%**		0.2%	U	**0.8%**				**40.1%**		**80%**	**34400**	
Chromium	8.2%	U	8.2%	U	8.2%	U	8.2%	U	8.2%	U	**59.2%**		**152%**	**40.3**		1.4%	U	1.4%	U	1.4%	U	1.4%	U	1.4%	U	**92.8%**		**110%**	**315**	
Cobalt	0.8%	U	**12.4%**		**22.1%**		0.8%	U	**14.2%**		**49.8%**		**87%**	**15.1**		0.2%	U	**1.5%**		**2.7%**		0.2%	U	**0.5%**		**94.9%**		**98%**	**44.1**	
Copper	1.7%	U	**1.8%**		**6.4%**		**4.1%**		**7.8%**		**78.1%**		**88%**	**33.2**		0.4%	U	**0.9%**		**1.3%**		**0.4%**		0.4%	U	**96.7%**		**91%**	**151**	
Iron	0.2%	U	**0.3%**		**4.2%**		**1.5%**		**27.6%**		**66.3%**		**91%**	**30300**		0.1%	U	**0.8%**		**4.5%**		**0.1%**		**0.7%**		**93.8%**		**101%**	**64700**	
Lead	0.6%	U	**16.8%**		**10.9%**		**16.1%**		**4.7%**		**50.8%**		**84%**	**96.9**		6.9%	U	**12.3%**		6.9%	U	**9.5%**		6.9%	U	**57.4%**		**130%**	**5.57**	
Lithium	9.6%	U	9.6%	U	9.6%	U	9.6%	U	9.6%	U	**52.1%**		**187%**	**27.9**		6.7%	U	6.7%	U	6.7%	U	6.7%	U	6.7%	U	**66.7%**		**167%**	**45**	
Manganese	**1.6%**		**34.6%**				**2.1%**		**13.1%**		**48.7%**		**74%**	**439**		**1.0%**		**24.7%**				**1.4%**		**2.4%**		**70.5%**		**80%**	**779**	
Molybdenum	14.5%	U	14.5%	U	14.5%	U	14.5%	U	**27.5%**		14.5%	U	**250%**	**1.38**		13.1%	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**34.7%**		**255%**	**1.5**	
Nickel	4.9%	U	4.9%	U	**6.6%**		4.9%	U	**25.1%**		**53.6%**		**100%**	**40.7**		1.1%	U	**1.5%**		**2.5%**		1.1%	U	1.1%	U	**92.6%**		**91%**	**198**	
Phosphorus	16.5%	U	16.5%	U	**67.0%**								**42%**	**725**		24.0%	U	24.0%	U	**51.9%**								**21%**	**986**	
Potassium	100.0%	U											4%	**2570**		100.0%	U											26%	**390**	
Selenium	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U	750%	**0.2**		12.4%	U	12.4%	U	12.4%	U	12.4%	U	31.1%	U	**19.3%**		**596%**	**0.27**	
Silver	14.5%	U	14.5%	U	14.5%	U	14.5%	U	14.5%	U	**27.5%**		**300%**	**0.23**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	0.1	U
Sodium	100.0%	U											32%	**310**		100.0%	U											77%	**130**	
Strontium	6.2%	U	**37.5%**		6.2%	U	6.2%	U	6.2%	U	**37.6%**		**105%**	**76.5**		3.1%	U	**50.3%**		3.1%	U	**6.3%**		3.1%	U	**34.0%**		**89%**	**180**	
Thallium	2.0%	U	2.0%	U	2.0%	U	2.0%	U	80.2%	U	**11.8%**		**913%**	**0.273**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	85.5%	U	**5.9%**		**4678%**	0.05	U
Tin	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U
Titanium	1.0%	U	1.0%	U	1.0%	U	1.0%	U	**1.5%**		**94.4%**		**87%**	**558**		2.6%	U	2.6%	U	2.6%	U	2.6%	U	2.6%	U	**86.8%**		**87%**	**219**	
Uranium	5.4%	U	**6.2%**		**9.1%**		5.4%	U	**18.5%**		**55.4%**		**91%**	**1.01**		**6.6%**		**51.1%**		**16.7%**		4.0%	U	**4.5%**		**17.2%**		**124%**	**1.01**	
Vanadium	0.6%	U	0.6%	U	**3.5%**		**0.6%**		**14.0%**		**80.8%**		**98%**	**37**		0.1%	U	**0.3%**		**3.2%**		0.1%	U	**0.5%**		**95.8%**		**99%**	**139**	
Zinc	0.7%	U	**1.5%**		**3.2%**		**2.9%**		**42.7%**		**49.1%**		**92%**	**162**		0.8%	U	**1.7%**		**1.9%**		0.8%	U	40.4%	U	**54.4%**		**169%**	**73.1**	

Table 6-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW002B															CH12-204-MW002B														
Sample ID	CH12-204-MW002B_SOB															CH12-204-MW002B_SOC														
Sample Interval (mbgs)	4.6 - 6.1															9.3 - 10														
Sample Date	7/6/2012															7/6/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.2%	U	0.2%	U	**1.2%**		0.2%	U	**2.0%**		**96.1%**		**85%**	**24800**		0.2%	U	0.2%	U	**2.7%**		**1.3%**		**4.5%**		**91.1%**		**100%**	**23200**	
Antimony	11.8%	U	11.8%	U	11.8%	U	11.8%	U	**23.5%**		**29.4%**		**109%**	**0.78**		7.0%	U	**9.1%**		**28.0%**		7.0%	U	**23.8%**		**25.2%**		**116%**	**1.23**	
Arsenic	0.1%	U	**0.2%**		**12.3%**		**5.8%**		**60.6%**		**20.9%**		**77%**	**48.1**		0.5%	U	**1.2%**		**14.0%**		**4.7%**		**28.7%**		**50.9%**		**104%**	**10.2**	
Barium	**19.8%**		**22.1%**		**10.9%**		**8.4%**		**11.0%**		**27.8%**		**72%**	**294**		**12.7%**		**23.3%**		**2.6%**		**6.5%**		**12.2%**		**42.7%**		**112%**	**237**	
Beryllium	13.1%	U	13.1%	U	13.1%	U	13.1%	U	13.1%	U	**34.6%**		**168%**	**0.91**		11.8%	U	11.8%	U	**14.8%**		11.8%	U	**13.6%**		**36.1%**		**156%**	**1.08**	
Bismuth	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	400%	**0.3**		15.2%	U	15.2%	U	15.2%	U	15.2%	U	15.2%	U	**24.2%**		**259%**	**0.51**	
Cadmium	12.7%	U	**21.8%**		12.7%	U	**15.7%**		**16.5%**		**20.8%**		**88%**	**0.45**		6.1%	U	**40.8%**		6.1%	U	6.1%	U	6.1%	U	**34.8%**		**105%**	**0.781**	
Calcium	**16.6%**		**9.5%**		0.7%	U	**8.3%**				**64.9%**		**90%**	**8230**		**16.0%**		**58.6%**		0.4%	U	**3.6%**				**21.3%**		**73%**	**15300**	
Chromium	3.1%	U	3.1%	U	3.1%	U	3.1%	U	3.1%	U	**84.3%**		**214%**	**74.2**		5.3%	U	5.3%	U	5.3%	U	5.3%	U	5.3%	U	**73.4%**		**141%**	**66.8**	
Cobalt	0.5%	U	0.5%	U	**19.6%**		0.5%	U	**26.4%**		**52.6%**		**84%**	**25.4**		**1.1%**		**7.0%**		**13.9%**		**1.3%**		**19.8%**		**56.9%**		**117%**	**18.6**	
Copper	1.5%	U	**1.9%**		**9.9%**		**1.7%**		**2.6%**		**82.3%**		**78%**	**42.8**		1.0%	U	**10.1%**		**20.0%**		**7.1%**		**5.4%**		**56.4%**		**110%**	**46.9**	
Iron	0.1%	U	0.1%	U	**6.9%**		**0.8%**		**33.5%**		**58.5%**		**86%**	**51200**		0.1%	U	**0.8%**		**10.7%**		**0.9%**		**20.1%**		**67.4%**		**120%**	**38100**	
Lead	2.6%	U	2.6%	U	**16.3%**		**5.5%**		**15.1%**		**58.0%**		**63%**	**30.6**		0.5%	U	**47.0%**		**2.0%**		**14.0%**		**3.4%**		**33.0%**		**107%**	**95.2**	
Lithium	7.8%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**60.9%**		**151%**	**42.5**		7.3%	U	7.3%	U	7.3%	U	7.3%	U	7.3%	U	**63.7%**		**155%**	**44.5**	
Manganese	1.4%	U	**9.0%**				**4.2%**		**21.4%**		**64.0%**		**44%**	**827**		**5.8%**		**22.4%**				**4.1%**		**15.1%**		**52.5%**		**82%**	**628**	
Molybdenum	12.6%	U	12.6%	U	**15.9%**		12.6%	U	**33.8%**		12.6%	U	**167%**	**2.38**		11.4%	U	11.4%	U	11.4%	U	11.4%	U	**22.4%**		**31.8%**		**240%**	**1.82**	
Nickel	2.3%	U	2.3%	U	**7.6%**		2.3%	U	**24.9%**		**60.5%**		**113%**	**75.6**		2.8%	U	**7.4%**		**13.0%**		2.8%	U	**19.6%**		**54.5%**		**119%**	**60**	
Phosphorus	22.7%	U	22.7%	U	**54.5%**								**29%**	**753**		8.7%	U	8.7%	U	**82.5%**								**72%**	**800**	
Potassium	100.0%	U											4%	**2790**		**100.0%**												4%	**3350**	
Selenium	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U	600%	**0.25**		11.9%	U	11.9%	U	11.9%	U	11.9%	U	29.8%	U	**22.6%**		**224%**	**0.75**	
Silver	20.0%	U	20.0%	U	20.0%	U	20.0%	U	20.0%	U	**#VALUE!**		**294%**	**0.17**		12.0%	U	12.0%	U	12.0%	U	12.0%	U	12.0%	U	**39.8%**		**237%**	**0.35**	
Sodium	100.0%	U											14%	**710**		100.0%	U											31%	**320**	
Strontium	**8.0%**		6.6%	U	6.6%	U	6.6%	U	6.6%	U	**65.4%**		**114%**	**66.2**		**10.4%**		**27.3%**		6.8%	U	**10.1%**		**11.4%**		**34.1%**		**104%**	**71.4**	
Thallium	2.0%	U	2.0%	U	2.0%	U	2.0%	U	81.5%	U	**10.4%**		**893%**	**0.275**		1.9%	U	1.9%	U	1.9%	U	1.9%	U	76.5%	U	**15.9%**		**852%**	**0.307**	
Tin	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U
Titanium	1.1%	U	1.1%	U	1.1%	U	1.1%	U	1.1%	U	**94.7%**		**83%**	**568**		0.7%	U	0.7%	U	**1.5%**		**1.7%**		**5.3%**		**90.0%**		**99%**	**701**	
Uranium	5.2%	U	**10.9%**		**8.4%**		5.2%	U	**17.6%**		**52.7%**		**105%**	**0.921**		**6.1%**		**19.8%**		**16.1%**		**2.2%**		**9.3%**		**46.5%**		**98%**	**2.36**	
Vanadium	0.5%	U	0.5%	U	**2.9%**		0.5%	U	**9.1%**		**86.6%**		**90%**	**49.2**		0.3%	U	0.3%		**9.9%**		**1.2%**		**10.5%**		**77.8%**		**110%**	**58.6**	
Zinc	0.8%	U	0.8%	U	**2.9%**		0.8%	U	39.7%	U	**55.0%**		**105%**	**120**		0.5%	U	**4.4%**		**15.1%**		**1.9%**		22.8%	U	**55.3%**		**114%**	**192**	

Table 6-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW002B															CH12-204-MW003B													
Sample ID	CH12-204-MW002B_SOF															CH12-204-MW003B_SOC													
Sample Interval (mbgs)	26 - 27															9.6 - 10.4													
Sample Date	7/6/2012															7/4/2012													
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	**44.8%**		1.7%	U	1.7%	U	**3.1%**		1.7%	U	**46.9%**		**97%**	**2950**		0.4%	U	**0.4%**		**3.4%**		**0.5%**		**2.3%**		**93.1%**		**91%**	**14300**	
Antimony	**0.7%**		**0.9%**		**1.7%**		**5.4%**		**5.9%**		**85.5%**		**85%**	**68.3**		4.5%	U	**5.8%**		**33.5%**		4.5%	U	**18.8%**		**33.0%**		**91%**	**2.47**	
Arsenic	**23.0%**		**0.6%**		**3.0%**		**0.8%**		**3.2%**		**69.4%**		**91%**	**268**		0.4%	U	**1.2%**		**23.1%**		**2.9%**		**25.8%**		**46.4%**		**86%**	**13.4**	
Barium	7.9%	U	7.9%	U	7.9%	U	7.9%	U	**36.6%**		**31.9%**		**144%**	**17.7**		**7.7%**		**8.1%**		**2.1%**		**4.1%**		**4.8%**		**73.2%**		**109%**	**329**	
Beryllium	**20.6%**		15.9%	U	15.9%	U	15.9%	U	15.9%	U	15.9%	U	**341%**	**0.37**		15.4%	U	15.4%	U	15.4%	U	15.4%	U	15.4%	U	**23.1%**		**217%**	**0.6**	
Bismuth	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	0.2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	364%	**0.33**	
Cadmium	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	0.05	U	4.9%	U	**47.2%**		4.9%	U	4.9%	U	4.9%	U	**33.3%**		**102%**	**1.01**	
Calcium	**75.3%**		6.2%	U	6.2%	U	6.2%	U			6.2%	U	**106%**	**765**		**8.0%**		**59.8%**		0.3%	U	**2.0%**				**29.9%**		**85%**	**17900**	
Chromium	**19.1%**		16.2%	U	16.2%	U	16.2%	U	16.2%	U	16.2%	U	**300%**	**10.3**		7.8%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**60.9%**		**143%**	**44.7**	
Cobalt	**69.6%**		1.1%	U	1.1%	U	1.1%	U	1.1%	U	**26.1%**		**143%**	**6.45**		0.7%	U	**6.3%**		**20.0%**		**0.8%**		**21.2%**		**51.1%**		**91%**	**16.6**	
Copper	**17.1%**		6.0%	U	**11.7%**		6.0%	U	6.0%	U	**53.1%**		**112%**	**7.38**		1.3%	U	**11.5%**		**25.2%**		**6.2%**		1.3%	U	**54.5%**		**90%**	**42.7**	
Iron	**27.5%**		**0.4%**		**0.7%**		**0.1%**		**4.4%**		**66.9%**		**123%**	**84700**		0.2%	U	**2.3%**		**14.9%**		**0.3%**		**21.0%**		**61.3%**		**89%**	**33200**	
Lead	5.2%	U	5.2%	U	**8.2%**		5.2%	U	5.2%	U	**71.1%**		**108%**	**8.93**		3.0%	U	**23.6%**		3.0%	U	**16.6%**		3.0%	U	**50.7%**		**79%**	**20.9**	
Lithium	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	5	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U	10.8%	U	**45.9%**		**186%**	**24.8**	
Manganese	**39.9%**		15.0%	U			15.0%	U	15.0%	U	15.0%	U	**295%**	**11.3**		**5.7%**		**43.7%**				**2.4%**		**9.1%**		**39.0%**		**67%**	**701**	
Molybdenum	16.2%	U	16.2%	U	16.2%	U	16.2%	U	**19.1%**		16.2%	U	**155%**	**2**		11.8%	U	11.8%	U	11.8%	U	11.8%	U	**40.2%**		**12.7%**		**138%**	**3.09**	
Nickel	**50.3%**		5.9%	U	5.9%	U	5.9%	U	5.9%	U	**26.2%**		**168%**	**20.2**		3.8%	U	**5.3%**		**13.3%**		3.8%	U	**21.6%**		**52.3%**		**102%**	**52.5**	
Phosphorus	**56.9%**		21.6%	U	21.6%	U							**294%**	**79**		8.9%	U	8.9%	U	**82.1%**								**49%**	**1140**	
Potassium	100.0%	U											6%	**1710**		100.0%	U											5%	**1950**	
Selenium	8.7%	U	8.7%	U	8.7%	U	8.7%	U	21.6%	U	**43.7%**		**196%**	**1.18**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	26.2%	U	**31.9%**		**174%**	**1.1**	
Silver	7.0%	U	7.0%	U	7.0%	U	7.0%	U	**12.7%**		**59.2%**		**112%**	**1.27**		13.5%	U	13.5%	U	13.5%	U	13.5%	U	13.5%	U	**32.4%**		**231%**	**0.32**	
Sodium	100.0%	U											100%	100	U	100.0%	U											53%	**190**	
Strontium	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	**457%**	**6.56**		7.1%	U	**29.5%**		7.1%	U	**11.0%**		7.1%	U	**38.2%**		**112%**	**63.1**	
Thallium	**5.6%**		**2.6%**		**3.3%**		**2.2%**		15.9%	U	**70.4%**		**127%**	**9.87**		2.0%	U	2.0%	U	2.0%	U	2.0%	U	81.0%	U	**10.9%**		**1098%**	**0.225**	
Tin	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U
Titanium	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	500%	**6**		1.0%	U	1.0%	U	**1.8%**		1.0%	U	**2.4%**		**92.9%**		**101%**	**511**	
Uranium	**54.8%**		8.1%	U	8.1%	U	8.1%	U	8.1%	U	**12.9%**		**132%**	**0.471**		**5.7%**		**20.6%**		**16.7%**		2.7%	U	**7.6%**		**46.6%**		**103%**	**1.79**	
Vanadium	**33.6%**		4.3%	U	**4.3%**		4.3%	U	**7.3%**		**46.1%**		**102%**	**4.57**		0.4%	U	0.4%	U	**11.3%**		**0.7%**		**10.4%**		**76.8%**		**95%**	**50.3**	
Zinc	**49.8%**		0.9%	U	0.9%	U	0.9%	U	46.5%	U	0.9%	U	**234%**	**45.9**		0.6%	U	**8.1%**		**12.0%**		**1.1%**		31.5%	U	**46.7%**		**111%**	**143**	

Table 6-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW004B															CH12-204-MW005B													
Sample ID	CH12-204-MW004B_SOB															CH12-204-MW005B_SOB													
Sample Interval (mbgs)	4.6 - 7.6															1.8 - 2.2													
Sample Date	7/2/2012															7/8/2012													
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.3%	U	0.3%	U	**3.9%**		**0.7%**		**1.4%**		**93.5%**		**93%**	**20800**		0.4%	U	**0.4%**		**4.3%**		0.4%	U	**1.9%**		**92.6%**		**103%**	**11500**	
Antimony	11.8%	U	11.8%	U	**25.9%**		11.8%	U	**16.5%**		**22.4%**		**125%**	**0.68**		12.8%	U	12.8%	U	12.8%	U	12.8%	U	**16.7%**		**32.1%**		**166%**	**0.47**	
Arsenic	0.4%	U	**1.5%**		**32.6%**		**10.2%**		**30.9%**		**24.4%**		**67%**	**18**		0.7%	U	**0.8%**		**27.5%**		**4.2%**		**29.7%**		**37.2%**		**122%**	**6.28**	
Barium	**24.3%**		**12.8%**		**1.7%**		**5.2%**		**8.4%**		**47.4%**		**85%**	**188**		**35.8%**		**12.0%**		**2.6%**		**2.8%**		**4.5%**		**42.2%**		**96%**	**95.2**	
Beryllium	12.7%	U	12.7%	U	12.7%	U	12.7%	U	12.7%	U	**36.3%**		**173%**	**0.91**		14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**28.6%**		**241%**	**0.58**	
Bismuth	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	324%	**0.37**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	197%	**0.61**	
Cadmium	9.8%	U	**26.0%**		9.8%	U	**9.8%**		9.8%	U	**34.6%**		107%	**0.476**		10.1%	U	**33.7%**		**13.9%**		10.1%	U	10.1%	U	**22.0%**		81%	**0.612**	
Calcium	**14.6%**		**2.4%**		0.9%	U	**10.0%**				**72.1%**		**90%**	**6050**		**14.8%**		**2.4%**		1.2%	U	**4.7%**				**76.9%**		**126%**	**3410**	
Chromium	7.8%	U	7.8%	U	7.8%	U	7.8%	U	7.8%	U	**61.1%**		**131%**	**49**		10.5%	U	10.5%	U	10.5%	U	10.5%	U	10.5%	U	**47.7%**		**155%**	**30.8**	
Cobalt	0.6%	U	**1.1%**		**17.3%**		**1.1%**		**15.0%**		**64.9%**		**88%**	**19**		1.2%	U	1.2%	U	**24.4%**		1.2%	U	**13.0%**		**58.9%**		**96%**	**8.39**	
Copper	1.2%	U	**9.9%**		**28.5%**		**3.6%**		**2.3%**		**54.5%**		**88%**	**48.4**		2.2%	U	**9.8%**		**37.3%**		2.2%	U	**3.9%**		**44.6%**		**66%**	**34.4**	
Iron	75.2%	U	**5.7%**		**3.8%**		**2.8%**		**2.0%**		**10.5%**		**0.14%**	**47100**		0.3%	U	0.3%	U	**8.5%**		**0.8%**		**17.5%**		**72.5%**		**92%**	**18500**	
Lead	3.0%	U	**23.6%**		3.0%	U	**16.6%**		3.0%	U	**50.7%**		**81%**	**20.5**		4.1%	U	**15.3%**		**26.9%**		**8.5%**		**5.8%**		**39.4%**		**74%**	**16.4**	
Lithium	7.4%	U	7.4%	U	7.4%	U	7.4%	U	7.4%	U	**63.2%**		**192%**	**35.4**		10.1%	U	10.1%	U	10.1%	U	10.1%	U	10.1%	U	**49.3%**		**214%**	**23**	
Manganese	1.8%	U	**1.8%**				1.8%	U	**17.8%**		**76.8%**		**88%**	**318**		3.4%	U	**11.4%**				3.4%	U	**9.4%**		**72.4%**		**63%**	**232**	
Molybdenum	15.7%	U	15.7%	U	**17.0%**		15.7%	U	**20.1%**		15.7%	U	**167%**	**1.9**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	278%	**1.08**	
Nickel	2.9%	U	2.9%	U	**15.3%**		2.9%	U	**12.4%**		**63.7%**		**91%**	**76.1**		7.1%	U	7.1%	U	7.1%	U	7.1%	U	**13.2%**		**58.4%**		**104%**	**26.9**	
Phosphorus	12.5%	U	12.5%	U	**75.1%**								**50%**	**796**		28.1%	U	28.1%	U	**43.8%**								**31%**	**571**	
Potassium	100.0%	U											5%	**2040**		100.0%	U											11%	**950**	
Selenium	13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U	250%	**0.6**		13.3%	U	13.3%	U	13.3%	U	13.3%	U	33.3%	U	13.3%	U	517%	**0.29**	
Silver	16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**18.0%**		**359%**	**0.17**		16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	545%	**0.11**	
Sodium	100.0%	U											17%	**590**		100.0%	U											48%	**210**	
Strontium	8.6%	U	8.6%	U	8.6%	U	8.6%	U	8.6%	U	**57.0%**		**102%**	**57.2**		7.9%	U	7.9%	U	7.9%	U	7.9%	U	7.9%	U	**60.7%**		**216%**	**29.5**	
Thallium	1.9%	U	1.9%	U	1.9%	U	1.9%	U	76.3%	U	**16.1%**		**871%**	**0.301**		2.1%	U	2.1%	U	2.1%	U	2.1%	U	85.2%	U	**6.3%**		**1878%**	**0.125**	
Tin	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U
Titanium	0.6%	U	0.6%	U	**1.5%**		**0.9%**		**0.7%**		**95.8%**		**128%**	**683**		1.6%	U	1.6%	U	**1.7%**		1.6%	U	1.6%	U	**91.9%**		**90%**	**345**	
Uranium	3.6%	U	**29.3%**		**17.8%**		3.6%	U	**6.5%**		**39.3%**		**103%**	**1.36**		3.9%	U	**32.2%**		**17.8%**		3.9%	U	**4.5%**		**37.6%**		**97%**	**1.31**	
Vanadium	0.4%	U	**0.5%**		**11.8%**		**1.2%**		**6.7%**		**79.3%**		**95%**	**49.9**		0.8%	U	0.8%	U	**7.1%**		0.8%	U	**8.1%**		**82.3%**		**96%**	**25.2**	
Zinc	0.6%	U	**1.4%**		**7.2%**		**1.9%**		31.9%	U	**57.0%**		**130%**	**121**		0.5%	U	**5.1%**		**11.2%**		**1.5%**		27.4%	U	**54.2%**		**93.7%**	**195**	

Table 6-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-MW005B															CH12-204-MW005B													
Sample ID	CH12-204-MW005B_SOD															CH12-204-MW905B_SOD													
Sample Interval (mbgs)	5.7 - 6.1															5.7 - 6.1													
Sample Date	7/8/2012															7/8/2012													
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.3%	U	0.3%	U	**2.7%**		**1.0%**		**1.8%**		**93.8%**		**101%**	**14500**		0.3%	U	0.3%	U	**2.9%**		**0.9%**		**1.6%**		**93.8%**		**107%**	**13700**	
Antimony	7.3%	U	**8.0%**		**54.0%**		7.3%	U	7.3%	U	**16.1%**		**105%**	**1.31**		7.7%	U	**10.8%**		**50.0%**		7.7%	U	7.7%	U	**16.2%**		**110%**	**1.18**	
Arsenic	0.6%	U	**3.7%**		**56.9%**		**3.9%**		**7.0%**		**27.9%**		**81%**	**10.5**		0.6%	U	**4.5%**		**59.4%**		**3.8%**		**5.9%**		**25.9%**		**94%**	**9.2**	
Barium	**12.4%**		**9.5%**		**2.1%**		**6.1%**		**4.6%**		**65.2%**		**93%**	**326**		**11.5%**		**8.8%**		**2.6%**		**6.2%**		**4.6%**		**66.3%**		**108%**	**287**	
Beryllium	14.2%	U	14.2%	U	14.2%	U	14.2%	U	14.2%	U	**29.1%**		**207%**	**0.68**		14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	**28.6%**		**222%**	**0.63**	
Bismuth	16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**18.0%**		**305%**	**0.4**		16.4%	U	16.4%	U	16.4%	U	16.4%	U	16.4%	U	**18.0%**		**349%**	**0.35**	
Cadmium	6.4%	U	**55.5%**		6.4%	U	6.4%	U	6.4%	U	**18.9%**		**101%**	**0.774**		6.6%	U	**52.4%**		6.6%	U	6.6%	U	6.6%	U	**21.3%**		**111%**	**0.683**	
Calcium	**14.0%**		**58.6%**		0.4%	U	**2.8%**				**24.1%**		**75%**	**16800**		**13.8%**		**57.4%**		0.4%	U	**3.1%**				**25.3%**		**85%**	**14000**	
Chromium	9.2%	U	9.2%	U	9.2%	U	9.2%	U	9.2%	U	**54.2%**		**151%**	**36.2**		9.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**55.2%**		**178%**	**31.4**	
Cobalt	**1.2%**		**12.8%**		**24.4%**		**1.9%**		**7.2%**		**52.4%**		**94%**	**13.7**		**1.1%**		**12.2%**		**24.7%**		**2.4%**		**6.9%**		**52.7%**		**113%**	**11.9**	
Copper	1.9%	U	**13.4%**		**32.0%**		**8.7%**		**3.9%**		**40.2%**		**86%**	**30.5**		1.8%	U	**10.3%**		**33.1%**		**9.1%**		**3.6%**		**42.0%**		**99%**	**27.7**	
Iron	0.2%	U	**2.9%**		**19.8%**		**0.8%**		**6.5%**		**69.8%**		**89%**	**28400**		0.2%	U	**3.4%**		**18.2%**		**0.7%**		**6.0%**		**71.5%**		**102%**	**25500**	
Lead	2.5%	U	**17.8%**		**2.7%**		**39.1%**		**3.3%**		**34.7%**		**89%**	**22.9**		2.5%	U	**22.4%**		2.5%	U	**35.5%**		**3.3%**		**33.7%**		**96%**	**20.5**	
Lithium	9.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**55.0%**		**177%**	**31.3**		9.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**54.8%**		**186%**	**29.8**	
Manganese	**8.0%**		**36.5%**				**3.6%**		**4.2%**		**47.6%**		**74%**	**554**		**5.0%**		**38.4%**				**3.9%**		**4.3%**		**48.3%**		**84%**	**479**	
Molybdenum	15.2%	U	15.2%	U	**24.0%**		15.2%	U	15.2%	U	15.2%	U	**253%**	**1.3**		16.4%	U	16.4%	U	**18.0%**		16.4%	U	16.4%	U	16.4%	U	**223%**	**1.37**	
Nickel	5.2%	U	**12.3%**		**18.6%**		5.2%	U	**7.6%**		**50.9%**		**102%**	**37.2**		5.1%	U	**11.9%**		**19.2%**		5.1%	U	**7.3%**		**51.4%**		**120%**	**32.8**	
Phosphorus	10.1%	U	10.1%	U	**79.9%**								**52%**	**956**		8.3%	U	8.3%	U	**83.4%**								**75%**	**807**	
Potassium	100.0%	U											3%	**2870**		100.0%	U											4%	**2750**	
Selenium	11.0%	U	11.0%	U	11.0%	U	11.0%	U	27.6%	U	**28.2%**		**323%**	**0.56**		13.2%	U	13.2%	U	13.2%	U	13.2%	U	32.9%	U	**14.5%**		**276%**	**0.55**	
Silver	14.7%	U	14.7%	U	14.7%	U	14.7%	U	14.7%	U	**26.5%**		**283%**	**0.24**		14.9%	U	14.9%	U	14.9%	U	14.9%	U	14.9%	U	**25.4%**		291%	**0.23**	
Sodium	100.0%	U											38%	**260**		100.0%	U											42%	**240**	
Strontium	**8.3%**		**30.4%**		7.1%	U	**9.5%**		7.1%	U	**37.7%**		**104%**	**67.9**		**7.8%**		**28.1%**		7.1%	U	**10.6%**		7.1%	U	**39.3%**		**115%**	**61.7**	
Thallium	2.0%	U	2.0%	U	2.0%	U	2.0%	U	79.0%	U	**13.1%**		**955%**	**0.265**		2.0%	U	2.0%	U	2.0%	U	2.0%	U	78.9%	U	**13.2%**		**994%**	**0.255**	
Tin	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U
Titanium	0.7%	U	0.7%	U	**2.0%**		**1.2%**		**0.9%**		**94.5%**		**90%**	**831**		0.6%	U	0.6%	U	**2.3%**		**1.2%**		**0.7%**		**94.6%**		**98%**	**791**	
Uranium	**8.8%**		**30.6%**		**15.8%**		2.6%	U	2.6%	U	**39.5%**		**107%**	**1.77**		**8.4%**		**28.2%**		**14.6%**		2.8%	U	2.8%	U	**43.2%**		**106%**	**1.69**	
Vanadium	0.5%	U	**0.9%**	**J**	**16.2%**		**0.8%**		**2.8%**		**78.9%**		**90%**	**49.1**		0.4%	U	**1.4%**	**J**	**17.6%**		**0.7%**		**2.5%**		**77.4%**		**101%**	**44.6**	
Zinc	0.6%	U	**15.9%**		**14.8%**		**2.0%**		28.9%	U	**37.9%**		**111%**	**156**		0.6%	U	**15.0%**		**14.8%**		**2.0%**		28.4%	U	**39.2%**		**136%**	**129**	

Table 6-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-204-PZ001														
Sample ID	CH12-204-PZ001_SOC														
Sample Interval (mbgs)	9.15 - 9.6														
Sample Date	6/25/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.3%	U	0.3%	U	**1.6%**		**0.5%**		**1.7%**		**95.5%**		**109%**	**13200**	
Antimony	14.3%	U	14.3%	U	**14.3%**		14.3%	U	**14.3%**		**28.6%**		**101%**	**0.69**	
Arsenic	0.7%	U	**1.0%**		**41.2%**		**11.5%**		**20.9%**		**24.8%**		**94%**	**8.17**	
Barium	**11.8%**		**13.0%**		**3.1%**		**3.4%**		**4.6%**		**64.0%**		**89%**	**154**	
Beryllium	13.8%	U	13.8%	U	13.8%	U	13.8%	U	13.8%	U	**31.0%**		**230%**	**0.63**	
Bismuth	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	0.2	U
Cadmium	12.6%	U	**27.5%**		12.6%	U	12.6%	U	12.6%	U	**22.0%**		**115%**	**0.345**	
Calcium	**6.1%**		**69.9%**		0.2%	U	**4.3%**				**19.4%**		**107%**	**18700**	
Chromium	7.7%	U	7.7%	U	7.7%	U	7.7%	U	7.7%	U	**61.7%**		**142%**	**45.9**	
Cobalt	0.8%	U	**14.4%**		**12.4%**		0.8%	U	**17.1%**		**54.4%**		**91%**	**13**	
Copper	2.1%	U	**4.5%**		**24.9%**		**5.5%**		**4.6%**		**58.3%**		**81%**	**28.9**	
Iron	0.2%	U	**0.6%**		**10.8%**		**1.4%**		**16.6%**		**70.4%**		**98%**	**23000**	
Lead	2.6%	U	**9.5%**		**25.2%**		**19.9%**		**3.3%**		**39.6%**		**87%**	**22.4**	
Lithium	9.5%	U	9.5%	U	9.5%	U	9.5%	U	9.5%	U	**52.4%**		**216%**	**24.3**	
Manganese	1.5%	U	**49.9%**				1.5%	U	**6.3%**		**40.8%**		**85%**	**388**	
Molybdenum	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	390%	**0.77**	
Nickel	4.7%	U	4.7%	U	**6.6%**		4.7%	U	**19.3%**		**59.9%**		**93%**	**45.6**	
Phosphorus	22.9%	U	22.9%	U	**54.1%**								**27%**	**816**	
Potassium	100.0%	U											6%	**1650**	
Selenium	11.8%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	**23.5%**		**125%**	**1.36**	
Silver	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	**16.7%**		545%	**0.11**	
Sodium	100.0%	U											29%	**340**	
Strontium	5.6%	U	**35.5%**		5.6%	U	5.6%	U	5.6%	U	**42.1%**		**120%**	**74.8**	
Thallium	2.1%	U	2.1%	U	2.1%	U	2.1%	U	83.5%	U	**8.1%**		**1663%**	**0.144**	
Tin	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	16.7%	U	600%	2	U
Titanium	1.2%	U	1.2%	U	1.2%	U	1.2%	U	1.2%	U	**94.1%**		**103%**	**407**	
Uranium	5.8%	U	**6.2%**		5.8%	U	5.8%	U	**12.2%**		**64.3%**		**98%**	**0.889**	
Vanadium	0.6%	U	0.6%	U	**7.9%**		**0.7%**		**7.3%**		**82.8%**		**97%**	**34.8**	
Zinc	0.9%	U	**1.5%**		**5.8%**		**1.3%**		43.4%	U	**47.1%**		**140%**	**82**	

Table 6-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:
Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC

The six individual steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.

Bold indicates the analyte was detected

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
PYRO - Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLN = Bound to crystalline oxide

Table 6-6. Cross Valley Dam Area Groundwater Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH12-204-MW001A	99.2% (sig +)	88.3% (+)	88.3% (+)		54.8% (+)	59.2% (+)	89.2% (-)
CH12-204-MW001B	75.8% (-)	50.0% (.)	59.2% (-)		59.2% (-)	50.0% (.)	
CH12-204-MW002B	75.8% (-)	97.2% (sig +)	97.2% (sig +)		59.2% (+)	97.2% (sig +)	72.6% (+)
CH12-204-MW003B		95.8% (sig +)	59.2% (-)				
CH12-204-MW004A	59.2% (-)	59.2% (-)	50.0% (.)		80.1% (-)	75.8% (+)	54.0% (+)
CH12-204-MW004B	59.2% (-)	59.2% (+)	75.8% (-)		64.0% (+)	59.2% (-)	84.5% (-)
MW1							
MW2							
P01-02A	100.0% (sig +)	84.9% (+)	100.0% (sig +)	85.1% (-)	67.2% (-)	69.4% (-)	53.7% (+)
P01-02B	100.0% (sig +)	100.0% (sig +)	66.3% (+)	60.4% (-)	98.0% (sig -)	100.0% (sig -)	76.5% (+)
P01-11	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	99.9% (sig -)	100.0% (sig +)	99.5% (sig +)
P03-09-01	98.4% (sig -)	70.5% (+)	78.2% (+)	57.9% (+)	91.8% (+)	57.1% (+)	
P03-09-02	81.9% (-)	99.8% (sig +)	99.7% (sig +)	73.6% (-)	76.7% (+)	100.0% (sig +)	100.0% (sig -)
P03-09-03	100.0% (sig +)	84.7% (-)	99.8% (sig +)	63.1% (+)	53.0% (+)	99.2% (sig +)	57.1% (+)
P03-09-04	100.0% (sig +)	54.7% (-)	100.0% (sig +)	98.2% (sig -)	79.2% (-)	100.0% (sig +)	100.0% (sig -)
P03-09-05	99.9% (sig +)	50.0% (.)	91.7% (+)	63.1% (+)	52.7% (+)	98.9% (sig +)	61.7% (-)
P03-09-06	100.0% (sig +)	85.0% (-)	100.0% (sig +)	86.2% (-)	61.0% (-)	100.0% (sig +)	100.0% (sig -)
P03-09-07	99.9% (sig +)	94.9% (-)	100.0% (sig +)	60.7% (-)	74.7% (+)	100.0% (sig +)	56.7% (-)
P03-09-08	100.0% (sig +)	99.8% (sig -)	100.0% (sig +)	83.6% (-)	99.3% (sig -)	100.0% (sig +)	94.9% (-)
P03-09-09	100.0% (sig +)	96.6% (sig -)	100.0% (sig +)	97.4% (sig -)	91.1% (-)	100.0% (sig +)	53.1% (-)
P05-01-01	73.6% (-)	100.0% (sig +)	100.0% (sig +)	99.6% (sig -)	94.9% (-)	100.0% (sig +)	100.0% (sig -)
P05-01-02	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	97.9% (sig -)	100.0% (sig +)	99.8% (sig -)
P05-01-03	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	99.8% (sig -)	99.9% (sig -)	100.0% (sig +)	97.4% (sig -)
P05-01-04	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	99.9% (sig -)	99.0% (sig -)	100.0% (sig +)	89.9% (-)
P05-01-05	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	100.0% (sig -)	100.0% (sig +)	70.2% (+)
P05-01-06	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	99.7% (sig -)	100.0% (sig +)	83.9% (+)
P05-02	100.0% (sig +)	100.0% (sig +)	100.0% (sig +)	100.0% (sig -)	99.5% (sig -)	100.0% (sig +)	100.0% (sig +)
P05-03	100.0% (sig +)	96.5% (sig +)	100.0% (sig +)	97.1% (sig -)	87.2% (-)	99.9% (sig +)	96.3% (sig -)
P09-C1	98.2% (sig +)	97.2% (sig +)	88.3% (+)	59.2% (-)	50.0% (+)	99.9% (sig +)	
P09-C2	81.0% (+)	98.8% (sig -)	97.3% (sig -)	73.6% (-)	97.9% (sig +)	69.0% (-)	97.9% (sig -)
P09-C3	77.0% (+)	58.0% (+)	100.0% (sig +)	77.0% (-)	63.1% (-)	99.9% (sig +)	96.7% (sig -)
CH12-204-MW001A	↑	NT	NT	ND	NT	NT	NT
CH12-204-MW001B	NT	NT	NT	ND	NT	NT	ND
CH12-204-MW002B	NT	↑	↑	ND	NT	↑	NT
CH12-204-MW003B	ND	↑	NT	ND	ND	ND	ND
CH12-204-MW004A	NT	NT	NT	ND	NT	NT	NT
CH12-204-MW004B	NT	NT	NT	ND	NT	NT	NT
MW1	ND	ND	ND	ND	ND	ND	ND
MW2	ND	ND	ND	ND	ND	ND	ND
P01-02A	↑	NT	↑	NT	NT	NT	NT
P01-02B	↑	↑	NT	NT	↓	↓	NT
P01-11	↑	↑	↑	↓	↓	↑	↑
P03-09-01	↓	NT	NT	NT	NT	NT	ND
P03-09-02	NT	↑	↑	NT	NT	↑	↓
P03-09-03	↑	NT	↑	NT	NT	↑	NT
P03-09-04	↑	NT	↑	↓	NT	↑	↓
P03-09-05	↑	NT	NT	NT	NT	↑	NT
P03-09-06	↑	NT	↑	NT	NT	↑	↓
P03-09-07	↑	NT	↑	NT	NT	↑	NT
P03-09-08	↑	↓	↑	NT	↓	↑	NT
P03-09-09	↑	↓	↑	↓	NT	↑	NT
P05-01-01	NT	↑	↑	↓	NT	↑	↓
P05-01-02	↑	↑	↑	↓	↓	↑	↓
P05-01-03	↑	↑	↑	↓	↓	↑	↓
P05-01-04	↑	↑	↑	↓	↓	↑	NT

Table 6-6. Cross Valley Dam Area Groundwater Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
P05-01-05	↑	↑	↑	↓	↓	↑	NT
P05-01-06	↑	↑	↑	↓	↓	↑	NT
P05-02	↑	↑	↑	↓	↓	↑	↑
P05-03	↑	↑	↑	↓	NT	↑	↓
P09-C1	↑	↑	NT	NT	NT	↑	ND
P09-C2	NT	↓	↓	NT	↑	↓	↓
P09-C3	NT	NT	↑	NT	NT	↑	↓

Notes:

Mann-Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Non-detectable concentrations were reduced to half the non-detectable limit.

Duplicate measurements were removed.

↑ - Significant increasing trend

↓ - Significant decreasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Table 7-1. Faro Pit Seeps 2015 Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
A25	97.8% (sig -)	94.9% (+)	75.6% (-)	50.0% (.)	70.9% (-)	89.2% (-)	82.5% (-)
CH-FP-23							
CH-FP-24							
CH-FP-25					88.3% (-)		
CH-FP-27							
CH-FP-28							
CH-FP-32							
CH-FP-37					50.0% (-)		
CH-FP-38							
CH-FP-39					50.0% (+)		
CH-FP-41							
FP01	50.0% (-)		95.8% (sig +)	75.8% (+)	59.2% (+)	59.2% (+)	95.8% (sig +)
FP02	75.8% (+)		59.2% (+)			95.8% (sig -)	75.8% (-)
FP04							
FP05	99.7% (sig -)	54.8% (-)	54.8% (-)	72.6% (-)	98.4% (sig +)	54.8% (-)	54.8% (+)
FP06	96.9% (sig +)		96.9% (sig +)	98.5% (sig +)	50.0% (+)	80.1% (-)	50.0% (-)
FP07					86.4% (+)		
FP09	98.5% (sig -)		98.5% (sig +)	86.4% (-)	95.8% (sig -)	99.0% (sig +)	80.9% (+)
FP10					75.8% (-)		
FP11	59.2% (+)		59.2% (-)	50.0% (.)	63.1% (-)	59.2% (-)	59.2% (+)
FP12	80.9% (+)		93.2% (+)	97.2% (sig +)	59.2% (-)	93.2% (+)	93.2% (+)
FP13			98.5% (sig -)	89.8% (+)	50.0% (.)	98.5% (sig -)	98.5% (sig -)
FP14		99.9% (sig +)	97.5% (sig +)	75.8% (-)	50.0% (.)	97.5% (sig +)	93.2% (+)
FP15							
FP16							
FP17							
FP18					98.5% (sig -)		
FP20							
A30	100.0% (sig -)	100.0% (sig +)	98.7% (sig +)	100.0% (sig -)	99.7% (sig -)	61.9% (+)	97.3% (sig +)
CH-FP-22							
CH-FP-26							
CH-FP-29					50.0% (+)		
CH-FP-30	95.8% (sig +)		88.3% (+)		59.2% (+)	88.3% (+)	
CH-FP-31	50.0% (-)		86.4% (-)		50.0% (-)	86.4% (-)	50.0% (+)
CH-FP-33	88.3% (-)		75.8% (-)		61.4% (+)	93.8% (-)	75.8% (-)
CH-FP-34	86.4% (+)		86.4% (-)		50.0% (+)	86.4% (-)	97.2% (sig -)
CH-FP-35	75.8% (+)		95.8% (sig -)		50.0% (+)	95.8% (sig -)	88.3% (-)
CH-FP-36			88.3% (-)		97.2% (sig +)	88.3% (-)	75.8% (-)
CH-FP-39					50.0% (+)		
CH-FP-40							
CH-FP-42					59.2% (-)		
SRK-FD40		98.5% (sig -)	98.5% (sig -)		50.0% (.)	98.5% (sig -)	98.5% (sig -)
A25	↓	NT	NT	NT	NT	NT	NT
CH-FP-23	ND	ND	ND	ND	ND	ND	ND
CH-FP-24	ND	ND	ND	ND	ND	ND	ND
CH-FP-25	ND	ND	ND	ND	NT	ND	ND
CH-FP-27	ND	ND	ND	ND	ND	ND	ND
CH-FP-28	ND	ND	ND	ND	ND	ND	ND

Table 7-1. Faro Pit Seeps 2015 Mann-Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH-FP-32	ND	ND	ND	ND	ND	ND	ND
CH-FP-37	ND	ND	ND	ND	NT	ND	ND
CH-FP-38	ND	ND	ND	ND	ND	ND	ND
CH-FP-39	ND	ND	ND	ND	NT	ND	ND
CH-FP-41	ND	ND	ND	ND	ND	ND	ND
FP01	NT	ND	↑	NT	NT	NT	↑
FP02	NT	ND	NT	ND	ND	↓	NT
FP04	ND	ND	ND	ND	ND	ND	ND
FP05	↓	NT	NT	NT	↑	NT	NT
FP06	↑	ND	↑	↑	NT	NT	NT
FP07	ND	ND	ND	ND	NT	ND	ND
FP09	↓	ND	↑	NT	↓	↑	NT
FP10	ND	ND	ND	ND	NT	ND	ND
FP11	NT	ND	NT	NT	NT	NT	NT
FP12	NT	ND	NT	↑	NT	NT	NT
FP13	ND	ND	↓	NT	NT	↓	↓
FP14	ND	↑	↑	NT	NT	↑	NT
FP15	ND	ND	ND	ND	ND	ND	ND
FP16	ND	ND	ND	ND	ND	ND	ND
FP17	ND	ND	ND	ND	ND	ND	ND
FP18	ND	ND	ND	ND	↓	ND	ND
FP20	ND	ND	ND	ND	ND	ND	ND
A30	↓	↑	↑	↓	↓	NT	↑
CH-FP-22	ND	ND	ND	ND	ND	ND	ND
CH-FP-26	ND	ND	ND	ND	ND	ND	ND
CH-FP-29	ND	ND	ND	ND	NT	ND	ND
CH-FP-30	↑	ND	NT	ND	NT	NT	ND
CH-FP-31	NT	ND	NT	ND	NT	NT	NT
CH-FP-33	NT	ND	NT	ND	NT	NT	NT
CH-FP-34	NT	ND	NT	ND	NT	NT	↓
CH-FP-35	NT	ND	↓	ND	NT	↓	NT
CH-FP-36	ND	ND	NT	ND	↑	NT	NT
CH-FP-39	ND	ND	ND	ND	NT	ND	ND
CH-FP-40	ND	ND	ND	ND	ND	ND	ND
CH-FP-42	ND	ND	ND	ND	NT	ND	ND
SRK-FD40	ND	↓	↓	ND	NT	↓	↓

Notes:

Mann-Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Non-detectable concentrations were reduced to half the non-detectable limit.

Duplicate measurements were removed.

↑ - Significant increasing trend

↓ - Significant decreasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Table 8-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC	
	Remediation Unit																						
	Sample ID			CH15-107-MW029_SOb		CH15-107-MW029_SOd		CH15-107-MW030_SOd		CH15-107-MW030_SOf		CH15-107-MW031_SOd		CH15-107-MW931_SOd		CH15-107-MW031_SOf		CH15-107-MW032_SOb		CH15-107-MW032_SOd		CH15-107-MW034_SOb		CH15-107-MW934_SOb		CH15-107-MW034_SOc	
	Sample Interval (mbgs)	12x Median Soil Content [a]	10x Crustal Abundance[b]	0.15 - 0.46 -		1.52 - 1.68		1.83 - 2.13		3.51 - 3.81		1.5 - 2.1		1.5 - 2.1		3.05 - 3.29		0.15 - 0.3		1.98 - 2.29		0 - 0.4		0 - 0.4		0.4 - 0.76	
	Sample Date			8/10/2015		8/10/2015		8/10/2015		8/10/2015		8/7/2015		8/7/2015		8/8/2015		8/9/2015		8/9/2015		8/7/2015		8/7/2015		8/7/2015	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	33,100		27,700		16,800		6,790		16,700		15,100		29,200		15,800		22,700		13,300		13,700		19,700	
Antimony	mg/kg	**60**	2	0.31		0.14		0.27		0.31		0.84		0.99		0.48		0.6		0.12		0.57		0.52		0.43	
Arsenic	mg/kg	**72**	18	5.17		0.76		7.13		2.62		44.2		49		33.8		9.08		2.97		8.03		7.56		3.94	
Barium	mg/kg	**6,000**	4,250	201		140		121		40		74.4		69.8		43.8		131		60.9		127		124		106	
Beryllium	mg/kg	**72**	30	1.64		1.33		1.39		1.34		1.34		1.29		1.68		0.79		2.61		0.94		1.03		1.67	
Bismuth	mg/kg	-	**0.085**	0.74		0.2		2.35		1.36		0.99	J	2.15	J	0.61		0.37		13.4		0.61		0.61		6.65	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.25		0.27		0.16		0.17		0.23		0.24		0.08		0.2		9.52		0.69		0.68		0.14	
Calcium	mg/kg	180,000	**415,000**	6,480		1,800		3,220		2,350		3,600		3,290		1,560		4,560		2,260		5,750		6,570		2,800	
Chromium	mg/kg	840	**1,020**	165		77.7		13		10.7		35.8		33.3		108		34		46.8		27.7		32.3		42.5	
Cobalt	mg/kg	96	**250**	42.9		60.9		15		9.85		45.6		44.1		47.9		11.7		27		12.6		12.8		26.8	
Copper	mg/kg	360	**600**	67.2		54.6		61.9		57.6		36.2		42.8		86.3		22.6		133		54.4		53.1		112	
Iron	mg/kg	480,000	**563,000**	55,400		62,400		41,500		29,700		77,000		74,400		82,800		26,400		77,200		24,700		26,300		48,100	
Lead	mg/kg	**420**	140	8.34		3.77		10.9		19.5		13		13.6		11		13.6		66.5		48.8		34.9		10.4	
Lithium	mg/kg	**300**	200	69.3		83.6		37.4		8.2		43.6		39.1		101		36.2		53		26.1		29.7		54.2	
Magnesium	mg/kg	60,000	**233,000**	14,700		10,200		6,840		1,710		6,920		6,250		12,300		6,730		9,510		4,780		5,220		7,490	
Manganese	mg/kg	**12,000**	9,500	548		657		344		297		1,630		1,740		1,090		383		1,420		355		396		472	
Mercury	mg/kg	0.72	**0.85**	0.01		0.005	U	0.01		0.01		0.01		0.01		0.005	U	0.01		0.01		0.05		0.03		0.0052	
Molybdenum	mg/kg	**24**	12	1.84		1.15		2.91		3.83		38		46.6		12		1.11		9.59		3.21		3.96		10.7	
Nickel	mg/kg	600	**840**	114		63.9		20.3		20.6		87.6		86.2		97.5		32.8		70.9		33.5		32.2		45.3	
Phosphorus	mg/kg	9,600	**10,500**	909		670		638		779		743		772		131		722		674		482		557		684	
Potassium	mg/kg	168,000	**208,500**	8,360		10,300		3,840		1,530		2,260		2,080		1,730		2,370		2,090		2,130		2,440		5,300	
Selenium	mg/kg	**4.8**	0.5	0.23		0.2	U	0.21		0.2	U	0.46		0.54		0.26		0.28		0.36		0.6		0.58		0.3	
Silver	mg/kg	-	**0.75**	0.13		0.1	U	0.14		0.17		0.22		0.23		0.28		0.1	U	1.11		0.31		0.27		0.21	
Sodium	mg/kg	60,000	**235,500**	464		189		227		95		87		85		65		348		50		261		269		166	
Strontium	mg/kg	3,000	**3,700**	41.3		13.9		19.9		9.85		23.5		22.2		15.8		46.2		9.56		47.3		55.4		18	
Sulphur	mg/kg	**8,400**	3,500	800		1,200		800		500		500	U	600		800		600		700		1,100		1,000		900	
Thallium	mg/kg	**108**	8.5	0.88		0.53		0.34		0.1		0.17		0.16		0.15		0.25		0.19		0.22		0.23		0.43	
Tin	mg/kg	**48**	23	2.6		2.6		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	1,780		1,960		558		51.3		172		169		241		775		152		523		583		799	
Uranium	mg/kg	24	**27**	0.97		0.59		1.47		1.92		1.34		1.33		0.8		1.23		1.5		2.18		2.29		1.85	
Vanadium	mg/kg	1,080	**1,200**	96.9		92.7		59.9		17.9		38		35.3		71.4		44.9		44.6		36.8		39		51.7	
Zinc	mg/kg	**1,080**	700	534		242		568		442		136		137		150		62.8		1,070		393		458		86.9	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	7.59		6.67		7.79		7.65		8.14		7.95		7.82		7.11		7.38		6.44		6.59		6.87	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		1		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	NT		NT		0.1	U
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	NT		NT		0.8	U

Table 8-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC	
Remediation Unit																							
Sample ID				CH15-107-MW034_SOf		CH15-107-MW035_SObg		CH15-107-MW935_SObg		CH15-107-MW035_SObi		CH15-107-MW035_SOk		CH15-107-MW935_SOk		CH15-107-MW035_SOv		CH15-107-PZ031_SOd		CH15-107-PZ032_SOc		CH15-107-PZ033_SOe		CH15-107-PZ034_SOe		CH15-107-PZ034_SOv	
Sample Interval (mbgs)	**12x Median Soil Content [a]**	**10x Crustal Abundance[b]**		2.1 - 2.44		48.2 - 49.7		48.2 - 49.7		49.8 - 51.4		10.5 - 11.6		10.5 - 11.6		20.7 - 22.3		3.04 - 3.57		2.3 - 2.4		2.8 - 2.9		4.2 - 4.5		19.2 - 19.7	
Sample Date				8/7/2015		9/2/2015		9/2/2015		9/2/2015		8/29/2015		8/29/2015		8/30/2015		7/26/2015		7/25/2015		8/1/2015		8/5/2015		8/7/2015	
Analyte	**Unit**			Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	mg/kg	**852,000**	823,000	22,100		6,860		6,560		7,560		13,700		14,200		6,620		14,900		16,000		17,800		18,600		17,100	
Antimony	mg/kg	**60**	2	0.23		0.27		0.3		0.26		1.39		1.49		0.28		0.55		0.46		0.5		1.65		1.43	
Arsenic	mg/kg	**72**	18	3.77		8.4		8.31		3.28		98.1	J	35.4	J	13.1		9.92		9.98		8.25		8.99		14.9	
Barium	mg/kg	**6,000**	4,250	132		67.1		63.6		74.8		185		195		137		210		143		212		280		223	
Beryllium	mg/kg	**72**	30	2.52		0.3		0.32		0.52		1.71		1.75		1.27		0.61		0.7		0.78		0.86		0.83	
Bismuth	mg/kg	-	**0.085**	1.84		0.2	U	0.32		0.22		1.4		1.24		1.02		0.22		0.28		0.25		0.25		0.45	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.38		0.2		0.14		0.2		0.39		0.35		0.18		0.25		0.25		0.27		0.61		0.68	
Calcium	mg/kg	180,000	**415,000**	1,900		4,880		5,300		6,590		5,150		5,340		3,400		6,370		7,750		6,080		20,400		8,750	
Chromium	mg/kg	840	**1,020**	43.1		14.5		12.1		15.5		35.2		39.4		34.1		39.6		39.8		46.2		52.2		36.6	
Cobalt	mg/kg	96	**250**	229		4.16		3.7		5		25.4		25.7		27		13.1		12.4		13.8		16.3		15.2	
Copper	mg/kg	360	**600**	589		4.71		5.12		7.92		62.1		59.9		62.1		28		30.8		28.8		38.1		33	
Iron	mg/kg	480,000	**563,000**	105,000		11,000		10,600		12,900		65,500		65,200		58,900		23,700		26,900		31,100		34,100		32,000	
Lead	mg/kg	**420**	140	66.6		5.34		5.86		7.26		53.4		51.6		31.6		11.3		12.8		10.4		11.2		22.5	
Lithium	mg/kg	**300**	200	53.1		25.2		23.2		24.2		35.2		35.4		16.6		24.8		26.8		29		29.6		39.3	
Magnesium	mg/kg	60,000	**233,000**	5,060		3,320		2,850		3,570		10,800		10,300		7,820		7,420		7,740		7,990		11,200		7,790	
Manganese	mg/kg	**12,000**	9,500	1,510		171		169		234		686		641		548		245		455		438		488		652	
Mercury	mg/kg	0.72	**0.85**	0.0098		0.0085		0.01		0.01		0.1		0.08		0.02		0.03	J	0.02	J	0.05		0.06		0.01	
Molybdenum	mg/kg	**24**	12	16.1		0.43		0.39		0.45		1.16		1.09		1.21		1.95		1.27		1.82		1.8		2.03	
Nickel	mg/kg	600	**840**	101		10.9		9.22		12.9		49.1		54.1		52		36.3		39.5		41.7		56.2		37.1	
Phosphorus	mg/kg	9,600	**10,500**	417		415		360		431		512		473		372		721		785		597		805		903	
Potassium	mg/kg	168,000	**208,500**	6,450		1,740		1,670		2,050		4,010		4,130		2,450		2,270		2,420		2,690		4,030		3,700	
Selenium	mg/kg	**4.8**	0.5	0.57		0.2	U	0.2	U	0.2	U	0.42		0.38		0.2	U	0.5		0.3		0.27		0.68		0.51	
Silver	mg/kg	-	**0.75**	0.64		0.1	U	0.13		0.15		0.33		0.37		0.32		0.13		0.12		0.11		0.19		0.23	
Sodium	mg/kg	60,000	**235,500**	117		160		163		170		120		138		120		289		304		346		372		285	
Strontium	mg/kg	3,000	**3,700**	13.8		26.8		31.2		33		20.3		23.4		24.2		40.5		43.8		46.3		105		43.4	
Sulphur	mg/kg	**8,400**	3,500	1,500		500	U	600		700		5,600		4,800		1,600		600		500	U	500		900		800	
Thallium	mg/kg	**108**	8.5	0.71		0.16		0.16		0.13		0.5		0.45		0.27		0.19		0.23		0.22		0.23		0.32	
Tin	mg/kg	**48**	23	2.4		2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	674		439		425		446		418		438		284		588		591		640		608		878	
Uranium	mg/kg	24	**27**	2.15		1.04		1.06		0.92		1.03		1.02		1.06		1.86		1.32		1.13		1.61		2.95	
Vanadium	mg/kg	1,080	**1,200**	55.7		16.5		16.5		20.6		44.5		44.5		32.5		43.7		40.7		49.1		56.4		51.7	
Zinc	mg/kg	**1,080**	700	69.2		40.7		37.5		31.2		241		227		114		67.2		63.1		58.9		91.2		109	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT				NT		NT	
pH (1:2 soil:water)	pH Units	-	-	7.27		8.37		8.66		8.82		8.06		8.07		8.17		6.64		7.83	J	7.6		8.34		7.8	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		2.1		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 8-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		WRD		NFRC		NFRC		NFRC		NFRC	
Remediation Unit																									
Sample ID				CH15-107-PZ037_SOg		CH15-107-PZ038_SOh		CH15-107-PZ039_SOb		CH15-107-PZ039_SOh		CH15-107-PZ040_SOd		CH15-107-PZ040_SOq		CH15-107-PZ041_SOd		CH15-107-PZ042_SOb		CH15-107-PZ043_SOb		CH15-107-TP005_SOa		CH15-107-TP006_SOa		CH15-107-TP906_SOa	
Sample Interval (mbgs)	**12x Median Soil Content [a]**	**10x Crustal Abundance[b]**		5.49 - 5.94		5.1 - 5.2		1 - 1.2		5.7 - 5.9		4.2 - 4.3		17.68 - 18.1		10.1 - 10.1		4 - 4.2		0.91 - 1.37		0.8 - 1		0 - 1.3		0 - 1.3	
Sample Date				7/28/2015		7/30/2015		8/3/2015		8/3/2015		8/7/2015		8/9/2015		8/26/2015		8/15/2015		8/24/2015		8/24/2015		8/25/2015		8/25/2015	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	17,600		21,700		18,000		20,200		10,300		7,890		17,100		16,900		16,800		14,500		13,800		12,800	
Antimony	mg/kg	**60**	2	0.95		0.77		0.52		0.65		1.05		0.5		0.62		0.7		1.03		0.67		0.67		0.58	
Arsenic	mg/kg	**72**	18	13.6		8.3		7.53		9.99		9.06		6.38		8.5		11.2		11.4		11		9.29		8.95	
Barium	mg/kg	**6,000**	4,250	286		224		211		163		251		55.1		148		208		274		103		172		158	
Beryllium	mg/kg	**72**	30	0.76		0.91		0.84		0.9		0.52		0.4		0.79		0.74		0.84		0.87		0.66		0.64	
Bismuth	mg/kg	-	**0.085**	0.3		0.32		0.28		0.32		0.26		0.26		0.59		0.25		0.25		0.55		0.32		0.31	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.51		0.38		0.35		0.27		0.51		0.1		0.35		0.41		0.62		0.22		0.4		0.49	
Calcium	mg/kg	180,000	**415,000**	17,800		22,700		6,170		13,800		12,400		2,710		14,500		6,640		24,400		6,510		4,470		4,480	
Chromium	mg/kg	840	**1,020**	43.9		47		49.2		60.5		22.7		18.2		42.6		42.7		58.7		43.2		28.4		24.4	
Cobalt	mg/kg	96	**250**	12.1		15.1		14.7		18.3		9.49		5.94		10.1		13.3		15.3		20.3		10.9		10.4	
Copper	mg/kg	360	**600**	29.5		30.5		29.4		40.6		20		12.7		28.1		34.1		38		52.1		21.9		21.7	
Iron	mg/kg	480,000	**563,000**	29,500		33,500		29,500		39,700		21,500		16,600		26,600		30,400		30,800		31,800		23,800		22,400	
Lead	mg/kg	**420**	140	13.4		12.5		10.7		10.9		12		8.49		13.7		13.8		11.5		18.6		12.8		12.4	
Lithium	mg/kg	**300**	200	32.2		36.5		30.2		33.9		21.7		21.5		48.1		24		24.2		35.6		29.4		27.6	
Magnesium	mg/kg	60,000	**233,000**	9,110		8,910		7,190		9,920		5,680		4,200		7,330		7,680		10,900		6,340		5,350		5,100	
Manganese	mg/kg	**12,000**	9,500	423		450		409		452		320		164		398		338		472		502		277		311	
Mercury	mg/kg	0.72	**0.85**	0.03		0.04		0.03		0.04		0.02		0.008		0.01		0.03		0.05		0.04		0.02		0.02	
Molybdenum	mg/kg	**24**	12	1.36		1.3		1.32		2.91		1.05		0.73		4.74		1.74		2.3		12.1		0.9		0.78	
Nickel	mg/kg	600	**840**	40.5		45.1		43.3		61.2		24.8		16.7		37.8		43.6		59.2		42.1		27.3		25.7	
Phosphorus	mg/kg	9,600	**10,500**	748		660		651		716		941		631		676		759		825		617		605		567	
Potassium	mg/kg	168,000	**208,500**	3,740		4,790		2,710		3,250		2,480		1,880		3,470		2,200		2,710		2,740		1,840		1,630	
Selenium	mg/kg	**4.8**	0.5	0.74		0.28		0.47		0.46		0.72		0.2	U	0.3		0.58		0.37		0.27		0.28		0.27	
Silver	mg/kg	-	**0.75**	0.15		0.13		0.12		0.14		0.13		0.12		0.17		0.14		0.19		0.17		0.19		0.19	
Sodium	mg/kg	60,000	**235,500**	316		514		351		337		270		114		753		422		341		215		212		182	
Strontium	mg/kg	3,000	**3,700**	85.3		145		59.8		73.9		65.1		14.1		83.5		51.2		82.8		32.3		46.1		42	
Sulphur	mg/kg	**8,400**	3,500	600		500	U	500	U	500	U	500	U	500	U	800		600		500	U	500	U	600		500	U
Thallium	mg/kg	**108**	8.5	0.24		0.28		0.24		0.22		0.21		0.14		0.3		0.22		0.22		0.19		0.22		0.19	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	700		715		604		494		586		343		774		531		459		532		615		531	
Uranium	mg/kg	24	**27**	1.77		1.63		2.38		1.52		1.46		0.81		2.55		2.33		1.73		1.3		2.47		2.63	
Vanadium	mg/kg	1,080	**1,200**	47.5		48.1		47.5		50.9		32.3		23.5		40.4		44.5		55.9		40.3		35.4		32.6	
Zinc	mg/kg	**1,080**	700	79.6		71.9		69.9		85.4		68.1		181		157		69.2		91.6		69.2		57.3		56.2	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT				NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	8.32		8.48		7.08		8.4		8.36		8.39		8.61		6.77		8.2		7.63		6.86		6.86	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT				NT		1		1.9		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT				NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT				NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT				NT		NT		NT		NT	

Table 8-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC	
Remediation Unit																							
Sample ID				CH15-107-TP007_SOa		CH15-107-TP029_SOa		CH15-107-TP031_SOa		CH15-107-TP931_SOa		CH15-107-TP032_SOa		CH15-107-TP032_SOb		CH15-107-TP033_SOa		CH15-107-TP034_SOa		CH15-107-TP034_SOb		CH15-107-TP035_SOa		CH15-107-TP036_SOa		CH15-107-TP037_SOa	
Sample Interval (mbgs)	**12x Median Soil Content [a]**	**10x Crustal Abundance[b]**		1.75 - 2.8		2.5 - 2.7		2 - 2.2		2 - 2.2		2 - 2.2		4.5 - 4.7		2.1 - 2.3		2 - 2.2		5 - 5.2		1.8 - 2		2.1 - 2.3		2 - 2.2	
Sample Date				8/24/2015		7/25/2015		7/27/2015		7/27/2015		7/25/2015		7/25/2015		8/21/2015		7/27/2015		7/27/2015		8/7/2015		8/7/2015		7/22/2015	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	14,600		15,100		19,400		15,800		8,750		10,300		16,900		16,800		11,100		11,600		12,500		10,800	
Antimony	mg/kg	**60**	2	0.65		0.65		0.29		0.3		0.65		0.71		0.54		0.84		0.6		0.77		0.59		0.61	
Arsenic	mg/kg	**72**	18	6.91		10.5		8.16		8.48		8.93		15.5		14.2		11.4		14.2		9.86		8.38		7.93	
Barium	mg/kg	**6,000**	4,250	191		227		81.2		146		150		105		131		138		118		131		100		95.4	
Beryllium	mg/kg	**72**	30	0.75		0.65		1.35		1.39		0.39		0.46		1		0.83		0.89		0.52		0.55		0.45	
Bismuth	mg/kg	-	**0.085**	0.36		0.25		0.23		0.2		0.2	U	1.39		0.32		0.4		0.25		3.26		0.25		0.24	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.33		0.47		0.25		0.25		0.23		0.33		0.42		0.36		0.79		0.35		0.25		0.19	
Calcium	mg/kg	180,000	**415,000**	8,080		6,870		40,200		40,700		7,930		10,300		11,800		6,650		13,400		3,610		3,080		3,530	
Chromium	mg/kg	840	**1,020**	30.9		37.8		49.9		47		17.8		20.9		50.3		36.7		37		27.8		25.5		19.3	
Cobalt	mg/kg	96	**250**	11		11.7		19.8		20		6.13		7.59		27.7		12.2		20.1		9.4		10.5		7.37	
Copper	mg/kg	360	**600**	32.5		34.4		20.9		21.6		13.7		17.6		58.7		28.5		36.7		23.8		24.4		15.9	
Iron	mg/kg	480,000	**563,000**	23,400		26,400		29,000		29,200		16,100		20,000		32,400		28,000		12,000		22,000		26,600		18,500	
Lead	mg/kg	**420**	140	11.4		12.1		21.3		19.1		9.44		25.1		13.8		16.9		10.7		15.7		14.8		10.9	
Lithium	mg/kg	**300**	200	29.4		31.4		19.3		18.3		16.4		18.3		37.4		33.9		18.6		19.9		21.4		18.9	
Magnesium	mg/kg	60,000	**233,000**	5,560		6,370		11,800		11,000		4,400		5,030		8,120		7,680		6,860		4,910		5,580		4,260	
Manganese	mg/kg	**12,000**	9,500	300		360		889		848		219		258		495		435		279		319		315		258	
Mercury	mg/kg	0.72	**0.85**	0.03		0.04		0.0062		0.0064		0.01		0.02		0.01		0.03		0.02		0.005	U	0.005	U	0.01	
Molybdenum	mg/kg	**24**	12	1.94		1.5		0.49		0.54		0.65		0.81		5.63		1.41		3.1		0.94		0.85		0.59	
Nickel	mg/kg	600	**840**	30.4		39.4		51.9		51.2		16.9		21.6		95.6		37.3		86.9		28.5		31		20.2	
Phosphorus	mg/kg	9,600	**10,500**	777		767		473		479		875		904		697		689		646		547		657		514	
Potassium	mg/kg	168,000	**208,500**	2,240		1,670		760		730		1,390		1,820		2,910		3,420		1,900		1,820		1,330		1,320	
Selenium	mg/kg	**4.8**	0.5	0.45		0.89		0.2	U	0.2	U	0.2	U	0.2	U	1.28		0.2	U	1.45		0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.17		0.16		0.1	U	0.1	U	0.11		0.18		0.16		0.14		0.14		0.2		0.13		0.12	
Sodium	mg/kg	60,000	**235,500**	204		237		85		80		197		241		312		253		215		257		234		247	
Strontium	mg/kg	3,000	**3,700**	61.5		57.9		104		115		49.2		72.6		51.5		35.7		70.2		31.8		35		40	
Sulphur	mg/kg	**8,400**	3,500	1,500		500		500		600		500	U	500	U	600		600		800		500	U	500	U	700	
Thallium	mg/kg	**108**	8.5	0.21		0.18		0.06		0.06		0.15		0.16		0.28		0.28		0.23		0.18		0.14		0.15	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	497		512		12.3		16.3		302		383		515		567		376		439		405		392	
Uranium	mg/kg	24	**27**	1.73		1.99		0.98		0.99		0.78		1.01		3.11		1.17		35.6		1.06		1.31		0.92	
Vanadium	mg/kg	1,080	**1,200**	37.7		42.4		37.8		34.4		26.2		29.2		61.2		43.9		38.2		30.1		31.2		30.1	
Zinc	mg/kg	**1,080**	700	70.4		61.2		101		104		51.2		85.9		78.6		88		126		73		102		46.3	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	6.32		7.25		8.57		8.58		8.64		8.57		8.21		8.26		7.96		8.39		7.2		6.64	
Organic Matter	percent	-	-	9.1		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 8-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC	
Remediation Unit																							
Sample ID				CH15-107-TP037_SOb		CH15-107-TP038_SOa		CH15-107-TP039_SOa		CH15-107-TP040_Soa		CH15-107-TP041_SOb		CH15-107-TP056_Soa		CH15-107-TP030_SOa		CH15-107-TP030_SOb		CH15-201-MW001_SOg		CH15-201-MW001_SOl		CH15-201-MW001_SOo		CH15-201-MW901_SOo	
Sample Interval (mbgs)		**12x Median Soil Content** [a]	**10x Crustal Abundance** [b]	**5 - 5.2**		**0.5 - 0.7**		**2 - 2.2**		**0.9 - 1.1**		**4 - 4.2**		**1.3 - 1.5**		**2.5 - 2.7**		**5.3 - 5.6**		**4.57 - 5.03**		**7.77 - 7.92**		**10.67 - 10.82**		**10.67 - 10.82**	
Sample Date				**7/22/2015**		**8/21/2015**		**8/6/2015**		**8/23/2015**		**8/23/2015**		**8/23/2015**		**7/25/2015**		**7/25/2015**		**8/13/2015**		**8/13/2015**		**8/13/2015**		**8/13/2015**	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	9,960		13,800		16,800		11,300		18,300		23,700		14,600		17,500		10,200		10,800		11,500		12,000	
Antimony	mg/kg	**60**	2	0.56		0.59		0.73		0.46		0.45		0.48		0.84		0.57		0.5		0.62		0.66		0.62	
Arsenic	mg/kg	**72**	18	7.53		3.85		10.9		18.9		18.6		16.5		8.99		10.6		44.1		37.2		14.4		15.3	
Barium	mg/kg	**6,000**	4,250	104		217		190		72.3		109		129		151		192		68		80.3		70.1		67.6	
Beryllium	mg/kg	**72**	30	0.41		0.63		0.6		0.47		0.78		1.03		0.62		0.92		0.34		0.36		0.49		0.53	
Bismuth	mg/kg	-	**0.085**	0.2	U	0.31		0.21		0.21		0.4		0.34	U	0.22		0.43		0.44		0.37		0.29		0.83	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.21		0.48		0.42		0.25	J	0.37		0.35		0.36		0.39		0.17		0.1		0.29		0.29	
Calcium	mg/kg	180,000	**415,000**	6,800		8,940		18,200		9,970		7,190		11,600		5,300		5,080		3,490		4,120		7,060		7,080	
Chromium	mg/kg	840	**1,020**	19.9		31.4		47.3		28.7		37		39.2		38.6		38.8		32.1		29.8		64.8		77.2	
Cobalt	mg/kg	96	**250**	7.53		8.51		15		12.2		18.5		17.6		12.7		15.5		6.88		5.56		9.39		9.7	
Copper	mg/kg	360	**600**	17.3		34.7		34.6		35.1		35.9		33.5		26.6		30.2		38.5		18.8		51.9		56.1	
Iron	mg/kg	480,000	**563,000**	19,600		15,800		30,600		25,100		34,300		32,900		26,800		29,900		36,700		27,600		29,000		30,400	
Lead	mg/kg	**420**	140	9.21		12.5		13.6		10.1		21		20.4		12.5		13.6		9.93		7.69		14		12.5	
Lithium	mg/kg	**300**	200	17.8		25.4		23.4		19		31.3		28.5		21.4		31.8		26		35.6		25.9		30.2	
Magnesium	mg/kg	60,000	**233,000**	4,790		5,800		9,180		6,880		8,730		7,280		6,770		7,030		5,160		4,910		5,320		5,290	
Manganese	mg/kg	**12,000**	9,500	261		122		447		270		505		443		398		624		185		325		250		275	
Mercury	mg/kg	0.72	**0.85**	0.01		0.04		0.005	U	0.01		0.02		0.01		0.02		0.02		0.01		0.0083		0.01		0.01	
Molybdenum	mg/kg	**24**	12	0.65		1.01		2.37		1.76		1.33		1.6		1.54		1.38		2.15		1.54		9.62		12.7	
Nickel	mg/kg	600	**840**	21.7		30.3		50		38.9		43.6		40.2		40.8		41.9		21.5		17		33.6		35.9	
Phosphorus	mg/kg	9,600	**10,500**	742		571		798		515		1200		848		830		633		576		507	J	604		596	
Potassium	mg/kg	168,000	**208,500**	1,710		1,730		2,270		1,450		2,840		3,000		2,510		3,810		2,220		2,240		2,320		2,610	
Selenium	mg/kg	**4.8**	0.5	0.2	U	2.09		0.32		0.38		0.35		0.31		0.31		0.65		0.21		0.2	U	0.24		0.2	U
Silver	mg/kg	-	**0.75**	0.1		0.21		0.14		0.13		0.13		0.17		0.13		0.16		0.15		0.1	U	0.12		0.12	
Sodium	mg/kg	60,000	**235,500**	192		331		308		229		482		1,310		304		319		319		334		330		373	
Strontium	mg/kg	3,000	**3,700**	44.1		59		63.4		45		98		301		51.2		48		25.9		36.9		49.3		53	
Sulphur	mg/kg	**8,400**	3,500	500	U	1,100		500	U	500	U	500	U	500	U	500		500	U	700		500	U	500	U	500	U
Thallium	mg/kg	**108**	8.5	0.14		0.19		0.21		0.14		0.24		0.27		0.18		0.28		0.22		0.21		0.23		0.25	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	369		347		448		321		550		637		458		680		477		548		474		538	
Uranium	mg/kg	24	**27**	1.12		7.34		1.53		0.87		1.86		2.13		0.99		1.48		0.74		1.07		7.35	J	1.14	J
Vanadium	mg/kg	1,080	**1,200**	27.3		33.1		44.4		34.2		39.5		43.3		41.4		45.5		30.1		25.8		28.2		29	
Zinc	mg/kg	**1,080**	700	51.3		76.1		82.2		57.2		79.1		64.5		68.8		79.5		130		96.8		233		265	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	8.39		7.44		8.56		7.97		7.67		7.73		7.43		7.74		6.21		7.93		8.15		8.1	
Organic Matter	percent	-	-	NT		5.2		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	

Table 8-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

				NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC		NFRC	
Remediation Unit																							
Sample ID				CH15-201-MW002_SOe		CH15-201-MW002_SOH		CH15-201-MW003_SOd		CH15-201-MW903_SOd		CH15-201-MW003_SOi		CH15-201-MW004_SOe		CH15-201-MW004_SOl		CH15-201-MW005_SOf		CH15-201-MW005_SOj		CH15-201-MW006_SOe		CH15-201-MW006_SOi	
Sample Interval (mbgs)		**12x Median Soil Content** [a]	**10x Crustal Abundance** [b]	3.05 - 3.51		4.57 - 6.1		1.83 - 2.13		1.83 - 2.13		8.53 - 8.99		1.98 - 2.13		6.71 - 7.16		3.35 - 3.66		7.62 - 8.08		3.05 - 3.51		8.53 - 8.99	
Sample Date				8/11/2015		8/11/2015		8/14/2015		8/14/2015		8/21/2015		8/14/2015		8/14/2015		8/15/2015		8/20/2015		8/15/2015		8/19/2015	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	25,000		20,600		5,790		5,040		9,520		16,800		13,900		15,200		10,800		13,200		11,300	
Antimony	mg/kg	**60**	2	0.48		0.61		0.37		0.38		0.46		0.43		0.65		0.7		0.99		0.49		0.43	
Arsenic	mg/kg	**72**	18	18.4		13.7		9.26		8.68		11.8		9.88		13		22.5		18		34.9		7.69	
Barium	mg/kg	**6,000**	4,250	127		119		150		164		51.1		137		107		101		123		68.6		71.7	
Beryllium	mg/kg	**72**	30	0.88		1		0.24		0.16		0.38		0.83		0.54		0.54		0.52		0.54		0.51	
Bismuth	mg/kg	-	**0.085**	0.3		0.28		0.2	U	0.2	U	0.25		0.34	U	0.33		0.45		0.63		0.3		0.2	U
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	1.01		0.32		0.12		0.12		0.26		0.22		0.31		0.41		0.5		0.28		0.22	
Calcium	mg/kg	180,000	**415,000**	8,610		19,800		3,810		3,880		2,910		4,560		13,600		2,740		5,870		7,890		3,950	
Chromium	mg/kg	840	**1,020**	41.5		46.8		12.7		12.1		19.7		43		58.1		28.7		21.9		105		21.7	
Cobalt	mg/kg	96	**250**	24.4		15.4		3.56		3.04		6.01		11.2		11.9		8.61		10.5		13.6		6.87	
Copper	mg/kg	360	**600**	77.8		28.8		21.6		21.9		15.2		26		29.6		32		37.2		16.4		21.5	
Iron	mg/kg	480,000	**563,000**	36,900		32,600		16,000		14,400		19,500		27,400		28,900		33,100		25,800		27,900		24,700	
Lead	mg/kg	**420**	140	15.3		9.4		34.9		42		10.8		8.95		10.4		26.6		94.1		9.37		10.4	
Lithium	mg/kg	**300**	200	28.1		51.9		24.4		15.6		18.5		52.7		35		28.8		34.3		35.9		29.1	
Magnesium	mg/kg	60,000	**233,000**	11,200		12,400		2,380		1,880		4,250		7,250		6,970		8,590		4,810		6,660		5,270	
Manganese	mg/kg	**12,000**	9,500	706		499		138		101		162		373		302		184		230		845		201	
Mercury	mg/kg	0.72	**0.85**	0.02		0.01		0.04		0.05		0.0083		0.0096		0.01		0.05	J	0.12		0.0089		0.01	
Molybdenum	mg/kg	**24**	12	1.62		3.01		0.1	U	0.1	U	0.1	U	0.73		5.31		0.85		1.72		7.68		1.13	
Nickel	mg/kg	600	**840**	45.9		38.8		7.86		7.41		18		32.4		33.7		29.9		17.8		43.3		21.8	
Phosphorus	mg/kg	9,600	**10,500**	692		578		252		235		528		640		782		563		503		517		508	
Potassium	mg/kg	168,000	**208,500**	3,420		3,640		1,910		1,480		1,520		4,380		2,720		1,570		2,570		2,380		2,330	
Selenium	mg/kg	**4.8**	0.5	0.31		0.22		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.19		0.1		0.14		0.16		0.1	U	0.12		0.13		0.13		0.46		0.12		0.14	
Sodium	mg/kg	60,000	**235,500**	1050		500		267		326		265		316		450		216		334		492		270	
Strontium	mg/kg	3,000	**3,700**	75.7		79.6		17.1		17.4		28		49.9		76.6		30.1		46		44.9		34.7	
Sulphur	mg/kg	**8,400**	3,500	3,100		2,000		2,100		2,900		500	U	1,800		1,400		1,600		5,800		600		500	U
Thallium	mg/kg	**108**	8.5	0.23		0.27		0.2		0.15		0.12		0.39		0.22		0.21		0.29		0.21		0.22	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	596		690		488		476		345		921		583		398		611		639		565	
Uranium	mg/kg	24	**27**	1.8		1.42		0.72		0.68		0.74		1.8		1.18		1.57		1.16		1.07		1.51	
Vanadium	mg/kg	1,080	**1,200**	42.1		60.2		21.9		21.6		23.2		44.5		36.1		26.3		25.2		30.6		29	
Zinc	mg/kg	**1,080**	700	712		128		85.8		71.9		478		105		518		853		562		176		568	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	7.81		8.21		4.32		4.33		5.85		8.06		8.26		6.27		8.4		7.72		7.94	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		1		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		0.26		NT		NT		0.1	U	NT		NT		0.1	U	NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		2.21		NT		NT		0.8	U	NT		NT		0.8	U	NT		NT		NT	

Table 8-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.

Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.

Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content***and*** 10x the crustal abundance.

[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London

[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).

12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

$CaCO_3$ = calcium carbonate

J = This analyte was present but the reported value may not be accurate or precise

mbgs = metre below ground surface

mg/kg = milligram per kilogram

NFRC = North Fork Rock Creek

NT = not tested

QA/QC = Quality Assurance and Quality Control

R = Data rejected

U = This analyte was analyzed for but not detected at the specified detection limit

Table 8-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential							Neutralization Potential					
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Neutralization Potential Ratio (NP/AP)
CH15-107-MW029_SOb	**NFRC**	0.2	0.5	8/10/2015	7.66		530		0.01	U	800		0.98	20		200	NT		204.5
CH15-107-MW029_SOd	**NFRC**	1.5	1.7	8/10/2015	6.2		618		0.01		1,200		2.61	8		80	NT		30.6
CH15-107-MW030_SOd	**NFRC**	1.8	2.1	8/10/2015	7.7		591		0.01	U	800		0.88	13		130	NT		147.7
CH15-107-MW030_SOf	**NFRC**	3.5	3.8	8/10/2015	7.28		524		0.01	U	500		0.18	7		70	NT		387.7
CH15-107-MW031_SOd	**NFRC**	1.5	2.1	8/7/2015	8.03		1,150		0.01	U	500	U	0.20	11		110	NT		561.7
CH15-107-MW931_SOd	**NFRC**	1.5	2.1	8/7/2015	7.91		1,150		0.01	U	600		0.51	10		100	NT		197.4
CH15-107-MW031_SOf	**NFRC**	3.1	3.3	8/8/2015	7.95		592		0.01	U	800		1.52	6		60	NT		39.5
CH15-107-MW032_SOb	**NFRC**	0.2	0.3	8/9/2015	7.05		769		0.01	U	600		0.90	14		140	NT		155.8
CH15-107-MW032_SOd	**NFRC**	2.0	2.3	8/9/2015	7.18		728		0.01	U	700		0.00	9		90	NT		0.0
CH15-107-MW034_SOb	**NFRC**	0	0.4	8/7/2015	6.34		NT		NT		1,100		*3.44*	NT		NC	NT		NC
CH15-107-MW934_SOb	**NFRC**	0	0.4	8/7/2015	6.77		NT		0.01		1,000		2.09	NT		NC	NT		NC
CH15-107-MW034_SOc	**NFRC**	0.4	0.8	8/7/2015	6.7		1,075		0.01	U	900		1.58	16		160	NT		101.5
CH15-107-MW034_SOf	**NFRC**	2.1	2.4	8/7/2015	7.19		401		0.01		1,500		3.94	9		90	NT		22.8
CH15-107-MW035_SObg	**NFRC**	48.2	49.7	9/2/2015	8.19		718		0.01	U	500	U	0.66	13		130	NT		196.7
CH15-107-MW935_SObg	**NFRC**	48.2	49.7	9/2/2015	8.29		653		0.01		600		1.03	11		110	NT		107.3
CH15-107-MW035_SObi	**NFRC**	49.8	51.4	9/2/2015	8.24		628		0.01	U	700		1.37	21		210	NT		153.8
CH15-107-MW035_SOk	**NFRC**	10.5	11.6	8/29/2015	7.6		1,255		0.01		5,600		15.9	35		350	NT		22.0
CH15-107-MW935_SOk	**NFRC**	10.5	11.6	8/29/2015	7.6		1,185		NT		4,800		*15.0*	26		260	NT		17.3
CH15-107-MW035_SOv	**NFRC**	20.7	22.3	8/30/2015	7.69		1,260		0.01	U	1,600		3.58	26		260	NT		72.7
CH15-107-PZ031_SOd	**NFRC**	3.0	3.6	7/26/2015	6.4		NT		NT		600		*1.88*	11		110	NT		58.7
CH15-107-PZ032_SOc	**NFRC**	2.3	2.4	7/25/2015	8.34		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-PZ033_SOe	**NFRC**	2.8	2.9	8/1/2015	7.2		NT		NT		500		*1.56*	NT		NC	NT		NC
CH15-107-PZ034_SOe	**NFRC**	4.2	4.5	8/5/2015	7.93		NT		NT		900		*2.81*	NT		NC	NT		NC
CH15-107-PZ034_SOe	**NFRC**	4.2	4.5	8/5/2015	8.02		NT		NT		800		*2.50*	NT		NC	NT		NC
CH15-107-PZ037_SOg	**NFRC**	5.5	5.9	7/28/2015	8.11		NT		NT		600		*1.88*	NT		NC	NT		NC
CH15-107-PZ038_SOh	**NFRC**	5.1	5.2	7/30/2015	8.3		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-PZ039_SOb	**NFRC**	1	1.2	8/3/2015	8.11		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-PZ039_SOh	**NFRC**	5.7	5.9	8/3/2015	6.81		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-PZ040_SOd	**NFRC**	4.2	4.3	8/7/2015	8.31		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-PZ040_SOq	**NFRC**	17.7	18.1	8/9/2015	8.41		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-PZ041_SOd	**NFRC**	10.1	10.1	8/26/2015	NT		NT		NT		800		*2.50*	NT		NC	NT		NC
CH15-107-PZ042_SOb	**NFRC**	4	4.2	8/15/2015	6.85		NT		NT		600		*1.88*	NT		NC	NT		NC
CH15-107-PZ043_SOb	**NFRC**	0.9	1.4	8/24/2015	8.09		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP005_SOa	**NFRC**	0.8	1	8/24/2015	7.91		NT		NT		500	U	*1.56*	12		120	NT		76.8
CH15-107-TP006_SOa	**NFRC**	0	1.3	8/25/2015	6.55		NT		NT		600		*1.88*	9		90	NT		48.0
CH15-107-TP906_SOa	**NFRC**	0	1.3	8/25/2015	6.44		NT		NT		500	U	*1.56*	11		110	NT		70.4
CH15-107-TP007_SOa	**NFRC**	1.75	2.8	8/24/2015	5.84		764		0.01	U	1,500		3.70	11		110	NT		29.7
CH15-107-TP029_SOa	**NFRC**	2.5	2.7	7/25/2015	7.09		NT		NT		500		*1.56*	NT		NC	NT		NC
CH15-107-TP030_SOa	**NFRC**	2.5	2.7	7/25/2015	6.99		NT		NT		500		*1.56*	NT		NC	NT		NC
CH15-107-TP030_SOb	**NFRC**	5.3	5.6	7/25/2015	7.36		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP031_SOa	**NFRC**	2	2.2	7/27/2015	8.08		NT		NT		500		*1.56*	NT		NC	NT		NC
CH15-107-TP931_SOa	**NFRC**	2	2.2	7/27/2015	8.04		NT		NT		600		*1.88*	NT		NC	NT		NC
CH15-107-TP032_SOa	**NFRC**	2	2.2	7/25/2015	8.21		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP032_SOb	**NFRC**	4.5	4.7	7/25/2015	8.16		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP033_SOa	**NFRC**	2.1	2.3	8/21/2015	8.06		NT		NT		600		*1.88*	NT		NC	NT		NC

Table 8-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential								Neutralization Potential					
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH15-107-TP034_SOa	**NFRC**	2	2.2	7/27/2015	7.89		NT		NT		600		*1.88*	NT		NC	NT		NC
CH15-107-TP034_SOb	**NFRC**	5	5.2	7/27/2015	7.61		NT		NT		800		*2.50*	NT		NC	NT		NC
CH15-107-TP035_SOa	**NFRC**	1.8	2	8/7/2015	7.84		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP036_SOa	**NFRC**	2.1	2.3	8/7/2015	7.24		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP037_SOa	**NFRC**	2	2.2	7/22/2015	6.73		NT		NT		700		*2.19*	NT		NC	NT		NC
CH15-107-TP037_SOb	**NFRC**	5	5.2	7/22/2015	8.23		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP038_SOa	**NFRC**	0.5	0.7	8/21/2015	7.2		NT		NT		1,100		*3.44*	NT		NC	NT		NC
CH15-107-TP039_SOa	**NFRC**	2	2.2	8/6/2015	8.25		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP040_Soa	**NFRC**	0.9	1.1	8/23/2015	7.59		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP041_SOb	**NFRC**	4	4.2	8/23/2015	7.74		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-107-TP056_Soa	**NFRC**	1.3	1.5	8/23/2015	7.63		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-201-MW001_SOg	**NFRC**	4.6	5.0	8/13/2015	6		NT		NT		700		*2.19*	14		140	NT		64.0
CH15-201-MW001_SOl	**NFRC**	7.8	7.9	8/13/2015	8.03		NT		NT		500	U	*1.56*	9		90	NT		57.6
CH15-201-MW001_SOo	**NFRC**	10.7	10.8	8/13/2015	8.11		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-201-MW901_SOo	**NFRC**	10.7	10.8	8/13/2015	7.98		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH15-201-MW002_SOe	**NFRC**	3.1	3.5	8/11/2015	8		NT		NT		3,100		*9.69*	21		210	NT		21.7
CH15-201-MW002_SOH	**NFRC**	4.6	6.1	8/11/2015	7.92		464		0.01		2,000		5.40	56		560	NT		103.7
CH15-201-MW003_SOd	**NFRC**	1.8	2.1	8/14/2015	4.41		NT		NT		2,100		*6.56*	NT		NC	NT		NC
CH15-201-MW903_SOd	**NFRC**	1.8	2.1	8/14/2015	4.31		NT		NT		2,900		*9.06*	NT		NC	NT		NC
CH15-201-MW003_SOi	**NFRC**	8.5	9.0	8/21/2015	6.01		855		0.01	U	500	U	0.00	10		100	NT		0.0
CH15-201-MW004_SOe	**NFRC**	2.0	2.1	8/14/2015	7.92		NT		NT		1,800		*5.63*	9		90	NT		16.0
CH15-201-MW004_SOl	**NFRC**	6.7	7.2	8/14/2015	7.99		NT		NT		1,400		*4.38*	56		560	NT		128
CH15-201-MW005_SOf	**NFRC**	3.4	3.7	8/15/2015	6.66		892		0.01	U	1,600		2.72	7		70	NT		25.8
CH15-201-MW005_SOj	**NFRC**	7.6	8.1	8/20/2015	8.16		NT		NT		5,800		*18.13*	NT		NC	NT		NC
CH15-201-MW006_SOe	**NFRC**	3.1	3.5	8/15/2015	8.3		NT		NT		600		*1.88*	20		200	NT		107
CH15-201-MW006_SOi	**NFRC**	8.5	9.0	8/19/2015	8.04		NT		NT		500	U	*1.56*	NT		NC	NT		NC

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Analytical results for neutralization potential by the AOAC 955.01 and MOD-SOBEK-3.2.3 methods are reported; results by the MOD-SOBEK-3.2.3 method are indicated using "*".
AOAC 955.01 is the preferred analytical method for neutralization potential; however, MOD-SOBEK-3.2.3 was applied to some samples collected in 2012 due to miscommunication.
Analytical results by the AOAC 955.01 method should be considered in future analysis and decision-making process.

Calculated values of AP presented italics were calculated based on total sulphur content, and represent conservative estimates of the acid generation potential.
Calculated AP values were set to zero where the accuracy of the laboratory measurements resulted in a negative AP value.

AP = acid potential
$CaCO_3$ = calcium carbonate
CaO = calcium oxide
J = Analyte was present but the reported value may not be accurate or precise.
kg = kilogram
LMB =
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NC = not calculated
NFRC = North Fork Rock Creek
NP/AP = nuetralization potential divided by acid potential
NT = not tested
ppm = parts per million
QA/QC = Quality Assurance and Quality Control
U = This analyte was analyzed for but not detected at the specified detection limit.

Table 8-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit			NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	Perimeter (South)	Perimeter (South)	Perimeter (South)
Sample ID			CH15-107-MW029_SOb	CH15-107-MW029_SOd	CH15-107-MW030_SOd	CH15-107-MW030_SOf	CH15-107-MW031_SOd	CH15-107-MW931_SOd	CH15-107-MW031_SOf	CH15-107-MW032_SOb	CH15-107-MW032_SOd	CH15-107-MW034_SOc	CH15-107-MW034_SOf	CH15-201-MW002_SOH	CH15-201-MW003_SOi	CH15-201-MW005_SOf
Depth From (mbgs)			0.2	1.5	1.8	3.5	1.5	1.5	3.1	0.2	2.0	0.4	2.1	4.6	8.5	3.4
Depth From (mbgs)			0.5	1.7	2.1	3.8	2.1	2.1	3.3	0.3	2.3	0.76	2.44	6.1	9.0	3.7
Sample Date		Screening Level	8/10/2015	8/10/2015	8/10/2015	8/10/2015	8/7/2015	8/7/2015	8/8/2015	8/9/2015	8/9/2015	8/7/2015	8/7/2015	8/11/2015	8/21/2015	8/15/2015
pH	**Result (pH units)**	6.5-9.0	7.95	7.79	7.95	8.1	7.32	7.75	7.95	7.29	7.6	NT	NT	8.34	6.3	6.55
	Result Qualifier															
Acidity	**Result (mg/L)**	-	5	3.9	2.9	3.3	2.9	3.1	2.7	4.5	2.9	6	3.5	2.3	5.3	3
	Result Qualifier															
Total Alkalinity	**Result (mg/L)**	-	19.4	2.8	37.6	12.1	60	45.5	36.8	20.5	12.7	12.7	16.6	42.4	1.8	1
	Result Qualifier															U
Specific Conductance	**Result (µS/cm)**	-	79.6	249	181	115	165	138	118	159	116	91.1	77	88.9	80.7	23.8
	Result Qualifier															
ORP Leachable	**Result (mV)**	-	283	310	266	285	254	261	265	264	270	254	256	358	246	260
	Result Qualifier															
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	26.5	0.005	0.65	2.75	0.005	0.005	0.005	14.8	0.71	15.1	3.02	0.19	0.005	0.005
	Result Qualifier			U			U	U	U						U	U
Antimony	**Result (mg/L)**	1.6	0.00041	0.00012	0.00033	0.00059	0.0001	0.0001	0.0001	0.00053	0.00013	0.00068	0.0003	0.0002	0.0001	0.0001
	Result Qualifier						U	U	U						U	U
Arsenic	**Result (mg/L)**	0.005	0.0072	0.001	0.0035	0.0035	0.001	0.001	0.001	0.0084	0.001	0.0062	0.0014	0.002	0.001	0.001
	Result Qualifier			U			U	U	U		U				U	U
Barium	**Result (mg/L)**	2.3	0.57	0.01	0.02	0.04	0.0017	0.0016	0.0016	0.21	0.01	0.12	0.03	0.02	0.001	0.21
	Result Qualifier														U	
Beryllium	**Result (mg/L)**	0.0053	0.00157	0.0005	0.0005	0.00069	0.0005	0.0005	0.0005	0.0006	0.0005	0.00136	0.0005	0.0005	0.0005	0.0005
	Result Qualifier			U	U		U	U	U		U		U	U	U	U
Boron	**Result (mg/L)**	1.5	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		U	U	U		U	U		U	U		U	U	U	U
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Cadmium	**Result (mg/L)**	Variable[c]	0.000465	0.000827	0.000056	0.000131	0.00005	0.00005	0.00005	0.000193	0.000759	0.000196	0.000094	0.00005	0.00116	0.000694
	Result Qualifier						U	U	U					U		
Calcium	**Result (mg/L)**	-	9.02	15	11.9	5.82	22.5	16.9	12.7	15.1	7.28	7.86	5.82	13.2	0.05	0.05
	Result Qualifier														U	U
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Chromium	**Result (mg/L)**	0.0089	0.03	0.0005	0.00133	0.00579	0.00089	0.00067	0.0005	0.01	0.00182	0.01	0.00406	0.0005	0.0005	0.0005
	Result Qualifier			U					U					U	U	U
Cobalt	**Result (mg/L)**	-	0.07	0.1	0.00243	0.00572	0.0001	0.0001	0.00018	0.00447	0.00098	0.02	0.05	0.0003	0.0001	0.0001
	Result Qualifier						U	U							U	U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.08	0.001	0.01	0.05	0.001	0.001	0.001	0.02	0.01	0.1	0.15	0.0017	0.001	0.001
	Result Qualifier			U			U	U	U						U	U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Iron	**Result (mg/L)**	0.3	21.8	0.03	5.65	18.7	0.03	0.03	0.03	12.9	2.96	26.4	13.7	0.45	0.03	0.03
	Result Qualifier			U			U	U	U					J	U	U
Lead	**Result (mg/L)**	0.001	0.02	0.0001	0.00378	0.01	0.0001	0.0001	0.0001	0.01	0.01	0.01	0.02	0.00045	0.0001	0.0001
	Result Qualifier			U			U	U	U						U	U
Lithium	**Result (mg/L)**	-	0.04	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.0078	0.02	0.01	0.005	0.005	0.0089
	Result Qualifier													U	U	
Magnesium	**Result (mg/L)**	-	8.82	10.5	9.93	5.38	3.99	3.44	3.32	9.03	4.32	4.85	2.69	1.6	0.1	0.1
	Result Qualifier													J	U	U
Manganese	**Result (mg/L)**	-	0.62	0.83	0.08	0.22	0.0005	0.0005	0.05	0.21	0.13	0.51	0.52	0.00654	0.79	0.07
	Result Qualifier						U	U								
Mercury	**Result (mg/L)**	0.000026	0.000127	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier			U	U	U	U	U	U	U	U	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.00316	0.00036	0.00715	0.01	0.01	0.00993	0.02	0.00188	0.02	0.02	0.04	0.00641	0.0001	0.0001
	Result Qualifier														U	U
Nickel	**Result (mg/L)**	0.025	0.08	0.07	0.00534	0.01	0.0005	0.0005	0.0005	0.02	0.00371	0.03	0.01	0.00071	0.0005	0.0005
	Result Qualifier						U	U	U						U	U

Table 8-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit			NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	NFRC	Perimeter (South)	Perimeter (South)	Perimeter (South)
Sample ID			CH15-107-MW029_SOb	CH15-107-MW029_SOd	CH15-107-MW030_SOd	CH15-107-MW030_SOf	CH15-107-MW031_SOd	CH15-107-MW931_SOd	CH15-107-MW031_SOf	CH15-107-MW032_SOb	CH15-107-MW032_SOd	CH15-107-MW034_SOc	CH15-107-MW034_SOf	CH15-201-MW002_SOH	CH15-201-MW003_SOi	CH15-201-MW005_SOf
Depth From (mbgs)			0.2	1.5	1.8	3.5	1.5	1.5	3.1	0.2	2.0	0.4	2.1	4.6	8.5	3.4
Depth From (mbgs)			0.5	1.7	2.1	3.8	2.1	2.1	3.3	0.3	2.3	0.76	2.44	6.1	9.0	3.7
Sample Date		Screening Level	8/10/2015	8/10/2015	8/10/2015	8/10/2015	8/7/2015	8/7/2015	8/8/2015	8/9/2015	8/9/2015	8/7/2015	8/7/2015	8/11/2015	8/21/2015	8/15/2015
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Potassium	**Result (mg/L)**	-	6.4	12.3	3.6	5.8	4.2	4.5	6.3	3.5	7.8	7.3	6	3	2	2
	Result Qualifier														U	U
Selenium	**Result (mg/L)**	0.001	0.0005	0.00276	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00059	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U		U	U	U	U	U	U	U		U	U	U	U
Silicon	**Result (mg/L)**	-	35.3	8.61	6.23	11.6	2.46	2.78	3.6	23.5	5.28	28	9.2	2.48	0.05	2.25
	Result Qualifier													J	U	
Silver	**Result (mg/L)**	0.0001	0.0012	0.00005	0.000052	0.000209	0.00005	0.00005	0.00005	0.000298	0.000377	0.000308	0.000244	0.00005	0.00005	0.00005
	Result Qualifier			U			U	U	U					U	U	U
Sodium	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier															
Strontium	**Result (mg/L)**	-	0.09	0.09	0.06	0.03	0.1	0.08	0.06	0.11	0.03	0.05	0.03	0.05	0.0005	0.01
	Result Qualifier														U	
Sulphate	**Result (mg/L)**	100	19.9	94.9	46	33.3	19.6	20.7	17.8	53.8	33.2	20.6	15.3	3.98	0.5	7.84
	Result Qualifier														U	
Sulphur	**Result (mg/L)**	-	0.5	41.4	16.9	0.5	0.5	0.5	0.5	18.7	0.5	0.5	0.5	1.31	9.61	2.52
	Result Qualifier		U			U	U	U	U		U	U	U			
Thallium	**Result (mg/L)**	0.0008	0.00021	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00013	0.0001	0.00019	0.0001	0.0001	0.0001	0.00018
	Result Qualifier			U	U	U	U	U	U		U		U	U	U	
Titanium	**Result (mg/L)**	0.1	0.37	0.01	0.03	0.1	0.01	0.01	0.01	0.21	0.05	0.29	0.06	0.01	0.01	0.01
	Result Qualifier			U			U	U	U					U	U	U
Uranium	**Result (mg/L)**	0.015	0.00199	0.00001	0.000315	0.000886	0.000032	0.00001	0.000011	0.00074	0.000194	0.00122	0.000564	0.000664	0.00001	0.000039
	Result Qualifier			U				U							U	
Vanadium	**Result (mg/L)**	-	0.04	0.001	0.0046	0.01	0.001	0.001	0.001	0.02	0.0019	0.02	0.0061	0.001	0.001	0.001
	Result Qualifier			U			U	U	U					U	U	U
Zinc	**Result (mg/L)**	0.03	0.44	0.02	0.06	0.24	0.01	0.01	0.01	0.03	0.05	0.06	0.01	0.01	1.43	0.62
	Result Qualifier						U	U	U					U		

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10\{hardness\}]-2.46}$ / 1,000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness > 180 mg/L, the CWQG is 4 µg/L; At hardness ≥ 82 to ≤ 180 mg/L the CWQG= $e^{0.8545[\ln(hardness)]-1.465}$ * 0.2 / 1,000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness > 180 mg/L, the CWQG is 7 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(hardness)]-4.705}$ / 1,000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness > 180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(hardness)]+1.06}$ / 1,000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

> = greater	J = analyte was present but the reported value may not be accurate or precise
≥ = greater than or equal to	mbgs = metre below ground surface
< = less than	mg/L = milligrams per litre
≤ = less than or equal to	mV = millivolt
°C = degrees Celsius	NFRC = North Fork Rock Creek
µg/L = micrograms per litre	NTU = Nephelometric Tubidity Unit
µS/cm = micro-Siemens per centimetre	ORP = Oxidation-reduction Potential
CCME = Canadian Council of Ministers of the Environment	R = result has been rejected for use
CWQG = Canadian Water Quality Guidelines	U = analyte was analyzed for but not detected at the specified detection limit
FIGQG =	UJ = analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Table 9-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow	
Sample ID				CH12-108-BH012-SOA		CH12-108-BH022-SOA		CH12-108-BH023-SOA		CH12-108-BH029-SOA		CH13-108-BH001-SOA		CH13-108-BH001-SOB		CH13-108-BH002-SOA		CH13-108-BH002-SOB		CH13-108-BH003-SOA		CH13-108-BH003-SOB		CH13-108-BH903-SOB		CH13-108-BH004-SOA		CH13-108-BH004-SOB	
Sample Interval (mbgs)		Content [a]	Abundance [b]	0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.3		0.5 - 1		0 - 0.3		0.5 - 1		0 - 0.3		0.4 - 0.5		0.4 - 0.5		0 - 0.3		0.2 - 0.3	
Sample Date				9/29/2012		9/29/2012		9/29/2012		9/29/2012		8/21/2013		8/22/2013		8/21/2013		8/22/2013		8/21/2013		8/28/2013		8/28/2013		8/21/2013		8/28/2013	
Geological Unit																											
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	19,800		20,000		22,500		12,600		19,500		16,700		19,000		10,200		34,000		21,500		22,600		18,200		23,300	
Antimony	mg/kg	**60**	2	1.19		0.79		0.64		0.63		0.39		0.76		0.45		0.25		0.23		0.54		0.57		0.43		0.59	
Arsenic	mg/kg	**72**	18	13.5		12.0		11.5		8.85		7.75		21.6		11.0		3.84		6.15		9.41		10.5		9.96		12.9	
Barium	mg/kg	**6,000**	4,250	337		253		313		136		198		155		176		159		377		153		177		148		156	
Beryllium	mg/kg	**72**	30	0.76		0.71		0.74		0.5		0.61		0.59		0.54		0.26		0.93		0.7		0.75		0.71		0.73	
Bismuth	mg/kg	-	**0.085**	0.27		0.27		0.28		0.32		0.3		0.27		0.24		0.2	U	0.2	U	0.22		0.24		0.25		0.2	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.815		0.53		0.318		0.328		0.144		0.245		0.156		0.124		0.083		0.184		0.223		0.258		0.229	
Calcium	mg/kg	180,000	**415,000**	23,300		24,000		5,680		11,100		5,100		6,180		7,360		9,990		17,400		6,360		6,230		20,800		5,590	
Chromium	mg/kg	840	**1,020**	61.8		58.2		57.5		32.1		48.4		37.7		48.3		25.9		45.3		65.6		73.2		46.3		52.2	
Cobalt	mg/kg	96	**250**	18.6		15.5		16		10.1		10.4		14.7		13.2		6.14		12.9		14		16.5		13.9		14.4	
Copper	mg/kg	360	**600**	42.7		37.6		36.5		25.5		16.7		25.1		27.0		18.9		17.1		28.4		31.6		29.2		25.4	
Iron	mg/kg	480,000	**563,000**	33,400		29,800		32,200		22,800		28,000		49,100		28,500		13,400		32,000		31,000		34,000		32,000		30,500	
Lead	mg/kg	**420**	140	15		23.9		48.5		12.4		16.5		18.7		16.0		8.71		8.60		12.6		14.7		18.4		26.2	
Lithium	mg/kg	**300**	200	25.6		25.1		28.6		20.7		34.1		23.3		28.5		10.8		45.9		34.4		35.2		31.6		35.0	
Magnesium	mg/kg	60,000	**233,000**	11,900		10,900		9,960		6,970		8,520		7,750		9,820		4,530		17,900		11,700		13,300		9,650		11,600	
Manganese	mg/kg	**12,000**	9,500	579		494		528		315		394		340		474		212		402		410		490		420		442	
Mercury	mg/kg	0.72	**0.85**	0.063		0.047		0.045		0.028		0.019		0.026		0.021		0.028		0.007		0.016		0.019		0.024		0.015	
Molybdenum	mg/kg	**24**	12	2.63		1.85		1.61		1.72		2.12		0.86		0.82		0.5	U	0.5	U	0.75		0.82		1.74		0.82	
Nickel	mg/kg	600	**840**	68.1		59.7		50.8		33.4		31.7		33.3		35.4		20.2		32.6		48.2		56.8		41.5		43.7	
Phosphorus	mg/kg	9,600	**10,500**	899		725		802		489		478		679		610		470		397		646		618		726		525	
Potassium	mg/kg	168,000	**208,500**	2,890		3,000		2,000		1,580		2,220		760		1,490		740		5,950		2,550		2,560		2,610		1,940	
Selenium	mg/kg	**4.8**	0.5	0.58		0.34		0.3		0.36		0.2	U	0.28		0.25		0.24		0.2	U	0.2	U	0.2	U	0.3		0.2	U
Silver	mg/kg	-	**0.75**	0.25		0.17		0.18		0.13		0.1		0.12		0.1	U	0.1		0.1	U	0.1	U	0.1	U	0.1		0.11	
Sodium	mg/kg	60,000	**235,500**	310		430		440		230		570		330		450		450		1,480		540		490		570		580	
Strontium	mg/kg	3,000	**3,700**	80.6		86.5		40.4		44.1		37		37.3		40.2		48.9		66		40.4		40.3		85.6		42.4	
Sulphur	mg/kg	**8,400**	3,500	NT		NT		NT		NT		500	U	600		500	U	1,700		500	U	500	U	500	U	500	U	500	U
Thallium	mg/kg	**108**	8.5	0.251		0.236		0.227		0.148		0.205		0.141		0.15		0.074		0.338		0.307		0.304		0.2		0.219	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	423		511		549		330		766		301		496		219		703		558		550		452		504	
Uranium	mg/kg	24	**27**	1.75		2.12		0.97		1.06		0.936		1.18		0.965		0.736		1.41		0.771		0.756		0.933		0.665	
Vanadium	mg/kg	1,080	**1,200**	58.5		48.7		51.9		37		45.5		40.5		49.2		23.5		38.5		44.5		49.9		41.1		43.8	
Zinc	mg/kg	**1,080**	700	112		89.7		104		69.7		66.9		75.8		57.7		35.4		43.5		67.2		71.2		70.8		97.2	
Moisture	percent	-	-	10.5		9.16		13.8		5.45		18.2		21.1		14.6		50.7		10.6		11.9		11.0		13.1		8.56	
pH (1:2 soil:water)	pH Units	-	-	8.25		8.36		6.69		8.33		7.11		6.93		7.62		6.33		8.45		7.84		7.57		8.39		6.61	
Organic Matter	percent	-	-	NT		NT		NT		NT		0.95		4.37		0.97		12.2		1.1		0.7	U	0.7	U	0.7	U	0.78	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		0.6		2.5		0.6		7.1		0.6		0.4		0.4	U	0.4		0.5	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT		0.1	U	0.1	U	0.3		0.15		0.35		0.1	U	0.1	U	0.39		0.1	U
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT		0.8	U	0.8	U	2.52		0.97		2.92		0.87		0.89		3.28		1.00	

Table 9-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow	
Sample ID				CH13-108-BH904-SOB		CH13-108-TP022-SOA		CH13-108-TP022A-SOA		CH13-108-TP025-SOA		CH13-108-TP026-SOA		CH13-108-TP027-SOA		CH13-108-TP027A-SOA		CH13-108-TP028-SOA		CH13-108-TP031-SOA		CH13-108-TP032-SOA		CH13-108-TP033-SOA		CH13-108-TP034-SOA	
Sample Interval (mbgs)		Content [a]	Abundance [b]	0.2 - 0.3		2.5 - 3.5		0 - 6		2.5 - 3.5		2 - 4		1.5 - 2.5		2 - 3		2 - 3		0 - 0		2 - 3		2 - 3		2 - 3	
Sample Date				8/28/2013		7/18/2013		7/25/2013		7/18/2013		7/18/2013		7/17/2013		7/18/2013		7/17/2013		7/18/2013		7/22/2013		7/25/2013		7/25/2013	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	20,100		21,100		18,800		29,800		11,800		16,600		14,800		14,600		21,200		22,000		17,700		21,100	
Antimony	mg/kg	**60**	2	0.53		0.4		0.54		0.46		0.51		0.65		0.36		0.57		1.01		0.56		0.63		0.91	
Arsenic	mg/kg	**72**	18	13.8		8.21		8.28		10.4		8.33		22.5		6.8		9.47		25.8		62.5		23.2		18.5	
Barium	mg/kg	**6,000**	4,250	155		116		133		270		66.9		107		104		102		163		134		109		293	
Beryllium	mg/kg	**72**	30	0.64		0.86		0.71		1.25		0.45		0.59		0.57		0.66		0.75		0.77		0.72		0.84	
Bismuth	mg/kg	-	**0.085**	0.21		0.4		0.31		5.69		0.25		0.23		0.3		0.28		0.27		0.23		0.28	J	0.43	J
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.27		0.569		0.34		0.493		0.231		0.212		0.252		0.249		0.39		0.164		0.263		0.522	
Calcium	mg/kg	180,000	**415,000**	5,040		6,200		6,540		6,140		2,750		19,300		16,600		11,400		23,200		27,500		12,700		5,650	
Chromium	mg/kg	840	**1,020**	50.7		42.8		39.6		76.5		23.5		39.4		31.9		39.1		71.3		73.9		38		50.1	
Cobalt	mg/kg	96	**250**	13.6		11.7		12.1		16		8.5		14.3		9.26		11.5		20.2		17.1		14.5		12.7	
Copper	mg/kg	360	**600**	26.3		22.6		22.8		49.7		16.7		31.8		17.4		26.4		45.1		29.4		33.5		29.1	
Iron	mg/kg	480,000	**563,000**	29,000		28,600		26,500		39,300		20,200		26,400		23,200		26,300		37,900		35,000		29,900		30,800	
Lead	mg/kg	**420**	140	30.8		25.3		24.6		74.9		10.4		19.3		18.4		19		30.5		16.5		16		23	
Lithium	mg/kg	**300**	200	28.1		32.1		28.6		48.1		24.4		28.1		24.6		23.9		33.3		38.9		30.5		37.6	
Magnesium	mg/kg	60,000	**233,000**	9,760		8,600		8,640		12,900		5,760		9,310		6,980		7,440		13,800		14,900		9,760		9,200	
Manganese	mg/kg	**12,000**	9,500	452		359		372		404		276		368		298		336		548		487		397		559	
Mercury	mg/kg	0.72	**0.85**	0.02		0.011		0.012		0.071		0.008		0.015		0.011		0.016		0.02		0.015		0.015		0.034	
Molybdenum	mg/kg	**24**	12	0.68		0.64		0.72		0.5	U	0.69		0.75		0.54		0.78		1.06		0.64		1.14		1.24	
Nickel	mg/kg	600	**840**	41.9		36.1		38.4		55.6		26.3		40.2		28.7		37.7		65.8		66.7		42.1		41.5	
Phosphorus	mg/kg	9,600	**10,500**	668		518		641		722		687		460	J	490		518		861		502		647		858	
Potassium	mg/kg	168,000	**208,500**	1,730		1,720		2,000		3,630		1,430		2,480		2,050		1,720		2,100		2,810		2,070		2,500	
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.27		0.2	U	0.39		0.33	
Silver	mg/kg	-	**0.75**	0.1		0.12		0.15		0.37		0.1	U	0.16		0.1	U	0.11		0.18		0.1	U	0.14		0.2	
Sodium	mg/kg	60,000	**235,500**	490		640		580		440		160		360		480		350		360		410		490		320	
Strontium	mg/kg	3,000	**3,700**	39.9		57.9		55.3		53.2		26.1		67.0		71.2		54.5		79.9		75.2		73.4		39.2	
Sulphur	mg/kg	**8,400**	3,500	500	U	500	U	700		500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Thallium	mg/kg	**108**	8.5	0.22		0.176		0.17		0.347		0.124		0.192		0.141		0.165		0.229		0.219		0.260		0.237	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	423		514		529		800		357		270		413		403		502		428		446		796	
Uranium	mg/kg	24	**27**	0.636		1.41		0.74		3.36		0.899		0.847		0.73		0.713		0.897		0.629		1.19		1.3	
Vanadium	mg/kg	1,080	**1,200**	42.8		37.1		38.5		58.6		28.6		35.2		29.4		36.4		59		39.5		39.8		51.9	
Zinc	mg/kg	**1,080**	700	106		148		85.6		180		54.8		76.3		71.9		72.5		103		75.7		68.3		102	
Moisture	percent	-	-	9.35		4.68		5.44		3.9	J	3.97	J	2.93	J	3.02	J	7.48		11.6	J	12.6	J	6.04		11.7	
pH (1:2 soil:water)	pH Units	-	-	6.3		7.01		8.09		7.23		7.23		8.70		8.76		8.60		8.37		8.47		8.18		8.15	
Organic Matter	percent	-	-	0.9		0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.7	U
Total Organic Carbon	percent	-	-	0.5		0.4	U	0.4	U	0.4	U	0.4		0.4	U	0.4	U	0.4	U	0.4	U	0.4		0.4	U	0.4	U
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1		0.1	U	0.87		0.36		0.34		0.72		0.43		0.29		0.1	U
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.88		0.8	U	0.8	U	0.87		0.8	U	7.26		3.04		2.83		6.02		3.55		2.45		0.91	

Table 9-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow	
Sample ID				CH13-108-TP934-SOA		CH13-108-TP041-SOA		CH13-108-TP043-SOA		CH13-108-SS001-SOA		CH13-108-SS002-SOA		CH13-108-SS003-SOA		CH13-108-SS004-SOA		CH13-108-SS005-SOA		CH13-108-SS006-SOA		CH15-403-TP007_SOa		CH15-403-TP007_SOb		CH15-403-TP009_SOa	
Sample Interval (mbgs)		Content [a]	Abundance [b]	2 - 3		4 - 5		4 - 5		0 - 0.3		0 - 0.3		0 - 0.3		0 - 0.3		0 - 0.3		0 - 0.5		2 - 2.2		5 - 5.2		1.5 - 1.7	
Sample Date				7/25/2013		8/13/2013		8/13/2013		7/8/2013		7/8/2013		7/8/2013		7/8/2013		7/8/2013		8/22/2013		7/24/2015		7/24/2015		8/2/2015	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	19,300		9,000		9,010		10,200		17,300		17,800		13,700		15,300		19,100		17,500		17,000		20,000	
Antimony	mg/kg	**60**	2	0.79		0.65		0.38		0.46		0.35		0.33		0.36		0.26		0.53		1		0.95		1.31	
Arsenic	mg/kg	**72**	18	13		7.32		5.76		6.92		7.25		8.05		6.52		6.42		16.4		14.5		14.6		14.5	
Barium	mg/kg	**6,000**	4,250	233		96.4		73.5		67.1		137		132		101		147		108		233		240		341	
Beryllium	mg/kg	**72**	30	0.77		0.44		0.35		0.43		0.74		0.75		0.52		0.6		0.81		0.84		0.85		0.79	
Bismuth	mg/kg	-	**0.085**	0.37	J	0.26		0.22		0.2	U	0.4		0.29		0.2	U	0.31		0.24		0.25		0.25		0.24	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.447		0.237		0.168		0.182		0.342		0.305		0.243		0.241		0.274		0.6		0.56		0.9	
Calcium	mg/kg	180,000	**415,000**	5,530		12,400		5,500		2,940		4,790		8,740		12,900		4,120		2,310		19,500		21,800		23,400	
Chromium	mg/kg	840	**1,020**	43.2		19.5		41.9		16		36.6		31.7		28.7		29.7		39.6		58.7		62.6		68.6	
Cobalt	mg/kg	96	**250**	11.2		7.68		8.16		6.83		11.2		10.0		8.99		10.1		13.2		16.9		17.9		18.4	
Copper	mg/kg	360	**600**	25.4		15.7		15.2		13.7		21.5		23.1		19.5		21.1		29.9		40.6		39		43.2	
Iron	mg/kg	480,000	**563,000**	25,300		19,400		18,300		17,000		24,900		23,600		20,600		23,400		29,200		35,100		35,900		34,500	
Lead	mg/kg	**420**	140	20.4		9.57		7.72		18.4		35.1		23.7		19.6		22.5		23.7		12.2		11.4		14.1	
Lithium	mg/kg	**300**	200	34.2		22.3		21.1		18.7		28.2		25.7		22.6		26.4		27.9		28.6		26.5		27.7	
Magnesium	mg/kg	60,000	**233,000**	8,090		4,560		4,700		4,700		6,860		7,150		6,500		7,200		8,140		12,700		13,300		12,600	
Manganese	mg/kg	**12,000**	9,500	471		252		200		233		379		437		308		349		328		466		484		572	
Mercury	mg/kg	0.72	**0.85**	0.033		0.012		0.013		0.008		0.019		0.016		0.016		0.012		0.014		0.04		0.03		0.07	
Molybdenum	mg/kg	**24**	12	1.18		0.78		0.5	U	0.57		0.64		0.57		0.5	U	0.5	U	0.93		2.51		2.62		2.78	
Nickel	mg/kg	600	**840**	36.9		21.3		25.8		18.3		31.4		29.4		25.5		26.4		40.4		58.8		64.1		70.4	
Phosphorus	mg/kg	9,600	**10,500**	705		586		599		589		510		550		441		486		453		790		782		946	
Potassium	mg/kg	168,000	**208,500**	2,310		1,990		1,680		880		1,610		1,750		1,440		1,550		830		2,240		1,870		3,010	
Selenium	mg/kg	**4.8**	0.5	0.25		0.2	U	0.2	U	0.2	U	0.2	U	0.26		0.2	U	0.2	U	0.25		0.89		1.06		0.59	
Silver	mg/kg	-	**0.75**	0.18		0.11		0.1		0.1	U	0.12		0.11		0.1	U	0.1	U	0.1		0.17		0.18		0.25	
Sodium	mg/kg	60,000	**235,500**	300		170		150		230		450		660		460		350		210		219		199		289	
Strontium	mg/kg	3,000	**3,700**	36.1		65.2		35.3		34.9		40.8		54.5		62.8		39.1		22.7		73.8		73		78.7	
Sulphur	mg/kg	**8,400**	3,500	500	U	500	U	700		500	U	500	U	500	U	500	U	500	U	500	U	600		800		500	U
Thallium	mg/kg	**108**	8.5	0.208		0.152		0.131		0.124		0.174		0.174		0.123		0.159		0.182		0.18		0.16		0.24	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	720		397		367		232		491		462		323		398		391		431		335		375	
Uranium	mg/kg	24	**27**	1.21		0.864		1.23		0.819		1.52		0.92		0.54		0.73		0.84		1.98		2.11		1.87	
Vanadium	mg/kg	1,080	**1,200**	44		25.8		27.9		23.2		34.8		33.3		26.9		35.2		36.3		51.6		50		60.9	
Zinc	mg/kg	**1,080**	700	87.2		51.9		46		64.3		96.8		77.1		69.8		70.5		77.4		102		102		121	
Moisture	percent	-	-	11.4		4.55		7.77		2.39	J	8.04	J	4.88		2.15	J	3.78	J	7.02				NT		NT	
pH (1:2 soil:water)	pH Units	-	-	8.14		8.67		8.74		6.12		6.31		7.98		8.54		7.21		6.17		NT		8.41		8.48	
Organic Matter	percent	-	-	0.7	U	0.7	U	0.7	U	0.7	UJ	0.7	UJ	0.7	UJ	0.7	UJ	0.7	UJ	0.7		NT		NT		NT	
Total Organic Carbon	percent	-	-	0.4	U	0.4	U	0.4	U	0.4	UJ	0.4	J	0.4	UJ	0.4	UJ	0.4	UJ	0.4		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.44		0.48		0.1	U	0.1	U	0.12		0.29		0.1	U	0.1	U	0.59		0.63		0.59	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	3.7		4		0.8	U	0.8	U	1		2.42		0.8	U	0.8	U	4.89		5.26		4.94	

Table 9-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow		Borrow	
Sample ID				CH15-403-TP009_SOb		CH15-403-TP011_SOa		CH15-403-TP012_SOa		CH15-403-TP012_SOb		CH15-403-TP013_SOa		CH15-403-TP013_SOb		CH15-403-TP014_SOa		CH15-403-TP015_SOA		CH15-403-TP008_SOb		CH15-403-TP010_SOa		CH15-403-TP910_SOa		CH15-403-TP010_SOb		CH14-403-TP001-SOCOMPA	
Sample Interval (mbgs)		Content [a]	Abundance [b]	4 - 4.2		1.8 - 2		2 - 2.2		5 - 5.2		1.2 - 1.5		4 - 4.3		1 - 1.2		2 - 2.2		6.3 - 6.5		2 - 2.2		2 - 2.2		5.2 - 5.5		1.2 - 6.7	
Sample Date				8/2/2015		7/23/2015		7/24/2015		7/24/2015		8/2/2015		8/2/2015		8/2/2015		7/23/2015		8/3/2015		7/24/2015		7/24/2015		7/24/2015		7/14/2014	
Geological Unit																										Alluv	
Analyte	**Unit**			Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
Aluminum	mg/kg	**852,000**	823,000	15,900		15,200		21,300		15,000		18,500		16,100		12,500		16,800		14,500		11,900		7,980		13,500		13,600	
Antimony	mg/kg	**60**	2	0.81		0.77		0.91		0.78		0.72		0.92		0.6		0.5		0.72		0.48		0.51		0.82		0.78	
Arsenic	mg/kg	**72**	18	10.8		10.6		13.4		8.9		12		14.7		9.22		6.79		10.1		8.52		7.21		11.8		15.8	
Barium	mg/kg	**6,000**	4,250	215		167		260		167		228		215		133		144		182		116		78.4		137		162	
Beryllium	mg/kg	**72**	30	0.63		0.71		0.85		0.63		0.79		0.63		0.51		1.18		0.64		0.47		0.32		0.58		0.59	
Bismuth	mg/kg	-	**0.085**	0.24		0.3		0.33		0.28		0.3		0.29		0.23		0.33		0.22		0.33		0.25		0.29		0.52	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.48		0.38		0.53		0.33		0.45		0.5		0.28		0.27		0.36		0.33		0.23		0.41		0.37	
Calcium	mg/kg	180,000	**415,000**	21,600		9,000		17,400		11,600		8,030		4,930		6,990		6,580		14,600		4,600		2,790		10,100		3,980	
Chromium	mg/kg	840	**1,020**	46		34.2		56.8		38		45		44.4		30		41.1		41.3		25		15.5		34.7		26.1	
Cobalt	mg/kg	96	**250**	16.4		12		17.3		11.9		14.6		13.1		10		18.7		12.7		8.12		5.53		11		12.2	
Copper	mg/kg	360	**600**	35.4		28.2		41.8		26.1		32.8		30.2		24.6		31.9		32.1		17.9		11.3		24.5		30.1	
Iron	mg/kg	480,000	**563,000**	29,200		27,200		35,800		25,500		31,000		29,200		22,100		43,500		26,700		20,800		15,000		24,500		24,900	
Lead	mg/kg	**420**	140	10.3		13.9		19.3		12.3		19.4		19.6		10.3		27.3		11.2		19.3		12.8		15.6		18.3	
Lithium	mg/kg	**300**	200	24.9		24.8		32.6		23.6		28.7		25		22		33.4		22.8		23.6		18.6		25.8		24.3	
Magnesium	mg/kg	60,000	**233,000**	10,000		6,820		11,400		7,040		7,660		6,840		6,040		7,170		8,860		5,660		3,510		6,900		5,740	
Manganese	mg/kg	**12,000**	9,500	471		360		506		340		380		402		289		498		344		248		177		341		415	
Mercury	mg/kg	0.72	**0.85**	0.03		0.03		0.03		0.03		0.02		0.05		0.02		0.02		0.02		0.0084		0.0087		0.02		0.020	
Molybdenum	mg/kg	**24**	12	1.78		1.42		2.94		1.46		1.54		1.72		1.33		1.05		1.89		0.67		0.79		1.12		0.91	
Nickel	mg/kg	600	**840**	49.2		38.2		59.3		38.5		45.2		44.8		30.3		44.3		44.7		25.8		17.2		38.7		30.9	
Phosphorus	mg/kg	9,600	**10,500**	697		749		761		917		852		783		797		595		771		717		507		1140		589	
Potassium	mg/kg	168,000	**208,500**	2,460		2,370		3,180		2,400		3,050		2,280		2,060		3,260		2,200		1,540		1,130		1,920		2,240	
Selenium	mg/kg	**4.8**	0.5	0.47		0.2	U	0.35		0.24		0.2	U	0.2	U	0.24		0.2	U	0.4		0.2		0.2	U	0.52		0.2	
Silver	mg/kg	-	**0.75**	0.14		0.15		0.2		0.13		0.13		0.18		0.11		0.13		0.16		0.17		0.1	U	0.19		0.15	
Sodium	mg/kg	60,000	**235,500**	278		319		393		220		292		163		279		224		350		274		163		264		280	
Strontium	mg/kg	3,000	**3,700**	86.9		51.2		61.7		61.4		50.5		31.7		35.3		39.5		62.6		35.5		24.4		50.7		42.7	
Sulphur	mg/kg	**8,400**	3,500	500	U	600		700		500		500	U	500	U	500	U	700		500	U	500		500	U	600		500	U
Thallium	mg/kg	**108**	8.5	0.16		0.19		0.26		0.18		0.24		0.2		0.17		0.25		0.19		0.18		0.12		0.18		0.275	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	428		495		603		460		534		505		382		593		416		419		308		455		462	
Uranium	mg/kg	24	**27**	1.39		0.91		1.65		1.51		0.95		0.86		0.91		1.33		1.51		0.85		0.7		1.4		1.3	
Vanadium	mg/kg	1,080	**1,200**	47.8		41.5		55.3		39		46.1		45		37.5		41.3		40.9		30.8		22.6		37.6		37.5	
Zinc	mg/kg	**1,080**	700	79.4		188		105		115		203		103		73.2		131		70.8		78.6		54.8		77.5		105	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		5.59	J
pH (1:2 soil:water)	pH Units	-	-	8.59		8.46		8.44		8.57		8.53		8.49		8.37		8.44		8.48		6.94		6.91		8.54		6.96	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.49		0.21		0.3		0.24		0.16		0.1	U	0.15		0.12		0.32		0.1	U	0.1	U	0.15		0.1	U
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	4.08		1.72		2.5		1.98		1.31		0.8	U	1.22		0.99		2.71		0.8	U	0.8	U	1.28		0.8	U

Table 9-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				Borrow		Borrow		Borrow		Borrow		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)	
Sample ID				CH14-403-TP001-SOCOMPB		CH14-403-TP002-SOCOMP		CH14-403-TP003-SOB		CH14-403-TP004-SOA		CH14-403-TP005-SOCOMP		CH15-403-TP016_SOa		CH15-403-TP017_SOa		CH15-403-TP018_SOa		CH15-403-TP918_SOa		CH15-403-TP019_SOa		CH15-403-TP020_SOa		CH15-403-TP020_SOb		CH15-403-TP021_SOa	
Sample Interval (mbgs)		Content [a]	Abundance [b]	1.2 - 6.7		1.5 - 6.5		7 - 7		1.5 - 1.5		1.5 - 7		0.15 - 0.3		0.15 - 0.3		0.15 - 0.45		0.15 - 0.45		0.1 - 0.3		0.3 - 0.5		1.5 - 2		0.3 - 0.5	
Sample Date				7/14/2014		7/15/2014		7/14/2014		7/14/2014		7/15/2014		8/4/2015		8/4/2015		8/4/2015		8/4/2015		8/4/2015		8/5/2015		8/5/2015		8/5/2015	
Geological Unit				Alluv		Alluv		Alluv		Alluv		Alluv																	
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	14,200		16,000		11,600		11,700		18,200		18,500		22,900		16,800		17,900		16,300		17,400		19,400		20,700	
Antimony	mg/kg	**60**	2	0.59		0.61		0.49		0.57		1.01		0.52		0.38		1.02		0.94		0.45		0.36		0.7		0.51	
Arsenic	mg/kg	**72**	18	17.7		11.6		9.42		6.99		16.1		20.7		19.8		12.5		12.7		12.9		17.6		12		20.5	
Barium	mg/kg	**6,000**	4,250	151		109		92.4		94.4		234		117		136		263		259		142		104		249		170	
Beryllium	mg/kg	**72**	30	0.53		0.59		0.52		0.48		0.83		0.78		0.98		0.7		0.71		0.74		0.73		0.8		0.82	
Bismuth	mg/kg	-	**0.085**	0.55		0.29		0.25		0.34		0.30		0.43		0.22		0.25		0.23		0.3		0.33		0.29		0.45	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.294		0.63		0.213		0.336		0.525		0.31		0.16		0.54		0.58		0.29		0.27		0.41		0.32	
Calcium	mg/kg	180,000	**415,000**	3,500		4,820		2,990		2,080		17,200		5,470		4,900		18,200		17,100		3,970		5,170		17,200		13,900	
Chromium	mg/kg	840	**1,020**	27.4		30.3		26.6		22		56.6		36.5		95.2		50.3		51.4		39.6		38.2		52.7		43.4	
Cobalt	mg/kg	96	**250**	13.7		10.5		8.93		8.07		17.6		16.8		27.6		15.6		15		15.5		15.3		16.7		17.1	
Copper	mg/kg	360	**600**	27.4		22.4		17.9		15		47		28.6		63.3		40		36.7		35.3		32.3		37		38.4	
Iron	mg/kg	480,000	**563,000**	26,700		24,800		20,800		19,900		36,000		34,500		43,700		31,800		30,600		32,100		31,800		32,600		36,200	
Lead	mg/kg	**420**	140	17.7		12.2		8.85		12.2		12.2		16.9		0.5	U	13.7		12.2		12.8		14.2		13.6		15.8	
Lithium	mg/kg	**300**	200	23.6		27.4		20.8		27.8		25.5		31.5		33.8		24.4		23.2		27.1		31		27.7		33	
Magnesium	mg/kg	60,000	**233,000**	6,360		6,310		5,110		5,080		12,600		9,390		13,300		9,540		9,610		8,230		9,240		9,920		10,300	
Manganese	mg/kg	**12,000**	9,500	378		385		272		249		499		472		485		461		451		460		395		516		447	
Mercury	mg/kg	0.72	**0.85**	0.024	J	0.022		0.011		0.005		0.042		0.01		0.02		0.05		0.04		0.01		0.01		0.03		0.02	
Molybdenum	mg/kg	**24**	12	0.78		0.82		0.63		0.58		2.5		0.94		0.98		2.05		1.88		0.86		0.76		2.01		1.12	
Nickel	mg/kg	600	**840**	31.4		30.8		24.9		23		59.3		42.1		94.9		53.8		52.8		43.2		43.4		52		47.1	
Phosphorus	mg/kg	9,600	**10,500**	602		842		495		595		880		746		816		987		811		502		555		774		1010	
Potassium	mg/kg	168,000	**208,500**	2,520		1,740		1,530		2,040		2,120		2,210		3,180		2,340		2,500		2,140		2,310		2,670		2,830	
Selenium	mg/kg	**4.8**	0.5	0.2		0.2	U	0.2	U	0.2	U	0.77		0.3		0.41		0.45		0.4		0.21		0.21		0.31		0.24	
Silver	mg/kg	-	**0.75**	0.18		0.11		0.17		0.1	U	0.22		0.1	U	0.1	U	0.18		0.17		0.12		0.1	U	0.15		0.12	
Sodium	mg/kg	60,000	**235,500**	220		310		170		150		240		379		315		298		328		291		364		433		469	
Strontium	mg/kg	3,000	**3,700**	33.8		57.7		32.2		19.9		65.7		54.7		31.5		74.7		67.8		40.1		52.5		68.5		87.8	
Sulphur	mg/kg	**8,400**	3,500	500	U	500	U	500	U	500	U	500	U	500		800		600		500	U	600		500	U	500	U	500	U
Thallium	mg/kg	**108**	8.5	0.226		0.168		0.133		0.167		0.214		0.2		0.23		0.21		0.2		0.21		0.22		0.24		0.26	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	517		438		317		417		517		556		732		441		511		549		555		624		613	
Uranium	mg/kg	24	**27**	1.27		1.12		0.656		0.835		2.32		1.28		1.32		1.57		1.42		1.08		1.08		1.5		1.47	
Vanadium	mg/kg	1,080	**1,200**	33		34.8		29.7		26.4		54.5		40.3		67.9		48.5		50		35.5		35.4		49.6		43.5	
Zinc	mg/kg	**1,080**	700	89.5		103		61.6		114		107		70		72.4		88.9		83.3		59.5		65		77.2		74.1	
Moisture	percent	-	-	6.32	J	NT		4.84	J	4.27	J	NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	6.95		7.11		7.18		6.24		8.28		7.77		7.48		8.56		8.62		8.1		7.92		8.49		8.36	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1	U	0.44		0.1	U	0.1	U	0.43		0.44		0.1	U	0.1	U	0.3		0.2	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	0.8	U	0.8	U	0.8	U	3.66		0.8	U	0.8	U	3.59		3.62		0.8	U	0.8	U	2.53		1.66	

Table 9-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)	
Sample ID				CH15-403-TP921_SOb		CH15-403-TP021_SOb		CH15-403-TP022_SOa		CH15-403-TP022_SOb		CH15-403-TP023_SOa		CH15-403-TP023_SOb		CH15-403-TP024_SOa		CH15-403-TP024_SOb		CH15-403-TP025_SOa		CH15-403-TP025_SOb		CH15-403-TP026_SOa		CH15-403-TP026_SOb		CH15-403-TP926_SOb	
Sample Interval (mbgs)		Content [a]	Abundance [b]	1.5 - 2		1.5 - 2		0.3 - 0.5		2.7 - 2.9		0.3 - 0.5		2.5 - 2.7		0.3 - 0.5		2.3 - 2.5		0.3 - 0.5		0.8 - 1		0.2 - 0.4		2.2 - 2.4		2.2 - 2.4	
Sample Date				8/5/2015		8/5/2015		8/6/2015		8/6/2015		8/6/2015		8/6/2015		8/5/2015		8/5/2015		8/5/2015		8/5/2015		8/6/2015		8/6/2015		8/6/2015	
Geological Unit																													
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	20,500		17,000		22,900		15,800		19,900		17,500		19,200		19,600		18,600		17,100		22,800		17,600		17,800	
Antimony	mg/kg	**60**	2	0.75		1.1		0.37		0.98		0.51		0.58		0.45		1.02		0.5		0.77		0.47		0.64		0.62	
Arsenic	mg/kg	**72**	18	11.6		11.4		23		15.1		20.8		13		27.4		12.7		18		12.4		23.5		11.6		11.8	
Barium	mg/kg	**6,000**	4,250	257		187		144		184		163		210		137		298		155		225		144		212		213	
Beryllium	mg/kg	**72**	30	0.84		0.75		0.96		0.69		0.82		0.69		0.74		0.78		0.78		0.71		1.39		0.66		0.64	
Bismuth	mg/kg	-	**0.085**	0.31		0.27		0.3		0.27		0.36		0.27		0.6		0.28		0.49		0.24		0.34		0.23		0.24	
Boron	mg/kg	-	**100**	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.39		0.37		0.29		0.41		0.37		0.34		0.34		0.62		0.32		0.55		0.28		0.38		0.39	
Calcium	mg/kg	180,000	**415,000**	10,500		13,600		5,950		13,700		6,920		11,700		7,560		19,100		9,010		16,900		5,120		17,200		16,400	
Chromium	mg/kg	840	**1,020**	52.4		46.9		104		42.6		66.8		44.7		44.7		56.9		44.6		48.6		127		48.5		47.7	
Cobalt	mg/kg	96	**250**	16.6		15.6		25.4		16.1		19.3		14.8		16		16.6		16.4		15.6		26.7		14.1		14.4	
Copper	mg/kg	360	**600**	41		36.2		58.6		38		41		36.7		37.5		38.4		38.2		37.6		53.6		35.6		35.9	
Iron	mg/kg	480,000	**563,000**	35,400		31,600		44,400		31,800		39,100		30,500		36,400		33,000		36,500		31,300		47,500		30,400		21,700	
Lead	mg/kg	**420**	140	13.1		14.2		18.1		13		15.7		13.4		16.1		13.2		16.1		13.3		12.6		13.8		14.7	
Lithium	mg/kg	**300**	200	28.6		25.3		41.3		23.7		31.8		23.2		30.5		27.9		28.8		24.4		38.6		24.6		23.3	
Magnesium	mg/kg	60,000	**233,000**	9,800		8,600		13,600		8,340		11,200		8,180		10,200		10,700		9,660		8,900		13,600		9,610		8,700	
Manganese	mg/kg	**12,000**	9,500	459		413		595		459		561		438		419		513		449		453		593		439		424	
Mercury	mg/kg	0.72	**0.85**	0.03		0.03		0.01		0.03		0.01		0.02		0.01		0.06		0.01		0.03		0.01		0.02	J	0.005	UJ
Molybdenum	mg/kg	**24**	12	1.74		1.99		1.04		1.6		1.74		1.87		1.01		2.29		1.22		2.08		1.47		1.81		1.67	
Nickel	mg/kg	600	**840**	53.3		51.7		89.7		46.7		63.6		47.8		46.3		56.4		48.2		51		91.1		47.8		46.1	
Phosphorus	mg/kg	9,600	**10,500**	675		590		623		666		658		764		690		863		574		809		676		856		748	
Potassium	mg/kg	168,000	**208,500**	2,460		2,290		4,180		2,420		2,980		1,990		2,770		3,010		2,880		2,110		5,080		2,290		2,410	
Selenium	mg/kg	**4.8**	0.5	0.31		0.38		0.24		0.4		0.35		0.35		0.27		0.41		0.29		0.43		0.35		0.33		0.31	
Silver	mg/kg	-	**0.75**	0.14		0.19		0.1	U	0.17		0.12		0.12		0.11		0.19		0.12		0.15		0.13		0.13		0.15	
Sodium	mg/kg	60,000	**235,500**	449		358		423		333		396		448		438		321		425		359		327		443		424	
Strontium	mg/kg	3,000	**3,700**	58		60.4		59.9		73		54.3		55.5		72.4		70.1		74.2		65.6		39.6		67.7		64.9	
Sulphur	mg/kg	**8,400**	3,500	500		500	U	700		500	U	600		500	U	500	U	500	U	600		500		600		500		500	U
Thallium	mg/kg	**108**	8.5	0.24		0.21		0.27		0.2		0.25		0.21		0.24		0.24		0.26		0.21		0.3		0.22		0.23	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	548		502		701		463		590		495		620		532		607		465		796		530		547	
Uranium	mg/kg	24	**27**	1.19		1.35		1.05		1.33		1.27		1.23		1.16		1.88		1.09		1.37		1.45		1.49		1.35	
Vanadium	mg/kg	1,080	**1,200**	51.7		45.6		55.8		41.5		46.2		46.2		39.6		55.5		41.2		44.9		53.9		44.7		44.6	
Zinc	mg/kg	**1,080**	700	77.6		69.2		83.8		71.9		75.9		68.4		75.4		90.5		68.9		77.8		72.4		73.3		75.9	
Moisture	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
pH (1:2 soil:water)	pH Units	-	-	8.43		8.51		7.92		8.43		8.16		8.28		8.13		8.57		8.33		8.56		7.84		8.41		8.44	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.15		0.2		0.1	U	0.33		0.1	U	0.18		0.1	U	0.43		0.14		0.37		0.1	U	0.35		0.38	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.28		1.65		0.8	U	2.73		0.8	U	1.51		0.8	U	3.55		1.2		3.12		0.8	U	2.89		3.15	

Table 9-1. Total Metals Analysis and General Chemical Parameter Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit (RU)				Borrow (Fresh Water Supply Dam)		Borrow (Fresh Water Supply Dam)	
Sample ID				CH15-403-TP027_SOa		CH15-403-TP028_SOa	
Sample Interval (mbgs)		Content [a]	Abundance [b]	0.1 - 0.3		0.1 - 0.3	
Sample Date				8/4/2015		8/4/2015	
Geological Unit							
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	19,500		15,900	
Antimony	mg/kg	**60**	2	0.53		0.82	
Arsenic	mg/kg	**72**	18	19		11.8	
Barium	mg/kg	**6,000**	4,250	174		225	
Beryllium	mg/kg	**72**	30	0.8		0.74	
Bismuth	mg/kg	-	**0.085**	0.39		0.3	
Boron	mg/kg	-	**100**	5	U	5	U
Cadmium	mg/kg	**4.2**	1.5	0.34		0.46	
Calcium	mg/kg	180,000	**415,000**	9,050		18,300	
Chromium	mg/kg	840	**1,020**	40.9		45.5	
Cobalt	mg/kg	96	**250**	19.4		15.7	
Copper	mg/kg	360	**600**	44.4		35.8	
Iron	mg/kg	480,000	**563,000**	37,200		30,400	
Lead	mg/kg	**420**	140	17.1		12.6	
Lithium	mg/kg	**300**	200	30.7		25.4	
Magnesium	mg/kg	60,000	**233,000**	9,360		9,010	
Manganese	mg/kg	**12,000**	9,500	512		469	
Mercury	mg/kg	0.72	**0.85**	0.01		0.03	
Molybdenum	mg/kg	**24**	12	1.04		2.11	
Nickel	mg/kg	600	**840**	46.5		50.4	
Phosphorus	mg/kg	9,600	**10,500**	842		745	
Potassium	mg/kg	168,000	**208,500**	3,110		2,680	
Selenium	mg/kg	**4.8**	0.5	0.29		0.38	
Silver	mg/kg	-	**0.75**	0.15		0.26	
Sodium	mg/kg	60,000	**235,500**	445		314	
Strontium	mg/kg	3,000	**3,700**	86		72.7	
Sulphur	mg/kg	**8,400**	3,500	500	U	600	
Thallium	mg/kg	**108**	8.5	0.28		0.21	
Tin	mg/kg	**48**	23	2	U	2	U
Titanium	mg/kg	-	**56,500**	746		491	
Uranium	mg/kg	24	**27**	1.28		1.64	
Vadanium	mg/kg	1,080	**1,200**	45.4		47.5	
Zinc	mg/kg	**1,080**	700	71		78.7	
Moisture	percent	-	-	NT		NT	
pH (1:2 soil:water)	pH Units	-	-	8.37		8.57	
Organic Matter	percent	-	-	NT		NT	
Total Organic Carbon	percent	-	-	NT		NT	
Total Inorganic Carbon	percent	-	-	0.12		0.39	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.02		3.27	

Table 9-1. Total Metals Analysis and General Chemical Parameter
Results (2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.

Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.

Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content ***and*** 10x the crustal abundance.

[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London

[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).

12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

$CaCO_3$ = calcium carbonate

J = This analyte was present but the reported value may not be accurate or precise

mbgs = metre below ground surface

mg/kg = milligram per kilogram

NT = not tested

QA/QC = Quality Assurance and Quality Control

R = Data rejected

U = This analyte was analyzed for but not detected at the specified detection limit

Table 9-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential								Neutralization Potential						
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	
CH12-108-BH004-SOA	**Borrow**	0	0.15	9/30/2012	6.84		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH012-SOA	**Borrow**	0	0.15	9/29/2012	7.17		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH022-SOA	**Borrow**	0	0.15	9/29/2012	7.35		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH023-SOA	**Borrow**	0	0.15	9/29/2012	6.62		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH029-SOA	**Borrow**	0	0.15	9/29/2012	7.51		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH040-SOA	**Borrow**	0	0.15	9/30/2012	7.31		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH100-SOA	**Borrow**	0	0.15	9/29/2012	7.34		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH101-SOA	**Borrow**	0	0.15	9/29/2012	7.59		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH102-SOA	**Borrow**	0	0.15	9/29/2012	7.56		NT		NT		NT		NC		NT		NC		NT		NC
CH12-108-BH103-SOA	**Borrow**	0	0.15	9/29/2012	7.53		NT		NT		NT		NC		NT		NC		NT		NC
CH13-108-BH001-SOA	**Borrow**	0	0.3	8/21/2013	6.5		849		0.01		500	U	1.14		9		90		NT		78.9
CH13-108-BH001-SOB	**Borrow**	0.5	1	8/22/2013	6.7		828		0.02		600		1.12		10		100		NT		89.3
CH13-108-BH002-SOA	**Borrow**	0	0.3	8/21/2013	7.39		774		0.01		500	U	1.15		18		180		NT		157
CH13-108-BH002-SOB	**Borrow**	0.5	1	8/22/2013	6.48		780		0.01		1,700		4.94		15		150		NT		30.4
CH13-108-BH003-SOA	**Borrow**	0	0.3	8/21/2013	7.62		1,340		0.01		500	U	1.18		48		480		NT		407
CH13-108-BH003-SOB	**Borrow**	0.4	0.5	8/28/2013	7.01		943		0.01	U	500	U	1.14		10		100		NT		87.7
CH13-108-BH903-SOB	**Borrow**	0.4	0.5	8/28/2013	7.53		968		0.01		500	U	1.13		15		150		NT		133
CH13-108-BH004-SOA	**Borrow**	0	0.3	8/21/2013	7.78		825		0.01		500	U	1.13		46		460		NT		407
CH13-108-BH004-SOB	**Borrow**	0.2	0.3	8/28/2013	6.32		1,030		0.01		500	U	1.09		8		80		NT		73.4
CH13-108-BH904-SOB	**Borrow**	0.2	0.3	8/28/2013	6.25		926		0.01	U	500	U	1.07		12		120		NT		112
CH13-108-SS001-SOA	**Borrow**	0	0.3	7/8/2013	5.95		NT		NT		500	U	*1.56*		5		50		NT		32.1
CH13-108-SS002-SOA	**Borrow**	0	0.3	7/8/2013	6.21		NT		NT		500	U	*1.56*		9		90		NT		57.7
CH13-108-SS003-SOA	**Borrow**	0	0.3	7/8/2013	7.29		NT		NT		500	U	*1.56*		18		180		NT		115
CH13-108-SS004-SOA	**Borrow**	0	0.3	7/8/2013	7.79		NT		NT		500	U	*1.56*		35		350		NT		224
CH13-108-SS005-SOA	**Borrow**	0	0.3	7/8/2013	6.93		NT		NT		500	U	*1.56*		9		90		NT		57.7
CH13-108-SS006-SOA	**Borrow**	0	0.5	8/22/2013	5.88		756		0.02		500	U	*0.81*		3		30		NT		37.0
CH13-108-TP022-SOA	**Borrow**	2.5	3.5	7/18/2013	6.41		NT		NT		500	U	*1.56*		7		70		NT		44.9
CH13-108-TP022A-SOA	**Borrow**	0	6	7/25/2013	7.46		NT		NT		700		*2.19*		16		160		NT		73.1
CH13-108-TP025-SOA	**Borrow**	2.5	3.5	7/18/2013	6.87		NT		NT		500	U	*1.56*		6		60		NT		38.5
CH13-108-TP026-SOA	**Borrow**	2	4	7/18/2013	6.86		NT		NT		500	U	*1.56*		5		50		NT		32.1
CH13-108-TP027-SOA	**Borrow**	1.5	2.5	7/17/2013	7.58		NT		NT		500	U	*1.56*		82		820		NT		526
CH13-108-TP027A-SOA	**Borrow**	2	3	7/18/2013	7.6		NT		NT		500	U	*1.56*		41		410		NT		263
CH13-108-TP028-SOA	**Borrow**	2	3	7/17/2013	7.48		NT		NT		500	U	*1.56*		19		190		NT		122
CH13-108-TP031-SOA	**Borrow**			7/18/2013	7.76		NT		NT		500	U	*1.56*		59		590		NT		378
CH13-108-TP032-SOA	**Borrow**	2	3	7/22/2013	6.82		NT		NT		500	U	*1.56*		65		650		NT		417
CH13-108-TP033-SOA	**Borrow**	2	3	7/25/2013	7.55		NT		NT		500	U	*1.56*		50		500		NT		321
CH13-108-TP034-SOA	**Borrow**	2	3	7/25/2013	7.6		NT		NT		500	U	*1.56*		13		130		NT		83.3
CH13-108-TP934-SOA	**Borrow**	2	3	7/25/2013	7.61		NT		NT		500	U	*1.56*		12		120		NT		76.9
CH13-108-TP040-SOA	**Borrow**	4	5	8/13/2013	7.54		817		0.01	U	1,000		2.7		19		190		NT		70.4
CH13-108-TP041-SOA	**Borrow**	4	5	8/13/2013	7.75		866		0.01	U	500	U	1.17		28		280		NT		239
CH13-108-TP043-SOA	**Borrow**	4	5	8/13/2013	7.56		1,010		0.01	U	700		1.8		42		420		NT		233
CH14-403-TP001-SOCOMPA	**Borrow**	1.2	6.7	7/14/2014	5.43		NT		NT		500	U	*1.56*		10		100		NT		64.0

Table 9-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential								Neutralization Potential						
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)		Result (percent)	Result Qualifier	
CH14-403-TP001-SOCOMPB	**Borrow**	1.2	6.7	7/14/2014	4.98		NT		NT		500	U	*1.56*		12		120		NT		76.8
CH14-403-TP002-SOCOMP	**Borrow**	1.5	6.5	7/15/2014	4.98		NT		NT		500	U	*1.56*		9		90		NT		57.6
CH14-403-TP003-SOB	**Borrow**	7	7	7/14/2014	6.61		NT		NT		500	U	*1.56*		6		60		NT		38.4
CH14-403-TP004-SOA	**Borrow**	1.5	1.5	7/14/2014	5.15		NT		NT		500	U	*1.56*		4		40		NT		25.6
CH14-403-TP005-SOCOMP	**Borrow**	1.5	7	7/15/2014	7.15		NT		NT		500	U	*1.56*		97		970		NT		621
CH15-403-TP007_SOa	**Borrow**	2.0	2.2	7/24/2015	8.25		1,030		0.01		600		0.65		62		620		NT		956
CH15-403-TP007_SOb	**Borrow**	5.0	5.2	7/24/2015	8.24		1,065		0.01		800		1.25		63		630		NT		505
CH15-403-TP008_SOa	**Borrow**	0.8	1.0	8/3/2015	8.15		977		0.01	U	500	U	0.39		51		510		NT		1,299
CH15-403-TP008_SOb	**Borrow**	6.3	6.5	8/3/2015	8.22		926		0.01		500	U	0.46		60		600		NT		1,304
CH15-403-TP009_SOa	**Borrow**	1.5	1.7	8/2/2015	8.24		1,215		0.01	U	500	U	0.17		72		720		NT		4,214
CH15-403-TP009_SOb	**Borrow**	4	4.2	8/2/2015	8.38		980		0.01	U	500	U	0.41		60		600		NT		1,471
CH15-403-TP010_SOa	**Borrow**	2	2.2	7/24/2015	7.37		767		0.01		500		0.56		24	J	240		NT		428
CH15-403-TP910_SOa	**Borrow**	2	2.2	7/24/2015	6.82		761		0.01		500	U	0.60		9	J	90		NT		149
CH15-403-TP010_SOb	**Borrow**	5.2	5.5	7/24/2015	8.3		1,025		0.01	U	600		0.69		34		340		NT		494
CH15-403-TP011_SOa	**Borrow**	1.8	2	7/23/2015	8.46		1,045		0.01	U	600		0.50		26		260		NT		515
CH15-403-TP012_SOa	**Borrow**	2	2.2	7/24/2015	8.03		1,175		0.01		700		0.85		37		370		NT		437
CH15-403-TP012_SOb	**Borrow**	5	5.2	7/24/2015	8.37		3,310		0.01		500		-1.35		31		310		NT		-230
CH15-403-TP013_SOa	**Borrow**	1.2	1.5	8/2/2015	8.27		855		0.01	U	500	U	0.31		21		210		NT		688
CH15-403-TP013_SOb	**Borrow**	4	4.3	8/2/2015	8.07		1,240		0.01	U	500	U	0.18		11		110		NT		620
CH15-403-TP014_SOa	**Borrow**	1	1.2	8/2/2015	8.18		944		0.01	U	500	U	0.44		34		340		NT		766
CH15-403-TP015_SOA	**Borrow**	2	2.2	7/23/2015	8.17		781		0.01	U	700		1.09		15		150		NT		137
CH15-403-TP016_SOa	**Borrow**	0.2	0.3	8/4/2015	7.62		NT		NT		500		*1.56*		19		190		NT		122
CH15-403-TP017_SOa	**Borrow**	0.2	0.3	8/4/2015	7.13		NT		NT		800		*2.50*		13		130		NT		52.0
CH15-403-TP018_SOa	**Borrow**	0.2	0.45	8/4/2015	8.05		NT		NT		600		*1.88*		49		490		NT		261
CH15-403-TP918_SOa	**Borrow**	0.2	0.5	8/4/2015	8.21		NT		NT		500	U	*1.56*		72		720		NT		461
CH15-403-TP019_SOa	**Borrow**	0.1	0.3	8/4/2015	7.76		NT		NT		600		*1.88*		16		160		NT		85.3
CH15-403-TP020_SOa	**Borrow**	0.3	0.5	8/5/2015	7.8		NT		NT		500	U	*1.56*		17		170		NT		109
CH15-403-TP020_SOb	**Borrow**	1.5	2	8/5/2015	8.09		NT		NT		500	U	*1.56*		46		460		NT		294
CH15-403-TP021_SOa	**Borrow**	0.3	0.5	8/5/2015	8.13		NT		NT		500	U	*1.56*		31		310		NT		198
CH15-403-TP021_SOb	**Borrow**	1.5	2	8/5/2015	8.15		NT		NT		500	U	*1.56*		35		350		NT		224
CH15-403-TP921_SOb	**Borrow**	1.5	2	8/5/2015	8.07		NT		NT		500		*1.56*		31		310		NT		198
CH15-403-TP022_SOa	**Borrow**	0.3	0.5	8/6/2015	7.72		NT		NT		700		*2.19*		17		170		NT		77.7
CH15-403-TP022_SOb	**Borrow**	2.7	2.9	8/6/2015	8.02		NT		NT		500	U	*1.56*		50		500		NT		320
CH15-403-TP023_SOa	**Borrow**	0.3	0.5	8/6/2015	8.02		NT		NT		600		*1.88*		25		250		NT		133
CH15-403-TP023_SOb	**Borrow**	2.5	2.7	8/6/2015	7.93		NT		NT		500	U	*1.56*		29		290		NT		186
CH15-403-TP024_SOa	**Borrow**	0.3	0.5	8/5/2015	7.98		NT		NT		500	U	*1.56*		20		200		NT		128
CH15-403-TP024_SOb	**Borrow**	2.3	2.5	8/5/2015	8.13		NT		NT		500	U	*1.56*		105		1,050		NT		672
CH15-403-TP025_SOa	**Borrow**	0.3	0.5	8/5/2015	8.14		NT		NT		600		*1.88*		32		320		NT		171
CH15-403-TP025_SOb	**Borrow**	0.8	1	8/5/2015	8.19		NT		NT		500		*1.56*		50		500		NT		320
CH15-403-TP026_SOa	**Borrow**	0.2	0.4	8/6/2015	7.7		NT		NT		600		*1.88*		17		170		NT		90.7
CH15-403-TP026_SOb	**Borrow**	2.2	2.4	8/6/2015	8.05		NT		NT		500	U	*1.56*		48		480		NT		307
CH15-403-TP926_SOb	**Borrow**	2.2	2.4	8/6/2015	8.06		NT		NT		500	U	*1.56*		62		620		NT		397

Table 9-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Paste pH		Acid Potential							Neutralization Potential					Neutralization Potential Ratio (NP/AP)
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		
					Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH15-403-TP027_SOa	**Borrow**	0.1	0.3	8/4/2015	8.11		NT		NT		500		*1.56*	19		190	NT		122
CH15-403-TP028_SOa	**Borrow**	0.1	0.3	8/4/2015	8.1		NT		NT		600		*1.88*	67		670	NT		357.3

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Analytical results for neutralization potential by the AOAC 955.01 and MOD-SOBEK-3.2.3 methods are reported; results by the MOD-SOBEK-3.2.3 method are indicated using "*".
AOAC 955.01 is the preferred analytical method for neutralization potential; however, MOD-SOBEK-3.2.3 was applied to some samples collected in 2012 due to miscommunication.
Analytical results by the AOAC 955.01 method should be considered in future analysis and decision-making process.

Calculated values of acid potential presented italics were calculated based on total sulphur content, and represent conservative estimates of the acid generation potential.A21

$CaCO_3$ = calcium carbonate
CaO = calcium oxide
J = Analyte was present but the reported value may not be accurate or precise.
kg = kilogram
LMB =
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NC = not calculated
NP/AP = nuetralization potential divided by acid potential
NT = not tested
ppm = parts per million
QA/QC = Quality Assurance and Quality Control
U = This analyte was analyzed for but not detected at the specified detection limit.

Table 9-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow
Sample ID			CH13-108-TP040-SOA	CH15-403-TP008_SOa	CH15-403-TP008_SOb	CH15-403-TP010_SOa	CH15-403-TP910_SOa	CH15-403-TP010_SOb	CH15-403-TP007_SOa	CH15-403-TP007_SOb	CH15-403-TP009_SOa	CH15-403-TP009_SOb	CH15-403-TP011_SOa	CH15-403-TP012_SOa	CH15-403-TP012_SOb	CH15-403-TP013_SOa	CH15-403-TP013_SOb	CH15-403-TP014_SOa	CH15-403-TP015_SOA
Depth From (mbgs)			4	0.8	6.3	2	2	5.2	2	5	1.5	4	1.8	2	5	1.2	4	1	2
Depth From (mbgs)			5	1	6.5	2.2	2.2	5.5	2.2	5.2	1.7	4.2	2	2.2	5.2	1.5	4.3	1.2	2.2
Sample Date			8/13/2013	8/3/2015	8/3/2015	7/24/2015	7/24/2015	7/24/2015	7/24/2015	7/24/2015	8/2/2015	8/2/2015	7/23/2015	7/24/2015	7/24/2015	8/2/2015	8/2/2015	8/2/2015	7/23/2015
pH	**Result (pH units)**	6.5-9.0	8.91	8.33	8.48	6.97	6.87	8.11	8.29	8.15	8.47	8.46	8.52	8.05	8.51	8.41	8.42	8.23	8.43
	Result Qualifier																		
Acidity	**Result (mg/L)**	-	1	1.7	1.5	2.6	3.2	1.2	1	1.2	1	1	1.3	1.5	1	1.6	1.8	1.9	1.3
	Result Qualifier		U						U		U	U			U				
Total Alkalinity	**Result (mg/L)**	-	54.6	55.7	56.7	8.7	9.6	73.3	77	88.9	52.5	60.1	47.4	82.5	51.4	50.6	42.6	34.2	45.2
	Result Qualifier																		
Specific Conductance	**Result (µS/cm)**	-	NT	110	118	29.2	32.2	141	222	327	110	130	92.4	165	108	96.7	80.6	61.8	94.9
	Result Qualifier																		
ORP Leachable	**Result (mV)**	-	315	370	347	429	409	383	401	408	419	380	408	381	384	385	370	378	405
	Result Qualifier																		
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.301	0.89	0.05	1.78	1.68	0.23	0.01	0.007	0.01	0.01	0.13	0.06	0.03	0.03	0.04	12.5	0.04
	Result Qualifier																		
Antimony	**Result (mg/L)**	1.6	0.00128	0.00028	0.00028	0.00017	0.00017	0.00019	0.0002	0.0002	0.0001	0.00014	0.00019	0.00011	0.00014	0.00016	0.00013	0.00141	0.0001
	Result Qualifier										U								U
Arsenic	**Result (mg/L)**	0.005	0.0036	0.0022	0.001	0.0029	0.0027	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.001
	Result Qualifier				U			U	U	U	U	U	U	U	U	U	U		U
Barium	**Result (mg/L)**	2.3	0.0171	0.05	0.04	0.05	0.04	0.03	0.08	0.06	0.09	0.06	0.04	0.07	0.03	0.04	0.04	0.26	0.02
	Result Qualifier																		
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00069	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.016	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier			U	U	U		U	U		U	U	U	U	U	U	U	U	U
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																		
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.00005	0.00005	0.000158	0.000112	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000385	0.00005
	Result Qualifier		U	U	U			U	U	U	U	U	U	U	U	U	U		U
Calcium	**Result (mg/L)**	-	13.4	19.9	12.9	4.63	5.45	23.5	20.5	33.6	15.7	14.7	14.2	27.2	14.6	16.8	13.5	12.2	13.4
	Result Qualifier																		
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																		
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0022	0.0005	0.00296	0.00269	0.0005	0.0005	0.00063	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00086	0.02	0.0005
	Result Qualifier		U						U		U	U	U	U	U	U			U
Cobalt	**Result (mg/L)**	-	0.0001	0.00072	0.0001	0.00123	0.00098	0.00022	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00692	0.0001
	Result Qualifier		U		U				U	U	U	U	U	U	U	U	U		U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.0065	0.001	0.01	0.0078	0.0026	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.05	0.001
	Result Qualifier		U		U				U	U	U	U	U	U	U	U	U		U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																		
Iron	**Result (mg/L)**	0.3	0.331	1.97	0.05	2.46	2.13	0.37	0.03	0.03	0.03	0.03	0.22	0.07	0.03	0.04	0.05	19.6	0.05
	Result Qualifier								U	U	U	U			U				
Lead	**Result (mg/L)**	0.001	0.00055	0.00114	0.0001	0.00964	0.00652	0.00046	0.0001	0.0001	0.0001	0.0001	0.00019	0.0001	0.0001	0.0001	0.0001	0.01	0.0001
	Result Qualifier				U				U	U	U	U		U	U	U	U		U
Lithium	**Result (mg/L)**	-	0.009	0.005	0.0065	0.005	0.005	0.005	0.01	0.01	0.0055	0.0086	0.005	0.005	0.007	0.005	0.005	0.01	0.0053
	Result Qualifier			U		U	U	U					U	U		U	U		
Magnesium	**Result (mg/L)**	-	1.35	1.56	6.38	0.83	0.83	2.31	12	17.4	3.02	6.11	1.03	2.26	3.15	1.02	1.06	2.55	1.72
	Result Qualifier																		
Manganese	**Result (mg/L)**	-	0.00401	0.01	0.0005	0.05	0.04	0.00868	0.0005	0.0005	0.0005	0.0005	0.00136	0.00059	0.0005	0.0005	0.00054	0.16	0.0005
	Result Qualifier				U				U	U	U	U			U	U			U
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000078	0.00005
	Result Qualifier		U	UJ	UJ	U	U	U	U	U	UJ	UJ	U	U	U	UJ	UJ	J	U
Molybdenum	**Result (mg/L)**	0.073	0.00346	0.00581	0.00565	0.00051	0.0007	0.00563	0.01	0.01	0.0068	0.01	0.00621	0.00894	0.01	0.00763	0.01	0.00277	0.00298
	Result Qualifier																		

Table 9-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex

Faro Mine Remediation Project

Remediation Unit		Screening Level	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow	Borrow
Sample ID			CH13-108-TP040-SOA	CH15-403-TP008_SOa	CH15-403-TP008_SOb	CH15-403-TP010_SOa	CH15-403-TP910_SOa	CH15-403-TP010_SOb	CH15-403-TP007_SOa	CH15-403-TP007_SOb	CH15-403-TP009_SOa	CH15-403-TP009_SOb	CH15-403-TP011_SOa	CH15-403-TP012_SOa	CH15-403-TP012_SOb	CH15-403-TP013_SOa	CH15-403-TP013_SOb	CH15-403-TP014_SOa	CH15-403-TP015_SOA
Depth From (mbgs)			4	0.8	6.3	2	2	5.2	2	5	1.5	4	1.8	2	5	1.2	4	1	2
Depth From (mbgs)			5	1	6.5	2.2	2.2	5.5	2.2	5.2	1.7	4.2	2	2.2	5.2	1.5	4.3	1.2	2.2
Sample Date			8/13/2013	8/3/2015	8/3/2015	7/24/2015	7/24/2015	7/24/2015	7/24/2015	7/24/2015	8/2/2015	8/2/2015	7/23/2015	7/24/2015	7/24/2015	8/2/2015	8/2/2015	8/2/2015	7/23/2015
Nickel	**Result (mg/L)**	0.025	0.0005	0.00494	0.0005	0.00676	0.00502	0.00138	0.0005	0.00059	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.03	0.0005
	Result Qualifier		U		U				U		U	U	U	U	U	U	U		U
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																		
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																		
Potassium	**Result (mg/L)**	-	6.7	2	2	2	2.5	3	4.5	5.8	3.2	3.4	2	2.3	2.5	2	2	4.2	2
	Result Qualifier			U	U	U							U			U	U		U
Selenium	**Result (mg/L)**	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.03	0.01	0.0005	0.00085	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U			U		U	U	U	U	U	U	U
Silicon	**Result (mg/L)**	-	3.92	4.42	1.91	5.2	4.85	2.74	2.13	1.86	2.2	2.61	3.31	3.31	2.82	3.47	3.67	25	1.93
	Result Qualifier																		
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.000532	0.000385	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.000143	0.00005
	Result Qualifier		U	U	U			U	U	U	U	U	U	U	U	U	U		U
Sodium	**Result (mg/L)**	-	3.7	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier																		
Strontium	**Result (mg/L)**	-	0.0475	0.06	0.08	0.02	0.02	0.08	0.15	0.17	0.08	0.13	0.04	0.08	0.07	0.04	0.04	0.04	0.05
	Result Qualifier																		
Sulphate	**Result (mg/L)**	100	2.03	1.52	5.37	1.83	2.1	3.44	29.2	70.5	4.56	6.68	1.33	5.62	2.92	1.97	0.99	0.5	3.78
	Result Qualifier																	U	
Sulphur	**Result (mg/L)**	-	0.69	0.7	1.99	0.66	0.8	1.36	9.31	23	1.54	2.31	0.55	2.04	1	0.75	0.5	0.5	1.3
	Result Qualifier																U	U	
Thallium	**Result (mg/L)**	0.0008	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00017	0.0001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U	U	U	U		U
Titanium	**Result (mg/L)**	0.1	0.01	0.03	0.01	0.03	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.32	0.01
	Result Qualifier		U		U			U	U	U	U	U	U	U	U	U	U		U
Uranium	**Result (mg/L)**	0.015	0.00147	0.000732	0.00245	0.000269	0.000252	0.000548	0.00412	0.00693	0.00177	0.00219	0.000154	0.00127	0.00172	0.000177	0.000218	0.000584	0.000205
	Result Qualifier																		
Vanadium	**Result (mg/L)**	-	0.0035	0.0038	0.001	0.0048	0.0044	0.0011	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.04	0.001
	Result Qualifier				U				U	U	U	U	U	U	U	U	U		U
Zinc	**Result (mg/L)**	0.03	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.08	0.01
	Result Qualifier		U	U	U			U	U	U	U	U	U	U	U	U	U		U

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1,000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness > 180 mg/L, the CWQG is 4 µg/L; At hardness ≥ 82 to ≤ 180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465}$ * 0.2 / 1,000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness > 180 mg/L, the CWQG is 7 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1,000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness > 180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1,000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

> = greater
≥ = greater than or equal to
< = less than
≤ = less than or equal to
°C = degrees Celsius
µg/L = micrograms per litre
µS/cm = micro-Siemens per centimetre
CCME = Canadian Council of Ministers of the Environment
CWQG = Canadian Water Quality Guidelines
FIGQG =
J - analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/L = milligrams per litre
mV = millivolt
NTU = Nephelometric Tubidity Unit
ORP = Oxidation-reduction Potential
R = result has been rejected for use
U = analyte was analyzed for but not detected at the specified detection limit
UJ = analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Vangorda WRD		Vangorda WRD		Vangorda WRD		Vangorda WRD		Vangorda WRD		Vangorda WRD		Vangorda WRD		Vangorda WRD		Vangorda WRD	
Sample ID				CH12-014-MW013-SOA		CH12-014-MW013-SOB		CH12-014-MW013-SOC		CH12-014-MW013-SOD		CH12-014-MW013-SOE		CH12-014-MW013-SOF		CH12-014-MW013-SOG		CH12-014-MW013-SOH		CH12-014-MW013-SOJ		CH12-014-MW013-SOK		CH12-014-MW013-SOL		CH12-014-MW013-SOM	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance [b]	0 - 0.1		5.4 - 5.6		9.3 - 9.5		15.4 - 15.6		20.6 - 20.8		24.9 - 25.1		30.4 - 30.6		38.9 - 39.1		4 - 4		10 - 10		25 - 25		43 - 43	
Sample Date				8/5/2012		8/5/2012		8/5/2012		8/6/2012		8/6/2012		8/6/2012		8/6/2012		8/7/2012		8/4/2012		8/4/2012		8/4/2012		8/4/2012	
Geological Unit				WR		WR		WR		WR		WR		WR		Alluv		BR - PHY									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	10,300		3,090		3,390		3,350		3,080		4,110		13,100		18,200		NT		NT		NT		NT	
Antimony	mg/kg	**60**	2	37.9		88.4		29.1		30.5		54		29.4		39.0		2.55		NT		NT		NT		NT	
Arsenic	mg/kg	**72**	18	475		553		728		489		714		405		199		16.7		NT		NT		NT		NT	
Barium	mg/kg	**6,000**	4,250	63.1		4.61	U	2.85	U	49.1		2.42	U	30.6		51		201		NT		NT		NT		NT	
Beryllium	mg/kg	**72**	30	0.36		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.44		0.21		NT		NT		NT		NT	
Bismuth	mg/kg	-	**0.085**	3.68		5.43		5.13		1.65		5.29		2.35		0.52		0.28		NT		NT		NT		NT	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NT		NT		NT		NT	
Cadmium	mg/kg	**4.2**	1.5	17		44.8		18.0		17.4		37.6		27.5		26.4		2.14		NT		NT		NT		NT	
Calcium	mg/kg	180,000	**415,000**	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	NT		NT		NT		NT	
Chromium	mg/kg	840	**1,020**	43.4		9.58		6.58		7.84		12		36		74.4		53		NT		NT		NT		NT	
Cobalt	mg/kg	96	**250**	56.8		238		236		66.8		166		75.6		42.5		15.5		NT		NT		NT		NT	
Copper	mg/kg	360	**600**	681		2,230		2,280		644		1,520		849		519		63.2		NT		NT		NT		NT	
Iron	mg/kg	480,000	**563,000**	97,600		217,000		235,000		65,900		250,000		121,000		60,600		38,300		NT		NT		NT		NT	
Lead	mg/kg	**420**	140	8330		14,200		5,000		7,890		2,510		7,450		10,700		735		NT		NT		NT		NT	
Lithium	mg/kg	**300**	200	14.1		5	U	5	U	5	U	5	U	6.3		19.2		39.3		NT		NT		NT		NT	
Magnesium	mg/kg	60,000	**233,000**	7,860		5,800		3,070		2,650		3,050		5,980		9,550		16,100		NT		NT		NT		NT	
Manganese	mg/kg	**12,000**	9,500	2,140		9,620		2,610		723		2,650		2,810		531		544		NT		NT		NT		NT	
Mercury	mg/kg	0.72	**0.85**	5.05		17.1		2.89		12.5		8.55		5.60		9.13		0.884		NT		NT		NT		NT	
Molybdenum	mg/kg	**24**	12	3.82		2.06		1.54		3.57		7.15		3.98		2.77		1.48		NT		NT		NT		NT	
Nickel	mg/kg	600	**840**	69.2		21		15.7		11.2		17.1		38.9		79.2		50.8		NT		NT		NT		NT	
Phosphorus	mg/kg	9,600	**10,500**	542		138		145		444		174		312		452		328		NT		NT		NT		NT	
Potassium	mg/kg	168,000	**208,500**	810		180		100	U	430		100	U	180		720		130		NT		NT		NT		NT	
Selenium	mg/kg	**4.8**	0.5	0.85		3.06		2.38		2		1.95		0.78		0.38		0.2	U	NT		NT		NT		NT	
Silver	mg/kg	-	**0.75**	12.6		44.1		18.5		13.1		25.2		12.4		14.5		1.08		NT		NT		NT		NT	
Sodium	mg/kg	60,000	**235,500**	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U	NT		NT		NT		NT	
Strontium	mg/kg	3,000	**3,700**	50.4		92.6		31.2		10		20.4		36.4		36.1		161		NT		NT		NT		NT	
Sulphur	mg/kg	**8,400**	3,500	78,900		214,000		252,000		74,200		271,000		109,000		105,000		6,200		292,000		136,000		80,400		245,000	
Thallium	mg/kg	**108**	8.5	6.68		14.9		3.84		3.32		8.11		2.87		6.17		0.374		NT		NT		NT		NT	
Tin	mg/kg	**48**	23	2	U	2.5		2	U	2	U	2	U	2	U	2	U	2	U	NT		NT		NT		NT	
Titanium	mg/kg	-	**56,500**	118		1	U	1	U	51.8		17.4		1	U	194		35.4		NT		NT		NT		NT	
Uranium	mg/kg	24	**27**	2.82		0.788		1.22		1.55		1.86		1.72		1.16		0.448		NT		NT		NT		NT	
Vanadium	mg/kg	1,080	**1,200**	26.1		10.1		8.05		10.3		16.1		17.7		33		18.7		NT		NT		NT		NT	
Zinc	mg/kg	**1,080**	700	12800		33,000		8,290		11,200		15,600		15,600		11,100		1,460		NT		NT		NT		NT	
Moisture	percent	-	-	10.50		17.4		10.4		7.78		10.6		18.4		13		14.8		5.4	J	5.66	J	4.17	J	3.82	J
pH (1:2 soil:water)	pH Units	-	-	5.72		5.62		4.5		3.74		3.57		5.38		7.19		8.33		NT		NT		NT		NT	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.20		0.83		0.5		0.16		0.26		0.67		0.23		1.31		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.69		6.95		4.17		1.34		2.20		5.58		1.91		10.9		NT		NT		NT		NT	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD	
Sample ID				CH12-014-MW011-SOA		CH12-014-MW011-SOB		CH12-014-MW011-SOC		CH12-014-MW011-SOD		CH12-014-MW911-SOD		CH12-014-MW011-SOE		CH12-014-MW011-SOF		CH12-014-MW011-SOG		CH12-014-MW911-SOG		CH12-014-MW011-SOH		CH12-014-MW011-SOI		CH12-014-MW011-SOJ	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance[b]	6 - 6.2		11.5 - 11.7		15.1 - 15.3		21.2 - 21.4		21.2 - 21.4		26.1 - 26.3		29.8 - 30						5 - 5		10 - 10		30 - 30	
Sample Date				8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012		8/3/2012	
Geological Unit				WR		WR		WR		WR		WR		Alluv		BR - PHY											
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	12,800		14,100		9,790		10,200		11,900		16,800		20,000		NT		NT		NT		NT		NT	
Antimony	mg/kg	**60**	2	0.39		0.53		0.92		0.73		1.12	J	0.96		2.76		NT		NT		NT		NT		NT	
Arsenic	mg/kg	**72**	18	12		16.2		18.5		15.8		16.6	J	22.8		38.1		NT		NT		NT		NT		NT	
Barium	mg/kg	**6,000**	4,250	133		129		147		92.9		118		216		116		NT		NT		NT		NT		NT	
Beryllium	mg/kg	**72**	30	0.45		0.45		0.56		0.45		0.5		0.43		0.41		NT		NT		NT		NT		NT	
Bismuth	mg/kg	-	**0.085**	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.21		0.21		NT		NT		NT		NT		NT	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NT		NT		NT		NT		NT	
Cadmium	mg/kg	**4.2**	1.5	0.118		0.145		0.416		0.614	J	0.247	J	0.484		0.434		NT		NT		NT		NT		NT	
Calcium	mg/kg	180,000	**415,000**	50	U	50	U	50	U	50	U	50	U	50	U	50	U	NT		NT		NT		NT		NT	
Chromium	mg/kg	840	**1,020**	25.6		27.0		24.0		16.6		19.7		35.7		40.5		NT		NT		NT		NT		NT	
Cobalt	mg/kg	96	**250**	15.3		16.6		17.6		13.1		16		15.5		24		NT		NT		NT		NT		NT	
Copper	mg/kg	360	**600**	26.2		32.2		34.8		23.8		28.4	J	31.4		48.7		NT		NT		NT		NT		NT	
Iron	mg/kg	480,000	**563,000**	39,700		41,000		37,300		33,500		37,900		33,900		44,800		NT		NT		NT		NT		NT	
Lead	mg/kg	**420**	140	20.6		13.4		21		0.5	U	0.5	U	53.4		467		NT		NT		NT		NT		NT	
Lithium	mg/kg	**300**	200	25		28.3		17.3		20.1		22.8		31		39.7		NT		NT		NT		NT		NT	
Magnesium	mg/kg	60,000	**233,000**	17,200		17,200		15,300		18,200		19,700		13,500		17,600		NT		NT		NT		NT		NT	
Manganese	mg/kg	**12,000**	9,500	457		528		478		521		485		487		396		NT		NT		NT		NT		NT	
Mercury	mg/kg	0.72	**0.85**	0.01		0.01	U	0.01		0.01		0.005	U	0.05		0.25		NT		NT		NT		NT		NT	
Molybdenum	mg/kg	**24**	12	1.77		1.74		5.09		2.72		2.92		1.69		1.68		NT		NT		NT		NT		NT	
Nickel	mg/kg	600	**840**	41.2		47		50		40.9		46.2		41.7		62.1		NT		NT		NT		NT		NT	
Phosphorus	mg/kg	9,600	**10,500**	717		905		1,600		1,030		1,430		603		594		NT		NT		NT		NT		NT	
Potassium	mg/kg	168,000	**208,500**	890		750		1,450		1,250		1,500		1,210		610		NT		NT		NT		NT		NT	
Selenium	mg/kg	**4.8**	0.5	0.32		0.4		1.33		0.89		1.23		0.27		0.43		NT		NT		NT		NT		NT	
Silver	mg/kg	-	**0.75**	0.11		0.16		0.14		0.1	U	0.1	U	0.23		0.87		NT		NT		NT		NT		NT	
Sodium	mg/kg	60,000	**235,500**	100	U	100	U	100	U	100	U	100	U	110		100	U	NT		NT		NT		NT		NT	
Strontium	mg/kg	3,000	**3,700**	79.4		114		100		114		105		72.3		59.7		NT		NT		NT		NT		NT	
Sulphur	mg/kg	**8,400**	3,500	2,600		2,700		6,000		4,400		3,600		3,100		2,000		5,700		5,200		3,600		3,000		3,700	
Thallium	mg/kg	**108**	8.5	0.122		0.107		0.195		0.228	J	0.588	J	0.145		0.277		NT		NT		NT		NT		NT	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	NT		NT		NT		NT		NT	
Titanium	mg/kg	-	**56,500**	36.4	J	81.0		42.1		46.3	J	119	J	196		75		NT		NT		NT		NT		NT	
Uranium	mg/kg	24	**27**	1.72		1.79		2.65		2.23		2.18		1.36		1.67		NT		NT		NT		NT		NT	
Vanadium	mg/kg	1,080	**1,200**	18.9		21.4		24.7		17.4		19.9		33.9		25.9		NT		NT		NT		NT		NT	
Zinc	mg/kg	**1,080**	700	93.8		87.3		89.2		92.9		65.6		131		461		NT		NT		NT		NT		NT	
Moisture	percent	-	-	9.6		6.53		4.54		1.81		NT		5.48		12.2		5.03	J	4.65	J	7.33	J	3.15	J	5.41	J
pH (1:2 soil:water)	pH Units	-	-	8.51		8.67		8.34		8.45		8.26		8.19		7.95		NT		NT		NT		NT		NT	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		0.96		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		0.6		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	1.64		1.12		1.56		2.1		2.1		2.16		0.19		NT		NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	13.7		9.35		13		17.3		17.5		18		1.55		NT		NT		NT		NT		NT	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum WRD		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH12-014-MW012-SOA		CH12-014-MW012-SOB		CH12-014-MW012-SOC		CH12-014-MW012-SOD		CH12-014-MW012-SOE		CH12-014-MW012-SOF		CH12-014-MW912-SOF		CH12-014-MW012-SOG		CH12-014-MW012-SOH		CH12-311-BH001-SOA		CH12-311-BH001-SOB		CH12-311-BH001-SOC	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance[b]	5.7 - 5.9		11.8 - 12		18.5 - 18.7		22.1 - 22.3		28.9 - 29.1		38.3 - 38.5		38.3 - 38.5		8 - 8		14 - 14		0.9 - 1.52		4.27 - 4.57		7.62 - 10.67	
Sample Date				8/4/2012		8/4/2012		8/4/2012		8/4/2012		8/4/2012		8/4/2012		8/4/2012		8/4/2012		8/4/2012		7/28/2012		7/28/2012		7/28/2012	
Geological Unit				WR		WR		WR		Alluv		Alluv		BR - PHY		BR - PHY											
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	14,600		17,000		19,500		14,700		9,190		17,800		16,500		NT		NT		17,700		15,500		15,200	
Antimony	mg/kg	**60**	2	0.52		0.55		0.67		0.6		0.71		0.76		0.66		NT		NT		0.51		1.6		2.43	J
Arsenic	mg/kg	**72**	18	35.5		21.7		15.9		13		14.1		12.4		13.5		NT		NT		9.78		16.0		131	J
Barium	mg/kg	**6,000**	4,250	180		179		230		216		131		169		163		NT		NT		129.00		472		214	
Beryllium	mg/kg	**72**	30	0.48		0.52		0.63		0.49		0.30		0.46		0.48		NT		NT		0.73		0.65		0.67	
Bismuth	mg/kg	-	**0.085**	0.2	U	0.21		0.27		0.23		0.82		0.2	U	0.2	U	NT		NT		0.52		0.33		0.46	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	NT		NT		10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.181		0.25		0.344		0.361		0.281		0.355		0.238		NT		NT		0.34		0.723		1.15	J
Calcium	mg/kg	180,000	**415,000**	50	U	50	U	50	U	50	U	50	U	50	U	50	U	NT		NT		7,260		13,400		11,000	
Chromium	mg/kg	840	**1,020**	115		70.2		58		41.8		32		65.1		50		NT		NT		48.90		31.7		34.2	
Cobalt	mg/kg	96	**250**	17.9		15.8		14.5		12.0		8.1		13.9		14.6		NT		NT		12.00		11.4		17.8	
Copper	mg/kg	360	**600**	20.6		26.2		27.1		25.4		20		26.8		24.3		NT		NT		23.20		36.3		69.4	J
Iron	mg/kg	480,000	**563,000**	35,900		31,400		33,100		26,000		19,100		35,800		33,500		NT		NT		28,100		27,400		33,200	
Lead	mg/kg	**420**	140	0.5	U	0.5	U	14.7		16.5		57.7		24.7		29.6		NT		NT		19.00		26.6		532	J
Lithium	mg/kg	**300**	200	26.5		30.7		36.4		26.4		19.3		32.8		28.4		NT		NT		40.90		24		27.9	
Magnesium	mg/kg	60,000	**233,000**	20,900		14,400		13,000		9,600		6,610		16,700		14,200		NT		NT		9,250		8,180		8,240	
Manganese	mg/kg	**12,000**	9,500	530		458		499		430		298		564		496		NT		NT		359		515		513	
Mercury	mg/kg	0.72	**0.85**	0.019		0.023		0.03		0.033		0.167		0.028		0.027		NT		NT		0.02		0.055		0.271	J
Molybdenum	mg/kg	**24**	12	1.47		0.87		0.94		1.07		0.96		1.13		1.63		NT		NT		0.50	U	0.5	U	0.5	U
Nickel	mg/kg	600	**840**	106		66.7		46.4		38.1		30.4		44.4		49.8		NT		NT		36		34.8		30.9	
Phosphorus	mg/kg	9,600	**10,500**	1,010		633		576		559		356		499		476		NT		NT		554		804		515	
Potassium	mg/kg	168,000	**208,500**	1,080		1,650		2,060		1,630		840		1,050		1,090		NT		NT		3,060		2,220		2,320	
Selenium	mg/kg	**4.8**	0.5	0.32		0.35		0.33		0.41		0.2	U	0.35		0.38		NT		NT		0.20	U	0.97		0.43	
Silver	mg/kg	-	**0.75**	0.11		0.11		0.14		0.15		0.18		0.15		0.11		NT		NT		0.11		0.29		1.1	J
Sodium	mg/kg	60,000	**235,500**	140		160		240		190		100	U	100	U	110		NT		NT		180		730		240	
Strontium	mg/kg	3,000	**3,700**	89.9		65.5		65.9		54.9		31.5		127		114		NT		NT		34.10		62.9		47.4	
Sulphur	mg/kg	**8,400**	3,500	1,900		3,100		1,700		1,500		1,200		1,100		1,700		2,700		3,800		500	U	600		3,100	
Thallium	mg/kg	**108**	8.5	0.111		0.138		0.157		0.124		0.109		0.15	J	0.86	J	NT		NT		0.24		0.191		0.508	J
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	NT		NT		2.00	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	201		327		542		346		208		184		173		NT		NT		548		370		453	
Uranium	mg/kg	24	**27**	1.51		1.3		1.47		1.21		0.788		1.17		1.34		NT		NT		2.39		2.08		2.35	
Vanadium	mg/kg	1,080	**1,200**	37.6		38		44.3		36.2		22.8		32.3		27.7		NT		NT		31.20		50.5		33.2	
Zinc	mg/kg	**1,080**	700	71.6		72.2		83.9		76.2		90.3		103		103		NT		NT		86		121		666	J
Moisture	percent	-	-	11		12.6		13.3		16.7		12.1		4.4		NT		6.71	J	7.04	J	10.7		10.8		10.1	
pH (1:2 soil:water)	pH Units	-	-	8.3		8.23		8.87		8.14		8.16		8.49		8.32		NT		NT		8.41		8.09		8.48	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	1.37		0.6		0.94		0.62		0.34		2.53		2.42		NT		NT		0.24		0.23		0.32	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	11.4		5.03		7.83		5.13		2.87		21.1		20.1		NT		NT		1.98		1.93		2.64	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH12-311-BH901-SOC		CH12-311-BH001-SOD		CH12-311-BH001-SOE		CH12-311-BH001-SOF		CH12-311-BH001-SOG		CH12-311-BH001-SOH		CH12-311-BH002-SOA		CH12-311-BH002-SOB		CH12-311-BH902-SOB		CH12-311-BH002-SOC		CH12-311-BH002-SOD		CH12-311-BH002-SOE	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance[b]	7.62 - 10.67		10.67 - 16.76		21.3 - 21.64		26.5 - 26.85		31.7 - 32		37.8 - 38.1		0 - 1.52		5.1 - 6.1		5.1 - 6.1		10.67 - 13.72		15.24 - 16.24		21.3 - 22.1	
Sample Date				7/28/2012		7/28/2012		7/28/2012		7/28/2012		7/28/2012		7/28/2012		7/29/2012		7/29/2012		7/29/2012		7/29/2012		7/29/2012		7/29/2012	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	18,300		18,200		26,700		18,200		19,400		22,100		15,900		5,520		4,620		21,700		25,100		18,200	
Antimony	mg/kg	**60**	2	0.69	J	0.69		0.27		0.73		0.85		0.88		0.7		0.86		0.59		0.61		0.3		0.54	
Arsenic	mg/kg	**72**	18	12.7	J	11.4	J	6.76		14		13.9		16.6		12.1		5.95	J	15.2	J	20.7		10.7		11.8	
Barium	mg/kg	**6,000**	4,250	193		210		55.0		258		273		322		273		50.6		55.9		39.8		41.8		215	
Beryllium	mg/kg	**72**	30	0.74		0.74		0.46		0.69		0.75		0.78		0.54		0.26		0.27		0.29		0.36		0.59	
Bismuth	mg/kg	-	**0.085**	0.37		0.36		0.2	U	0.34		0.36		0.37		0.27		0.2	U	0.2	U	0.2	U	0.2	U	0.31	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.319	J	0.267		0.126		0.462		0.491		0.507		0.367		0.05	U	0.054		0.089		0.072		0.42	
Calcium	mg/kg	180,000	**415,000**			8,790		32,000		8,950		8,940		13,300		9,210		38,700		43,400		25,800		39,400		11,200	
Chromium	mg/kg	840	**1,020**	40.8		36.2		33.1		45.9		51		58.2		28.6		16.8		18.8		34.4		36.7		46.6	
Cobalt	mg/kg	96	**250**	11.8		11.6		18.8		15.8		16.0		14.5		10.9		16.4		16.1		25.1		10.9		16.2	
Copper	mg/kg	360	**600**	26.1	J	20.3		21.5		38.1		39.6		34.7		22.9		45.3	J	24.4	J	27.6		26.4		34.3	
Iron	mg/kg	480,000	**563,000**	27,800		28,900		46,800		33,000		33,900		32,700		26,700		40,000		37,200		43,300		45,300		33,400	
Lead	mg/kg	**420**	140	40.5	J	14.2		14.8		15.1		17.5		18.2		16.6		42.0	J	24.5	J	38		13.5		15	
Lithium	mg/kg	**300**	200	32.4		32.7		56.0		29.6		30.8		38.2		25.7		8.4		6.7		40.7		48.9		32.3	
Magnesium	mg/kg	60,000	**233,000**	9,490		9,040		19,400		9,680		10,200		11,900		7,840		15,500		15,600		18,800		20,300		10,000	
Manganese	mg/kg	**12,000**	9,500	418		437		517		460		462		505		418		459		494		409		517		474	
Mercury	mg/kg	0.72	**0.85**	0.023	J	0.013		0.006		0.039		0.023		0.043		0.086		0.064		0.04		0.106		0.023		0.031	
Molybdenum	mg/kg	**24**	12	0.5	U	0.5	U	2.58		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Nickel	mg/kg	600	**840**	36.7		30.4		38.1		44.1		46		46.9		26.6		44.1		44.5		52.6		44.5		43	
Phosphorus	mg/kg	9,600	**10,500**	567		566		821		705		703		666		703		495		459		591		650		661	
Potassium	mg/kg	168,000	**208,500**	2,570		2,460		1,030		2,230		2,350		3,080		2,180		880		870		470		680		1,950	
Selenium	mg/kg	**4.8**	0.5	0.29		0.35		0.2	U	0.47		0.55		0.64		0.37		0.2	U	0.2	U	0.2	U	0.33		0.46	
Silver	mg/kg	-	**0.75**	0.20	J	0.15		0.15		0.19		0.2		0.19		0.15		0.14		0.12		0.12		0.1	U	0.16	
Sodium	mg/kg	60,000	**235,500**	290		270		110		260		280		230		260		100	U	100		100	U	100	U	200	
Strontium	mg/kg	3,000	**3,700**	53.1		40.5		135		42.7		44.7		56.3		42.4		124		146		114		143		48.6	
Sulphur	mg/kg	**8,400**	3,500	11,200		1,300		1,200		NT		1,000		900		700		2,600		1,900		900		1,500		1,100	
Thallium	mg/kg	**108**	8.5	0.210	J	0.177		0.074		0.174		0.198		0.198		0.149		0.31		0.226		0.149		0.175		0.149	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	488		487		138		540		557		459		509		12.2		11.8		46.3		50.6		324	
Uranium	mg/kg	24	**27**	2.19		2.11		1.2		2.21		2.39		2.14		1.65		1.13		1.08		1.31		1.24		1.82	
Vanadium	mg/kg	1,080	**1,200**	36.0		36.8		41.8		44.2		46.7		49.3		38.6		11.1		9.74		20.2		38.7		35.4	
Zinc	mg/kg	**1,080**	700	96.1	J	76.1		89.2		89.0		94.0		99.6		82.1		100		104		154		86.1		88	
Moisture	percent	-	-	8.3		9.03		13.4		13.8		11.9		9.83		15		1.78		2.71		12.9		11.5		11.7	
pH (1:2 soil:water)	pH Units	-	-	8.4		8.49		8.50		8.14		8.13		8.28		8.44		8.87		8.95		8.57		8.58		8.34	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.28		0.2		1.18		0.24		0.1	U	0.44		0.21		1.94		2.23		1.19		1.39		0.41	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	2.33		1.66		9.85		2.02		0.7	U	3.69		1.74		16.1		18.6		9.93		11.6		3.38	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH12-311-BH002-SOF		CH12-311-BH002-SOG		CH12-311-BH002-SOH		CH12-311-BH002-SOI		CH12-311-BH002-SOJ		CH12-311-BH003-SOA		CH12-311-BH003-SOB		CH12-311-BH003-SOC		CH12-311-BH003-SOD		CH12-311-BH903-SOD		CH12-311-BH003-SOE		CH12-311-BH003-SOF	
Sample Interval (mbgs)	12x Median Soil Content [a]	10x Crustal Abundance [b]		25.3 - 25.9		30.8 - 31.4		35.7 - 36.3		40.5 - 41.1		43.29 - 43.89		0.91 - 1.52		4.57 - 7.62		7.62 - 9.75		15.74 - 16.24		15.74 - 16.24		21.6 - 22.25		25.9 - 26.5	
Sample Date				7/29/2012		7/29/2012		7/29/2012		7/29/2012		7/30/2012		7/30/2012		7/30/2012		7/30/2012		7/30/2012		7/30/2012		7/30/2012		7/30/2012	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	19,400		18,800		19,100		20,500		20,900		16,300		11,400		17,900		16,000		14,200		15,600		15,400	
Antimony	mg/kg	**60**	2	0.57		0.59		0.98		0.51		0.48		0.71		0.66		0.97		0.61		0.63		0.63		0.54	
Arsenic	mg/kg	**72**	18	14.9		13.6		17.2		14.0		19.3		12.3		19.6		92.6		10.5		9.19		11.2		12.3	
Barium	mg/kg	**6,000**	4,250	224		213		380		185		225		283		191		199		205		205		157		207	
Beryllium	mg/kg	**72**	30	0.63		0.61		0.66		0.69		0.69		0.56		0.52		0.7		0.69		0.66		0.78		0.47	
Bismuth	mg/kg	-	**0.085**	0.38		0.31		0.32		0.35		0.4		0.29		0.24		0.34		0.37		0.34		0.43		0.24	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.389		0.398		0.609		0.289		0.351		0.384		0.247		0.325		0.272		0.265		0.266		0.429	
Calcium	mg/kg	180,000	**415,000**	9,940		9,980		15,600		10,900		7,880		8,510		21,300		11,600		8,720		8,606		7,130		11,500	
Chromium	mg/kg	840	**1,020**	49.3		47.8		48		50.8		66.8		32		34.8		43.9		35.4		33		28.4		40.8	
Cobalt	mg/kg	96	**250**	17.2		15.5		13.8		15.5		15.4		11.1		16.1		15		10.9		9.28		9.22		11.4	
Copper	mg/kg	360	**600**	54.4		42.1		35.3		29.4		40.3		25.2		33.9		25.1		18.9		16.9		17.9		24.1	
Iron	mg/kg	480,000	**563,000**	35,600		33,800		31,100		33,900		38,100		27,800		35,000		28,600		24,200		21,300		23,700		25,900	
Lead	mg/kg	**420**	140	21		15.6		16		12.7		33.5		16.7		51.4		51.3		14.3		14.0		14.7		14.5	
Lithium	mg/kg	**300**	200	33.7		32.8		32.1		37.5		41.8		27.1		21.1		31.8		30.7		28.8		32.4		27.2	
Magnesium	mg/kg	60,000	**233,000**	10,200		10,300		11,100		11,100		10,200		7,580		13,200		9,390		7,510		6,140		6,440		9,050	
Manganese	mg/kg	**12,000**	9,500	500		476		481		495		474		433		454		424		369		350		357		400	
Mercury	mg/kg	0.72	**0.85**	0.043		0.03		0.046		0.019		0.028		0.024		0.049		0.443		0.018		0.026		0.021		0.038	
Molybdenum	mg/kg	**24**	12	0.5	U	0.5	U	0.5	U	0.5	U	4.07		1.1		1.90		0.62		0.78		0.69		0.70		1.02	
Nickel	mg/kg	600	**840**	46.7		45		43.6		44.6		43.3		29.2		45.6		40.7		28.3		25.6		22.8		34.4	
Phosphorus	mg/kg	9,600	**10,500**	687		660		772		627		696		679		866		579		544		538		526		722	
Potassium	mg/kg	168,000	**208,500**	2,120		2,140		2,720		2,860		3,700		2,040		1,600		2,390		2,430		2,240		2,610		1,470	
Selenium	mg/kg	**4.8**	0.5	0.37		0.43		0.79		0.34		0.37		0.43		0.44		0.27		0.27		0.31		0.27		0.54	
Silver	mg/kg	-	**0.75**	0.16		0.16		0.22		0.14		0.17		0.18		0.16		0.19		1.60		1.26		0.16		0.2	
Sodium	mg/kg	60,000	**235,500**	210		200		210		280		400		250		170		230		240		250		200		190	
Strontium	mg/kg	3,000	**3,700**	45.4		44.2		71.5		49.6		44.3		42		73.7		49.9		37.9		35.7		33.8		55.9	
Sulphur	mg/kg	**8,400**	3,500	900		1,200		1,000		800		700		700		1,500		800		600		800		600		700	
Thallium	mg/kg	**108**	8.5	0.161		0.156		0.191		0.197		0.257		0.148		0.343		0.199		0.187		0.178		0.216		0.143	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	377		377		375		498		593		445		225		471		513		474		558		363	
Uranium	mg/kg	24	**27**	1.50		1.34		1.75		3.55		1.59		1.81		2.11		2.18		2.53		2.59		2.39		1.56	
Vanadium	mg/kg	1,080	**1,200**	38.5		38.9		48.7		40		41.1		37.5		31.9		36.4		34		32.3		31.3		34.2	
Zinc	mg/kg	**1,080**	700	91.6		92.5		105		83.4		109		84.2		138		133		73.3		67.2		70.3		77.6	
Moisture	percent	-	-	9.68		11.4		9.99		8.79		10.3		10.3		10.6		11.3		8.80		9.02		10.5		12.2	
pH (1:2 soil:water)	pH Units	-	-	8.34		8.39		8.49		8.45		8.61		8.33		8.52		8.56		8.54		8.51		8.50		8.16	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.24		0.3		0.38		0.28		0.29		0.26		0.68		0.28		0.23		0.31		0.19		0.36	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	2		2.49		3.16		2.31		2.38		NT		NT		NT		NT		NT		NT		NT	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH12-311-BH003-SOG		CH12-311-BH003-SOH		CH12-311-BH004-SOA		CH12-311-BH004-SOB		CH12-311-BH904-SOB		CH12-311-BH004-SOC		CH12-311-BH004-SOD		CH12-311-BH004-SOE		CH12-311-BH004-SOF		CH12-311-BH004-SOG		CH12-311-BH005-SOA		CH12-311-BH005-SOB	
Sample Interval (mbgs)	12x Median Soil Content [a]	10x Crustal Abundance[b]		31.39 - 32		39.9 - 40.5		0.61 - 1.22		6.4 - 7.31		6.4 - 7.31		12.8 - 13.4		21 - 21.6		26.2 - 26.8		32.3 - 32.91		35.4 - 36		0.91 - 1.52		5.79 - 6.4	
Sample Date				7/30/2012		7/31/2012		8/1/2012		8/1/2012		8/1/2012		8/1/2012		8/2/2012		8/2/2012		8/2/2012		8/2/2012		7/31/2012		7/31/2012	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	14,200		19,400		15,900		4,100	U	3,560	U	12,900		16,400		17,700		17,900		16,700		17,500		20,500	
Antimony	mg/kg	**60**	2	0.48		0.62		0.77		0.82		0.94		6.78		0.61		0.52		0.39		0.38		0.1	U	0.1	U
Arsenic	mg/kg	**72**	18	14.3		82.0		9.31		27.8		45.2	J	31.1		9.99		9.72		13.2		14.3		10.0		30.0	
Barium	mg/kg	**6,000**	4,250	144		178		289		412		408		262		196		163		149		149		179		55.9	
Beryllium	mg/kg	**72**	30	0.52		0.55		0.6		0.49		0.51		0.54		0.67		0.68		0.52		0.49		0.73		0.28	
Bismuth	mg/kg	-	**0.085**	0.56		0.31		0.27		0.2	U	0.2	U	0.41		0.36		0.37		0.24		0.23		0.53		0.2	U
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.395		0.313		0.383		0.179		0.05	U	3.54		0.312		0.262		0.249		0.218		0.285		0.05	U
Calcium	mg/kg	180,000	**415,000**	5,030		17,800		50	U	17,400		18,600		50	U	50	U	50	U	50	U	50	U	7,280		20,300	
Chromium	mg/kg	840	**1,020**	30.2		49.7		31.4		0.5	U	0.5	U	43		33.4		42.7		50		29.8		46.2		38.8	
Cobalt	mg/kg	96	**250**	11.7		17.9		9.76		13.1		17.5		9.67		10.4		10.7		14.1		14		12		24.1	
Copper	mg/kg	360	**600**	27.5		29.3		20.4		22.0	J	223.00	J	27.5		22.2		23.7		24.7		25.9		0.5	U	0.5	U
Iron	mg/kg	480,000	**563,000**	25,300		34,600		24,900		34,400		39,600		25,000		25,400		27,500		32,300		29,900		28,900		48,500	
Lead	mg/kg	**420**	140	15.3		15.9		13.7		33.2		32.3	J	1,270		13.7		14.8		10.8		14.4		0.5	U	0.5	U
Lithium	mg/kg	**300**	200	26.3		34.1		27.2		5	U	5	U	27.8		30.9		35.9		36.6		31.5		37.6		37.9	
Magnesium	mg/kg	60,000	**233,000**	6,390		11,500		7,250		11,600		12,700		8,020		7,620		9,100		11,400		8,550		8,920		19,200	
Manganese	mg/kg	**12,000**	9,500	347		508		404		455		532		365		386		376		465		401		398		435	
Mercury	mg/kg	0.72	**0.85**	0.024		0.03		0.036		0.05		0.051	J	2.11		0.023		0.021		0.02		0.031		0.02		0.007	
Molybdenum	mg/kg	**24**	12	0.79		2.34		0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	2.6		0.5	U	0.5	U	0.5	U	0.5	U
Nickel	mg/kg	600	**840**	31.9		42.7		0.5	U	33.7		45.8		31.0		27.7		29.9		41.7		31.4		35.2		57.3	
Phosphorus	mg/kg	9,600	**10,500**	628		652		673		655		629		550		622		536		559		602		538		521	
Potassium	mg/kg	168,000	**208,500**	1,420		1,750		2,510		100	U	100	U	1,550		2,260		2,380		1,380		1,190		2,800		100	U
Selenium	mg/kg	**4.8**	0.5	0.3		0.4		0.38		0.24	J	0.43	J	0.25		0.29		0.28		0.27		0.2	U	0.25		0.39	
Silver	mg/kg	-	**0.75**	0.16		0.19		0.1	U	0.1	U	0.1	U	2.43		0.1	U	0.1	U	0.1	U	0.1	U	0.13		0.12	
Sodium	mg/kg	60,000	**235,500**	160		320		240		100	U	100	U	140	U	250		100	U	100	U	240		190		100	U
Strontium	mg/kg	3,000	**3,700**	29		69.8		46.2		72.7		75.8		50.2		0.5	U	0.5	U	46.1		0.5	U	35.5		78	
Sulphur	mg/kg	**8,400**	3,500	600		1,200		800		2,700		2,600		2,100		900		700		800		800		900		6,000	
Thallium	mg/kg	**108**	8.5	0.149		0.151		0.182		0.6		0.733		0.313		0.182		0.192		0.122		0.131		0.23		0.918	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	363		350		570		1	U	1	U	330		426		399		293		263		503		34.2	
Uranium	mg/kg	24	**27**	2.08		1.55		3.74		1.58		1.7		1.43		2.37		2.18		1.4		1.08		1.67		2.06	
Vanadium	mg/kg	1,080	**1,200**	29.4		37.6		38.8		22.2		24.1		26.5		33.8		33.3		32.7		26.6		33.4		29.1	
Zinc	mg/kg	**1,080**	700	72.5		92.6		74		128		108		1,950		70.6		71.3		73.2		72.1		1	U	1	U
Moisture	percent	-	-	12.4		12		10		4.99		5.16		7.05		11.6		13		9.63		6.18		12.6		2.92	
pH (1:2 soil:water)	pH Units	-	-	8.39		8.46		8.41		8.45		8.49		8.47		8.41		8.36		8.44		8.04		8.29		8.52	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.24		0.56		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.19		0.77	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		2.08		10.20		12.90		1.52		1.50		1.63		3.56		0.90		1.62		6.4	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH12-311-BH005-SOC		CH12-311-BH905-SOC		CH12-311-BH005-SOD		CH12-311-BH005-SOE		CH12-311-BH005-SOF		CH12-311-BH005-SOG		CH12-311-BH005-SOH		CH12-311-BH005-SOI		CH12-311-BH006-SOA		CH12-311-BH006-SOB		CH12-311-BH006-SOC		CH12-311-BH006-SOD	
Sample Interval (mbgs)	12x Median Soil Content [a]	10x Crustal Abundance[b]		12.5 - 13.1		12.5 - 13.1		15.2 - 15.8		19.2 - 19.8		24.38 - 25		29.87 - 30.48		35 - 35.66		39.6 - 40.2		1.22 - 1.52		5.18 - 6.1		10.36 - 10.66		14.6 - 15.8	
Sample Date				7/31/2012		7/31/2012		7/31/2012		7/31/2012		7/31/2012		7/31/2012		7/31/2012		7/31/2012		8/1/2012		8/1/2012		8/1/2012		8/1/2012	
Geological Unit																											
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	18,700		21,400		10,800		29,200		21,300		15,500		17,900		18,200		21,300		16,500		18,900		14,600	
Antimony	mg/kg	**60**	2	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.63		0.92		0.46		0.63	
Arsenic	mg/kg	**72**	18	10.4		12.4		11.5		13.6		14.0		16.0		10.6		10.5		13.4		13.1		41.2		11.4	
Barium	mg/kg	**6,000**	4,250	179		218		105		80.0		260		152	J	214		103		250		256		54.8		125	
Beryllium	mg/kg	**72**	30	0.78		0.51		0.37		0.38		0.75		0.6		0.65		0.7		0.72		0.6		0.71		0.54	
Bismuth	mg/kg	-	**0.085**	0.47		0.32		0.22		0.2	U	0.34		0.27		0.36		0.42		0.42		0.38		0.47		0.67	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.275		0.296		0.356		0.05	U	0.405		0.306		0.37		0.05	U	0.382		0.405		0.05	U	0.232	
Calcium	mg/kg	180,000	**415,000**	8,930		13,100		50	U	44,200		9,540		50	U	8,910		12,500		50	U	50	U	50	U	50	U
Chromium	mg/kg	840	**1,020**	39.7		61.1		20.6		59.9		56.2		31.9		44.8		112		48.6		59.3		59.4		36.7	
Cobalt	mg/kg	96	**250**	12.1		13.4		10.3		24.4		14.9		12.8		12.8		15.4		16.3		13.2		26.2		12.4	
Copper	mg/kg	360	**600**	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	38.7		37.3		53.4		28.1	
Iron	mg/kg	480,000	**563,000**	29,000		31,100		22,100		50,600		34,400		28,700		31,100		29,400		36,000		28,700		54,500		28,400	
Lead	mg/kg	**420**	140	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	23.2		37.5		7.38		13.3	
Lithium	mg/kg	**300**	200	39.4		38.4		5	U	58.6		37.7		5	U	5	U	39.7		37.6		25.6		31.3		30.9	
Magnesium	mg/kg	60,000	**233,000**	9,690		14,600		5,050		24,000		10,300		6,860		9,060		15,300		10,300		10,500		18,100		7,600	
Manganese	mg/kg	**12,000**	9,500	413		458		316		567		457		445		487		385		460		451		630		350	
Mercury	mg/kg	0.72	**0.85**	0.016		0.025		0.017		0.01		0.036		0.02		0.035		0.008		0.036		0.059		0.01	U	0.019	
Molybdenum	mg/kg	**24**	12	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	2.35	
Nickel	mg/kg	600	**840**	34.1		55.5		26.4		49		43.4		34.9		36.5		94		43.4		52.2		64		31.7	
Phosphorus	mg/kg	9,600	**10,500**	584		591		482		681		682		449		617		493		676		662		589		526	
Potassium	mg/kg	168,000	**208,500**	2,690		2,510		730		930		2,450		1,050	J	2,530		2,490		2,660		1,890		1,150		1,510	
Selenium	mg/kg	**4.8**	0.5	0.23		0.35		0.29		0.2	U	0.39		0.35		0.45		0.2	U	0.45		0.43		0.21		0.26	
Silver	mg/kg	-	**0.75**	0.12		0.16		0.11		0.1	U	0.17		0.25		0.15		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Sodium	mg/kg	60,000	**235,500**	240		240		110		100	U	370		250		260		110		270		100	U	100	U	100	U
Strontium	mg/kg	3,000	**3,700**	43.7		55.3		0.5	U	153		53.1		21		39.9		53		0.5	U	46		0.5	U	0.5	U
Sulphur	mg/kg	**8,400**	3,500	1,000		1,000		600		3,700		1,100		500	U	900		600		1,200		700		2,600		700	
Thallium	mg/kg	**108**	8.5	0.224		0.178		0.105		0.085		0.186		0.13		0.183		0.219		0.196		0.191		0.086		0.156	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	492		487		236		62.4		525		384	J	434		521		539		570		1	U	328	
Uranium	mg/kg	24	**27**	2.18		2.66		1.61		0.98		1.7		2.52		2.41		1.57		1.68		2.35		1.44		1.63	
Vanadium	mg/kg	1,080	**1,200**	34.4		40.9		23.3		49.7		41.4		32.2		37.4		35		39.9		41.1		44.9		26.7	
Zinc	mg/kg	**1,080**	700	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U	112		107		77.2		74.6	
Moisture	percent	-	-	9.42		10.7		5.21		4.59		13.3		12.9		9.93		10.5		11.6		11.8		4.77		13.1	
pH (1:2 soil:water)	pH Units	-	-	8.54		8.45		7.54		8.68		8.28		6.77		8.37		8.64		7.87		8.13		8.49		8.23	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.19		0.18		0.1	U	1.25		0.18		0.1	U	0.14		0.32		0.1	U	0.1	U	0.1	U	0.1	U
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.6		1.49		0.7	U	10.4		1.53		0.7	U	1.18		2.65		1.47		1.90		5.69		0.91	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH12-311-BH006-SOE		CH12-311-BH906-SOE		CH12-311-BH006-SOF		CH12-311-BH006-SOG		CH12-311-BH006-SOH		CH12-311-TP007-SOA		CH12-311-TP008-SOA		CH12-311-TP009-SOA		CH12-311-TP012-SOA		CH12-311-TP013-SOA		CH12-311-TP014-SOA		CH12-311-TP015-SOA	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance [b]	23.16 - 24.07		23.16 - 24.07		27.7 - 28.34		32.3 - 32.9		36.88 - 37.49		0 - 5.2		0 - 3.05		0 - 4.27		0 - 5.49		0 - 3.7		0 - 4.25		0 - 6.1	
Sample Date				8/1/2012		8/1/2012		8/1/2012		8/1/2012		8/1/2012		8/7/2012		8/7/2012		8/7/2012		8/7/2012		8/7/2012		8/7/2012		8/7/2012	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	18,200		17,700		15,900		21,400		24,500		15,400		18,600		12,500		17,700		12,800		17,100		12,800	
Antimony	mg/kg	**60**	2	0.57		0.65		0.1	U	0.44		0.39		1.84		1.31		0.46		0.82		0.45		2.75		0.82	
Arsenic	mg/kg	**72**	18	11.0		10.9		10.4		11		6.5		25.2		25		7.79		17.4		15.9		49.5		21.3	J
Barium	mg/kg	**6,000**	4,250	210		217		82.1		191		187		246		208		165		314		120		116		167	
Beryllium	mg/kg	**72**	30	0.57		0.60		0.48		0.72		0.49		0.57		0.63		0.47		0.61		0.43		0.43		0.43	
Bismuth	mg/kg	-	**0.085**	0.29		0.28		0.24		0.48		0.29		0.41		0.35		0.26		0.47		0.21		0.23		0.23	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.367		0.325		0.172		0.338		0.05	U	0.617		0.57		0.264		0.487		0.332		0.437		0.604	
Calcium	mg/kg	180,000	**415,000**	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	50	U	16,500		50	U
Chromium	mg/kg	840	**1,020**	50		41.2		36.2		43.2		200		48.2		46.3		26.8		42.0		24.6		34.5		22.8	
Cobalt	mg/kg	96	**250**	14.2		13		13.3		13.1		32.6		14.5		17.5		8.11		13.3		11.1		25.4		13.8	
Copper	mg/kg	360	**600**	31.1		28.8		17.7		32.1		83.2		49		35.4		19.1		30.4		23.3		46.5		41.0	
Iron	mg/kg	480,000	**563,000**	31,900		29,500		29,200		33,000		35,800		32,500		35,800		20,300		31,500		25,400		45,800		25,900	
Lead	mg/kg	**420**	140	13.1		12.9		9.74		23.1		17.8		219		129		11.4		33.7		46.7		767		81	
Lithium	mg/kg	**300**	200	32.1		30.6		36.2		38.3		59.2		27.1		35.1		23		30.3		25		29.7		22	
Magnesium	mg/kg	60,000	**233,000**	9,950		8,890		7,750		9,250		20,600		10,100		11,600		6,000		9,370		6,370		14,300		6,630	
Manganese	mg/kg	**12,000**	9,500	421		405		373		412		440		478		466		284		456		574		417		324	
Mercury	mg/kg	0.72	**0.85**	0.029		0.031		0.012		0.024		0.009		0.193		0.115		0.023		0.047		0.052		0.258		0.059	
Molybdenum	mg/kg	**24**	12	0.5	U	0.5	U	0.5	U	0.5	U	5.7		0.98		0.81		0.52		1.15		0.8		2.72		0.76	
Nickel	mg/kg	600	**840**	41.7		34.9		38.4		35		170		47		46.5		23.3		40.6		27.8		59		30.4	
Phosphorus	mg/kg	9,600	**10,500**	705		546		443		658		477		562		569		399		595		462		752		564	
Potassium	mg/kg	168,000	**208,500**	2,070		2,020		1,100		3,070		5,880		1,630		1,780		1,620		2,150		850		680		930	
Selenium	mg/kg	**4.8**	0.5	0.44		0.36		0.2	U	0.31		0.2	U	0.36		0.29		0.24		0.55		0.2	U	0.68		0.29	
Silver	mg/kg	-	**0.75**	0.1	U	0.1	U	0.1	U	0.1	U	46.6		0.51		0.32		0.11		0.18		0.20		1.1		0.19	
Sodium	mg/kg	60,000	**235,500**	290		260		230		400		340		130		150		160		230		110		100	U	210	
Strontium	mg/kg	3,000	**3,700**	46.7		52.1		0.5	U	48.5		47		38.1		59.5		33.2		45.1		18.3		67.8		28.6	
Sulphur	mg/kg	**8,400**	3,500	1,700		1,300		600		800		500	U	1,400		900		1,000		800		800		3,100		1,500	
Thallium	mg/kg	**108**	8.5	0.152		0.157		0.115		0.23		0.676		0.251		0.272		0.132		0.197		0.14		0.339		0.178	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	5.50		2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	407		409		363		613		869		312		344		330		436		273		99.6		246	
Uranium	mg/kg	24	**27**	1.89		1.72		175		2.73		1.09		1.6		1.89		1.41		1.85		2.1		1.99		1.23	
Vanadium	mg/kg	1,080	**1,200**	37.6		32.6		28		39.5		37.6		31.3		32.9		25.2		38.5		24.9		27.1		22.3	
Zinc	mg/kg	**1,080**	700	86.8		77.3		70.1		135		81.4		302		275		61.4		100		140		417		215	
Moisture	percent	-	-	9.99		9.79		7.64		9.57		6.08		11		12.5		11.3		10.9		9.11		9.12		13	J
pH (1:2 soil:water)	pH Units	-	-	8.27		8.25		7.49		8.27		8.88		8.22		8.03		8.13		8.28		7.65		7.95		6.8	
Organic Matter	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.3		0.38		0.17		0.19		0.18		0.54		0.10	J
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.87		2.13		0.7	U	0.82		1.11		2.51		3.19		1.45		1.59		1.46		4.47		0.86	J

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH12-311-TP915-SOA		CH13-311-BH011-SOA		CH13-311-BH011-SOB		CH13-311-BH011-SOC		CH13-311-BH011-SOD		CH13-311-BH011-SOE		CH13-311-BH911-SOE		CH13-311-BH012-SOA		CH13-311-BH012-SOB		CH13-311-BH012-SOC		CH13-311-BH012-SOD		CH13-311-BH013-SOA	
Sample Interval (mbgs)	12x Median Soil Content [a]	10x Crustal Abundance [b]		0 - 6.1		3.66 - 4.57		9.75 - 10.67		25 - 25.91		34.14 - 35.05		37.19 - 38.1		37.19 - 38.1		0.61 - 1.5		9.75 - 10.67		18.9 - 19.81		40.23 - 41.15			
Sample Date				8/7/2012		7/23/2013		7/23/2013		7/23/2013		7/23/2013		7/24/2013		7/24/2013		7/24/2013		7/24/2013		7/24/2013		7/25/2013		7/18/2013	
Geological Unit																											
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	12,800		20,000		16,900		19,200		20,700		19,600		19,100		17,200		17,200		16,600		21,000		17,200	
Antimony	mg/kg	**60**	2	1.23		0.62		3.2		0.69		0.51		1.02		0.97		0.76		0.98		1.05		0.63		0.81	
Arsenic	mg/kg	**72**	18	39.2	J	11.2		50.8		15.3		16.4		26.3	J	15	J	10		212		16.8		19.7		12.1	
Barium	mg/kg	**6,000**	4,250	192		202		290		265		227		383		353		340		326		216		246		280	
Beryllium	mg/kg	**72**	30	0.42		0.68		0.67		0.60		0.63		0.68		0.68		0.67		0.63		0.79		0.99		0.59	
Bismuth	mg/kg	-	**0.085**	0.22		0.35		0.32		0.31		0.29		0.31		0.34		0.32		0.26		0.54		0.39		0.28	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.592		0.265		0.871		0.411		0.328		0.558		0.539		0.369		0.394		0.567		0.411		0.403	
Calcium	mg/kg	180,000	**415,000**	50	U	13,600		11,100		11,600		19,600		17,800		14,100		8,530		10,300		4,840		14,700		9,860	
Chromium	mg/kg	840	**1,020**	26.5		44.8		48.7		45.9		61.5		45.7		43		27.8		28.9		34.2		52.9		32.2	
Cobalt	mg/kg	96	**250**	14.9		12.7		14.3		14.1		15.4		12.6		12.7		9.86		10.7		11		16.6		10.8	
Copper	mg/kg	360	**600**	44.4		26.9		46.5		33.4		29.7		31.9		29.6		23.8		25		24.4		38.3		76.7	
Iron	mg/kg	480,000	**563,000**	28,100		29,100		31,000		31,500		32,200		29,700		29,100		25,800		27,200		26,600		35,800		27,000	
Lead	mg/kg	**420**	140	133		18.9		485		15.4		16		19.4		21		14.6		18		168		16.9		15.3	
Lithium	mg/kg	**300**	200	22.4		32.3		28.4		29.8		34.6		33.6		33.5		29.5		25.2		33.2		36		27.9	
Magnesium	mg/kg	60,000	**233,000**	7,750		9,390		9,400		9,970		12,800		10,700		10,500		6,950		7,620		7,390		10,600		7,250	
Manganese	mg/kg	**12,000**	9,500	350		456		400		465		574		476		462		393		400		371		522		434	
Mercury	mg/kg	0.72	**0.85**	0.097		0.025		0.336		0.038		0.024		0.058		0.053		0.029		0.035		0.229		0.036		0.024	
Molybdenum	mg/kg	**24**	12	0.78		0.5	U	1.22		0.5	U	0.5	U	1.57		1.13		0.9		1.17		0.71		0.86		1.58	
Nickel	mg/kg	600	**840**	33.9		39		48.2		42.5		49.1		40.9		41.1		25.5		27.9		29.8		48.1		28.9	
Phosphorus	mg/kg	9,600	**10,500**	626		608		608		649		704		1,290	J	727	J	654		754		623		874		653	
Potassium	mg/kg	168,000	**208,500**	840		2,580		2,110		2,380		2,200		3,040		2,720		2,550		2,280		2,310		2,360		2,650	
Selenium	mg/kg	**4.8**	0.5	0.32		0.38		0.5		0.54		0.33		0.86		0.82		0.43		0.53		0.27		0.41		0.37	
Silver	mg/kg	-	**0.75**	0.27		0.15		0.99		0.16		0.1	U	0.22		0.21		0.15		0.16		0.42		0.16		0.15	
Sodium	mg/kg	60,000	**235,500**	200		230		180		250		190		230		170		280		350		170		220		340	
Strontium	mg/kg	3,000	**3,700**	29.3		58		49.4		52.3		71.9		93		65.8		44.9		49.4		26.3		67.4		46	
Sulphur	mg/kg	**8,400**	3,500	1,000		1,200		4,300		2,000		1,700		1,500		1,500		700		900		800		600		900	
Thallium	mg/kg	**108**	8.5	0.193		0.184		0.291		0.184		0.171		0.203		0.194		0.192		0.159		0.250		0.171		0.182	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	205		545		424		460		491		423		362		592		549		530		363		594	
Uranium	mg/kg	24	**27**	1.51		2.23		1.95		1.49		1.49		1.82		1.76		2.04		1.7		2.01		1.37		3.31	
Vanadium	mg/kg	1,080	**1,200**	22.4		36.8		37.7		39.6		41.3		47.3		43.3		40.6		42.0		32.3		40.8		40.9	
Zinc	mg/kg	**1,080**	700	242		79.1		602		87.1		85.5		98.1		98.2		77.6		81.7		217		98.1		84.8	
Moisture	percent	-	-	22.2	J	7.53		11.9		10.4		9.74		10.6		10.4		11.7		9.75		10.3		11.1	J	9.04	J
pH (1:2 soil:water)	pH Units	-	-	6.84		8.23		8.29		8.25		8.50		8.36		8.33		8.29		8.07		8.23		8.22		8.39	
Organic Matter	percent	-	-	NT		0.7	U	0.7	U	0.7	U	0.7	U	0.7	U	0.85		0.7	U	0.7	U	0.7	U	0.7	U	0.7	U
Total Organic Carbon	percent	-	-	NT		0.4	U	0.4	U	0.4	U	0.4	U	0.4		0.5		0.4	U	0.4	U	0.4	U	0.4	U	0.4	
Total Inorganic Carbon	percent	-	-	0.19	J	0.39		0.36		0.31		0.52		0.47		0.36		0.15		0.30		0.18		0.12		0.2	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.6	J	3.25		3.57		2.92		3.62		3.45		3.51		1.34		1.95		0.95		2.01		1.65	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH13-311-BH013-SOB		CH13-311-BH913-SOB		CH13-311-BH013-SOC		CH13-311-BH013-SOD		CH13-311-BH013-SOE		CH13-311-BH014-SOA		CH13-311-BH014-SOB		CH13-311-BH014-SOC		CH13-311-BH014-SOD		CH13-311-BH014-SOE		CH13-311-BH015-SOA		CH13-311-BH015-SOB	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance[b]																						
Sample Date				7/18/2013		7/18/2013		7/18/2013		7/19/2013		7/19/2013		7/20/2013		7/20/2013		7/20/2013		7/20/2013		7/20/2013		7/22/2013		7/22/2013	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	7,010		7,530		17,300		20,400		21,000		16,800		15,900		17,400		21,400		21,400		14,500	J	14,900	J
Antimony	mg/kg	**60**	2	6.99		5.7		0.62		0.98		0.43		7.69		2.89		0.46		0.79		0.71		4.92	J	9.60	J
Arsenic	mg/kg	**72**	18	65.9		70.1		10.4		18.1		13.1		52.7		78.7		15.6		17		15.3		72.9	J	153	J
Barium	mg/kg	**6,000**	4,250	91.5		78		202		207		150		119		377		170		287		230		476	J	372	J
Beryllium	mg/kg	**72**	30	0.43		0.43		0.72		0.60		0.73		0.71		0.68		0.51		0.70		0.68		0.54	J	0.4	J
Bismuth	mg/kg	-	**0.085**	0.2	U	0.2	U	0.39		0.31		0.65		0.24	J	0.38	J	0.25	J	0.41	J	0.96	J	0.6	J	0.23	J
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	UJ	10	UJ
Cadmium	mg/kg	**4.2**	1.5	3.02		2.28		0.261		0.436		0.263		7.71		0.704		0.304		0.52		0.406		1.95	J	4.46	J
Calcium	mg/kg	180,000	**415,000**	9,980		8,580		8,620		14,500		10,800		7,190		11,400		9,450		11,600		10,500		11,600	J	13,000	J
Chromium	mg/kg	840	**1,020**	33.5		33.0		36.2		46.5		56.5		25.4		54.0		44.3		54.9		55.9		43.4	J	122	J
Cobalt	mg/kg	96	**250**	25.5		26.7		10.8		17.5		15.1		16.9		15.2		14.2		18.5		18.4		14.1	J	22.1	J
Copper	mg/kg	360	**600**	36.1		57.6		21.8		35.2		32.5		69.1		43.1		25.8		35.2		44.0		46.9	J	77.8	J
Iron	mg/kg	480,000	**563,000**	48,300		51,000		25,700		37,000		34,400		48,500		32,500		30,900		36,800		38,700		33,500	J	39,800	J
Lead	mg/kg	**420**	140	850	J	483	J	31.8		34.1		17.4		2,000		418		14.4		19		19.9		497	J	986	J
Lithium	mg/kg	**300**	200	11.6		12.7		32.9		34.8		40.0		33.7		28.3		30.6		35.7		36.8		21.4	J	22.4	J
Magnesium	mg/kg	60,000	**233,000**	11,500		11,500		7,810		12,000		10,200		10,800		9,780		9,470		11,000		11,000		9,430	J	13,500	J
Manganese	mg/kg	**12,000**	9,500	1,350		1,470		410		577		459		420		459		507		542		546		545	J	619	J
Mercury	mg/kg	0.72	**0.85**	1.240		0.79		0.021		0.04		0.015		1.31		0.388		0.026		0.044		0.031		0.59	J	1.2	J
Molybdenum	mg/kg	**24**	12	1.19		1		0.59		0.89		1.34		4.32		1.49		0.59		1.03		1.1		1.37	J	1.74	J
Nickel	mg/kg	600	**840**	92.1		71.9		28.8		47.1		41.3		40.8		54.5		39		51.2		51		47.8	J	91.2	J
Phosphorus	mg/kg	9,600	**10,500**	598		597		580		810		609		1,350		596		623		774		676		728	J	671	J
Potassium	mg/kg	168,000	**208,500**	930		1,150		2,720		2,130		3,500		720		2,010		1,620		2,620		2,540		1,630	J	1,020	J
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.2	U	0.25		0.46		0.25		1.72		0.61		0.29		0.52		0.5		0.59	J	0.62	J
Silver	mg/kg	-	**0.75**	2.28	J	1.21	J	0.14		0.22		0.23		4.47		0.89		0.13		0.21		0.2		0.89	J	1.86	J
Sodium	mg/kg	60,000	**235,500**	100	U	100	U	250		230		320		100	U	150		180		240		260		200	J	100	UJ
Strontium	mg/kg	3,000	**3,700**	35.1		27.8		40.1		60.9		50.6		31.2		58.7		36.4		54.8		46.6		53.8	J	60.9	J
Sulphur	mg/kg	**8,400**	3,500	4,700		6,000		800		1,700		1,400		5,500		900		700		900		900		2,500	J	3,400	J
Thallium	mg/kg	**108**	8.5	1.24		1.32		0.206		0.181		0.237		0.862		0.344		0.142		0.267		0.184		0.359	J	0.626	J
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	UJ	2	UJ
Titanium	mg/kg	-	**56,500**	40.0	J	73.6	J	587		349		491		63.3		421		357		408		393		407	J	381	J
Uranium	mg/kg	24	**27**	1.61		1.57		2.50		1.83		2.04		2.61		2.43		1.69		1.48		1.62		1.7	J	2.16	J
Vanadium	mg/kg	1,080	**1,200**	19		19.7		35.4		41.1		34		21.6		44.3		33.5		46.6		43.2		37.6	J	40.8	J
Zinc	mg/kg	**1,080**	700	4,310		3,770		82.6		445		99.8		6,490		433		79.4		106		104		1,070	J	2,700	J
Moisture	percent	-	-	4.66	J	4.1	J	10.3	J	8.41		6.12		4.9		11		11.9		10.1		11.8		10.8	J	13.7	J
pH (1:2 soil:water)	pH Units	-	-	8.07		7.92		8.42		8.36		8.46		7.8		8.32		8.02		8.13		8.15		8.13	J	8.03	J
Organic Matter	percent	-	-	1.19		0.9		0.7	U	0.7	U	0.7	U	2.29		0.7	U	0.74		0.7	U	0.7	U	0.7	UJ	1.05	J
Total Organic Carbon	percent	-	-	0.7		0.5		0.4	U	0.4	U	0.4	U	1.3		0.4	U	0.4		0.4	U	0.4		0.4	J	0.6	J
Total Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.97		1.05		0.22		0.43		0.23		0.12		0.2		0.27		0.28		0.25		0.31		0.41	
				9.6		8.73		2.72		3.79		1.95		0.99		1.7		2.26		2.50		2.07		2.57		3.42	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump		Grum Overburden Dump	
Sample ID				CH13-311-BH015-SOC		CH13-311-BH915-SOC		CH13-311-BH015-SOD		CH13-311-BH015-SOE		CH13-311-TP002-SOA		CH13-311-TP902-SOA		CH13-311-TP003-SOA		CH13-311-TP903-SOA		CH13-311-TP004-SOA		CH13-311-TP904-SOA		CH13-311-TP005-SOA		CH13-311-TP905-SOA	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance[b]	0 - 4		0 - 4		0 - 6		0 - 6		1 - 6		1 - 6		1 - 6		1 - 6		1 - 6		1 - 6		1 - 6	
Sample Date				7/22/2013		7/22/2013		7/22/2013		7/22/2013		8/14/2013		8/14/2013		8/14/2013		8/14/2013		8/14/2013		8/14/2013		8/14/2013		8/14/2013	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	15,700	J	16,300	J	10,400	J	21,400	J	18,200		20,000		16,100		15,600		12,800		11,900		16,600		16,100	
Antimony	mg/kg	**60**	2	0.75	J	0.75	J	4.83	J	0.39	J	0.58		0.50		1.77	J	0.58	J	6.44	J	3.01	J	0.87		0.77	
Arsenic	mg/kg	**72**	18	9.31	J	9.34	J	260	J	12.1	J	12.8		12.0		11.2		8.08		86.2		77.9		10.2		10.0	
Barium	mg/kg	**6,000**	4,250	253	J	270	J	258	J	140	J	198		190		177		192		281		371		266		253	
Beryllium	mg/kg	**72**	30	0.62	J	0.62	J	0.46	J	0.85	J	0.67		0.67		0.64		0.71		0.57		0.49		0.69		0.74	
Bismuth	mg/kg	-	**0.085**	0.43	J	0.28	J	0.2	UJ	0.53	J	0.38		0.62		0.43		0.39		0.56		0.2	U	0.39		0.37	
Boron	mg/kg	-	**100**	10	UJ	10	UJ	10	UJ	10		10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.322	J	0.312	J	8.43	J	0.29	J	0.372		0.31		0.271		0.261		1.06		0.864		0.374		0.338	
Calcium	mg/kg	180,000	**415,000**	7,490	J	8,460	J	15,900	J	8,040	J	6,860		7,260		8,160		8,080		10,600		10,100		8,210		8,040	
Chromium	mg/kg	840	**1,020**	26.3	J	26.9	J	256	J	46.2	J	46.1		43.8		40.4		35.5		37.8	J	77.5	J	29		27.6	
Cobalt	mg/kg	96	**250**	8.71	J	8.5	J	29	J	14.1	J	15.6		15		12.6		9.74		18		24.9		10.6		9.82	
Copper	mg/kg	360	**600**	17	J	18.4	J	65.3	J	30	J	36.5		35.6		24.8		19.4		64	J	36.8	J	22.6		21	
Iron	mg/kg	480,000	**563,000**	22,900	J	23,600	J	46,100	J	33,000	J	32,500		33,400		28,600		23,900		42,000		50,500		26,400		25,600	
Lead	mg/kg	**420**	140	13.8	J	12.4	J	658	J	22.1	J	19.2		17.4		22.4		14.8		996	J	378	J	17.7		14.7	
Lithium	mg/kg	**300**	200	27.8	J	27.7	J	11.8	J	43.7	J	36.1		39.3		33.1		32.1		25.3		20.7		31.6		32.2	
Magnesium	mg/kg	60,000	**233,000**	6,110	J	6,320	J	15,500	J	9,280	J	8,560		9,080		8,400		6,850		10,300		14,900		6,900		6,750	
Manganese	mg/kg	**12,000**	9,500	357	J	371	J	662	J	451	J	449		418		407		366		461		606		403		390	
Mercury	mg/kg	0.72	**0.85**	0.028	J	0.026	J	1.45	J	0.016	J	0.032		0.032		0.027		0.023		0.735	J	0.349	J	0.126	J	0.036	J
Molybdenum	mg/kg	**24**	12	0.73	J	0.82	J	2.51	J	0.56	J	0.84		0.68		0.69		0.52		1.22		0.88		0.98		0.79	
Nickel	mg/kg	600	**840**	22.5	J	22.7	J	202	J	37.5	J	41.8		38.8		37.1		29.7		44.7	J	82.9	J	26.9		25.5	
Phosphorus	mg/kg	9,600	**10,500**	585	J	554	J	859	J	594	J	691		674		550		516		627		570		667		534	
Potassium	mg/kg	168,000	**208,500**	2,510	J	2,630	J	680	J	3,540	J	2,130		2,670		2,190		2,580		1,390		950		2,600		2,650	
Selenium	mg/kg	**4.8**	0.5	0.34	J	0.33	J	0.63	J	0.22	J	0.24		0.29		0.24		0.25		0.33		0.31		0.4		0.44	
Silver	mg/kg	-	**0.75**	0.13	J	0.12	J	1.77	J	0.12	J	0.15		0.16		0.15		0.11		2.08	J	0.74	J	0.16		0.17	
Sodium	mg/kg	60,000	**235,500**	290	J	350	J	100	UJ	320	J	250		320		180		220		110		100	U	280		250	
Strontium	mg/kg	3,000	**3,700**	36.9	J	41.1	J	61.8	J	43.6	J	36.8		41.6		38.1		44.1		49.7		41.2		41.6		40.6	
Sulphur	mg/kg	**8,400**	3,500	800	J	1,000	J	1,300	J	900	J	900		700		800		600		4,600		3,900		600		1,500	
Thallium	mg/kg	**108**	8.5	0.183	J	0.172	J	0.3	J	0.244	J	0.178		0.191		0.22		0.201		0.56		0.634		0.211		0.198	
Tin	mg/kg	**48**	23	2	UJ	2	UJ	2	UJ	2	UJ	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	584	J	609	J	160	J	589	J	374		488		448		540		226	J	118	J	564		559	
Uranium	mg/kg	24	**27**	1.93	J	1.98	J	2.53	J	2.43	J	1.76		1.77		2.12		2.32		1.98		1.67		2.42		2.48	
Vanadium	mg/kg	1,080	**1,200**	35.1	J	37.2	J	45.8	J	34.8	J	36.4		35.4		31.9		32.8		26.1		24.2		38.1		36.7	
Zinc	mg/kg	**1,080**	700	70.4	J	69.3	J	5,190	J	99.5	J	95.3		94.3		88.8		93.1		812		572		82.5		77.2	
Moisture	percent	-	-	8.14	J	9.4	J	8.62	J	9.51	J	8.6	J	9.51	J	8.98	J	7.68	J	7.94	J	5.31	J	9.44	J	8.9	J
pH (1:2 soil:water)	pH Units	-	-	8.33	J	8.32	J	8.02	J	8.37	J	7.99		7.99		8.09		8.27		8.18		8.32		8.39		8.38	
Organic Matter	percent	-	-	0.7	UJ	0.7	UJ	0.7	UJ	0.7	UJ	0.78		0.7	U	0.7	U	0.7	U	0.99		1.07		0.7	U	0.7	U
Total Organic Carbon	percent	-	-	0.4	UJ	0.4	UJ	0.4	UJ	0.4	UJ	0.5		0.4		0.4	U	0.4	U	0.6		0.6		0.4		0.4	U
Total Inorganic Carbon	percent	-	-	0.2		0.15		0.41		0.17		0.18		0.13		0.20		0.16		0.75		0.6		0.21		0.25	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.66		1.23		3.38		1.43		1.06		1.09		1.09		1.80		4.35		6.03		1.41		1.77	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Overburden Dump		Grum Overburden Dump		Grum Pit		Grum Pit		Grum Pit		Grum Pit		Grum Pit		Grum Pit		Grum Pit		Grum Pit	
Sample ID				CH13-311-TP006-SOA		CH13-311-TP906-SOA		CH12-311-BH104-SOA		CH12-311-BH9104-SOA		CH13-311-SS023-SOA		CH13-311-SS024-SOA		CH13-311-SS025-SOA		CH13-311-SS027-SOA		CH13-311-SS028-SOA		CH13-311-SS029-SOA		CH13-311-SS030-SOA		CH13-311-SS031-SOA	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance[b]	1 - 6		1 - 6		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15	
Sample Date				8/13/2013		8/13/2013		9/30/2012		9/30/2012		7/12/2013		7/12/2013		7/12/2013		7/15/2013		7/15/2013		7/15/2013		7/15/2013		7/15/2013	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	17,900		17,200		13,900		13,800		17,900		16,200		12,900		16,000		12,900		17,300		18,600		18,000	
Antimony	mg/kg	**60**	2	0.79		0.72		0.61		0.90		0.55		1.02		0.56		0.87		0.85		0.84		0.47		0.81	
Arsenic	mg/kg	**72**	18	12.2		11.6		7.49		9.3		17.0		12.2		6.52		11.4		12.4		14.9		10.5		19.3	
Barium	mg/kg	**6,000**	4,250	202		192		193		227		204		218		163		250		237		283		142		161	
Beryllium	mg/kg	**72**	30	0.81		0.7		0.67		0.60		0.6		0.58		0.66		0.58		0.56		0.62		0.83		0.80	
Bismuth	mg/kg	-	**0.085**	0.42		0.47		0.65	J	0.31	J	0.29		0.29		0.39		0.28		0.35		0.26		0.53		0.46	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.287		0.277		0.265		0.305		0.339		0.373		0.248		0.426		0.325		0.408		0.186		0.287	
Calcium	mg/kg	180,000	**415,000**	9,780		9,210		6,260		7,700		6,960		7,880		4,850		10,100		5,710		11,500		7,260		9,860	
Chromium	mg/kg	840	**1,020**	43.3		41		23.1		24.1		38		42.9		19.2		30.9		31.4		31		53.8		52.1	
Cobalt	mg/kg	96	**250**	12.4		11.7		7.49		8.4		15.5		10.3		6.08		10.7		10.8		11.5		12.8		13.8	
Copper	mg/kg	360	**600**	25.4		26.3		15.2		17.0		33.6		18.2		12.3		23.4		24.2		26		24.1		26.8	
Iron	mg/kg	480,000	**563,000**	28,900		28,800		19,800		21,700		30,800		24,900		16,600		25,900		23,600		28,100		29,700		29,400	
Lead	mg/kg	**420**	140	18.9		19.2		12.1		12.0		19.9		15.7		10.7		13.5		28.3		15.4		21.4		18.7	
Lithium	mg/kg	**300**	200	38.1		36.6		26.6		26.3		29.6		26.1		25.0		26.5		23.7		27.4		42.2		41.3	
Magnesium	mg/kg	60,000	**233,000**	8,390		8,200		5,260		6,130		8,160		7,990		4,330		7,120		6,560		7,750		9,620		9,470	
Manganese	mg/kg	**12,000**	9,500	422		398		312		384		471		385		286		417		292		475		393		399	
Mercury	mg/kg	0.72	**0.85**	0.019		0.023		0.02		0.025		0.050	U	0.05	U	0.05	U	0.029		0.041		0.029		0.014		0.019	
Molybdenum	mg/kg	**24**	12	0.64		0.71		0.5	U	0.52		0.66		0.78		0.5	U	0.95		0.74		1		0.5	U	0.5	U
Nickel	mg/kg	600	**840**	36.4		34.2		19.4		22.9		40.4		35.9		15.9		28.1		31.8		28.6		40.9		44.3	
Phosphorus	mg/kg	9,600	**10,500**	591		607		761		626		618		568		529		691		566		648		593		558	
Potassium	mg/kg	168,000	**208,500**	2,860		2,500		2,250		2,150		1,630		2,190		2,230		1,980		1,470		2,170		2,940		3,010	
Selenium	mg/kg	**4.8**	0.5	0.31		0.32		0.24		0.31		0.20	U	0.26		0.21		0.41		0.53		0.52		0.2	U	0.22	
Silver	mg/kg	-	**0.75**	0.15		0.15		0.16		0.12		0.14		0.12		0.11		0.15		0.14		0.35		0.12		0.12	
Sodium	mg/kg	60,000	**235,500**	230		220		190		240		200		200		170		290		130		330		190		140	
Strontium	mg/kg	3,000	**3,700**	45.1		45.3		35.2		34.0		35.7		36.7		25.9		49		34.6		51.3		38.0		44.6	
Sulphur	mg/kg	**8,400**	3,500	1,600		1,600		NT		NT		500		500		500	U	600		500	U	700		500	U	500	
Thallium	mg/kg	**108**	8.5	0.236		0.213		0.187		0.178		0.149		0.185		0.209		0.147		0.16		0.157		0.242		0.259	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	625		530		478		480		369		545		485		518		487		568		537		532	
Uranium	mg/kg	24	**27**	3.25		2.98		2.06		2.02		0.99		1.83		1.79		1.59		2.11		1.74		2.11		4.69	
Vanadium	mg/kg	1,080	**1,200**	37.9		35		31.3		32.9		33		36.7		27.7		38.9		31.1		42.2		32.3		35.1	
Zinc	mg/kg	**1,080**	700	81.2		81.6		61.5		66.2		93.6		83.0		56.4		75.0		86.5		79.7		92.2		88.7	
Moisture	percent	-	-	6.88	J	9.68	J	7.80		9.31		8.17		7.49		9.83		9.69		10.5		10.4		7.79		8.38	
pH (1:2 soil:water)	pH Units	-	-	8.3		8.11		8.31		8.2		8.14		8.56		8.39		8.08		8.39		8.17		8.43		8.59	
Organic Matter	percent	-	-	0.7	U	0.77		NT		NT		0.70	U	0.7	U	0.7	U	NT		NT		0.7		NT		NT	
Total Organic Carbon	percent	-	-	0.4	U	0.4		NT		NT		0.4		0.4	U	0.4	U	NT		NT		0.4		0.4	U	NT	
Total Inorganic Carbon	percent	-	-	0.24		0.21		NT		NT		0.16		0.28		0.12		0.27		0.17		0.24		0.18		0.22	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	2.34		1.99		NT		NT		1.34		2.31		1.01		2.22		1.4		1.98		1.63		1.87	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Pit		Grum Pit		Grum Pit		Grum Pit		Grum Pit		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area	
Sample ID				CH13-311-SS032-SOA		CH13-311-SS033-SOA		CH13-311-SS034-SOA		CH13-311-SS035-SOA		CH13-311-SS036-SOA		CH13-311-SS037-SOA		CH12-311-BH107-SOA		CH12-311-BH110-SOA		CH12-311-BH112-SOA		CH13-311-BH001-SOA		CH13-311-BH001-SOB		CH13-311-BH002-SOB	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance [b]	0 - 0.15				0 - 0.15		0 - 0.15		0 - 0.15				0 - 0.15		0 - 0.15		0 - 0.15		0.00635 - 0.10668		0.1524 - 1.463		0.2042 - 0.6614	
Sample Date				7/15/2013		7/15/2013		7/15/2013		7/15/2013		7/15/2013		7/15/2013		9/30/2012		9/30/2012		10/3/2012		8/23/2013		8/23/2013		8/22/2013	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	15,400		15,000		16,500		19,000		14,300		16,900		19,400		14,500		9,790		20,200		20,100		13,200	
Antimony	mg/kg	**60**	2	0.59		0.35		0.52		0.38		0.67		0.90		0.64		0.34		0.27		0.49		0.39		0.33	
Arsenic	mg/kg	**72**	18	11.7		8.79		15.2		11.7		10.3		11.2		14.5		11.3		6.65		16.3		18.1		12.1	J
Barium	mg/kg	**6,000**	4,250	189		111		176		156		230		312		271		70.7		36.9		150		72.5		118	
Beryllium	mg/kg	**72**	30	0.55		0.56		0.57		0.65		0.54		0.59		0.71		0.65		0.72		0.66		0.72		0.38	
Bismuth	mg/kg	-	**0.085**	0.31		0.34		0.33		0.38		0.28		0.28		0.31		0.26		0.64		0.31		0.26		0.25	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.351		0.202		0.273		0.294		0.404		0.427		0.344		0.628		0.081		0.216		0.309		0.119	
Calcium	mg/kg	180,000	**415,000**	11,300		5,820		7,110		4,710		9,900		9,830		3,230		4,960		736		1,950		1,660		2,550	
Chromium	mg/kg	840	**1,020**	38.1		47.8		50.1		45.1		29.3		27.7		67.7		30		10.3		41.2		28.9		24.3	
Cobalt	mg/kg	96	**250**	11.8		11.9		13.8		17.2		10.2		10.4		15.3		14.8		2.95		18.3		14.6		9.22	
Copper	mg/kg	360	**600**	21.2		23.2		35.1		31.1		21.7		21.3		39.4		25.8		5.31		36.6		20.7		15.9	
Iron	mg/kg	480,000	**563,000**	25,300		26,000		29,500		33,600		24,000		26,200		29,900		27,800		12,100		35,500		30,300		23,900	
Lead	mg/kg	**420**	140	16.4		15.4		37.5		22.9		11.6		12.5		15.8		20.2		13.4		15.4		14.9		9.19	
Lithium	mg/kg	**300**	200	27.8		29.8		30.1		33.8		26.8		26.7		25.2		27.5		22		33.8		26.9		19.9	
Magnesium	mg/kg	60,000	**233,000**	8,430		8,040		8,980		9,590		7,220		6,790		8,960		6,710		1,860		8,100		5,390		5,560	
Manganese	mg/kg	**12,000**	9,500	432		354		406		424		360		458		435		349		103		524		335		262	
Mercury	mg/kg	0.72	**0.85**	0.02		0.013		0.022		0.014		0.036		0.032		0.040		0.012		0.032		0.019		0.022		0.013	
Molybdenum	mg/kg	**24**	12	0.66		0.5	U	0.72		0.5	U	0.74		1.6		0.99		0.58		0.5	U	0.85		0.95		1.20	
Nickel	mg/kg	600	**840**	36.5		37.8		41.9		43		28.1		26		55.0		48.1		7.49		40.7		32.8		19.8	
Phosphorus	mg/kg	9,600	**10,500**	886		514		624		524		609		647		805		1,450		422		591		823		614	J
Potassium	mg/kg	168,000	**208,500**	1,940		1,970		1,700		2,130		1,930		2,330		1,690		690		820		1,500		770		710	
Selenium	mg/kg	**4.8**	0.5	0.24		0.21		0.26		0.2	U	0.48		0.5		0.30		0.2	U	0.25		0.21		0.25		0.2	U
Silver	mg/kg	-	**0.75**	0.11		0.1	U	0.13		0.1	U	0.15		0.2		0.19		0.16		0.15		0.1	U	0.11		0.1	U
Sodium	mg/kg	60,000	**235,500**	210		160		160		220		180		300		170		220		100	U	120		100	U	210	
Strontium	mg/kg	3,000	**3,700**	50.8		29.1		33.2		30.1		45.5		48.4		22.5		40.1		3.79		15.1		16.5		17.2	
Sulphur	mg/kg	**8,400**	3,500	700		700		500	U	500	U	1,000		700		NT		NT		NT		600		600		1,000	
Thallium	mg/kg	**108**	8.5	0.144		0.174		0.146		0.164		0.145		0.174		0.188		0.09		0.173		0.163		0.096		0.136	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	448		409		433		454		362		545		407		279		256		391		332		418	
Uranium	mg/kg	24	**27**	1.8		1.4		1.4		1.44		1.69		2.36		1.33		3.28		1.33		1.2		0.818		1.35	
Vanadium	mg/kg	1,080	**1,200**	32.8		25.3		30		30.8		32		42.5		44		26.4		16.4		32.3		29.7		36.6	
Zinc	mg/kg	**1,080**	700	120		89.2		102		146		76.5		77		82.1		106		34.7		87.2		71.5		59.5	
Moisture	percent	-	-	8.07		4.85		9.43		10.2		6.26		8.4		11.80		7.75		7.04		6.05		9.14		15.3	
pH (1:2 soil:water)	pH Units	-	-	8.25		8.25		8.17		8.58		8.35		8.37		5.89		6.9		5.08		6.1		5.22		5.27	
Organic Matter	percent	-	-	0.7	U	0.7	U	NT		NT		0.7	U	0.70	U	NT		NT		NT		0.7	U	2.69		1.49	
Total Organic Carbon	percent	-	-	0.4	U	0.4	U	NT		NT		0.4	U	0.40	U	NT		NT		NT		0.4		1.6		0.9	
Total Inorganic Carbon	percent	-	-	0.23		0.15		0.18		0.14		0.29		0.25		NT		NT		NT		0.1	U	0.1	U	0.1	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	1.92		1.76		1.52		1.19		2.41		2.18		NT		NT		NT		0.8	U	0.8	U	0.82	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area	
Sample ID				CH13-311-BH003-SOA		CH13-311-BH003-SOB		CH13-311-BH903-SOB		CH13-311-BH004-SOA		CH13-311-BH005-SOA		CH13-311-BH005-SOB		CH13-311-BH010-SOA		CH13-311-BH010-SOB		CH13-311-BH010-SOC		CH13-311-BH010-SOD		CH13-311-BH022-SOA		CH13-311-BH022-SOB	
Sample Interval (mbgs)	12x Median Soil Content [a]	10x Crustal Abundance [b]		0 - 3.7		0.1005 - 0.1768		0.2 - 0.4		1.3716 - 3.2004		0.1524 - 2.4384		0.1524 - 0.4267		0.5 - 1.5		3 - 4		10.5 - 11.5		13 - 14		1 - 2		0.15 - 0.4	
Sample Date				8/22/2013		8/22/2013		8/22/2013		8/23/2013		8/23/2013		8/23/2013		7/18/2013		7/18/2013		7/18/2013		7/18/2013		8/25/2013		8/25/2013	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	23,200		18,100		20,000		20,600		18,400		15,700		21,300		21,800		15,300		22,600		6,810		7,700	
Antimony	mg/kg	**60**	2	0.84		0.59		0.71		0.54		1.07		0.48		0.64		0.32		0.66		0.1		0.22		0.17	
Arsenic	mg/kg	**72**	18	22.1	J	12.9	J	15.2		11.2		14.8		11.8		15.8		19.1		11.3		1.62		7.45		6.10	
Barium	mg/kg	**6,000**	4,250	349		241		293		295		457		149		271		88.3		240		30.5		63		90.7	
Beryllium	mg/kg	**72**	30	0.82		0.57		0.63		0.7		0.73		0.4		0.74		0.76		0.74		0.78		0.44		0.5	
Bismuth	mg/kg	-	**0.085**	0.37		0.24		0.29		0.38		0.29		0.23		1.18		0.31		0.3		0.24		0.29		0.35	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.493		0.203		0.252		0.443		0.46		0.157		0.441		0.234		0.425		0.052		0.105		0.12	
Calcium	mg/kg	180,000	**415,000**	5,780		2,540		2,740		3,550		4,050		1,440		5,700		1,630		8,580		4,950		1,630		1,690	
Chromium	mg/kg	840	**1,020**	62.6		44.1		52.6		74.9		33.5		34.2		46.6		31.1		35.6		31.6		11.8		14	
Cobalt	mg/kg	96	**250**	18.5		14.5		15.8		16.3		11.4		9.12		17.3		22.3		16.3		18.5		4.77		2.95	
Copper	mg/kg	360	**600**	42.8		26.6		33.3		38.9		32.4		22.1		36.6		34.7		31		24.3		7.25		8.54	
Iron	mg/kg	480,000	**563,000**	36,900		28,500		31,200		33,300		27,800		23,600		37,100		39,300		36,200		52,500		10,500		12,300	
Lead	mg/kg	**420**	140	17.1		13.8		15.2		19.3		14		11.1		15.4		15.5		24		7.9		12		9.48	
Lithium	mg/kg	**300**	200	32.9		27.4		29.0		33.3		22.9		19.4		35		40.5		25.7		49.8		14.7		14.5	
Magnesium	mg/kg	60,000	**233,000**	9,720		7,330		7,950		8,540		5,820		5,970		9,430		8,160		9,340		13,400		2,540		2,480	
Manganese	mg/kg	**12,000**	9,500	632		461		544		488		556		276		513		375		472		526		204		120	
Mercury	mg/kg	0.72	**0.85**	0.045		0.032		0.041		0.031		0.066		0.027		0.034		0.011		0.039		0.005	U	0.007		0.01	
Molybdenum	mg/kg	**24**	12	1.03		0.61		0.7		1.09		1.38		0.79		0.85		0.75		2		0.5	U	0.64		0.51	
Nickel	mg/kg	600	**840**	59.7		36.8		44		51.5		34.7		28.2		46.6		46		44.3		38.4		11.20		8.24	
Phosphorus	mg/kg	9,600	**10,500**	874	J	632	J	635		798		1,030		463		653		481		644		566		497		504	
Potassium	mg/kg	168,000	**208,500**	2,920		1,370		1,710		2,020		1,770		1,220		2,260		1,520		1,860		620		650		630	
Selenium	mg/kg	**4.8**	0.5	0.29		0.25		0.27		0.26		0.42		0.22		0.24		0.33		0.51		0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.16		0.1	U	0.1	U	0.16		0.21		0.14		0.17		0.1	U	0.17		0.1	U	0.1	U	0.1	U
Sodium	mg/kg	60,000	**235,500**	300		160		180		290		190		220		280		180		180		130		100	U	100	U
Strontium	mg/kg	3,000	**3,700**	30.6		18.8		19.1		24.2		32.1		12.5		32.3		14.1		41.1		25.6		9.19		10.4	
Sulphur	mg/kg	**8,400**	3,500	700		600		500	U	500	U	500	U	500	U	500	U	500	U	1,400		3,200		600		500	U
Thallium	mg/kg	**108**	8.5	0.248		0.151		0.179		0.19		0.212		0.147		0.184		0.148		0.131		0.1	U	0.113	U	0.134	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	591		514		525		537		390		376		426		368		295		43.5		213		226	
Uranium	mg/kg	24	**27**	1.09		0.86		0.93		1.6		1.27		0.66		1.08		1.19		1.61		1.43		2.94		3.35	
Vanadium	mg/kg	1,080	**1,200**	53.2		38.9		43.9		42		51.3		37.3		42.7		27.5		36.8		19.3		15.4		18.3	
Zinc	mg/kg	**1,080**	700	108		71		86.6		102		88.6		57.6		102		97.1		104		106		39.3		39	
Moisture	percent	-	-	13.4		13.7		14.0		0.25	UJ	17.8	J	25.7	J	8.98		7.44		12.3	J	4.71	J	14	J	16.1	J
pH (1:2 soil:water)	pH Units	-	-	7.94		5.88		6.35		5.57		6.5		4.83		8.07		5.65		8.34		8.62		5.98		5.51	
Organic Matter	percent	-	-	0.7	U	0.7	U	0.7	U	0.7	U	1.6		3.35		0.7	U	0.8		0.7	U	1.01		0.7	U	1.48	
Total Organic Carbon	percent	-	-	0.4	U	0.4	U	0.4	U	0.4		0.9		1.9		0.4	U	0.5		0.4		0.6		0.4	U	0.9	U
Total Inorganic Carbon	percent	-	-	0.1		0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.13		0.1	U	0.52		0.41		0.1	U	0.1	U
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.83		0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	4.34		2.5		0.8	U	1.05	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Grum Mine Area		Other (Haul Road)		Other (Haul Road)		Other (Haul Road)		Other (Haul Road)	
Sample ID				CH13-311-BH023-SOA		CH13-311-BH023-SOB		CH13-311-BH024-SOA		CH13-311-BH024-SOB		CH13-311-BH924-SOB		CH13-311-TP021-SOA		CH13-311-TP022-SOA		CH13-311-TP023-SOA		CH12-108-BH004-SOA		CH12-108-BH040-SOA		CH12-108-BH100-SOA		CH12-108-BH101-SOA	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance[b]	0.1524 - 3.3528		0.1006 - 0.381		0.1524 - 3.3528		0.1524 - 0.6096		0.1524 - 0.6096		2.4384 - 2.7432		3.048 - 5.7912		0.3048 - 2.4384		0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15	
Sample Date				8/24/2013		8/24/2013		8/24/2013		8/24/2013		8/24/2013		8/27/2013		8/26/2013		8/26/2013		9/30/2012		9/30/2012		9/29/2012		9/29/2012	
Geological Unit																									
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	12,200		10,000		4,560		5,090		3,820		23,100		19,500		21,000		17,700		22,100		15,800		20,000	
Antimony	mg/kg	**60**	2	0.37		0.21		0.4		0.33		0.26		0.50		0.83		0.57		0.52		0.31		0.54		0.42	
Arsenic	mg/kg	**72**	18	11.9		5.83		9.36		7.64	J	4.12	J	18.0		14.0		17.3		12.4		26.7		11.2		10.2	
Barium	mg/kg	**6,000**	4,250	121		99.8		63.1		27.8		18.4		269		349		225		126		115		192		71.4	
Beryllium	mg/kg	**72**	30	0.89		1		0.48		0.41		0.31		0.84		0.68		0.72		0.6		0.75		0.63		0.90	
Bismuth	mg/kg	-	**0.085**	0.57		0.38		0.42		0.54	J	4.07	J	0.33		0.33		0.37		0.73		0.47		0.38		0.34	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.234		0.11		0.22		0.145		0.089		0.201		0.505		0.293		0.234		0.634		0.361		0.161	
Calcium	mg/kg	180,000	**415,000**	2,400		1,810		1,890		1,210	J	496	J	4,070		3,850		2,280		5,440		68,800		20,500		33,700	
Chromium	mg/kg	840	**1,020**	18.4		12.2		9.82		13.6	J	4.15	J	44.6		47.3		45.1		29.2		33.3		34.4		37.3	
Cobalt	mg/kg	96	**250**	6.66		2.92		3.04		2.76		1.92		16		15		18.9		12.8		11.0		10.8		12.7	
Copper	mg/kg	360	**600**	15.0		9.84		7.26		4.09		2.71		36.6		36		41.5		24.6		25		22.9		23.2	
Iron	mg/kg	480,000	**563,000**	17,800		9,710		8,760		7,830		5,730		39,200		32,700		36,900		27,600		26,000		24,600		28,000	
Lead	mg/kg	**420**	140	23.2		16.5		15.6		16.5		10.6		12.8		13.7	J	33.3	J	14.4		55.5		15		12.9	
Lithium	mg/kg	**300**	200	25.8		17.5		12.1		11.9		10.3		37.2		31.4		35.3		26.5		49.9		25.9		38.1	
Magnesium	mg/kg	60,000	**233,000**	3,780		2,600		1,740		1,730		1,170		9,140		8,570		9,790		6,930		8,470		8,460		7,670	
Manganese	mg/kg	**12,000**	9,500	309		123		170		142		103		344		463		573		388		397		368		410	
Mercury	mg/kg	0.72	**0.85**	0.015		0.021		0.012		0.007	J	0.023	J	0.02		0.05		0.025		0.016		0.012		0.026		0.009	
Molybdenum	mg/kg	**24**	12	0.89		0.5	U	0.68		0.5	U	0.5	U	0.81		0.85		0.65		0.56		0.5	U	0.63		0.5	U
Nickel	mg/kg	600	**840**	14.9		7.57		8.22		6.41		4.04		43.3		44.7		46.6		33.2		26.1		32.3		33.5	
Phosphorus	mg/kg	9,600	**10,500**	510		520		628		577	J	205	J	773		733		630		372		597		823		381	
Potassium	mg/kg	168,000	**208,500**	2,710		890		870		680		550		2,730		2,330		2,020		1,750		2,740		3,160		3,390	
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.28		0.2	U	0.2	U	0.2	U	0.24		0.2	U
Silver	mg/kg	-	**0.75**	0.11		0.23		0.13		0.1	U	0.1	U	0.13		0.16		0.14		0.1	U	0.17		0.12		0.1	U
Sodium	mg/kg	60,000	**235,500**	190		230		100	U	100	U	100	U	460		250		140		430		730		350		720	
Strontium	mg/kg	3,000	**3,700**	17.8		14.5		9.46		5.19	J	2.6	J	42.0		26.9		17.0		87.1	J	574		100		234	
Sulphur	mg/kg	**8,400**	3,500	500	U	500	U	500	U	500	U	500	U	500		2,700		600		NT		NT		NT		NT	
Thallium	mg/kg	**108**	8.5	0.298		0.227		0.174		0.13		0.09		0.214		0.196		0.162		0.202		0.258		0.219		0.23	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	469		349		190		153		109		549		458		406		539		545		540		648	
Uranium	mg/kg	24	**27**	2.87		8.79		1.58		1.15		0.842		1.24		0.83		1.01		1.18		1.27		1.61		1.22	
Vanadium	mg/kg	1,080	**1,200**	22.2		18.3		10.4		8.66		12.1		38.4		45.6		37.7		32.2		30.2		34.9		29.9	
Zinc	mg/kg	**1,080**	700	69.8		42.4		48.2		37.8		27.9		93.1		100		97.0		56.7		123		65.0		67.1	
Moisture	percent	-	-	15.9		33.7		6.66		3.72		3.44		11.9	J	9.09	J	11.3	J	6.12		7.46		11		4.37	
pH (1:2 soil:water)	pH Units	-	-	7.6		5.6		6.63		6.25		6.19		4.57		7.83		6.92		7.06		8.56		8.55		8.52	
Organic Matter	percent	-	-	0.7	U	1.51		0.7	U	0.7	U	0.7	U	0.7	U	1.9		0.7	U	NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	0.4	U	0.9		0.4	U	0.4	U	0.4	U	0.4	U	1.1		0.4	U	NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.74		0.1	U	NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	0.8	U	6.18		0.8	U	NT		NT		NT		NT	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit (RU)				Other (Haul Road)		Other (Haul Road)		Other (Haul Road)		Other (Haul Road)	
Sample ID				CH12-108-BH102-SOA		CH12-108-BH103-SOA		CH12-108-BH111-SOA		CH12-108-BH9111-SOA	
Sample Interval (mbgs)		12x Median Soil Content [a]	10x Crustal Abundance [b]	0 - 0.15		0 - 0.15		0 - 0.15		0 - 0.15	
Sample Date				9/29/2012		9/29/2012		10/3/2012		10/3/2012	
Geological Unit											
Analyte	**Unit**			**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**	**Result**	**Qualifier**
Aluminum	mg/kg	**852,000**	823,000	16,500		14,400		4,230		4,810	
Antimony	mg/kg	**60**	2	0.5		0.54		0.18		0.25	
Arsenic	mg/kg	**72**	18	14.2		9.39		5.93		6.04	
Barium	mg/kg	**6,000**	4,250	204		152		10.1		13	
Beryllium	mg/kg	**72**	30	0.77		0.86		0.33		0.43	
Bismuth	mg/kg	-	**0.085**	1.75		0.42		0.4		0.43	
Boron	mg/kg	-	**100**	10	U	10	U	10	U	10	U
Cadmium	mg/kg	**4.2**	1.5	0.304		0.305		0.05	U	0.055	
Calcium	mg/kg	180,000	**415,000**	11,100		4,280		345	J	609	J
Chromium	mg/kg	840	**1,020**	31.2		24.4		3.28		4.94	
Cobalt	mg/kg	96	**250**	11.4		7.96		1.5		1.42	
Copper	mg/kg	360	**600**	23.2		16.3		2.57		2.11	
Iron	mg/kg	480,000	**563,000**	24,300		20,500		6,130		6,540	
Lead	mg/kg	**420**	140	18.3		21.6		12.5		14.9	
Lithium	mg/kg	**300**	200	32.5		33.6		11.5		14.6	
Magnesium	mg/kg	60,000	**233,000**	7,170		5,410		950		1,040	
Manganese	mg/kg	**12,000**	9,500	382		305		78.7		80.5	
Mercury	mg/kg	0.72	**0.85**	0.020		0.019		0.006		0.007	
Molybdenum	mg/kg	**24**	12	0.5	U	0.5	U	0.5	U	0.5	U
Nickel	mg/kg	600	**840**	30.5		22.8		2.35		2.47	
Phosphorus	mg/kg	9,600	**10,500**	626		584		223		315	
Potassium	mg/kg	168,000	**208,500**	2,810		2,290		500		720	
Selenium	mg/kg	**4.8**	0.5	0.2	U	0.2	U	0.2	U	0.2	U
Silver	mg/kg	-	**0.75**	0.12		0.12		0.1	U	0.1	U
Sodium	mg/kg	60,000	**235,500**	250		220		100	U	100	U
Strontium	mg/kg	3,000	**3,700**	50.3		45.6		1.82		2.6	
Sulphur	mg/kg	**8,400**	3,500	NT		NT		NT		NT	
Thallium	mg/kg	**108**	8.5	0.242		0.252		0.111		0.155	
Tin	mg/kg	**48**	23	2	U	2	U	2	U	2	U
Titanium	mg/kg	-	**56,500**	521		584		102		151	
Uranium	mg/kg	24	**27**	0.925		1.44		0.937		1.09	
Vanadium	mg/kg	1,080	**1,200**	31.4		29.6		5.26		7.52	
Zinc	mg/kg	**1,080**	700	68.4		72.9		25.4		28.8	
Moisture	percent	-	-	9.95		7.17		3.89		3.71	
pH (1:2 soil:water)	pH Units	-	-	8.53		7.75		5.37		5.34	
Organic Matter	percent	-	-	NT		NT		NT		NT	
Total Organic Carbon	percent	-	-	NT		NT		NT		NT	
Total Inorganic Carbon	percent	-	-	NT		NT		NT		NT	
Inorganic Carbon (as $CaCO_3$ Equivalent)	percent	-	-	NT		NT		NT		NT	

Table 10-1. Total Metals Analysis and General Chemical Parameter Results
(2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Notes:

Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC.

Values indicated in black text with a grey background were identified at concentrations that are greater than 12x the Median World Soil Content.

Values indicated in white text with a grey background were identified at concentrations that are greater than 10x the crustal abundance.

Values indicated in white text with a black background were identified at concentrations that are greater than both 12x the Mediam World Soil Content ***and*** 10x the crustal abundance.

[a] 12x the Median world soil content retrieved from Bowen, H.J.M. (1979) Environmental Chemistry of the Elements. Academic Press, London

[b] Values from Price, W.A. 1997. Draft *Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia* (Appendix 3).

12x Median World Soil Content values and 10x Continental Crustal Abundance values that are bolded and underlined indicate the highest value between the two.

$CaCO_3$ = calcium carbonate
J = This analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/kg = milligram per kilogram
NT = not tested
QA/QC = Quality Assurance and Quality Control
R = Data rejected
U = This analyte was analyzed for but not detected at the specified detection limit
WRD = waste rock dump

Table 10-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential						Neutralization Potential					
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH12-014-MW013-SOA	Vangorda WRD	0	0.1	8/5/2012	5.33		10000	J	0.67		78,900		*198.33*	23		230	26		1
CH12-014-MW013-SOB	Vangorda WRD	5.4	5.6	8/5/2012	5.59		10,000	J	0.55		214,000		590	34		340	38		0.6
CH12-014-MW013-SOB	Vangorda WRD	5.4	5.6	8/5/2012	NT		NT		NT		NT		NC	113*		1,130*	NT		NC
CH12-014-MW013-SOC	Vangorda WRD	9.3	9.5	8/5/2012	5		10,000	J	0.75		252,000		745	22		220	24		0.3
CH12-014-MW013-SOC	Vangorda WRD	9.3	9.5	8/5/2012	NT		NT		NT		NT		NC	47*		470*	NT		NC
CH12-014-MW013-SOD	Vangorda WRD	15.4	15.6	8/6/2012	4.07		10,000	J	0.64		74,200		187	31		310	35		1.7
CH12-014-MW013-SOD	Vangorda WRD	15.4	15.6	8/6/2012	NT		NT		NT		NT		NC	1*	U	10*	NT		NC
CH12-014-MW013-SOE	Vangorda WRD	20.6	20.8	8/6/2012	3.65		10,000	J	0.92		271,000		789	70		700	78		0.9
CH12-014-MW013-SOE	Vangorda WRD	20.6	20.8	8/6/2012	NT		NT		NT		NT		NC	14*		140*	NT		NC
CH12-014-MW013-SOF	Vangorda WRD	24.9	25.1	8/6/2012	5.03		10,000	J	0.35		109,000		299	44		440	49		1.5
CH12-014-MW013-SOF	Vangorda WRD	24.9	25.1	8/6/2012	NT		NT		NT		NT		NC	14*		140*	NT		NC
CH12-014-MW013-SOG	Vangorda WRD	30.4	30.6	8/6/2012	5.98		10,000	J	0.25		105,000		294	41		410	46		1.4
CH12-014-MW013-SOG	Vangorda WRD	30.4	30.6	8/6/2012	NT		NT		NT		NT		NC	30*		300*	NT		NC
CH12-014-MW013-SOH	Vangorda WRD	38.9	39.1	8/7/2012	6.13		1,155		0.01	U	6,200		16	40		400	45		25.3
CH12-014-MW013-SOH	Vangorda WRD	38.9	39.1	8/7/2012	NT		NT		NT		NT		NC	147*		1,470*	NT		NC
CH12-014-MW013-SOJ	Vangorda WRD	4	4	8/4/2012	5.94	J	673		0.09		292,000		*913*	124		1,240	NT		1.4
CH12-014-MW013-SOK	Vangorda WRD	10	10	8/4/2012	5.8	J	10,000	J	0.4		136,000		*425*	146		1,460	NT		3.4
CH12-014-MW013-SOL	Vangorda WRD	25	25	8/4/2012	5.92	J	10,000	J	0.55		80,400		*251*	147		1,470	NT		5.9
CH12-014-MW013-SOM	Vangorda WRD	43	43	8/4/2012	6.06	J	10,000	J	0.42		245,000		*766*	88		880	NT		1.1
CH12-014-MW011-SOA	Grum WRD	6	6.2	8/3/2012	6.23		1,145		0.01	U	2,600		*8.1*	31		310	35		38.2
CH12-014-MW011-SOA	Grum WRD	6	6.2	8/3/2012	NT		NT		NT		NT		NC	156*		1,,560*	NT		NC
CH12-014-MW011-SOB	Grum WRD	11.5	11.7	8/3/2012	6.21		1,655		0.01	U	2,700		6.93	44		44	49		6.3
CH12-014-MW011-SOB	Grum WRD	11.5	11.7	8/3/2012	NT		NT		NT		NT		NC	106*		1,060*	NT		NC
CH12-014-MW011-SOC	Grum WRD	15.1	15.3	8/3/2012	6.14		1,465		0.01	U	6,000		17.4	29		290	32		16.7
CH12-014-MW011-SOC	Grum WRD	15.1	15.3	8/3/2012	NT		NT		NT		NT		NC	165*		1,650*	NT		NC
CH12-014-MW011-SOD	Grum WRD	21.2	21.4	8/3/2012	6.17		1,460		0.01	U	4,400		12.4	50		500	55		40.4
CH12-014-MW011-SOD	Grum WRD	21.2	21.4	8/3/2012	NT		NT		NT		NT		NC	180*		1,800*	NT		NC
CH12-014-MW911-SOD	Grum WRD	21.2	21.4	8/3/2012	6.36		NT		0.01	U	3,600		*11.25*	58		580	65		51.6
CH12-014-MW011-SOE	Grum WRD	26.1	26.3	8/3/2012	6.22		767		NT		3,100		*9.69*	29		290	32		29.9
CH12-014-MW011-SOF	Grum WRD	29.8	30	8/3/2012	6.37		2,330		0.01	U	2,000		5.00	24		240	27		48.0
CH12-014-MW011-SOF	Grum WRD	29.8	30	8/3/2012	NT		NT		NT		NT		NC	35*		350*	NT		NC
CH12-014-MW011-SOG	Grum WRD			8/3/2012	7.05	J	1,380		0.01	U	5,700		*17.8*	154		1,540	NT		86.5
CH12-014-MW911-SOG	Grum WRD			8/3/2012	7.13	J	1,280		0.01		5,200		*16.3*	152		1,520	NT		93.5
CH12-014-MW011-SOH	Grum WRD	5	5	8/3/2012	7.1	J	1,300		0.01	U	3,600		*11.3*	207		2,070	NT		184
CH12-014-MW011-SOI	Grum WRD	10	10	8/3/2012	7.05	J	1,355		0.01	U	3,000		*9.38*	161		1,610	NT		172
CH12-014-MW011-SOJ	Grum WRD	30	30	8/3/2012	7.09	J	1,755		0.01	U	3,700		*11.6*	110		1,100	NT		95.1
CH12-014-MW012-SOA	Grum WRD	5.7	5.9	8/4/2012	6.25		892		0.01	U	1,900		5.02	32		320	35		63.8
CH12-014-MW012-SOA	Grum WRD	5.7	5.9	8/4/2012	NT		NT		NT		NT		NC	145*		1,450*	NT		NC
CH12-014-MW012-SOB	Grum WRD	11.8	12	8/4/2012	6.49		1,220		0.01	U	3,100		8.53	35		350	39		41.0
CH12-014-MW012-SOB	Grum WRD	11.8	12	8/4/2012	NT		NT		NT		NT		NC	59*		590*	NT		NC
CH12-014-MW012-SOC	Grum WRD	18.5	18.7	8/4/2012	6.65		989		0.01	U	1,700		4.30	66		660	74		154
CH12-014-MW012-SOD	Grum WRD	22.1	22.3	8/4/2012	6.64		947		0.01	U	1,500		3.72	50		500	56		135
CH12-014-MW012-SOD	Grum WRD	22.1	22.3	8/4/2012	NT		NT		NT		NT		NC	59*		590*	NT		NC
CH12-014-MW012-SOE	Grum WRD	28.9	29.1	8/4/2012	6.67		1,030		0.01	U	1,200		2.68	32		320	36		120
CH12-014-MW012-SOE	Grum WRD	28.9	29.1	8/4/2012	NT		NT		NT		NT		NC	27*		270*	NT		NC
CH12-014-MW012-SOF	Grum WRD	38.3	38.5	8/4/2012	6.77		650		0.02		1,100		2.17	57		570	64		263
CH12-014-MW012-SOF	Grum WRD	38.3	38.5	8/4/2012	NT		NT		NT		NT		NC	239*		2,390*	NT		NC

Table 10-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential					Neutralization Potential				
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur	Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH12-014-MW912-SOF	Grum WRD	38.3	38.5	8/4/2012	6.4		413		0.01	U	1,700		4.68	41		410	46		87.6
CH12-014-MW012-SOG	Grum WRD	8	8	8/4/2012	6.97	J	995		0.01	U	2,700		*8.44*	111		1,110	NT		132
CH12-014-MW012-SOH	Grum WRD	14	14	8/4/2012	7.09	J	1,090		0.01	U	3,800		*11.9*	126		1,260	NT		106
CH12-108-BH111-SOA	Grum Mine Area	0	0.15	10/3/2012	6.25		NT		NT		NT		NC	NT		NC	NT		NC
CH12-108-BH9111-SOA	Grum Mine Area	0	0.15	10/3/2012	6.09		NT		NT		NT		NC	NT		NC	NT		NC
CH12-311-BH107-SOA	Grum Mine Area	0	0.2	9/30/2012	6.62		NT		NT		NT		NC	NT		NC	NT		NC
CH12-311-BH110-SOA	Grum Mine Area	0	0.2	9/30/2012	6.68		NT		NT		NT		NC	NT		NC	NT		NC
CH12-311-BH112-SOA	Grum Mine Area	0	0.2	10/3/2012	5.96		NT		NT		NT		NC	NT		NC	NT		NC
CH13-311-BH001-SOA	Grum Mine Area	0.0	0.1	8/23/2013	6.08		815		0.01		600		1.42	4		40	NT		28.1
CH13-311-BH001-SOB	Grum Mine Area	0.2	1.5	8/23/2013	5.46		854		0.01		600		1.45	4		40	NT		27.7
CH13-311-BH002-SOB	Grum Mine Area	0.2	0.7	8/22/2013	5.58		837		0.02		1,000		2.40	4		40	NT		16.6
CH13-311-BH003-SOA	Grum Mine Area	0.0	3.7	8/22/2013	7.77		1,150		0.02		700		1.39	10		100	NT		72.0
CH13-311-BH003-SOB	Grum Mine Area	0.1	0.2	8/22/2013	5.85		1,070		0.01		600		1.45	5		50	NT		34.6
CH13-311-BH903-SOB	Grum Mine Area	0.2	0.4	8/22/2013	6.67		1,070		0.01	U	500	U	1.11	6		60	NT		54.1
CH13-311-BH004-SOA	Grum Mine Area	1.4	3.2	8/23/2013	5.37		1,025		0.01		500	U	1.08	5		50	NT		46.1
CH13-311-BH005-SOA	Grum Mine Area	0.2	2.4	8/23/2013	5.99		1,050		0.01		500	U	1.11	7		70	NT		63.2
CH13-311-BH005-SOB	Grum Mine Area	0.2	0.4	8/23/2013	6.06		752		0.01		500	U	1.16	4		40	NT		34.6
CH13-311-BH010-SOA	Grum Mine Area	0.5	1.5	7/18/2013	7.51		NT		NT		500	U	*1.56*	10		100	NT		64.1
CH13-311-BH010-SOB	Grum Mine Area	3	4	7/18/2013	6.1		NT		NT		500	U	*1.56*	3		30	NT		19.2
CH13-311-BH010-SOC	Grum Mine Area	10.5	11.5	7/18/2013	7.41		NT		NT		1,400		*4.38*	35		350	NT		79.9
CH13-311-BH010-SOD	Grum Mine Area	13.0	14.0	7/18/2013	7.73		NT		NT		3,200		*10*	16		160	NT		16.0
CH13-311-BH022-SOA	Grum Mine Area	1	2	8/25/2013	5.8		788		0.01	U	600		1.50	3		30	NT		20.0
CH13-311-BH022-SOB	Grum Mine Area	0.2	0.4	8/25/2013	5.39		775		0.01	U	500	U	1.19	3		30	NT		25.3
CH13-311-BH023-SOA	Grum Mine Area	0.2	3.4	8/24/2013	5.91		816		0.01		500	U	1.13	5		50	NT		44.2
CH13-311-BH023-SOB	Grum Mine Area	0.1	0.4	8/24/2013	5.82		830		0.02		500	U	0.865	3		30	NT		34.7
CH13-311-BH024-SOA	Grum Mine Area	0.2	3.4	8/24/2013	6.41		813		0.01	U	500	U	1.17	3		30	NT		25.7
CH13-311-BH024-SOB	Grum Mine Area	0.2	0.6	8/24/2013	5.82		679		0.01		500	U	1.18	1		10	NT		8.4
CH13-311-BH924-SOB	Grum Mine Area	0.2	0.6	8/24/2013	5.75		710		0.01	U	500	U	1.20	2		20	NT		16.6
CH12-311-BH001-SOA	Grum Overburden Dump	0.9	1.5	7/28/2012	6.78		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH12-311-BH001-SOB	Grum Overburden Dump	4.3	4.6	7/28/2012	6.79		NT		NT		600		*1.88*	NT		NC	NT		NC
CH12-311-BH001-SOC	Grum Overburden Dump	7.6	10.7	7/28/2012	6.98		NT		NT		3,100		*9.69*	NT		NC	NT		NC
CH12-311-BH901-SOC	Grum Overburden Dump	7.6	10.7	7/28/2012	7.62		NT		NT		11,200		*35*	NT		NC	NT		NC
CH12-311-BH001-SOD	Grum Overburden Dump	10.7	16.8	7/28/2012	7.26		NT		NT		1,300		*4.06*	NT		NC	NT		NC
CH12-311-BH001-SOE	Grum Overburden Dump	21.3	21.6	7/28/2012	7.42		NT		NT		1,200		*3.75*	NT		NC	NT		NC
CH12-311-BH001-SOF	Grum Overburden Dump	26.5	26.8	7/28/2012	6.98		NT		NT		NT		NC	NT		NC	NT		NC
CH12-311-BH001-SOG	Grum Overburden Dump	31.7	32.0	7/28/2012	7.31		NT		NT		1,000		*3.13*	NT		NC	NT		NC
CH12-311-BH001-SOH	Grum Overburden Dump	37.8	38.1	7/28/2012	7.6		NT		NT		900		*2.81*	NT		NC	NT		NC
CH12-311-BH002-SOA	Grum Overburden Dump	0	1.5	7/29/2012	7.19		NT		NT		700		*2.19*	NT		NC	NT		NC
CH12-311-BH002-SOB	Grum Overburden Dump	5.1	6.1	7/29/2012	7.35		NT		NT		2,600		*8.13*	NT		NC	NT		NC
CH12-311-BH902-SOB	Grum Overburden Dump	5.1	6.1	7/29/2012	7.32		NT		NT		1,900		*5.94*	NT		NC	NT		NC
CH12-311-BH002-SOC	Grum Overburden Dump	10.7	13.7	7/29/2012	7.2		NT		NT		900		*2.81*	NT		NC	NT		NC
CH12-311-BH002-SOD	Grum Overburden Dump	15.2	16.2	7/29/2012	7.22		NT		NT		1,500		*4.69*	NT		NC	NT		NC
CH12-311-BH002-SOE	Grum Overburden Dump	21.3	22.1	7/29/2012	7.25		NT		NT		1,100		*3.44*	NT		NC	NT		NC
CH12-311-BH002-SOF	Grum Overburden Dump	25.3	25.9	7/29/2012	7.26		NT		NT		900		*2.81*	NT		NC	NT		NC
CH12-311-BH002-SOG	Grum Overburden Dump	30.8	31.4	7/29/2012	7.17		NT		NT		1,200		*3.75*	NT		NC	NT		NC
CH12-311-BH002-SOH	Grum Overburden Dump	35.7	36.3	7/29/2012	7.27		NT		NT		1,000		*3.13*	NT		NC	NT		NC
CH12-311-BH002-SOI	Grum Overburden Dump	40.5	41.1	7/29/2012	7.37		NT		NT		800		*2.5*	NT		NC	NT		NC

Table 10-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

					Paste pH		Acid Potential							Neutralization Potential					
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH12-311-BH002-SOJ	Grum Overburden Dump	43.3	43.9	7/30/2012	8		NT		NT		700		*2.19*	NT		NC	NT		NC
CH12-311-BH003-SOA	Grum Overburden Dump	0.91	1.52	7/30/2012	7.94		NT		NT		700		*2.19*	NT		NC	NT		NC
CH12-311-BH003-SOB	Grum Overburden Dump	4.57	7.62	7/30/2012	8.16		NT		NT		1,500		*4.69*	NT		NC	NT		NC
CH12-311-BH003-SOC	Grum Overburden Dump	7.62	9.75	7/30/2012	7.24		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-BH003-SOD	Grum Overburden Dump	15.7	16.2	7/30/2012	7.28		NT		NT		600		*1.88*	NT		NC	NT		NC
CH12-311-BH903-SOD	Grum Overburden Dump	15.7	16.2	7/30/2012	7.47		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-BH003-SOE	Grum Overburden Dump	21.6	22.3	7/30/2012	7.41		NT		NT		600		*1.88*	NT		NC	NT		NC
CH12-311-BH003-SOF	Grum Overburden Dump	25.9	26.5	7/30/2012	6.72		NT		NT		700		*2.19*	NT		NC	NT		NC
CH12-311-BH003-SOG	Grum Overburden Dump	31.4	32	7/30/2012	7.3		NT		NT		600		*1.88*	NT		NC	NT		NC
CH12-311-BH003-SOH	Grum Overburden Dump	39.9	40.5	7/31/2012	7.59		NT		NT		1,200		*3.75*	NT		NC	NT		NC
CH12-311-BH004-SOA	Grum Overburden Dump	0.61	1.22	8/1/2012	6.85		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-BH004-SOB	Grum Overburden Dump	6.4	7.31	8/1/2012	6.78		NT		NT		2,700		*8.44*	NT		NC	NT		NC
CH12-311-BH904-SOB	Grum Overburden Dump	6.4	7.31	8/1/2012	7.28		NT		NT		2,600		*8.13*	NT		NC	NT		NC
CH12-311-BH004-SOC	Grum Overburden Dump	12.8	13.4	8/1/2012	7.33		NT		NT		2,100		*6.56*	NT		NC	NT		NC
CH12-311-BH004-SOD	Grum Overburden Dump	21	21.6	8/2/2012	7.26		NT		NT		900		*2.81*	NT		NC	NT		NC
CH12-311-BH004-SOE	Grum Overburden Dump	26.2	26.8	8/2/2012	7.22		NT		NT		700		*2.19*	NT		NC	NT		NC
CH12-311-BH004-SOF	Grum Overburden Dump	32.3	32.9	8/2/2012	7.3		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-BH004-SOG	Grum Overburden Dump	35.4	36	8/2/2012	6.92		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-BH005-SOA	Grum Overburden Dump	0.91	1.52	7/31/2012	6.69		NT		NT		900		*2.81*	NT		NC	NT		NC
CH12-311-BH005-SOB	Grum Overburden Dump	5.79	6.4	7/31/2012	6.84		NT		NT		6,000		*18.75*	NT		NC	NT		NC
CH12-311-BH005-SOC	Grum Overburden Dump	12.5	13.1	7/31/2012	7.04		NT		NT		1,000		*3.13*	NT		NC	NT		NC
CH12-311-BH905-SOC	Grum Overburden Dump	12.5	13.1	7/31/2012	7.03		NT		NT		1,000		*3.13*	NT		NC	NT		NC
CH12-311-BH005-SOD	Grum Overburden Dump	15.2	15.8	7/31/2012	7.14		NT		NT		600		*1.88*	NT		NC	NT		NC
CH12-311-BH005-SOE	Grum Overburden Dump	19.2	19.8	7/31/2012	6.97		NT		NT		3,700		*11.56*	NT		NC	NT		NC
CH12-311-BH005-SOF	Grum Overburden Dump	24.4	25	7/31/2012	6.99		NT		NT		1,100		*3.44*	NT		NC	NT		NC
CH12-311-BH005-SOG	Grum Overburden Dump	29.9	30.5	7/31/2012	6.96		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH12-311-BH005-SOH	Grum Overburden Dump	35	35.7	7/31/2012	7.35		NT		NT		900		*2.81*	NT		NC	NT		NC
CH12-311-BH005-SOI	Grum Overburden Dump	39.6	40.2	7/31/2012	6.98		NT		NT		600		*1.88*	NT		NC	NT		NC
CH12-311-BH006-SOA	Grum Overburden Dump	1.22	1.52	8/1/2012	6.97		NT		NT		1,200		*3.75*	NT		NC	NT		NC
CH12-311-BH006-SOB	Grum Overburden Dump	5.18	6.1	8/1/2012	7.08		NT		NT		700		*2.19*	NT		NC	NT		NC
CH12-311-BH006-SOC	Grum Overburden Dump	10.4	10.7	8/1/2012	7.16		NT		NT		2,600		*8.13*	NT		NC	NT		NC
CH12-311-BH006-SOD	Grum Overburden Dump	14.6	15.8	8/1/2012	7.21		NT		NT		700		*2.19*	NT		NC	NT		NC
CH12-311-BH006-SOE	Grum Overburden Dump	23.2	24.1	8/1/2012	6.59		NT		NT		1,700		*5.31*	NT		NC	NT		NC
CH12-311-BH906-SOE	Grum Overburden Dump	23.2	24.1	8/1/2012	7.54		NT		NT		1,300		*4.06*	NT		NC	NT		NC
CH12-311-BH006-SOF	Grum Overburden Dump	27.7	28.3	8/1/2012	7.37		NT		NT		600		*1.88*	NT		NC	NT		NC
CH12-311-BH006-SOG	Grum Overburden Dump	32.3	32.9	8/1/2012	7.48		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-BH006-SOH	Grum Overburden Dump	36.9	37.5	8/1/2012	7.09		NT		NT		500	U	*1.56*	NT		NC	NT		NC
CH12-311-TP007-SOA	Grum Overburden Dump	0	5.2	8/7/2012	5.94		NT		NT		1,400		*4.38*	NT		NC	NT		NC
CH12-311-TP008-SOA	Grum Overburden Dump	0	3.1	8/7/2012	6.06		NT		NT		900		*2.81*	NT		NC	NT		NC
CH12-311-TP009-SOA	Grum Overburden Dump	0	4.3	8/7/2012	6.2		NT		NT		1,000		*3.12*	NT		NC	NT		NC
CH12-311-TP012-SOA	Grum Overburden Dump	0	5.5	8/7/2012	6.14		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-TP013-SOA	Grum Overburden Dump	0	3.7	8/7/2012	6.01		NT		NT		800		*2.5*	NT		NC	NT		NC
CH12-311-TP014-SOA	Grum Overburden Dump	0	4.3	8/7/2012	6.12		NT		NT		3,100		*9.69*	NT		NC	NT		NC
CH12-311-TP015-SOA	Grum Overburden Dump	0	6.1	8/7/2012	6.33		NT		NT		1,500		*4.69*	NT		NC	NT		NC
CH12-311-TP915-SOA	Grum Overburden Dump	0	6.1	8/7/2012	6.17		NT		NT		1,000		*3.13*	NT		NC	NT		NC
CH13-311-BH011-SOA	Grum Overburden Dump	3.7	4.6	7/23/2013	7.11		NT		NT		1,200		*3.75*	50		500	NT		133
CH13-311-BH011-SOB	Grum Overburden Dump	9.8	10.7	7/23/2013	7.23		NT		NT		4,300		*13.4*	38		380	NT		28.4

Table 10-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential						Neutralization Potential					
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH13-311-BH011-SOC	Grum Overburden Dump	25.0	25.9	7/23/2013	7.3		NT		NT		2,000		*6.25*	36		360	NT		57.6
CH13-311-BH011-SOD	Grum Overburden Dump	34.1	35.1	7/23/2013	7.73		NT		NT		1,700		*5.31*	41		410	NT		77.2
CH13-311-BH011-SOE	Grum Overburden Dump	37.2	38.1	7/24/2013	7.83		NT		NT		1,500		*4.69*	50		500	NT		107
CH13-311-BH911-SOE	Grum Overburden Dump	37.2	38.1	7/24/2013	6.64		NT		NT		1,500		*4.69*	46		460	NT		98.1
CH13-311-BH012-SOA	Grum Overburden Dump	0.6	1.5	7/24/2013	7.57		NT		NT		700		*2.19*	27		270	NT		123
CH13-311-BH012-SOB	Grum Overburden Dump	9.8	10.7	7/24/2013	7.51		NT		NT		900		*2.81*	40		400	NT		142
CH13-311-BH012-SOC	Grum Overburden Dump	18.9	19.8	7/24/2013	7.52		NT		NT		800		*2.5*	7		70	NT		28.0
CH13-311-BH012-SOD	Grum Overburden Dump	40.2	41.2	7/25/2013	7.62		NT		NT		600		*1.88*	28		280	NT		149
CH13-311-BH013-SOA	Grum Overburden Dump			7/18/2013	7.51		NT		NT		900		*2.81*	26		260	NT		92.5
CH13-311-BH013-SOB	Grum Overburden Dump			7/18/2013	7.7		NT		NT		4,700		*14.7*	59		590	NT		40.1
CH13-311-BH913-SOB	Grum Overburden Dump			7/18/2013	7.76		NT		NT		6,000		*18.8*	32		320	NT		17.0
CH13-311-BH013-SOC	Grum Overburden Dump			7/18/2013	7.51		NT		NT		800		*2.5*	21		210	NT		84.0
CH13-311-BH013-SOD	Grum Overburden Dump			7/19/2013	7.44		NT		NT		1,700		*5.31*	46		460	NT		86.6
CH13-311-BH013-SOE	Grum Overburden Dump			7/19/2013	7.49		NT		NT		1,400		*4.38*	32		320	NT		73.1
CH13-311-BH014-SOA	Grum Overburden Dump			7/20/2013	7.49		NT		NT		5,500		*17.2*	45		450	NT		26.2
CH13-311-BH014-SOB	Grum Overburden Dump			7/20/2013	7.6		NT		NT		900		*2.81*	32		320	NT		114
CH13-311-BH014-SOC	Grum Overburden Dump			7/20/2013	7.62		NT		NT		700		*2.19*	24		240	NT		110
CH13-311-BH014-SOD	Grum Overburden Dump			7/20/2013	7.49		NT		NT		900		*2.81*	30		300	NT		107
CH13-311-BH014-SOE	Grum Overburden Dump			7/20/2013	7.71		NT		NT		900		*2.81*	32		320	NT		114
CH13-311-BH015-SOA	Grum Overburden Dump			7/22/2013	6.81	J	NT		NT		2,500	J	*7.81*	40		400	NT		51.2
CH13-311-BH015-SOB	Grum Overburden Dump			7/22/2013	6.9	J	NT		NT		3,400	J	*10.6*	151		1,510	NT		142
CH13-311-BH015-SOC	Grum Overburden Dump			7/22/2013	7.13	J	NT		NT		800	J	*2.5*	20		200	NT		80.0
CH13-311-BH915-SOC	Grum Overburden Dump			7/22/2013	7.12	J	NT		NT		1,000	J	*3.13*	22		220	NT		70.3
CH13-311-BH015-SOD	Grum Overburden Dump			7/22/2013	7.15	J	NT		NT		1,300	J	*4.06*	29		290	NT		71.4
CH13-311-BH015-SOE	Grum Overburden Dump			7/22/2013	7.29	J	NT		NT		900	J	*2.81*	26		260	NT		92.5
CH13-311-TP002-SOA	Grum Overburden Dump	0	4	8/14/2013	7.45		1,185		0.02		900		2.03	21		210	NT		103
CH13-311-TP902-SOA	Grum Overburden Dump	0	4	8/14/2013	7.29		1,180		0.01	U	700		1.72	20		200	NT		116
CH13-311-TP003-SOA	Grum Overburden Dump	0	6	8/14/2013	7.35		1,090		0.01	U	800		2.04	31		310	NT		152
CH13-311-TP903-SOA	Grum Overburden Dump	0	6	8/14/2013	7.44		1,075		0.01	U	600		1.41	19		190	NT		135
CH13-311-TP004-SOA	Grum Overburden Dump	1	6	8/14/2013	7.42		3,200		0.02		4,600		12.0	75		750	NT		62.4
CH13-311-TP904-SOA	Grum Overburden Dump	1	6	8/14/2013	7.36		3,360		0.02		3,900		10.5	66		660	NT		62.8
CH13-311-TP005-SOA	Grum Overburden Dump	1	6	8/14/2013	7.59		1,175		0.01	U	600		1.43	22		220	NT		154
CH13-311-TP905-SOA	Grum Overburden Dump	1	6	8/14/2013	7.56		1,190		0.01	U	1,500		4.25	19		190	NT		44.7
CH13-311-TP006-SOA	Grum Overburden Dump	1	6	8/13/2013	7.59		1,075		0.01	U	1,600		4.55	22		220	NT		48.3
CH13-311-TP906-SOA	Grum Overburden Dump	1	6	8/13/2013	7.45		1,100		0.01		1,600		4.55	23		230	NT		50.5
CH12-311-BH104-SOA	Grum Pit	0	0.2	9/30/2012	7.1		NT		NT		NT		NC	NT		NC	NT		NC
CH12-311-BH9104-SOA	Grum Pit	0	0.2	9/30/2012	6.82		NT		NT		NT		NC	NT		NC	NT		NC
CH13-311-SS023-SOA	Grum Pit	0	0.2	7/12/2013	7.23		NT		NT		500		*1.56*	21		210	NT		135
CH13-311-SS024-SOA	Grum Pit	0	0.2	7/12/2013	6.8		NT		NT		500		*1.56*	22		220	NT		141
CH13-311-SS025-SOA	Grum Pit	0	0.2	7/12/2013	7.54		NT		NT		500	U	*1.56*	12		120	NT		76.9
CH13-311-SS027-SOA	Grum Pit	0	0.2	7/15/2013	7.45		1,135		0.01	U	600		1.44	23		230	NT		160
CH13-311-SS028-SOA	Grum Pit	0	0.2	7/15/2013	7.48		NT		0.01	U	500	U	*1.56*	67		670	NT		429
CH13-311-SS029-SOA	Grum Pit	0	0.2	7/15/2013	7.43		1,100		0.01	U	700		1.75	20		200	NT		114
CH13-311-SS030-SOA	Grum Pit			7/15/2013	7.51		NT		0.01	U	500	U	*1.56*	19		190	NT		122
CH13-311-SS031-SOA	Grum Pit	0	0.2	7/15/2013	7.79		NT		0.01	U	500		*1.56*	18		180	NT		115
CH13-311-SS032-SOA	Grum Pit	0	0.2	7/15/2013	7.36		959		0.01	U	700		1.68	23		230	NT		137
CH13-311-SS033-SOA	Grum Pit			7/15/2013	7.58		548		0.01	U	700		1.73	12		120	NT		69.4

Table 10-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

							Acid Potential							Neutralization Potential				
					Paste pH		Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)		Neutralization Potential Ratio (NP/AP)
Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	
CH13-311-SS034-SOA	Grum Pit	0	0.2	7/15/2013	7.43		NT		0.01	U	500	U	*1.56*	17		170	NT		109
CH13-311-SS035-SOA	Grum Pit	0	0.2	7/15/2013	7.69		NT		0.01	U	500	U	*1.56*	14		140	NT		89.7
CH13-311-SS036-SOA	Grum Pit	0	0.2	7/15/2013	7.59		1,090		0.01	U	1,000		2.69	24		240	NT		89.2
CH13-311-SS037-SOA	Grum Pit			7/15/2013	7.59		1,200		0.01	U	700		1.75	24		240	NT		137
CH13-311-TP021-SOA	Grum Pit	2.4	2.7	8/27/2013	5.08	J	1,235		0.01	U	500		1.10	5		50	NT		45.4
CH13-311-TP022-SOA	Grum Pit	3.0	5.8	8/26/2013	6.98	J	1,240		0.01	U	2,700		7.97	8		80	NT		10.0
CH13-311-TP023-SOA	Grum Pit	0.3048	2.4384	8/26/2013	6.17	J	1190		0.01	U	600		*1.40*	5		50	NT		36

Table 10-2. Acid Base Accounting Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Sample ID	Reclamation Unit	Depth From (mbgs)	Depth To (mbgs)	Sample Date	Paste pH		Acid Potential							Neutralization Potential						Neutralization Potential Ratio (NP/AP)
							Barium, LMB		Sulphate, Acid Soluble		Total Sulphur		Acid Potential (as $CaCO_3$ Eq.)	Neutralization Potential (as $CaCO_3$ Eq.)		Neutralization Potential (As $CaCO_3$ Eq.)	Neutralization Potential (as CaO Eq.)			
					Result (pH Units)	Result Qualifier	Result (ppm)	Result Qualifier	Result (percent)	Result Qualifier	Result (mg/kg)	Result Qualifier	(kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier	Calculated Result (kg $CaCO_3$/tonne)	Result (percent)	Result Qualifier		

Notes:

Laboratory data has been validated by CH2M HILL prior to importing to EquIS. This summary table has been through QA/QC.

Analytical results for neutralization potential by the AOAC 955.01 and MOD-SOBEK-3.2.3 methods are reported; results by the MOD-SOBEK-3.2.3 method are indicated using "*".

AOAC 955.01 is the preferred analytical method for neutralization potential; however, MOD-SOBEK-3.2.3 was applied to some samples collected in 2012 due to miscommunication.

Analytical results by the AOAC 955.01 method should be considered in future analysis and decision-making process.

Calculated values of acid potential presented italics were calculated based on total sulphur content, and represent conservative estimates of the acid generation potential

$CaCO_3$ = calcium carbonate

CaO = calcium oxide

J = Analyte was present but the reported value may not be accurate or precise.

kg = kilogram

LMB =

mg/kg = milligram per kilogram

NC = not calculated

NP/AP = nuetralization potential divided by acid potential

NT = not tested

ppm = parts per million

QA/QC = Quality Assurance and Quality Control

U = This analyte was analyzed for but not detected at the specified detection limit.

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**
	Sample ID		**CH12-014-MW013-SOA**	**CH12-014-MW013-SOB**	**CH12-014-MW013-SOC**	**CH12-014-MW013-SOD**	**CH12-014-MW013-SOE**	**CH12-014-MW013-SOF**	**CH12-014-MW013-SOG**	**CH12-014-MW013-SOH**	**CH12-014-MW013-SOJ**	**CH12-014-MW013-SOK**	**CH12-014-MW013-SOL**	**CH12-014-MW013-SOM**
	Depth From (mbgs)		0	5.4	9.3	15.4	20.6	24.9	30.4	38.9	4	10	25	43
	Depth From (mbgs)		0.1	5.6	9.5	15.6	20.8	25.1	30.6	39.1	4	10	25	43
	Sample Date	**Screening Level**	8/5/2012	8/5/2012	8/5/2012	8/6/2012	8/6/2012	8/6/2012	8/6/2012	8/7/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012
pH	**Result (pH units)**	6.5-9.0	6.22	6.92	6.23	4.54	5.59	5.93	6.98	8.36	7.25	6.97	7.53	6.67
	Result Qualifier										J	J	J	J
Acidity	**Result (mg/L)**	-	734	10.7	197	763	981	200	8.7	1	8.2	15.9	10.9	58.6
	Result Qualifier									U	J	J	J	J
Total Alkalinity	**Result (mg/L)**	-	53.3	142	14.3	1	25.1	50.1	140	52.5	258	243	130	172
	Result Qualifier					U					J	J	J	J
Specific Conductance	**Result (µS/cm)**	-	3840	2520	3070	3100	4390	2040	1150	399	1850	2750	2370	2750
	Result Qualifier										J	J	J	J
ORP Leachable	**Result (mV)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier													
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.25	0.025	0.025	0.025	0.25	0.05	0.01	0.005	0.01	0.015	0.01	0.015
	Result Qualifier		U	U	U	U	U	U	U	U	UJ	UJ	UJ	UJ
Antimony	**Result (mg/L)**	1.6	0.005	0.0021	0.0005	0.00092	0.005	0.001	0.0212	0.00671	0.00404	0.015	0.00253	0.00324
	Result Qualifier		U		U		U	U			J	J	J	J
Arsenic	**Result (mg/L)**	0.005	0.05	0.005	0.005	0.0254	0.05	0.01	0.0072	0.001	0.002	0.003	0.002	0.003
	Result Qualifier		U	U	U		U	U		U	U	U	UJ	U
Barium	**Result (mg/L)**	2.3	0.05	0.005	0.005	0.005	0.05	0.01	0.002	0.001	0.002	0.003	0.002	0.003
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Beryllium	**Result (mg/L)**	0.0053	0.025	0.0025	0.0025	0.0025	0.025	0.005	0.001	0.0005	0.001	0.0015	0.001	0.0015
	Result Qualifier		U	U	U	U	U	U	U	U	UJ	UJ	UJ	UJ
Boron	**Result (mg/L)**	1.5	0.5	0.05	0.05	0.05	0.5	0.1	0.035	0.016	0.02	0.03	0.022	0.03
	Result Qualifier		U	U	U	U	U	U			UJ	UJ	J	UJ
Bromide	**Result (mg/L)**	-	1	1	1	1	1	1	0.5	0.05	NT	NT	NT	NT
	Result Qualifier		U	U	U	U	U	U	U	U				
Cadmium	**Result (mg/L)**	Variable[c]	0.917	0.00025	0.00025	0.989	0.273	0.0519	0.00052	0.00005	0.0001	0.00015	0.0001	0.00174
	Result Qualifier			U	U					U	UJ	U	U	J
Calcium	**Result (mg/L)**	-	520	526	572	334	536	177	217	44.6	374	620	432	554
	Result Qualifier										J	J	J	J
Chloride	**Result (mg/L)**	120	10	10	10	10	10	10	5	0.5	NT	NT	NT	NT
	Result Qualifier		U	U	U	U	U	U	U	U				
Chromium	**Result (mg/L)**	0.0089	0.025	0.0025	0.0025	0.0025	0.025	0.005	0.001	0.0005	0.001	0.0015	0.001	0.0015
	Result Qualifier		U	U	U	U	U	U	U	U	UJ	UJ	UJ	UJ
Cobalt	**Result (mg/L)**	-	1.47	0.0005	0.0005	1.65	0.0826	0.0415	0.0002	0.0001	0.0002	0.0003	0.0002	0.0003
	Result Qualifier			U	U				U	U	U	U	U	U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.05	0.005	0.005	0.005	0.05	0.01	0.002	0.001	0.002	0.003	0.002	0.003
	Result Qualifier		U	U	U	U	U	U	U	U	UJ	UJ	UJ	UJ
Fluoride	**Result (mg/L)**	0.12	0.4	0.4	0.4	0.55	0.4	0.4	0.2	0.397	NT	NT	NT	NT
	Result Qualifier		U	U	U		U	U	U					
Iron	**Result (mg/L)**	0.3	0.06	0.06	104	68.2	101	21.4	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier		U	U					U	U	UJ	U	U	U
Lead	**Result (mg/L)**	0.001	2.68	0.0005	0.0005	2.02	1.9	1.78	0.255	0.0001	0.0002	0.261	0.0002	0.925
	Result Qualifier			U	U		U			U	U	J	U	J
Lithium	**Result (mg/L)**	-	0.25	0.025	0.067	0.099	0.25	0.108	0.028	0.0079	0.01	0.043	0.063	0.055
	Result Qualifier		U	U			U				U	J	J	J
Magnesium	**Result (mg/L)**	-	250	135	182	201	279	152	35.4	10.2	63	84	99.6	117

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit			**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**	**Vangorda WRD**
Sample ID			**CH12-014-MW013-SOA**	**CH12-014-MW013-SOB**	**CH12-014-MW013-SOC**	**CH12-014-MW013-SOD**	**CH12-014-MW013-SOE**	**CH12-014-MW013-SOF**	**CH12-014-MW013-SOG**	**CH12-014-MW013-SOH**	**CH12-014-MW013-SOJ**	**CH12-014-MW013-SOK**	**CH12-014-MW013-SOL**	**CH12-014-MW013-SOM**
Depth From (mbgs)			0	5.4	9.3	15.4	20.6	24.9	30.4	38.9	4	10	25	43
Depth From (mbgs)			0.1	5.6	9.5	15.6	20.8	25.1	30.6	39.1	4	10	25	43
Sample Date		**Screening Level**	8/5/2012	8/5/2012	8/5/2012	8/6/2012	8/6/2012	8/6/2012	8/6/2012	8/7/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012
Magnesium	**Result Qualifier**										J	J	J	J

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

			Remediation Unit	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD	Vangorda WRD
			Sample ID	CH12-014-MW013-SOA	CH12-014-MW013-SOB	CH12-014-MW013-SOC	CH12-014-MW013-SOD	CH12-014-MW013-SOE	CH12-014-MW013-SOF	CH12-014-MW013-SOG	CH12-014-MW013-SOH	CH12-014-MW013-SOJ	CH12-014-MW013-SOK	CH12-014-MW013-SOL	CH12-014-MW013-SOM
			Depth From (mbgs)	0	5.4	9.3	15.4	20.6	24.9	30.4	38.9	4	10	25	43
			Depth From (mbgs)	0.1	5.6	9.5	15.6	20.8	25.1	30.6	39.1	4	10	25	43
			Sample Date	8/5/2012	8/5/2012	8/5/2012	8/6/2012	8/6/2012	8/6/2012	8/6/2012	8/7/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012
Manganese	**Result (mg/L)**	-	149	19.6	70.5	55.3	283	98.7	10.8	0.0005	2.42	17.3	28.1	43
	Result Qualifier									U	J	J	J	J
Mercury	**Result (mg/L)**	0.000026	0.000077	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier			U	U	U	U	U	U	U	R	R	R	R
Molybdenum	**Result (mg/L)**	0.073	0.005	0.0005	0.0005	0.0005	0.005	0.001	0.00061	0.0197	0.00283	0.0003	0.0002	0.0003
	Result Qualifier		U	U	U	U	U	U			J	U	U	U
Nickel	**Result (mg/L)**	0.025	1.41	0.0025	0.0025	0.85	0.871	0.657	0.0128	0.0005	0.001	0.0015	0.0354	0.0574
	Result Qualifier			U	U					U	U	U	J	J
Nitrate	**Result (mg/L)**	13	0.11	0.13	0.1	0.15	0.11	0.1	0.05	0.0064	NT	NT	NT	NT
	Result Qualifier				U			U	U					
Nitrite	**Result (mg/L)**	0.06	0.02	0.022	0.02	0.02	0.024	0.034	0.024	0.0024	NT	NT	NT	NT
	Result Qualifier		U		U	U								
Potassium	**Result (mg/L)**	-	29.5	6.6	23.2	47.9	17.7	38.2	17.5	31.2	2.7	27.1	34.5	15
	Result Qualifier										J	J	J	J
Selenium	**Result (mg/L)**	0.001	0.025	0.0025	0.0025	0.0025	0.025	0.005	0.001	0.0005	0.001	0.0015	0.001	0.0015
	Result Qualifier		U	U	U	U	U	U	U	U	UJ	UJ	UJ	UJ
Silicon	**Result (mg/L)**	-	8.62	5.95	9.47	26.8	12.3	13.7	8.71	2.31	0.05	0.1	0.05	0.1
	Result Qualifier										U	U	U	U
Silver	**Result (mg/L)**	0.0001	0.0025	0.00025	0.00025	0.00025	0.0025	0.0005	0.0001	0.00005	0.0001	0.00044	0.0001	0.00015
	Result Qualifier		U	U	U	U	U	U	U	U	U	J	U	U
Sodium	**Result (mg/L)**	-	4	4	4	3.9	4	3.7	6.9	7.4	2	4	2.7	4
	Result Qualifier		U	U	U		U				UJ	UJ	J	UJ
Strontium	**Result (mg/L)**	-	0.025	0.181	0.22	0.232	0.025	0.949	0.285	0.269	0.572	0.163	0.332	0.267
	Result Qualifier		U				U				J	J	J	J
Sulphate	**Result (mg/L)**	100	3110	1640	2320	2440	3780	1310	531	140	811	1560	1380	1610
	Result Qualifier										J	J	J	J
Sulphur	**Result (mg/L)**	-	1080	1040	990	788	1300	531	269	47.6	819	1500	872	1600
	Result Qualifier										J	J	J	J
Thallium	**Result (mg/L)**	0.0008	0.0076	0.0005	0.0005	0.00138	0.005	0.001	0.00047	0.0001	0.0002	0.0003	0.0002	0.00059
	Result Qualifier			U	U		U	U		U	UJ	UJ	UJ	J
Titanium	**Result (mg/L)**	0.1	0.02	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.0005	0.00134	0.00005	0.00548	0.0005	0.0001	0.00252	0.000576	0.00185	0.00294	0.00108	0.00003
	Result Qualifier		U		U		U	U			J	J	J	U
Vanadium	**Result (mg/L)**	-	0.05	0.005	0.005	0.005	0.05	0.01	0.002	0.001	0.002	0.003	0.002	0.003
	Result Qualifier		U	U	U	U	U	U	U	U	UJ	UJ	UJ	UJ
Zinc	**Result (mg/L)**	0.03	407	0.501	0.496	307	449	93.8	0.979	0.01	0.02	4.59	2.04	29.9
	Result Qualifier									U	U	J	J	J

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		**Other - VC, VD**	**Other - VC, VD**	**Other - VC, VD**	**Other - VC, VD**	**Other - VC, VD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**
	Sample ID		**CH13-311-BH001-SOA**	**CH13-311-BH001-SOB**	**CH13-311-BH002-SOB**	**CH13-311-BH003-SOA**	**CH13-311-BH003-SOB**	**CH12-014-MW011-SOA**	**CH12-014-MW011-SOB**	**CH12-014-MW011-SOC**	**CH12-014-MW011-SOD**	**CH12-014-MW911-SOD**	**CH12-014-MW011-SOE**	**CH12-014-MW011-SOF**
	Depth From (mbgs)		0.01	0.15	0.20	0	0.1005	6	11.5	15.1	21.2	21.2	26.1	29.8
	Depth From (mbgs)		0.11	1.46	0.66	3.7	0.1768	6.2	11.7	15.3	21.4	21.4	26.3	
	Sample Date	**Screening Level**	8/23/2013	8/23/2013	8/22/2013	8/22/2013	8/22/2013	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012
pH	**Result (pH units)**	6.5-9.0	7.02	6.25	6.3	7.77	6.75	8.08	8.23	7.86	8.1	8.41	7.95	8.13
	Result Qualifier													
Acidity	**Result (mg/L)**	-	2.9	6.4	6.7	2.8	2.4	1	1	1.5	1	1.2	1	1
	Result Qualifier							U	U		U		U	U
Total Alkalinity	**Result (mg/L)**	-	114	21.1	13.2	90.7	37.2	166	127	94.3	105	113	191	73.4
	Result Qualifier		J	J										
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT	NT	637	445	1020	755	785	674	281
	Result Qualifier													
ORP Leachable	**Result (mV)**	-	461	455	482	472	457	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier													
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.0287	32.4	24.2	0.005	1.15	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Result Qualifier				J	U	J	U	U	U	U	U	U	U
Antimony	**Result (mg/L)**	1.6	0.00032	0.00074	0.00121	0.00017	0.00067	0.00074	0.00076	0.0011	0.00229	0.00314	0.0104	0.00744
	Result Qualifier													
Arsenic	**Result (mg/L)**	0.005	0.001	0.0271	0.0579	0.001	0.0091	0.001	0.001	0.001	0.0034	0.0045	0.0145	0.0057
	Result Qualifier		U		J	UJ	J	U	U	U				
Barium	**Result (mg/L)**	2.3	0.0995	0.218	0.388	0.106	0.121	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier							U	U	U	U	U	U	U
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.00108	0.00114	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U			U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.024	0.038	0.034	0.013	0.014	0.014	0.012	0.014	0.02	0.022	0.018	0.02
	Result Qualifier													
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	0.05	0.05	0.5	0.5	0.5	0.5	0.05
	Result Qualifier							U	U	U	U	U	U	U
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.000402	0.000269	0.00005	0.000123	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U			U		U	U	U	U	U	U	U
Calcium	**Result (mg/L)**	-	36.6	1.27	4.22	26.4	9.87	48.5	38.1	150	72.7	75.9	80.8	38
	Result Qualifier													
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	0.5	0.5	5	5	5	5	0.5
	Result Qualifier							U	U	U	U	U	U	U
Chromium	**Result (mg/L)**	0.0089	0.0005	0.03	0.0359	0.0005	0.00336	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U		J	UJ	J	U	U	U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.00034	0.019	0.0357	0.0001	0.00394	0.0001	0.0001	0.0001	0.0001	0.0001	0.00108	0.0001
	Result Qualifier					U		U	U	U	U	U		U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.0027	0.0274	0.0455	0.001	0.0167	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier				J	UJ	J	U	U	U	U	U	U	U
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	0.61	0.768	0.56	0.61	0.54	0.33	0.791
	Result Qualifier													
Iron	**Result (mg/L)**	0.3	0.06	31.3	48.4	0.03	6.61	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier					U		U	U	U	U	U	U	U
Lead	**Result (mg/L)**	0.001	0.00012	0.0256	0.034	0.0001	0.00666	0.0001	0.0001	0.0001	0.0001	0.0001	0.0148	0.0001
	Result Qualifier					U		U	U	U	U	U	U	U
Lithium	**Result (mg/L)**	-	0.005	0.0127	0.0153	0.0078	0.005	0.0271	0.0105	0.017	0.0147	0.0162	0.021	0.0064
	Result Qualifier		U				U							
Magnesium	**Result (mg/L)**	-	6.05	2.64	3.49	2.69	2.31	52.8	29.7	60.3	49.3	51	41.6	8.46

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit			**Other - VC, VD**	**Other - VC, VD**	**Other - VC, VD**	**Other - VC, VD**	**Other - VC, VD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**
Sample ID			**CH13-311-BH001-SOA**	**CH13-311-BH001-SOB**	**CH13-311-BH002-SOB**	**CH13-311-BH003-SOA**	**CH13-311-BH003-SOB**	**CH12-014-MW011-SOA**	**CH12-014-MW011-SOB**	**CH12-014-MW011-SOC**	**CH12-014-MW011-SOD**	**CH12-014-MW911-SOD**	**CH12-014-MW011-SOE**	**CH12-014-MW011-SOF**
Depth From (mbgs)			0.01	0.15	0.20	0	0.1005	6	11.5	15.1	21.2	21.2	26.1	29.8
Depth From (mbgs)			0.11	1.46	0.66	3.7	0.1768	6.2	11.7	15.3	21.4	21.4	26.3	
Sample Date		**Screening Level**	8/23/2013	8/23/2013	8/22/2013	8/22/2013	8/22/2013	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012
Magnesium	**Result Qualifier**													

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		Other - VC, VD	Other - VC, VD	Other - VC, VD	Other - VC, VD	Other - VC, VD	Grum WRD	Grum WRD	Grum WRD	Grum WRD	Grum WRD	Grum WRD	Grum WRD
	Sample ID		CH13-311-BH001-SOA	CH13-311-BH001-SOB	CH13-311-BH002-SOB	CH13-311-BH003-SOA	CH13-311-BH003-SOB	CH12-014-MW011-SOA	CH12-014-MW011-SOB	CH12-014-MW011-SOC	CH12-014-MW011-SOD	CH12-014-MW911-SOD	CH12-014-MW011-SOE	CH12-014-MW011-SOF
	Depth From (mbgs)		0.01	0.15	0.20	0	0.1005	6	11.5	15.1	21.2	21.2	26.1	29.8
	Depth From (mbgs)		0.11	1.46	0.66	3.7	0.1768	6.2	11.7	15.3	21.4	21.4	26.3	
	Sample Date	Screening Level	8/23/2013	8/23/2013	8/22/2013	8/22/2013	8/22/2013	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012
Manganese	Result (mg/L)	-	0.00517	0.555	0.961	0.00055	0.167	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier							U	U	U	U	U	U	U
Mercury	Result (mg/L)	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Molybdenum	Result (mg/L)	0.073	0.00322	0.00123	0.00512	0.00486	0.00064	0.0231	0.0254	0.048	0.0299	0.0353	0.0108	0.0453
	Result Qualifier													
Nickel	Result (mg/L)	0.025	0.00132	0.0301	0.0491	0.0005	0.0115	0.0005	0.0005	0.0005	0.0005	0.0005	0.0181	0.0005
	Result Qualifier					U		U	U	U	U	U		U
Nitrate	Result (mg/L)	13	NT	NT	NT	NT	NT	0.0101	0.0092	0.05	0.119	0.13	0.05	0.0141
	Result Qualifier									U			U	
Nitrite	Result (mg/L)	0.06	NT	NT	NT	NT	NT	0.009	0.0028	0.01	0.01	0.013	0.01	0.0036
	Result Qualifier									U	U		U	
Potassium	Result (mg/L)	-	8.1	11.7	7.3	3.2	2	26.6	22.6	31.6	34.1	35.5	18	12.9
	Result Qualifier						U							
Selenium	Result (mg/L)	0.001	0.0005	0.00054	0.0005	0.0005	0.0005	0.0005	0.00139	0.00644	0.00386	0.0028	0.00068	0.00203
	Result Qualifier		U		U	U	U	U						
Silicon	Result (mg/L)	-	6.79	44.7	54.8	6.38	9.68	2.67	2.46	3.05	2.75	3.13	4.46	6.97
	Result Qualifier													
Silver	Result (mg/L)	0.0001	0.00005	0.000175	0.000261	0.00005	0.00005	0.00005	0.00005	0.00005	0.00007	0.000076	0.00005	0.00005
	Result Qualifier		U			U	U	U	U	U			U	U
Sodium	Result (mg/L)	-	5.2	6.9	10.7	2.4	2	4.6	4	5.8	10.2	10.9	11.5	2.8
	Result Qualifier						U							
Strontium	Result (mg/L)	-	0.119	0.0241	0.0437	0.0878	0.054	0.193	0.175	0.313	0.224	0.235	0.364	0.121
	Result Qualifier													
Sulphate	Result (mg/L)	100	20.6	8.2	16.9	0.5	2.52	192	115	557	313	313	214	72
	Result Qualifier					U								
Sulphur	Result (mg/L)	-	6.85	1.24	5.17	0.5	0.72	64.5	38.2	182	132	132	70	24
	Result Qualifier					U								
Thallium	Result (mg/L)	0.0008	0.0001	0.00019	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00016	0.0001
	Result Qualifier		U			U	U	U	U	U	U	U		U
Titanium	Result (mg/L)	0.1	0.01	0.725	1.49	0.01	0.119	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		U			U		U	U	U	U	U	U	U
Uranium	Result (mg/L)	0.015	0.000436	0.00109	0.00212	0.00116	0.000404	0.00467	0.00389	0.0148	0.008	0.00843	0.00562	0.00446
	Result Qualifier													
Vanadium	Result (mg/L)	-	0.001	0.0401	0.0863	0.001	0.0079	0.001	0.001	0.001	0.001	0.001	0.001	0.006
	Result Qualifier		U		J	UJ	J	U	U	U	U	U	U	
Zinc	Result (mg/L)	0.03	0.01	0.053	0.122	0.01	0.022	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		U			U		U	U	U	U	U	U	U

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**
	Sample ID		**CH12-014-MW011-SOG**	**CH12-014-MW911-SOG**	**CH12-014-MW011-SOH**	**CH12-014-MW011-SOI**	**CH12-014-MW011-SOJ**	**CH12-014-MW012-SOA**	**CH12-014-MW012-SOB**	**CH12-014-MW012-SOD**	**CH12-014-MW012-SOE**	**CH12-014-MW012-SOF**	**CH12-014-MW912-SOF**	**CH12-014-MW012-SOG**
	Depth From (mbgs)				5	10	30	5.7	11.8	22.1	28.9	38.3	38.3	8
	Depth From (mbgs)				5	10	30	5.9	12	22.3	29.1	38.5	38.5	8
	Sample Date	**Screening Level**	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012
pH	**Result (pH units)**	6.5-9.0	7.99	7.97	8.17	8.14	8.12	8.1	8.17	8.14	8.36	8.24	8.08	7.94
	Result Qualifier		J	J	J	J	J							J
Acidity	**Result (mg/L)**	-	1.6	1.7	1	1	1	1	3	1	1	1	1	1.6
	Result Qualifier		J	J	R	R	R	U		U	U	U	U	J
Total Alkalinity	**Result (mg/L)**	-	215	201	183	191	138	152	65.3	75.6	69.5	109	138	125
	Result Qualifier		J	J	J	J	J							J
Specific Conductance	**Result (µS/cm)**	-	833	801	714	654	510	640	454	519	303	303	376	603
	Result Qualifier		J	J	J	J	J							J
ORP Leachable	**Result (mV)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier													
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Antimony	**Result (mg/L)**	1.6	0.00162	0.00207	0.0001	0.0001	0.0001	0.00164	0.00294	0.00121	0.00107	0.001	0.00119	0.00196
	Result Qualifier		J	J	U	U	U							J
Arsenic	**Result (mg/L)**	0.005	0.001	0.001	0.001	0.001	0.001	0.0093	0.005	0.001	0.0032	0.001	0.001	0.001
	Result Qualifier		U	U	U	UJ	U			U		U	U	U
Barium	**Result (mg/L)**	2.3	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Boron	**Result (mg/L)**	1.5	0.018	0.018	0.017	0.019	0.013	0.02	0.023	0.023	0.017	0.015	0.017	0.021
	Result Qualifier		J	J	J	J	J							J
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	0.25	0.05	0.05	0.05	0.05	0.05	NT
	Result Qualifier							U	U	U	U	U	U	
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Calcium	**Result (mg/L)**	-	51.4	50.3	43.5	44.1	41.8	59.3	59.6	70.5	41.1	32.5	39.9	68.2
	Result Qualifier		J	J	J	J	J							J
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	2.5	0.5	0.5	0.5	0.5	0.5	NT
	Result Qualifier							U	U	U	U	U	U	
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Cobalt	**Result (mg/L)**	-	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	0.58	0.657	0.601	0.489	0.356	0.322	NT
	Result Qualifier													
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Lead	**Result (mg/L)**	0.001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Lithium	**Result (mg/L)**	-	0.042	0.0436	0.0315	0.0283	0.005	0.0213	0.0079	0.0104	0.005	0.0065	0.0096	0.005
	Result Qualifier		J	J	J	J	U				U			U
Magnesium	**Result (mg/L)**	-	78.3	75	52.7	49.6	32.5	47.5	16.1	19	7.25	13.6	18.9	32.3

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit			**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**
Sample ID			**CH12-014-MW011-SOG**	**CH12-014-MW911-SOG**	**CH12-014-MW011-SOH**	**CH12-014-MW011-SOI**	**CH12-014-MW011-SOJ**	**CH12-014-MW012-SOA**	**CH12-014-MW012-SOB**	**CH12-014-MW012-SOD**	**CH12-014-MW012-SOE**	**CH12-014-MW012-SOF**	**CH12-014-MW912-SOF**	**CH12-014-MW012-SOG**
Depth From (mbgs)					5	10	30	5.7	11.8	22.1	28.9	38.3	38.3	8
Depth From (mbgs)					5	10	30	5.9	12	22.3	29.1	38.5	38.5	8
Sample Date		**Screening Level**	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012
Magnesium	**Result Qualifier**		J	J	J	J	J							J

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**	**Grum WRD**
	Sample ID		**CH12-014-MW011-SOG**	**CH12-014-MW911-SOG**	**CH12-014-MW011-SOH**	**CH12-014-MW011-SOI**	**CH12-014-MW011-SOJ**	**CH12-014-MW012-SOA**	**CH12-014-MW012-SOB**	**CH12-014-MW012-SOD**	**CH12-014-MW012-SOE**	**CH12-014-MW012-SOF**	**CH12-014-MW912-SOF**	**CH12-014-MW012-SOG**
	Depth From (mbgs)				5	10	30	5.7	11.8	22.1	28.9	38.3	38.3	8
	Depth From (mbgs)				5	10	30	5.9	12	22.3	29.1	38.5	38.5	8
	Sample Date	**Screening Level**	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/3/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012	8/4/2012
Manganese	**Result (mg/L)**	-	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U	U	U	U	U	U	U	U	U
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		R	R	R	R	R	U	U	U	U	U	U	R
Molybdenum	**Result (mg/L)**	0.073	0.0153	0.015	0.0253	0.0166	0.0297	0.0142	0.0157	0.0141	0.0204	0.00406	0.00406	0.019
	Result Qualifier		J	J	J	J	J							J
Nickel	**Result (mg/L)**	0.025	0.0005	0.0005	0.0005	0.0005	0.0005	0.00471	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	UJ	U	UJ		U	U	U	U	U	U
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	0.025	0.0169	0.009	0.0132	0.0079	0.0058	NT
	Result Qualifier							U						
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	0.0052	0.0381	0.001	0.0016		0.001	NT
	Result Qualifier									U			U	
Potassium	**Result (mg/L)**	-	24.3	24	28.1	30.4	25.5	16.6	12.2	14.8	13.5	20	19.4	15.2
	Result Qualifier		J	J	J	J	J							J
Selenium	**Result (mg/L)**	0.001	0.00184	0.00166	0.00128	0.00148	0.00178	0.0005	0.00181	0.00074	0.0005	0.00061	0.00071	0.0021
	Result Qualifier		J	J	J	J	J	U			U			J
Silicon	**Result (mg/L)**	-	0.05	0.05	0.05	0.05	0.05	3.82	3.38	4.94	4.8	3.87	4.73	0.05
	Result Qualifier		U	U	U	U	U							U
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Sodium	**Result (mg/L)**	-	3.4	3.5	18.1	6.4	4	8.3	6.4	9	8.5	6.2	6.1	5.5
	Result Qualifier		J	J	J	J	J							J
Strontium	**Result (mg/L)**	-	0.227	0.222	0.192	0.176	0.166	0.28	0.268	0.231	0.121	0.243	0.341	0.358
	Result Qualifier		J	J	J	J	J							J
Sulphate	**Result (mg/L)**	100	244	240	191	164	131	212	174	197	83.9	55.4	66.7	188
	Result Qualifier		J	J	J	J	J							J
Sulphur	**Result (mg/L)**	-	84.4	83.4	67.7	55	44.4	68.8	68.5	65.2	28	18.5	22.9	65
	Result Qualifier		J	J	J	J	J							J
Thallium	**Result (mg/L)**	0.0008	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Uranium	**Result (mg/L)**	0.015	0.00568	0.00543	0.00711	0.00527	0.00533	0.00617	0.00735	0.00539	0.00206	0.000948	0.00136	0.00771
	Result Qualifier		J	J	J	J	J							J
Vanadium	**Result (mg/L)**	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier		UJ	UJ	UJ	UJ	UJ	U	U	U	U	U	U	UJ
Zinc	**Result (mg/L)**	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		UJ	U	UJ	UJ	UJ	U	U	U	U	U	U	UJ

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		Grum WRD	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Pit
	Sample ID		CH12-014-MW012-SOH	CH12-311-BH001-SOC	CH12-311-BH002-SOB	CH12-311-BH004-SOC	CH12-311-TP014-SOA	CH13-311-TP004-SOA	CH13-311-TP904-SOA	CH13-311-TP006-SOA	CH13-311-TP906-SOA	CH13-311-SS029-SOA
	Depth From (mbgs)		14	7.62	5.1	12.8	0					0
	Depth From (mbgs)		14	10.67	6.1	13.4	4.25					0.15
	Sample Date	Screening Level	8/4/2012	7/28/2012	7/29/2012	8/1/2012	8/7/2012	8/14/2013	8/14/2013	8/13/2013	8/13/2013	7/15/2013
pH	**Result (pH units)**	6.5-9.0	8.06	7.85	8.2	8.3	7.88	7.68	7.59	8.18	8.15	8.03
	Result Qualifier		J									
Acidity	**Result (mg/L)**	-	1	3.6	1	1.4	3.8	6.4	6.5	11.7	6.2	8.7
	Result Qualifier		R		U							
Total Alkalinity	**Result (mg/L)**	-	162	141	133	77.1	88.8	155	207	67.3	82.4	60
	Result Qualifier		J									
Specific Conductance	**Result (µS/cm)**	-	556	544	301	240	858	NT	NT	NT	NT	NT
	Result Qualifier		J									
ORP Leachable	**Result (mV)**	-	NT	NT	NT	NT	NT	277	294	339	330	386
	Result Qualifier											
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.005	0.005	0.005	0.005	0.0208	0.0097	0.0083	0.0211	0.0244	0.0237
	Result Qualifier		U	U	U	U						
Antimony	**Result (mg/L)**	1.6	0.0001	0.0113	0.00558	0.0141	0.00255	0.00977	0.00174	0.00268	0.00223	0.00235
	Result Qualifier		U					J	J			
Arsenic	**Result (mg/L)**	0.005	0.001	0.0012	0.0064	0.001	0.002	0.0034	0.0012	0.0013	0.0015	0.0011
	Result Qualifier		U			U						
Barium	**Result (mg/L)**	2.3	0.001	0.14	0.001	0.001	0.0466	0.0667	0.0398	0.0861	0.103	0.069
	Result Qualifier		U		U	U		J	J			
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		UJ	U	U	U	U	U	U	U	U	U
Boron	**Result (mg/L)**	1.5	0.02	0.031	0.023	0.029	0.024	0.016	0.016	0.014	0.015	0.017
	Result Qualifier		J									
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier											
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.00005	0.00005	0.00005	0.00005	0.000645	0.000257	0.000062	0.00005	0.000122
	Result Qualifier		UJ	U	U	U	U	J	J		U	
Calcium	**Result (mg/L)**	-	50.1	68.1	26	0.05	137	79.9	78.4	64.1	55.1	71.8
	Result Qualifier		J			U						
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier											
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		UJ	U	U	U	U	U	U	U	U	U
Cobalt	**Result (mg/L)**	-	0.0001	0.0001	0.0001	0.0001	0.00084	0.00158	0.00087	0.00015	0.00011	0.0001
	Result Qualifier		UJ	U	U	U		J	J			U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.001	0.001	0.001	0.001	0.001	0.0014	0.001	0.0013	0.0012	0.0132
	Result Qualifier		UJ	U	U	U	U		U			
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier											
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
	Result Qualifier		UJ	U	U	U	U	U	U	U	U	U
Lead	**Result (mg/L)**	0.001	0.0001	0.0001	0.0001	0.0001	0.00077	0.0699	0.00355	0.0001	0.0001	0.00023
	Result Qualifier		U	U	U	U		J	J	U	U	
Lithium	**Result (mg/L)**	-	0.0188	0.0228	0.0216	0.005	0.0168	0.032	0.0347	0.005	0.005	0.005
	Result Qualifier		J			U				U	U	U
Magnesium	**Result (mg/L)**	-	37.4	15.2	16	0.1	32.7	30.4	61.6	9.84	9.12	11

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		Grum WRD	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Pit
	Sample ID		CH12-014-MW012-SOH	CH12-311-BH001-SOC	CH12-311-BH002-SOB	CH12-311-BH004-SOC	CH12-311-TP014-SOA	CH13-311-TP004-SOA	CH13-311-TP904-SOA	CH13-311-TP006-SOA	CH13-311-TP906-SOA	CH13-311-SS029-SOA
	Depth From (mbgs)		14	7.62	5.1	12.8	0					0
	Depth From (mbgs)		14	10.67	6.1	13.4	4.25					0.15
	Sample Date	Screening Level	8/4/2012	7/28/2012	7/29/2012	8/1/2012	8/7/2012	8/14/2013	8/14/2013	8/13/2013	8/13/2013	7/15/2013
Magnesium	Result Qualifier		J			U		J	J			

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		Grum WRD	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Overburden Dump	Grum Pit
	Sample ID		CH12-014-MW012-SOH	CH12-311-BH001-SOC	CH12-311-BH002-SOB	CH12-311-BH004-SOC	CH12-311-TP014-SOA	CH13-311-TP004-SOA	CH13-311-TP904-SOA	CH13-311-TP006-SOA	CH13-311-TP906-SOA	CH13-311-SS029-SOA
	Depth From (mbgs)		14	7.62	5.1	12.8	0					0
	Depth From (mbgs)		14	10.67	6.1	13.4	4.25					0.15
	Sample Date	Screening Level	8/4/2012	7/28/2012	7/29/2012	8/1/2012	8/7/2012	8/14/2013	8/14/2013	8/13/2013	8/13/2013	7/15/2013
Manganese	**Result (mg/L)**	-	0.0005	0.196	0.0005	0.0005	0.079	0.226	0.0856	0.0633	0.0453	0.0355
	Result Qualifier		U		U	U		J	J			
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		R	R	R	R	R	U	U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.0115	0.0001	0.0001	0.0001	0.0185	0.00428	0.00275	0.0211	0.0197	0.0405
	Result Qualifier		J	U	U	U						
Nickel	**Result (mg/L)**	0.025	0.0005	0.0005	0.0005	0.0005	0.00241	0.00437	0.00459	0.00117	0.00101	0.00086
	Result Qualifier		U	U	U	U						
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier											
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
	Result Qualifier											
Potassium	**Result (mg/L)**	-	18.8	23.3	27.4	18.6	28.1	15	24.2	9.3	9.1	9.9
	Result Qualifier		J									
Selenium	**Result (mg/L)**	0.001	0.00174	0.00237	0.0005	0.00262	0.00116	0.00148	0.00052	0.00217	0.00156	0.00131
	Result Qualifier		J		U							
Silicon	**Result (mg/L)**	-	0.05	4.71	2.62	0.05	4.02	4.01	3.44	3.07	3.07	2.62
	Result Qualifier		U			U						
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		UJ	U	U	U	U	U	U	U	U	U
Sodium	**Result (mg/L)**	-	5.2	16	3	11.9	5.6	6.2	3.5	6.8	7.8	9.9
	Result Qualifier		J									
Strontium	**Result (mg/L)**	-	0.274	0.331	0.142	0.0005	0.45	0.421	0.243	0.303	0.282	0.304
	Result Qualifier		J			U		J	J			
Sulphate	**Result (mg/L)**	100	134	142	27.5	35.9	366	191	271	142	111	192
	Result Qualifier		J					J	J			
Sulphur	**Result (mg/L)**	-	46.3	47.5	14.1	0.5	133	64.1	90.8	48.3	38.1	62
	Result Qualifier		J			U						
Thallium	**Result (mg/L)**	0.0008	0.0001	0.00016	0.00014	0.0001	0.00018	0.00024	0.00032	0.0001	0.0001	0.0001
	Result Qualifier		UJ			U				U	U	U
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Result Qualifier		UJ	U	U	U	U	U	U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.00771	0.00804	0.000749	0.00001	0.00754	0.0175	0.00614	0.0323	0.0214	0.00839
	Result Qualifier		J			U		J	J			
Vanadium	**Result (mg/L)**	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	Result Qualifier		UJ	U	U	U	U	U	U	U	U	U
Zinc	**Result (mg/L)**	0.03	0.01	0.01	0.01	0.01	0.01	0.034	0.017	0.01	0.01	0.01
	Result Qualifier		UJ	U	U	U	U			U	U	U

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		**Grum Pit**	**Grum Pit**	**Grum Pit**	**Grum Pit**
	Sample ID		**CH13-311-SS032-SOA**	**CH13-311-SS033-SOA**	**CH13-311-SS036-SOA**	**CH13-311-SS037-SOA**
	Depth From (mbgs)		0		0	
	Depth From (mbgs)		0.15		0.15	
	Sample Date	**Screening Level**	7/15/2013	7/15/2013	7/15/2013	7/15/2013
pH	**Result (pH units)**	6.5-9.0	8.21	8.21	8.17	8.27
	Result Qualifier					
Acidity	**Result (mg/L)**	-	3.8	2.9	2.5	2.3
	Result Qualifier					
Total Alkalinity	**Result (mg/L)**	-	53.5	45.1	66.8	59.4
	Result Qualifier					
Specific Conductance	**Result (µS/cm)**	-	NT	NT	NT	NT
	Result Qualifier					
ORP Leachable	**Result (mV)**	-	395	380	395	394
	Result Qualifier					
Aluminum	**Result (mg/L)**	0.005 to 0.1[b]	0.0335	0.0504	0.0165	0.0268
	Result Qualifier					
Antimony	**Result (mg/L)**	1.6	0.00237	0.0012	0.00253	0.00299
	Result Qualifier					
Arsenic	**Result (mg/L)**	0.005	0.0027	0.0021	0.0012	0.0017
	Result Qualifier					
Barium	**Result (mg/L)**	2.3	0.0704	0.0761	0.12	0.105
	Result Qualifier					
Beryllium	**Result (mg/L)**	0.0053	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U
Boron	**Result (mg/L)**	1.5	0.017	0.011	0.021	0.015
	Result Qualifier					
Bromide	**Result (mg/L)**	-	NT	NT	NT	NT
	Result Qualifier					
Cadmium	**Result (mg/L)**	Variable[c]	0.00005	0.00005	0.00005	0.000061
	Result Qualifier		U	U	U	
Calcium	**Result (mg/L)**	-	63.1	50.9	42.7	38.4
	Result Qualifier					
Chloride	**Result (mg/L)**	120	NT	NT	NT	NT
	Result Qualifier					
Chromium	**Result (mg/L)**	0.0089	0.0005	0.0005	0.0005	0.0005
	Result Qualifier		U	U	U	U
Cobalt	**Result (mg/L)**	-	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U
Copper	**Result (mg/L)**	0.002 to 0.004[d]	0.0013	0.001	0.0013	0.0016
	Result Qualifier					
Fluoride	**Result (mg/L)**	0.12	NT	NT	NT	NT
	Result Qualifier					
Iron	**Result (mg/L)**	0.3	0.03	0.03	0.03	0.03
	Result Qualifier		U	U	U	U
Lead	**Result (mg/L)**	0.001	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U
Lithium	**Result (mg/L)**	-	0.005	0.005	0.0062	0.005
	Result Qualifier		U	U		U
Magnesium	**Result (mg/L)**	-	9.36	6.85	7.5	5.26

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Remediation Unit			**Grum Pit**	**Grum Pit**	**Grum Pit**	**Grum Pit**
Sample ID			**CH13-311-SS032-SOA**	**CH13-311-SS033-SOA**	**CH13-311-SS036-SOA**	**CH13-311-SS037-SOA**
Depth From (mbgs)			0		0	
Depth From (mbgs)			0.15		0.15	
Sample Date		**Screening Level**	7/15/2013	7/15/2013	7/15/2013	7/15/2013
Magnesium	**Result Qualifier**					

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

	Remediation Unit		**Grum Pit**	**Grum Pit**	**Grum Pit**	**Grum Pit**
	Sample ID		**CH13-311-SS032-SOA**	**CH13-311-SS033-SOA**	**CH13-311-SS036-SOA**	**CH13-311-SS037-SOA**
	Depth From (mbgs)		0		0	
	Depth From (mbgs)		0.15		0.15	
	Sample Date	**Screening Level**	7/15/2013	7/15/2013	7/15/2013	7/15/2013
Manganese	**Result (mg/L)**	-	0.00864	0.017	0.00487	0.0015
	Result Qualifier					
Mercury	**Result (mg/L)**	0.000026	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U
Molybdenum	**Result (mg/L)**	0.073	0.0179	0.00698	0.0214	0.0659
	Result Qualifier					
Nickel	**Result (mg/L)**	0.025	0.00096	0.00056	0.00072	0.0005
	Result Qualifier					U
Nitrate	**Result (mg/L)**	13	NT	NT	NT	NT
	Result Qualifier					
Nitrite	**Result (mg/L)**	0.06	NT	NT	NT	NT
	Result Qualifier					
Potassium	**Result (mg/L)**	-	7.9	10.2	6.9	5.2
	Result Qualifier					
Selenium	**Result (mg/L)**	0.001	0.0016	0.00434	0.00261	0.00371
	Result Qualifier					
Silicon	**Result (mg/L)**	-	3.72	4.26	2.98	2.54
	Result Qualifier					
Silver	**Result (mg/L)**	0.0001	0.00005	0.00005	0.00005	0.00005
	Result Qualifier		U	U	U	U
Sodium	**Result (mg/L)**	-	5.7	4.5	3.6	5.1
	Result Qualifier					
Strontium	**Result (mg/L)**	-	0.257	0.248	0.23	0.229
	Result Qualifier					
Sulphate	**Result (mg/L)**	100	146	122	80.8	69
	Result Qualifier					
Sulphur	**Result (mg/L)**	-	51.2	40.1	25.6	22.6
	Result Qualifier					
Thallium	**Result (mg/L)**	0.0008	0.0001	0.0001	0.0001	0.0001
	Result Qualifier		U	U	U	U
Titanium	**Result (mg/L)**	0.1	0.01	0.01	0.01	0.01
	Result Qualifier		U	U	U	U
Uranium	**Result (mg/L)**	0.015	0.0105	0.00353	0.00951	0.00669
	Result Qualifier					
Vanadium	**Result (mg/L)**	-	0.0017	0.0017	0.001	0.0012
	Result Qualifier				U	
Zinc	**Result (mg/L)**	0.03	0.01	0.01	0.01	0.01
	Result Qualifier		U	U	U	U

Table 10-3. De-ionized Water Leach Test Results (2012-2015):
Faro Mine Complex
Faro Mine Remediation Project

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$ / 1000 mg/L

[d] CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f] CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FIGQG

Detection limit exceeds FIGQG

> = greater
≥ = greater than or equal to
< = less than
≤ = less than or equal to
°C = degrees Celsius
µg/L = micrograms per litre
µS/cm = micro-Siemens per centimetre
CCME = Canadian Council of Ministers of the Environment
CWQG = Canadian Water Quality Guidelines
FIGQG =
J - analyte was present but the reported value may not be accurate or precise
mbgs = metre below ground surface
mg/L = milligrams per litre
mV = millivolt
NTU = Nephelometric Tubidity Unit
ORP = Oxidation-reduction Potential
R = result has been rejected for use
U = analyte was analyzed for but not detected at the specified detection limit
UJ = analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Table 10-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW011															CH12-014-MW012													
Sample ID	CH12-014-MW011_SOE															CH12-014-MW012_SOA													
Sample Interval (mbgs)	26.1 - 26.3															5.7 - 5.9													
Sample Date	8/3/2012															8/4/2012													
General Location	GRUM SULPHIDE CELL															GRUM SULPHIDE CELL													
Geologic Unit	ALLUVIUM															WASTE ROCK													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	**57**		**277**		50	U	**112**		**14800**		**15396**	**16800**		100	U	50	U	**375**		50	U	**223**		**14100**		**14898**	**14600**	
Antimony	0.2	U	0.1	U	**0.16**		0.1	U	0.1	U	**0.17**		**0.830**	**0.96**		0.2	U	0.1	U	**0.27**		0.1	U	0.1	U	**0.24**		**1.01**	**0.52**	
Arsenic	0.1	U	**0.176**		**3.55**		**0.209**		0.5	U	**10.7**		**15.2**	**22.8**		0.1	U	**0.320**		**21.8**		**0.885**		**1.8**		**20**		**44.9**	**35.5**	
Barium	**20.8**		**30.5**		**4.8**		**8.8**		**4.5**		**55.1**		**125**	**216**		**24.7**		**40**		**6.4**		**11.9**		**7.5**		**80**		**171**	**180**	
Beryllium	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.40	**0.43**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.27**		1.47	**0.48**	
Bismuth	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.40	**0.21**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.40	0.2	U
Cadmium	0.1	U	**0.073**		0.05	U	0.05	U	0.05	U	**0.175**		**0.50**	**0.484**		0.1	U	**0.087**		0.05	U	0.05	U	0.05	U	**0.066**		**0.403**	**0.181**	
Calcium	**770**		**17600**		50	U	**252**		NT		**8570**		**27242**	18900	U	**970**		**6850**		50	U	**286**		NT		**12800**		**20956**	25300	U
Chromium	10	U	5	U	5	U	5	U	5	U	**29.9**		**59.9**	**35.7**		10	U	5	U	5	U	5	U	5	U	**123**		**153**	**115**	
Cobalt	0.2	U	**1.48**		**1.01**		0.1	U	**0.34**		**9.31**		**12.4**	**15.5**		0.2	U	**4.27**		**3.86**		0.1	U	**0.97**		**0.33**		**9.73**	**17.9**	
Copper	1	U	**1.01**		**2.71**		0.5	U	0.5	U	**16.4**		**22.1**	**31.4**		1	U	**1.64**		**7.24**		**0.75**		0.5	U	**10.8**		**21.9**	**20.6**	
Iron	100	U	**538**		**3150**		**61**		**654**		**26500**		**31003**	**33900**		100	U	**423**		**5230**		**76**		**1490**		**26900**		**34219**	**35900**	
Lead	1	U	**7.52**		**0.78**		**5.72**		0.5	U	**10.1**		**25.6**	**53.4**		1	U	**2.37**		0.5	U	**2.23**		0.5	U	**3.71**		**10.3**	10.4	U
Lithium	10	U	5	U	5	U	5	U	5	U	**29.1**		**59.1**	**31**		10	U	5	U	5	U	5	U	5	U	**23.4**		**53.4**	**26.5**	
Manganese	10	U	**186**		**36.7**		**5.6**		**10.6**		**233**		**482**	**487**		10	U	**103**		**42.9**		**6.4**		**14.3**		**321**		**498**	**530**	
Molybdenum	1	U	0.5	U	**0.53**		0.5	U	0.5	U	**0.97**		**4.00**	**1.69**		1	U	0.5	U	**0.56**		0.5	U	0.5	U	**0.64**		**3.70**	**1.47**	
Nickel	4	U	**2.2**		**3.6**		2	U	2	U	**24.8**		**38.6**	**41.7**		4	U	**8.7**		**28.2**		2	U	**6.2**		**67.2**		**116**	**106**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**603**		NT		NT		NT		NT		NT		NT		NT	**1010**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**1210**		200	U	NT		NT		NT		NT		NT		200	**1080**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.3**		**1.80**	**0.27**		0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.70	**0.32**	
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.700	**0.23**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.700	**0.11**	
Sodium	200	U	NT		NT		NT		NT		NT		200	**110**		200	U	NT		NT		NT		NT		NT		200	**140**	
Strontium	10	U	**57.5**		5	U	**6.2**		5	U	**26.7**		**110**	**72.3**		10	U	**20.2**		5	U	**7.3**		5	U	**44.7**		**92.2**	**89.9**	
Thallium	0.1	U	0.05	U	0.05	U	0.05	U	2	U	**0.145**		**2.40**	**0.145**		0.1	U	0.05	U	0.05	U	0.05	U	2	U	**0.172**		**2.42**	**0.111**	
Tin	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U
Titanium	10	U	5	U	5	U	5	U	5	U	**249**		**279**	**196**		10	U	5	U	**6.5**		5	U	5	U	**211**		**243**	**201**	
Uranium	0.1	U	**0.157**		**0.168**		0.05	U	0.05	U	**0.656**		**1.18**	**1.36**		0.1	U	**0.278**		**0.42**		0.05	U	**0.054**		**0.653**		**1.56**	**1.51**	
Vanadium	0.4	U	0.2	U	**1.57**		0.2	U	**0.31**		**22.9**		**25.6**	**33.9**		0.4	U	0.2	U	**3.65**		0.2	U	**0.71**		**30.3**		**35.5**	**37.6**	
Zinc	2	U	**4.3**		**11.2**		1	U	50	U	**70.5**		**139**	**131**		2	U	**3.7**		**16.2**		1	U	50	U	**47.9**		**121**	**71.6**	

Table 10-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW012														CH12-014-MW012													
Sample ID	CH12-014-MW012_SOD														CH12-014-MW012_SOE													
Sample Interval (mbgs)	22.1 - 22.3														28.9 - 29.1													
Sample Date	8/4/2012														8/4/2012													
General Location	GRUM SULPHIDE CELL														GRUM SULPHIDE CELL													
Geologic Unit	ALLUVIUM														ALLUVIUM													
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	50	U	**626**		**70**		**310**		**15100**		**16256**	**14700**		100	U	**71**		**512**		**132**		**320**		**14600**		**15735**	**9190**	
Antimony	0.2	U	0.1	U	**0.22**		0.1	U	0.1	U	**0.22**		**0.940**	**0.6**		0.2	U	0.1	U	**0.13**		0.1	U	**0.14**		**0.42**		**1.09**	**0.71**	
Arsenic	0.1	U	**0.125**		**6.18**		**0.584**		**1.99**		**53.4**		**62.4**	**13**		0.1	U	**0.113**		**5.59**		**1.5**		**6.18**		**7.32**		**20.8**	**14.1**	
Barium	**39.3**		**49**		**8.9**		**10.8**		**9.8**		**101**		**219**	**216**		**47.0**		**44**		**11.6**		**12.1**		**22.3**		**146**		**283**	**131**	
Beryllium	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.28**		**1.48**	**0.49**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.27**		**1.47**	**0.3**	
Bismuth	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.40	**0.23**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.40	**0.82**	
Cadmium	0.1	U	**0.161**		0.05	U	0.05	U	0.05	U	**0.127**		**0.538**	**0.361**		0.1	U	**0.149**		0.05	U	**0.071**		0.05	U	**0.182**		**0.602**	**0.281**	
Calcium	**1330**		**7760**		50	U	**274**		NT		**2500**		**11914**	15300	U	**1330**		**3310**		50	U	**719**		NT		**1890**		**7299**	8170	U
Chromium	10	U	5	U	5	U	5	U	5	U	**41.3**		**71.3**	**41.8**		10	U	5	U	5	U	5	U	5	U	**49.3**		**79.3**	**32**	
Cobalt	0.2	U	**1.34**		**2.37**		0.1	U	**1.18**		**6.66**		**11.9**	**12**		0.2	U	**0.76**		**3.21**		0.1	U	**1.61**		**6.42**		**12.3**	**8.1**	
Copper	1	U	**2**		**9.83**		0.5	U	0.5	U	**10.1**		**23.9**	**25.4**		1	U	**0.66**		**3.9**		**1.1**		**0.54**		**20.6**		**27.8**	**20**	
Iron	100	U	**126**		**3040**		**73**		**2650**		**20600**		**26589**	**26000**		100	U	**59**		**1620**		**341**		**5080**		**19500**		**26700**	**19100**	
Lead	1	U	**3.16**		**1.45**		**1.87**		**0.64**		**6.42**		**14.5**	**16.5**		1	U	**17.9**		**15.5**		**17.7**		**2.74**		**40.5**		**95.3**	**57.7**	
Lithium	10	U	5	U	5	U	5	U	5	U	**28.9**		**58.9**	**26.4**		10	U	5	U	5	U	5	U	5	U	**25.7**		**55.7**	**19.3**	
Manganese	10	U	**121**		**44.4**		5	U	**18.5**		**219**		**418**	**430**		10	U	**67**		**148**		**9.2**		**26.7**		**189**		**450**	**298**	
Molybdenum	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.50	**1.07**		1	U	0.5	U	0.5	U	0.5	U	**0.62**		0.5	U	**3.62**	**0.96**	
Nickel	4	U	**2.1**		**6.7**		2	U	**4**		**24**		**42.8**	**38.1**		4	U	2	U	**3.4**		2	U	**7**		**33.1**		**51.5**	**30.4**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**559**		NT		NT		NT		NT		NT		NT		NT	**356**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**1630**		200	U	NT		NT		NT		NT		NT		200	**840**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**0.23**		**1.73**	**0.41**		0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.70	0.2	U
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.11**		**0.710**	**0.15**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.22**		**0.820**	**0.18**	
Sodium	200	U	NT		NT		NT		NT		NT		200	**190**		200	U	NT		NT		NT		NT		NT		200	100	U
Strontium	10	U	**24.6**		5	U	5	U	5	U	**16**		**65.6**	**54.9**		10	U	**10.4**		5	U	5	U	5	U	**12.8**		**48.2**	**31.5**	
Thallium	0.1	U	0.05	U	0.05	U	0.05	U	2	U	**0.193**		**2.44**	**0.124**		0.1	U	0.05	U	0.05	U	0.05	U	2	U	**0.188**		**2.44**	**0.109**	
Tin	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U
Titanium	10	U	5	U	**9.2**		**5.2**		**5.3**		**357**		**392**	**346**		10	U	5	U	**8.8**		5	U	**5.6**		**344**		**378**	**208**	
Uranium	0.1	U	**0.229**		**0.199**		0.05	U	**0.086**		**0.675**		**1.34**	**1.21**		0.1	U	**0.144**		**0.129**		0.05	U	**0.167**		**0.421**		**1.01**	**0.788**	
Vanadium	0.4	U	0.2	U	**3.23**		**0.29**		**1.57**		**30.9**		**36.6**	**36.2**		0.4	U	0.2	U	**1.79**		**0.42**		**3**		**26.9**		**32.7**	**22.8**	
Zinc	2	U	**2.4**		**12.9**		1	U	50	U	**58.6**		**127**	**76.2**		2	U	**2.7**		**10.2**		**3.2**		50	U	**89.8**		**158**	**90.3**	

Table 10-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW012															CH12-014-MW012														
Sample ID	CH12-014-MW012_SOF															CH12-014-MW912_SOF														
Sample Interval (mbgs)	38.3 - 38.5															38.3 - 38.5														
Sample Date	8/4/2012															8/4/2012														
General Location	GRUM SULPHIDE CELL															GRUM SULPHIDE CELL														
Geologic Unit	BEDROCK															BEDROCK														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	50	U	**268**		50	U	**91**		**13500**		**14059**	**17800**		100	U	50	U	**239**		50	U	**92**		**14200**		**14731**	**16500**	
Antimony	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.700	**0.76**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**0.12**		**0.720**	**0.66**	
Arsenic	0.1	U	**0.092**		**2.15**		**0.183**		**1.02**		**1.84**		**5.39**	**12.4**		0.1	U	**0.101**		**2**		**0.223**		**0.79**		**1.76**		**4.97**	**13.5**	
Barium	**17.1**		**15**		**2.5**		**9.2**		**4.2**		**50.6**	**J**	**98.6**	**169**		**17**		**14**		**3.7**		**12**		**4.5**		**86**	**J**	**137**	**163**	
Beryllium	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.22**		**1.42**	**0.46**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.3**		**1.50**	**0.48**	
Bismuth	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.40	0.2	U	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	1.40	0.2	U
Cadmium	0.1	U	**0.056**		0.05	U	0.05	U	0.05	U	0.05	U	**0.356**	**0.355**		0.1	U	**0.055**		0.05	U	0.05	U	0.05	U	**0.078**		**0.383**	**0.238**	
Calcium	**830**		**36600**		50	U	**243**		NT		**35800**		**73523**	41400	U	**760**		**37400**		50	U	**239**		NT		**39100**		**77549**	39800	U
Chromium	10	U	5	U	5	U	5	U	5	U	**21.9**		**51.9**	**65.1**		10	U	5	U	5	U	5	U	5	U	**57.4**	**J**	**87.4**	**50**	
Cobalt	0.2	U	**0.36**		**1.5**		0.1	U	**0.67**		**7.66**		**10.5**	**13.9**		0.2	U	**0.38**		**1.36**		0.1	U	**0.63**		**9.58**		**12.3**	**14.6**	
Copper	1	U	**0.74**		**2.65**		0.5	U	0.5	U	**8.06**		**13.5**	**26.8**		1	U	**0.92**		**2.86**		0.5	U	0.5	U	**11.7**		**17.5**	**24.3**	
Iron	100	U	**905**		**3320**		50	U	**953**		**24400**		**29728**	**35800**		100	U	**920**		**3100**		50	U	**890**		**25600**		**30660**	**33500**	
Lead	1	U	**2.9**		0.5	U	**2.01**		0.5	U	**6.34**		**13.3**	**24.7**		1	U	**3.7**		0.5	U	**2.05**		0.5	U	**6.19**		**14.0**	**29.6**	
Lithium	10	U	5	U	5	U	5	U	5	U	**27.1**		**57.1**	**32.8**		10	U	5	U	5	U	5	U	5	U	**23.1**		**53.1**	**28.4**	
Manganese	10	U	**254**		**46.3**		**7.4**		**14.4**		**415**		**747**	**564**		10	U	**237**		**41.4**		**6.5**		**13.1**		**425**		**733**	**496**	
Molybdenum	1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.50	**1.13**		1	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	3.50	**1.63**	
Nickel	4	U	2	U	**3.7**		2	U	2	U	**17.8**	**J**	**31.5**	**44.4**		4	U	2	U	**4.5**		2	U	**2.3**		**43.3**	**J**	**58.1**	**49.8**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**499**		NT		NT		NT		NT		NT		NT		NT	**476**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**1050**		200	U	NT		NT		NT		NT		NT		200	**1090**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.70	**0.35**		0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.70	**0.38**	
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.700	**0.15**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.700	**0.11**	
Sodium	200	U	NT		NT		NT		NT		NT		200	100	U	200	U	NT		NT		NT		NT		NT		200	**110**	
Strontium	10	U	**86.2**		5	U	**11.2**		5	U	**12.8**		**130**	**127**		10	U	**80.4**		5	U	**12.5**		5	U	**115**		**228**	**114**	
Thallium	0.1	U	0.05	U	0.05	U	0.05	U	2	U	**0.121**		**2.37**	**0.15**	**J**	0.1	U	0.05	U	0.05	U	0.05	U	2	U	**0.114**		**2.36**	0.86	J
Tin	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U	4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U
Titanium	10	U	5	U	5	U	5	U	5	U	**191**	**J**	**221**	**184**		10	U	5	U	5	U	5	U	5	U	**86.7**	**J**	**117**	**173**	
Uranium	0.1	U	**0.129**		**0.174**		0.05	U	0.05	U	**0.314**		**0.817**	**1.17**		0.1	U	**0.121**		**0.145**		0.05	U	0.05	U	**0.258**		**0.724**	**1.34**	
Vanadium	0.4	U	0.2	U	**1.31**		0.2	U	**0.34**		**16.3**		**18.8**	**32.3**		0.4	U	0.2	U	**1.36**		0.2	U	**0.38**		**16.4**		**18.9**	**27.7**	
Zinc	2	U	**1.6**		**6.5**		1	U	50	U	**51.3**		**112**	**103**		2	U	**1.8**		**6.4**		1	U	50	U	**54.8**		**116**	**103**	

Table 10-4. Sequential Extraction Results (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW013															CH12-014-MW013														
Sample ID	CH12-014-MW013_SOB															CH12-014-MW013_SOG														
Sample Interval (mbgs)	5.4 - 5.6															30.4 - 30.6														
Sample Date	8/5/2012															8/6/2012														
General Location	VANGORDA WASTE DUMP															VANGORDA WASTE DUMP														
Geologic Unit	WASTE ROCK															ALLUVIUM														
	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
Analyte (mg/kg)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	100	U	50	U	**63**		50	U	50	U	**2610**		**2923**	**3090**		100	U	50	U	**681**		**201**		**318**		**13400**		**14750**	**13100**	
Antimony	0.2	U	**0.28**		**8.72**		**1.48**		**2.06**		**66.9**		**79.6**	**88.4**		0.2	U	**1.01**		**4.07**		**0.34**		**0.23**		**10.1**		**16.0**	**39**	
Arsenic	0.1	U	**0.215**		**11.3**		**12.2**		**13.80**		**1200**		**1238**	**553**		0.1	U	**0.504**		**23.7**		**4**		**6.35**		**78.9**		**114**	**199**	
Barium	**9.6**		**10.4**		**65.4**		**88**		**312**		**14.2**		**500**	4.61	U	**53.6**		**106**		**49.4**		**77.3**		**14.2**		**278**		**579**	**51**	
Beryllium	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	0.4	U	1.60	0.2	U	0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.26**		**1.46**	**0.44**	
Bismuth	0.4	U	0.2	U	**0.3**		0.2	U	0.2	U	**5.05**		**6.35**	**5.43**		0.4	U	0.2	U	0.2	U	0.2	U	0.2	U	**0.21**		**1.41**	**0.52**	
Cadmium	**0.98**		**0.898**		**0.189**		**0.339**		0.05	U	**40.2**		**42.7**	**44.8**		**1.64**		**2.480**		**0.226**		**0.316**		0.05	U	**5.45**		**10.2**	**26.4**	
Calcium	**2240**		**1040**		50	U	**1030**		NT		**11200**		**15560**	11500	U	**1540**		**970**		50	U	**545**		NT		**1280**		**4385**	5010	U
Chromium	10	U	5	U	5	U	5	U	5	U	10	U	40.0	**9.58**		10	U	5	U	**5.5**		5	U	5	U	**74.3**		**105**	**74.4**	
Cobalt	**2.05**		**0.5**		**1.11**		**0.81**		**0.41**		**224**		**229**	**238**		**1.64**		**4.1**		**8.19**		**0.4**		**2.08**		**14.1**		**30.5**	**42.5**	
Copper	1	U	0.5	U	**7.13**		**4.94**		0.5	U	**1690**		**1704**	**2230**		1	U	**66.7**		**72**		**6.55**		**0.87**		**353**		**500**	**519**	
Iron	**490**		**508**		**11800**		**1040**		**11200**		**178000**		**203038**	**217000**		100	U	**185**		**5190**		**465**		**4130**		**33500**		**43570**	**60600**	
Lead	**560**		**2320**		**193**		**1510**		**4.21**		**24400**		**28987**	**14200**		**26.9**		**1490**		**116**		**415**		**2.74**		**1500**		**3551**	**10700**	
Lithium	10	U	5	U	5	U	5	U	5	U	10	U	40.0	5	U	10	U	5	U	5	U	5	U	5	U	**22.5**		**52.5**	**19.2**	
Manganese	**254**		**254**		**704**		**55.3**		**106**		**8170**		**9543**	**9620**		**77**		**124**		**143**		**15.1**		**27.8**		**243**		**630**	**531**	
Molybdenum	1	U	0.5	U	0.5	U	0.5	U	0.5	U	**2.6**		**5.60**	**2.06**		1	U	0.5	U	0.5	U	0.5	U	0.5	U	**0.91**		**3.91**	**2.77**	
Nickel	4	U	2	U	2	U	2	U	2	U	**15.6**		**27.6**	**21**		4	U	**2.3**		**8.9**		2	U	**6.5**		**48**		**71.7**	**79.2**	
Phosphorus	NT		NT		NT		NT		NT		NT		NT	**138**		NT		NT		NT		NT		NT		NT		NT	**452**	
Potassium	200	U	NT		NT		NT		NT		NT		200	**180**		200	U	NT		NT		NT		NT		NT		200	**720**	
Selenium	0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	**2.5**		**4.00**	**3.06**		0.4	U	0.2	U	0.2	U	0.2	U	0.5	U	0.2	U	1.70	**0.38**	
Silver	0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**42**		**42.6**	**44.1**		0.2	U	0.1	U	0.1	U	0.1	U	0.1	U	**5.56**		**6.16**	**14.5**	
Sodium	200	U	NT		NT		NT		NT		NT		200	100	U	200	U	NT		NT		NT		NT		NT		200	100	U
Strontium	10	U	**26**		5	U	**11.7**		**7.5**		**99**		**159**	**92.6**		10	U	5	U	5	U	5	U	5	U	**13.9**		**43.9**	**36.1**	
Thallium	**0.1**		**0.179**		**0.108**		**0.225**		2	U	**14.3**		**16.9**	**14.9**		**0.1**		**0.094**		**0.101**		**0.059**		2	U	**1.6**		**3.95**	**6.17**	
Tin	4	U	2	U	2	U	2	U	2	U	4	U	16.0	**2.5**		4	U	2	U	2	U	2	U	2	U	2	U	14.0	2	U
Titanium	10	U	5	U	5	U	5	U	5	U	**15**		**45.0**	12.7	U	10	U	5	U	**20.1**		**8.9**		5	U	**244**		**293**	**194**	
Uranium	0.1	U	**0.066**		**0.085**		0.05	U	0.05	U	**0.75**		**1.10**	**0.788**		0.1	U	**0.205**		**0.144**		0.05	U	0.10	U	**0.474**		**1.07**	**1.16**	
Vanadium	0.4	U	0.2	U	**0.51**		0.2	U	**0.23**		**8.5**		**10.0**	**10.1**		0.4	U	0.2	U	**5.61**		**0.58**		**2.43**		**27.5**		**36.7**	**33**	
Zinc	**211**		**215**		**625**		**56.2**		50	U	**27300**		**28457**	**33000**		**74.2**		**243**		**191**		**12.8**		50	U	**3140**		**3711**	**11100**	

Sequential Extraction Table 10-4.
Results (2012-2015): Faro Mine Complex
Faro Mine Remediation Project

Notes:
Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC
The six individual extraction steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.
Bold indicates the analyte was detected

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
NT = not tested
PYRO - Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLN = Bound to crystalline oxide

Table 10-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW011															CH12-014-MW012													
Sample ID	CH12-014-MW011_SOE															CH12-014-MW012_SOA													
Sample Interval (mbgs)	26.1 - 26.3															5.7 - 5.9													
Sample Date	8/3/2012															8/4/2012													
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.6%	U	**0.4%**		**1.8%**		0.3%	U	**0.7%**		**96.1%**		**92%**	**16800**		0.7%	U	0.3%	U	**2.5%**		0.3%	U	**1.5%**		**94.6%**		**102%**	**14600**	
Antimony	24.1%	U	12.0%	U	**19.3%**		12.0%	U	12.0%	U	**20.5%**		**86%**	**0.96**		19.8%	U	9.9%	U	**26.7%**		9.9%	U	9.9%	U	**23.8%**		**194%**	**0.52**	
Arsenic	0.7%	U	**1.2%**		**23.3%**		**1.4%**		3.3%	U	**70.2%**		**67%**	**22.8**		0.2%	U	**0.7%**		**48.5%**		**2.0%**		**4.0%**		**44.5%**		**126%**	**35.5**	
Barium	**16.7%**		**24.5%**		**3.9%**		**7.1%**		**3.6%**		**44.3%**		**58%**	**216**		**14.5%**		**23.5%**		**3.8%**		**7.0%**		**4.4%**		**46.9%**		**95%**	**180**	
Beryllium	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	326%	**0.43**		27.2%	U	13.6%	U	13.6%	U	13.6%	U	13.6%	U	**18.4%**		306%	**0.48**	
Bismuth	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	667%	**0.21**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	0.2	U
Cadmium	20.1%	U	**14.7%**		10.0%	U	10.0%	U	10.0%	U	**35.1%**		**103%**	**0.484**		24.8%	U	**21.6%**		12.4%	U	12.4%	U	12.4%	U	**16.4%**		**223%**	**0.181**	
Calcium	**2.8%**		**64.6%**		0.2%	U	**0.9%**				**31.5%**		**144%**	18900	U	**4.6%**		**32.7%**		0.2%	U	**1.4%**				**61.1%**		**83%**	25300	U
Chromium	16.7%	U	8.3%	U	8.3%	U	8.3%	U	8.3%	U	**49.9%**		**168%**	**35.7**		6.5%	U	3.3%	U	3.3%	U	3.3%	U	3.3%	U	**80.4%**		**133%**	**115**	
Cobalt	1.6%	U	**11.9%**		**8.1%**		0.8%	U	**2.7%**		**74.8%**		**80%**	**15.5**		2.1%	U	**43.9%**		**39.7%**		1.0%	U	**10.0%**		**3.4%**		**54%**	**17.9**	
Copper	4.5%	U	**4.6%**		**12.3%**		2.3%	U	2.3%	U	**74.1%**		**70%**	**31.4**		4.6%	U	**7.5%**		**33.0%**		**3.4%**		2.3%	U	**49.2%**		**106%**	**20.6**	
Iron	0.3%	U	**1.7%**		**10.2%**		**0.2%**		**2.1%**		**85.5%**		**91%**	**33900**		0.3%	U	**1.2%**		**15.3%**		**0.2%**		**4.4%**		**78.6%**		**95%**	**35900**	
Lead	3.9%	U	**29.4%**		**3.0%**		**22.3%**		2.0%	U	**39.4%**		**48%**	**53.4**		9.7%	U	**23.0%**		4.8%	U	**21.6%**		4.8%	U	**36.0%**		**99%**	10.4	U
Lithium	16.9%	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	**49.2%**		**191%**	**31**		18.7%	U	9.4%	U	9.4%	U	9.4%	U	9.4%	U	**43.8%**		**202%**	**26.5**	
Manganese	2.1%	U	**38.6%**		**7.6%**		**1.2%**		**2.2%**		**48.4%**		**99%**	**487**		2.0%	U	**20.7%**		**8.6%**		**1.3%**		**2.9%**		**64.5%**		**94%**	**530**	
Molybdenum	25.0%	U	12.5%	U	**13.3%**		12.5%	U	12.5%	U	**24.3%**		**237%**	**1.69**		27.0%	U	13.5%	U	**15.1%**		13.5%	U	13.5%	U	**17.3%**		**252%**	**1.47**	
Nickel	10.4%	U	**5.7%**		**9.3%**		5.2%	U	5.2%	U	**64.2%**		**93%**	**41.7**		3.4%	U	**7.5%**		**24.2%**		1.7%	U	**5.3%**		**57.8%**		**110%**	**106**	
Phosphorus														**603**															**1010**	
Potassium	100.0%	U											17%	**1210**		100.0%	U											19%	**1080**	
Selenium	22.2%	U	11.1%	U	11.1%	U	11.1%	U	27.8%	U	**16.7%**		**667%**	**0.27**		23.5%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	11.8%	U	531%	**0.32**	
Silver	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	304%	**0.23**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	636%	**0.11**	
Sodium	100.0%	U											182%	**110**		100.0%	U											143%	**140**	
Strontium	9.1%	U	**52.1%**		4.5%	U	**5.6%**		4.5%	U	**24.2%**		**153%**	**72.3**		10.8%	U	**21.9%**		5.4%	U	**7.9%**		5.4%	U	**48.5%**		**103%**	**89.9**	
Thallium	4.2%	U	2.1%	U	2.1%	U	2.1%	U	83.5%	U	**6.1%**		**1652%**	**0.145**		4.1%	U	2.1%	U	2.1%	U	2.1%	U	82.6%	U	**7.1%**		**2182%**	**0.111**	
Tin	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U
Titanium	3.6%	U	1.8%	U	1.8%	U	1.8%	U	1.8%	U	**89.2%**		**142%**	**196**		4.1%	U	2.1%	U	**2.7%**		2.1%	U	2.1%	U	**87.0%**		**121%**	**201**	
Uranium	8.5%	U	**13.3%**		**14.2%**		4.2%	U	4.2%	U	**55.5%**		**87%**	**1.36**		6.4%	U	**17.9%**		**27.0%**		3.2%	U	**3.5%**		**42.0%**		**103%**	**1.51**	
Vanadium	1.6%	U	0.8%	U	**6.1%**		0.8%	U	**1.2%**		**89.5%**		**75%**	**33.9**		1.1%	U	0.6%	U	**10.3%**		0.6%	U	**2.0%**		**85.4%**		**94%**	**37.6**	
Zinc	1.4%	U	**3.1%**		**8.1%**		0.7%	U	36.0%	U	**50.7%**		**106%**	**131**		1.7%	U	**3.1%**		**13.4%**		0.8%	U	41.4%	U	**39.7%**		**169%**	**71.6**	

Table 10-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW012															CH12-014-MW012														
Sample ID	CH12-014-MW012_SOD															CH12-014-MW012_SOE														
Sample Interval (mbgs)	22.1 - 22.3															28.9 - 29.1														
Sample Date	8/4/2012															8/4/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.6%	U	0.3%	U	**3.9%**		**0.4%**		**1.9%**		**92.9%**		**111%**	**14700**		0.6%	U	**0.5%**		**3.3%**		**0.8%**		**2.0%**		**92.8%**		**171%**	**9190**	
Antimony	21.3%	U	10.6%	U	**23.4%**		10.6%	U	10.6%	U	**23.4%**		**157%**	**0.6**		18.3%	U	9.2%	U	**11.9%**		9.2%	U	**12.8%**		**38.5%**		**154%**	**0.71**	
Arsenic	0.2%	U	**0.2%**		**9.9%**		**0.9%**		**3.2%**		**85.6%**		**480%**	**13**		0.5%	U	**0.5%**		**26.9%**		**7.2%**		**29.7%**		**35.2%**		**148%**	**14.1**	
Barium	**18.0%**		**22.4%**		**4.1%**		**4.9%**		**4.5%**		**46.2%**		**101%**	**216**		**16.6%**		**15.5%**		**4.1%**		**4.3%**		**7.9%**		**51.6%**		**216%**	**131**	
Beryllium	27.0%	U	13.5%	U	13.5%	U	13.5%	U	13.5%	U	**18.9%**		**302%**	**0.49**		27.2%	U	13.6%	U	13.6%	U	13.6%	U	13.6%	U	**18.4%**		**490%**	**0.3**	
Bismuth	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	609%	**0.23**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	171%	**0.82**	
Cadmium	18.6%	U	**29.9%**		9.3%	U	9.3%	U	9.3%	U	**23.6%**		**149%**	**0.361**		16.6%	U	**24.8%**		8.3%	U	**11.8%**		8.3%	U	**30.2%**		**214%**	**0.281**	
Calcium	**11.2%**		**65.1%**		0.4%	U	**2.3%**				**21.0%**		**78%**	15300	U	**18.2%**		**45.3%**		0.7%	U	**9.9%**				**25.9%**		**89%**	8170	U
Chromium	14.0%	U	7.0%	U	7.0%	U	7.0%	U	7.0%	U	**57.9%**		**171%**	**41.8**		12.6%	U	6.3%	U	6.3%	U	6.3%	U	6.3%	U	**62.2%**		**248%**	**32**	
Cobalt	1.7%	U	**11.3%**		**20.0%**		0.8%	U	**10.0%**		**56.2%**		**99%**	**12**		1.6%	U	**6.2%**		**26.1%**		0.8%	U	**13.1%**		**52.2%**		**152%**	**8.1**	
Copper	4.2%	U	**8.4%**		**41.1%**		2.1%	U	2.1%	U	**42.2%**		**94%**	**25.4**		3.6%	U	**2.4%**		**14.0%**		**4.0%**		**1.9%**		**74.1%**		**139%**	**20**	
Iron	0.4%	U	**0.5%**		**11.4%**		**0.3%**		**10.0%**		**77.5%**		**102%**	**26000**		0.4%	U	**0.2%**		**6.1%**		**1.3%**		**19.0%**		**73.0%**		**140%**	**19100**	
Lead	6.9%	U	**21.7%**		**10.0%**		**12.9%**		**4.4%**		**44.2%**		**88%**	**16.5**		1.0%	U	**18.8%**		**16.3%**		**18.6%**		**2.9%**		**42.5%**		**165%**	**57.7**	
Lithium	17.0%	U	8.5%	U	8.5%	U	8.5%	U	8.5%	U	**49.1%**		**223%**	**26.4**		18.0%	U	9.0%	U	9.0%	U	9.0%	U	9.0%	U	**46.1%**		**289%**	**19.3**	
Manganese	2.4%	U	**29.0%**		**10.6%**		1.2%	U	**4.4%**		**52.4%**		**97%**	**430**		2.2%	U	**14.8%**		**32.9%**		**2.0%**		**5.9%**		**42.0%**		**151%**	**298**	
Molybdenum	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	327%	**1.07**		27.6%	U	13.8%	U	13.8%	U	13.8%	U	**17.1%**		13.8%	U	**377%**	**0.96**	
Nickel	9.3%	U	**4.9%**		**15.7%**		4.7%	U	**9.3%**		**56.1%**		**112%**	**38.1**		7.8%	U	3.9%	U	**6.6%**		3.9%	U	**13.6%**		**64.3%**		**169%**	**30.4**	
Phosphorus														**559**															**356**	
Potassium	100.0%	U											12%	**1630**		100.0%	U											24%	**840**	
Selenium	23.1%	U	11.6%	U	11.6%	U	11.6%	U	28.9%	U	**13.3%**		**422%**	**0.41**		23.5%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	11.8%	U	850%	0.2	U
Silver	28.2%	U	14.1%	U	14.1%	U	14.1%	U	14.1%	U	**15.5%**		**473%**	**0.15**		24.4%	U	12.2%	U	12.2%	U	12.2%	U	12.2%	U	**26.8%**		**456%**	**0.18**	
Sodium	100.0%	U											105%	**190**		100.0%	U											200%	100	U
Strontium	15.2%	U	**37.5%**		7.6%	U	7.6%	U	7.6%	U	**24.4%**		**119%**	**54.9**		20.7%	U	**21.6%**		10.4%	U	10.4%	U	10.4%	U	**26.6%**		**153%**	**31.5**	
Thallium	4.1%	U	2.0%	U	2.0%	U	2.0%	U	81.9%	U	**7.9%**		**1970%**	**0.124**		4.1%	U	2.1%	U	2.1%	U	2.1%	U	82.0%	U	**7.7%**		**2237%**	**0.109**	
Tin	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U
Titanium	2.6%	U	1.3%	U	**2.3%**		**1.3%**		**1.4%**		**91.1%**		**113%**	**346**		2.6%	U	1.3%	U	**2.3%**		1.3%	U	**1.5%**		**90.9%**		**182%**	**208**	
Uranium	7.5%	U	**17.1%**		**14.9%**		3.7%	U	**6.4%**		**50.4%**		**111%**	**1.21**		9.9%	U	**14.2%**		**12.8%**		4.9%	U	**16.5%**		**41.6%**		**128%**	**0.788**	
Vanadium	1.1%	U	0.5%	U	**8.8%**		**0.8%**		**4.3%**		**84.4%**		**101%**	**36.2**		1.2%	U	0.6%	U	**5.5%**		**1.3%**		**9.2%**		**82.2%**		**143%**	**22.8**	
Zinc	1.6%	U	**1.9%**		**10.2%**		0.8%	U	39.4%	U	**46.2%**		**167%**	**76.2**		1.3%	U	**1.7%**		**6.5%**		**2.0%**		31.7%	U	**56.9%**		**175%**	**90.3**	

Table 10-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW012															CH12-014-MW012														
Sample ID	CH12-014-MW012_SOF															CH12-014-MW912_SOF														
Sample Interval (mbgs)	38.3 - 38.5															38.3 - 38.5														
Sample Date	8/4/2012															8/4/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	0.7%	U	0.4%	U	**1.9%**		0.4%	U	**0.6%**		**96.0%**		**79%**	**17800**		0.7%	U	0.3%	U	**1.6%**		0.3%	U	**0.6%**		**96.4%**		**89%**	**16500**	
Antimony	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	92%	**0.76**		27.8%	U	13.9%	U	13.9%	U	13.9%	U	13.9%	U	**16.7%**		**109%**	**0.66**	
Arsenic	1.9%	U	**1.7%**		**39.9%**		**3.4%**		**18.9%**		**34.2%**		**43%**	**12.4**		2.0%	U	**2.0%**		**40.2%**		**4.5%**		**15.9%**		**35.4%**		**37%**	**13.5**	
Barium	**17.3%**		**15.2%**		**2.5%**		**9.3%**		**4.3%**		**51.3%**	**J**	**58%**	**169**		**12.4%**		**10.3%**		**2.7%**		**8.7%**		**3.3%**		**62.6%**	**J**	**84%**	**163**	
Beryllium	28.2%	U	14.1%	U	14.1%	U	14.1%	U	14.1%	U	**15.5%**		**309%**	**0.46**		26.7%	U	13.3%	U	13.3%	U	13.3%	U	13.3%	U	**20.0%**		**313%**	**0.48**	
Bismuth	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	0.2	U	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	0.2	U
Cadmium	28.1%	U	**15.7%**		14.0%	U	14.0%	U	14.0%	U	14.0%	U	**100%**	**0.355**		26.1%	U	**14.4%**		13.1%	U	13.1%	U	13.1%	U	**20.4%**		**161%**	**0.238**	
Calcium	**1.1%**		**49.8%**		0.1%	U	**0.3%**				**48.7%**		**178%**	41400	U	**1.0%**		**48.2%**		0.1%	U	**0.3%**				**50.4%**		**195%**	39800	U
Chromium	19.3%	U	9.6%	U	9.6%	U	9.6%	U	9.6%	U	**42.2%**		**80%**	**65.1**		11.4%	U	5.7%	U	5.7%	U	5.7%	U	5.7%	U	**65.7%**	**J**	**175%**	**50**	
Cobalt	1.9%	U	**3.4%**		**14.3%**		1.0%	U	**6.4%**		**73.0%**		**75%**	**13.9**		1.6%	U	**3.1%**		**11.1%**		0.8%	U	**5.1%**		**78.2%**		**84%**	**14.6**	
Copper	7.4%	U	**5.5%**		**19.7%**		3.7%	U	3.7%	U	**59.9%**		**50%**	**26.8**		5.7%	U	**5.3%**		**16.4%**		2.9%	U	2.9%	U	**66.9%**		**72%**	**24.3**	
Iron	0.3%	U	**3.0%**		**11.2%**		0.2%	U	**3.2%**		**82.1%**		**83%**	**35800**		0.3%	U	**3.0%**		**10.1%**		0.2%	U	**2.9%**		**83.5%**		**92%**	**33500**	
Lead	7.5%	U	**22.0%**		3.8%	U	**15.1%**		3.8%	U	**47.8%**		**54%**	**24.7**		7.2%	U	**26.6%**		3.6%	U	**14.7%**		3.6%	U	**44.3%**		**47%**	**29.6**	
Lithium	17.5%	U	8.8%	U	8.8%	U	8.8%	U	8.8%	U	**47.5%**		**174%**	**32.8**		18.8%	U	9.4%	U	9.4%	U	9.4%	U	9.4%	U	**43.5%**		**187%**	**28.4**	
Manganese	1.3%	U	**34.0%**		**6.2%**		**1.0%**		**1.9%**		**55.5%**		**132%**	**564**		1.4%	U	**32.3%**		**5.6%**		**0.9%**		**1.8%**		**58.0%**		**148%**	**496**	
Molybdenum	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	310%	**1.13**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	215%	**1.63**	
Nickel	12.7%	U	6.3%	U	**11.7%**		6.3%	U	6.3%	U	**56.5%**	**J**	**71%**	**44.4**		6.9%	U	3.4%	U	**7.7%**		3.4%	U	**4.0%**		**74.5%**	**J**	**117%**	**49.8**	
Phosphorus														**499**															**476**	
Potassium	100.0%	U											19%	**1050**		100.0%	U											18%	**1090**	
Selenium	23.5%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	11.8%	U	486%	**0.35**		23.5%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	11.8%	U	447%	**0.38**	
Silver	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	467%	**0.15**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	636%	**0.11**	
Sodium	100.0%	U											200%	100	U	100.0%	U											182%	**110**	
Strontium	7.7%	U	**66.2%**		3.8%	U	**8.6%**		3.8%	U	**9.8%**		**103%**	**127**		4.4%	U	**35.3%**		2.2%	U	**5.5%**		2.2%	U	**50.5%**		**200%**	**114**	
Thallium	4.2%	U	2.1%	U	2.1%	U	2.1%	U	84.4%	U	**5.1%**		**1581%**	**0.15**	**J**	4.2%	U	2.1%	U	2.1%	U	2.1%	U	84.6%	U	**4.8%**		**275%**	0.86	J
Tin	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U	28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U
Titanium	4.5%	U	2.3%	U	2.3%	U	2.3%	U	2.3%	U	**86.4%**	**J**	**120%**	**184**		8.6%	U	4.3%	U	4.3%	U	4.3%	U	4.3%	U	**74.3%**	**J**	**67%**	**173**	
Uranium	12.2%	U	**15.8%**		**21.3%**		6.1%	U	6.1%	U	**38.4%**		**70%**	**1.17**		13.8%	U	**16.7%**		**20.0%**		6.9%	U	6.9%	U	**35.6%**		**54%**	**1.34**	
Vanadium	2.1%	U	1.1%	U	**7.0%**		1.1%	U	**1.8%**		**86.9%**		**58%**	**32.3**		2.1%	U	1.1%	U	**7.2%**		1.1%	U	**2.0%**		**86.6%**		**68%**	**27.7**	
Zinc	1.8%	U	**1.4%**		**5.8%**		0.9%	U	44.5%	U	**45.6%**		**109%**	**103**		1.7%	U	**1.6%**		**5.5%**		0.9%	U	43.1%	U	**47.2%**		**113%**	**103**	

Table 10-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Location ID	CH12-014-MW013															CH12-014-MW013														
Sample ID	CH12-014-MW013_SOB															CH12-014-MW013_SOG														
Sample Interval (mbgs)	5.4 - 5.6															30.4 - 30.6														
Sample Date	8/5/2012															8/6/2012														
Analyte	NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total		NSE		AS		AMPH		PYRO		XLN		RES		Σ - total	Total	
(Percentage, %)	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier		Result	Qualifier
Aluminum	3.4%	U	1.7%	U	**2.2%**		1.7%	U	1.7%	U	**89.3%**		**95%**	**3090**		0.7%	U	0.3%	U	**4.6%**		**1.4%**		**2.2%**		**90.8%**		**113%**	**13100**	
Antimony	0.3%	U	**0.4%**		**10.9%**		**1.9%**		**2.6%**		**84.0%**		**90%**	**88.4**		1.3%	U	**6.3%**		**25.5%**		**2.1%**		**1.4%**		**63.3%**		**41%**	**39**	
Arsenic	0.0%	U	**0.0%**		**0.9%**		**1.0%**		**1.1%**		**97.0%**		**224%**	**553**		0.1%	U	**0.4%**		**20.9%**		**3.5%**		**5.6%**		**69.5%**		**57%**	**199**	
Barium	**1.9%**		**2.1%**		**13.1%**		**17.6%**		**62.4%**		**2.8%**		**10837%**	4.61	U	**9.3%**		**18.3%**		**8.5%**		**13.4%**		**2.5%**		**48.1%**		**1134%**	**51**	
Beryllium	25.0%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	25.0%	U	800%	0.2	U	27.4%	U	13.7%	U	13.7%	U	13.7%	U	13.7%	U	**17.8%**		**332%**	**0.44**	
Bismuth	6.3%	U	3.1%	U	**4.7%**		3.1%	U	3.1%	U	**79.5%**		**117%**	**5.43**		28.4%	U	14.2%	U	14.2%	U	14.2%	U	14.2%	U	**14.9%**		**271%**	**0.52**	
Cadmium	**2.3%**		**2.1%**		**0.4%**		**0.8%**		0.1%	U	**94.2%**		**95%**	**44.8**		**16.1%**		**24.4%**		**2.2%**		**3.1%**		0.5%	U	**53.6%**		**38%**	**26.4**	
Calcium	**14.4%**		**6.7%**		0.3%	U	**6.6%**				**72.0%**		**135%**	11500	U	**35.1%**		**22.1%**		1.1%	U	**12.4%**				**29.2%**		**88%**	5010	U
Chromium	25.0%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	25.0%	U	418%	**9.58**		9.5%	U	4.8%	U	**5.2%**		4.8%	U	4.8%	U	**70.9%**		**141%**	**74.4**	
Cobalt	**0.9%**		**0.2%**		**0.5%**		**0.4%**		**0.2%**		**97.9%**		**96%**	**238**		**5.4%**		**13.4%**		**26.9%**		**1.3%**		**6.8%**		**46.3%**		**72%**	**42.5**	
Copper	0.1%	U	0.0%	U	**0.4%**		**0.3%**		0.0%	U	**99.2%**		**76%**	**2230**		0.2%	U	**13.3%**		**14.4%**		**1.3%**		**0.2%**		**70.6%**		**96%**	**519**	
Iron	**0.2%**		**0.3%**		**5.8%**		**0.5%**		**5.5%**		**87.7%**		**94%**	**217000**		0.2%	U	**0.4%**		**11.9%**		**1.1%**		**9.5%**		**76.9%**		**72%**	**60600**	
Lead	**1.9%**		**8.0%**		**0.7%**		**5.2%**		**0.0%**		**84.2%**		**204%**	**14200**		**0.8%**		**42.0%**		**3.3%**		**11.7%**		**0.1%**		**42.2%**		**33%**	**10700**	
Lithium	25.0%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	25.0%	U	800%	5	U	19.0%	U	9.5%	U	9.5%	U	9.5%	U	9.5%	U	**42.9%**		**273%**	**19.2**	
Manganese	**2.7%**		**2.7%**		**7.4%**		**0.6%**		**1.1%**		**85.6%**		**99%**	**9620**		**12.2%**		**19.7%**		**22.7%**		**2.4%**		**4.4%**		**38.6%**		**119%**	**531**	
Molybdenum	17.9%	U	8.9%	U	8.9%	U	8.9%	U	8.9%	U	**46.4%**		**272%**	**2.06**		25.6%	U	12.8%	U	12.8%	U	12.8%	U	12.8%	U	**23.3%**		**141%**	**2.77**	
Nickel	14.5%	U	7.2%	U	7.2%	U	7.2%	U	7.2%	U	**56.5%**		**131%**	**21**		5.6%	U	**3.2%**		**12.4%**		2.8%	U	**9.1%**		**66.9%**		**91%**	**79.2**	
Phosphorus														**138**															**452**	
Potassium	100.0%	U											111%	**180**		100.0%	U											28%	**720**	
Selenium	10.0%	U	5.0%	U	5.0%	U	5.0%	U	12.5%	U	**62.5%**		**131%**	**3.06**		23.5%	U	11.8%	U	11.8%	U	11.8%	U	29.4%	U	11.8%	U	447%	**0.38**	
Silver	0.5%	U	0.2%	U	0.2%	U	0.2%	U	0.2%	U	**98.6%**		**97%**	**44.1**		3.2%	U	1.6%	U	1.6%	U	1.6%	U	1.6%	U	**90.3%**		**42%**	**14.5**	
Sodium	100.0%	U											200%	100	U	100.0%	U											200%	100	U
Strontium	6.3%	U	**16.3%**		3.1%	U	**7.3%**		**4.7%**		**62.2%**		**172%**	**92.6**		22.8%	U	11.4%	U	11.4%	U	11.4%	U	11.4%	U	**31.7%**		**122%**	**36.1**	
Thallium	**0.6%**		**1.1%**		**0.6%**		**1.3%**		11.8%	U	**84.6%**		**114%**	**14.9**		**2.5%**		**2.4%**		**2.6%**		**1.5%**		50.6%	U	**40.5%**		**64%**	**6.17**	
Tin	25.0%	U	12.5%	U	12.5%	U	12.5%	U	12.5%	U	25.0%	U	640%	**2.5**		28.6%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	14.3%	U	700%	2	U
Titanium	22.2%	U	11.1%	U	11.1%	U	11.1%	U	11.1%	U	**33.3%**		**354%**	12.7	U	3.4%	U	1.7%	U	**6.9%**		**3.0%**		1.7%	U	**83.3%**		**151%**	**194**	
Uranium	9.1%	U	**6.0%**		**7.7%**		4.5%	U	4.5%	U	**68.1%**		**140%**	**0.788**		9.4%	U	**19.2%**		**13.5%**		4.7%	U	8.9%	U	**44.4%**		**92%**	**1.16**	
Vanadium	4.0%	U	2.0%	U	**5.1%**		2.0%	U	**2.3%**		**84.7%**		**99%**	**10.1**		1.1%	U	0.5%	U	**15.3%**		**1.6%**		**6.6%**		**74.9%**		**111%**	**33**	
Zinc	**0.7%**		**0.8%**		**2.2%**		**0.2%**		0.2%	U	**95.9%**		**86%**	**33000**		**2.0%**		**6.5%**		**5.1%**		**0.3%**		1.3%	U	**84.6%**		**33%**	**11100**	

Table 10-5. Sequential Extraction Results – Percentage of Total (2012-2015): Faro Mine Complex

Faro Mine Remediation Project

Notes:
Laboratory data has been validated by CH2M before importing to EquIS. This summary table has been through QA/QC
The six individual steps were operationally defined, and make up a progressively more aggressive extraction sequence with respect to extractant solutions. They provide guidance to how susceptible the trace metals are to mobilization and what phases they might be associated with.
Bold indicates the analyte was detected.

AMPH = Bound to amorphous oxide
AS = Acid Soluble
J = Analyte was present but the reported value may not be accurate or precise
mbgs = metres below ground surface
mg/kg = milligrams per kilogram
NSE = Neutral Salt Exchangeable
PYRO - Bound to organic matter
QA/QC = Quality Assurance and Quality Control
RES = Residual
U = This analyte was analyzed for but not detected at the specified detection limit
UJ = The analyte was not detected above the detection limit objective. However, the reported detection limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
XLN = Bound to crystalline oxide

Table 10-6. Grum/Vangorda 2015 Seeps Mann Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulfate	Dissolved Zinc
CH-VP-17		80.9% (+)	80.9% (+)		61.4% (+)	80.9% (+)	80.9% (-)
CH-VP-18		75.8% (-)	59.2% (-)		50.0% (.)	59.2% (-)	59.2% (-)
CH-VP-19					59.2% (+)		
CH-VP-20					80.9% (+)		
CH-VP-21							
VP01							
VP02							
VP03		88.3% (+)	75.8% (+)			88.3% (+)	75.8% (+)
VP04							
VP05							
VP06							
VP07					97.8% (sig +)		
VP08					50.0% (.)		
VP09		91.1% (+)	91.1% (+)	75.8% (-)	94.6% (-)	80.1% (+)	64.0% (+)
VP10					97.2% (sig -)		
VP11					86.2% (-)		
SRK-VD01							
SRK-VD02	87.5% (-)	99.2% (sig +)	67.6% (+)	50.0% (+)	77.0% (-)	67.6% (+)	91.8% (+)
SRK-VD03	88.3% (-)	99.9% (sig +)	99.9% (sig +)	98.7% (sig -)	99.7% (sig -)	99.9% (sig +)	98.7% (sig +)
SRK-VD04		98.4% (sig +)	64.0% (+)		91.1% (+)	86.2% (+)	72.6% (+)
SRK-VD05		86.2% (+)	72.6% (+)		96.9% (sig -)	64.0% (+)	72.6% (+)
SRK-VD06	86.4% (-)		64.0% (-)	86.4% (-)	94.0% (-)	86.4% (-)	64.0% (-)
SRK-VD07					86.4% (-)		
SRK-VD09		99.4% (sig +)	61.9% (+)	88.3% (-)	94.0% (-)	97.8% (sig +)	96.2% (sig +)
SRK-VD10		99.7% (sig +)	99.7% (sig +)	97.2% (sig +)	80.1% (+)	98.4% (sig +)	90.4% (+)
SRK-VD12							
CH-GP-19	80.9% (+)	93.2% (+)	80.9% (-)	59.2% (+)	64.0% (+)	61.4% (-)	
CH-GP-20							
CH-GP-21							
CH-GP-22					80.9% (-)		
CH-GP-23					76.4% (+)		
CH-GP-24					50.0% (-)		
CH-GP-25					80.9% (-)		
CH-GP-26					93.2% (-)		
CH-GP-27					59.2% (-)		
CH-GP-28							
CH-GP-29							
CH-GP-30							
GP01							
GP02	89.8% (+)	70.5% (+)	95.0% (sig +)	56.0% (+)	98.9% (sig -)	81.6% (+)	57.1% (-)
GP03	69.4% (-)	75.7% (-)	93.6% (+)	54.8% (-)	80.9% (-)	91.0% (+)	97.8% (sig -)
GP04	61.9% (-)	76.2% (-)	61.7% (-)	54.0% (-)	57.9% (-)	61.9% (+)	69.4% (+)
GP05							
GP06					70.0% (+)		
GP07	75.8% (-)		88.3% (+)	59.2% (-)	97.7% (sig -)	88.3% (+)	99.2% (sig +)
GP08	61.4% (+)	61.4% (-)	50.0% (+)	80.9% (+)	81.0% (-)	50.0% (-)	80.9% (-)
GP09	97.0% (sig +)	81.5% (-)	74.5% (+)	95.7% (sig -)	91.7% (-)	74.5% (+)	61.7% (-)
GP10	54.8% (-)	82.1% (-)	50.0% (.)	91.1% (+)	52.4% (-)	50.0% (.)	61.9% (+)
GP11							
GP12	80.9% (-)	80.9% (-)	50.0% (-)	93.2% (-)	93.2% (-)	50.0% (+)	80.9% (+)
GP13							
GP14					86.4% (+)		

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulfate	Dissolved Zinc
CH-VP-17	ND	NT	NT	ND	NT	NT	NT
CH-VP-18	ND	NT	NT	ND	NT	NT	NT
CH-VP-19	ND	ND	ND	ND	NT	ND	ND
CH-VP-20	ND	ND	ND	ND	NT	ND	ND
CH-VP-21	ND	ND	ND	ND	ND	ND	ND
VP01	ND	ND	ND	ND	ND	ND	ND
VP02	ND	ND	ND	ND	ND	ND	ND
VP03	ND	NT	NT	ND	ND	NT	NT
VP04	ND	ND	ND	ND	ND	ND	ND
VP05	ND	ND	ND	ND	ND	ND	ND
VP06	ND	ND	ND	ND	ND	ND	ND
VP07	ND	ND	ND	ND	↑	ND	ND
VP08	ND	ND	ND	ND	NT	ND	ND
VP09	ND	NT	NT	NT	NT	NT	NT
VP10	ND	ND	ND	ND	↓	ND	ND
VP11	ND	ND	ND	ND	NT	ND	ND
SRK-VD01	ND	ND	ND	ND	ND	ND	ND
SRK-VD02	NT	↑	NT	NT	NT	NT	NT
SRK-VD03	NT	↑	↑	↓	↓	↑	↑
SRK-VD04	ND	↑	NT	ND	NT	NT	NT
SRK-VD05	ND	NT	NT	ND	↓	NT	NT
SRK-VD06	NT	ND	NT	NT	NT	NT	NT
SRK-VD07	ND	ND	ND	ND	NT	ND	ND
SRK-VD09	ND	↑	NT	NT	NT	↑	↑
SRK-VD10	ND	↑	↑	↑	NT	↑	NT
SRK-VD12	ND	ND	ND	ND	ND	ND	ND
CH-GP-19	NT	NT	NT	NT	NT	NT	ND
CH-GP-20	ND	ND	ND	ND	ND	ND	ND
CH-GP-21	ND	ND	ND	ND	ND	ND	ND
CH-GP-22	ND	ND	ND	ND	NT	ND	ND
CH-GP-23	ND	ND	ND	ND	NT	ND	ND
CH-GP-24	ND	ND	ND	ND	NT	ND	ND
CH-GP-25	ND	ND	ND	ND	NT	ND	ND
CH-GP-26	ND	ND	ND	ND	NT	ND	ND
CH-GP-27	ND	ND	ND	ND	NT	ND	ND
CH-GP-28	ND	ND	ND	ND	ND	ND	ND
CH-GP-29	ND	ND	ND	ND	ND	ND	ND
CH-GP-30	ND	ND	ND	ND	ND	ND	ND
GP01	ND	ND	ND	ND	ND	ND	ND
GP02	NT	NT	↑	NT	↓	NT	NT
GP03	NT	NT	NT	NT	NT	NT	↓
GP04	NT	NT	NT	NT	NT	NT	NT
GP05	ND	ND	ND	ND	ND	ND	ND
GP06	ND	ND	ND	ND	NT	ND	ND
GP07	NT	ND	NT	NT	↓	NT	↑
GP08	NT	NT	NT	NT	NT	NT	NT
GP09	↑	NT	NT	↓	NT	NT	NT
GP10	NT	NT	NT	NT	NT	NT	NT
GP11	ND	ND	ND	ND	ND	ND	ND
GP12	NT	NT	NT	NT	NT	NT	NT
GP13	ND	ND	ND	ND	ND	ND	ND
GP14	ND	ND	ND	ND	NT	ND	ND

Table 10-6. Grum/Vangorda 2015 Seeps Mann Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulfate	Dissolved Zinc
GP17							
GP22							
GD05 d/s					83.3% (+)		
Sheep Creek							
SRK-GD01	94.6% (+)		94.6% (+)	50.0% (-)	72.6% (+)	98.4% (sig +)	64.0% (-)
SRK-GD02					93.2% (+)		
SRK-GD04							
SRK-GD05	86.5% (+)		76.2% (+)	50.0% (+)	50.0% (-)	61.9% (+)	69.4% (-)
SRK-GD06					80.9% (+)		
SRK-GD07	86.4% (+)	86.4% (+)	86.4% (+)	50.0% (.)	64.0% (+)	97.2% (sig +)	
SRK-GD08					88.3% (+)		
SRK-GD09							
SRK-GD10					87.0% (+)		
SRK-GD11	99.9% (sig +)		99.9% (sig +)	83.3% (-)	50.0% (.)	99.9% (sig +)	64.0% (-)
SRK-GD12					61.9% (+)		
SRK-GD13	94.6% (+)		80.1% (+)	50.0% (-)	64.0% (-)	80.1% (+)	
SRK-GD16	50.0% (.)		88.3% (+)	50.0% (.)	59.2% (-)	88.3% (+)	75.8% (+)
SRK-GD17							
SRK-GD18							
SRK-GD19							
SRK-GD20					75.8% (-)		
SRK-GD22							
SRK-GD23					86.4% (+)		
SRK-GD24							
Sweet Creek							
V15	91.9% (+)	75.7% (-)	100.0% (sig -)	91.5% (-)	99.2% (sig +)		100.0% (sig -)
WGD01							
WTA02					50.0% (+)		

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulfate	Dissolved Zinc
GP17	ND	ND	ND	ND	ND	ND	ND
GP22	ND	ND	ND	ND	ND	ND	ND
GD05 d/s	ND	ND	ND	ND	NT	ND	ND
Sheep Creek	ND	ND	ND	ND	ND	ND	ND
SRK-GD01	NT	ND	NT	NT	NT	↑	NT
SRK-GD02	ND	ND	ND	ND	NT	ND	ND
SRK-GD04	ND	ND	ND	ND	ND	ND	ND
SRK-GD05	NT	ND	NT	NT	NT	NT	NT
SRK-GD06	ND	ND	ND	ND	NT	ND	ND
SRK-GD07	NT	NT	NT	NT	NT	↑	ND
SRK-GD08	ND	ND	ND	ND	NT	ND	ND
SRK-GD09	ND	ND	ND	ND	ND	ND	ND
SRK-GD10	ND	ND	ND	ND	NT	ND	ND
SRK-GD11	↑	ND	↑	NT	NT	↑	NT
SRK-GD12	ND	ND	ND	ND	NT	ND	ND
SRK-GD13	NT	ND	NT	NT	NT	NT	ND
SRK-GD16	NT	ND	NT	NT	NT	NT	NT
SRK-GD17	ND	ND	ND	ND	ND	ND	ND
SRK-GD18	ND	ND	ND	ND	ND	ND	ND
SRK-GD19	ND	ND	ND	ND	ND	ND	ND
SRK-GD20	ND	ND	ND	ND	NT	ND	ND
SRK-GD22	ND	ND	ND	ND	ND	ND	ND
SRK-GD23	ND	ND	ND	ND	NT	ND	ND
SRK-GD24	ND	ND	ND	ND	ND	ND	ND
Sweet Creek	ND	ND	ND	ND	ND	ND	ND
V15	NT	NT	↓	NT	↑	ND	↓
WGD01	ND	ND	ND	ND	ND	ND	ND
WTA02	ND	ND	ND	ND	NT	ND	ND

Table 10-7. Vangorda/Grum Waste Rock Dump Groundwater Analytical Results

Faro Mine Remediation Project

				CH12-014-MW011_060315	CH12-014-MW911_GW0615	CH12-014-MW012_060515	CH12-014-MW013_060315	CH12-014-MW011_100815	CH12-014-MW012_100715	CH12-014-MW013_100815
				Grum WRD	Grum WRD	Grum WRD	Vangorda WRD	Grum WRD	Grum WRD	Vancorda WRD
				3-Jun-15	3-Jun-15	5-Jun-15	3-Jun-15	8-Oct-15	7-Oct-15	8-Oct-15
Analyses ID	**Units**	**FMC Discharge Criteria**	**CCME Screening Level**							
General Chemistry										
pH, Field	pH Units	6.5	6.5 - 9.0	**6.62**		**7.5**	**6.32**	**7.05**	**8.08**	**6.72**
Temperature, Field	deg C	-	-	**6.38**		**7.82**	**12.72**	**8.46**	**4.98**	**13.62**
Hardness (as CaCO3)	mg/L	-	-	**2710**	**2710**	**1280**	**4250**	**2530**	**1220**	**4750**
Total Suspended Solids	mg/L	15	-	**11**	**2**	**81.2**	**20.4**	**8.8**	**41.2**	**18.8**
Total dissolved solids	mg/L	-	-	**3670**	**3700**	**1650**	**5910**	**3340**	**1600**	**6400**
Turbidity, Field	NTU	-	-	**-3.2**		**433.5**	**7.6**	**72.2**	**30.4**	**18.6**
Anions and Nutrients										
Acidity, hot peroxide	mg/L	-	-	25 U	25 U	25 U	25 U	25 UJ		25 UJ
Alkalinity, Bicarbonate (as CaCO3)	mg/L	-	-	**690**	**714**	**407**	**1250**	**691**	**391**	**1260**
Alkalinity, Carbonate (as CaCO3)	mg/L	-	-	20 U	20 U	2 U	20 U	20 U	2 U	20 U
Alkalinity, Hydroxide (as CaCO3)	mg/L	-	-	20 U	20 U	2 U	20 U	20 U	2 U	20 U
Alkalinity, Total (as CaCO3)	mg/L	-	-	**690**	**714**	**407**	**1250**	**691**	**391**	**1260**
Ammonia	mg/L	1.3	Variable[a]	**0.274**	**0.268**	**0.049**	**0.0413**	**0.32**	**0.02**	**0.04**
Chloride (Cl)	mg/L	-	120	10 U	10 U	2.5 U	10 U	5 U	2.5 U	10 U
Fluoride	mg/L	-	0.12	0.4 U	**0.78**	**0.25**	**0.7**	0.2 U	**0.19**	0.4 U
Nitrate (as N)	mg/L	-	13	**8.53**	**8.54**	0.025 U	0.1 U	**1.72 J**	0.025 U	0.1 UJ
Nitrite (as N)	mg/L	-	0.06	**0.065**	**0.063**	0.005 U	0.02 U	**0.01 J**	0.005 U	0.02 UJ
Sulfate	mg/L	-	100	**2120**	**2130**	**892**	**3350**	**1760**	**829**	**3620**
Carbon, dissolved organic (DOC)	mg/L	-	-	**3.31**	**3.48**	**1.4**	**12.4**	**3.32**	**1.44**	**12**
Dissolved Metals										
Aluminum, dissolved	mg/L	-	0.005 to 0.1[b]	**0.0048**	**0.0035**	**0.0012**	**0.0056**	**0.0044**	**0.0026**	**0.0074**
Antimony (Sb)-Dissolved	mg/L	0.1	1.6	0.0002 U	0.0002 U	0.0001 U	0.0005 U	0.0002 U	0.0001 U	0.0005 U
Arsenic (As)-Dissolved	mg/L	0.05	0.005	**0.00041**	**0.00037**	**0.0151**	**0.00181**	**0.00023**	**0.01**	**0.00135**
Barium (Ba)-Dissolved	mg/L	1	2.3	**0.018**	**0.0189**	**0.0335**	**0.016**	**0.01**	**0.03**	**0.01**
Beryllium (Be)-Dissolved	mg/L	-	0.0053	0.0002 U	0.0002 U	0.0001 U	0.0005 U	0.0002 U	0.0001 U	0.0005 U
Boron (B)-Dissolved	mg/L	-	1.5	0.02 U	0.02 U	0.01 U	0.05 U	0.02 U	0.01 U	0.05 U
Cadmium (Cd)-Dissolved	mg/L	0.02	Variable[c]	**0.000304**	**0.000276**	0.000005 U	**0.00254**	**0.000459**	0.000005 U	**0.00514**
Calcium, dissolved	mg/L	-	-	**477**	**474**	**313**	**649**	**444**	**298**	**695**
Chromium (Cr)-Dissolved	mg/L	-	0.0089	0.0002 U	0.0002 U	0.0001 U	0.0005 U	**0.00202**	0.0001 U	**0.00177**
Cobalt (Co)-Dissolved	mg/L	-	-	**0.00149**	**0.0015**	**0.00026**	**0.0392**	**0.00216**	**0.00022**	**0.04**
Copper (Cu)-Dissolved	mg/L	0.2	0.002 to 0.004[d]	**0.00199**	**0.00204**	0.0002 U	**0.0022**	**0.00157**	**0.00101**	**0.0071**
Iron, dissolved	mg/L	-	0.3	**0.051**	**0.052**	**6.93**	**5.51**	**0.73**	**7.01**	**4.95**
Ferrous Iron, dissolved	mg/L	-	-	**0.058**	**0.069**	**6.14**	**7.53**	**0.84**	**6.62**	**5.05**
Lead (Pb)-Dissolved	mg/L	0.2	0.001[e]	0.0001 U	0.0001 U	0.00005 U	**0.00589**	**0.00014**	**0.000071**	**0.01**
Lithium, dissolved	mg/L	-	-	**0.0401**	**0.0392**	**0.0166**	**0.0313**	**0.03**	**0.01**	**0.03**
Magnesium, dissolved	mg/L	-	-	**368**	**371**	**122**	**638**	**346**	**116**	**731**
Manganese, dissolved	mg/L	-	-	**0.922**	**0.985**	**0.251**	**11.2**	**1.79**	**0.27**	**11.7**
Mercury, dissolved	mg/L	0.005	0.000026	0.000025 U	0.000025 U	0.000005 U	0.000025 U	0.000005 U	0.000005 U	**0.0000154**
Molybdenum (Mo)-Dissolved	mg/L	0.5	0.073	**0.00048**	**0.00056**	**0.00143**	**0.00149**	**0.00125**	**0.00137**	**0.00181**
Nickel (Ni)-Dissolved	mg/L	0.5	0.025[f]	**0.0882**	**0.0918**	**0.00056**	**0.108**	**0.08**	**0.00065**	**0.11**
Phosphorus, dissolved	mg/L	-	0.004 to 0.10[g]	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.6 U
Potassium, dissolved	mg/L	-	-	**7.29**	**7.4**	**3.32**	**3.19**	**7.3**	**3.47**	**3.35**
Selenium (Se)-Dissolved	mg/L	0.05	0.001	**0.00044**	**0.00042**	0.00005 U	0.00025 U	0.0001 U	0.00005 U	0.00025 U
Silica, Dissolved	mg/L	-	-	**9.61**	**9.55**	**11.7**	**24.2**	**9.76**	**11.6**	**25.8**
Silicon, dissolved	mg/L	-	-	**4.49**	**4.47**	**5.48**	**11.3**	**4.56**	**5.44**	**12.1**
Silver (Ag)-Dissolved	mg/L	0.1	0.0001	0.00002 U	0.00002 U	0.00001 U	0.00005 U	0.00002 U	0.00001 U	0.00005 U

Table 10-7. Vangorda/Grum Waste Rock Dump Groundwater Analytical Results

Faro Mine Remediation Project

				CH12-014-MW011_060315	CH12-014-MW911_GW0615	CH12-014-MW012_060515	CH12-014-MW013_060315	CH12-014-MW011_100815	CH12-014-MW012_100715	CH12-014-MW013_100815
				Grum WRD	Grum WRD	Grum WRD	Vangorda WRD	Grum WRD	Grum WRD	Vancorda WRD
				3-Jun-15	3-Jun-15	5-Jun-15	3-Jun-15	8-Oct-15	7-Oct-15	8-Oct-15
Sodium (Na)-Dissolved	mg/L	-	-	**11**	**11.6**	**7.91**	**17.4**	**11.2**	**8.12**	**16.3**
Strontium, dissolved	mg/L	-	-	**1.1**	**1.12**	**1.76**	**1.94**	**1.12**	**1.68**	**2**
Sulfur, dissolved	mg/L	-	-	**644**	**641**	**267**	**974**	**605**	**262**	**1120**
Thallium (Tl)-Dissolved	mg/L	-	0.0008	**0.000028**	**0.000029**	0.00001 U	**0.000123**	0.00002 U	0.00001 U	**0.000172**
Titanium, dissolved	mg/L	-	0.1	0.0006 U	0.0006 U	0.0003 U	0.0015 U	0.0006 U	0.0003 U	0.0015 U
Uranium (U)-Dissolved	mg/L	-	0.015	**0.0561**	**0.056**	**0.0308**	**0.0873**	**0.04**	**0.02**	**0.08**
Vanadium (V)-Dissolved	mg/L	-	-	0.001 U	0.001 U	0.0005 U	0.0025 U	0.001 U	0.0005 U	0.0025 U
Zinc (Zn)-Dissolved	mg/L	0.5	0.03	0.886	0.908	0.001 U	5.72	**0.81**	**0.0047**	**5.57**

Notes:

[a] CCME guideline is pH and temperature dependent;p guidelines used here assume 5°C, typical laboratory storage temperature.

[b] CCME guideline is pH dependent; 0.005 mg/L if pH < 6.5, 0.1 mg/L if pH ≥ 6.5

[c] CCME guideline is hardness dependent; If hardness is > 0 to < 17 mg/L, the CWQG is 0.04 µg/L; At hardness > 280 mg/L, the CWQG is 0.37 µg/L; At hardness ≥ 17 to ≤ 280 mg/L cadmium concentration = $10^{0.83[\log10(\text{hardness})]-2.46}$/ 1000 mg/L

[d]CCME guideline is hardness dependent; If hardness is 0 to < 82 mg/L, the CWQG is 2 µg/L; At hardness >180 mg/L, the CWQG is 4 µg/L; At hardness ≥82 to ≤180 mg/L the CWQG= $e^{0.8545[\ln(\text{hardness})]-1.465} * 0.2$ / 1000 mg/L

[e] CCME guideline is hardness dependent; 0 to ≤ 60 mg/L, the CWQG is 1 µg/L; At hardness >180 mg/L, the CWQG is 7 µg/L; At hardness >60 to ≤ 180 mg/L the CWQG = $e^{1.273[\ln(\text{hardness})]-4.705}$ / 1000 mg/L

[f]CCME guideline is hardness dependent; At hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L; At hardness >180 mg/L, the CWQG is 150 µg/L; At hardness > 60 to ≤ 180 mg/L the CWQG is = $e^{0.76[\ln(\text{hardness})]+1.06}$ / 1000 mg/L

[g] CCME trigger range for oligotrophic phosphorous

pH reported is the field parameter value

Bold indicates the analyte was detected

Concentration exceeds FMC discharge criteria

Concentration exceeds CCME Guideline

Concentration exceeds FMC discharge criteria and CCME Guideline

Detection limit exceeds CCME Guideline

J - analyte was present but the reported value may not be accurate or precise

R - result has been rejected for use

m/l = milligrams per litre

NTU = Nephelometric Tubidity Unit

U - analyte was analyzed for but not detected at the specified detection limit

UJ - analyte was not detected above the detection limit; however, the reported detection limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample

Table 10-8. Vangorda/Grum Waste Rock Dump Groundwater Mann Kendall Results

Faro Mine Remediation Project

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH12-014-MW011	99.9% (sig +)	66.2% (+)	84.7% (+)	50.0% (.)	85.9% (+)	66.2% (+)	66.2% (-)
CH12-014-MW012	99.8% (sig +)	77.7% (-)	53.0% (+)	61.4% (-)	91.0% (+)	91.8% (+)	79.9% (-)
CH12-014-MW013	96.2% (sig +)	93.6% (+)	99.9% (sig +)	76.2% (-)	90.4% (+)	97.9% (sig +)	91.8% (+)

Location	Total Alkalinity	Dissolved Iron	Dissolved Magnesium	pH	Field pH	Sulphate	Dissolved Zinc
CH12-014-MW011	↑	NT	NT	NT	NT	NT	NT
CH12-014-MW012	↑	NT	NT	NT	NT	NT	NT
CH12-014-MW013	↑	NT	↑	NT	NT	↑	NT

Notes:

Mann Kendall trend statistics calculated only for dataset with 5 or more detectable data points.

Level of significance tested is 95%.

Non-detectable concentrations were reduced to half the non-detectable limit.

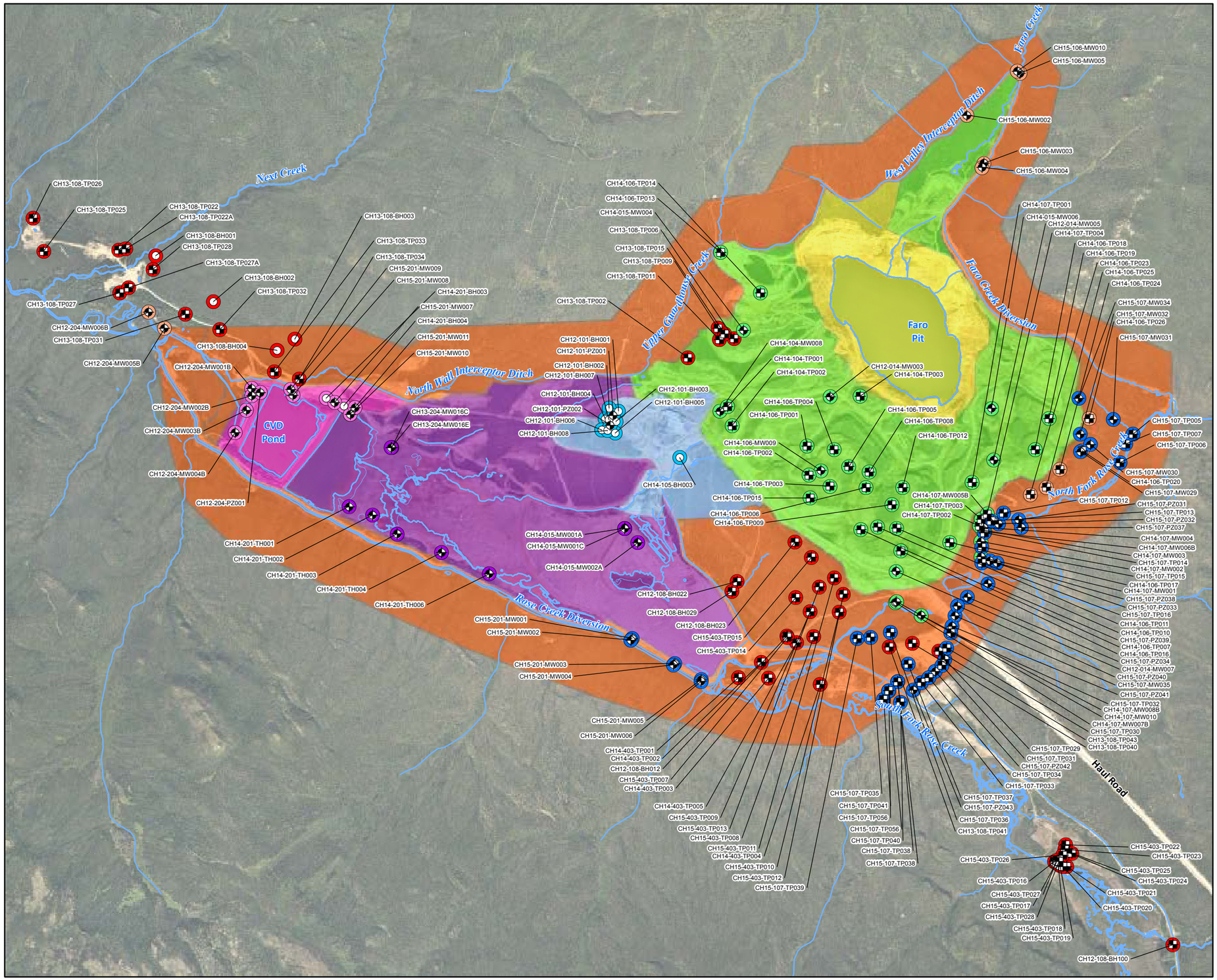
Duplicate measurements were removed.

↑ - Significant increasing trend

ND - Less than the required number of data points with detections.

NT - No significant trend observed.

Figures



REGIONAL MAP



- Borehole
- Monitoring Well
- Test Pit
- Faro Mine Site Watercourse

Reclamation Unit and Report Section
- Perimeter - Section 2
- Waste Rock Dumps - Section 3
- Mill / Emergency Tailings Area RU - Section 4
- Rose Creek Tailings Area - Section 5
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond RU
- North Fork Roce Creek - Section 8
- Borrow - Section 9
- Vangorda Grum Mine Area - Section 10

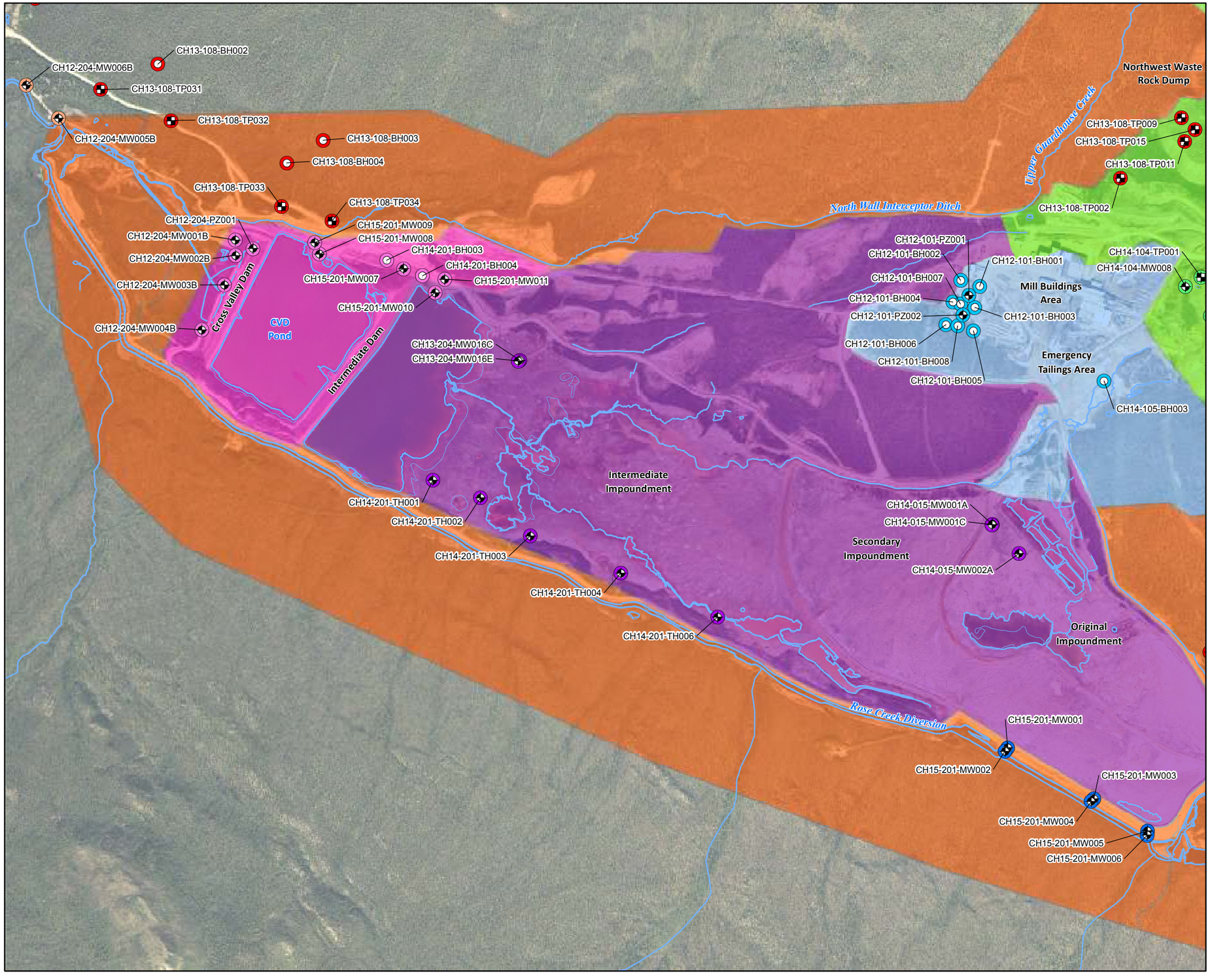
Reclamation Unit
- Perimeter
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond
- Faro Pit

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

N

0 250 500 750 1,000
Metres

FIGURE 1-1
Geochemical Solids Data Investigation Locations - Faro Mine Area
Faro Mine Remediation Project



REGIONAL MAP



- Borehole
- Monitoring Well
- Test Pit
- Faro Mine Site Watercourse

Reclamation Unit and Report Section
- Perimeter - Section 2
- Waste Rock Dumps - Section 3
- Mill / Emergency Tailings Area RU - Section 4
- Rose Creek Tailings Area - Section 5
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond RU
- North Fork Roce Creek - Section 8
- Borrow - Section 9
- Vangorda Grum Mine Area - Section 10

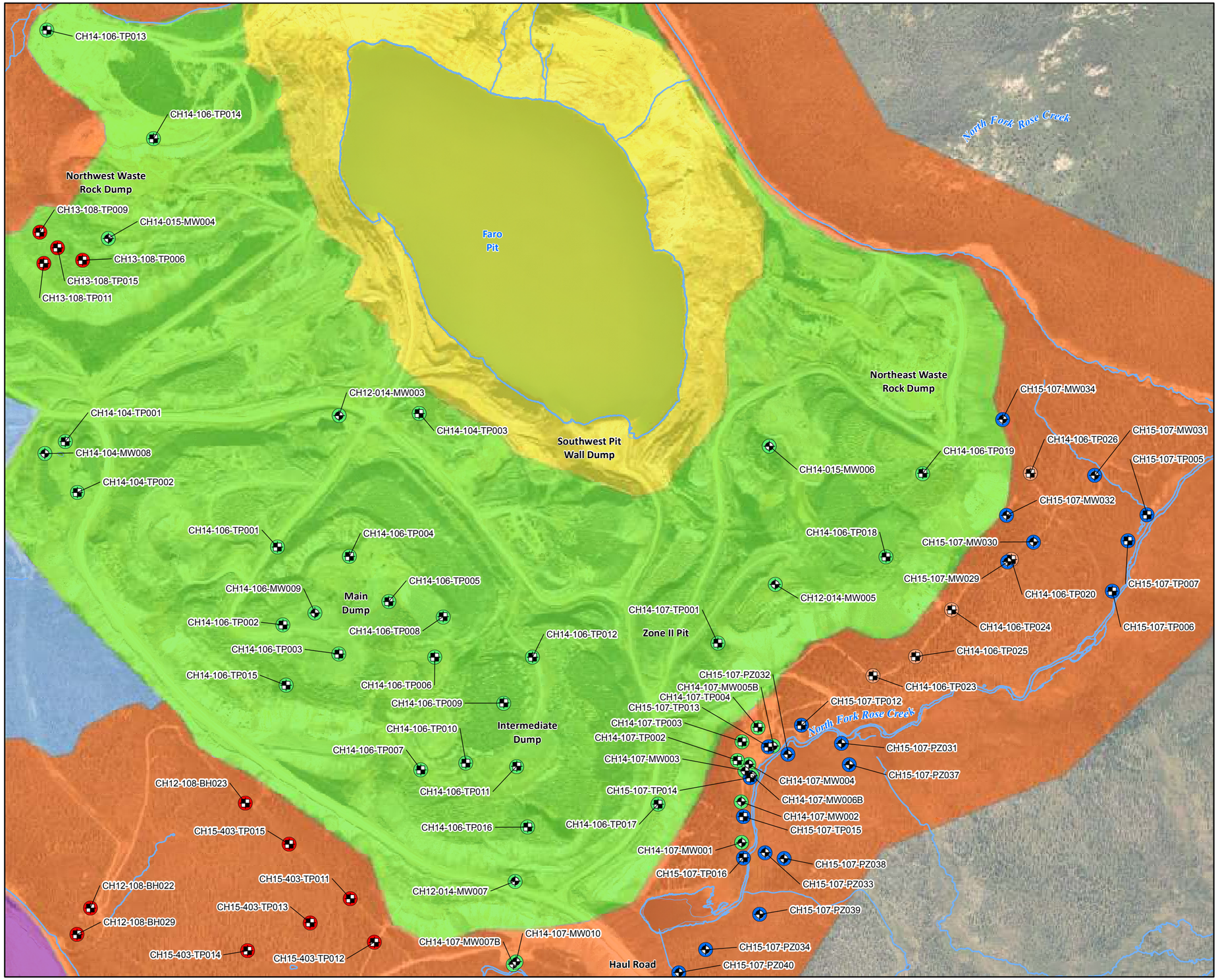
Reclamation Unit
- Perimeter
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond
- Faro Pit

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. CVD = Cross Valley Dam

N

0 100 200 300 400
Metres

FIGURE 1-2
Geochemical Solids Data Investigation Locations - Rose Creek Tailings Area
Faro Mine Remediation Project



REGIONAL MAP



- Borehole
- Monitoring Well
- Test Pit
- Faro Mine Site Watercourse

Reclamation Unit and Report Section
- Perimeter - Section 2
- Waste Rock Dumps - Section 3
- Mill / Emergency Tailings Area RU - Section 4
- Rose Creek Tailings Area - Section 5
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond RU
- North Fork Roce Creek - Section 8
- Borrow - Section 9
- Vangorda Grum Mine Area - Section 10

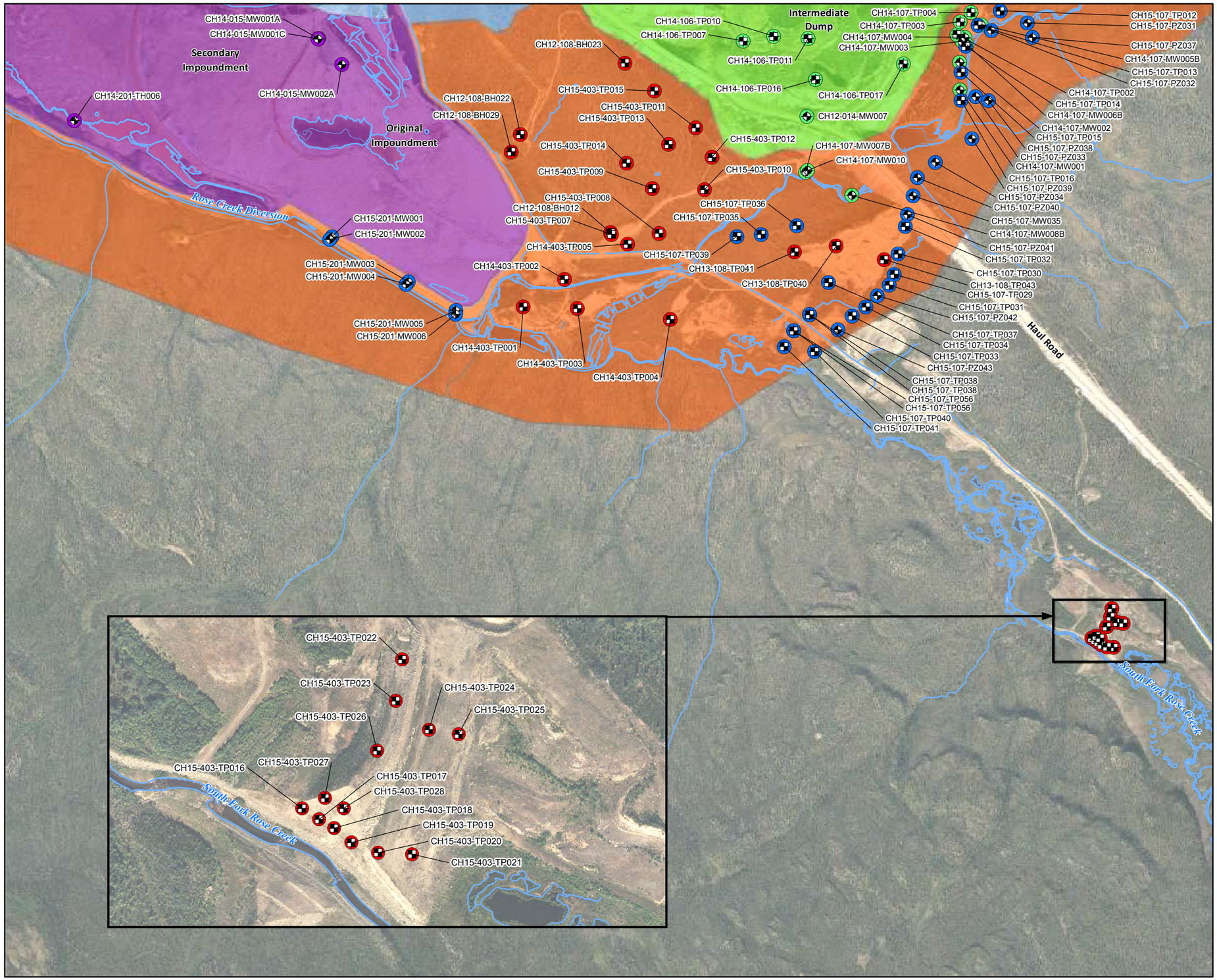
Reclamation Unit
- Perimeter
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond
- Faro Pit

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. NFRC = North Fork Rose Creek

N

0 100 200 300 400
Metres

FIGURE 1-3
Geochemical Solids Data Investigation Locations - North Fork Rose Creek (NFRC) Upstream and Waste Rock Dumps
Faro Mine Remediation Project



REGIONAL MAP



- Borehole
- Monitoring Well
- Test Pit
- Faro Mine Site Watercourse

Reclamation Unit and Report Section
- Perimeter - Section 2
- Waste Rock Dumps - Section 3
- Mill / Emergency Tailings Area RU - Section 4
- Rose Creek Tailings Area - Section 5
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond RU
- North Fork Roce Creek - Section 8
- Borrow - Section 9
- Vangorda Grum Mine Area - Section 10

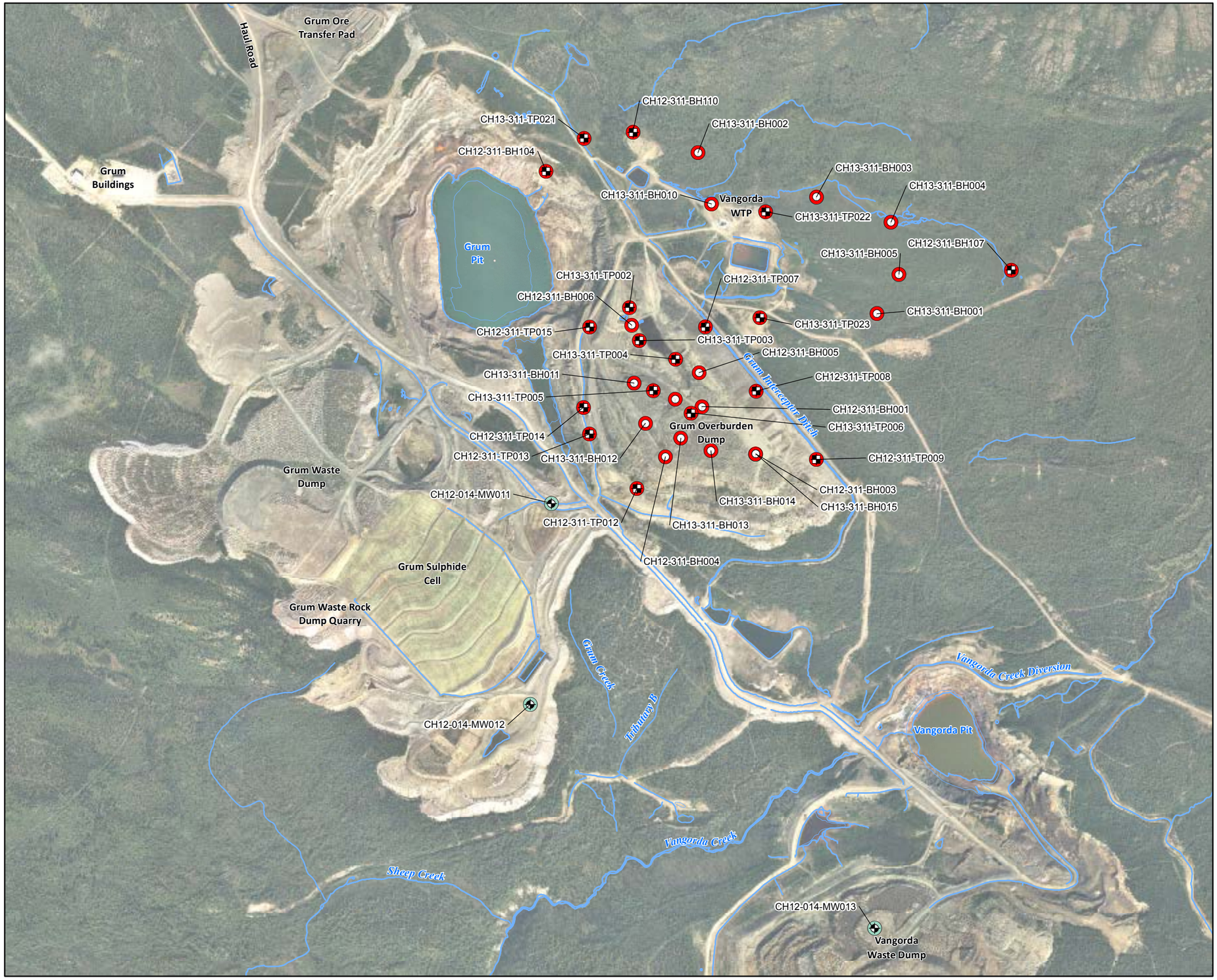
Reclamation Unit
- Perimeter
- Waste Rock Dump
- Mill / Emergency Tailings Area
- Rose Creek Tailings Area
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond
- Faro Pit

Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.
3. NFRC = North Fork Rose Creek

N

0 100 200 300 400
Metres

FIGURE 1-4
Geochemical Solids Data Investigation Locations - North Fork Rose Creek (NFRC) Downstream
Faro Mine Remediation Project



REGIONAL MAP



- Borehole
- Monitoring Well
- Test Pit
- Faro Mine Site Watercourse

Reclamation Unit and Report Section

- Perimeter - Section 2
- Waste Rock Dumps - Section 3
- Mill / Emergency Tailings Area RU - Section 4
- Rose Creek Tailings Area - Section 5
- Cross Valley Dam, Intermediate Dam, and Cross Valley Dam Pond RU
- North Fork Roce Creek - Section 8
- Borrow - Section 9
- Vangorda Grum Mine Area - Section 10

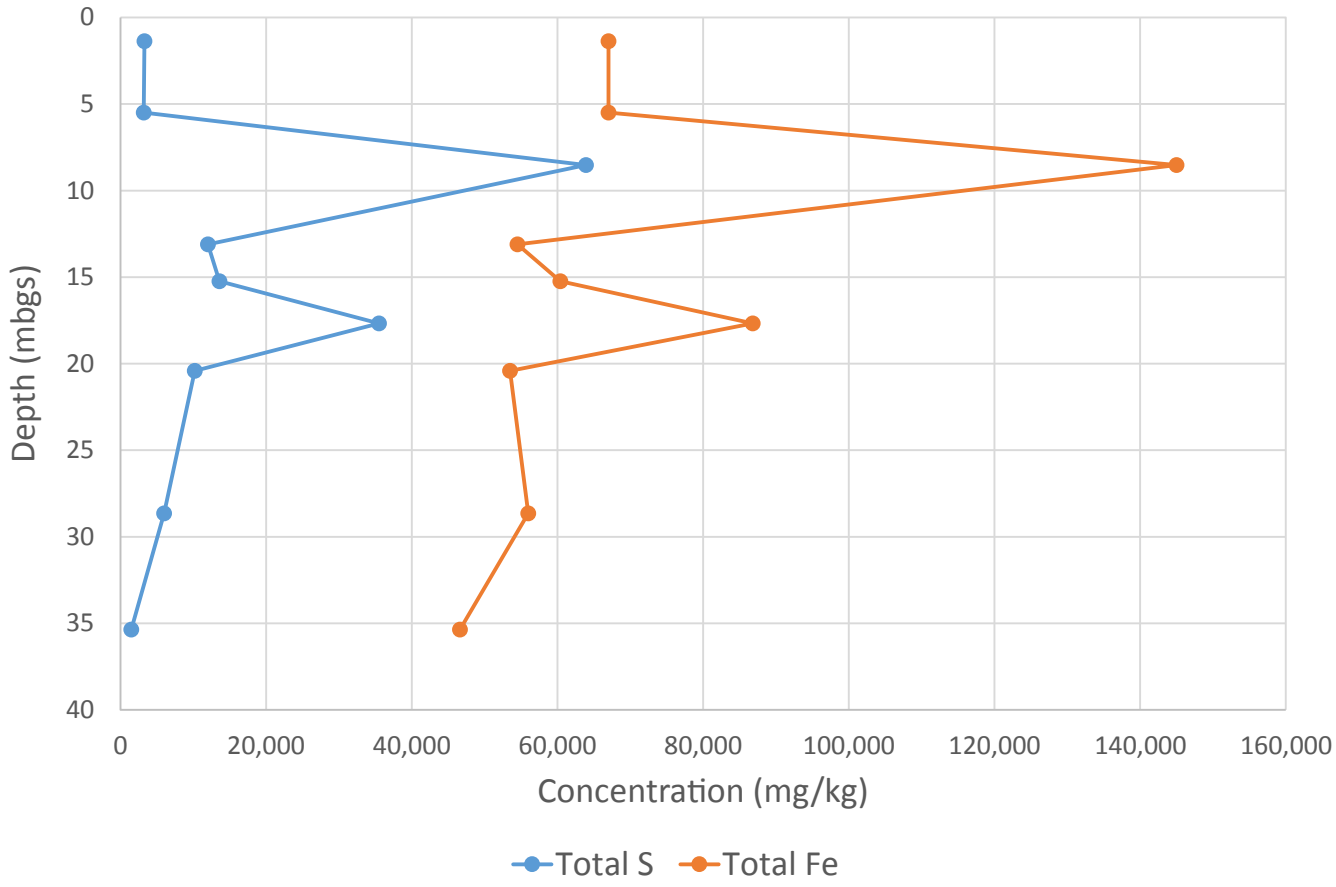
Notes:
1. Aerial photography acquired by Peregrine Aerial Surveyors Inc. and Eagle Mapping in August 2012.
2. Orthophotography prepared by Critigen Canada Corp.

N

0 100 200 300 400
Metres

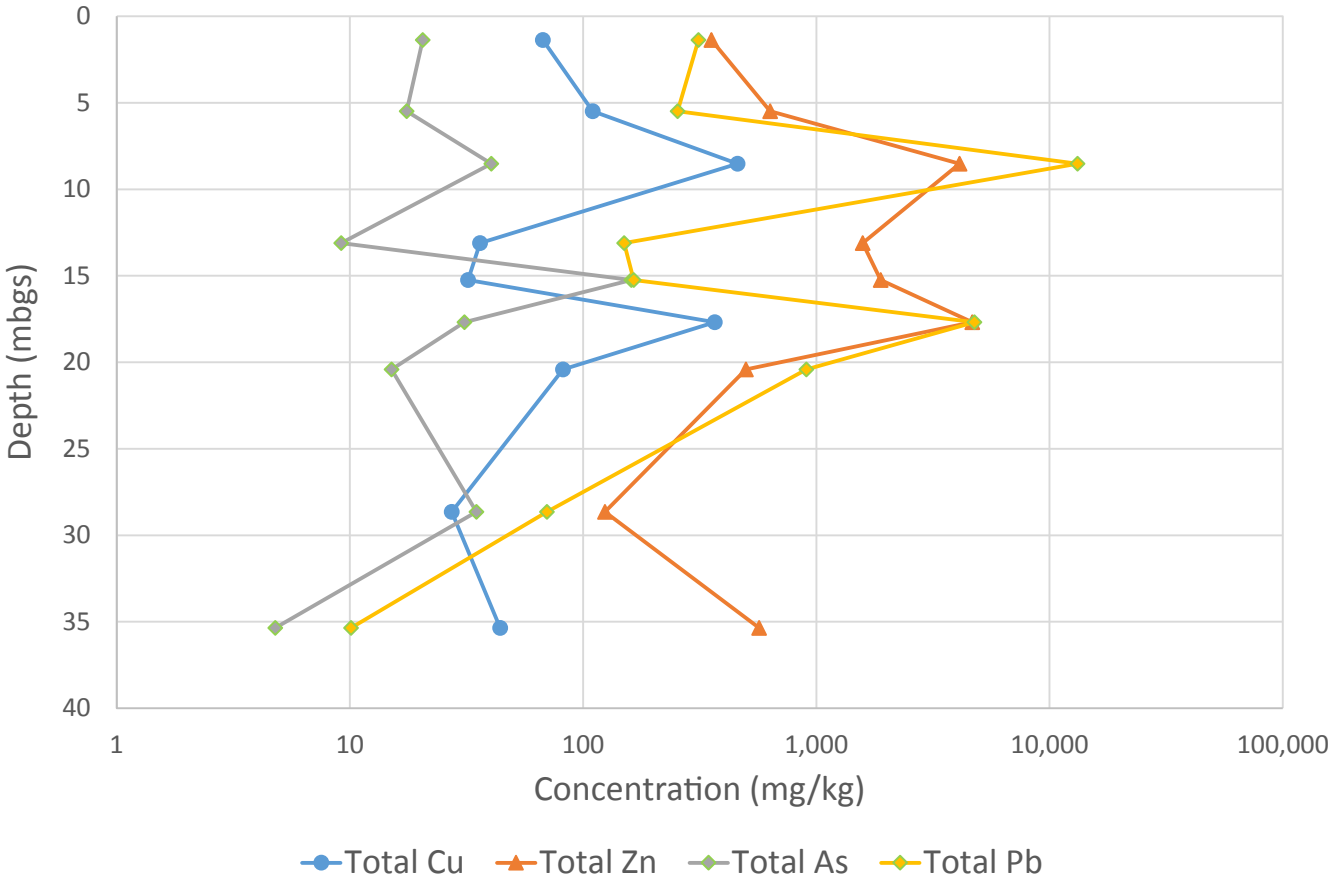
FIGURE 1-5
Geochemical Solids Data Investigation Locations - Vangorda Grum Mine Area
Faro Mine Remediation Project

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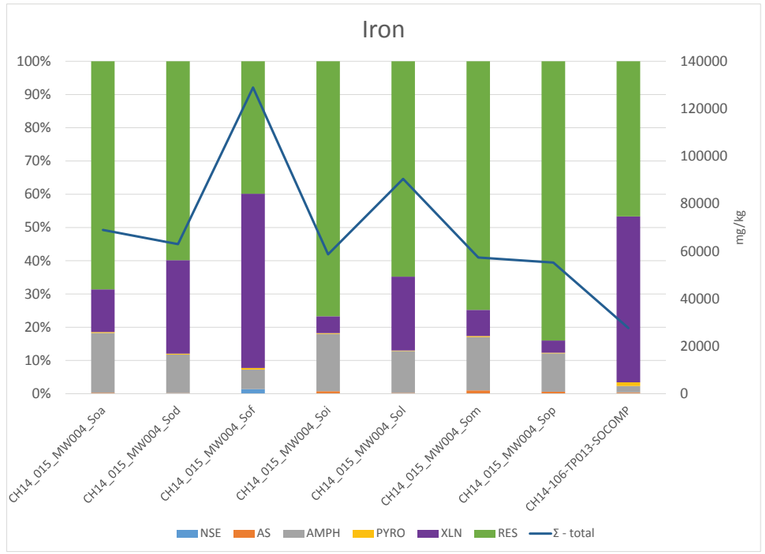
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

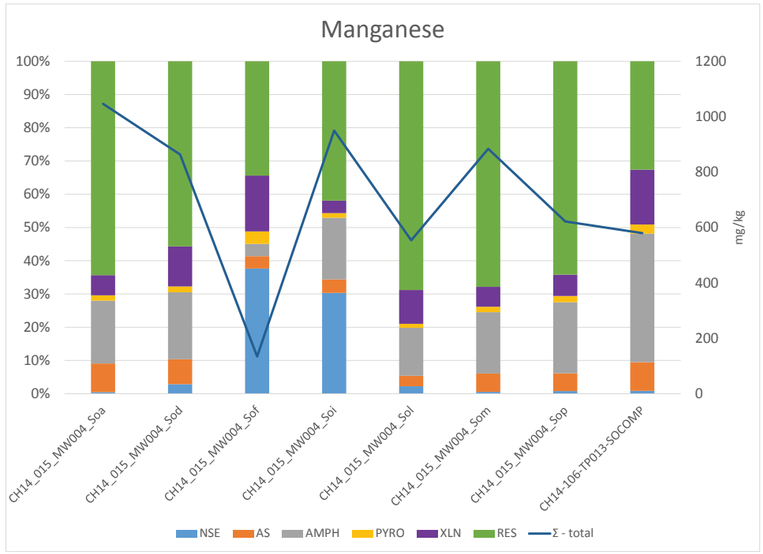
FIGURE 3-1
Total Iron and Sulphur - CH14-015-MW004
Faro Mine Remediation Project

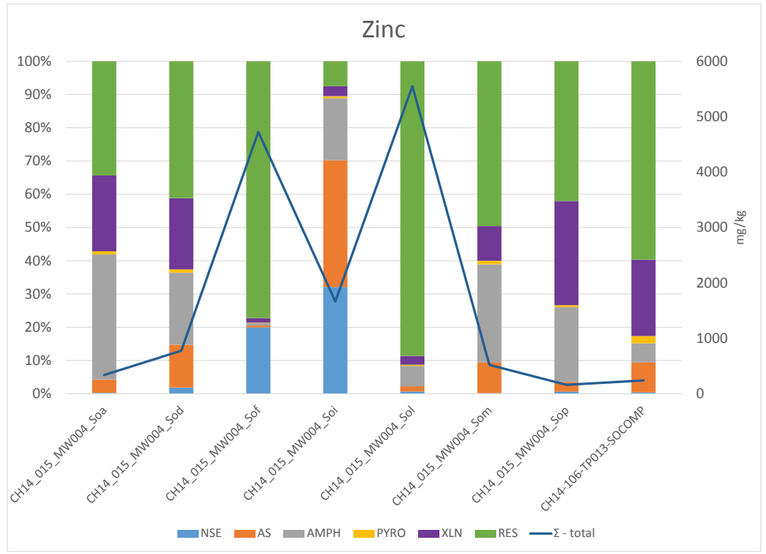


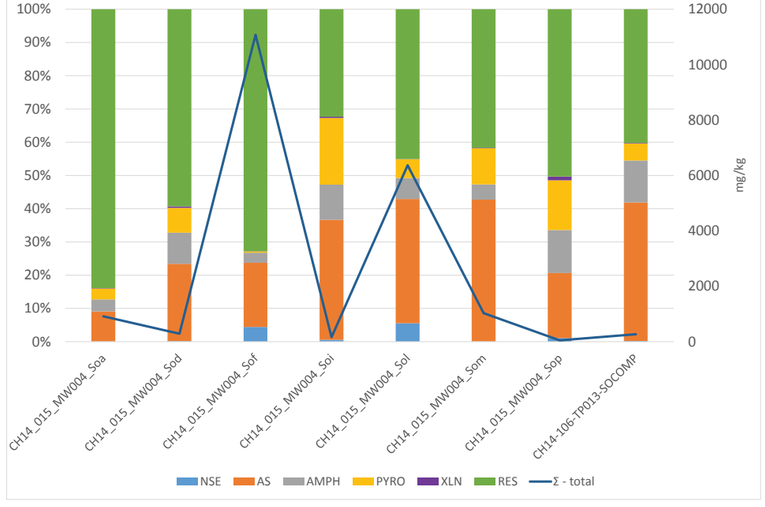
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

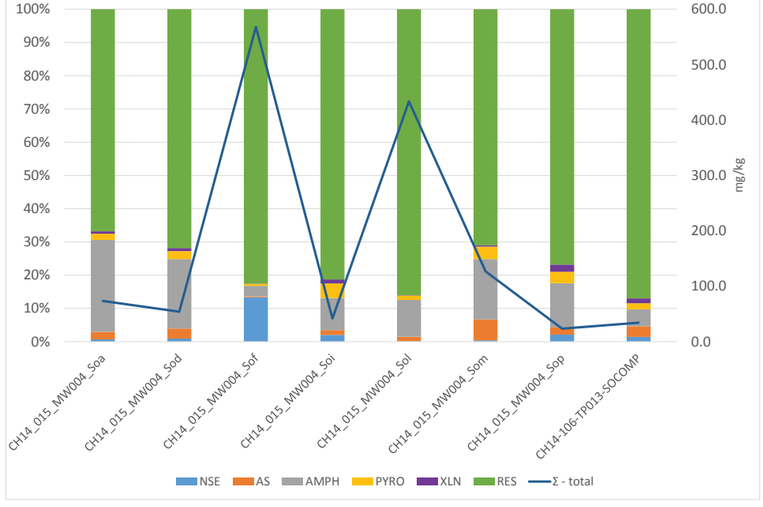
FIGURE 3-2
Select Total Trace Elements - CH14-015-MW004
Faro Mine Remediation Project

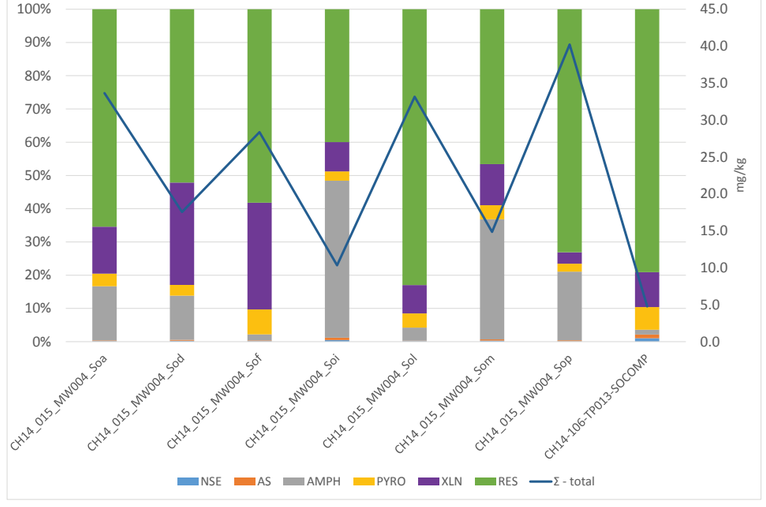






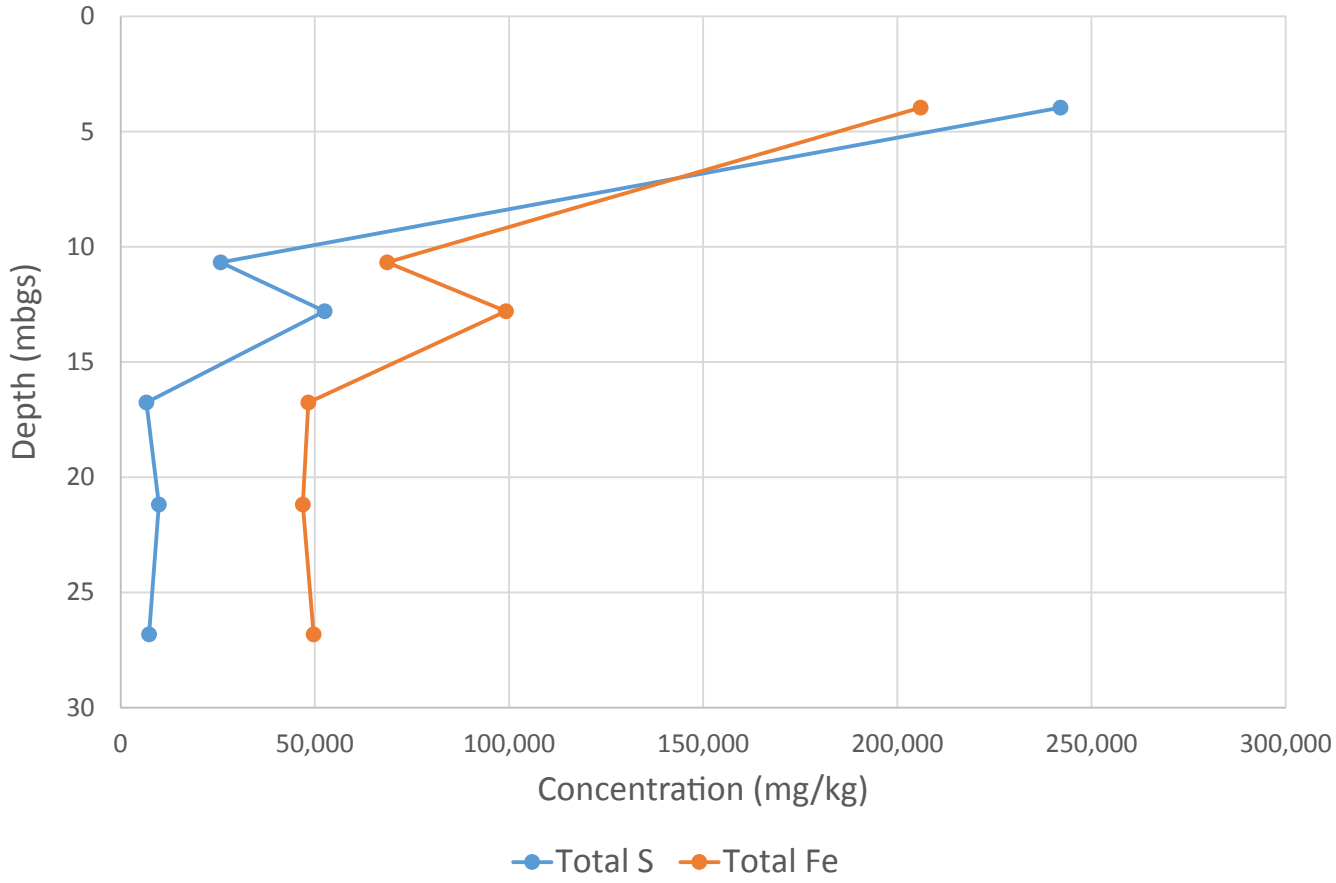






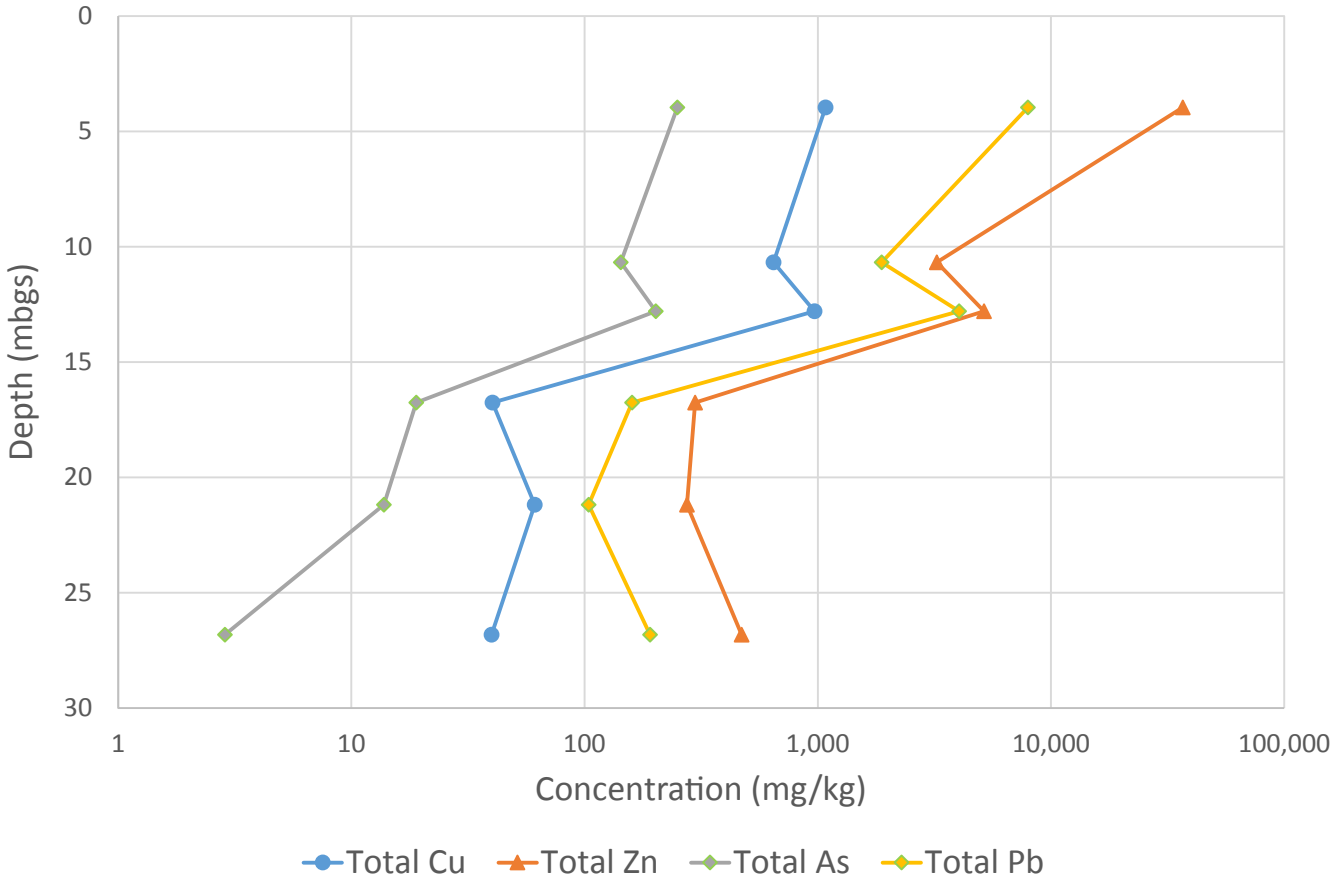
Note:
mg/kg = milligram per kilogram

FIGURE 3-3
Sequential Extract on Monitoring Results for Northwest Dump Borings and Test Pits
Faro Mine Remediation Project



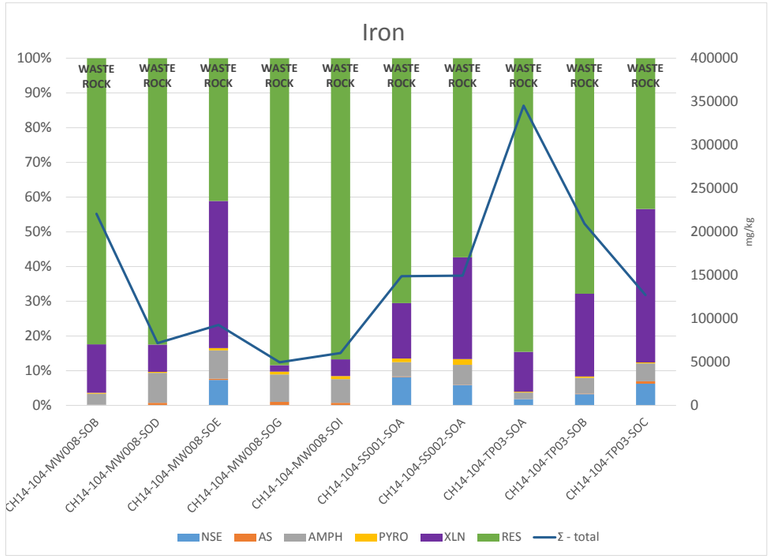
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

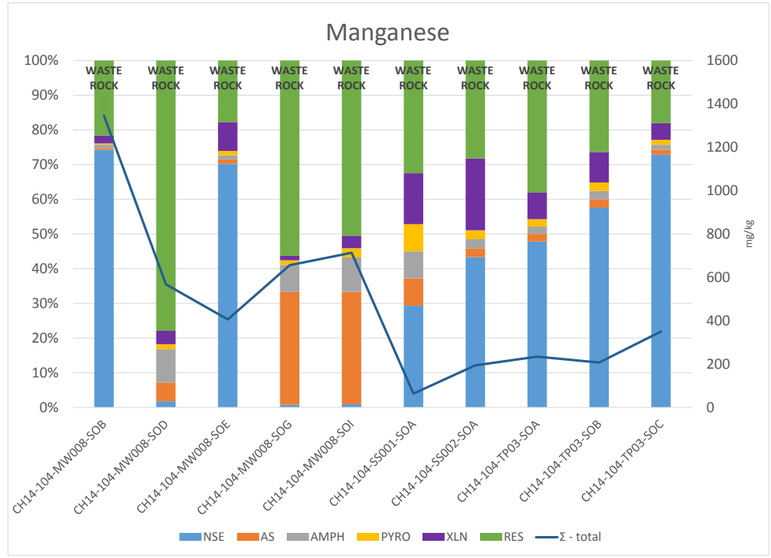
FIGURE 3-4
Total Iron and Sulphur - CH14-104-MW008
Faro Mine Remediation Project

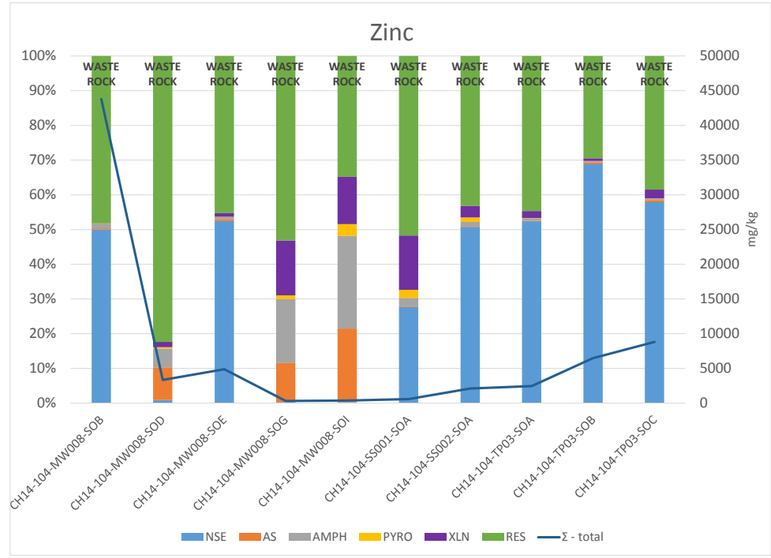


Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

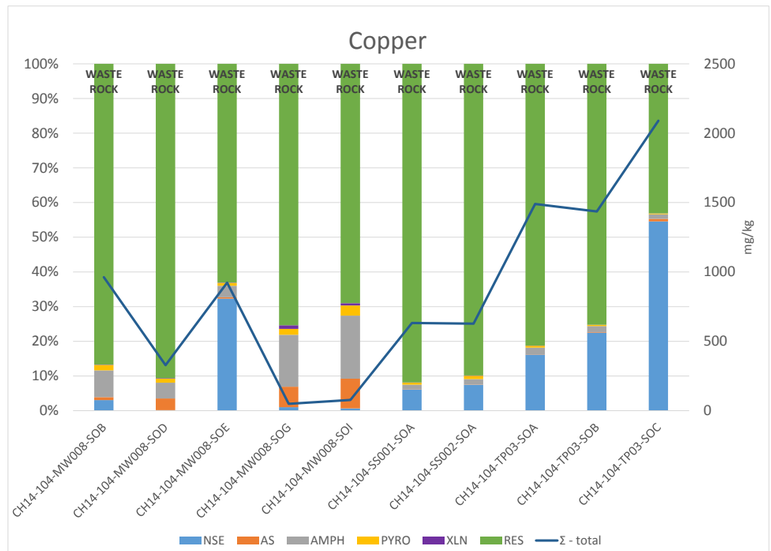
FIGURE 3-5
Select Total Trace Elements - CH14-104-MW008
Faro Mine Remediation Project

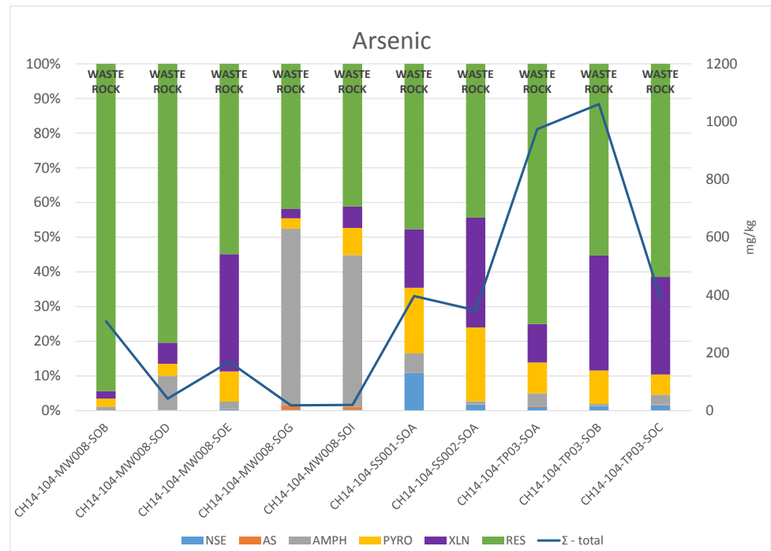






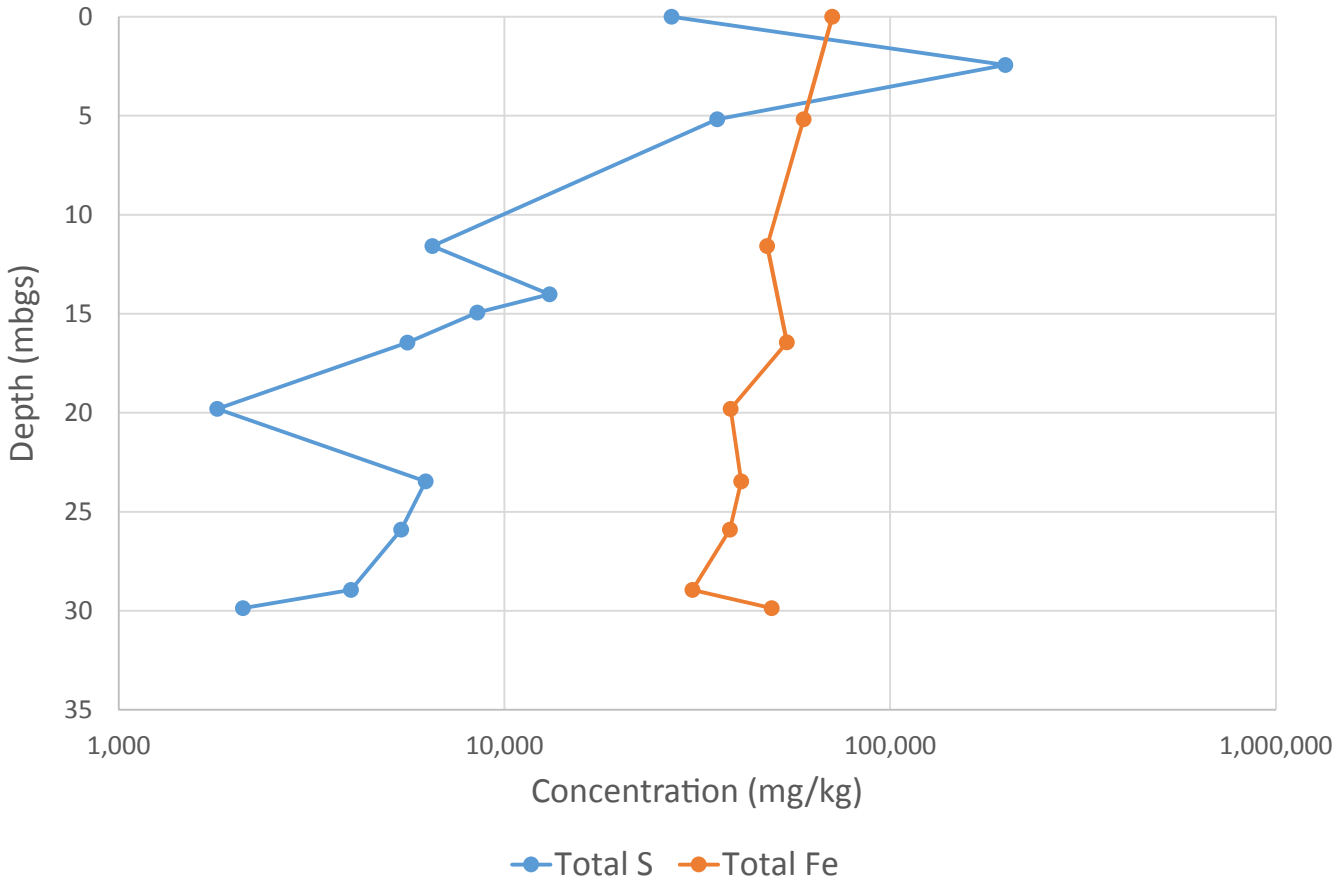






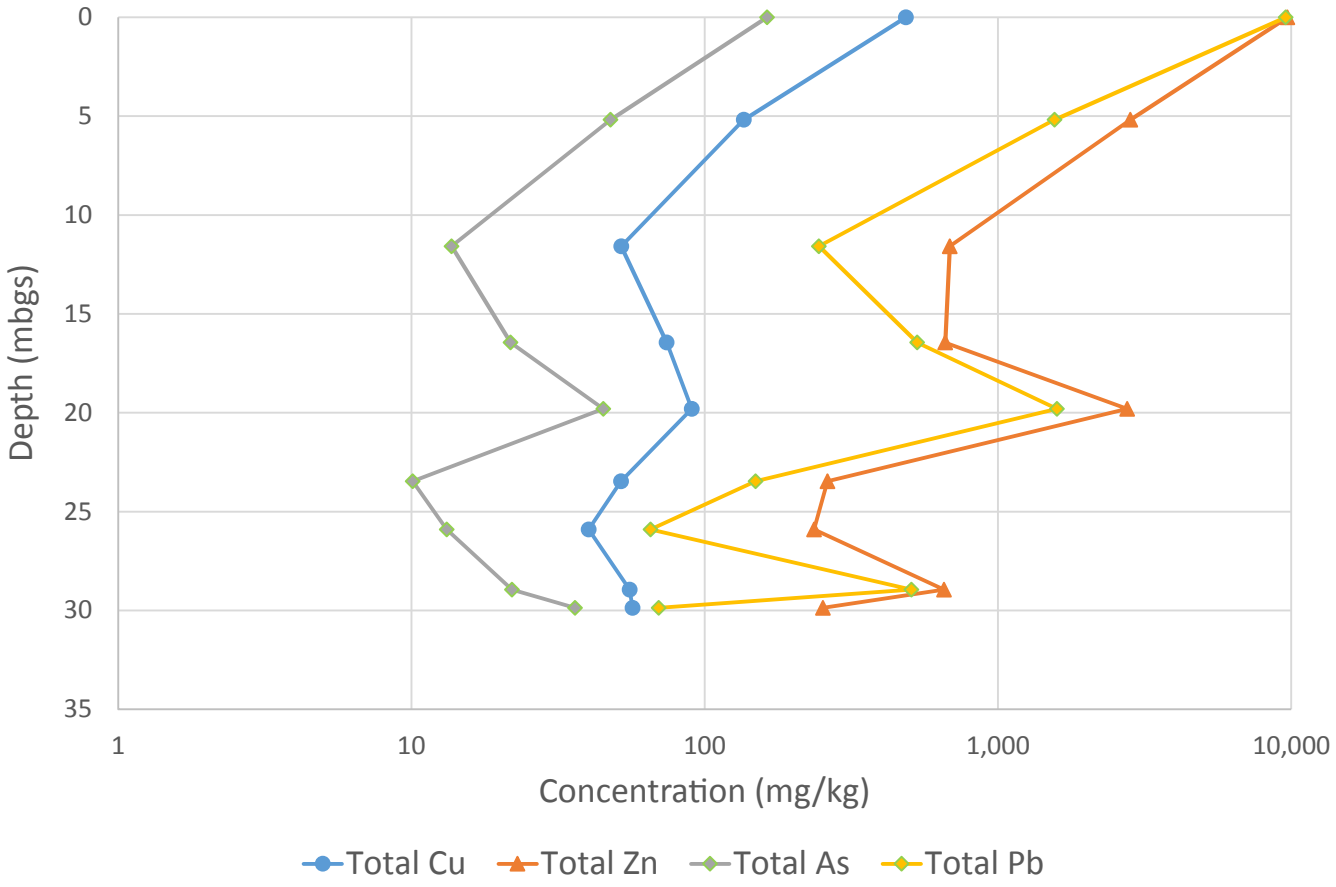
Note:
mg/kg = milligram per kilogram

FIGURE 3-6
Sequential Extraction Monitoring Results for Stockpile Borings and Test Pits
Faro Mine Remediation Project



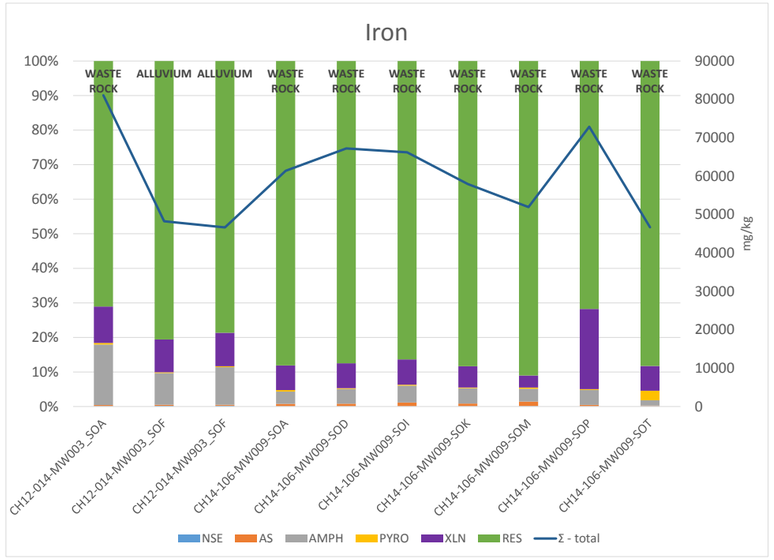
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

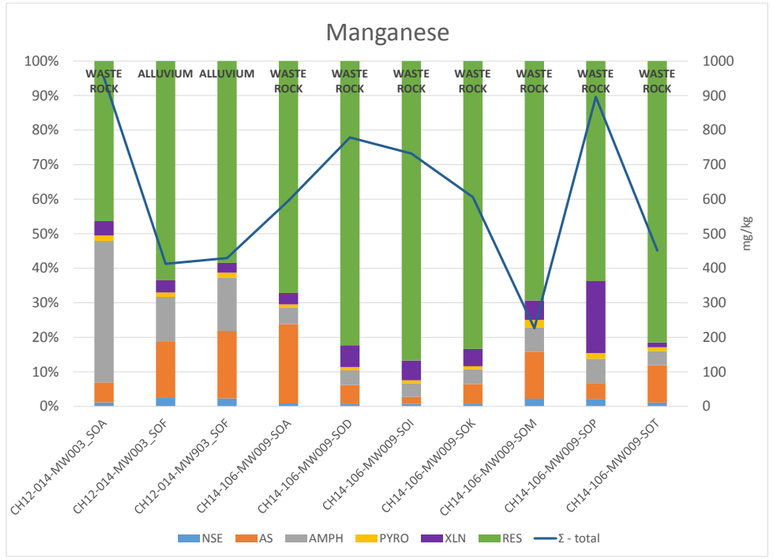
FIGURE 3-7
Total Iron and Sulphur - CH12-014-MW003
Faro Mine Remediation Project

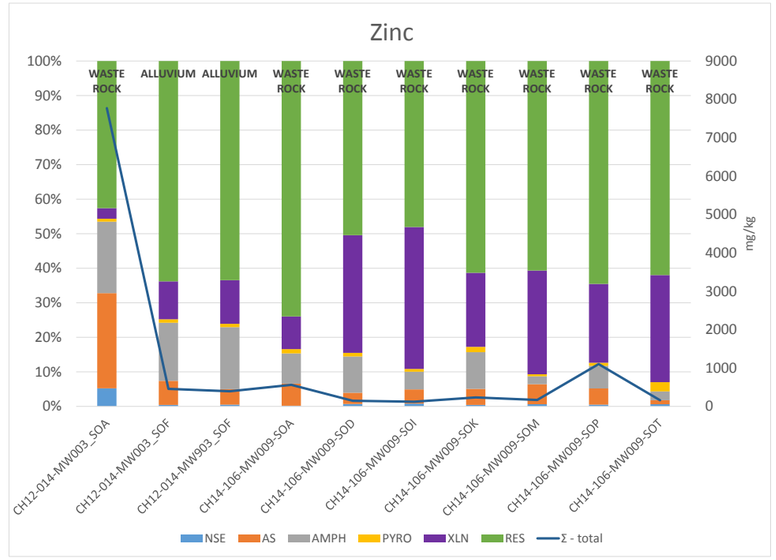


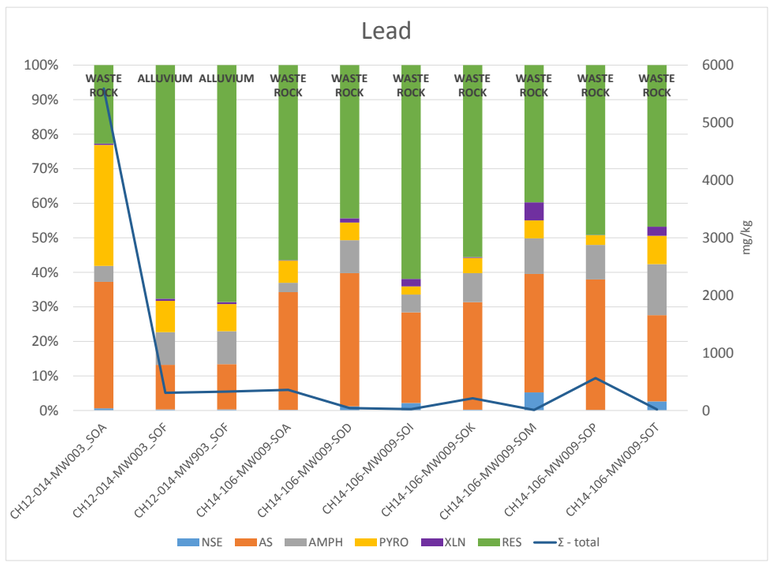
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

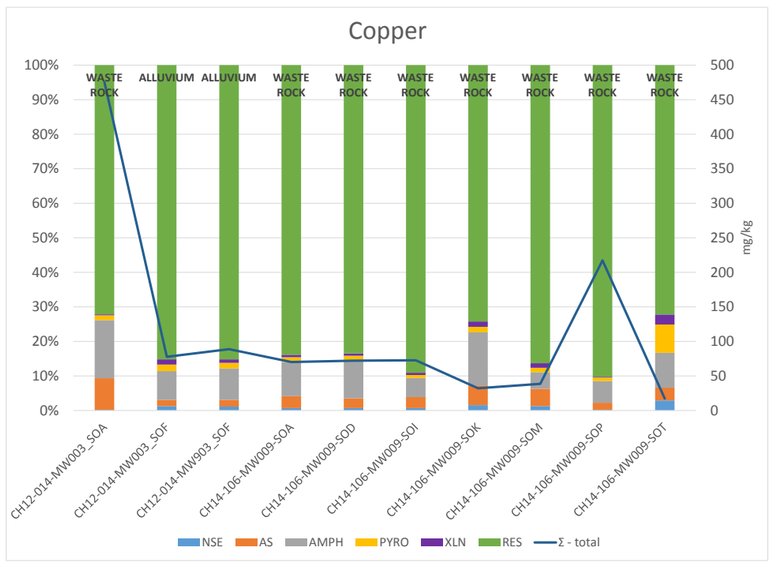
FIGURE 3-8
Select Total Trace Elements - CH12-014-MW003
Faro Mine Remediation Project

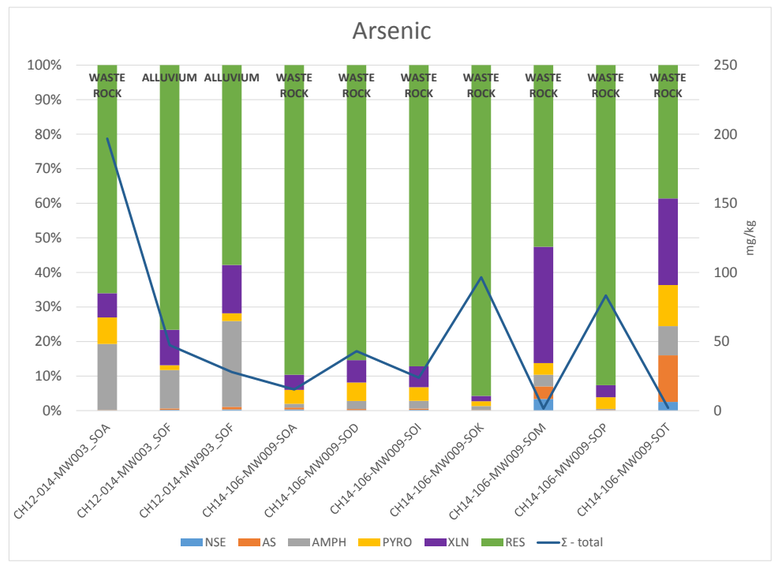






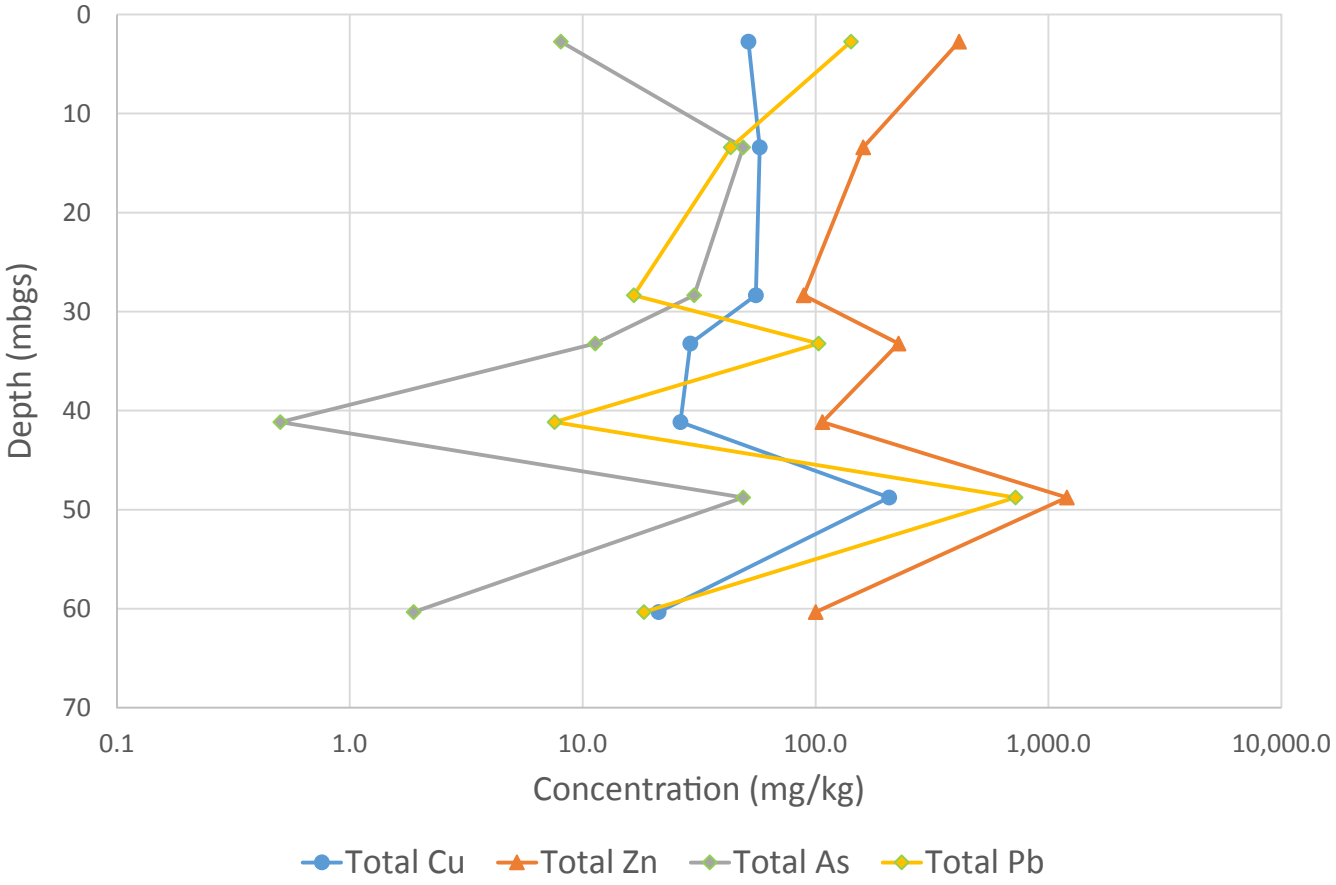






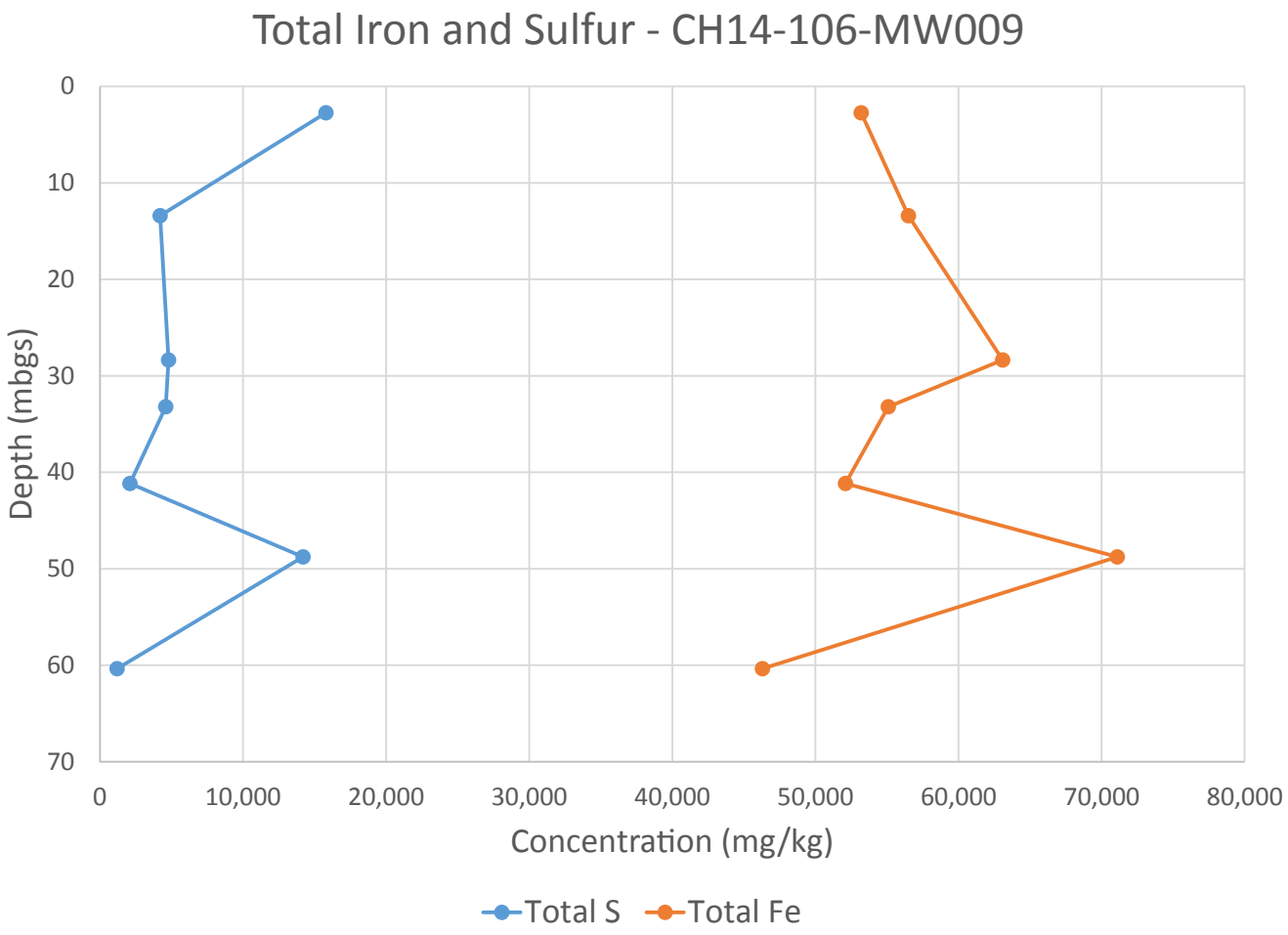
Note:
mg/kg = milligram per kilogram

FIGURE 3-9
Sequential Extraction Monitoring Results for the Main Dump Boreholes
Faro Mine Remediation Project



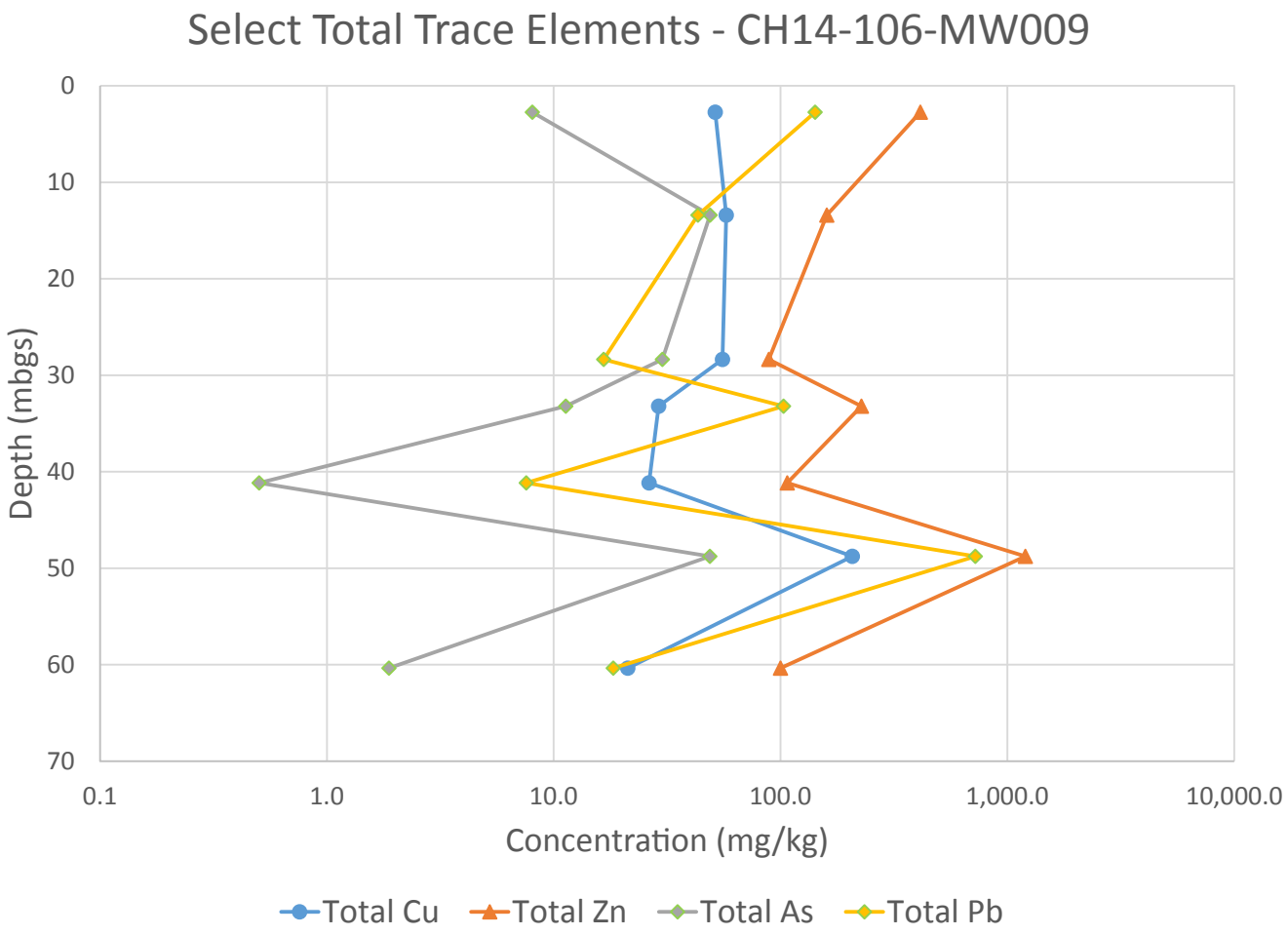
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 3-10
Select Total Trace Elements - CH14-106-MW009
Faro Mine Remediation Project



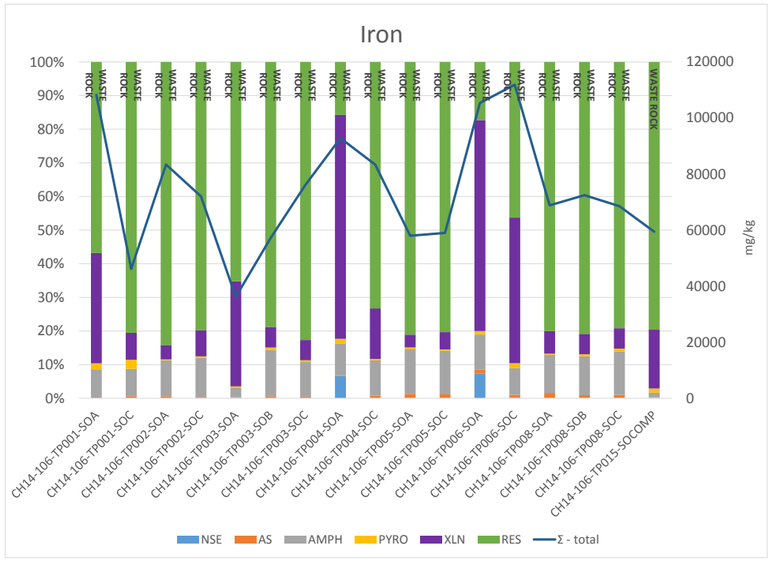
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

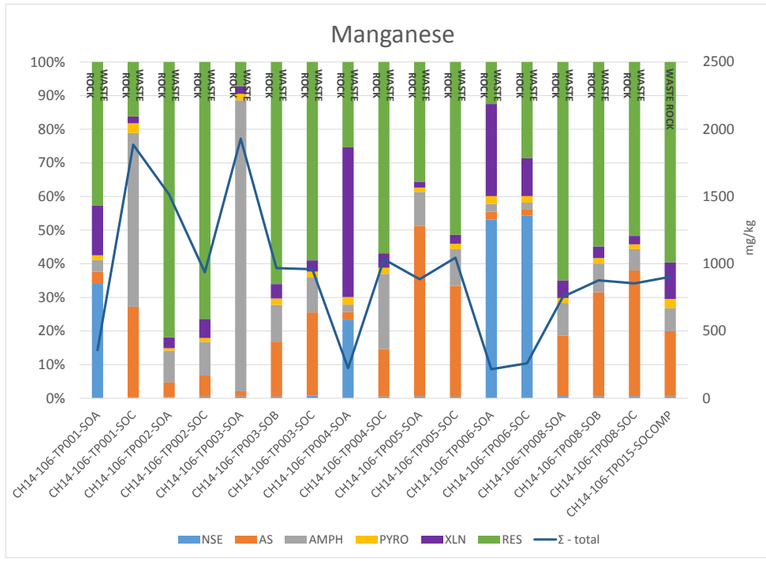
FIGURE 3-10
Total Iron and Sulphur - CH14-106-MW009
Faro Mine Remediation Project

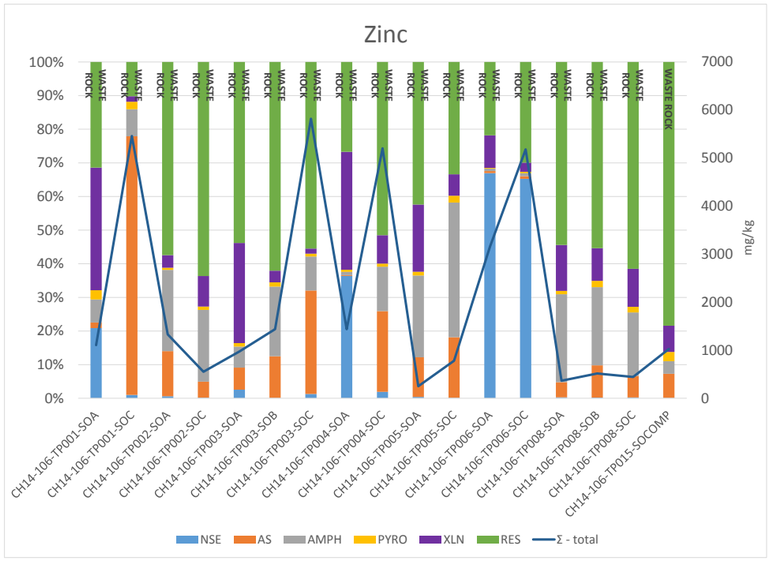


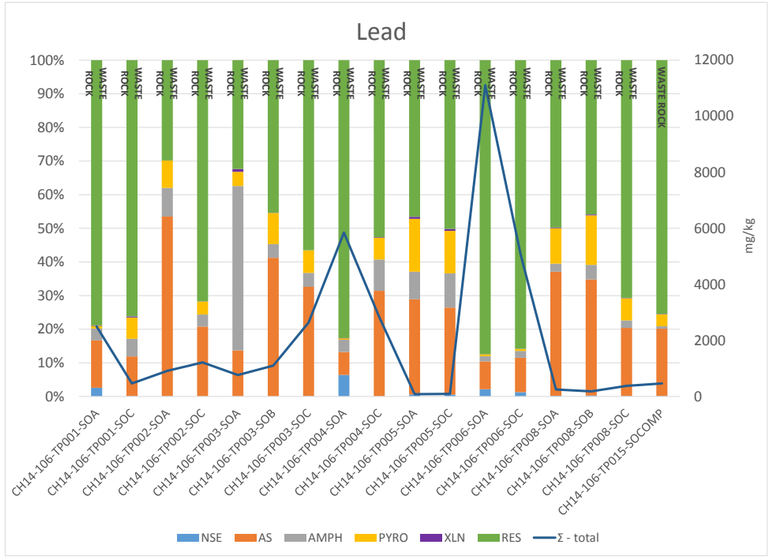
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

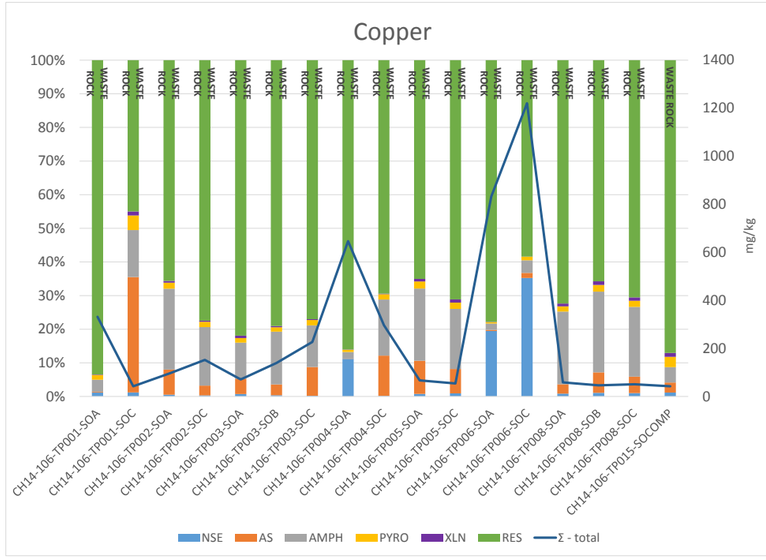
FIGURE 3-11
Select Total Trace Elements - CH14-106-MW009
Faro Mine Remediation Project

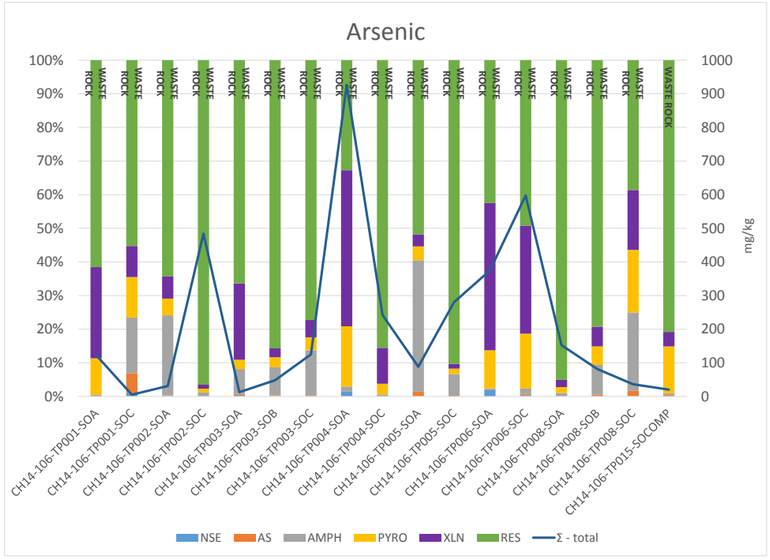






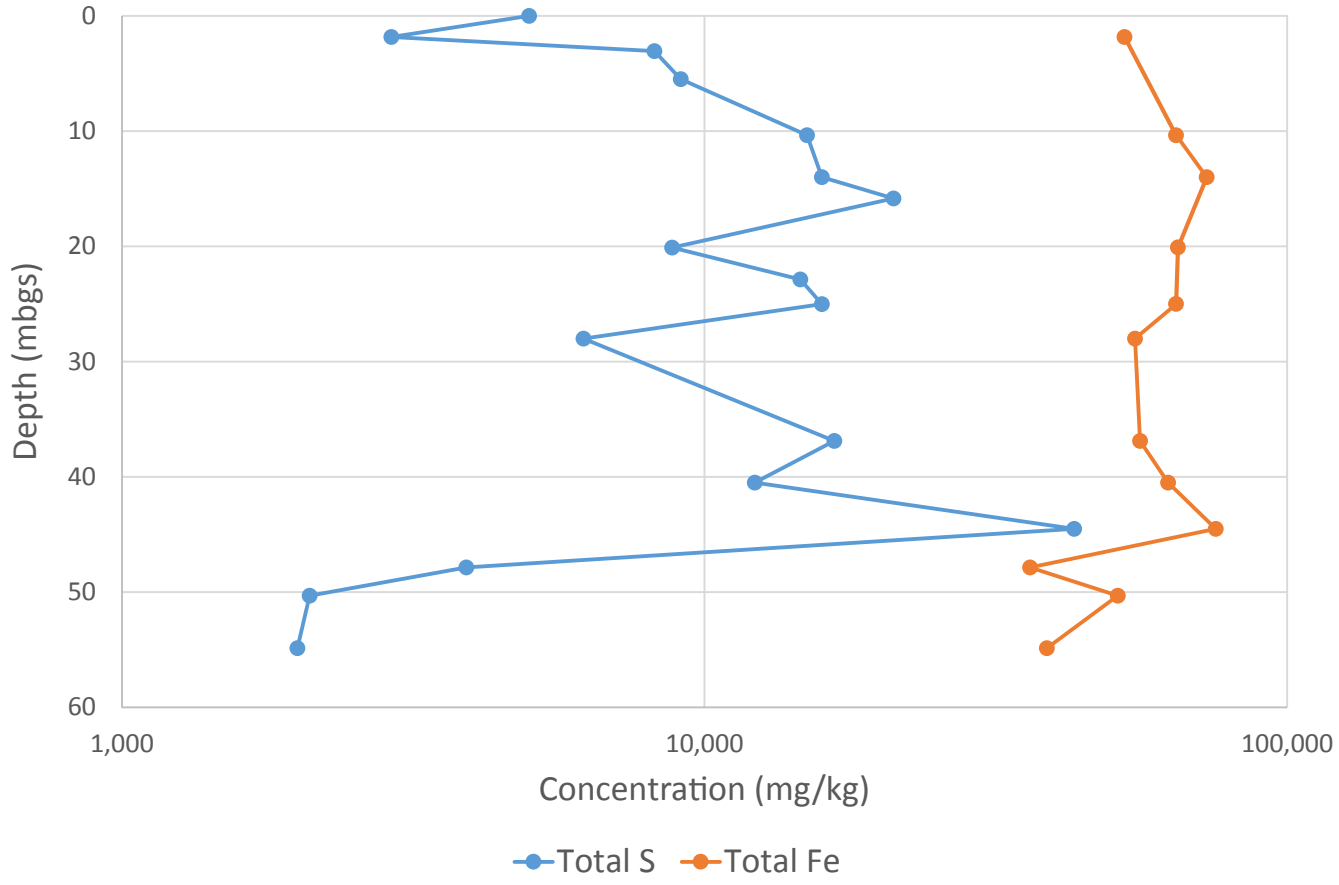






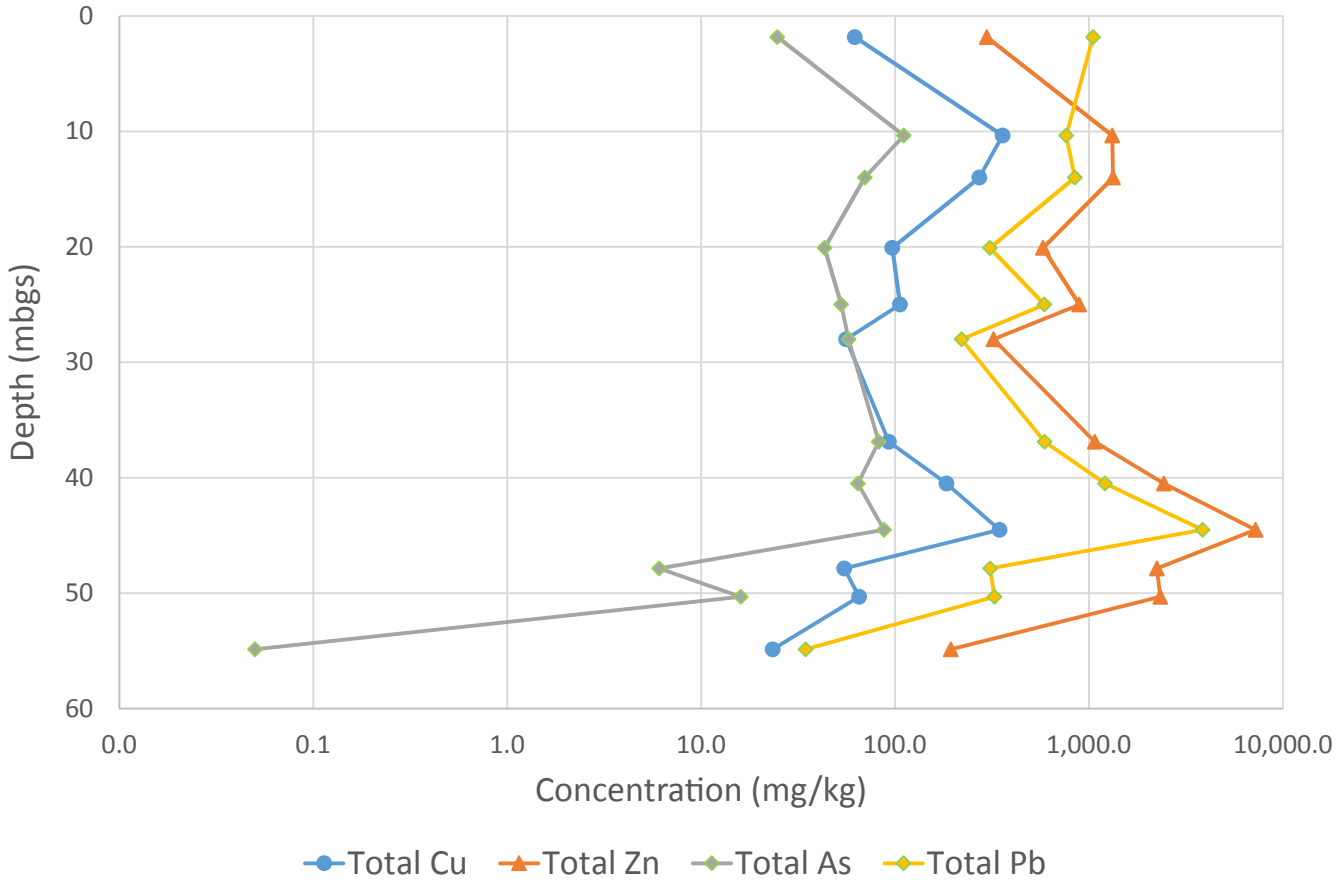
Note:
mg/kg = milligram per kilogram

FIGURE 3-12
Sequential Extraction Monitoring Results for Main Dump Test Pits
Faro Mine Remediation Project



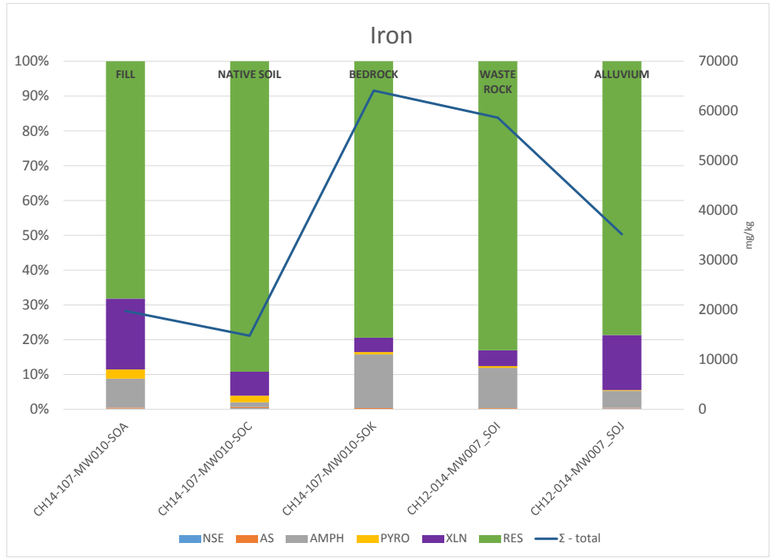
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

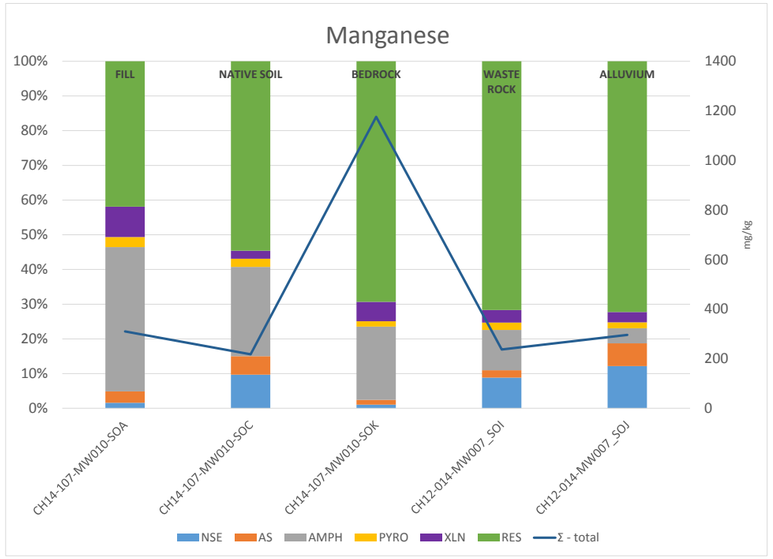
FIGURE 3-13
Total Iron and Sulphur - CH12-014-MW007
Faro Mine Remediation Project

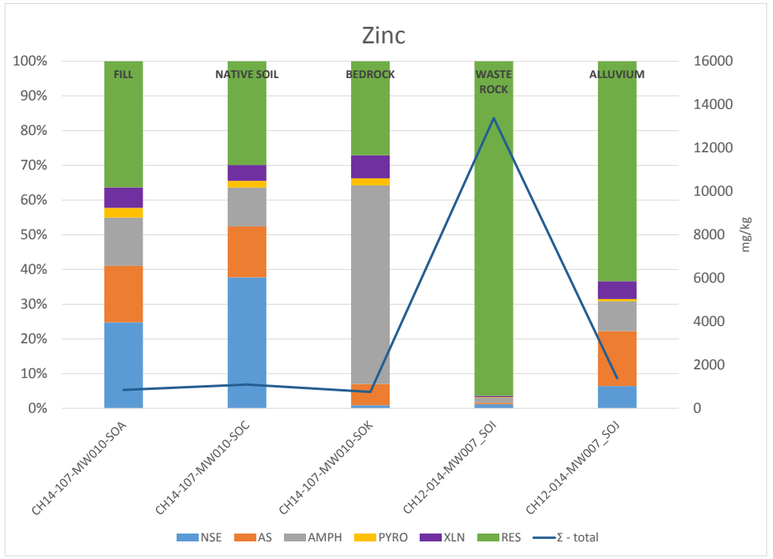


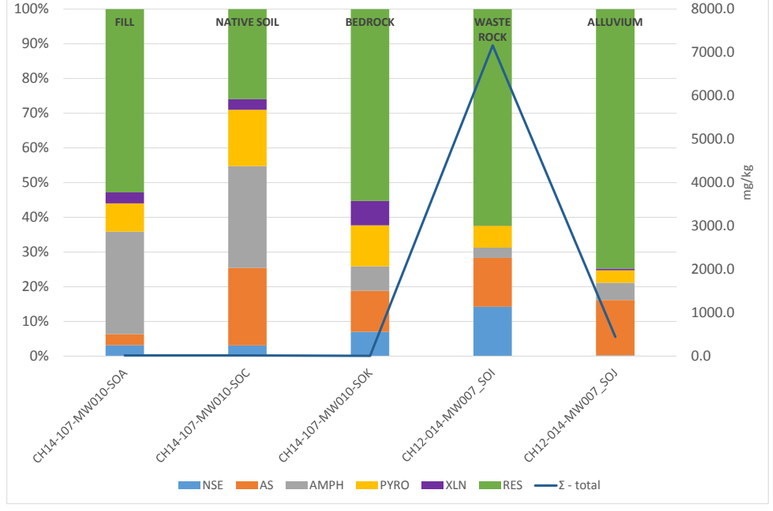
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

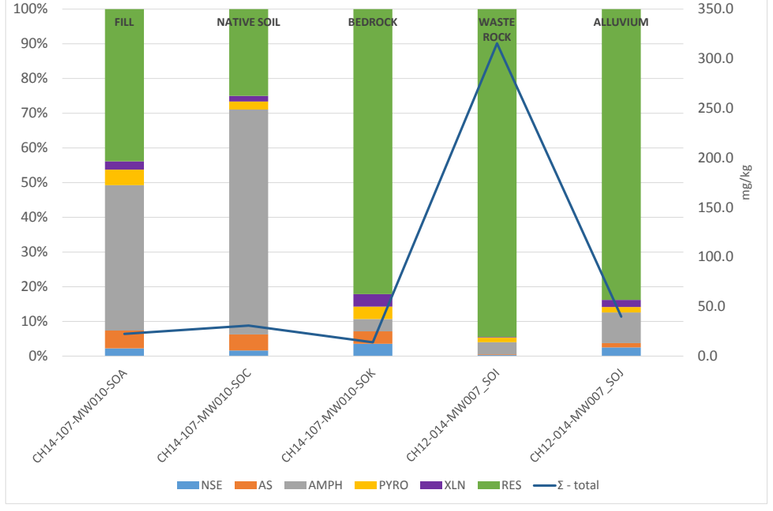
FIGURE 3-14
Select Total Trace Elements - CH12-014-MW007
Faro Mine Remediation Project

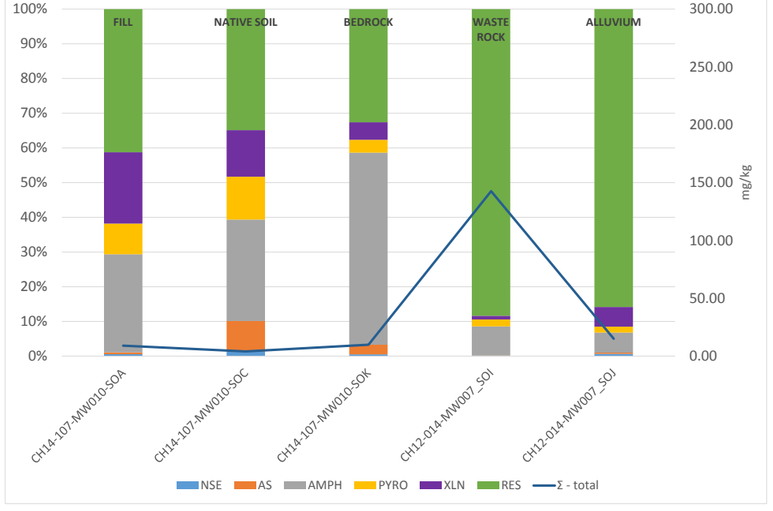






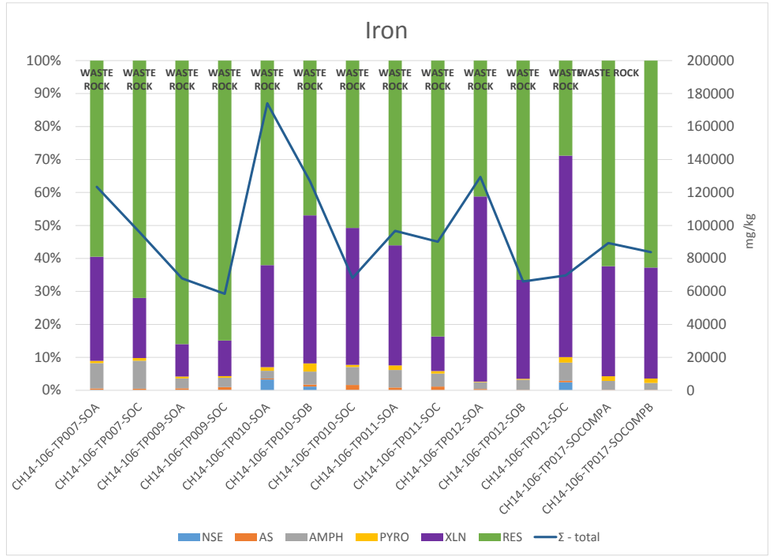


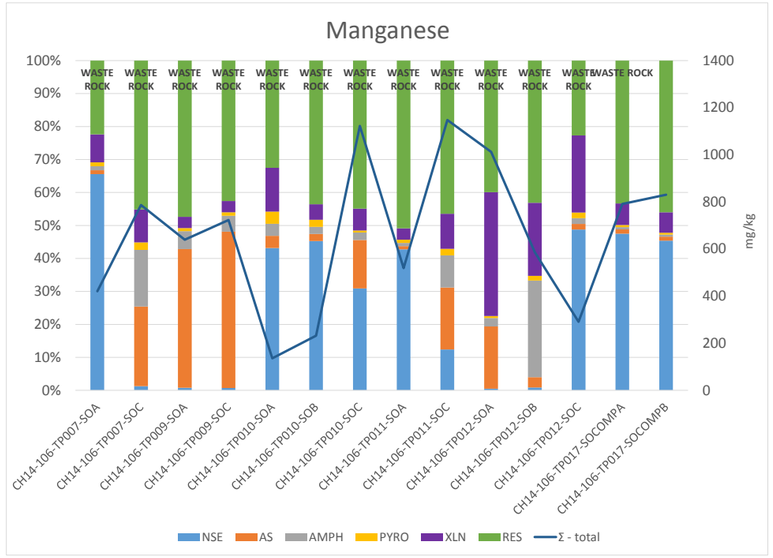


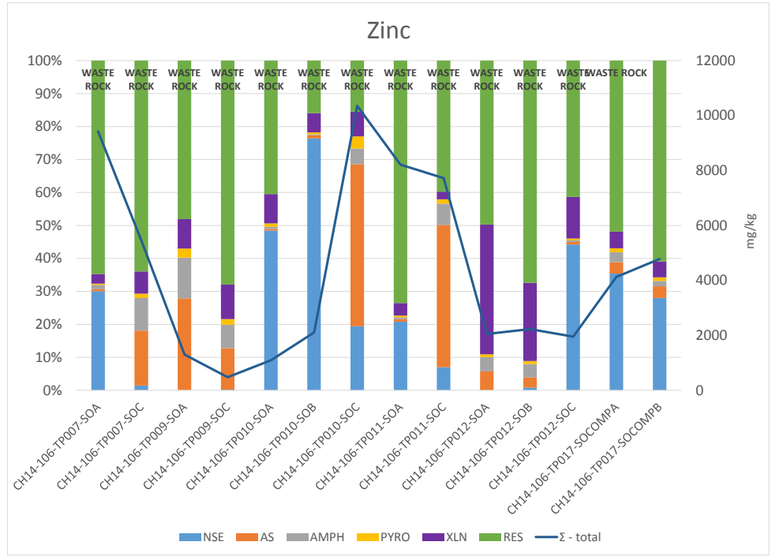


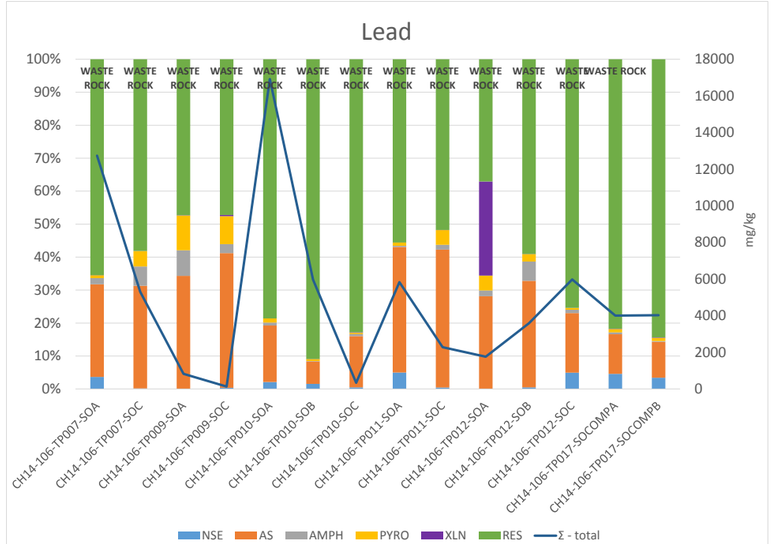
Note:
mg/kg = milligram per kilogram

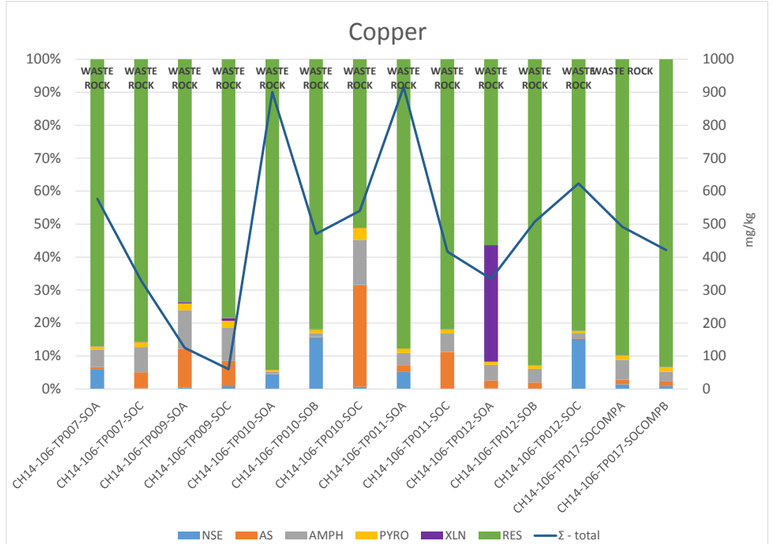
FIGURE 3-15
Sequential Extraction Monitoring Results for the Intermediate Dump and S-wells Boreholes
Faro Mine Remediation Project











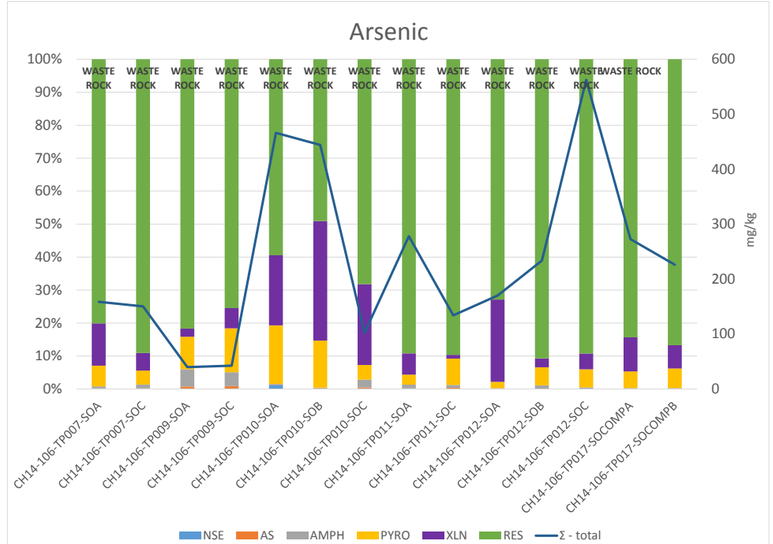
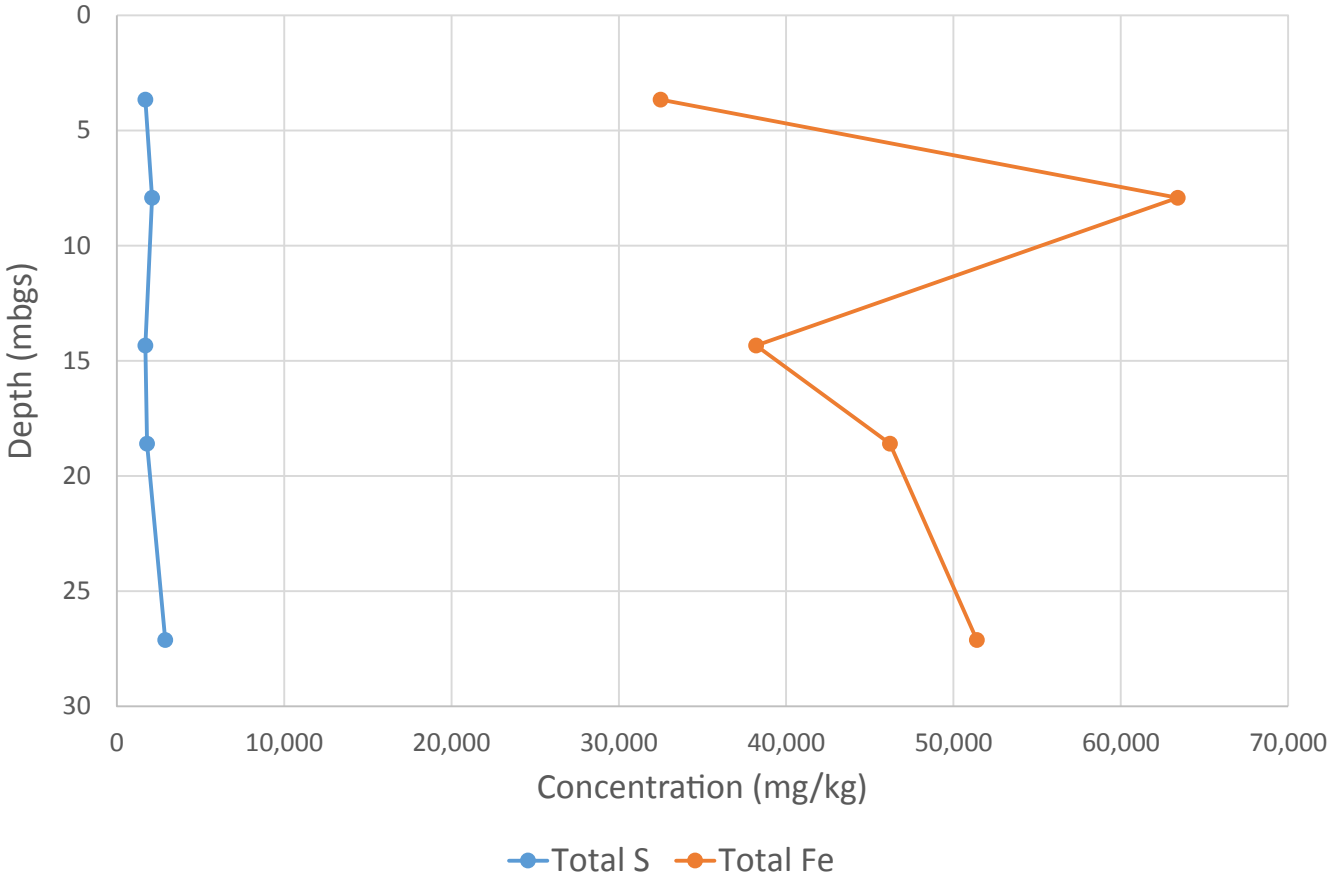


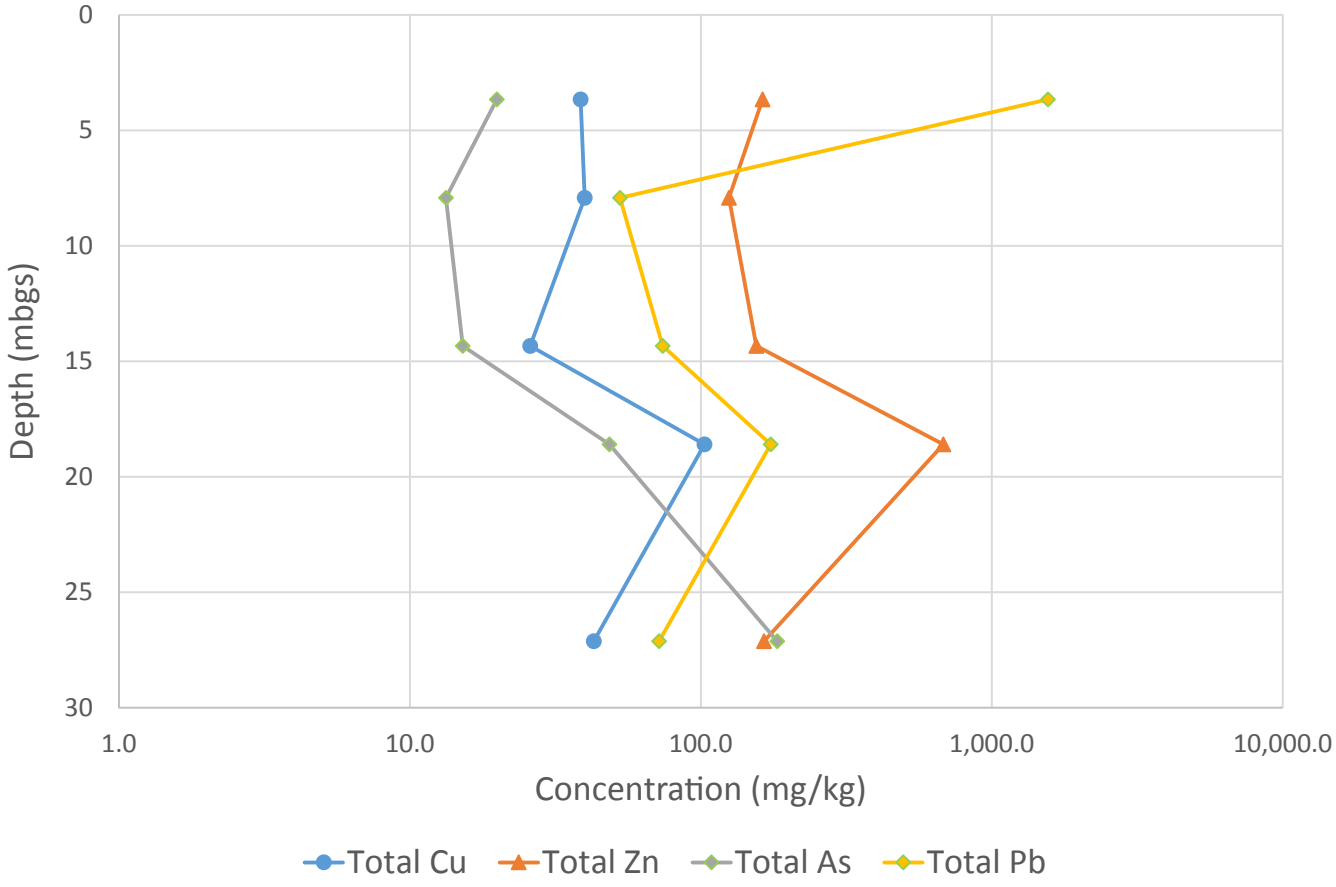
FIGURE 3-16
Sequential Extraction Results for the Intermediate Dump – Test Pits
Faro Mine Remediation Project

Note:
mg/kg = milligram per kilogram



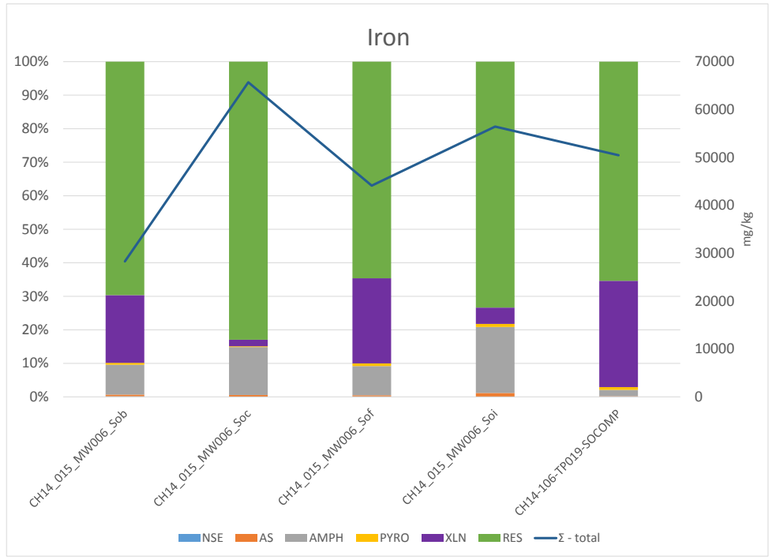
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

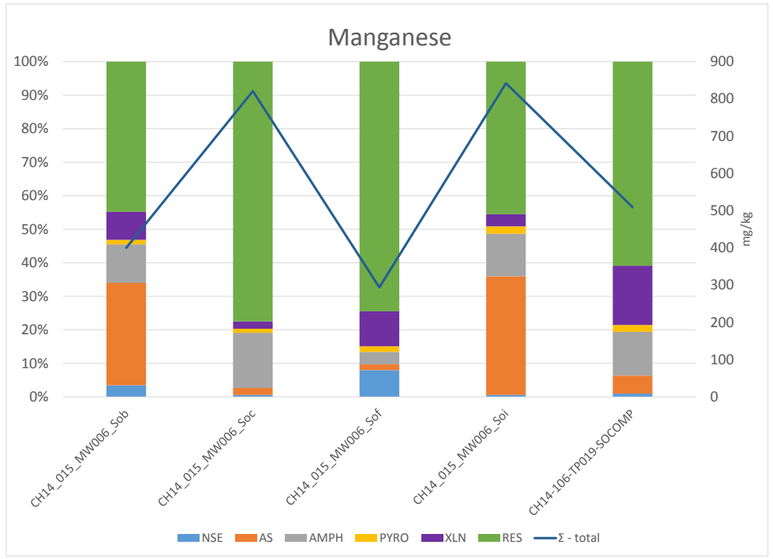
FIGURE 3-17
Total Iron and Sulphur - CH14-015-MW006
Faro Mine Remediation Project

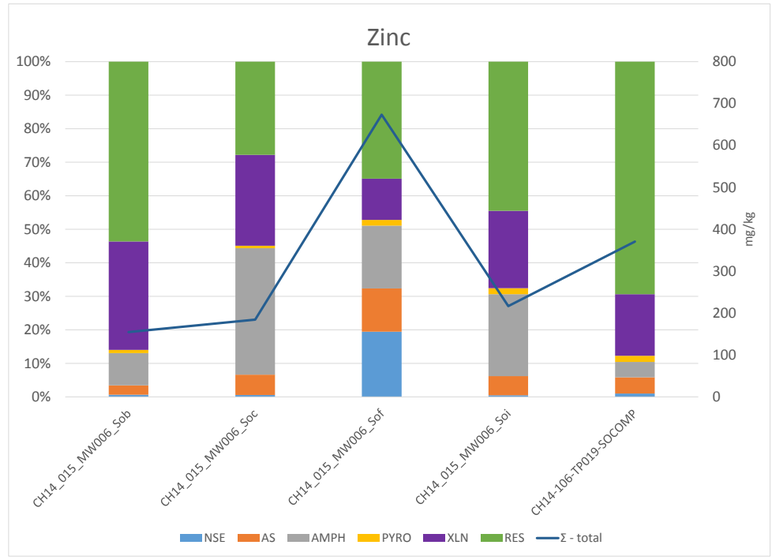


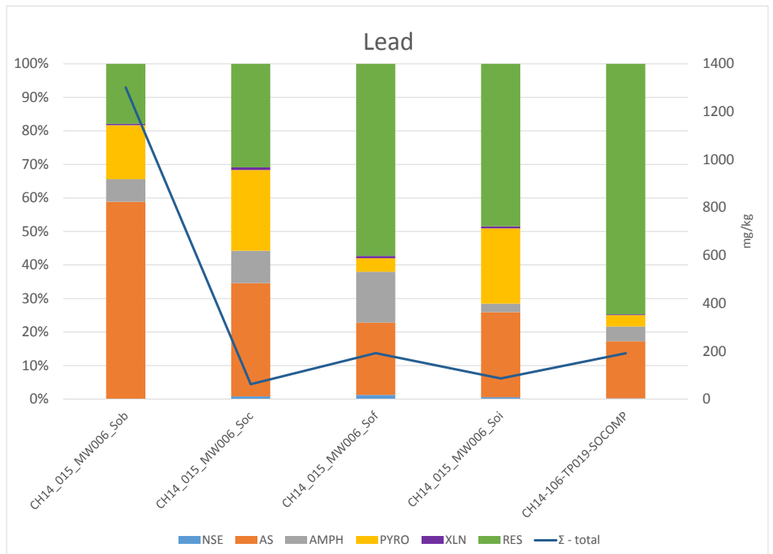
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

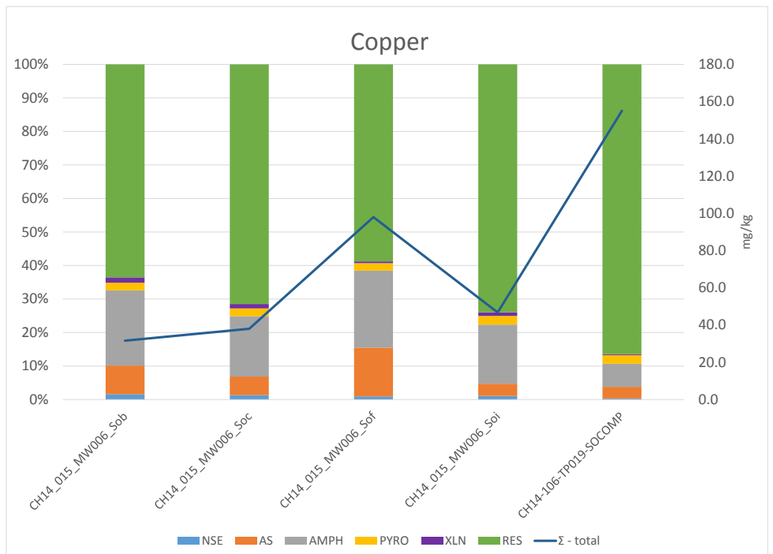
FIGURE 3-18
Select Total Trace Elements - CH14-015-MW006
Faro Mine Remediation Project

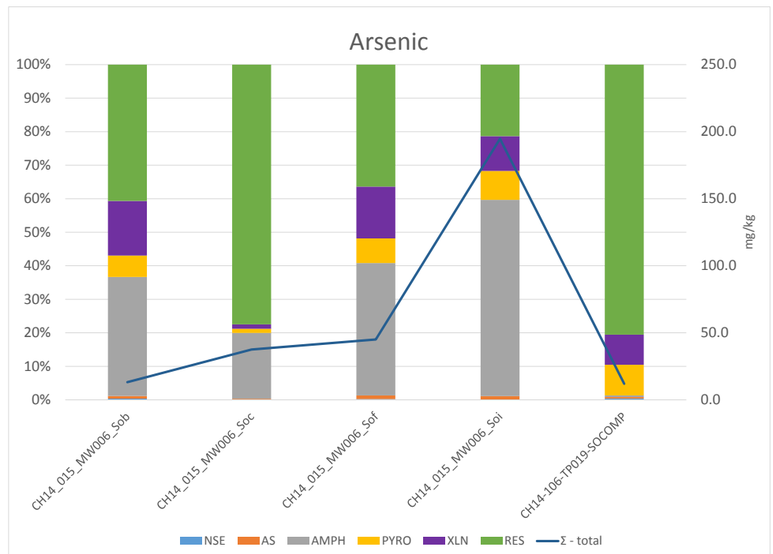






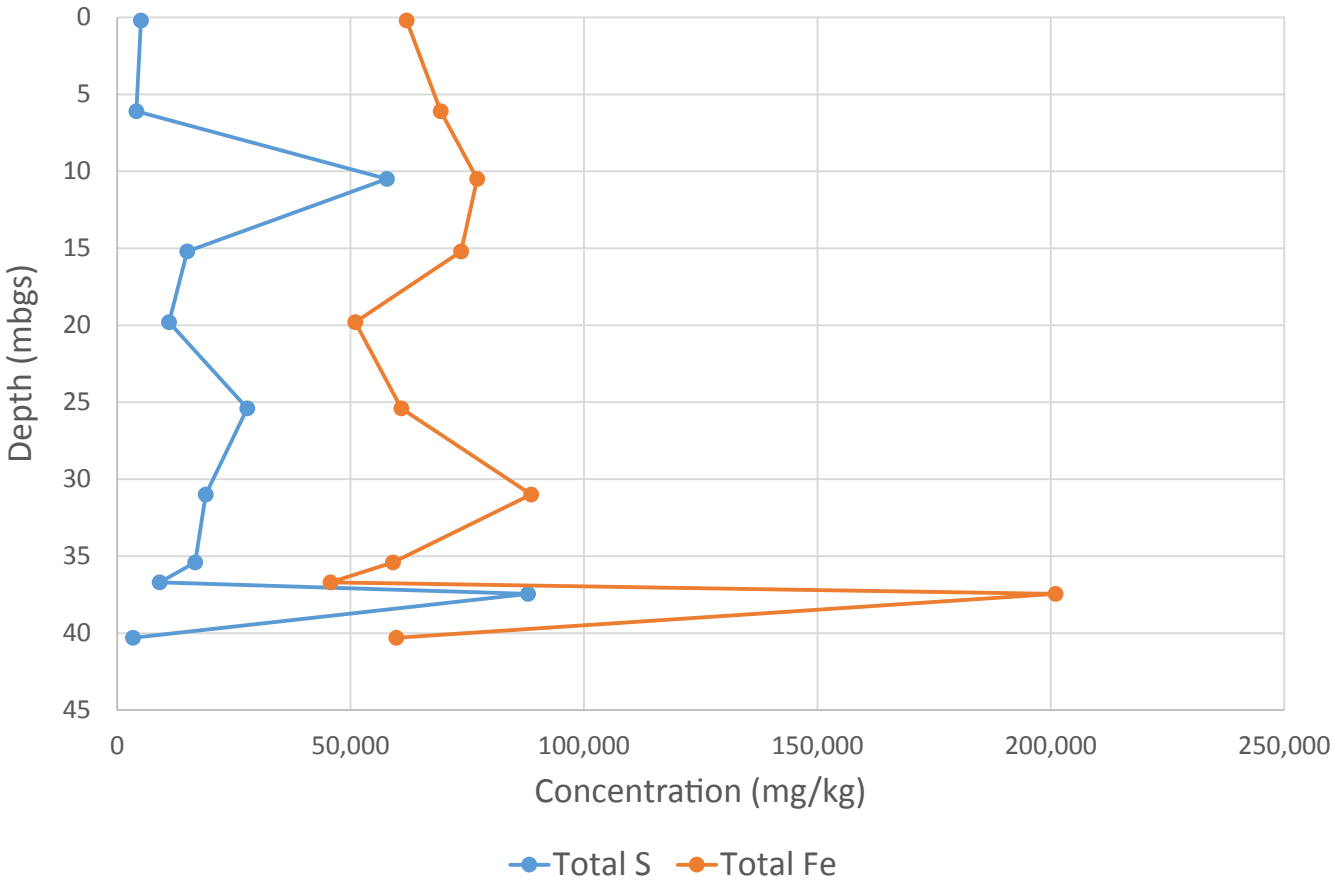






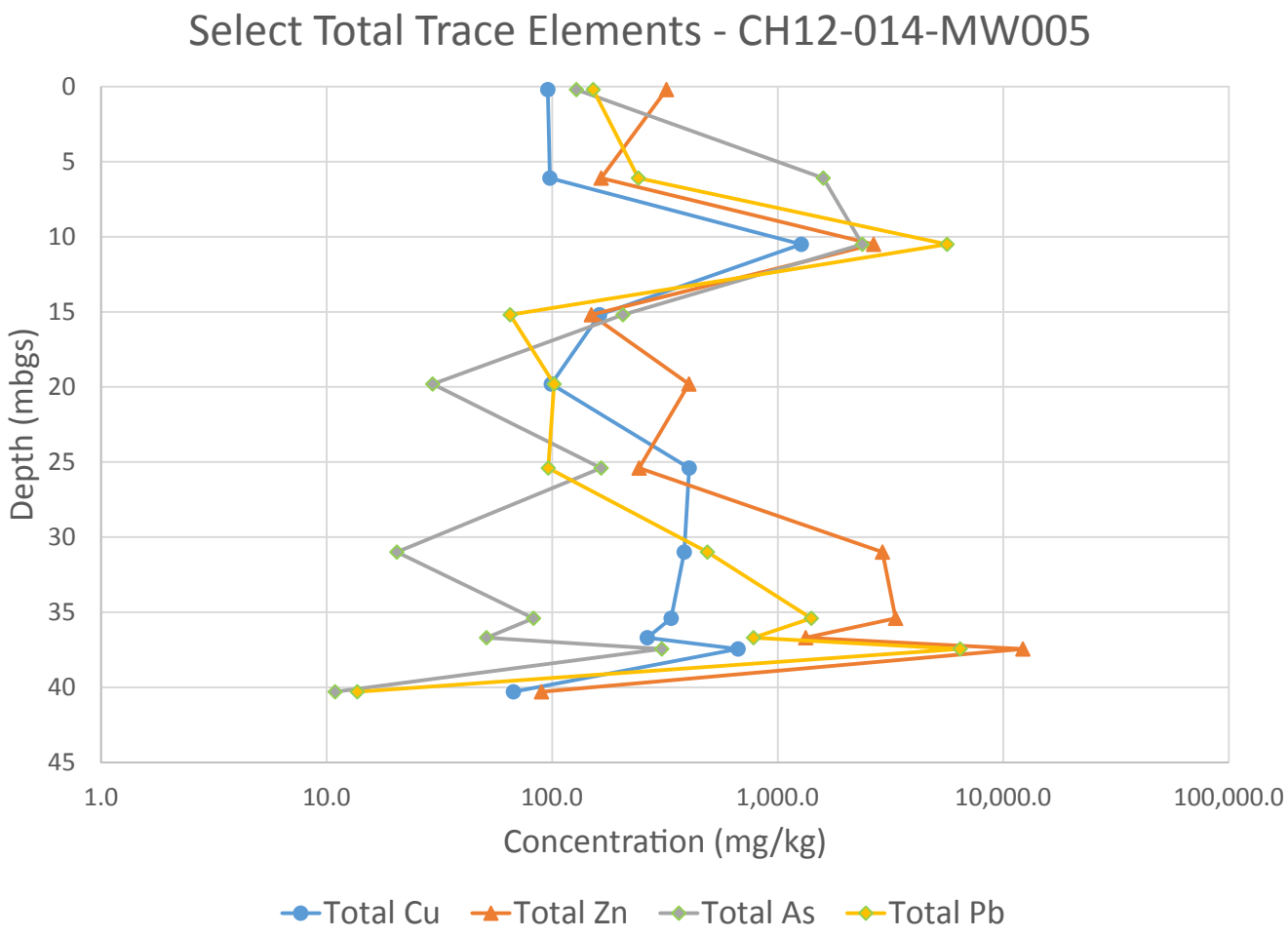
Note:
mg/kg = milligram per kilogram

FIGURE 3-19
Sequential Extract on Monitoring Results for Northeast Dump Borings and Test Pits
Faro Mine Remediation Project



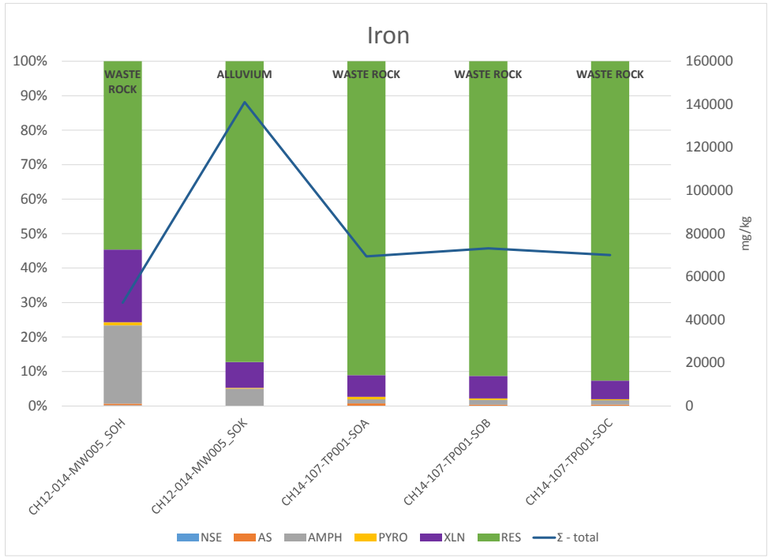
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

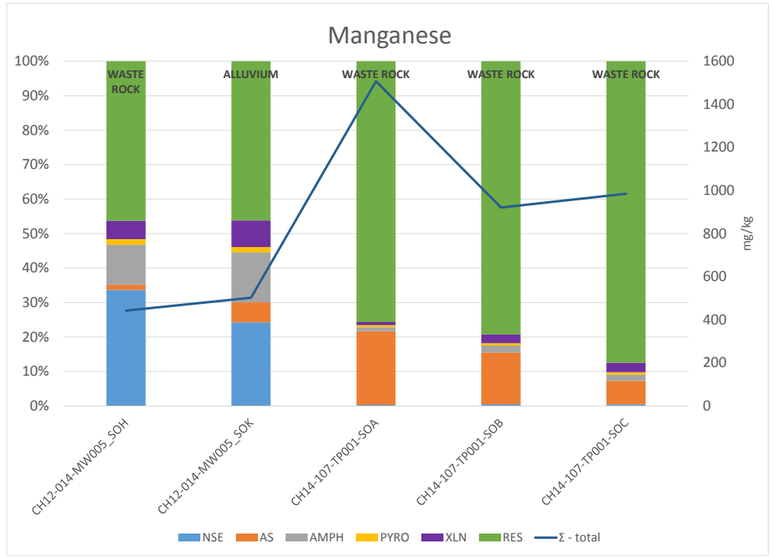
FIGURE 3-20
Total Iron and Sulphur - CH12-014-MW005
Faro Mine Remediation Project

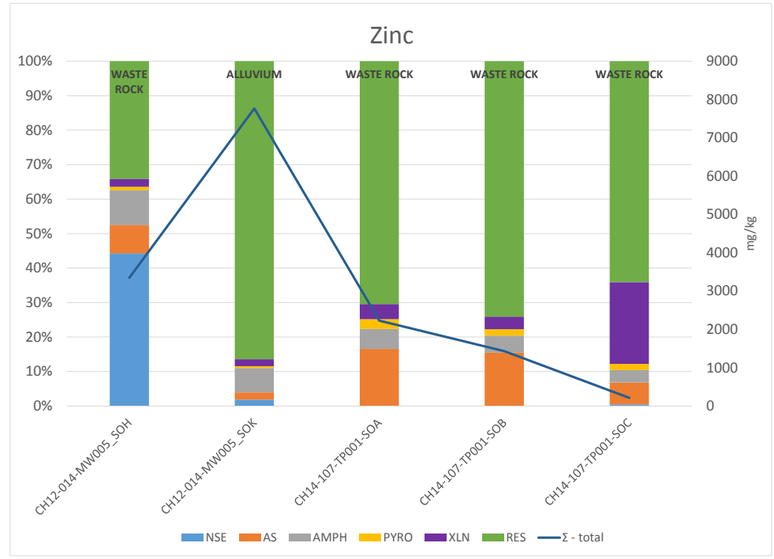


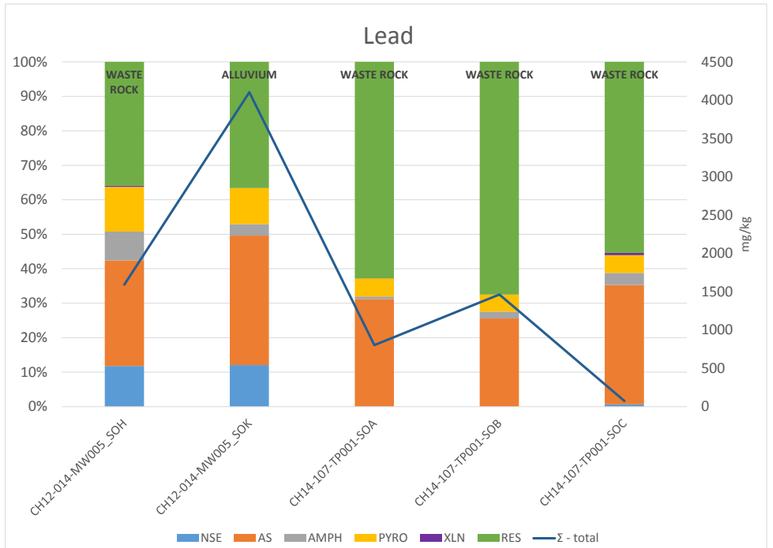
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

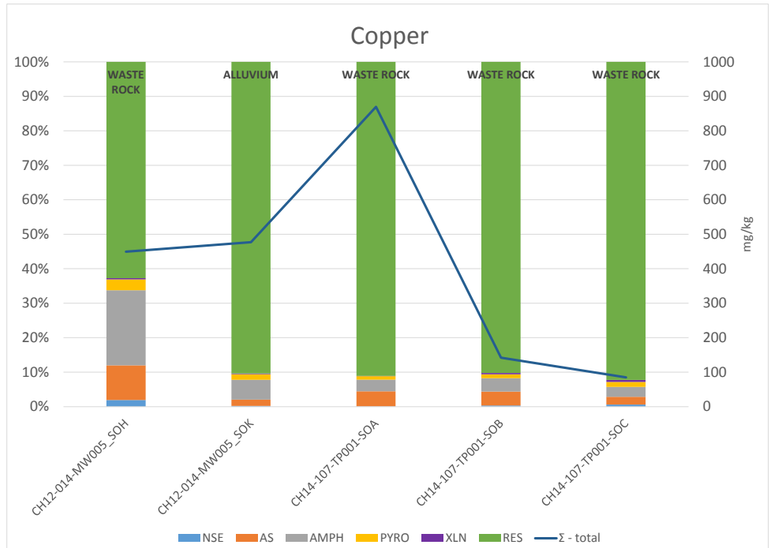
FIGURE 3-21
Select Total Trace Elements - CH12-014-MW005
Faro Mine Remediation Project

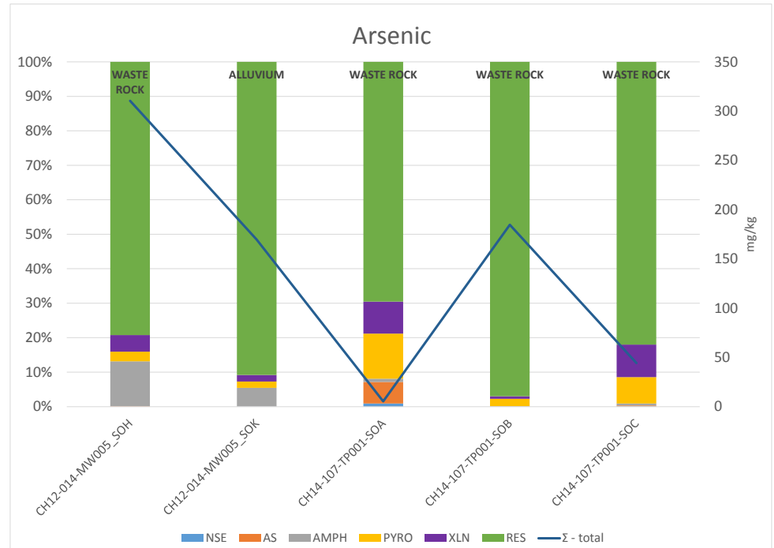






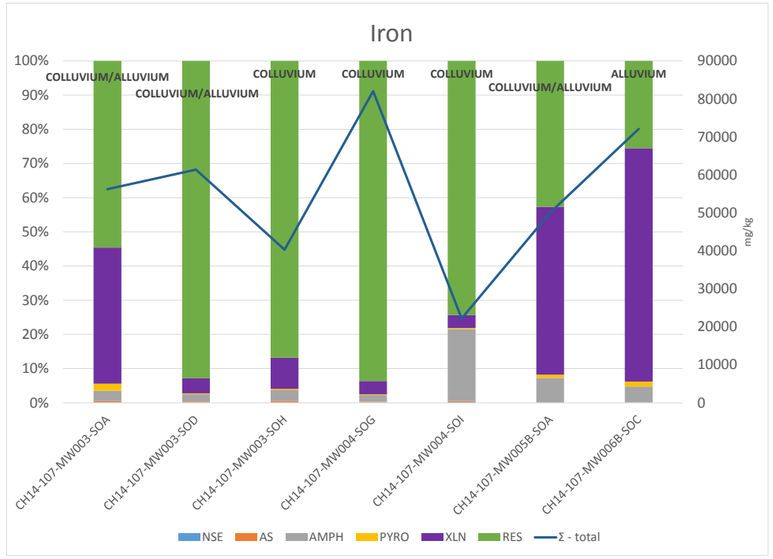


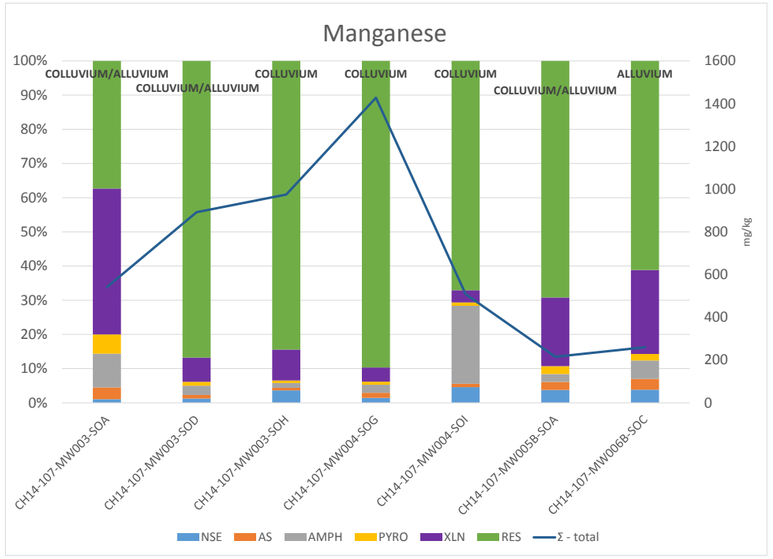


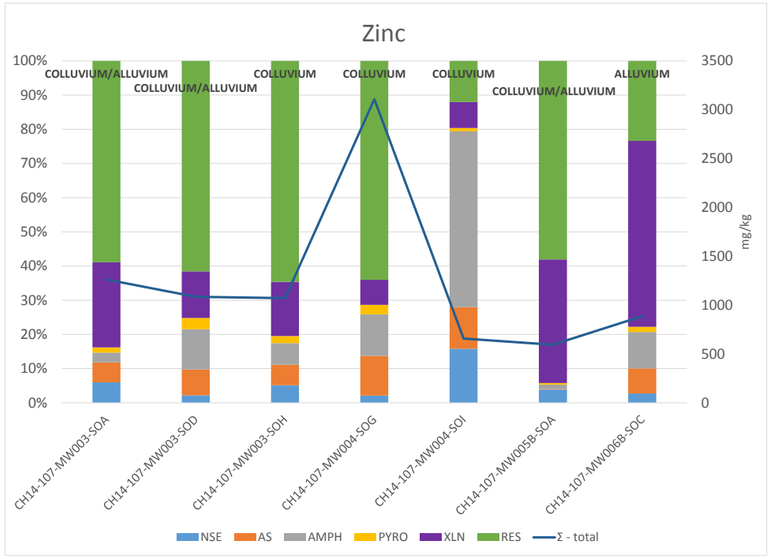


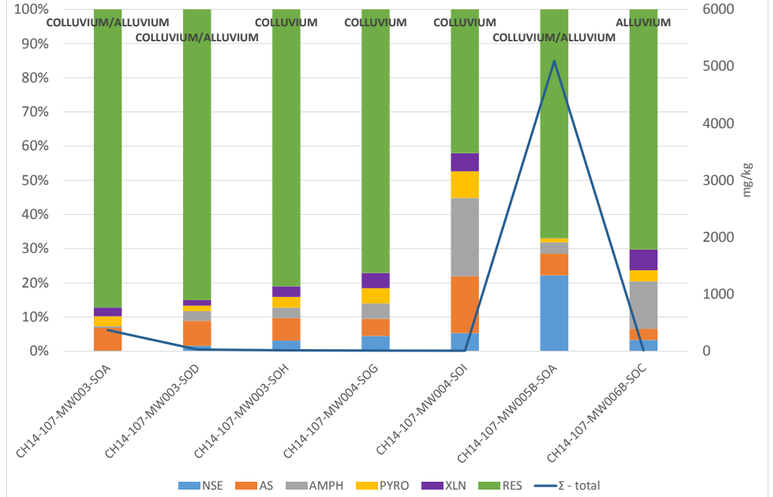
Note:
mg/kg = milligram per kilogram

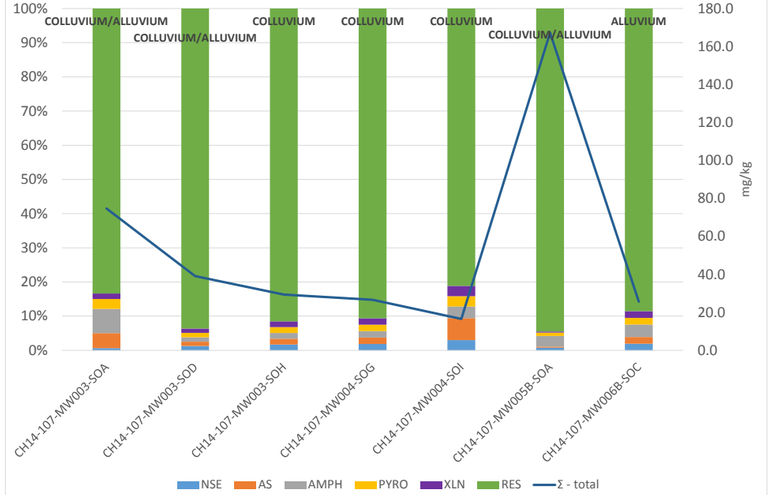
FIGURE 3-22
Sequential Extraction Monitoring Results for the Zone II Waste Rock Dump Boreholes and Test Pits
Faro Mine Remediation Project

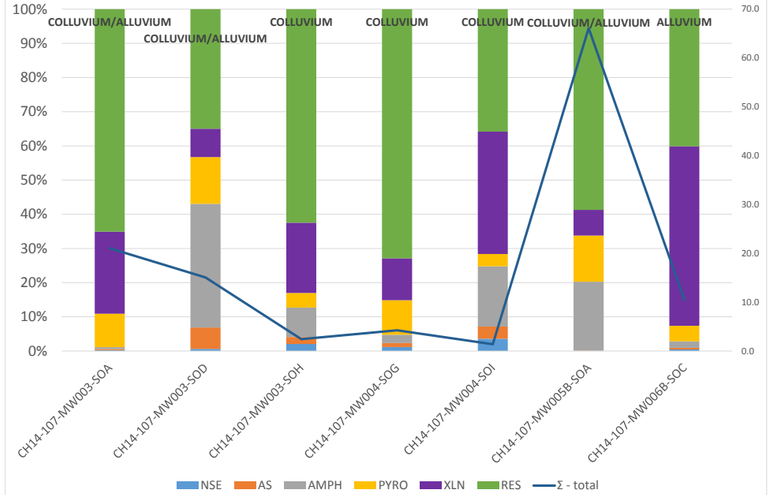






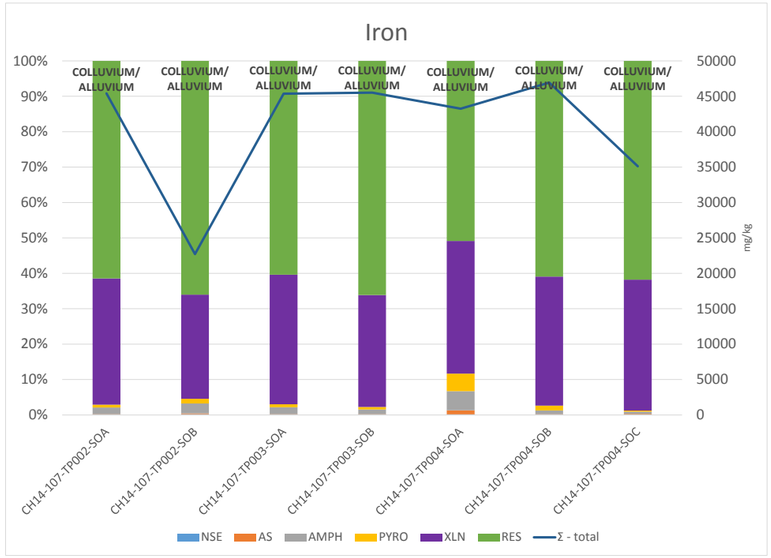


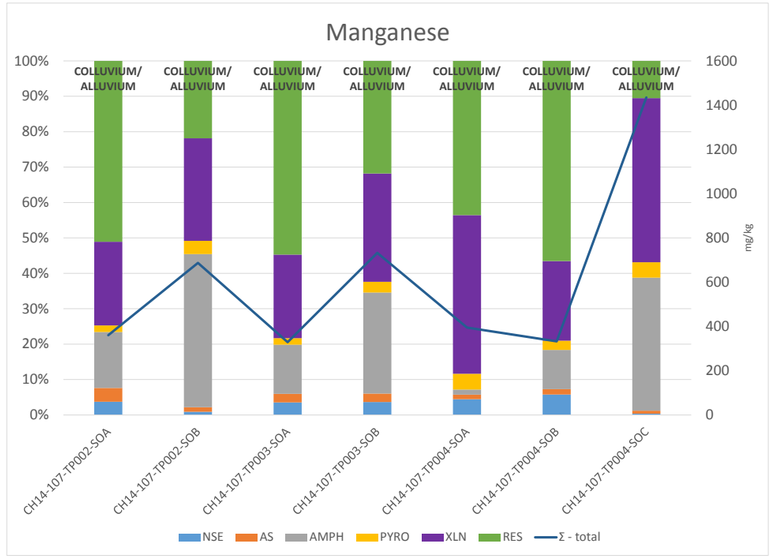


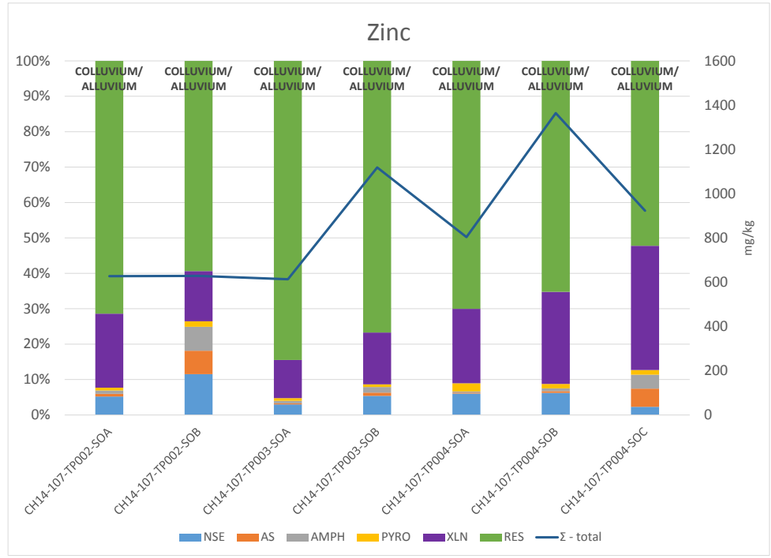


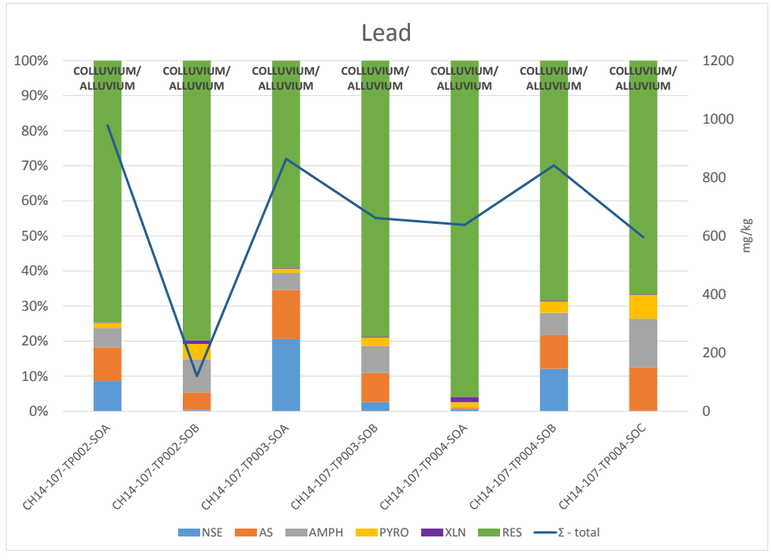
Note:
mg/kg = milligram per kilogram

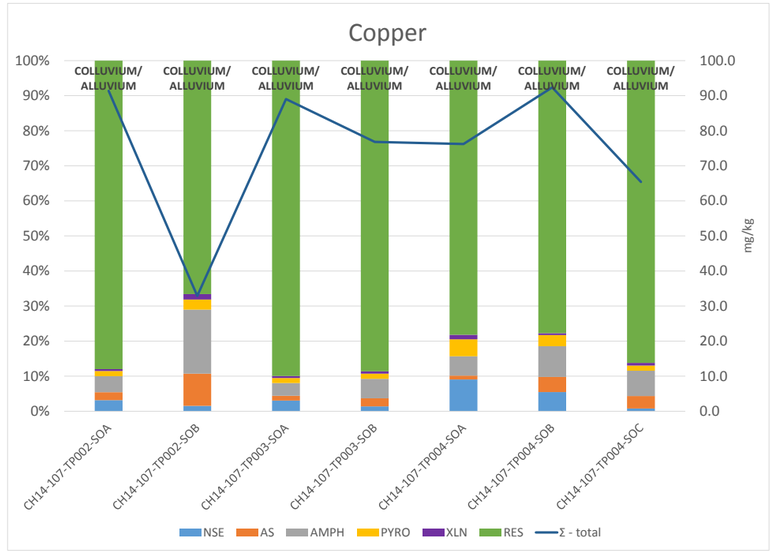
FIGURE 3-23
Sequential Extraction Monitoring Results for Zone II Outwash Boreholes
Faro Mine Remediation Project

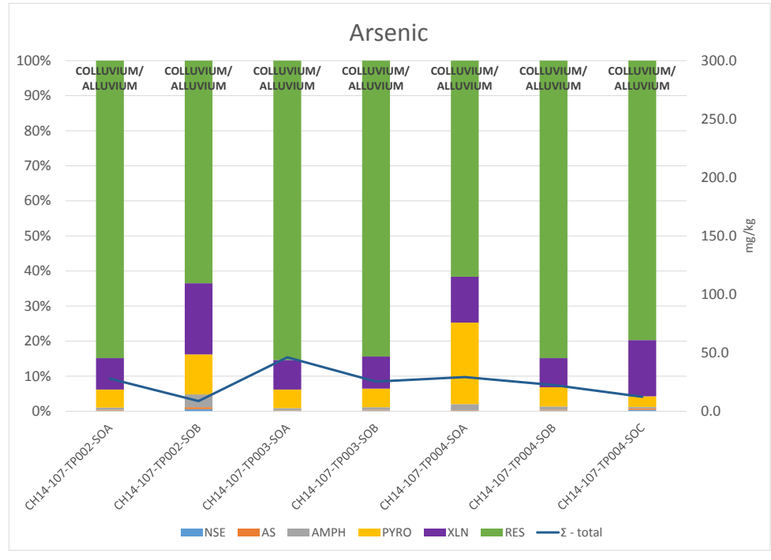






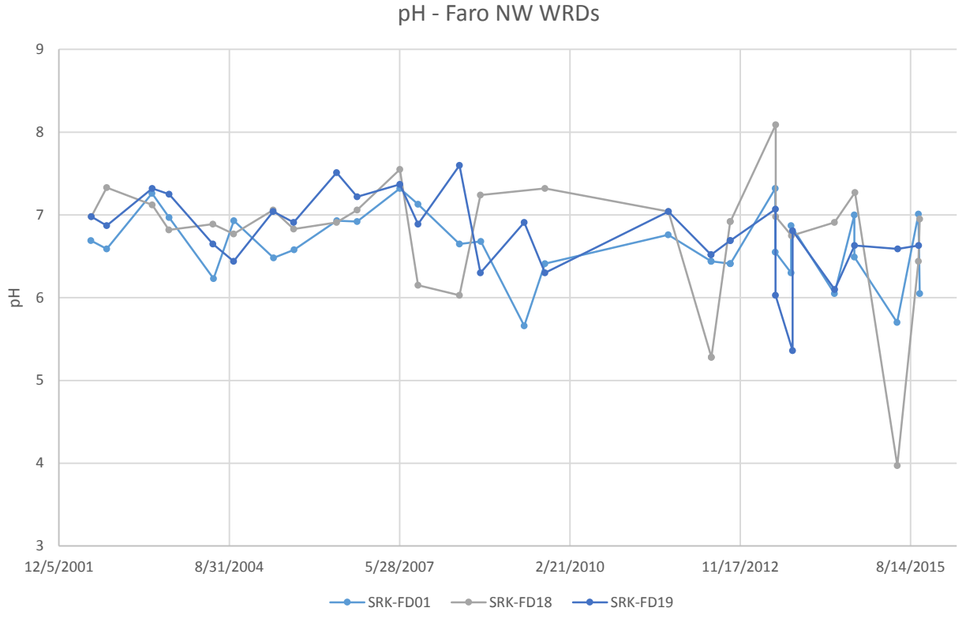


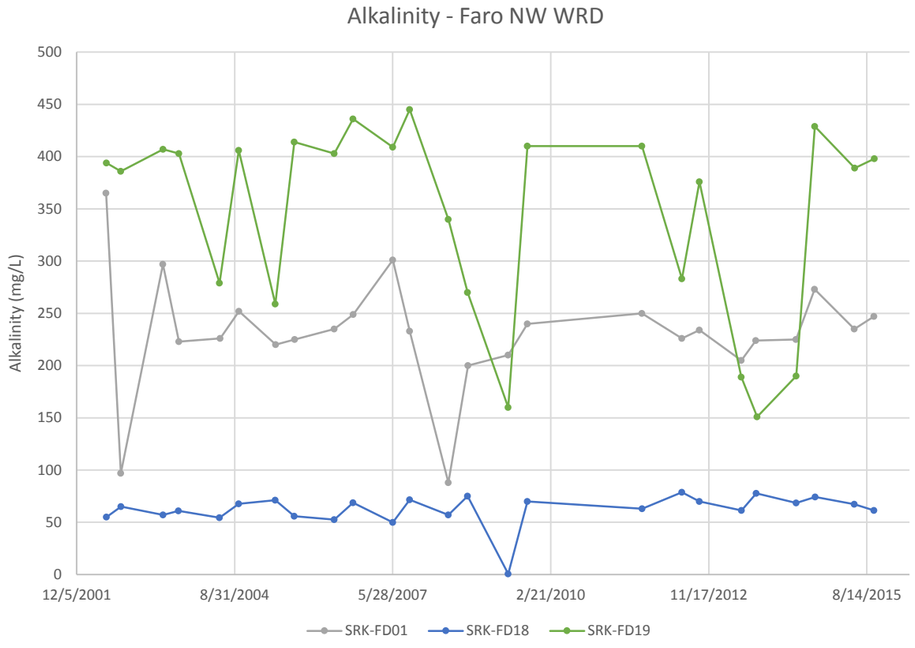


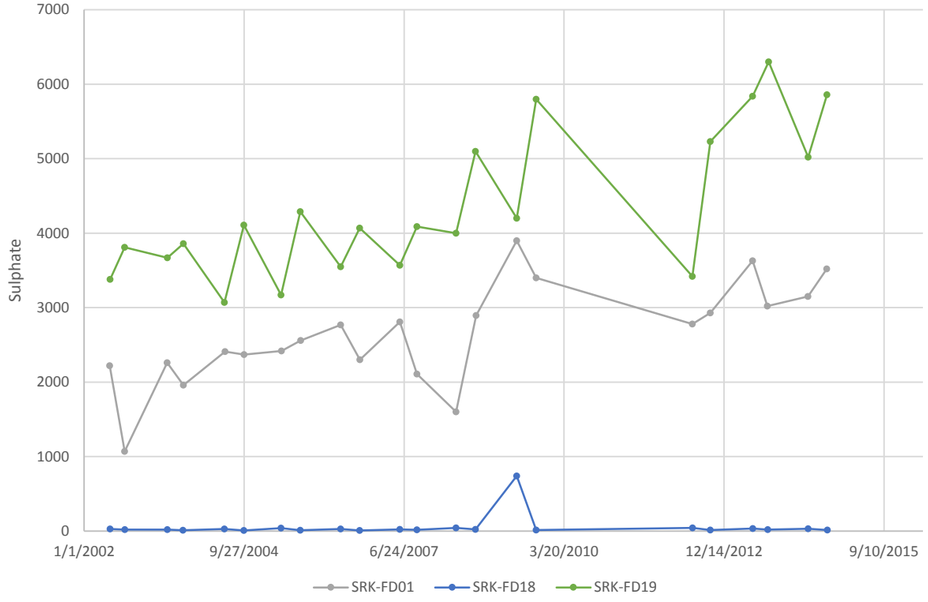


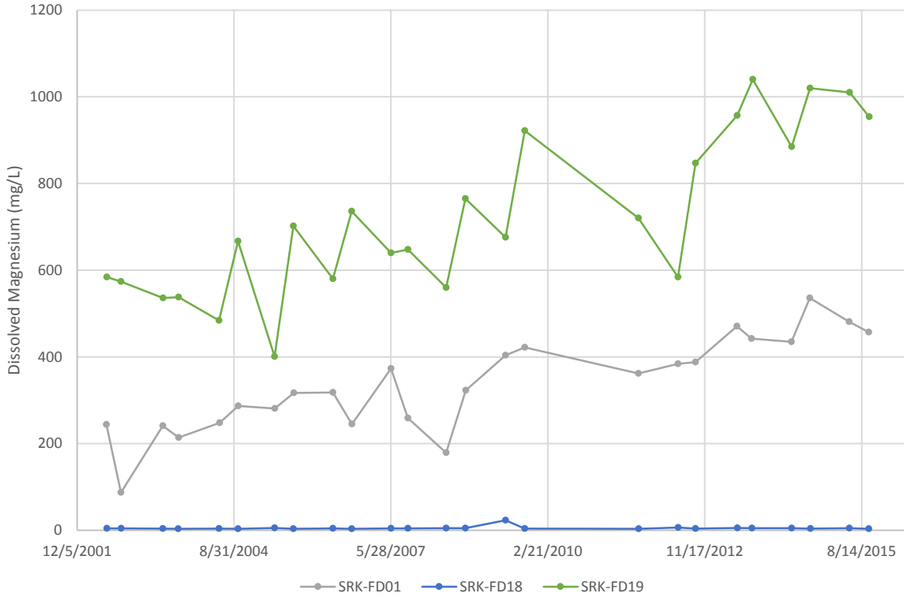
Note:
mg/kg = milligram per kilogram

FIGURE 3-24
Sequential Extraction Results for the Zone II Outwash Test Pits
Faro Mine Remediation Project



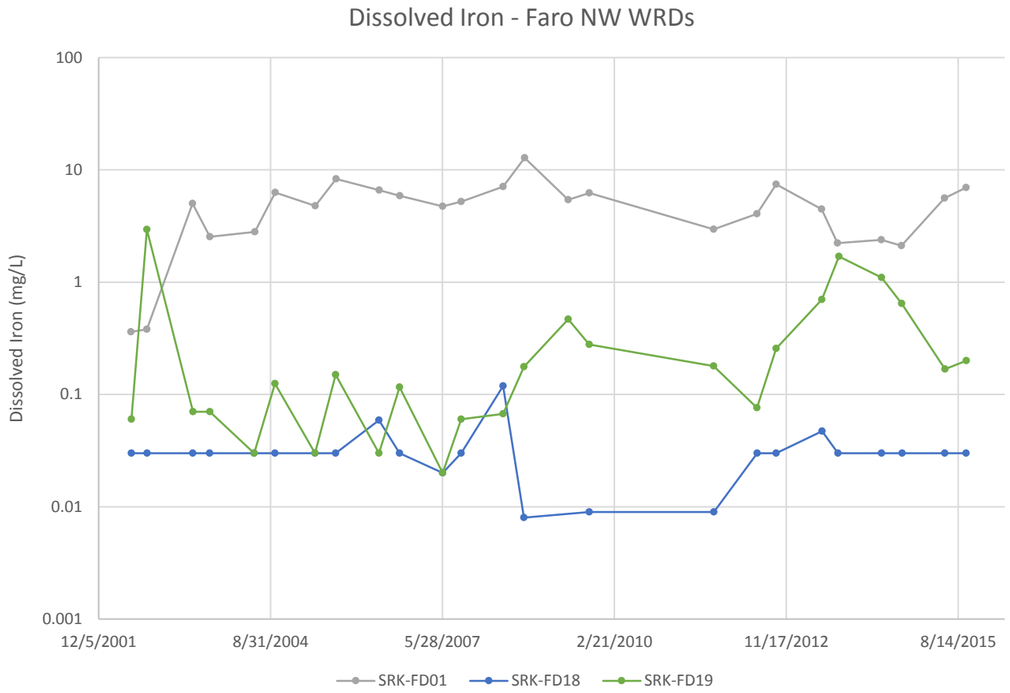


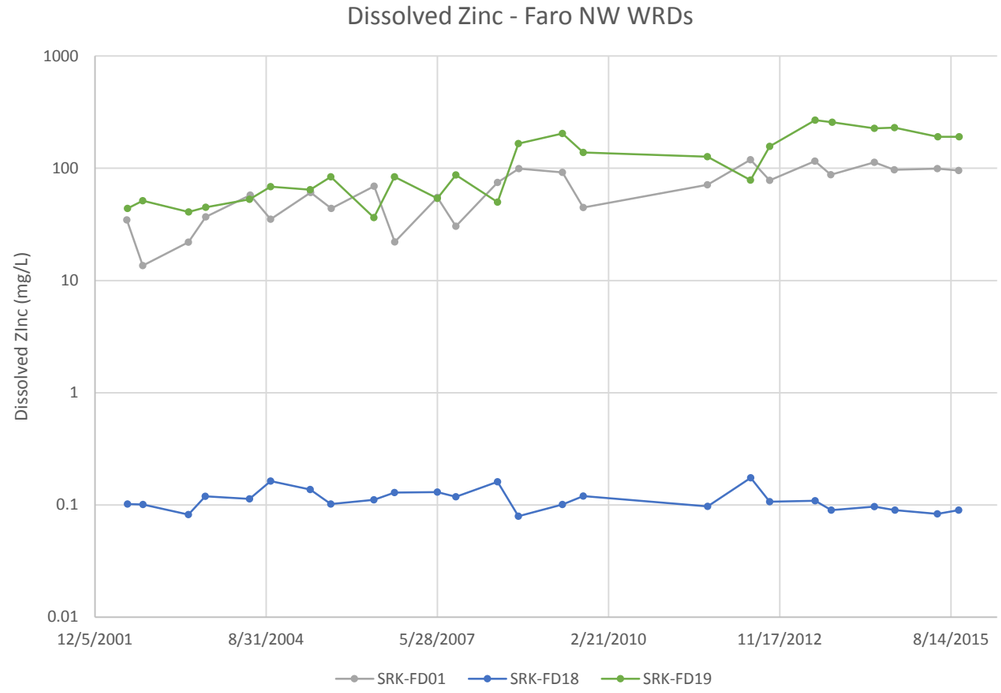




Notes:
NW WRD = Northwest Waste Rock Dump
mg/L = milligrams per litre

FIGURE 3-25 - *1 of 2*
Water Quality Time Series Trends - Northwest Waste Rock Dump
Faro Mine Remediation Project

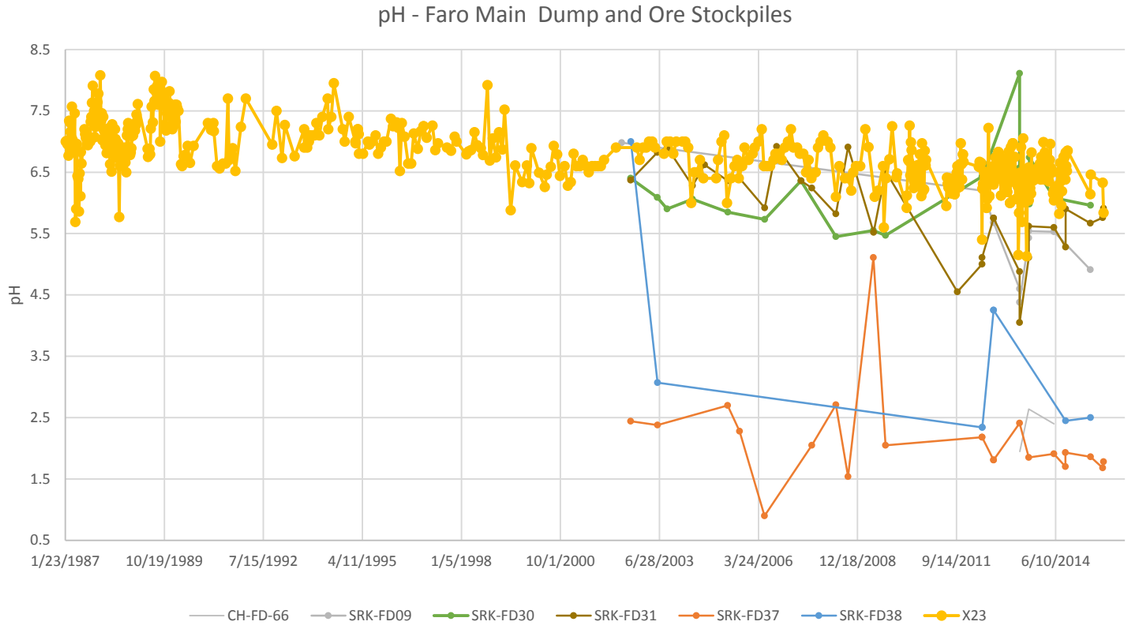


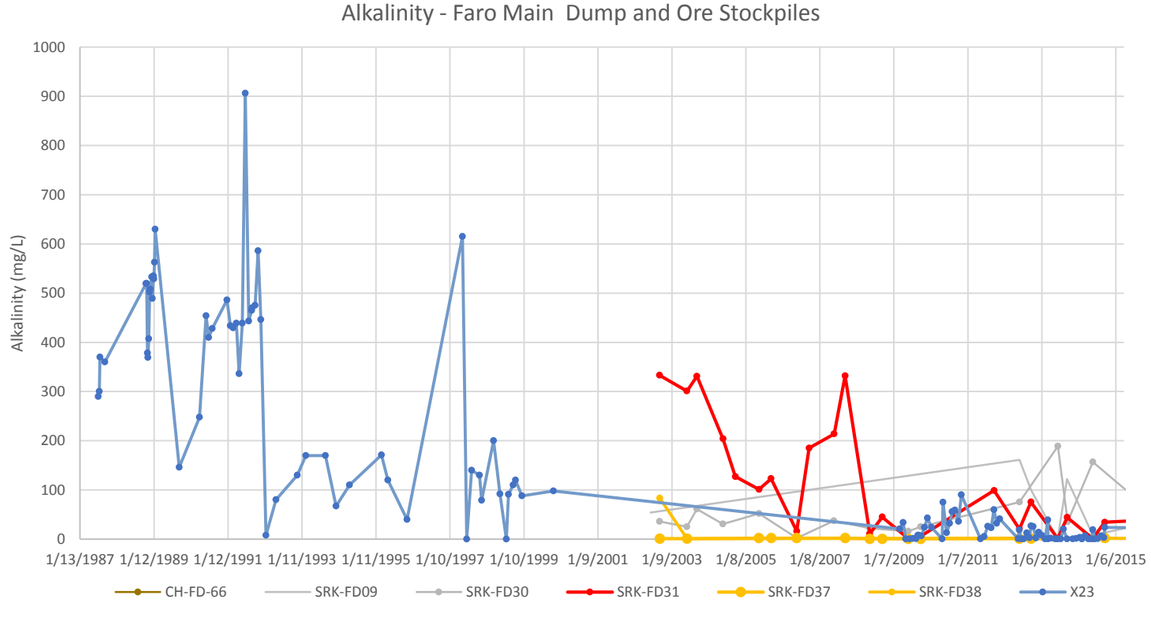


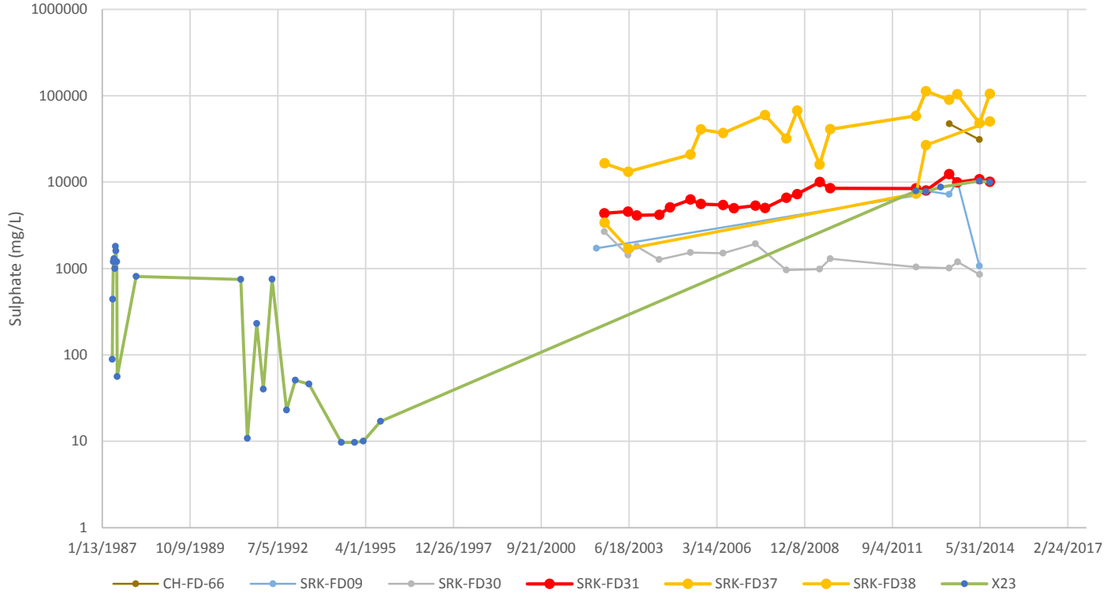
Notes:
NW WRD = Northwest Waste Rock Dump
mg/L = milligrams per litre

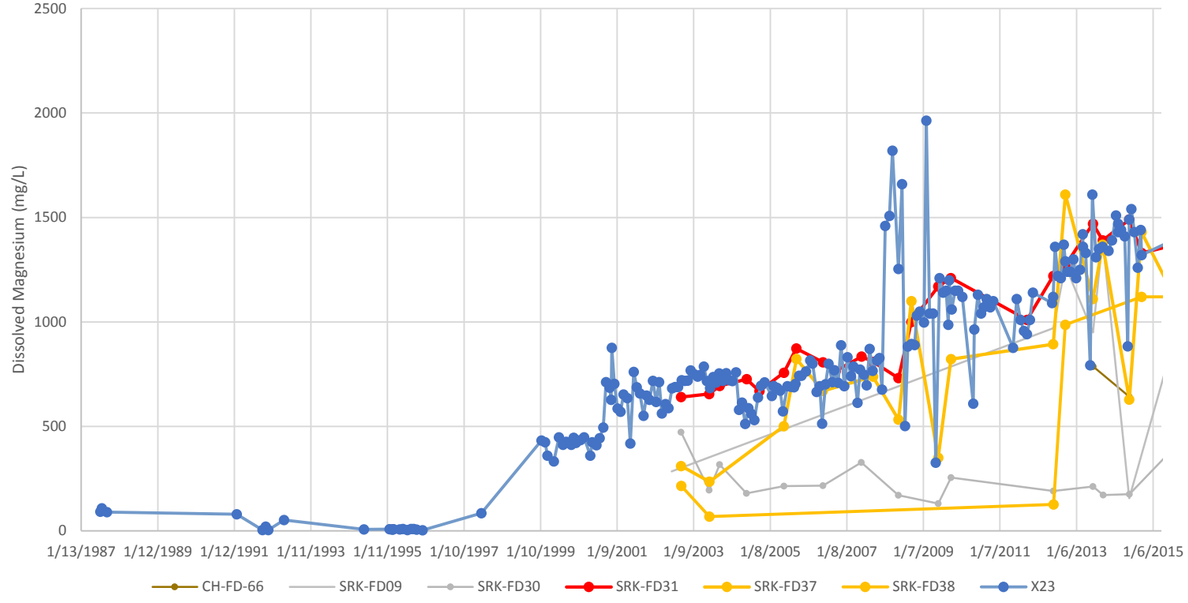
FIGURE 3-25 - *2 of 2*
Water Quality Time Series Trends - Northwest Waste Rock Dump
Faro Mine Remediation Project

ch2m.



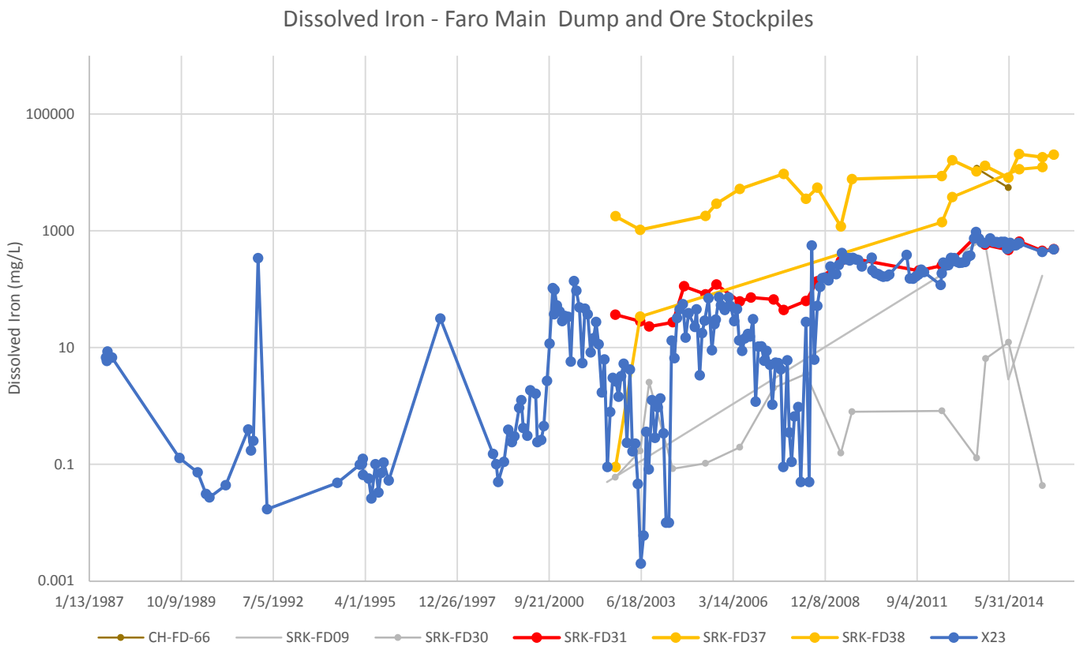


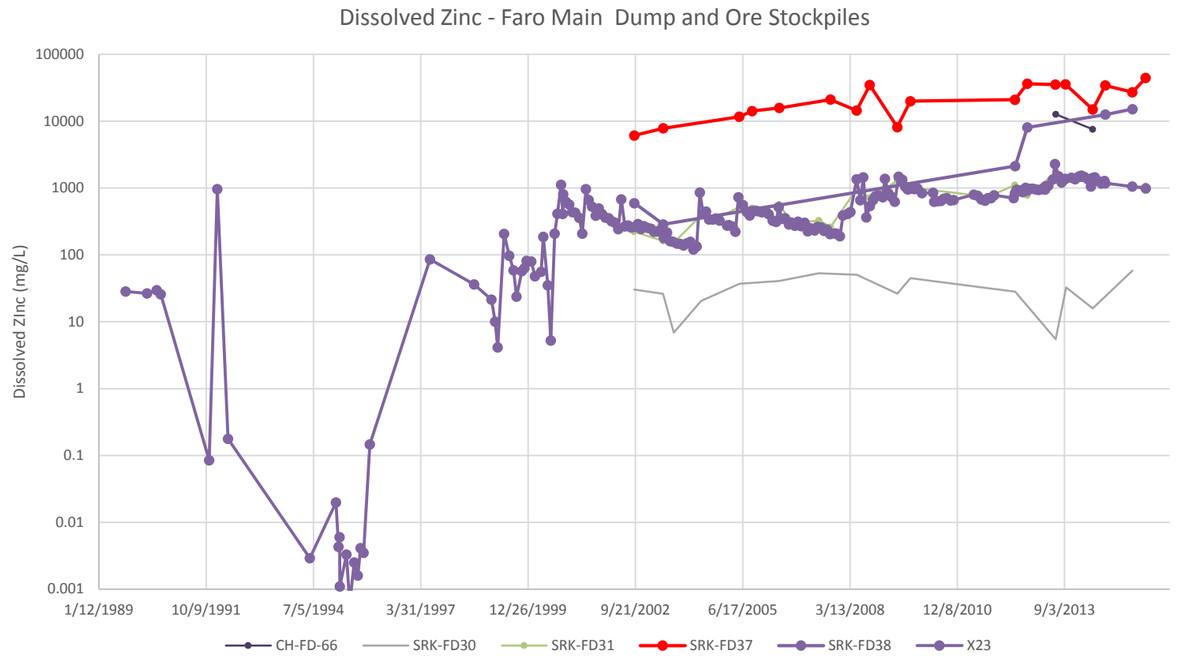




Note:
mg/L = milligrams per litre

FIGURE 3-26 - *1 of 2*
Water Quality Time Series Trends - Faro Main Dump and Stockpiles
Faro Mine Remediation Project

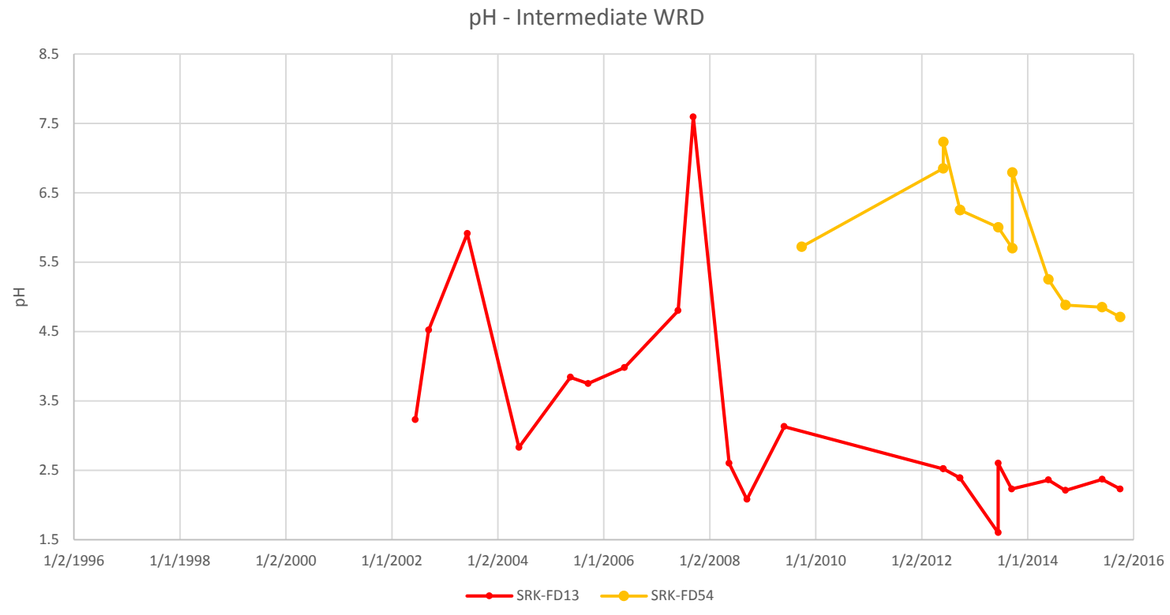


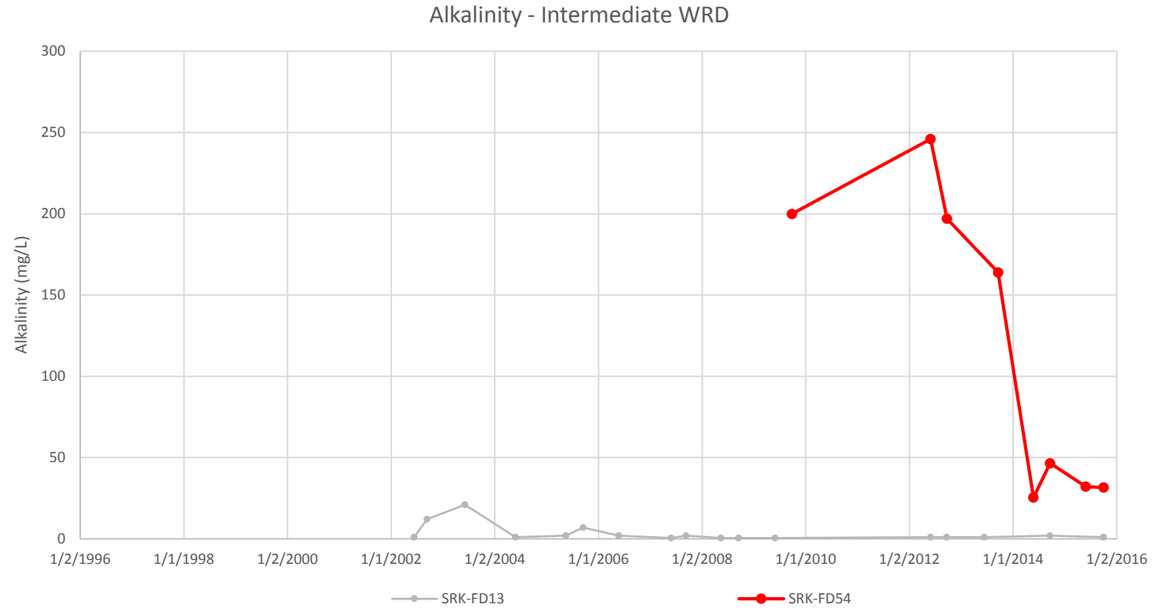


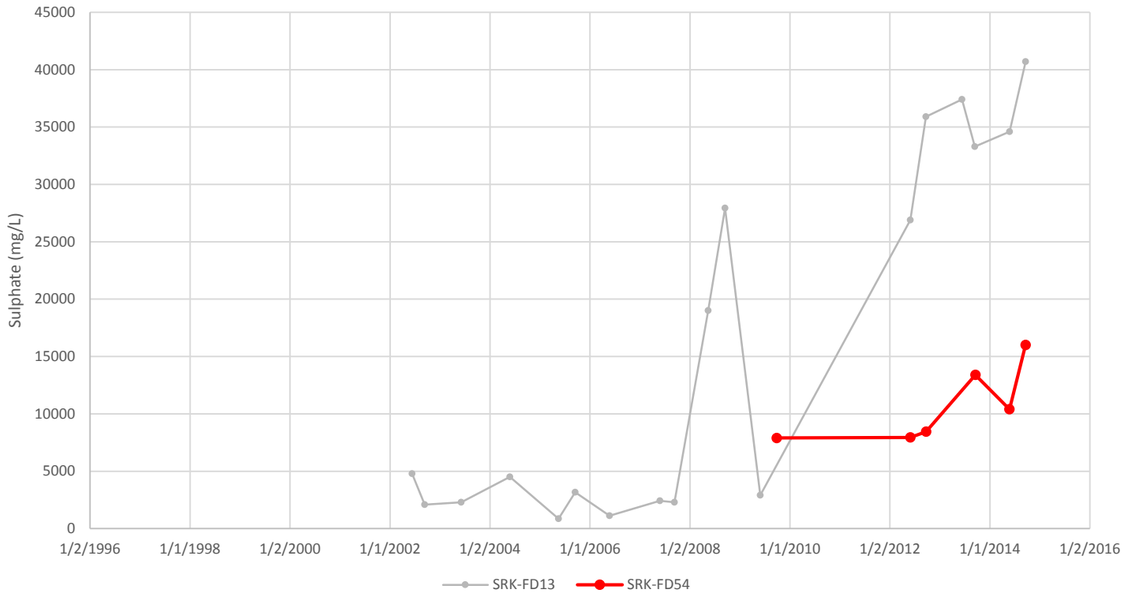
Note:
mg/L = milligrams per litre

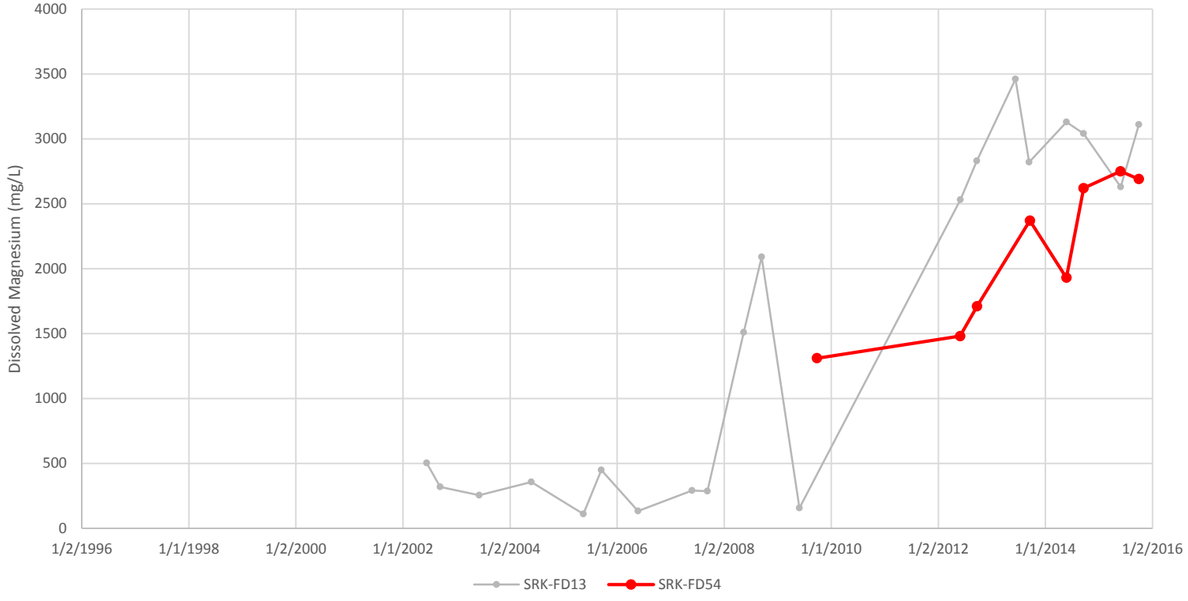
FIGURE 3-26 - *2 of 2*
Water Quality Time Series Trends - Faro Main Dump and Stockpiles
Faro Mine Remediation Project

ch2m.



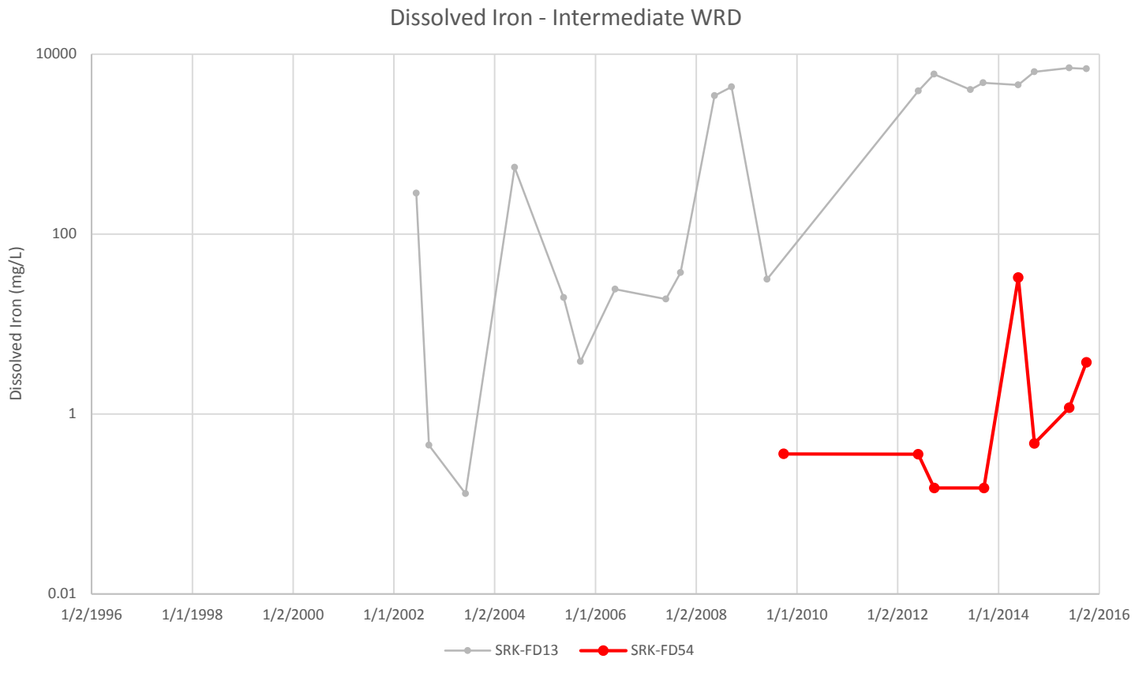


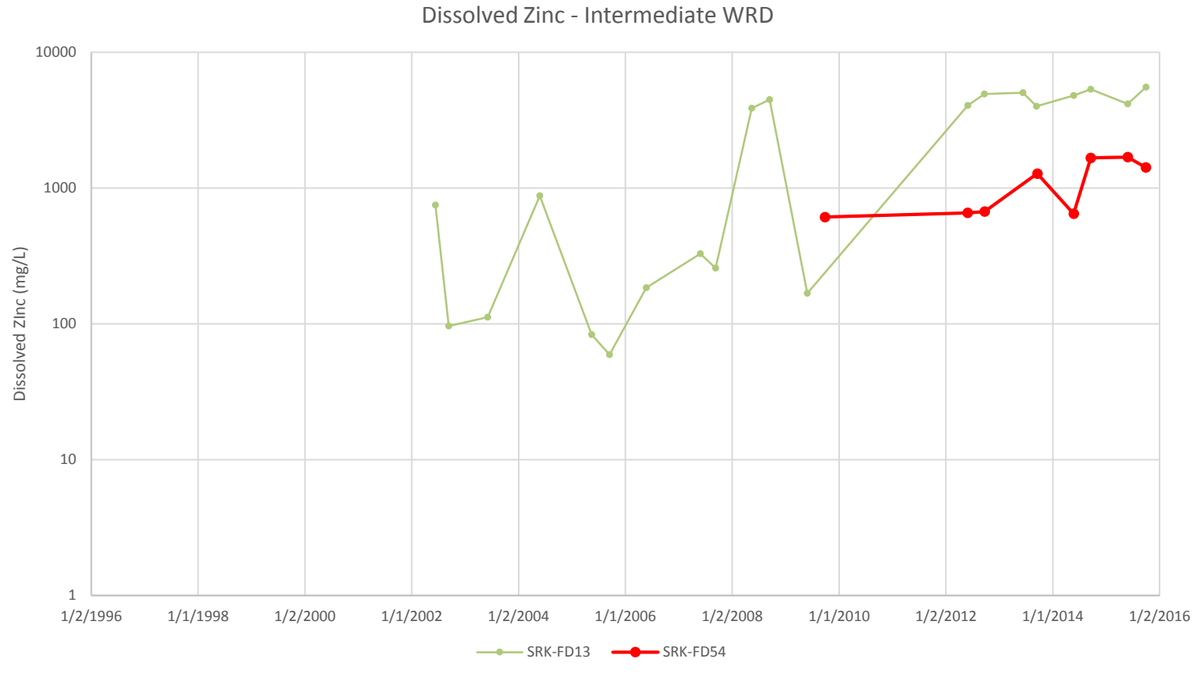




Notes:
mg/L = milligrams per litre
WRD = Waste Rock Dump

FIGURE 3-27 - *1 of 2*
Water Quality Time Series Trends - Intermediate Waste Rock Dump
Faro Mine Remediation Project

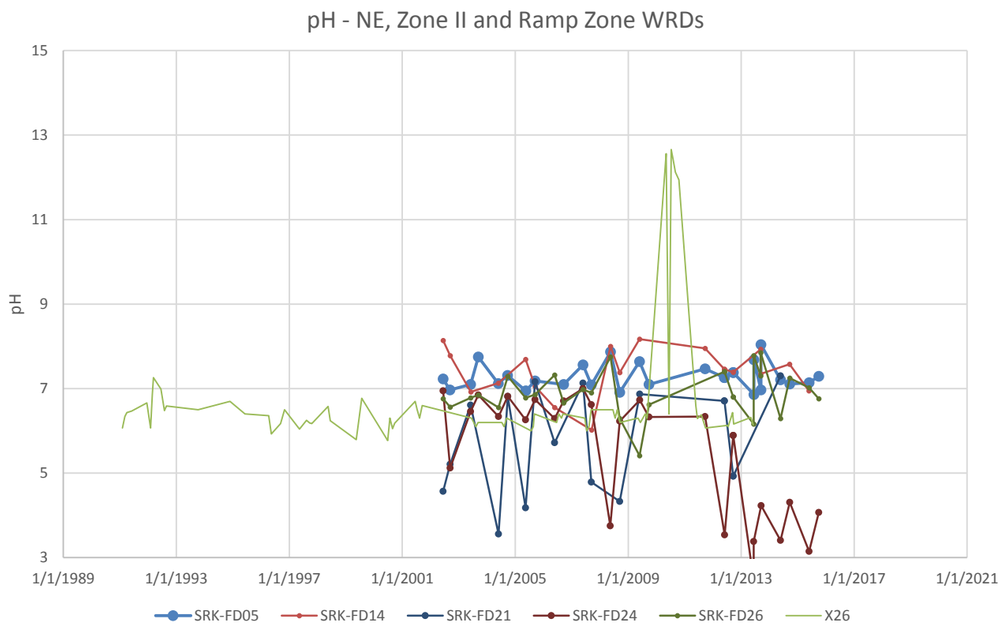


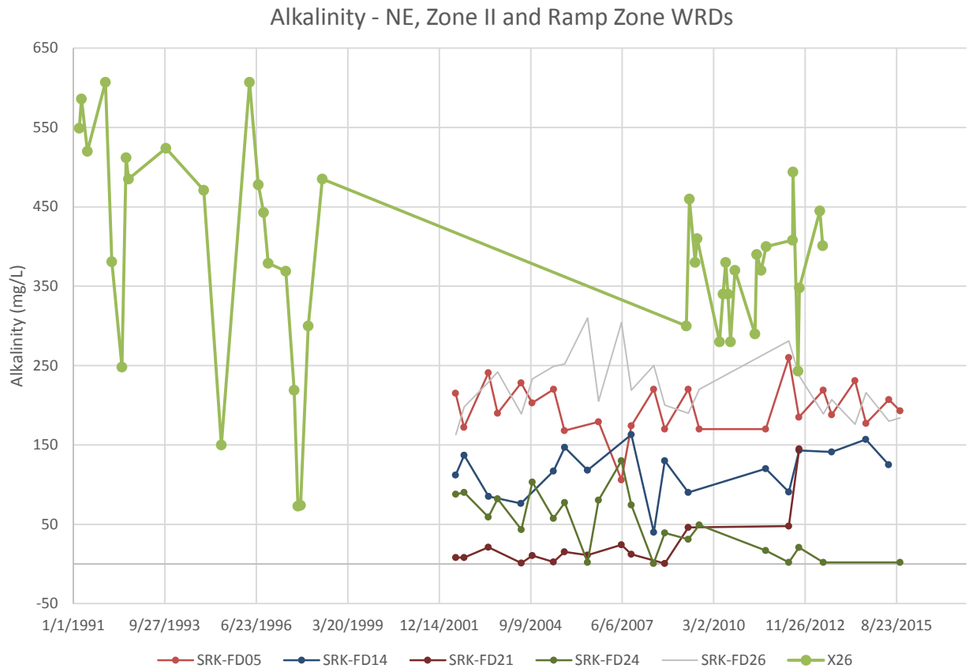


Notes:
mg/L = milligrams per litre
WRD = Waste Rock Dump

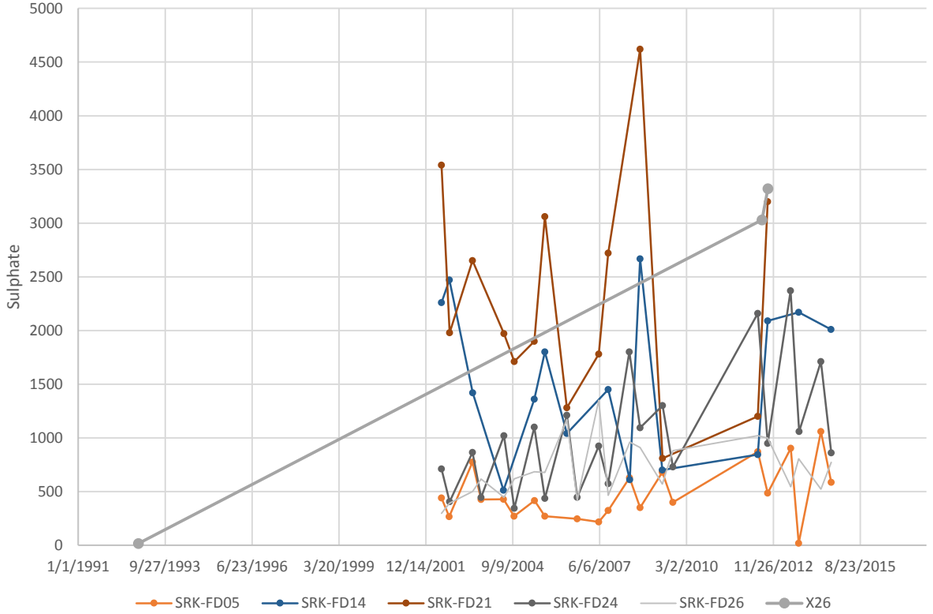
FIGURE 3-27 - *2 of 2*
Water Quality Time Series Trends - Intermediate Waste Rock Dump
Faro Mine Remediation Project

ch2m.

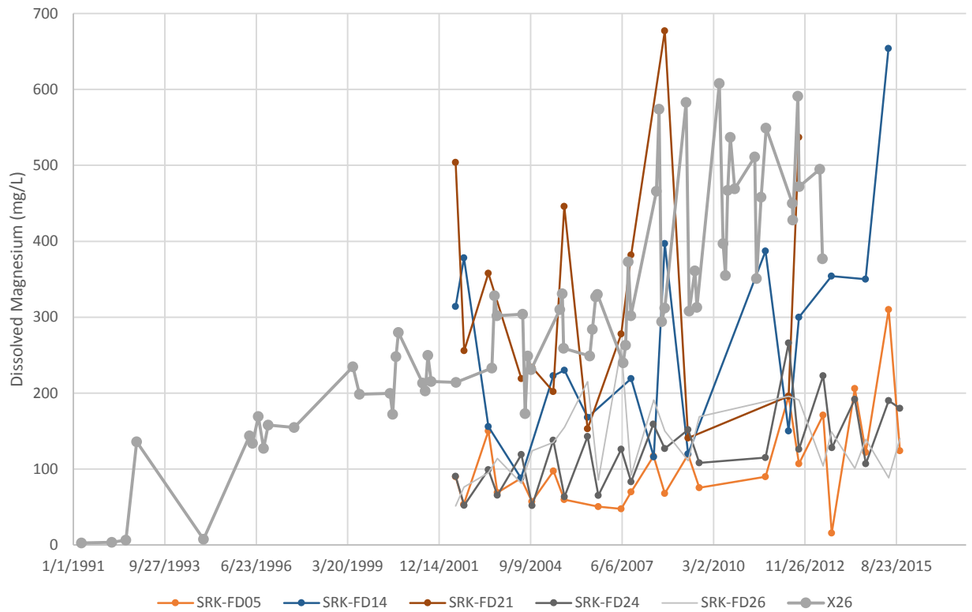




Sulphate - NE, Zone II and Ramp Zone WRDs

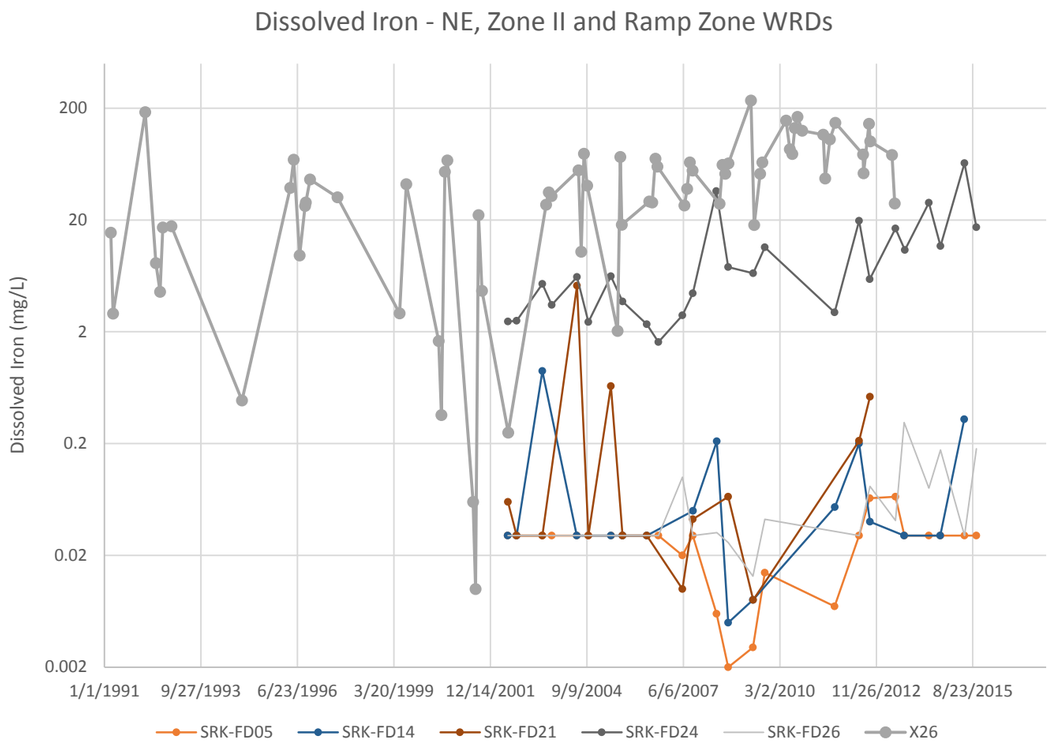


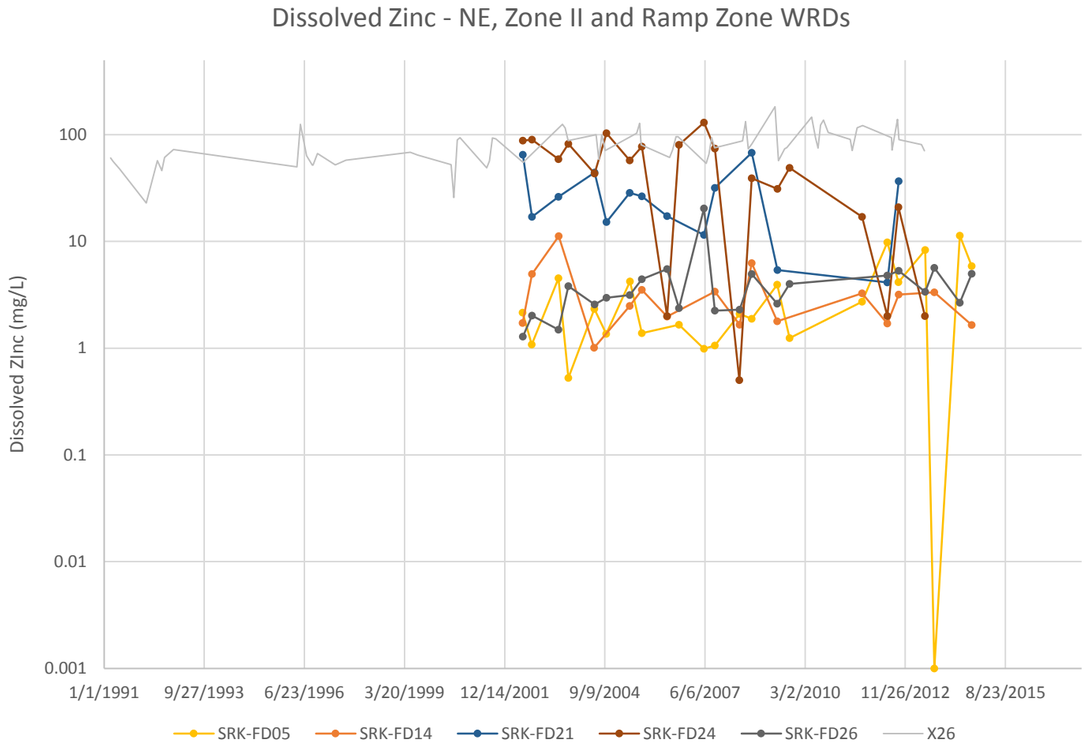
Dissolved Magnesium - NE, Zone II, and Ramp Zone WRDs



Notes:
mg/L = milligrams per litre
NE = Northeast
WRD = Waste Rock Dump

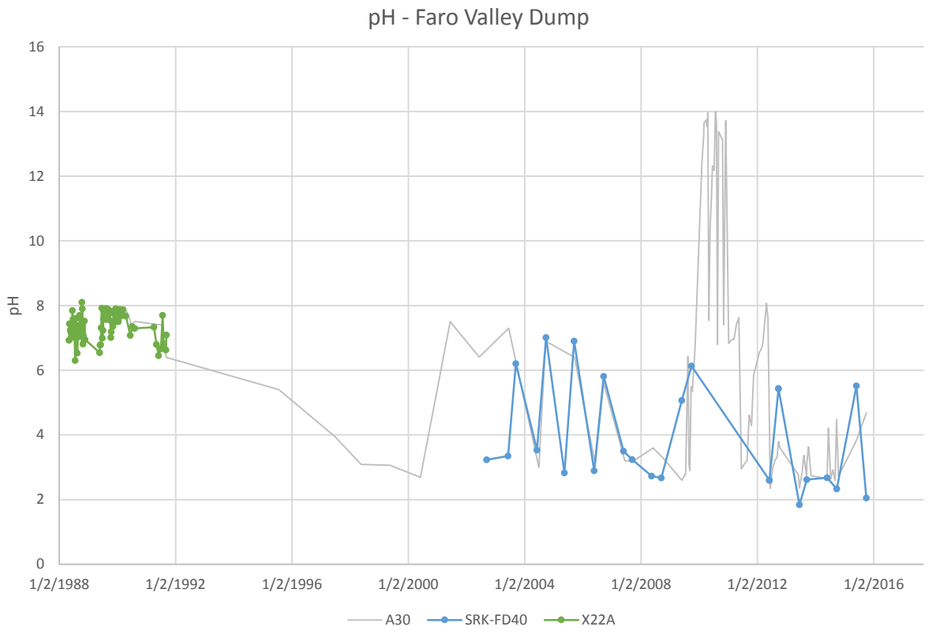
FIGURE 3-28 - *1 of 2*
Water Quality Time Series Trends - Northeast, Zone II and Ramp Zone Waste Rock Dumps
Faro Mine Remediation Project

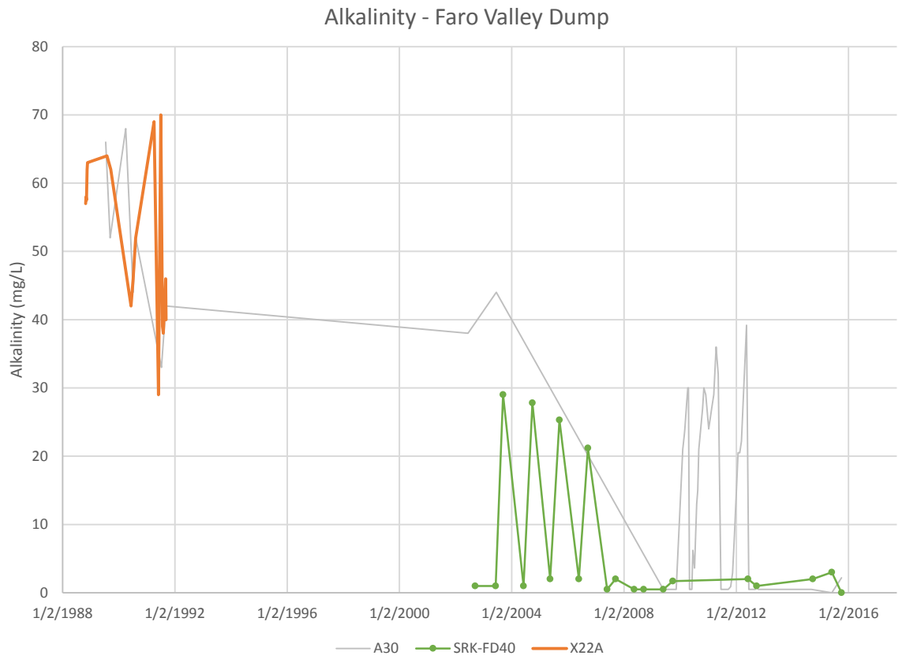


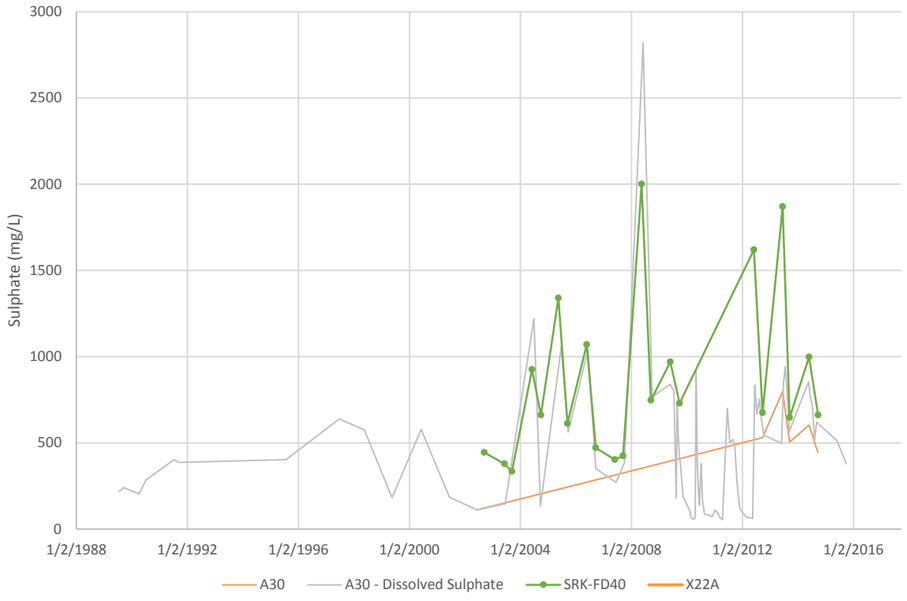


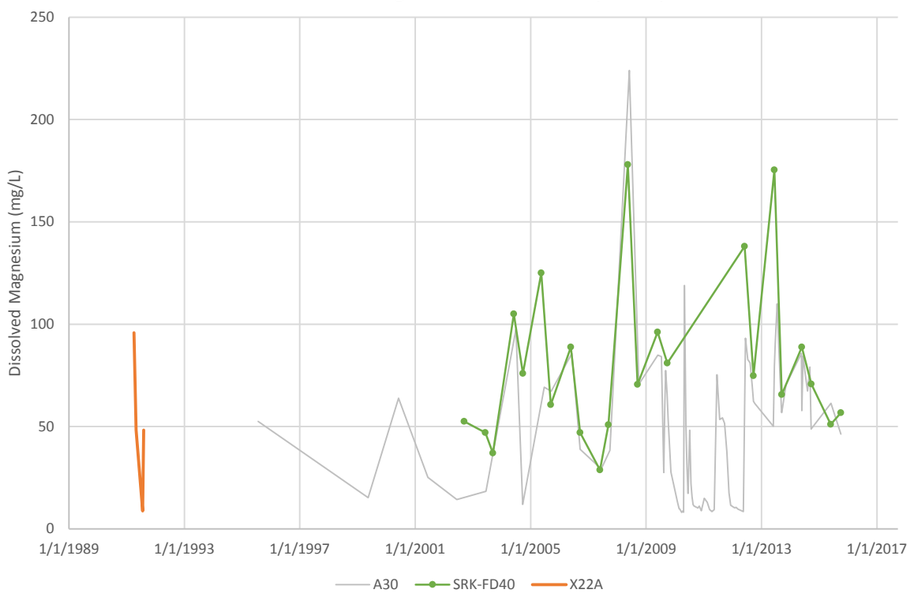
Notes:
mg/L = milligrams per litre
NE = Northeast
WRD = Waste Rock Dump

FIGURE 3-28 - *2 of 2*
Water Quality Time Series Trends - Northeast, Zone II and Ramp Zone Waste Rock Dumps
Faro Mine Remediation Project



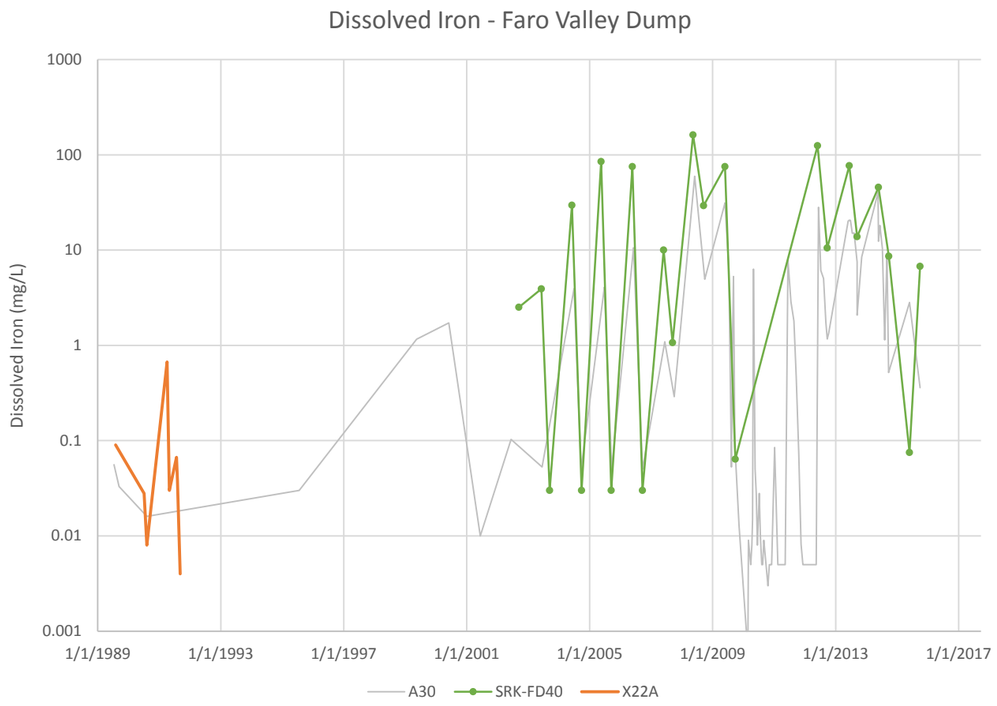


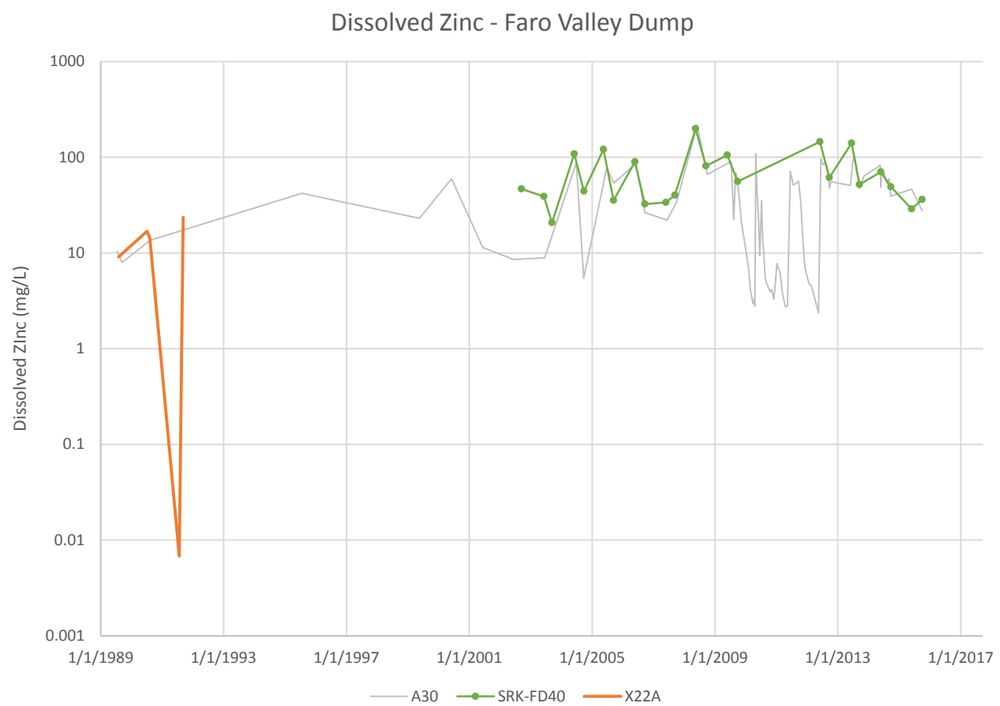




Note:
mg/L = milligrams per litre

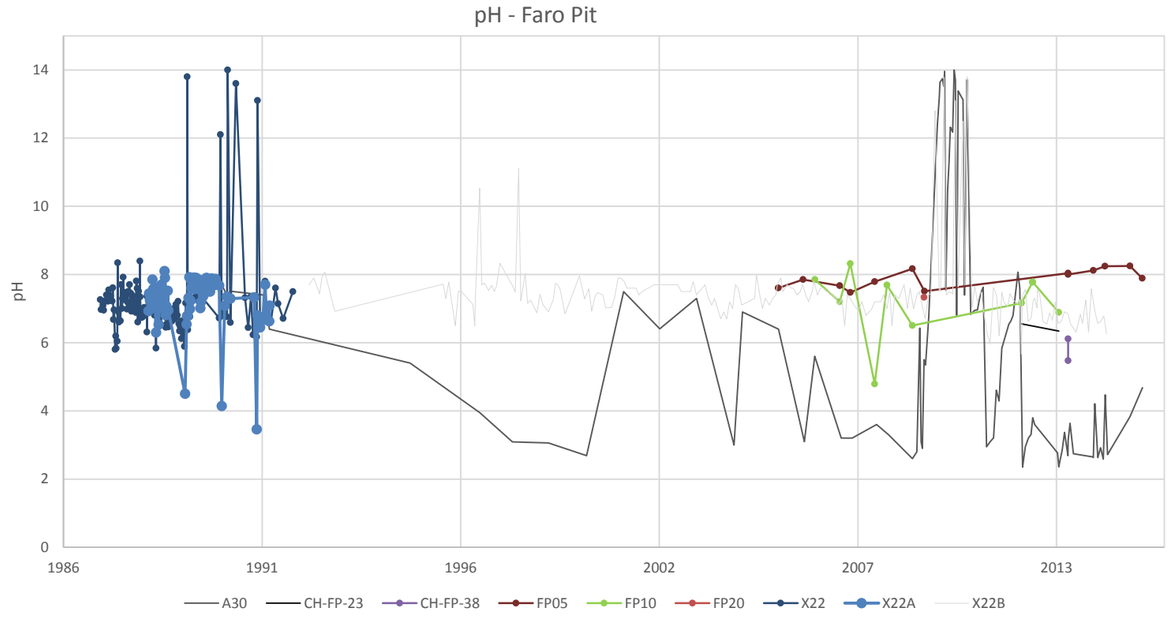
FIGURE 3-29 - *1 of 2*
Water Quality Time Series Trends - Faro Valley Waste Rock Dump
Faro Mine Remediation Project

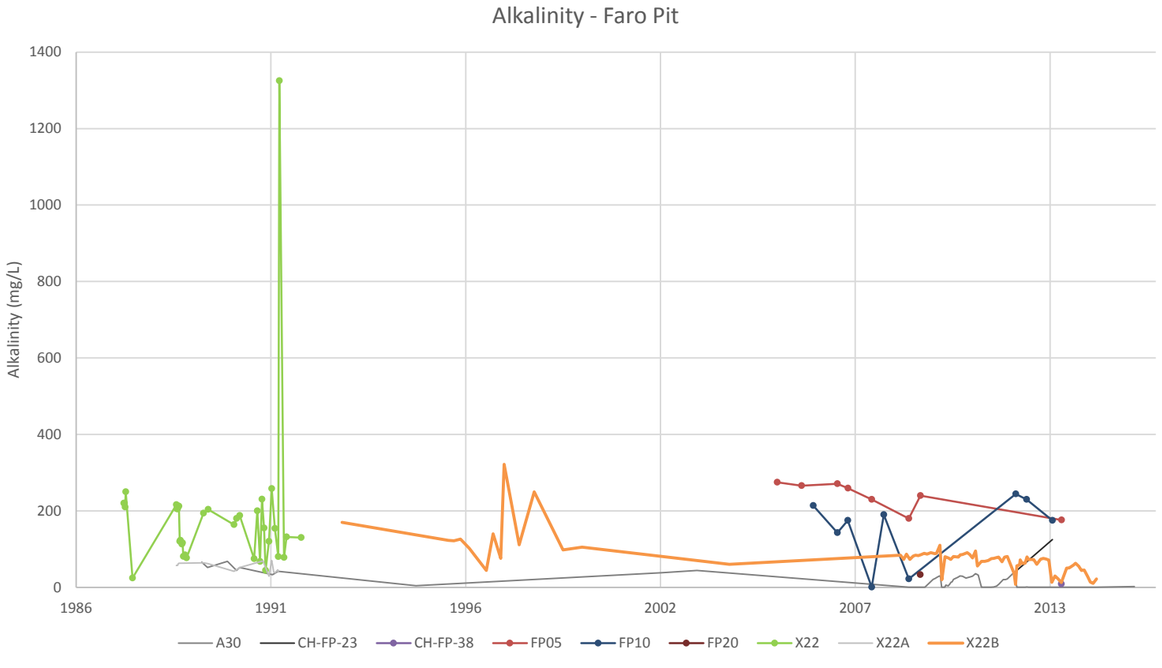


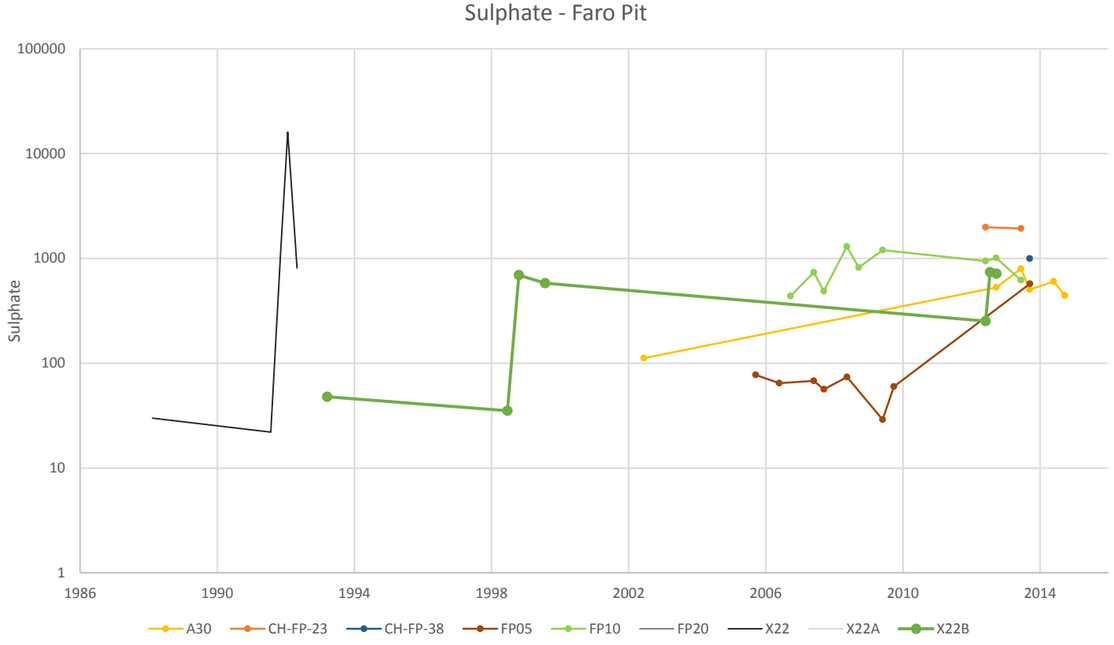


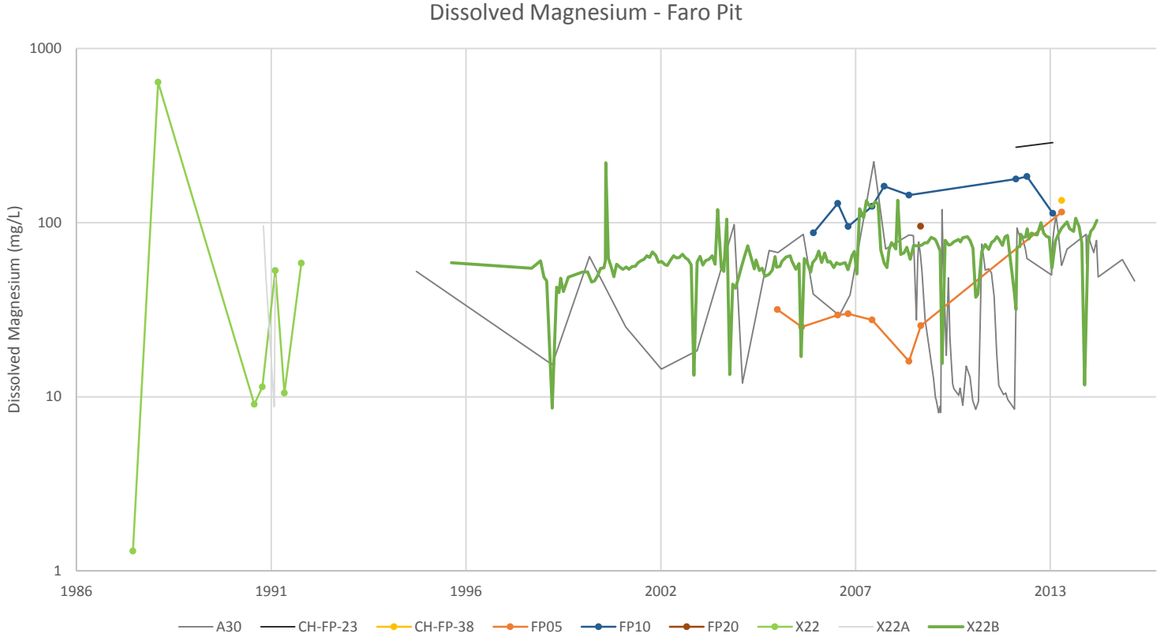
Note:
mg/L = milligrams per litre

FIGURE 3-29 - *2 of 2*
Water Quality Time Series Trends - Faro Valley Waste Rock Dump
Faro Mine Remediation Project





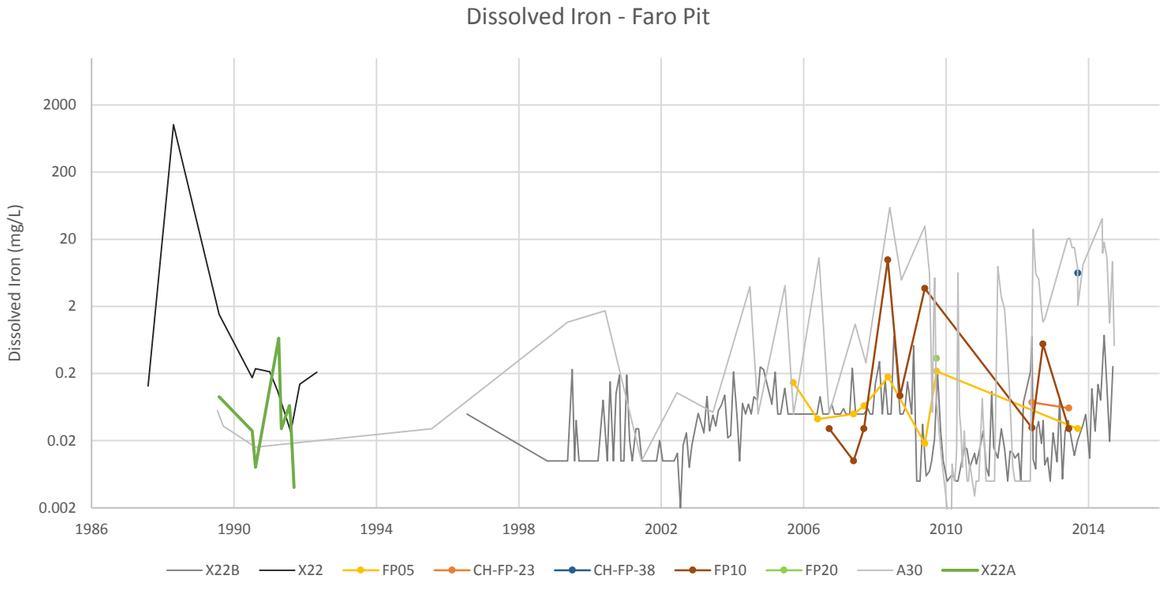


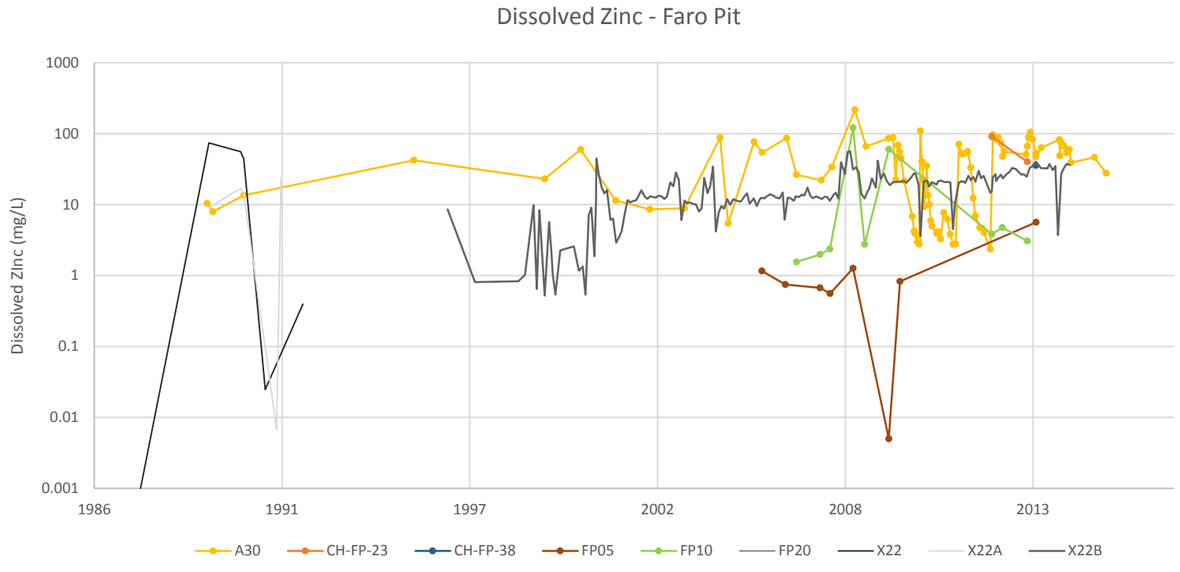


Note:
mg/L = milligrams per litre

FIGURE 3-30 - *1 of 2*
Water Quality Time Series Trends - Faro Pit
Faro Mine Remediation Project

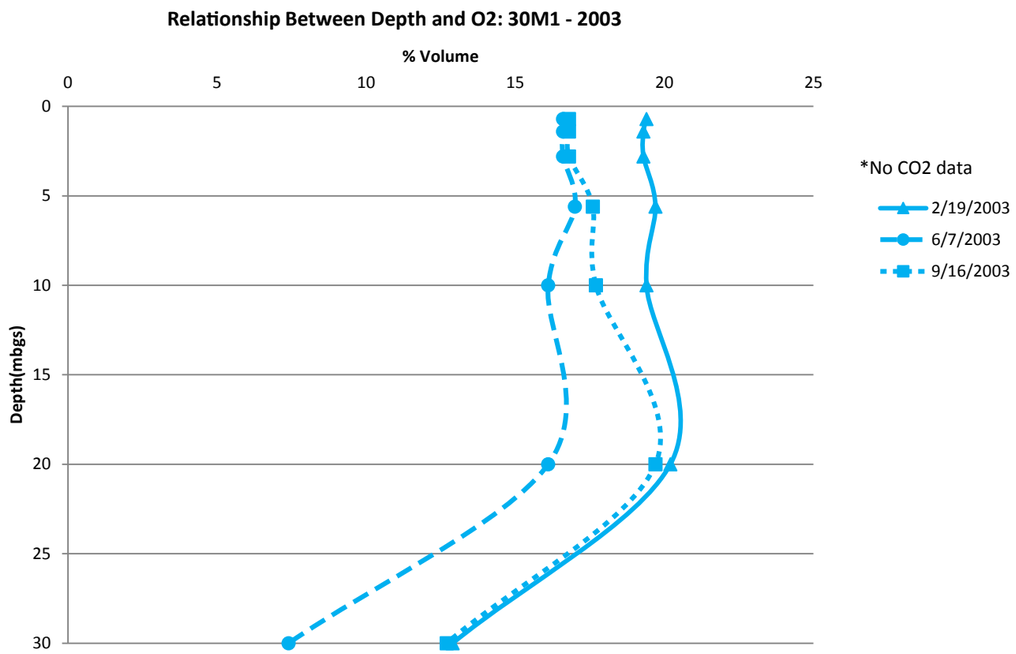
ch2m

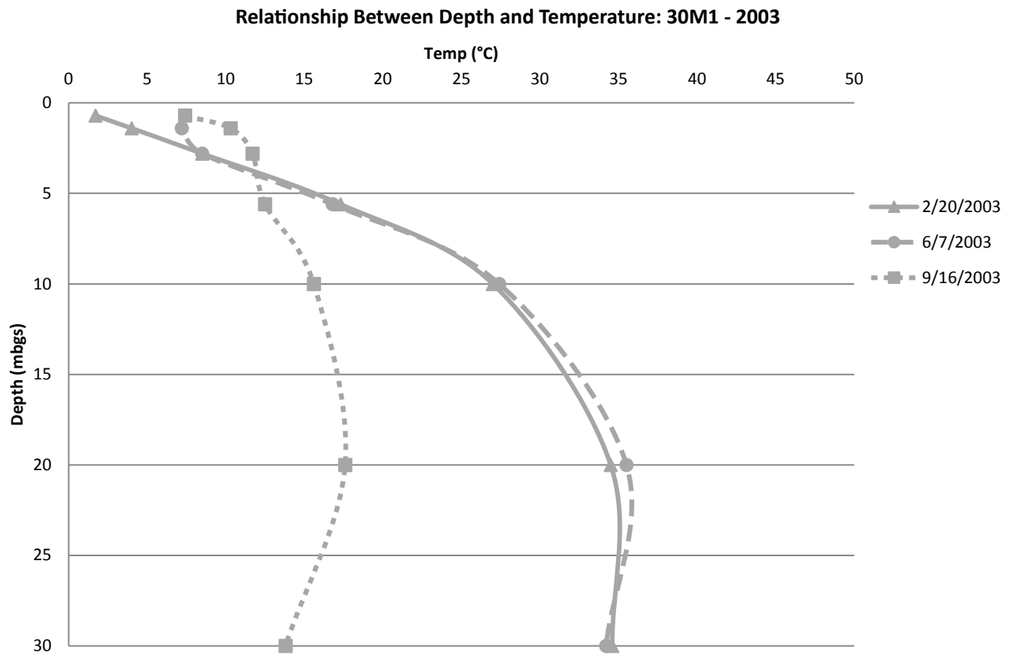


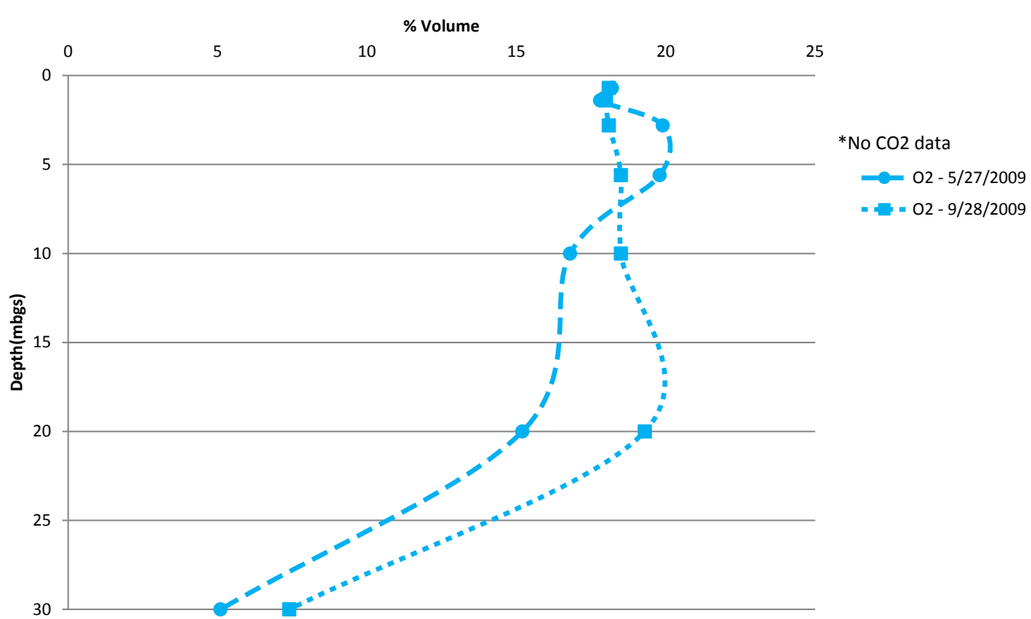


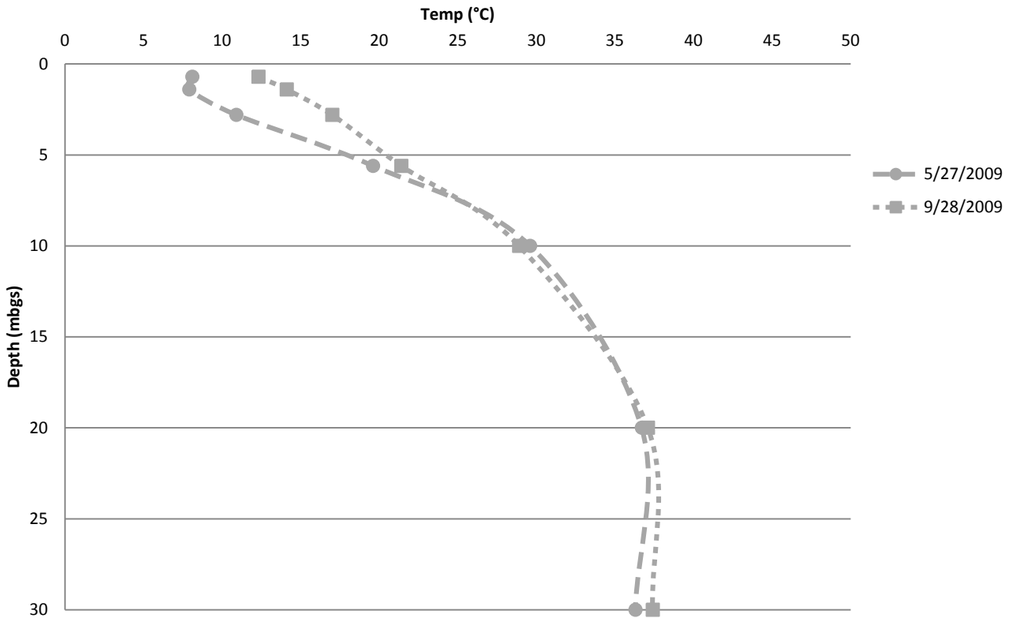
Note:
mg/L = milligrams per litre

FIGURE 3-30 - *2 of 2*
Water Quality Time Series Trends - Faro Pit
Faro Mine Remediation Project



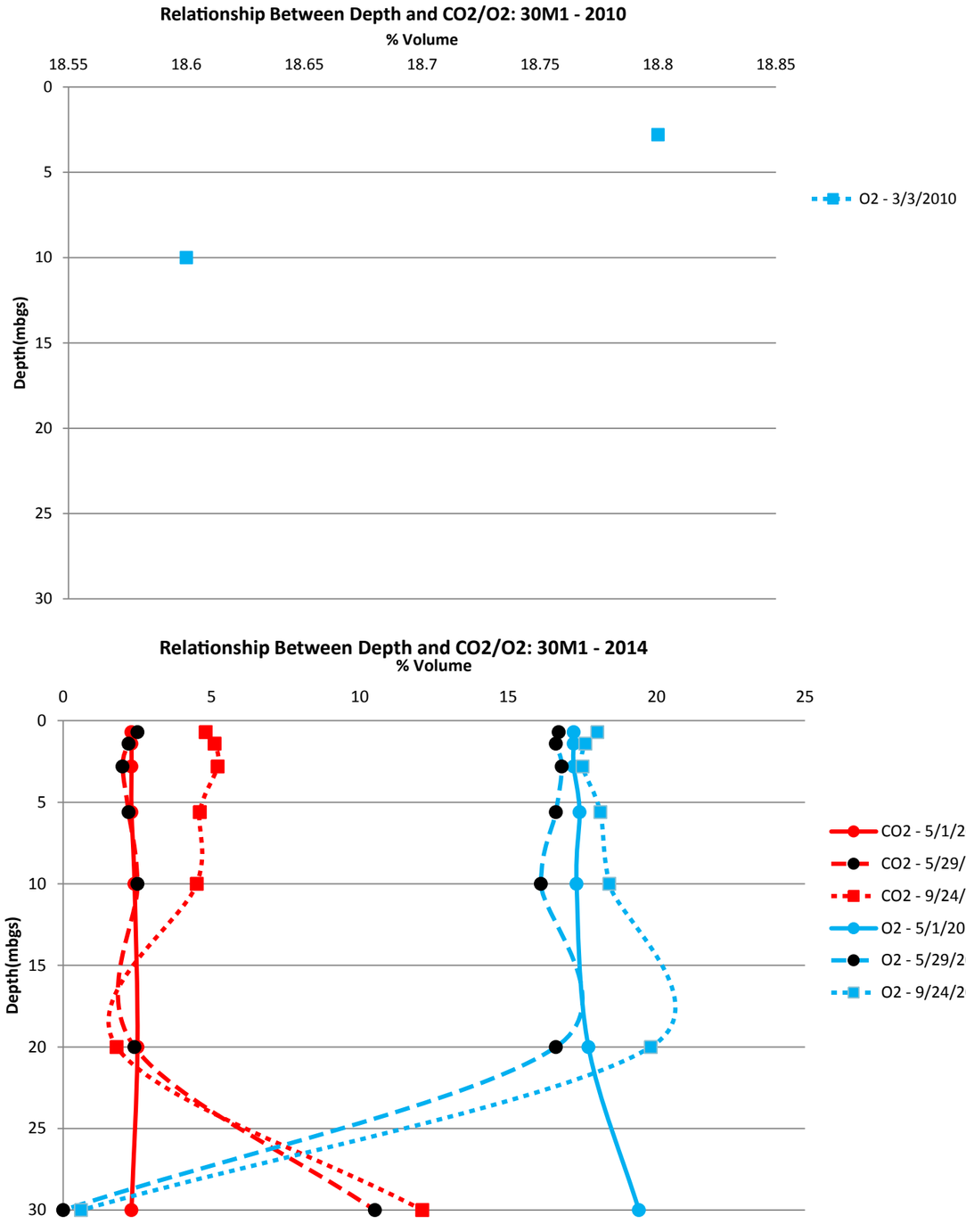


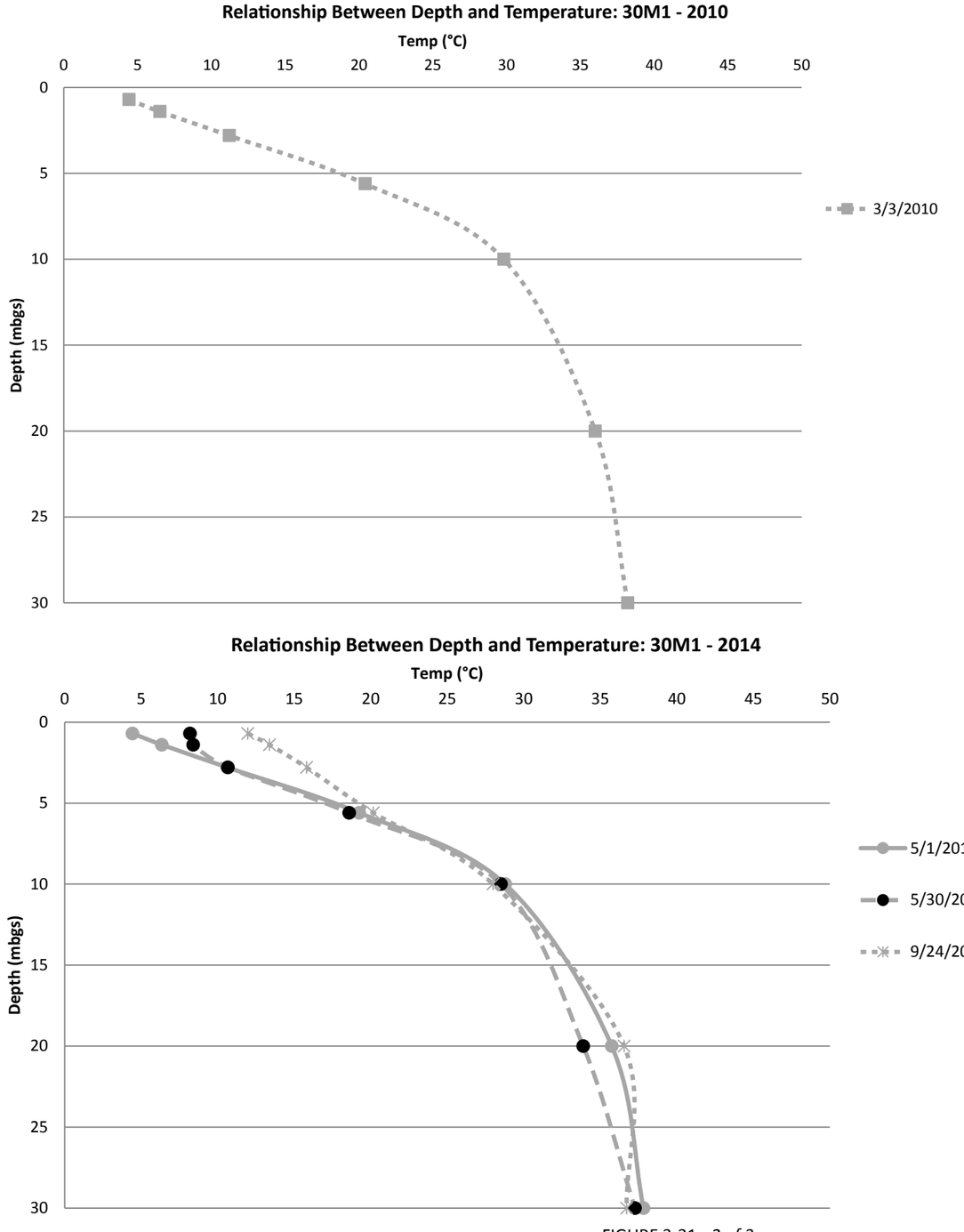




Note:
mbgs = metres below ground surface

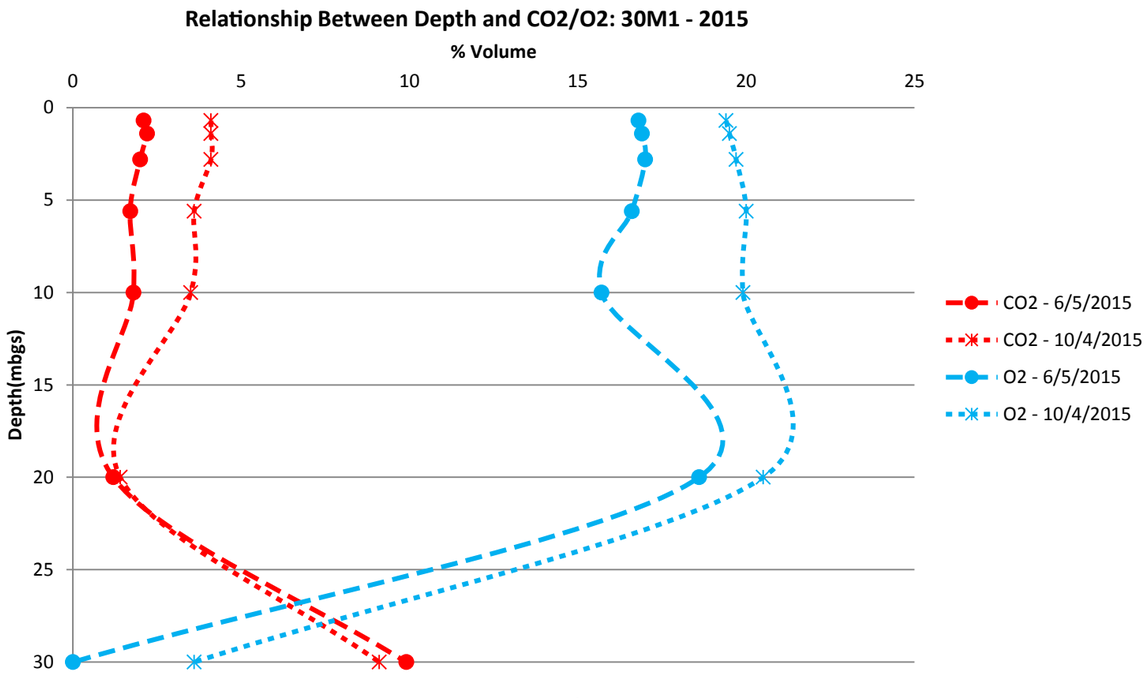
FIGURE 3-31 - *1 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - 30M1
Faro Mine Remediation Project

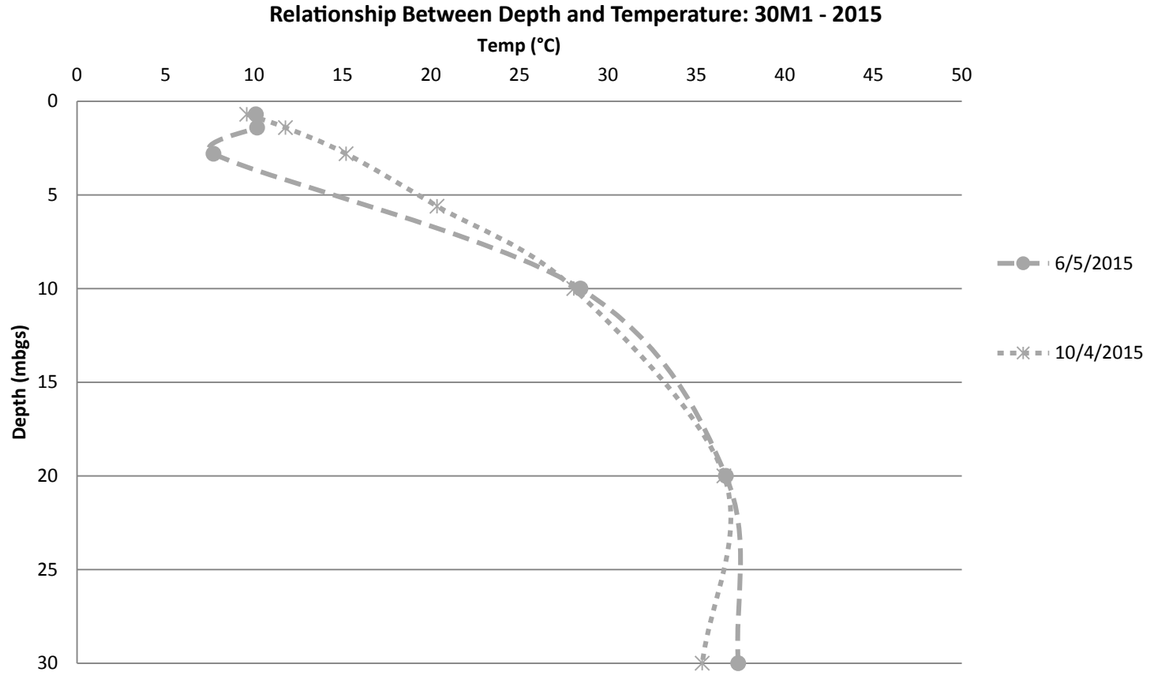


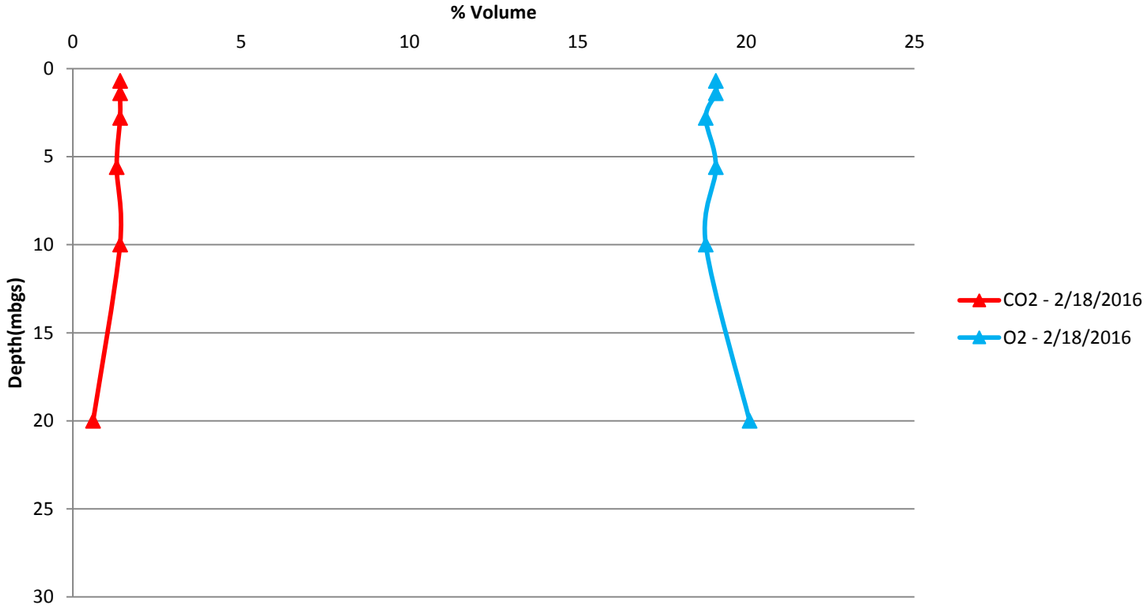


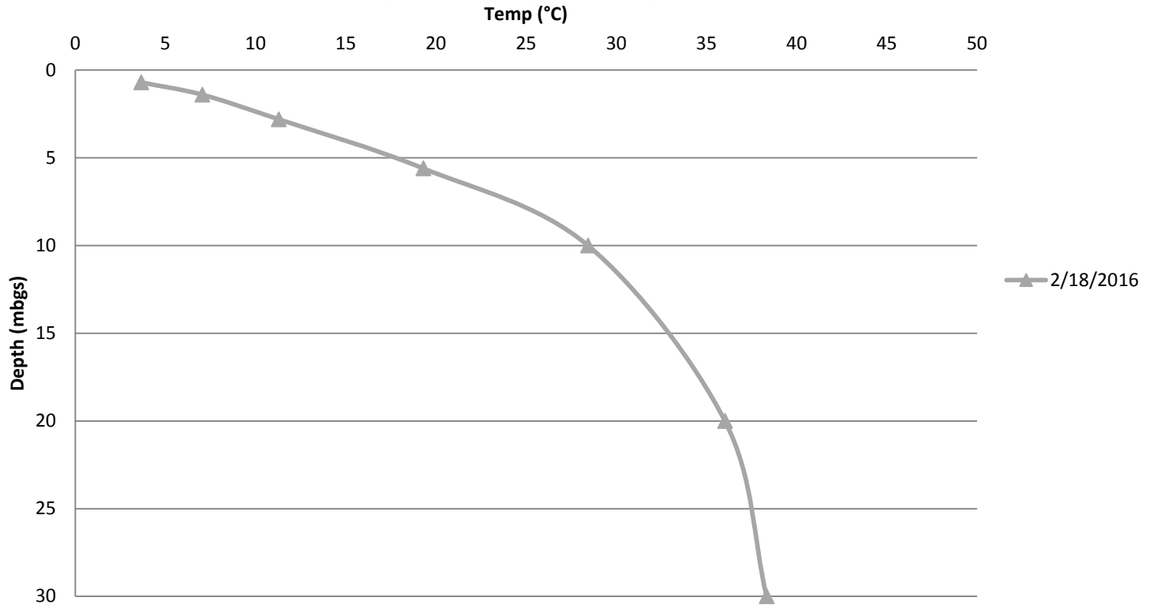
Note:
mbgs = metres below ground surface

FIGURE 3-31 - *2 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - 30M1
Faro Mine Remediation Project





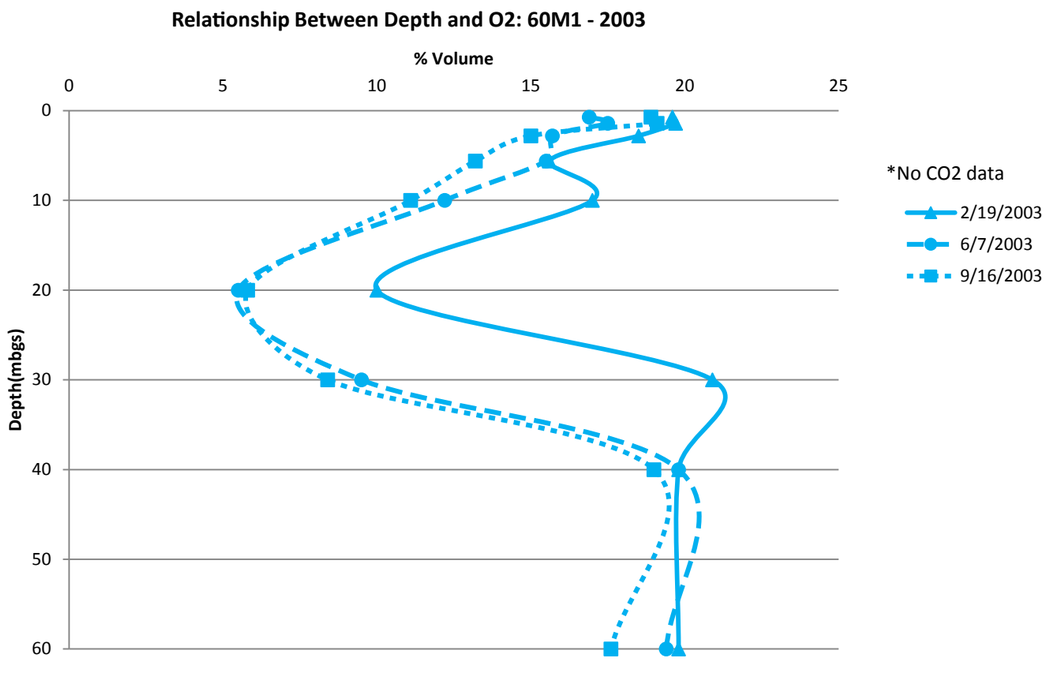


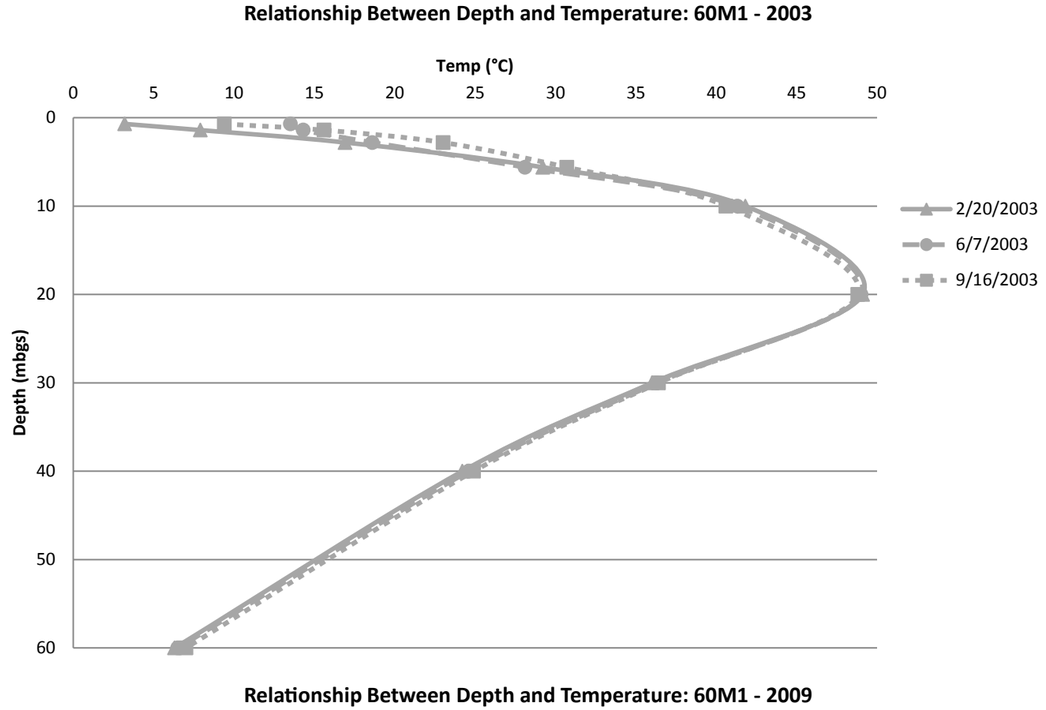


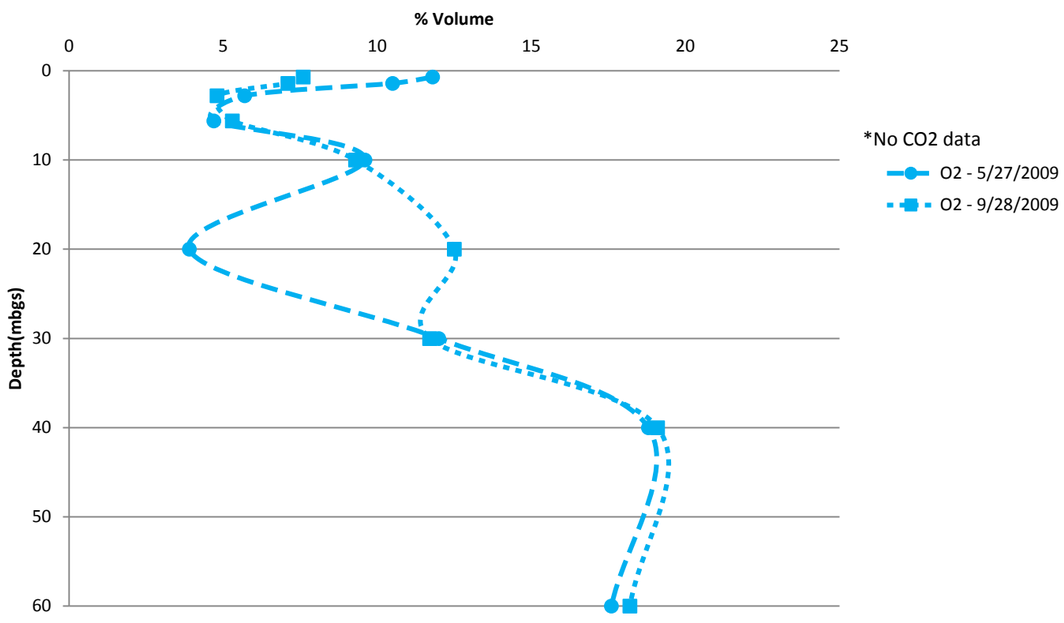
Note:
mbgs = metres below ground surface

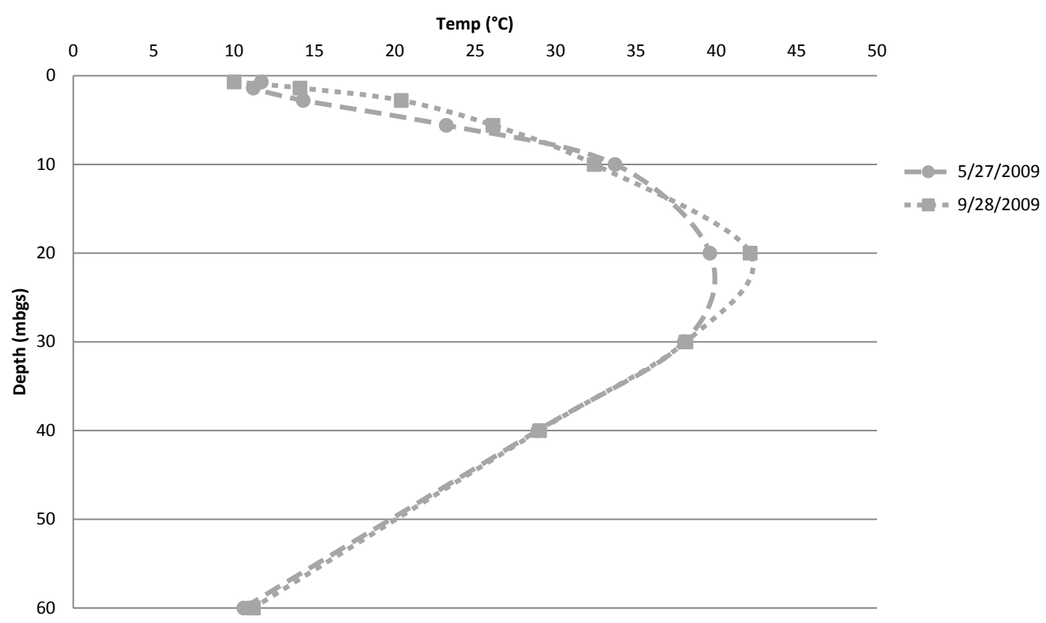
FIGURE 3-31 - *3 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - 30M1
Faro Mine Remediation Project

ch2m.



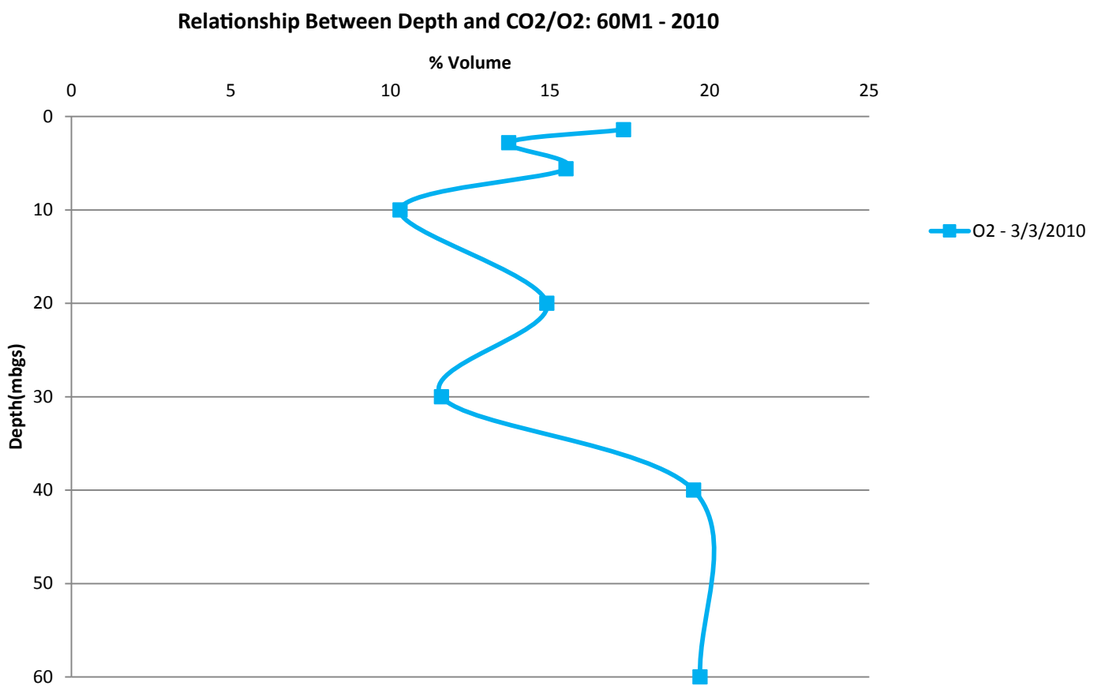


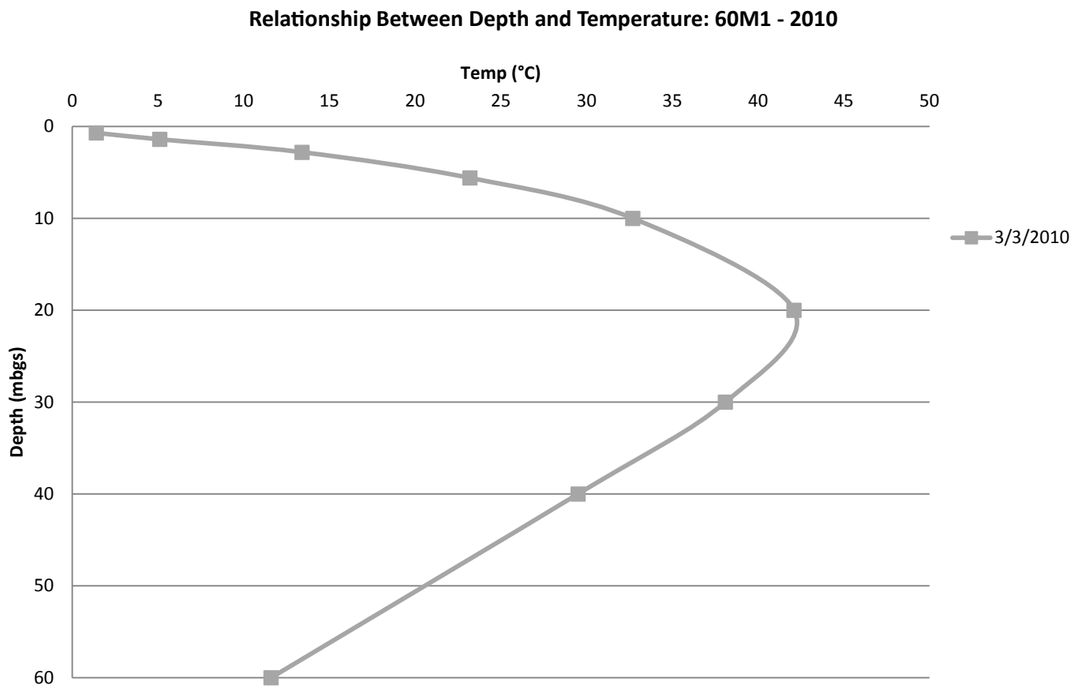


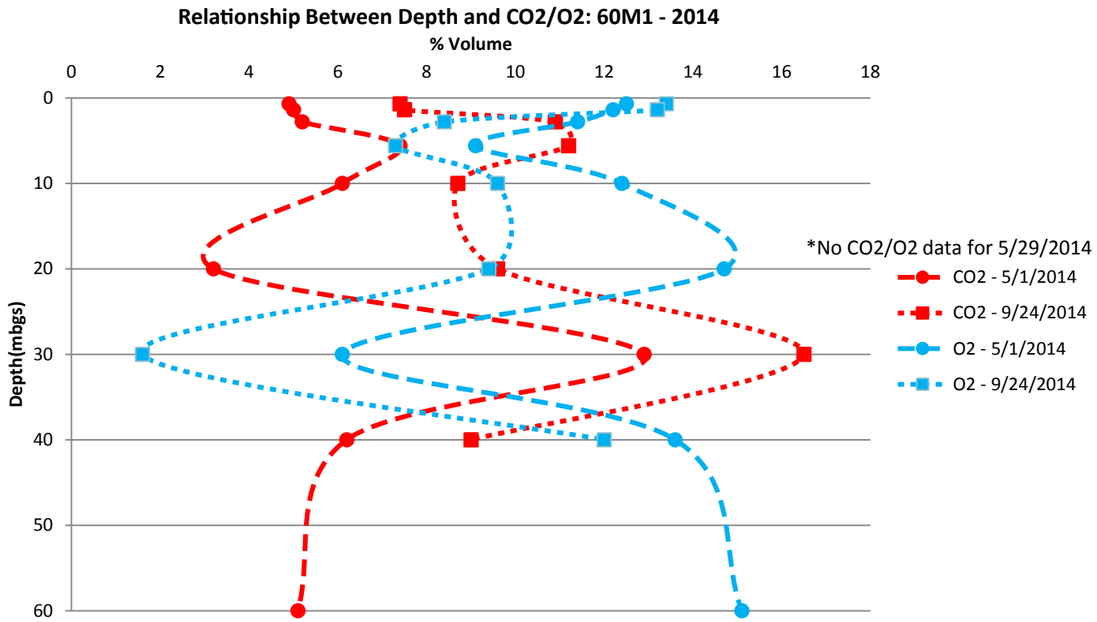


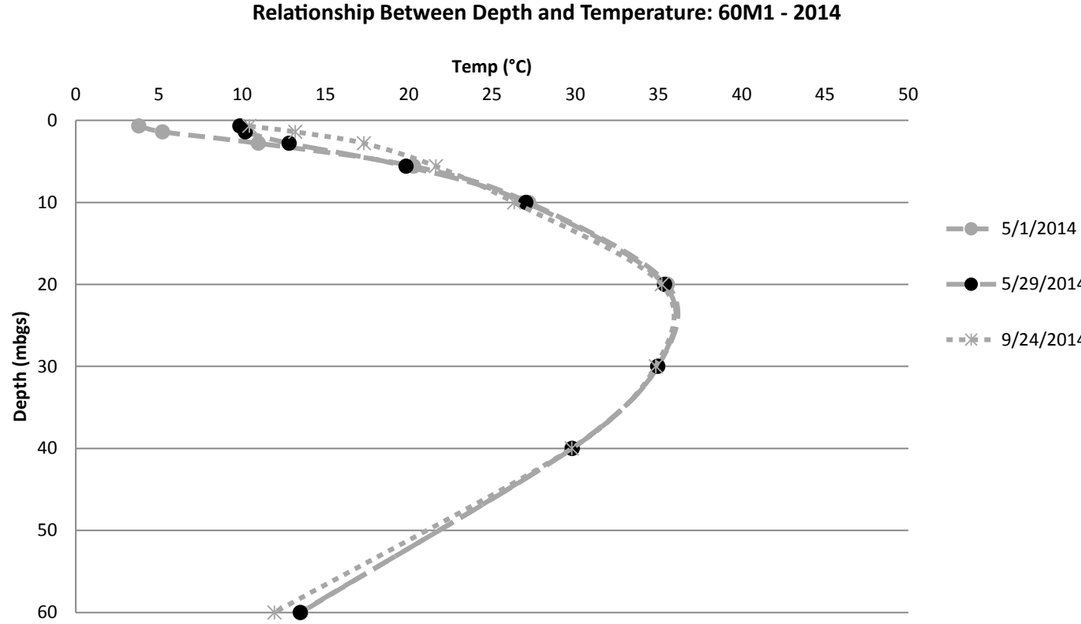
Note:
mbgs = metres below ground surface

FIGURE 3-32 - *1 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - 60M1
Faro Mine Remediation Project



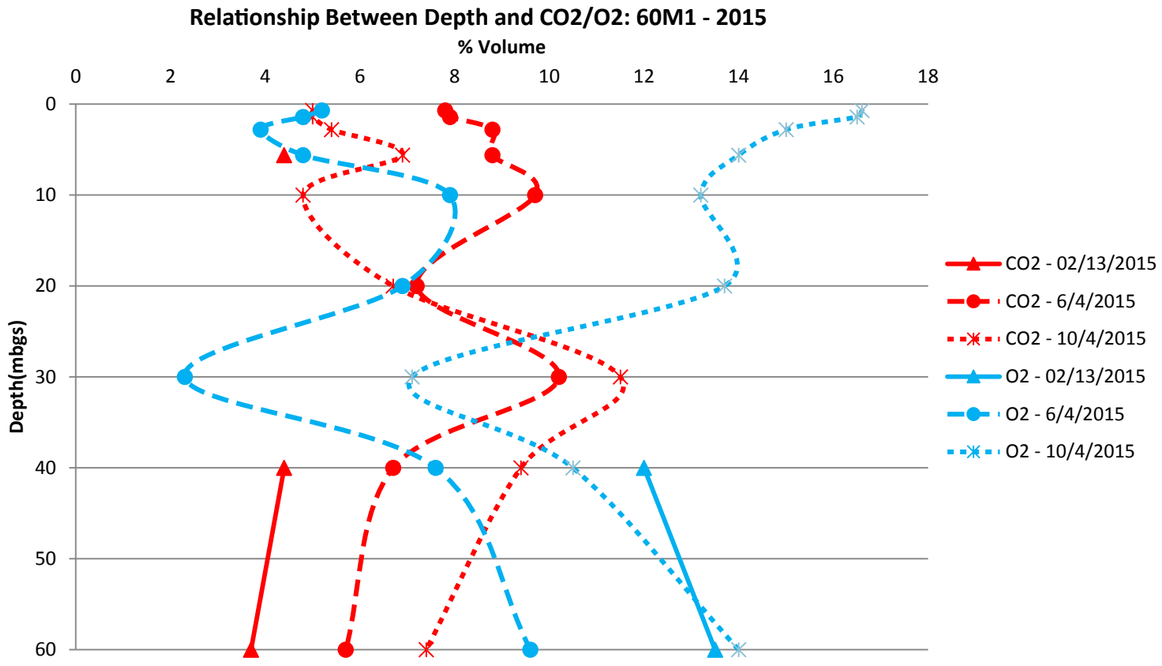


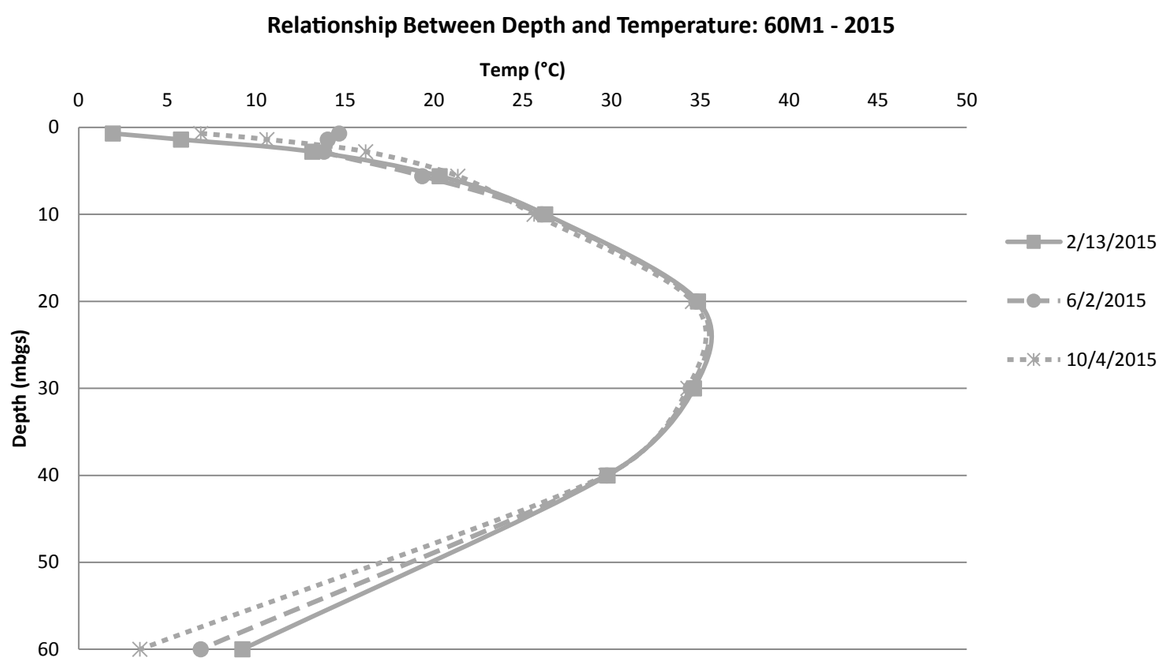


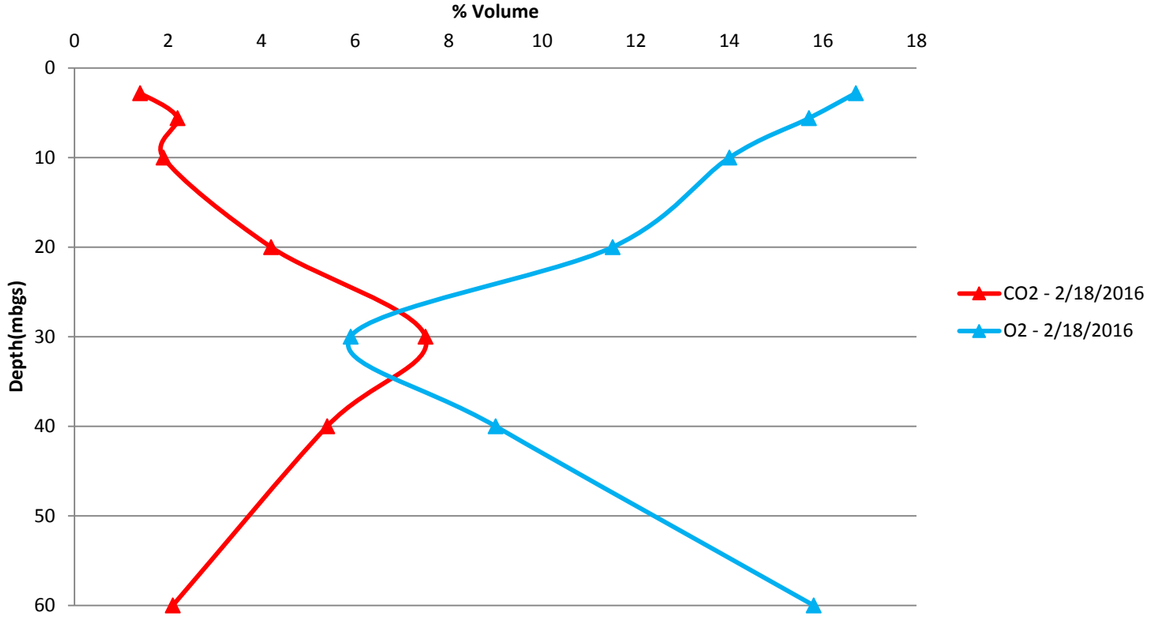


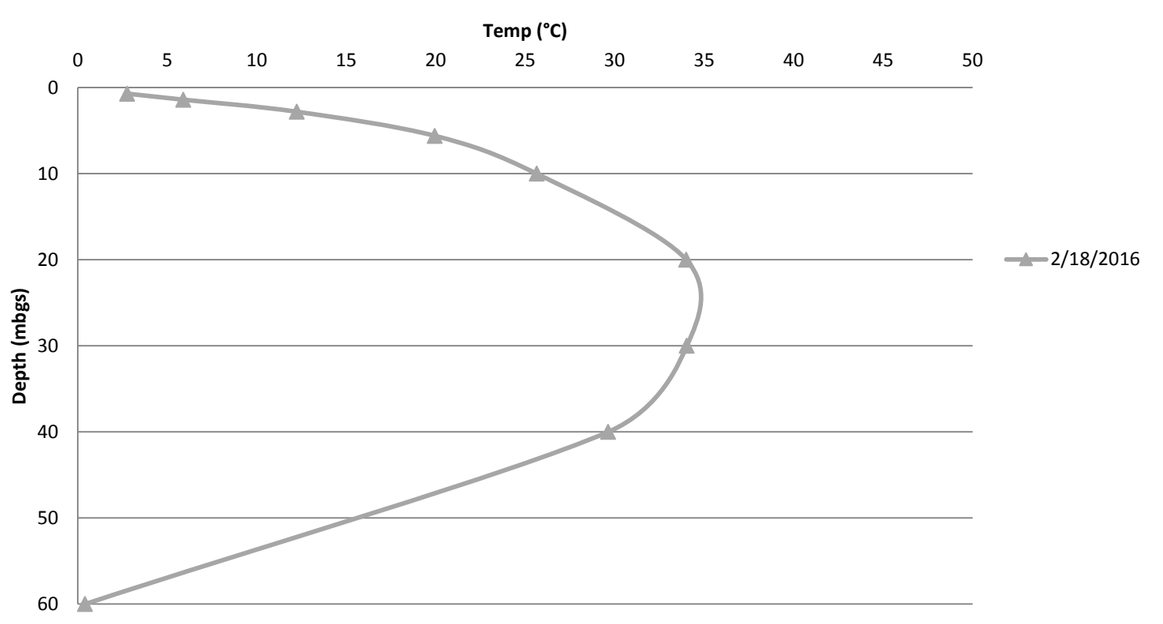
Note:
mbgs = metres below ground surface

FIGURE 3-32 - *2 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - 60M1
Faro Mine Remediation Project



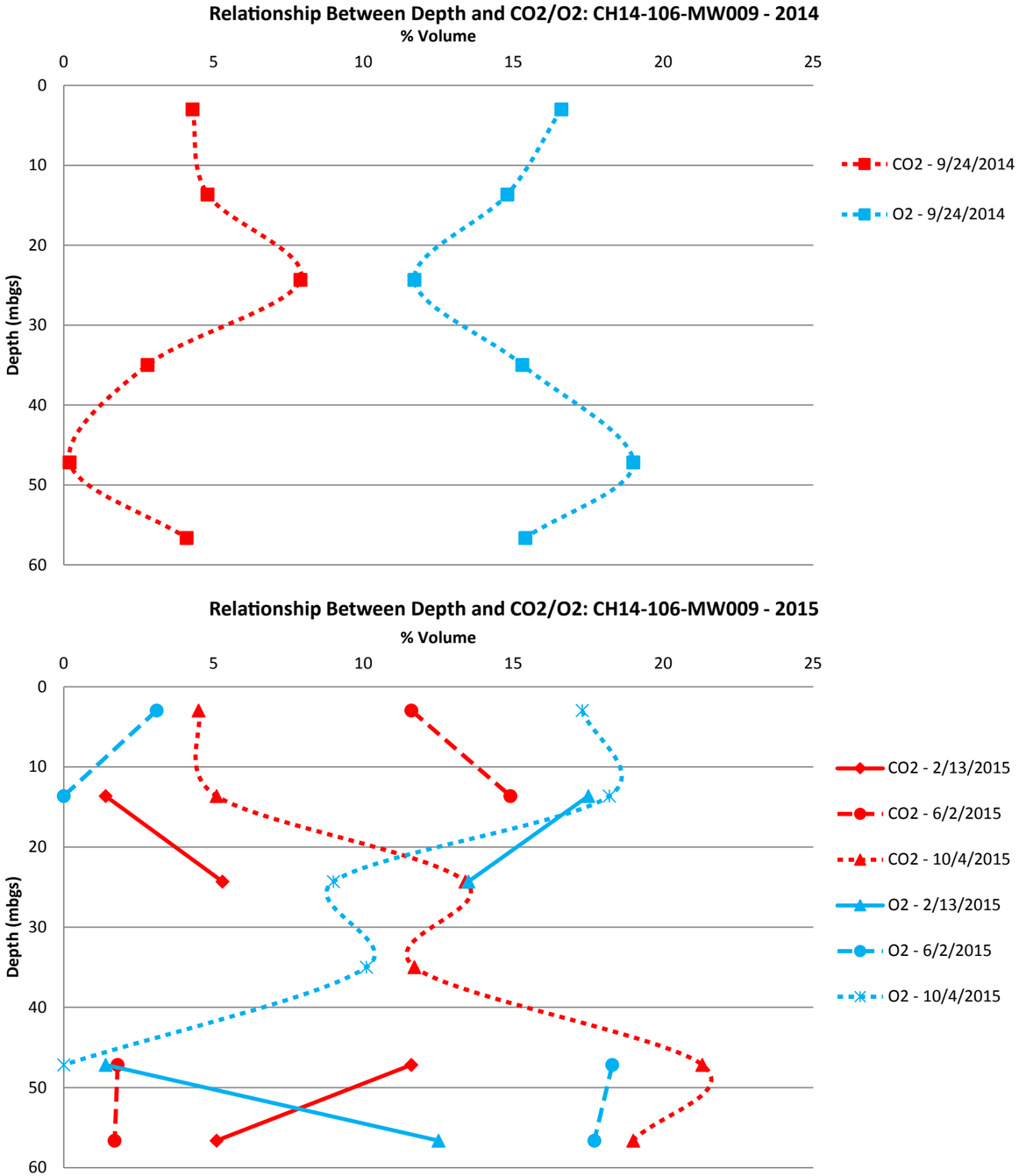


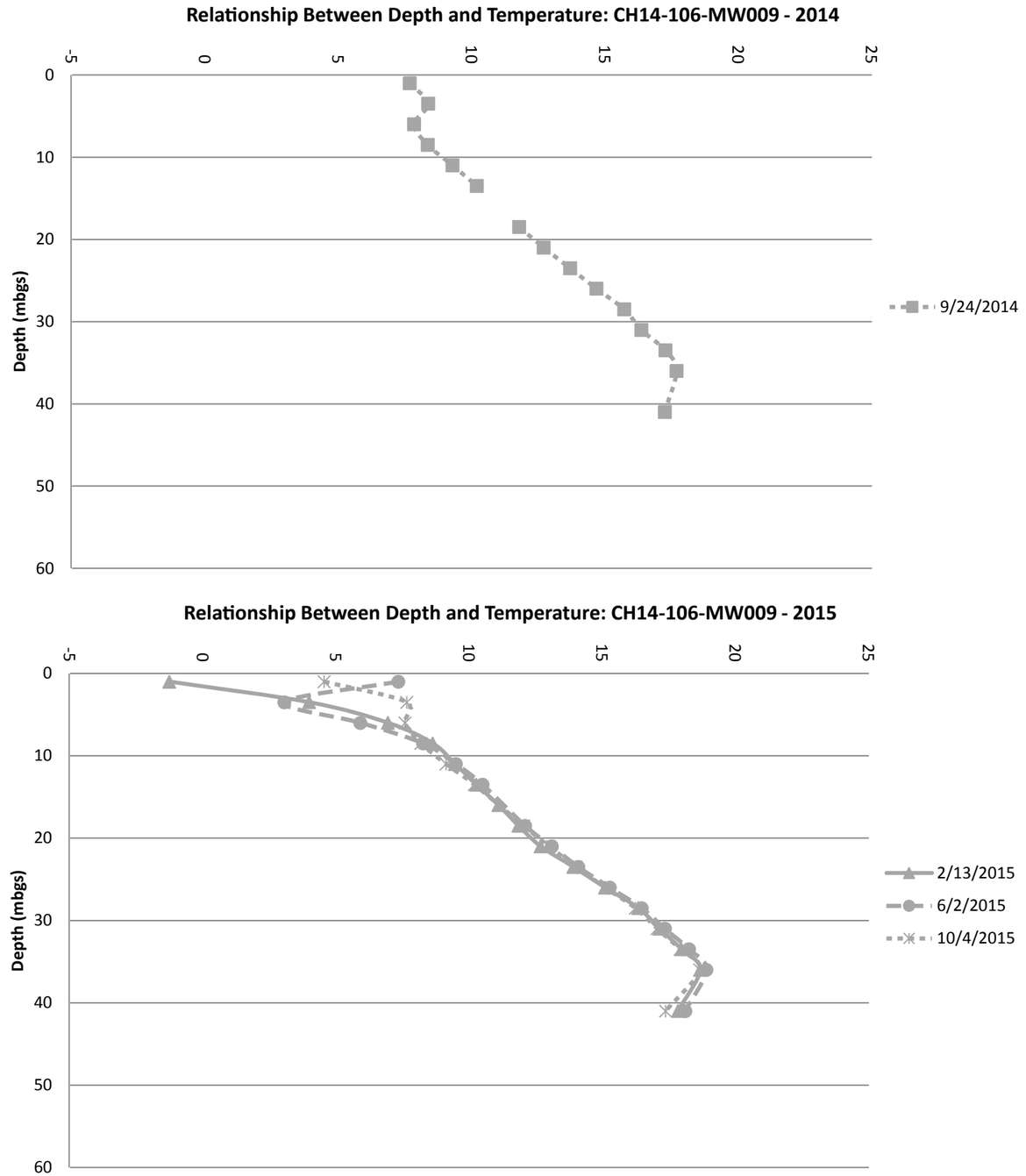




Note:
mbgs = metres below ground surface

FIGURE 3-32 - *3 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - 60M1
Faro Mine Remediation Project

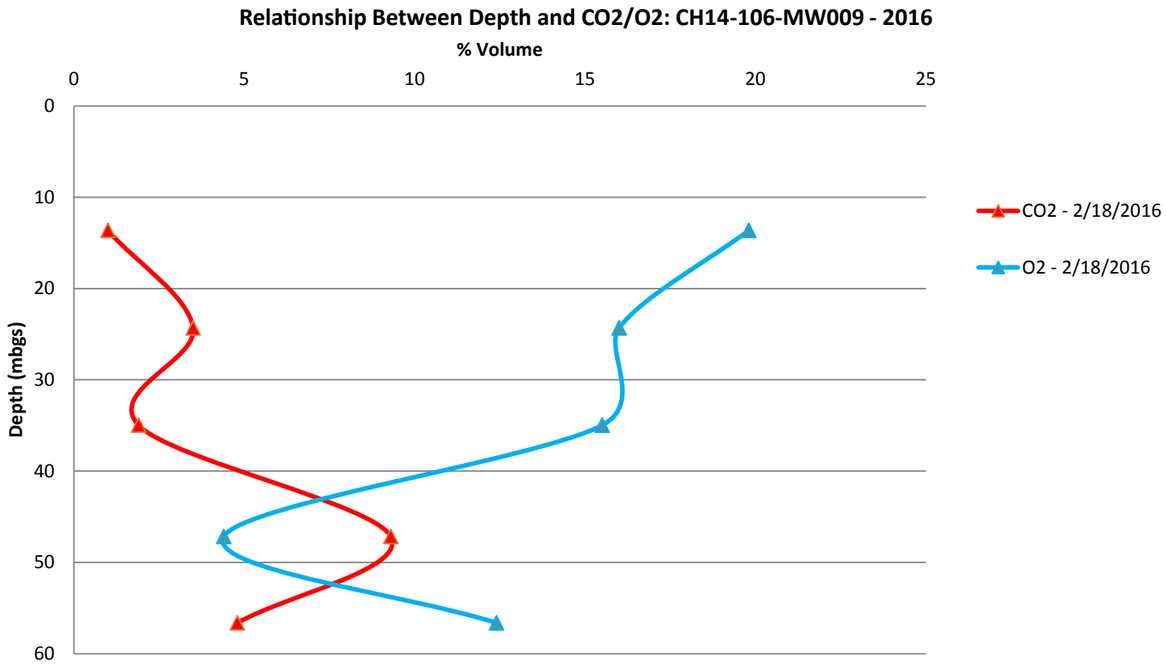


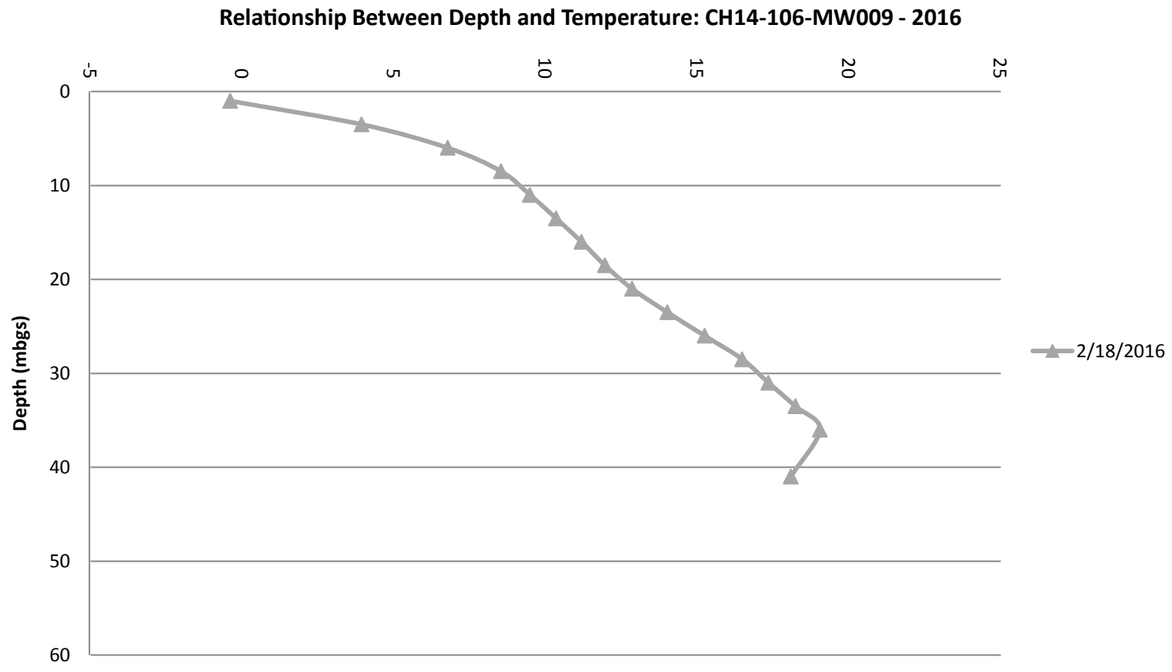


Note:
mbgs = metres below ground surface

FIGURE 3-33 - *1 of 2*
Pore Gas and Temperature Profiles - Main Waste Rock Dump - CH14-106-MW009
Faro Mine Remediation Project

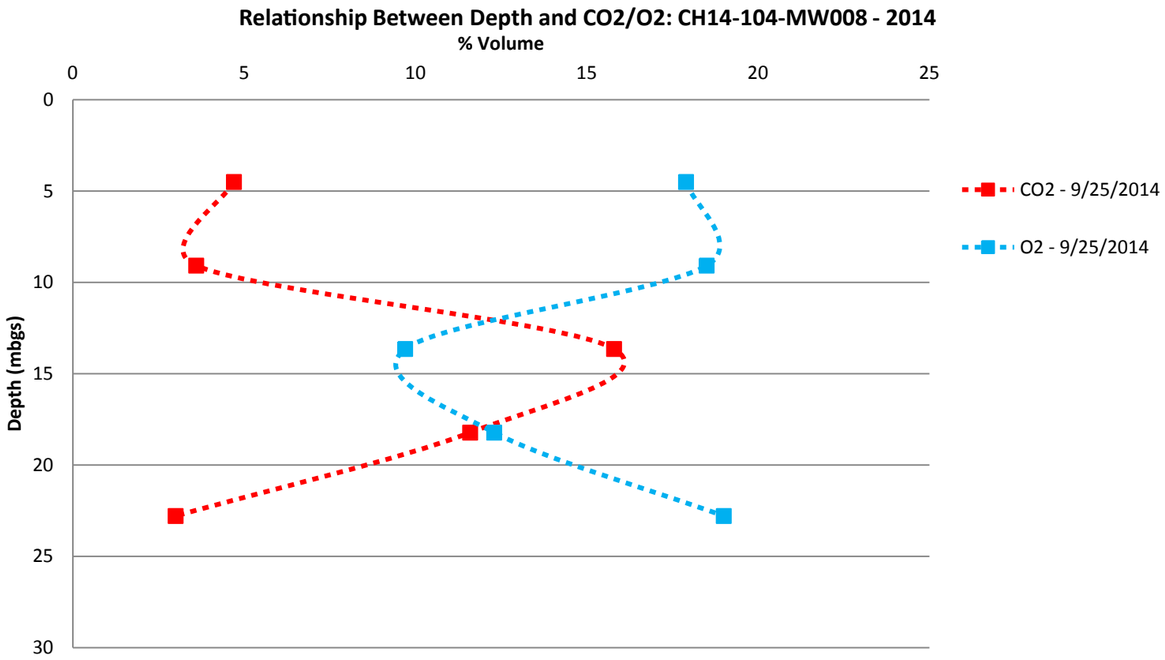
ch2m

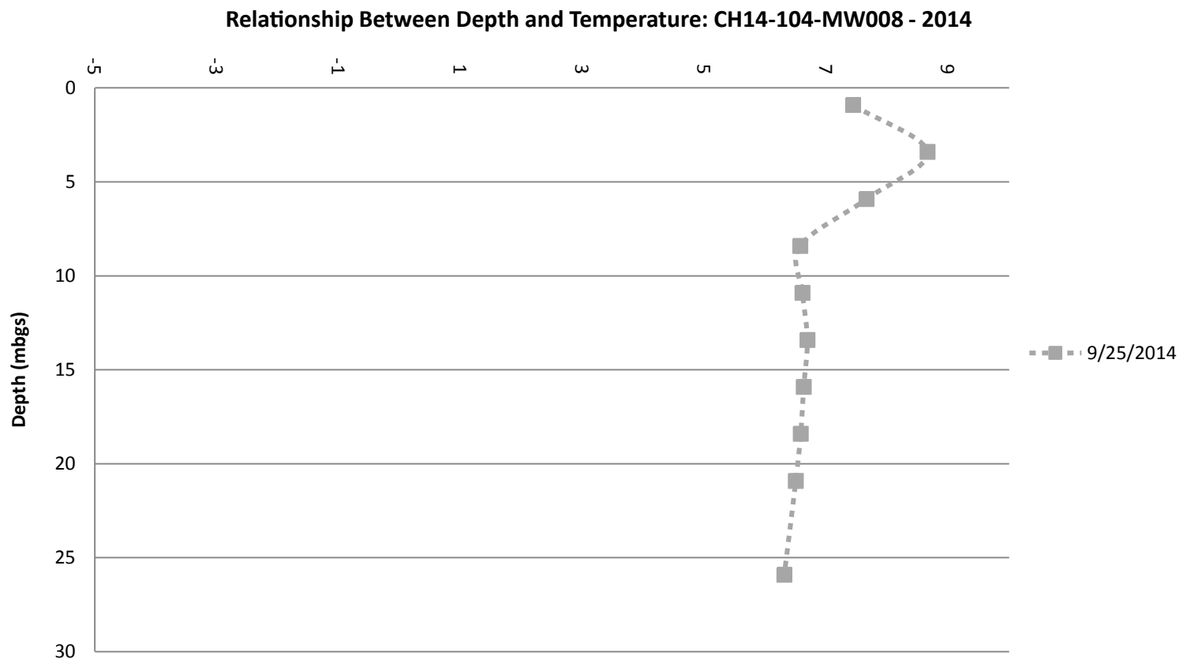


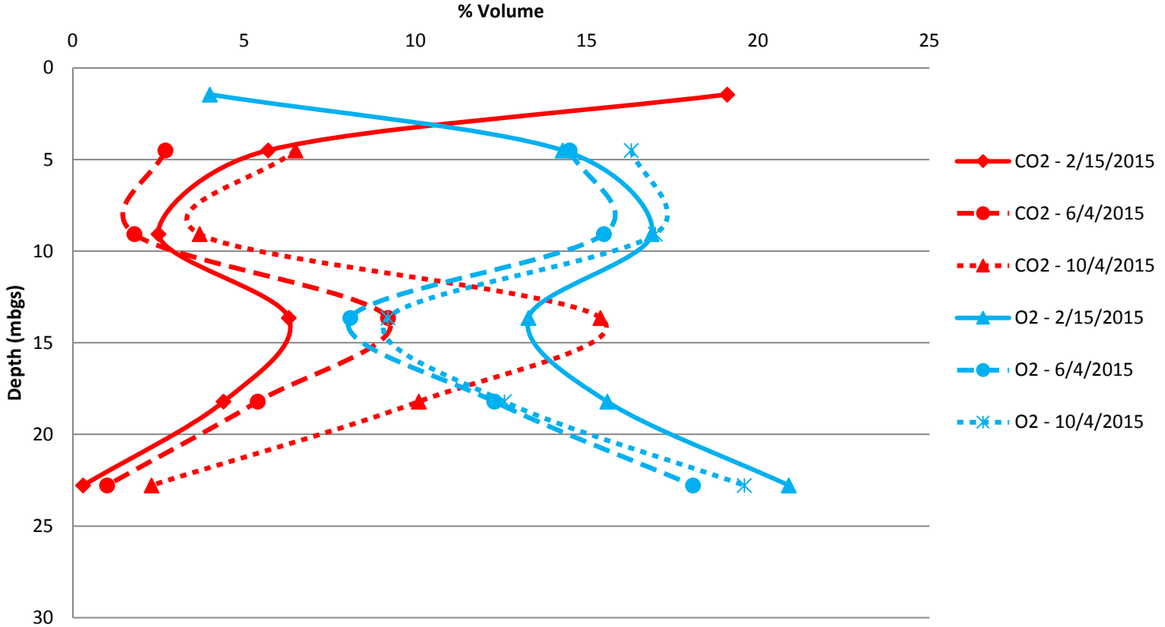


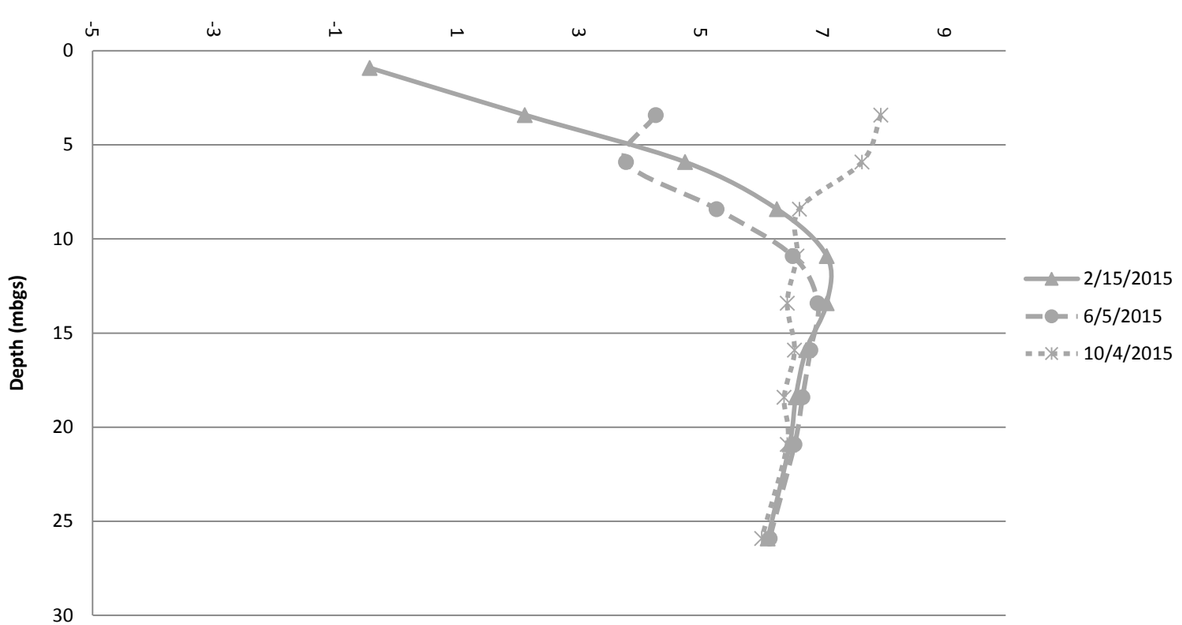
Note:
mbgs = metres below ground surface

FIGURE 3-33 - *2 of 2*
Pore Gas and Temperature Profiles -
Main Waste Rock Dump - CH14-106-MW009
Faro Mine Remediation Project



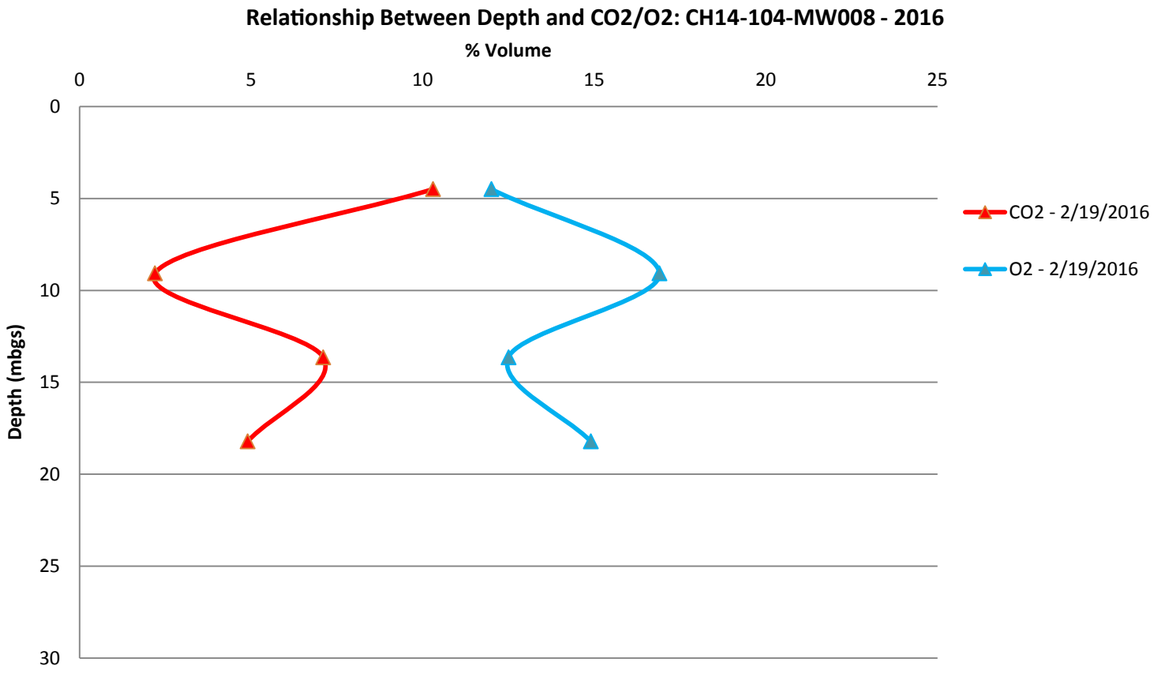


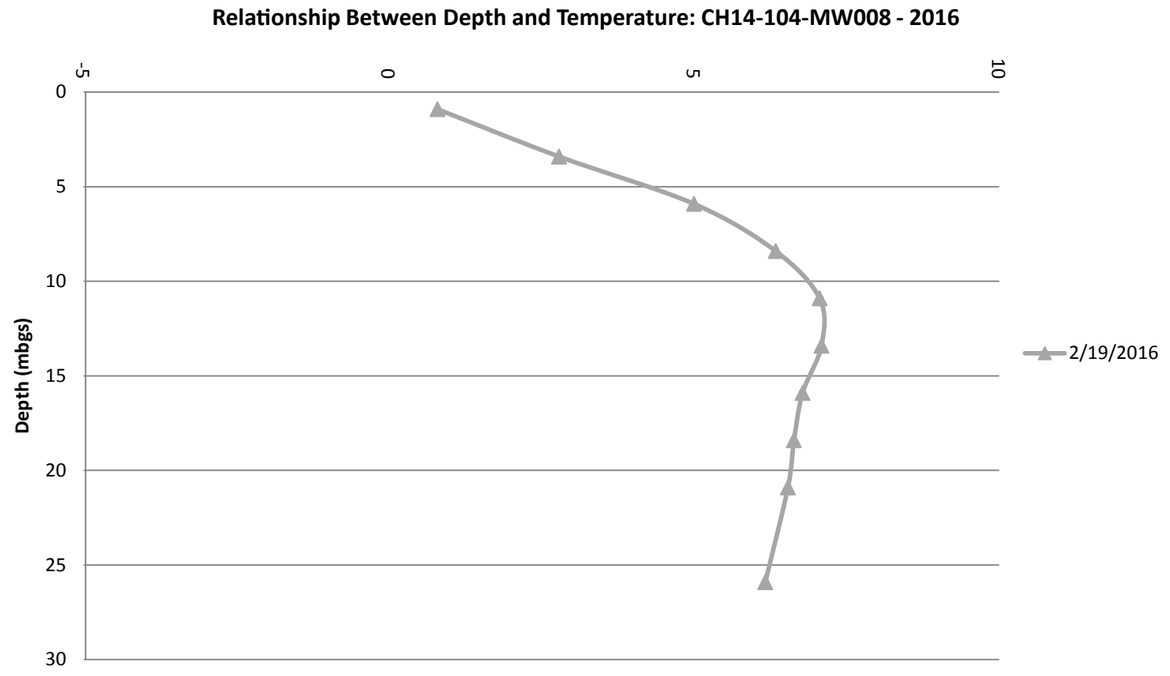




Note:
mbgs = metres below ground surface

FIGURE 3-34 - *1 of 2*
Pore Gas and Temperature Profiles - Oxide Fines Stockpile - CH14-104-MW008
Faro Mine Remediation Project

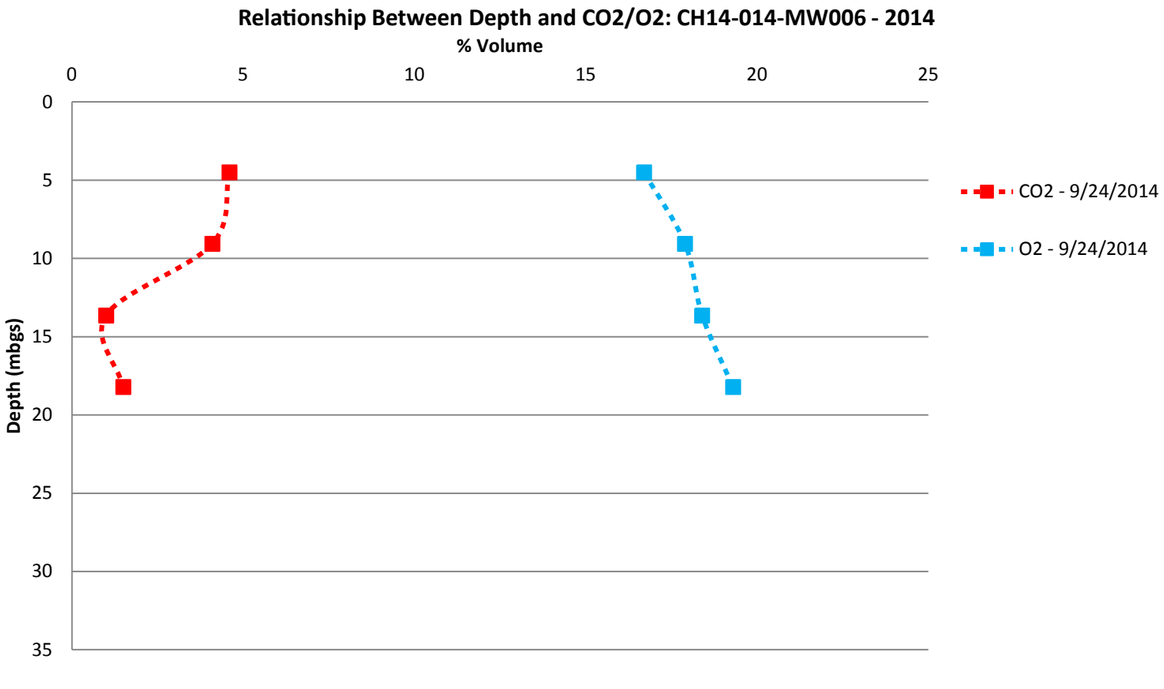


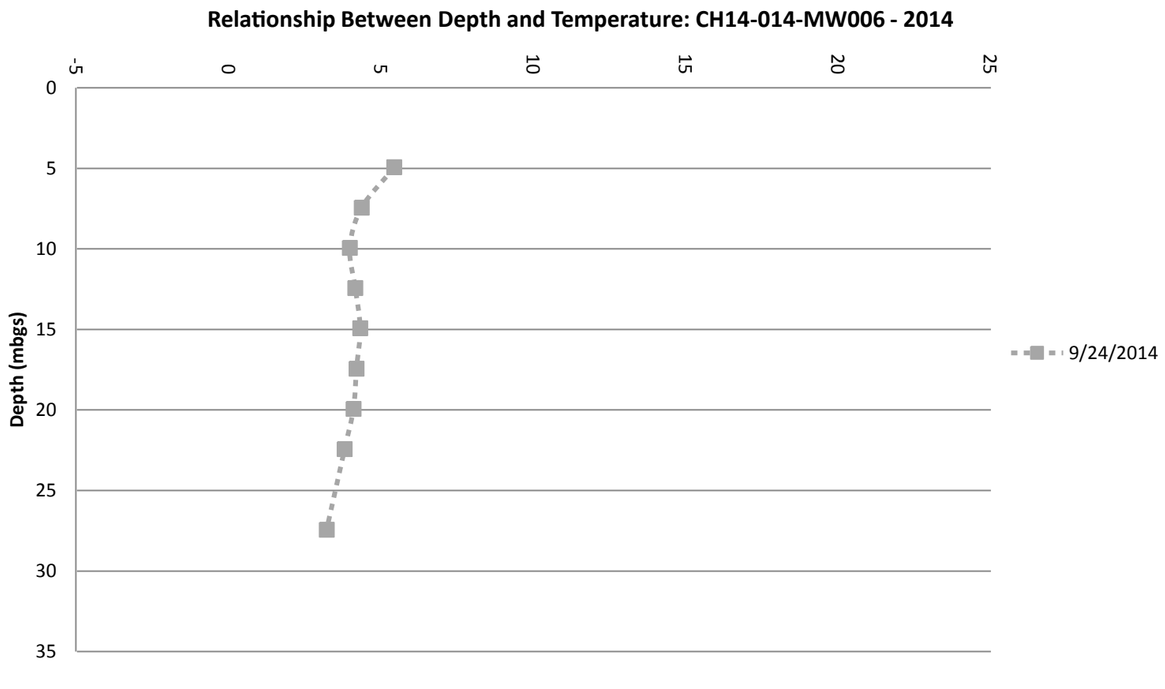


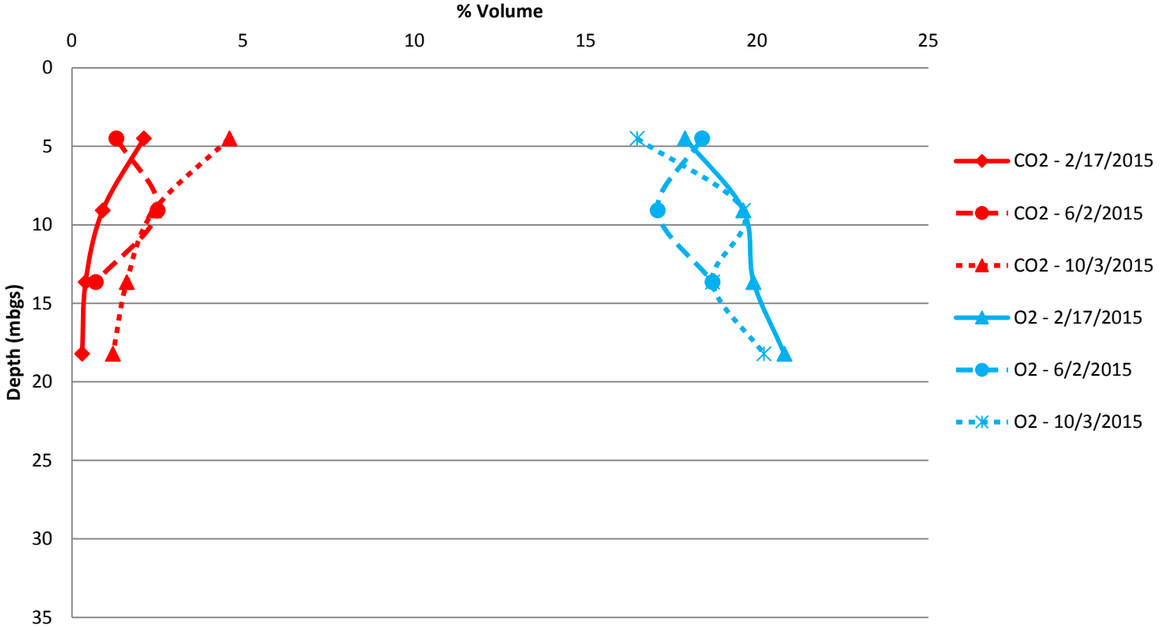
Note:
mbgs = metres below ground surface

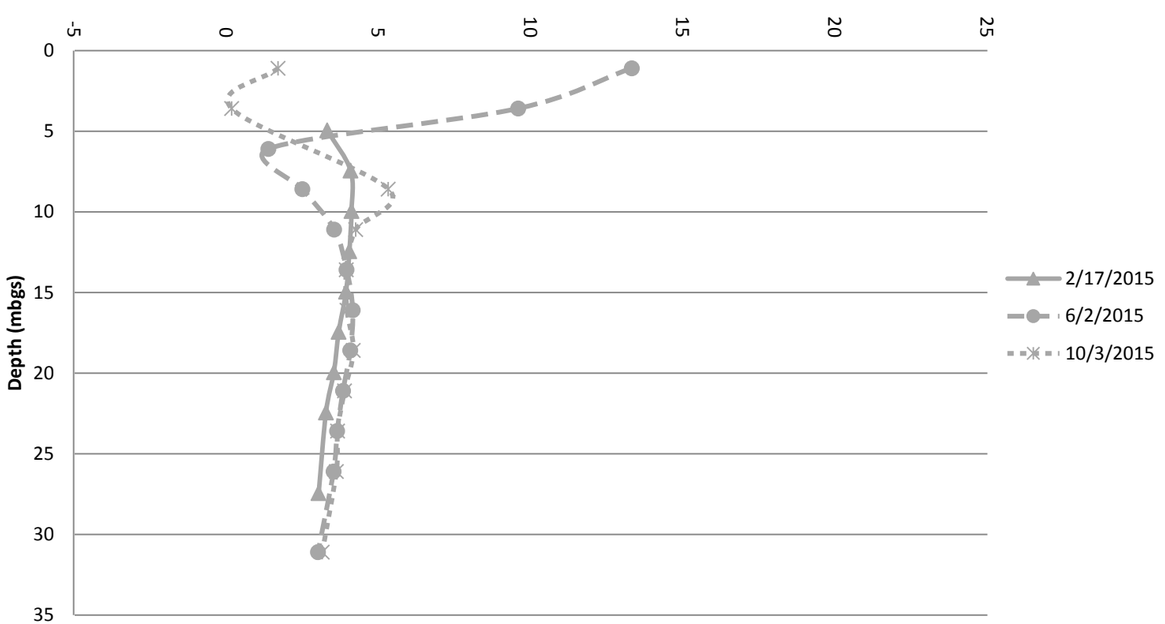
FIGURE 3-34 - *2 of 2*
Pore Gas and Temperature Profiles -
Oxide Fines Stockpile - CH14-104-MW008
Faro Mine Remediation Project

ch2m.



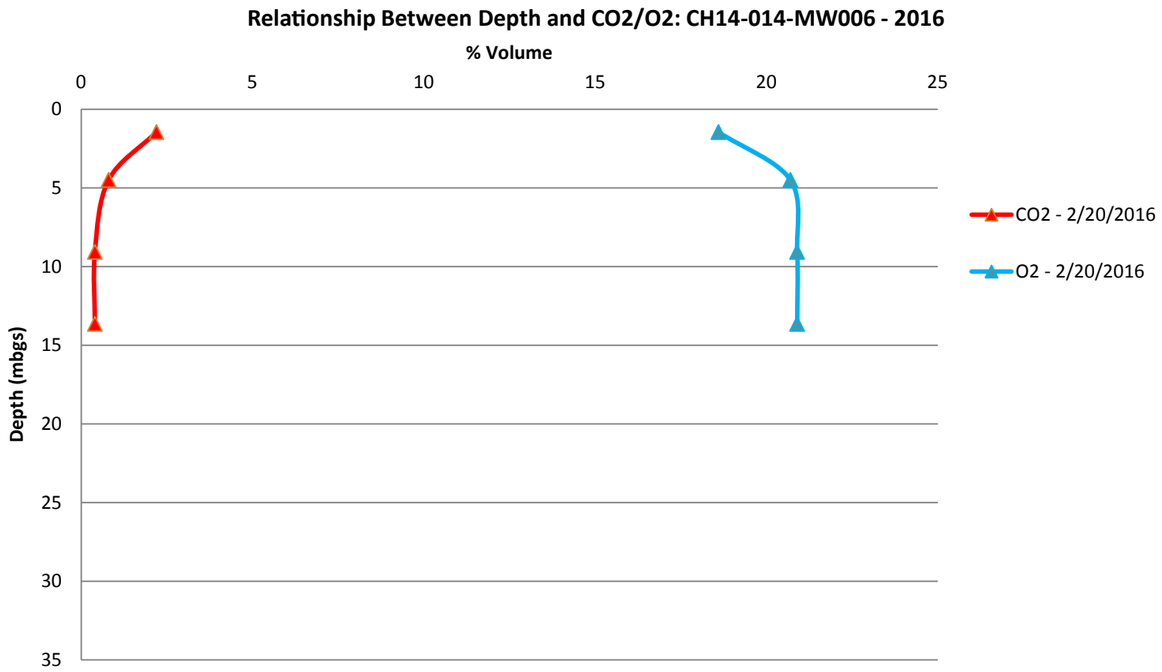


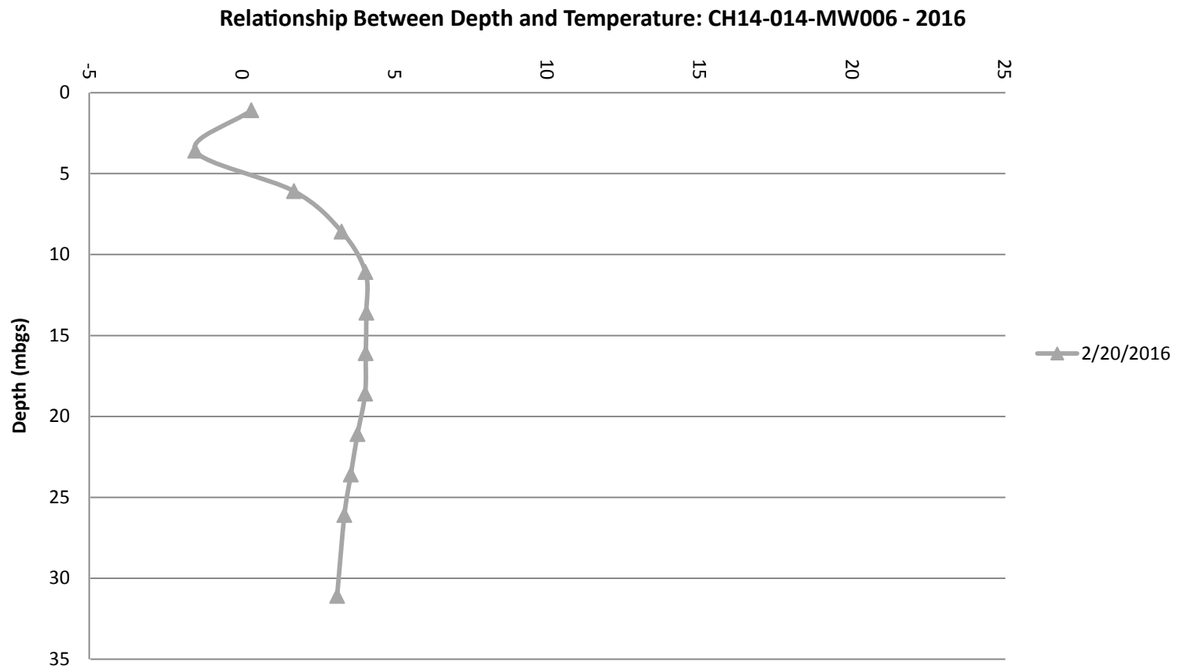




Note:
mbgs = metres below ground surface

FIGURE 3-35 - *1 of 2*
Pore Gas and Temperature Profiles - Northeast Waste Rock Dump - CH14-015-MW006
Faro Mine Remediation Project

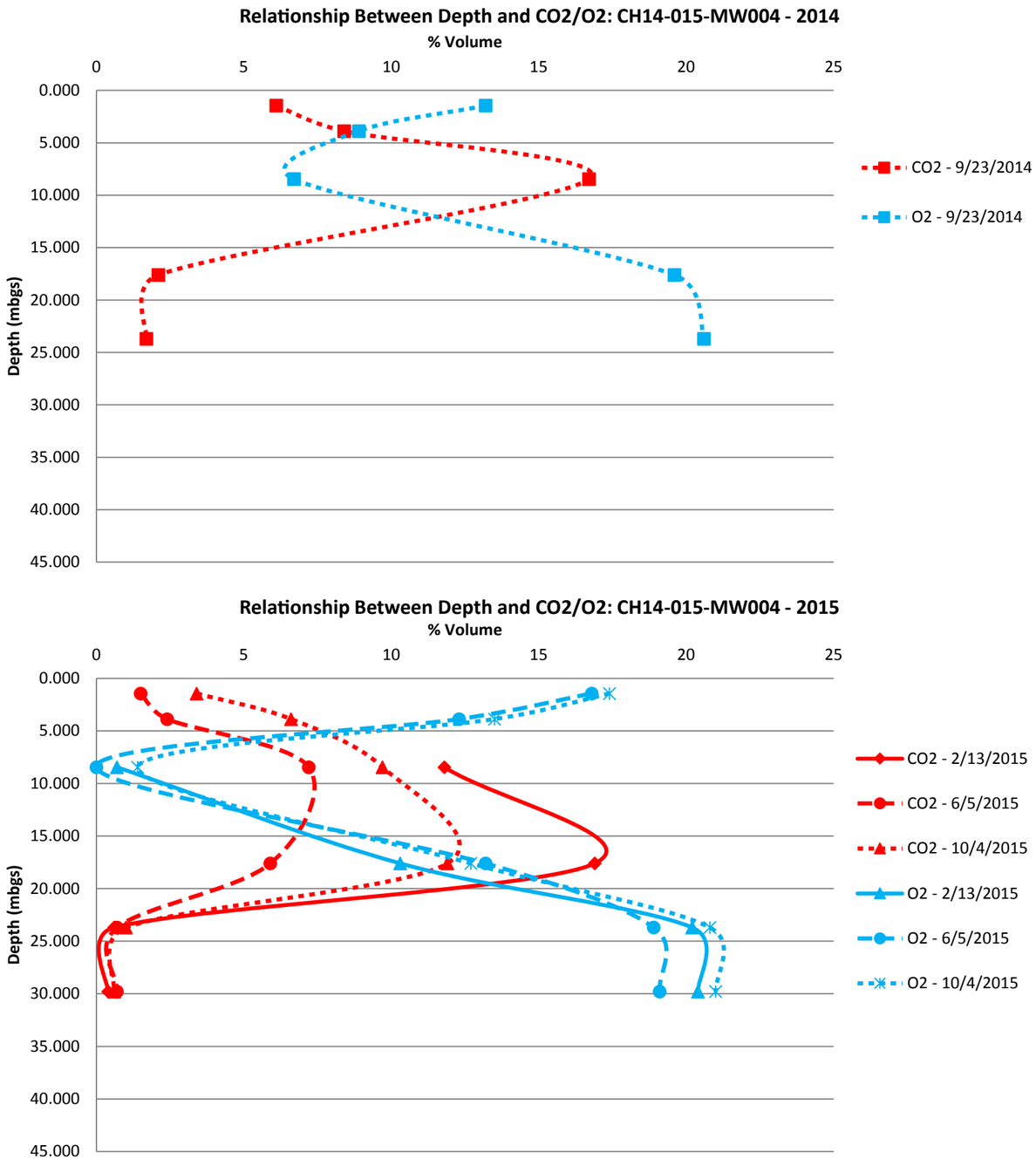


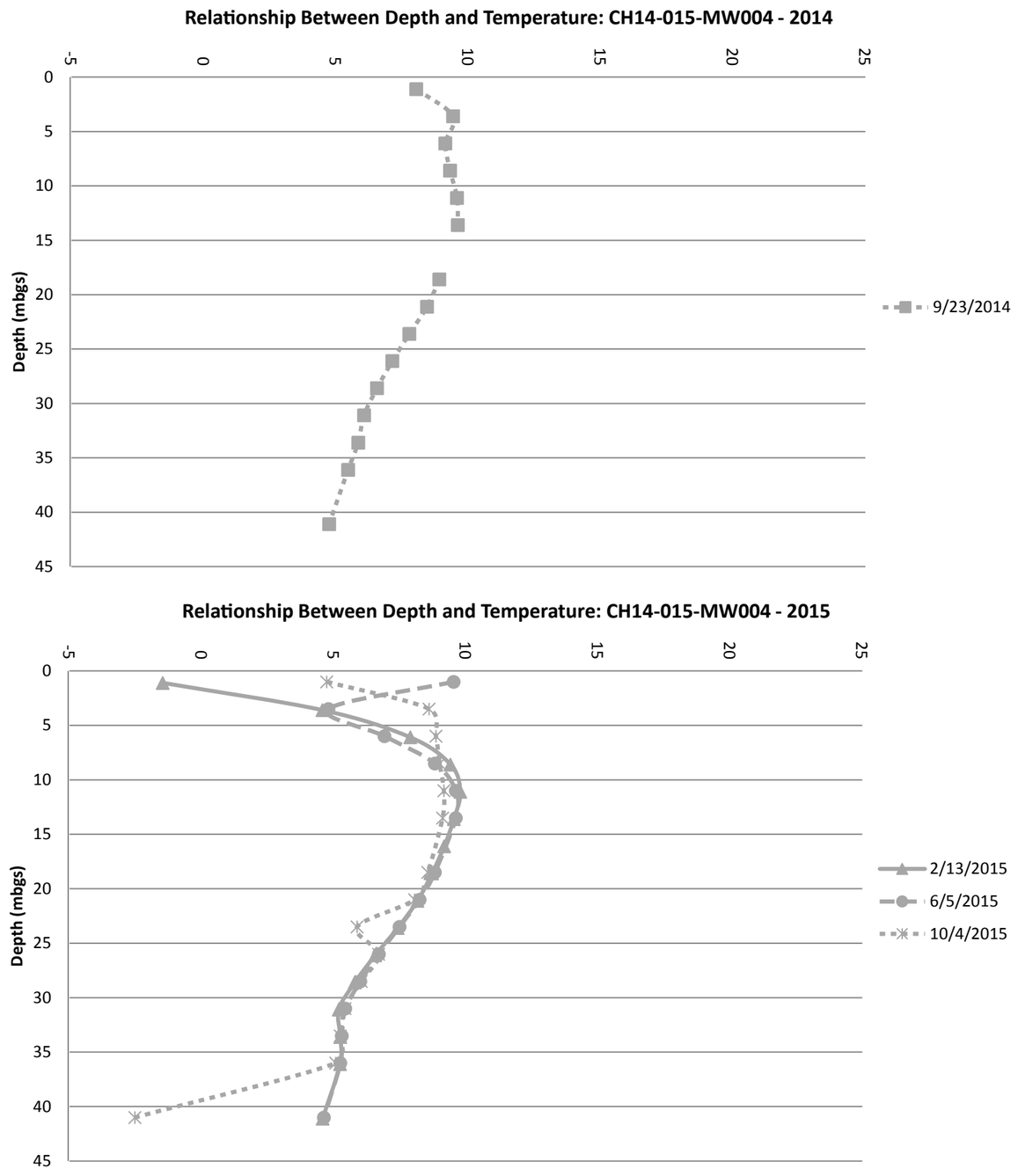


Note:
mbgs = metres below ground surface

FIGURE 3-35 - *2 of 2*
Pore Gas and Temperature Profiles -
Northeast Waste Rock Dump - CH14-015-MW006
Faro Mine Remediation Project

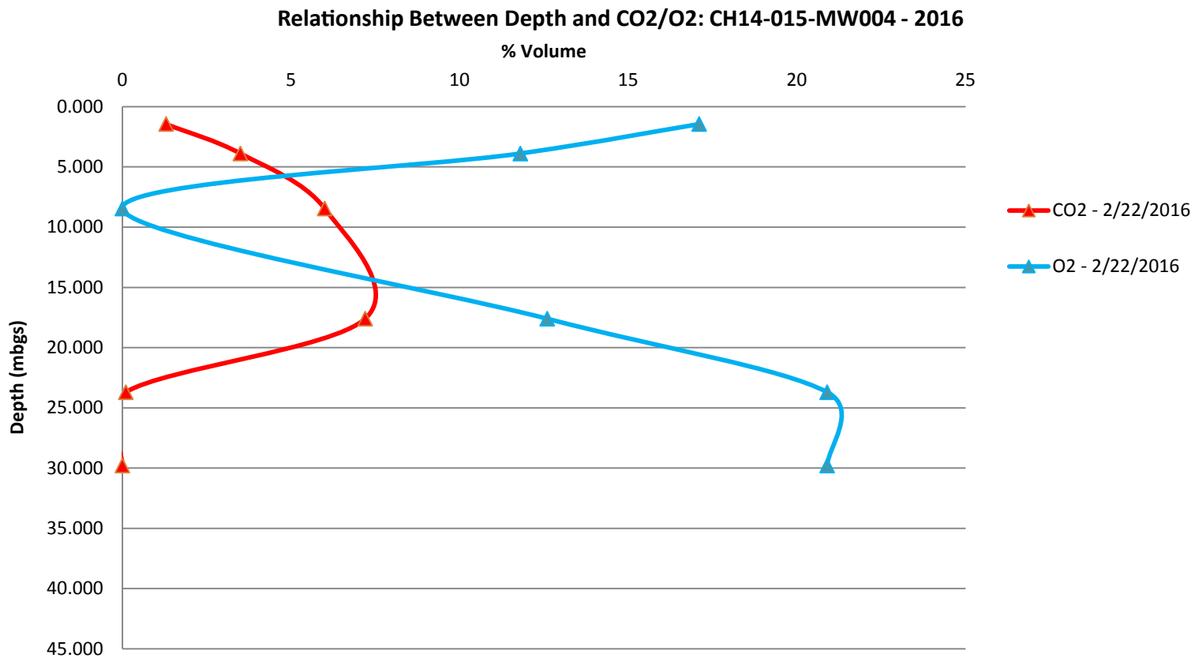
ch2m

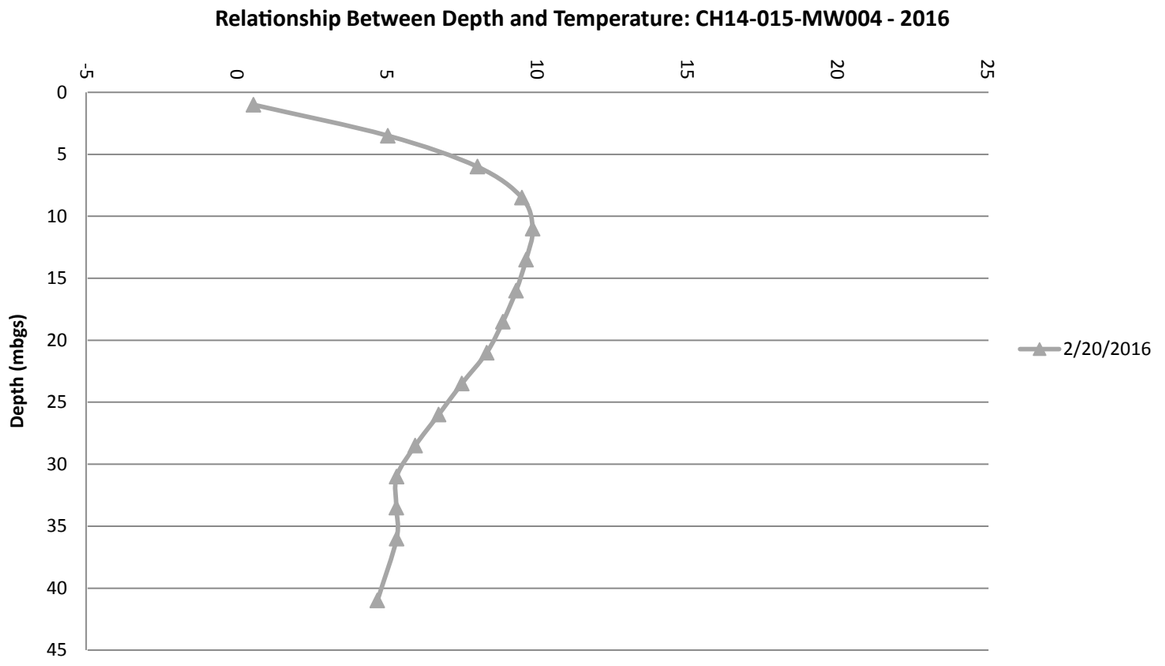




Note:
mbgs = metres below ground surface

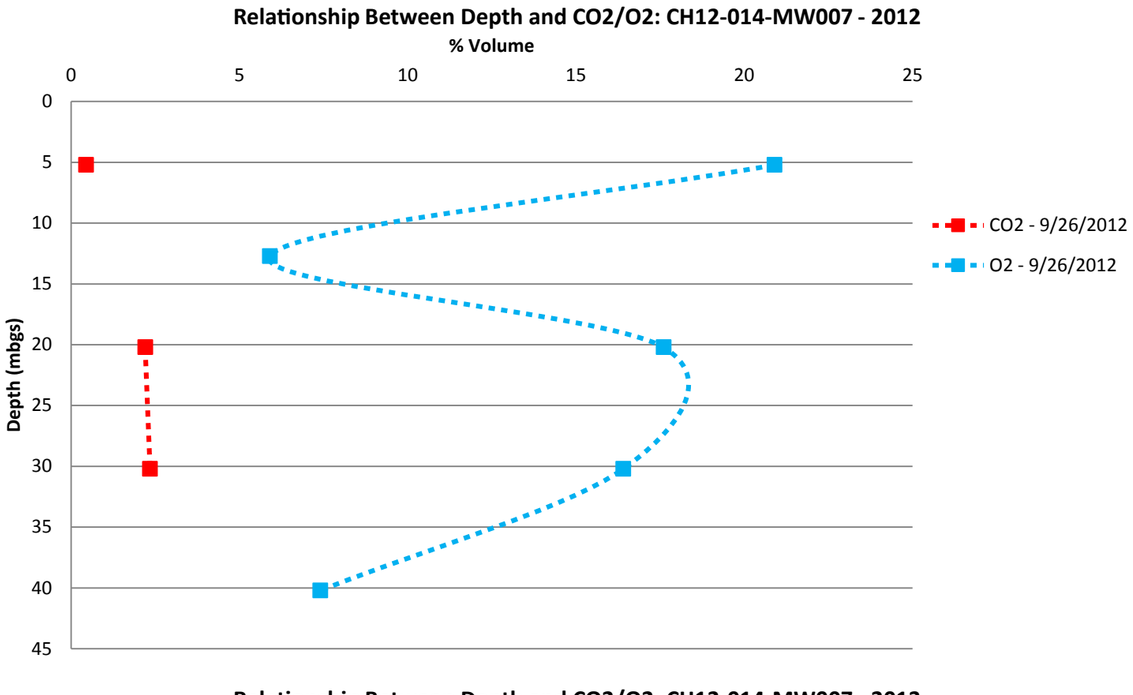
FIGURE 3-36 - *1 of 2*
Pore Gas and Temperature Profiles - Northwest Waste Rock Dump - CH14-015-MW004
Faro Mine Remediation Project

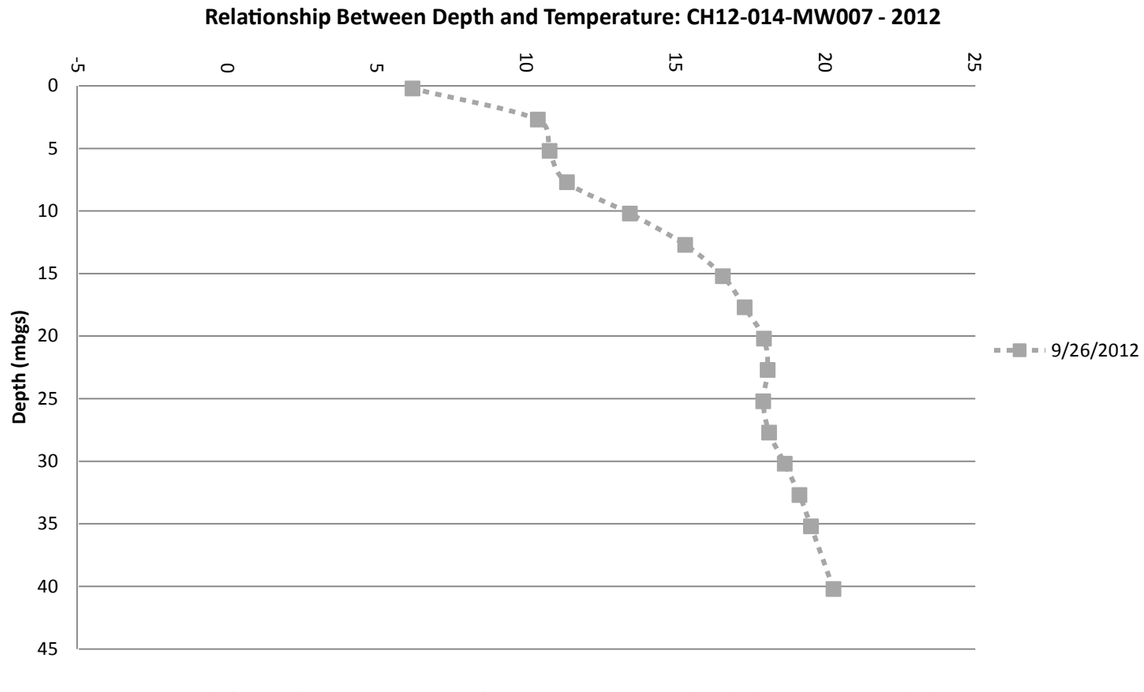


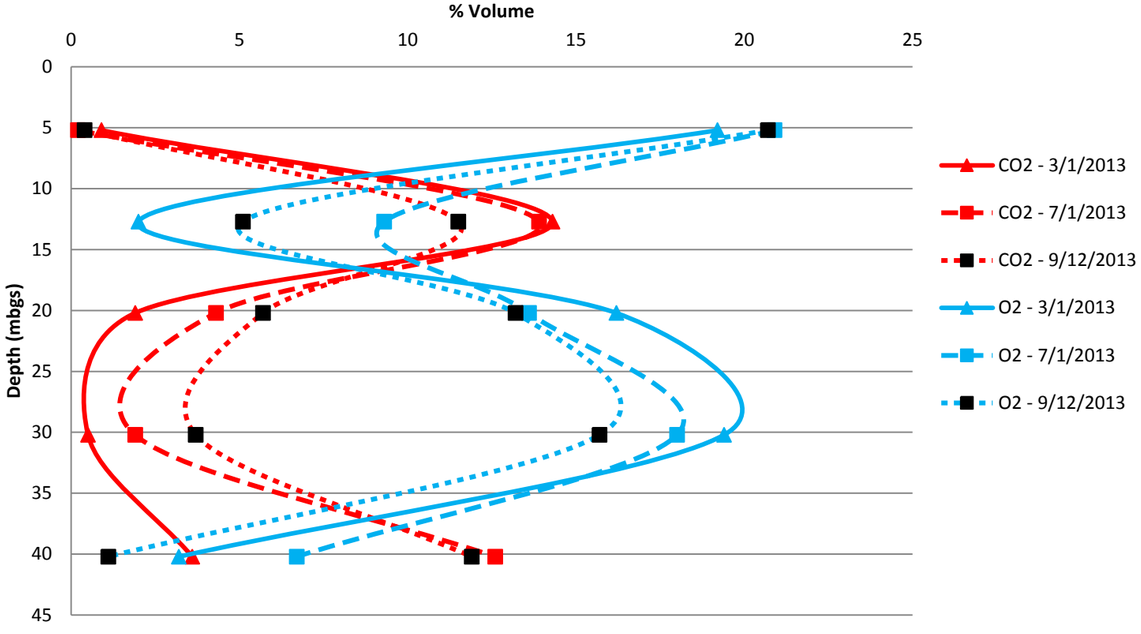


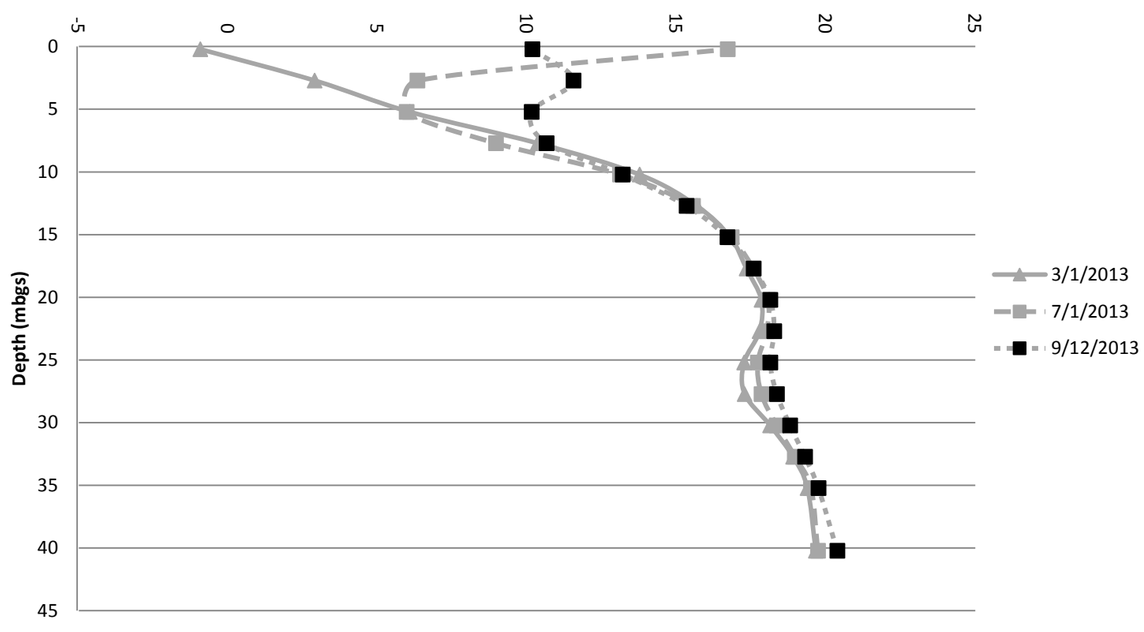
Note:
mbgs = metres below ground surface

FIGURE 3-36 - *2 of 2*
Pore Gas and Temperature Profiles -
Northwest Waste Rock Dump - CH14-015-MW004
Faro Mine Remediation Project



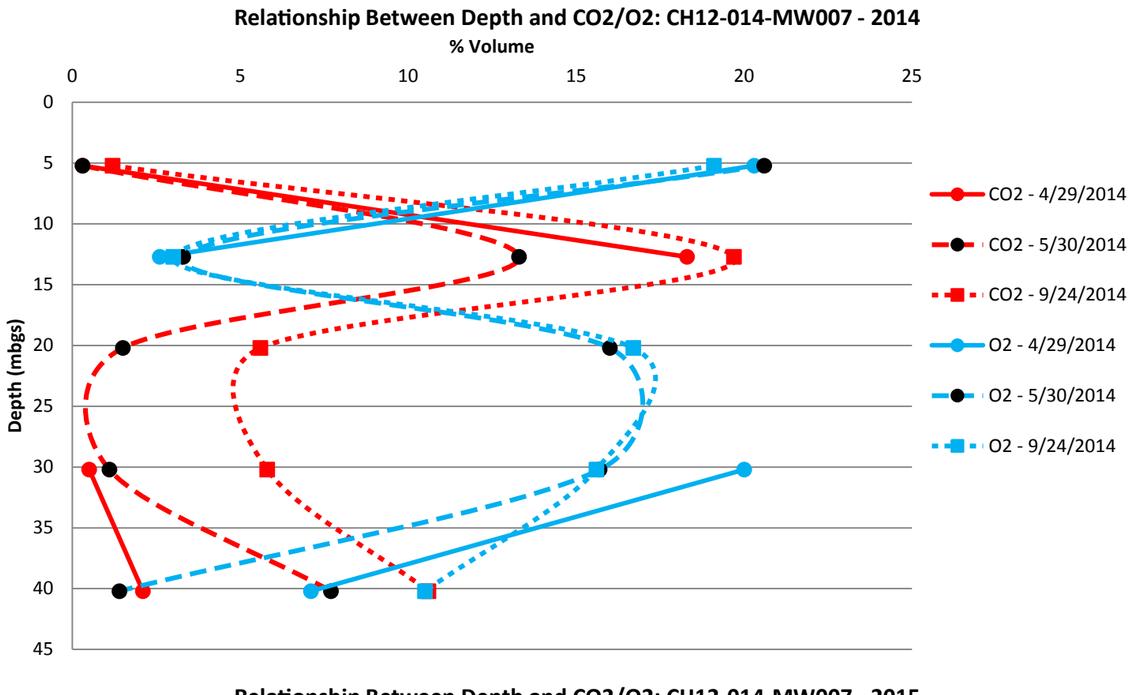


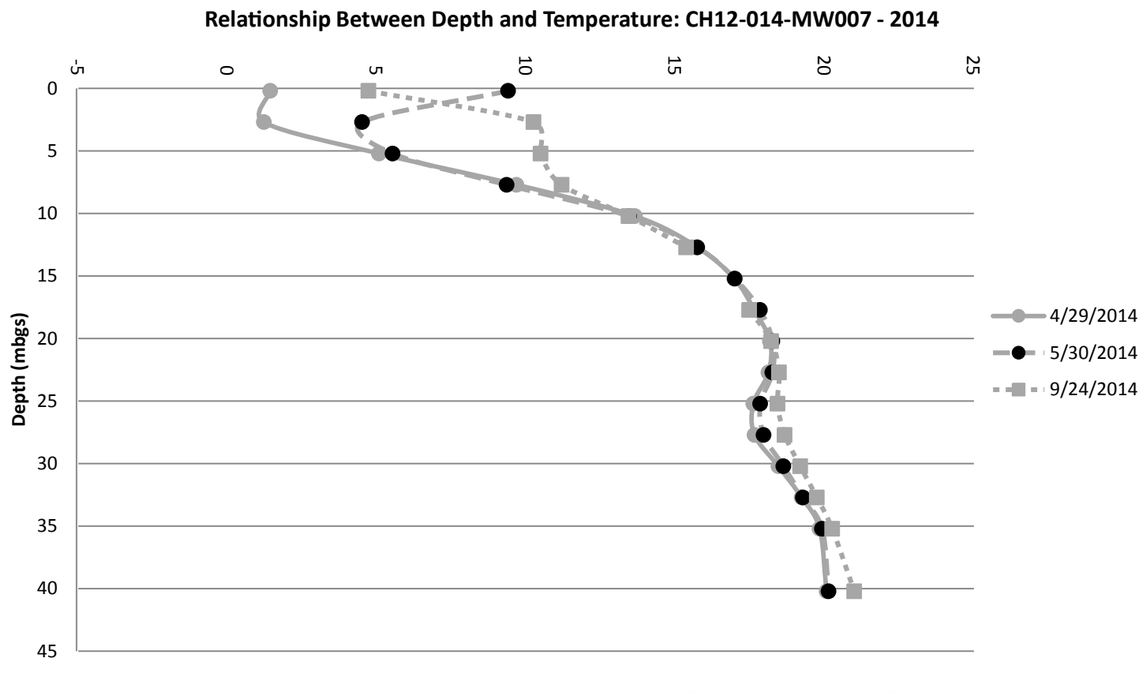


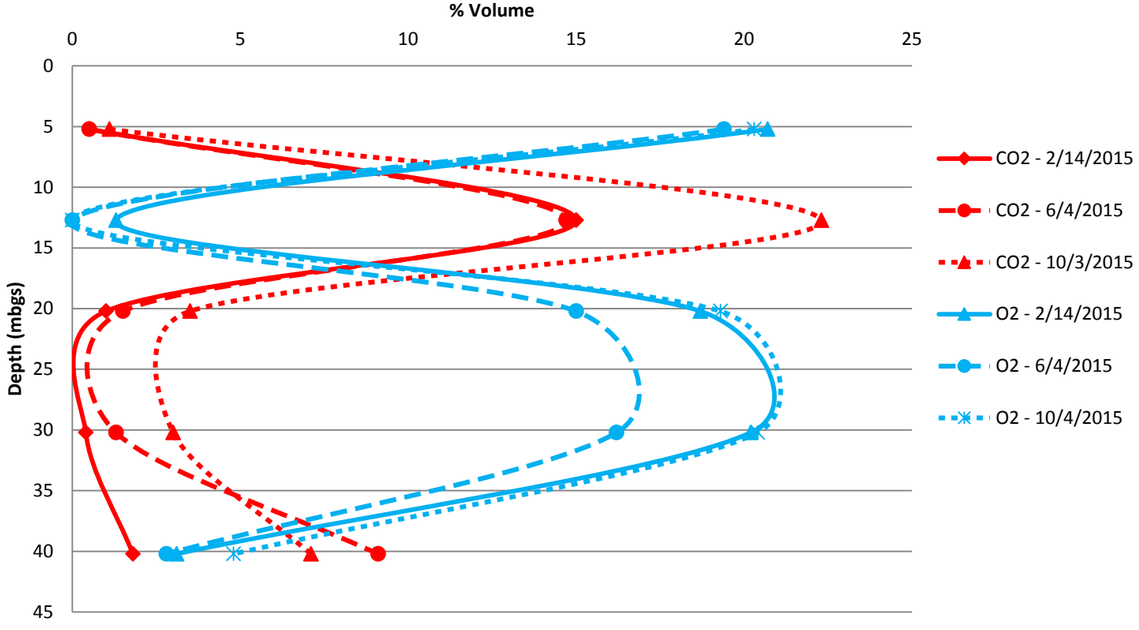


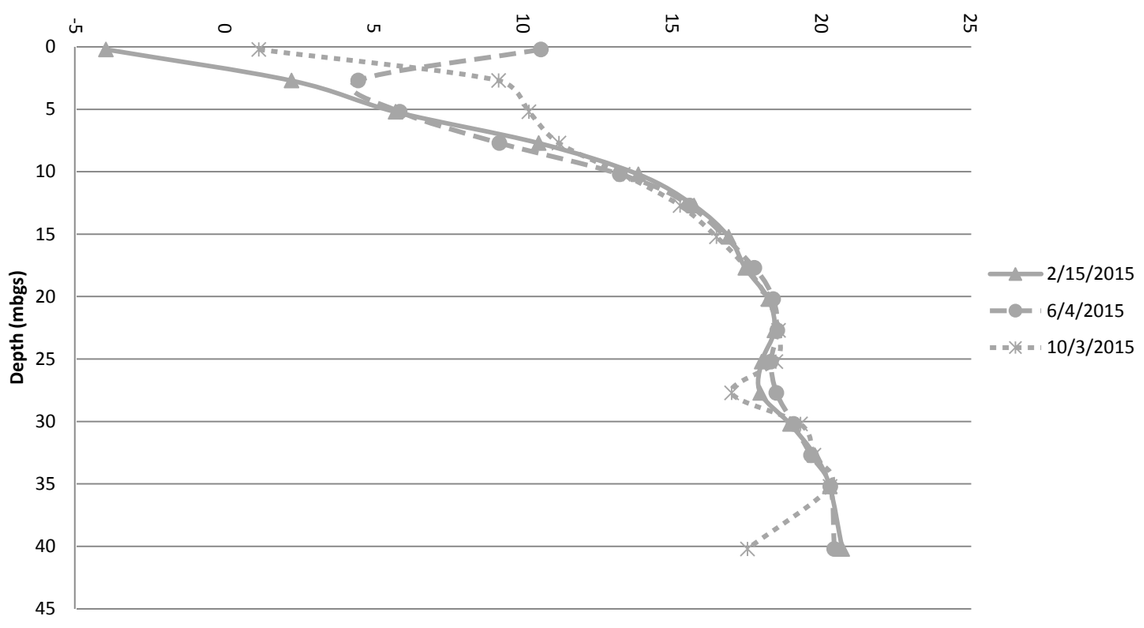
Note:
mbgs = metres below ground surface

FIGURE 3-37 - *1 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - CH12-014-MW007
Faro Mine Remediation Project



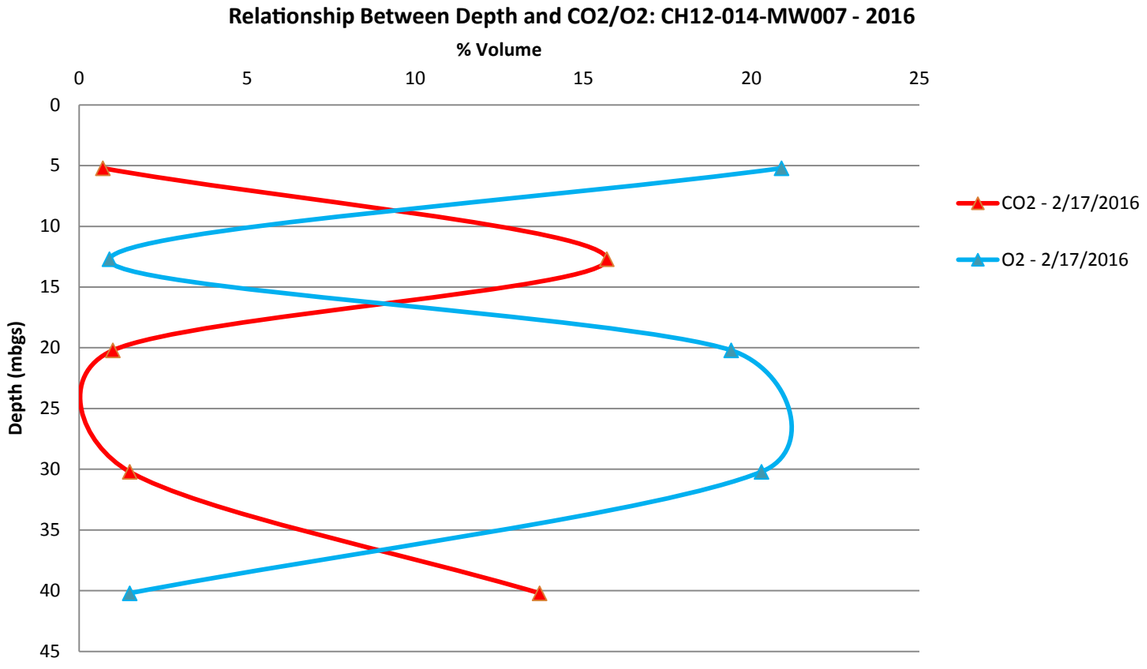


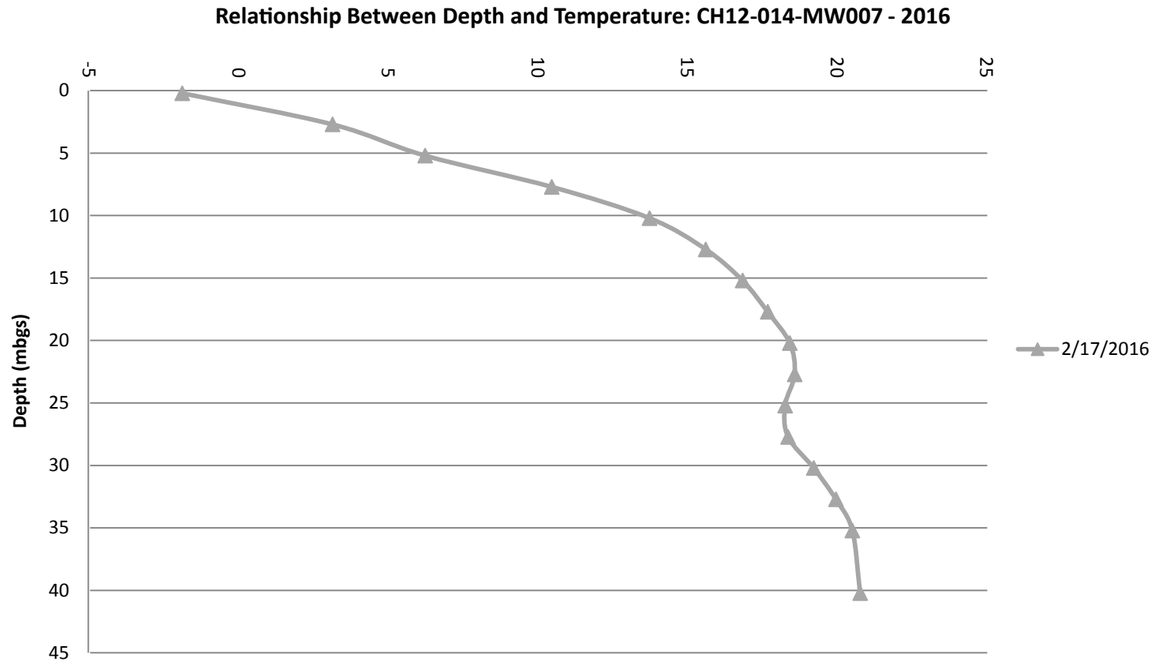




Note:
mbgs = metres below ground surface

FIGURE 3-37 - *2 of 3*
Pore Gas and Temperature Profiles - Intermediate Waste Rock Dump - CH12-014-MW007
Faro Mine Remediation Project

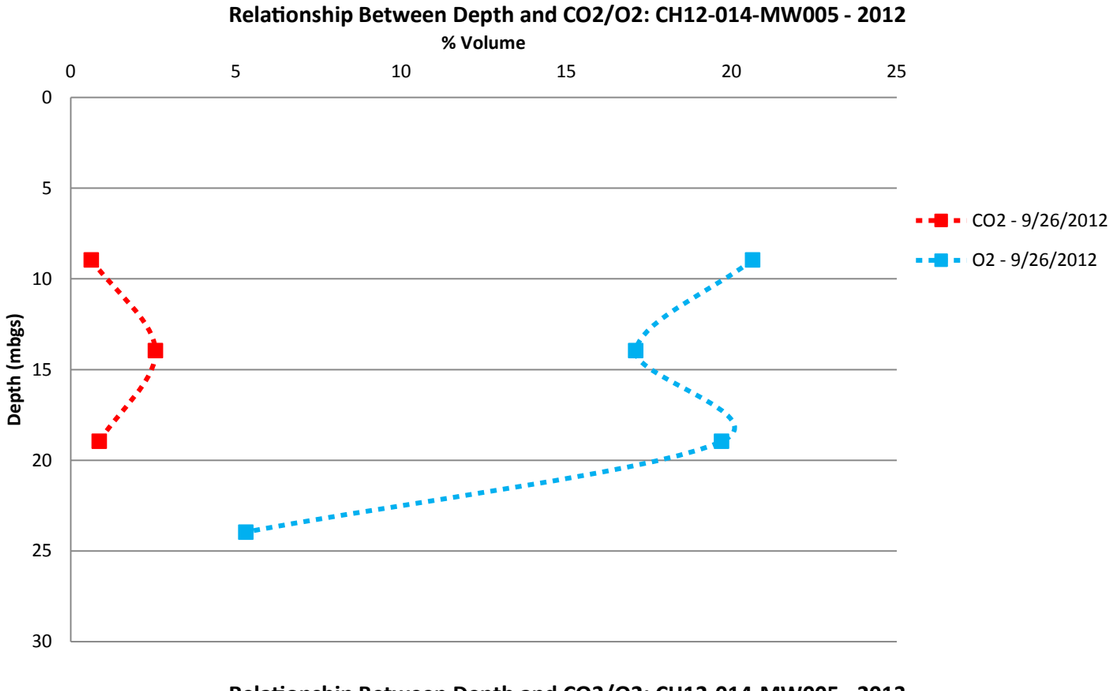


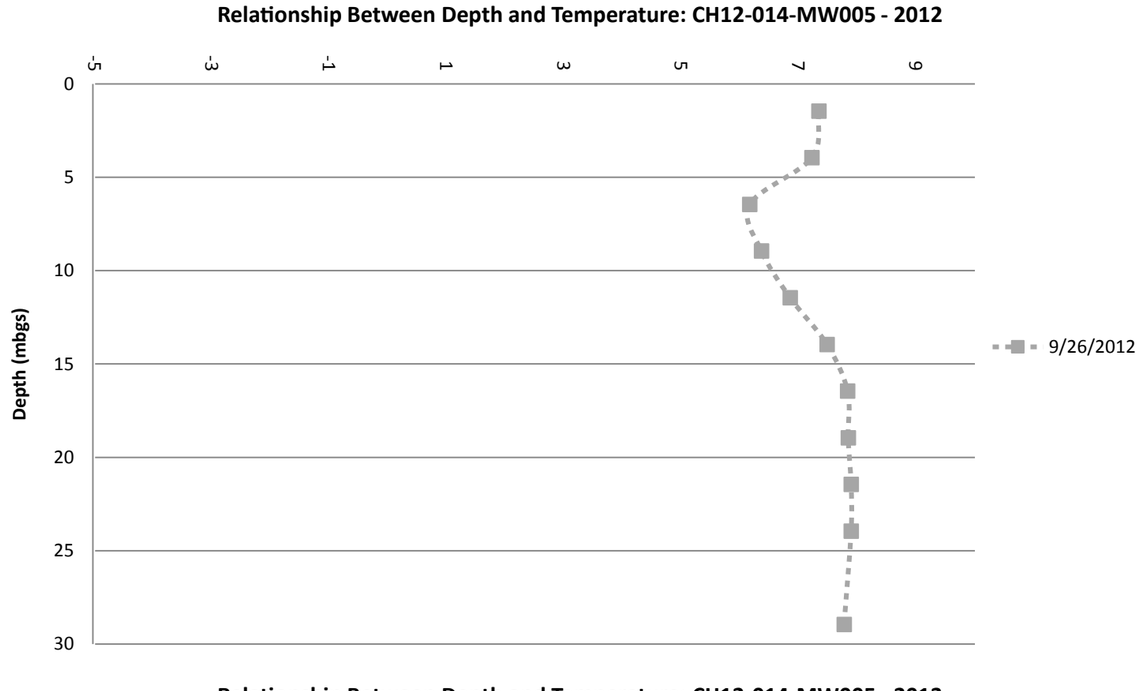


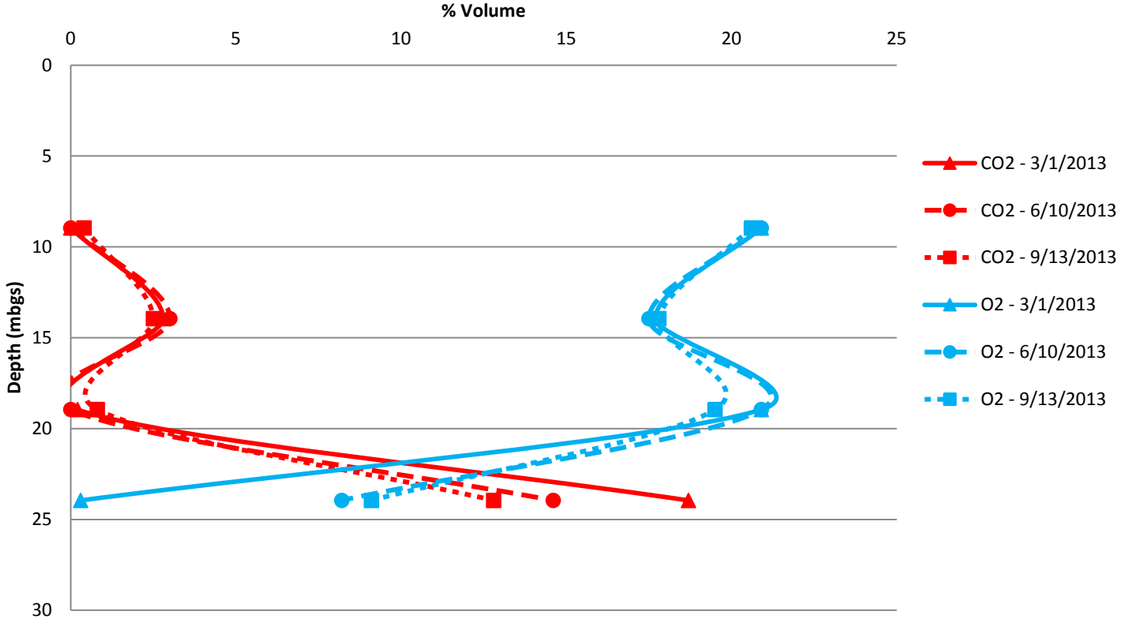
Note:
mbgs = metres below ground surface

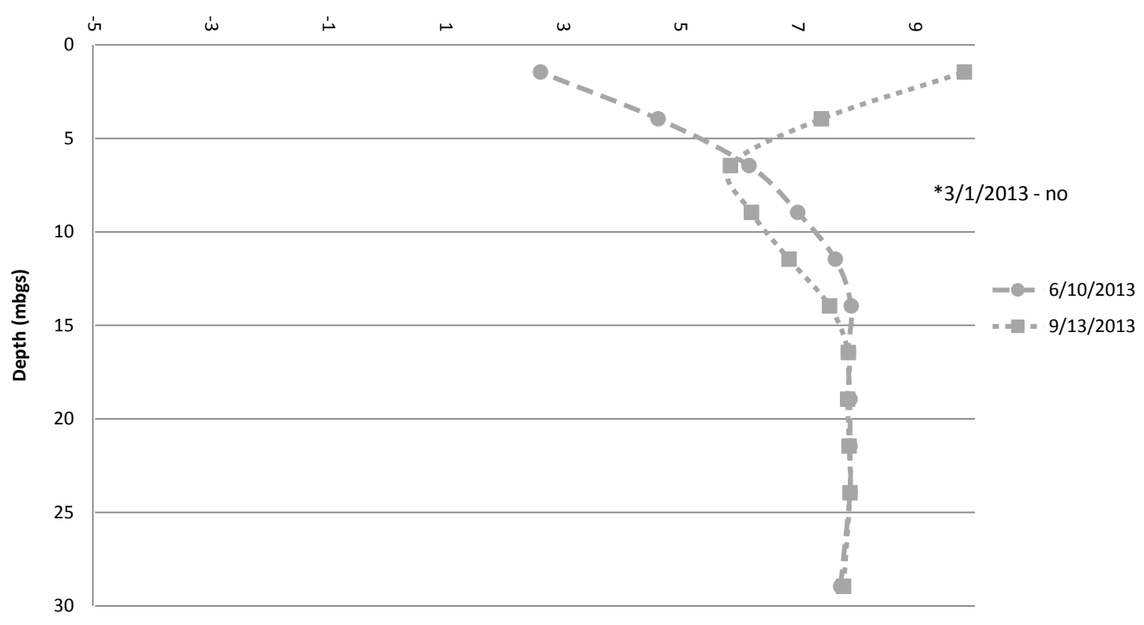
FIGURE 3-37 - *3 of 3*
Pore Gas and Temperature Profiles -
Intermediate Waste Rock Dump - CH12-014-MW007
Faro Mine Remediation Project

ch2m



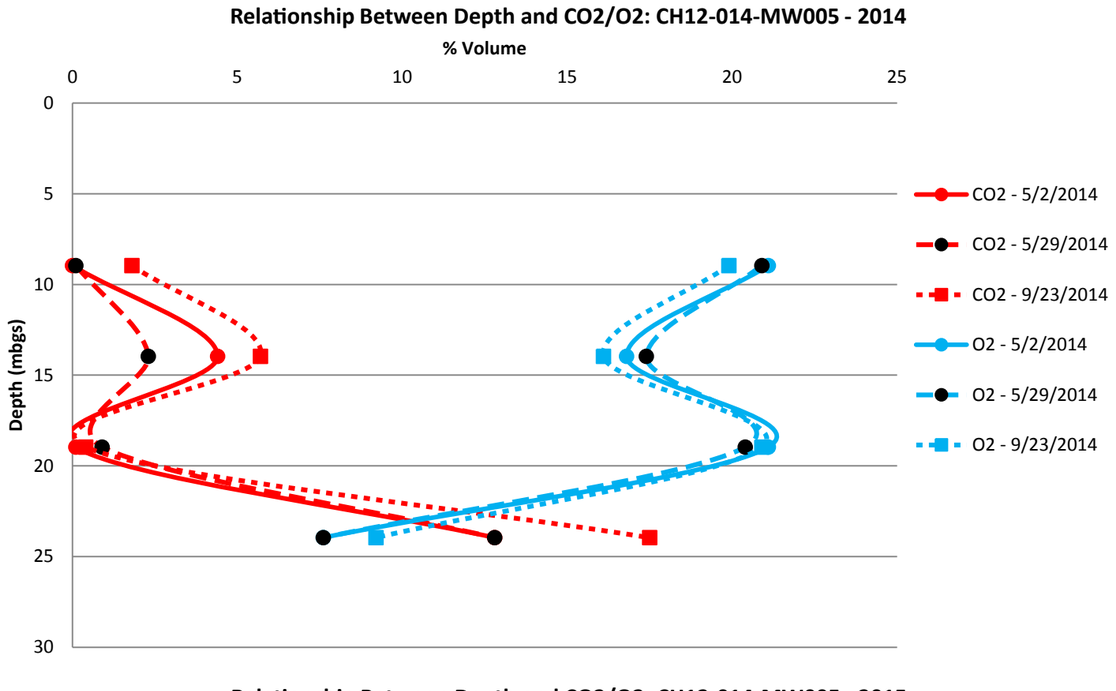


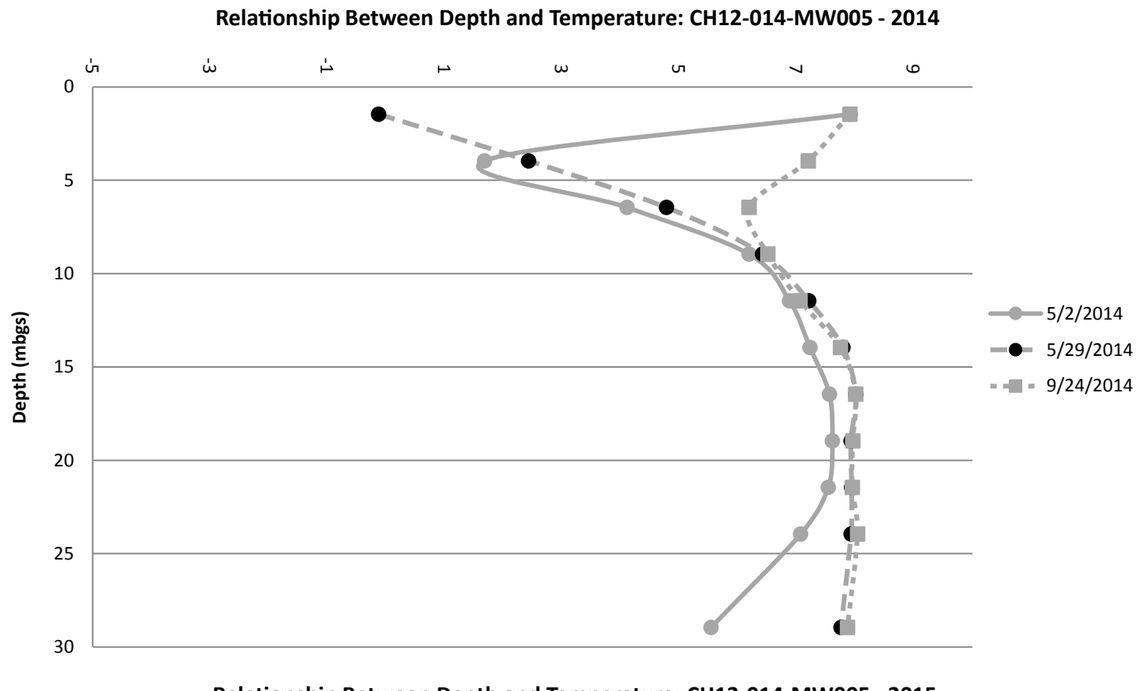


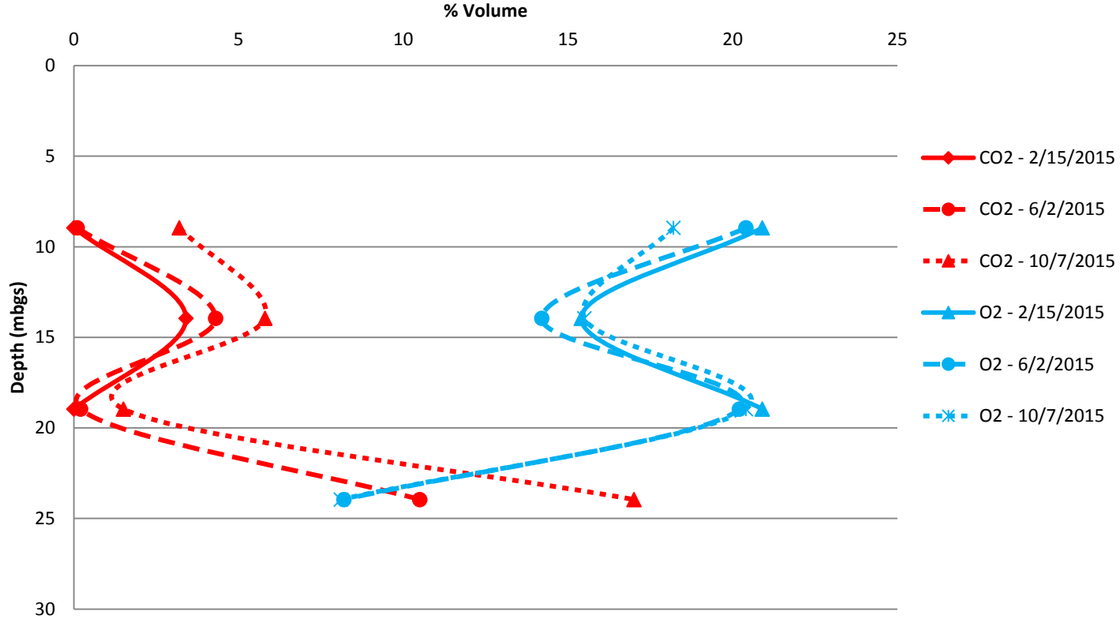


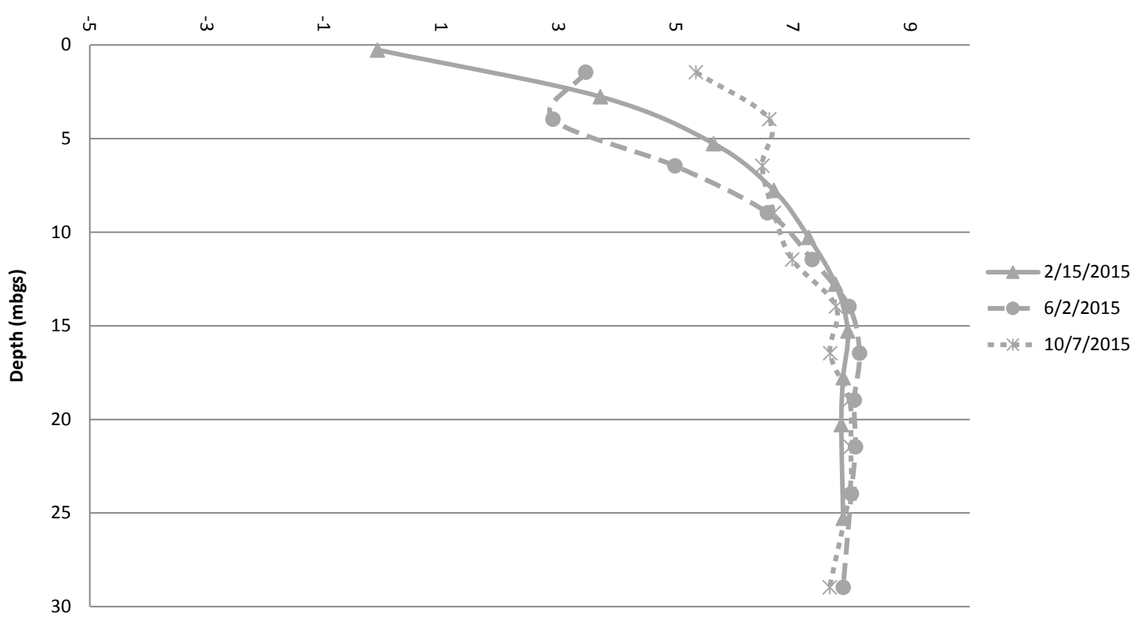
Note:
mbgs = metres below ground surface

FIGURE 3-38 - *1 of 3*
Pore Gas and Temperature Profiles -
Zone II Waste Rock Dump - CH12-014-MW005
Faro Mine Remediation Project



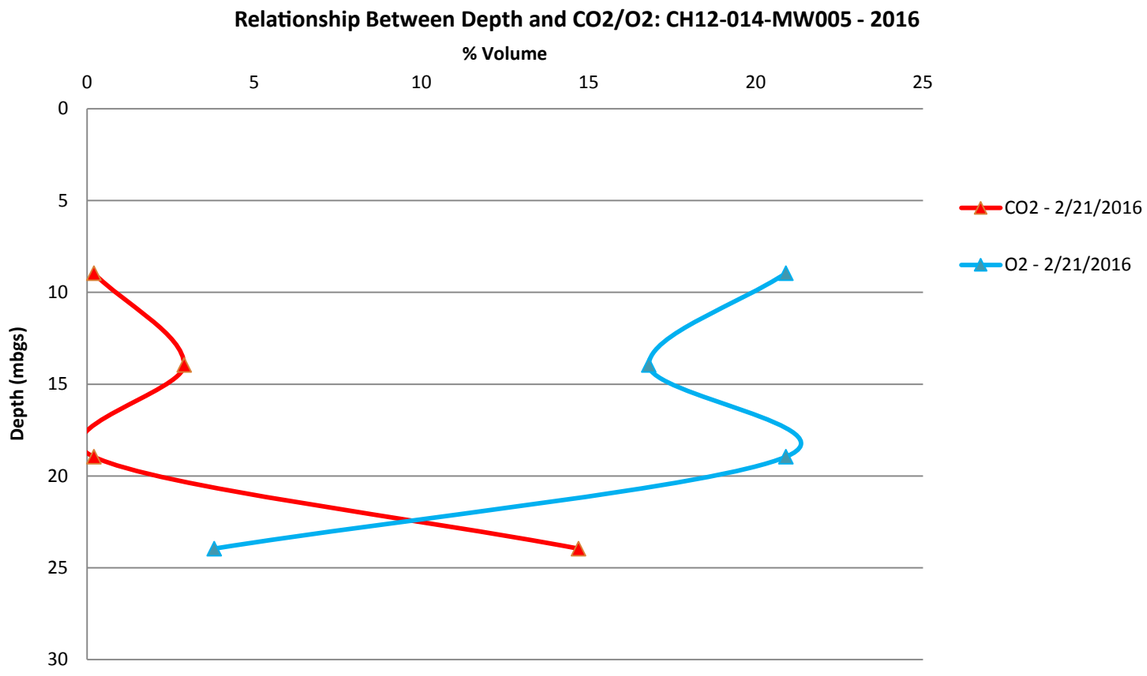


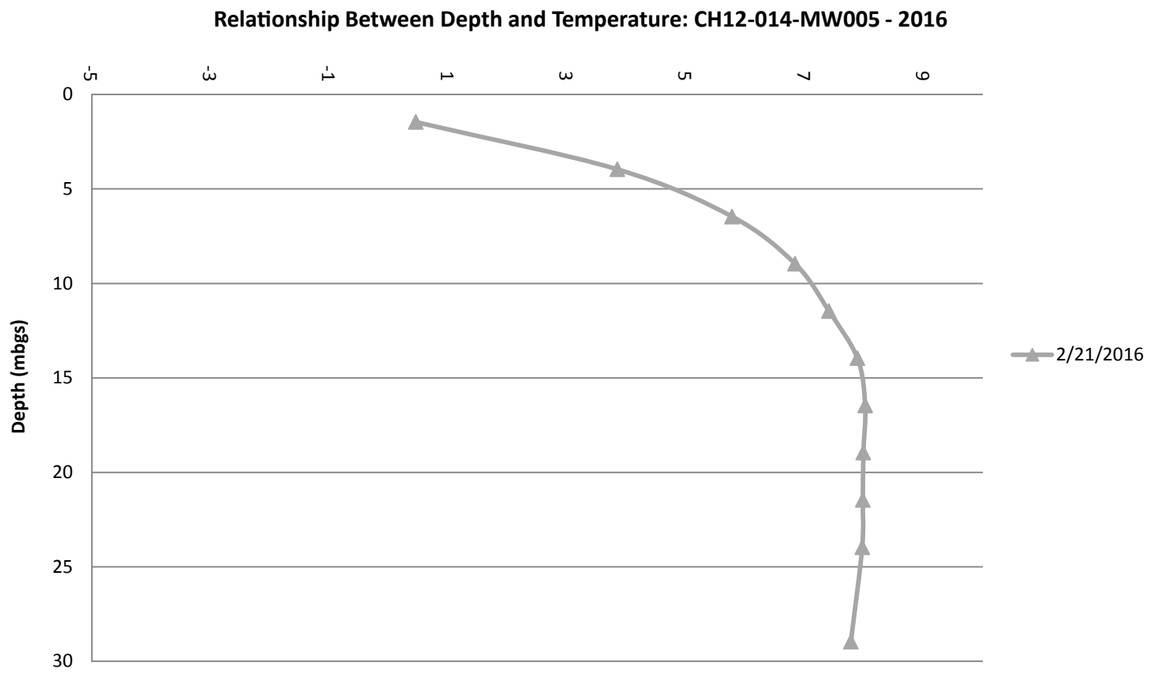




Note:
mbgs = metres below ground surface

FIGURE 3-38 - *2 of 3*
Pore Gas and Temperature Profiles -
Zone II Waste Rock Dump - CH12-014-MW005
Faro Mine Remediation Project

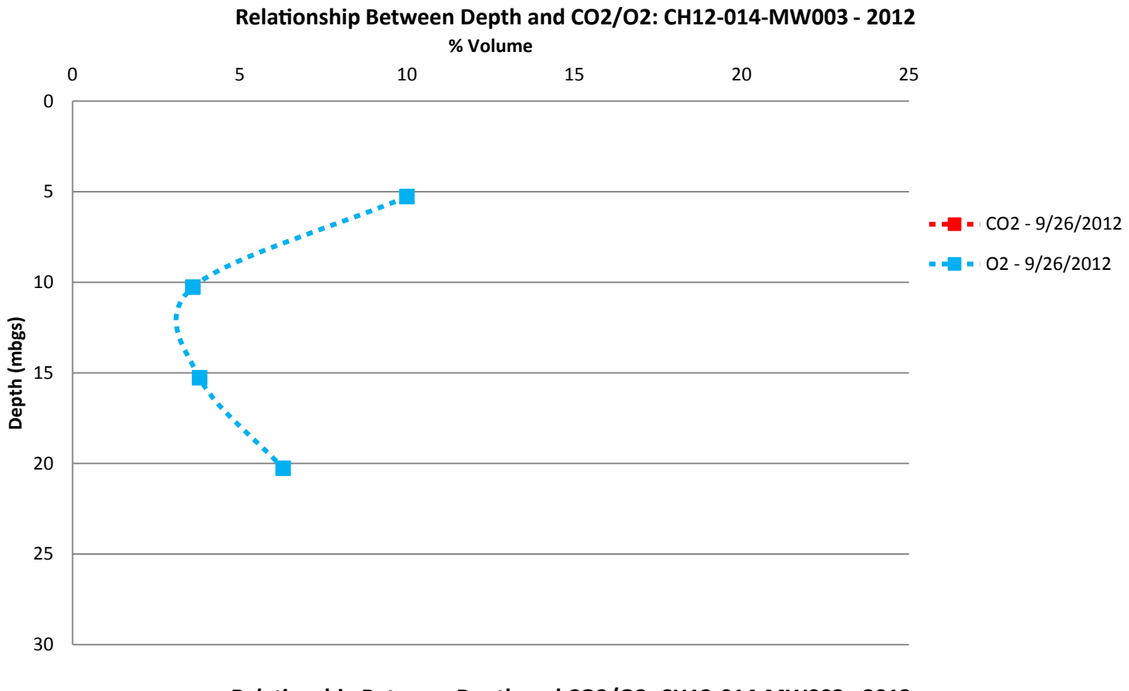


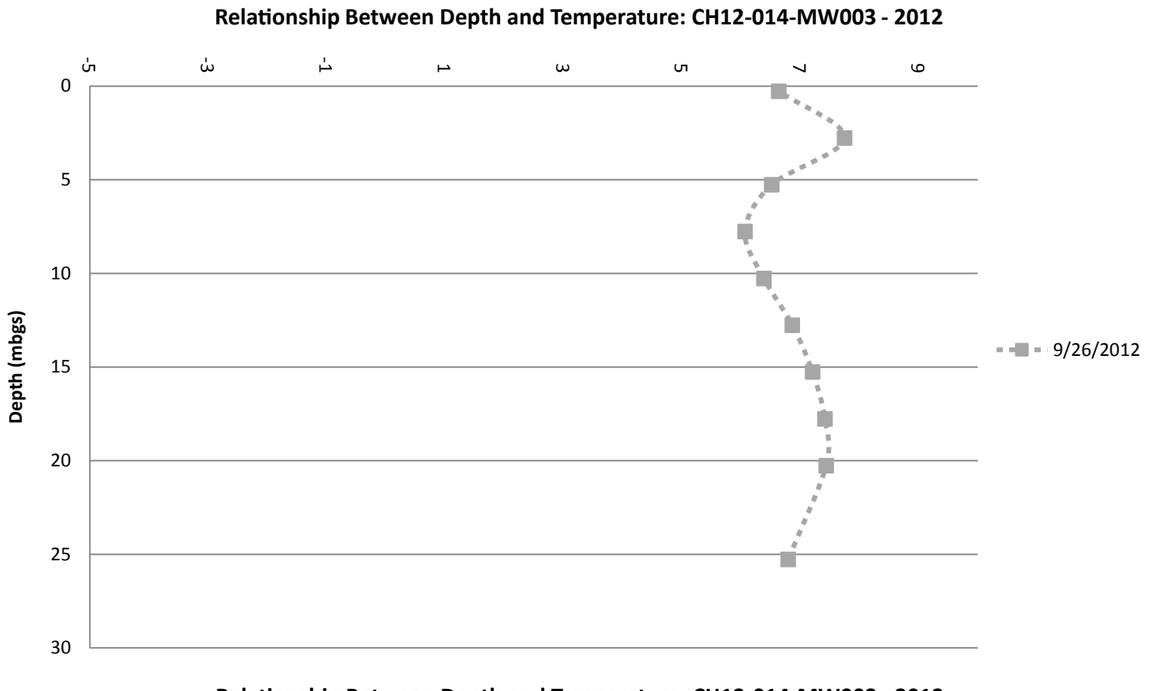


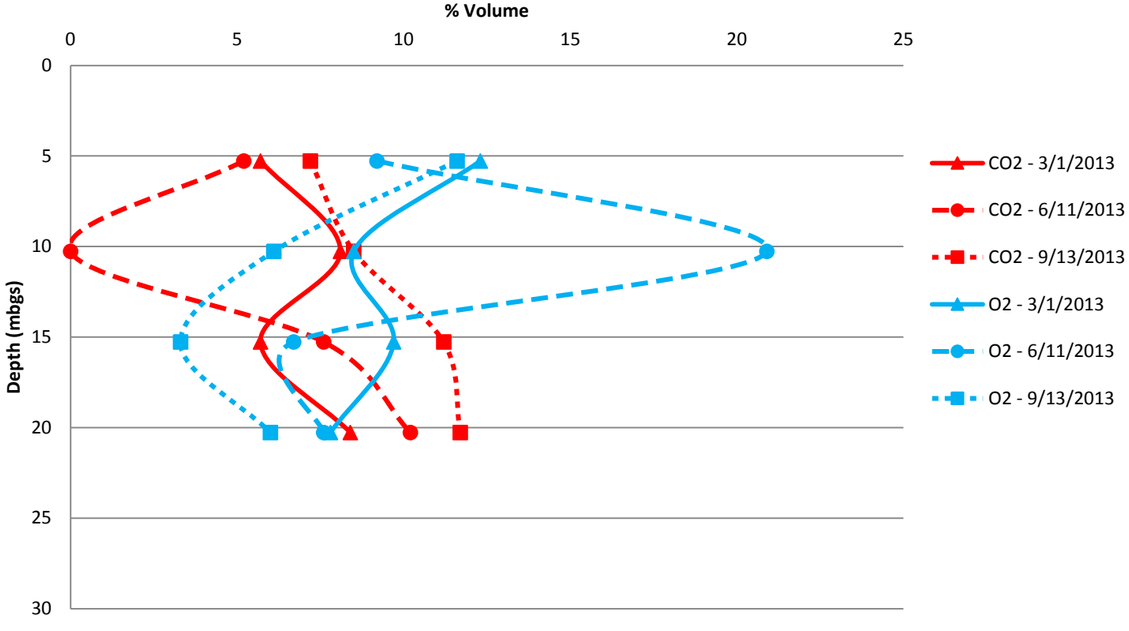
Note:
mbgs = metres below ground surface

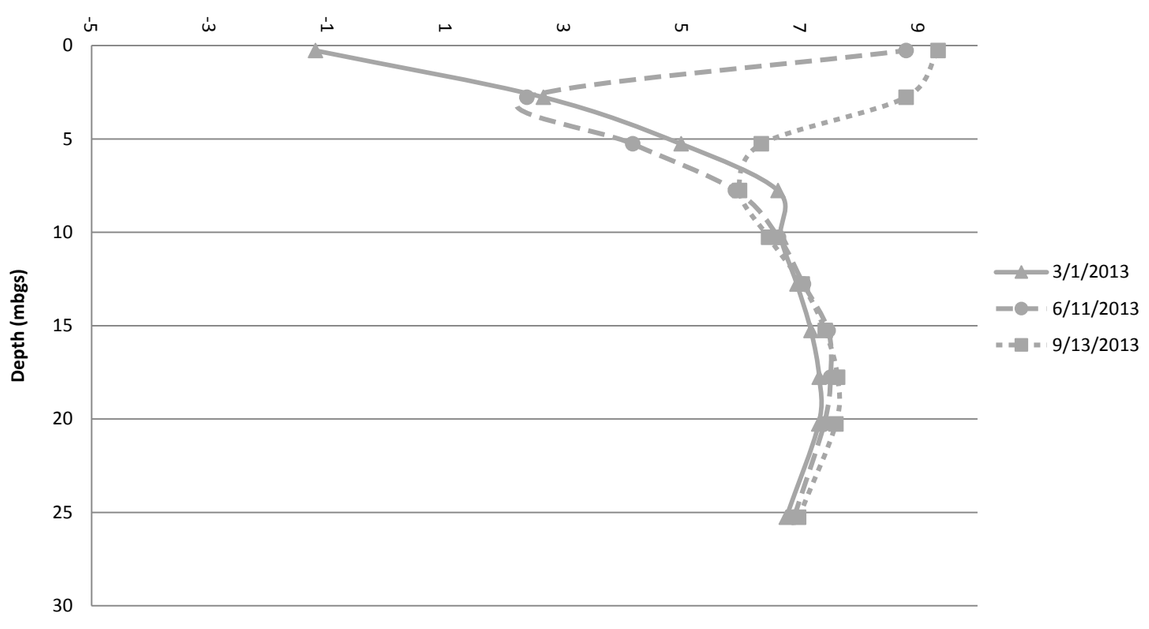
FIGURE 3-38 - *3 of 3*
Pore Gas and Temperature Profiles -
Zone II Waste Rock Dump - CH12-014-MW005
Faro Mine Remediation Project

ch2m



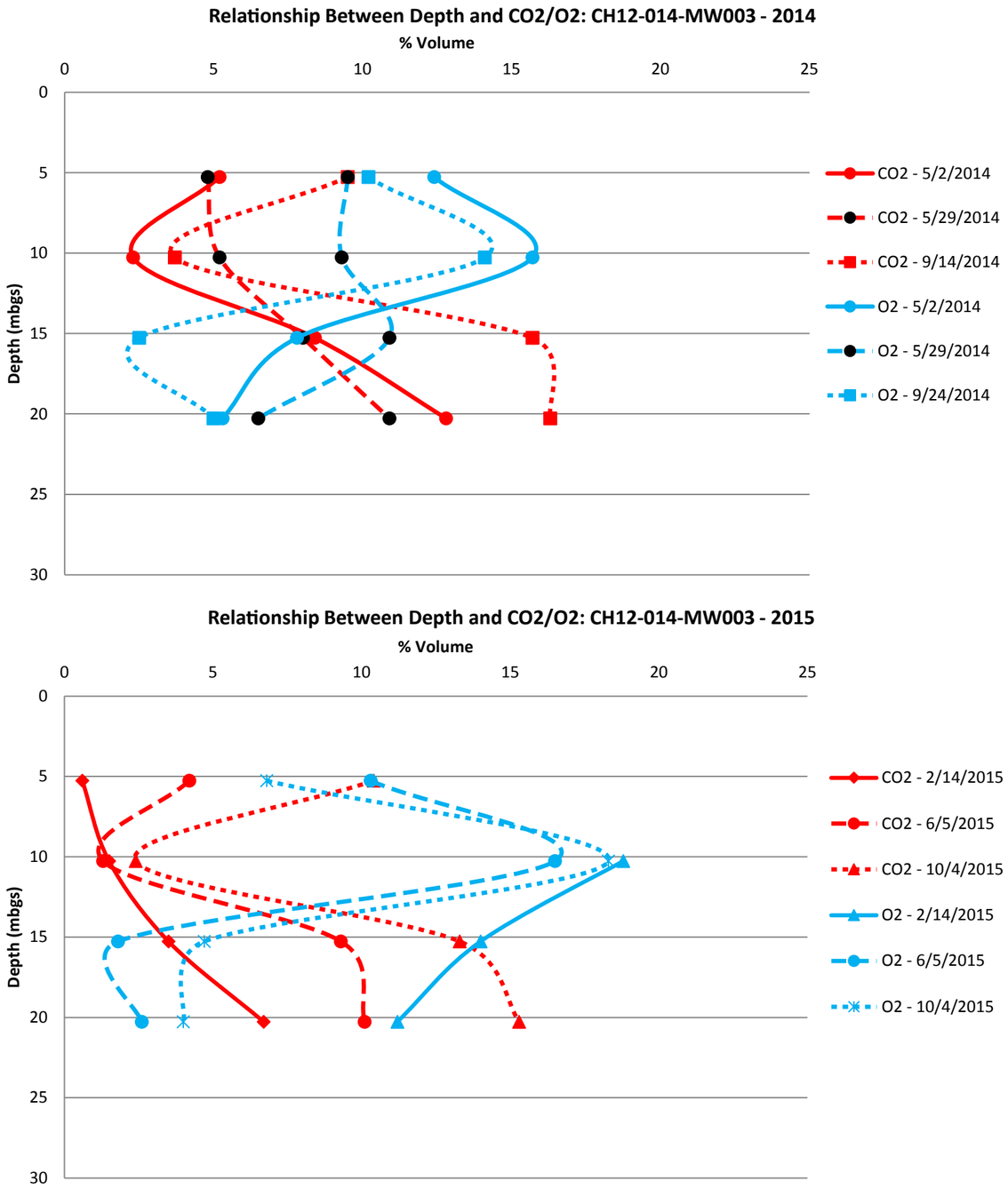


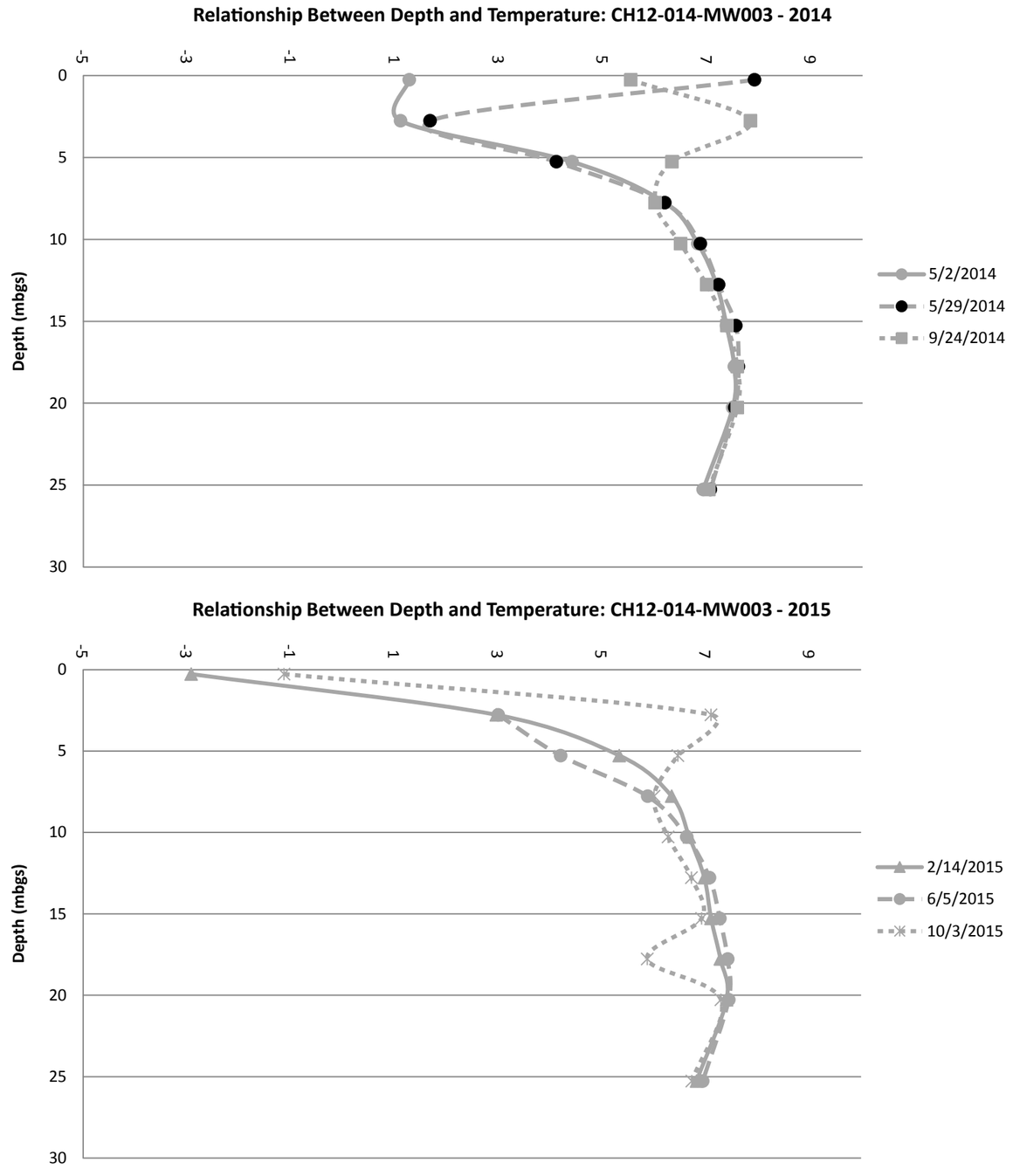




Note:
mbgs = metres below ground surface

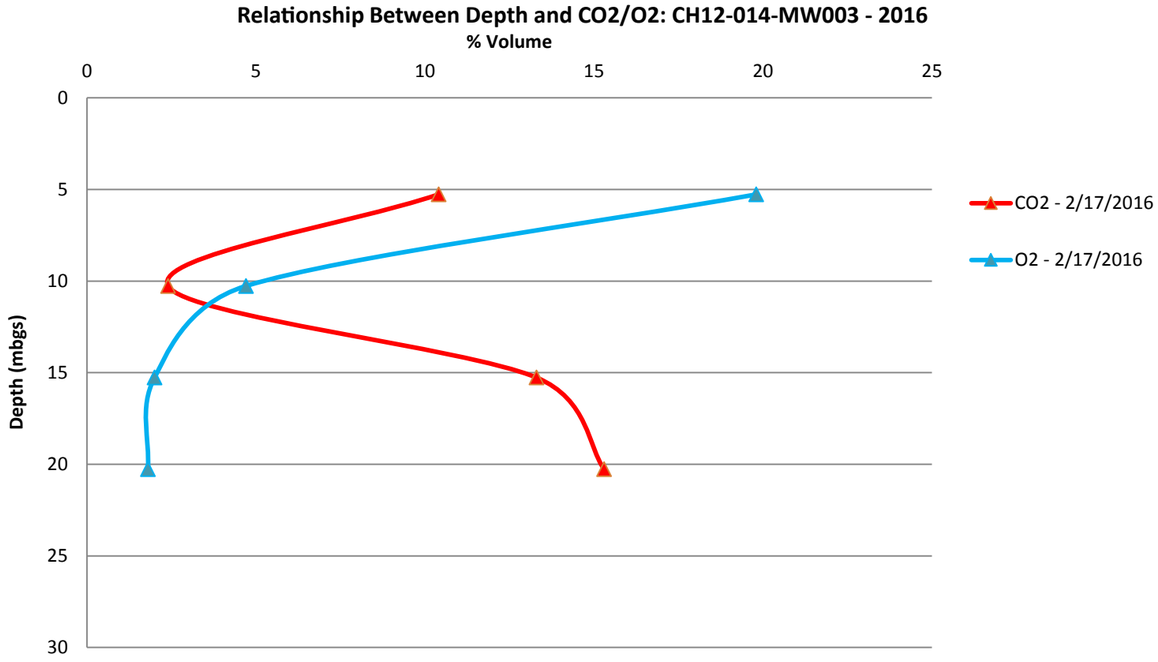
FIGURE 3-39 - *1 of 3*
Pore Gas and Temperature Profiles - Main Waste Rock Dump - CH12-014-MW003
Faro Mine Remediation Project

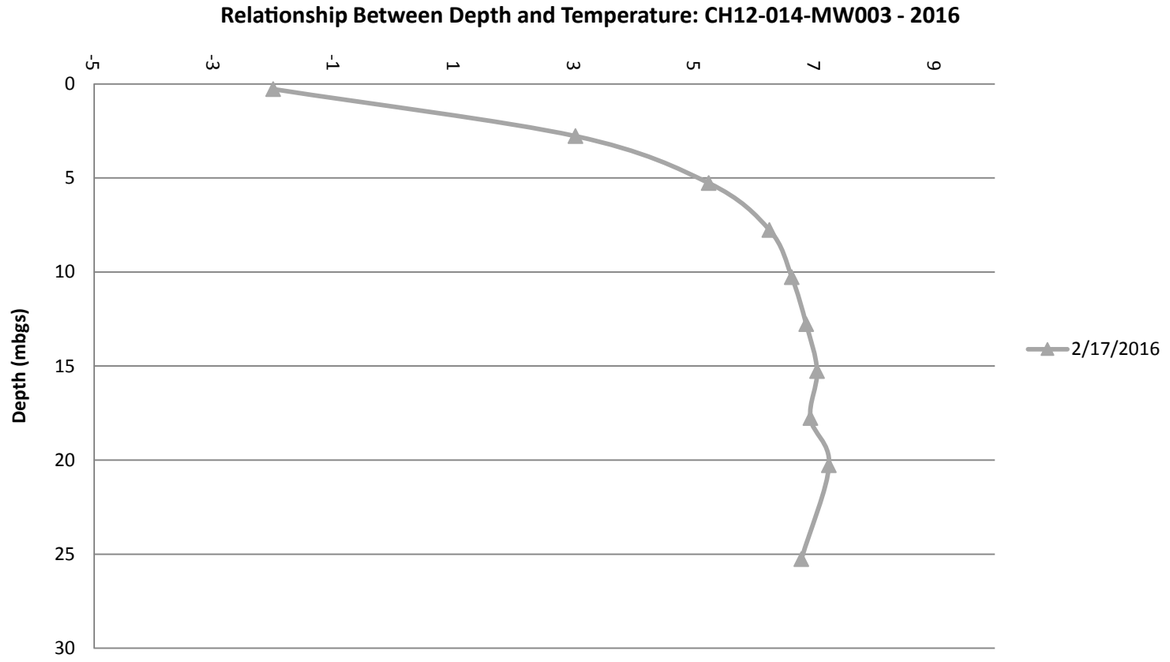




Note:
mbgs = metres below ground surface

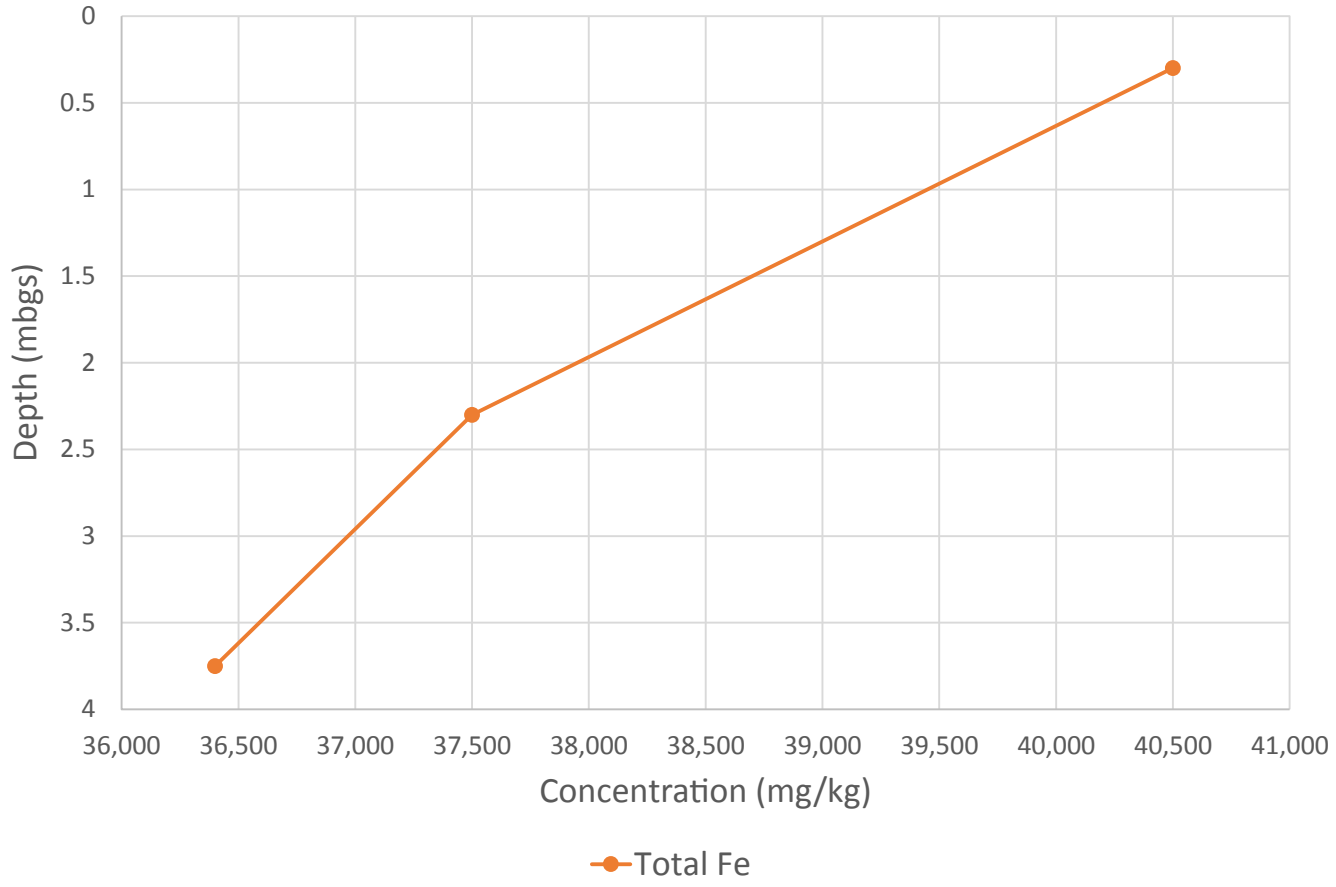
FIGURE 3-39 - *2 of 3*
Pore Gas and Temperature Profiles -
Main Waste Rock Dump - CH12-014-MW003
Faro Mine Remediation Project





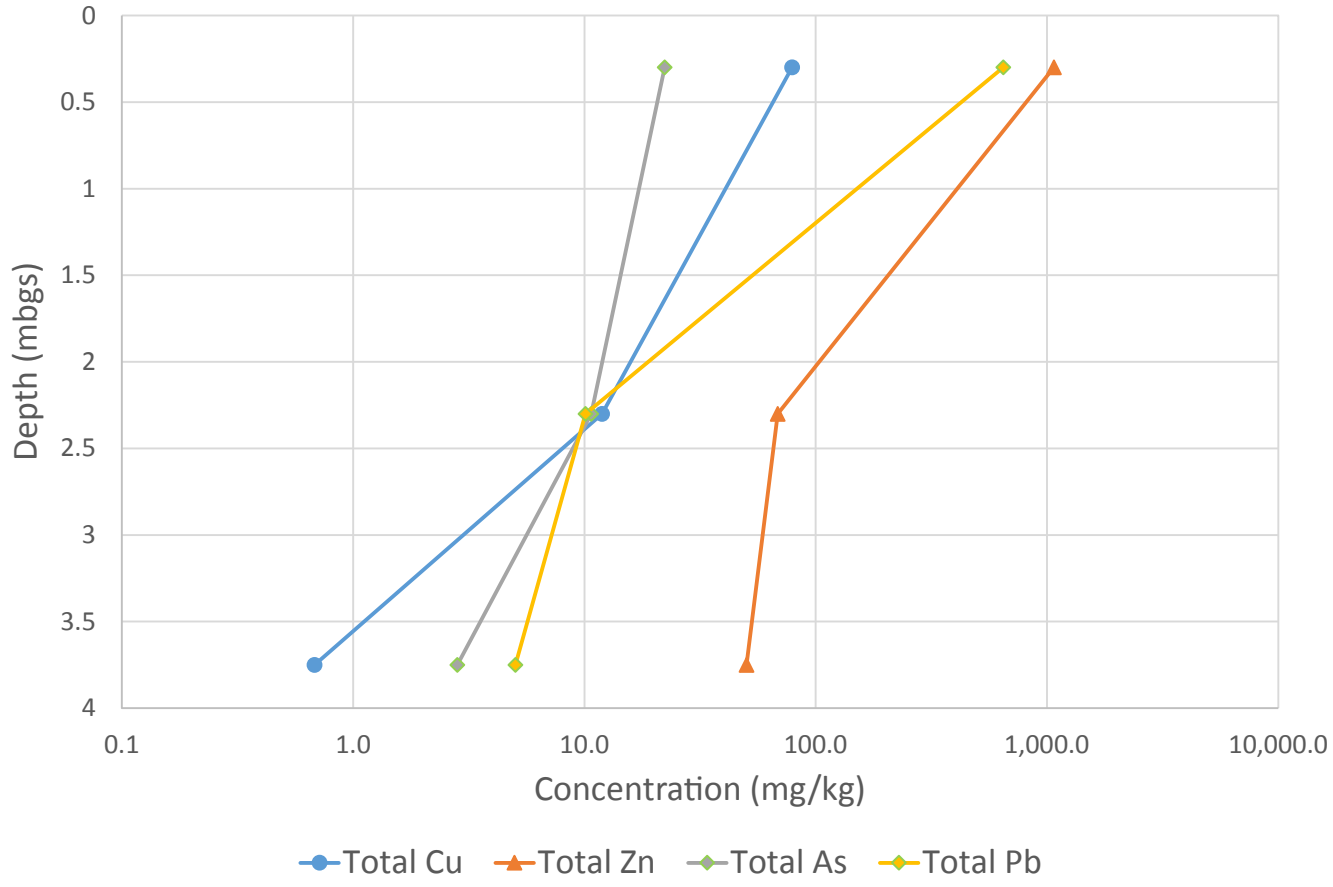
Note:
mbgs = metres below ground surface

FIGURE 3-39 - *3 of 3*
Pore Gas and Temperature Profiles -
Main Waste Rock Dump - CH12-014-MW003
Faro Mine Remediation Project



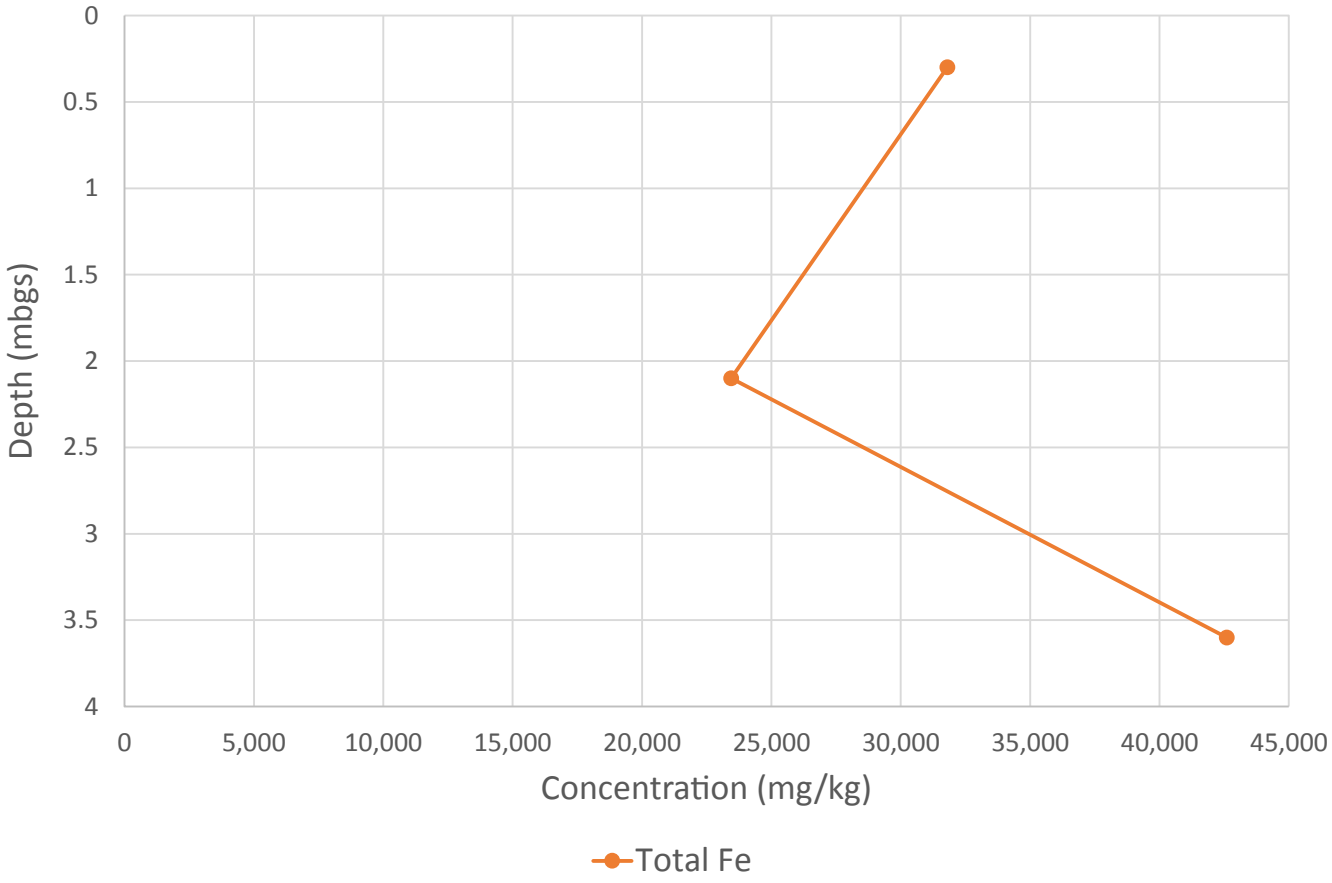
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-1
Total Iron and Sulphur - CH12-101-BH001
Faro Mine Remediation Project



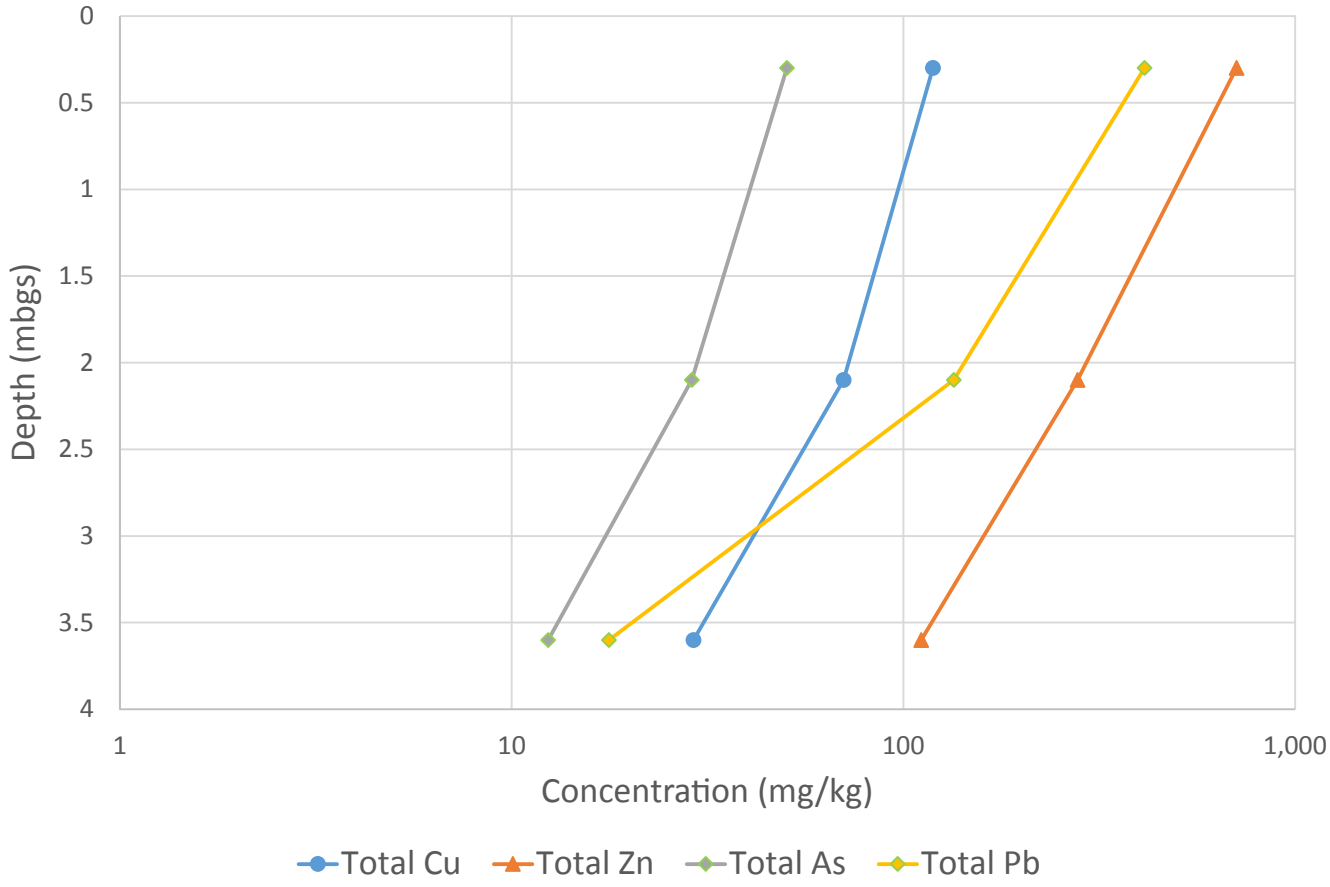
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-2
Select Total Trace Elements - CH12-101-BH001
Faro Mine Remediation Project



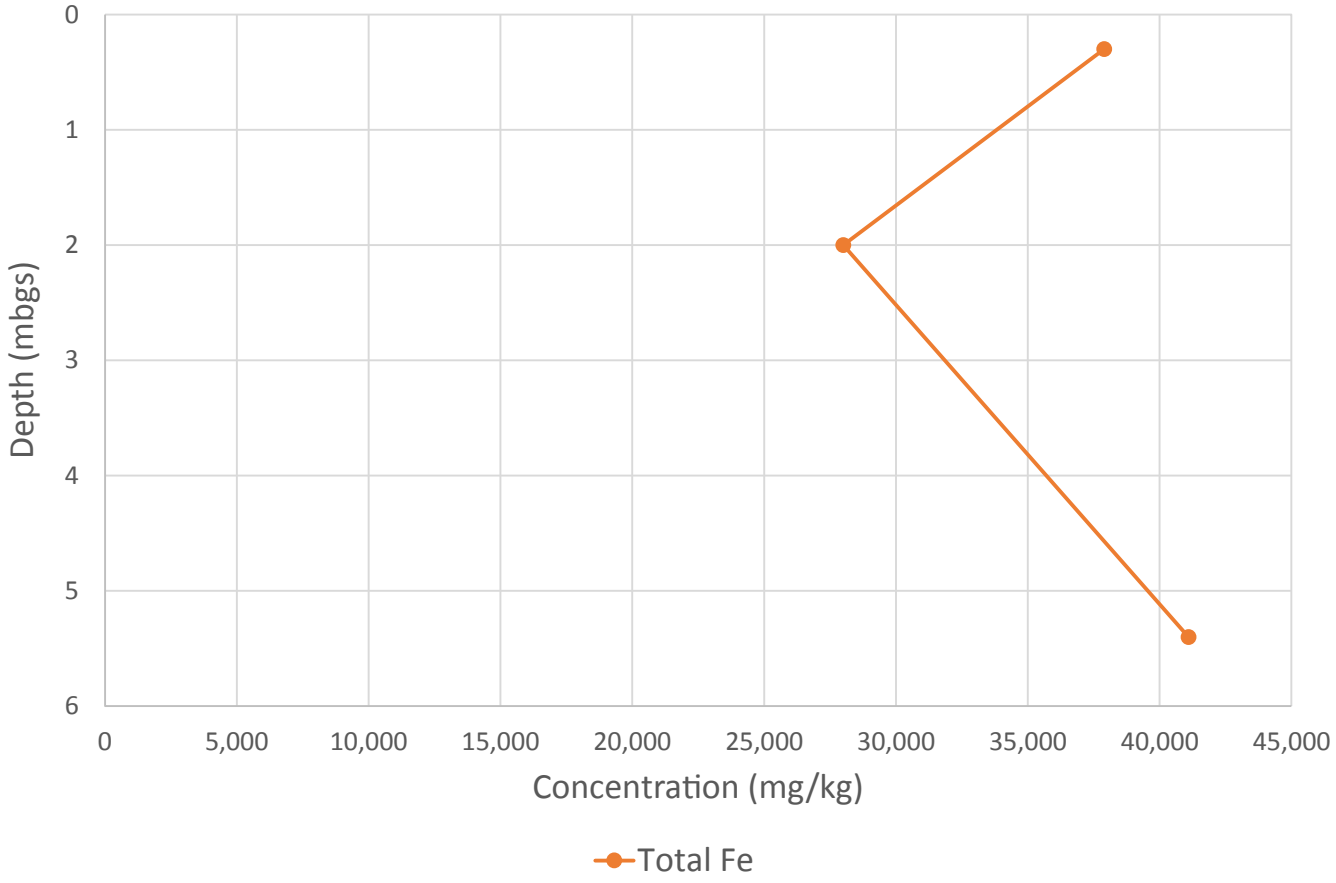
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-3
Total Iron and Sulphur - CH12-101-BH002
Faro Mine Remediation Project



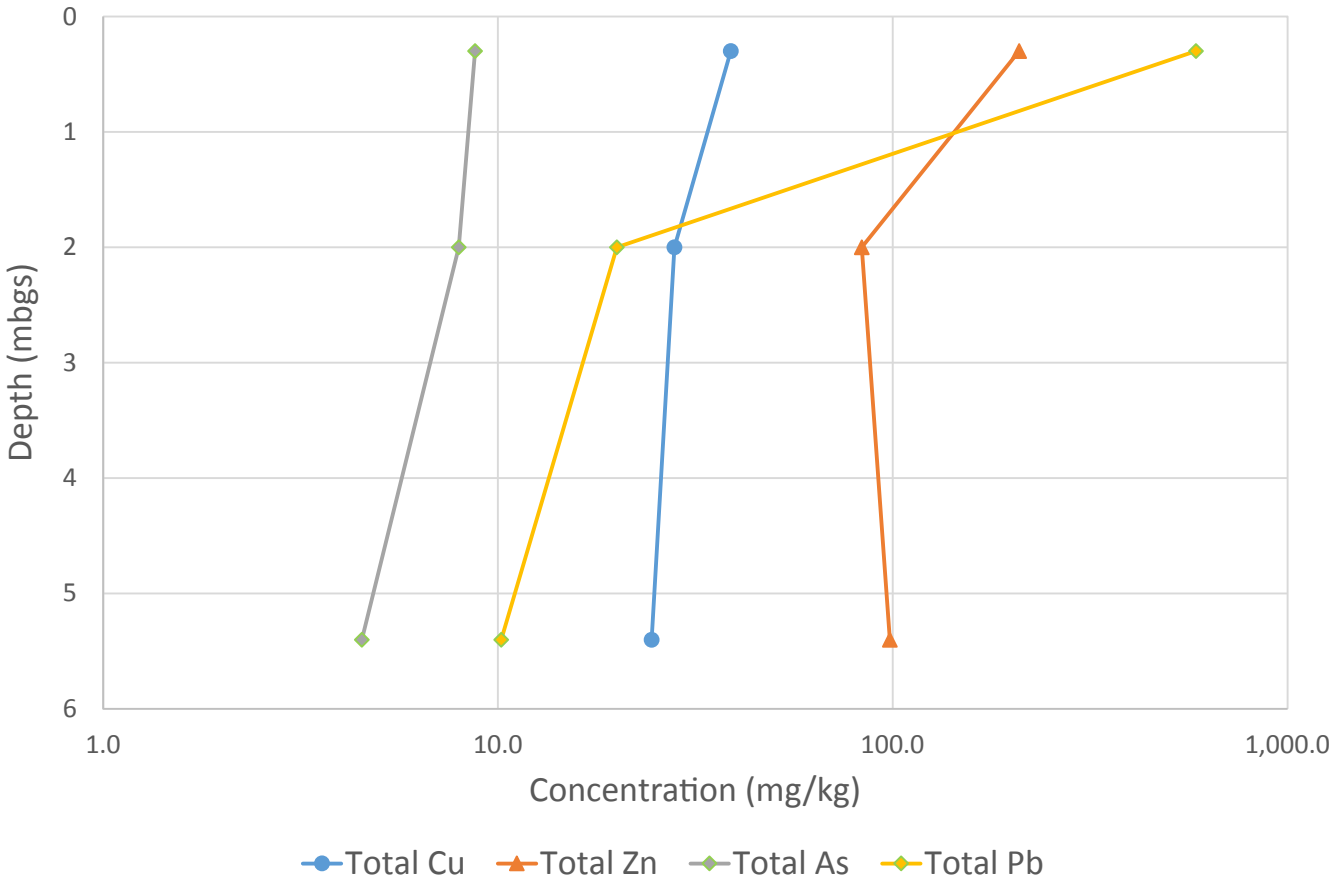
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-4
Select Total Trace Elements - CH12-101-BH002
Faro Mine Remediation Project



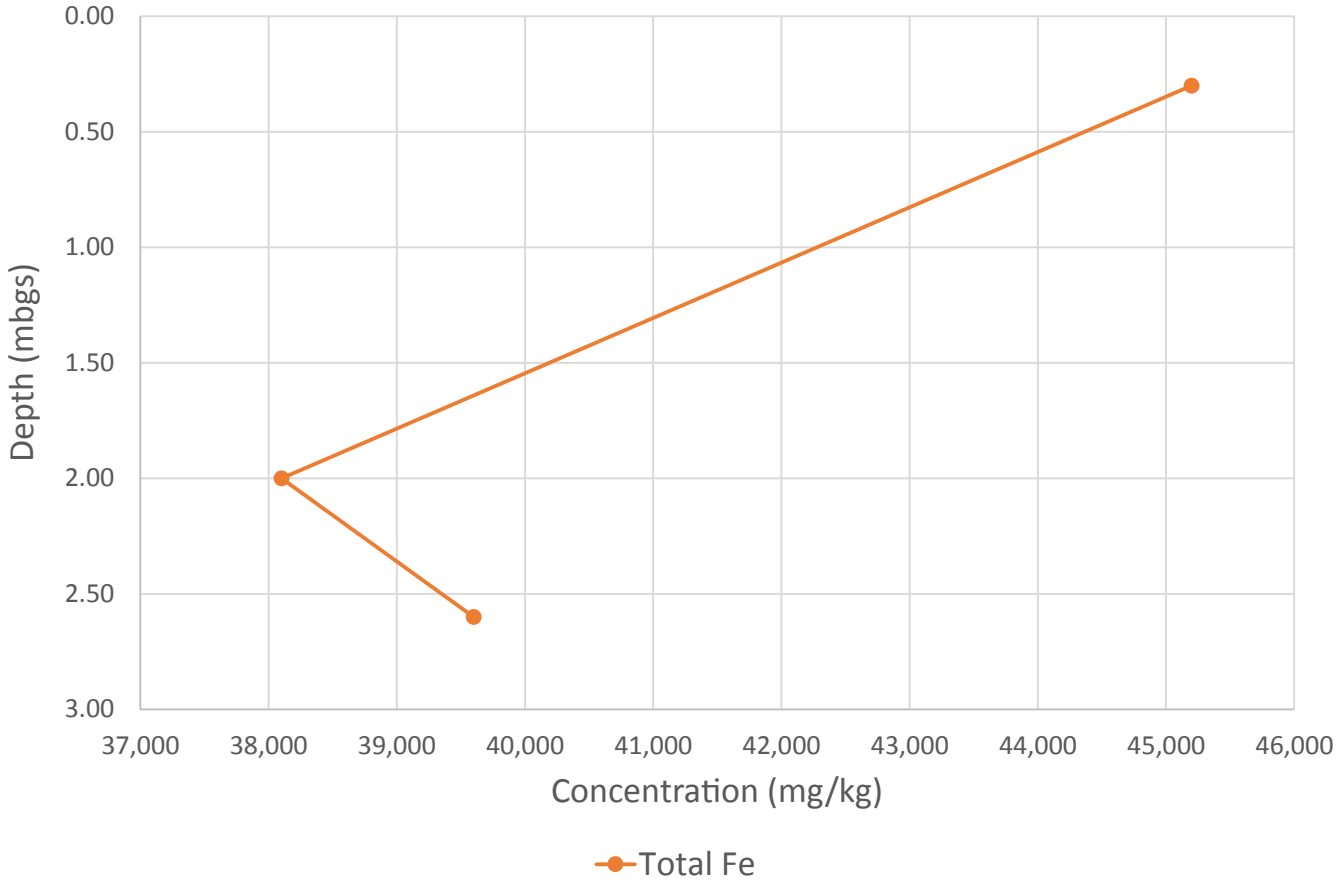
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-5
Total Iron and Sulphur - CH12-101-BH003
Faro Mine Remediation Project



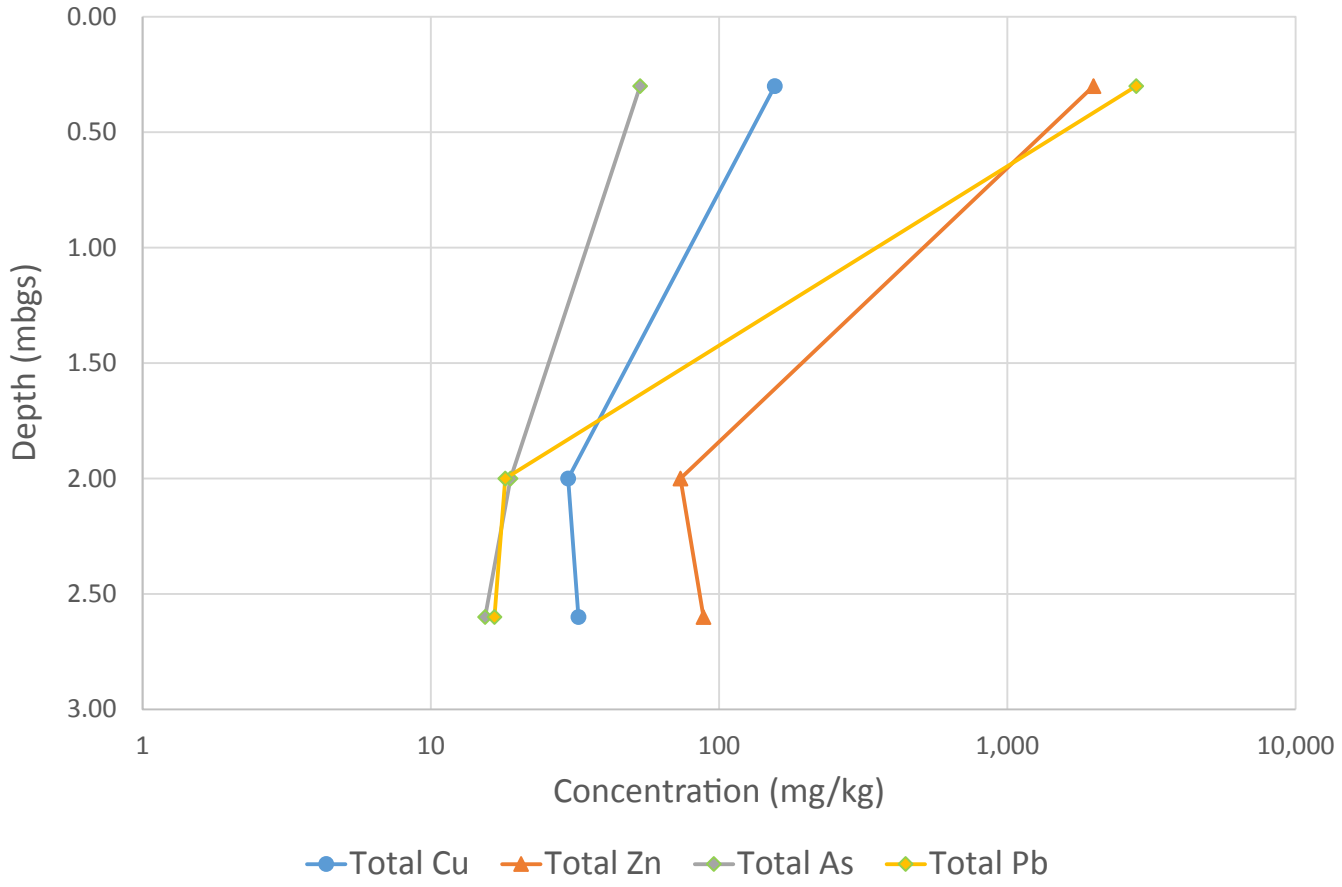
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-6
Select Total Trace Elements - CH12-101-BH003
Faro Mine Remediation Project



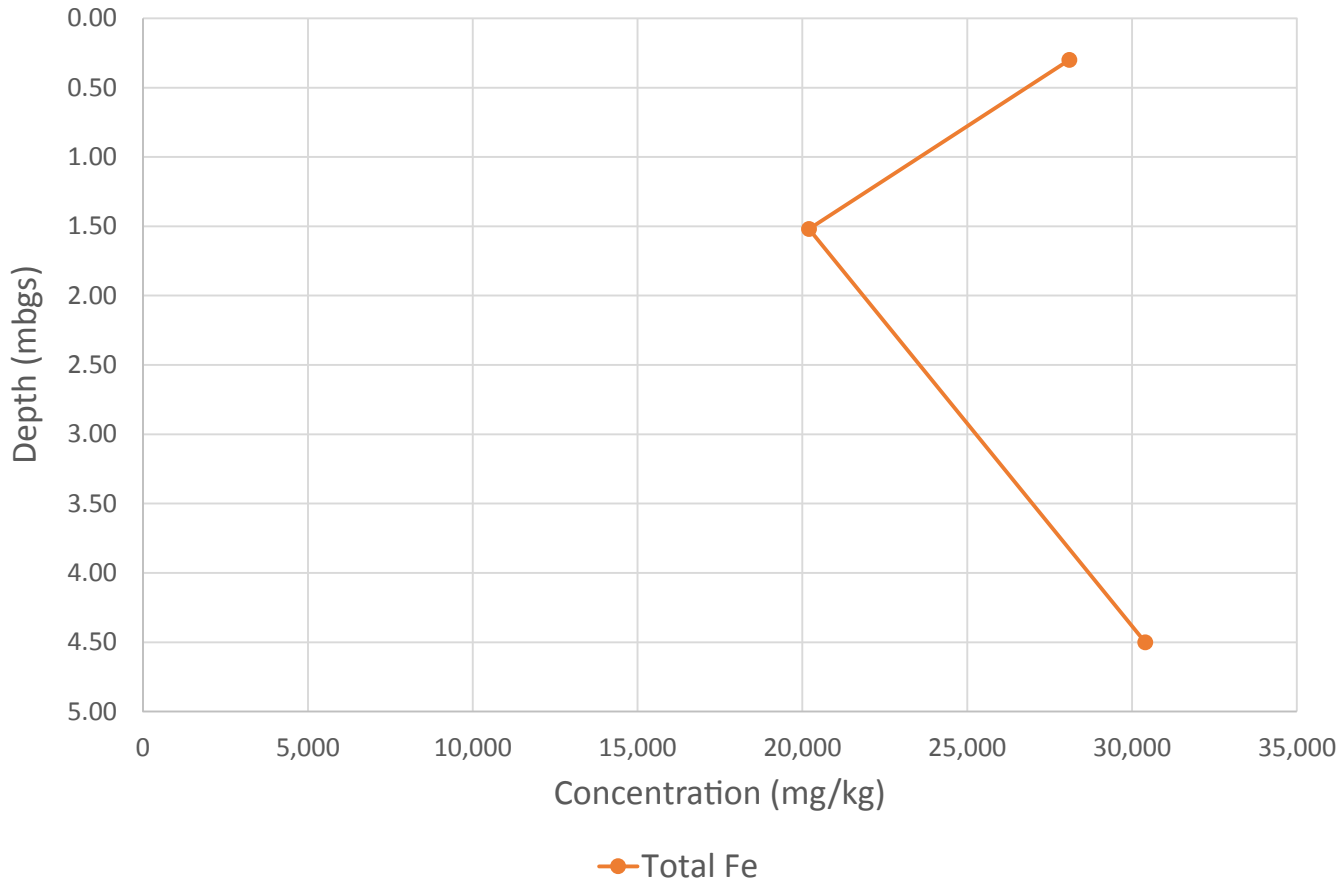
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-7
Total Iron and Sulphur - CH12-101-BH004
Faro Mine Remediation Project



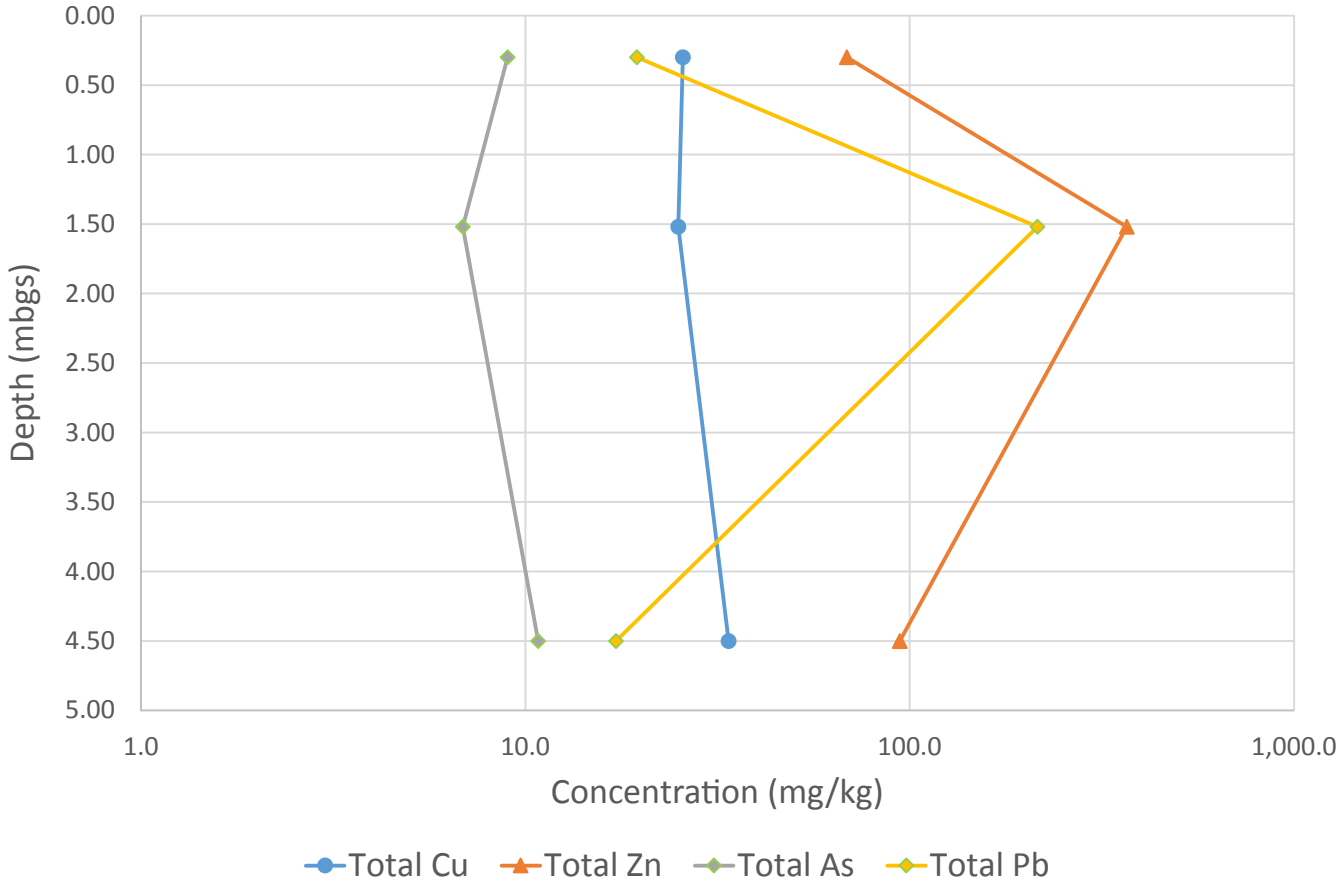
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-8
Select Total Trace Elements - CH12-101-BH004
Faro Mine Remediation Project



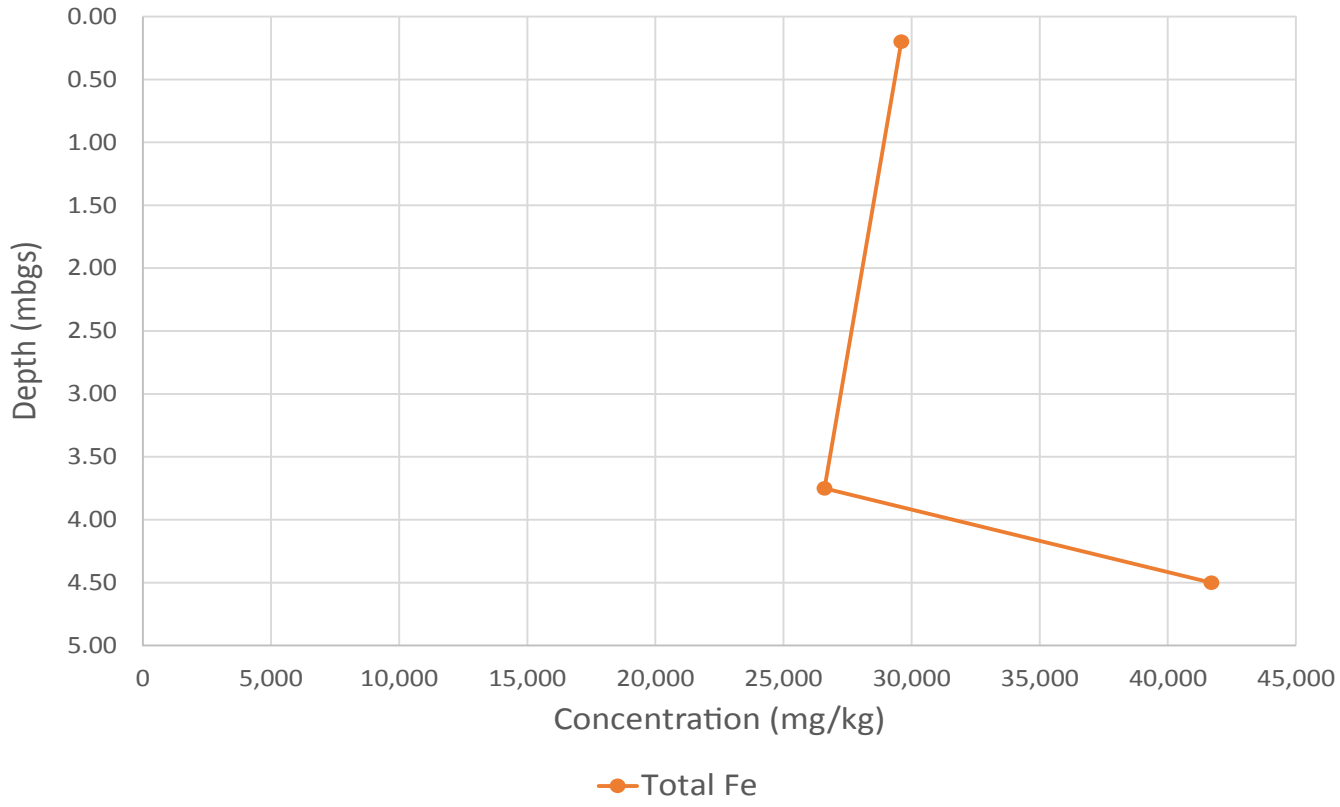
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-9
Total Iron and Sulphur - CH12-101-BH005
Faro Mine Remediation Project



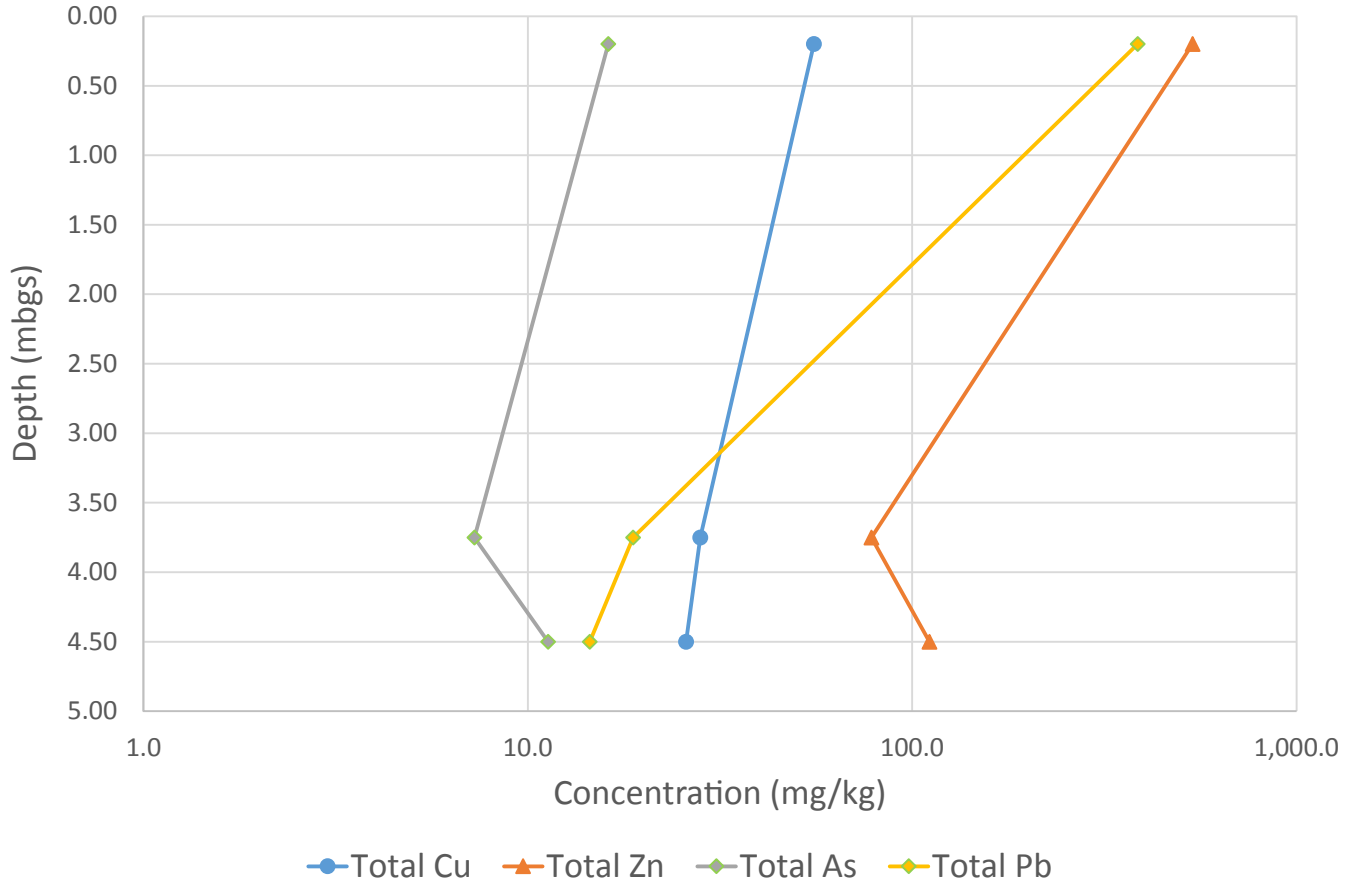
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-10
Select Total Trace Elements - CH12-101-BH005
Faro Mine Remediation Project



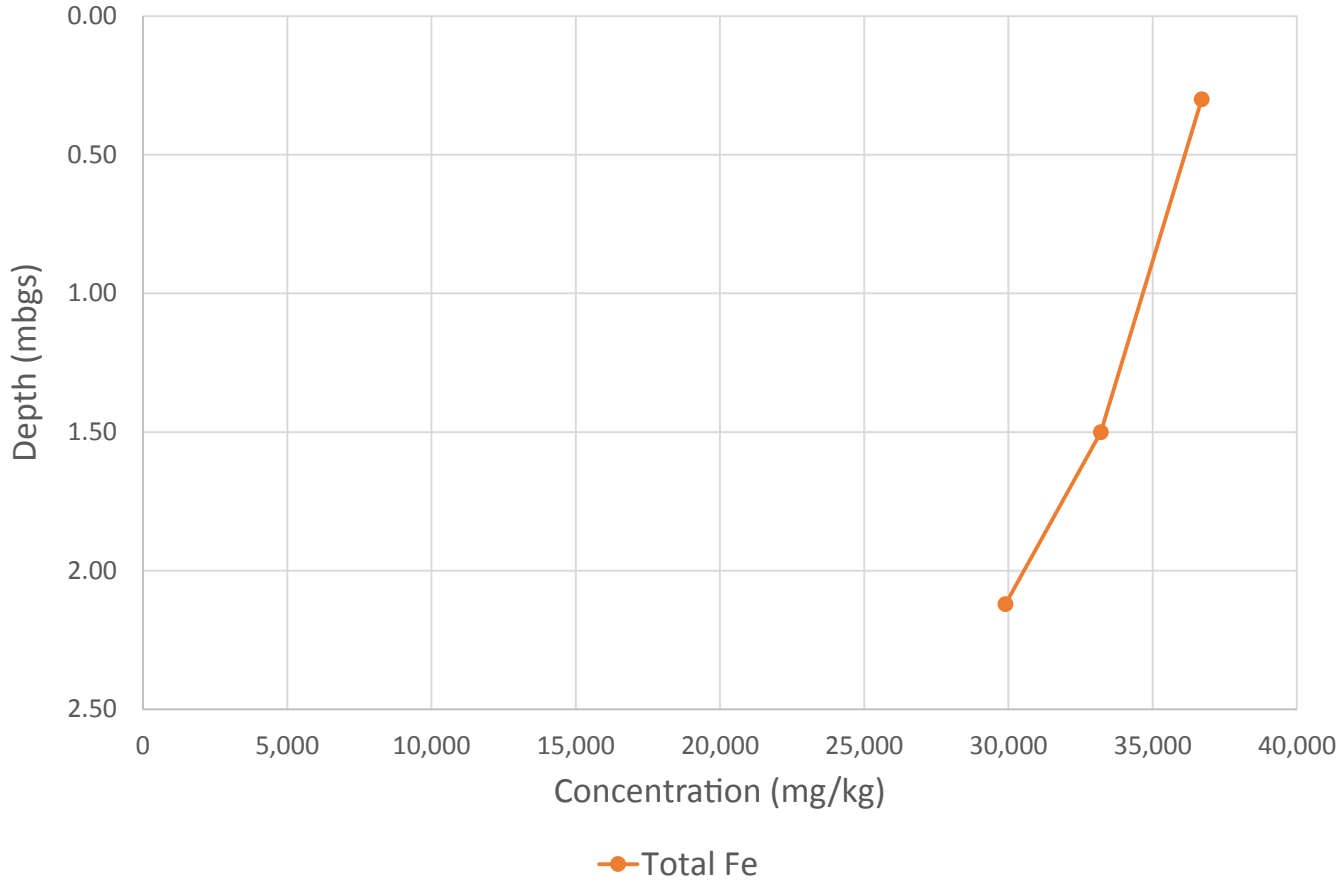
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-11
Total Iron and Sulphur - CH12-101-PZ001
Faro Mine Remediation Project



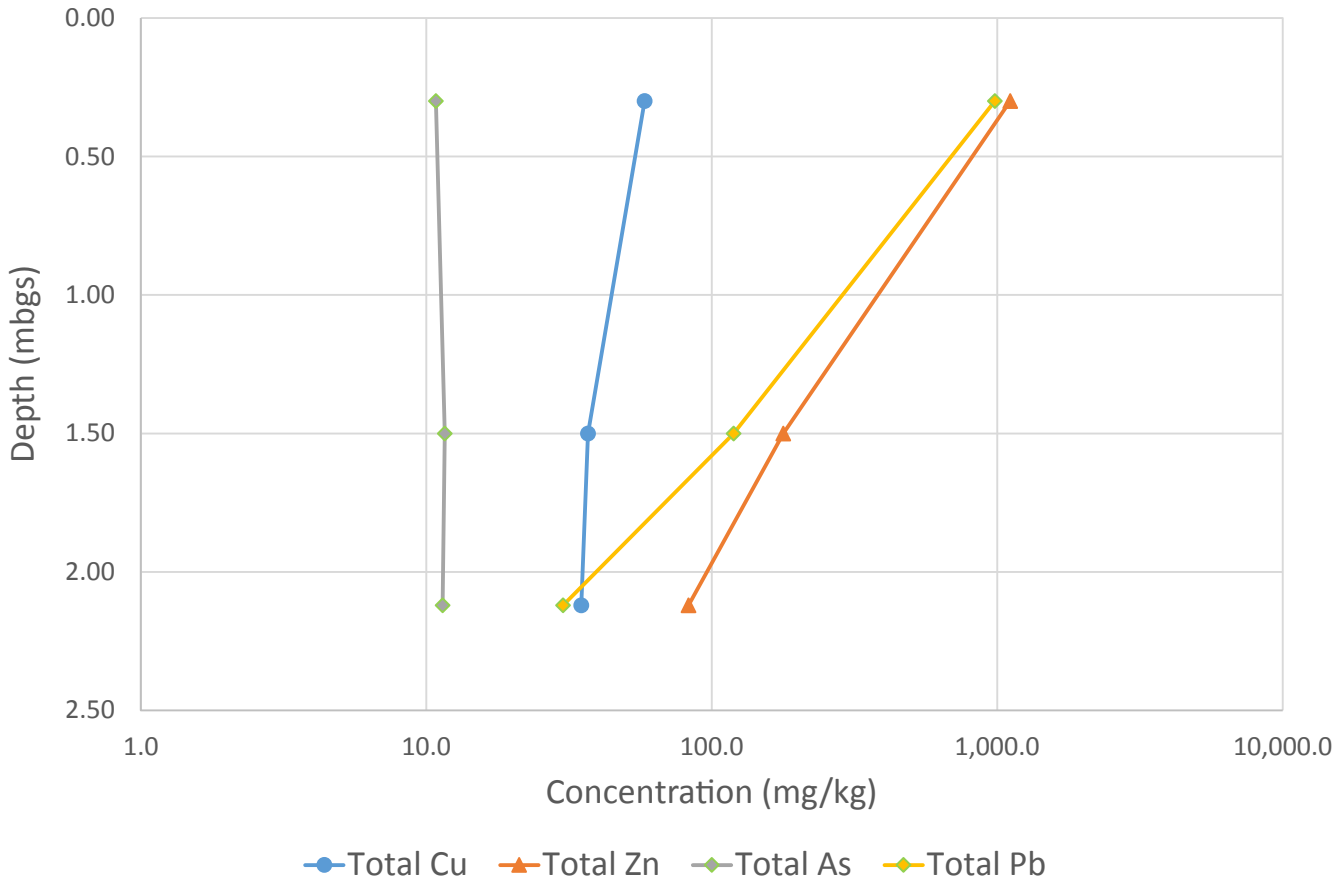
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-12
Select Total Trace Elements - CH12-101-PZ001
Faro Mine Remediation Project



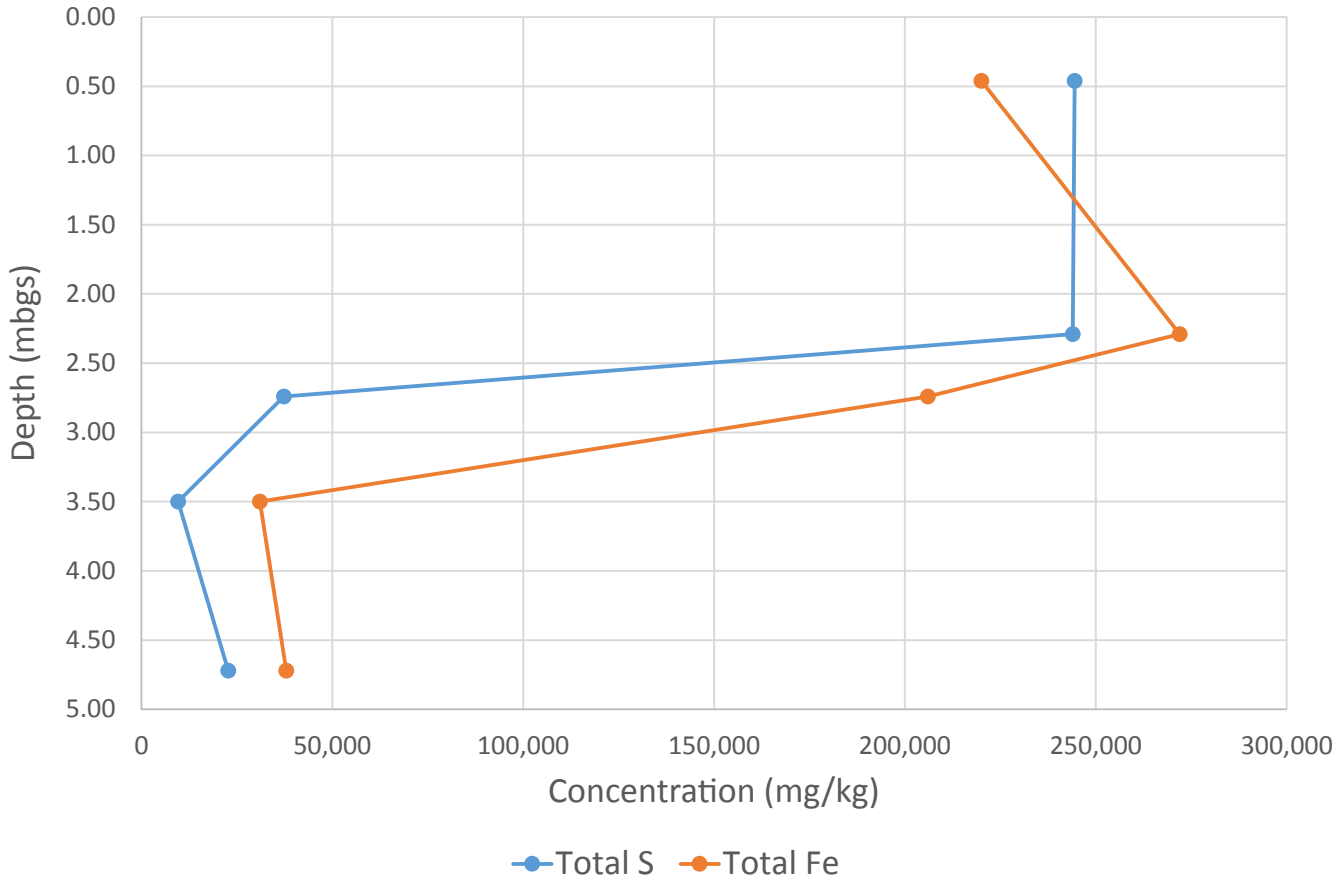
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-13
Total Iron and Sulphur - CH12-101-PZ002
Faro Mine Remediation Project



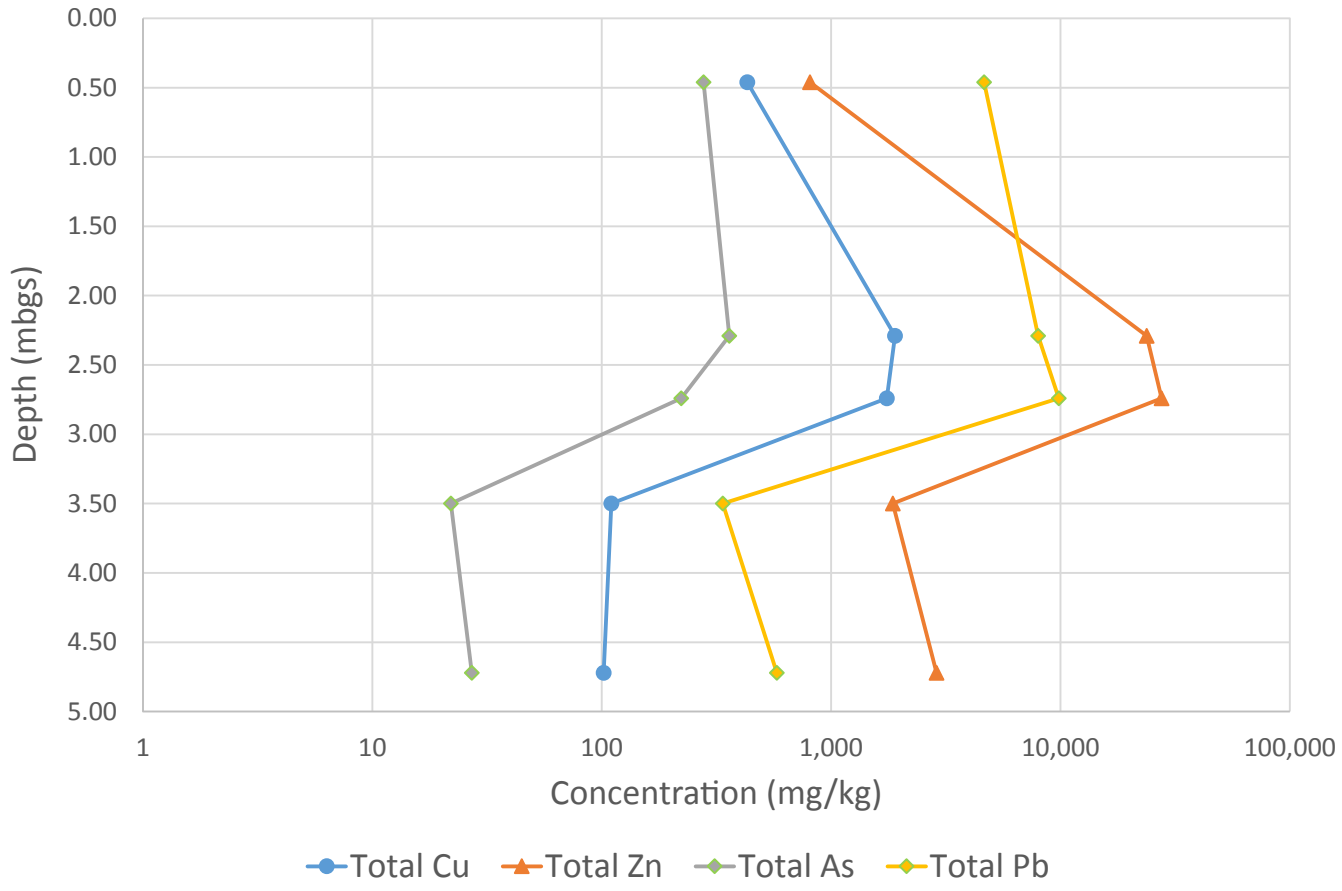
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-14
Select Total Trace Elements - CH12-101-PZ002
Faro Mine Remediation Project



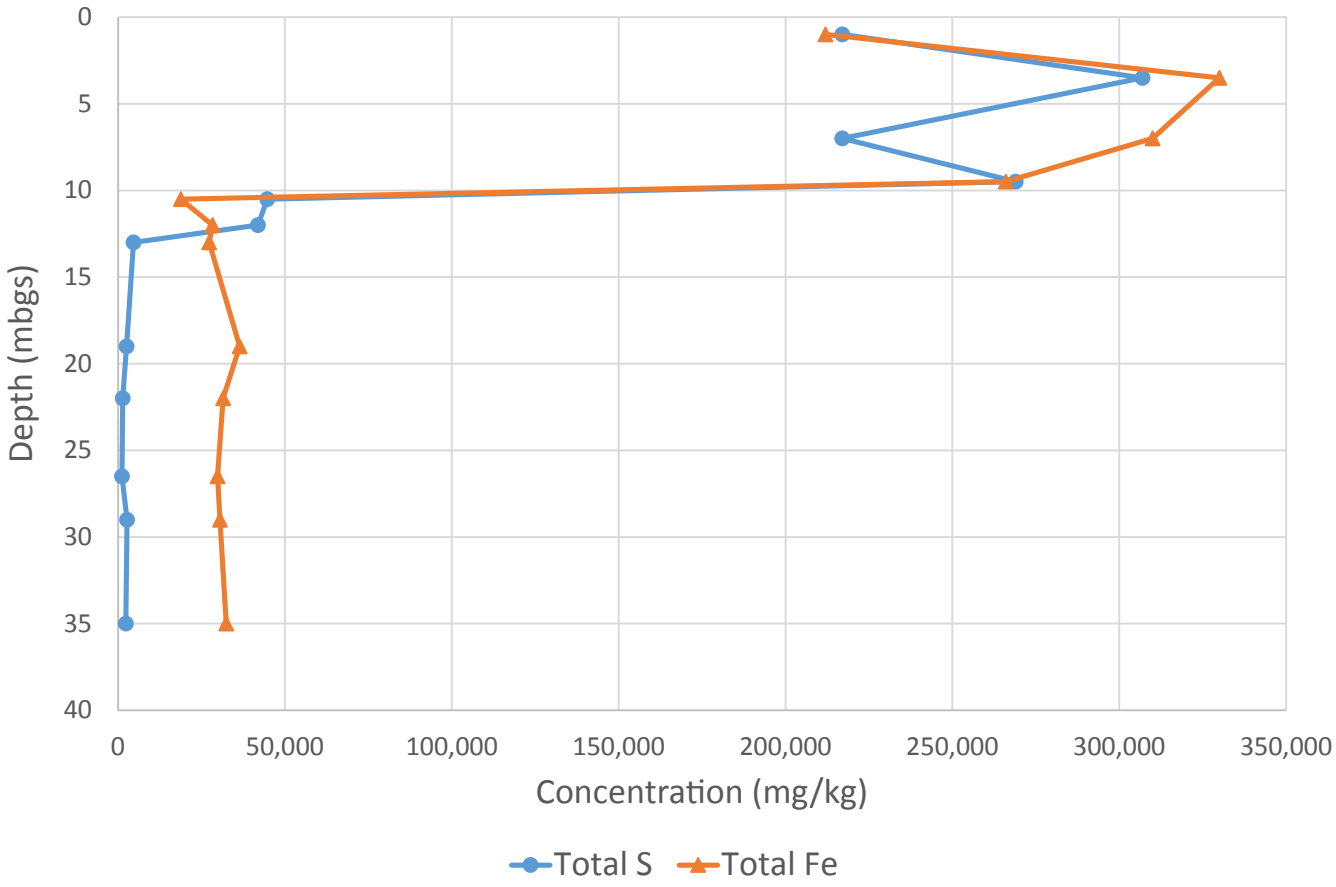
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-15
Total Iron and Sulphur - CH14-105-BH003
Faro Mine Remediation Project



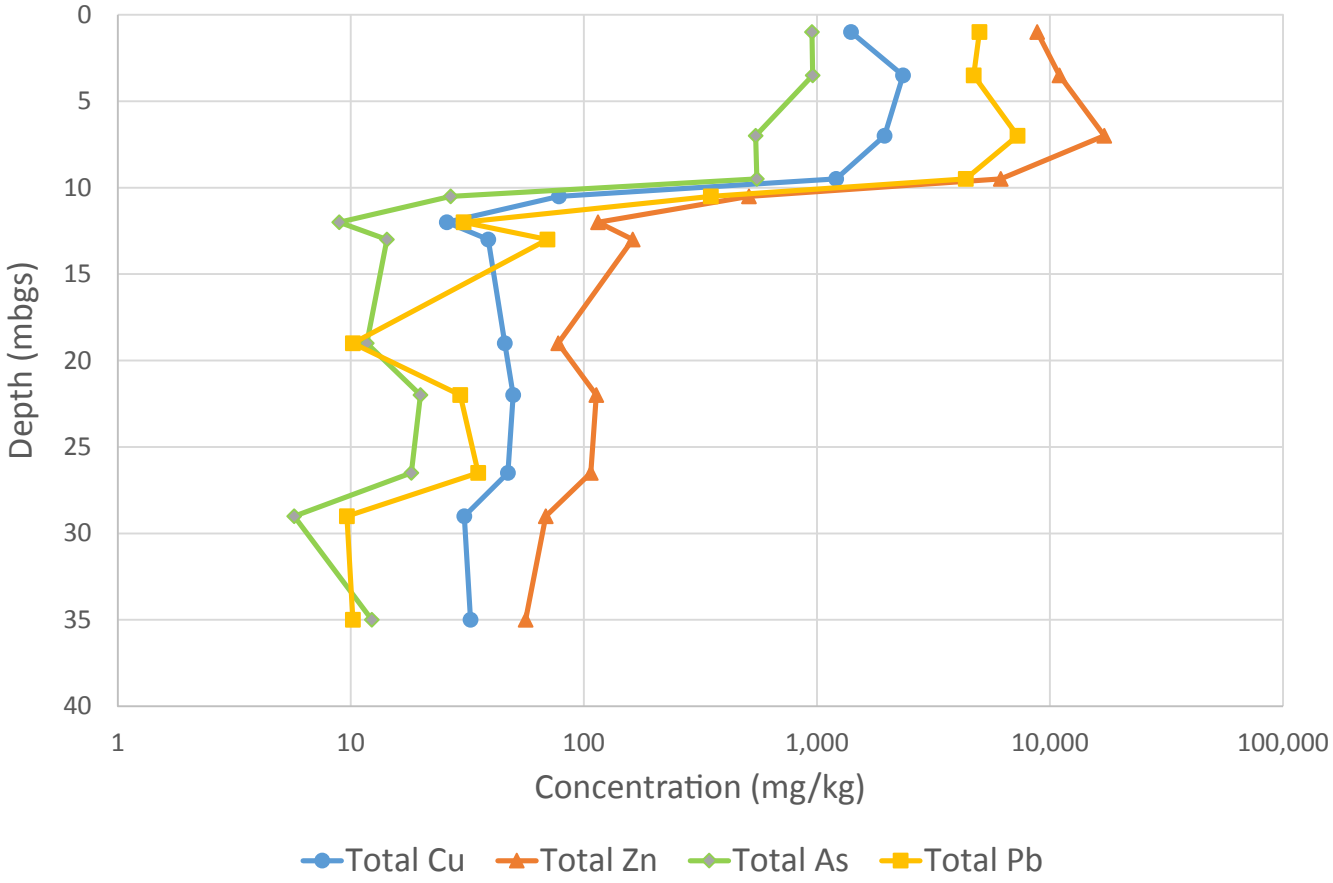
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 4-16
Select Total Trace Elements - CH14-105-BH003
Faro Mine Remediation Project



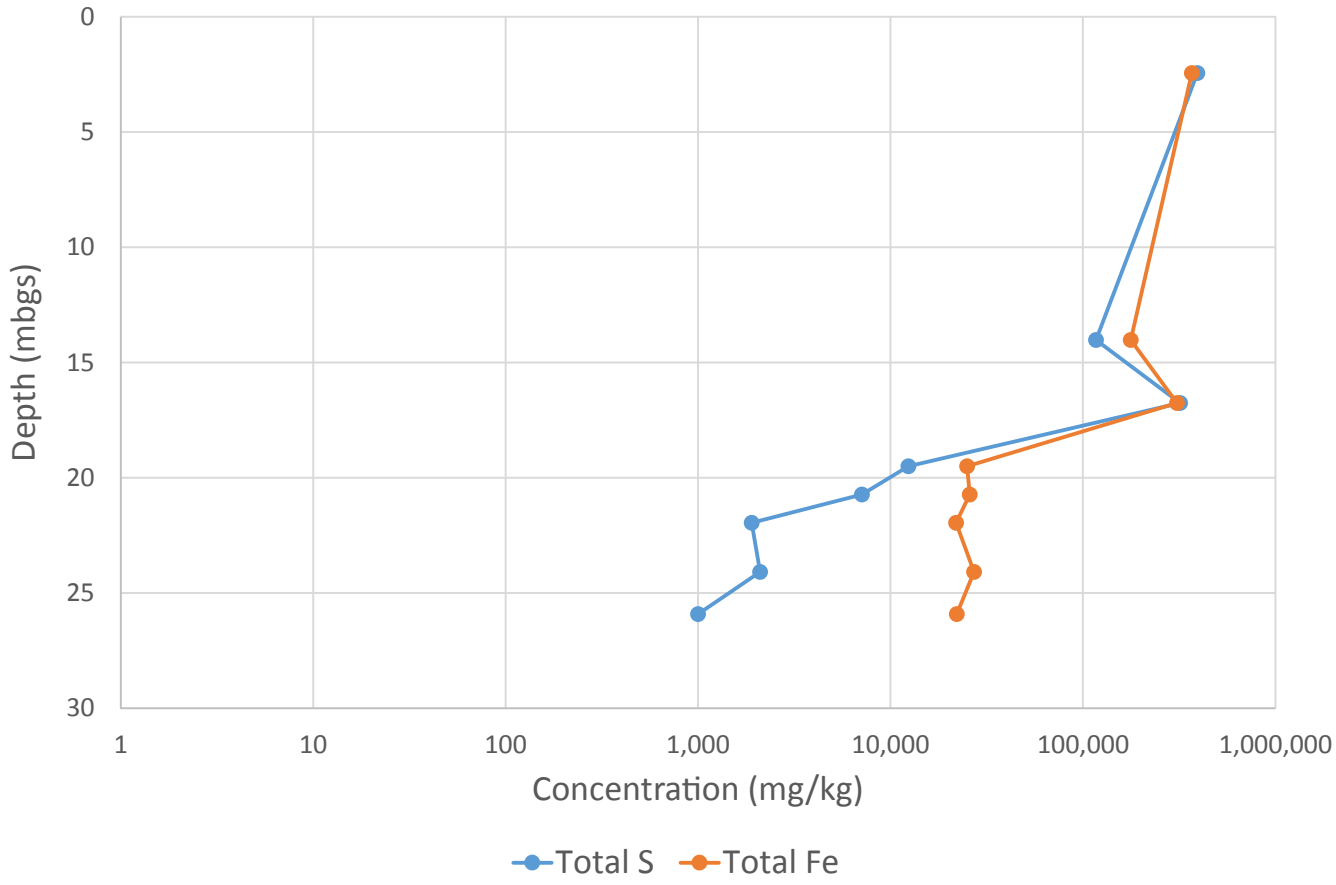
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 5-1
Total Iron and Sulphur - CH12-204-MW016
Faro Mine Remediation Project



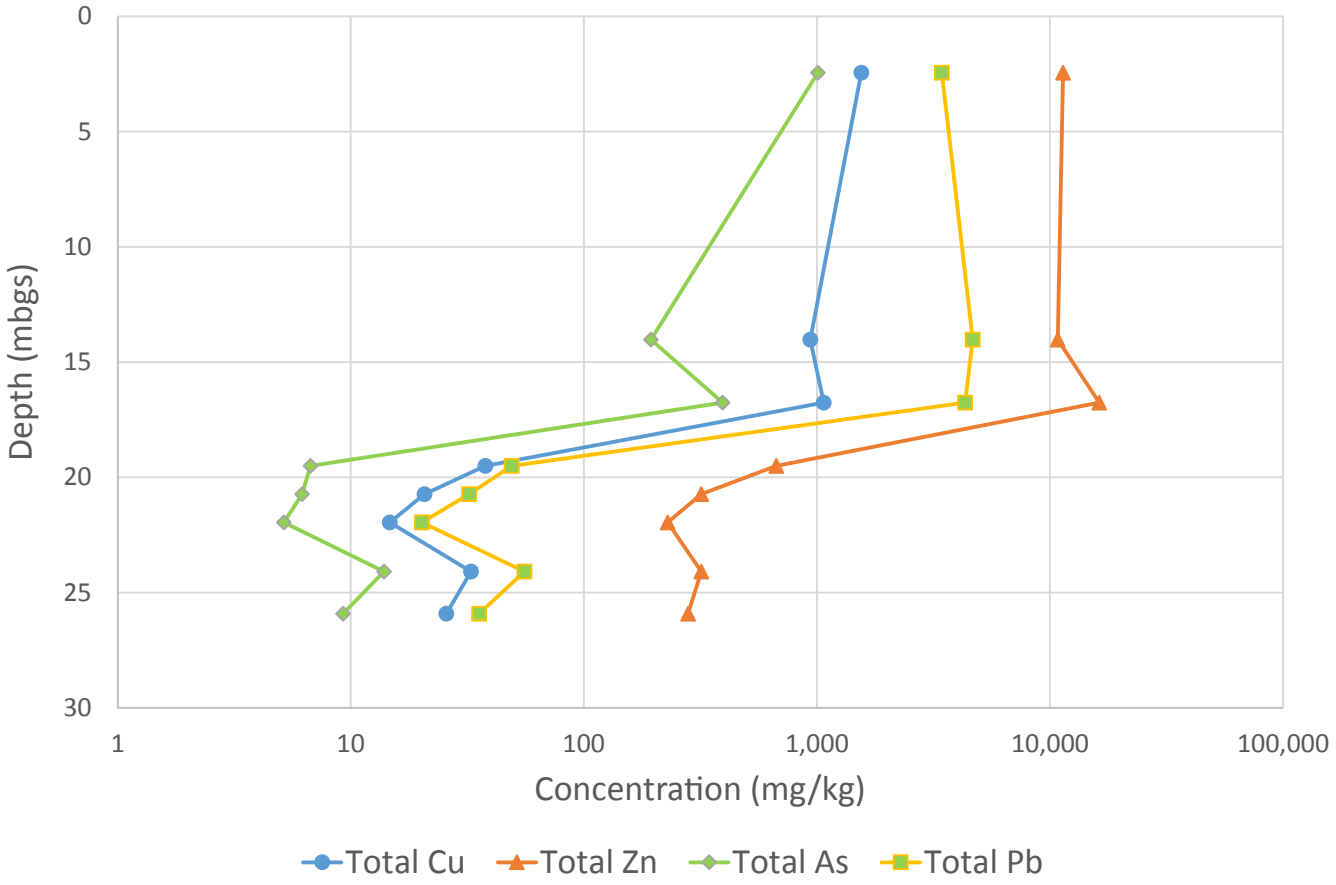
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 5-2
Select Total Trace Elements - CH12-204-MW016
Faro Mine Remediation Project



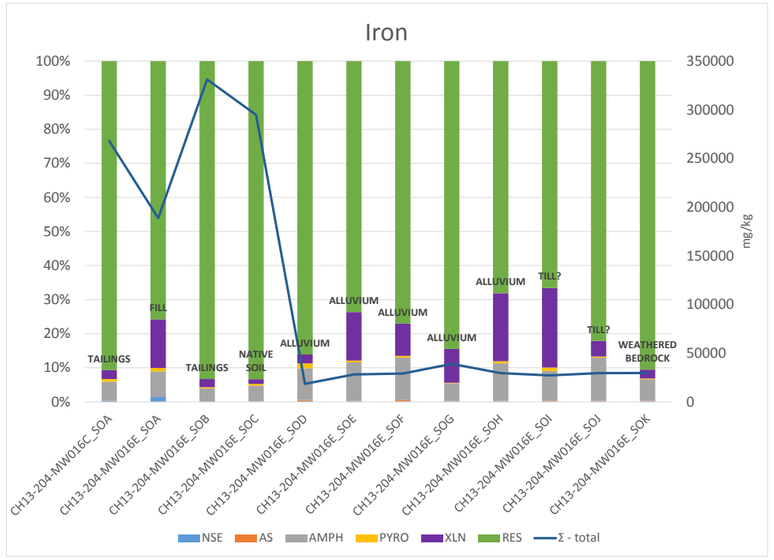
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

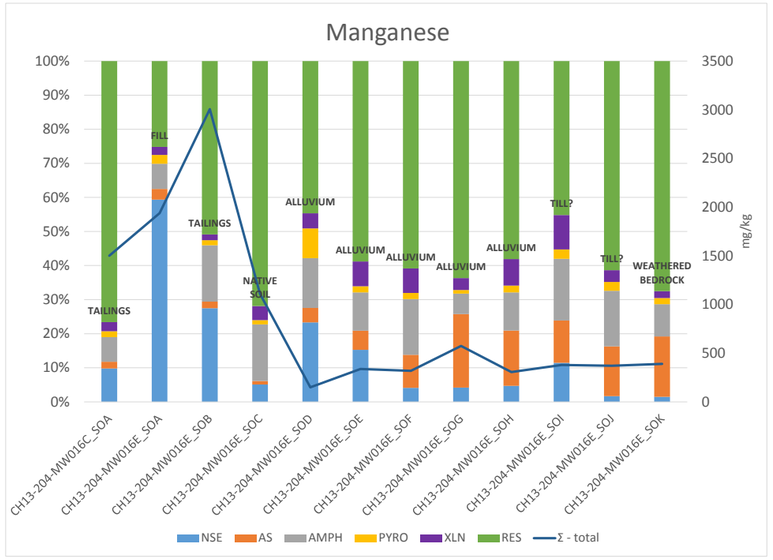
FIGURE 5-3
Total Iron and Sulphur - CH14-015-MW001
Faro Mine Remediation Project

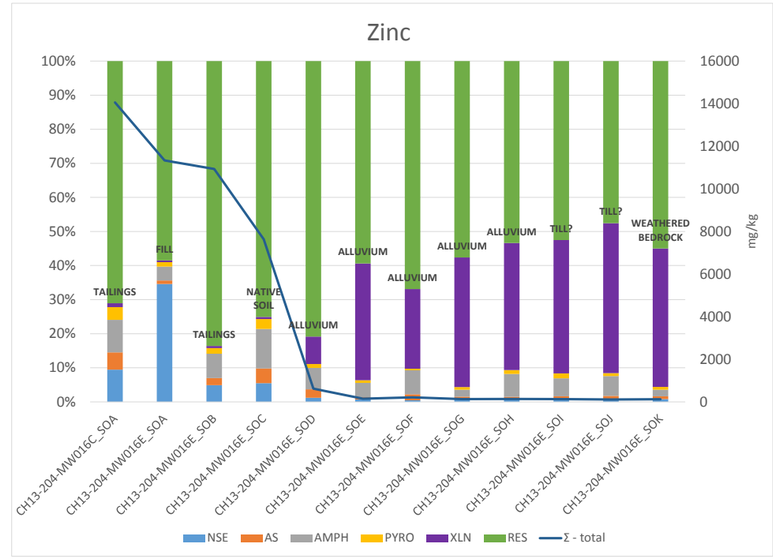


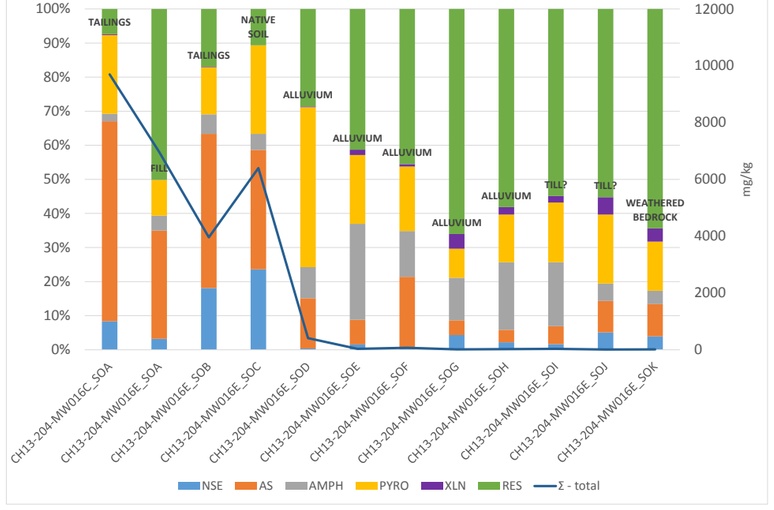
Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

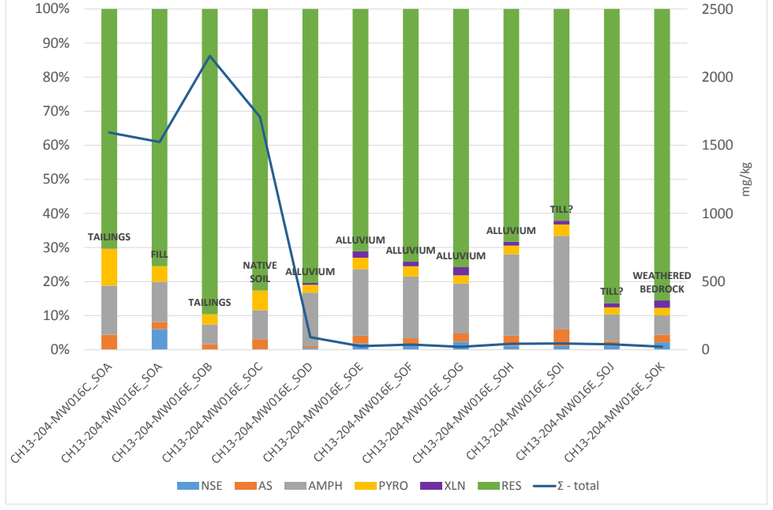
FIGURE 5-4
Select Total Trace Elements - CH14-015-MW001
Faro Mine Remediation Project

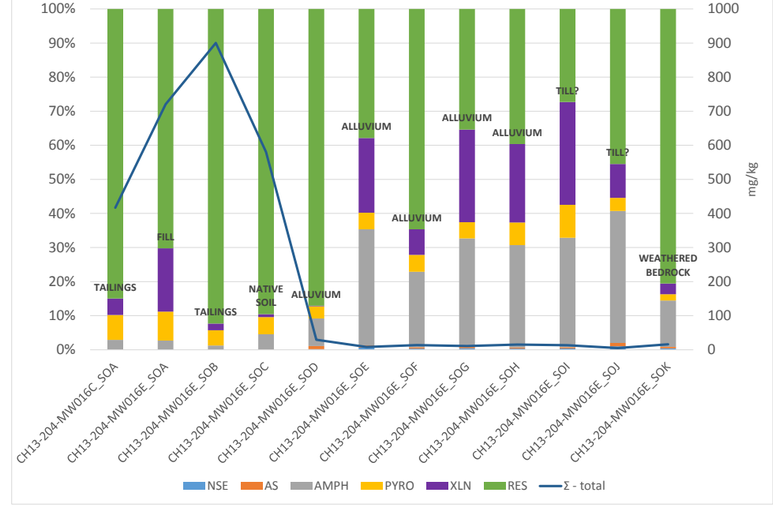






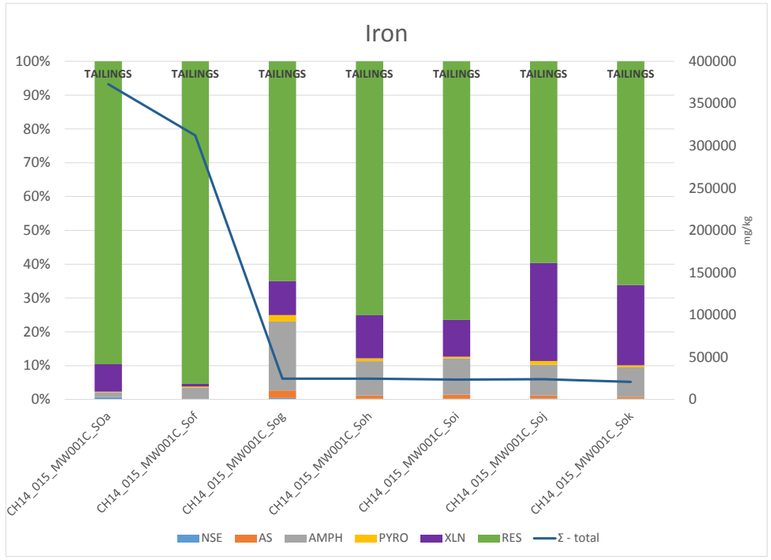


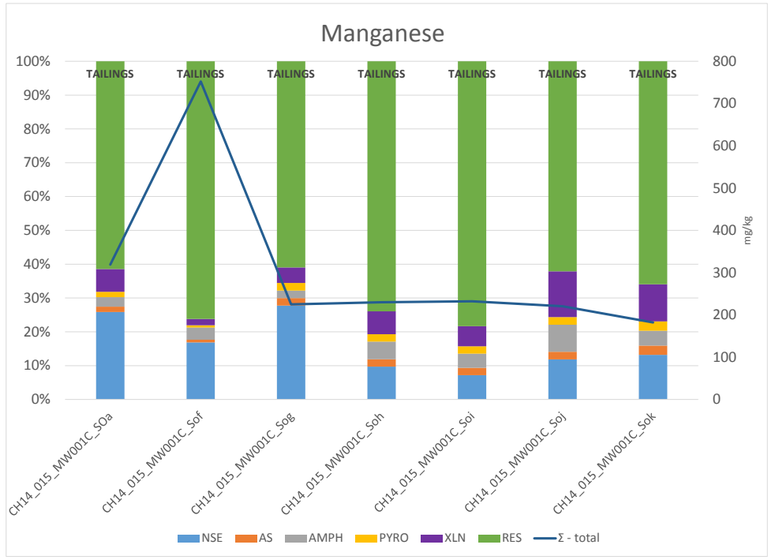


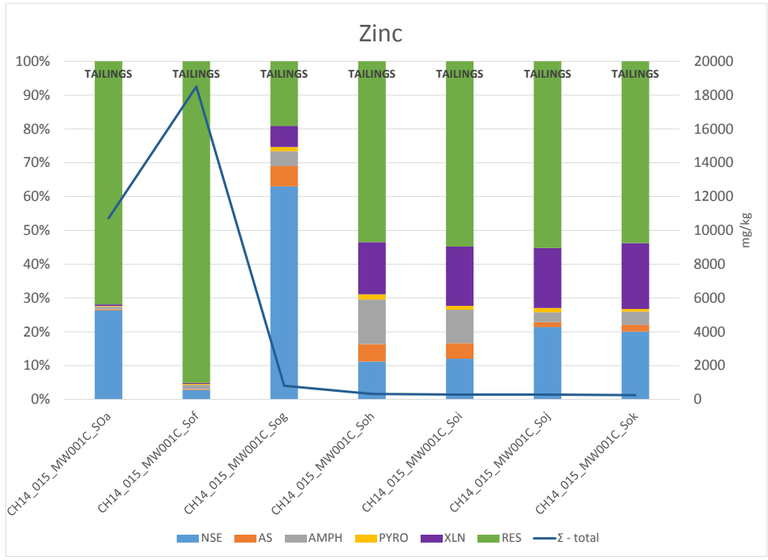


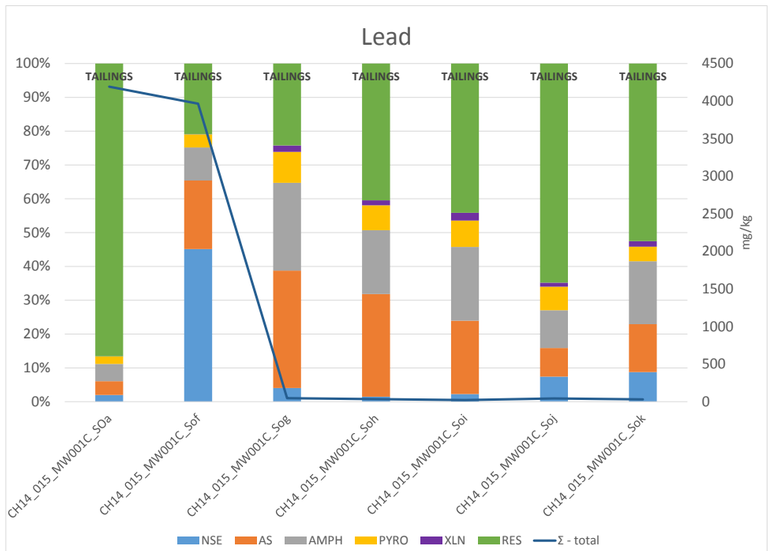
Note:
mg/kg = milligram per kilogram

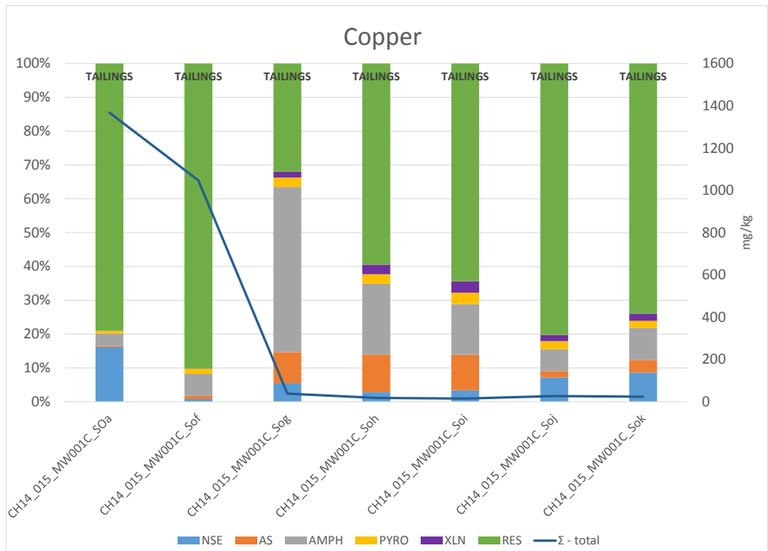
FIGURE 5-5
Sequential Extraction Monitoring Results for the Rose Creek Tailings Area Boring
Faro Mine Remediation Project

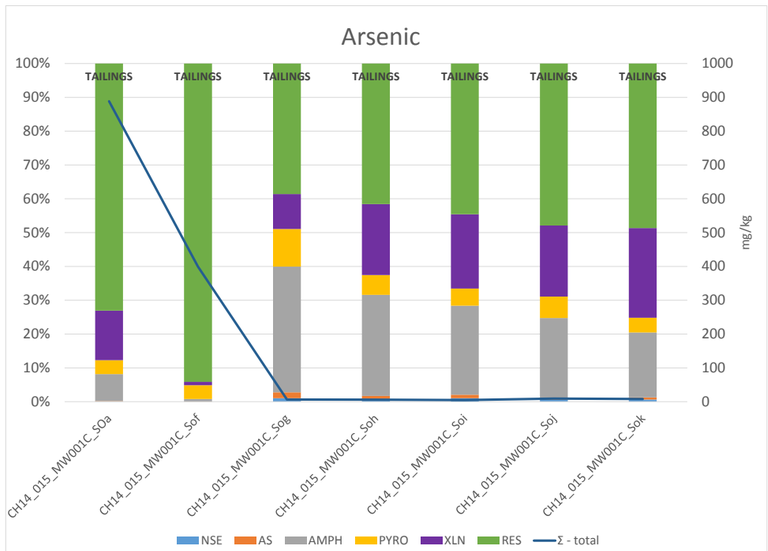






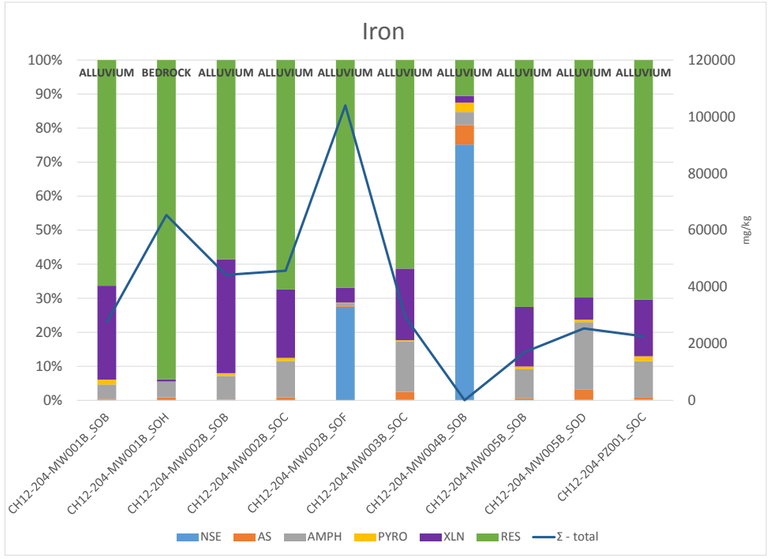


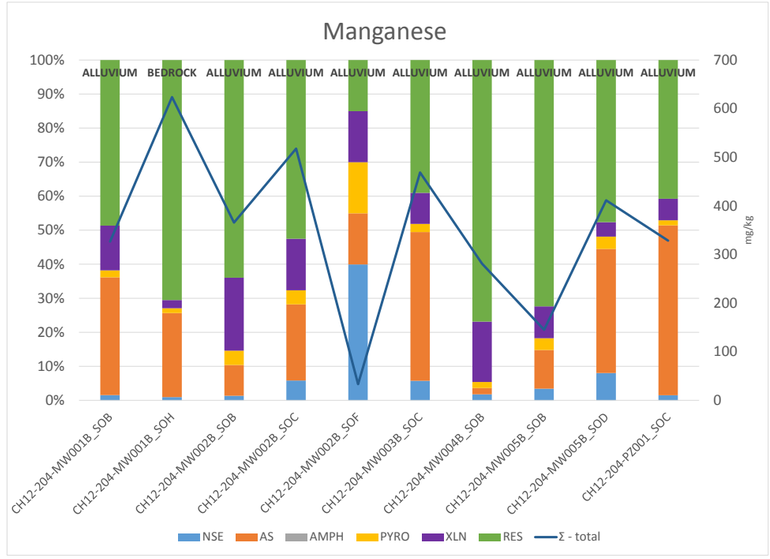


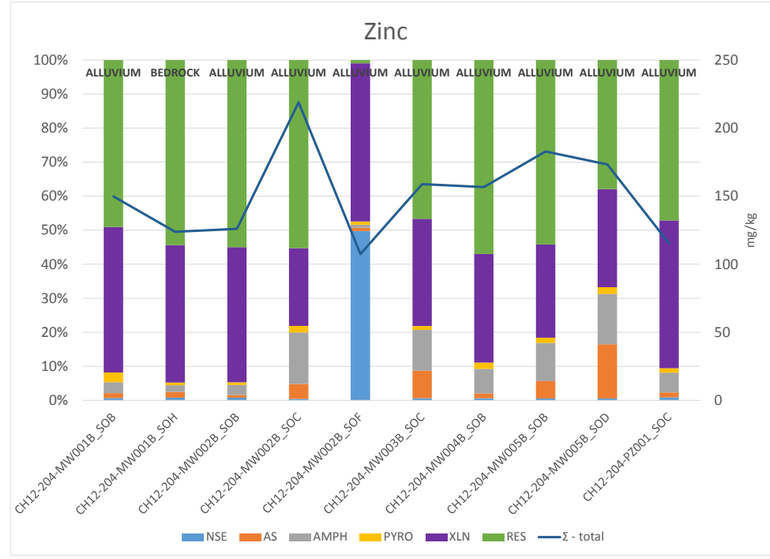


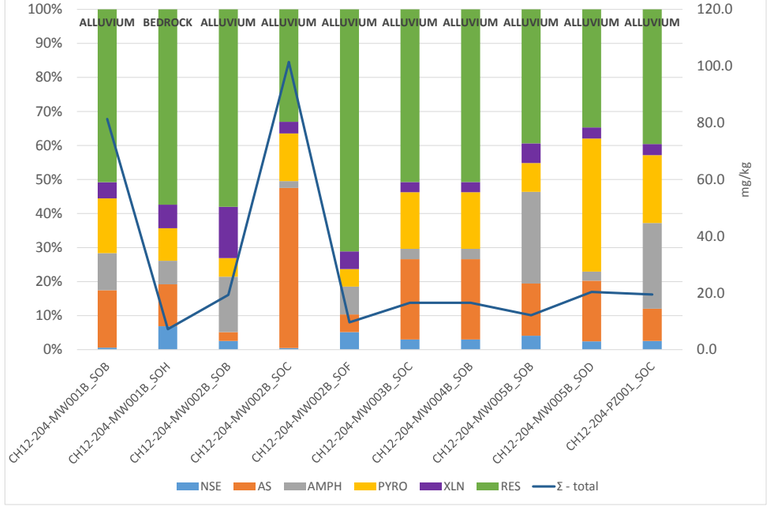
Note:
mg/kg = milligram per kilogram

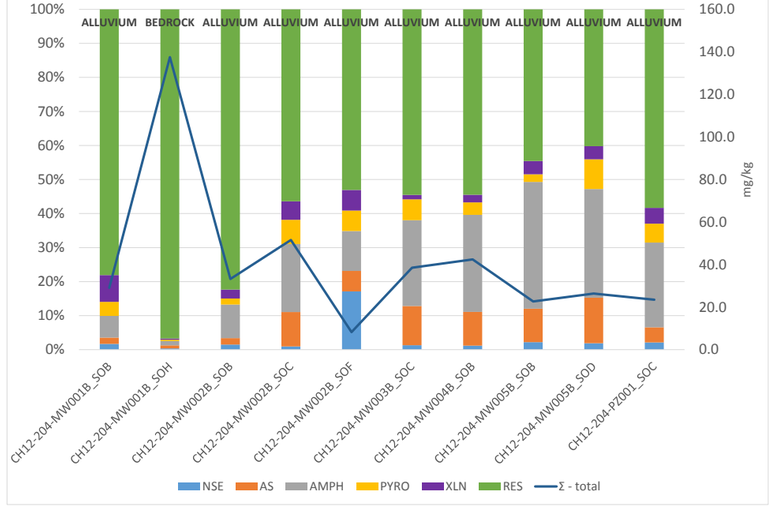
FIGURE 5-6
Sequential Extract on Monitoring Results for the Rose Creek Tailings Area – 2014 Boring
Faro Mine Remediation Project

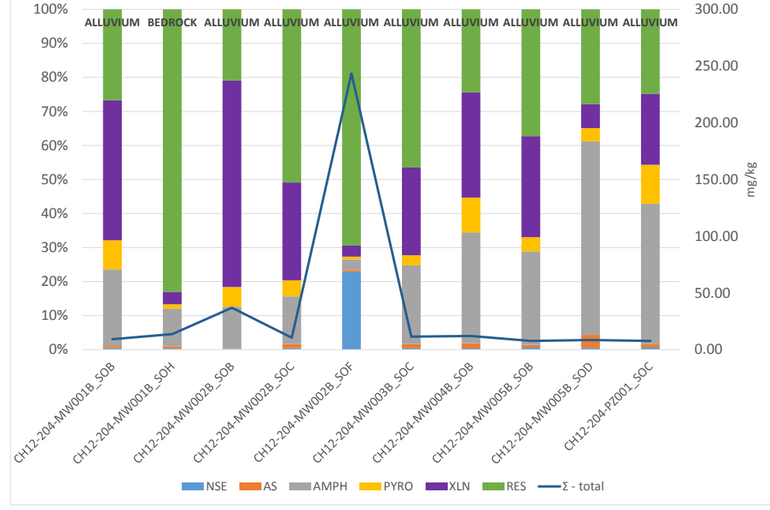






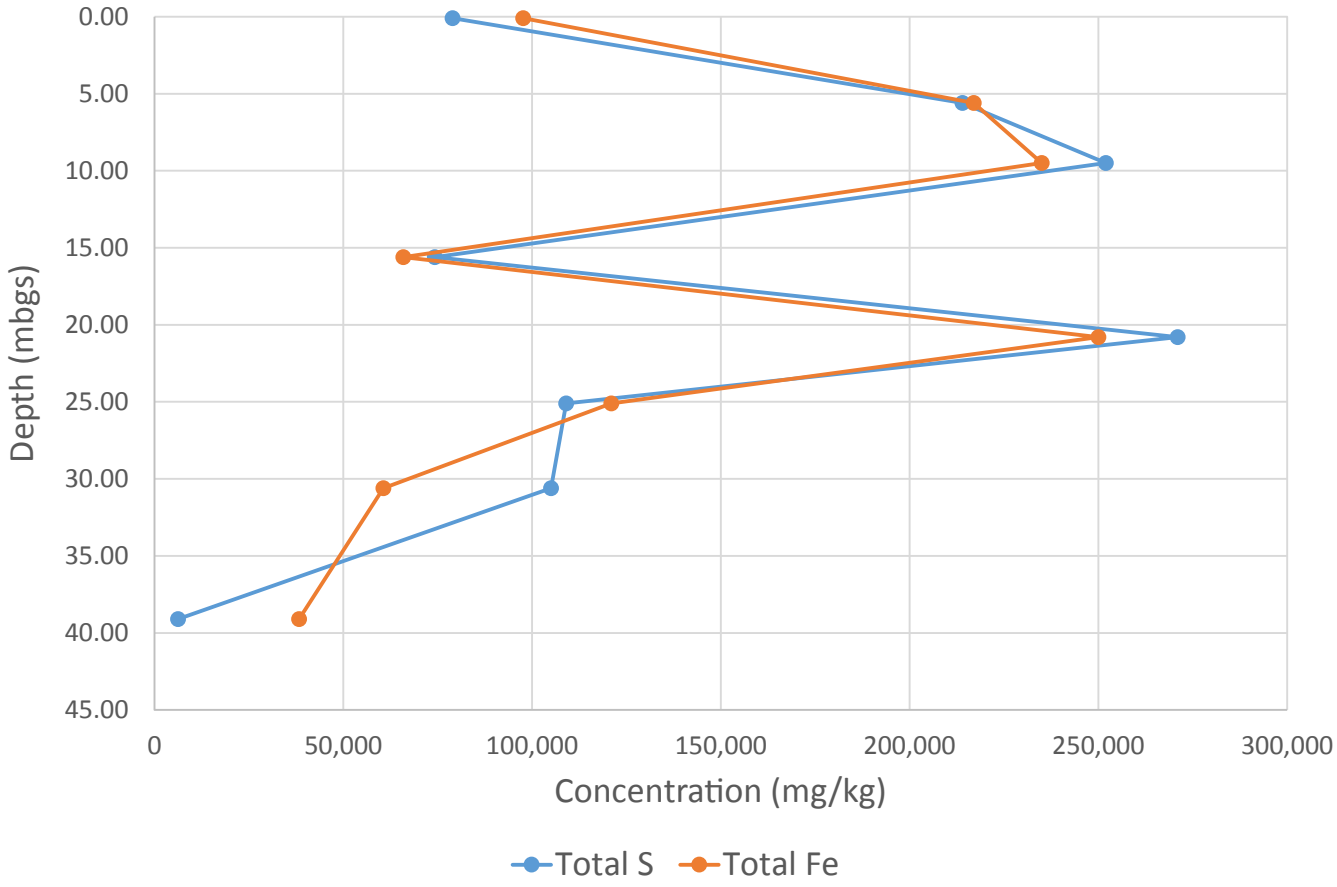






Note:
mg/kg = milligram per kilogram

FIGURE 6-1
Sequential Extract on Monitoring Results for the Cross Valley Dam Area
Faro Mine Remediation Project



Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 10-1
Total Iron and Sulphur - CH12-014-MW013
Faro Mine Remediation Project

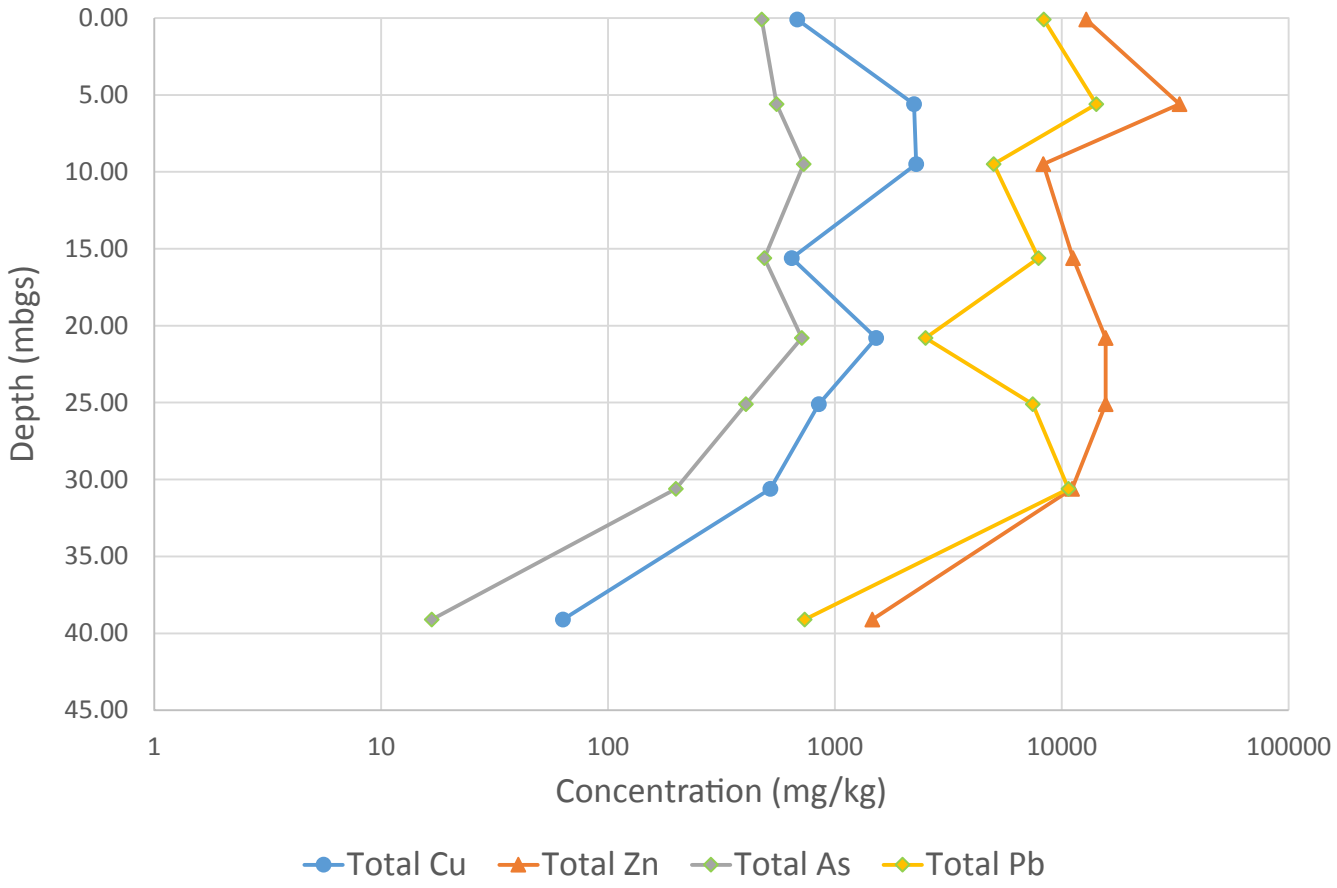
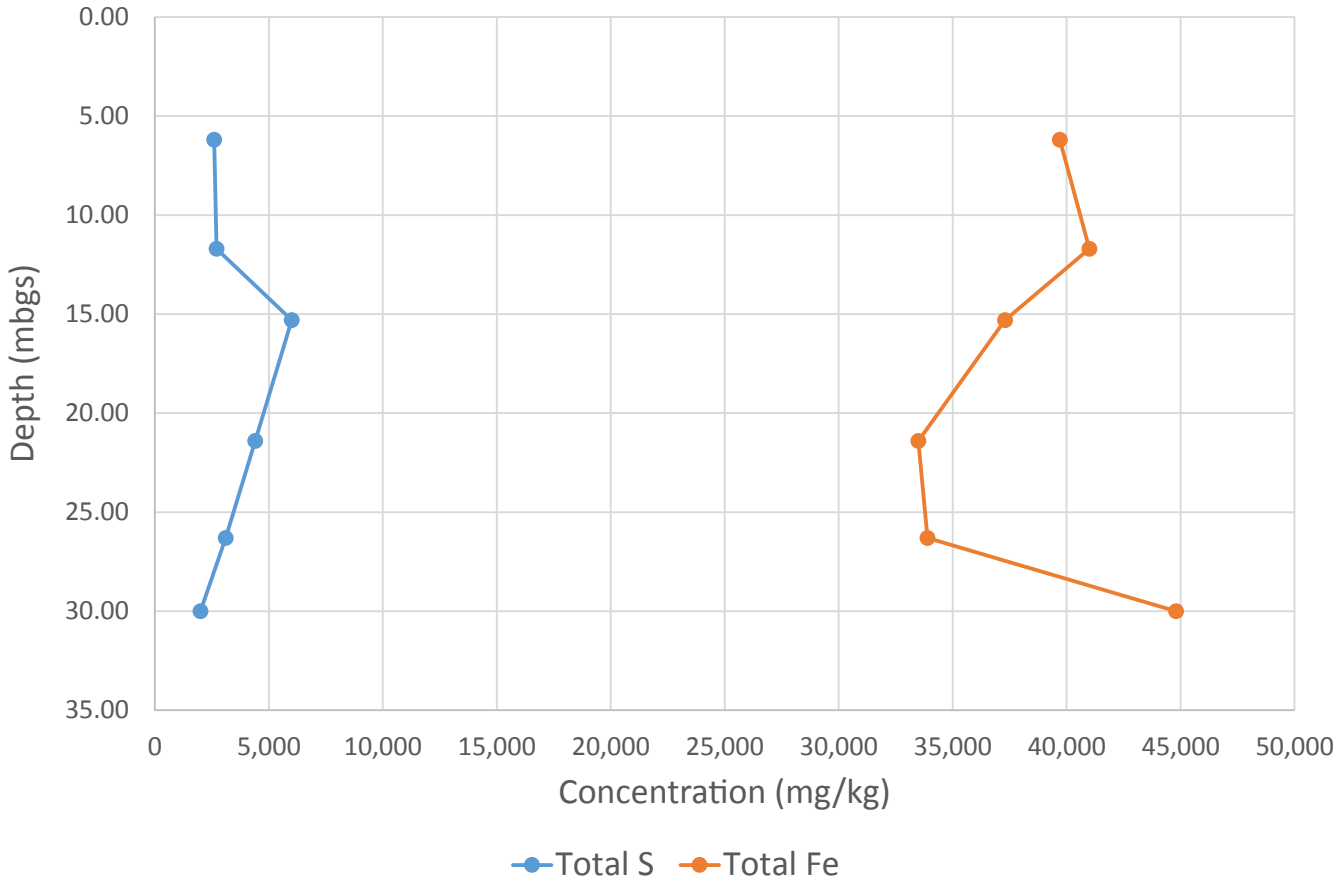


FIGURE 10-2
Select Total Trace Elements - CH12-014-MW013
Faro Mine Remediation Project



Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 10-3
Total Iron and Sulphur - CH12-014-MW011
Faro Mine Remediation Project

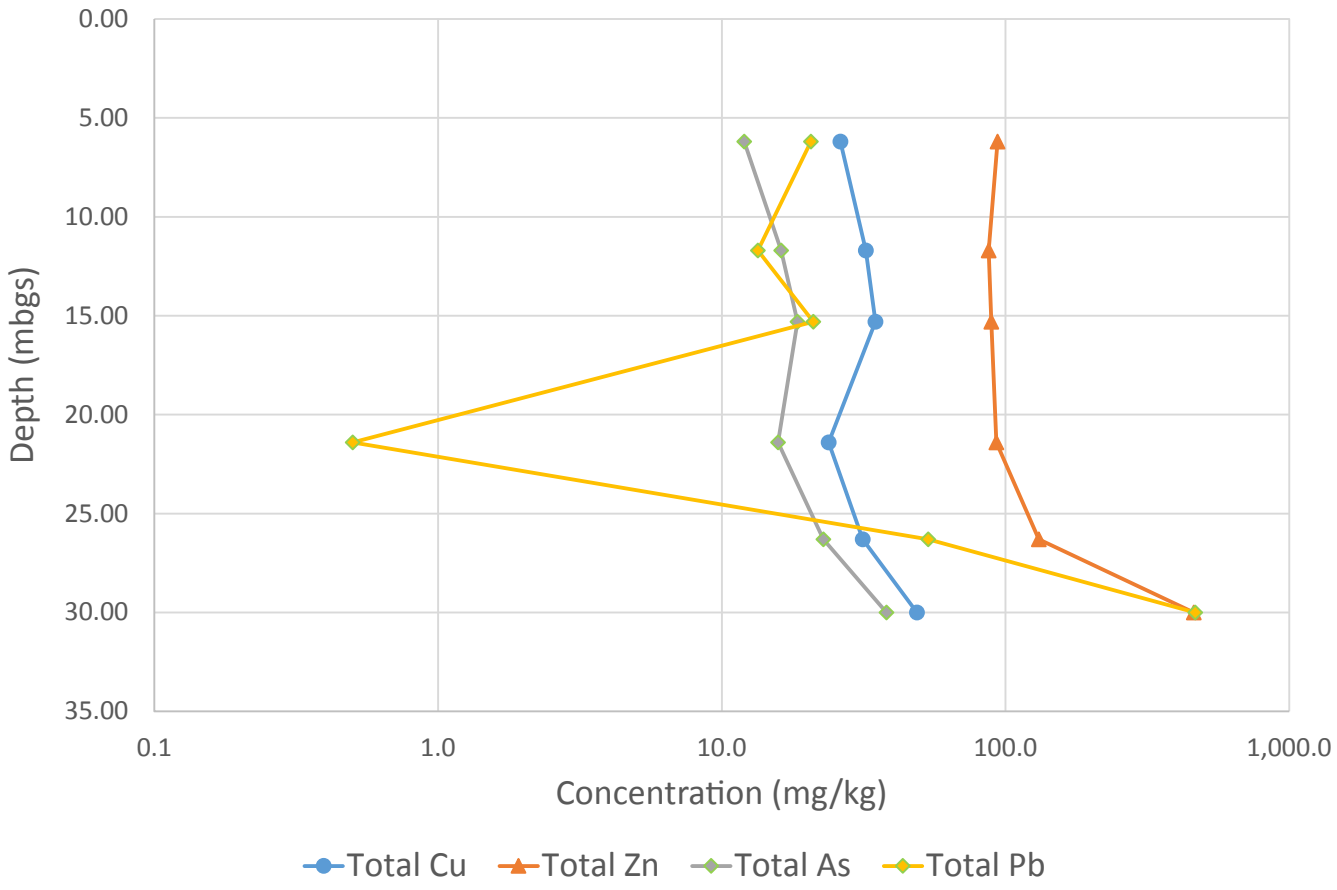
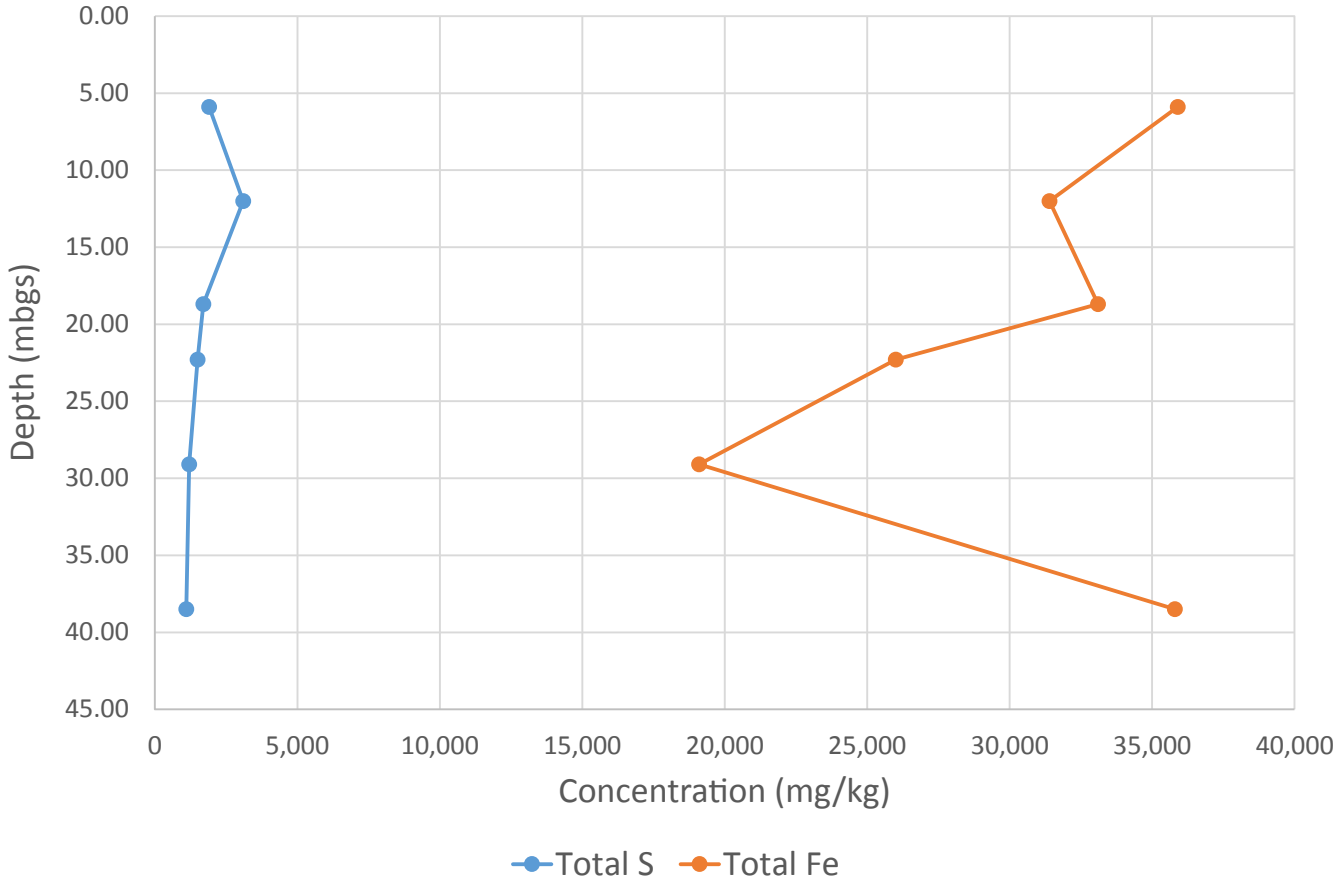


FIGURE 10-4
Select Total Trace Elements - CH12-014-MW011
Faro Mine Remediation Project



Notes:
mbgs = metres below ground surface
mg/kg = milligrams per kilogram

FIGURE 10-5
Total Iron and Sulphur - CH12-014-MW012
Faro Mine Remediation Project

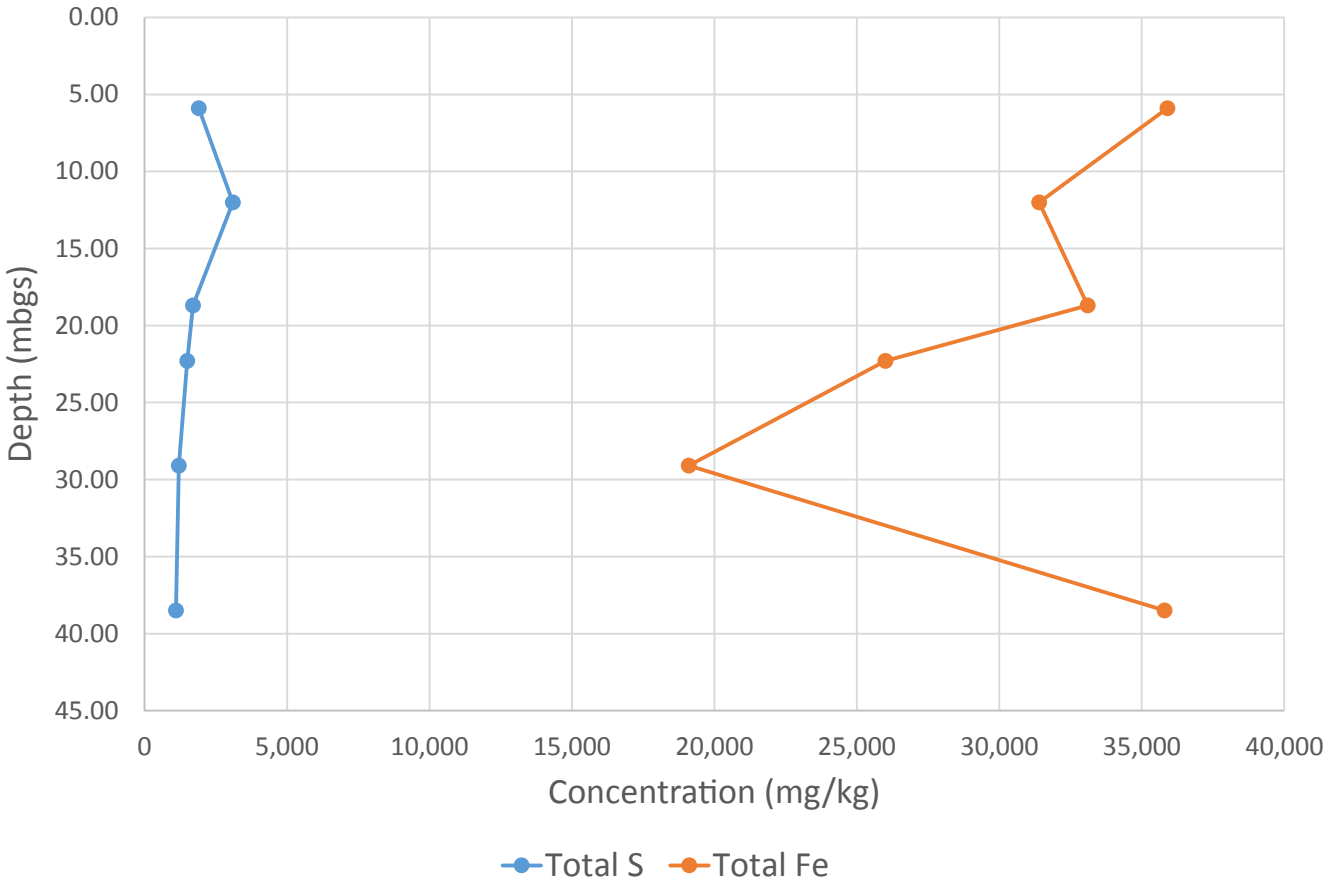
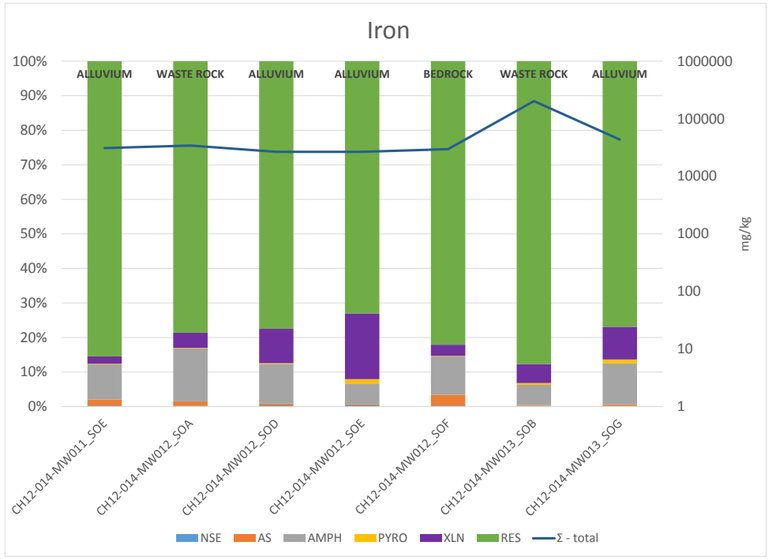
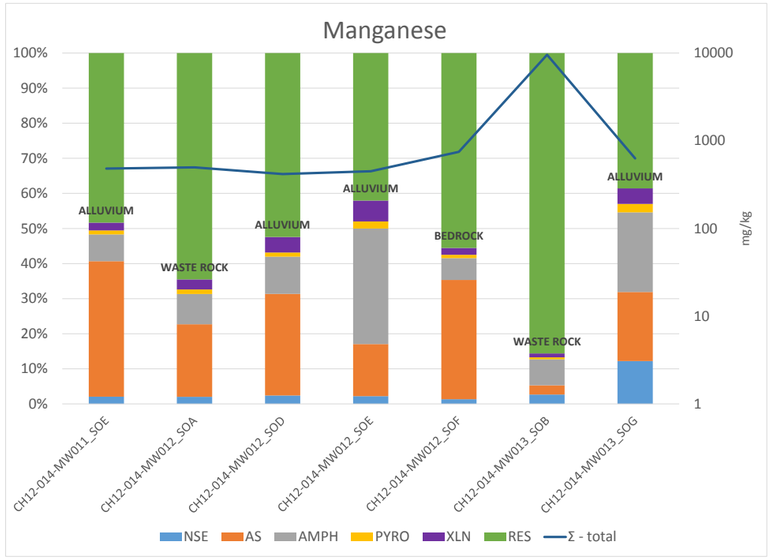
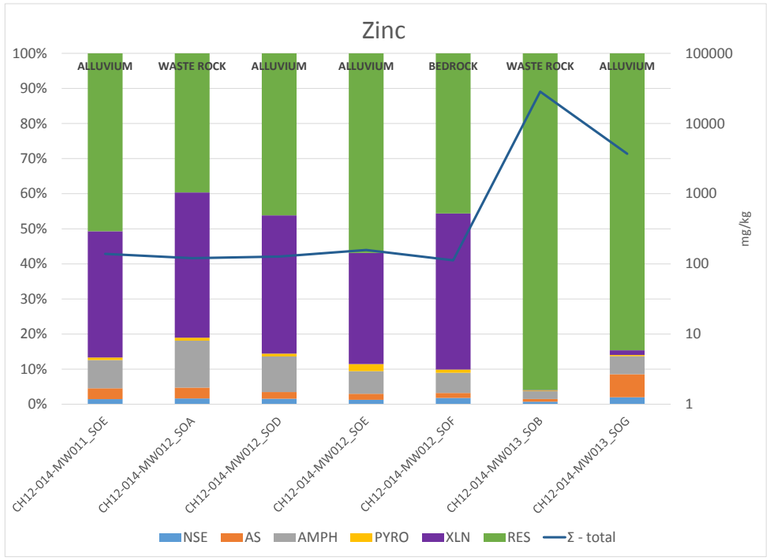
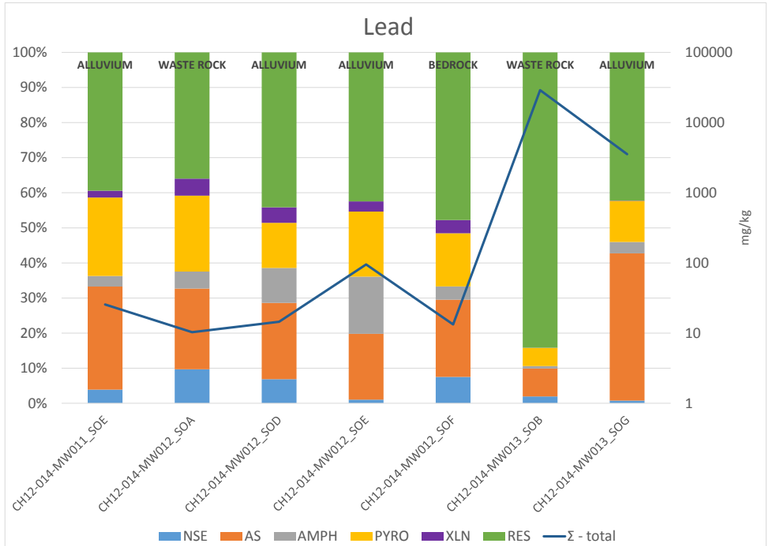


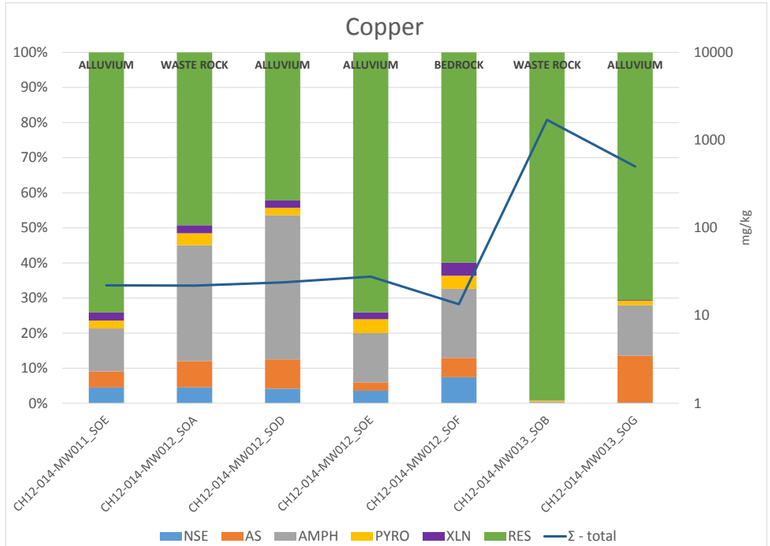
FIGURE 10-6
Select Total Trace Elements - CH12-014-MW012
Faro Mine Remediation Project











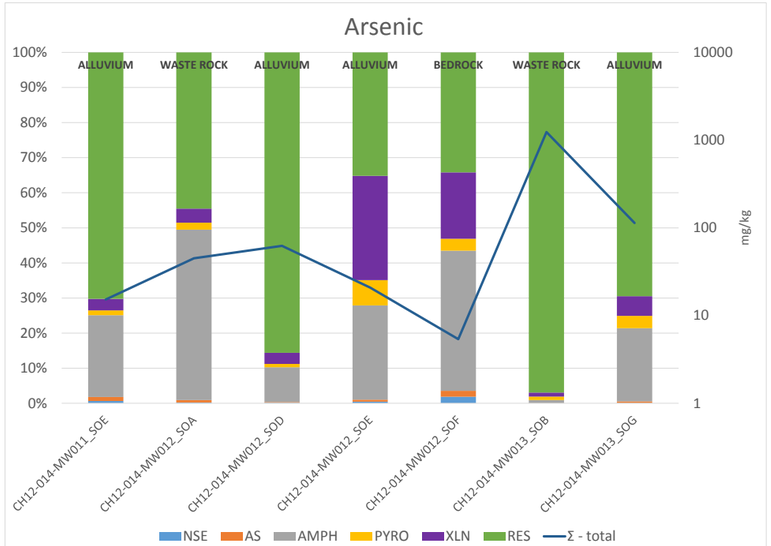
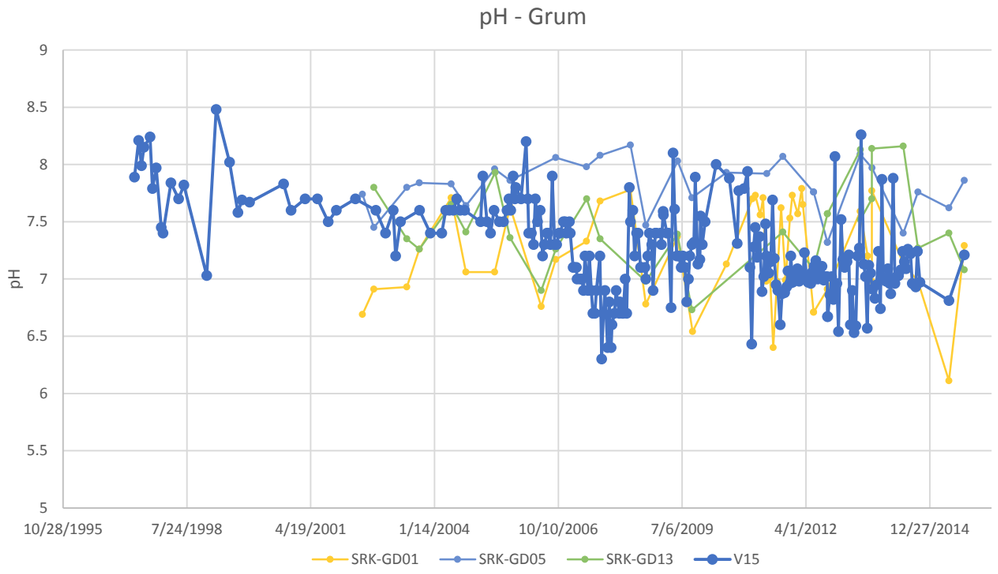
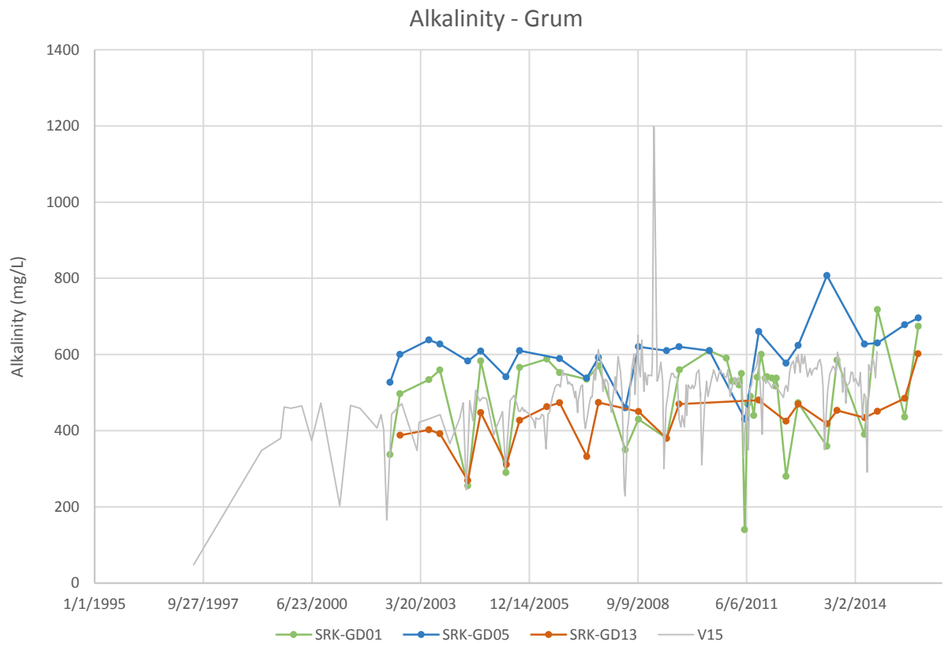


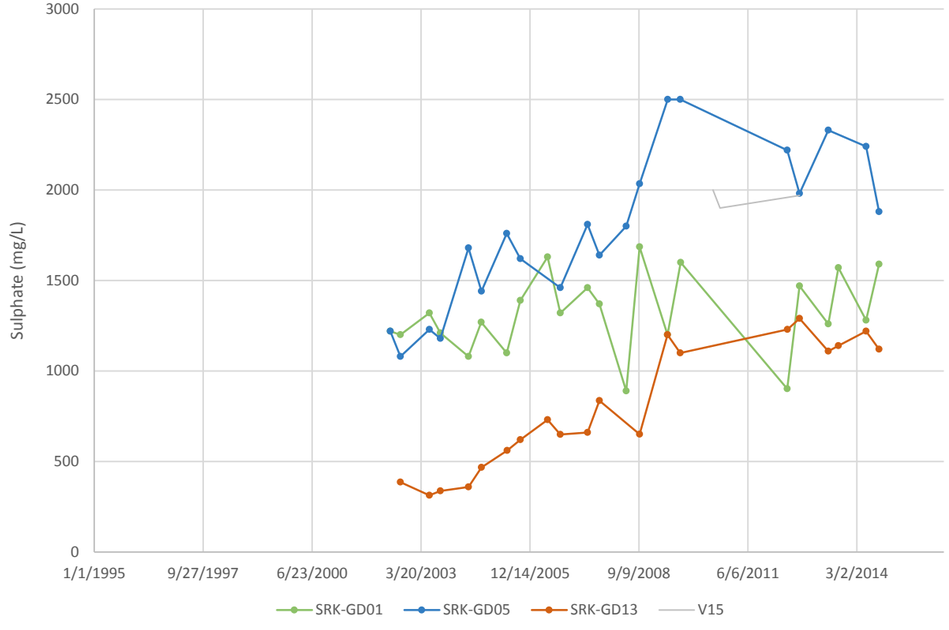
FIGURE 10-7
Sequential Extraction Monitoring Results for the Grum and Vangorda Mine Areas
Faro Mine Remediation Project

Note:
mg/kg = milligram per kilogram

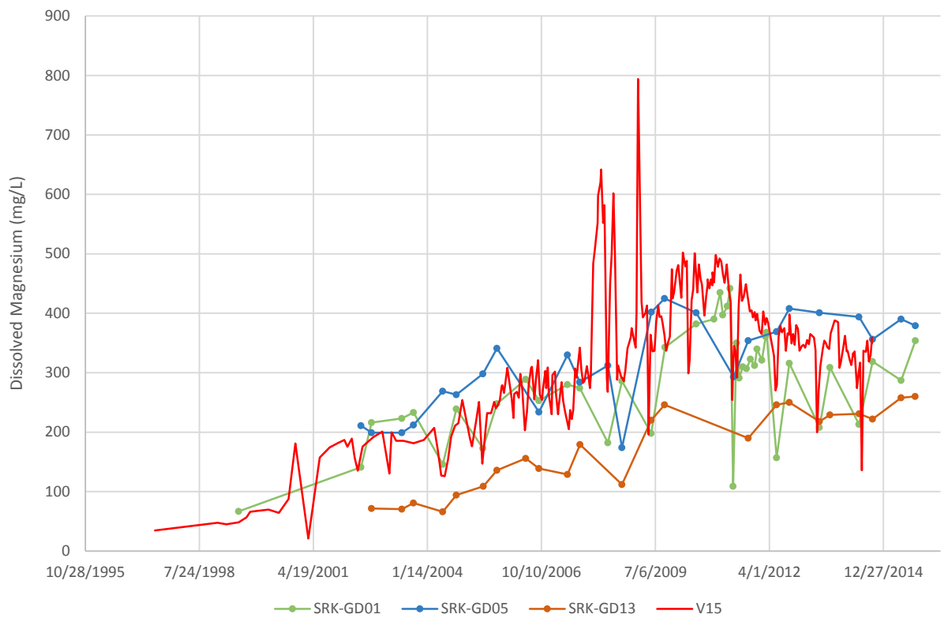




Sulphate - Grum

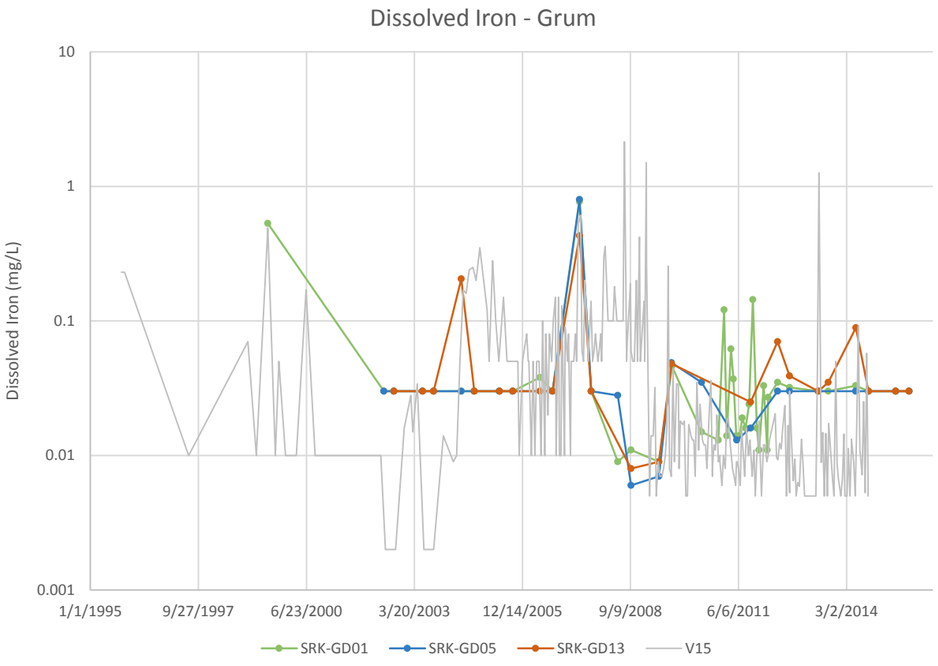


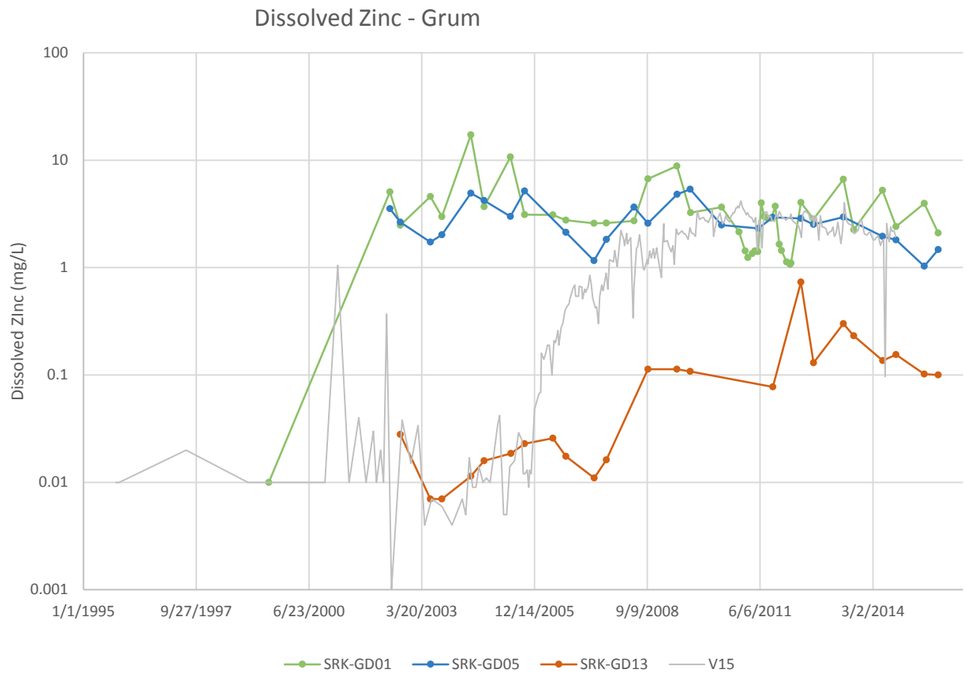
Dissolved Magnesium - Grum



Notes:
mg/L = milligrams per litre

FIGURE 10-8 - *1 of 2*
Water Quality Time Series Trends - Grum Waste Rock Dump
Faro Mine Remediation Project

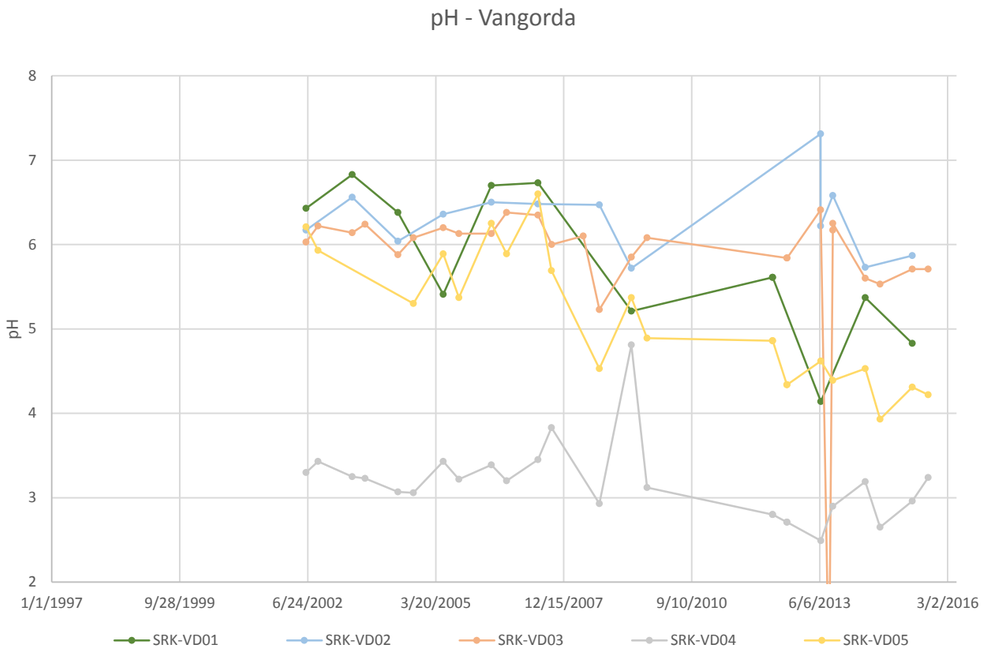


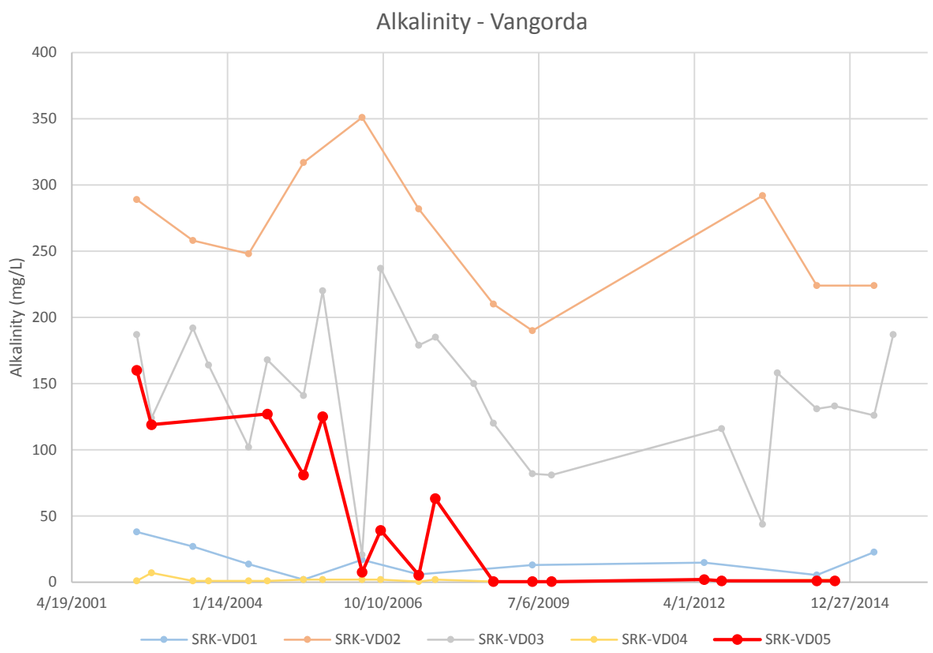


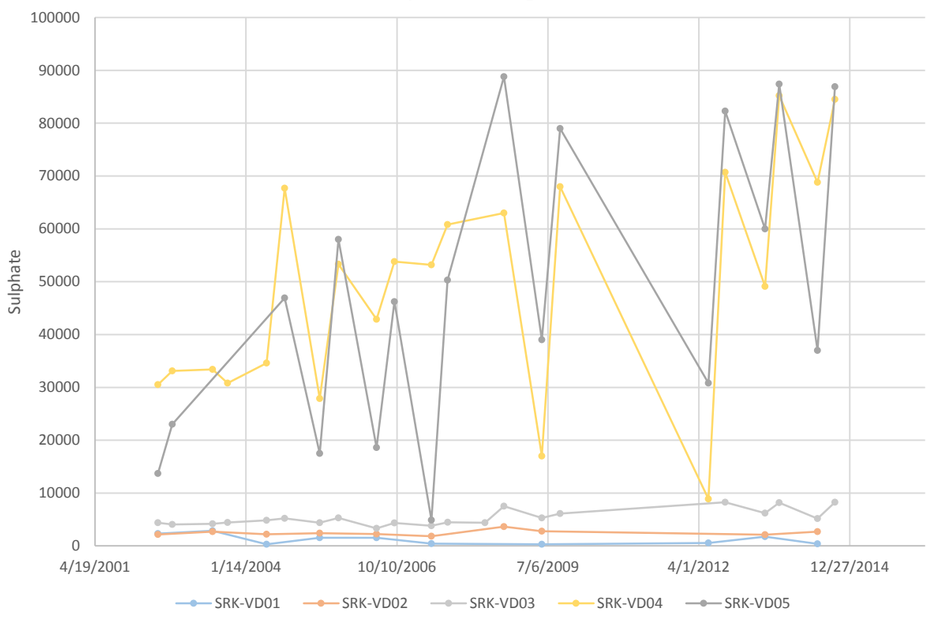
Notes:
mg/L = milligrams per litre

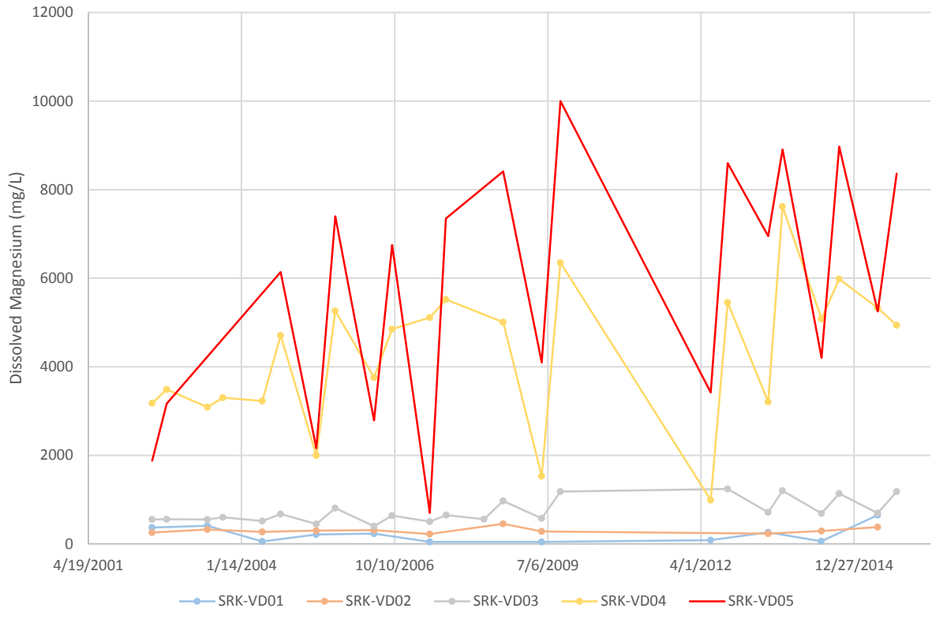
FIGURE 10-8 - *2 of 2*
Water Quality Time Series Trends - Grum Waste Rock Dump
Faro Mine Remediation Project

ch2m.



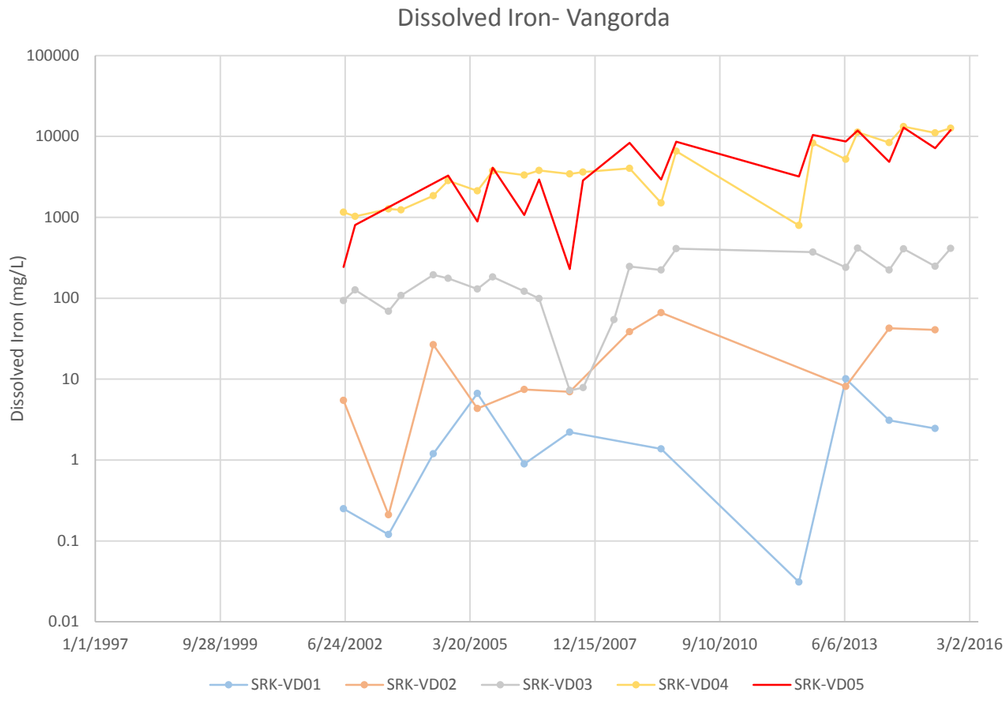


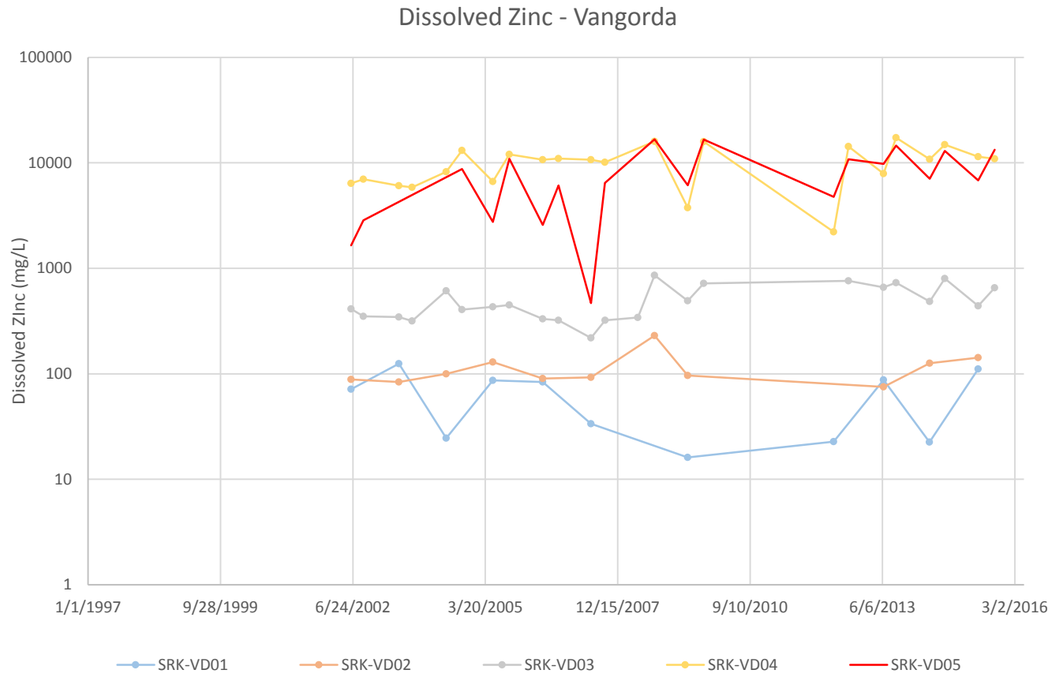




Notes:
mg/L = milligrams per litre

FIGURE 10-9 - *1 of 2*
Water Quality Time Series Trends - Vangorda Waste Rock Dump
Faro Mine Remediation Project

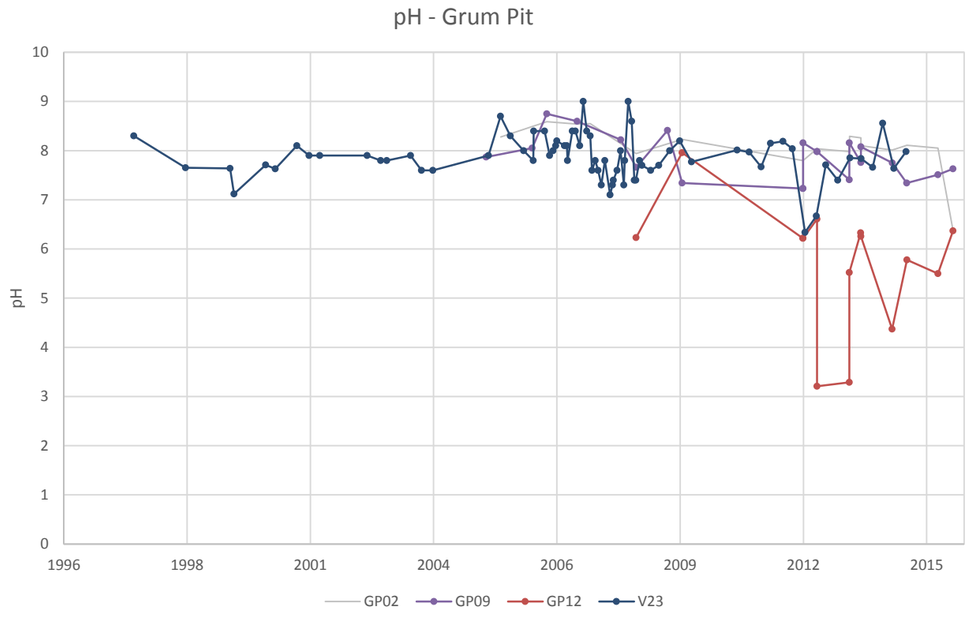


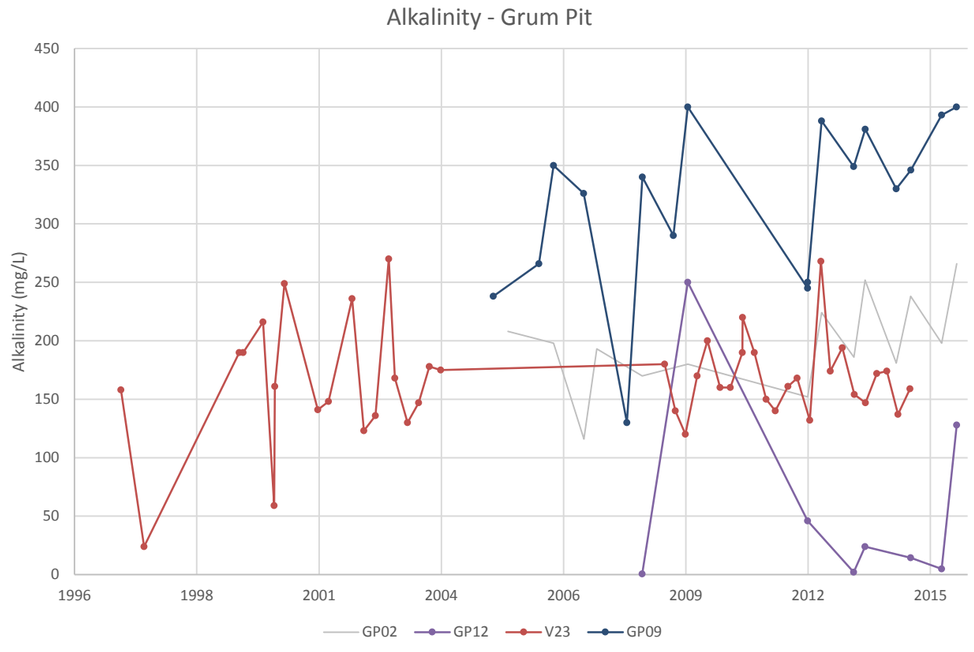


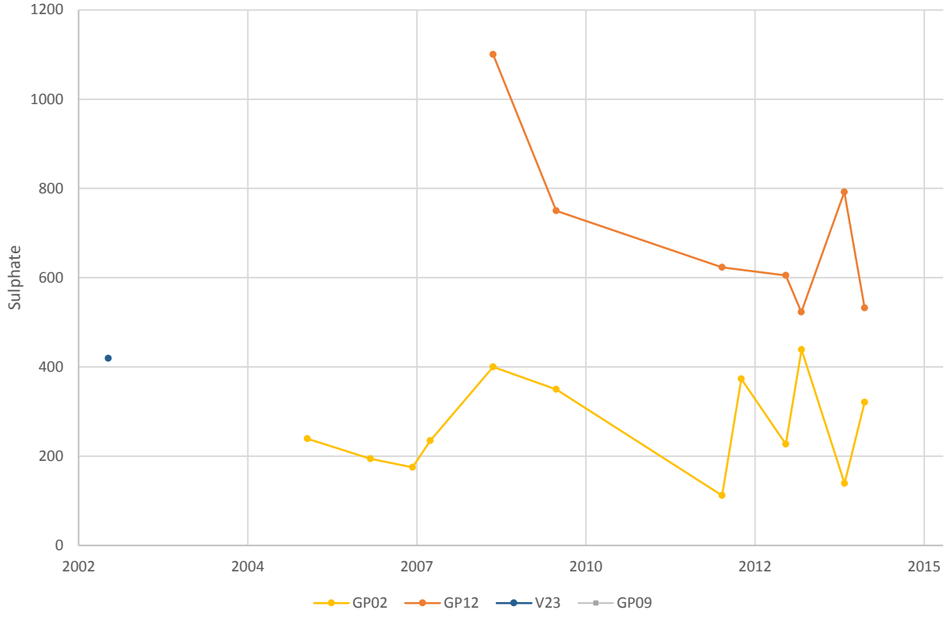
Notes:
mg/L = milligrams per litre

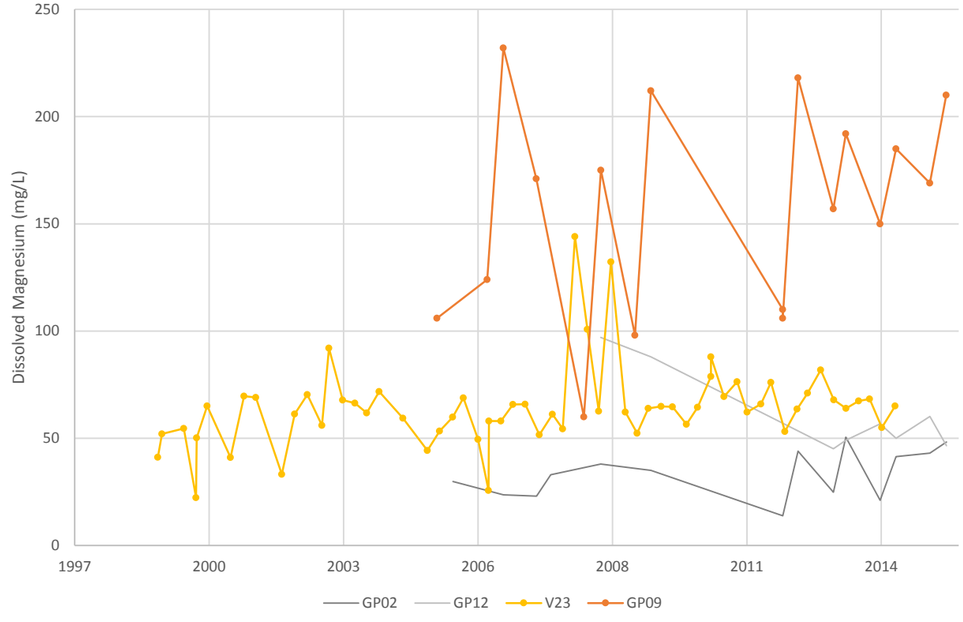
FIGURE 10-9 - *2 of 2*
Water Quality Time Series Trends - Vangorda Waste Rock Dump
Faro Mine Remediation Project

ch2m.





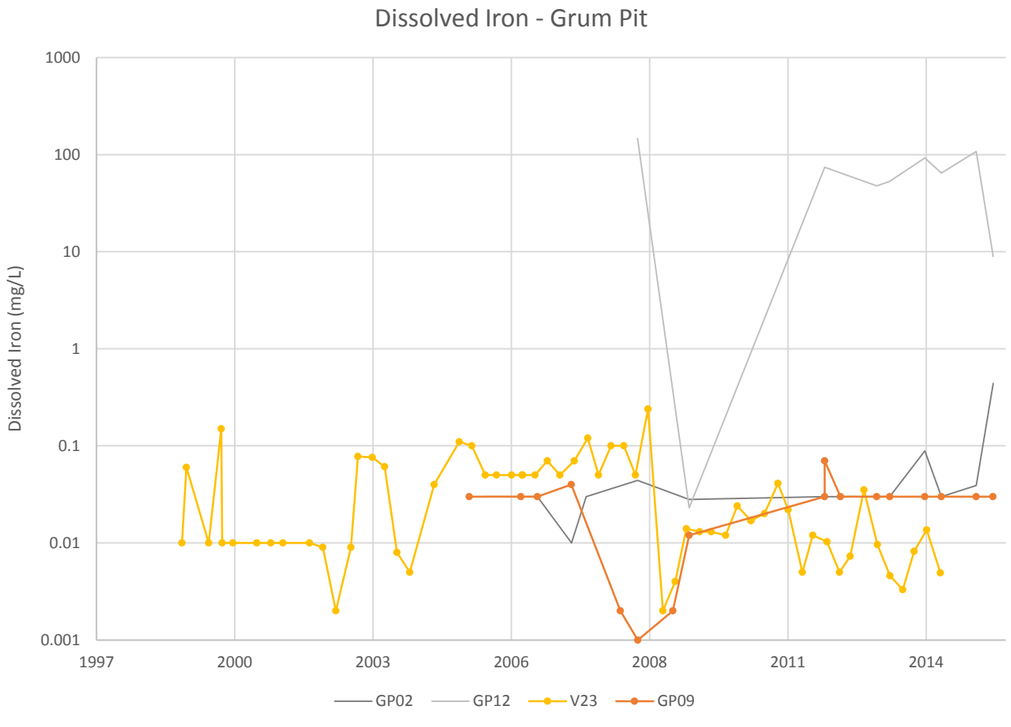


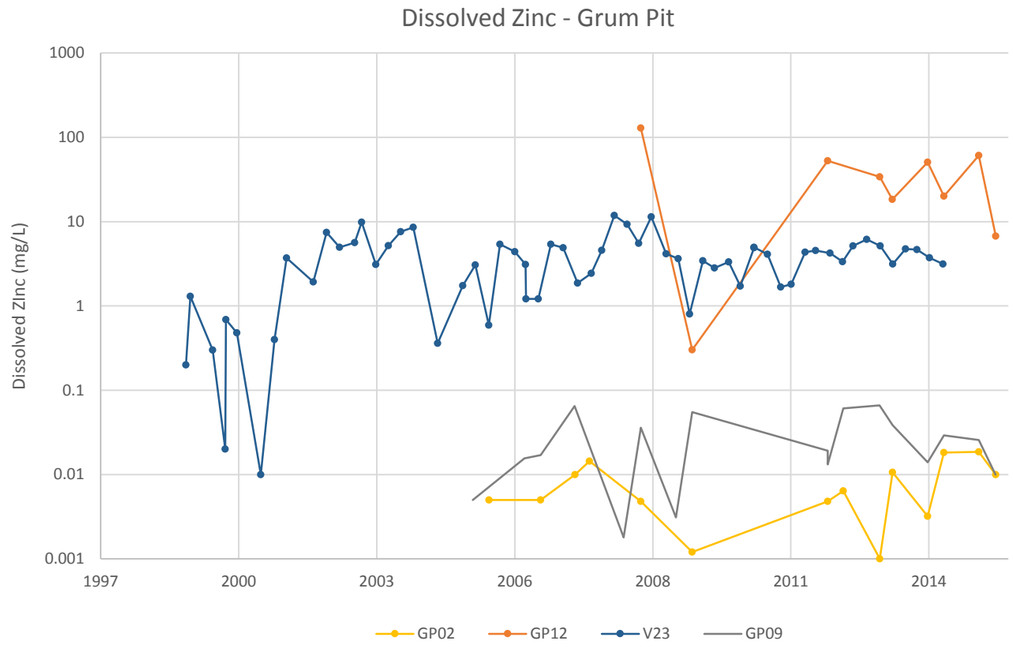


Notes:
mg/L = milligrams per litre

FIGURE 10-10 - *1 of 2*
Water Quality Time Series Trends - Grum Pit
Faro Mine Remediation Project

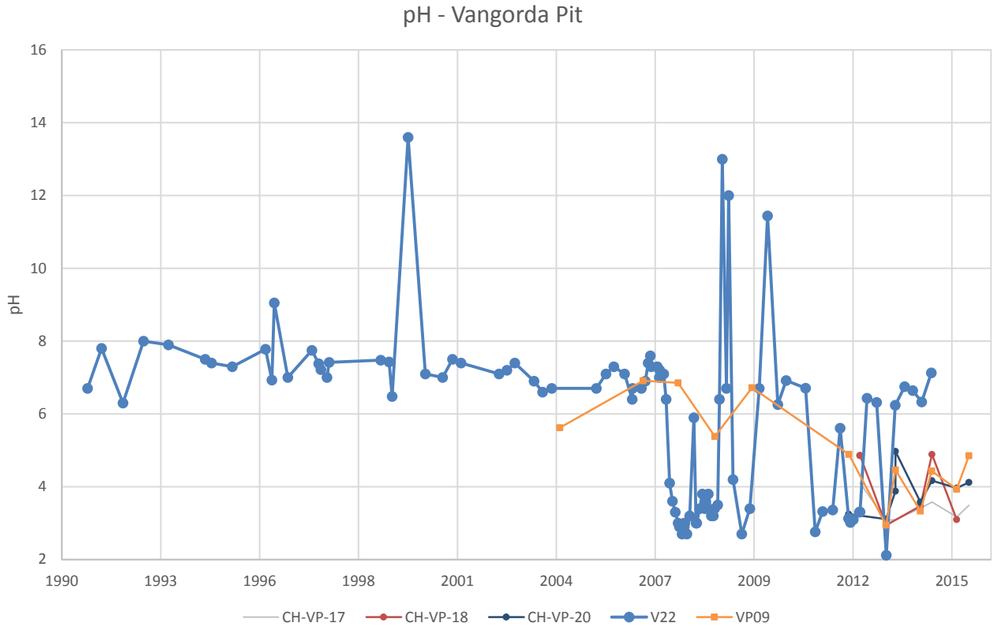
ch2m.

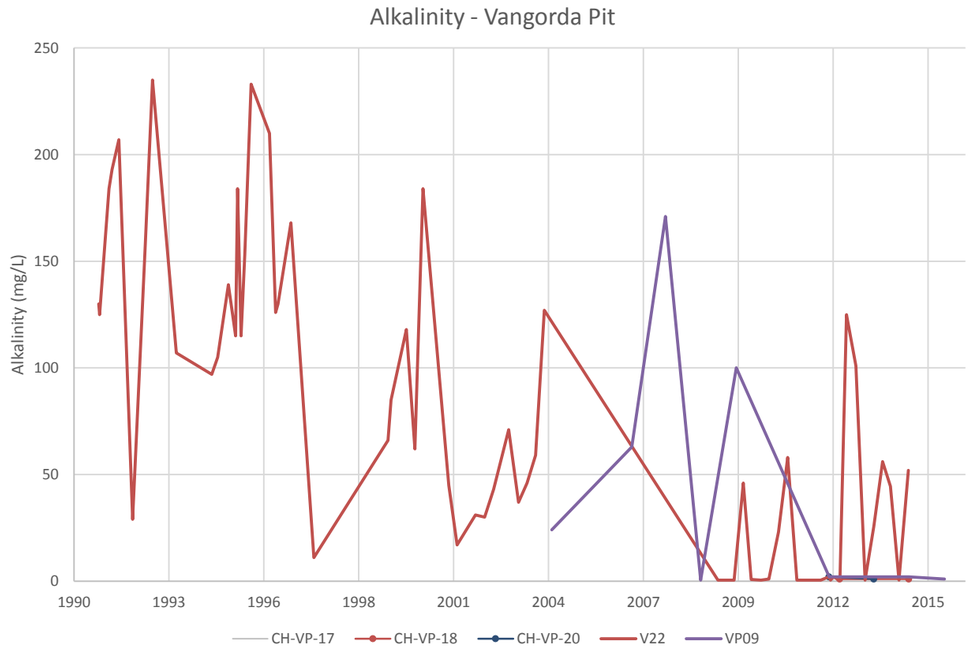


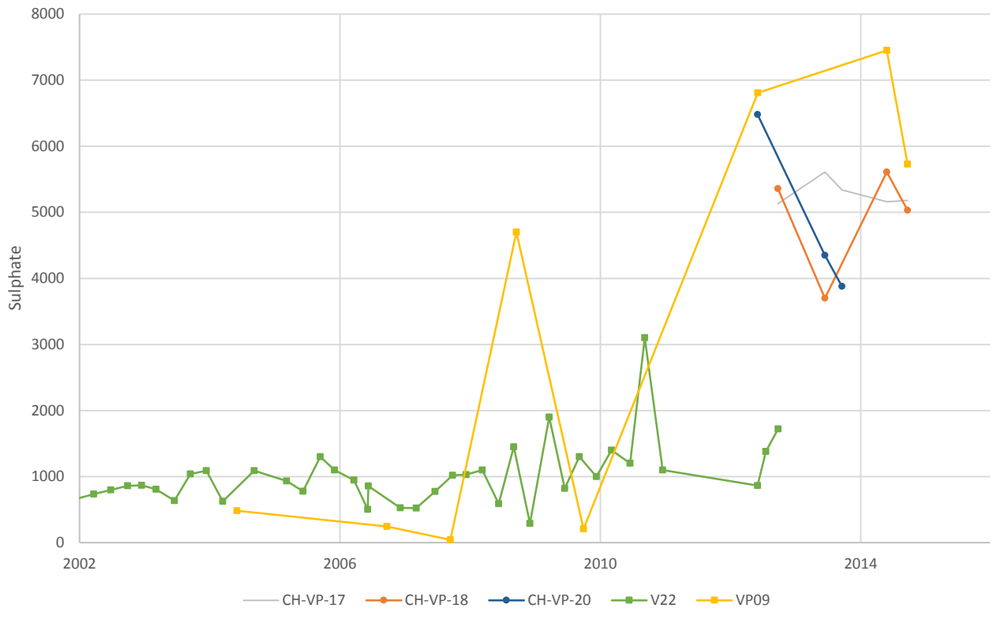


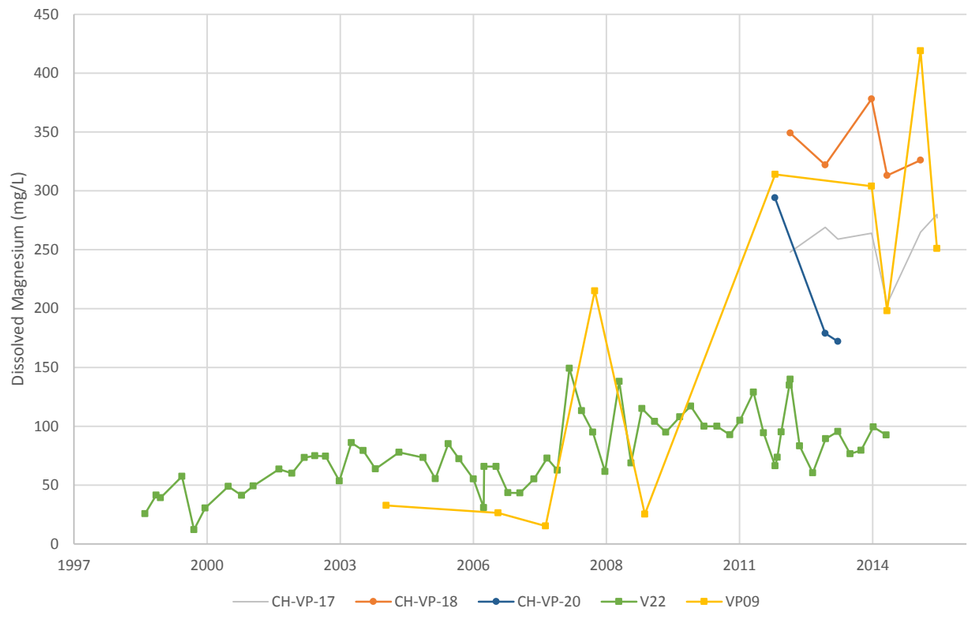
Notes:
mg/L = milligrams per litre

FIGURE 10-10 - *2 of 2*
Water Quality Time Series Trends - Grum Pit
Faro Mine Remediation Project



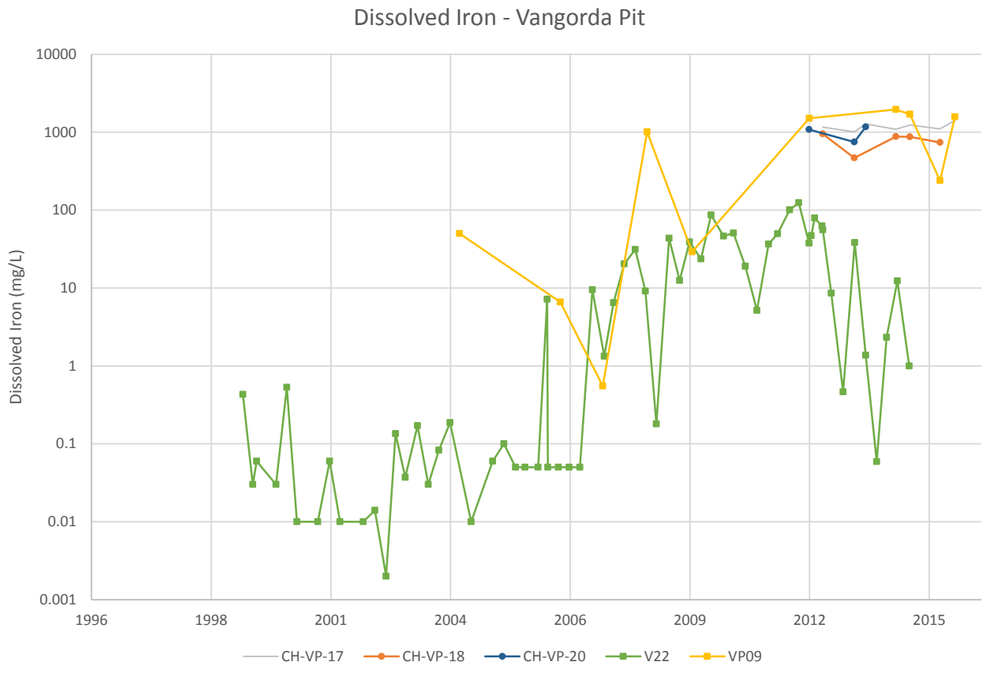


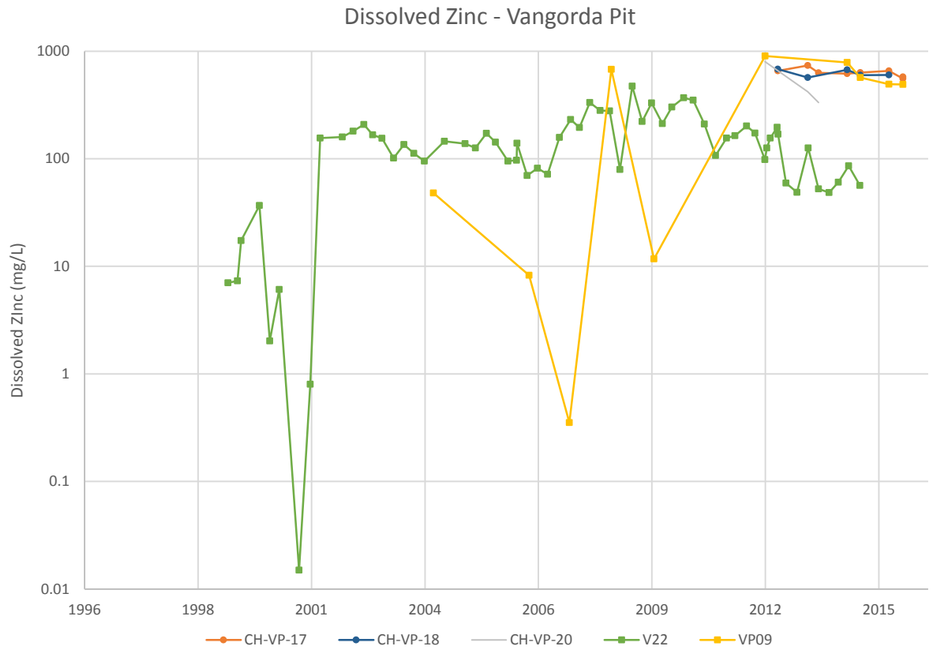




Notes:
mg/L = milligrams per litre

FIGURE 10-11 - *1 of 2*
Water Quality Time Series Trends - Vangorda Pit
Faro Mine Remediation Project

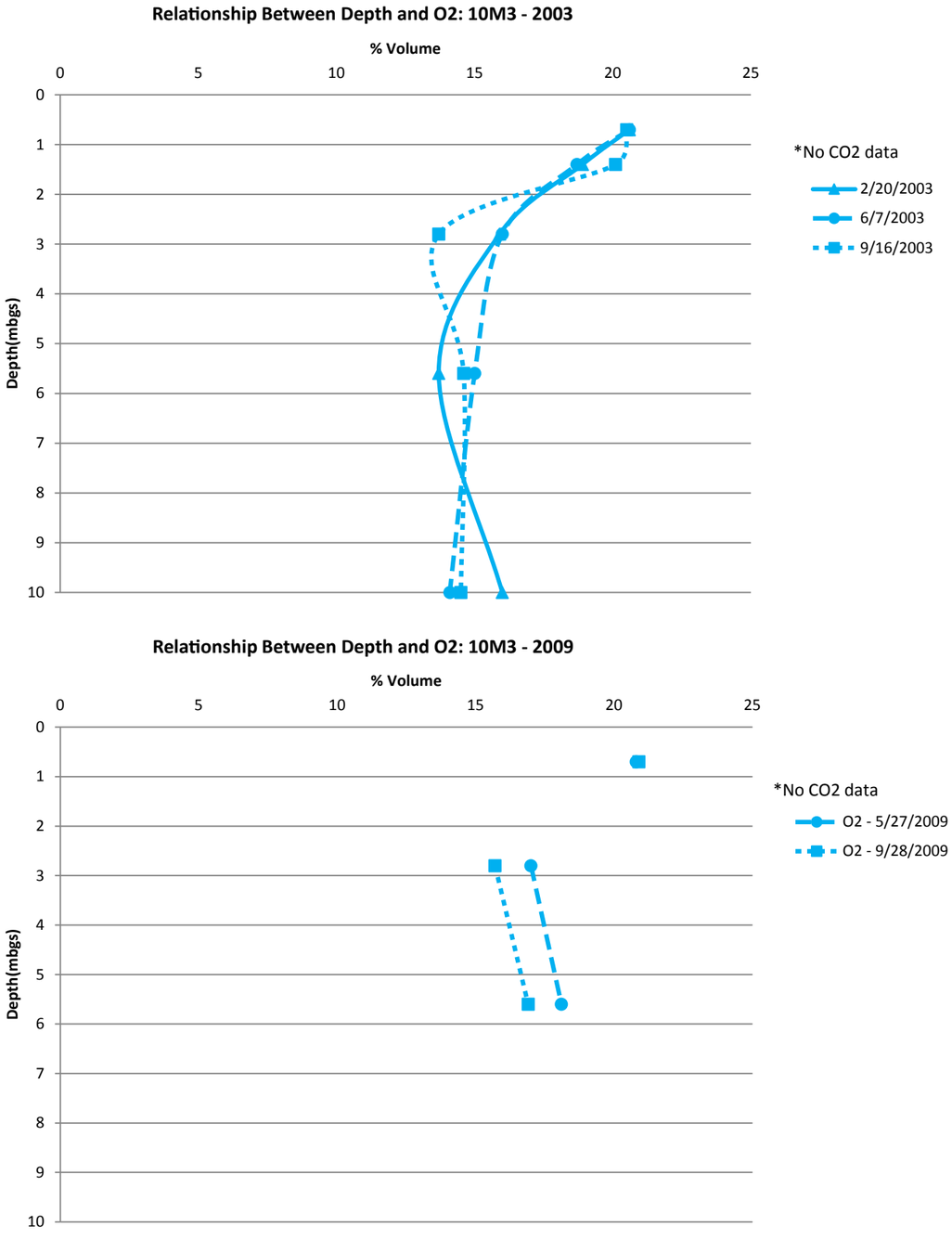


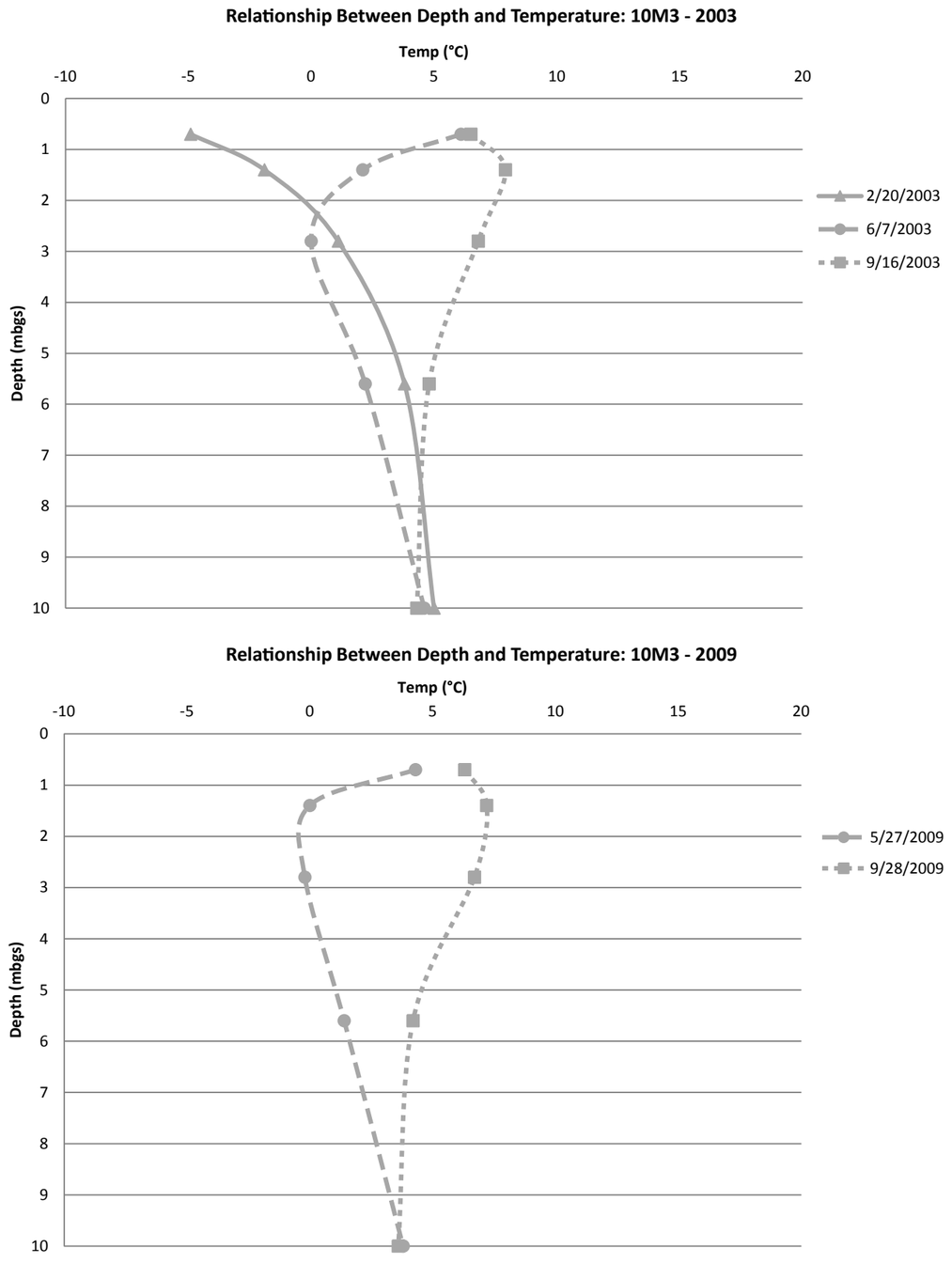


Notes:
mg/L = milligrams per litre

FIGURE 10-11 - *2 of 2*
Water Quality Time Series Trends - Vangorda Pit
Faro Mine Remediation Project

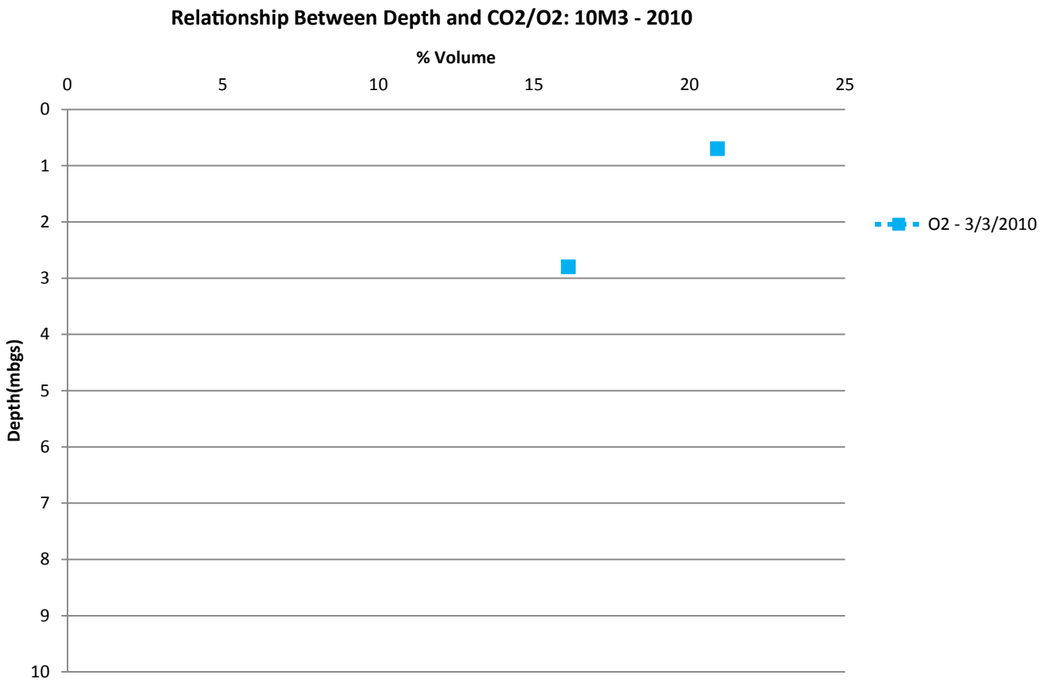
ch2m.

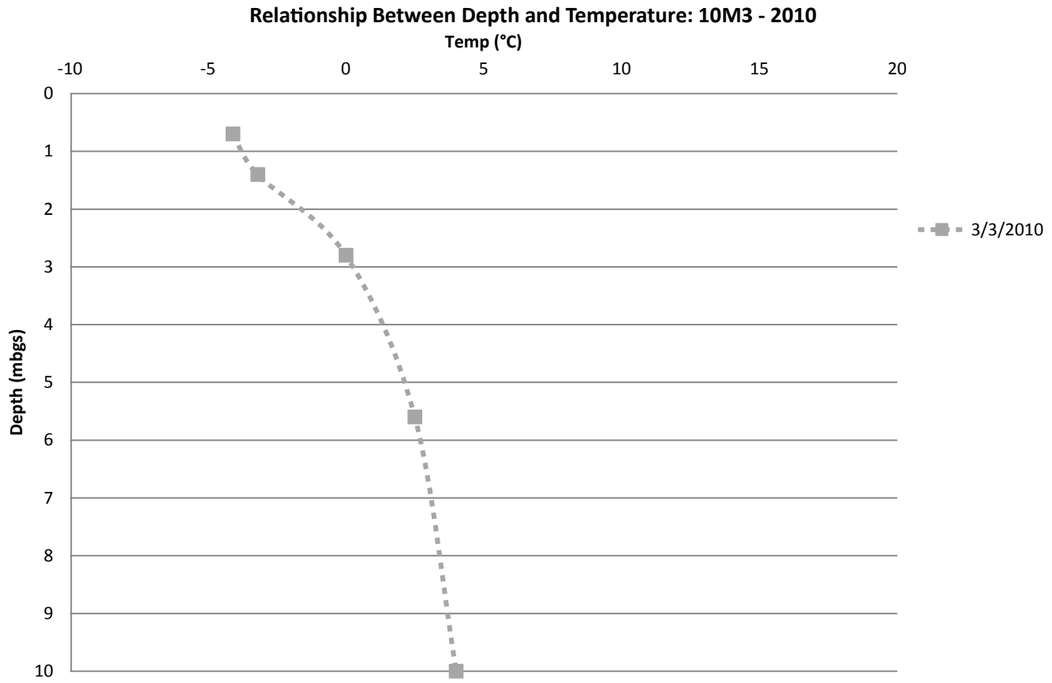


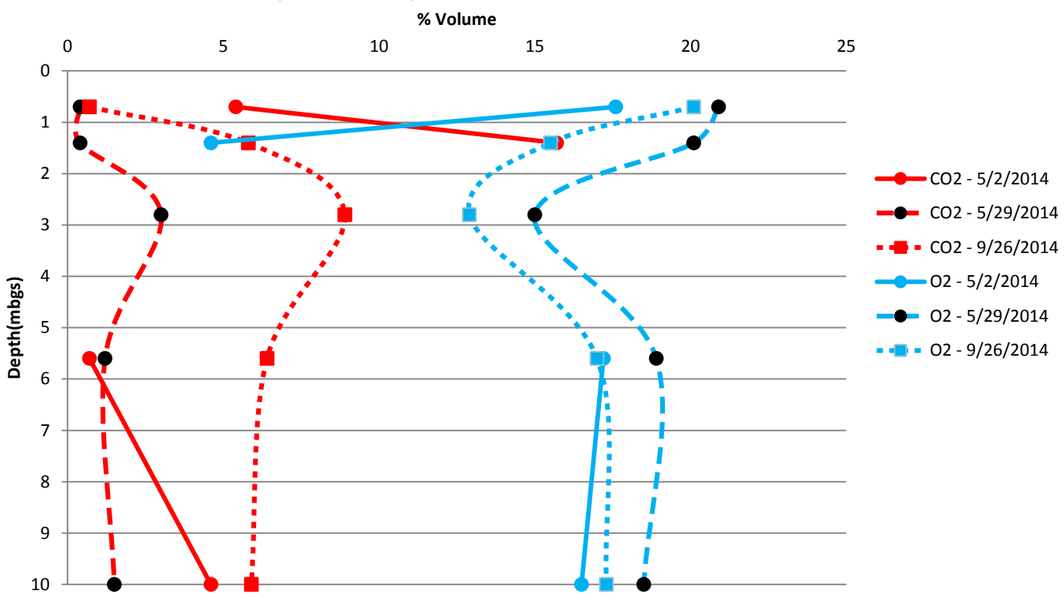


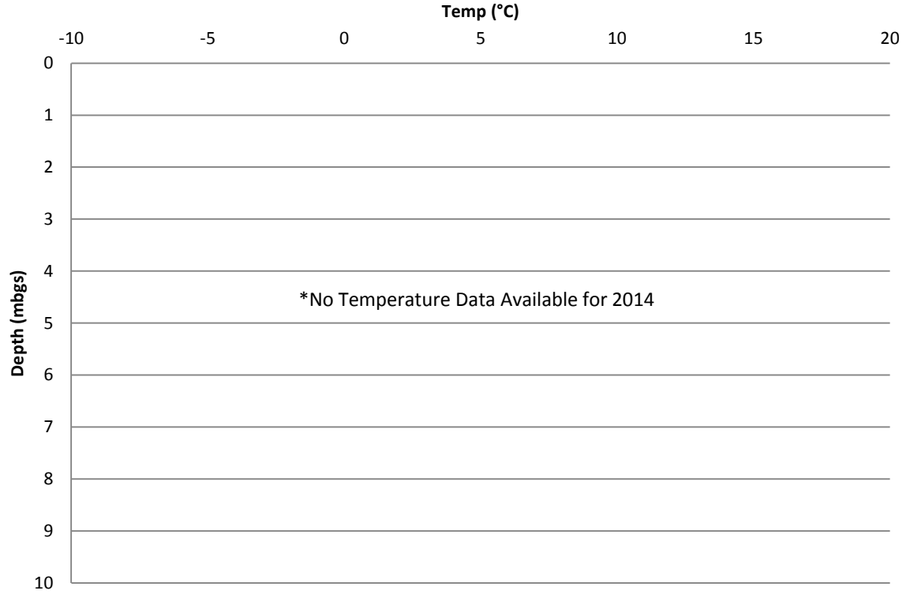
Note:
mbgs = metres below ground surface

FIGURE 10-12 - *1 of 3*
Pore Gas and Temperature Profiles - Grum Waste Rock Dump - 10M3
Faro Mine Remediation Project



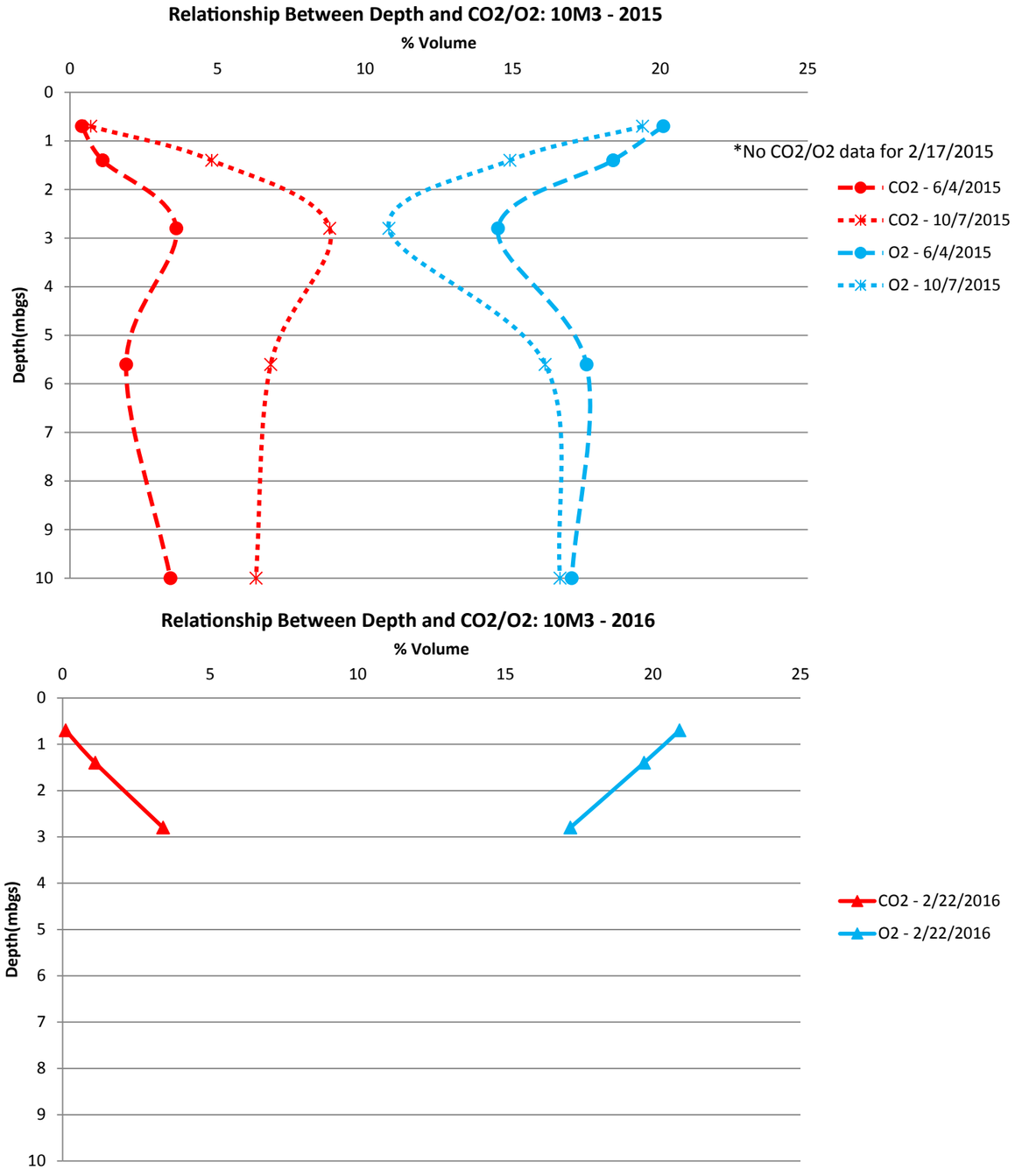


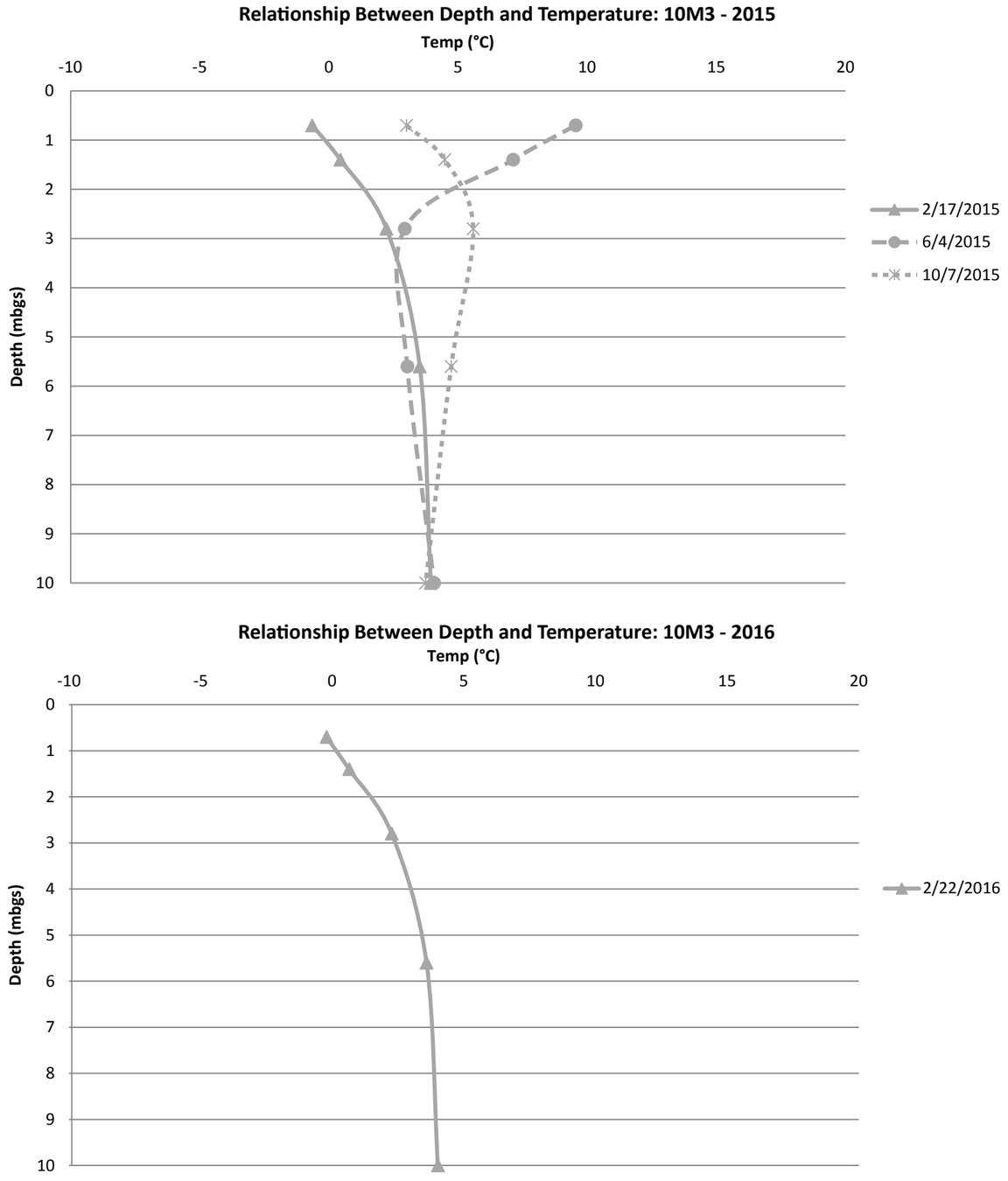




Note:
mbgs = metres below ground surface

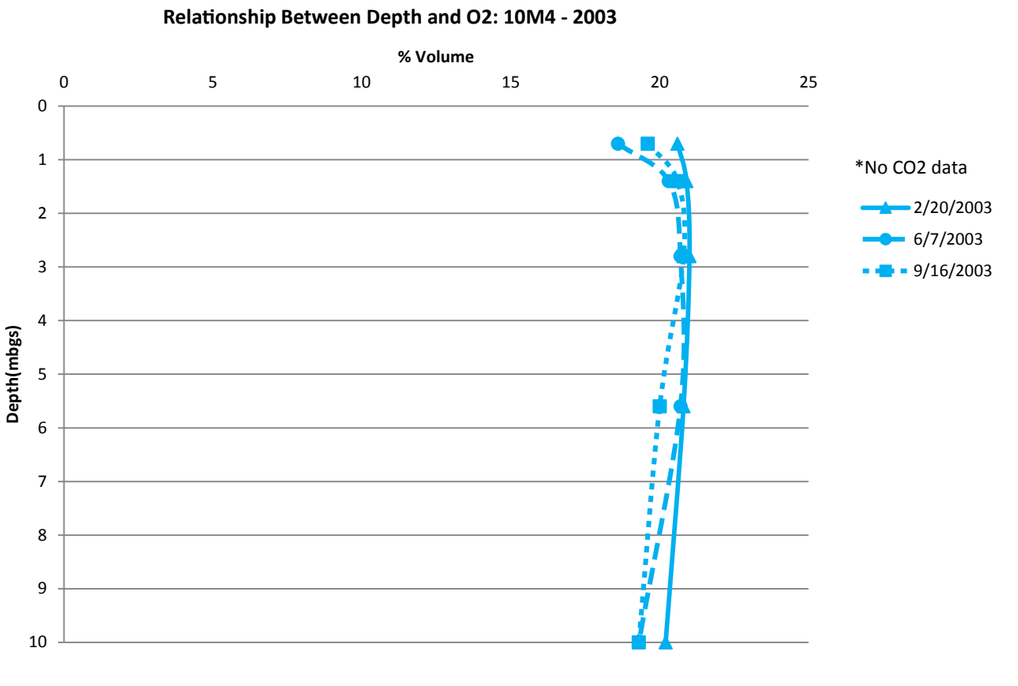
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Pore Gas and Temperature Profiles - Grum Waste Rock Dump - 10M3
Faro Mine Remediation Project

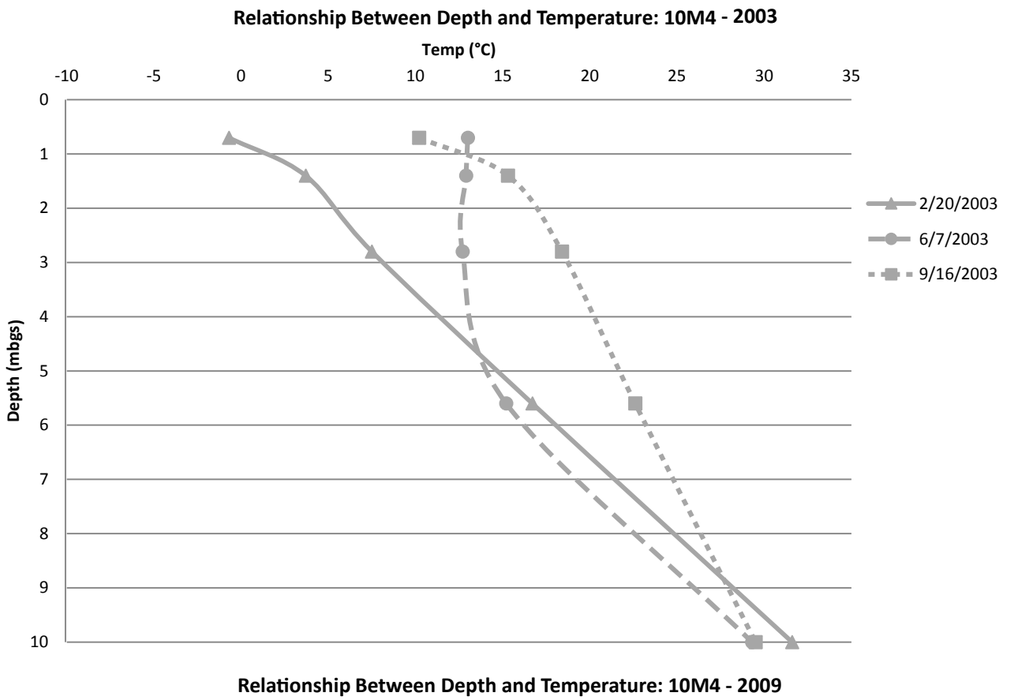


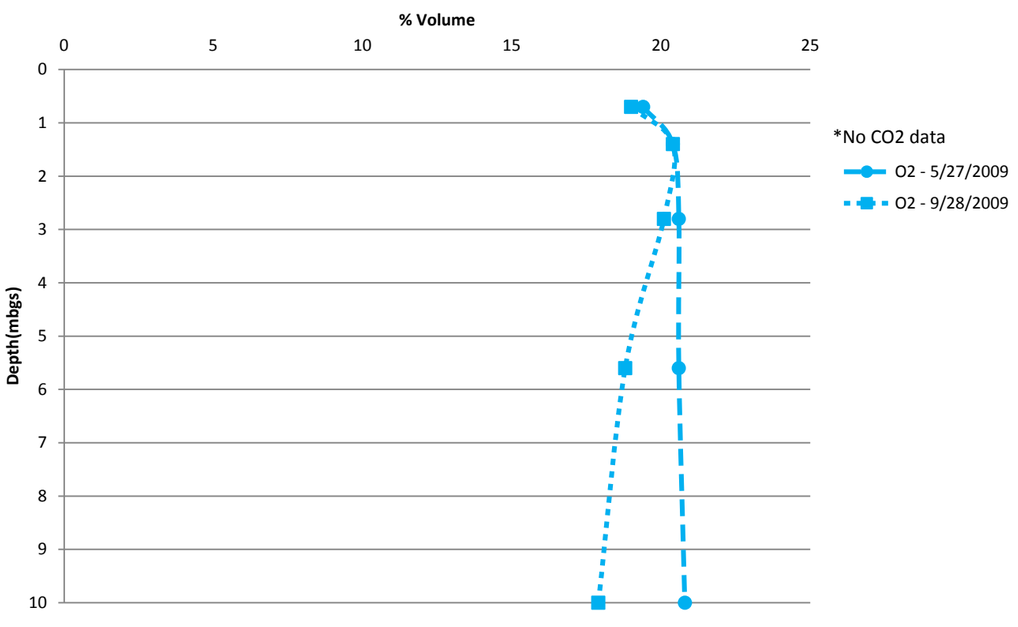


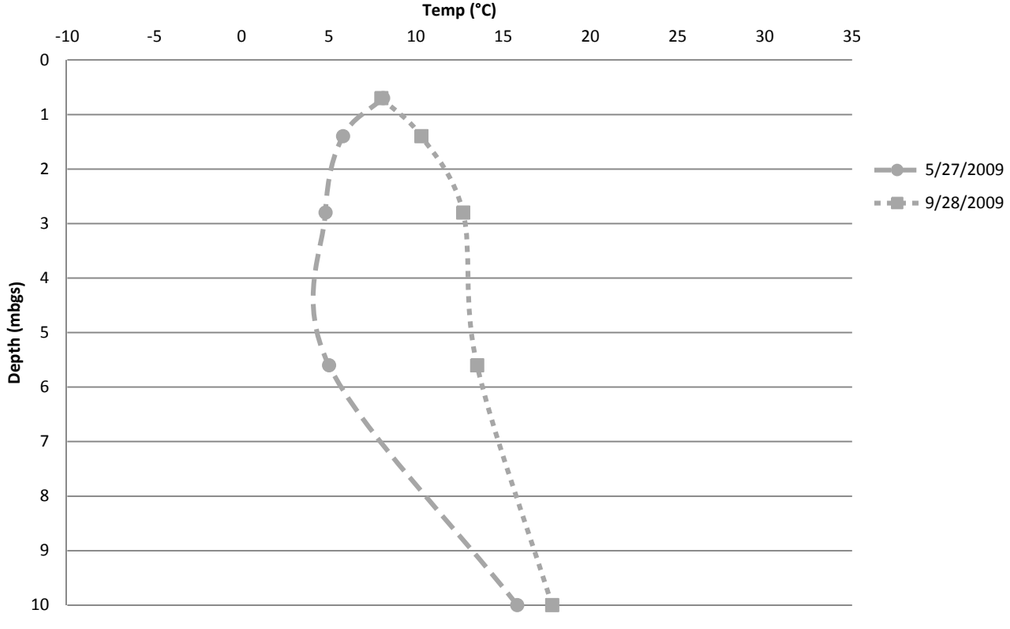
Note:
mbgs = metres below ground surface

FIGURE 10-12 - *3 of 3*
Pore Gas and Temperature Profiles - Grum Waste Rock Dump - 10M3
Faro Mine Remediation Project



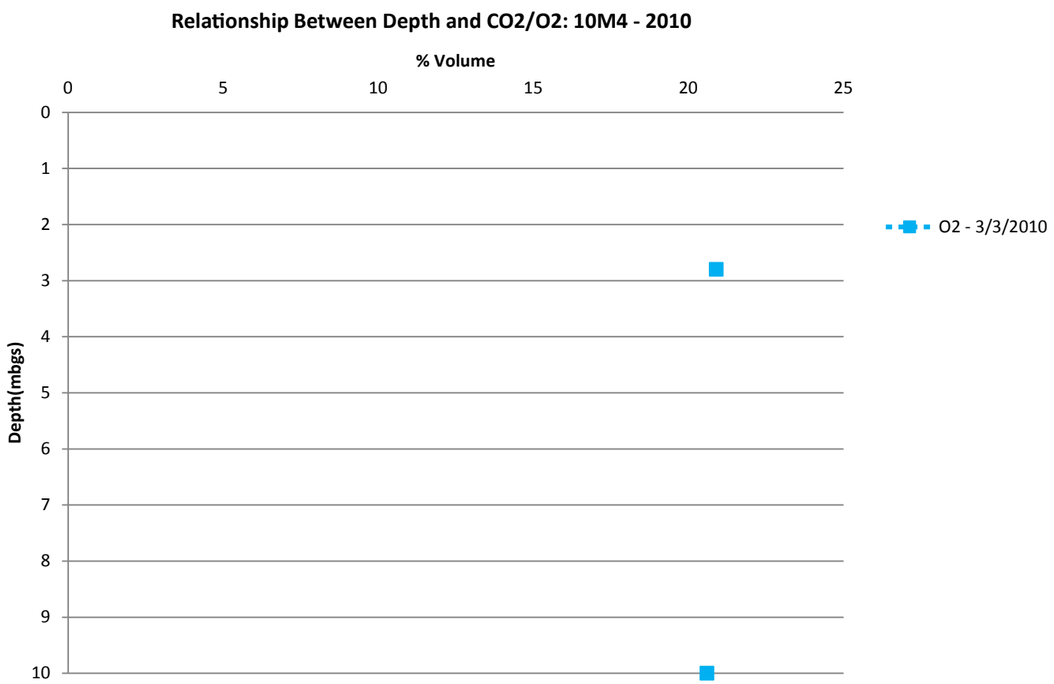


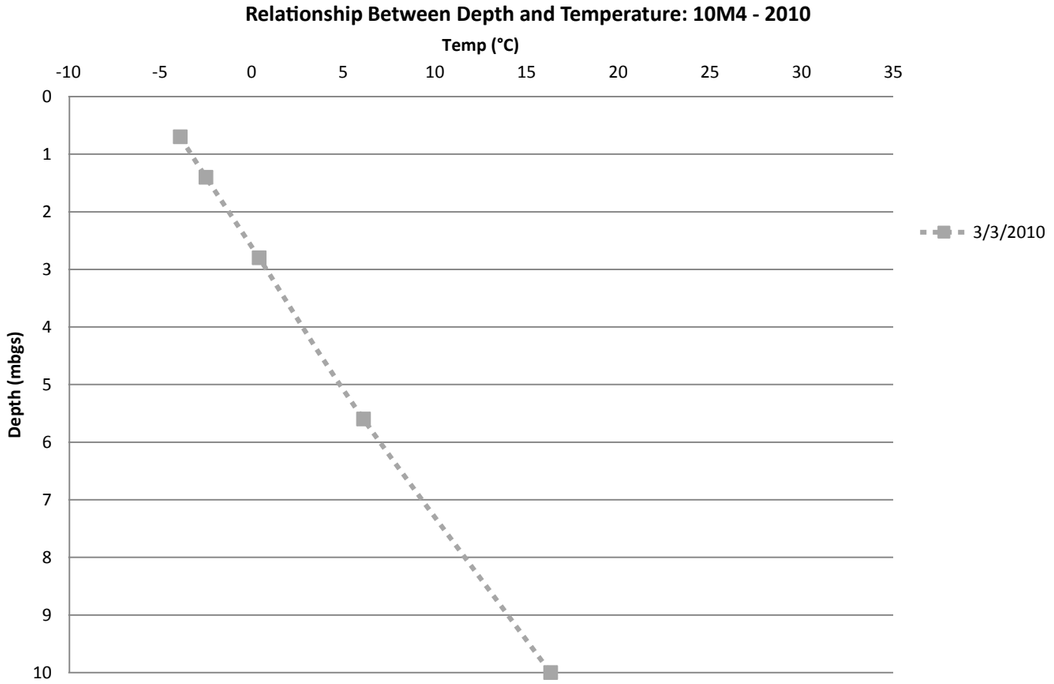


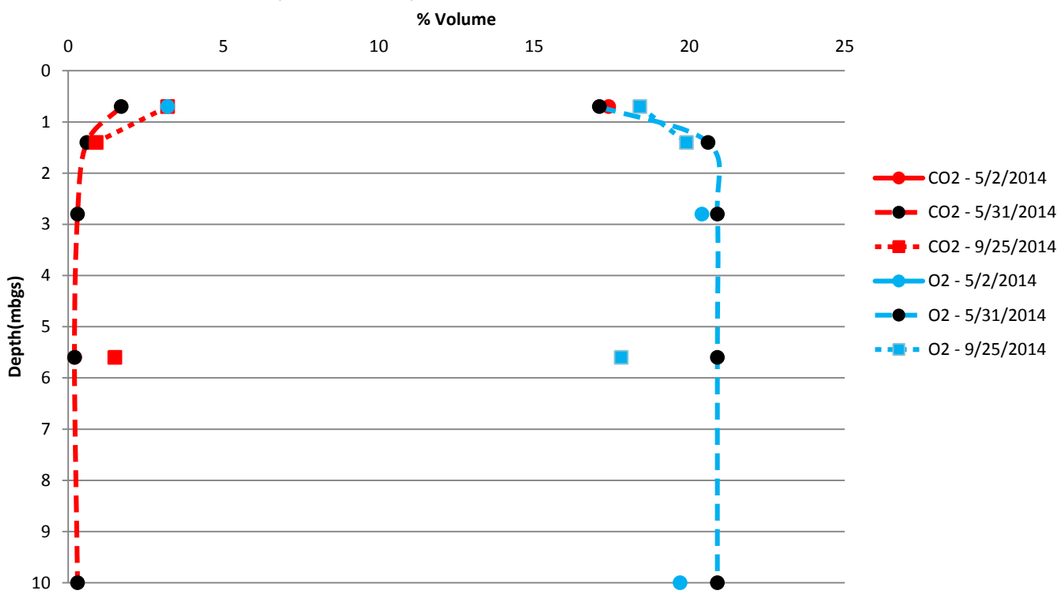


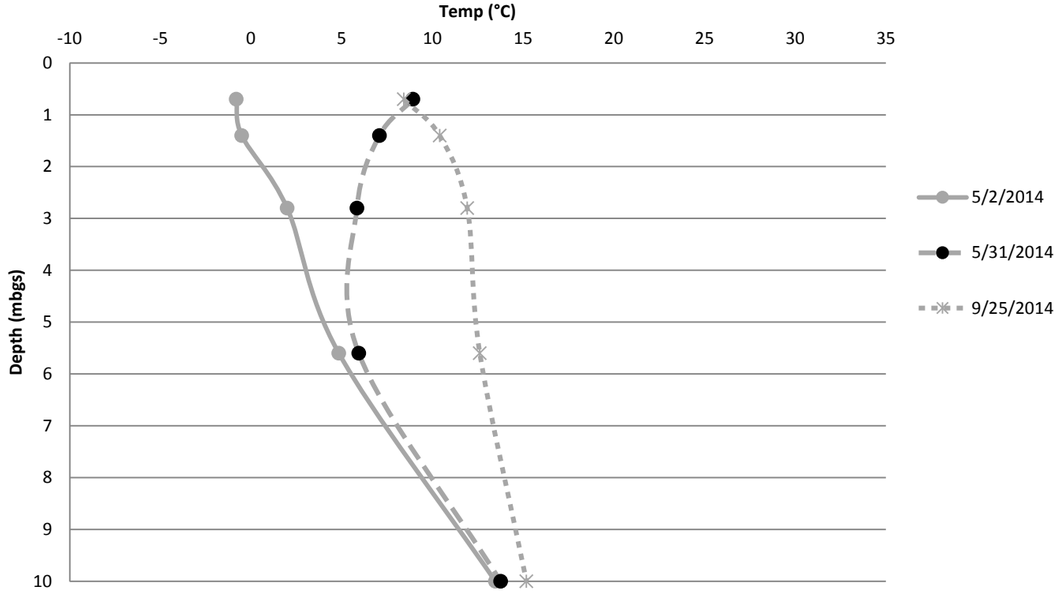
Note:
mbgs = metres below ground surface

FIGURE 10-13 - *1 of 3*
Pore Gas and Temperature Profiles - Vangorda Waste Rock Dump - 10M4
Faro Mine Remediation Project





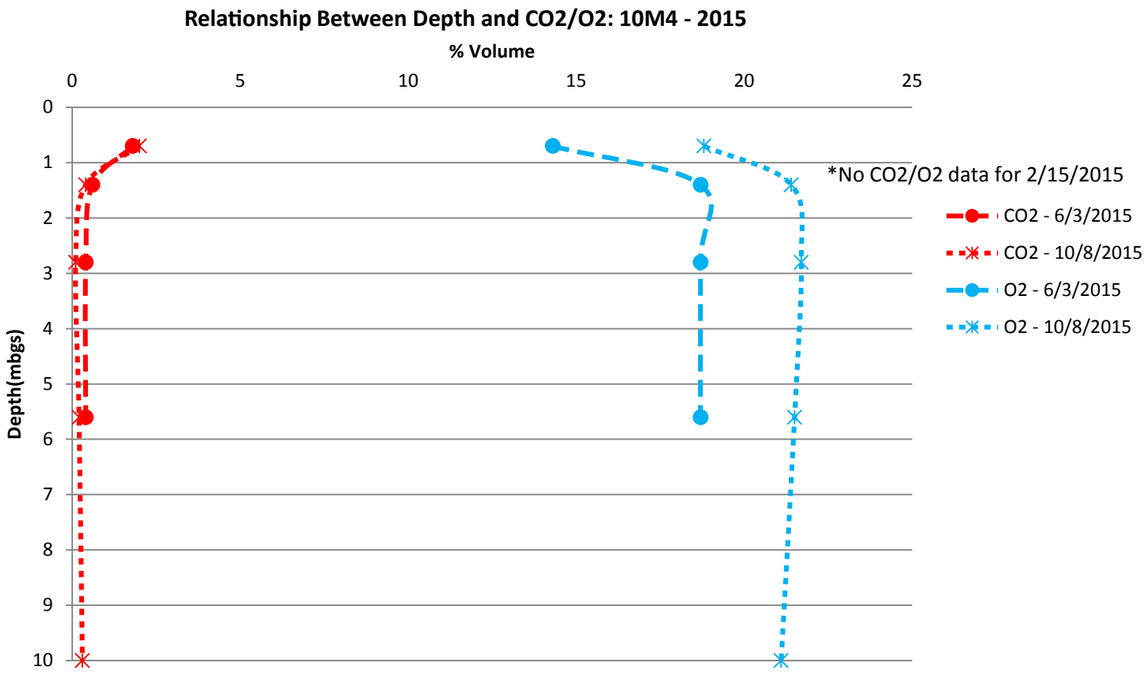


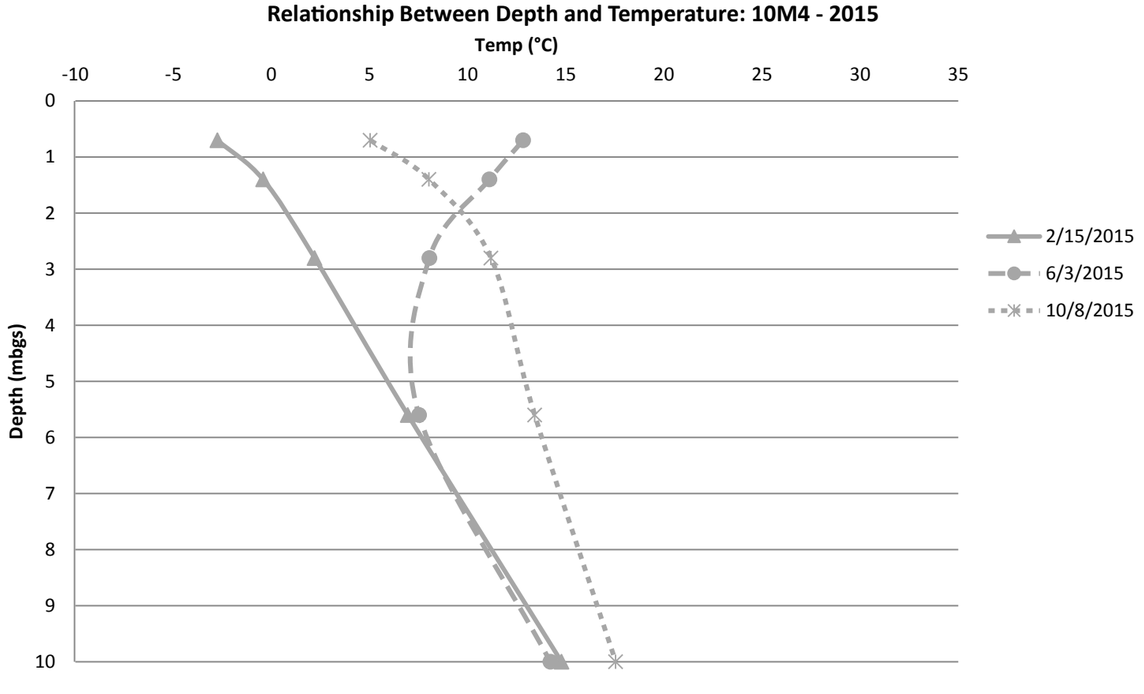


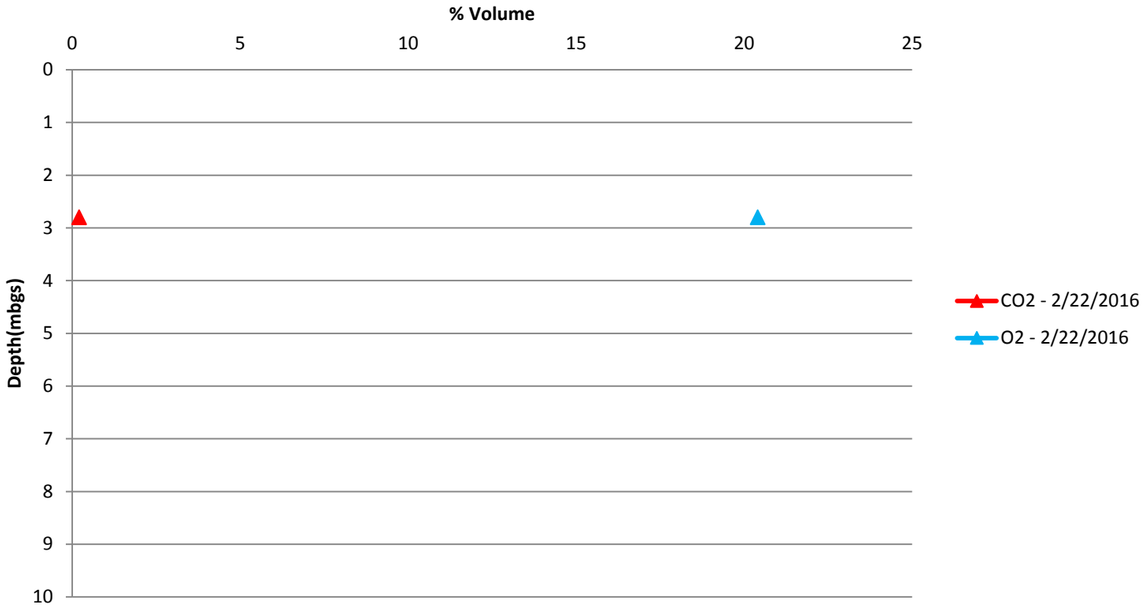
Note:
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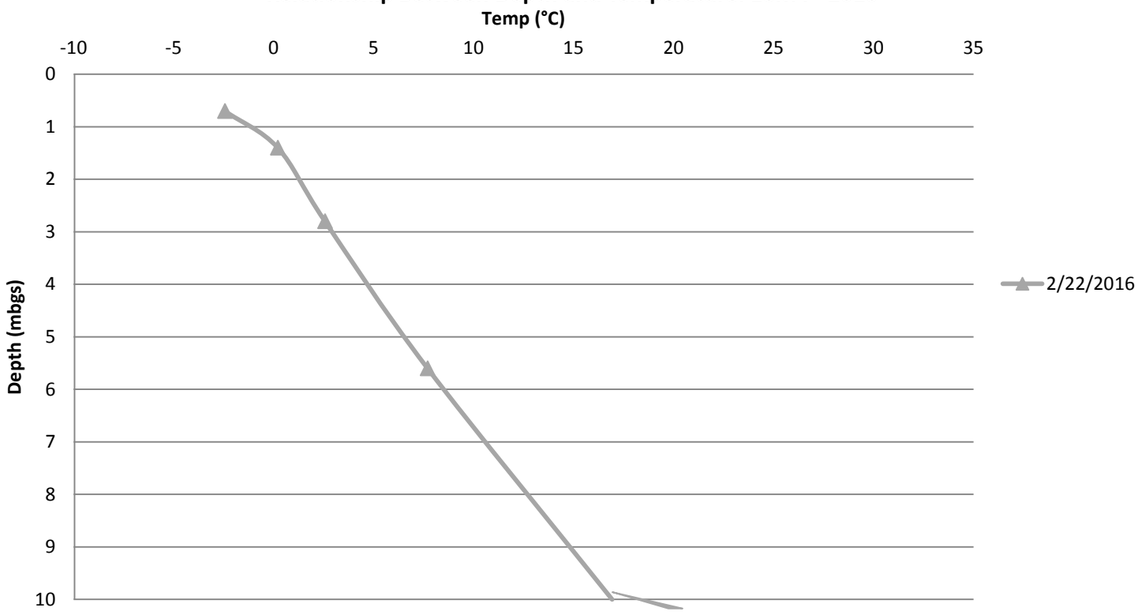
FIGURE 10-13 - *2 of 3*
Pore Gas and Temperature Profiles - Vangorda Waste Rock Dump - 10M4
Faro Mine Remediation Project

ch2m





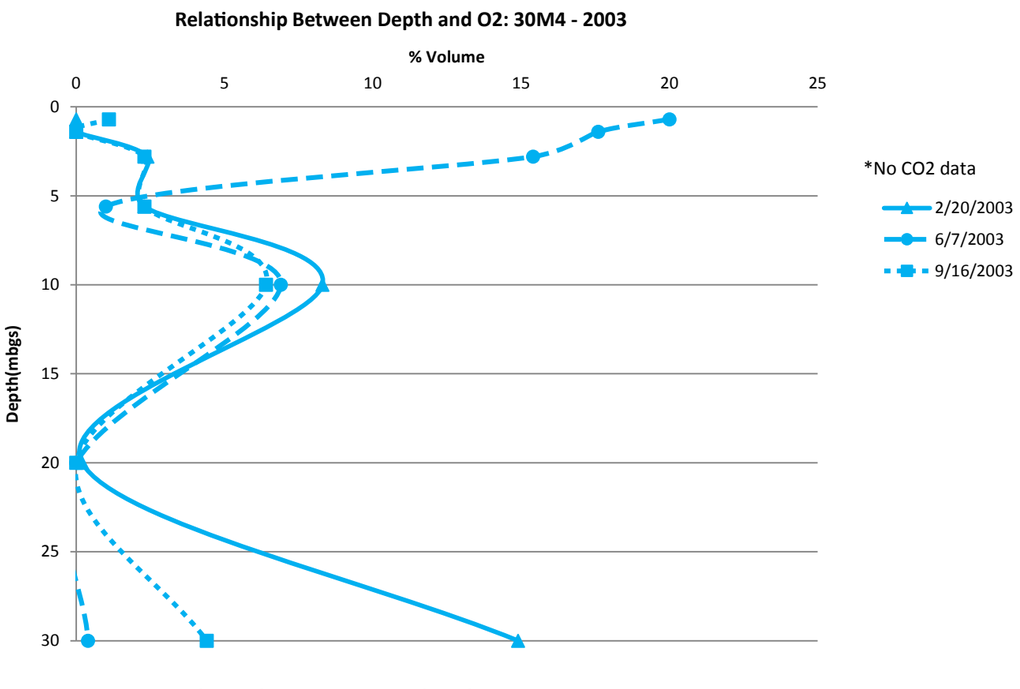


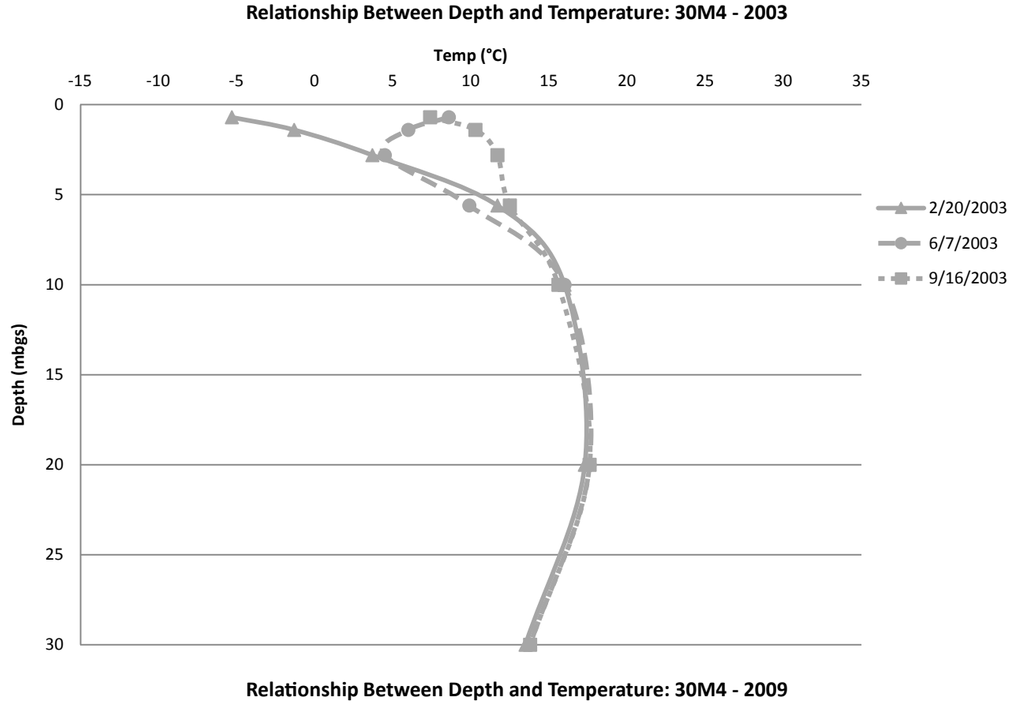


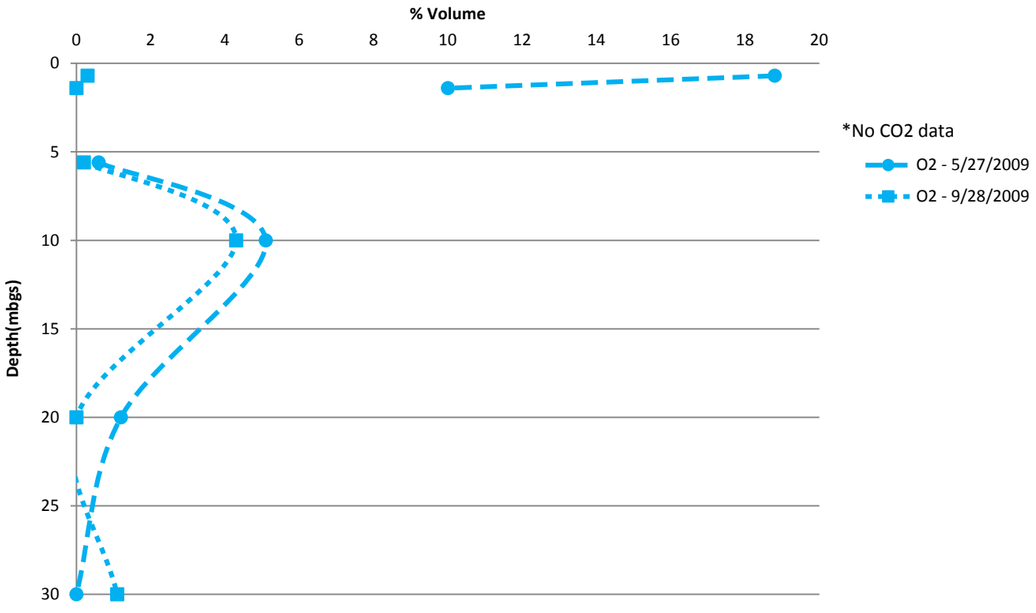
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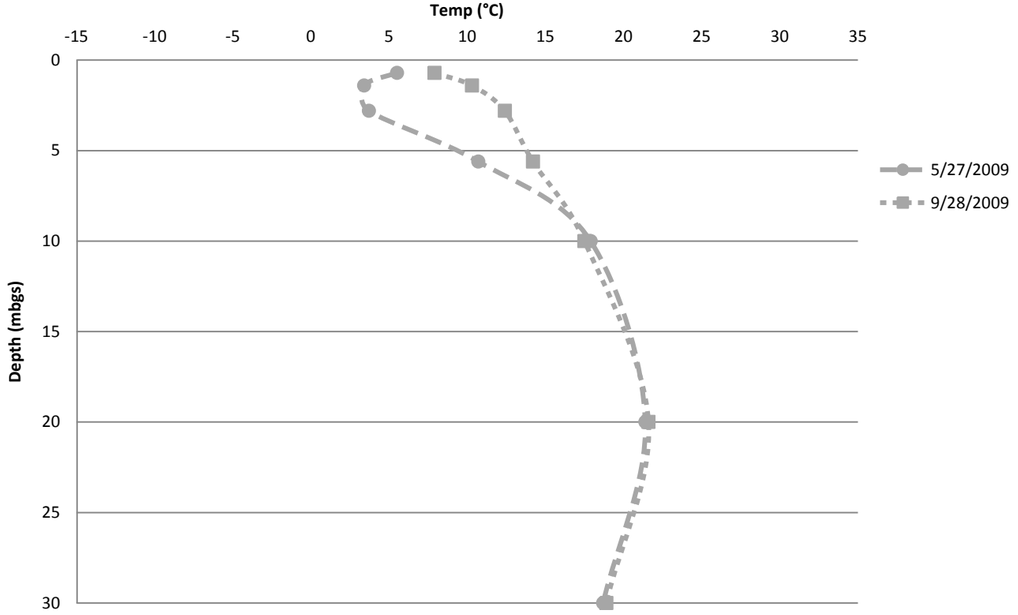
FIGURE 10-13 - *3 of 3*
Pore Gas and Temperature Profiles - Vangorda Waste Rock Dump - 10M4
Faro Mine Remediation Project

ch2m.



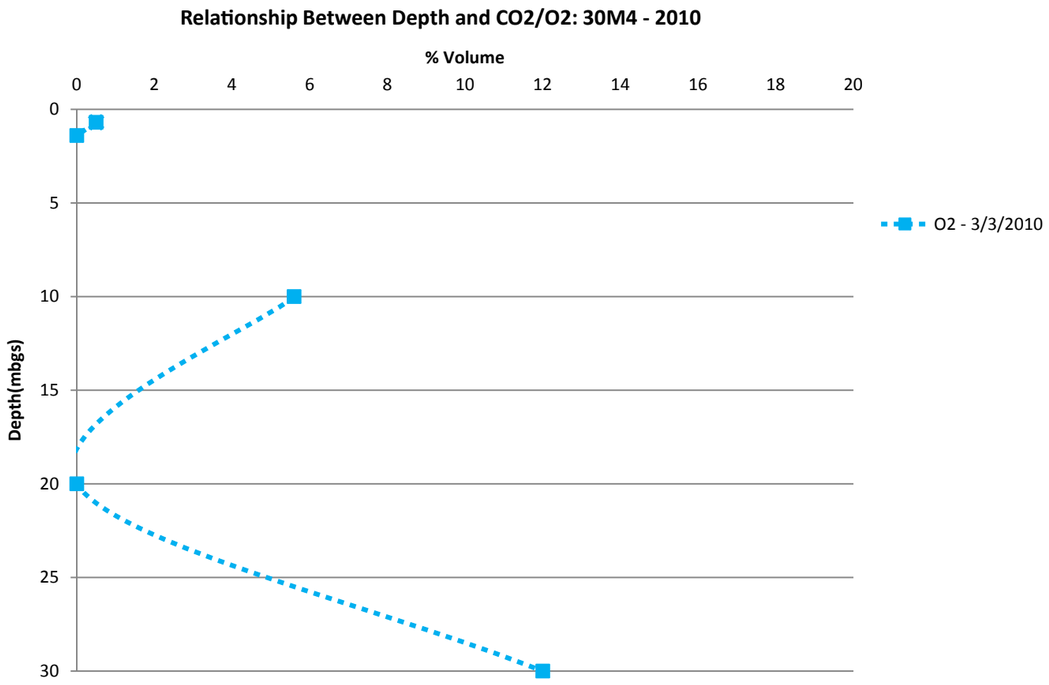


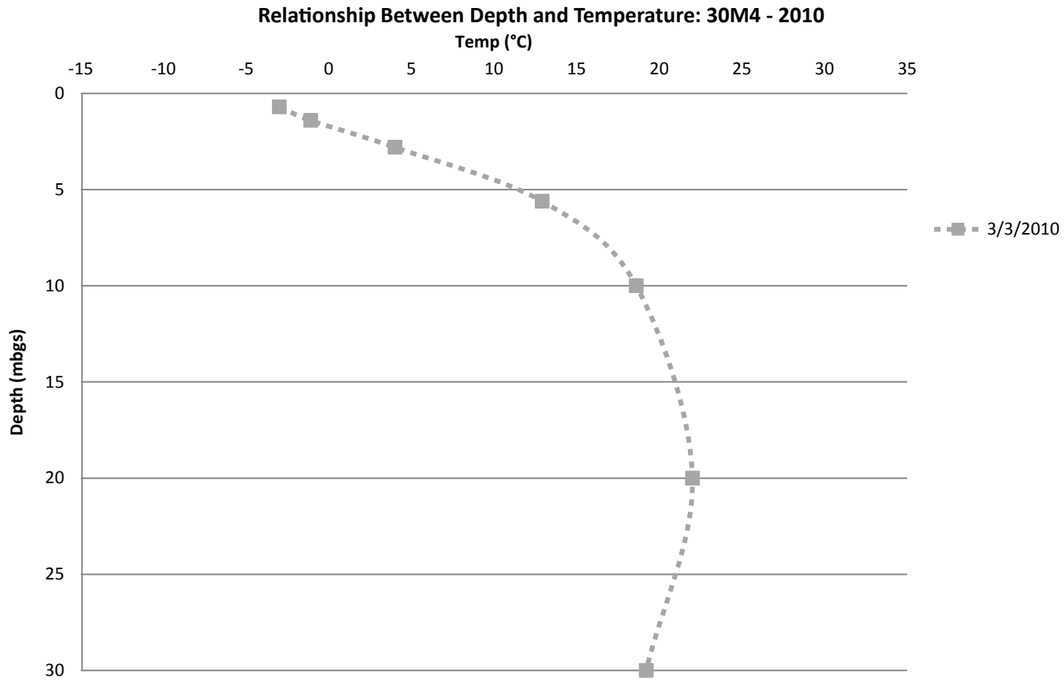


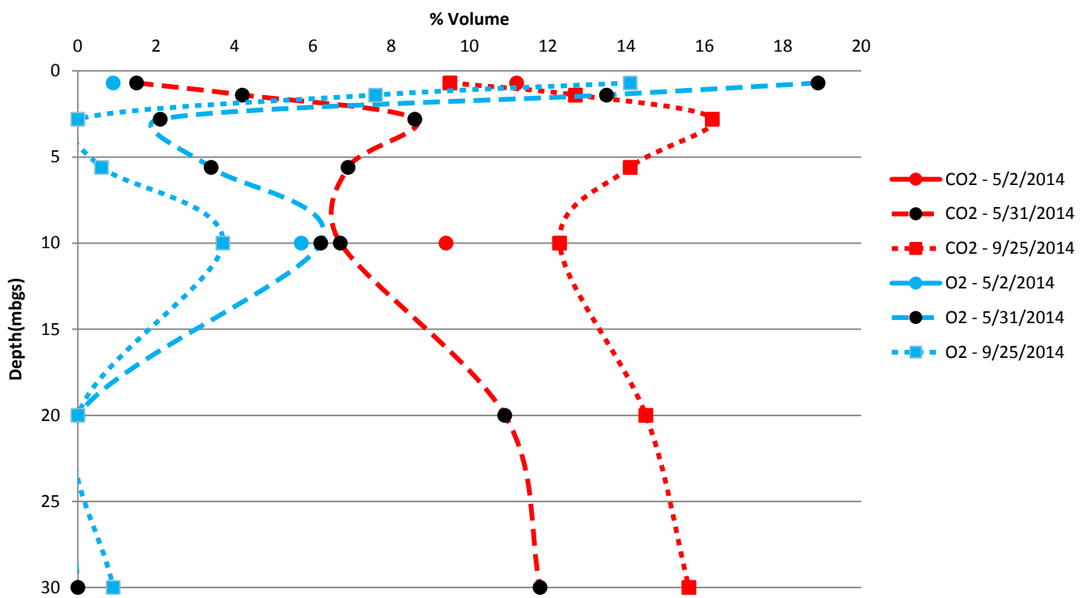


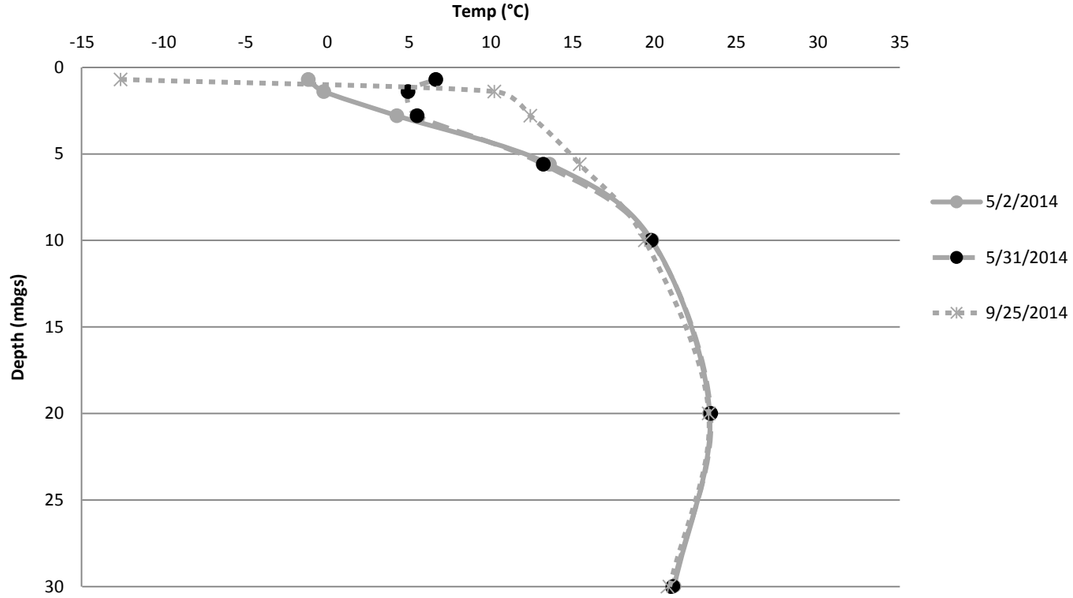
Note:
mbgs = metres below ground surface

FIGURE 10-14 - *1 of 3*
Pore Gas and Temperature Profiles - Vangorda Waste Rock Dump - 30M4
Faro Mine Remediation Project



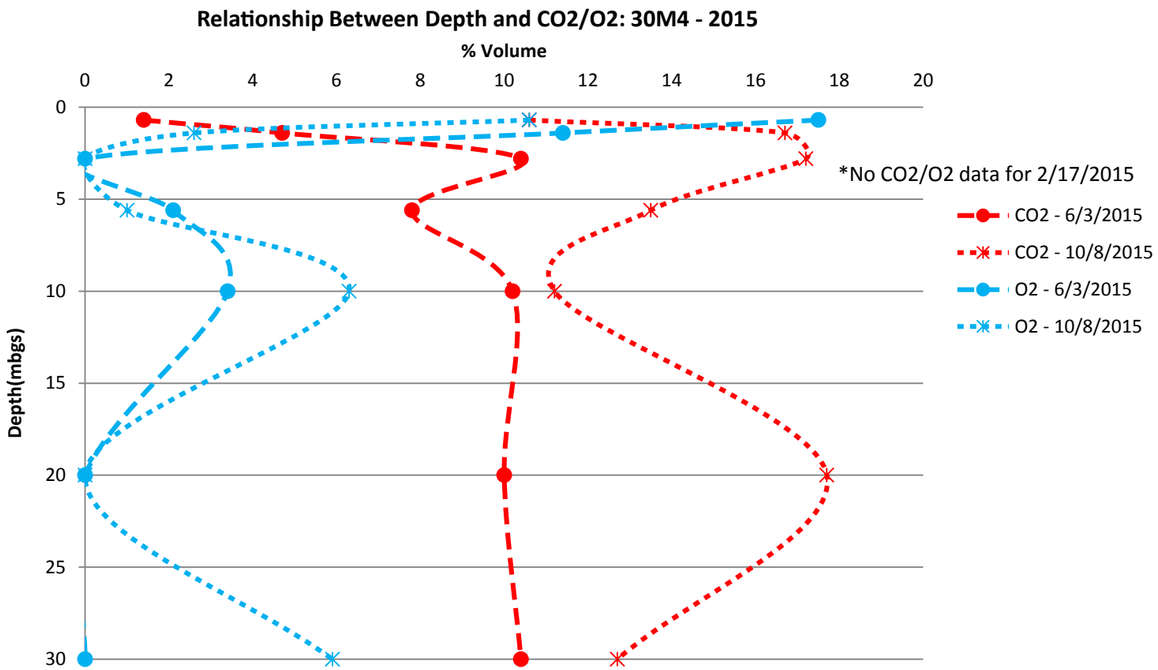


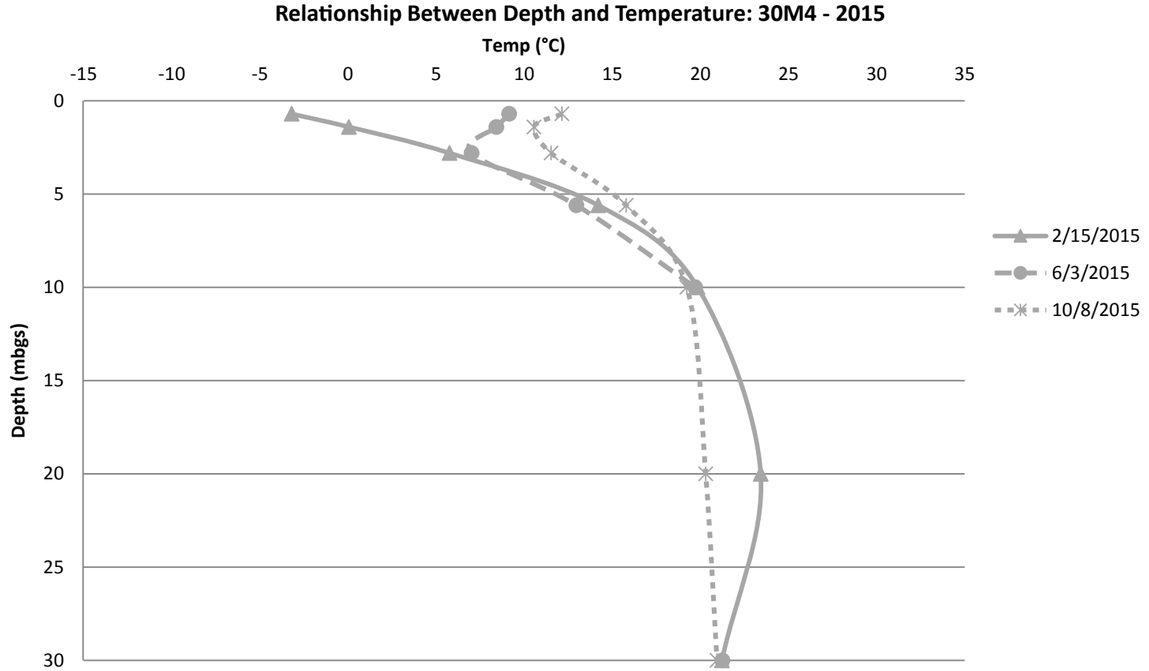




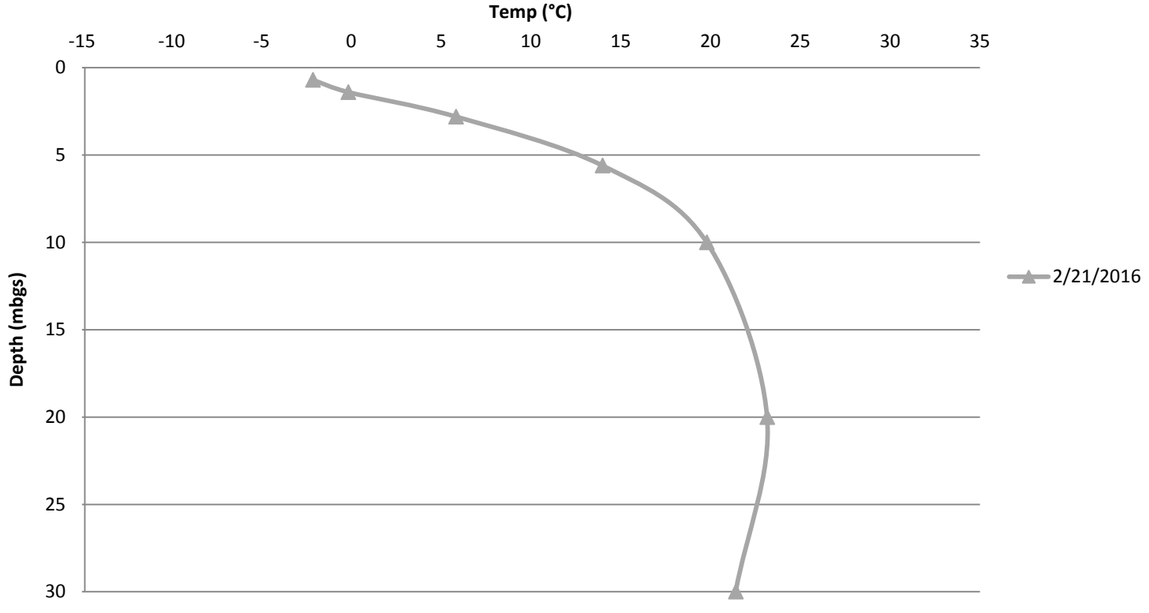
Note:
mbgs = metres below ground surface

FIGURE 10-14 - *2 of 3*
Pore Gas and Temperature Profiles - Vangorda Waste Rock Dump - 30M4
Faro Mine Remediation Project



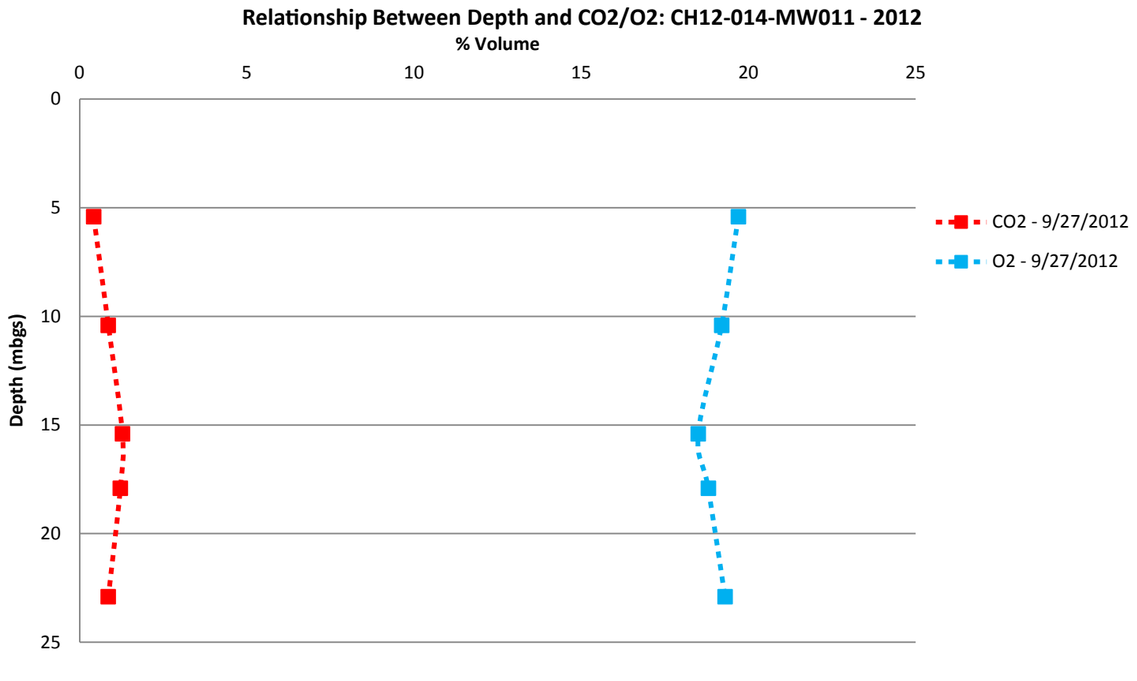


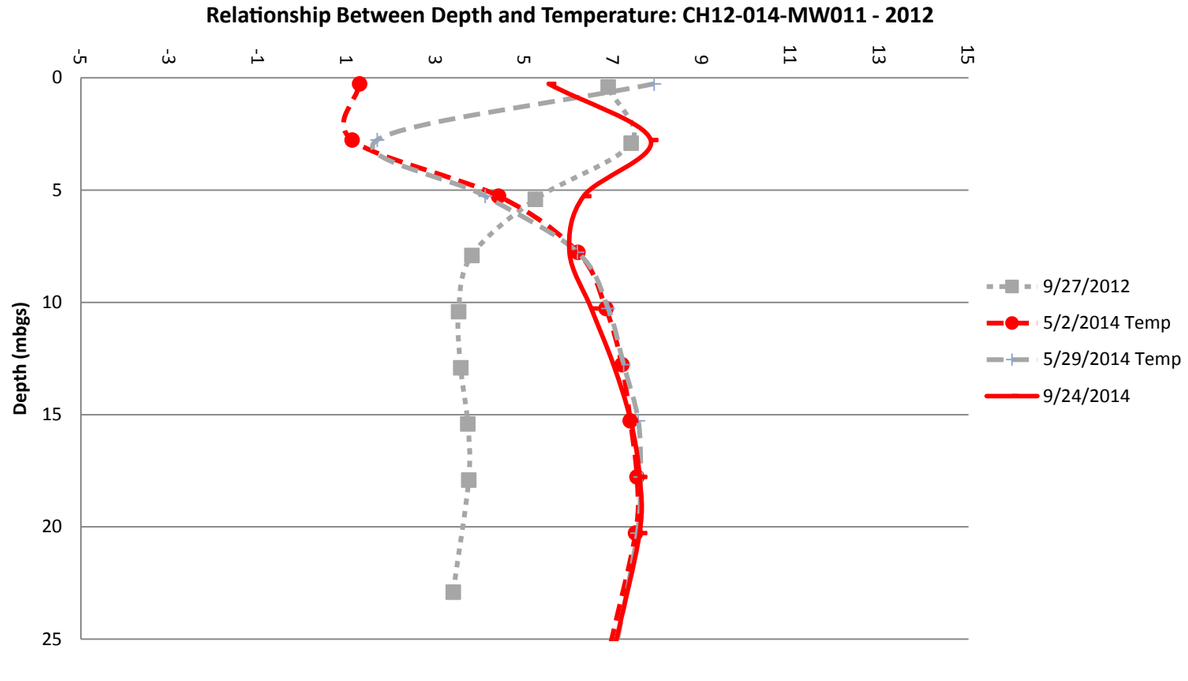


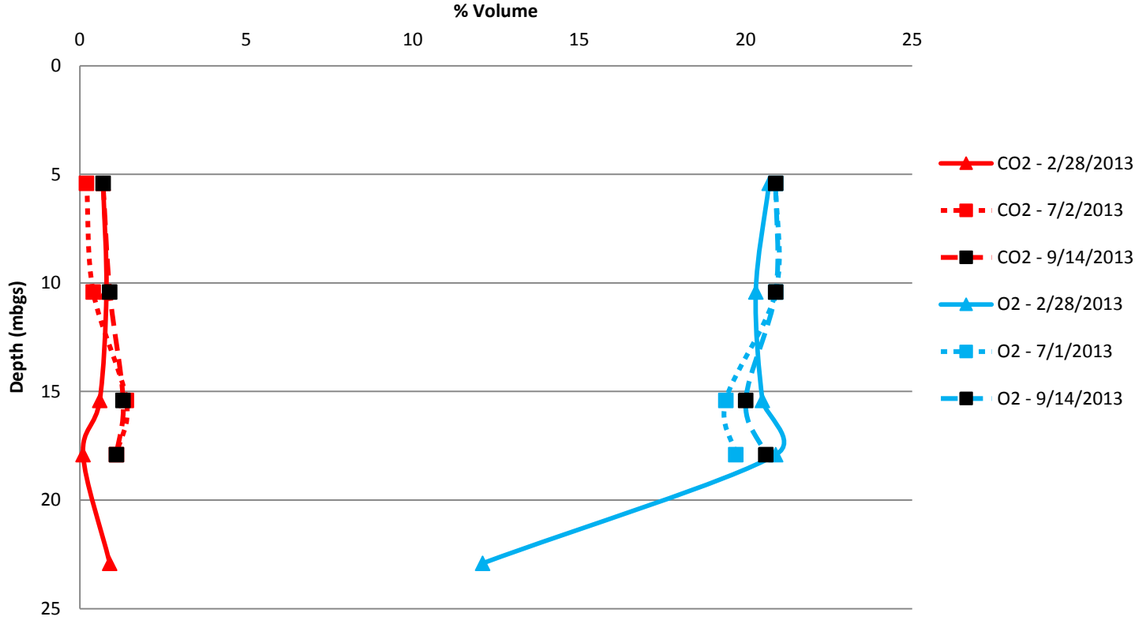


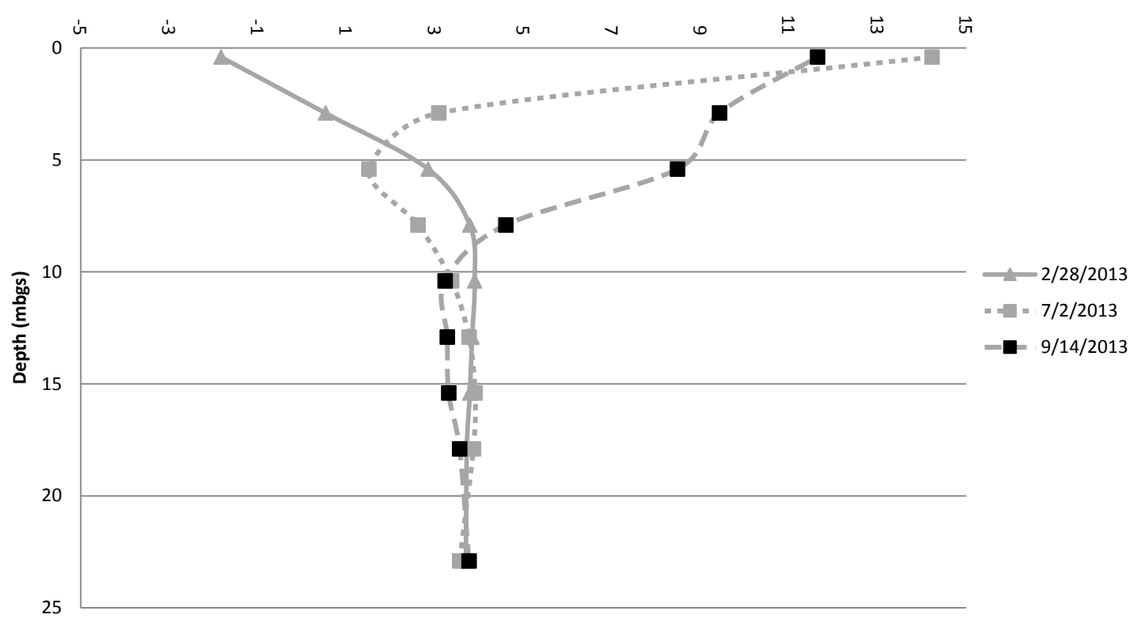
Note:
mbgs = metres below ground surface

FIGURE 10-14 - *3 of 3*
Pore Gas and Temperature Profiles - Vangorda Waste Rock Dump - 30M4
Faro Mine Remediation Project





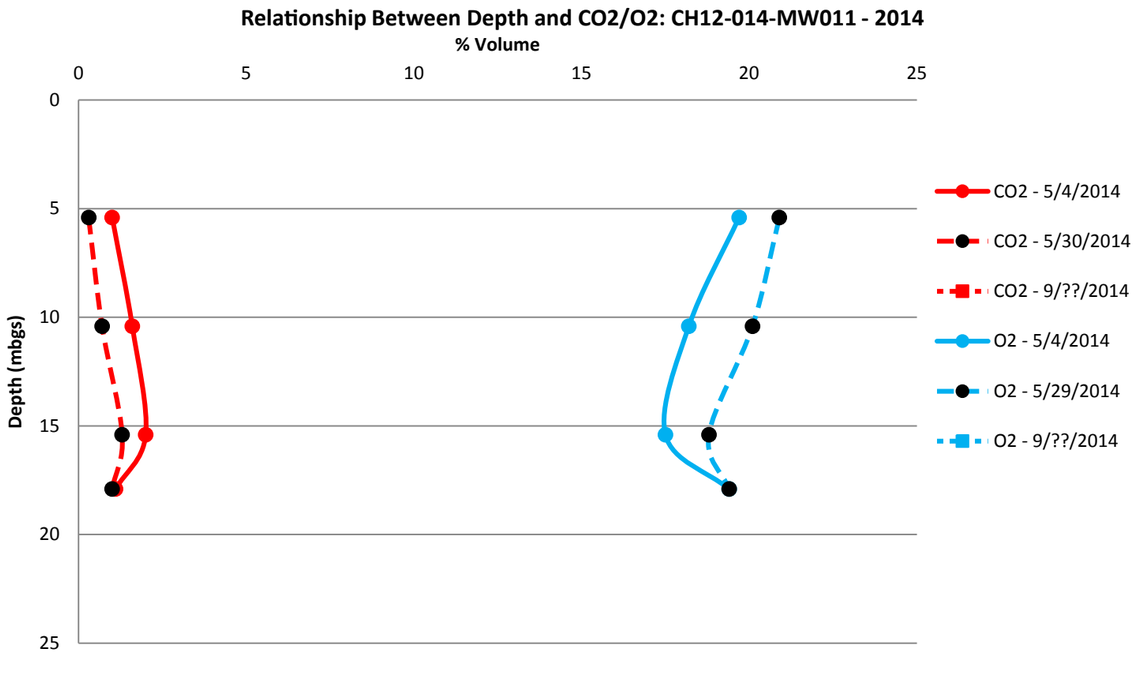


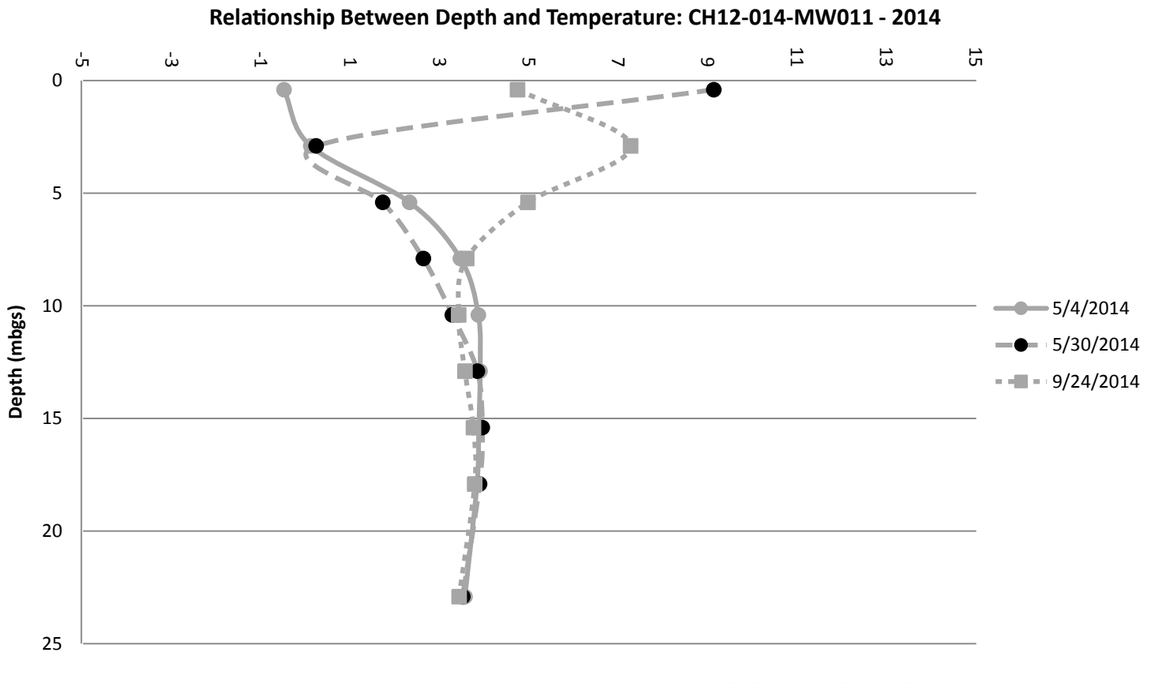


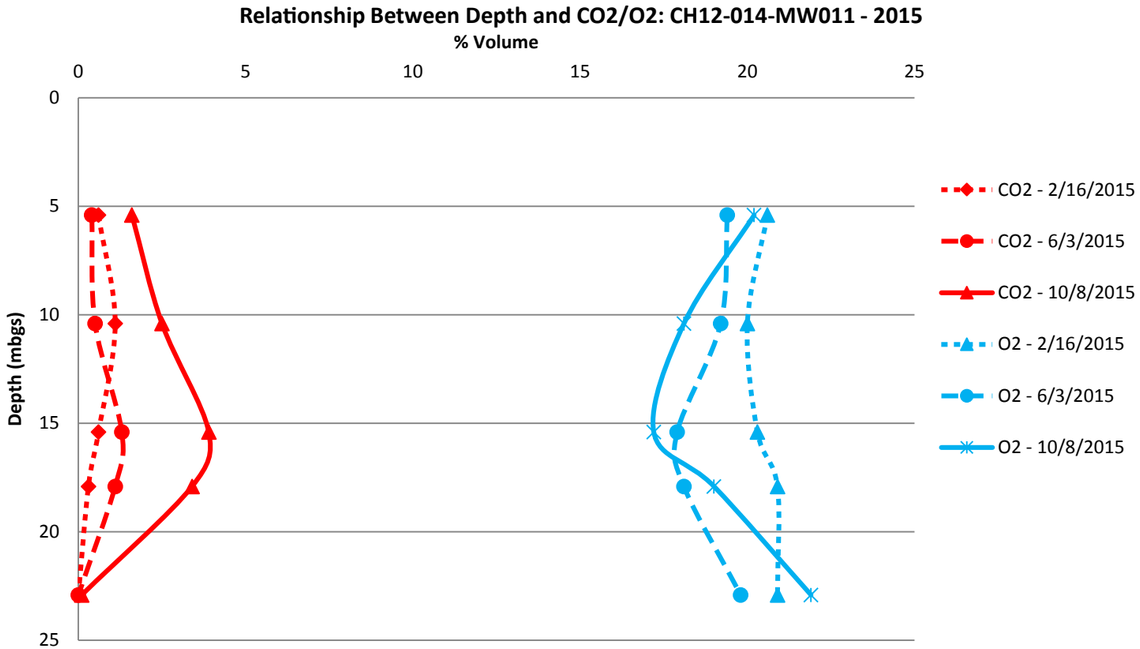
Note:
mbgs = metres below ground surface

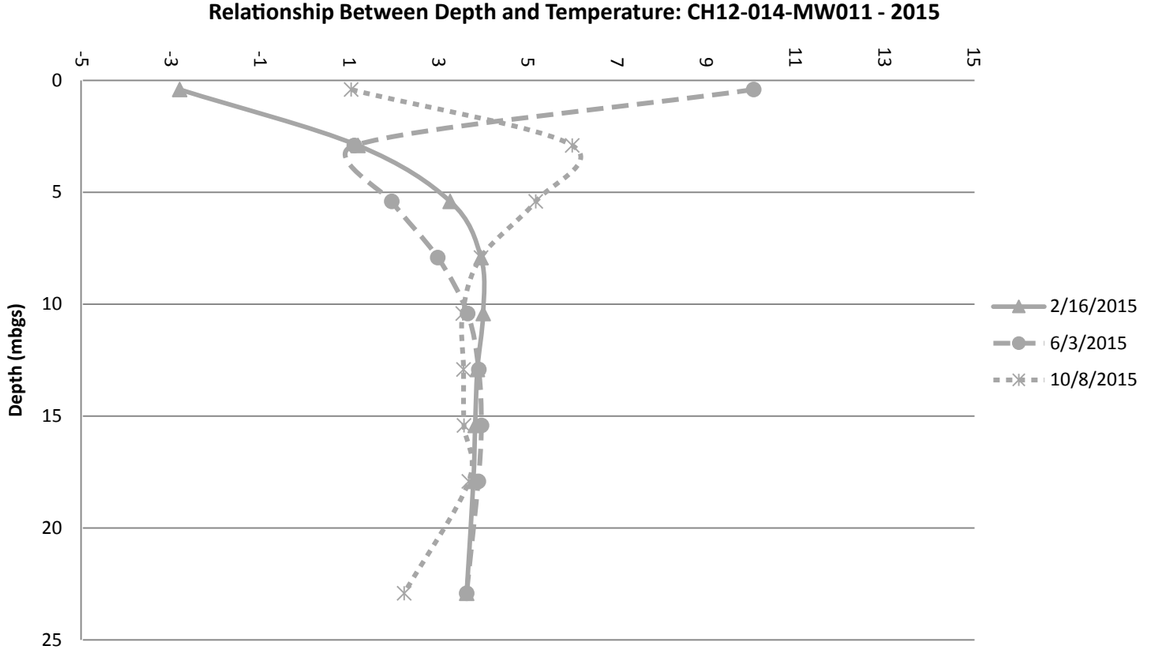
FIGURE 10-15 - *1 of 3*
Pore Gas and Temperature Profiles - Grum Waste Rock Dump - CH12-014-MW011
Faro Mine Remediation Project

ch2m





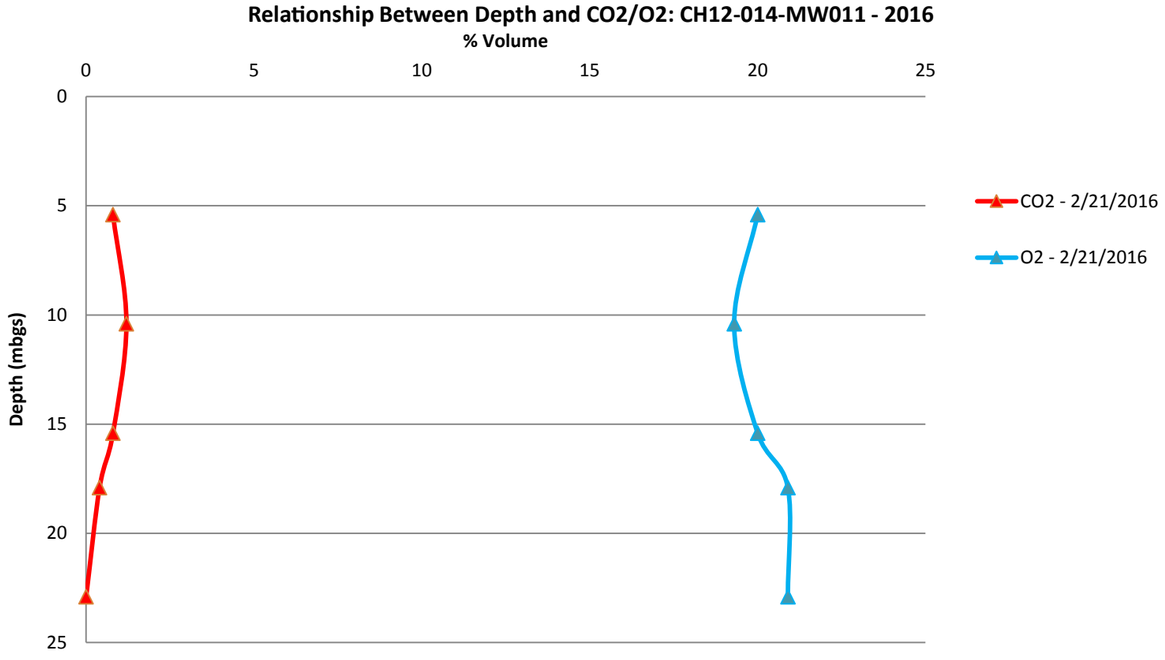


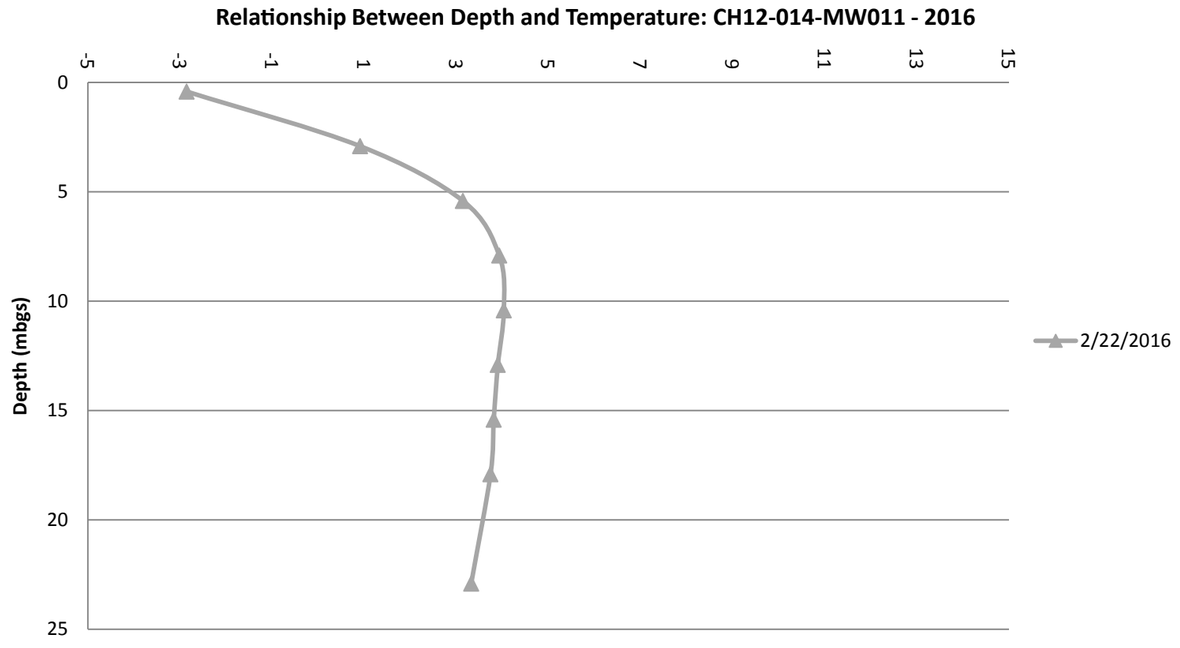


Note:
mbgs = metres below ground surface

FIGURE 10-15 - *2 of 3*
Pore Gas and Temperature Profiles - Grum Waste Rock Dump - CH12-014-MW011
Faro Mine Remediation Project

ch2m

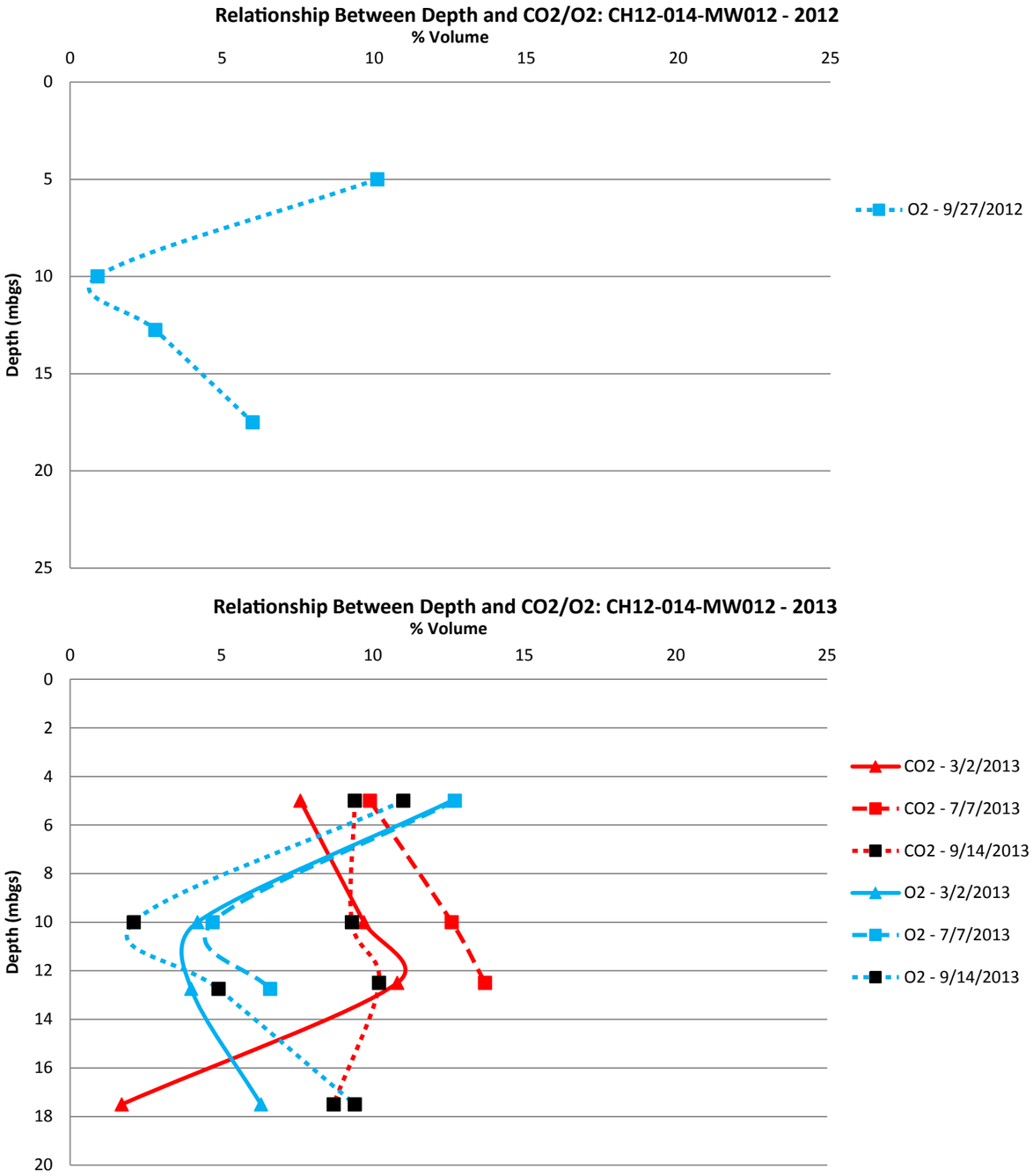


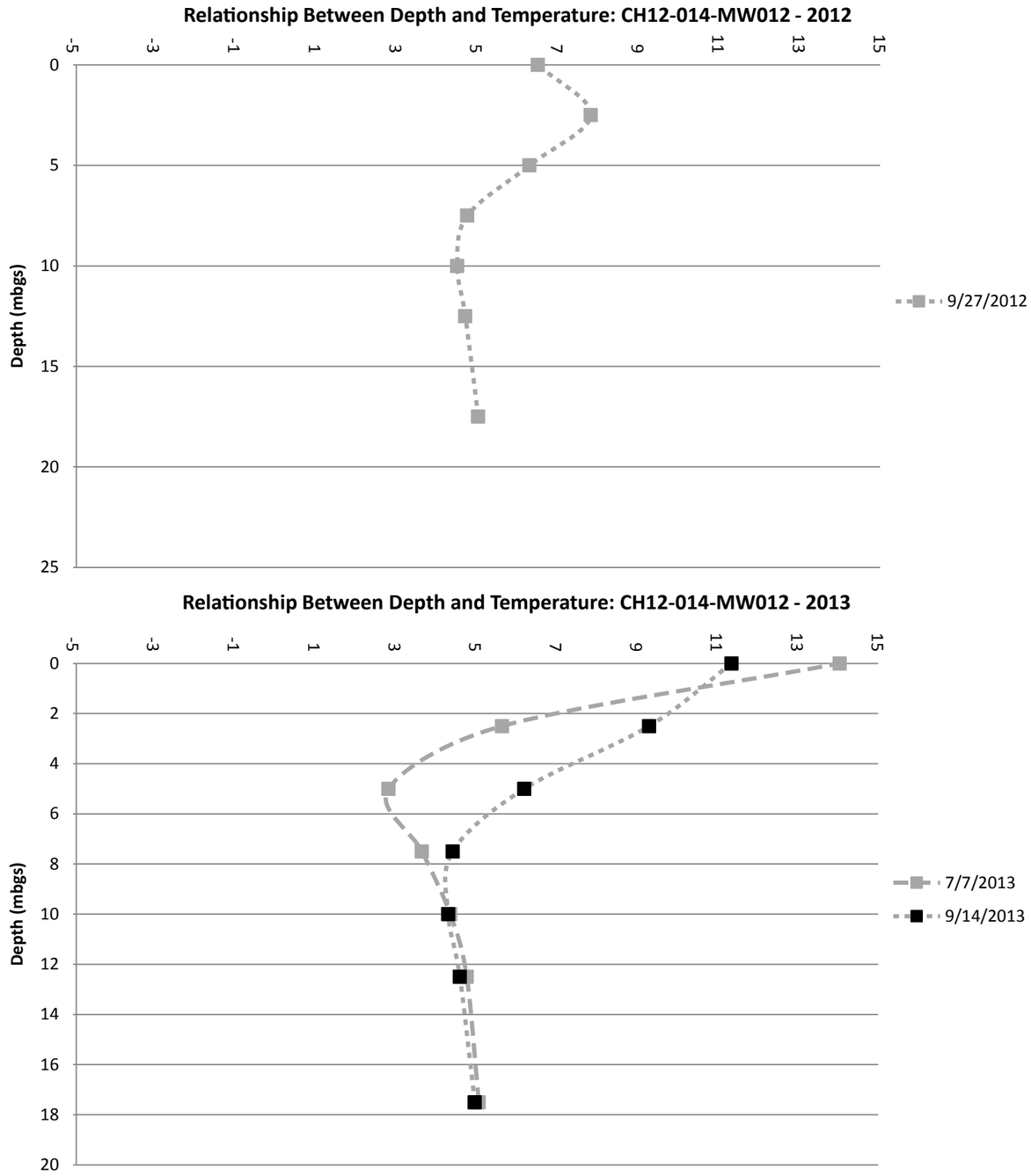


Note:
mbgs = metres below ground surface

FIGURE 10-15 - *3 of 3*
Pore Gas and Temperature Profiles -
Grum Waste Rock Dump - CH12-014-MW011
Faro Mine Remediation Project

ch2m

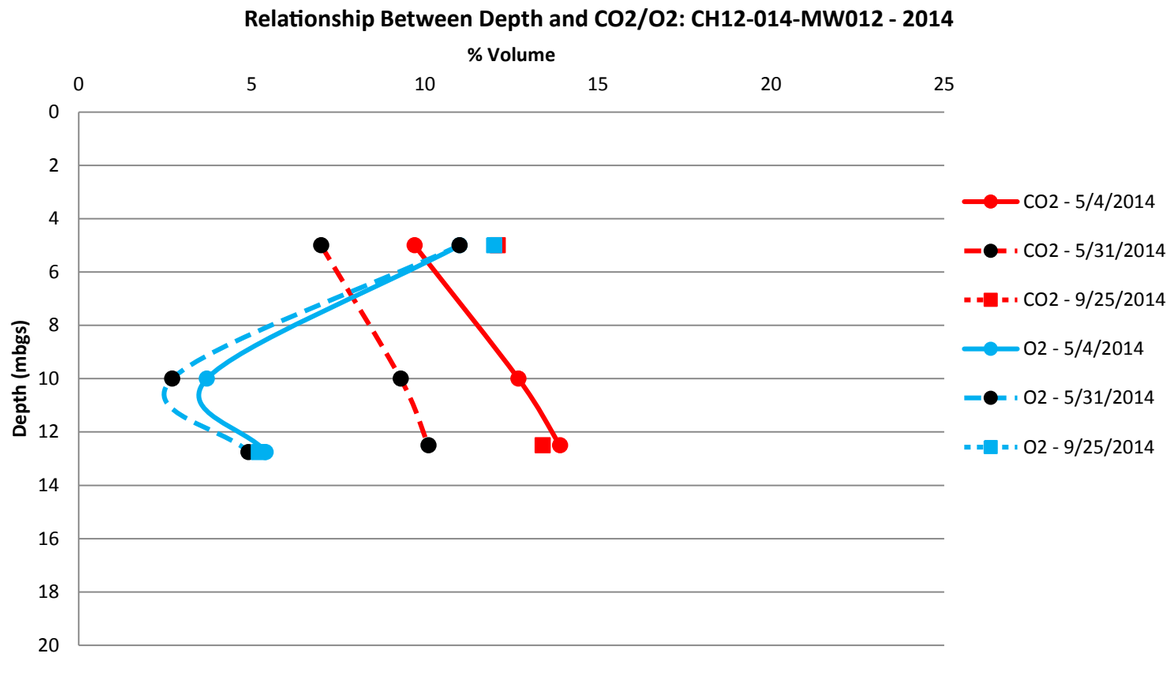


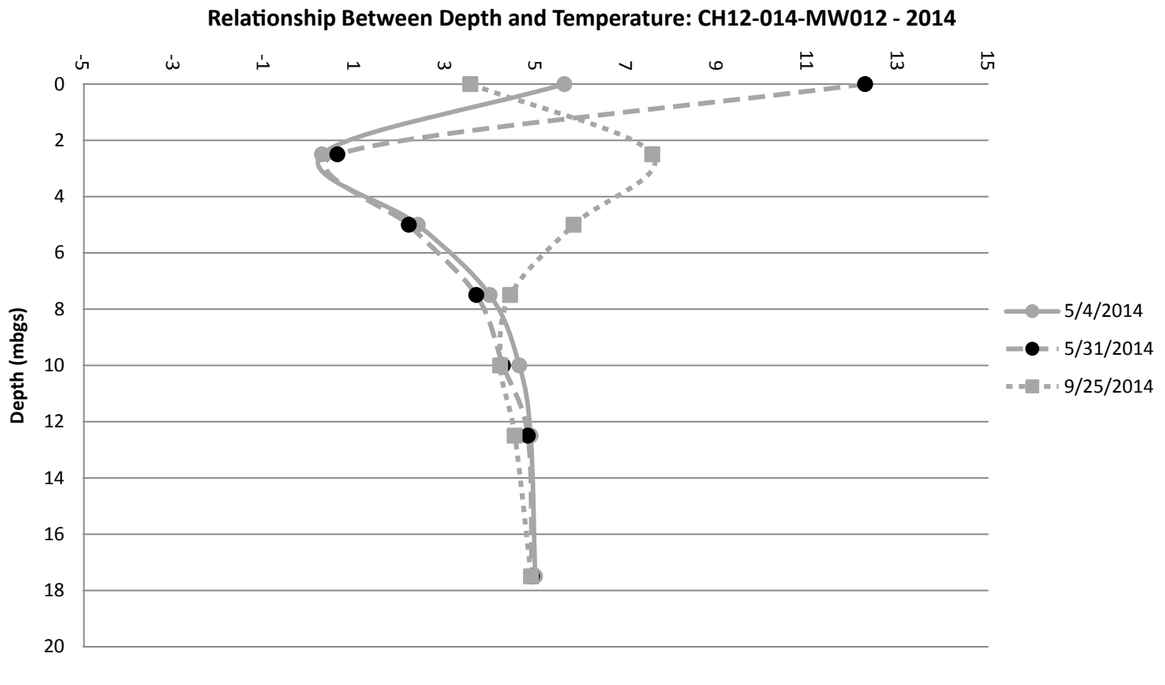


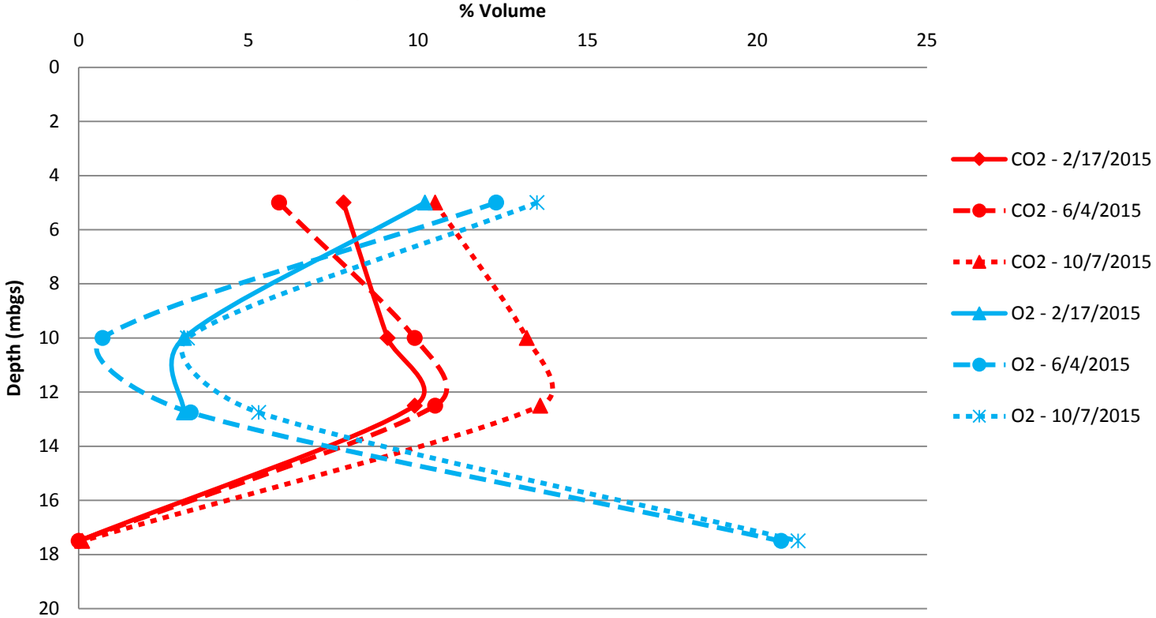
Note:
mbgs = metres below ground surface

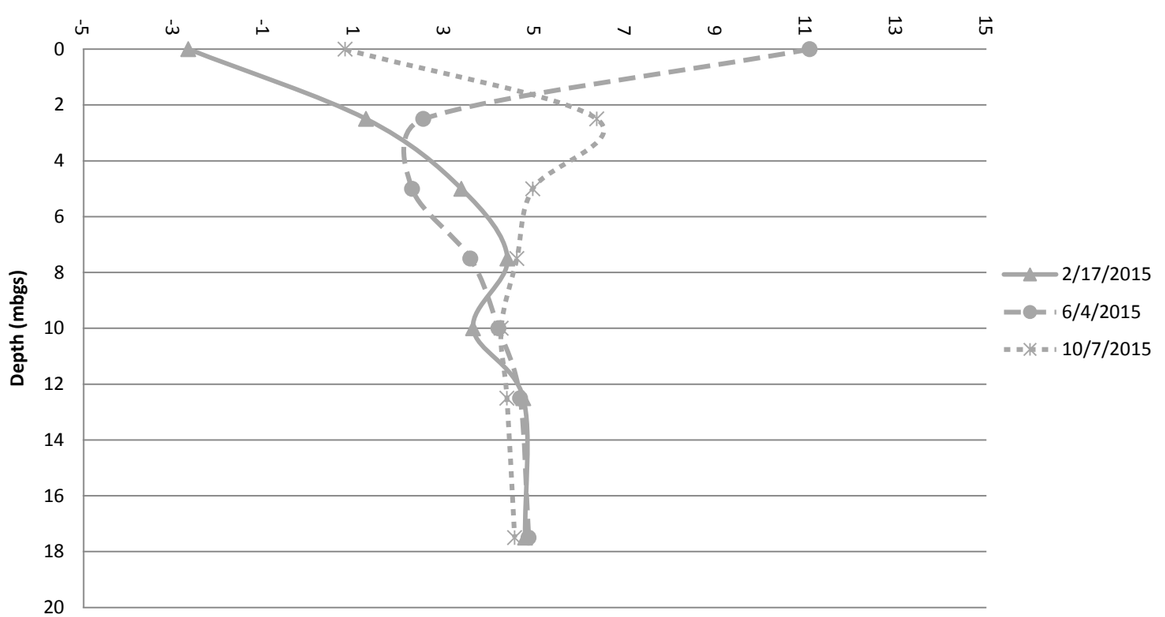
FIGURE 10-16 - *1 of 3*
Pore Gas and Temperature Profiles - Grum Waste Rock Dump - CH12-014-MW012
Faro Mine Remediation Project

ch2m.





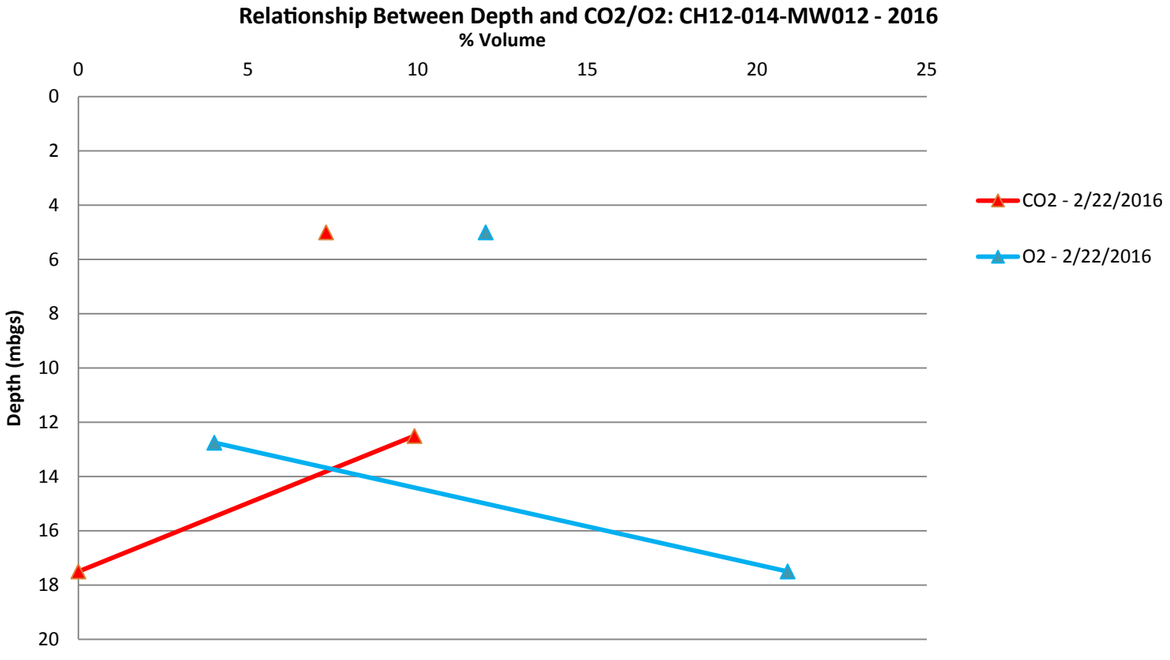


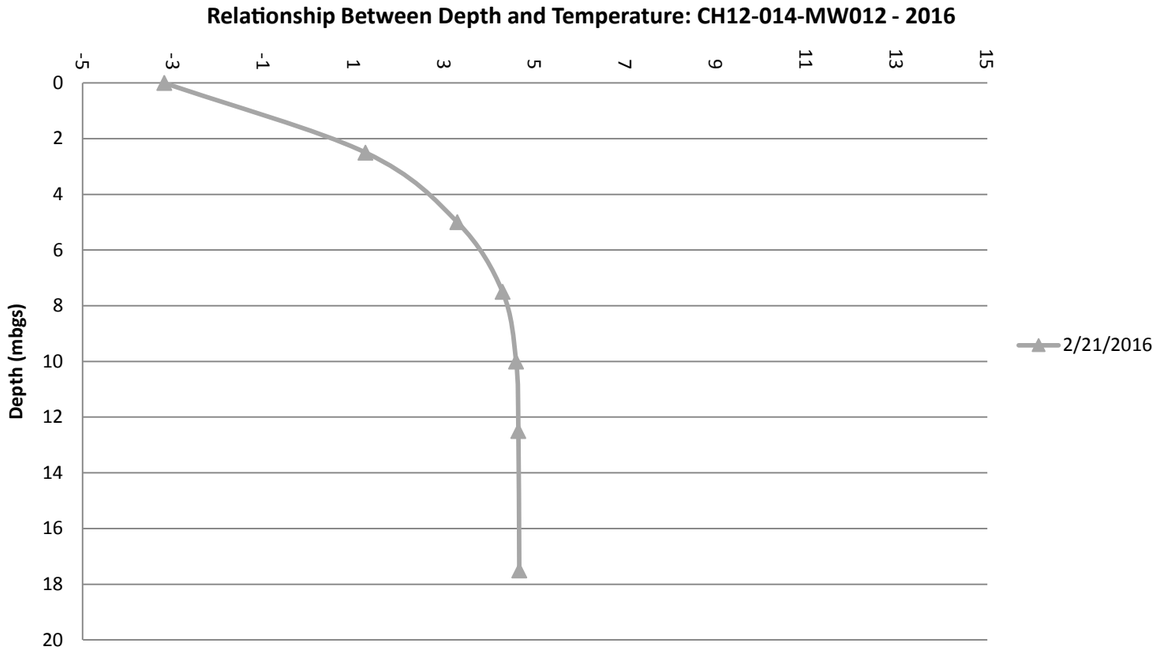


Note:
mbgs = metres below ground surface

FIGURE 10-16 - *2 of 3*
Pore Gas and Temperature Profiles - Grum Waste Rock Dump - CH12-014-MW012
Faro Mine Remediation Project

ch2m





Note:
mbgs = metres below ground surface

FIGURE 10-16 - *3 of 3*
Pore Gas and Temperature Profiles -
Grum Waste Rock Dump - CH12-014-MW012
Faro Mine Remediation Project

Appendix H
Modelling Comment Adjudication Summary

CH2M's Responses to Comments on Faro Mine Modelling Deliverables, Faro Mine Remediation Project

PREPARED FOR:	Government of Yukon
PREPARED BY:	CH2M HILL Canada Limited (CH2M)
DATE:	April 29, 2016
PROJECT NUMBER:	660430.20.01.02.04.02.ML.CR

This memorandum presents a response to comments provided on March 24, 2015, by Dr. Christoph Wels, M.Sc., P. Geo., Principal, Robertson Geoconsultants Inc. and on April 30, 2015, by Leslie Gomm, P.Eng., Ph.D., Principal Consultant, Faro Mine Remediation Project regarding the following:

- CH2M's Fiscal Year 14 Water Modelling Presentation consisting of the following modelling subjects: Surface Water, Groundwater, Geochemistry, and GoldSim
- Draft Cross Valley Dam Seepage Interception System Phase 2 – Groundwater Modelling Draft Technical Memorandum
- Update of Rose Creek Tailings Area Geochemical Reactive Transport Model Technical Memorandum
- Fiscal Year 2013 Water Quality Modelling Analysis Report

Number	Page/ Section/ Slides	Comments	Response
Surface Water Modelling PowerPoint Presentation			
Reviewer: Dr. Christoph Wels, M.Sc., P. Geo., Principal, Robertson Geoconsultants Inc.			
1	Slides 21-22	Slides 21-22 provided a very general overview of additional hydrology work completed in FY14. This work included: • Collection of continuous flow data at existing stations as well as new ones supplement rating curves for stations • Expansion of spot flow measurement program (i.e. more sites and simultaneous measurements) • Ongoing processing and QA/QC of flow and climate data • Operation and maintenance of site met stations • Further discretization of sub-catchments – quantify unique hydrologic response (i.e. disturbed areas) • Updated Regional Analysis for extreme flood event prediction • Development of intensity-duration-frequency (IDF) curves for FMC (event based modelling) However, insufficient information was provided to comment on this work.	Acknowledged.
2	Slides 23-24	The final two slides (23-24) of this presentation discussed "next steps" for hydrological modeling. Proposed improvements to the HEC/HMS model comprise: • Improved integration with groundwater, geochemical and site-wide water quality tools • Continuous improvement of data collection, processing and QA/QC protocols • Incorporate processed flow and met data into model – updated calibration • Updated catchment delineation and parameterization – focus on disturbed areas • Improved representation of low-flow conditions • Apply historic climate record (temp/ppt) to model • Use IDF data for event-based simulations • Wider range of continuous simulations (wet/dry year) • Potential impacts of climate change on runoff response	The initial goal of the HEC-HMS model work in Fiscal Year (FY) 2012 was to develop a baseline hydrology tool in which available meteorological data, flow records, catchment discretization, and related parameterization could be incorporated. The modelling platform was selected based on the then-current understanding of data availability and the initial objective of completing a calibration of rainfall-runoff from the Rose Creek and Vangorda catchments. The HEC-HMS model was considered an appropriately complex model at the time given the understanding of the hydrological system including available input and calibration data. The objective of the FY2012 modelling efforts was to simulate rainfall-runoff responses from large, undisturbed catchments tributary to the main Faro Mine Complex (FMC) conveyance features. This would allow for initial characterization of seasonal variations in flow for more frequent return period events. This would also form a baseline tool that could be further developed based on subsequent collaboration with the hydrogeological and geochemical modelling teams and by incorporating updated meteorological, flow, and physical data. It was recognized at the time that the tool was not as appropriate for modelling attenuation impacts from impacted landforms including a waste rock dump (WRD) or for simulating

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		The author generally supports the proposed steps in further surface water modeling but notes that no sensitivity analyses appear to be planned for future work (as recommended earlier). Furthermore, no details or supporting documents were provided to allow an in depth review of these proposed activities. The author would like to re-emphasize earlier review comments that the HEC-HMS runoff model, in its current form: • is not a good predictor of stream baseflow and caution should be exercised when using stream flows predicted by the runoff model for water quality predictions during baseflow • may not be representative of areas disturbed by mining (specifically waste rock dumps) and should be recalibrated for such disturbed areas. In the author's opinion, consideration should be given to employing a more complex watershed-based runoff model suitable for northern climates which overcomes some of the limitations of the HEC-HMS model (in particular related to seasonal variations in runoff). CH2M Hill also acknowledged that HEC-HMS is not an optimal tool for WRD hydrology and water balance. Instead, they propose a "compartmentalized approach based on RMUs" which focuses on specific areas of interest (i.e. WRD, cover area, etc.). They further proposed to utilize existing work, including Janowicz's water balance work on WRDs and trial covers. The author agrees that the earlier work and existing flow data (e.g. at X23) should be reviewed prior to defining a suitable modeling approach and framework for runoff from disturbed areas.	baseflow conditions in which groundwater-surface water interaction is the dominant process. Flow and meteorological data compilation was completed in parallel with model development during FY2012. From this work, various issues related to processing this data and associated operations and maintenance of the equipment resulted in concerns with the quality of the data and suitability for model calibration. In addition, two key data gaps were identified, including (1) a lack of understanding of meteorological and physical conditions in the upper reaches of catchments tributary to the FMC, and (2) unknown impacts of WRD and related disturbed landforms on infiltration and subsequent sub-surface flow of water. The focus of hydrological analyses subsequent to FY2012 was on developing estimates of peak instantaneous flow and runoff volumes in FMC diversion features that convey runoff from the larger, undisturbed tributary catchments. It was determined that regional analyses incorporating data from a variety of catchments and over a number of years was more appropriate for estimation of peak flow rate and runoff volume in diversion channels around the FMC for larger, less-frequent events (i.e., 1-in-10 year to 1-in-1000-year). This data was used for conveyance design as well as conceptual design of proposed attenuation facilities. Numerous recommendations were made regarding meteorological and hydrological data collection at the site with the intention of incorporating improved data sets into subsequent modelling efforts. It is recommended that subsequent modelling efforts include consideration of improvements listed CH2M's Fiscal Year 14 Water Modelling Presentation. This includes calibration and validation based on flow and meteorological data collected since FY2012. A sensitivity analysis is also recommended on key modelling parameters to account for uncertainties in catchment physical characteristics including runoff processes and conveyance.
Reviewer: Dr. Leslie Gomm, P. Eng., Ph.D. Principal Consultant, SLR Consulting (Canada) Ltd.			
1	Overall	Overall a significant amount of work that has been done on surface water modelling to characterise the flow year round at several key locations in the project area. One concern that I have is the lack of year round flow data at several key locations, specifically winter low flow, including R7, X2, X14, V1 and V8. The workplan moving forward, as highlighted in the presentation, is	We agree that subsequent hydrological analyses should include improved representation of low-flow conditions, maintenance of the existing flow monitoring network and installation of new permanent flow monitoring stations, and consultation with YG Department of Environment

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		to improve the representation of low flow conditions. To facilitate this robust site low flow data is required. Characterization of the low flow conditions is key as this is when the impacts of seepage and groundwater inflows on surface waters is most pronounced. Therefore I recommend that permanent Water Survey of Canada (WSC) type stations be established at these key monitoring locations. This would consist of the installation of a stilling well to adequately house the level logger during year round conditions and ensure year round operations. It is also recommended, to ensure the work completed to date meets the needs and expectations for potential reviewers, that the surface water model work be reviewed by the Government of Yukon's Department of Environment hydrologist, Richard Janowicz. This will ensure that the work is consistent with and meets the needs and expectations from a government perspective for the assessment and permitting process. The information provided in the presentation, and therefore supporting modelling work, only includes data up to 2011. This work should be updated to include all data collected from that time, up to and included 2014, which will provide for an additional 3 years of data to base the model work on. Finally, for the monitoring data in Vangorda Creek at V8, the flow data collected by YG at their station should also be included to increase the amount of available data used for the modelling.	hydrologists. This is in addition to other recommendations listed in the response to comment 2 above. Please refer to the response to comment 2 for a description of hydrologic analyses completed to date as well as recommendations related to subsequent analyses. Regarding flow monitoring, please refer to the following documents for a list of recommendations made by CH2M: - CH2M. 2015. *2014 Hydrology Field Program Report, Faro Mine Remediation Project.* Draft 1. Prepared for the Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. February. - CH2M. 2015. *Surface Water Data Processing Report, Faro Mine Remediation Project*. Prepared for Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. March.
Groundwater Modelling PowerPoint Presentation			
Reviewer: Dr. Christoph Wels, M.Sc., P. Geo., Principal, Robertson Geoconsultants Inc.			
1	2.2.1 2013/2014 Hydrogeological Field Activities; Rose Creek Diversion Leakage Study	Key findings of the RCD leakage study were presented (see slide 16). The methodology of this work is briefly summarized in CH2M Hill (2014a) and indicates that leakage rates along different reaches of the RCD were based on Darcy calculations using local field observations (local stratigraphy, hydraulic parameters and hydraulic gradients). The author would like to point out that Darcy calculations (with point estimates of K and hydraulic gradients) carry a significant uncertainty. Direct measurements of flow rates along the RCD (and hence leakage rates from specific reaches by difference) are, in the author's opinion, more reliable and have been collected during previous investigations. For example, Laberge Environmental Services of Whitehorse, Yukon, carried out two field surveys as part of a water and load balance study for the Rose Creek Tailings Facility (RGC Report 118001/1) to determine stream flow and constituent loading in various streams and seeps in the Rose Creek Valley2.	Estimates of leakage from the Rose Creek Diversion (RCD) were primarily obtained from site-specific models constructed for individual segments of the RCD along the RCTA, not just using Darcy's Law as is inferred in the comment. These site-specific models used the RCD stage measurements, the location-specific stratigraphy observed during drilling at that location (alluvial thickness, thickness of weathered bedrock, and competent bedrock topography), hydraulic conductivity estimates from aquifer testing, and groundwater levels measured at the site. Darcy's Law calculations were also performed as a check on model estimates or in areas where site-specific boring/aquifer testing data was not available to support model development. It should also be noted that estimates of RCD leakage rates through comparison of measured surface water flow rates also contain significant uncertainty. The accuracy of surface water flow measurements were estimated by the U.S. Geological Survey (USGS) to be +/- 10 percent in

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		The first survey was carried out on October 19-20, 2004 under moderate low flow conditions (~500 L/s at X14). The second survey was conducted on April 15-17, 2005 under winter base flow conditions (~235 L/s at X14). These surveys suggested significant variations in leakage from the RCD depending on flow conditions. In the author's experience, leakage from the RCD has a significant effect on groundwater flow and water quality in the RCAA, and as such, on the performance of any seepage interception system in the RCAA (in particular downgradient of the CVD). The author therefore recommends that these earlier flow measurements be reviewed and considered for any further calibration of the groundwater flow model. If required, additional flow surveys may have to be carried out to determine leakage rates along different reaches of the RCD. Slide 16 also summarizes the simulated water balance in the RCAA for average flow conditions, including water balances for the Intermediate Pond and the CVD Pond and simulated groundwater flows along different reaches of the RCAA. In this section we comment only on the reconstructed (average) water balances for the two ponds. The groundwater modeling results are commented on in section 2.2.2 below. According to CH2M Hill (2014a), historic pumping records (from 2007 to 2013) for the Intermediate Pond and CVD Pond were compiled and reviewed to reconstruct the long-term average water balances for these ponds. This review suggested an average net inflow of 51.7 L/s to the CVD Pond which CH2M Hill attributed to groundwater inflow. This is an important finding as it suggests that a significant amount of groundwater (almost 50% of all groundwater in the RCAA upstream of the ID) is currently discharging to the CVD Pond.	ideal situations and more typically +/- 20 percent. When comparing two flow estimates that both contain uncertainties of this magnitude, the estimate yielded by this procedure can also contain significant uncertainty. However, the independent RCD seepage estimates referred to in the comment will be assessed and incorporated into the groundwater model as appropriate.
		Considering the importance of this conclusion, the author recommends that these water balance calculations be checked and verified with on-site staff to ensure that the records are correct and no other water additions/extractions took place. For the Intermediate Pond, pumping records indicated an average extraction rate (water pumped out of the pond) of 41.7 L/s during the period 2007 to 2013. CH2M Hill closed the water balance for this pond by assuming 57.9 L/s of surface inflow, 67.5 L/s groundwater inflow and 24.7 L/s leakage to	Water balance estimates for the Cross Valley Dam (CVD) Pond and Intermediate Dam (ID) Pond were further evaluated during development of the transient groundwater flow model of the site. Estimates obtained during that modeling effort were compared to observations and measurements made by field operations staff where available and indicate the model provides reasonable agreement with the observed values.

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		groundwater (see Slide 16). The author could not find any data or calculations that support these assumed water balance fluxes. However, the author cautions that the Intermediate Pond is underlain by many meters of low permeability slimes that can be expected to limit interaction of the pond water with the groundwater in the underlying aquifer. The author recommends that simplified 2D cross-sectional modeling be completed to estimate the potential range of seepage into and out of the Intermediate Pond using reasonable K estimates for the underlying tailings (slimes) and the Intermediate Dam. In addition, the author recommends that a transient (say monthly) water balance be developed for the Intermediate Dam pond and the Cross Valley Dam pond with explicit tracking of the pond stage, including the winter periods when no water management (water treatment and discharge) is taking place to confirm that net groundwater discharge into these ponds is indeed as significant as suggested by the current conceptual (and numerical) model.	
		The author recommends that any updated water balance calculations for the ID pond and CVD pond to be used for updates to the RCAA groundwater model be summarized in a technical memorandum for review.	As part of the transient groundwater flow model development effort, a detailed monthly water balance was developed for the ponds based on pumping and changes in storage. The modeling team elected to use the existing three-dimensional model to develop these pond budgets as opposed to creating separate two-dimensional models as suggested by the commenter. Seepage estimates are consistent with the numbers provided in the comment. These calculations will be provided in the Draft 2014/2015 Modelling Report. The reviewers comment that no water management takes place during winter period is incorrect. The Care and Maintenance (C&M) contractor releases water from the pond via the siphon, as necessary year round including during winter periods when water treatment is not taking place. The siphons are not equipped with inline flow meters and the discharge from the CVP is calculated by the C&M contractor based on valve position, elevation, and intermittently pipe flow measurements.
2	NFRC Leakage Study	Slides 17-20 show vertical hydraulic gradients and zinc concentrations in shallow piezometers measured along the NFRC (in August 2013 and July 2014). The results of these surveys are generally consistent with hydrogeological studies completed by RGC in 2013. Specifically, the surveys suggest that (i) shallow groundwater in the reach between the Zone 2	Vertical hydraulic head and water quality were measured during fall 2015 and the results will be incorporated into the transient groundwater flow model.

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		outwash area and the rock drain is only moderately impacted (~3-5 mg/L Zinc) and not a major source of zinc loading to NFRC and (ii) shallow groundwater discharging to the NFRC immediately downgradient of the toe of the rock drain is only slightly impacted (Zn < 0.1 mg/L) and not a significant source of zinc loading to NFRC. These observations support the hypothesis that the significant zinc load observed at the toe of the rock drain is caused by a discrete (potentially perched) seep entering the NFRC under the rock drain. The author would like to caution, however, that vertical hydraulic gradients driving the surface/groundwater interaction and contaminant loading may vary significantly throughout the flow seasons. The author recommends that additional measurements of VHG and water quality be obtained (using manual surveys or in-situ probes/loggers) during late fall and/or early spring (when the NFRC is most impacted) to evaluate seasonal variations in the surface water/groundwater interactions.	
3	2.2.3 Modeling Activities in Response to IPRP	Slides 21-27 provide a brief overview of modeling work completed in FY14 and/or planned by CH2M Hill in response to comments from the IPRP.	
		The key comments/concerns raised by the IPRP were as follows: • "Idealized" valley alluvium profile using a very coarse grid Heterogeneity poorly represented at the scale of the individual wells and local zones of permeability differences • Model may not be suitable for assessing groundwater capture in alluvial aquifers given significant spatial heterogeneity in hydraulic properties at scales smaller than the model grid blocks • The incorporation of a dewatered trench with pressure relief wells reduces well drawdown fluctuations and improves the security of maintaining water extraction capacity. • The incorporation of a cut-off wall secures the efficiency of contaminated water interception…and could provide storage upon system failure. Subsequently, CH2M Hill evaluated an alternative SIS using a 2-cell dewatering trench with a drawdown of 4-5m in the trench and passive dewatering wells down to bedrock. According to the power point presentation the predicted pumping rate for this scenario was 177 L/s. This predicted interception rate is only marginally higher than the 164 L/s	The grid spacing of the initial CVD model was too coarse to capture all the complexities in the valley alluvium, however, refinements to the groundwater model were made to significantly increase the resolution of the tool, and to include the flexibility to add heterogeneity where needed. This refined version of the model tested all the failure scenarios mentioned in the comment and results were presented to the Independent Peer Review Panel (IPRP) in early 2015. The IPRP responses were favorable and they felt that the heterogeneity issue had been adequately addressed. These have been documented in CH2M, 2015 – CVD SIS Alternative Analyses Report. March.

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		predicted for 9 SIS wells (Scenario A) using the updated FY13 model report to fully capture the RCAA groundwater flow. The author acknowledges the significant operational advantage of using a dewatering trench with passive wells which (i) provides a uniform drawdown across the width of the aquifer (at least in the upper portion of the aquifer) and (ii) reduces the requirements for a larger number of pumping wells (with associated submersible pumps and pump controls). However, the dewatering trench also provides operational disadvantages. Specifically, the dewatering trench is less flexible in controlling drawdown in specific portions of the RCAA than the use of a series of traditional pumping wells. In the trench option, (i) the drawdown cannot be easily adjusted locally to account for spatial variations in the local aquifer transmissivity, groundwater quality and/or well losses and (ii) the SIS is more difficult to bring on line in stages or upgrade as contaminant breakthrough proceeds (e.g. first in the northern portion and later in the center and southern portion of the valley).	
		The author notes that potential alternative SIS options were not evaluated in FY14 (or at least not presented in the presentations); these options include: • Pumping from the CVD Pond to intercept seepage from the RCAA • Use of alternative alignment(s) for the SIS (wells and/or cutoff walls) including – Distance of SIS wells and cutoff walls from the CVD down the valley – Spacing and screening intervals of the SIS wells – Use of secondary or tertiary fences of wells to improve capture efficiency and/or provide redundancy (in lieu of cutoff walls) • Lining of the RCD to reduce leakage (and hence water to be collected and treated) The potential influence of pumping of the CVD Pond on groundwater flow towards the CVD SIS has already been discussed above. To the best of the author's knowledge, different alignments of the SIS have not been evaluated at this point. The currently proposed alignment is very close to the toe of the CVD and the CVD Pond. This alignment can be expected to intercept significant seepage from the CVD Pond (if retained). An SIS alignment further downgradient would have the benefit of reducing induced seepage from the CVD Pond and potentially easier capture of	Pumping the CVD Pond to intercept seepage from the Rose Creek Alluvial Aquifer (RCAA) was not considered as a viable alternative by the client or the IPRP and, therefore, was not further evaluated during this effort. Alternative locations for the Seepage Interception System (SIS) further downstream of the CVD, as well as various configurations of screened intervals and well locations were evaluated. The results are presented in the 2014 CVD SIS Design Basis Report. The use of secondary or tertiary fences of wells were not evaluated as the modelling analysis indicated that a single line of wells is sufficient to obtain complete hydraulic capture and meet remedial objectives. Lining the RCD was evaluated as part of the overall alternatives analysis, but was not explicitly simulated in the modelling effort as the effects of cutting off RCD seepage to the RCTA is similar whether it is achieved using a cut-off wall or liner.

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		seepage through the northern embankment, but may result in significant additional capture of (clean) leakage from the RCD (if not cut off). In FY13, different alignments of cutoff walls along the RCD were simulated for the active pumping well scenario to assess the effects on seepage interception rates. An alternative, and potentially more cost-effective, method for reducing leakage from the RCD may be lining of the diversion channel (using geosynthetics, shotcrete or concrete) along reaches where leakage provides significant flow to the CVD. This option should be evaluated using the FY13 model by reducing the streambed conductance accordingly in selected reaches of the RCD. The author recommends that several alternative SIS designs (and alignments) be evaluated with respect to performance (% by-pass), operational efficiency (pumping rates and power requirements), risk of failure and overall cost (CAPEX & OPEX) prior to selection of a preferred alternative. CH2M Hill also outlined a list of planned work tasks to evaluate potential for hydraulic failure. These include: • Assess scale of heterogeneity from boring logs • Analyze conditions most likely to compromise capture: – Full pool behind the CVD – High permeability conduit oriented US/DS between extraction wells – Passive wells screened in lower permeability materials surrounded by higher permeability sediments – High permeability conduit connected to high head pool behind CVD and extending between extraction/passive wells – High horizontal to vertical anisotropy (layering of low permeability material) • Simulations will be run to steady-state and flowline analysis performed to evaluate capture The author supports the above proposed analyses and recommends that these sensitivity analyses be run for (i) a fence of pumping wells (original design) and (ii) trench with passive wells (alternative scenario)[8]. --- [8] Note: using both scenarios for these sensitivity analyses may already be planned by CH2M HILL	

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		Care should be taken in those simulations to account for well losses in pumping wells which reduce the available drawdown at a given well point.	
		The author further recommends that additional sensitivity analyses be conducted to evaluate the uncertainty in: • Hydraulic conductivity of the sediments in the CVD Pond controlling seepage from the CVD Pond • Seepage conditions along the northern abutment (where impacted seepage is already observed) • Leakage from the RCD (in particular downgradient of the Cross Valley Dam) and its effect of clean water capture in the SIS	Project focus in 2015 shifted to development of the North Fork Rose Creek (NFRC) Diversion Design and resulted in redirection of the project team away from issues associated with the CVD SIS. Therefore, these sensitivity analyses were not performed.
		Finally, the author notes that the power point presentation makes no mention of any water and load balance studies for the RCAA. It is unclear whether such work was undertaken to understand current conditions in the CVD area and support the hydrogeological modeling for the CVD SIS. In the author's experience, a water and load balance model is a very valuable tool to understanding seepage and groundwater flow in the CVD area (see RGC Report 118001/1 for details). If not already completed, the author recommends that the earlier water and load balance model for the RCAA (RGC Report 118001/1) be updated using recent flow and water quality monitoring data in the RCAA**.**	Water and load balances were evaluated during transient groundwater flow model development. Full documentation of the groundwater flow model development and calibration will be provided in the FY2015 Groundwater Development Report. Results from the groundwater flow model are summarized in the FY 2015 Comprehensive Design Road Map report, including summary level water budgets.
4	2.2.5 Future Modeling Work	Slides 28-34 of the power point presentation touched on future groundwater modeling work for the FMRP. CH2M Hill proposes to use the recently developed Un-Structured Gridding (USG) code for MODFLOW to allow for subarea refinement of grid cells and layering. CH2M Hill proposed the following grid refinements in subareas of interest:	
		• CVD: 1.5m×1.5m cells • Zone 2 Outwash, S-Wells, ETA, CVD SIS areas: 3m×3m cells • RCD: 12m×12m cells • Along NFRC, SFRC, Lower Rose Creek and other principal streams: 25m×25m cells In the author's opinion, the proposed cell sizes appear to be adequately refined for the simulation of hydraulic conditions (groundwater flow). However, as mentioned in earlier reviews, the author prefers the telescopic modeling approach in which a coarser regional model is initially used to develop a regional groundwater flow field and more detailed sub-models	The groundwater modelling team opted to use the MODFLOW-USG modelling platform over the subarea modelling approach because it provides flexibility for future model refinement which is much more difficult and time consuming to achieve with local or "subarea" models. MODFLOW-USG allows both subgridding and sublayering in any portion of interest in the model grid and eliminates the need to define and transfer boundary conditions between the parent and local subarea models. For instance, if the model is used to support the design of an SIS or seepage collection pond at the site, the existing transient groundwater flow model grid can be refined spatially by adding additional elements, and refined vertically by adding additional layers, to whatever scale the designer deems

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		are subsequently developed for specific areas of concern, e.g. the NFRC area or the RCAA. This approach provides more flexibility in model setup (cell grid spacing and layering) and typically results in a more transparent and efficient numerical model. During the presentation CH2M Hill pointed out that numerical difficulties were encountered with the new USG MODFLOW package and that the assistance of the original programmer of the USG package was sought. In the author's opinion, there is significant risk that the modeling work could get delayed due to numerical issues when applying this new USG code to this large regional model. Again, it is recommended that stand-alone subarea models be developed which do not require the use of the USG package.	necessary. The refined model will then automatically integrate surrounding boundary heads and fluxes into the refined areas to support design efforts. Initial numerical challenges applying MODFLOW-USG were solved through consultation with the model developer and the resulting current transient groundwater flow model provides effective analysis to support the project.
		Slide 33 provided an overview of the planned groundwater flow modeling activities for FY15, including: FY15, including: • Develop transient GW flow model – Monthly stress periods – Simulation period coincident with GoldSim • Advance SIS designs – CVD to 90% level – Zone 2 Outwash to 30% level – S-Wells Optimization to 30% level • Evaluate subsurface flowpaths from WRD source areas to NFRC discharge areas (with and w/o stream realignment) • Evaluate cover effectiveness • Evaluate lining of new stream diversions (NFRC & SFRC) • Evaluate constructability and performance of low-permeability cutoff walls The author generally supports these planned modeling activities for FY15. The development of a transient flow model using monthly time steps is considered an important and necessary improvement to the groundwater flow model. The groundwater flow system at Faro is significantly influenced by seasonal runoff, specifically high groundwater flow during spring runoff and late fall and recession flow during the cold winter period. These seasonal runoff patterns cause significant variations in seepage rates from mine waste units and flow in receiving groundwater and surface water and	As discussed above, the transient groundwater flow model of the FMC was developed and calibrated. However, the scope of the current project changed to focus solely on the design of the NFRC re-alignment and associated water management strategies. Under the current scope, the advancement of detailed SIS designs was deemed lower priority and was not completed in FY2015. This is also true for cover effectiveness evaluations and this analysis was also not completed.

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		need to be considered in the design of seepage interception systems in the various sub-areas (CVD, Zone 2 Outwash, S-Wells). The author noted that CH2M Hill is planning to complete SIS designs for the Zone 2 Outwash area and the S-Wells area of the NFRC reach. These areas had previously been identified as high and moderate priority areas by the author for seepage interception, respectively. However, recent monitoring and hydrogeological studies in the NFRC reach have shown that recent increases in zinc concentrations in the NFRC are not caused by seepage from the Zone 2 outwash area or the reach along the S-Cluster SIS, but instead by (potentially perched) seepage from the Intermediate Dump which reaches the NFRC under the rock drain. In the author's opinion, design of a seepage interception system along the reach of the rock drain should have priority over an improved design of the S-cluster SIS or a new design in the Zone 2 outwash area.	
		The author also supports an evaluation of subsurface flowpaths from WRD source areas to NFRC discharge areas (with and w/o stream realignment). However, no details were provided for this work task. The author recommends that this modeling work be preceded by a detailed data review and formal development of a conceptual model of groundwater flow and contaminant transport for the NFRC. Once such a conceptual model has been developed (and reviewed) a numerical model for the NFRC subarea should be developed. This model should then be used to evaluate integrated closure strategies for the NFRC reach (i.e. local SISs, stream realignment, stream bed lining, etc.). It is recommended that a detailed work plan be developed for analysis and modeling of the NFRC reach which integrates data review, conceptual model development and numerical modeling of closure strategies for this aquifer reach. This work plan should be reviewed by the Technical Advisors of YG-AAM (who are familiar with the NFRC issues) prior to execution of this work.	While a more comprehensive analysis of the flow and transport characteristics of the NFRC system would be beneficial to the overall project, this effort was not scoped or funded in FY2016, and, therefore, was not completed. However, the flowpath analysis was performed and used in conjunction with groundwater budgets defined by the flow model to evaluate subsurface pathways and flow rates between WRD source areas and NFRC discharge areas. These efforts are documented in Appendix C and D of the 2016 NFRC Design Basis Report (CH2M, March 2016b).
Geochemical Modeling PowerPoint Presentation			
Reviewer: Dr. Christoph Wels, M.Sc., P. Geo., Principal, Robertson Geoconsultants Inc.			
1	GW beneath Rose Creek Tailings Area (RCTA) (FY2012,	The presentation on geochemical modeling included four sections: • Faro Pit Lake (FY2012) • GW beneath Faro waste rock dumps (WRDs) (FY2012, 2013) • GW beneath Rose Creek Tailings Area (RCTA) (FY2012, updated FY2013)	

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	updated FY2013)	• External review (FY2014) This review focusses on the geochemical modeling in the RCTA (third bullet), and specifically any updates completed in FY13. Note that a detailed review of the FY12 PHAST modeling of the RCTA was reviewed by the author (and Dr. Paul Ferguson) in provided in an earlier review report dated May 26, 2013. The present review comments should be read in conjunction with these earlier review comments.	
GoldSim Water Model Presentation from the January 20, 2015 meeting			
Reviewer: Dr. Leslie Gomm, P. Eng., Ph.D. Principal Consultant, SLR Consulting (Canada) Ltd.			
1	Overall	This document describes model updates to support the Interim Works Project Proposal, incorporation of PHREEQC to support geochemical components of the model, development of model for use as water management tool and next steps. I was actively involved in the updates of the model to support the Interim Works, many of which are then incorporated into the closure model so I do not have many specific comments on model. I feel that the team has made significant progress refining the model, specifically with respect to how it deals with source inputs from waste rock dumps and getting better calibration with historical data. As the work continues it will be important to continuously re-evaluate the calibration with more recent site data as conditions on the site are progressing and this will help provide confidence in the ability of the model to adequately predict these changes. For the overall closure model, during the presentation the issue of stratification and turnover of the Faro Pit was discussed and whether this was incorporated into the model. It was highlighted that it was not. The concern stems from the potential for increased lime demand due to mixing of deeper metal laden waters during spring and fall turn over. Following the meeting Jim Stefanoff provided some clarification on the physical stability of Faro Pit with respect to turn over and impact on operation of the water treatment plant. Based on his assessment, based on current pit water quality data, there will be minimal impact on the treatment system due to turn over. Although this clarification was provided, the potential for turnover should be incorporated into the closure model to ensure as water quality conditions in the pit changes during closure and post-closure that any turnover is taken into consideration.	a. Agree. The model is a working, evolving tool that will be regularly be compared with newly collected data and updated as significant discrepancies with observed data are discovered. b. Pit lake turnover potential should continue to be considered as a potential hazard as design progresses, and could be incorporated into the closure model should the need arise.

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		With respect to the water management tool component of the model, again this should be routinely updated based on calibration as more recent site data becomes available. I think this is a powerful tool to assist in site water management decisions and planning so ensure ongoing update and calibration is key to is use.	
Update of RCTA Geochemical Reactive Transport Model Technical Memorandum			
Reviewer: Dr. Christoph Wels, M.Sc., P. Geo., Principal, Robertson Geoconsultants Inc.			
1	Overall	The following changes were made to the FY12 model: • Adjustments to the hydraulic aquifer properties and boundary conditions (from updated RCAA flow model) • Spatially distributed source concentrations by tailings area (adjusted by model calibration) • Adjusted location for surficial recharge of ETA seepage (along surface channel on Intermediate Impoundment; see figure 6) These adjustments resulted in an overall improvement in the model calibration, i.e. overall match of observed time trends of sulphate and zinc at selected monitoring wells in the RCAA (in particular at the ID and CVD). In the author's opinion, the primary improvement to the PHAST model of the RCTA is the use of spatially distributed source terms (sulphate and zinc concentrations via the use of infiltration concentration factors for each of the 11 tailings areas). This allowed more flexibility in matching observed water quality trends in the RCAA. However, the calibrated infiltration concentration factors are not consistent with field observations and our conceptual model of pore water quality evolution in the tailings. For example, the oldest and coarsest tailings area IN-c has a calibrated concentration factor of only 0.1 (representing a low source concentration) whereas the much younger and finer tailings area of IIIS-f had a calibrated concentration factor of 0.6 (higher source concentrations). Field observations and experience would suggest the opposite, i.e. much earlier breakthrough and higher sulphate and zinc concentrations in zone IN-c compared to at IIIS-f. As mentioned in our initial review of the FY12 work, we recommend that as a first approximation, the breakthrough curves for sulphate and zinc estimated for each tailings area in SRK (2005c) should be used to develop these time-dependent source terms[9]. If required, adjustments should then be made to individual source terms during model calibration (using	a. The sulphate loading estimates for the Original, Secondary (east), Secondary (west), and Intermediate tailings impoundments from the SRK 2005 study could be used in replacement of the overall average sulphate loading previously used in the model. It would be useful and more efficient to use the Excel source calculations offered by RGC in the footnote to this comment. As noted in in Section 2.5 of SRK (2005), the zinc loading estimates are likely overestimated because of the lack of consideration of zinc precipitate formation. This was shown to be the case in the use of the average loading values during initial calibration of the model, and use of these estimates was abandoned, with a sulphate ratio method used instead. In the interest of time efficiency, this could be repeated for the sulphate loading of individual impoundments. Observed tailings porewater and underlying groundwater quality should be used as guiding ranges during calibration. The water quality is highly variable because of the heterogeneous nature of the tailings, and therefore does not lend itself to specific calibration unless the model was made to be much more detailed than required by the stated objectives. Proposed refinements in the next iteration could include adjustments to loading estimates, as well as thermodynamic considerations, to improve the match with observed data. b. We agree that the water quality at FCS-4 is the most representative of the current water quality that is entering the RCTA from the Faro Creek canyon drainage. FCS-4 data was used for model calibration for the period between 2009 and 2014; since data is only available for this station beginning in 2009.In prior years of the calibration period (between 2002 and 2009), drainage from X23 was used as an estimate of water quality input to the RCTA from the ETA. The FCS-4 data was weighed more heavily during calibration for this key node point in GoldSim, which is named X23 for convenience purposes only.

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		observed water quality and/or thermodynamic considerations) to better match the observed groundwater quality in the RCAA. --- [9] The author has the original sulphate and zinc predictions for different tailings areas (in EXCEL format) and could provide these for use by CH2M Hill, if required The following comments/recommendations from our earlier review still apply to the revised FY13 version of the PHAST model and are repeated here for ease of reference (with slight modifications): • CH2M Hill used seepage water quality observed at station X-23 to represent Faro Creek seepage (FCS). As discussed earlier the water quality at X-23 differs significantly from that observed at the mouth of Faro Creek canyon (FCS-4). The water quality observed at station FCS-4 is more representative of Faro Creek seepage contributing to contaminant loading to RCAA (in particular with respect to metals such as Fe and Zn) and should be used as input to the RCAA reactive transport model. • In the reactive transport model FCS seepage was assumed to enter the RCAA in two ways: – Lateral groundwater inflow (w/ X-23 water quality) in an appr. 800m long reach along the northern boundary of the model domain (near the Faro Creek canyon) – Seepage from the Intermediate Pond referred to as "ETA surface water infiltration zone" in Figure 6 (w/ IIIN-c water quality) Both of these assumed contaminant loads strongly influence the predicted groundwater quality in the northern portion of the RCAA and deserve further comment. CH2M Hill assumed that 10% of the FCS load entered the RCAA as surficial recharge through the tailings. This is a reasonable assumption. It is unclear, however, whether the other 90% of the flow and load of FCS seepage was assumed to enter the RCAA as lateral groundwater inflow. To the best of our knowledge this lateral inflow is the product of the groundwater flux (determined from the regional groundwater model) and the assumed water quality (X-23). In our experience, the main source of contaminant load in this area is leakage from the FCS running in the diversion channel (not groundwater flow from the upstream areas). Hence, leakage estimates from flow surveys along the diversion channel rather than groundwater flow estimates from the regional model should be used for this source term. As mentioned above, this flow term should be multiplied by	c. The GW model has been extensively refined to accommodate more specific flow processes at the ETA/RCTA interface and this model will be used as the basis for any future PHAST model improvements. The FCS-4 water chemistry will be assigned to this flow for present/recent years, and into the future by the WRD mixing model. d. We agree that consideration of groundwater chemistry at all depths should be used at each calibration point, where available. Although the multi-depth data were reviewed during calibration, we only displayed what we felt was the most representative water chemistry (erring on the side of more conservative concentrations). In the next iteration, all data at each location (coded by depth) could be displayed to give a more complete picture of the calibration process. We feel this would provide a clearer depiction of the water quality at each location than would a vertical average. e. Agreed that there is room for improvement in the calibration at these locations. Zinc is much more reactive than sulphate and therefore predictions of concentration will be expected to have greater uncertainty and variation compared to observed data. The work reported was envisioned to be an intermediate product during development of the final model. In addition to improving the ETA source terms, the adsorptive properties in the model were planned to be adjusted to improve fits to the degree that is reasonable, given literature ranges and expected variability in this setting. f. Reporting of parameter sensitivity was to be performed with the next series of model improvements. Some parameters are dependent on one another in order to achieve a reasonable calibration. An example of this is the pairing of adsorptive capacity and zinc loading: if adsorptive capacity is decreased, the zinc source would need to be decreased to maintain calibration. Dispersivity may also play a role in this process. Ultimately, the final model will require professional judgement to select the most reasonable transport and geochemical parameters. g. As stated above, parameter sensitivity was to be discussed in the next version. No groundwater model presents a truly unique solution, and this is especially true for groundwater transport models. Professional judgement must and does play a role in calibrating a reasonable model with defensible choices for parameters. The work reported was envisioned to be an intermediate product during development of the final model; this could be made more clear further versions.

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		FCS-4 water quality (rather than X-23 water quality) to estimate the load entering the RCAA via this lateral inflow. • The RCAA was represented as a single model layer in the reactive transport model. In our opinion, this is a reasonable approach for this modeling exercise. However, this raises the question on how to average variations in groundwater quality observed with depth in the aquifer for calibration targets. CH2M Hill decided to use observed water quality in selected wells rather than vertical averaging, both for initial conditions as well as transient model calibration. In our opinion, both initial conditions and calibration targets should be obtained by vertical averaging wherever water quality from multiple screening depths in the RCAA are available. • A comparison of predicted and observed time trends indicated reasonably good agreement in many wells (especially for the wells at the ID and the CVD). However, some wells showed poor agreement. Of particular note here are the wells P03-06-04 and X21-96B, both located in the northern portion of the RCTA, which showed significantly higher zinc concentrations in recent years than predicted by the model. The fact that zinc concentrations in recent years have increased more than predicted suggests either (i) higher zinc-to-sulphate ratios for ETA seepage and/or for tailings seepage and/or (ii) lower sorption of zinc along the flow path than assumed. The mismatch of zinc breakthrough at those wells (lower zinc predicted than observed) can be expected to underestimate future zinc concentrations at the CVD. • The PHAST model predicts that zinc concentrations will remain below 0.2 mg/L for the next 20 years. CH2M Hill points out that this delay in zinc breakthrough is a direct function of the sorption capacity of the alluvial sediments (i.e. FeOOH concentration). However, no discussion or sensitivity analysis is presented to illustrate the influence of this parameter (or any other uncertainty in the model) on predicted breakthrough of zinc along the CVD. • Considering the large number of modeling assumptions required for this type of reactive transport modeling (time-dependent source terms, seepage and groundwater flow rates, reaction parameters) model calibration will never be unique, i.e. different sets of modeling assumptions may be able to describe the observed system response. This non-uniqueness of model calibration is not discussed in the report and no sensitivity analyses are presented to explore the uncertainty in	h. Agreed, to the extent of geochemical and transport parameters. For hydraulic parameters such as seepage rates from Faro Creek and through the tailings, the groundwater flow model has been calibrated to head data and other calibration targets. These parameters will be updated in the transport model as they are altered in the groundwater flow model. Unless a reasonable calibration is not possible in the transport model without altering one or more of the hydraulic parameters, they will be fixed to maintain consistency between the models. i. We agree that additional constituents provide useful information to assist in calibration. These have been used internally for calibration in the past. Key general chemistry constituents could be reported for comparison to observed data in addition to zinc and sulphate. However, these constituents have been used as geochemical system checks rather than calibration points. Attempting to fit all parameters would result in excessive calibration time and was considered out of scope. The objective remains to produce a reasonable geochemical transport model for use in comparing design alternatives and the relative effects of each alternative on mobility of constituents. Sulphate has been chosen as the general chemistry transport indicator, and zinc as the trace metal indicator, and will remain the principal calibration constituents. j. We appreciate your input, but respectfully disagree with this approach. The use of a retardation coefficient in transport is a generalized empirical approach that ignores the variety of chemical interactions that affect trace metals like zinc. For example, precipitation of ferric hydroxide, which will occur along the flowpath, will produce additional adsorbate surface for attenuation of zinc. This is a dynamic process that will lead to underestimation of adsorption using a fixed isotherm equation. The use of this approach will not assist in improving the predictive capability, nor the improvement of the PHAST model. The PHAST model was deliberately made in a more simple grid density than the MODFLOW model for the purpose of providing a reasonably fast-running tool for use in comparing alternatives for design and predicting breakthrough times. We feel that adding layers and increasing cell density will produce what we feel would be a time-intensive, complex calibration process which will not add proportionate value to the model. With the previously recommended changes and ideas provided by the reviewers, we feel the current PHAST model will provide a useful tool for

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		modeling predictions. In our opinion, this is a serious limitation of the reactive transport modeling presented in this draft report. • In our opinion, the deliverables of such a reactive transport study should include a sensitivity analysis that illustrates the controls on groundwater quality and brackets the uncertainty in water quality predictions. To this end we recommend that the following parameters be evaluated in a sensitivity analysis: – Different source terms for tailings (e.g. use of sulphate-to-metal rations vs use of observed tailings pore water) – FCS seepage rate (groundwater inflow from flux boundary) – Tailings seepage rate(s) – Range of FeOOH concentrations (controlling metal sorption) • The modeling results presented in this draft report only include predictions for sulphate and zinc. However, concentrations of other constituents of concern, including major cations (Ca, Mg) and other metals (Fe and Mn) have also increased significantly in the RCAA over time. Consideration should be given to including these other CoCs into the transport model. Simulation of these additional constituents may provide additional clues and constraints on the sources and geochemical controls on contaminant transport in the RCAA. At a more conceptual level, the author feels that significant compromises have been made in the physical aspects of groundwater flow and contaminant transport in the PHAST model to allow the use of the very complex and computing intensive reactive transport code (e.g. simplified model grid and lack of vertical discretization, simplification of water budgets for ponds). In the author's opinion, more emphasis should be placed on understanding the physical aspects of solute transport before tackling the reactive transport. To this end, the author recommends that the sulphate transport in the RCTA be modeled using a conventional solute transport model (e.g. MT3D) that is integrated with the RCAA sub-area model (in MODFLOW). The physical transport parameters should first be calibrated using the historic sulphate time trends (again using the spatially distributed source terms for sulphate developed by SRK, 2005c). Once this aspect of the model is calibrated, zinc transport should be modeled using the simplified geochemical options available in MT3D (e.g. using a retardation factor approach). Insight gained from the PHAST modeling to date should be	design that can be ready for use with some additional refinements and updates.

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		used to constrain assumptions about the reactive transport of zinc. Provided this reactive transport model for zinc can be calibrated against historic time trends, this model could then be used to predict future zinc transport in the RCAA. If successful, such a calibrated solute transport model could also be used to evaluate the efficiency of different SIS option to extract contaminant loads (sulphate and/or zinc) from the aquifer. The author recommends that geochemical transport modeling using PHAST be put on hold until the results of solute transport modeling using MT3D has been completed.	
Draft Technical Memorandum on Phase 2 CVD SIS Modeling (FY13) AKA: Cross Valley Dam Seepage Interception System Phase 2 – Groundwater Modelling Draft Technical Memorandum			
Reviewer: Dr. Christoph Wels, M.Sc., P. Geo., Principal, Robertson Geoconsultants Inc.			
1	Overall	The author has the following comments on the updated model and its calibration results:	
		• Earlier drilling and interpretation of the geological section along the Cross Valley Dam by the author had indicated large variations in grading ranging from very coarse gravel to silty sand and silt layers (see Figure 2-2 in RGC, 2006[5]). The inferred stratigraphic model shown in figure 2 of CH2M Hill (2014a) is a highly simplified representation of actual site conditions;	To the extent possible, the site complexities are integrated into the numerical model. Site heterogeneities deemed important to assessing contaminant migration are also incorporated into the current transient numerical groundwater flow model.
		• The modeling memo does not provide a direct comparison of the observed drill logs to the spatial distribution of K zones in the model; however, a visual comparison of figures 2 and 3 suggests that the model is significantly simplified, even compared to the conceptual cross-section shown in figure 2; • In the author's opinion, the model discretization and assumed spatial distribution of K zones may not be adequate to assess the performance of a seepage interception system with a high degree of confidence; potential issues currently not addressed include: – Seepage by-pass in high K channels (not considered in current model) – Difficulties in installing and operating pumping wells screened across the entire thickness of the valley sediments (as assumed in the model)	The development of any numerical model is necessarily a simplification of the true complexity of the hydrogeologic system being evaluated. The degree of complexity required to support the SIS design centers on the ability of the model to accurately replicate the hydraulic conditions that result from groundwater extraction in the CVD area. As is discussed above, the influence of small scale aquifer heterogeneity on achievement of full hydraulic capture was evaluated with a refined model. This analysis was performed and presented to the IPRP in early 2015.

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		• The updated RCD leakage rates (150 L/s) are significantly higher than in the FY12 model (111 L/s) resulting in higher groundwater flows in the RCAA (e.g. 117 L/s vs 100 L/s underflow beneath CVD). These updated flow rates are more consistent with earlier modeling results (RGC, 2006) which were calibrated using measured leakage rates in the RCD and seepage rates downstream of the CVD. --- [5] RGC Report 118004/1 entitled "DESIGN OF GROUNDWATER INTERCEPTION SYSTEM FOR ROSE CREEK TAILINGS STORAGE FACILITY, FARO MINE, YUKON TERRITORY", submitted October 2006. • The calibrated FY13 model overestimated hydraulic heads in wells near the toe of the CVD (by about 0.5 to 1.5m) and significantly overestimated seepage rates at the toe of the CVD (56 L/s vs ~20 L/s observed at X13). In addition, the simulated pond elevation in the CVD Pond was about 2m less than the target. CH2M Hill points out that these discrepancies are conservative in that they result in higher seepage rates for SIS design. However, in the author's opinion, these discrepancies are significant and may indicate a problem with the conceptual model. For example, why was the model calibration not improved by increasing the Kv of the CVD pond material thus raising the pond level to the observed calibration target? How would this have affected the heads along the toe of the CVD and toe drainage at X13? The author recommends that the cause and effect of the significant remaining discrepancies be evaluated using a series of sensitivity analyses to confirm that the current conceptual model is correct. Such sensitivity analyses should be discussed and documented in a modeling report. • The FY13 model differs significantly from the RGC (2006) model with respect to the predicted groundwater flow rates downstream of the CVD. The FY13 model predicted a groundwater discharge of 158 L/s to surface (between the CVD and the end of the RCD) with only 21 L/s remaining in the aquifer. In contrast, the RGC (2006) model predicted 82 L/s GW discharge to surface and 175 L/s underflow. These discrepancies are very significant and require further discussion. It should be pointed out that the RGC (2006) model was calibrated against observed seepage rates in this reach of the RCAA. It is unclear what additional field data were collected by CH2M Hill that justify such a significant change in predicted groundwater flow both to surface and in groundwater.	Improved flux estimates, including in the areas near the toe and downstream of the CVD, were included as flux calibration targets during calibration of the current groundwater flow model. Improved agreement between simulated and observed flows was achieved during calibration of the 2015 version of the model (CH2M, March 2015gg).

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		• In the author's opinion, the revised representation of the CVD Pond and the Intermediate Pond in the FY13 model as "pseudo-lakes" with high Kh and low Kv is problematic. This representation is highly conceptualized and the Kv of the ponds has no physical meaning. In the author's opinion, a better representation of the ponds would be as a general head boundary (GHB) or as "lake nodes" using the lake package of MODFLOW in which the pond stage can be input as a fixed (known) variable and the underlying tailings (or sludge in the case of the CVD pond) can be represented more explicitly as a vertical conductance term. This way the flow conditions are more accurately represented and the model is calibrated using known pond stages rather than net inflows.	The representation of the RCAA ponds was revised during development and calibration of the 2015 transient groundwater flow model. The ponds are no longer represented as "pseudo-lakes." This change is documented in the FY2015 Groundwater Flow Model Development Report.
		Once calibrated, the FY13 model was used to evaluate alternative designs of a seepage interception system using a combination of interception wells and cutoff walls. For these model predictions the ponds were assumed to be "decommissioned", i.e. without the current manipulation of the hydraulic system, which pumps and siphons water in and out of the ID Pond and the CVD Pond. The author has the following comments on those predictive runs: • The model predicts a significant increase in groundwater flow under the CVD (from 117 L/s to 156 L/s) due to not managing the ponds. No further information was provided in the TM to explain this significant increase in underflow. The physical reason(s) for this significant increase in groundwater flow (to be collected by the SIS) should be explained. This should include a presentation of the simulated flow field (head solution) in cross-section for this scenario.	In the FY2013 groundwater model, the rate of siphon out of the CVD Pond was greater than the rate of input from the water treatment plant, so the pond is a net sink of groundwater (the current operations results in the net removal of groundwater from the aquifer). If water management is halted, groundwater will flow into the CVD Pond until a dynamic equilibrium is reached with the groundwater system. At this point, there will no longer be a net removal of groundwater from the aquifer and the groundwater discharge below the CVD will increase. The current transient groundwater flow model was re-configured using transient constant head boundary conditions to represent the CVD Pond and ID Pond in the RCTA.
		• It is not clear to the author why the ponds were assumed to be "decommissioned" for SIS design predictions. Assuming the model predictions are correct and the CVD Pond does indeed intercept a significant portion of the groundwater flow from the RCAA it would be prudent to continue pumping from the CVD Pond to intercept seepage from the RCAA. In fact, the CVD Pond could potentially be pumped even more aggressively to capture more groundwater upstream of the SIS and further reduce the groundwater flow to be intercepted in the interception wells. The author recommends that several sensitivity runs be completed with different pond stages in the CVD Pond to evaluate the potential for seepage interception by pumping the CVD Pond[6] ---	The ponds were assumed to be decommissioned because it was initially assumed that they could be used to capture stormwater runoff and provide onsite storage to help manage the movement of mine impacted water at the site. Additional simulations were later conducted to assess the influence of a full pool on CVD effectiveness as is discussed in earlier comment responses. Also discussed in earlier comment responses, the pumping of the CVD Pond was never endorsed by the overall project team (Government of Yukon, Indigenous and Northern Affairs Canada, IPRP) as a viable alternative and was, therefore, not evaluated in detail.

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		6 These sensitivity runs should preferably be run using a modified/refined model in which the ponds are represented as GHBs or lake nodes with an explicit representation of surrounding embankment material and underlying tailings (see earlier recommendation)	
		• The FY13 predicts a significantly higher seepage interception rate for the "base case" SIS of 9 interception wells (164 L/s) compared to the FY12 model (106 L/s). This increase in predicted seepage interception rates is primarily due to the higher RCD leakage rates used in the FY13 model. • The FY13 model predicted only a marginal reduction in the seepage interception rate for the "base case" SIS of 9 interception wells (164 L/s) compared to the FY12 model (106 L/s). This increase in predicted seepage interception rates is primarily due to the higher RCD leakage rates used in the FY13 model.	In both cases, the higher seepage interception rate is primarily from the alternate method of simulating the ponds versus the FY2012 model, as described above.
		• The FY13 model predicted only a marginal reduction in the seepage interception rates for the scenario with a cutoff wall across the RCAA sediments (Scenario B). The cross-valley cutoff wall (scenario B) may not provide a significant decrease in pumping rates but would provide additional flexibility during operation of the SIS wells, i.e. providing full capture in the case of local heterogeneity and/or preventing immediate off-site migration during temporary system failure (such as shut-down of some or all of the pumping wells).	Agreed. A cut-off wall may help eliminate risk posed by difficult-to-otherwise-capture groundwater flowing in hypothesized continuous high-hydraulic conductivity sediments, as well as temporarily holding back groundwater flow in the case of temporary well shut down
		• The FY13 model also predicted only a marginal reduction in the seepage interception rates for the scenario with a cutoff wall across the RCAA and extending south to the RCD berm and along the berm to the ID (Scenario C). This modeling result is surprising as a cutoff wall along the d/s side of the RCD along this 1km reach should significantly reduce leakage from the RCD and hence the total amount of water flowing in the RCAA to be collected and treated. The author recommends that detailed flow nets be plotted (in section) and flow budgets be extracted along the southern side of the RCAA from this modeling run to determine why the predicted seepage interception rate is not declining with a commensurate decrease in the lateral inflow from the RCD into the RCAA. • The predicted decreases in seepage rates to be extracted from the SIS for the other scenarios (providing larger extents of the cutoff wall along the RCD) appear consistent with the assumed leakage rates from the	Scenario C has a cut-off wall that only extends along the CVD Pond. The 50 USGPM reduction is consistent with estimates of leakage across this reach.

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		RCD (along the respective reaches of the RCD) and appear therefore reasonable[7]. --- [7] Note that the text descriptions and predicted seepage rates quoted for Scenarios G and H in the TM do not match the figures and tables provided with the text; these apparent errors should be corrected in the final version of the TM.	
		In summary, considering the potential importance of the ID and CVD ponds in influencing groundwater flow in the RCAA and the extraction rates for a future SIS the author recommends that the interaction of the groundwater system with the ID Pond and CVD Pond be studied in more detail. As outlined above this should include the development of a transient (monthly) water balance for these ponds, and more detailed cross-sectional modeling of the flow field in the reach between the Intermediate Pond and the CVD. The results of this 2D cross-sectional modeling should be compared to the results of the current (simplified) modeling approach used in the 3D model. If required, a more realistic representation of these ponds and/or additional model layers should be introduced in the 3D RCAA sub-model that allow a more accurate representation of the hydraulic interaction of the aquifer with the ponds and the surrounding embankment materials and underlying tailings/sludge. It is further recommended that the RCAA sub-model be developed as a stand-alone model (de-coupled from the regional model) which would facilitate local changes to the model grid (layers and cell spacing) without constraints and extra effort required for the very large regional model.	A transient water budget was developed for the ID Pond and CVD Pond as documented in the FY2015 Groundwater Flow Model Development Report. Additional studies of the CVD SIS were deferred due to re-prioritization of project focus to the NFRC Diversion Design.
Fiscal Year 2013 Water Quality Modelling Analysis Report, Faro Mine Remediation Project/Goldsim Model Revisions, March 2014			
Reviewer: Dr. Leslie Gomm, P. Eng., Ph.D. Principal Consultant, SLR Consulting (Canada) Ltd.			
1	Overall	These documents provide details on updates to the model that were made in 2013 and 2014 in including updates on how geochemical source terms from waste rock are incorporated into the model as well as changes to the RCTA model (reviewed by others). I have not specific comments on these update other than a significant amount of progression has been made on refining and improving on how the geochemical source terms are dealt with in the model.	

Appendix I
Permanent Water Treatment Plant Siting Cost Benefit Analysis

Water Treatment Plant – Plant Siting Cost Benefit Analysis
Faro Mine Remediation Project

PREPARED FOR:	Government of Yukon
PREPARED BY:	CH2M Canada Limited
DATE:	August 26, 2016
PROJECT NUMBER:	660403

Purpose

The purpose of this technical memorandum is to evaluate two siting options for the replacement water treatment plant (WTP): the Mill Area and the Gravel Pit (also known as the horse corral). These locations are presented on Figure 1 and are the areas described in *Faro WTP Design Definition – Plant Siting, Faro Mine Remediation Project* (CH2M, November 2012b).

The assessment also includes a comparative estimate of both the Mill Area and Gravel Pit WTP site pumping power costs under two scenarios. The first, seasonal WTP pumping, involves seasonal (April 15 to Oct 15) water treatment at the water treatment plant for all water sources. The second, year-round WTP pumping, involves year-round water treatment at the WTP for select water sources. Pumping power costs were expected to vary between the Mill Area and Gravel Pit sites, in part because of differences in site elevation and distances from the water source. Therefore, although the costs presented in this technical memo are not inclusive of all project costs, they provide value for comparison purposes.

Background

As part of the Government of Yukon (YG) long-term water management strategy at the Faro Mine Complex (FMC), the construction, commissioning, and implementation of a replacement WTP was deemed necessary. Under Task Authorization 013, CH2M HILL Canada Limited (CH2M) prepared a replacement WTP 90 percent design to treat a variety of water sources. Sources of water to be treated onsite included the Faro Pit, Emergency Tailings Area (ETA), Intermediate Dam (ID) Pond, and seepage collected by the Cross Valley Dam (CVD) Seepage Interception System (SIS).

Based on these sources of water, assumed flows, and other factors, a plant siting memorandum was prepared, recommending the plant site location be at the Mill Area (CH2M, November 2012b). That document compared the following three potential sites for construction of the new replacement WTP:

- Eastern end of the Rose Creek Tailings Area (BXL Site)
- Southwest of the existing mill (Mill Area)
- Gravel borrow pit downstream from the CVD (Gravel Pit site)

The Mill Area was recommended as the preferred alternative based on its comparative ranking against the other sites. The recommendation considered many factors, including suitability for the treatment process, ease and speed of construction, access and usability for site-wide care and maintenance, construction cost, and annual operating cost including the long-term cost of pumping water to the plant

location. The assessment also considered sufficient area for the placement of the plant, laydown areas for construction, and floodplain risk.

Since completion of the initial siting evaluation, better understanding of the sources of water requiring future collection and treatment suggests an increase in both the annual volume of water expected to be treated, and in particular, the annual volume to be collected and pumped from the CVD SIS, as well as the addition of new sources not known at the time of the previous siting evaluation. Given the potentially significantly higher annual pumping cost to the Mill Area, YG requested the siting evaluation be updated to re-compare the Mill Area site and the Gravel Pit site, which is located downgradient of the CVD SIS and which would have the lowest pumping requirements for all site water sources requiring treatment. The proposed locations are depicted in Figure 1.

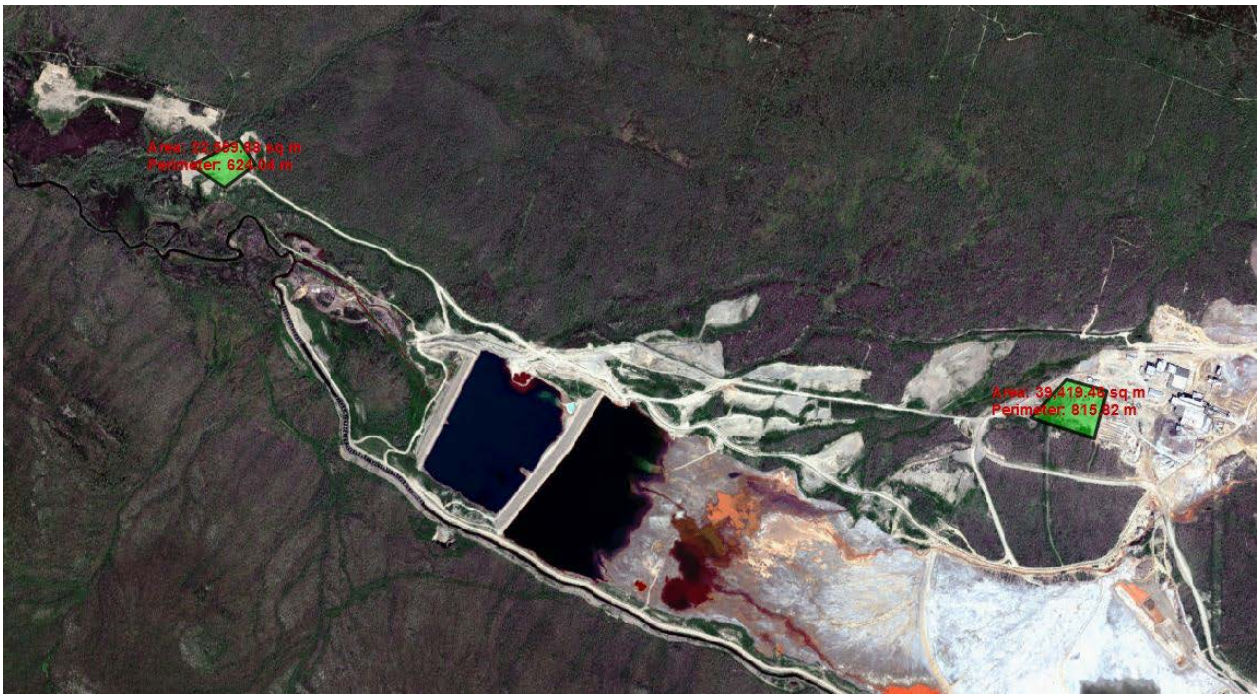


Figure 1. Water Treatment Plant Site Locations
Faro Mine Remediation Project

Description of Candidate Sites

Mill Area

The Mill Area site (Figure 2) is located to the southwest of the existing Mill Building. The site, as shown, covers approximately 39 hectares (ha). There is adequate space for the initial plant construction, with space to double the plant capacity. There is adequate space for temporary construction staging purposes, as well. The approximate elevation of the site is 1,140 metres (m) above mean sea level (amsl).

The Mill Building was a central hub of activity during the mine's operation and was converted to a temporary lime treatment facility. As such, this site has developed infrastructure, including pipelines, roads, electrical substation, communications, and parking facilities that can be reused or adapted. The construction of a WTP at this site requires the least level of infrastructure development, compared to other sites.

The proposed location is sufficiently removed from the existing buildings, so that locating a WTP at the proposed site will not pose a significant barrier to subsequent decommissioning activities that will be required for future mine closure activities.

This site provides the topographical relief necessary to implement gravity flow through the plant profile (including a lower bench for the filters) without an undue level of site regrading. It would be expected to provide the fastest and most economical implementation of a new WTP. A number of the existing shop, administration, and support building facilities can be reused for the new WTP, thereby achieving cost savings.

The site is also suitable as a long-term operations centre, within the overall site remediation strategy, with parking areas for the fleet of trucks and machines necessary for ongoing maintenance of the closed FMC. Security gates can be provided to direct vehicular traffic towards this location as the initial entry point to the FMC. Of all the potential sites, the Mill Area also has the largest available space for future expansion.

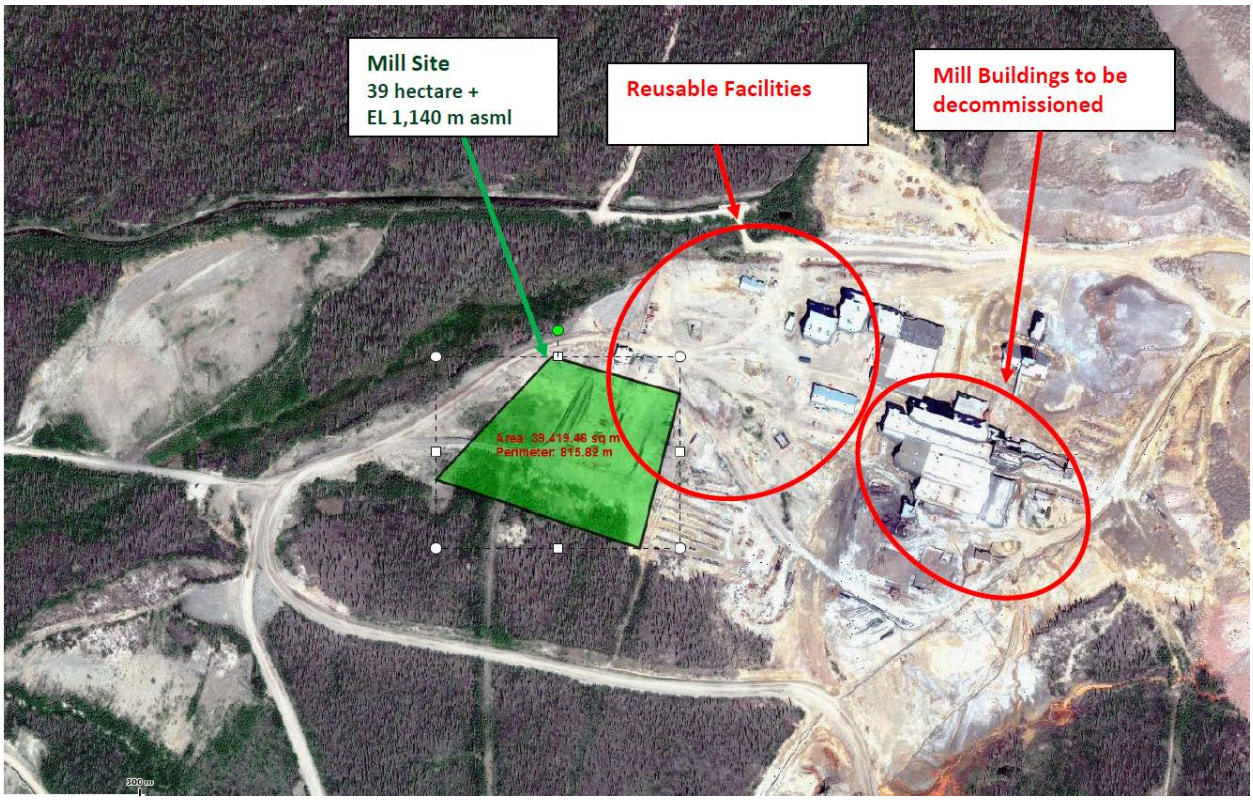


Figure 2. Mill Area Location
Faro Mine Remediation Project

Gravel Pit

The Gravel Pit site (Figure 3) (also known as the horse corrals) is the first (highest elevation) of a series of three benches (used as gravel pits), located downgradient of the CVD. The site is at an approximate elevation of 1,028 m amsl and has approximately 15 ha of available space. The available space is adequate for current needs and has provision for doubling the WTP capacity in the future (6 ha), but is constrained for construction-related space. This site is limited for further expansion without considerable grade changes.

This site is more remote than the Mill Area. It requires the highest investment in infrastructure development to support the new WTP, including influent and sludge piping, electrical power, communications, administrative facilities, water, and sewage.

While a detailed investigation was not performed, this site may also have a flood risk because of its low elevation. Visually, it appears to be some distance above the apparent high water mark of Rose Creek bottom, but there is also a smaller creek that runs by the site to the north.

This site is being evaluated because it represents the scenario for the lowest influent pumping lift and pumping energy from the ID Pond, the future North Fork Rose Creek (NFRC) Seepage Collection Pond, future CVD SIS, and potential pumping needs from the CVD Pond. This evaluation provides insight into the economic value of pumping energy savings over a long period of evaluation. Based on location, the small creek could be an effective clean water source for lime slaking.

This site has been identified in the *Faro Mine Complex Final Closure and Remediation Plan Project Description – Draft 4* (SRK, March 2010a) as a borrow area (for cap and cover activities). Clean granular fill is a relatively scarce resource. The construction of a WTP at this location would necessitate replacement of this borrow site, although considerable material could be removed and stockpiled during plant construction.

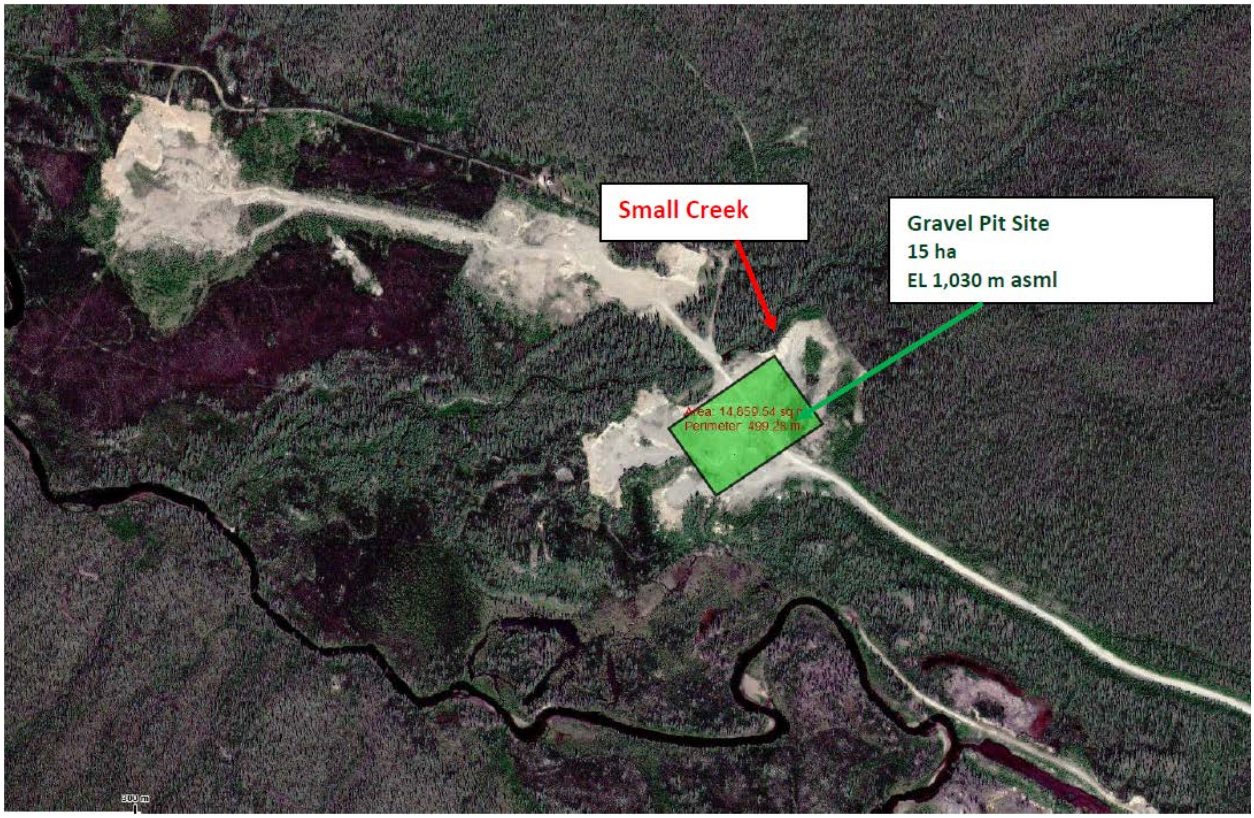


Figure 3. Gravel Pit site Location
Faro Mine Remediation Project

Water Treatment Plant Influent Sources

For purposes of this assessment, the following five water sources would be treated at the WTP, as described in Table 1: the CVD SIS, CVD Pond, ID Pond, NFRC Seepage Collection Pond, and the ETA. The locations of each of the sources of water assessed, along with flow paths to the Mill Area and the Gravel Pit sites, are shown on Figure 4 and Figure 5, respectively (dark blue path). A sixth source of water treated would come from water that recharges or drains into Faro Pit from its catchment. Once that water is pumped over the wall of the Faro Pit, gravity flow would take the water to either the Mill Area or the Gravel Pit sites; the cost to pump this sixth source of water from the Faro Pit would be the same for both sites and has been omitted from the cost benefit analysis assessment. However, water that is

pumped into Faro Pit for temporary storage would need to be pumped back out (light blue path, Figure 4 and Figure 5), incurring an additional cost. The cost of pumping this water back out was considered in this assessment as it effects seasonal versus year-round treatment differently.

For pumping to the WTP, flow rates would vary if treatment were conducted seasonally or year-round. The differences in pumping cost for seasonal or year-round treatment scenarios was assessed using the information summarized in the following bullets and in Table 1:

- **Seasonal WTP pumping** – All water sources would be pumped to the WTP for treatment from April 15 to October 15 (6 months). For the remainder of the year, the CVD SIS, ID Pond, and ETA water sources would be pumped to Faro Pit. It was assumed that water would be stored within the NFRC Seepage Collection Pond and the CVD Pond over the winter, requiring no pumping during the winter.
- **Year-round WTP pumping** - The CVD SIS, ID Pond, and ETA water sources would be pumped to the WTP for year-round treatment; the NFRC Seepage Collection Pond and CVD Pond would only be pumped for treatment from April 15 to October 15.

Table 1. WTP Influent Sources
Faro Mine Remediation Project

Source	Elevation (m amsl)	Annual Assumed Water Volume Treated (m^3)	Flow Rate during pumping season (m^3/s)	Assumed Future Treatment Demand (seasonal or year-round)	Basis
CVD SIS	1,014	5,570,958	0.177 year-round pumping to WTP	Once in operation, required to operate year-round to maintain groundwater capture.	Future water source. Flow is groundwater collected in the Rose Creek alluvial aquifer with the operating flow rate predicted by the groundwater flow model for the site.
CVD Pond	1,027.5	1,345,557	0.085 6 month pumping to WTP	Pumped from April 15 to October 15 each year.	Expected to require treatment due to contaminated seepage and need to maintain emergency storage capacity. Year-round emergency storage capacity achieved by pumping for 6 months per year. Dedicated working volume used for winter storage.
ID Pond	1,044	1,530,000	0.049 year-round pumping to WTP	Pumped year round to align to current water management plan discussions.	Current water source. Assumed pumped year-round to prevent formation of a pond on the tailings cover.
NFRC Seepage Collection Pond	1,075	615,302	0.039 6 month pumping to WTP	Pumped from April 15 to October 15 each year.	Future water source. Operating level maintained by achieving the flow rate for a period of 6 months each year. Water assumed to be drawn down in the NFRC Seepage Collection Pond and allowed to fill over winter months for subsequent drainage.
ETA	1,090	82,799	0.003	Year round pumping assumed to prevent water	Current water source.

Table 1. WTP Influent Sources
Faro Mine Remediation Project

Source	Elevation (m amsl)	Annual Assumed Water Volume Treated (m^3)	Flow Rate during pumping season (m^3/s)	Assumed Future Treatment Demand (seasonal or year-round)	Basis
			year-round pumping to WTP	from reporting to tailings area.	
Water Seasonally Stored in Faro Pit	Faro Pit Lake = 1,141 Pit Rim High Point = 1,180	3,591,879	0.228 6 month pumping	Pumped from April 15 to October 15 each year.	Total of water pumped into Faro Pit for CVD SIS, ID pond, and ETA for the 6-month period the WTP does not operate

Notes:
Elevation = mean elevation used for calculating pumping costs
m^3 = cubic metre
m^3/s = cubic metre per second

Water Conveyance

The current sources of water to be treated by the WTP include the Faro Pit, the ETA, and the ID Pond. Future sources of water to be treated include the NFRC Seepage Collection Pond, the CVD SIS, and potentially the CVD Pond. The total annual volume of water requiring treatment from these sources at the replacement WTP before the installation of waste rock and tailings covers is 9.14 million m^3. The flow rates and pumping requirements for the Mill Area and Gravel Pit sites were estimated under seasonal and year-round water treatment scenarios. For the seasonal scenario it was assumed that 3 water sources, the CVD SIS, ID Pond, and ETA, would be pumped to the WTP from April 15 to October 15 and then pumped to Faro Pit for the remainder of the year. In the year-round scenario, these same three water sources would be pumped to the WTP for treatment year-round. For both scenarios, the NFRC Seepage Collection Pond and CVD Pond would be pumped to the WTP from April 15 to October 15, and then accumulated within their impoundments over the winter months.

For seasonal pumping to the WTP for all 5 water sources, treating this volume of water would result in a flow rate of 0.580 metre per second (m/s) (9,190 gallons per minute [gpm]) to the WTP from April 15 to October 15. It should, however, be cautioned that these treatment volumes and flow rates do not include the extra water needing treatment from Faro Pit, only the volume of water sent to Faro Pit from CVD SIS, ID Pond, and ETA over the winter months that would then require treatment over the summer months. For year-round pumping to the WTP for the CVD SIS, ID Pond, and ETA, treating this volume of water would result in a treatment rate of 0.228 m/s (3,610 gpm) from October 15 to April 15, and then a treatment rate of 0.352 m/s (5,580 gpm) from April 15 to October 15 (because of the addition of the NFRC Seepage Collection Pond and CVD Pond for summer treatment). Again, these treatment rates do not include water that recharges (originates from) Faro Pit.

Once waste rock and tailings covers are installed, the volume of water requiring treatment from the ID Pond and the CVD Pond is expected to decrease somewhat. However, for the purpose of this evaluation, no decrease has been assumed. Other sources of water on the FMC that go untreated are assumed to meet the discharge limits for the site and do not require treatment before passing through the FMC.

Cross Valley Dam Seepage Interception System

A future installation includes the CVD SIS water collected downstream of the CVD that would be either seasonally conveyed to the WTP (April 15 to October 15) and up to the Faro Pit the remaining 6 months of the year or conveyed to the WTP year-round for treatment. For the purposes of this assessment, it is assumed that the pipeline from the CVD SIS would be independent from other pipelines. However, future optimizations may involve a combined pipeline with CVD Pond or ID Pond water, or both. For the combination of pipelines and water sources, assessment of backpressures and geochemical considerations would be needed.

Cross Valley Dam Pond

This assessment includes the possibility of treating water from the CVD Pond for 6 months of the year. For the purposes of this assessment, it is assumed that the pipeline from the CVD SIS would be independent from other pipelines. However, as with the CVD SIS, future optimizations may involve a combined pipeline with CVD Pond or ID Pond. For the combination of pipelines and water sources, assessment of backpressures and geochemical considerations would be needed.

Intermediate Dam Pond

For purposes of this assessment, and similar to the CVD SIS pumping scenarios, the water from the ID Pond would be conveyed to the WTP seasonally for 6 months and up to the Faro Pit for the remaining 6 months of the year. Alternately, the water could be treated year-round at the WTP. The assumption is that a pond would not be allowed to accumulate on the tailings cover. As with the previous paragraphs, for the purposes of this assessment it is assumed that the pipeline from the ID Pond would be independent from other pipelines. However, future optimizations may involve a combined pipeline with CVD Pond, ID Pond, or both, depending on assessment of backpressures and geochemical considerations.

North Fork Rose Creek Seepage Collection Pond

Part of the overall site water management strategy is to contain the seeps that emerge from the waste dumps along the NFRC with the NFRC Seepage Collection Pond. Water could be pumped either year-round or seasonally to either WTP location. For this assessment, it is assumed that water conveyed to the WTP from the NFRC Seepage Collection Pond would be conveyed independently of ETA water, but along the same route. However, future optimizations may involve a combined pipeline with other sources depending on backpressures and geochemical compatibility. Figures 4 and 5 show the assumed pipeline routing. During design, an evaluation should be performed to determine if the pipeline could be located across the tailings area near the sludge ponds to reduce pumping head.

Emergency Tailings Area

Without collection, water from the ETA flows to the RCTA. Under the procedures for a replacement WTP and for purposes of this assessment, the ETA water is assumed to be either seasonally treated or treated year-round. In the seasonal treatment scenario, for the 6 months the WTP is offline, the water would be conveyed up to the Faro Pit. For this assessment, water conveyed to the WTP from the ETA is conveyed independently of NFRC Seepage Collection Pond, but along the same route. However, future optimizations may involve a combined pipeline as for the other pipelines.

Faro Pit

The Faro Pit is the main storage location for water on the site, currently contains water from a variety of sources, and will continue to be a storage solution as part of the long-term water management plan and

strategy. For purposes of this assessment, it is assumed that water that drains into Faro Pit from its catchment would be pumped over the Faro Pit ramp high point and then drain by gravity to either the Mill Area or the Gravel Pit site. As a result, pumping costs from Faro Pit to the WTP would be identical for both sites for the catchment area water. However, additional pumping costs would be incurred to pump water originating in the CVD SIS, ID Pond, and ETA back out of Faro Pit if those three water sources are pumped to Faro Pit during the winter for the seasonal scenario described previously. It is assumed that the pipeline conveying water from the pump station to the Faro Pit ramp high point would follow the ramp similar to the existing pipeline (light blue path, Figure 4 and Figure 5).

The Hazen-Williams equation was used to calculate pump power requirements associated with the total dynamic head (TDH). Static head was based on the highest required vertical lift. Friction losses were calculated for the length of pipeline to the high point, assuming gravity flow after. The friction loss calculations also assumed individual pipelines from each water source to the WTP site; therefore, back pressure effects, precipitate formations, and other factors associated with combining pipelines were not considered and would require consideration for the pipeline routing indicated in Figures 4 and 5. Pipeline sizes were selected for a specific flow velocity range that would reduce the risk of solids settling. It should be cautioned that pressure specifications for some of the selected pipelines do not necessarily meet calculated needs, but could meet needs with design optimization such as adding booster stations and pipes in series.



Figure 4. Mill Area Water Conveyance
Faro Mine Remediation Project



Figure 5. Gravel Pit Water Conveyance
Faro Mine Remediation Project

The pipeline routes, total lengths, and pipeline length, size, and TDH used to calculate pumping power requirements are shown in Table 2 and Table 3 for the Mill Area and Gravel Pit WTP sites, respectively.

Table 2. Mill Area – Water Conveyance
Faro Mine Remediation Project

Water Source	Total Pipeline Length Along Route (Figure 4)	Pipeline Size and Length Used for Hazen-Williams	Calculated Total Dynamic Head (TDH)
CVD Pond	2,430 m of pipe to WTP alongside CVD SIS and ID Pond pipes	2,430 m of 14-inch DR 9 (200 psi)	133.7 m (to WTP)
NFRC Seepage Collection Pond	2,520 m of pipe to WTP alongside ETA pipe	2,520 m of 10-inch DR 9 (200 psi)	83.6 m (to WTP)
CVD SIS	2,570 m of pipe to WTP alongside CVD Pond and ID Pond pipes 4,170 m of pipe to Faro Pit alongside ID Pond pipe for seasonal treatment scenario	2,570 m of 18-inch DR 9 (200 psi) 4040 m of 18-inch DR 9 (200 psi) to Faro Pit for seasonal treatment scenario	151.5 m (to WTP) 252.8 m (to Faro Pit)
ID Pond	2,170 m of pipe to WTP alongside CVD Pond and CVD SIS pipes 3,770 m of pipe to Faro Pit alongside CVD SIS pipe for seasonal treatment scenario	2,170 m of 10-inch DR 9 (200 psi) 3,640 m of 10-inch DR 9 (200 psi) to Faro Pit for seasonal treatment scenario	120.0 m (to WTP) 223.0 m (to Faro Pit)
ETA	690 m of pipe to WTP alongside NFRC Seepage Collection Pond pipe 1,600 m of pipe to Faro Pit for seasonal treatment scenario	690 m of 2-inch DR 9 (200 psi) 1,470 m of 2-inch DR 9 (200 psi) to Faro Pit for seasonal treatment scenario	103.2 m (to WTP) 248.6 m (to Faro Pit)
Water Seasonally Stored in Faro Pit	580 m of pipe from Pit lake pump station to pit ramp high point for seasonal treatment scenario.	580 m of 20-inch DR 17 (125 psi) (Note: Assumes use of a dedicated pipe. A larger pipe may be used for overall pit dewatering.)	42.1 m (to pit ramp high point)

Note:

DR =dimension ratio

psi = pounds per square inch

Table 3. Gravel Pit site – Water Conveyance
Faro Mine Remediation Project

Water Source	Total Pipeline Length along Route (Figure 5)	Pipeline Size and Length Used for Hazen-Williams	Calculated Total Dynamic Head (TDH)
CVD Pond	1320 m of pipe to WTP alongside CVD SIS and ID Pond pipes	410 m of 14-inch DR 9 (200 psi)	19.9 m (to WTP)
NFRC Seepage Collection Pond	6330 m of pipe to WTP alongside ETA pipe	2100 m of 10-inch DR 9 (200 psi)	50.0 m (to WTP)
CVD SIS	1250 m of pipe to WTP alongside CVD Pond and ID Pond pipes 4340 m of pipe to Faro Pit alongside ID Pond pipe for seasonal treatment scenario	340 m of 18-inch DR 9 (200 psi) 4040 m of 20-inch DR 9 (200 psi) to Faro Pit for seasonal treatment scenario	33.5 m (to WTP) 236.9 m (to Faro Pit)
ID Pond	1740 m of pipe to WTP alongside CVD Pond and CVD SIS pipes 3770 m of pipe to Faro Pit alongside CVD SIS pipe for seasonal treatment scenario	50 m of 10-inch DR 9 (200 psi) 3640 m of 10-inch DR 9 (200 psi) to Faro Pit for seasonal treatment scenario	5.0 m (to WTP) 223.0 m (to Faro Pit)
ETA	4530 m of pipe to WTP alongside NFRC Seepage Collection Pond pipe 1600 m of pipe to Faro Pit for seasonal treatment scenario	300 m of 2-inch DR 9 (200 psi) 1470 m of 2-inch DR 9 (200 psi) to Faro Pit for seasonal treatment scenario	42.9 m (to WTP) 249.8 m (to Faro Pit)
Water Seasonally Stored in Faro Pit	580 m of pipe from Pit lake pump station to pit ramp high point for seasonal treatment scenario.	580 m of 20-inch DR 17 (125 psi) (Note: Assumes use of a dedicated pipe. A larger pipe may be used for overall pit dewatering.)	42.1 m (to pit ramp high point)

Technical Evaluation of Alternative Sites

The primary basis of evaluation was to compare the estimated extra pumping costs associated with the Mill Area site to the expected additional infrastructure costs required for the Gravel Pit site.

The secondary basis of evaluation was to assess other technical merits of each site. This was done by updating the previous technical merit evaluation (CH2M, November 2012b). CH2M ranked each of the sites on a number of technical requirements, necessary to meet the short- and long-term goals of the project. Rankings were assigned on a scale of 1 to 5, with 5 being highest. A total score was tallied for each site. The highest score represents the more favorable of the two sites. Table 4 summarizes the technical rankings of each site.

Technical Criteria

The following characteristics are desirable for the WTP location:

- Generally flat area, of sufficient size to accommodate the main process building and equipment, as well as potential expansion of the WTP or construction of a parallel WTP in the future

- Additional flat space nearby to use as a laydown area, base materials stockpile, and for other purposes during construction
- Sufficient topographical relief adjacent to the selected area to locate the filter system at a lower elevation and allow gravity flow from the thickener to the filters, and from the filters to the plant discharge pipeline
- Adequate distance from the Mill Building and other contaminated materials to avoid interference with demolition and remediation activities
- Good road access
- Convenient location for access to existing pipelines (e.g., influent lines from Faro Pit, ID Pond, and ETA and effluent line to CVD Pond and Rose Creek), electrical power, potable water, sewer system (e.g., septic tank and drain field), and other utilities, as appropriate
- Satisfactory subsurface conditions for foundations, which would not require an undue amount of work in solid rock
- Effectiveness of location as long-term operational base of the closed Faro Mine
- Low risk of site flooding and other detrimental weather-related impacts

Technical Evaluation

Table 4 summarizes the technical rankings of each site.

Table 4. Summary of Technical Ranking of Two WTP Sites
Faro Mine Remediation Project

Technical Factor	Mill Area	Gravel Pit site
Available for long-term expansion	5	3
Space for construction staging purposes	5	3
Topographical relief for gravity feed to filters	5	3
Adequate distance from existing areas that require demolition or remediation	4	4
Road and parking infrastructure	5	2
Convenient location for new pipelines and tie-in to existing pipelines	5	1
Access for electrical power	5	1
Access for potable water and sewer	3	5
Communications access	5	1
Low risk of flood	5	3
Long-term effectiveness as operational base	4	1
Total Score	**51**	**27**

Cost Evaluation

Additional Infrastructure Costs

For purposes of this assessment, it is assumed that all water sources described in this memo are available for treatment at the time the water treatment plant is commissioned. It is presumed that this timeline is at some point into the future, at the end of the useful or required life of the Interim Water Treatment System.

If the Gravel Pit site were to be chosen for the WTP, there would be additional infrastructure costs relative to the Mill Area. According to *Faro WTP Design Definition – Plant Siting, Faro Mine Remediation Project* (CH2M, November 2012b), these costs have been estimated to be within the range of $4 million to $6 million and include the following:

- A detailed site investigation and site preparation
- Additional influent pipelines from the Mill Area to Gravel Pit site
- Additional sludge pipe from the Gravel Pit site to the Mill Area
- An upgrade to road services and parking (approximately 3.65 kilometers [km] of road from the Mill Area to the Gravel Pit site)
- Construction and installation of electrical power and communications lines (approximately 3.65 km to nearest utilities at Mill Area)
- Construction of a security gate, because of the current uncontrolled access to this location more remote location of the Gravel Pit site
- Installation of a septic field
- Construction of an administrative area at the Gravel Pit site

Pumping Costs

The pumping costs for the two sites were analyzed and compared in the following two separate scenarios of treatment frequency:

1. Seasonal WTP operation for 6 months of the year (April 15 to October 15)
2. Year-round WTP operation

Pumping Cost Assumptions

The pumping cost analysis was prepared based on establishing assumptions related to the annual pumping rates, TDH calculations, and electricity costs. The following assumptions were made:

- Combined pump and motor efficiency of 75 percent
- Minor losses (fittings, valves, etc.) used a K value of 4
- Friction losses used a C factor of 130
- The replacement WTP comes online when the CVD SIS becomes operational, at which time the NFRC Seepage Collection Pond system is already operational
- TDH used to calculate electricity costs for pumping accounted for the highest elevation along the pipeline length as well as friction and minor losses
- Tables 2 and 3 list TDH values used in energy cost calculations

- Assumed electricity cost of $0.23/kilowatt-hour
- Costs were only for water to be treated from the 5 water sources and did not include the cost to pump sludge to Faro Pit

Seasonal Operation Pumping Costs

Seasonal operation of the WTP would likely vary each year, depending on breakup of the ice, freshet, and the onset of freezing conditions each fall. For purposes of this long-term assessment, a typical pumping and treatment season is assumed to be 6 months annually, from April 15 to October 15 of each year.

As mentioned in the water conveyance section, there are three water sources that are expected to be pumped year-round for treatment or storage: the CVD SIS, ID Pond, and ETA. When not being treated at the WTP under a seasonal (April 15 to Oct 15) WTP operating scenario, the water would be pumped up to Faro Pit over the winter for future seasonal treatment. The CVD pond may need to be pumped year-round depending on emergency storage requirements. However, for this analysis it was assumed that the CVD pond would be pumped seasonally using a portion of the pond for over-winter storage.

Table 5 provides a summary of the calculated costs for a seasonally operated WTP, where all 5 water sources would be pumped to the WTP during the warmer summer months (April 15 to October 15). For the winter months the CVD SIS, ID Pond, and ETA would be pumped to Faro Pit for over-winter storage.

Table 5. Seasonal Pumping Costs by Water Source
Faro Mine Remediation Project

Water Source	Seasonal Mill Area Pumping Costs[a]	Seasonal Gravel Pit site Pumping Costs[a]
CVD Pond	$124,000	$24,000
NFRC Seepage Collection Pond	$35,000	$27,000
CVD SIS	$967,000	$834,000
ID Pond	$227,000	$167,000
ETA	$10,000	$9,000
Pump Seasonally Stored Water Back Out of Faro Pit[b]	$126,000	$126,000
Total	$1,489,000	$1,188,000

Notes:

[a]Costs rounded to nearest $1,000
[b]Consists of CVD SIS, ID Pond, and ETA water stored for 6 months in Faro Pit

Year-round Operation Pumping Costs

The year-round operation of the WTP includes treatment of water 12 months of the year from the CVD SIS, ID Pond, and ETA. Two water sources, the CVD Pond and NFRC Seepage Collection Pond, would be treated 6 months (April 15 to Oct 15) of the year and left to accumulate water for the remainder of the year. Tables 6 provides a summary of the year-round pumping cost.

Table 6. Year-round Pumping Costs by Water Source
Faro Mine Remediation Project

Water Source	Annual Mill Area Pumping Costs	Annual Gravel Pit site Pumping Costs
CVD Pond	$161,000	$24,000
NFRC Seepage Collection Pond	$35,000	$27,000
CVD SIS	$905,000	$83,000
ID Pond	$82,000	$3,000
ETA	$3,000	$2,000
Total	$1,186,000	$139,000

Pumping Cost Net Present Value Evaluation

The net present value (NPV) was calculated using annual estimated pumping costs over a 10- to 100-year period. The federal interest rate schedule (Government of Canada, 2016) was used to select semi-annual interest rates, which were converted to an effective annual rate and used to estimate variable rates for the first 25 years that the WTP is online. After the first 25 years, a fixed rate of 4.04 percent annually was considered until year 100. The NPVs for both the Mill Site and the Gravel Pit site under the two different scenarios can be found in Table 7 for 10, 15, 25, 50, and 100 years from the point when the WTP is online, which was considered time zero for the NPV calculations.

Table 7. NPV of Pumping Costs
Faro Mine Remediation Project

	Annual Mill Area WTP NPV		Annual Gravel Pit site WTP NPV	
Evaluation Period (years)	Seasonal ($ million)	Year-Round ($ million)	Seasonal ($ million)	Year-Round ($ million)
10	$13.3	$10.6	$10.6	$1.2
15	$17.7	$14.1	$14.1	$1.7
25	$23.2	$18.5	$18.5	$2.2
50	$31.8	$25.3	$25.3	$3.0
100	$36.2	$28.8	$28.8	$3.4

As shown in Table 7, the NPV of pumping costs associated with the year-round scenario at the Gravel Pit site is lower than both the seasonal and year-round scenarios at the Mill Site and the seasonal scenario at the Gravel Pit site. The year-round Gravel Pit WTP scenario is approximately 12 percent of the cost of the year-round Mill Area WTP scenario, which amounts to an estimated cost savings of $16.3 million for a 25-year period and $25.4 million over a 100-year operating period. The cost savings are expected to be substantially higher than the additional infrastructure requirements for siting the WTP at the Gravel Pit site (estimated at $4 to $6 million).

The seasonal pumping scenarios at both the Mill Area site and the Gravel Pit site are more costly than the year-round scenarios because of (1) the increased TDH up to Faro Pit for 6 months of the year and (2) the need to pump the stored water back out of the pit. The additional costs associated with

constructing year-round versus seasonal pipelines have not been assessed, but are expected to be significantly less than the savings obtained from year-round pumping.

Future Design Considerations

Costs were developed for comparative purposes only. Additional considerations and optimizations that are required for pump and pipeline sizing during design, include the following:

- Collection of more information pertaining to the water and sludge streams (e.g., chemistry, density, particle size distribution of solids) to determine pump type and sizing requirements
- Investigation of pump brands and types that would be optimal for high TDHs and the application
- Investigation of the need for booster stations or pumps in series to overcome TDH and to lower the pressure
- Consideration of local suppliers for pumps and pipelines, if available, to facilitate acquisition of spare parts and service support
- Optimization of pipeline routing and sizing
- Pipeline free-draining and insulation requirements
- Consideration of start-up and shut-down efficiencies, pressures, minimum and maximum expected flowrates, surge propagation, optimization of velocities to prevent settling, and cleanout
- Consideration of a back-up system for water storage during WTP down-time

Gravel Pit site Operating Costs

Operating the Gravel Pit site as the WTP will involve additional infrastructure and construction costs compared to the Mill Area site. Further, there would be additional costs to operate a WTP at the Gravel Pit site compared to the Mill Area site, including items such as road maintenance, snow clearing, and powerline maintenance.

These additional operating costs are considered to be somewhat incidental to the entire annual operating budget for the FMC, and are expected to be much less than the estimated annual pumping savings. These additional operating costs will be somewhat offset by the lower operating costs associated with the simpler site-wide conveyance system which makes better use of gravity. Therefore, no specific estimates have been prepared for these operating costs in this evaluation.

Conclusion and Recommendation

The Gravel Pit Site allows better use of gravity flow than the Mill Area site, especially if year-round treatment is conducted. If seasonal treatment is conducted, the resulting power savings associated with the Gravel Pit site are less significant, and may not be sufficient to appreciably offset the higher additional construction cost for that location.

The primary large difference in pumping costs between the two sites, in comparison to the previous Cost-Benefit Analysis (CH2M, November 2012b), is the increased flow expected from the CVD SIS, the new water source coming from the NFRC Seepage Collection Pond, and the potential requirement to treat water from the CVD Pond. These water sources have elevations resulting in a significantly higher TDH to the Mill Area site than to the Gravel Pit Site. The largest difference in cost stems from the CVD SIS, which is anticipated to require the movement of about 5.6 million m^3 of water annually.

There are technical and physical limitations (area for construction and within the potential flood plain, among others) to the Gravel Pit Site compared to the Mill Area site. The Mill Area provides the most technically suitable location for the WTP, with the lowest cost infrastructure, largest site size for future expansion, the safest location against flood risk, and a good centralized location for long-term operation. However, the significantly lower pumping costs associated with the Gravel Pit Site are expected to readily offset the likely lower initial capital cost of the Mill Area Site if treatment is conducted year-round.

It is recommended that the Gravel Pit site be considered for the location of the Permanent WTP, and that this cost-benefit analysis be revisited in the future when more is known of long-term water sources requiring collection and treatment. A flood plain assessment is also recommended for the Gravel Pit site before moving forward with additional investigation and assessment of its location as a viable location for the WTP.

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Appendix J
Seismic Stability Analyses of Selected Dams for the FMRP

FINAL

Seismic Stability Analyses of Selected Dams for the Faro Mine Remediation Project

Prepared for

Government of Yukon and the Government of Canada as represented by Indigenous and Northern Affairs Canada

August 2016

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Acronyms and Abbreviations

%	percent
1-D	one-dimensional
2-D	two-dimensional
amsl	above mean sea level
BPT	Becker Penetration Test
CDA	Canadian Dam Association
CH2M	CH2M HILL Canada Limited
CL	centreline
cm	centimetre(s)
cm/yr	centimeter(s) per year
CPT	cone penetration test
CSR	cyclic stress ratio
CVD	Cross Valley Dam
ELSD	East Limb of the Secondary Dam
FMC	Faro Mine Complex
g	acceleration because of gravity (9.81 metres per second squared [m/s^2])
G_{max}	low-strain shear modulus
GMPE	ground-motion prediction equation
Golder	Golder Associates (Ltd.)
GPS	global positioning system
GSC	Geological Survey of Canada
H:V	horizontal to vertical
Hz	Hertz
ID	Intermediate Dam
INAC	Indigenous and Northern Affairs Canada
Ka	thousand years ago
KCB	Klohn Crippen Berger Consultants
KCC	Klohn Crippen Consultants
km	kilometre(s)
kN/m^3	kilonewton(s) per cubic metre
kPa	kilopascal(s)
LPT	large penetration test
m	metre(s)

m/s	metre(s) per second
MASW	multichannel analysis of surface waves
MC	Mohr-Coulomb
ML	sandy silt
mm	millimetre(s)
mm/year	millimetre(s) per year
NBCC	National Building Code of Canada
NEHRP	National Earthquake Hazard Reduction Program
No.	number
PGA	peak ground acceleration
PI	plasticity index
PSHA	probabilistic seismic hazard analysis
RCTA	Rose Creek Tailings Area
Ru	pore pressure ratio
SCPT	seismic cone penetration test
SPT	standard penetration test
s_{ur}/σ'_{vo}	residual shear strength ratio
USCS	Unified Soil Classification System
V_s	shear wave velocity
wc/LL	water content/liquid limit ratio
YG	Government of Yukon

SECTION 1

Introduction

1.1 Overview of 2016 Seismic Studies

Analyses were conducted by CH2M HILL Canada Limited (CH2M) to evaluate seismic stability of two existing dams within the Rose Creek Tailings Area (RCTA) of the Faro Mine Complex (FMC). These analyses were conducted to meet requirements within Canadian Dam Association (CDA) Safety Guidelines (CDA, 2007, as revised in 2013) and the requests by the Government of Yukon (YG).

The analyses involved two-dimensional (2-D), nonlinear effective stress modelling of the dams to determine the potential for embankment slope movement, and included the potential effects of pore-water pressure build-up and liquefaction on these movements. Earthquake time histories developed by Atkinson and Assatourians (April 2013) were used as a basis for the analyses. Results from the analyses were used to evaluate the magnitude of ground deformation that could occur during a 1-in-10,000-year seismic event.

These seismic stability analyses were conducted in accordance with YG Task Authorization TA020-2015-010.

1.2 Background

This section provides background for the project, including a description of the overall facility, the background for seismic stability concerns, and a brief summary of previous seismic analyses. Additional discussions of the previous seismic stability analyses are provided in Section 1.4 of this report.

1.2.1 Overall Facility Description

The RCTA is located within the Rose Creek Valley of the FMC, as shown on Figure 1-1. The RCTA contains approximately 28.6 million cubic metres of flotation-derived process tailings deposited between 1969 and 1998. The tailings are contained by engineered earthfill dams, which include (beginning from downstream) the Intermediate Dam (ID), Secondary Dam, and the Original Dam. The Secondary Dam has two sections: the West Limb that separates the secondary and intermediate tailings areas, and the East Limb (the ELSD) that runs parallel to the Rose Creek Diversion.

In addition to the tailings dam, the Cross Valley Dam (CVD), located downgradient of the ID, retains a polishing pond that has been used to settle out solids contained in the water treatment plant discharges and achieve water quality requirements, before discharge to Rose Creek.

An aerial photo of the dams is shown on Figure 1-2.

1.2.2 2002 Dam Safety Review

In 2002, KCC performed dam safety reviews for several dams in the Faro Mine Complex, including the CVD. Under the 1999 Canadian Dam Associations (CDA) guidelines, the CVD was assigned a *very high hazard* classification, based upon the consequences of breaching. This was the highest classification that a dam could receive, requiring a dam to be evaluated for the Probable Maximum Flood (PMF) and Maximum Credible Earthquake (MCE) scenario, which is considered the 1-in-10,000 year event in the CDA guidelines.

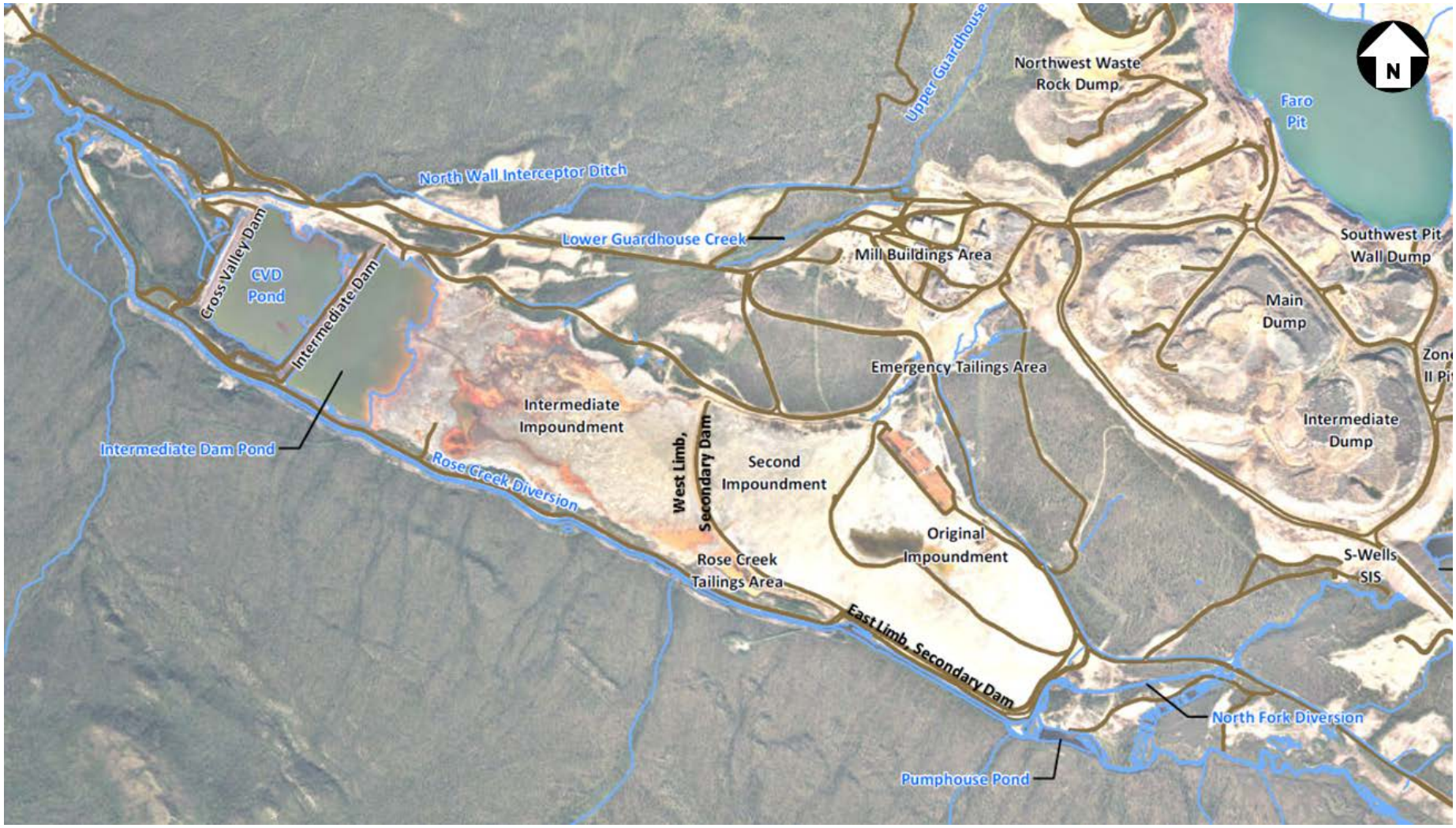


Figure 1-1. Site Plan of the Faro Mine Complex and the Rose Creek Tailings Area
Faro Mine Remediation Project

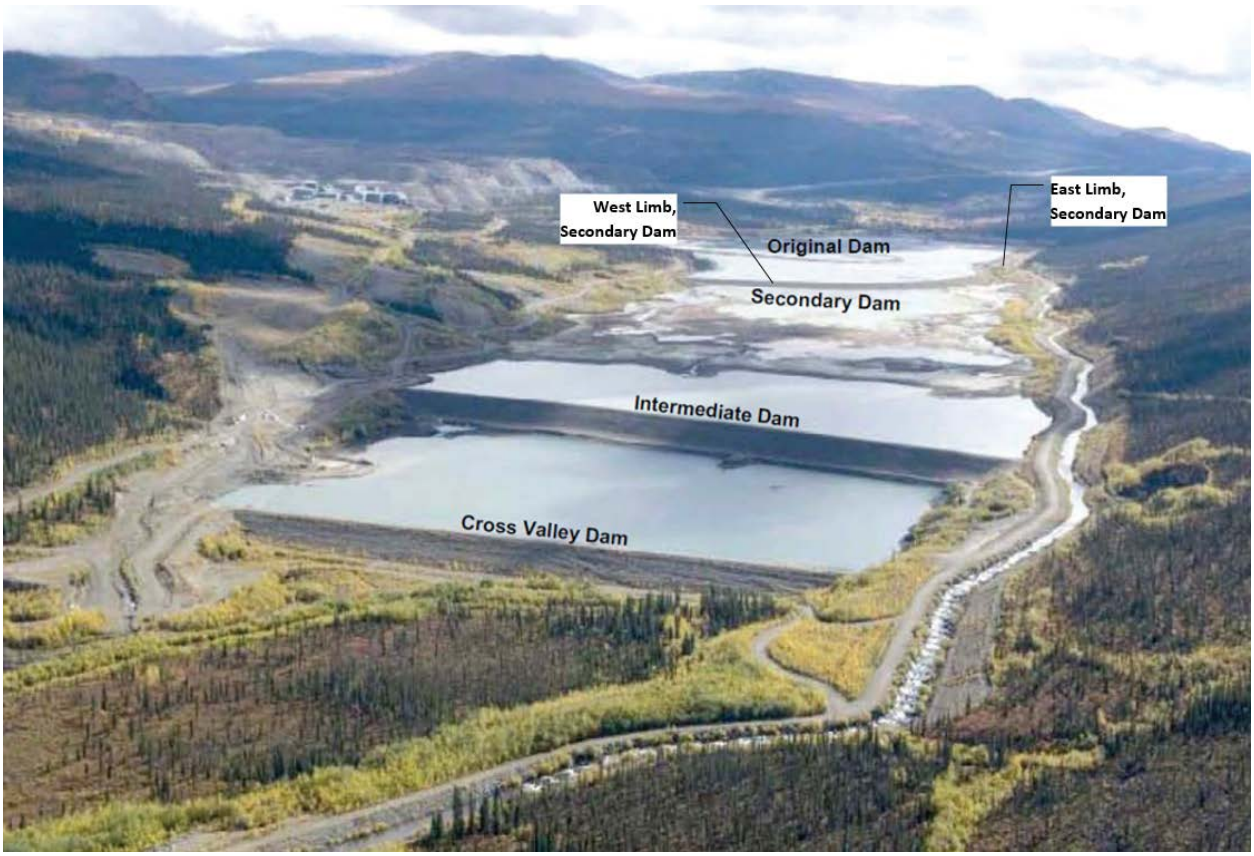


Figure 1-2. Aerial Photos of Dams in the Rose Creeks Tailings Area
Faro Mine Remediation Project

1.2.3 Seismic Stability Concerns

Following the dam safety review (KCC, 2002), seismic stability studies were performed by Golder (June 2004) and KCC (March 2006; June 2006), in which the ID, Secondary Dam, and the CVD were evaluated for seismic loading associated with the 1-in-10,000-year earthquake event. The results of these assessments indicated that the dams are generally stable under the seismic design loading conditions (1-in-10,000-year earthquake), except for the CVD and the ELSD. In both cases, the dams were identified as potentially susceptible to slope failure and breaching because of liquefaction within the foundation soils under the design ground motions identified by Atkinson (May 2004). To reduce the potential of foundation failure from liquefaction, KCC (June 2006) suggested mitigation measures for both the CVD and ELSD.

The ID was not identified by KCC as having liquefiable soils within the foundation, and it was concluded that a breach because of seismic loading was unlikely. The West Limb of the Secondary dam was identified by KCC (March 2006) as having about 7 metres (m) of liquefiable soil within the foundation, but would be unstable only if the downstream tailings were removed as a part of the closure process. KCC found that the eastern section of the ELSD required remediation.

The Original Dam was not included in the seismic stability assessment as it is nearly buried with tailings, with an approximate 1.5 m tailings surface differential between the original and secondary tailings area (Golder, June 2004).

1.2.4 Geometry and Site Conditions for CVD and ELSD

The CVD was constructed as part of the Down Valley Project in the early 1980s, a project to expand the tailings disposal capacity in the Rose Creek Valley. The height of the dam is about 18 m above the original grade. The dam section contains a central, nearly impervious core, supported by upstream and downstream granular shells at slopes of 2 horizontal (H) to 1 vertical (V). The core and downstream shell are separated by a chimney drain that connects to a blanket drain, directing seepage to drain out the downstream toe.

The ELSD is a relatively low retention dike that was constructed between 1974 and 1975 as part of the Secondary Dam, parallel to the southern Rose Creek Valley. The total height of the ELSD is about 10 m above the original grade. The dam section was constructed of compacted fill at slopes of 2H:1V. A cross section of the dam is presented in Section 3.3.1 in this report.

The CVD and ELSD are founded on saturated granular alluvial, glacio-alluvial, and Pleistocene sediments. The primary seismic stability concern is that ground shaking within the loose, saturated, granular sediments could lead to liquefaction, potentially triggering a failure within the earth dams, either through the foundation materials or within the embankments. Such failure could lead to a dam breach, resulting in flooding and impacting the water quality to fish, wildlife, and recreation downstream.

1.2.5 Updated Ground Motions and Seismic Hazard Review

Following the 2004 seismic hazard assessment by Atkinson, additional studies were performed to better characterize the Tintina Fault and to better define the level of shaking that this fault is capable of generating. In 2013, Atkinson and Assatourians made an update of the seismic hazard assessment for the FMC in which the ground shaking levels for the FMC were lower than the 2004 values. For the 1-in-10,000-year event, the site-adjusted peak ground acceleration (PGA) from the 2004 study was reported as 0.56g, where g is the acceleration because of gravity (9.81 metres per second squared [m/s^2]), whereas the PGA for Site Class C conditions for the FMC is reported to be 0.30 g based upon the more recent study (Atkinson and Assatourians, April 2013).

The CDA updated their dam safety guidelines in 2007, and added revisions in 2013 (CDA, 2007 as revised in 2013). In 2015, WorleyParsons Canada Services Ltd. (WorleyParsons, March 2015) performed a dam safety review of several dams in the RCTA, including the CVD. In their assessment, they classified the CVD as a high hazard dam under the CDA Guidelines, where high hazard classification was now the midpoint in the hazard classification range with extreme hazard as the highest classification. The high hazard classification requires that the dam be stable under an earthquake design ground motion (EDGM) associated with a 1-in-2,500-year earthquake event. Despite this requirement, the evaluations in this report have been performed for an earthquake with a frequency of exceedance of 1 in 10,000 years, as explained in the next section.

1.3 Purpose and Scope

Given the change in the design seismic ground motions at the site, a re-evaluation of the seismic stability of both the CVD and ELSD was performed for the final closure using the updated ground motions from Atkinson and Assatourians (April 2013). Other major dams of the RCTA, including the West Limb of the Secondary Dam and the ID, were found to be stable under the higher 2004 ground motions, and therefore were not re-evaluated. Only the CVD and ELSD were identified as requiring mitigation in 2006 and were re-evaluated herein to determine the effects of the lower ground motions.

The CH2M scope of work consisted of the following tasks:

- Reviewing previous seismic studies and original construction drawings at the FMC, previous geotechnical studies of the CVD and ELSD, and existing seismic design criteria for the tailings dams.

- Describing the geotechnical conditions at the site, including geology, seismicity, lithology, and groundwater.
- Developing the subsurface profiles and properties for the foundation of the CVD and the ELSD.
- Using one-dimensional (1-D) site-response analyses and 2-D limit equilibrium stability evaluations to perform a simplified screening analyses, which involved the following:
  - Performing an initial liquefaction evaluation for both dams using simplified methods
  - Evaluating the dam performance by conducting a dynamic analysis and seismic stability evaluation with unimproved soil
  - Evaluating strategies previously identified by KCC (June 2006) to mitigate zones of liquefaction and improve seismic performance
- Performing 2-D site response evaluations using advanced methods of analyses to evaluate the seismic response of the CVD and ELSD in terms of transient and permanent ground motions. The advance methods of analyses involved use of the computer program FLAC [Fast Lagrangian Analysis of Continua] (Itasca, 2012) for both the CVD and ELSD, using the interpreted profiles. These evaluations included developing design criteria, ground motions, and dynamic soil properties required for the 2-D site response analyses of the CVD and the ELSD. These analyses were coupled analyses of site-response, pore-pressure generation and liquefaction, and embankment performance that did not rely on simplified screening analysis results.
- Summarizing the analyses in this geotechnical report.

The approach in using both the simplified analyses and the more advanced numerical analyses, and how these tools were combined in a comprehensive evaluation process is illustrated in the flowchart in Figure 1-3. In meetings with the YG, Indigenous and Northern Affairs Canada, and the Independent Peer Review Panel, it was agreed that the dams should be designed to pass the Probable Maximum Flood (PMF) and to withstand seismic loading consistent with a Maximum Credible Earthquake (MCE), based on the significant potential for very severe environmental consequences in case of an uncontrolled release of tailings. This corresponds to an *extreme* hazard classification. Based on revisions to the CDA Guidelines published in 2013, a dam with an *extreme* hazard classification must be evaluated for an earthquake with a frequency of exceedance of 1 in 10,000 years.

Based on this understanding, the evaluations in this report have been performed using an earthquake with a frequency of exceedance of 1 in 10,000 years.

1.4 Review of Previous Analyses

In earlier phases of the FMC closure process, several geotechnical studies and analyses were performed for the ELSD and the CVD. Figures 1-4 and 1-5 present the locations of previous explorations performed at the CVD and the ELSD, respectively, including borings at the ELSD performed by CH2M. Figure 1-6 shows locations of borings performed in the vicinity of the CVD for the CVD seepage interception system (SIS) system. The explorations shown on the figures were used in support of the seismic stability analyses conducted by CH2M.

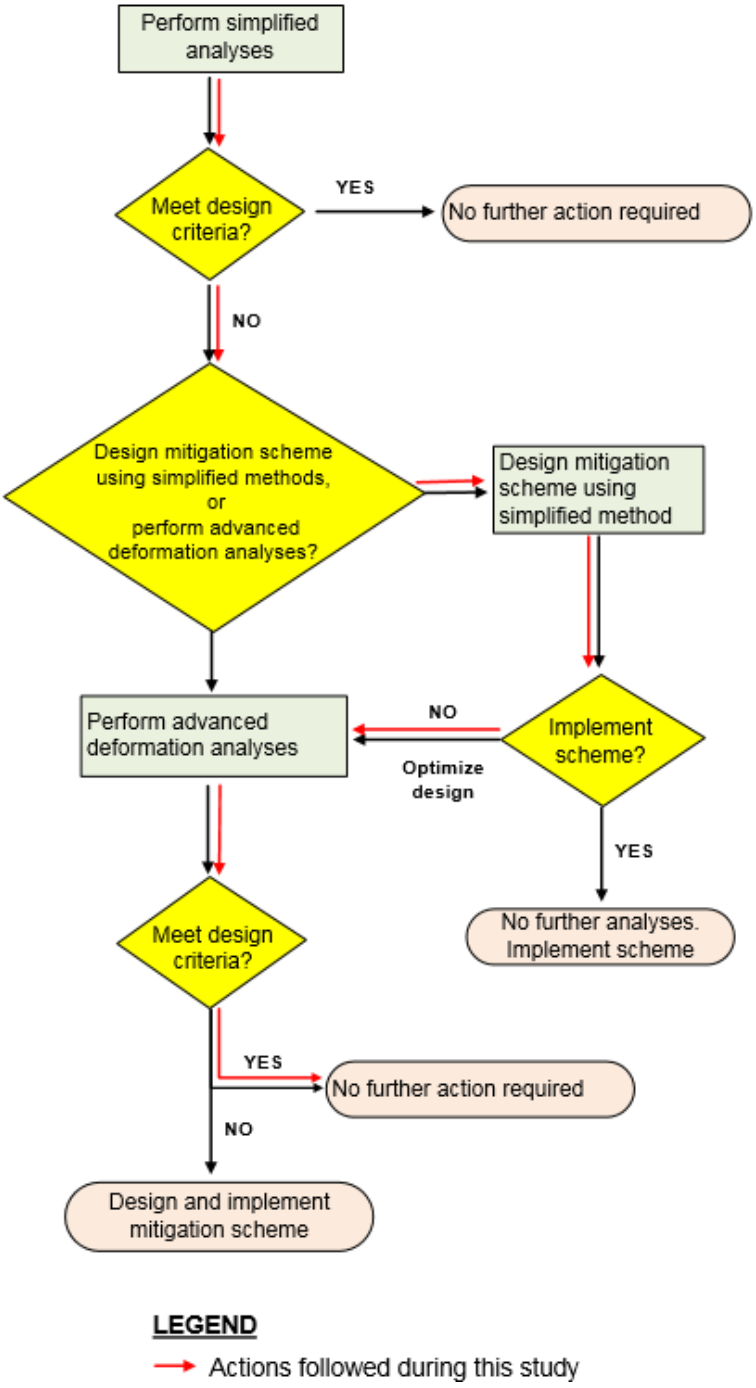


Figure 1-3. Flow Chart Showing Use of Both Simplified and Advanced Deformation Analyses to Evaluate Seismic Stability
Faro Mine Remediation Project

1.4.1 Golder Associates, 2004

Golder Associates (Golder) performed a site characterization and seismic stability assessment of the RCTA in 2004. Cone penetration test (CPT) soundings were performed to characterize the tailings deposition pattern and to assess liquefaction susceptibility of the tailings material. A total of 36 CPT soundings were advanced through the tailings, with five of the CPT soundings involving seismic CPT (SCPT) profiling to measure in situ shear wave velocity (V_s). A key concern brought up in the study by Golder was the behaviour of the fine tailings slime during an earthquake (Golder, June 2004). These fine tailings were found to be liquefiable under the design ground motions at the time (based on Atkinson,

May 2004), with a high potential for subsequent flow slides where located on sloping ground or associated with an unsupported free face.

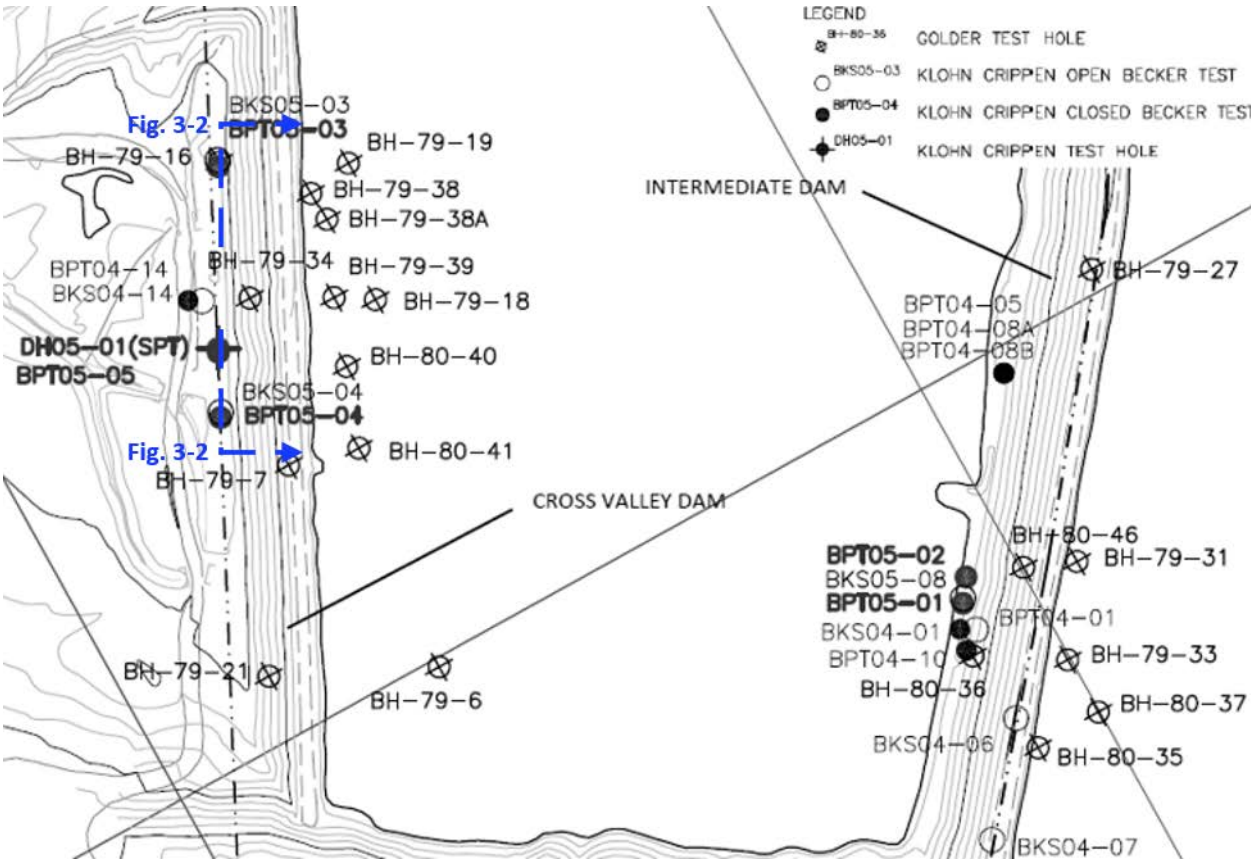


Figure 1-4. Previous Explorations at the Cross Valley Dam (adapted from KCC, June 2006)
Faro Mine Remediation Project

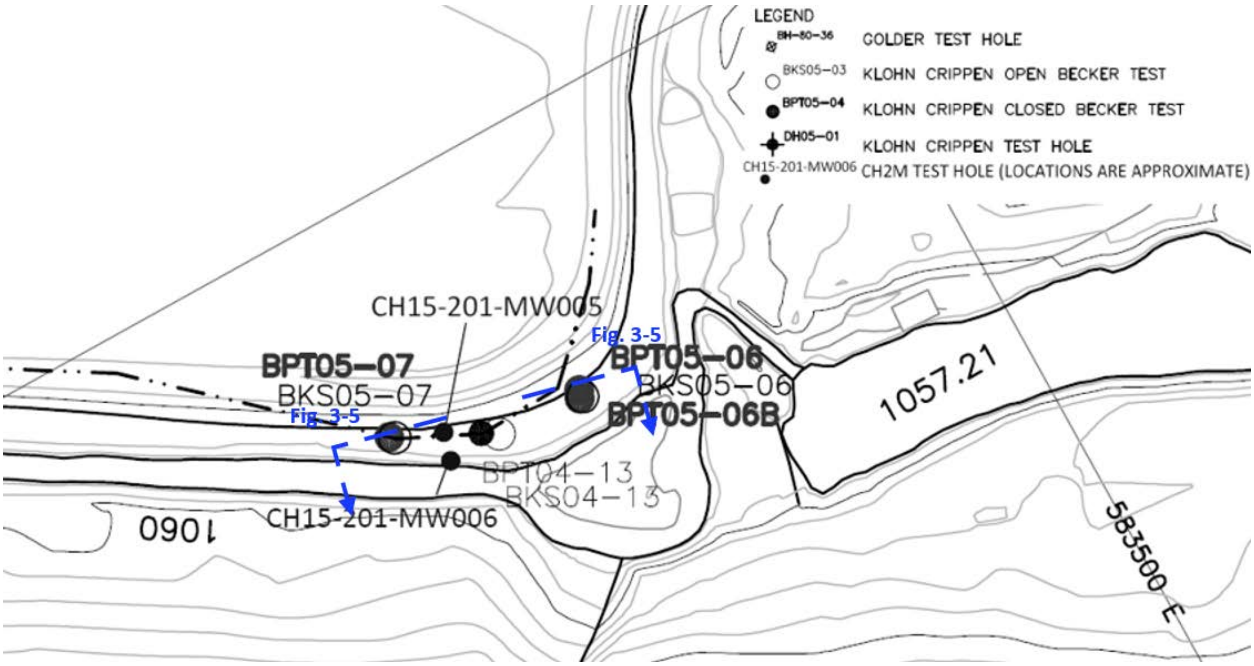


Figure 1-5. Explorations at the East Limb of the Secondary Dam (adapted from KCC, June 2006)
Faro Mine Remediation Project

1.4.2 Klohn Crippen Consultants, 2006

KCC performed a seismic stability analysis for all the dams within the RCTA, including the ID and Secondary Dam (West Limb and East Limb), and summarized their findings in the *Rose Creek Tailings Impoundment Seismic Stability Assessment – Intermediate and Secondary Dams* report (KCC, March 2006). As part of their analysis, KCC advanced 14 borings using the Becker Penetration Test (BPT) method to assess the density and sample the sand and gravel material, with four of the borings advanced along the ELSD.

Both closed- and open-ended BPTs were conducted during the KCC program. A closed end BPT used to assess penetrations is denoted by "BPT" and open-end BPT used for sampling is denoted as "BKS." KCC would typically advance both BPT and BKS borings adjacent to each other. During this in situ testing, the diesel hammer for the Becker hammer misfired routinely within several borings, leading to uncertainty in the energy measurements and overall results. Further work was recommended to verify the findings at the ELSD.

Seismic stability analyses were performed for a 1-in-10,000-year seismic event, the design ground motion at the time for a *very high* hazard dam under CDA (1999). Their analysis identified that ELSD was situated on a layer of loose, saturated sands within the foundation soils that was susceptible to liquefaction. Given the possible strength loss associated with liquefaction, this created a high potential for embankment failure and breaching. KCC proposed a conceptual remediation design in their report for the ELSD that involved in situ densification of the loose sands along the downstream half of the dam, mitigating their high susceptibility to liquefaction (KCC, March 2006).

In a June 2006 addendum to their earlier report, KCC evaluated the CVD's seismic stability analysis, and addressed the recommended additional work that was discussed in the previous report for the ELSD. A total of three borings were advanced along the CVD, including BPT and standard penetration test (SPT) methods, and two borings along the ELSD. No investigation was performed along the upstream slope of the CVD. It was assumed in the analysis that the foundation soils within the upstream slope were similar to those observed in the boreholes located along the downstream slope. In their findings, KCC reported that some of the foundation soils of the CVD was susceptible to liquefaction resulting from a 1-in-10,000-year seismic event; this could lead to flow sliding along both the upstream and downstream slopes. Remediation strategies were evaluated, including a toe berm and densification of potentially liquefiable soils. The earlier recommendations for the ELSD were also validated in this study.

1.4.3 CH2M HILL Canada Limited, 2012-2015

1.4.3.1 Seismic Stability Analysis of the East Limb of Secondary Dam

CH2M performed a seismic stability analysis for the ELSD in 2013. A summary of the analysis can be found in the *Seismic Stability Analysis, Secondary Dam – East Limb, Faro Mine Complex* technical memorandum (CH2M, October 2013d). This analysis was completed in conjunction with development of an Interim Works Project Proposal describing closure activities that would provide interim protection at the site until a site-wide closure plan could be developed and approved by regulatory agencies. For the purposes of the interim closure period, the analysis evaluated the liquefaction potential and slope stability of the ELSD based upon an earthquake with return period of 1 in 500 years.

A simplified liquefaction analysis was carried out following the procedure by Youd et al. (2001), but modified to account for the BPTs, performed by KCC (March 2006; June 2006). The analysis incorporated the updated seismic hazard values presented by Atkinson and Assatourians (April 2013). Results of the simplified analyses showed that for a 1-in-500-year earthquake event, liquefaction is not anticipated within the foundation soils of the ELSD, and that the ELSD embankment would remain stable even with liquefied tailings upstream of the dam. This conclusion was consistent with the 2004 Golder findings.

1.4.3.2 Field Investigation for Cross Valley Dam Seepage Interception System

In 2012 and 2013, CH2M performed site investigations downstream of the CVD for the support of the design of an SIS (CH2M, March 2013g and February 2014q). The CVD SIS is designed to intercept contaminated groundwater flowing through the tailings and both the alluvial and weathered bedrock units. The purpose of the investigation was to collect the geological and hydrological data to support the design of the SIS that will collect groundwater passing through the Rose Creek Alluvial Aquifer. The 2012 field investigation (CH2M, March 2013g) included the installation of six new monitoring wells along the downstream toe of the CVD along the proposed CVD SIS alignment. Two additional monitoring wells were installed and developed within Rose Creek as well. Sonic drilling was performed, equipped with a SPT sampler, for the in situ testing and sampling of the overburden soils. Soil samples were collected in each of the borings for geochemical and geotechnical properties. The borings advanced during the 2012 field investigation are shown in Figure 1-6.

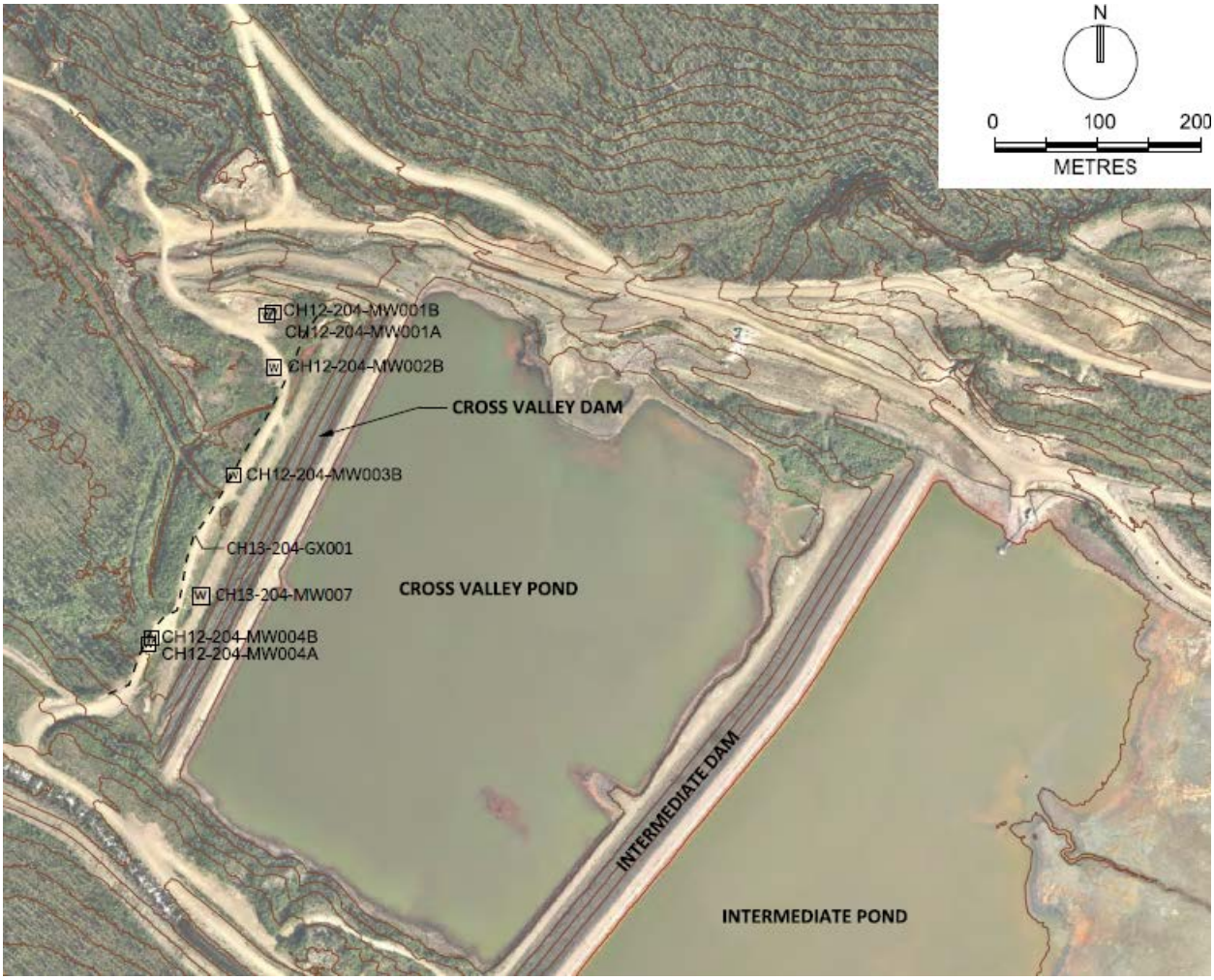


Figure 1-6. Boring Locations for the Design of the CVD SIS System (CH2M, February 2014q)
Faro Mine Remediation Project

In the 2012 study (CH2M, March 2013f), it was found that alluvium varied in thickness from 30 to 43 m, with overburden thickness increasing from north to south. During the study, groundwater was typically encountered within 1 to 2 m of the surface. Blowcounts from the SPT in situ testing were collected in the upper 26 m of each boring. Generally, blowcounts collected in the upper 20 m of the boring profiles indicated loose to dense alluvium layers, and then becoming dense to very dense when deeper than 20 m. Underlying the alluvium was weathered bedrock, with zones ranging from 2 to 15 m thick, before transitioning to dark green phyllite.

In 2013, an additional boring and a geophysical survey were performed along the proposed CVD SIS alignment along the downstream toe of the CVD (CH2M, February 2014q). The geophysical survey included short-dipole resistivity, ground penetrating radar, seismic reflection and seismic refraction surveys along a 450-m line to estimate the thickness of weathered bedrock above competent bedrock, distinguish layers of high and low permeability soil and rock, and to estimate the depth and variation in groundwater. The geotechnical boring (CH13-204-MW007) was advanced along the southern half of the CVD where the 2012 field investigation identified a deeper alluvium zone. Collected data indicate that the upper few meters of the soil profile is very loose to loose, then becoming medium dense to very dense with depth. The alluvium layer continues to approximately 51 m below the ground surface then transitions to weathered bedrock.

The interpreted subsurface profile from the 2012 and 2013 geotechnical borings and the 2013 geophysical survey provided a similar profile to that presented by KCC (June 2006) at the CVD. The CH2M data, including soil type and density, were used to validate the subsurface interpretations made by KCC (June 2006). However, in the absence of soil consistency measurements (i.e., SPT and Becker hammer testing) within the deeper zones of the soil profile, interpretation of subsurface conditions depended more on the KCC (June 2006) data.

1.4.3.3 Field Investigation for New Side Channel and Side Channel Dike

CH2M conducted a geotechnical investigation in 2014 along the Rose Creek Diversion and Rose Creek Diversion dike, as summarized in the *Summary of 2014 Field Investigation – Construct New Side Channel and Side Channel Dike* technical memorandum (CH2M, March 2015z). The side channel will be situated adjacent the Rose Creek Diversion in the tailings area between the Secondary Dam and ID. Borings and CPT soundings were advanced within the Intermediate Tailings Area and laboratory testing was performed on selected samples. CPT soundings included SCPT profiling and pore-water pressure dissipation tests. This information was obtained to supplement data obtained from the 2004 Golder study.

1.4.3.4 Additional Field Investigation for East Limb of Secondary Dam

In 2015, CH2M conducted additional geotechnical exploration work, advancing several additional borings and geophysical surveys along the Rose Creek diversion, located on the downstream berm of the ELSD. Downhole shear wave velocity (V_s) testing was performed in the six borings, extending to a typical depth of 10 m below the ground surface. Geophysical surveys included resistivity, seismic refraction, and surface wave surveys. A full report of the geophysical work is presented by Frontier Geosciences, Inc. (September 2015), with the full exploration program provided in CH2M (March 2016b). Data from the exploration program were used in the analyses presented herein. The location of these borings and seismic survey are shown on Figure 1-4.

1.5 Design Criteria

The design criteria for the seismic analysis are based upon the CDA Dam Safety Guidelines (CDA, 2007 as revised in 2013). The acceptable minimum factors of safety for slope stability in seismic analyses are presented in Table 1-1. Note that these required minimum factors of safety were not updated in the 2013 revisions and are irrespective of dam hazard classification.

Table 1-1. Factors of Safety for Slope Stability – Seismic Assessment
Faro Mine Remediation Project

Loading Condition	Minimum Factor of Safety
Pseudo-static	1.0
Post-Seismic	1.2 – 1.3

Source: CDA, 2007 as revised in 2013

For large dams subjected to seismic loading, CDA (2007, as revised in 2013) states that it is usually more appropriate to use more sophisticated methods of analysis, such as numerical finite-element models to assess stress, strain, and displacements. The simplified seismic stability analyses using the limit-equilibrium method can serve as a screening tool, but the dynamic analyses should be relied upon to better predict the performance of the dam under seismic loading. Following the standard of practice, the CDA recommends that the dynamic analyses should include an assessment of the following failure mechanisms:

- Slope instability leading to overtopping
- Permanent deformation leading to overtopping
- Fissuring or cracking leading to internal erosion failure
- Liquefaction (both triggering and post-liquefaction stability conditions)

For the purpose of this study the following acceptable performance criteria were adopted:

Cross Valley Dam Acceptable Performance Criteria:

1. Vertical crest displacement less than 1.7 m, which for the purposes of this study was assumed to be the applicable freeboard defined as the "minimal vertical distance between the maximum still pool level reservoir level and the crest of the containing structure" by the CDA guidelines (CDA, 2007 as revised in 2013). In this case the dam core is considered to be the containing structure. This is consistent with the CDA guidelines requirement that steady or quasi-steady state water levels (i.e., excluding waves) should not exceed the top of the impervious core including the condition after dam crest settlement because of the design earthquake. The design crest elevation of the CVD is 1,033.5, but the low point from a 2003 survey was 1,032.7 m (nhc, November 2006). For purposes of slope stability computations, the crest elevation is assumed to be 1,034 m, consistent with the value used in the KCC reports (March 2006, June 2006). The top of the core is only about 1,032.5 m (KCB, February 2014), with the spillway crest elevation at about 1,030.8 m (KCB, February 2014) resulting in about 1.7 m of applicable freeboard. Note that the normal maximum operating pond level is 1,030.3 m, which is 2.2 m below the top of the core, so the assumption of an applicable freeboard of 1.7 m for a full reservoir elevation is considered to be conservative.
2. Horizontal displacement less than half of the thickness of the chimney filter/drain (2 m), such that it can be assumed that the drains will still have a capacity of at least 50 percent of the pre-earthquake drain capacity.

East Limb of Secondary Dam Acceptable Performance Criteria:

1. Vertical crest displacement less than 1.5 m, which is approximately 75 percent of the vertical distance of 2.0 m between the secondary tailings surface elevation and the ELSD dam crest elevation.
2. Horizontal displacement of less than 2 m, somewhat arbitrarily selected to reduce the likelihood of significant crack formation. In this case there is no internal drainage system, but the potential for internal erosion and piping is also considered to be a lesser concern for the tailings dam given that the water levels in the tailings are a few metres below the tailings surface and it would generally be less vulnerable to excessive seepage through defects as compared to a water-retention structure.

1.6 Limitations

This report has been prepared for the exclusive use of YG and the Government of Canada as represented by Indigenous and Northern Affairs Canada, and of CH2M, for specific application to the CVD and ELSD at the FMC, Yukon, Canada. It has been prepared based on generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from available published literature, and on data obtained from subsurface explorations and laboratory testing. Exploration data indicate soil conditions and water levels only at specific locations at times, and only to the depths penetrated. Subsurface conditions and water levels at other locations may differ from conditions occurring at these explored locations. In addition, the passage of time may result in a change in conditions at these locations. Some of the information provided is based upon interpretation, and reflects the opinion of the engineer for the specific evaluation presented herein. Any use of *interpreted* information for other purposes could lead to erroneous assumptions and faulty conclusions.

The methods used to estimate levels of earthquake ground shaking given in this report are based on work conducted by scientists and engineers involved in earthquake studies. The nature of this work is such that uncertainties exist in the predictive methods and results. Whereas an effort has been made during this project to account for these uncertainties in the estimation of ground motions with currently available methods, higher levels of ground shaking could occur. The profession's understanding of earthquake ground motions continues to evolve and, as a result, the basis of the recommendations given in this report could change in the future. These changes could necessitate reconsideration of the recommendations provided in this report.

CH2M is not responsible for any claims, damages, or liability associated with the interpretation of recommendations provided in this report without CH2M's express written authorization.

SECTION 2

Site Conditions

2.1 Geology

2.1.1 Regional Geology

Yukon lies within the northern Canadian Cordillera, a tectonically and seismically active region, extending from a terrane collision zone on the continental margin to an active fold and thrust belt at the eastern mountain front. In Yukon interior, the two major geological components are separated primarily by the northwest trending right-lateral Tintina Fault Zone (circa 60 to 10 Million years ago [Ma]). A regional geology map is provided in Figure 2-1.

Geophysical data presented by Lowe et al. (1994) show that the Tintina Fault Zone separates two regions with distinct physical properties: a relatively homogeneous region to the northeast and a more heterogeneous region to the southwest. The northeasterly region is composed of a thick, older sequence of sedimentary rocks (Miogeocline) that was deposited on the western margin of the stable paleo-North American continental margin from the Mid-Proterozoic Era until the Early Jurassic Era (Lowe et al., 1994; Wheeler et al., 1991). The region southwest of the Tintina Fault Zone comprises several younger, litho-tectonic terranes of varying rock types that amalgamated and accreted to the stable sedimentary package.

The miogeoclinal assemblage to the northeast were deposited from the mid-Proterozoic through the early Jurassic Era (1,250 to 190 Ma) and are dominantly limestone and sandstone formed on the stable submerged continental shelf off the western edge of the ancient North American continent. Shale, sandstone, and chert accumulated in adjacent basins (e.g., Selwyn Basin deposits). Fringing, parautochthonous terranes (e.g., Cassiar and Kootenay terranes) are also considered to be part of the miogeoclinal assemblage (Colpron et al., 2007).

To the southwest of the Tintina Fault Zone, the geology consists of a mosaic of accreted and fault-separated amalgamated terranes that are different from one other, as well as the rocks of the ancient North America. Geological evidence further suggests that several of these terranes may have amalgamated with each other before their accretion to ancient North America. Major geological terranes south of the Tintina Fault Zone include the late Devonian to mid-Permian (circa 365 to 270 Ma) Yukon-Tanana Terrane (YTT), which comprises a metamorphosed continental arc assemblage, the Stikinia Terrane (a Late Triassic to Mid-Jurassic magmatic arc assemblage), and the Missippian to late Triassic Cache Creek oceanic assemblage (Lowe et al., 1994). These Intermontane terranes are thought to represent one interrelated set of arcs, marginal seas, and continental fragments that once formed a Paleozoic to early Mesozoic fringe to North America (Colpron et al., 2007).

Regionally, the Tintina Fault Zone can be mapped for over 1,000 kilometres (km), trending northwest from Watson Lake on the Yukon/British Columbia border to its termination into a series of splay faults in the Yukon Flats area of Alaska (Snyder et al., 2005). In the central Yukon area, a bimodal volcanic suite (circa 50 to 60 Ma) occurring within the miogeoclinal assemblage was emplaced as a continuous igneous province and is currently found both north of the Tintina Fault Zone near Ross River and south of the fault zone near Dawson area. The estimated cumulative right-lateral displacement, based on the offset of this assemblage and other terranes (such as the YTT and Cassiar terrane), is approximately 425 km (Snyder et al., 2005).

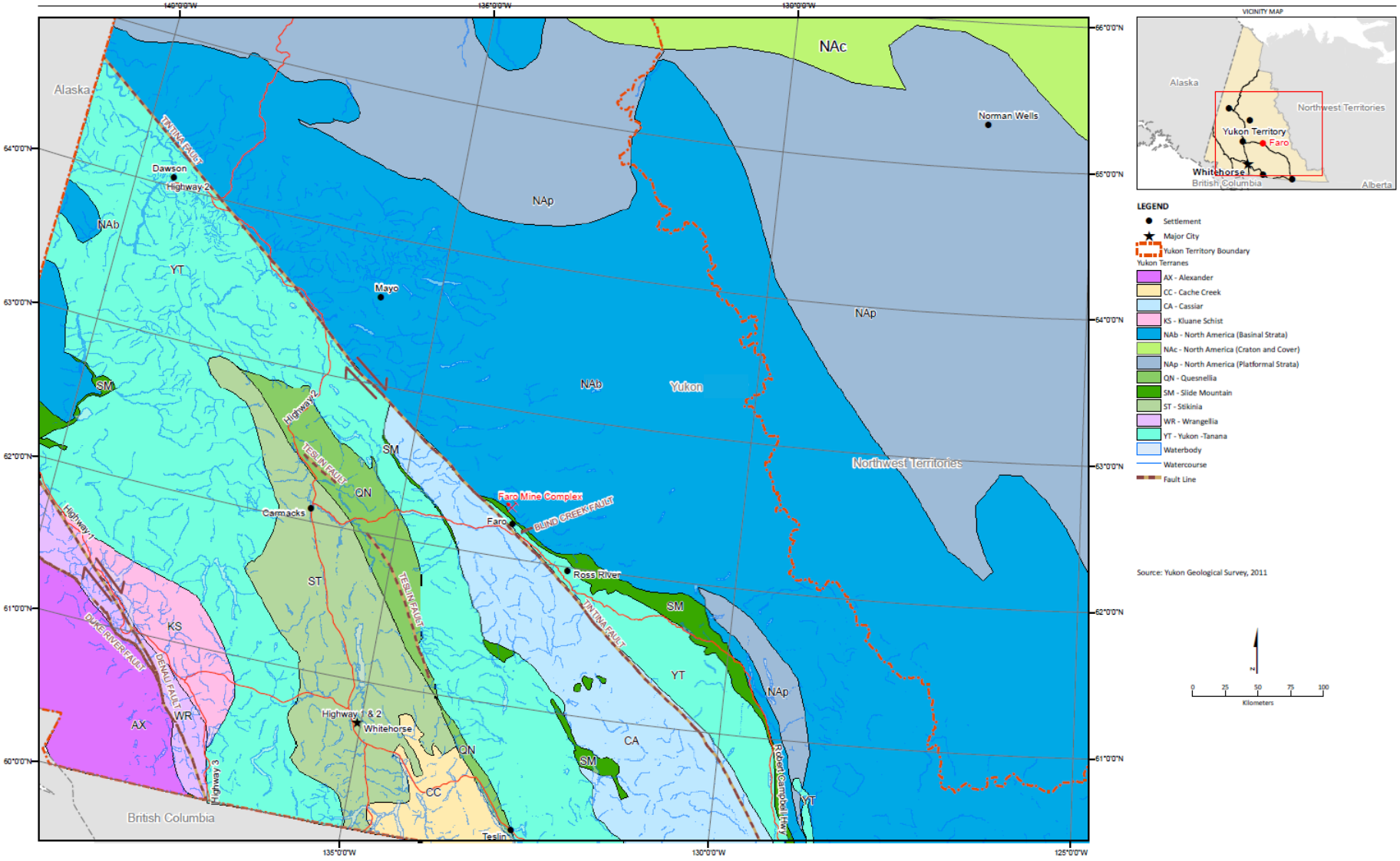


Figure 2-1. Regional Geology Map of Yukon
Faro Mine Remediation Project

2.1.2 Local Geology

The region's physiography is dominated by the northwest trending Tintina Fault Zone (Figure 2-2), which coincides with a linear valley that is structurally a trans-tensional graben. At the latitude of the Anvil Range, the valley is occupied by the northwest flowing Pelly River. A number of rivers cross the Tintina Fault Zone without significant lateral displacement (Snyder et al., 2005). Rose Mountain (elevation 1,985 metres above sea level [masl]) is the highest point of the Rose Mountains, a ridge of resistant basalt, parallel to and immediately northeast of the Tintina Valley. The Anvil Range is a northwest elongate, alpine mountain complex northeast of the Tintina Trench. Mount Mye (elevation 2,061 masl) is the local summit of the Anvil Range in the area of the FMC ore deposits.

Overburden materials consist of thin, discontinuous deposits of glacial till and glacio-fluvial deposits. Important exceptions are a buried valley filled with up to 70 m of overburden over the subcrop of the Grum deposit and a ridge of highly compacted till up to 40 m thick overlying the Vangorda deposit (RGC, November 1996). Thick till and fluvial deposits also occur in the Rose Creek, the west fork of Vangorda Creek, and in the Blind Creek valleys.

The bedrock stratigraphy of the Anvil District consists of a structurally thickened sequence of late Precambrian to upper Paleozoic poly-deformed, poly-metamorphosed, metasedimentary and metavolcanic schists and phyllites (Jennings and Jilson, 1986) of the miogeoclinal assemblage. As mentioned, the Anvil Batholith, a major northwest trending Cretaceous granitic body, is the central feature of the district and forms the core of the Anvil Arch. The degree of metamorphism within sedimentary and volcanic strata range from moderate (schist) to low (phyllite). The lower part of the sequence, Silurian aged and earlier, as represented primarily by the Mount Mye and Vangorda Formations, is the most important with respect to the FMC site geology. A higher degree of metamorphism is generally observed near the Anvil Batholith contact. The strata of the metamorphic sequence dip northeast and southwest, away from the Anvil Batholith. The FMC occurs on the southern flank of Anvil Arch and consists of three (Faro, Grum, and Vangorda) of the five stratiform lead/zinc/silver- bearing massive sulphide ore bodies that occur in the Cambrian phyllites or schists of the metamorphic sequence.

Southwest of the Tintina Fault Zone, near Ross River (approximately 60 km southeast of the FMC), sedimentary rocks of the Cassiar Terrane associated with miogeoclinal appear to be present (Snyder et al., 2005). The 2004 report by Smith (WMC, 2004) also indicated that a sedimentary terrane with a continental shelf affinity is present for about 100 km southwest of Faro, before being truncated by the Semenoff Fault.

2.1.3 Subsurface Conditions at the Rose Creek Tailings Area

Within the RCTA, the original terrain was relatively flat before the tailings deposition with terrace sands and gravels that were used as the primary borrow fill source for the construction of the dams. A longitudinal section along the CVD and the ELSD crests indicate the foundation of these dams are underlain by the unconsolidated Rose Creek sediments developed on Pleistocene sand, gravel, glacial till, and bedrock.

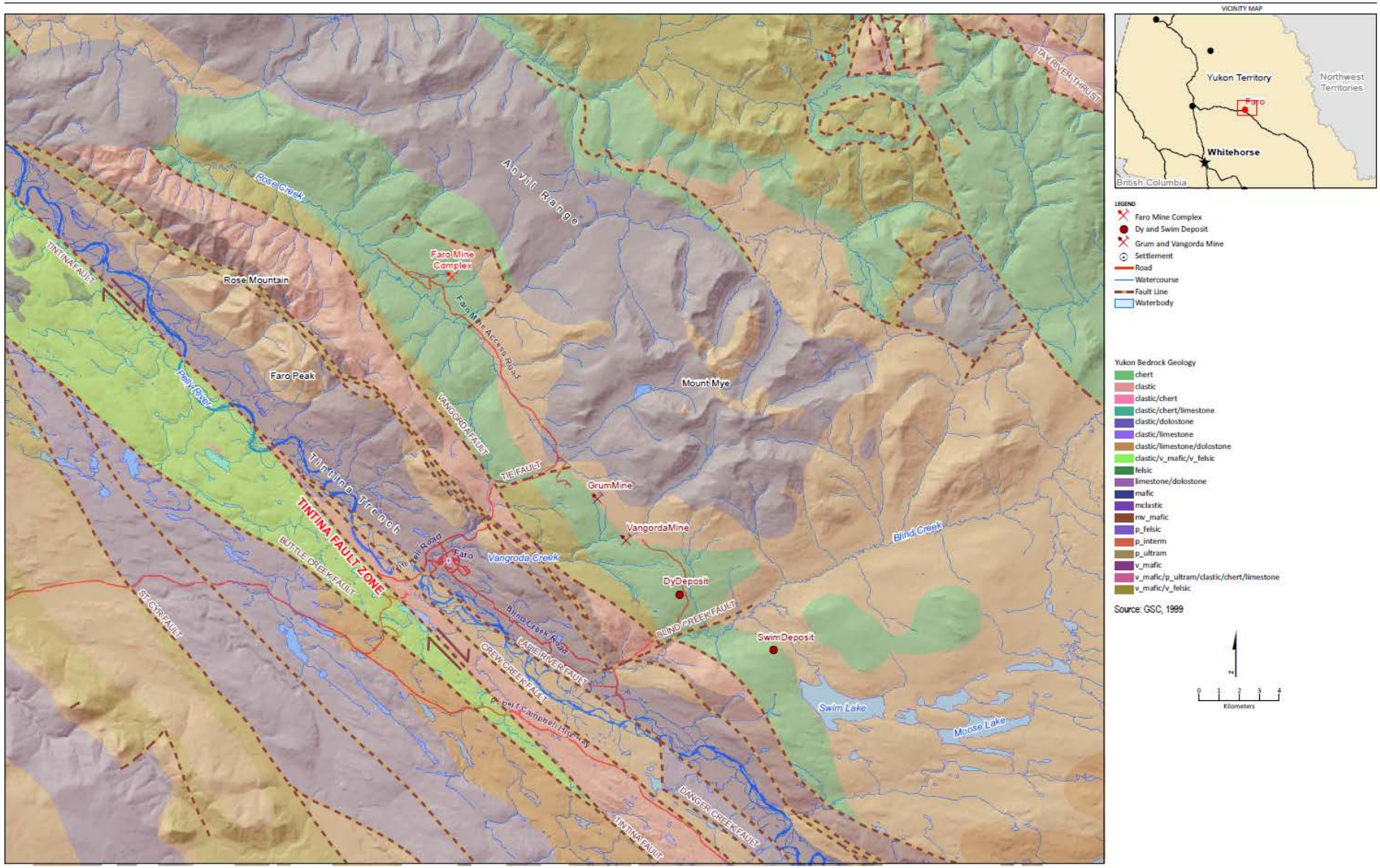


Figure 2-2. Faro Mine Complex Bedrock Geology
Faro Mine Remediation Project

The unconsolidated Rose Creek sediments are Holocene deposits made in flood-plain channels. The Rose Creek sediments has extremely erratic distribution, and composed of wide range of material of different particle sizes with great variation in thickness and horizontal extent. The color of these sediments is usually yellowish-brown. Based on the three BPT explorations drilled at the CVD (BPT05-03, BPT05-04, and BPT05-05), Rose Creek sediments are clearly divided into an upper and lower soil zones. The composition of the two soil zones is very similar and generally composed of sands, gravels, and silt layers; however, the upper zone soil layers are characterized by higher relative density than the soil layers in the lower zone.

Comparisons between the original boreholes drilled in the late 1970s at the CVD and 2005 boreholes suggest that the upper zone originally contained loose and soft soils which appear to have been removed and replaced with compacted fill or densified during the construction of the dams. The thickness of the upper zone ranges between 2 and 4.5 m, and the depth of the lower zone ranges between 14.5 and 18.5 m below the natural ground surface. Between these zones exists denser alluvium material. Estimates for the amount of gravel in the coarser grained soil of the Rose Creek sediments ranges up to 43 percent, while the amount of fines ranges between 9 and 30 percent. Atterberg limits for the finer grained soil show liquid limit of about 30 percent and plastic limit of about 21 percent.

Based on the three BPT explorations drilled at the ELSD, BKS04-13, BPT05-06, and BPT05-07, Rose Creek sediments have similar characteristics to those at the CVD; however, the thickness of the upper zone ranges between 3 and 4 m, and the depth of the lower zone ranges between 11 and 14 m below the natural ground surface. Between these two zones the material consists of denser, coarser alluvial deposits.

Typical native soils at the FMC consist of thin discontinuous deposits of glacial till and glaciofluvial deposits overlying phyllitic and schistose bedrock. A geotechnical exploration conducted by CH2M in 2012 at the site of the proposed water treatment plant classified the location as a Class C site (very dense soil and soft rock) (CH2M, September 2012b).

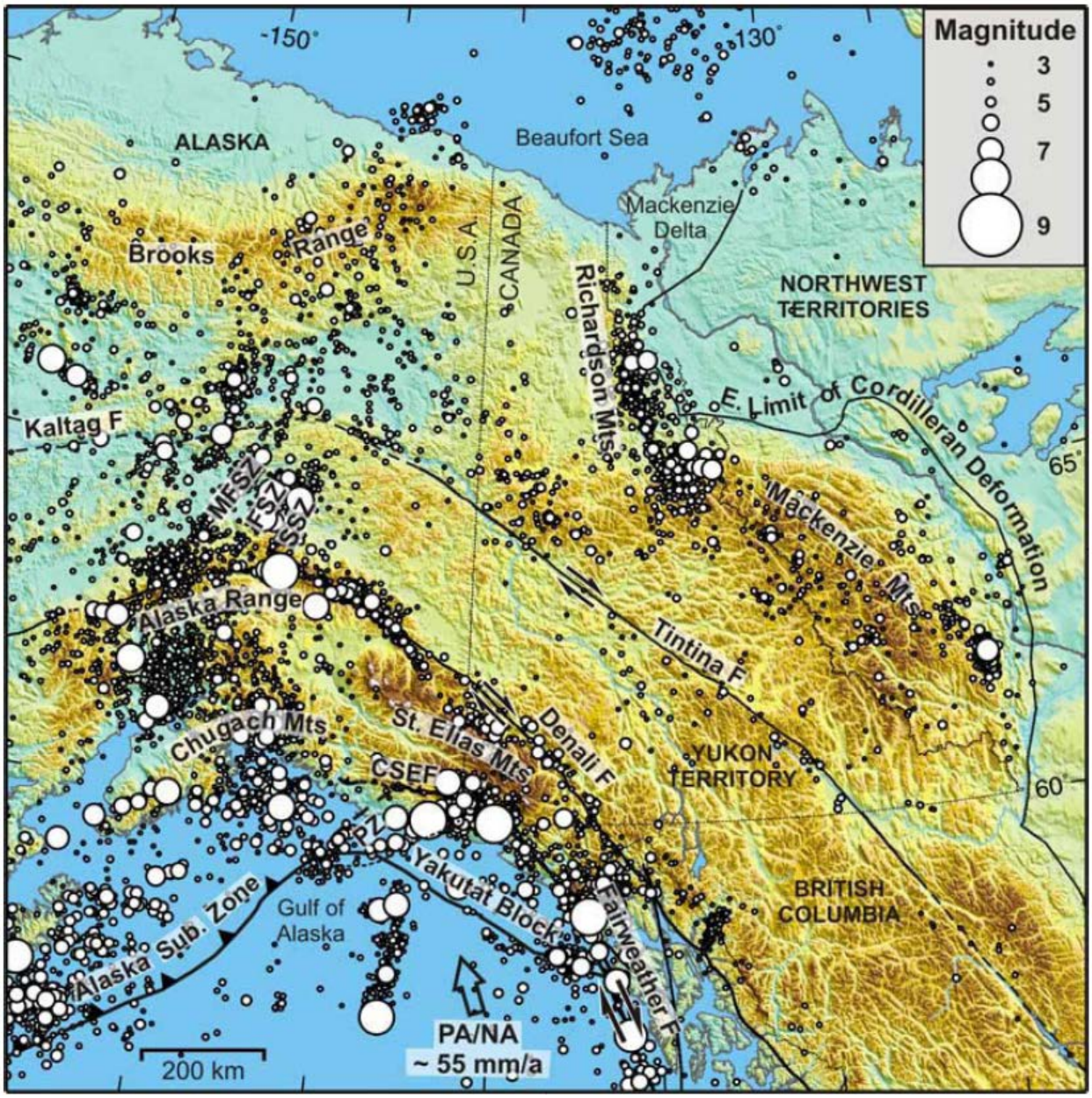
2.2 Seismicity and Earthquake Hazard

2.2.1 Regional Seismicity

Figure 2-3 illustrates the relationship between regional tectonics and seismicity recorded between 1899 and 2004. The distribution of seismicity is the most important indicator of the current pattern of crustal deformation. Earthquake mechanisms provide constraints on faulting and stress directions. The most seismically active region is in the region of the collision of the Yakutat Block in the corner of the Gulf of Alaska. The area of the plate margin has experienced many large earthquakes, including a sequence of three earthquakes of magnitude 7.4 to 8.0 in 1899 and a magnitude 7.9 earthquake in 1958. There is a very intense concentration of seismicity in the region of the collision of the Yakutat Block in the corner of the Gulf of Alaska (Figure 2-3).

The seismicity decreases to the east of the collision zone (Figure 2-3). The most significant inland seismicity occurs along segments of the Denali Fault Zone, where the seismicity rate is an order of magnitude lower than that in the coastal region. The Denali Fault is a transpressive right-lateral strike-slip fault. The region between the Denali and Tintina systems is relatively aseismic through the central part of the northern Cordillera, with relatively few and small earthquakes (Hyndman et al., 2005a).

To the east there is minor seismicity in the central part of the northern Cordillera, including a small concentration along the strike-slip Tintina Fault Zone. There appears to be a small concentration of epicentres aligned along the Tintina Fault Zone; however, these are all very small earthquakes (less than magnitude 5), and most of the activity is at the northern end, close to the Alaskan border (Cassidy et al., 2005). This suggests that this geological fault structure remains a zone of weakness.



Source: Leonard et al., 2007. Reproduced by permission of American Geophysical Union, 2012.
White circles are earthquakes M≥3, between 1899–2004. Alaskan events with depths >25 km are excluded.
PA/NA: Pacific plate motion relative to North America plate; CSEF: Chugach–St. Elias fault system; PZ: Pamplona zone; MFSZ, FSZ, and SSZ: Minto Flats, Fairbanks, and Salcha seismic zones, respectively.

Figure 2-3. Regional Tectonics and Seismicity
Faro Mine Remediation Project

Farther inland, the earthquake activity increases strongly from 600 to 800 km northeast of the Yakutat collision zone near the Cordilleran eastern mountain front. This fold and thrust belt seismicity is concentrated in two areas: the MacKenzie-Ogilvie Mountains region and the Richardson Mountains region (Hyndman et al., 2005a). The largest earthquake recorded in this area is the December 1985 magnitude 6.9 earthquake in the Mackenzie mountains. Three earthquakes greater than magnitude 6 have occurred in the Richardson Mountains of the YT (magnitude 6.2 and magnitude 6.5 in 1940, and magnitude 6.6 in 1955); a region more than 350 km distant from the FMC.

The active faults (based on an alignment of epicentres and faulting style from focal mechanisms) are concentrated in the offshore region (e.g., Fairweather, Queen Charlotte, Transition Zone, and Pampolona Faults). In the onshore/inland region, the only faults that appear to be seismically active are in Alaska (e.g., the Denali, Totschunda, and Chugach – St. Elias Faults). Through the interior of Yukon, there are only three focal mechanisms from recent moderate (less than magnitude 5) earthquakes in the vicinity of the Tintina Fault system (Cassidy et al., 2005; Leonard et al., 2008). They are a mixture of right lateral strike slip and thrust earthquakes, and do not align with the orientation of the Tintina Fault system. Furthermore, there has been no evidence found for active faulting along the Canadian segments of the Tintina Fault Zone or the Denali Fault system (Cassidy et al., 2005).

The 2004 WMC report noted a slight concentration of weak earthquakes located to the west of the Tintina Fault Zone (Mazzotti and Hyndman, 2002). It was implied that faults to the west of the Tintina Fault Zone are the active faults or that a systematic error is present in the model used for calculating epicenters.

The most recent seismic event in Yukon was a magnitude 4 event that occurred approximately 158 km north of Keno Hill (65.24°N 134.22°W) on October 24, 2012, within the Richardson Mountains Seismic Zone. This location is approximately 325 km north of the FMC site.

2.2.2 Neotectonics

Earth-shaking events can trigger a variety of natural hazards, including ground vibrations, large landslides and avalanches, liquefaction of saturated sediments, and surface rupture. In May 2004, a limited site-specific seismic hazard assessment was conducted by Dr. Gail Atkinson that identified the possibility of post-glacial movements in the region along the nearby Tintina Valley Fault System (Tintina Fault Zone) which may increase the site-specific seismic hazard within the FMC beyond that given by the 2005 National Building Code of Canada (NBCC) Seismic Hazard Maps (Adams and Halchuck, 2003).

More recently, CH2M contracted Dr. Atkinson to re-evaluate current seismic/tectonic conditions of the area. The work performed by Dr. Atkinson included review of and discussions with individuals involved in the 2015 update to the Seismic Hazard Maps prepared by the GSC. The intent of the work performed by Dr. Atkinson was to update the 2004 site-specific seismic hazard evaluation of the FMC to include the most current understanding regarding the Tintina Fault Zone directly adjacent to the FMC, as well as other changes that were being made to the national seismic ground motion hazard model, including ground motion predictive equations (GMPEs), being developed by the GSC (CH2M, February 2013d; GSC, 2012). In 2013, Atkinson and Assatourians performed a seismic hazard assessment update for the FMC.

2.2.3 2013 Seismic Hazard Study

Findings from the Atkinson and Assatourians (April 2013) seismic hazard assessment summary showed that there is little documented evidence of recent displacements along the Tintina Fault Zone in this region of Yukon. There appears to be a small concentration of epicentres aligned along the Tintina Fault; however, these were minor earthquakes (less than magnitude 5), and most of the activity is at the northern end, close to the Alaskan border, which suggests that this geological fault structure remains a zone of weakness (Cassidy et al., 2005).

A 2008 global positioning system (GPS) -based deformation study by Leonard et al. (2008) associated the Tintina Fault Zone with low-level seismicity (up to magnitude 5) and calculated a maximum right-lateral strike-slip rate of only 0.5 millimetres per year (mm/year), suggesting that the fault no longer accommodates significant seismic deformation (Leonard et al., 2008). In contrast, the zones with the highest deformation rates are those that most directly represent the North America plate boundaries with the Pacific plate, Yakutat block, or both: the Fairweather Fault Zone (27.3 mm/year) and the southern St. Elias zones (3.6 to 18.3 mm/year), located more than 400 km southwest of the FMC (Leonard et al., 2008). Through the interior of Yukon, there are only three focal mechanisms from recent

moderate (less than magnitude 5) earthquakes in the vicinity of the Tintina Fault system (Cassidy et al., 2005; Leonard et al., 2008).

Atkinson and Assatourians report a mixture of right lateral strike slip and thrust earthquakes that do not align with the orientation of the Tintina Fault system. Furthermore, they report that there has been no evidence found for active faulting along the Canadian segments of the Tintina Fault Zone or the Denali Fault system (Cassidy et al., 2005). Atkinson and Assatourians also extracted data on recent earthquakes that occurred within about 250 km of the FMC site (62.2°N 133.2°W) from September 1985 to November 2012 from the Earthquakes Canada/GSC database. No earthquakes of greater than magnitude 5 have occurred within approximately 220 km of the site. Within a 50-km radius of the FMC, Atkinson and Assatourians report that approximately 38 earthquakes have been recorded since 1985. Only one event, a magnitude 4.6 event occurring in November 2002 in the Pelly Mountains, exceeded magnitude 4. The closest documented event, a magnitude 2.2, occurred about 15 km northwest of the FMC on Christmas Day, 1986.

The most relevant conclusion from the 2013 Atkinson and Assatourians study is that evidence for contemporary activity along the Tintina Fault appears weak. The Tintina Fault Zone is a 30-km-wide fault zone that is characterized by a low current slip rate and low activity rates, with the most recent interpretation suggesting that the fault no longer accommodates significant seismic deformation (Leonard et al., 2008), although the evidence for this is not entirely conclusive. Moreover, it exhibits a "flower structure" with the fault zone being wide at the surface and appearing to narrow with depth (Snyder et al., 2005). Based on these findings, it now appears that the Tintina Fault may be better treated as an aerial source zone that may contain fault structures, as opposed to a distinct linear active fault.

2.2.4 Updated Probabilistic Seismic Hazard Analysis

A probabilistic seismic hazard analysis (PSHA) was completed by the GSC in association with the 2010 NBCC (GSC, 2012). These analyses predicted a peak ground acceleration hazard for a 2-in-50-year probability of exceedance event, or a 1-in-2,475-year frequency event, to be 0.110 g.

A 2004 study by Atkinson found that for an annual probability of exceedance for a 1-in-10,000-year event, the mean value of PGA at the FMC site is 0.557g for Site Class D soil conditions based on the NBCC soil class descriptions.

The updated seismic hazard analysis performed for the FMC by Atkinson and Assatourians (April 2013) considered the updated regional seismotectonic data setting and regional geologic interpretation. This seismic hazard analysis was conducted using EqHaz software and considered two options for the Tintina Fault: one in which it is an aerial source zone, and one in which it is a linear fault source. This study found that for an annual probability of exceedance for a 1-in-2,475-year return-period ground motion, the mean-hazard value of PGA at FMC is approximately 0.12g for Site Class B/C soil conditions. For an annual probability of a 1-in-10,000-year return-period ground motion, the mean-hazard value of PGA at FMC is approximately 0.24g for the Site Class B/C soil conditions (average V_s of 760 metres per second [m/s] in upper 30 m).

The recommended response spectra from Atkinson and Assatourians (April 2013) are summarized in Table 2-1. The response spectra for the 1-in-10,000-year event is shown in Figure 2-4 for NEHRP B/C conditions. To convert to Site Class C conditions, the B/C values were multiplied by the Site Class Adjustment factor.

Table 2-1. Mean Hazard Uniform Hazard Response Spectra Average Horizontal Component Spectral Accelerations for the Faro Mine Complex
Faro Mine Remediation Project

	Approximate Earthquake Frequency					Site Class Adjustment B/C to C
Period(s)	1-in-100-year	1-in-500-year	1-in-1,000-year	1-in-2,500-year	1-in-10,000-year	
0	0.012	0.043	0.068	0.118	0.245	1.210
0.05	0.014	0.054	0.087	0.154	0.332	1.140
0.1	0.022	0.081	0.133	0.237	0.511	1.140
0.2	0.031	0.101	0.155	0.264	0.547	1.180
0.3	0.032	0.090	0.133	0.218	0.433	1.260
0.5	0.026	0.066	0.095	0.152	0.308	1.370
1	0.017	0.040	0.055	0.082	0.158	1.440
2	0.009	0.020	0.027	0.039	0.072	1.470
5	0.003	0.006	0.008	0.012	0.021	1.470
10	0.001	0.003	0.004	0.005	0.008	1.470

Source: after Atkinson and Assatourians, April 2013

Notes:

Mean hazard uniform hazard response spectra average horizontal component spectral accelerations shown in g

Shown with 5 percent damping for rock (NEHRP B/C) conditions

For comparison purposes the response spectra for the FMC for Site Class C conditions for a 1-in-10,000-year event are shown in Figure 2-5 for the Atkinson (2004) report and the Atkinson and Assatourians (April 2013) report. This plot shows the reduction in spectral acceleration from 2004 to 2013.

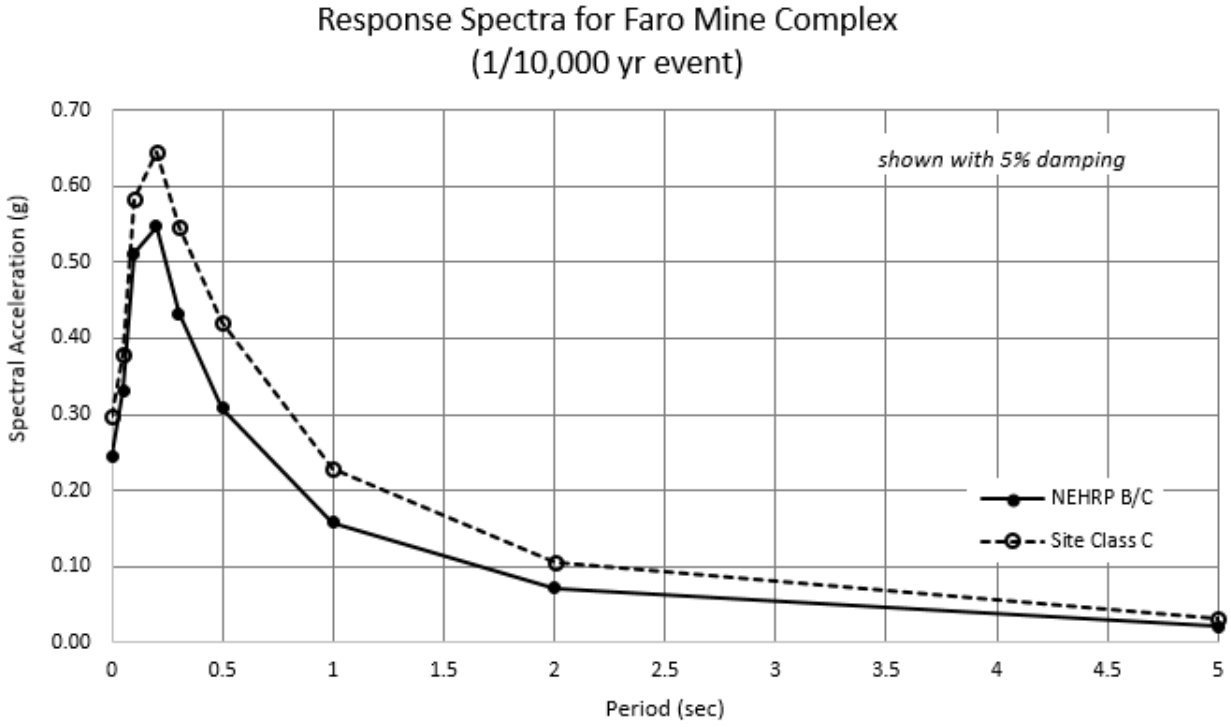


Figure 2-4. Response Spectra for the Faro Mine Complex (after Atkinson and Assatourians, April 2013)
Faro Mine Remediation Project

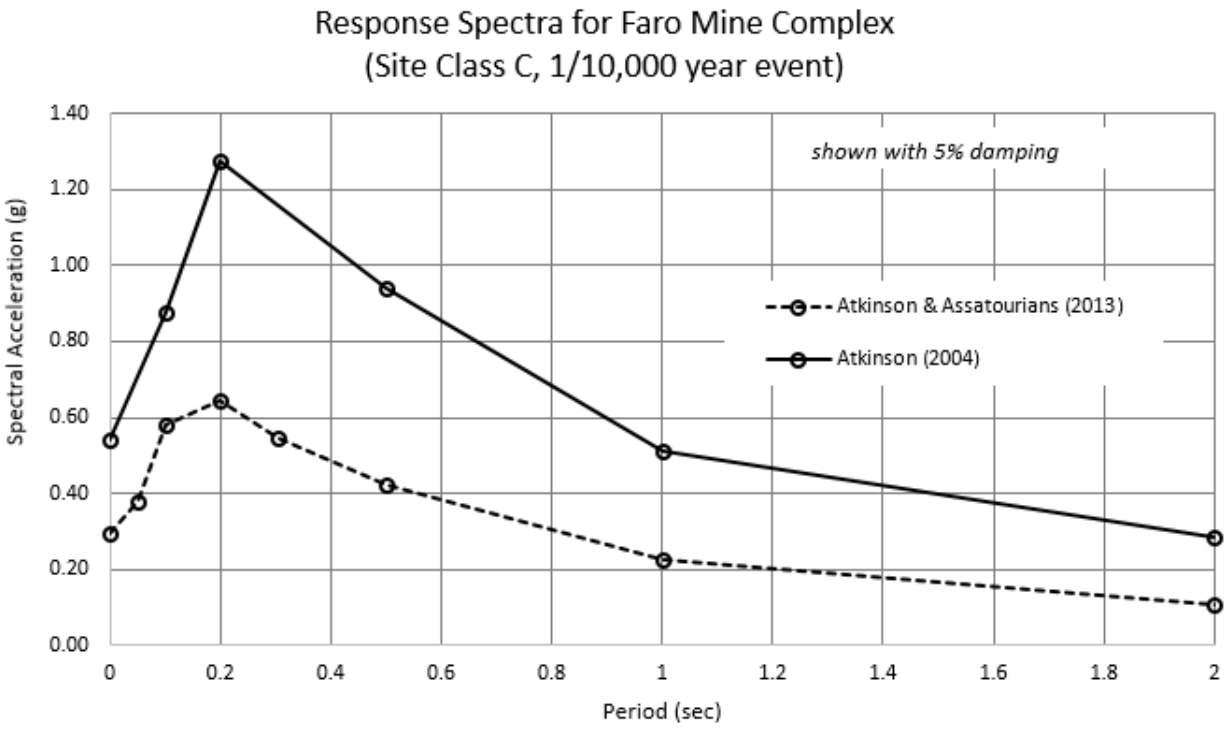


Figure 2-5. Response Spectra Comparison of Atkinson (2004) and Atkinson and Assatourians (April 2013) for the Faro Mine Complex

Faro Mine Remediation Project

2.3 Groundwater

The Rose Creek Alluvial Aquifer system is a fluvial depositional system deposited by Rose Creek and its tributary, the NFRC. The alluvial aquifer is composed of a heterogeneous mixture of silt, sand, gravel, and cobbles. The alluvial deposits are thickest near the centre of the valley, aligned with the ancestral thalweg of Rose Creek, with the thickest deposits around 50 m.

Before tailings deposition, Rose Creek was flowing in a meandering stream channel that crossed the valley floor and was fed by several smaller streams that drained the hillsides of Rose Creek Valley. The water table of the underlying valley-fill aquifer was very close to the stream level, indicating a good hydraulic connection between the stream and the groundwater that flowed in the permeable valley sediments (RGC, November 1996). Following the onset of mining operations, tailings were deposited over the alluvial valley-fill deposits to a maximum thickness of about 25 m. The greatest thicknesses of tailings were deposited in the Original and Secondary impoundments, with thickness diminishing toward the edges of the valley (RGC, November 1996).

Groundwater levels are elevated beneath the ID Pond and CVD Pond (also known as the Polishing Pond) because of vertical leakage from the impoundments. This condition results in the development of significant upward gradients within the alluvial aquifer just downgradient from the CVD and the presence of an associated groundwater discharge area in that location. Groundwater elevation data in the alluvium aquifer downgradient from the CVD indicate groundwater is estimated to be within 5 m of the ground surface.

KCB (2012) reported historical measurements of the water levels in monitoring wells located at the Secondary Tailings Impoundment; three monitoring wells in the crest of the dam and three wells in the tailings). The measurements indicate groundwater levels in the dam deeper than 6 m below the crest of the dam (KCB, 2012) and water levels in the tailings about 2 to 3 m below the tailings surface.

SECTION 3

Subsurface Profiles and Properties

3.1 General

Historically, Rose Creek was observed to meander within the RCTA, distributing alluvial deposits along the creek. Although the material across the site has similar depositional history, these alluvium deposits vary in thickness and composition. In review of the data, the subsurface profiles of each dam generally consists of terraced sands and gravels, and unconsolidated upper layers. The earthfill embankments were mostly constructed from these materials.

For the CVD, no additional explorations have been performed since KCC (June 2006) performed its exploration and seismic analysis. However, in 2012 and 2013, CH2M performed a site investigation downstream of the CVD for the support of the design of an SIS (CH2M, February 2014q). The boring logs provided limited information to the study presented herein as they were advanced mostly with continuous air rotary with samples being collected only within the upper few metres. The geophysical survey identified the contact between the overburden soil and bedrock, and was found to validate the KCC (March 2006; June 2006) data.

At the ELSD, geophysical surveys and geotechnical borings were conducted in 2015 by CH2M and integrated with the existing data for this analysis.

3.2 Cross Valley Dam

3.2.1 Embankment Configuration

The CVD is the only dam constructed within the RCTA to impound only water rather than tailings. The crest of the dam is reported to be at elevation 1,034 m amsl in the KCC reports (March 2006; June 2006). Previous reports show the crest to be at elevation 1,066 m, but this is based on the Down Valley datum, which is converted to amsl by subtracting 32 m. All elevations presented herein are based on amsl.

The CVD is a zoned earthfill embankment dam with a nominal height of 18 m, with the downstream toe located at elevation 1,016 m. From previous reports, the reported freeboard from the crest to the polishing pond is 1.7 m. The core of the dam is constructed of low permeability silt material with a width of 4 m at the top, thickening to a maximum of 7 m at the base. The core is extended 3 m into the native materials to provide a seepage barrier. This material is referred to as Class IV material in KCC (2002).

The core is supported by granular shell material comprised of random fill (Class VII and VIII material) along the downstream and upstream sides, sloped at 2H:1V. A 4-m-thick granular chimney drain comprised of Class IX and X material separates the core from the downstream shell before transitioning to a 2-m-thick blanket drain along the downstream base. A 4-m-thick granular filter zone (Class IX and X) serves as a filter between the upstream shell and the core. This filter zone continues along the upstream base, providing a 1-m-thick filter between the upstream shell and primary blanket. Current drawings show the primary blanket, constructed of similar material as the impervious core, extending as a secondary blanket upstream of the toe for 60 m. The secondary and primary blankets work with the low permeability cutoff core trench to reduce seepage through the foundation soils.

The dam fill is considered to be well compacted and assumed to not liquefy or undergo excess pore pressure generation during a major earthquake; however, during a large earthquake, the slopes forming the embankments could deform, resulting in loss of freeboard. This potential was investigated during this seismic study. Figure 3-1 provides a typical cross section of the CVD.

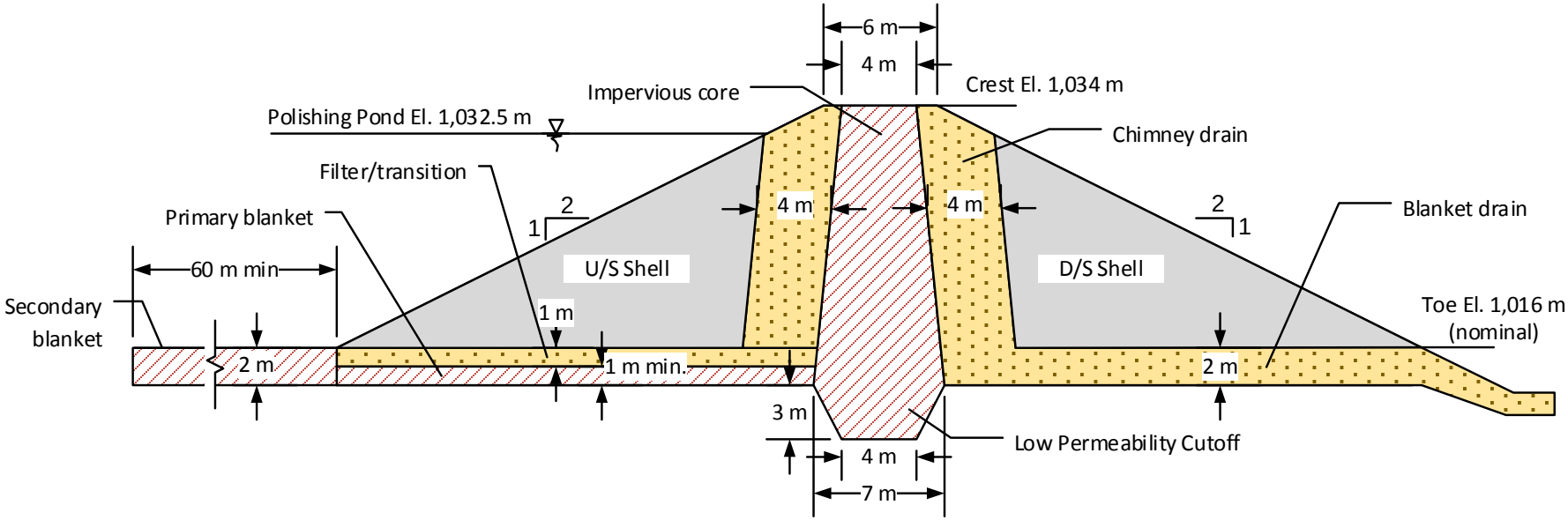


Figure 3-1. Typical Cross Section of the Cross Valley Dam
Faro Mine Remediation Project

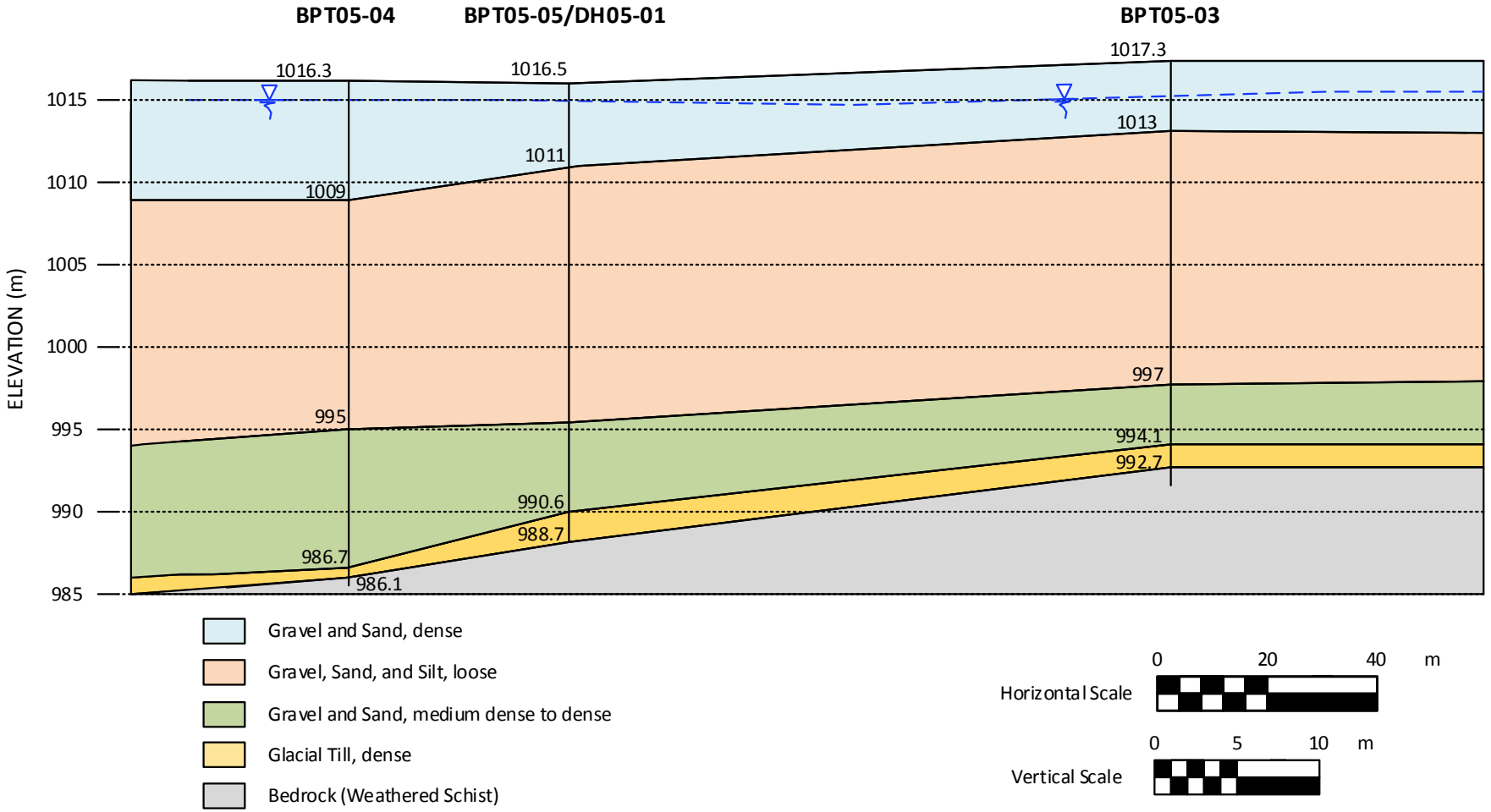


Figure 3-2. Generalized Subsurface Profile of the Cross Valley Dam (Looking Downstream)
Faro Mine Remediation Project

3.2.2 Subsurface Profile

The interpreted subsurface profile is based upon the boring logs provided in the KCC reports (March 2006; June 2006), CH2M 2014, and information collected by Golder (June 1980; June 2004). The generalized interpreted subsurface profile along the center of the CVD is shown in Figure 3-2. The interpreted subsurface profile is based upon the data from KCC (June 2006) and Golder (June 1980), and is shown along the longitudinal section of the original ground surface, looking downstream.

The subsurface profile shown in Figure 3-2 is based on a number of exploration programs and exploration methods. Before construction of the CVD, 21 borings were advanced within the foundation soils during the Golder 1979 and 1980 studies, as presented in Golder (June 1980). In 2005, KCC performed three BPTs along the downstream toe of the CVD, to depths of approximately 27 m. No subsurface information was collected along the upstream face of the dam during the 2005 exploration.

Results of the Golder and KCC exploration programs show that the CVD alignment is situated on recent alluvial deposits for Rose Creek, which consist of stratified terrace deposits of gravels, sands, and silts. Although majority of the near-surface deposits along Rose Creek are loose and considered liquefiable (KCC, March 2006), the overall composition of the top 4.5 m of the foundation soils at the CVD are observed to be dense. It is understood that this zone was likely densified during construction of the CVD.

In addition, during the 1979 and 1980 explorations, Golder (June 1980) identified several zones of soft silt layers and permafrost soils. However, such soils were not encountered in the 2005 KCC investigation, suggesting the soils were likely removed during construction of the CVD. Densification of the top layer of soil could have occurred during this removal because of construction traffic.

Below the compacted alluvium soils, loose silty sand and gravel was present from 14.5 m thick along the left half of the CVD and increased to approximately 16 m thick along the right half. This material was identified as potentially liquefiable in the KCC study (March 2006) under the 1-in-10,000-year ground motions. In addition, KCC identified a 5-m-thick low plasticity silt zone in Borehole DH05-10. This silt zone was noted to be lacustrine, and included thin interbeddings of sand and gravel.

Underlying the alluvium are dense sands and gravels, ranging in thickness from 7 to 12 m before transitioning to glacial till. The glacial till was observed to be relatively thin, only a few metres thick, before transitioning to bedrock. Bedrock encountered in the 1979/1980 borings was identified as green to grey schist, and weathered for the top several metres.

The 14.5- to 16-m thick layer of loose silts, sands, and gravels below the compacted alluvium sols is of primary concern from a seismic loading standpoint. If this layer were to liquefy during a strong seismic event, the loss of strength of the layer from cyclic loading and associated pore-water pressure increases could lead to instability of the embankment dam slopes, depending on the degree of pore-water pressure buildup and loss in soil strength. Volumetric changes in this layer from development of excess pore-water pressures could also result in post-seismic settlement, which would result in reduction in free-board as well as potential for cracking of the embankment core.

3.2.3 Laboratory Testing Data

Laboratory tests from previous investigations (KCC, March 2006) included gradations, moisture contents, and Atterberg Limits for the finer-grained soils. No cyclic tests were conducted on soils from either the embankment or foundation soils to determine performance of the silts and sands during cyclic loading. Strengths of these soils during cyclic loading were estimated based on empirical correlations with SPT and BPT blow counts.

Results of Index testing indicate that foundation soils are stratified coarse sediment, predominantly consisting of fine to coarse sand with variable amounts of fines and gravel. From the Atterberg Limits

tests, the plasticity of the fines ranges from low plasticity silts to lean clays. The sand is angular with an average grain size D_{50} ranging between 0.3 and 3 millimetres.

Table 3-1 provides a summary of the index testing performed for the SPT and BKS (open end Becker hammer) samples collected during the KCC investigation (KCC, June 2006).

Table 3-1. Summary of Index Test Results for the Cross Valley Dam
Faro Mine Remediation Project

Boring	Sample No.	Depth (m)	Water Content (%)	Fines Content (%)	Liquid Limit	Plasticity Index	USCS
DH05-01	SPT 1	1.5	8.0	5	-	-	-
	SPT 2	3.0	7.7	5	-	-	-
	SPT 3	4.6	10.1	7	-	-	-
	SPT 4	4.9	14.2	7	-	-	-
	SPT 4	5.0	19.2	12	-	-	-
	SPT 5	6.1	12.6	8	-	-	-
	SPT 6	7.6	27.0	50	22	3	ML
	SPT 7	8.8	29.7	84	24	3	ML
	SPT 8	9.7	25.9	92	24	6	CL-ML
	SPT 9	10.7	33.6	98	32	9	CL
	SPT 9	11.0	29.9	89	-	-	-
	SPT 10	12.2	33.4	96	34	12	CL
	SPT 10	12.5	21.7	53	-	-	-
	SPT 11	13.7	29.3	91	30	10	CL
	SPT 11	14.0	8.4	10	-	-	-
	SPT 12	15.2	10.7	16	-	-	-
	SPT 13	16.8	-	14	-	-	-
	SPT 14	18.3	-	13	-	-	-
	LPT 15	19.8	14.4	15	-	-	-
	LPT 16	21.3	11.0	10	-	-	-
	LPT 17	22.9	15.3	14	-	-	-
	LPT 18	24.4	11.7	12	23	3	ML
	LPT 19	25.9	8.8	11	-	-	-
	LPT 20	27.4	7.3	8	-	-	-
BKS05-03	LPT 1	7.6	-	9	-	-	-
	LPT 2	10.1	17.0	16	-	-	-
	LPT 3	14.9	9.0	10	-	-	-

Table 3-1. Summary of Index Test Results for the Cross Valley Dam
Faro Mine Remediation Project

Boring	Sample No.	Depth (m)	Water Content (%)	Fines Content (%)	Liquid Limit	Plasticity Index	USCS
BKS05-04	SPT 1	9.4	16.6	31	-	-	-
	SPT 2	14.3	28.0	95	30	9	CL
	SPT 3	16.8	-	53	-	-	-

Notes:
% = percent
CL = lean clay
LPT = large penetration test
ML = silt
No. = number
USCS = Unified Soil Classification System
Source: KCC, June 2006

3.2.4 Shear Wave Velocity Profiles

In situ shear wave velocity (V_s) measurements were not performed by either Golder or KCC at the CVD. Therefore, shear wave velocity profiles were developed by KCC using empirical correlations presented by KCC (March 2006; June 2006) based on SPT blowcounts, overburden pressure, and stress-corrected correct blowcount ($[N_1]_{60}$) values. For consistency with the previous interpretation of the BPT blow counts, the equivalent $(N_1)_{60}$ was estimated from the BPT blowcounts using the Sy (1993) method.

The shear wave velocity was estimated based on the fundamental relationship between low-strain shear modulus (G_{max}) and V_s:

$$G_{max} = \rho V_s^2 \qquad [1]$$

Where ρ is the total mass density of the soil.

Empirical correlations were also used by KCC to estimate G_{max}. Following the method presented by KCC (March 2006), the correlations used to estimate G_{max} for the subsurface profile are summarized in Table 3-2.

Table 3-2. Empirical Correlations used for Shear Wave Velocity Profiles
Faro Mine Remediation Project

Subsurface Layer	Empirical Correlations	Reference	Comments
Foundation Soils	$G_{max} = 434\,[(N_1)_{60}]^{0.33}[\sigma'_m\ x\ P_a]^{0.5}F$	Seed et al (1986)	σ'_m = mean effective confining stress, P_a = atmospheric pressure (101.35 kPa), F = constant assumed equal to 1.0 for sand and silt, and 1.5 for gravel
Dam Fill	$G_{max} = 3255\,[\sigma'_m\ x\ P_a]^{0.5}$	KCC (March 2006)	Assumed dam had saturated soil conditions

Note:
kPa = kilopascal

The interpreted V_s profiles are shown on Figure 3-3 for borings BPT05-03, BPT05-04, and DH05-01 at the CVD. Profiles include both the free field (an assumed horizontal site without the dam) and the centreline of the dam.

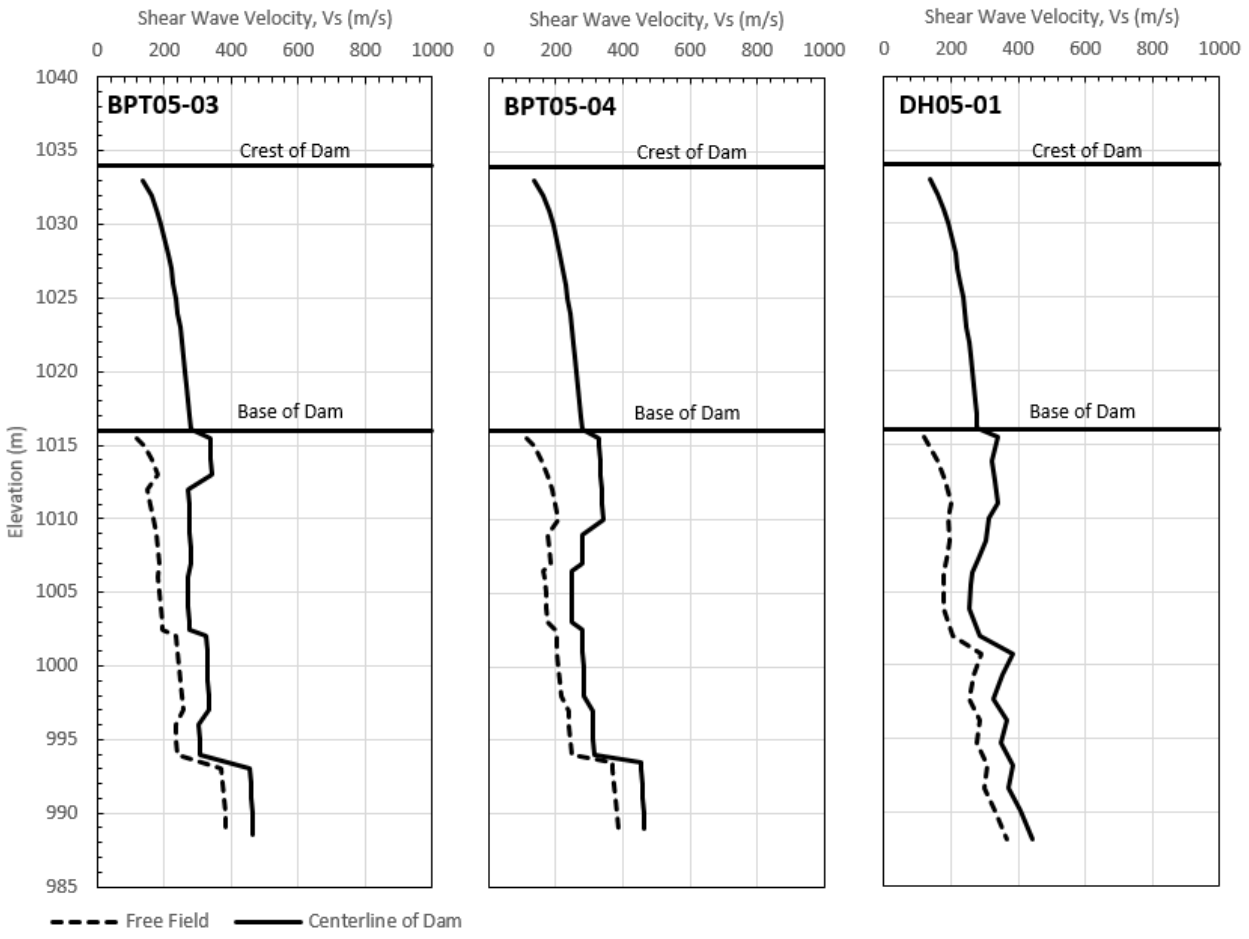


Figure 3-3. Interpreted Shear Wave Velocity Profiles for the Cross Valley Dam (in m/s)
Faro Mine Remediation Project

3.2.5 Recommended Soil Strength Properties

Based upon the subsurface data available for the foundation soils at the CVD, estimates of the drained strength of the layers were made based upon measured SPT $(N_1)_{60}$ values or BPT-converted $(N_1)_{60}$ values, following the recommendations from Peck, et al. (1974). Zero cohesion was assumed for all soil layers.

These strength properties were developed specifically for the static slope stability analysis. Details regarding the strength parameters of the foundation layers for the pseudo-static and post-seismic loading conditions are presented later in Section 5. The strength values for the dam core, filter and shell fill are assumed to be equal, based upon the recommendations from KCC (June 2006).

The recommended soil properties for the CVD for static loading conditions are summarized in Table 3-3.

Table 3-3. Recommended Static Soil Strength Properties for the Cross Valley Dam
Faro Mine Remediation Project

Soil Layer	Total Unit Weight, γ_t (kN/m^3)	Effective Friction Angle, ϕ' (degrees)	Effective Cohesion, c' (kPa)
Dam Core and Fill	21	35	0
Layer 1 - Gravel and Sand, dense	21	36	0
Layer 2 - Gravel, Sand, and Silt, loose	20	34	0
Layer 3 - Gravel and Sand, medium dense to dense	21	38	0
Layer 4 - Glacial Till, Dense	21	40	0
Bedrock (weathered schist)	24	Assume infinite strength in the analysis	

Note:

kN/m^3= kilonewton per cubic metre

3.3 East Limb of the Secondary Dam

3.3.1 Embankment Configuration

The ELSD was originally designed by Golder and began construction in 1974. Initially, the ELSD was a small embankment approximately 4.5 m high, constructed of compacted mine tailings. After deposition of tailings behind the dam in 1974, the crest was raised several times. In 1975, the embankment was raised to a crest elevation of 1,055 m, then again in 1979 to elevation 1,059 m. The final raise of the dam brought the crest elevation to 1,064 m.

The downstream slope is at a 2H:1V before transitioning to a 12-m-wide toe berm. The top of the toe berm slopes downstream from elevation 1,058 to 1,057 m before transitioning to a 2H:1V slope. KCC (June 2006) reported that there is no known seepage barrier for the ELSD.

Minimal information is known about the ELSD. The dam itself was considered in previous analyses by KCC (March 2006; June 2006) to be well-compacted and dense. From the available literature, there does not appear to be any core or filter within the ELSD.

The embankment geometry for the ELSD is presented on Figure 3-4.

3.3.2 Subsurface Profile

Several soil profiles were developed for the ELSD based on the following exploration borings:

- 2004 KCC study (June 2006): BPT04-13
- 2005 KCC study (March 2006): BPT05-06, BPT05-07
- 2015 CH2M study (March 2016j): CH15-201-MW005, CH15-201-MW006

Before construction of the ELSD, Rose Creek flowed in this area, depositing loose, stratified layers of alluvium. For construction of the ELSD, Rose Creek was diverted to the diversion channel parallel to the south boundary of the RCTA, which empties into the original creek channel downstream of the Secondary Dam. Based on the available borings, the cumulative alluvial layers are approximately 12 m thick, and consist of loose to dense layers of silty sand to poorly graded gravel. Less fine-grained material was observed at the ELSD than that observed at the CVD.

Underlying the more recent alluvium were dense sands and gravels, likely glacio-fluvial deposits, ranging in thickness from 7 to 12 m before transitioning to weathered rock. Weathered schist was encountered

in several borings at an approximate elevation of 1,045 m, with the exception of Boring BPT05-06 where top of rock was encountered deeper at approximately elevation 1,042 m.

Figure 3-5 provides a typical profile of the ELSD (KCC, June 2006).

3.3.3 Tailings Liquefaction

In 2004, Golder performed a liquefaction study within the tailings area of the RCTA behind the ELSD. Its investigation included 36 CPT soundings and five SCPT soundings to estimate the shear wave velocity. On selected samples, a critical state triaxial testing program was conducted on both loose and dense reconstituted samples. In its analysis, Golder (June 2004) found that the tailings, which consisted of sand and silt, were susceptible to liquefaction triggering, but that only the silts would undergo significant strength loss.

In a later study by KCC (June 2006), silts and sands within the tailings area were also assumed to undergo liquefaction uniformly. Conservatively, the recommended normalized residual strength ratio provided by Golder (June 2004) for silts was used rather than differentiating between the sand and silt.

A similar approach as taken by KCC (June 2006) is adopted for this evaluation.

3.3.4 Laboratory Testing Data

The laboratory tests undertaken in the previous KCC and Golder investigations included gradations, moisture contents, and Atterberg Limits for fine-grained soils. Similar to the CVD investigation, no cyclic testing was performed; cyclic strengths were estimated based on empirical correlations to SPT, CPT, and BPT results.

Results of index testing indicate that the foundation soils are stratified sediments, consisting primarily of fine to coarse sand with variable amounts of fines and gravel. From the recent explorations, the data indicate that the fill within the samples areas consists of sand and gravel, and has very little fines content.

Table 3-4 provides a summary of the index testing performed for samples collected during the KCC (March 2006; June 2006) and CH2M (March 2016j) investigations.

3.3.5 Shear Wave Velocity Profiles

The 2015 CH2M geotechnical exploration program for ELSD included measurement of V_s to a maximum depth of 10 m. In the area of interest within the ELSD, a downhole seismic shear wave velocity survey was performed in Boring CH15-201-MW005 to a depth of 8 m. The boring was terminated within the alluvium and did not reach the rock boundary. Therefore, to supplement the measured data and to fill in the gaps, empirical correlations based upon SPT $(N_1)_{60}$ values as presented earlier for the CVD were used.

The interpreted V_s profiles are shown on Figure 3-6 for borings BPT04-13, BPT05-06, BPT05-07, and CH15-201-MW005 at the ELSD.

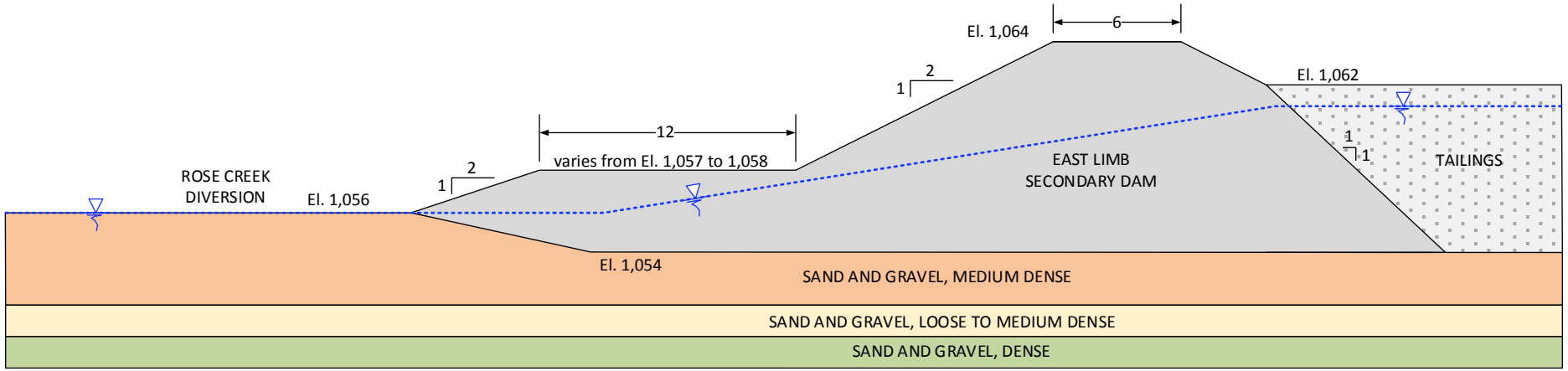


Figure 3-4. Typical Cross Section of the East Limb of the Secondary Dam
(elevations and dimensions shown in metres)
Faro Mine Remediation Project

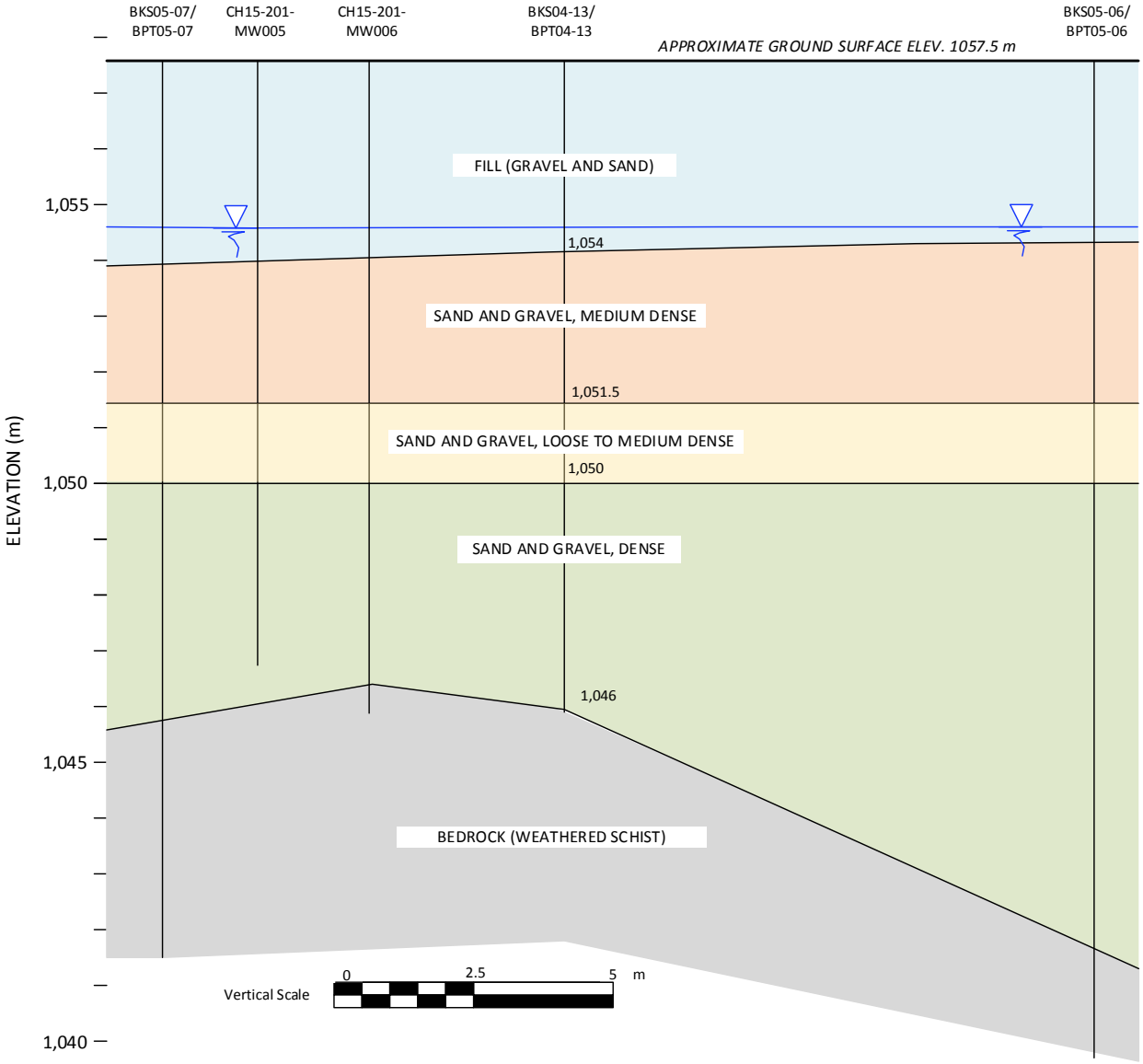


Figure 3-5. Generalized Subsurface Profile of the East Limb of the Secondary Dam
Faro Mine Remediation Project

Table 3-4. Summary of Index Test Results for the East Limb of the Secondary Dam
Faro Mine Remediation Project

Boring	Sample No.	Depth (m)	Water Content (%)	Fines Content (%)	Liquid Limit	Plasticity Index	USCS
BPT04-13	1	1.5	1.9	-	-	-	-
	2	3.7	11.4	4	-	-	-
	3	6.1	11.4	3	-	-	-
	4	10.4	9.0	-	-	-	-
	5	14.3	5.6	-	-	-	-
BPT05-06	SPT 1	3.2	-	10	-	-	-
	SPT 2	3.4	-	14	-	-	-
	SPT 3	5.2	-	9	-	-	-
	SPT 4	10.1	13.1	7	-	-	-
	SPT 5	12.2	12.8	13	25	2	ML
BPT05-07	SPT 1	7.6	-	2	-	-	-
	SPT 2	10.1	13.2	20	25	3	ML
CH15-201-MW005	SPT 1	0.3	-	26	-	-	-
	SPT 3	2.6	-	15	-	-	-
CH15-201-MW006	SPT 1	0.3	-	15	-	-	-
	SPT 2	1.9	-	16	-	-	-

Sources: KCC, March 2006; KCC, June 2006; CH2M, March 2016j

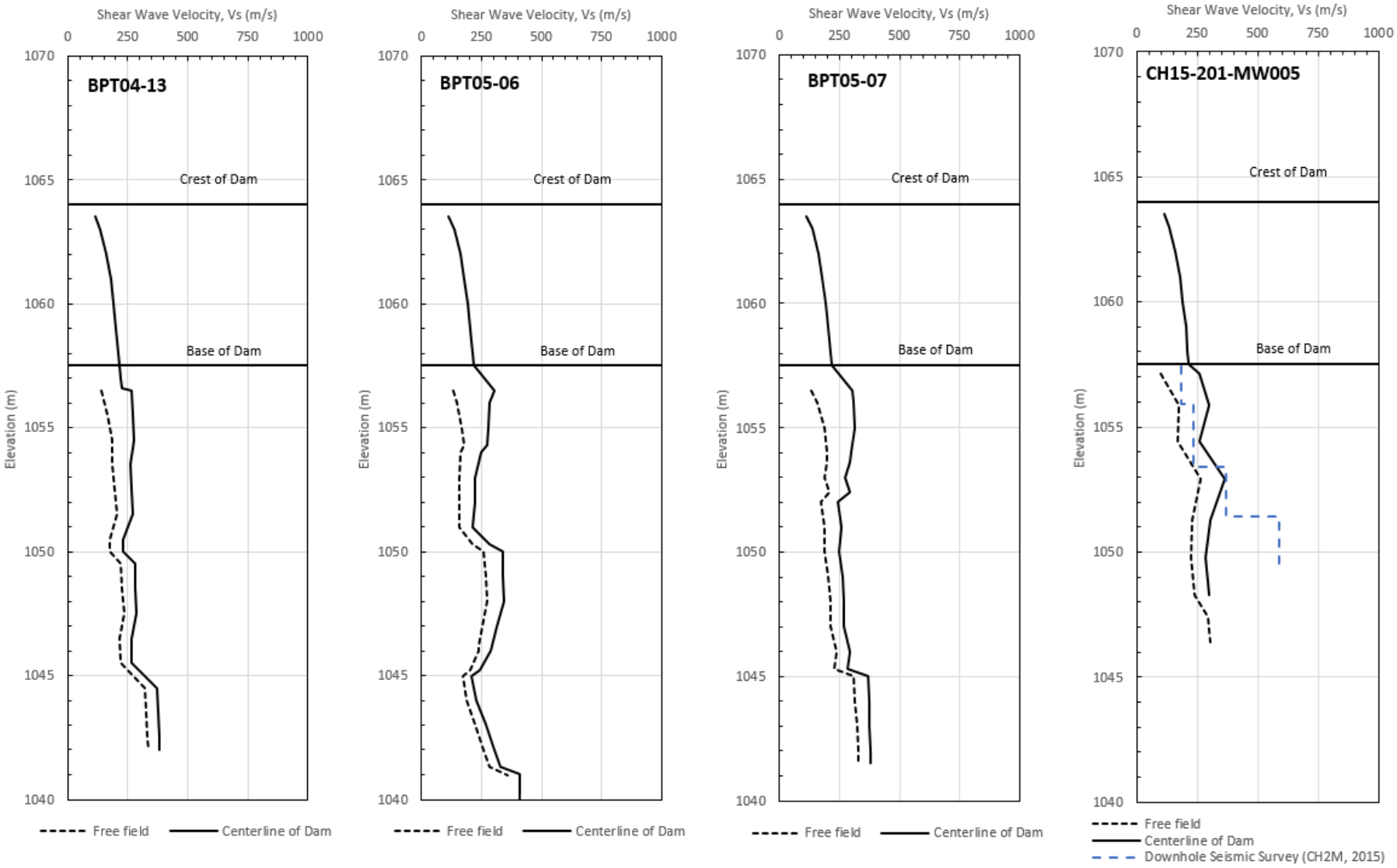


Figure 3-6. Interpreted Shear Wave Velocity Profiles of the East Limb of the Secondary Dam
Faro Mine Remediation Project

3.3.6 Recommended Soil Properties

For the subsurface conditions encountered at the ELSD, estimates of the drained strength of the embankment and foundation layers were estimated based upon measured SPT $(N_1)_{60}$ values and BPT-converted $(N_1)_{60}$ values. The values for the dam fill were selected based upon the recommendations from KCC (March 2006; June 2006). Strength parameters for the foundation layers are interpreted based on recorded data from the KCC (March 2006; June 2006) and CH2M (March 2016j) exploration data. All materials were assumed to be cohesionless.

The strength values for the tailings are based upon the recommendations from Golder (June 2004). The liquefied strength of the tailings material estimated by Golder is expressed by an undrained residual strength ratio, S_{ur}/σ'_{vo}, where S_{ur} is the undrained liquefaction residual soil strength and σ'_{vo} is the vertical effective stress before the earthquake.

The recommended soil properties for the ELSD for static loading conditions are summarized in Table 3-5. Similar to the CVD, the layers were divided into sublayers and specific strengths and material parameters were assigned to each layer.

Table 3-5. Recommended Static Soil Properties for the East Limb of the Secondary Dam
Faro Mine Remediation Project

Soil Layer	Total Unit Weight, γ_t (kN/m^3)	Effective Friction Angle, ϕ' (degrees)	Effective Cohesion, c' (kPa)
Dam Fill	21.0	35	0
Layer 1 - Sand and Gravel, medium dense	20.5	36	0
Layer 2 - Sand and Gravel, loose	20.0	34	0
Layer 3 - Sand and Gravel, dense	21.0	38	0
Tailings Sand and Silt	19.5	30	0
Tailings (liquefied)	24.0	$S_{ur}/\sigma'_{vo} = 0.05$	
Bedrock (weathered schist)	24.0	Assume infinite strength in the analysis	

SECTION 4

Site Response Analyses

4.1 Introduction

1-D site ground response analyses were conducted for the RCTA site to estimate the level of shaking for use in simplified liquefaction triggering evaluations and for limit-equilibrium seismic slope stability evaluations. In addition, the 1-D analyses were used as both input to the base of the advanced 2-D numerical model FLAC and as a check on ground motions in the free field.

4.2 Dam Hazard Classification

As previously noted, in meetings with YG, Indigenous and Northern Affairs Canada, and the Independent Peer Review Panel, it was agreed that the dams should be designed to pass the PMF and to withstand seismic loading consistent with a MCE, corresponding to an *extreme hazard* classification based on the CDA guidelines (CDA, 2007 revised in 2013). A dam with an *extreme hazard* classification must be evaluated for an earthquake with a frequency of exceedance of 1 in 10,000 years.

4.3 Target Ground Motions

Ground motions used in the 1-D site ground response analyses were based on an updated probabilistic seismic hazard analysis (PSHA) conducted by Atkinson and Assatourians (April 2013). The updated PSHA accounted for newer ground-motion prediction equations (GMPEs) relative to what was used by Atkinson (2004) and incorporated geologic and seismic data gathered after 2004 regarding the activity of the Tintina Fault, which is the closest fault to the project site.

The results of the 2013 study provided the mean hazard for a range of recurrence levels, ranging from 0.01 to 0.0001 per year (i.e., 1-in-100- to 1-in-10,000-year probability). All ground motions were developed for the Site Class B/C boundary (760 m/s). Atkinson and Assatourians (April 2013) also provided conversion factors from the B/C boundary to Class C (450 m/s). These values were presented earlier in Table 2-1. As shown in Table 2-1, the more recent PSHA resulted in lower ground motions.

Results of the studies by Atkinson and Assatourians (April 2013) were used to compute ground shaking levels for Site Class C for comparison with the reference condition being used in the 2015 NBCC. Direct comparison between the computed and the NBCC values is not possible for all probability levels of the target ground motions. However, comparisons with the probability levels for 1-in-100-year, 1-in-1,000-year, and 1-in-2,500-year levels are shown in Figure 4-1. These results show that the Atkinson and Assatourians (April 2013) spectral accelerations are slightly higher than those from the NBCC 2015 for periods less than 1 second and about the same or slightly lower for longer periods. These differences reflect the more detailed nature of the seismic model used by Atkinson and Assatourians (April 2013).

4.4 Time History Records

Time history records compatible with the target (Site Class B/C) ground motions were also recommended by Atkinson and Assatourians (April 2013). The records were selected based on the de-aggregation of the hazard, which resulted in records for events of magnitudes 6.0 to 7.3 recorded for Site Class B or C site conditions at distances less than 100 km from the fault and for a range of fault mechanisms.

The spectrum for each earthquake was taken as the geometric mean of the two horizontal components and scaled to match the target spectrum such that the minimum ratio between the mean spectrum of all of the records and the target spectrum was greater than or equal to 1.0 in every frequency from 0.5 to 20 Hertz (Hz). This scaling procedure was applied to the best three records based on the spectral shape, to obtain the “avg-

3" spectrum for the worst-case response, and also to the seven records to obtain the "avg-7" spectrum for the mean response as an alternative choice if all seven records were to be used in the analyses.

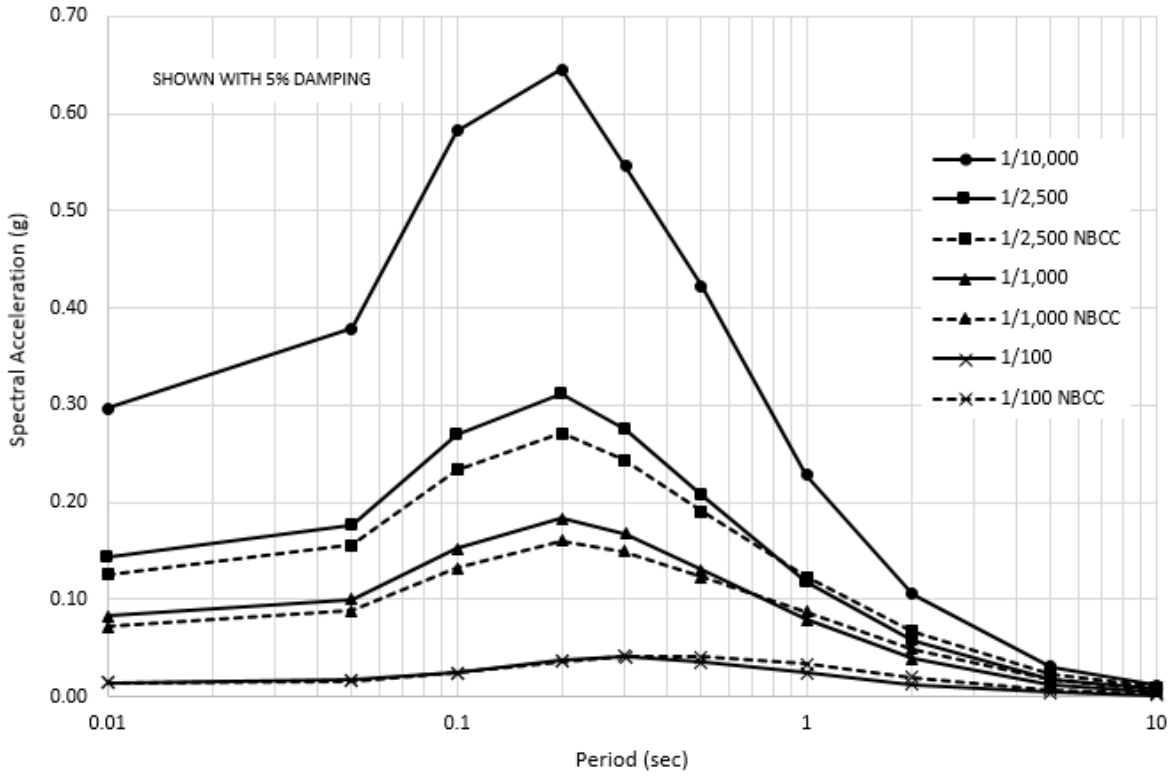


Figure 4-1. Comparison of Site-specific Ground Motions (Site Class C) from Atkinson and Assatourians (April 2013) with NBCC for a Range of Annual Frequencies
Faro Mine Remediation Project

Table 4-1 lists the records selected by Atkinson and Assatourians (April 2013) and the scaling factors to bring the avg-3 (average of the best three) or the avg-7 (average of the seven) records to exceed the target spectrum for the 1-in-10,000-year event at all frequencies from 0.5 to 20 Hz. Figure 4-2 provides plots showing the following:

- The geometric mean of each record
- The best three records and the average - Figure 4-2(a)
- Seven records and the average of the seven - Figure 4-2(b)
- Target spectra

Table 4-1. Selected Time-History Records for B/C Site Conditions for the 1-in-10,000-year Earthquake
Faro Mine Remediation Project

No. [a]	Earthquake	Moment Magnitude	Distance (km)	NGA Record No.	Scaling Factor
1	Chi-Chi, Taiwan-06	6.3	34	3472	2.29
2	Hector Mine	7.1	68	1836	4.60
3	Irpinia, Italy-01	6.9	31	291	2.48
4	Loma Prieta	6.9	20	801	0.82
5	Northridge-01 (Santa Susan Ground)	6.7	15	1078	0.85
6	Chi-Chi, Taiwan-03	6.2	34	2619	1.75
7	Northridge-01 (UCLA Grounds)	6.7	19	1006	0.80

Notes:
[a] The best three records are the first three from No. 1 through 3.
NGA = Next Generation Attenuation
Source: Atkinson and Assatourians, April 2013

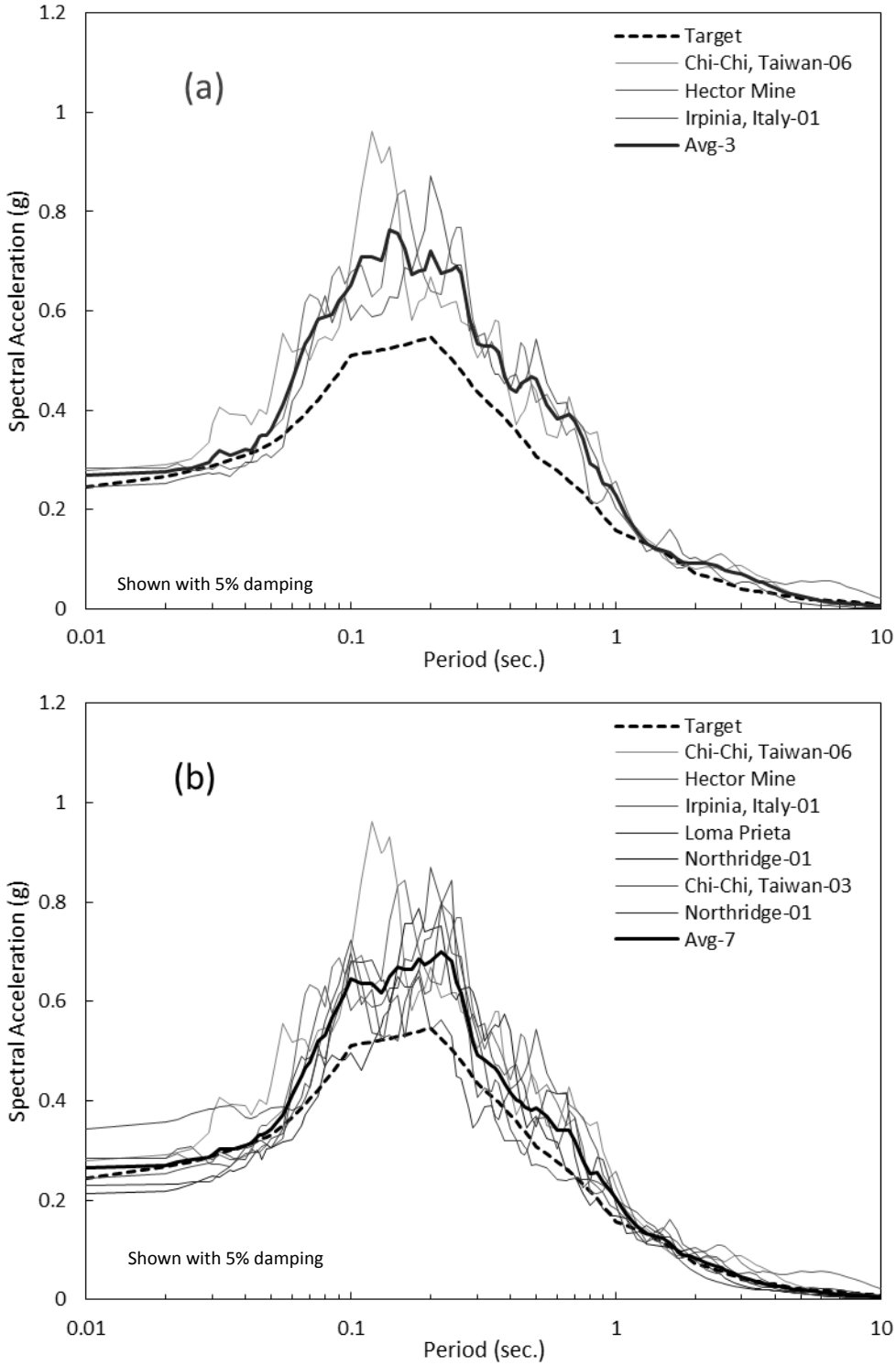


Figure 4-2. 1-in-10,000-year Mean Response Spectra (Site Class B/C) (a) Average of Best Three Records, (b) Average of 7 Records

Faro Mine Remediation Project

4.5 Stratigraphy and Soil Properties

The soil stratigraphy and soil properties are consistent with the summary in Section 3. Table 4-2 summarizes the specific layering used in the 1-D site ground response analyses.

Table 4-2. Material Properties of Foundation Profiles

Faro Mine Remediation Project

Foundation Profile	Elevation (m)		USCS	Total Unit Weight (kN/m^3)	$(N_1)_{60}$ [a]	-P200 [b] (%)	Estimated D_r [c] (%)
	From	To					
BPT05-03	1016.0	1013.0	SP-SM	20.9	45 (7-97)	9	99
(CVD)	1013.0	1007.0	GM-SM	19.8	13 (10-16)	9	53
	1007.0	1002.5	SW-SM	19.7	10 (7-13)	12	47
	1002.5	997.00	SP-SM	20.3	25 (14-36)	12	74
	997.00	994.00	SM-GM	19.9	15 (12-22)	48	57
	994.00	988.50	GP-SM	22.4	100 (30-100)	9	99
	less than 988.5		Bedrock		greater than 100	-	-
BPT05-04	1016.0	1013.5	SP-SM	20.9	45 (7-100)	9	99
(CVD)	1013.5	1009.0	GP-SM	20.9	45 (7-100)	9	99
	1009.0	1006.5	SP-SM	19.8	13 (7-26)	12	53
	1006.5	1002.5	SM	19.5	6 (3-14)	48	36
	1002.5	997.00	ML	19.7	11 (4-21)	92	49
	997.00	993.50	SM	20.0	17 (8-27)	48	61
	993.50	988.50	GW-SM	22.4	100 (31-100)	9	100
	less than 988.5		Bedrock		greater than 100	-	-
BPT04-13	1057.5	1054.5	SP-SM	20.9	45 (7-100)	13	99
(ELSD)	1054.5	1051.5	SP-SM	20.6	33 (23-49)	13	85
	1051.5	1050.0	SP-SM	19.8	13 (10-16)	13	53
	1050.0	1047.5	SP-SM	20.6	35 (25-54)	13	87
	1047.5	1045.5	SP-SM	20.2	22 (14-31)	13	69
	1045.5	1042.0	GP-SM	22.4	100 (100)	9	99
	less than 1042		bedrock		greater than 100	-	-

Notes:

[a] Average value interpreted as the equivalent $(N_1)_{60}$ blow counts from KCC (March 2006; June 2006) BPT. Values in parenthesis are the maximum and the minimum values in the depth range.

[b] Percent passing No. 200 sieve interpreted as the average value from KCC (March 2006; June 2006) investigation.

[c] Relative density estimated from Idriss and Boulanger (2008) as $[(N_1)_{60}/C_d]^{0.5}$ with $C_d = 46$.

4.6 Modulus Reduction and Damping Curves

Standard curves for shear modulus reduction (G/G_{max}) and damping ratio (D) with cyclic shear strain (γ) were used to represent the soil layers for the CVD and the ELSD. The characteristics for these curves are different depending on the soil type, and were selected as follows:

- EPRI (December 1993) curves for sands
- Rollins et al. (May 1998) curve for gravels
- EPRI (December 1993) curve for fine-grained soils with Plasticity Index (PI)=15, but with slightly higher damping ratio curves (following the recommendations of KCC [March 2006; June 2006])
- EPRI (December 1993) curves for soft rock.

The 1-D site ground response analyses were conducted using the computer codes, Strata and FLAC 1-D, as discussed in the next section. In the numerical implementation of these curves in FLAC, the three-parameter sigmoidal continuous function defined by the following expression was used:

$$\frac{G}{G_{max}} = \frac{a}{1 + \exp\left(\frac{x_o - L}{b}\right)}$$

Where a, b and x_o are material parameters and L is equal to $log_{10}(\gamma)$. The material parameters in this function are determined by curve fitting such that residuals between the simulated and the target curves for the modulus reduction and the damping ratio are minimized. The damping ratios associated with these curves are derived from the energy dissipated from the hysteretic loop at a given cyclic shear strain following the Masing rules. A small amount of Rayleigh damping was introduced in the FLAC model as discussed later in this report.

Table 4-3 lists the parameters selected for the material types in the foundation profiles, and Figure 4-3 plots the comparison between the simulated and the target values.

Table 4-3. Material Parameters for Numerical Implementation
Faro Mine Remediation Project

Material No.	Description	Depth	a	b	x_o
1	Sands	0.0 – 6.0	1.182	-0.642	-1.70
2	Sands	6.4 - 15.2	1.211	-0.668	-1.57
3	Sands	15.5 -36.6	1.148	-0.658	-1.32
4	Gravels	-	1.141	-0.755	-1.60
5	Silt (PI=10) [a]	-	1.155	-0.693	-1.50
6	Rock	6.4 - 15.2	1.214	-0.622	-1.90
7	Rock	15.5 -36.6	1.260	-0.629	-1.88

Note:

[a] The EPRI curve for PI=15 is used without modification, but damping ratios were modified.

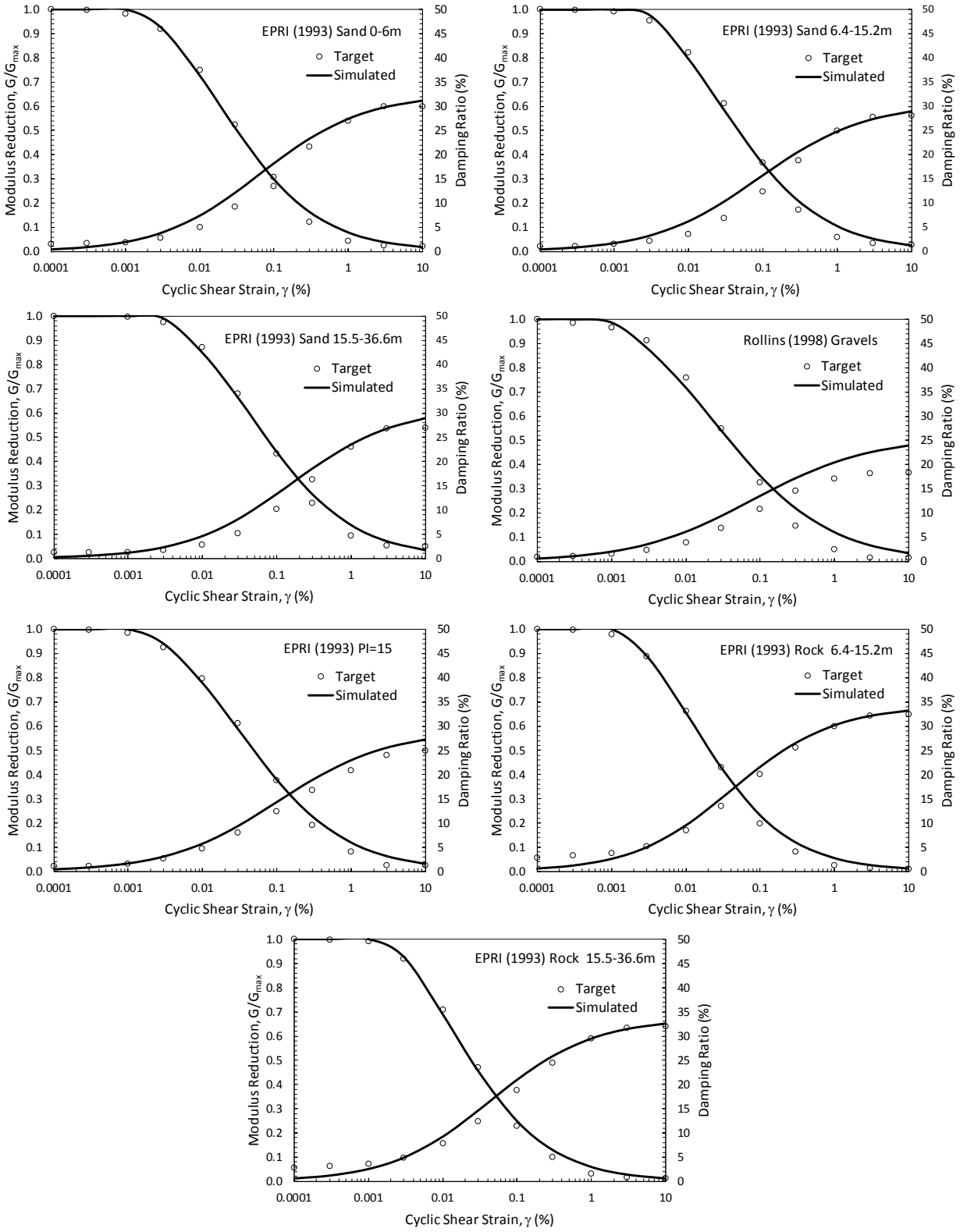


Figure 4-3. Modulus Reduction and Damping Curves
Faro Mine Remediation Project

4.7 Site-specific Response Analyses

4.7.1 Analysis Approach

1-D total stress seismic site response analyses were carried out for the CVD and the ELSD using frequency and time domain solutions. The computer program Strata, developed by the University of Texas - Austin (Kottke et al., 2013) was used for the solution in frequency domain, and the finite difference code FLAC (Itasca, 2012) was used for the solution in time domain. The goal of using these two codes is to validate the implementation of the modulus reduction and damping curves from FLAC solution in time domain against known theoretical wave equation solution from Strata in frequency domain. These validations set the stage for more complicated analyses using non-linear material models specifically developed for liquefaction evaluation as discussed in Section 7.

For the site-specific response analyses, both the frequency and time domain analyses utilized the same foundation profiles and soil properties developed for the CVD and ELSD. The 1-in-10,000-year ground motions from the best three records were applied directly at the base of the models as outcrop motions at a depth of about 27.5 m for the CVD and 15.5 m for the ELSD. These depths were based on the estimated depth to a shear wave velocity of 760 m/s from the multichannel analysis of surface waves (MASW) profile at ELSD. The outcrop motion was used with a half-space in the Strata analyses, while a rigid base using within ground motions (Kwok et. al., 2007) was used for the FLAC analyses.

4.7.2 Summary of Results

The general trends of the results from FLAC 1-D analyses are in good agreement with the results from Strata. However, the site response analyses from FLAC 1-D have a tendency to predict larger shear strains, which is attributed to the contribution from the reflected waves at the base of the model.

4.7.2.1 Results for CVD

Figures 4-4 through 4-9 show the results of the acceleration response spectra at the ground surface, PGA profiles, and the maximum shear strain profile for the two horizontal components of each record at the CVD. Variations exist in the PGA and shear strain profiles for each of the time histories evaluated, but overall, they are similar. FLAC generally predicted higher shear strains than predicted from Strata. For the PGA profile, Strata generally predicted lower acceleration values at the base of the model than FLAC, with the difference becoming smaller at shallower depths.

4.7.2.2 Results for ELSD

Figures 4-10 through 4-12 show the results of the acceleration response spectra at the ground surface, PGA profile, and the maximum shear strain profile for the two horizontal components of each record at the ELSD occurred at the BPT04-13 profile. The shear strain profiles are generally more consistent than those observed in the CVD analyses. Overall, there appears to be good agreement between the two methods.

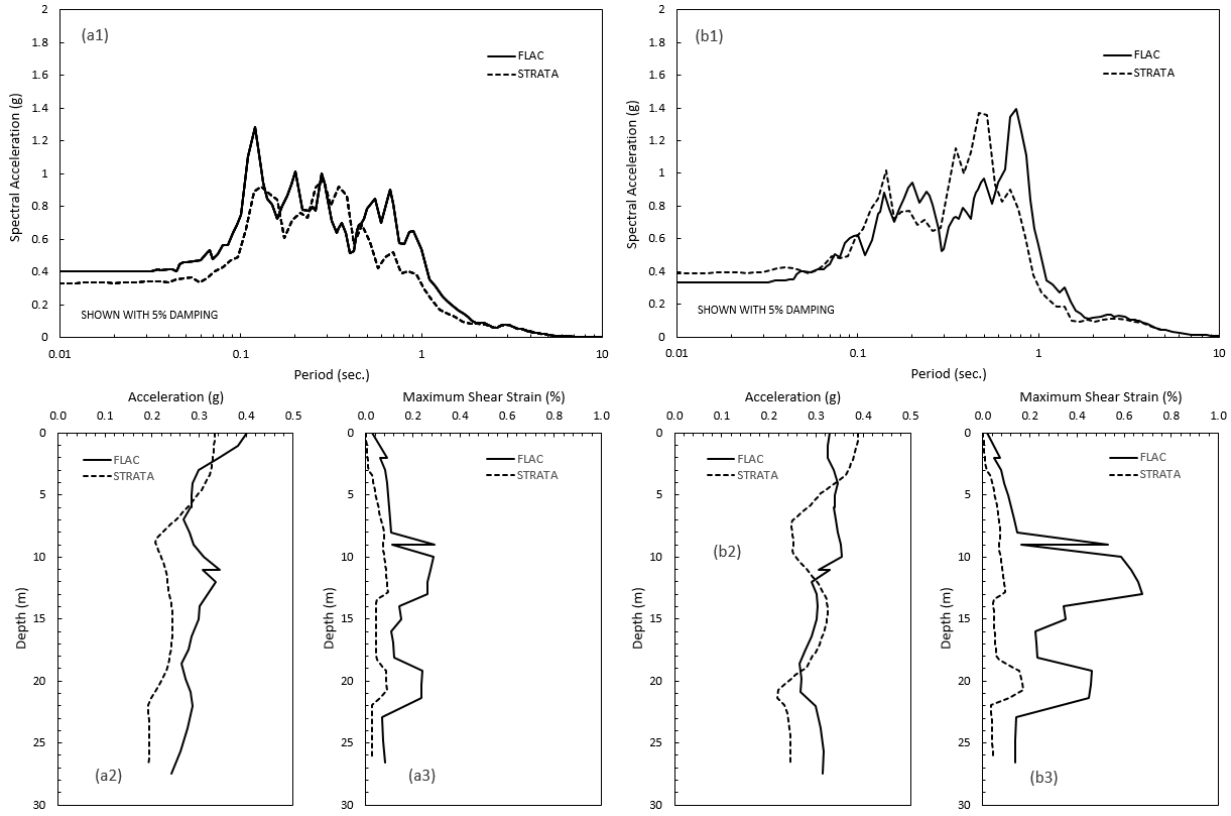


Figure 4-4. BPT05-03 Site Response - Chi-Chi, Taiwan-06 (a) TCU076E (b) TCU076N

Faro Mine Remediation Project

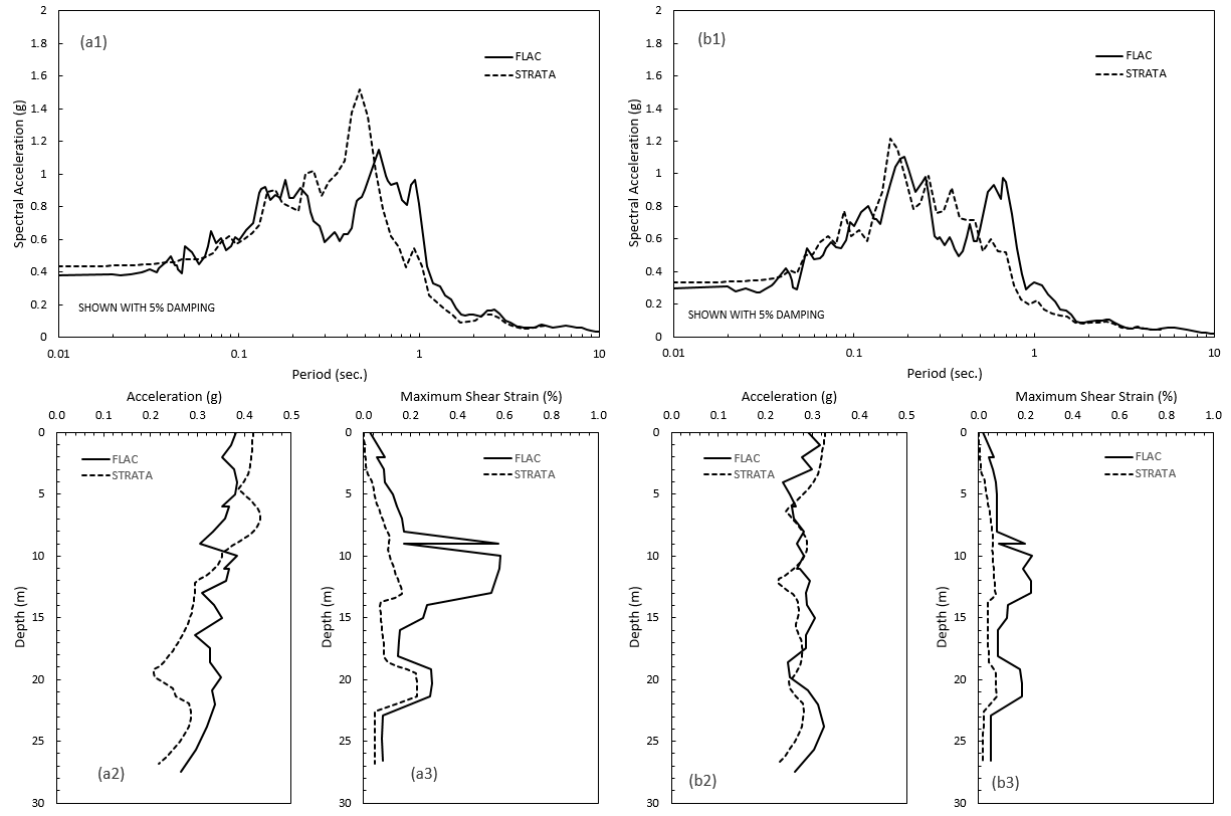


Figure 4-5. BPT05-03 Site Response - Hector Mine (a) 29P090 (b) 29P360

Faro Mine Remediation Project

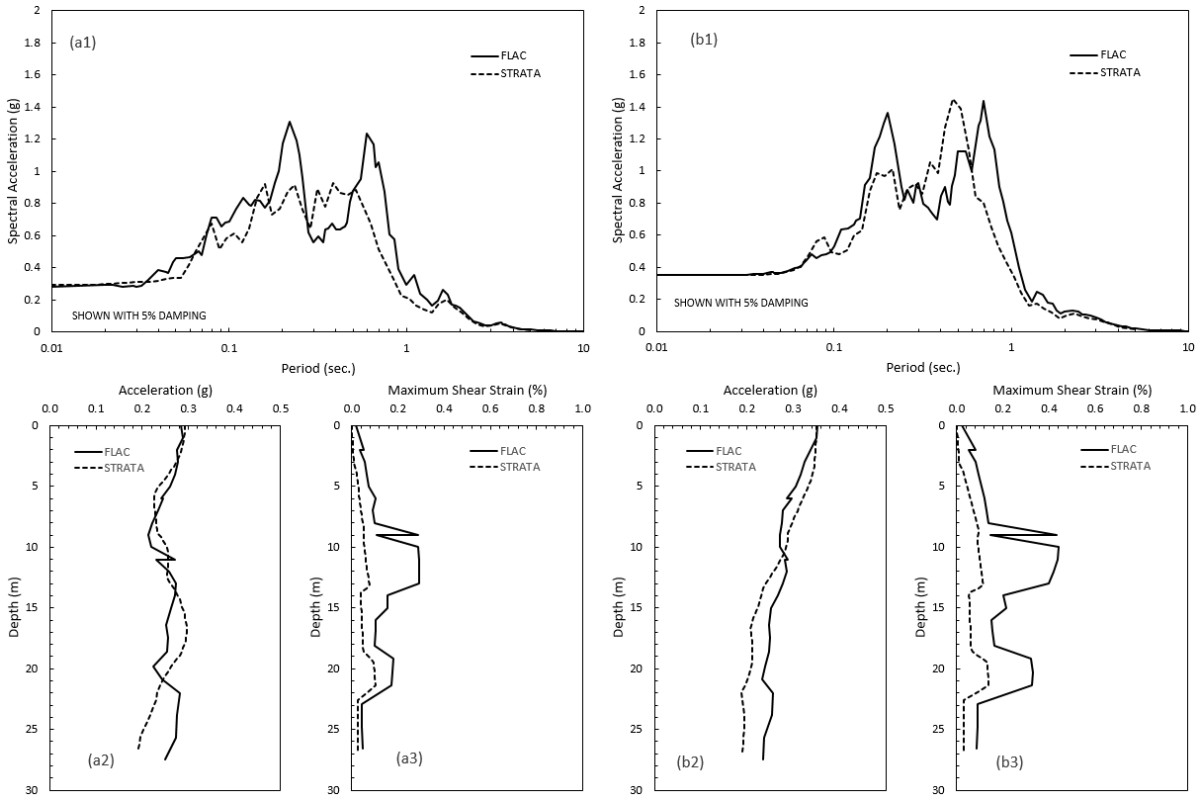


Figure 4-6. BPT05-03 Site Response – Irpinia, Italy (a) VLT000 (b) VLT360

Faro Mine Remediation Project

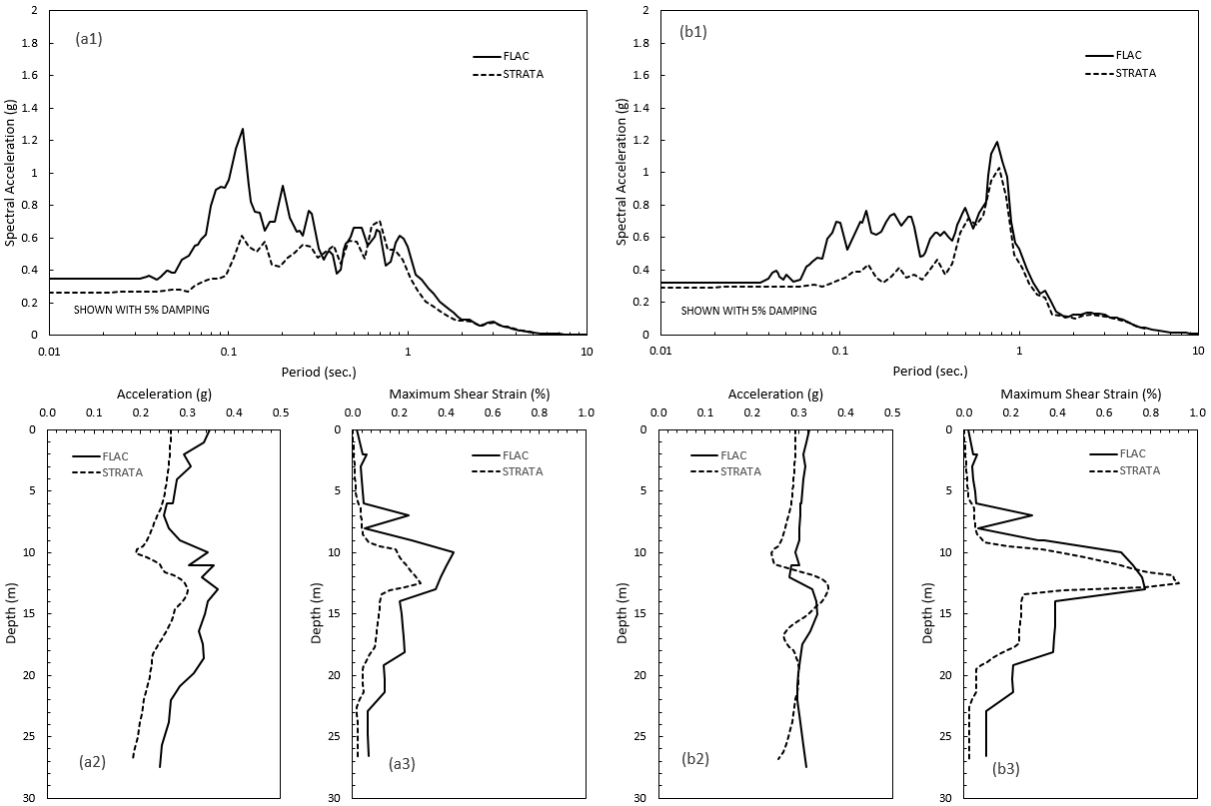


Figure 4-7. BPT05-04 Site Response – Chi-Chi, Taiwan-06 (a) TCU076E (b) TCU076N

Faro Mine Remediation Project

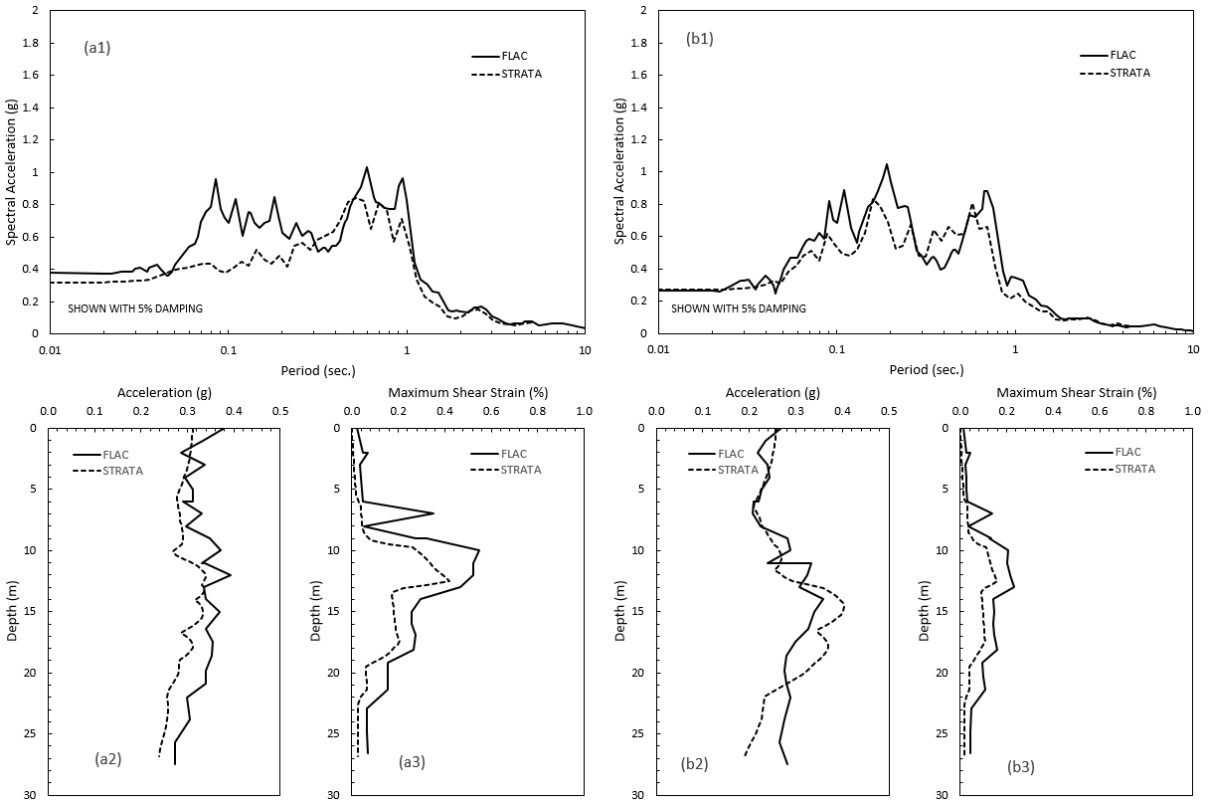


Figure 4-8. BPT05-04 Site Response - Hector Mine (a) 29P090 (b) 29P360

Faro Mine Remediation Project

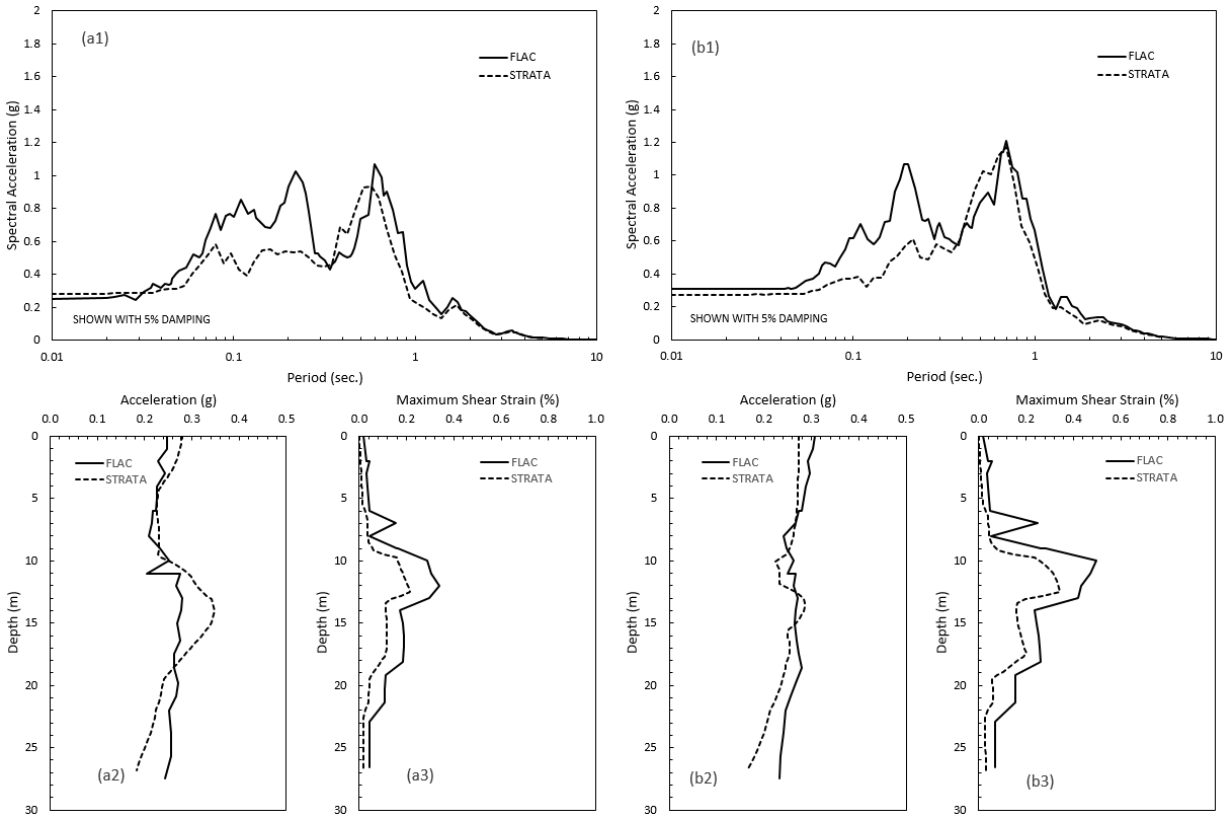


Figure 4-9. BPT05-04 Site Response – Irpinia, Italy (a) VLT000 (b) VLT360

Faro Mine Remediation Project

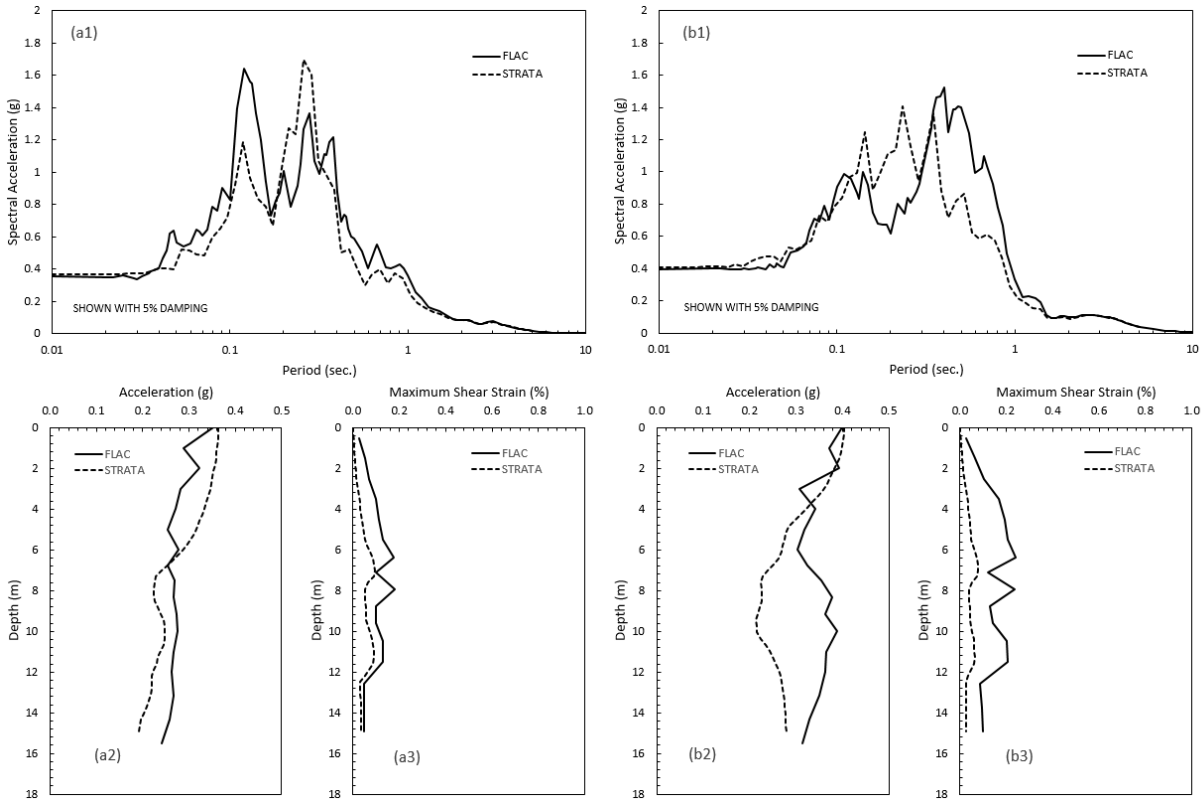


Figure 4-10. BPT04-13 Site Response – Chi-Chi, Taiwan-06 (a) TCU076E (b) TCU076N

Faro Mine Remediation Project

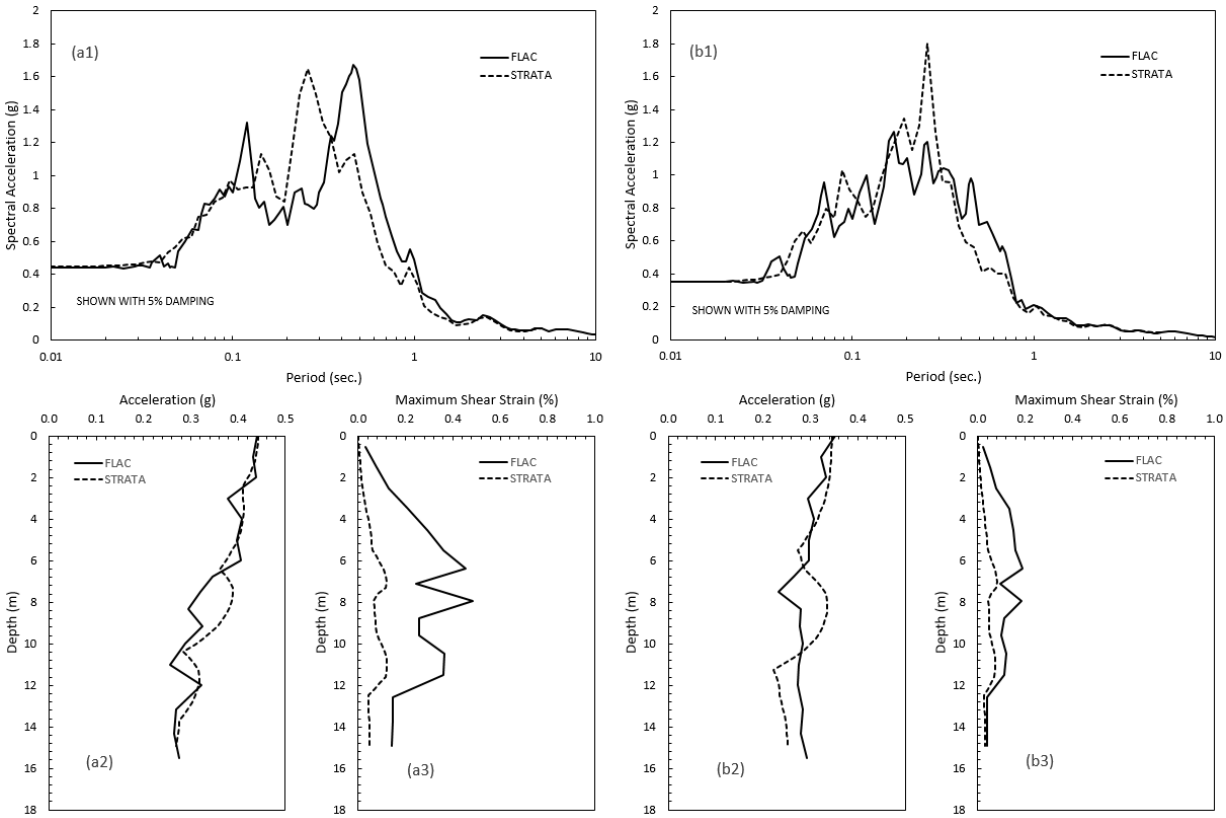


Figure 4-11. BPT04-13 Site Response - Hector Mine (a) 29P090 (b) 29P360

Faro Mine Remediation Project

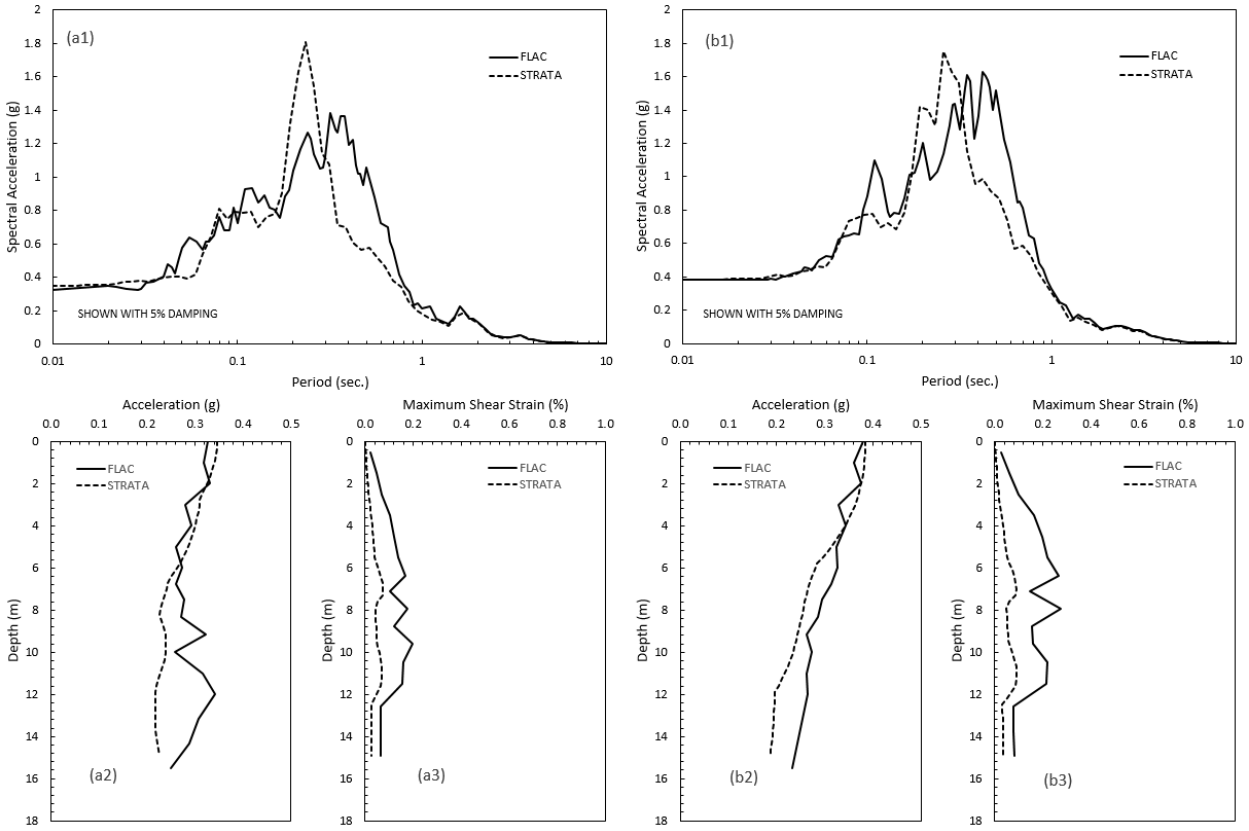


Figure 4-12. BPT04-13 Site Response – Irpinia, Italy (a) VLT000 (b) VLT360
Faro Mine Remediation Project

SECTION 5

Liquefaction Evaluation

5.1 Methodology Use for Liquefaction Triggering Evaluation

An assessment of liquefaction triggering was made to determine whether sands and non-plastic silts could liquefy during the levels of ground shaking estimated for the RCTA site. Liquefaction refers to the loss in strength that saturated non-cohesive soil deposits can experience during undrained cyclic loading, such as earthquake loading. The susceptibility of a soil deposit to liquefaction is dependent on saturation, as well as influenced by soil grain size, relative density, percent fines, age of deposit, plasticity of fine-grained material, and earthquake ground motion characteristics. The following subsections summarize methods used to screen soils for liquefaction potential, to estimate the potential for liquefaction triggering, and the residual strength of liquefied soils. Results of these liquefaction assessments for each dam are summarized in the following two sections.

5.1.1 Screening of Low-Plasticity Soils

Liquefaction is not only restricted to sandy soils, but can also occur in non-cohesive and low-plasticity silts. Criteria used to evaluate the liquefaction susceptibility of non-to-low plasticity silts and sand was based on empirical methods by Boulanger and Idriss (November 2006) and Bray and Sancio (September 2006). These methods screen the material based upon index properties such as Atterberg Limits and water content.

Boulanger and Idriss (November 2006) classify non-plastic silts and clays as having sand-like behaviour and susceptible to liquefaction when the PI is less than 7, and having clay-like behaviour and not having susceptibility to liquefaction when the PI is greater than 7. However, these clay-like soils may still exhibit other forms of behaviour such as cyclic softening during a seismic event, resulting in a loss of shear strength and strain development that need to be accounted for in design.

Bray and Sancio (September 2006) classify soils with a PI less than 12 and a water content/liquid limit ratio (wc/LL) greater than 0.85 as susceptible to liquefaction. Soils with PI greater than 18 and wc/LL less than 0.80 are considered non-susceptible to liquefaction. However, these may still undergo significant deformation because of cyclic softening, resulting in shear strength loss and strain development. Soils in the transition zone between these values are considered moderately susceptible to liquefaction. In practice, the Bray and Sancio (September 2006) method typically considers a wider range of soils as susceptible to liquefaction than the simpler approach by Boulanger and Idriss (November 2006).

5.1.2 Liquefaction Evaluation

The Youd et al. (2001) simplified method was used to assess the soil profiles at both the CVD and ELSD for liquefaction. This method is based largely upon SPT $(N_1)_{60}$ values, fines content, earthquake magnitude, and levels of seismic shaking. The cyclic stress ratio (CSR) profile estimated using Strata (see Section 4) for each respective subsurface profile was used in the analysis of liquefaction triggering. Soil liquefaction evaluations were conducted both beneath the embankment and for the free field site conditions.

5.1.3 Residual Strength of the Liquefied Layers

For soils identified as potentially liquefiable for the design ground motions, the undrained liquefied residual strength was estimated for use in evaluating the post-seismic stability. The residual strength of the soil layers was estimated using the weighted average of several different methods, as recommended by Kramer (2008). These methods included Olson and Stark (2002), Idriss and Boulanger (2007), Idriss (January 1999), and Kramer and Wang (2015).

A weighted average was developed as recommended by Kramer (2008), and used 20 percent of each the Idriss (January 1999), Olson and Stark (2002), and Idriss and Boulanger (2007) methods, and 40 percent of the Kramer and Wang (May 2015) method. These relationships are based upon the SPT $(N_1)_{60}$ value, or BPT-converted $(N_1)_{60}$ value, from the KCC report (KCC, March 2006). The weighted average residual shear strength ratio, s_{ur}/σ'_{vo}, was estimated for all potentially liquefiable soils.

5.1.4 Post-liquefaction Settlement

Settlement because of liquefaction can occur following shaking as the excess pore pressures within the liquefied soil begin to dissipate. Magnitudes of volumetric strain after liquefaction vary based on relative density and maximum shear strain, but can be up to 2 to 3 percent (Kramer, 1996). If sand boils are present, post-earthquake settlements are likely to be irregular. Post-liquefaction settlement was estimated based upon the Tokimatsu and Seed method (1987).

5.2 Cross Valley Dam

5.2.1 Screening of Low Plasticity Soils

Table 5-1 shows the results from the non-to low-plasticity soil susceptibility screening using the available laboratory testing data from the KCC report (KCC, March 2006). Based on the results, it is reasonable that the fine-grained soils present within the upper 10 m of the foundation soils have sand-like behaviour and are considered susceptible to liquefaction. However, from depths of 10 to 14 m, the two methods provide some contrasting conclusions on susceptibility. For this evaluation, it was conservatively assumed that fine-grained material at the CVD is susceptible to liquefaction.

Table 5-1. Liquefaction Susceptibility Screening of Fine-Grained Soils at the Cross Valley Dam
Faro Mine Remediation Project

					Liquefaction Susceptibility	
Boring	**Sample No.**	**Depth (m)**	**PI**	**wc/LL**	**Bray and Sancio (September 2006)**	**Boulanger and Idriss (November 2006)**
DH05-01	SPT 6	7.6	3	1.23	Susceptible	Susceptible
DH05-01	SPT 7	8.8	3	1.24	Susceptible	Susceptible
DH05-01	SPT 8	9.7	6	1.08	Susceptible	Susceptible
DH05-01	SPT 9	10.7	9	1.05	Susceptible	Non-susceptible
DH05-01	SPT 10	12.2	12	0.98	Moderately susceptible	Non-susceptible
DH05-01	SPT 11	13.7	10	0.98	Susceptible	Non-susceptible
DH05-01	LPT 18	24.4	3	0.51	Moderately susceptible	Susceptible
BKS05-04	SPT 1	9.4	9	0.93	Susceptible	Non-susceptible

5.2.2 Liquefaction of Foundation Soils

Liquefaction evaluations for Borings BPT05-03 and BPT05-04 at the CVD were performed according to the Youd et al. simplified method (Youd et al., 2001). The CSR used in the liquefaction evaluation was from the site-specific ground response analysis for each of the profiles presented in Section 4. A design earthquake with a moment magnitude of 7 was assumed for the analysis, based upon the recommendations from the Atkinson and Assatourians (April 2013). This magnitude was also the upper bound of the selected earthquakes for the site response analysis. Figure 5-1 presents profiles of the factor of safety against liquefaction at the free field and at the centreline of the dam for Borings BPT05-03, BPT05-04, and DH05-01 for a 1-in-10,000-year event.

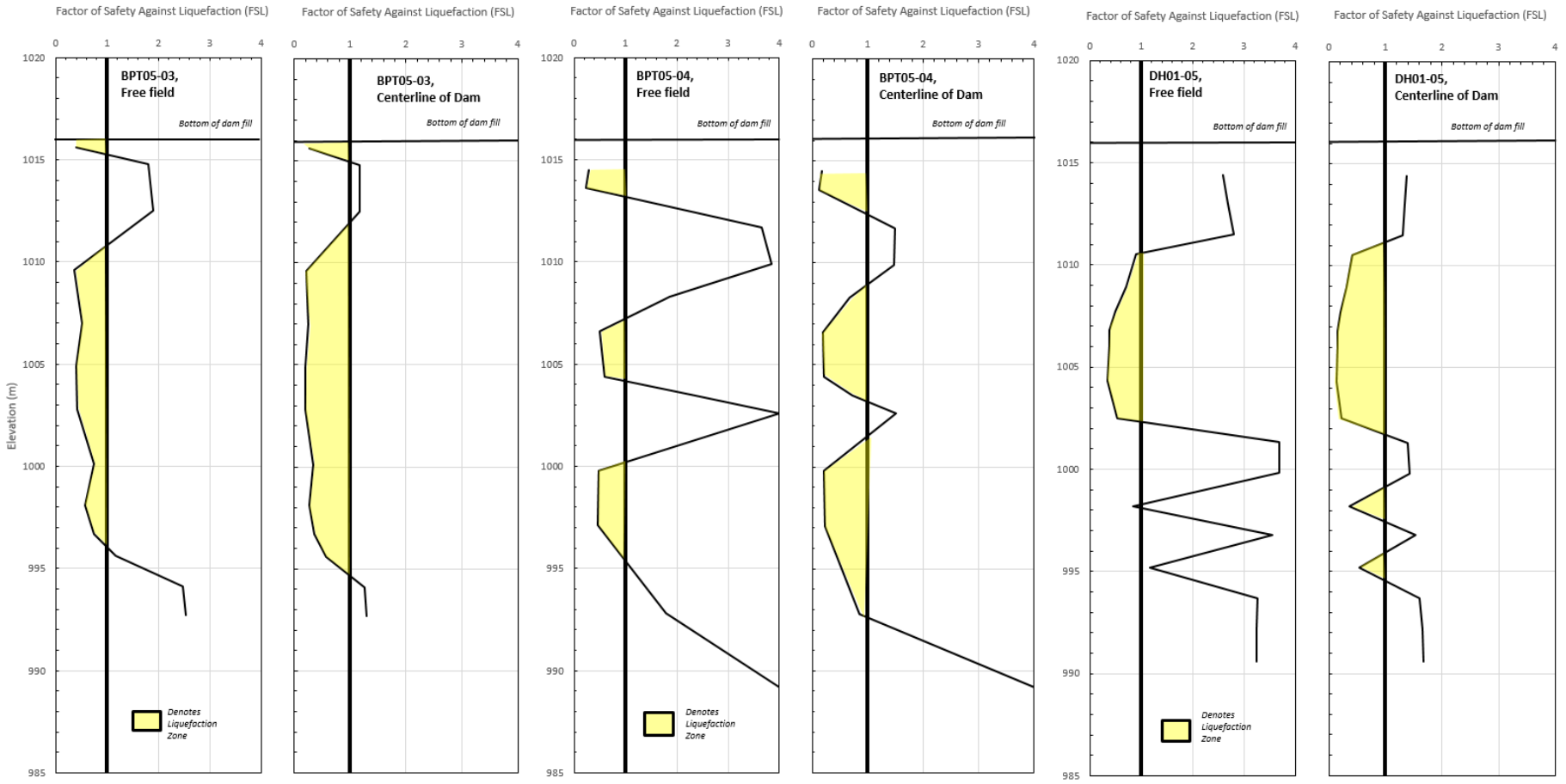


Figure 5-1. Liquefaction Profiles for Borings BKS05-03, BKS05-04, and DH01-05 at the Cross Valley Dam for a 1-in-10,000-year Event
Faro Mine Remediation Project

Liquefaction was generally predicted within the loose layer of alluvial gravel, sand, and silt between elevations of 995 and 1,011 m. Pockets of liquefaction were also predicted in the denser alluvium in Boring BPT05-03. Boring BPT05-03 has the thickest and more continuous zone of liquefaction, extending approximately from an elevation of 995.5 to 1,011.5 m, with a cumulative thickness of liquefied material of around 17 m.

The data show that liquefaction is anticipated to be thicker along the centreline of the dam than in the free field. Although a slightly more conservative approach, the zone of liquefaction used in the stability studies is assumed to be horizontal and equal to that shown under the centreline of the dam.

5.2.3 Residual Strength of Liquefied Soil

The undrained liquefied residual strengths of the liquefied soils were estimated for the potentially liquefiable layers. Figure 5-2 presents the estimated residual shear strength ratios, s_{ur}/σ'_{vo} for the liquefied layers and the zones of liquefaction for each profile. Figure 5-2 and Table 5-2 also show the recommended design residual shear strength ratio, s_{ur}/σ'_{vo}, for each liquefaction zone.

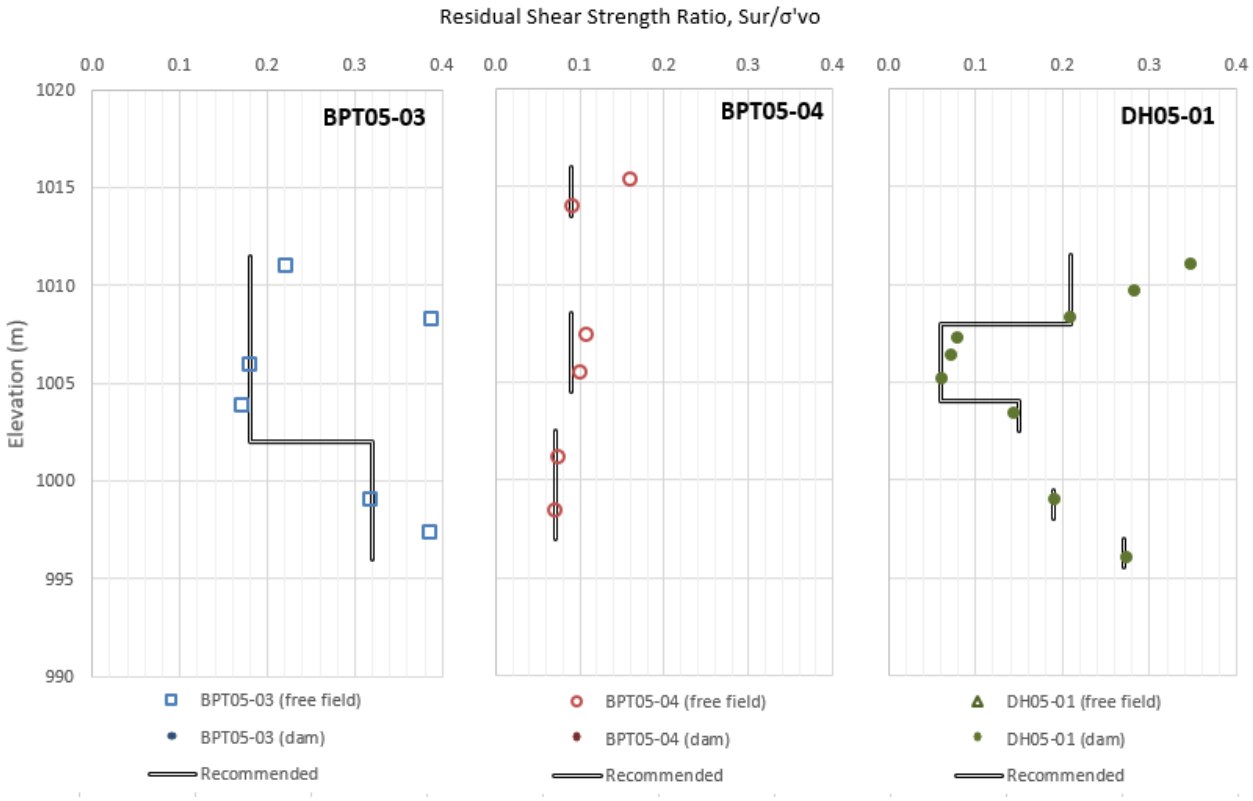


Figure 5-2. Recommended Residual Shear Strength Ratios of the Liquefied Layers at the Cross Valley Dam
Faro Mine Remediation Project

5.2.4 Post-Liquefaction Settlement (because of volumetric strain only)

Settlement resulting from liquefaction-induced volumetric strain was estimated at the CVD following the Tokimatsu and Seed method (1987). Settlements were estimated to range from 22 to 34 centimetres (cm) for the various profiles at the dam centreline. Results of the estimates are provided in Table 5-3.

Table 5-2. Liquefaction Zones and Recommended Residual Shear Strength Ratios at the Cross Valley Dam
Faro Mine Remediation Project

Subsurface Profile	Liquefaction Zone (approximate)		Recommended Residual Shear Strength Ratio, s_{ur}/σ'_{vo}
	Bottom Elevation (m)	Top Elevation (m)	
BPT05-03	1,015.5	1,016.0	0.32
	1,002.0	1,011.5	0.18
	996.0	1,002.0	0.32
BPT05-04	1,013.5	1016.0	0.09
	1,004.5	1,008.5	0.09
	997.0	1,002.5	0.07
DH01-05	1,008.0	1,011.5	0.21
	1,004.0	1,008.0	0.06
	1,002.5	1,004.0	0.15
	998.0	999.0	0.19
	995.0	997.0	0.27

Table 5-3. Liquefaction-Induced Settlement at the Cross Valley Dam (after Tokimatsu and Seed, 1987)
Faro Mine Remediation Project

Subsurface Profile	Thickness of Liquefiable Layers (m)		Liquefaction-Induced Settlement (cm)	
	Free Field	Centreline of Dam	Free Field	Centreline of Dam
BPT05-03	17.3	17.3	27	29
BPT05-04	12.1	12.1	33	34
DH05-01	10.6	12.2	12	22

5.3 East Limb of the Secondary Dam

5.3.1 Screening of Fine-Grained Soils

Table 5-4 shows the results from the fine-grained soil susceptibility screening using the available laboratory testing data from the KCC (March 2006; June 2006) and CH2M (March 2016j) reports. The results show the fine-grained zones are relatively sparse. However, the behaviour of these zones is estimated to be more sand-like, and are therefore considered to be liquefiable.

Table 5-4. Liquefaction Susceptibility Screening of Fine-Grained Soils at the East Limb of the Secondary Dam
Faro Mine Remediation Project

Boring	Sample No.	Depth (m)	PI	wc/LL	Liquefaction Susceptibility	
					Bray and Sancio (September 2006)	Boulanger and Idriss (November 2006)
BPT05-06	SPT 1	7.6	2	0.51	Moderately Susceptible	Susceptible
BPT05-07	SPT 2	10.1	3	0.53	Moderately Susceptible	Susceptible

5.3.2 Liquefaction of Foundation Soils

Liquefaction evaluation for the ELSD included the profiles from Borings BPT04-13, BPT05-06, BPT05-07, CH15-201-MW005, and CH15-201-MW006. The method presented by Youd et al. (2001) was used to estimate the liquefaction potential using the CSR results from the site-specific, seismic ground response analysis presented in Section 4.

Figures 5-3 and 5-4 present elevation profiles for the factor of safety against liquefaction at the free field and centreline of the dam for each of the subsurface profiles evaluated. Figure 5-3 presents the profiles for Borings CH15-201-MW005 and CH15-201-MW006 for a 1-in-10,000-year event, and Figure 5-4 presents the profiles for Borings BPT04-13, BPT05-06, and BPT05-07.

The liquefaction results were not consistent across each profile. Although a layer was predicted to liquefy in one boring profile, the same layer was not predicted to liquefy in the adjacent boring profile. This may suggest that these layers are not equally distributed in regard to density, and that liquefaction may be a localized occurrence and may occur more in lenses rather than horizontally continuous layers.

However, from the overall investigation results of the liquefaction extent by CH2M and KCC (for the purpose of performing simplified seismic slope stability evaluations described in Section 7) it is conservatively assumed that the southeastern portion of the ELSD is underlain by liquefiable layers that are horizontally continuous.

Liquefaction was generally predicted within the loose to medium dense layer of alluvial sand and gravel between elevations of 1,050 and 1,055 m in some borings. The cumulative thickness of the liquefied layer under the design ground motions ranged from 1.5 m to 7.5 m.

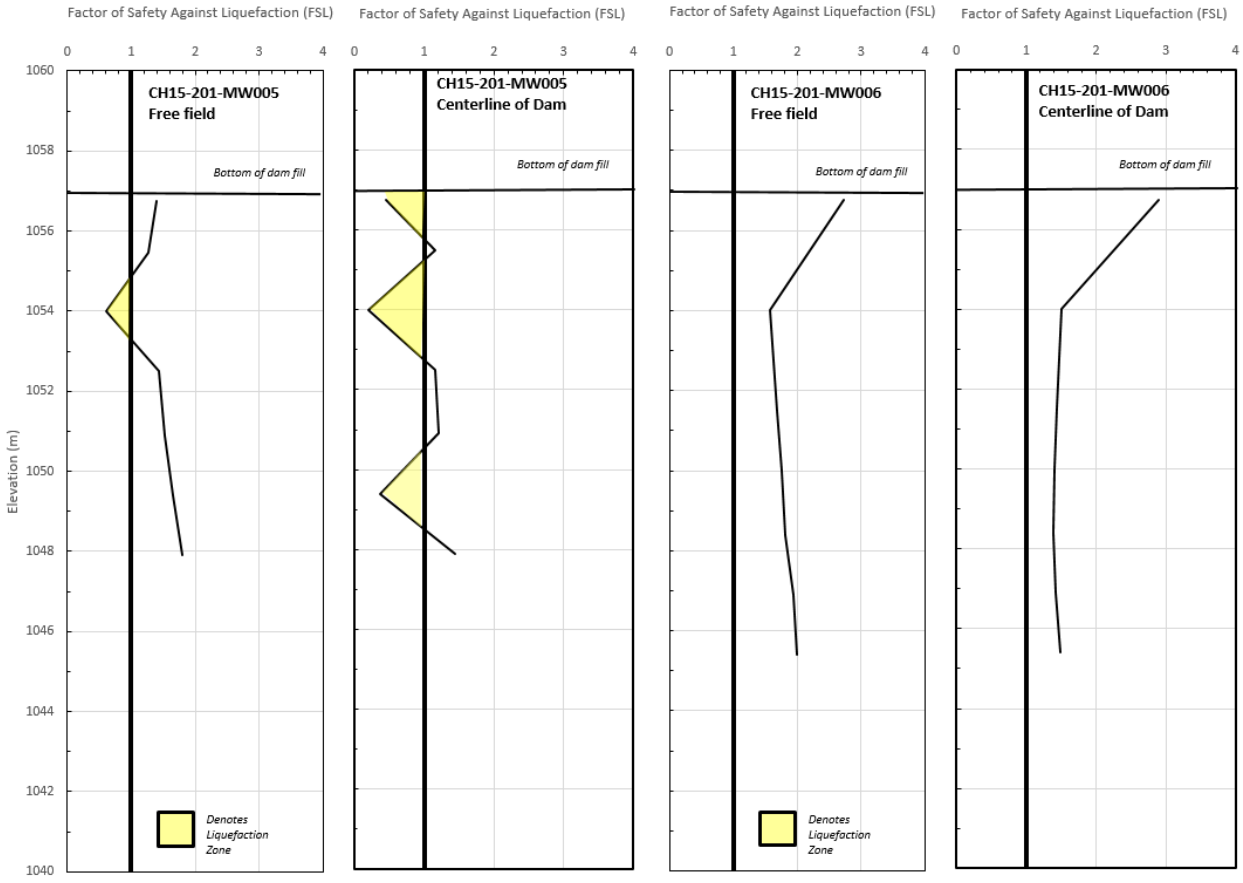


Figure 5-3. Liquefaction Profiles for Borings CH15-201-MW005 and CH15-201-MW006 at the East Limb of the Secondary Dam for a 1-in-10,000-year Event

Faro Mine Remediation Project

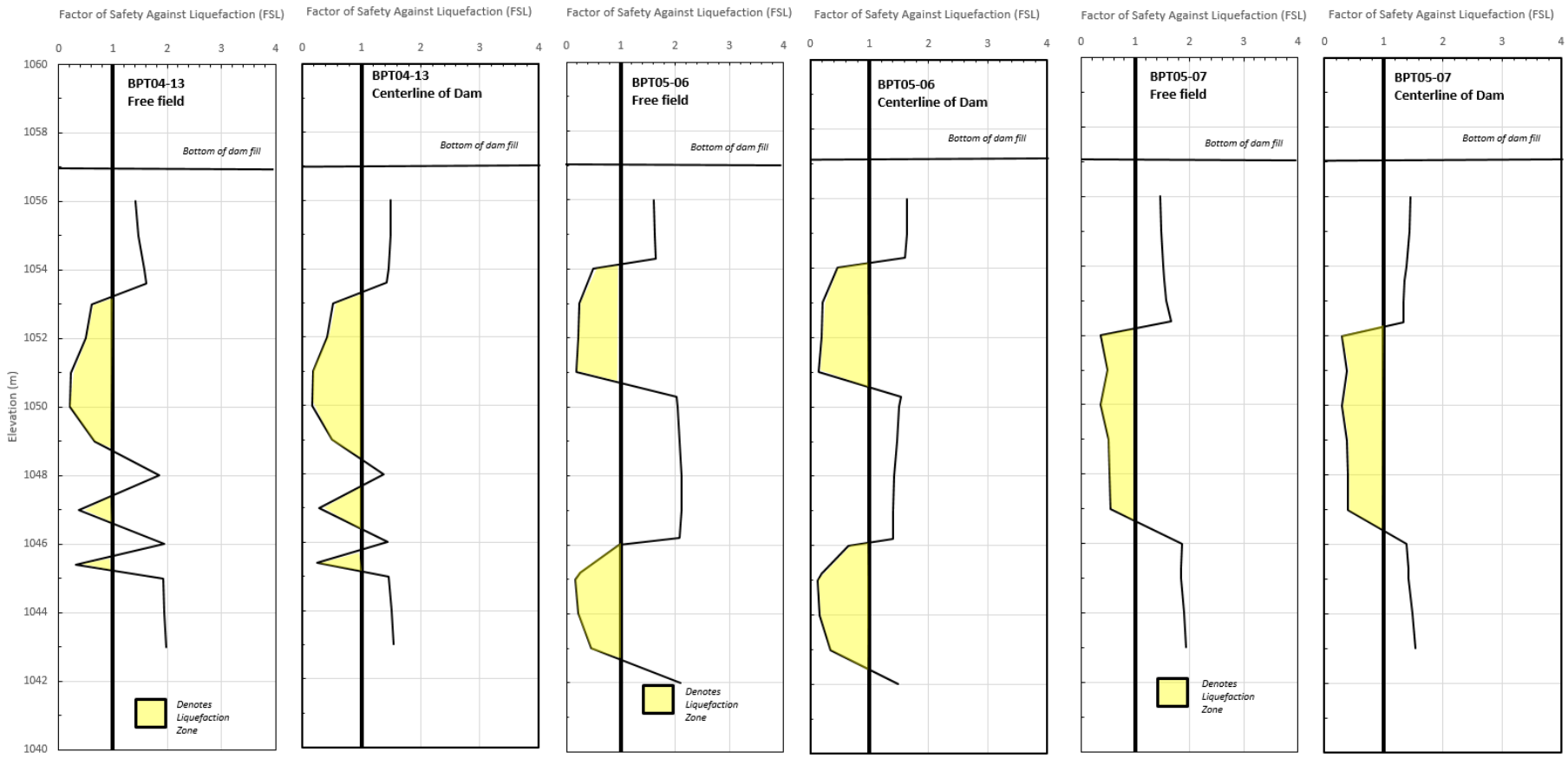


Figure 5-4. Liquefaction Profiles for Borings BPT04-13, BPT05-06, and BPT05-07 Profile at the East Limb of the Secondary Dam for a 1-in-10,000-year Event
Faro Mine Remediation Project

5.3.3 Residual Strength of Liquefied Soil

The estimated residual shear strength ratios, s_{ur}/σ'_{vo}, for the liquefied layers and the zones of liquefaction for the ELSD for each profile are presented on Figure 5-4. Figure 5-5 and Table 5-5 show the recommended design residual shear strength ratio, s_{ur}/σ'_{vo}, for each liquefaction zone.

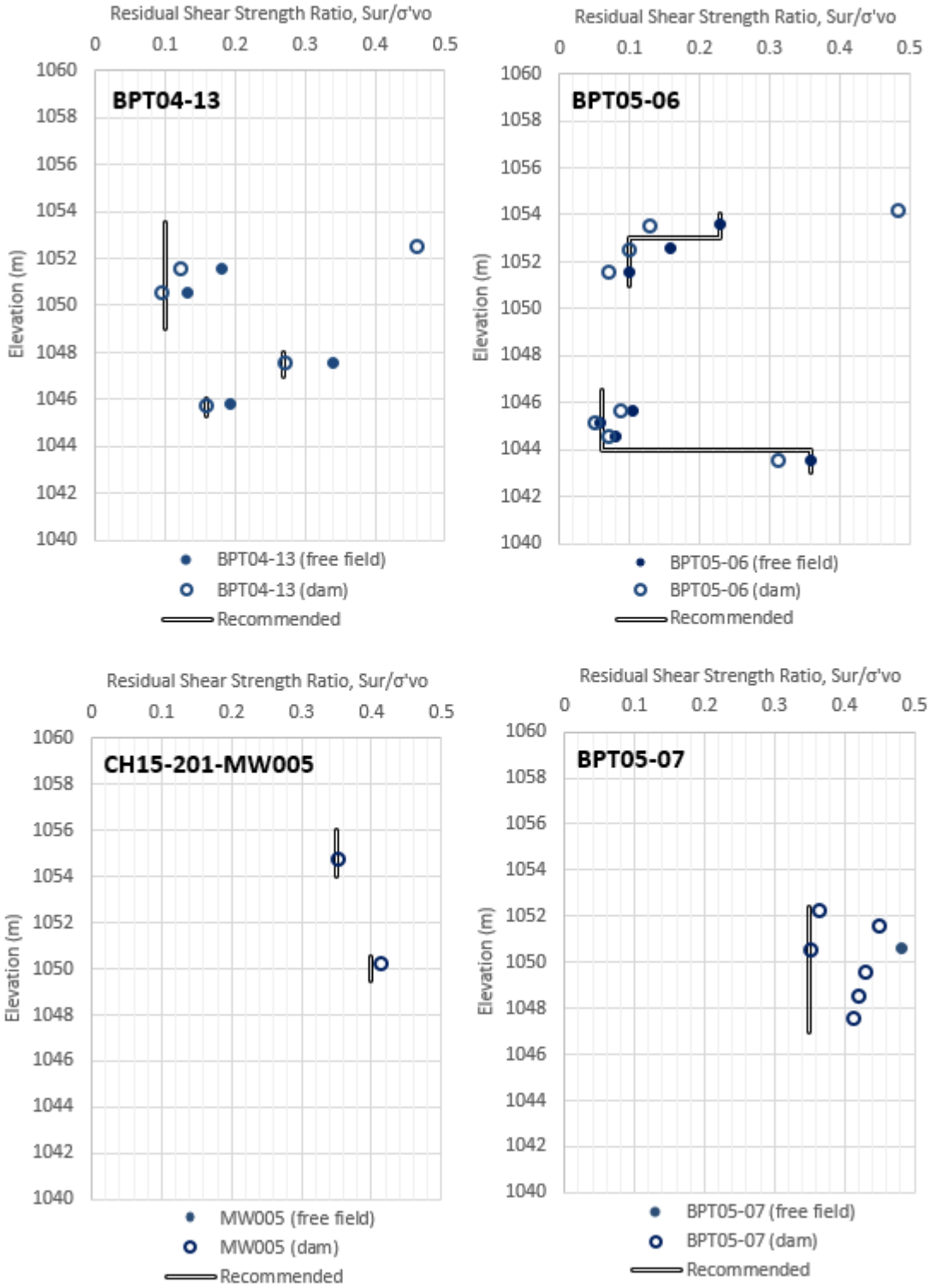


Figure 5-5. Recommended Residual Shear Strength Ratios of the Liquefied Layers at the East Limb of the Secondary Dam

Faro Mine Remediation Project

Table 5-5. Liquefaction Zones and Recommended Residual Shear Strength Ratios at the ELSD
Faro Mine Remediation Project

Subsurface Profile	Liquefaction Zone (approximate)		Recommended Residual Shear Strength Ratio, s_{ur}/σ'_{vo}
	Bottom Elevation (m)	Top Elevation (m)	
BPT04-13	1,049.0	1,053.5	0.10
	1,047.0	1,048.0	0.27
	1,045.3	1,046.0	0.16
BPT05-06	1,053.0	1,054.0	0.23
	1,051.0	1,053.0	0.10
	1,044.0	1,046.5	0.06
	1,043.0	1,044.0	0.36
BPT05-07	1,047.0	1,052.4	0.35
CH15-201-MW005	1,054.0	1,056.0	0.35
	1,049.5	1,050.5	0.40
CH15-201-MW006	No liquefiable layers identified		

5.3.4 Post-Liquefaction Settlement (because of volumetric strain only)

Settlement because of liquefaction-induced volumetric strain was estimated at the ELSD following the Tokimatsu and Seed method (1987). Settlements were estimated to range from 7 to 16 cm for the various profiles at the dam centreline. Results of the estimates are provided in Table 5-6.

Table 5-6. Liquefaction-Induced Settlement at the East Limb of the Secondary Dam (after Tokimatsu and Seed, 1987)
Faro Mine Remediation Project

Subsurface Profile	Thickness of Liquefiable Layers (m)		Liquefaction-Induced Settlement (cm)	
	Free Field	Centreline of Dam	Free Field	Centreline of Dam
BPT04-13	6.2	6.2	10	10
BPT05-06	6.5	6.5	16	16
BPT05-07	5.4	5.4	7	7
CH15-201-MW005	1.5	3.2	1	3
CH15-201-MW006	No liquefiable layers identified			

SECTION 6

Simplified Seismic Slope Stability Evaluation

6.1 Introduction

Simplified limit-equilibrium slope stability analyses were performed to estimate the seismic stability of the CVD and ELSD. Although the limit-equilibrium method is used extensively in practice, the results of seismic analyses contain much uncertainty and are not able to capture complex behaviour such as pore-water-pressure generation and liquefaction. However, these analyses were used as a screening tool and to assist in validating the advanced finite-difference evaluation presented in Section 7.

6.2 Design Criteria

The simplified slope stability analyses were performed following the CDA Dam Safety Guidelines for static (steady state), pseudo-static, and post-seismic loading cases (2007). The minimum factors of safety adopted for the slope stability analyses are based on those provided by CDA (2007) for seismic assessments and presented in Table 6-1. These factors of safety are meant to account for the uncertainty of inputs into the stability analysis, the probability of the loading condition, and the consequences of potential failure.

Table 6-1. Factors of Safety for Slope Stability – Seismic Assessment
Faro Mine Remediation Project

Loading Condition	Minimum Factor of Safety
Static Steady State	1.5
Pseudo-static	1.0
Post-Seismic	1.2 – 1.3

Source: CDA, 2007 as revised in 2013

6.3 Loading Cases

6.3.1 Static Stability

The static stability case assumed steady state seepage through the embankment dam. The static water level was assumed to be at full pool (freeboard of 1.5 m) for the CVD, corresponding to an elevation of approximately 1,062.5 m. For the ELSD, the water level was assumed to be 1 m below the surface of the tailings area, following a similar assumption presented by KCC (March 2006; June 2006). This corresponds to an elevation of 1,061 m (3 m below the crest of the dam). Soil strengths used in the analysis were based upon the recommended values presented in Section 3.

6.3.2 Pseudo-static Stability

The pseudo-static analyses were similar to the static loading case, except that a seismic load was included as a horizontal inertial force acting at the centroid of the critical sliding mass. The intensity of the seismic loading was specified in terms of a seismic coefficient (k_h). If the dam material was a rigid mass, the pseudo-static force would be equal to the product of the horizontal acceleration at the base of the dam and the weight of the sliding mass. However, because the dams are earth embankments and are not rigid, the acceleration at the base of the embankment will be amplified to the crest of the dam.

The method developed by Bray and Travasarou (September 2009) was used to estimate the pseudo-static coefficient for the seismic slope stability evaluation. An allowable seismic displacement was selected based upon the lesser value between half the filter width or freeboard (minus the settlement because of liquefaction estimated in Section 5). The reason that this criterion was selected is that the dam is considered to be susceptible to breaching if the lateral movement has rendered the filter to be no longer in operation, or if vertical movement (assumed to be equal to horizontal movement) is greater than the available freeboard and overtopping has occurred. Therefore, if the computed factor of safety from the pseudo-static analysis is greater than 1.0, it can be concluded that the expected seismic displacement would be less than the allowable displacement, with a 16 percent probability of exceeding this displacement.

For the CVD, the allowable displacement of 1.4 m was selected based on 1.7 m freeboard, minus the estimated settlement of 30 cm because of liquefaction-induced volumetric strain. For the ELSD, the allowable displacement is 1.8 m, based upon a vertical distance between the dam crest and the tailings surface of 2 m and an estimated settlement because of liquefaction-induced volumetric strain of 20 cm.

Table 6-2 shows the predicted seismic coefficients. There is very little difference in the computed pseudo-static horizontal coefficients (k_h) between each profile at each dam. Therefore, a representative value for each dam site was selected for analysis.

Table 6-2. Pseudo-static Coefficients based upon Allowable Displacements
Faro Mine Remediation Project

Dam Site (Subsurface Profile)	Allowable Displacement (m)	Pseudo-static Coefficient (after Bray and Travasarou, September 2009)
CVD (BPT05-03, BPT05-04, DH05-01)	1.40	0.09
ELSD (BPT04-13, BPT05-06, CH15-201-MW005)	1.80	0.08

Note:

Allowable displacement is based upon the lesser of the following values: (1) half the width of the filter or (2) the design freeboard minus the settlement attributed to liquefaction.

Two scenarios were considered in the pseudo-static evaluation for modelling the foundation soils:

1. Pore-pressure generation and liquefaction occurs during strong shaking.
2. Pore-pressure generation and liquefaction occurs at the end of strong shaking.

If the duration of shaking is relatively short (i.e., 20 to 30 seconds), significant pore-water pressure and possible strength loss because of liquefaction may not occur during shaking. In this scenario, the static strengths were used, assuming no significant pore pressure buildup and no resulting strength loss. In the second scenario, the duration of shaking is considered long enough or the initial dynamic loads are strong enough to cause significant strain and pore pressure development early in the shaking that liquefaction does occur during strong shaking, and that the foundation soils undergo inertial loading while exhibiting undrained residual liquefied soil strengths. Both of these options were evaluated and presented for each profile.

Similar to the static analyses, a normal full pool or tailings reservoir was assumed for the pseudo-static analyses. The failure surfaces considered in the analyses for the pseudo-static case using the auto-search routine were forced through the dam, extending into the foundation soils and were limited in extending no further than beyond the toe of the dam a distance equal to 4 times the embankment height.

6.3.3 Post-seismic Stability

As presented in Section 5, the foundation soils of both dams are anticipated to undergo some amount of liquefaction triggering or partial pore-water increase during a 1-in-10,000-year seismic event, leading to a reduction in the soil strength, possibly as low as the undrained liquefaction residual strength. The post-seismic stability loading case evaluates the slope stability after the strong shaking has stopped and liquefaction has occurred, referred to as a flow failure. A flow failure is characterized by sudden initiation, rapid failure, and the large distances that the failure materials move (Kramer, 1996). These can occur near the end or shortly after strong shaking has occurred. Currently, there are no simplified methods in practice to predict the amount of deformation for a flow failure.

The foundation soils for each profile are modelled with their representative zone of liquefaction and the estimated residual strength, as presented in Section 5. No liquefaction was assumed to occur within the compacted dam fill. CDA guidelines require a post-seismic factor of safety of 1.2 or greater (CDA, 2007 as revised in 2013).

The failure surfaces considered in the post-seismic analyses were forced through the dam, extending into the foundation soils, and were assumed to extend no further than a distance equal to 4 times the embankment height beyond the toe of the dam.

6.4 Method of Analysis

Limit-equilibrium slope stability analyses were performed using the computer program *SLIDE v7* (Rocscience, 2016). Spencer's method (1967) was used to estimate the factor of safety for each of the loading cases. Analyses were completed using the non-circular path search option in *SLIDE* for all cases, and the optimization function within *SLIDE* was used to identify the critical failure surface.

6.5 Cross Valley Dam

6.5.1 Results

Table 6-3 presents the results from the slope stability analyses for static, pseudo-static, and post-seismic loading conditions for the CVD. For profiles in which the factor of safety for the post-seismic loading case was greater than 1.0, the pseudo-static case was also evaluated assuming liquefied conditions. This is to represent the scenario of having liquefaction occur during shaking. For cases where the post-seismic loading cases factor of safety was less than 1.0, there was no reason to check the pseudo-static factor of safety for the liquefied condition, as very large deformation were expected either during or following liquefaction. Because the CVD is impounding water, both the upstream and downstream slopes were evaluated.

Results from the stability analyses for the profile BPT05-04 are presented on Figures 6-1 through 6-4. The results of the evaluation indicate that liquefaction significantly compromises the stability of the CVD, with all post-seismic factors of safety for the downstream slope being less than 1.0.

For the upstream slope, the factor of safety for each profile was marginally stable (FS greater than 1.0) for the post-seismic loading case; however, for the profile at DH05-01 the factor of safety was less than the minimum factors of safety of 1.2 to 1.3 required by the CDA guidelines (CDA, 2007 as revised in 2013). Note that the reason the required values are higher than 1.0 is to account for the uncertainty in soil properties, seismic loading, and other parameters.

If liquefaction is assumed during shaking, the results from the pseudo-static analyses indicate factors of safety of less than 1.0, indicating that deformation analyses should be performed to evaluate whether acceptable performance criteria are met.

The results from these simplified analyses, used as a screening method, indicate unacceptable performance. Following these results, two approaches are commonly used to proceed with the evaluations and design:

1. Implement mitigation measures until the performance is acceptable using these simplified analyses. These analyses use the same simplified methods of analyses, but through the use of mitigation measures to strengthen the soil, modify the geometry, or include structural elements, an acceptable factor of safety is determined.
2. Conduct advanced analyses that fully account for the non-linear behaviour, coupled behaviour or pore pressure generation and ground shaking, propagation of the ground motions through the model to directly account for wave spreading, flexible failure mass behaviour, temporal change in pore pressures, spatial variations in pore-pressure generation, etc. These analyses may or may not include mitigation measures, but by using more theoretically correct analyses generally result in a more accurate estimate of performance.

Both of the above approaches were implemented for this project, with Approach 1 presented in Section 6.5.2 and Approach 2 in Chapter 7.

Table 6-3. Summary of Results for Slope Stability Analyses at the Cross Valley Dam for a 1-in-10,000-year Event
Faro Mine Remediation Project

Subsurface Profiles	Slope Direction	Factor of Safety			
		Static, Steady State	Pseudo-static [a] (non-liquefied)	Pseudo-static (liquefied) [b]	Post-seismic
BPT05-03	Downstream	1.7	1.4	--	0.6
	Upstream	1.9	1.4	0.8	1.2
BPT05-04	Downstream	1.6	1.4	--	0.6
	Upstream	1.9	1.4	0.9	1.2
DH05-01	Downstream	1.6	1.4	--	0.5
	Upstream	1.9	1.4	0.7	1.0

Notes:

[a] Pseudo-static analysis is based upon allowable deformation of 140 cm. If the factor of safety is above 1.0, then the expected seismic displacement will be less than the allowable given the probability of exceedance of 16 percent.

[b] If the computed factor of safety for the post-seismic loading condition is less than 1.0, the pseudo-static case with liquefied soil layers is not evaluated.

CROSS VALLEY DAM
BPT05-04
STATIC ANALYSIS

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Core		21	Mohr-Coulomb	0	35
Shell		21	Mohr-Coulomb	0	35
Filter/Drain		21	Mohr-Coulomb	0	35
Foundation Layer 1 - Sands and Gravels, dense		21	Mohr-Coulomb	0	36
Foundation Layer 2 - Gravel, Sand, and Silt, loose		20	Mohr-Coulomb	0	34
Foundation Layer 3 - Sands and Gravels		21	Mohr-Coulomb	0	38
Glacial Till		21	Mohr-Coulomb	0	40

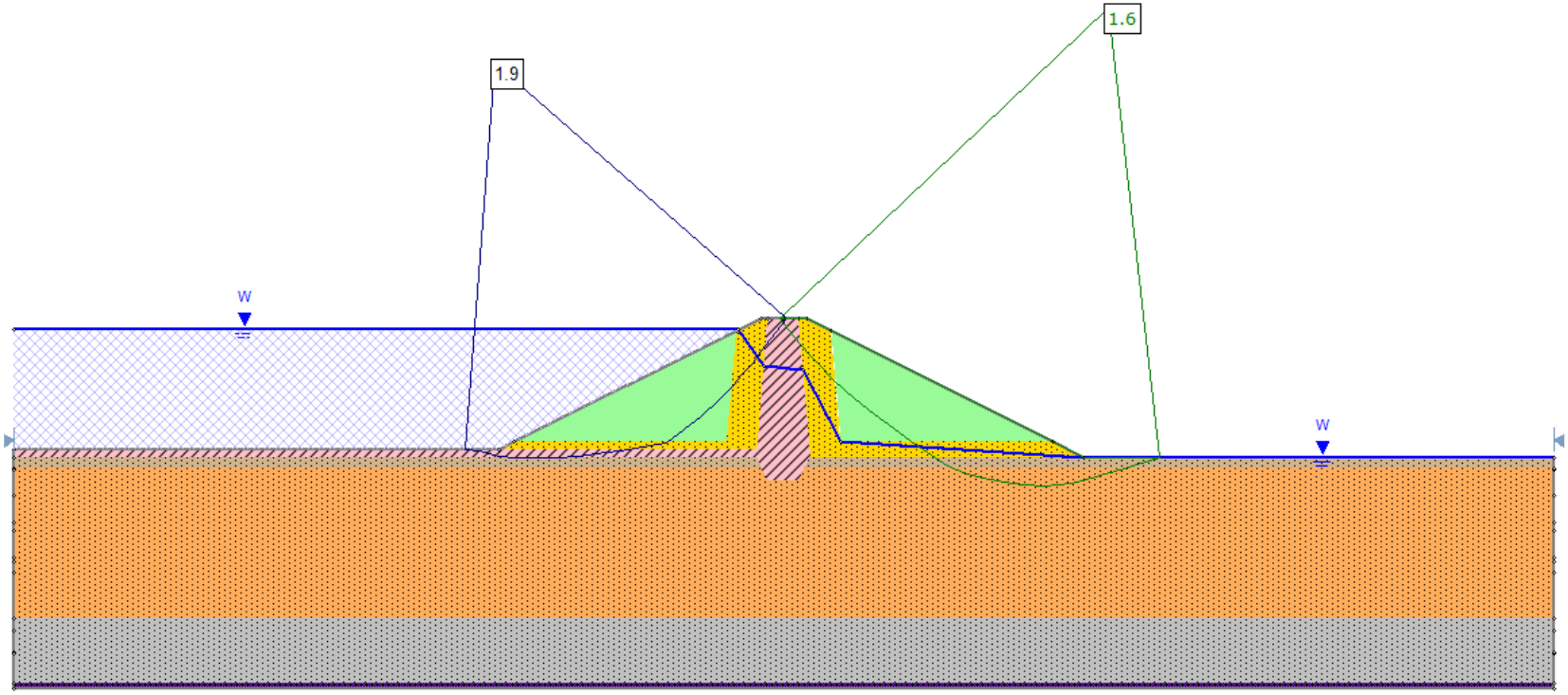


Figure 6-1. Slope Stability Results for Cross Valley Dam, BPT05-04 Profile, Static Loading Case for both Upstream and Downstream Slopes
Faro Mine Remediation Project

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Core		21	Mohr-Coulomb	0	35
Shell		21	Mohr-Coulomb	0	35
Filter/Drain		21	Mohr-Coulomb	0	35
Foundation Layer 1 - Sands and Gravels, dense		21	Mohr-Coulomb	0	36
Foundation Layer 2 - Gravel, Sand, and Silt, loose		20	Mohr-Coulomb	0	34
Foundation Layer 3 - Sands and Gravels		21	Mohr-Coulomb	0	38
Glacial Till		21	Mohr-Coulomb	0	40

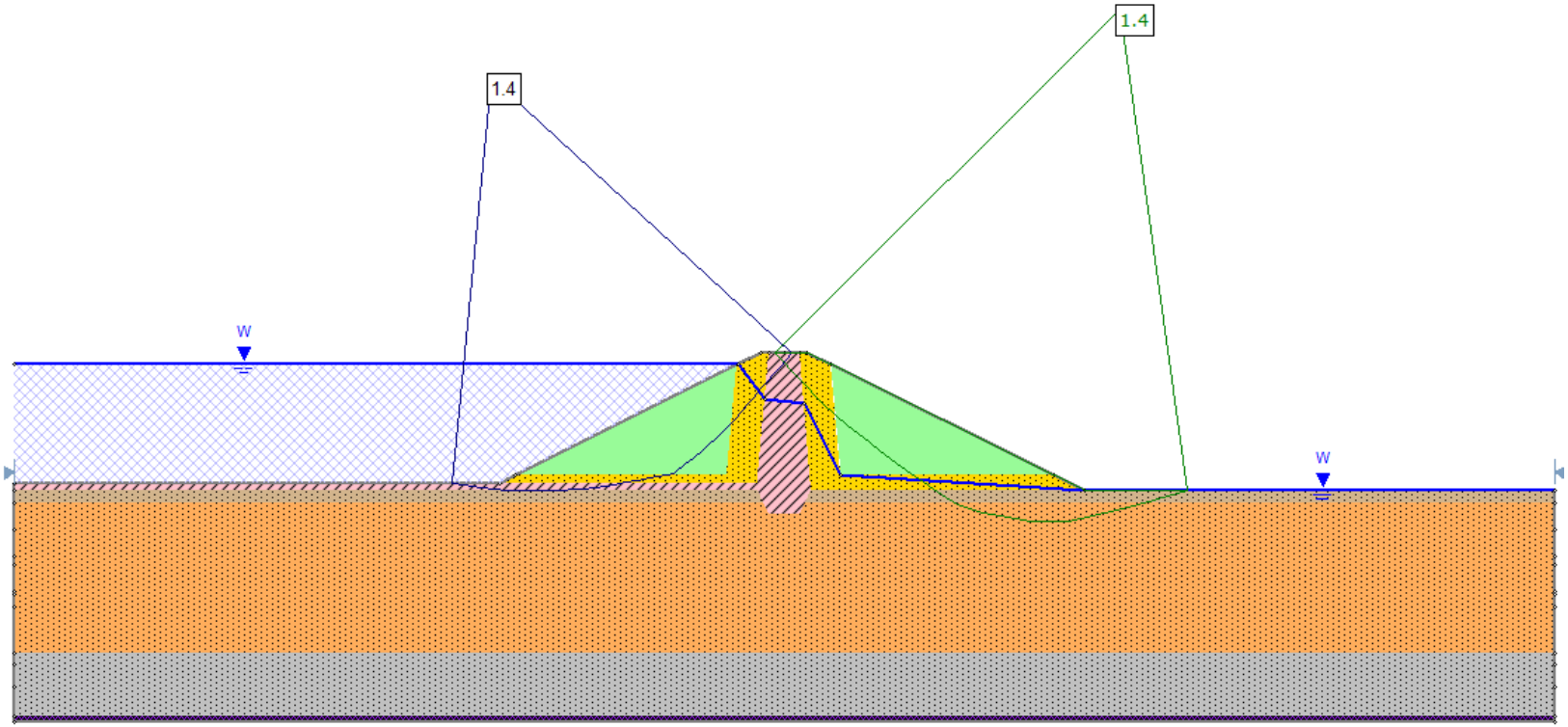
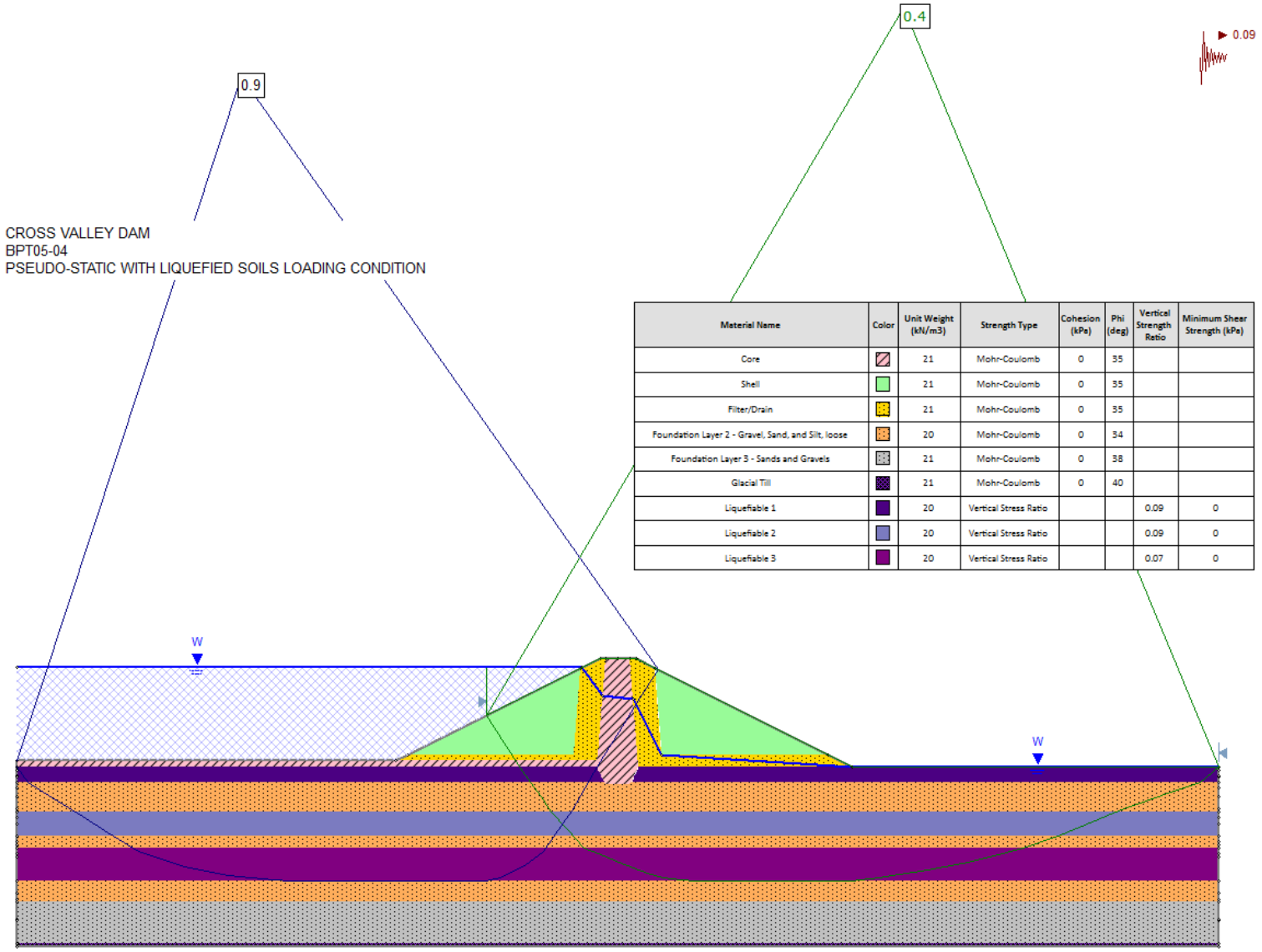


Figure 6-2. Slope Stability Results for Cross Valley Dam, BPT05-04 Profile, Pseudo-static Loading Case for both Upstream and Downstream Slopes

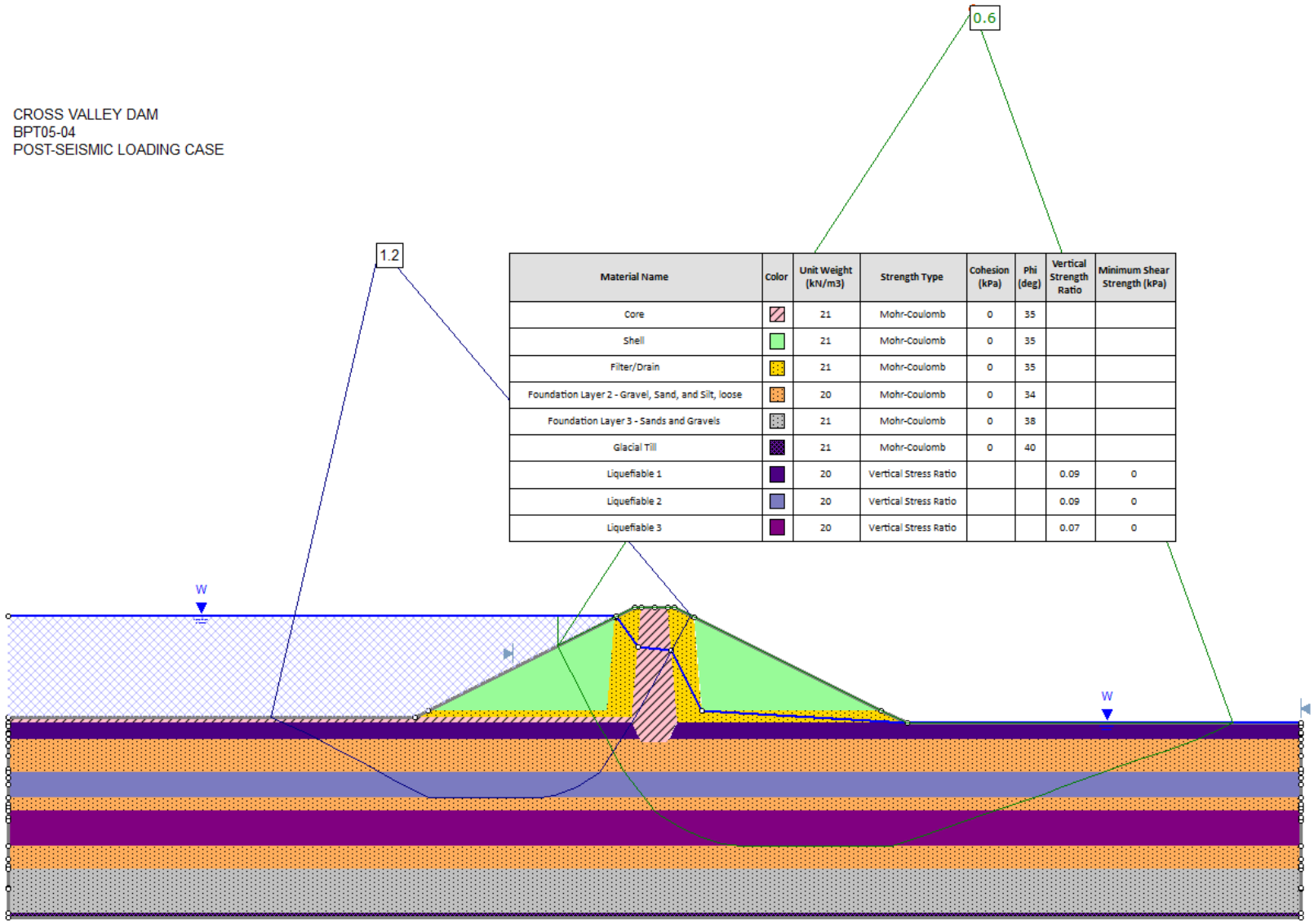
Faro Mine Remediation Project



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Vertical Strength Ratio	Minimum Shear Strength (kPa)
Core		21	Mohr-Coulomb	0	35		
Shell		21	Mohr-Coulomb	0	35		
Filter/Drain		21	Mohr-Coulomb	0	35		
Foundation Layer 2 - Gravel, Sand, and Silt, loose		20	Mohr-Coulomb	0	34		
Foundation Layer 3 - Sands and Gravels		21	Mohr-Coulomb	0	38		
Glacial Till		21	Mohr-Coulomb	0	40		
Liquefiable 1		20	Vertical Stress Ratio			0.09	0
Liquefiable 2		20	Vertical Stress Ratio			0.09	0
Liquefiable 3		20	Vertical Stress Ratio			0.07	0

Figure 6-3. Slope Stability Results for Cross Valley Dam, BPT05-04 Profile, Pseudo-static Loading Case with Liquefied Soils for both Upstream and Downstream Slopes

Faro Mine Remediation Project



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Vertical Strength Ratio	Minimum Shear Strength (kPa)
Core		21	Mohr-Coulomb	0	35		
Shell		21	Mohr-Coulomb	0	35		
Filter/Drain		21	Mohr-Coulomb	0	35		
Foundation Layer 2 - Gravel, Sand, and Silt, loose		20	Mohr-Coulomb	0	34		
Foundation Layer 3 - Sands and Gravels		21	Mohr-Coulomb	0	38		
Glacial Till		21	Mohr-Coulomb	0	40		
Liquefiable 1		20	Vertical Stress Ratio			0.09	0
Liquefiable 2		20	Vertical Stress Ratio			0.09	0
Liquefiable 3		20	Vertical Stress Ratio			0.07	0

Figure 6-4. Slope Stability Results for Cross Valley Dam, BPT05-04 Profile, Post-Seismic Loading Case for both Upstream and Downstream Slopes

Faro Mine Remediation Project

6.5.2 Remediation Evaluation

Given the unacceptable factors of safety for the pseudo-static and post-seismic loading conditions, remediation efforts recommended by KCC (March 2006; June 2006) to stabilize the dam for the anticipated seismic loading were evaluated. Because the KCC remediation evaluations were performed under the 1999 CDA criteria (CDA, 1999) requiring a factor of safety of 1.1 for the post-seismic loading condition, and the current criteria (CDA, 2007 as revised in 2013) requires a higher factor of safety of 1.2 to 1.3, it was necessary to re-analyze the mitigation concept to verify that the scheme has adequate safety margins given the new stricter criteria.

In the KCC reports (March 2006; June 2006), the recommended remediation scheme included adding a toe berm along both the downstream and upstream slope, and in situ densification of the potentially liquefiable soils near the toe of the dam to prevent liquefaction from occurring. The proposed remediation at the upstream toe of the dam would require dewatering. At this point of the analyses, it is assumed that this is achievable. Figure 6-5 shows the proposed remediation layout.

In the KCC conceptual design, it was assumed that the densified soils would not undergo liquefaction during the design earthquake event. The toe berm and densified layer were assumed to have a friction angle of 35 degrees and a unit weight of 21 kN/m^3. Dimensions of the recommended remediation layout was determined by KCC (March 2006; June 2006) by performing several iterations assessing the post-seismic stability based upon a target minimum factor of safety of 1.1. Note that their evaluation did not include pseudo-static loading and the resulting displacement associated with the inertial loading.

The KCC conceptual remediation layout was re-evaluated for the cross section of DH05-01 at the CVD. Both post-liquefaction and pseudo-static analyses were performed for the remediation layout for the upstream and downstream slopes. Results are presented in Table 6-4. Based upon the analyses, the dam is stable under post-seismic loading conditions, with a factor of safety well above the required minimum of 1.3.

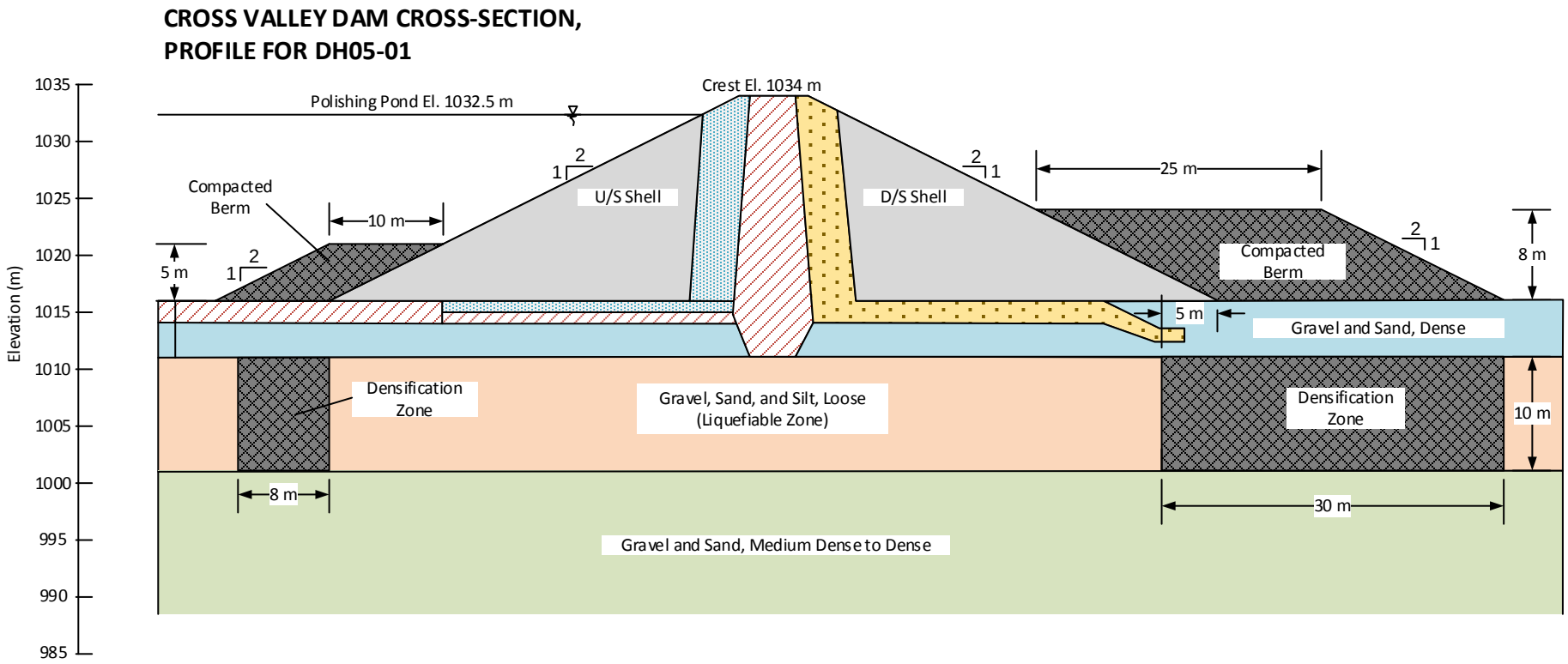


Figure 6-5. Proposed Remediation Layout for the Cross Valley Dam (after KCC, June 2006)

Faro Mine Remediation Project

For the pseudo-static case, assuming liquefied soil conditions occurring during shaking, calculations were performed to estimate the amount of slope displacement using the Bray and Travasarou method (September 2009). Results of the estimated slope displacement from this analysis are summarized in Table 6-4. The estimated displacement is based upon a 50 percent probability of exceedance (i.e., median values), with plus and minus one standard deviation provided for range.

Slope stability results for the remediation layout at the CVD are presented in Figures 6-6 and 6-7 for the pseudo-static (showing yield acceleration) and the post-seismic loading cases, respectively.

Table 6-4. Stability Analysis Results from Remediated Slopes at Cross Valley Dam
Faro Mine Remediation Project

Subsurface Profile	Slope Direction	Proposed Remediation Scheme	Factor of Safety for Post-seismic	Yield Acceleration (g)	Mean Estimated Displacement [-1σ to +1σ] (m)
DH05-01	Downstream	30-m-wide in situ densification and 25 m x 8 m toe berm	1.5	0.07	0.9 (0.5 to 1.8)
	Upstream	8-m-wide in situ densification and 10 m x 5 m toe berm	1. 6	0.06	1.1 (0.6 to 2.1)

Note:

σ = standard deviation (± 16-percent from median)

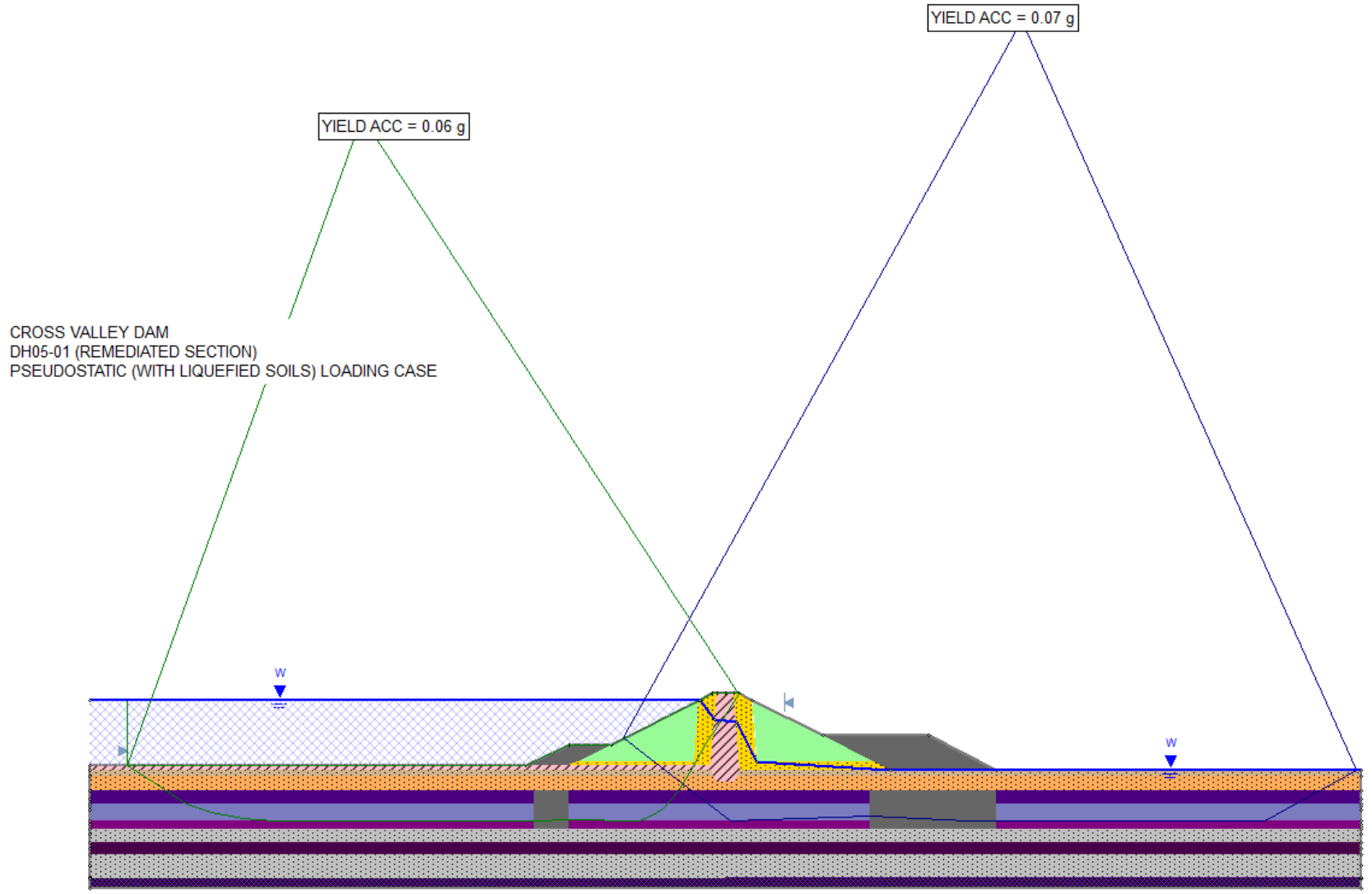


Figure 6-6. Slope Stability Results for the Remediated Cross Valley Dam, DH05-01 Profile, Pseudo-static Loading Case with Liquefied Soils for both Upstream and Downstream Slopes

Faro Mine Remediation Project

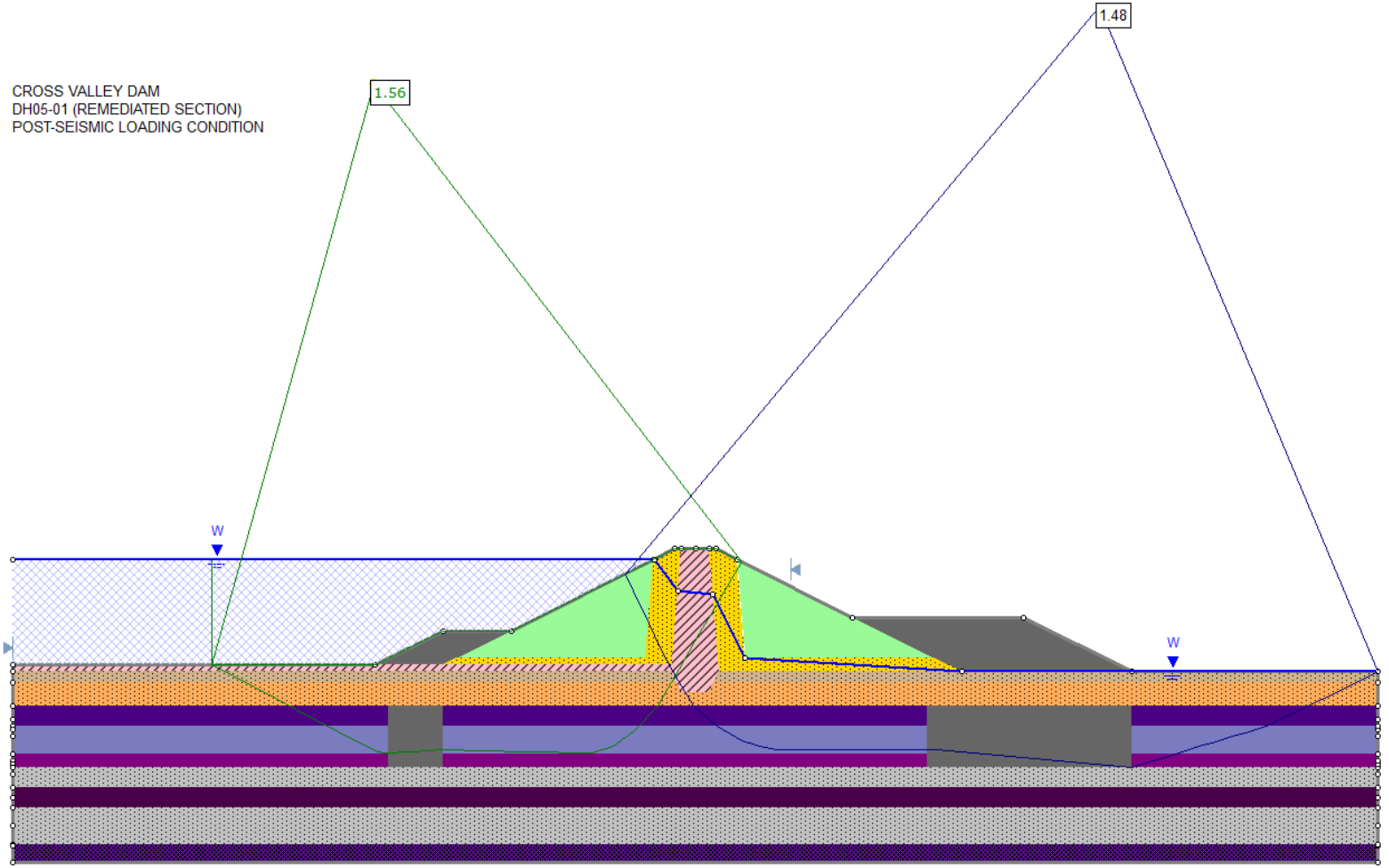


Figure 6-7. Slope Stability Results for the Remediated Cross Valley Dam, DH05-01 Profile, Post-Seismic Loading Case with Liquefied Soils for both Upstream and Downstream Slope

Faro Mine Remediation Project

6.6 East Limb of the Secondary Dam

6.6.1 Results

Results from the slope stability analyses for static, pseudo-static, and post-seismic loading conditions for the ELSD are presented in Table 6-5. Only the downstream slope was evaluated. Similar to that of the CVD, the profile with a factor of safety greater than 1.0 for the post-seismic case was also evaluated for the pseudo-static case assuming liquefied conditions.

The results from the post-seismic loading case indicate a mix on stability performance given the varying liquefaction profiles, with factors of safety ranging from approximately 0.8 to 1.3. However, given that these profiles are relatively close and that other supporting information is not available at this time to identify the extents of the liquefied layer, the analysis and discussion presented herein conservatively assumed that the potentially liquefiable layers are horizontally continuous across the area of interest, and the most critical section is representative of the southeastern corner of the ELSD.

Results from the stability analyses for the profile BPT05-06 are presented in Figures 6-8 through 6-11. These figures show the critical failure surface (i.e., failure surface for lowest factor of safety). It can be concluded that deeper failure surfaces would have higher factors of safety.

As discussed in Section 6.5.1, the results from the simplified analyses, used as a screening method, indicate unacceptable performance. Similar to the CVD, both evaluations incorporating mitigation measures and advanced analyses (unimproved foundation) were conducted as illustrated in the flow chart in Figure 1-3, with the mitigation measure evaluation presented in Section 6.6.2 and the advanced analyses presented in Chapter 7.

Table 6-5. Summary of Results for Slope Stability Analyses at the East Limb of the Secondary Dam for a 1-in-10,000-year event
Faro Mine Remediation Project

		Factor of Safety			
Subsurface Profiles	**Slope Direction**	**Static, Steady State**	**Pseudo-static [a] (non-liquefied)**	**Pseudo-static (liquefied)**	**Post-seismic**
BPT04-13	Downstream	1.5	1.2	--	1.0
BPT05-06	Downstream	1.5	1.2	0.3	0.8
CH15-201-MW005	Downstream	1.5	1.2	0.5	1.3

Note:

[a] Pseudo-static analysis is based upon allowable deformation of 180 cm. If the factor of safety is above 1.0, then the expected seismic displacement will be less than the allowable given the probability of exceedance of 16 percent.

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Tailings		19.5	Mohr-Coulomb	0	30
Fill		21	Mohr-Coulomb	0	35
Sand and Gravel, loose		20	Mohr-Coulomb	0	34
Sand and Gravel, medium dense		20.5	Mohr-Coulomb	0	36
Sand and Gravel, dense		21	Mohr-Coulomb	0	38
Bedrock		24	Infinite strength		
Embankment Fill		21	Mohr-Coulomb	0	35

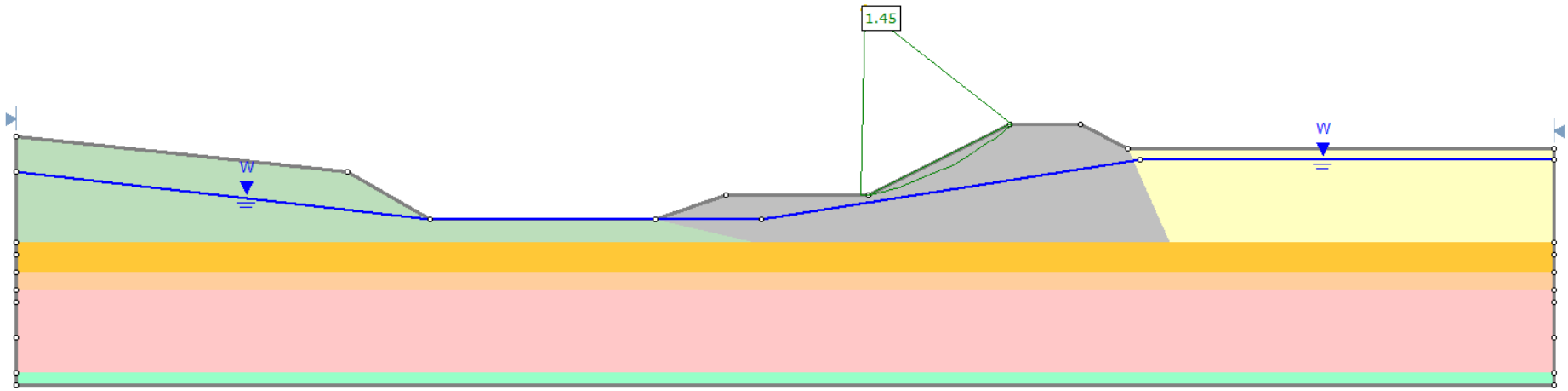
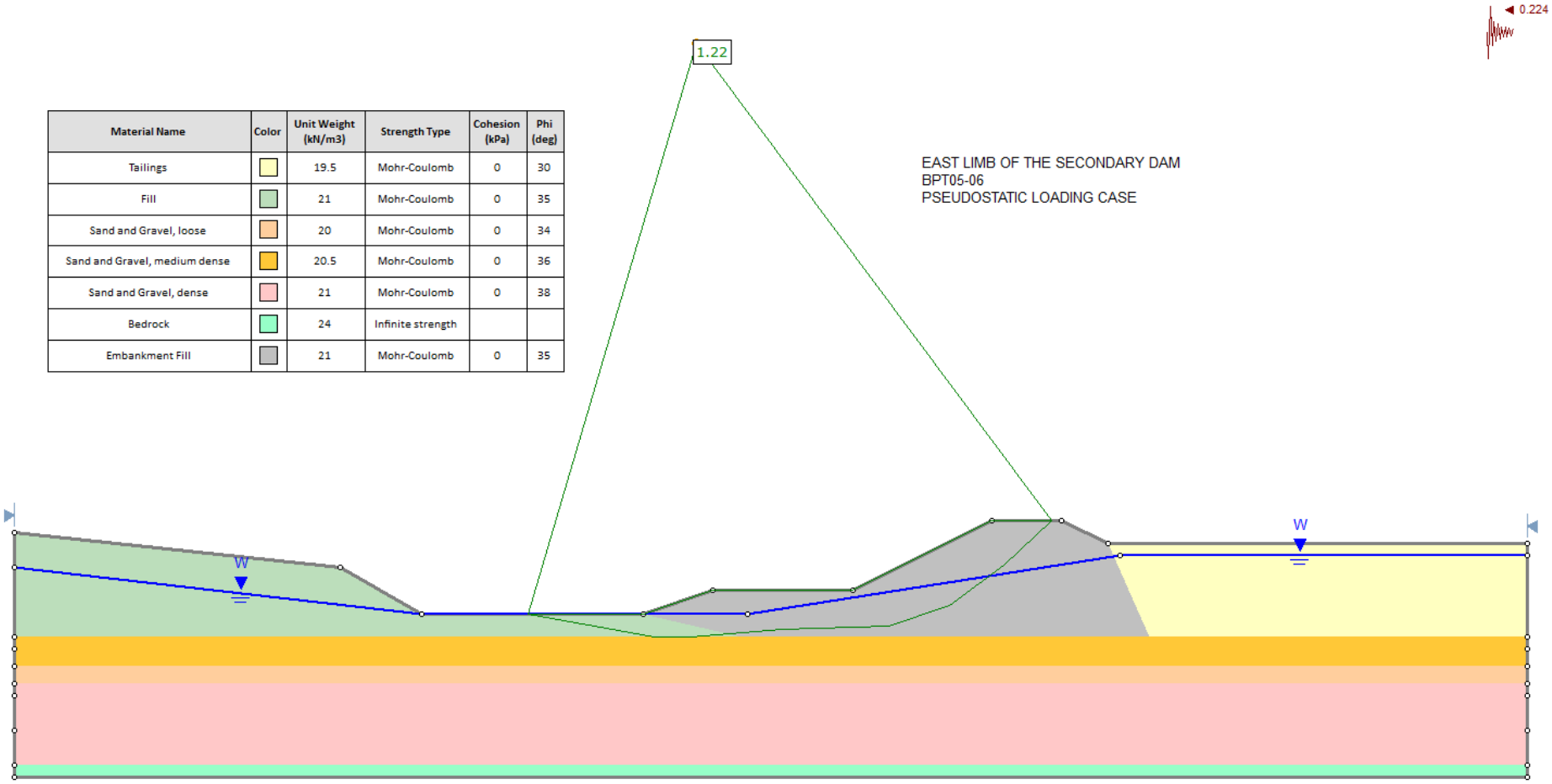


Figure 6-8. Slope Stability Results for East Limb of the Secondary Dam, BPT05-06 Profile, Static Loading Case

Faro Mine Remediation Project



Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)
Tailings		19.5	Mohr-Coulomb	0	30
Fill		21	Mohr-Coulomb	0	35
Sand and Gravel, loose		20	Mohr-Coulomb	0	34
Sand and Gravel, medium dense		20.5	Mohr-Coulomb	0	36
Sand and Gravel, dense		21	Mohr-Coulomb	0	38
Bedrock		24	Infinite strength		
Embankment Fill		21	Mohr-Coulomb	0	35

Figure 6-9. Slope Stability Results for East Limb of the Secondary Dam, BPT05-06 Profile, Pseudo-static Loading Case

Faro Mine Remediation Project

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Vertical Strength Ratio
Tailings (liquefied)		24	Vertical Stress Ratio			0.05
Fill		21	Mohr-Coulomb	0	35	
Sand and Gravel, loose		20	Mohr-Coulomb	0	34	
Sand and Gravel, dense		21	Mohr-Coulomb	0	38	
Bedrock		24	Infinite strength			
Embankment Fill		21	Mohr-Coulomb	0	35	
Liquefied Zone 1		20	Vertical Stress Ratio			0.23
Liquefied Zone 2		20	Vertical Stress Ratio			0.1
Liquefied Zone 3		20	Vertical Stress Ratio			0.06
Liquefied Zone 4		20	Vertical Stress Ratio			0.36

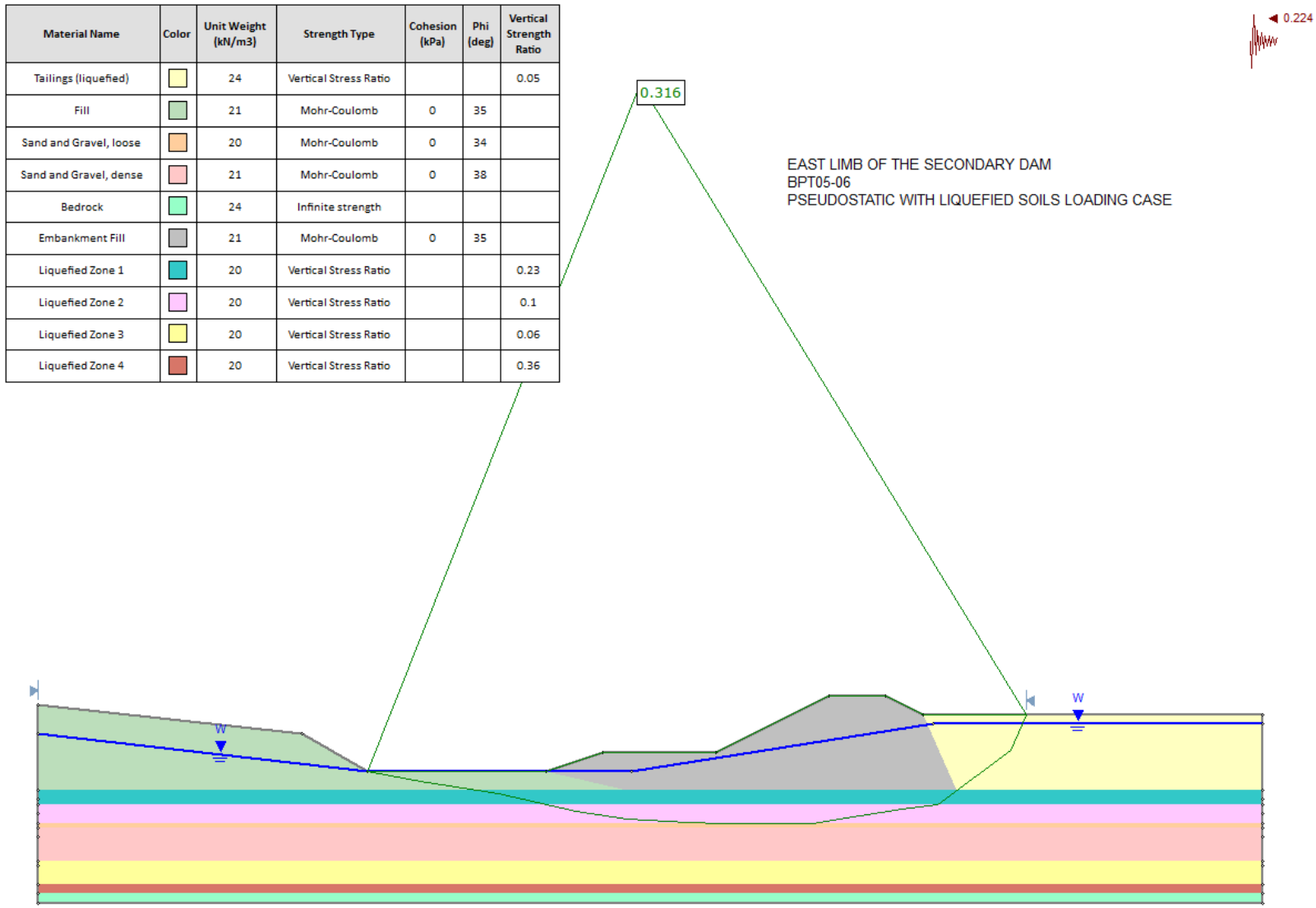


Figure 6-10. Slope Stability Results for East Limb of the Secondary Dam, BPT05-06 Profile, Pseudo-static Loading Case with Liquefied Soils

Faro Mine Remediation Project

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Vertical Strength Ratio
Tailings (liquefied)		24	Vertical Stress Ratio			0.05
Fill		21	Mohr-Coulomb	0	35	
Sand and Gravel, loose		20	Mohr-Coulomb	0	34	
Sand and Gravel, dense		21	Mohr-Coulomb	0	38	
Bedrock		24	Infinite strength			
Embankment Fill		21	Mohr-Coulomb	0	35	
Liquefied Zone 1		20	Vertical Stress Ratio			0.23
Liquefied Zone 2		20	Vertical Stress Ratio			0.1
Liquefied Zone 3		20	Vertical Stress Ratio			0.06
Liquefied Zone 4		20	Vertical Stress Ratio			0.36

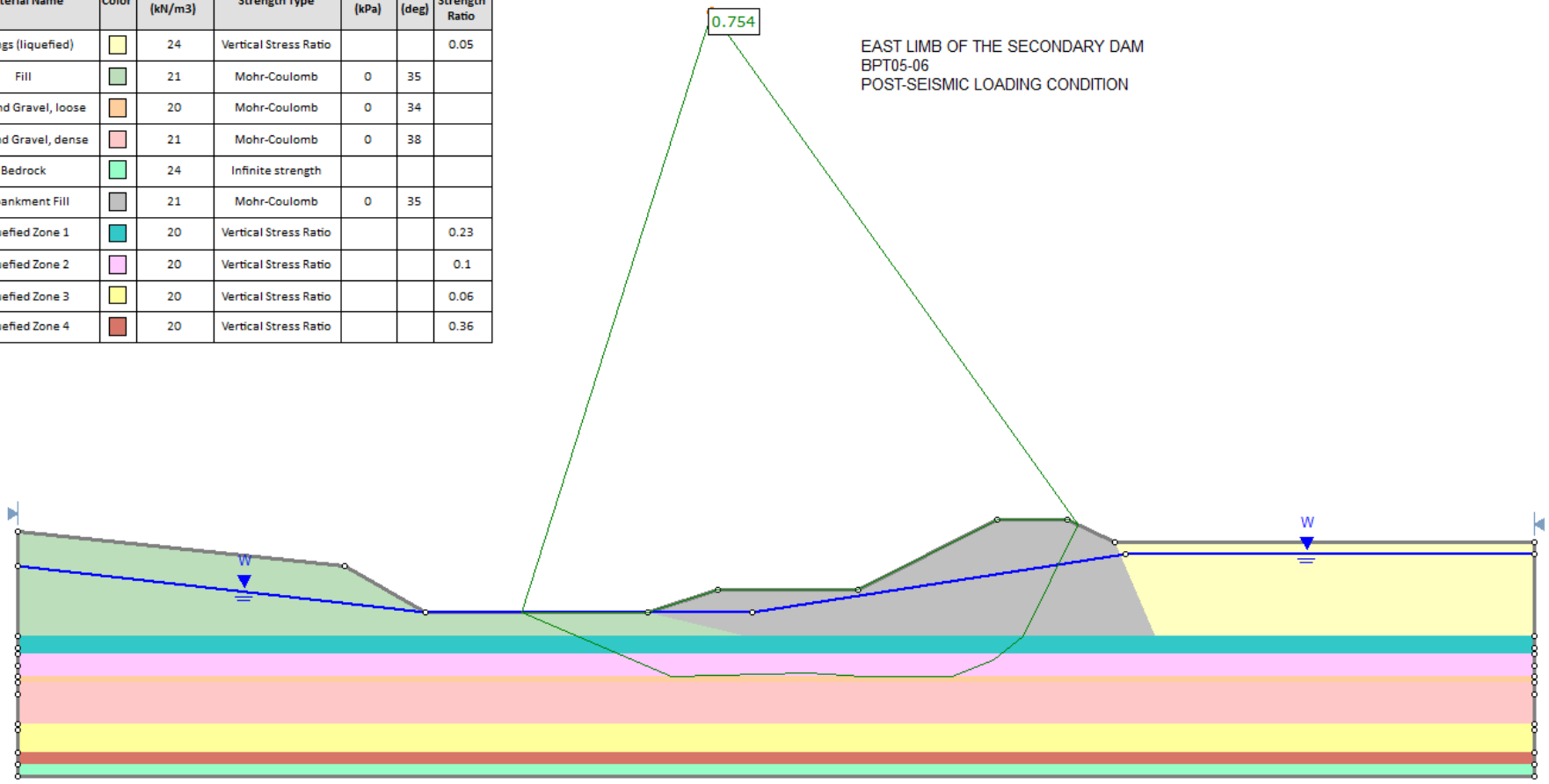


Figure 6-11. Slope Stability Results for East Limb of the Secondary Dam, BPT05-06 Profile, Post-Seismic Loading Case
Faro Mine Remediation Project

6.6.2 Remediation Evaluation

In their report, KCC (March 2006; June 2006) recommended remediation efforts that include an in situ densification zone along the downstream berm, extending in depth to the bottom of the liquefiable zone. The proposed remediation layout is presented in Figure 6-12.

The KCC conceptual design assumed that the densified soils would not undergo liquefaction during the design earthquake event. The densified layer was assumed to have a friction angle of 38 degrees and a unit weight of 21 kN/m^3. Dimensions of the recommended remediation layout were determined by KCC by performing several iterations assessing the post-seismic stability based upon a target minimum factor of safety of 1.1. As with the CVD, KCC did not include the pseudo-static loading condition in their remediation evaluation.

The conceptual layout by KCC (March 2006; June 2006) was evaluated in the current CH2M study for the critical cross section, identified as BPT05-06 in this simplified analysis, for the ELSD. Because the KCC remediation evaluations were performed under the 1999 CDA criteria (CDA, 1999) requiring a factor of safety of 1.1 for the post-earthquake loading condition, and the current criteria (CDA, 2007 as revised in 2013) requires a higher factor of safety of 1.2 to 1.3, it was necessary to re-analyze the mitigation concept. Both post-liquefaction and pseudo-static analyses were performed for the remediation layout for both the upstream and downstream slopes. Results are presented in Table 6-6.

Based upon the analyses, the dam is stable under post-seismic loading conditions, with a factor of safety well above the required minimum of 1.3. An iterative evaluation of the pseudo-static case assuming liquefied soil conditions occurring during shaking was also performed to estimate seismic displacement, as described earlier for the CVD. Results of CH2M's estimated slope displacement are summarized in Table 6-6.

Table 6-6. Stability Analysis Results from Remediated Slopes at ELSD
Faro Mine Remediation Project

Subsurface Profile	Slope Direction	Proposed Remediation Scheme	Factor of Safety for Post-seismic	Yield Acceleration (g)	Mean Estimated Displacement [-1σ to +1σ] (m)
BPT05-06	Downstream	15 m wide in situ densification	1.82	0.09	0.9 (0.5 – 1.8)

Note:

σ = standard deviation (± 16-percent from median)

Slope stability results demonstrating the stability from the remediation to the ELSD for the pseudo-static (showing yield acceleration) and the post-seismic loading cases are presented in Figures 6-13 and 6-14, respectively.

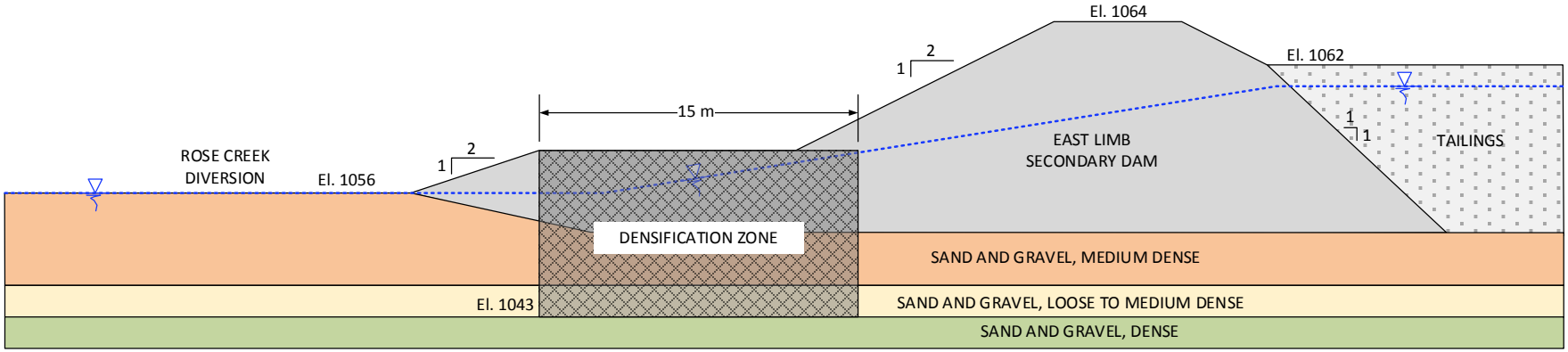


Figure 6-12. Proposed Remediation Layout for the East Limb of the Secondary Dam (after KCC, June 2006)

Faro Mine Remediation Project

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Vertical Strength Ratio
Tailings (liquefied)		24	Vertical Stress Ratio			0.05
Fill		21	Mohr-Coulomb	0	35	
Sand and Gravel, loose		20	Mohr-Coulomb	0	34	
Sand and Gravel, dense		21	Mohr-Coulomb	1	38	
Bedrock		24	Infinite strength			
Embankment Fill		21	Mohr-Coulomb	0	35	
Liquefied Zone 1		20	Vertical Stress Ratio			0.23
Liquefied Zone 2		20	Vertical Stress Ratio			0.1
Liquefied Zone 3		20	Vertical Stress Ratio			0.06
Liquefied Zone 4		20	Vertical Stress Ratio			0.36
Densified Zone		21	Mohr-Coulomb	0	38	

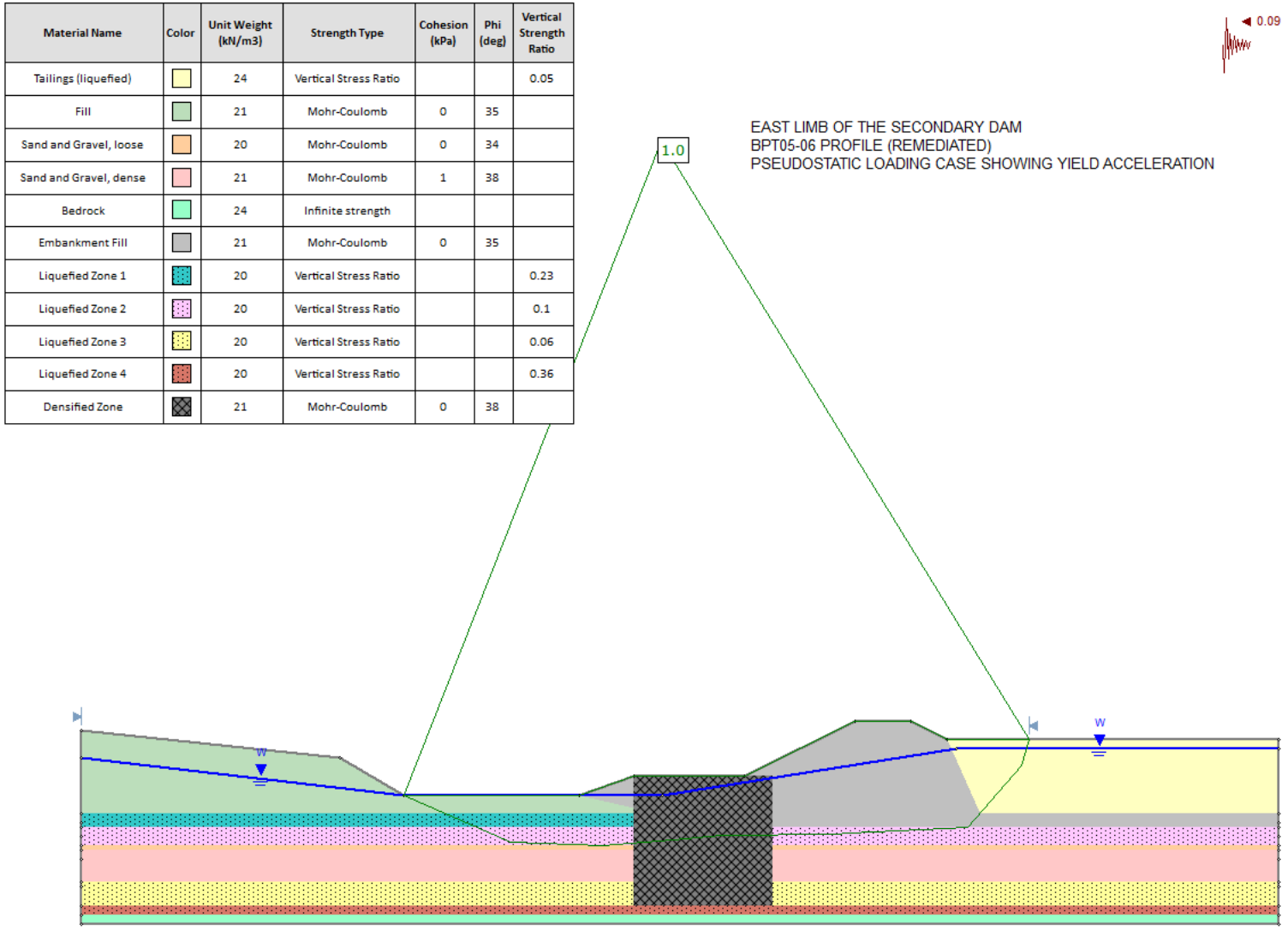


Figure 6-13. Slope Stability Results for the Remediated East Limb of the Secondary Dam, BPT05-06 Profile, Pseudo-static Loading Case with Liquefied Soils for both Upstream and Downstream Slopes

Faro Mine Remediation Project

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (deg)	Vertical Strength Ratio
Tailings (liquefied)		24	Vertical Stress Ratio			0.05
Fill		21	Mohr-Coulomb	0	35	
Sand and Gravel, loose		20	Mohr-Coulomb	0	34	
Sand and Gravel, dense		21	Mohr-Coulomb	1	38	
Bedrock		24	Infinite strength			
Embankment Fill		21	Mohr-Coulomb	0	35	
Liquefied Zone 1		20	Vertical Stress Ratio			0.23
Liquefied Zone 2		20	Vertical Stress Ratio			0.1
Liquefied Zone 3		20	Vertical Stress Ratio			0.06
Liquefied Zone 4		20	Vertical Stress Ratio			0.36
Densified Zone		21	Mohr-Coulomb	0	38	

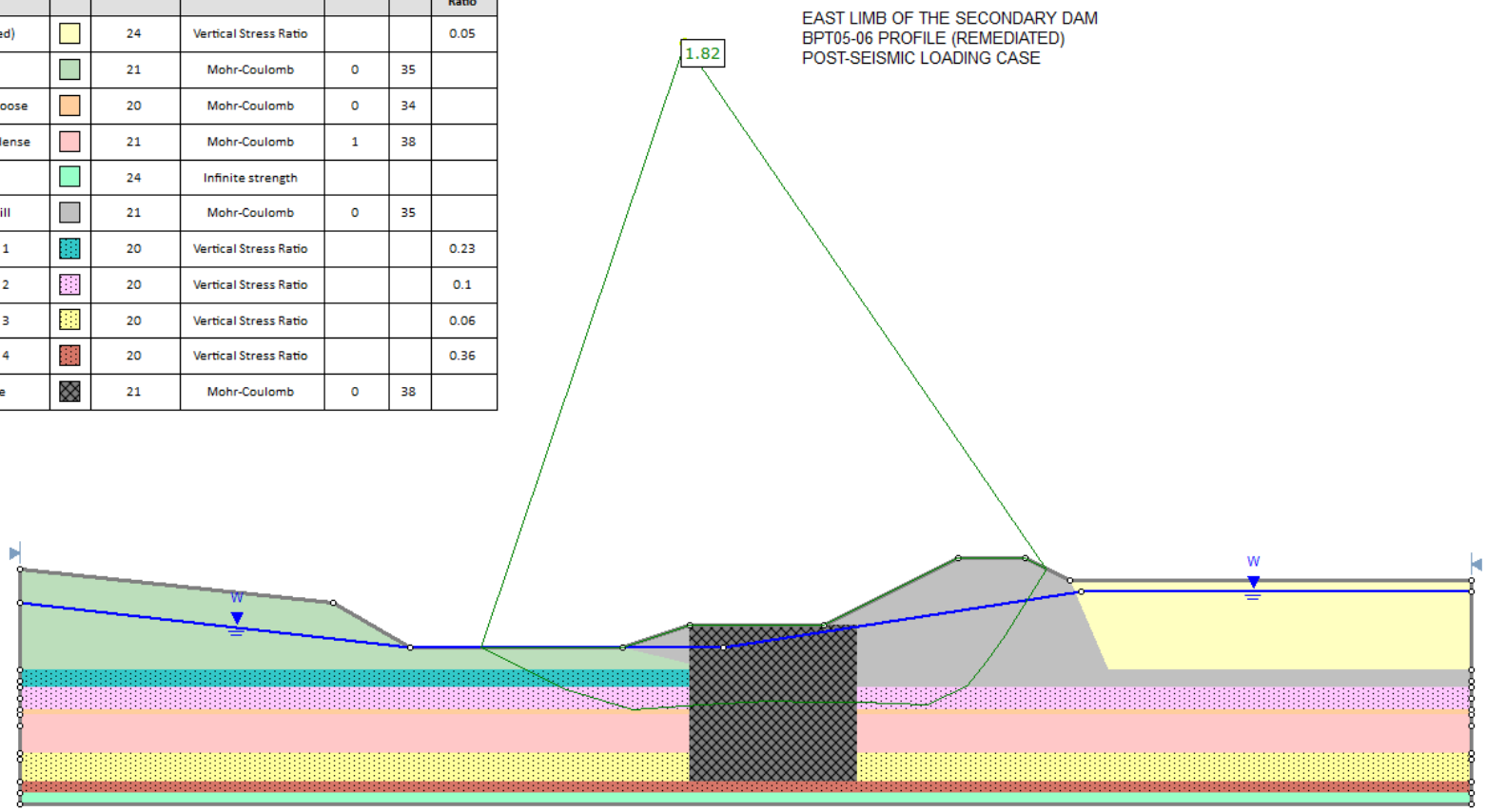


Figure 6-14. Slope Stability Results for the Remediated East Limb of the Secondary Dam, BPT05-06 Profile, Post-Seismic Loading Case with Liquefied Soils for both Upstream and Downstream Slopes

Faro Mine Remediation Project

SECTION 7

Dynamic Analyses and Seismic Stability Evaluation

7.1 Introduction

This section summarizes the numerical modelling completed for the analysis of the CVD and the ELSD. The numerical modelling evaluated the performance of the two RCTA dams under the 1-in-10,000-year earthquake ground shaking level, using the 2-D, nonlinear effective stress computer program FLAC (Itasca, 2012). The following subsections describe the components of the numerical models and present the results from these analyses.

The numerical analyses presented were conducted to determine whether conclusions from simplified analyses regarding factors of safety and need for mitigation were reasonable and if a more advanced analysis would demonstrate acceptable performance of the dams under seismic loading without mitigation.

7.2 Seismic Analysis Approach

As discussed in Section 3, the foundation for the two dams consists of sandy soil layers with a range of relative densities and initial effective confining pressures. These conditions are important considerations in the deformation analysis of problems involving soil liquefaction. In the current study, liquefaction is defined as the process by which saturated, non-cohesive soils lose significant strength and stiffness as a result of an increase in pore-water pressure from ground shaking. This is a general definition and does not provide a specific threshold regarding how much pore-water-pressure increase is required to trigger liquefaction or the amount and form of deformations in an embankment and embankment foundation resulting from ground shaking.

The limit-equilibrium analysis results summarized in the previous section indicate potential for embankment instability or large deformations that could result in breaching. However, these limit-equilibrium based analyses involved a number of simplifications regarding seismic response, including the method of estimating seismic deformations. Because the amount of seismic deformation will determine the ability of the embankment to contain mine tailings or impounded water during and after an earthquake, more advanced seismic analyses were conducted using a numerical model that accounts for soil non-linearity, the generation of excess pore-water pressures, seismic inertial loading of the embankment mass, and kinematic movement of the embankment.

7.3 Description of the Numerical Model

7.3.1 Soil Elements and Constitutive Models

The more advanced numerical modelling was conducted using the 2-D computer program FLAC (Itasca, 2012). The key feature of the Lagrangian calculation scheme in FLAC is the ability to capture the plastic collapse in large strain mode which is well suited for the deformation associated with soil liquefaction.

Two different constitutive models were used for the soil layers in the embankment and foundation soil profiles of the CVD and the ELSD. Soil layers with $(N_1)_{60CS}$ blow counts above 30 were considered too dense to liquefy and were modelled using a Mohr-Coulomb (MC) plasticity model. The MC plasticity

model was also used for the soil zones in the dam embankment. The deformation parameters for the MC plasticity model were based on the shear modulus, bulk modulus, and Poisson's ratio of 0.3, while the strength parameters were selected based on a friction angle of 35 degrees for the dam embankment and the upper sandy layers, and 38 to 40 degrees for the transitional layers at the bottom of the foundation. The dam embankment $(N_1)_{60}$ is assumed to be 26 and not susceptible to soil liquefaction. Section 4 further describes the cyclic behaviour of the soil layers in the MC model in the elastic range, as approximated using the shear modulus reduction and material damping curves selected for the seismic site response.

Soil layers with $(N_1)_{60\,CS}$ blow counts of 30 or less were considered susceptible to soil liquefaction or pore-water pressure build-up and were modelled using a constitutive model with the ability to estimate the stiffness and the strength degradation associated with the cyclic behaviour of saturated soil during dynamic loading. For soil liquefaction, the PM4Sand (Version 3) developed within the framework of the bounding surface plasticity model of sand (Boulanger and Ziotopoulou, March 2015) was used. This plasticity model has the ability to predict the stress-strain behaviour of potentially liquefiable soil and the associated ground deformations.

The pore-water-pressure generation parameters for the PM4Sand model were estimated using a numerical model calibration of default parameters as recommended by the model developers (Boulanger and Ziotopoulou, March 2015). The PM4Sand parameters used for the liquefaction triggering were based on SPT N-values, and the estimated CRR based on the Youd et al. (2001) liquefaction triggering procedure. The CRR from Youd et al. (2001) was used to anchor the CRR curve at 15 uniform cycles of shaking, and the CRR versus number of cycles of shaking greater to and less than 15 cycles was determined using default model parameters that were based on typical sand soil behaviour.

Figure 7-1 plots the liquefaction triggering curves used in the seismic stability evaluation of the dams. The estimated values for the parameter b (labelled beside each curve) in the cyclic stress ratio versus N simulations ranges between 0.18 and 0.28. The parameter, b, is strongly a function of soil density, with higher b values being representative of higher soil densities. Table 7-1 summarizes the PM4Sand-calibrated parameters for the CVD and the ELSD. Parameters not listed used the default values from the PM4Sand documentation.

Table 7-1. Material Parameters for PM4Sand Constitutive Model
Faro Mine Remediation Project

Foundation Profile	Layer No.	$CRR_{M=7.5}$ [a]	D_r [b] (%)	G_o [c]	h_{po} [d]	n [b e]
BPT05-03	2	0.149	53	1531	0.36	0.096
	3	0.130	47	935	0.55	0.147
	4	0.351	74	1269	1.70	0.060
	5	0.257	57	1070	3.65	0.474
BPT05-04	3	0.160	53	1018	0.55	0.101
	4	0.094	36	787	0.49	0.336
	5	0.194	49	965	2.65	0.136
	6	0.205	61	1115	0.62	0.088

Table 7-1. Material Parameters for PM4Sand Constitutive Model
Faro Mine Remediation Project

Foundation Profile	Layer No.	$CRR_{M=7.5}$ [a]	D_r [b] (%)	G_o [c]	h_{po} [d]	n[b e]
BPT04-13	3	0.165	53	1018	0.63	0.097
	5	0.290	69	1215	0.95	0.063
	Tailings [f]	0.188	49	970	2.35	0.500

Notes:

[a] CRR based on Youd et al. (2001).

[b] Relative density based on Idriss and Boulanger (2008).

[c] Initial shear modulus coefficient based on the shear wave velocity of the layer.

[d] Contraction rate parameter selected based on the CRR for the layer.

[e] Dilatancy parameter selected based on an average effective friction angle of 34 degrees.

[f] Tailings are assumed to have minimum void ratio, e_{min} of 0.56, maximum void ratio, $e_{max,}$ of 2.99, and constant volume friction angle of 30 degrees, and specific gravity of 4.48 as reported for the test sample B in Golder (June 2004) report.

7.3.2 Boundary Conditions

In the static-stress initialization analyses, the initial in situ state of stresses was calculated using roller boundaries along the sides of the 2-D model and a fixed boundary along the base. In the dynamic analysis, the numerical model was configured differently for an effective transmission of the seismic waves to simulate the unbounded lateral extent of the soil using the free-field boundary option in FLAC.

7.3.3 Reservoir Pool and Groundwater

In the CVD modelling, the free-standing water in the reservoir pool was included in the analysis as a hydrostatic pressure applied normal to the reservoir floor and waterside embankment. A water unit weight of 9.81 kN/m^3 was used in the calculation of the effective stresses of the soil elements and the pressure boundaries of the free-standing water in the reservoir pool. In the ELSD modelling, tailings were assumed to be fully saturated.

Groundwater for both dams was included in the analysis as hydrostatic pressure considering the effect of the seepage pressures in the embankment in the calculation of the effective stresses.

7.4 Initial Static Stress State Modelling

The stages included in the FLAC 2-D analyses were based on an assumed simple construction sequence for each of the dams to initialize the model stress state for the dynamic analyses. The loading stages included the following:

1. Initial Stress State before Dam Construction: Established the initial in situ total stresses for horizontal ground at the toe elevation of the dam; groundwater was assumed at the ground surface.
2. Construct the Dam: Incrementally placed soil layers for the dam (each approximately 1 m thick) to represent construction of the dam. After the subsurface profile was constructed, the model was solved for static equilibrium. For the ELSD, this also included placing the backfill for the tailings. During construction of the dam, the groundwater level was kept at the base of the dam, and the embankment soils were assumed to be nearly saturated.
3. Fill the Reservoir: Established initial steady-state solution for the saturation and the pore-pressure distribution for the phreatic line in the dam fill for the full reservoir water level with a freeboard of about 1.7 m in the CVD, and for raised groundwater level at the top surface of the tailings in the

ELSD. The analyses assumed horizontal hydraulic conductivity values equal to three times the vertical hydraulic conductivity for the embankment, which is within the typical range (kH/kV ratios typically range from 2 to 10, as suggested by Reclamation [2014] for embankment materials). It was also assumed that the foundation soils have hydraulic conductivity values approximately equal to the embankment hydraulic conductivity values.

4. The completion of these stages generated a model with a stress-state representing a stress state assumed to be in place before seismic loading. The initial stress state was modelled in FLAC 2-D using the small strain logic.

7.5 Dynamic Analyses

After the initial stress state calculation, the low-strain shear modulus for seismic site response modelling was calculated and applied to the soil zones, the displacements for the soil grid points were set to zero to define a reference for the additional deformation resulting from the seismic loading, the free field boundary conditions were specified, the large strain logic was turned on, and seismic motions applied at the base of the model

7.5.1 Seismic Input Motions

The input-ground motions were applied at the base of the FLAC 2-D models as acceleration time histories at the model base. The model base was represented as a *rigid base* condition, and because of this, the input ground motions were *within* type-ground motions determined from the 1-D equivalent linear site response analyses using Strata (Section 4) at the same elevation as the model base.

The analyses were conducted for the three sets of ground motions representing the 1-in-10,000-year event (discussed in Section 4). Each set of ground motions consisted of the two horizontal components, for a total of six time histories used for each soil profile.

7.5.2 Rayleigh Damping

Soil damping in the FLAC 2-D model was represented by hysteretic damping in the soil zones as the primary damping mechanism, with the addition of Rayleigh-type damping used to dampen the model at low levels of cyclic excitation. A critical damping ratio of 0.1 percent was used for Rayleigh damping at the predominant frequency of the model.

7.6 Results of FLAC 2-D Analyses

The following two sections present the result of the FLAC 2-D analyses. These results include horizontal displacement time histories, response spectra, PGA profiles, maximum shear strain profiles, CSR profiles, and the excess pore-water pressure ratios (Ru) for each dam. Displacement trajectories and plots of permanent displacement are also summarized for each case.

7.6.1 Cross Valley Dam Stability Evaluation

FLAC 2-D models for the seismic stability evaluation of the CVD were developed for two cases: one based on soil boring BPT05-03 and the other based on soil boring BPT05-04; the two cases are considered to cover the range of subsurface conditions, specifically the variation in depth to bedrock. The FLAC models represented a 240-m-wide cross section through the dam, and modelled a depth of 27.5 m below the dam foundation for both profiles. The height of the dam measured at the downstream side was 18 m. Figures 7-1 and 7-2 shows the grids used in the analyses for the two profiles. The material properties are those presented in Table 7-1.

Representative results showing the horizontal displacement time history, the response spectra, PGA profile, maximum shear strain, CSR, and the excess pore-water pressure ratio (Ru) are presented in Figures 7-3 through 7-9. Displacement values are shown at the downstream toe, upstream toe, and crest for each profile and for the three set of earthquake records. These results show that liquefaction was triggered in the sand layer between elevations 1,003 and 1,007 m in the BPT05-03 profile and between elevations 1,002.5 and 1,006.5 m in the BPT05-04 profile.

Table 7-2 summarizes the seismic deformation estimated from the analyses. The maximum results are presented, as the evaluation included only three acceleration time histories. Maximum permanent deformations range from 0.35 to nearly 1.5 m horizontally, depending on location, and from approximately 0.8 to 1.3 m vertically at the centreline of the crest. The maximum horizontal and vertical displacement occurred from the Irpinia earthquake time histories. At the end of the seismic shaking, and assuming liquefaction-induced settlement associated with volumetric strain of about 0.3 m for a total crest displacement of 1.6 m, there was about 0.1 m of freeboard remaining in the worst-case scenario (i.e., 1.7 m minus 1.6 m).

These deformations are considered acceptable relative to the acceptable crest displacement and horizontal movement, per the design criteria established for this project as documented in Section 1.5. In contrast to the instability and large deformations predicted by the simplified analyses, the numerical analysis results indicate vertical crest displacement should be in the order of 1.5 m without ground improvement.

Table 7-2. Permanent Total Deformation – Cross Valley Dam
Faro Mine Remediation Project

Foundation Profile	Horizontal Displacement [a] (m)			Vertical Displacement [b] (m)
	Crest [b]	Upstream Toe	Downstream Toe	
BPT05-03	0.1 to 0.3	-0.8 to 0.1	0.3 to 1.2	0.4 to 1.3
BPT05-04	0.3 to 0.8	0 to 0.4	0.5 to 1.4	0.4 to 0.8

Notes:

[a] Negative displacement is the outward displacement towards the upstream side of the dam.

[b] At the centreline of the crest

7.6.2 East Limb of the Secondary Dam Stability Evaluation

A FLAC model was developed for the BPT04-13 profile in the seismic stability evaluation of the ELSD. The FLAC model represented 160-m-wide cross section through the dam, and modelled a depth of 13.5 m below the dam foundation. The height of the dam measured at the downstream side was 8 m. Figure 7-10 shows the grid used in the analyses. The material properties used are those presented in Table 7-1.

Representative results showing the horizontal displacement time history, the response spectra, PGA profile, maximum shear strain, CSR, and the Ru values are presented in Figures 7-11 through 7-13. Similar to the CVD results, displacement values are shown at the downstream toe, upstream toe, and crest for each profile and for the three set of earthquake records. The Ru results indicate that liquefaction was triggered in the sand layer between elevations 1,050 and 1,051.5 m. Table 7-3 summarizes the estimated seismic deformation.

Table 7-3 summarizes the seismic deformation estimated from the analyses. Maximum permanent deformations range from approximately 0.9 to nearly 1.2 m horizontally, depending on location, and are approximately 0.4 vertically at the centreline of the crest. The maximum horizontal and vertical displacement occurred from the Irpinia earthquake time histories.

These deformation are considered acceptable relative to crest displacement and marginally acceptable for horizontal movement. Relative to the simplified analyses, they show that ground displacements will be less than roughly 1 m without ground improvement.

Table 7-3. Permanent Total Deformation - East Limb of the Secondary Dam
Faro Mine Remediation Project

Foundation Profile	Horizontal Displacement (m)			Vertical Displacement [a] (m)
	Crest [a]	Downstream Toe	Upstream Toe	
BPT04-13	0.2 to 0.9	0.2 to 1.0	0.3 to 1.1	0.1 to 0.4

Note:

[a] At the centreline of the crest

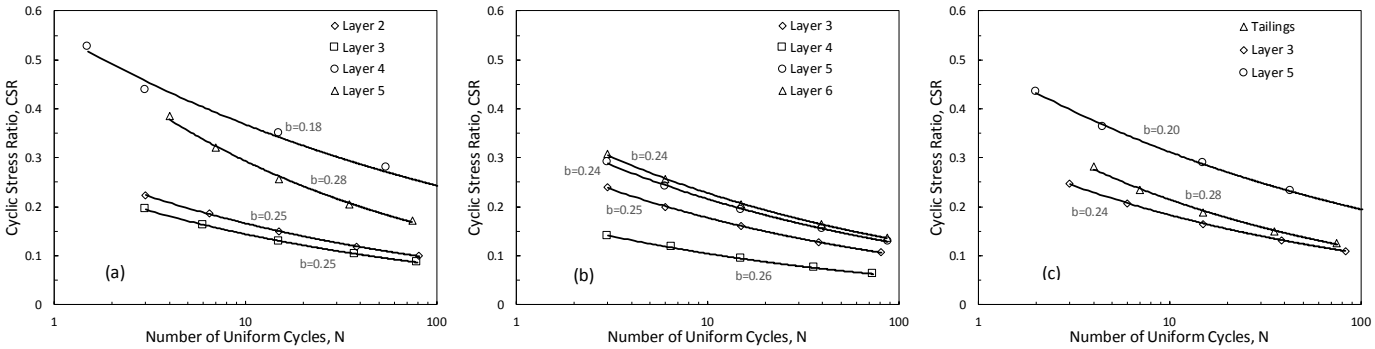


Figure 7-1. Cyclic Stress Ratios Versus Number of Uniform Cycles (a) BPT05-03 (b) BPT05-04 (c) BPT04-13
Faro Mine Remediation Project

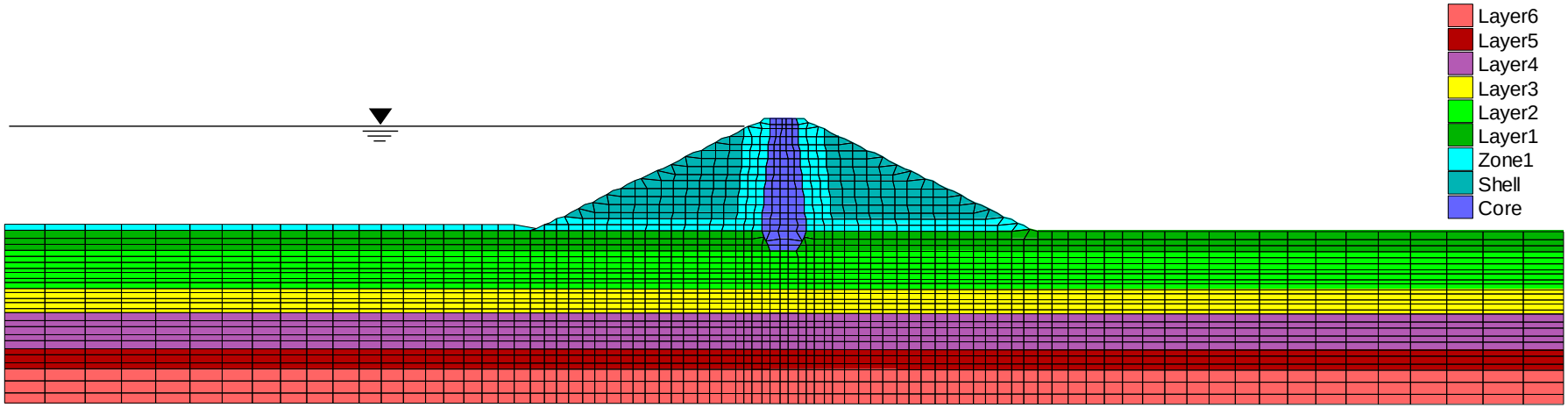


Figure 7-2. FLAC Grid for BPT05-03 Profile
Faro Mine Remediation Project

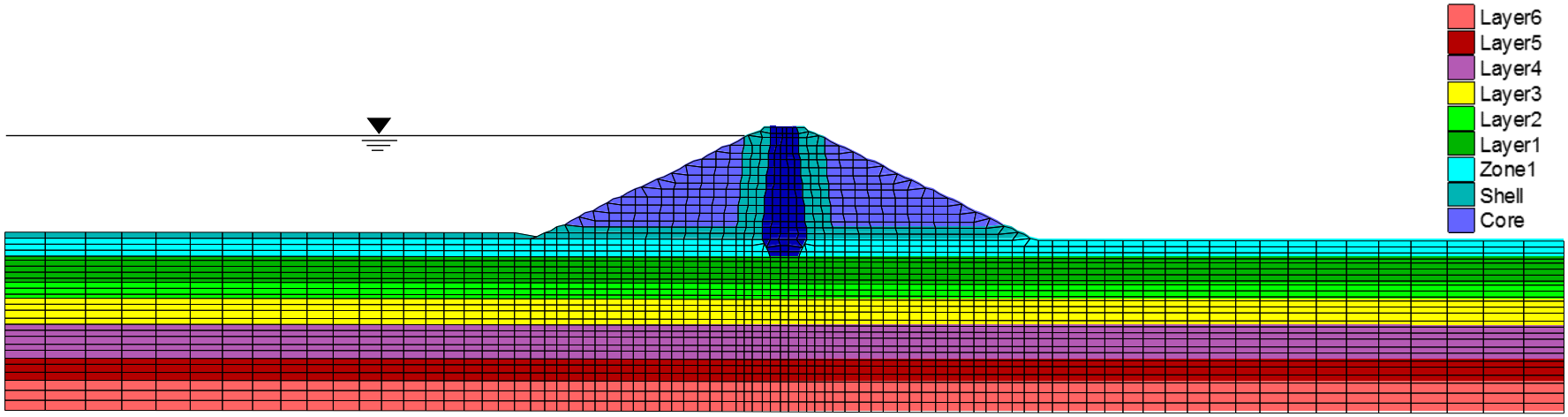


Figure 7-3. FLAC Grid for BPT05-04 Profile
Faro Mine Remediation Project

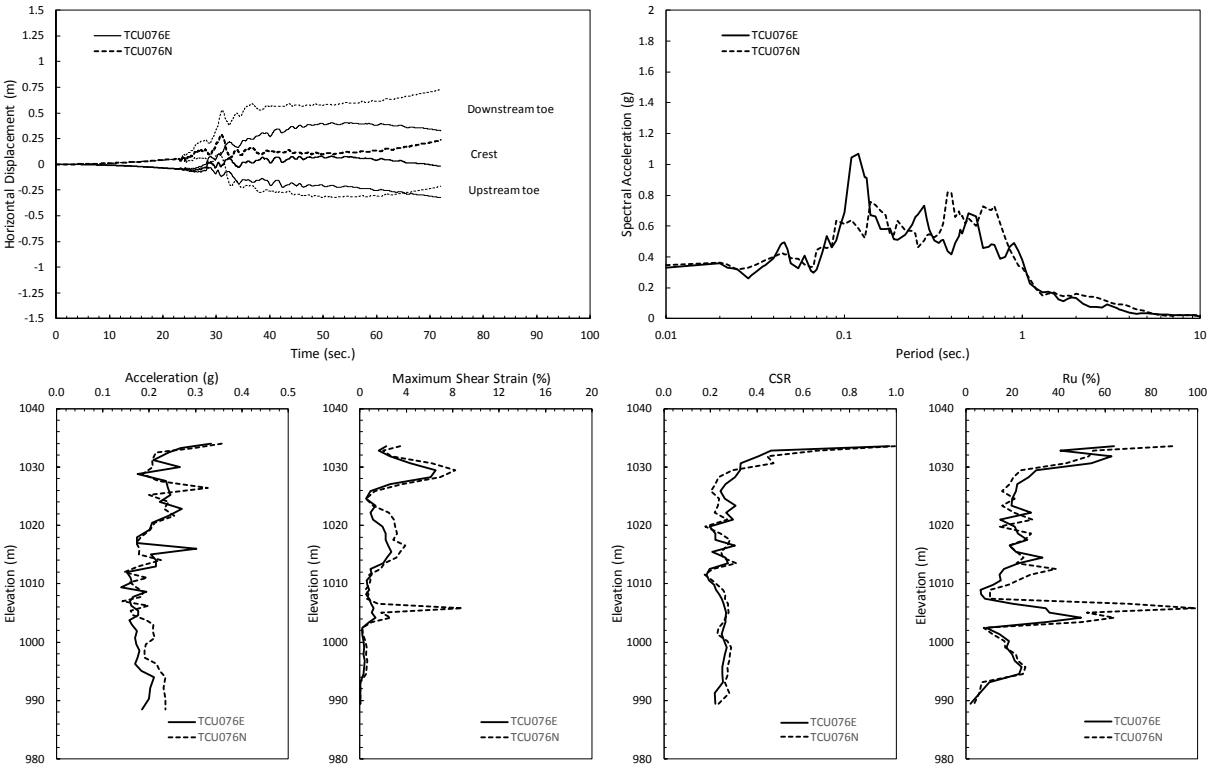


Figure 7-4. Profile BPT05-03 Response – Chi-Chi Earthquake

Faro Mine Remediation Project

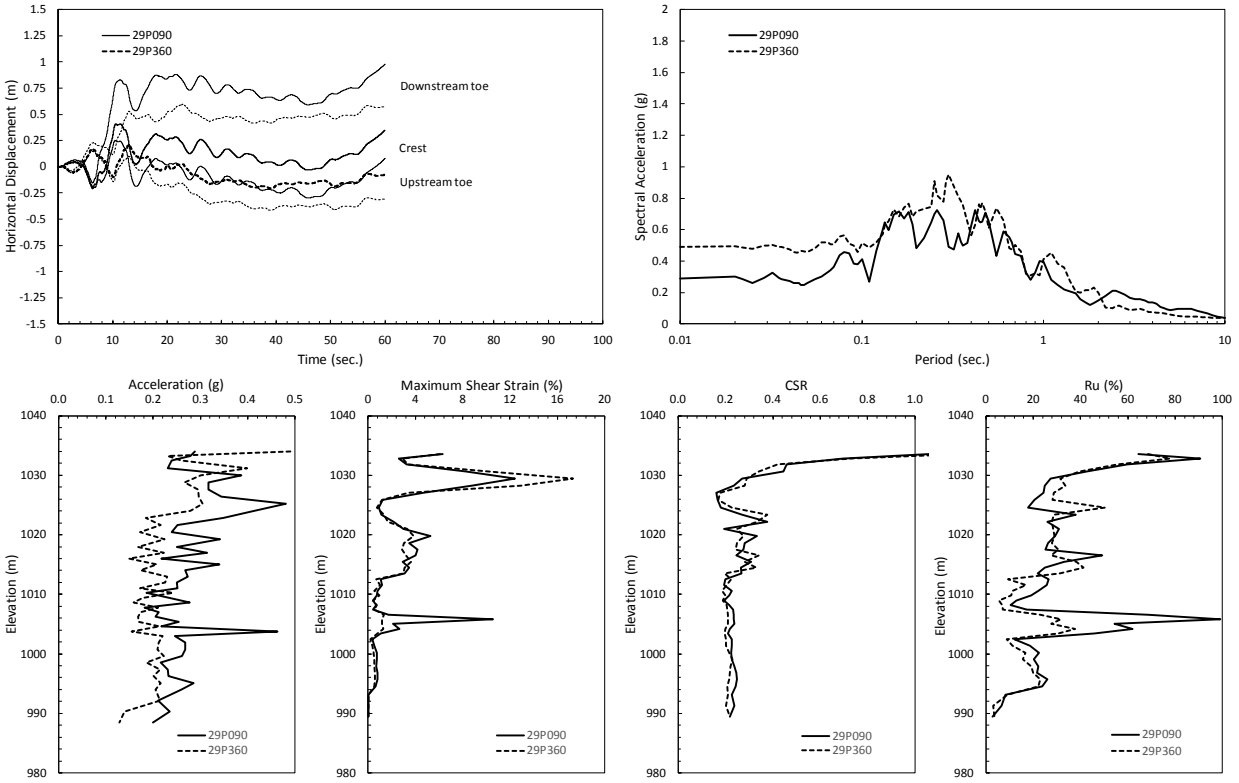


Figure 7-5. Profile BPT05-03 Response – Hector Mine Earthquake

Faro Mine Remediation Project

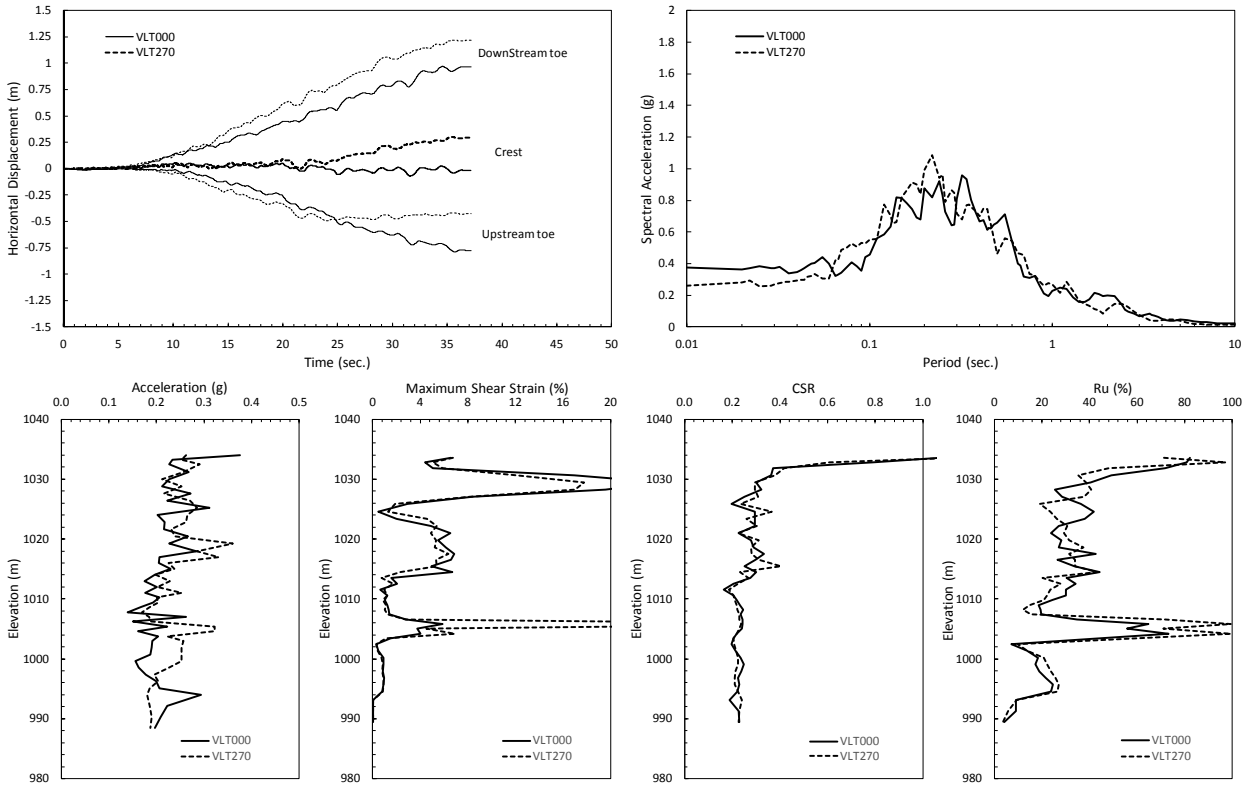


Figure 7-6. Profile BPT05-03 Response – Irpinia Earthquake
Faro Mine Remediation Project

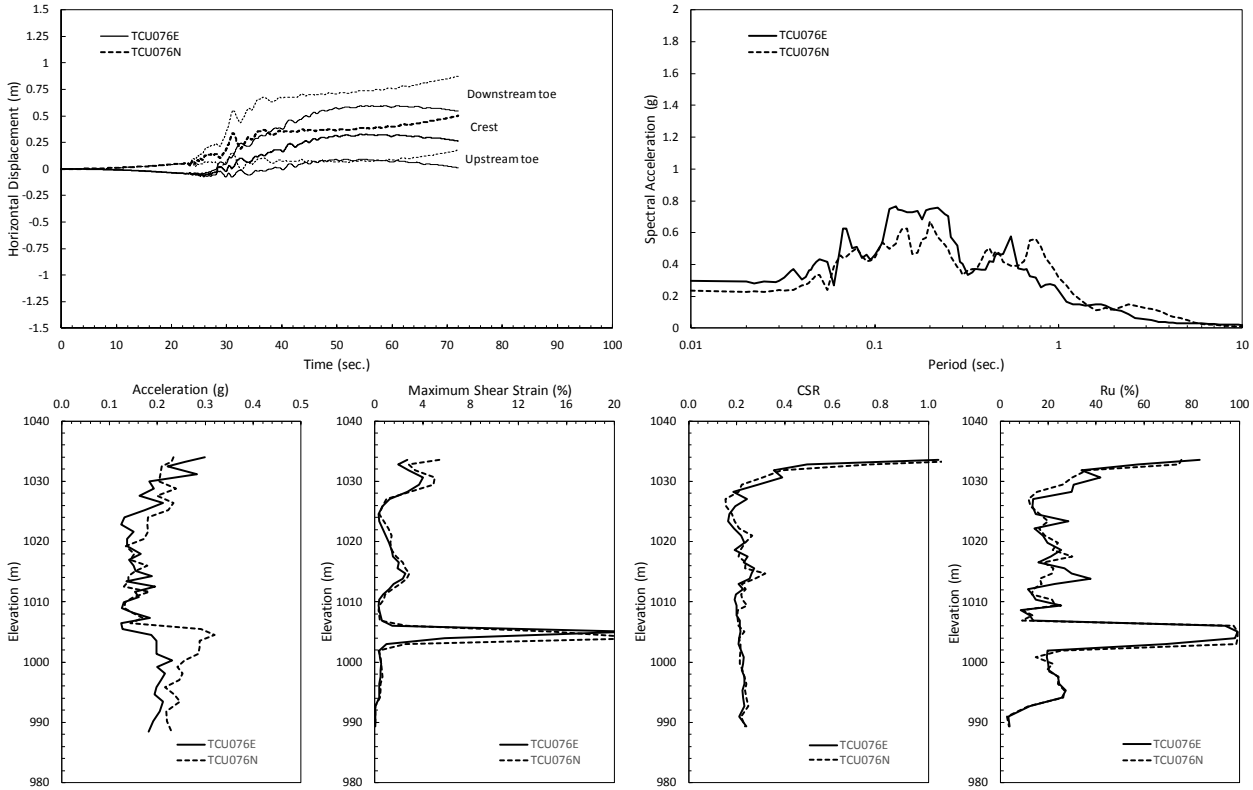


Figure 7-7. Profile BPT05-04 Response – Chi-Chi Earthquake
Faro Mine Remediation Project

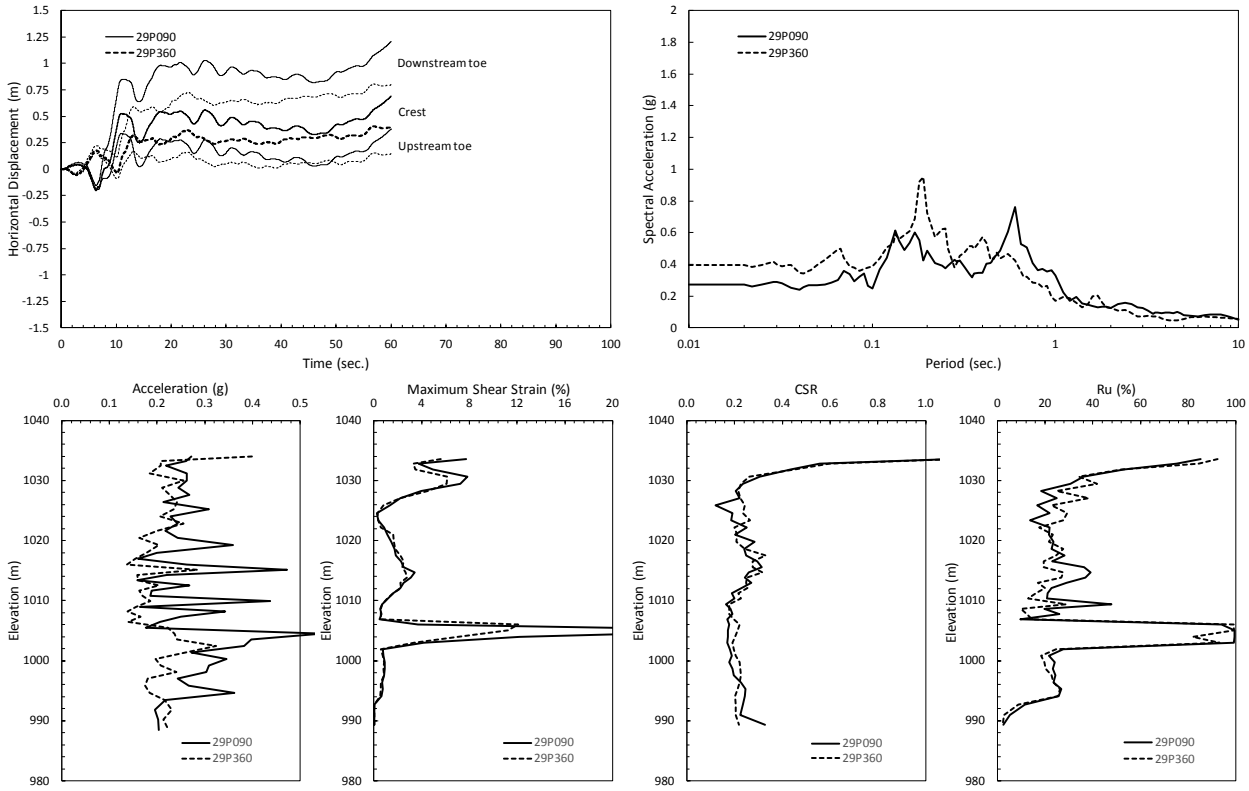


Figure 7-8. Profile BPT05-04 Response – Hector Mine Earthquake
Faro Mine Remediation Project

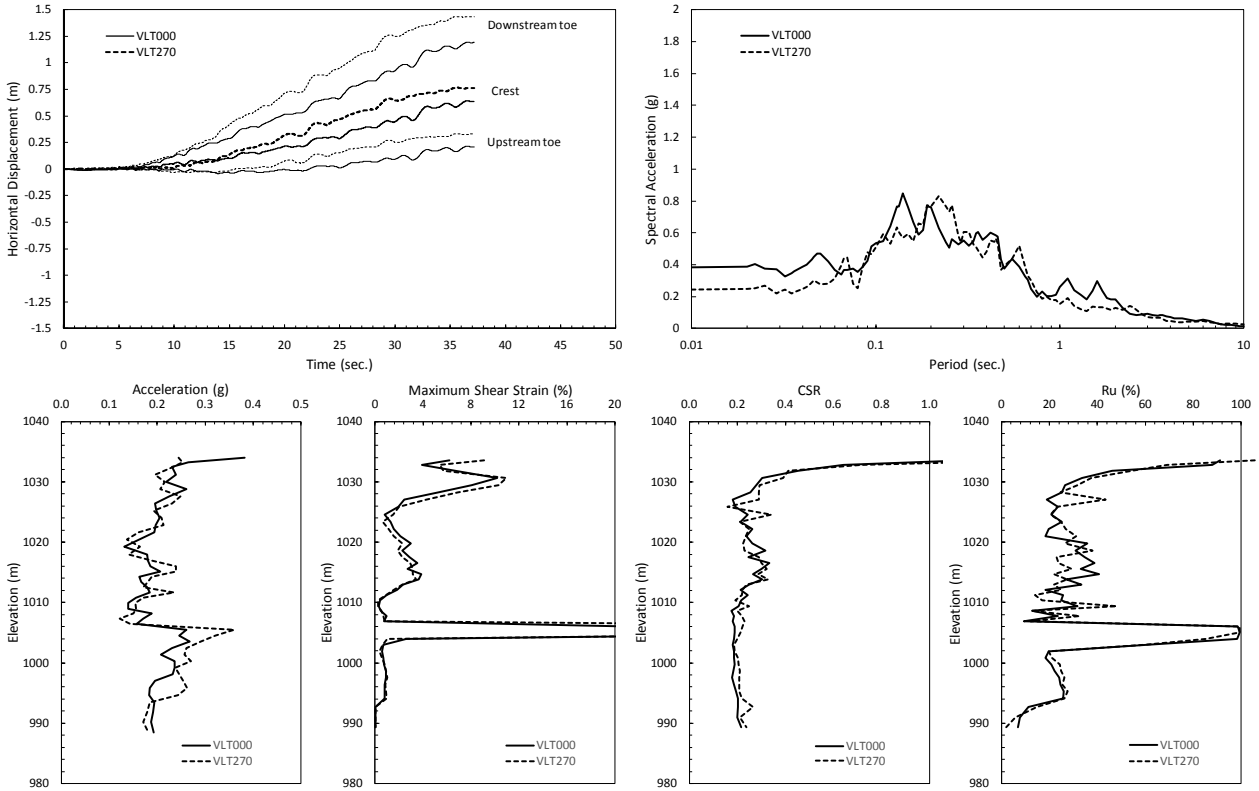


Figure 7-9. Profile BPT05-04 Response – Irpinia Earthquake
Faro Mine Remediation Project

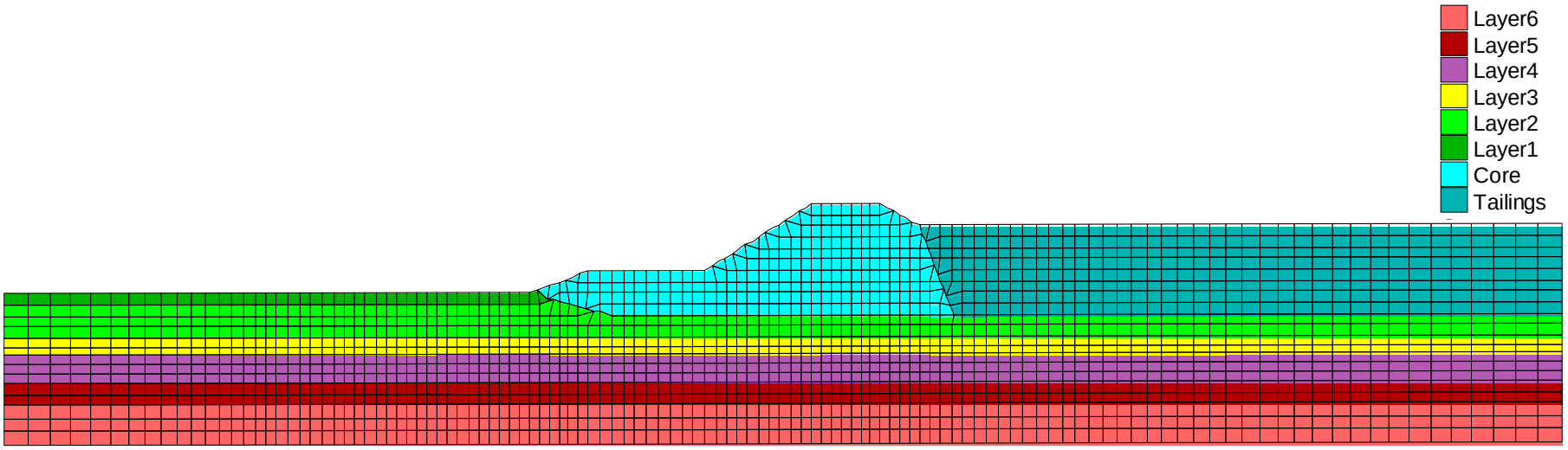


Figure 7-10. FLAC Grid for BPT04-13 Profile
Faro Mine Remediation Project

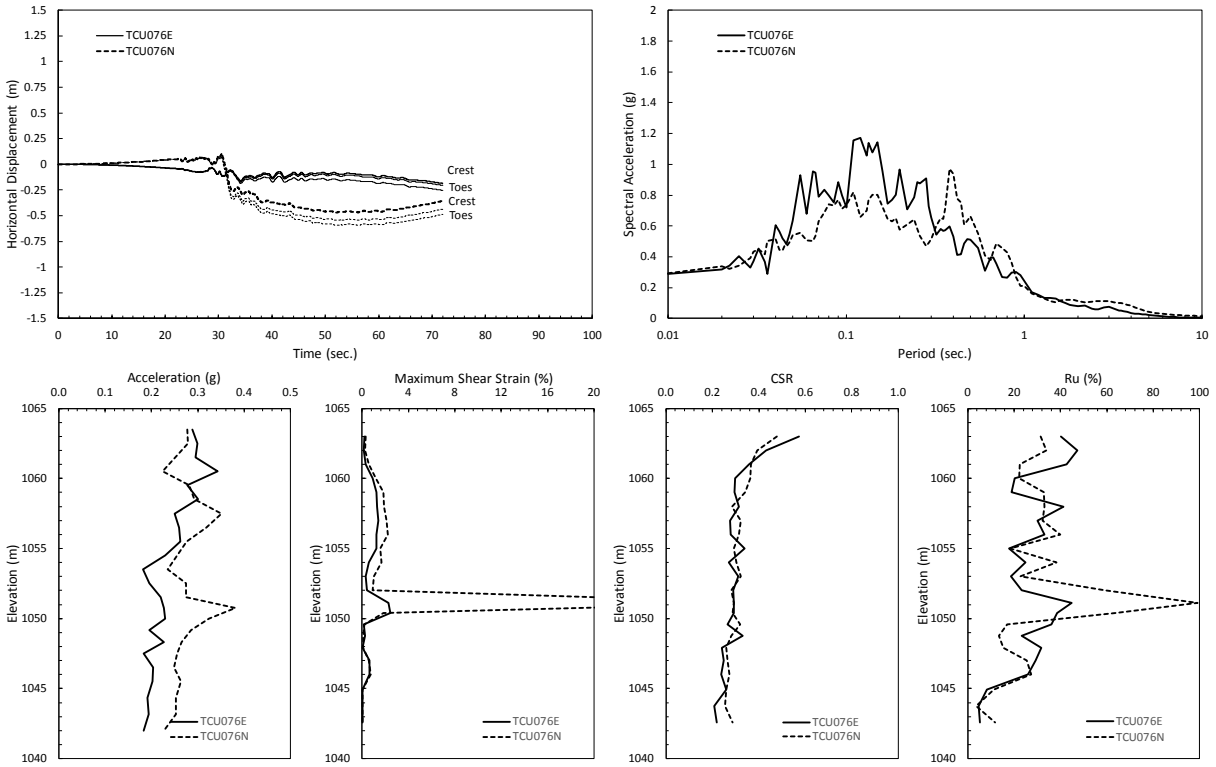


Figure 7-11. Profile BPT04-13 Response – Chi-Chi Earthquake

Faro Mine Remediation Project

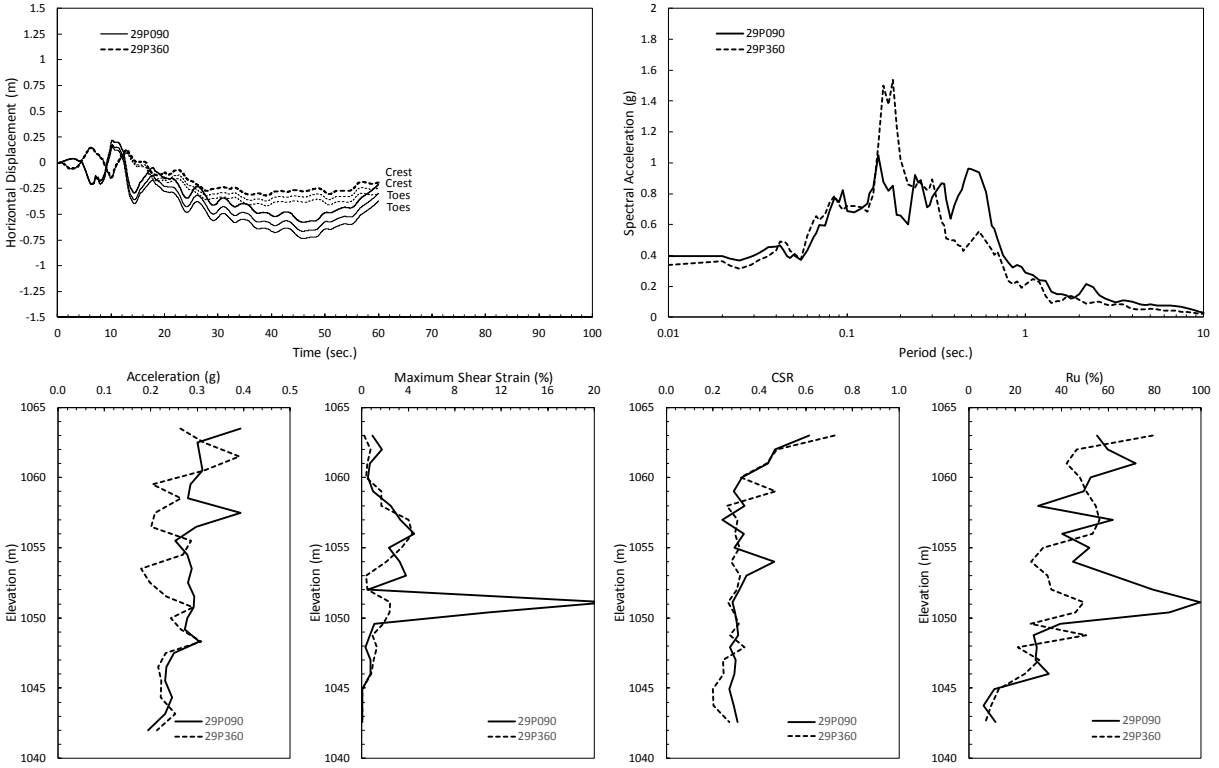


Figure 7-12. Profile BPT04-13 Response – Hector Mine Earthquake

Faro Mine Remediation Project

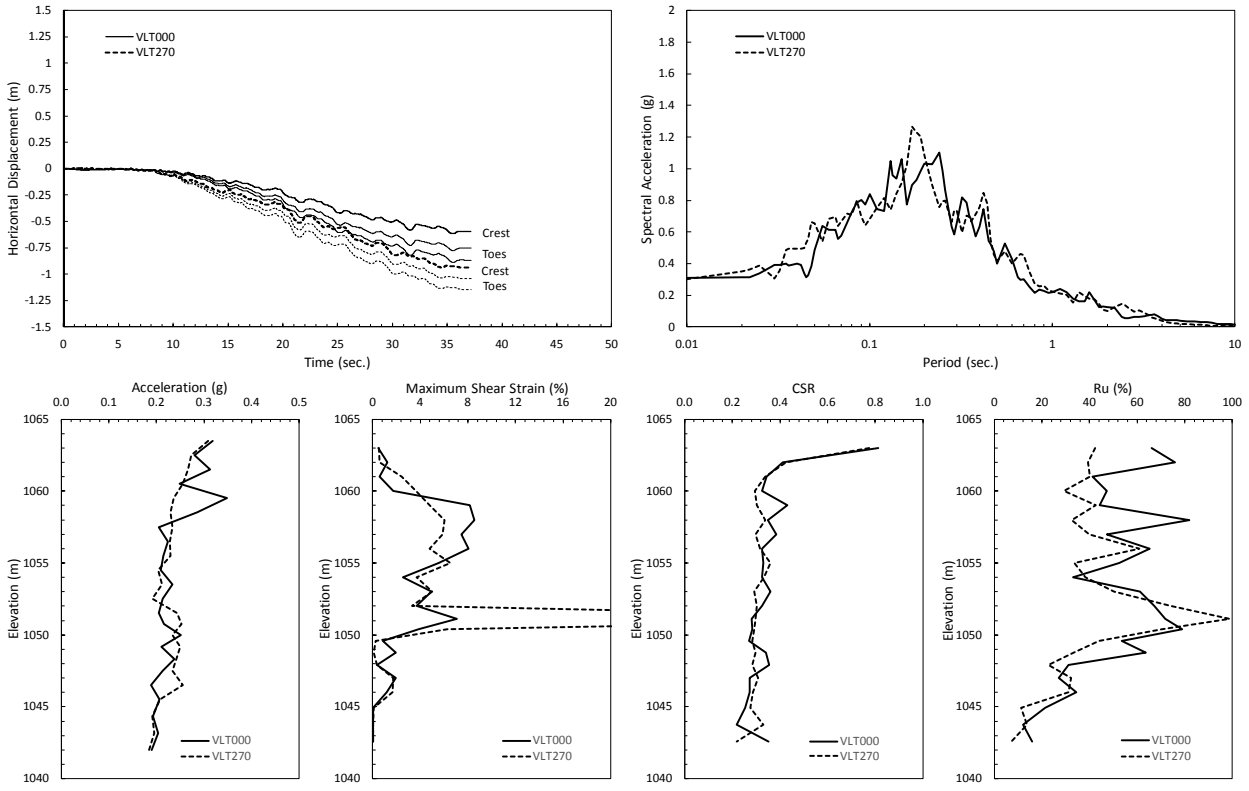


Figure 7-13. Profile BPT04-13 Response – Irpinia Earthquake
Faro Mine Remediation Project

SECTION 8

Conclusions

Seismic stability analyses of the CVD and the ELSD were performed for the 1-in-10,000-year earthquake event. Both simplified analyses and advanced non-linear dynamic analyses were performed. The purpose of the analyses was to evaluate deformation within the two dams for updated ground motions determined for the RCTA site during a PSHA conducted by Atkinson and Assatourians (April 2013). The updated seismic motions for the 1-in-10,000-year earthquake event were lower than earlier results determined by Atkinson (May 2004) and led to a question whether ground improvement was still required to meet regulatory requirements under the lower levels of ground shaking. Simplified and advanced analyses conducted to address this question included the potential effects of liquefaction at the RCTA site. Results of these analyses will be used to support decision-making regarding protection of the dams against possible breaching during a 1-in-10,000-year seismic event.

8.1 Simplified Seismic Stability Analyses

Simplified seismic stability analyses were conducted initially as a screening method for evaluating the potential for and consequences of liquefaction resulting from the updated 1-in-10,000-year seismic event. The simplified analysis procedure comprised three elements:

1. 1-D site response ground analyses were conducted to estimate the level of shaking for use in simplified liquefaction triggering evaluations and for the limit-equilibrium seismic slope stability evaluations (see Section 4).
2. Liquefaction potential was assessed using the Youd et al. (2001) simplified method (see Section 5). The method uses SPT $(N_1)_{60}$ values, fines content, earthquake magnitude, and seismic loading. The CSR profile estimated using Strata (see Section 4) for each respective subsurface profile was used in the analysis of liquefaction triggering. Soil liquefaction evaluations were conducted both beneath the embankment and for the free field site conditions.
3. Simplified limit-equilibrium slope stability analyses were performed to estimate the seismic stability of the CVD and ELSD in terms of factors of safety and estimated permanent displacements (see Section 6).

The key findings from the simplified analyses are as follows:

- With the updated earthquake-induced ground motions estimated by Atkinson and Assatourians (April 2013), the PGA for a 1-in-10,000-year event at the Site Class B/C boundary was reduced from 0.54g (Atkinson, May 2004) to 0.24g (Atkinson and Assatourians, April 2013).
- Liquefaction and slope stability analyses using the limit-equilibrium method found that the existing geometries of the CVD and ELSD do not meet the CDA requirements (CDA, 2007 as revised in 2013) during pseudo-static and post-seismic conditions assuming that liquefaction has occurred within the foundation soils, indicating a significant likelihood of embankment instability and large deformations.
- Remediation layouts proposed by KCC (June 2006) for the CVD and ELSD, and evaluated herein, yielded acceptable seismic factors of safety computed by the simplified methods. Using the limit-equilibrium method and slope displacement estimation method by Bray and Travasarou (September 2009), anticipated mean displacements of the CVD with mitigation are estimated to be approximately 1 m downstream and 1.1 m upstream. Mean slope displacement of 1 m was computed for the ELSD following the KCC recommended mitigation measures. These displacements were considered acceptable, given the conservative assumptions made for the simplified analyses.

8.2 Numerical Seismic Stability Analyses

Seismic stability evaluations were conducted using 2-D FLAC, an advanced, numerical model method that accounts for nonlinear soil response and development of pore-water pressures during seismic loading. The analyses provide a more rigorous evaluation of performance and eliminate many of the assumptions inherent in the simplified analyses to provide a better estimate of performance.

The FLAC 2-D analyses were used to estimate the displacements of the two dams under the 1-in-10,000-year seismic loading – with the potential effects of liquefaction included in the analyses. These analyses did not include remediation of liquefaction. If unacceptable performance would have been predicted, mitigation methods may have been implemented in the models, but given that they resulted in acceptable performance, mitigation was not evaluated.

The following results were attained from the 2-D FLAC analyses:

- For the CVD, the predicted deformations resulted in a maximum horizontal deformation of 1.4 m and a maximum crest vertical displacement of 1.3 m. Because the numerical model does not account for volumetric change during shaking, an additional 0.3 m of vertical displacement because of volumetric strain was estimated and added to the estimated 2-D FLAC vertical displacement for a total estimated crest vertical displacement of 1.6 m.
- For the ELSD, the predicted deformations resulted in a maximum horizontal deformation of 1.3 m and a maximum crest vertical displacement of approximately 0.4 m. For the ELSD, an additional 0.2 m of vertical displacement because of volumetric strain was estimated and added to the estimated FLAC-2D vertical displacement for a total estimated crest vertical displacement of 0.6 m.

The performance criteria require that overtopping is prevented; that the internal filter system remains intact; and that the performance evaluation accounts for seismic loading, liquefaction, and post-liquefaction behaviour. Performance of the dams during seismic loading meets the performance criteria listed in Section 1.5:

- For the CVD, the computed vertical deformations do not exceed the freeboard of 1.7 m (assuming a full pond) for the CVD. The remaining distance between the top of core and the pond level following the design earthquake is estimated to be about 0.1 m, which meets the performance criteria with a small safety margin. However, given that the normal maximum operating water level in the CVD Pond is 2.2 m below the top of the core of the CVD, so that the remaining distance between the top of core and the maximum operating pond level following the design earthquake would be an estimated 0.6 m, this is considered acceptable.
- For the ELSD, the computed vertical deformations do not exceed the allowable vertical displacement of 2 m. The remaining distance between the dam crest and the tailings surface following the design earthquake is estimated to be 1.4 m, which is a significant safety margin.
- For the CVD, the horizontal deformations do not exceed half the thickness of the chimney filter and drain system, that is, it does not exceed 2 m; therefore, the predicted deformations are anticipated to not detrimentally affect the chimney performance. For the ELSD, the horizontal displacements do not exceed 1.5 m, so that major defects in the dam embankment are not expected to result from the design earthquake.

Because the performance criteria are met using this advanced numerical analysis, liquefaction mitigation proposed by KCC (June 2006) are not required. This different conclusion (than the KCC [June 2006] conclusion) resulted from a combination of reduced ground shaking levels obtained by Atkinson and Assatourians (April 2013), and application of advanced deformation analyses using 2-D FLAC.

Although the performance criteria are met without liquefaction remediation, large vertical and horizontal displacements of about 1.5 m are predicted for the CVD. If the CVD Pond will be operated as a full pond (i.e., with an applicable freeboard of 1.7 m) and there are concerns about the uncertainty in predicting, and consequences of this amount of deformation, liquefaction mitigation can be considered and evaluated to provide operation and maintenance continuity and to minimize risks of uncontrolled release of reservoir contents.

Results from the numerical seismic analyses for the ESLD indicate displacements of less than 1 m (about 0.6 m), indicating satisfactory performance under the design earthquake loading. The estimated displacements are not considered large enough to warrant liquefaction mitigation for this dam. Also, whereas it was conservatively assumed in this study that the groundwater level is at the top of the tailings, it is typically 1 to 3 m below the tailings surface at the ELSD; this unsaturated crust lowers the risk of a tailings flow failure that could overtop the dam following an earthquake.

SECTION 9

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Appendix K
Water Management Strategy
Presentation Materials

TABLE 1
Faro Mine Water Management Strategy Overview—Draft
Faro Mine Remediation Project

Reclamation Unit/Water Type	Applicable Water	Current Conditions	Remedial Component	Remedial Objectives	Primary Remedial Actions	Water Management Prior to Remedial Action	Water Management During Remedial Action	Water Management After Remedial Action
West Side Diversion								
Surface Stream	Upper Guardhouse Creek (UGC)	Originates up gradient of mining disturbance and discharges to the north Wall Interceptor Ditch (NWID) Not appreciably impacted, except where NW Dump toe encroaches into channel	Creek channel	Protect water quality Efficiently carry design flow around WRDs Prevent leakage of clean creek water to subsurface where cost-effective against collection and treatment	Upgrade reaches of existing alignment as needed to carry design flow to confluence with NWID. Design flow to be selected using a failure consequence evaluation. Line upgraded channel with a low permeability liner system where a positive benefit-cost can be earned against water collection and treatment	Continue current water monitoring program Follow Adaptive Management Plan if unacceptable water quality impact is detected.	Perform channel improvements using a segmental construction approach typically working from downstream to upstream Implement BMPs	Maintain diversion Continue water monitoring program Follow Adaptive Management Plan if unacceptable water quality impact is detected
Surface Stream	North Wall Interceptor Ditch (NWID)	Originates above Mill Yard and receives flow from UGC. Discharges below Cross Valley Dam (CVD) to Rose Creek valley. Not appreciably impacted	Ditch channel	Protect water quality Efficiently carry design flow around Mill Yard and tailings area Prevent leakage of clean creek water to subsurface where cost-effective against collection and treatment	Upgrade reaches existing alignment as needed to carry design flow below the CVD. Design flow to be selected using a failure consequence evaluation. Line the upgraded channel with a low permeability liner system where a positive benefit-cost can be earned against collection and treatment.	Continue current water monitoring program Follow Adaptive Management Plan if unacceptable water quality impact is detected	Perform channel improvements using a segmental construction approach typically working from downstream to upstream Implement BMPs	Maintain diversion Continue water monitoring program Follow Adaptive Management Plan if unacceptable water quality impact is detected
Stormwater	Up Gradient Watershed Stormwater (UGC and NWID)	Not impacted Flows into UGC or NWID from north	UGC and NWID channels	Collect stormwater to prevent it from encountering mine waste	Configure upgraded channels to collect stormwater	None	Temporarily collect and route below segment being constructed	Maintain constructed features such as interception channels or culverts
Stormwater	WRD Stormwater (Northwest Upper Waste Rock Dump)	Stormwater from the northwest side of the Northwest Upper Waste Rock Dump (WRD) has the potential to impact the adjacent UGC	UGC and Northwest Upper WRD	Prevent contaminated runoff from entering UGC	Pull back toe of Northwest Upper WRD from creek and separate with cutoff ditch which directs runoff to SWM pond, until the WRD cover system is established, then direct ditch into UGC if water quality is acceptable	None	Channelize WRD runoff to SWM pond until cover is established. After settling discharge from SWM pond to creek or pump to Faro Pit or WTP based on water quality	Maintain WRD cover system
Contaminated Seepage	WRD Seepage (Northwest Upper WRD)	Seepage from the northwest side of the Northwest Upper Waste Rock Dump (WRD) has the potential to impact the adjacent UGC	Seepage from Northwest Upper WRD	Prevent seepage from entering UGC	Pull back toe of Northwest Upper WRD from creek and separate with cutoff ditch to collect seepage and stormwater runoff and conveys to a SWM pond. Line the SWM pond if needed to prevent migration back to creek alluvial system. Pump or gravity drain to WTP or Faro Pit. Install deeper cutoff(s) if required or seepage interception system (SIS) system if needed. Reduce seeps of clean water by reducing the footprint of the WRD-side of the NWID watershed by selective grading	None	Channelize seepage to SWM pond and gravity drain or pump to Faro Pit or WTP if required.	Maintain ditch/SIS systems.

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					and ditching of the WRD at the top of the slopes to shed clean water south or west.			
Groundwater	Groundwater	UGC largely losses to groundwater. Groundwater generally flows south-southwest. Not impacted	Groundwater will not be diverted or collected	Reduce recharge of clean surface water to groundwater where cost-effective by lining upgraded UGC and NWID channels. Groundwater expected to not need collection.	None	None	None	None
East Side Diversion								
Surface Stream	Faro Creek (FC)	Originates up gradient of mining disturbance. Discharges to NFRC. No to minimal impact	Faro Creek Diversion (FCD)	Protect water quality Efficiently carry design flow around Faro Pit Prevent leakage of creek water to Faro Pit	Upgrade existing alignment to carry design flow to confluence with NFRC. Design flow to be the 500-year flow with the PMF containable within the channel freeboard. Alternative 1 is to move the entire WVID and FCD upslope and away from pit. Alternative 2 is to only move the portion of FCD closest to the pit upslope. Line upgraded channel with a low permeability liner system where a positive benefit-cost can be earned against water collection and treatment.	Continue current water monitoring program Continue to monitor pit wall stability with respect to the existing diversion Implement response plan if failure of the existing diversion occurs and water flows into Faro Pit	Perform channel improvements using a segmental construction approach typically working from downstream to upstream Implement BMPs	Maintain diversion Continue water monitoring program
Surface Stream	North Fork Rose Creek (NFRC)	Originates up gradient of mining disturbance. Discharges to South Fork Rose Creek (SFRC) just upstream from Original Tailings Impoundment. Unimpacted above WRDs. Significantly impacted from WRD seeps.	Creek diversion channel	Recover water quality Efficiently carry design flow past WRDs, through the Haul Road, and into the Rose Creek Diversion (RCD). Prevent leakage of creek water to subsurface.	The diversion channel will begin where sufficient vertical or horizontal separation from the existing creek can be gained to obtain positive separation from existing alluvial flow and future WRD seepage. Route this new channel through the Haul Road east of the Rock Drain through a culvert to maintain the Haul Road for future closure work, and then southwesterly across to the existing NFRC channel near the head of the creek ponds below the access road. Line the upgraded channel with a low permeability liner system where a positive benefit-cost can be earned against water collection and treatment. Construct a single SWM pond for WRD stormwater, WRD seepage, as well as impacted alluvial groundwater by constructing a dam in the existing NFRC channel below the haul road and above the access road where the existing creek channel narrows. This pond would be sized, to the extent practicable, to store water over the winter without removal. A pump station and pipeline would convey it to the WTP for treatment or to the CVP or Faro Pit (depending on WTP location) for interim storage. Install a lining system if necessary to prevent unacceptable leakage into groundwater which recharges Rose Creek. Install SCADA for monitoring and control from the WTP. Collect seeps at their source if it cost-effectively reduces O&M associated with the channel system	Continue current water monitoring program Continue to operate the new Rock Drain SIS Continue to operate the S-Wells SIS Follow Adaptive Management Plan if additional unacceptable water quality impact is detected	Perform channel improvements using a segmental construction approach typically working from downstream to upstream Implement BMPs Sequence construction to allow the NFRC to be diverted around the SWM pond area during its construction, and then to use the new SWM pond for stormwater and seepage management while the remaining segments of the new channel are constructed	Maintain diversion Maintain SWM pond Continue water monitoring program Continue to collect WRD seepage and stormwater in the SWM pond and pump to storage in the CVP or Faro Pit or directly to the WTP Follow Adaptive Management Plan if unacceptable water quality impact is detected

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Surface Stream	South Fork Rose Creek (SFRC)	SFRC is not significantly impacted.	Creek channel	Efficiently convey design flow (PMF) into the Rose Creek Diversion (RCD).	No changes to the existing SFRC channel. If needed, improvements will be made to the entrance to the RCD to ensure the PMF can be passed.	None	Implement BMPs	Maintain any constructed improvements
Stormwater	Up Gradient Watershed Stormwater (FC and NFRC)	Not impacted Flows into existing channels	None	Convey into new diversion channels	Configure channels to collect clean stormwater	None	Temporarily collect and route below segment being constructed	Maintain any constructed features such as interception channels or culverts
Stormwater	WRD Stormwater	No current impact to NFRC	Stormwater runoff from the Northeast, Zone II, Intermediate, and Main WRDs	Prevent contaminated runoff from entering NFRC	Keep impacted WRD stormwater from the Northeast, Zone II, and the east side of the Intermediate WRDs from entering the NFRC diversion channel by capturing it in the existing creek channel and an additional channel just to the west of the diversion channel if needed Reduce the magnitude of stormwater flows to the extent practicable and cost effective by reducing the footprint of the WRDs which are in the NFRC watershed by selective grading and ditching of the WRDs at the top of the slopes to shed water south or west Convey the residual stormwater to the single NFRC SWM pond If needed, construct a collection ditch below and south of the Main and Intermediate WRDs which conveys water southeast into the SWM pond Install cover system and stormwater runoff management conveyances on surface of regraded WRD	None	Channelize WRD runoff to SWM pond. Pump to treatment or interim storage (Faro Pit or CVD pond).	Maintain WRD cover system and stormwater collection and conveyance systems to the SWM pond
Contaminated Seepage	WRD Seepage	Seepage is hydraulically and chemically maturing necessitating construction of the NFRC diversion channel project	Seepage collection system for the Northeast, Zone II, and Intermediate WRDs	Protect the water quality in the NFRC Provide reliable long-term collection and storage prior to treatment.	Keep impacted WRD seeps and impacted groundwater from entering NFRC by capturing them in the existing creek channel and/or an additional channel just to the west depending on the location of the new diversion channel. Reduce the magnitude of the seeps to the extent practicable and cost effective by reducing the footprint of the WRD-side of the NFRC watershed by selective grading and ditching of the WRDs at the top of the slopes to shed runoff south or west. Collect seepage from the residual WRD-side of the NFRC watershed using the same channels used for WRD stormwater and convey to the single SWM pond. If needed, construct a collection ditch below and south of the Main and Intermediate WRDs which conveys water southeast into the SWM pond.	Continue to operate existing SIS systems	Continue to operate existing SIS systems and switch to use of the new SWM when available	Operate and maintain the collection channel(s) and the SWM pond and associated pump station and pipelines. Abandon the existing SIS systems (NFRD and S-Wells).
Groundwater	Groundwater	The FCD losses clean water to groundwater which enters Faro Pit. There is no cutoff	FCD and NFRC diversions	Reduce recharge of clean surface water to groundwater where cost-effective by lining the FC	Diversion channels to be lined to reduce flow of clean stream water to groundwater where cost-effective against collection and treatment.	None	None	Operate and maintain the collection channel(s) and the SWM pond and associated pump station and pipelines

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		where the FCD crosses the creek channel and alluvial flow continues along old creek channel and into Faro Pit. NFRC alluvial water downstream of the Zone II Outwash is impacted.	NFRC GW interception system	and NFRC diversion channels. Prevent residual NFRC contaminated GW from entering NFRC	Prevent residual NFRC contaminated GW from entering NFRC by constructing the NFRC diversion such that its bed is higher than the existing creek. Collect GW in the existing NFRC channel, and if needed, in the additional ditches described above. Capture this water in the single SWM pond for treatment.			
Waste Rock Dumps (WRDs) and Faro Pit								
Impoundment	Faro Pit Lake	Contaminated water is stored as needed in Faro Pit Lake prior to treatment at the Interim Water Treatment System (IWTS). Pit lake water is seasonally pumped (typically May to October) using a moveable skid-mounted electric centrifugal pump located at the bottom of the pit ramp which draws from the lake via a floating intake and which discharges into a surface-laid HDPE pipeline located against the pit wall side of the pit ramp and which continues to the IWTS.	Contaminated Water Storage and Pumping System	Provide reliable year-round pit lake storage and pumping Provide pumping capacity equal to that of the permanent water treatment plant	Route pipelines carrying water to Faro Pit Lake either through the existing pit ramp notch or through the existing Zone II notch depending of WRD grading Enhance or replace the existing pump to allow year-round operation Provide remote control and monitoring of the pumping system from the WTP Freeze-protect the pipeline to the WTP by configuring it to rapidly drain when pumping halts and/or by burial/insulation	Maintain existing pit access roads Maintain existing pit lake dewatering pumping system and pipelines	Maintain existing pit access roads Maintain existing pit lake dewatering pumping system and pipelines	Maintain pit access roads Maintain upgraded pit lake dewatering pumping system and pipelines
Stormwater	WRD Stormwater	Existing surfaces largely unchanged since mine shutdown. No specific grading of WRD surfaces to control runoff. Existing roads have stormwater ditches.	WRD surface grading and stormwater runoff management	Create slopes stable from erosion Enhance surface drainage off the WRDs, to the extent practicable, to clean receiving bodies	Perform selective grading to stabilize interior slopes Use grading, benches, ditches, and berms to direct clean stormwater to clean receiving streams to the extent practicable. Cover with growth medium layer and revegetate according to landform-appropriate species prescription to store and release precipitation. Keep impacted WRD stormwater from the Northeast, Zone II, and the east side of the Intermediate WRDs from	Maintain existing road ditches	Use localized lined SWM ponds in the interim until the cover system is established. Settle and decant water if dischargeable, or pump to treatment if not.	Maintain WRD cover system and stormwater collection and conveyance systems.

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					entering the NFRC diversion channel by capturing it in the existing creek channel and/or an additional channel just to the west of the new diversion channel Reduce the magnitude of stormwater flows to the extent practicable and cost effective by reducing the footprint of the WRDs which are in the NFRC watershed by selective grading and ditching of the WRDs at the top of the slopes to shed water south or west If needed, construct a collection ditch below and south of the Main and Intermediate WRDs which conveys water southeast into the single NFRC SWM pond			
Contaminated Seepage	WRD Seepage	Seepage from all WRDs is hydraulically and chemically maturing	Seepage reduction and collection systems	Protect surface water quality Reduce seepage generation where cost-effective compared to collection and treatment Provide reliable long-term collection and storage prior to treatment	Move and consolidate the Oxide Fines Stockpile (OXSP), Medium Grade Stockpile (MGSP) Low Grade Ore Stockpile A (LGSPA) with the Low Grade Ore Stockpile C (LGSPC) and cover with a very low permeability cover system Cover sulphide cells, and other areas that have very high acid generation potential, with a very low permeability cover system Cover the remaining WRD upper surfaces with a simple vegetative cover system where suitable for successful vegetation establishment. Use rock armoring in other areas or leave uncovered if existing surfaces do not pose risk. Faro Valley Dump Seepage: Collect in Faro Pit Northeast and Zone II WRD Seepage: Collect in Faro Pit, Zone II Pit, and the NFRC seepage collection system Intermediate WRD Seepage: Collect in NFRC seepage collection system Main WRD Seepage: Collect in NFRC and ETA SISs Consolidated OXSP, MGSP, LGSPA, LGSPC; and SWPWD Seepage: Collect in Faro Pit MME, MMW, FTE, FTW, SPB, and CHSP: Collect in ETA Canyon SIS UPL, and LPL: Collect in Lower Guardhouse Creek Northwest WRD Seepage: Collect in Upper Guardhouse Creek or ETA Canyon SIS Mill Area Seepage: Collect in ETA Canyon SIS	Continue to operate existing SIS systems	Continue to operate existing SIS systems	Operate and maintain all WRD covers and SIS systems
Groundwater	Zone II Pit Groundwater	Water level controlled to prevent migration to NFRC using an extraction well which pumps year-round via a heat-traced and insulated	Dewatering System	Prevent migration of Zone II Pit groundwater to NFRC Provide for monitoring and operation of the	Maintain and continue to operate the dewatering well system and pipeline to Faro Pit Lake Install SCADA for monitoring and control from the WTP	Maintain and operate existing dewatering pumping system and pipelines	Maintain and operate existing dewatering pumping system and pipelines. Extend well as needed for WRD grading and covering and replace pump if necessary.	Maintain and operate dewatering pumping system and pipelines

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		pipeline to Faro Pit Lake		dewatering system from the WTP				
Mill/ETA								
Stormwater	Stormwater	Stormwater merges with ARD seepage	Stormwater collection and diversion system	Collect clean stormwater and route it to clean surface water	Construct stormwater ditches around the ETA and merge these into a ditch system carrying stormwater down the road coming up the west side of the ETA from the RCTA. Merge this ditch into the north-side RCTA stormwater ditch system. Construct a similar ditch system for stormwater originating to the east of the ETA area and route this to the east and into the lower NFRC.	None needed	None needed	Maintain the stormwater diversion ditch system.
Contaminated Seepage	Faro Creek Valley WRD Seepage	Seepage emerges at X23 and at the Mill Seep, as well as in other non-point source seeps within the valley and below the Access Road in the canyon. This seepage is very acidic with very high concentration of dissolved metals including iron and zinc, and presents a significant contaminant load.	Seepage Collection System	Collect seepage and its large contaminant load to reduce downstream contaminant loading and collection costs.	Remove the tailings to the RCTA. Construct drainage ditches from X23 and Mill Canyon through the former ETA to a culvert under the mine access road discharging to Faro Creek Canyon. The ditches would be constructed in the alluvium and would provide positive drainage for X23, Mill Canyon, and the alluvium in the former ETA. Leave the contaminated alluvium (that had underlain the tailings) in place. Provide a vegetated till cover. Collect this contaminated water behind a dam constructed in the Canyon where the bedrock narrows. Either pump or drain this water through winterized pipelines to the WTP or the CVP. Provide ability to regularly clean the pipelines using pigging or jetting, and the ditches by mucking.	Maintain and operate the existing ETA collection system below the Access Road	Maintain and operate the existing ETA collection system below the Access Road when feasible during construction	Maintain and operate the new drainage ditches and dam-based seepage collection system and its associated conveyance systems year-round
Contaminated Seepage	Main WRD Seepage	No known seepage of concern is occurring other than that emerging into the ETA Canyon Potential for future seepage from the WRD toe to the east of the ETA area	Seepage collection system if needed	Collect seepage and prevent it from entering clean stormwater diversions down gradient.	If needed, construct a seepage interception ditch to capture shallow seepage and convey it west into the ETA area, and another which conveys it east and into the ditch system constructed below the Intermediate WRD which conveys seepage to the NFRC SWM Pond. This same ditch system will collect stormwater so the ditch shall be constructed as close to the toe of the WRD as feasible to reduce the volume of stormwater collected.	None needed	Construct ditch system typically working downstream to upstream Implement BMPs	Maintain the ditch system
Contaminated Seepage	ETA Seepage (ARD which is generated by the tailings)	This seepage merges with the WRD seepage and other seeps which emerge in the area	Seepage Collection System	Collect seepage and prevent it from entering clean stormwater diversions down gradient.	Manage this seepage the same as that originating from the canyon WRDs.	Maintain and seasonally operate the existing ETA collection system below the Access Road	Maintain and seasonally operate the existing ETA collection system below the Access Road when feasible during construction.	Maintain and operate the new drainage ditches and dam-based seepage collection system and its associated conveyance systems year-round.
Groundwater	Groundwater	Contaminated groundwater emerges within the ETA area down to the bedrock	Groundwater collection system	Prevent contaminated groundwater from entering clean stormwater diversions.	Collect groundwater within the seepage collection ditches and co-manage this water behind the canyon dam with ARD seepage.	None needed	Construct channels typically working downstream to upstream. Implement BMPs	Maintain and operate the new drainage ditches and dam-based seepage collection system and its

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		pinch-out below the Access Road. The groundwater accelerates leaching of the tailings.						associated conveyance systems year-round
Rose Creek Tailings Area (RCTA)								
Surface Stream	Lower Guardhouse Creek (LGC)	Originates in the upper Mill Yard and discharges to the Intermediate Tailings Significantly impacted	UGC Channel	Long-Term: Recover water quality Near-Term: Use for contaminated water collection system Efficiently carry design flow around Mill Yard and tailings area Prevent leakage of creek water to subsurface where cost-effective	Upgrade existing alignment to carry design flow to CVP for collection and treatment. Design flow to be selected using a failure consequence evaluation. Re-route channel into the lower NWID when clean.	Maintain existing channel	Perform channel improvements using a segmental construction approach typically working from downstream to upstream Implement BMPs	Maintain diversion Continue water monitoring program Continue to collect in CVP and treat Route to NMID when water quality allows Follow Adaptive Management Plan if unacceptable water quality impact is detected
Surface Stream	Rose Creek	Channelized flow within the Rose Creek Diversion along the south side of the tailings area. Needs repair to carry the 500-year design flow event. Leaks considerable water through its bed and dyke to and below the RCTA, CVP, and below the CVP Moderately impacted	Rose Creek Diversion Channel	Reduce leakage using lining or cutoff walls where practicable and cost-effective against collection and treatment Provide capability to safely pass the PMF event	Repair the RCD l downstream of the fuse plug to safely pass the 500-year design flow. Upgrade the RCD upstream of the fuse plug to safely pass the PMF. Install a liner or cutoff walls where practicable and cost-effective against collection and treatment Install a new side-channel adjacent and parallel to the RCD from the Fuse Plug to the Intermediate Dam Pond to pass flow in excess of the 500-year event Improve the Intermediate Dam to safely pass the PMF by improving the spillway and raising the dam if required	Maintain existing RCD	Perform channel improvements using a segmental construction approach typically working from downstream to upstream Implement BMPs Coordinate operation of the Intermediate Dam Pond pump barge system to manage water within the ID pond	Maintain and operate the RCD, the Side-Channel Diversion, and the ID and ID spillway
Stormwater	North side of RCTA Stormwater	Stormwater flows to the RCTA via the upslope road ditch and culverts which pass under the road Water quality is unknown	Stormwater collection and conveyance	Divert clean stormwater away from the RCTA	Construct an improved ditch north of the road to intercept and transport clean stormwater north of the RCTA, around the CVP, and to the lower NWID.	None	Continue to collect stormwater during construction using the existing road ditch and culverts to the RCTA Perform channel improvements using a segmental construction approach typically working from downstream to upstream Divert new channel outfall into the CVP if stormwater does not meet discharge criteria Implement BMPs	Maintain and operate the stormwater collection ditch system

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Stormwater	RCTA Stormwater	Rain and snowmelt which does not evaporate either infiltrates the tailings (the minor portion) and eventually discharges into the RCAA, or flows along the surface towards the Intermediate Dam and accumulates in the ID Pond (the major portion) Water is severely impacted	Tailings surface grading, ditching, and cover	Provide positive drainage of stormwater off the tailings surface Gravity drain or pump clean stormwater off the cover when cost-effective against collection and treatment	Grade tailings surface to provide positive slope and flow of stormwater. Cover with growth medium layer and revegetate according to appropriate species prescription. Use ditching to augment flow if cost effective, such as to the north from the Secondary Tailings Pump clean stormwater from a sump located near the north abutment of the ID, prior to the spillway, up into the NWID if cost effective against collecting it into the contaminated water system and treating it. An option is to provide a gravity channel to pass this water down the side of the spillway and around the CVP.	None	Sequence surface grading and stormwater management working from upslope to downslope (towards the ID Pond). Operate existing barge pump system to pump water to the WTP or alternately to Faro Pit for interim storage. Decommission the barge system once the contaminated seepage collection (French drain) system located on the upstream slope of the ID is functional. The seepage collection system will collect contaminated water from the tailings surface and convey it to a pump station in the northwest corner of the tailings for transfer to the WTP or the CVD Pond. Tie stormwater flow off the cover to this pump station until the stormwater is demonstrated clean enough to discharge. Then separate it and direct it to a separate pump station for pumping into the NWID for transport around the CVD Pond to Rose Creek.	Maintain cover and stormwater management system
Stormwater	South side of RCTA Stormwater	Stormwater enters the RCD by flow off the hillside	None	Maintain ability to collect south side stormwater in the RCD	None	Maintain southern RCD slope for collection of stormwater	Maintain southern RCD slope for collection of stormwater	Maintain southern RCD slope for collection of stormwater
Contaminated Seepage	Tailings Seepage	Seepage generated by surface water percolating through the tailings and by pore water squeezed from the tailings as a result of tailings consolidation Seepage is severely impacted	Seepage collection	Prevent seepage which enters the RCAA from entering Rose Creek Prevent seepage from Secondary Tailings from entering Rose Creek between the start of the RCD to the Fuse Plug	Install a SIS below the CVD to capture the impacted RCAA to prevent recharge to Rose Creek. *See the CVD SIS Remedial Action in the CVD Reclamation Unit for more information* Install a cutoff wall in the secondary tailings dam from the fuse plug to the confluence between the NFRC and SFRC to prevent seepage into the RCD.	None	None	Maintain and operate the CVD SIS and monitor the effectiveness of the cutoff wall.
Contaminated Seepage	Seepage through the cover which drains along the trafficability layer on top of tailings surface	Currently the tailings are not covered so this water is surface water which collects in the ID Pond	Contaminated seepage collection (French drain) system near the upstream face of the ID which is tied into the	Collect water which moves through the tailings cover and which migrates along the tailings surface towards the ID.	Construct a contaminated seepage (French drain) system near the upstream face of the ID which is tied into the tailings cover trafficability layer. This drain system will convey seepage water to a sump pumping station which will pump the collected water to either the CVP or the WTP.	Operate and maintain existing barge pump system	Sequence other remedial actions prior to this to remove as much hydraulic loading to the tailings surface as practical Already have installed a new pipeline to the WTP having more	Operate and maintain the sump pumping station year-round

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			tailings cover trafficability layer, as well as a pump sump located near the right abutment.				capacity than the existing IP pipeline Use additional pumps to dewater the ID Pond to allow construction of the new sump pumping station Operate both the new sump pumping station and the other pumps as needed to keep the ID Pond drawn down for construction of the French drain system	
Groundwater	Groundwater	Groundwater flows parallel to the valley floor from east to west Sulfate is increasing but zinc is still at low levels. Zinc and other metals expected to increase significantly over time	None	None *(see CVD Reclamation unit for a description of the CVD SIS which will collect this water)*	None	None	None	None
Cross Valley Dam (CVD)								
Surface Stream	Leakage from RCD	Significant water leaks from the RCD into the CVP and the RCAA	Cutoff walls or lined channel if cost-effective against collection and treatment	Reduce the amount of creek water requiring collection and treatment if cost-effective	Install creek channel lining if practicable or cutoff walls	None	None for cutoff walls Creek lining would require segmental construction with water diversions	Maintain the lining system if installed Monitor the effectiveness of cutoff walls if installed
Impoundment	Cross Valley Pond	Not currently used for WTP effluent polishing. Requires periodic syphoning of water to X5 due to inflow from RCD leakage and ID Pond seepage. Water quality periodically fails discharge standards due to suspended solids and pH.	Rehabilitated CVD Pond used for storage of contaminated water	Provide temporary storage of contaminated stormwater, groundwater, or seepage Safely pass the PMF	Improve the CVD spillway to safely pass the PMF Install a pumping system to pump water to the WTP or Faro Pit Upgrade dam to be able to withstand the 1-in-10,000 year (maximum credible earthquake [MCE]) earthquake loading	Continue current operations of maintaining the water level by syphon discharge Improve pond water pH by lime addition and mixing to help control water quality	Pump pond down sufficiently to allow construction of the improved spillway and the pumping system.	Operate and maintain the pumping system and maintain the spillway.
Stormwater	Northside Stormwater	Northside stormwater is collected in the NWID Water quality is sufficient to discharge	Upgraded NWID	Collect and route stormwater around the CVD Pond	Ensure that up gradient stormwater can be collected in the upgraded NWID	Continue to maintain the NWID	Perform NWID channel improvements using a segmental construction approach typically working from downstream to upstream Implement BMPs	Maintain NWID

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Reclamation Unit/Water Type	Applicable Water	Current Conditions	Remedial Component	Remedial Objectives	Primary Remedial Actions	Water Management Prior to Remedial Action	Water Management During Remedial Action	Water Management After Remedial Action
Stormwater	Southside Stormwater	Southside stormwater is collected in the RCD	None	Continue to collect south side stormwater in the RCD	None	Maintain the RCD	Maintain the RCD	Maintain the RCD
Groundwater	Groundwater	The groundwater below the CVD is the RCAA Sulfate is increasing but zinc is still at low levels. Zinc and other metals expected to increase significantly over time, beginning on the north side.	CVD SIS Down gradient cutoff wall if require.	Prevent unacceptable discharge of contaminated groundwater to Rose Creek	Install a line of extraction wells along the toe of the CVD sequencing their installation as needed to collect unacceptable groundwater. Pump the collected water to either the WTP or to the CVP or Faro Pit if temporary storage is required. Install downgradient cutoff wall across the Rose Creek Valley if necessary.	None	None	Operate and maintain the CVD SIS year-round Monitor the dow- gradient groundwater quality and the surface water quality in Rose Creek Per an Adaptive Management Plan, adjust pumping rates as needed for efficient capture Install a down-gradient cutoff wall if it is found that there is unacceptable bypass
Other								
Water Treatment	All contaminated water	All contaminated water is collected where practicable and treated in the Interim Water treatment System (IWTS) located below the Mill. The effluent is discharged to the CVP or the lower NWID. Sludge is pumped to the existing tailings-area sludge ponds	Treatment Plant	Treat contaminated water meeting discharge standards Provide centralized control of all associated active water management systems from the WTP control room as practicable.	Construct a permanent WTP using the lime high density sludge (HDS) treatment process with media filters. Configure the plant and its effluent and sludge discharge pipelines to operate year-round. Site the plant either in the Mill Yard or in the Horse Corral Area depending on the cost-benefit of long-term operation and water conveyance Install SCADA for centralized operation of associated active water management systems as practicable, such as the Faro Pit and the CVD SIS dewatering systems. Also provide local manual operation capability. Pump sludge to the bottom of Faro Pit for permanent disposal	Operate and maintain the IWTS	Operate and maintain the IWTS while the Permanent WTP is being constructed	Operate and maintain the Permanent WTP

PROJECT DESIGN TEAM

Faro Mine Remediation Project

June 9, 2015



Faro Mine - Water Management Strategy
June 2015 IPRP Meeting

Water Management Strategy - Agenda

- **Guiding Objectives**
- **Site-Wide Conceptual Site Model – Existing Conditions**
- **Overview and Approach for Site-Wide Water Management integrated into Closure Activities**
- **Overall Integrated Approach**
- **Water Management at the Reclamation Unit Level**

Guiding Closure Objectives

- **Protect human health and safety.**
- **Protect and, to the extent practicable, restore the environment including land, air, water, fish and wildlife.**
- **Return the mine site to an acceptable state of use that reflects pre-mining land use where practicable.**
- **Maximize local and Yukon socio-economic benefits.**
- **Manage long-term site risk in a cost-effective manner.**

Introduction

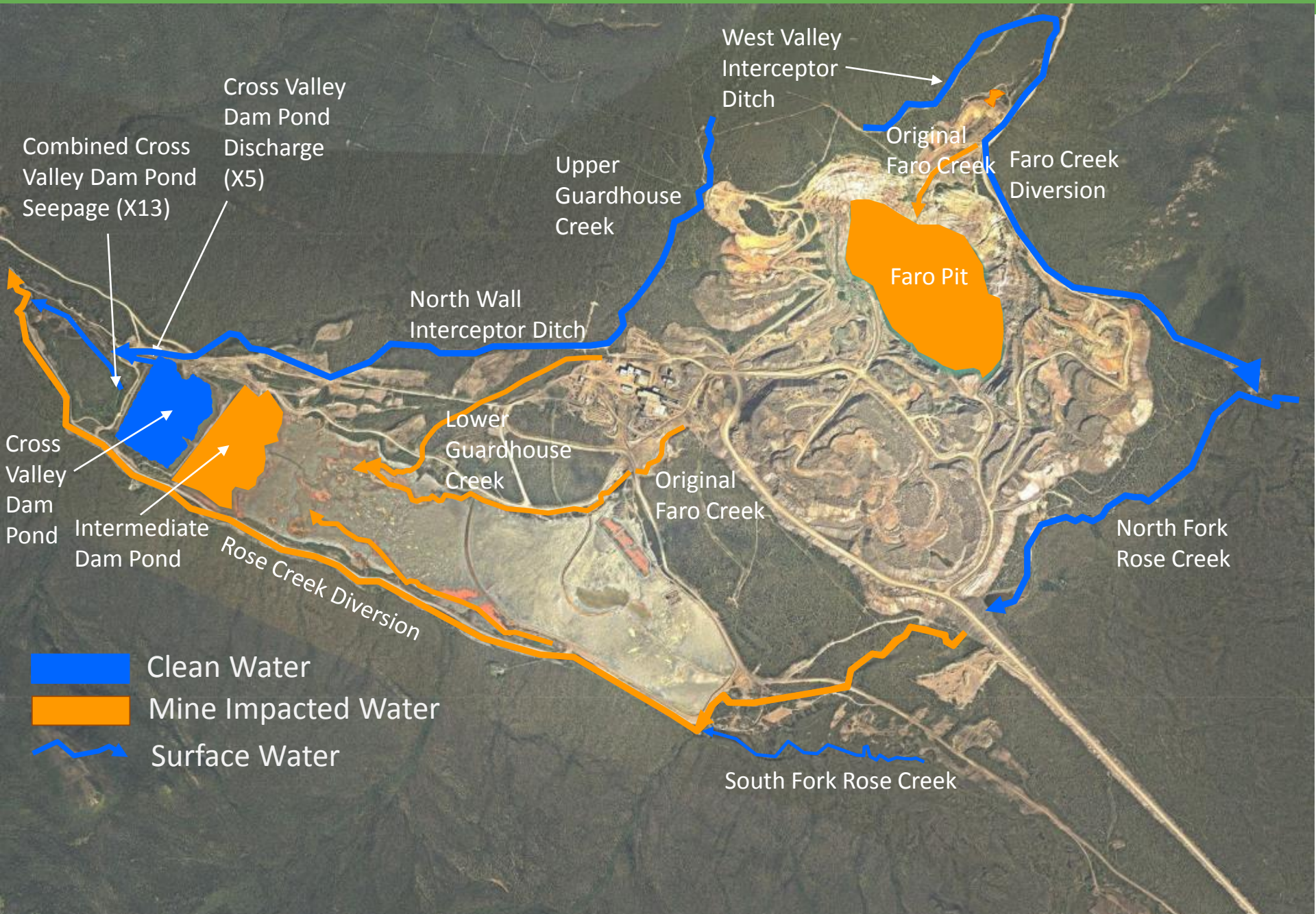
- **Why the focus on water management**
  - Most significant driver of site risk
  - Most significant driver of long-term care and maintenance cost
  - Impacts and informs the alternatives evaluated and their designs

- **Evolution of water management considerations & approaches**
  - During Construction:
    - Significant potential to generate TSS and metals in surface water
    - Waste disturbance will result in short-term (many years) increase in contaminant release
    - Disturbances have potential to create additional oxidation
    - Staging of activities and BMPs are important to control construction-related impacts
  - Post-Construction:
    - “Maturing” of remediations
    - Many years to shed the construction disturbance and return to a new wasteload baseline
    - Performance monitoring and adaptive management
  - Long-Term Management:
    - Care and maintenance
    - Adaptive Management

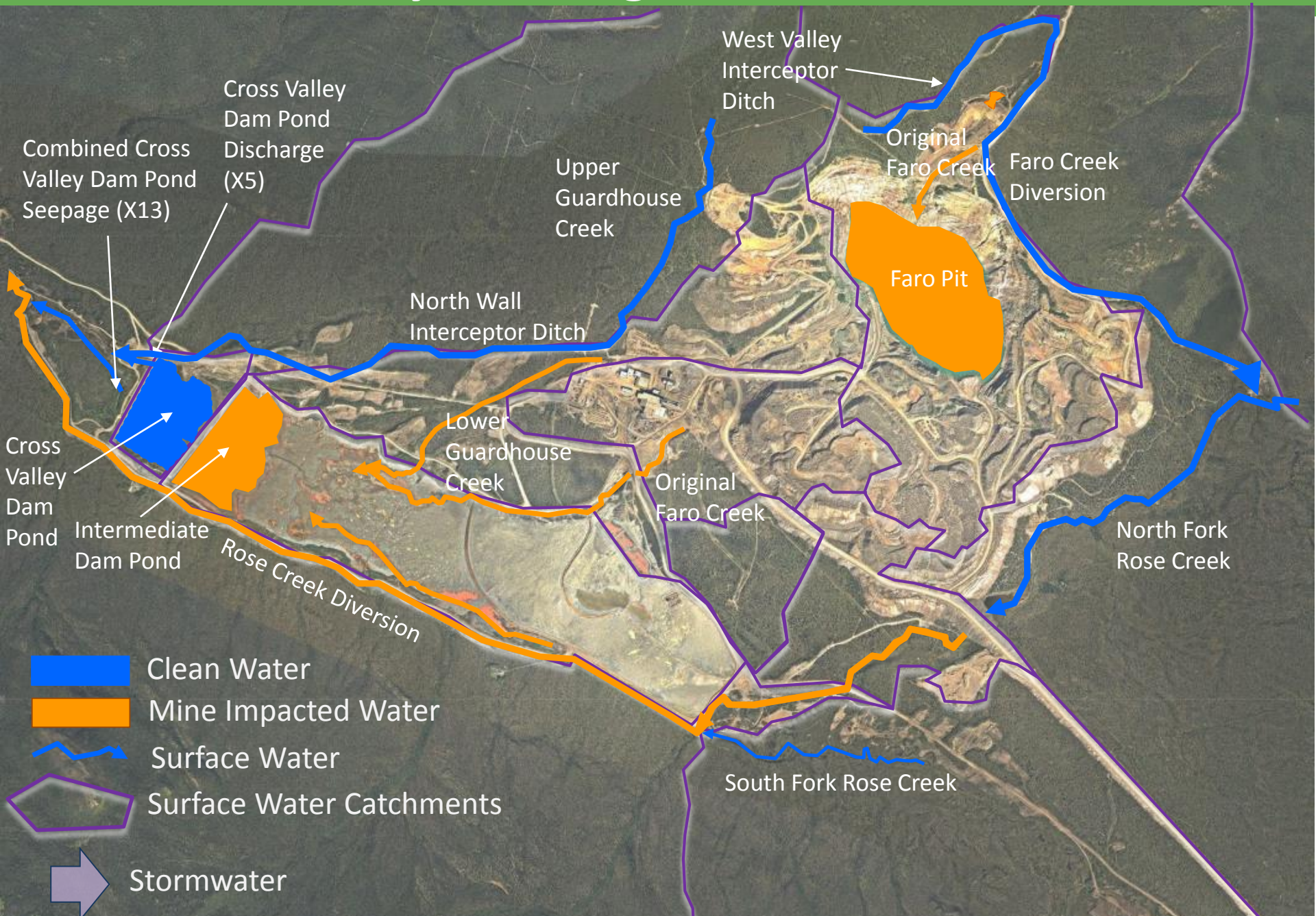
The Site Today: Existing Site Water Movement



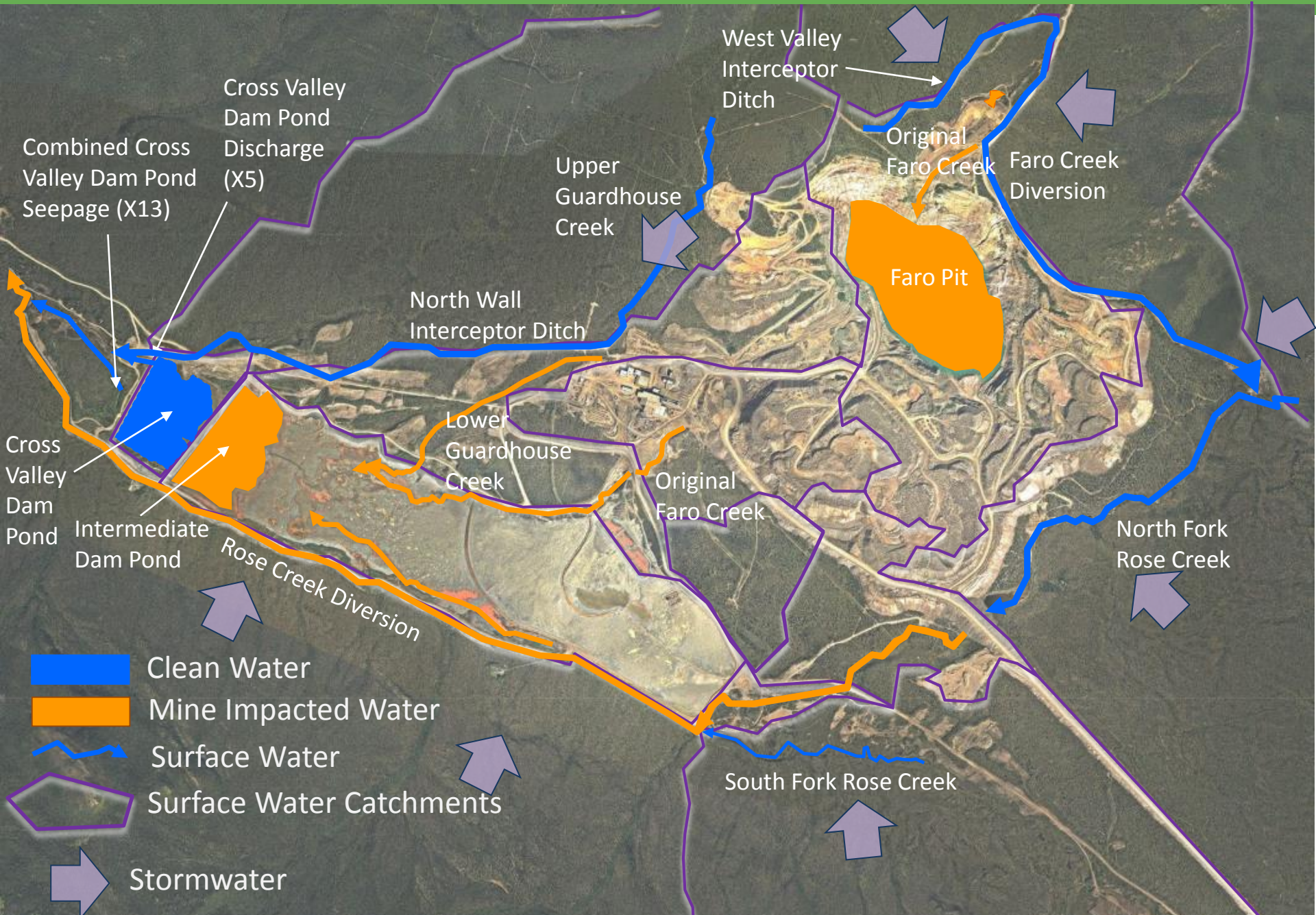
The Site Today: Existing Site Water Movement



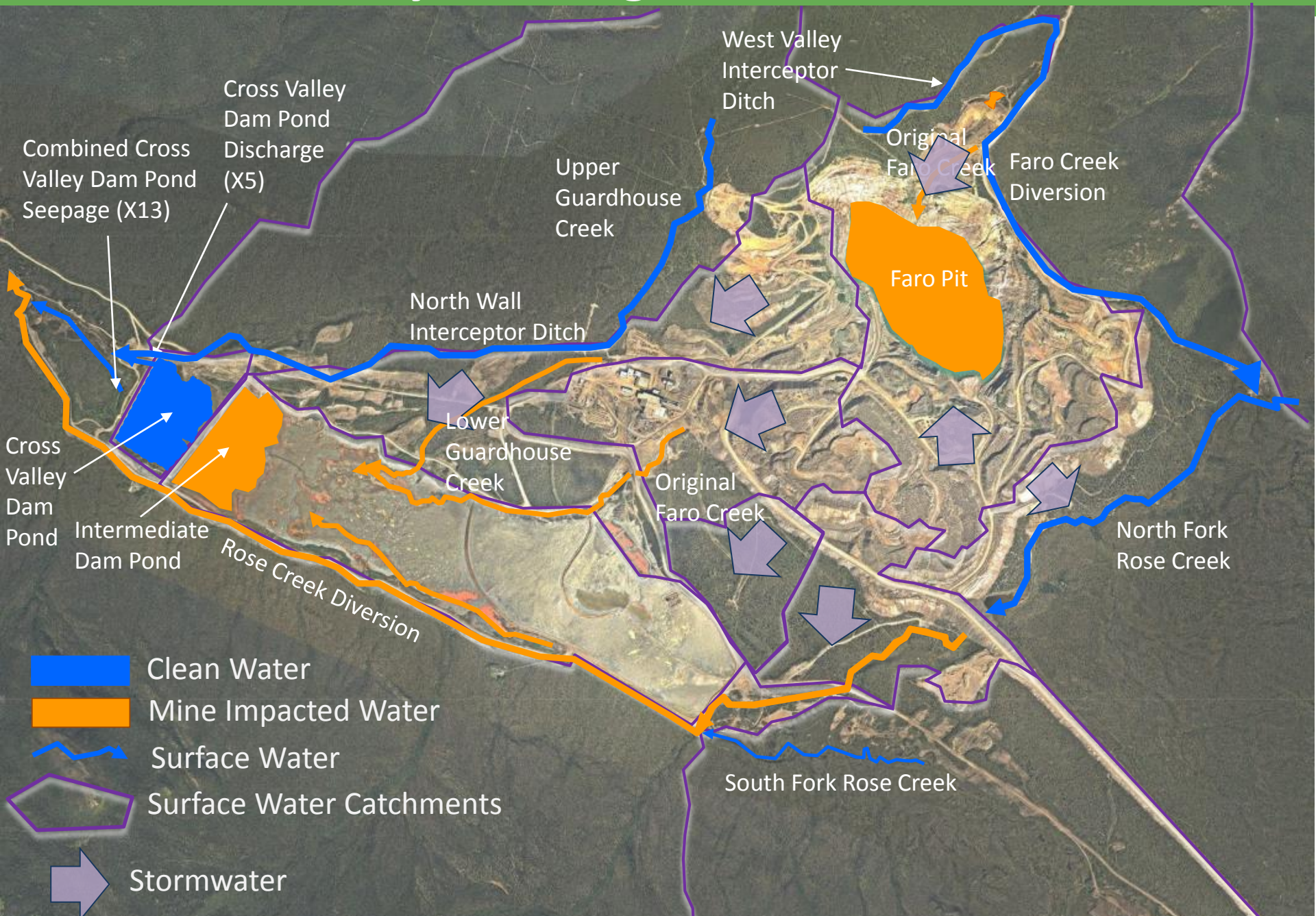
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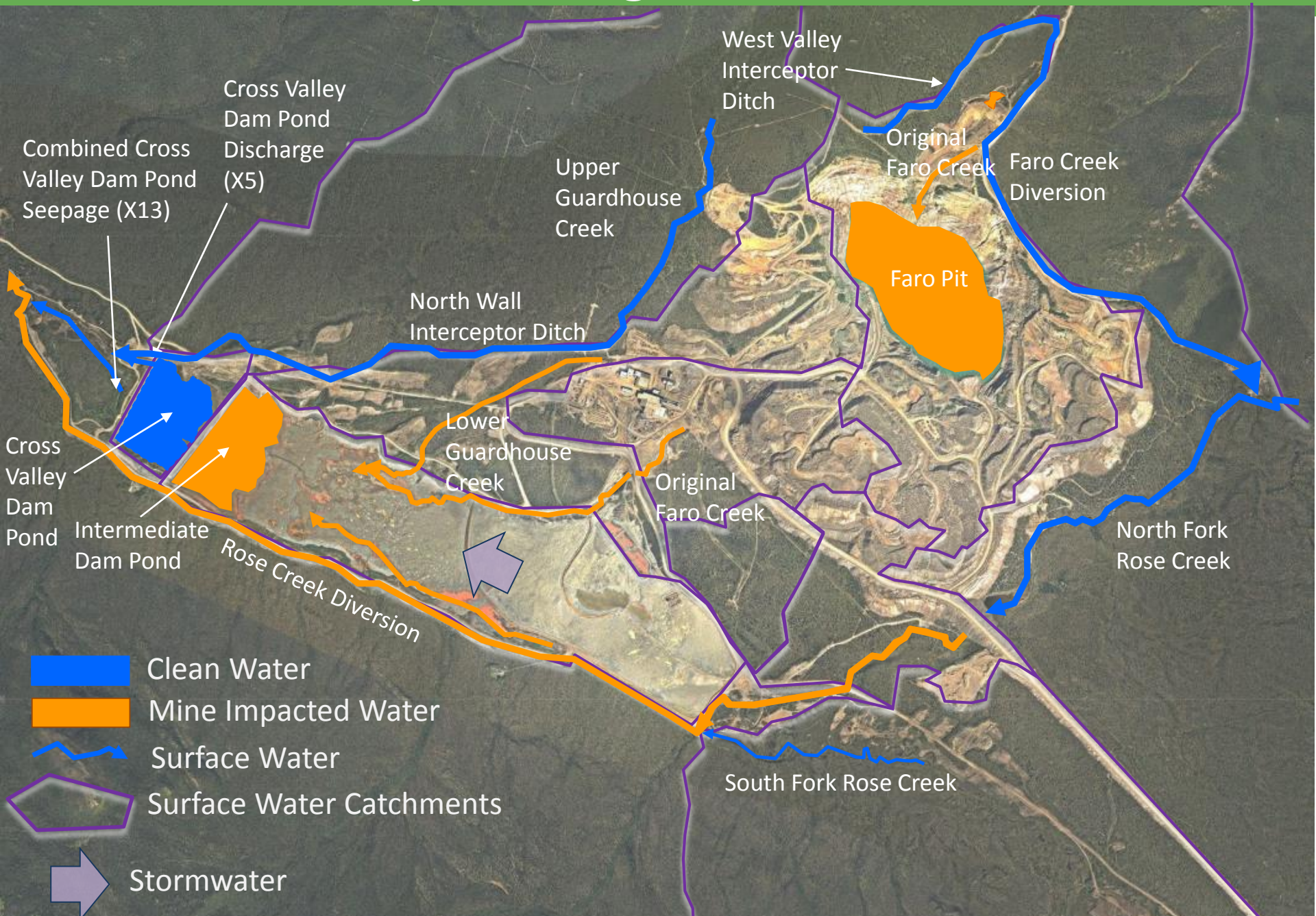
The Site Today: Existing Site Water Movement



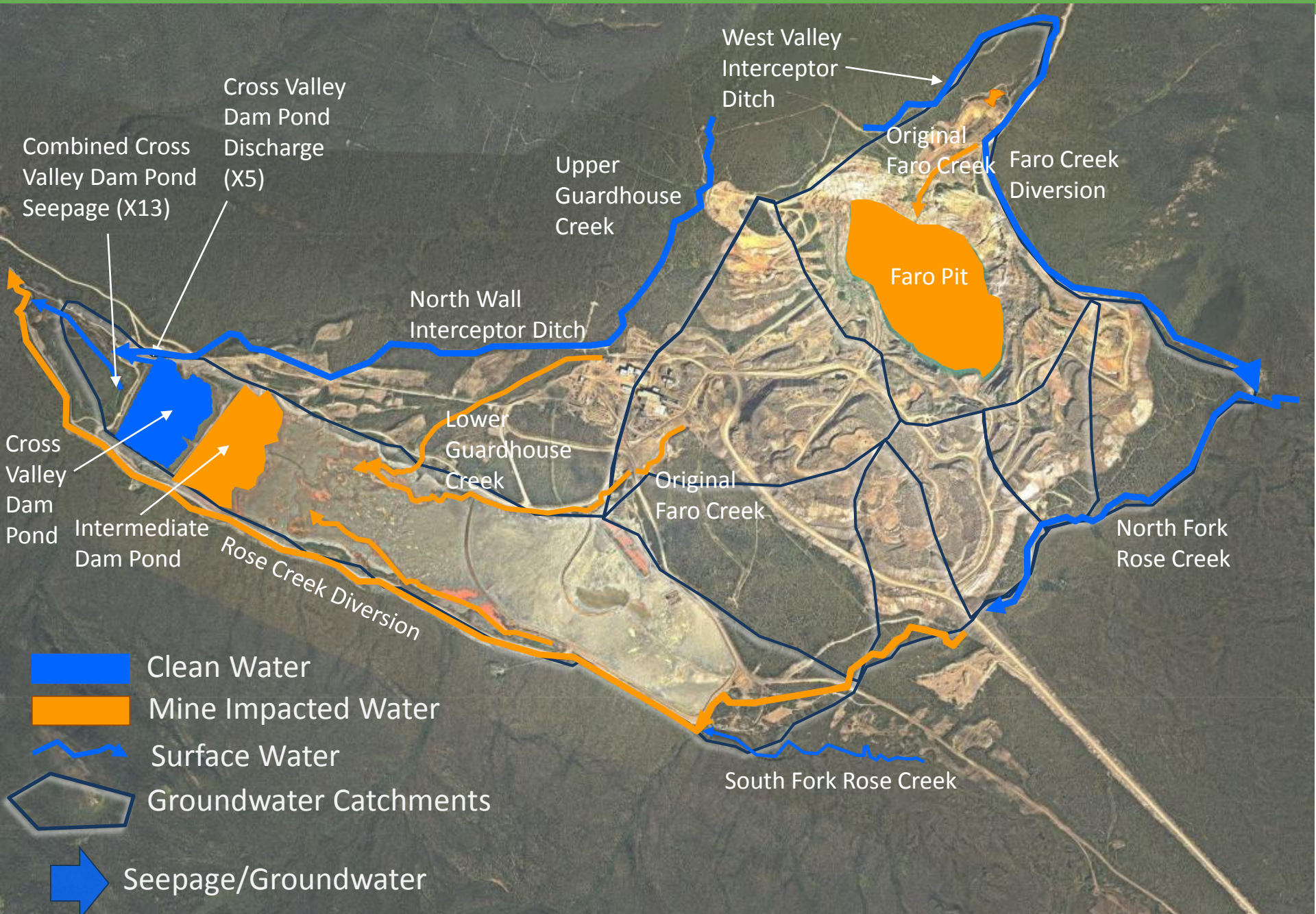
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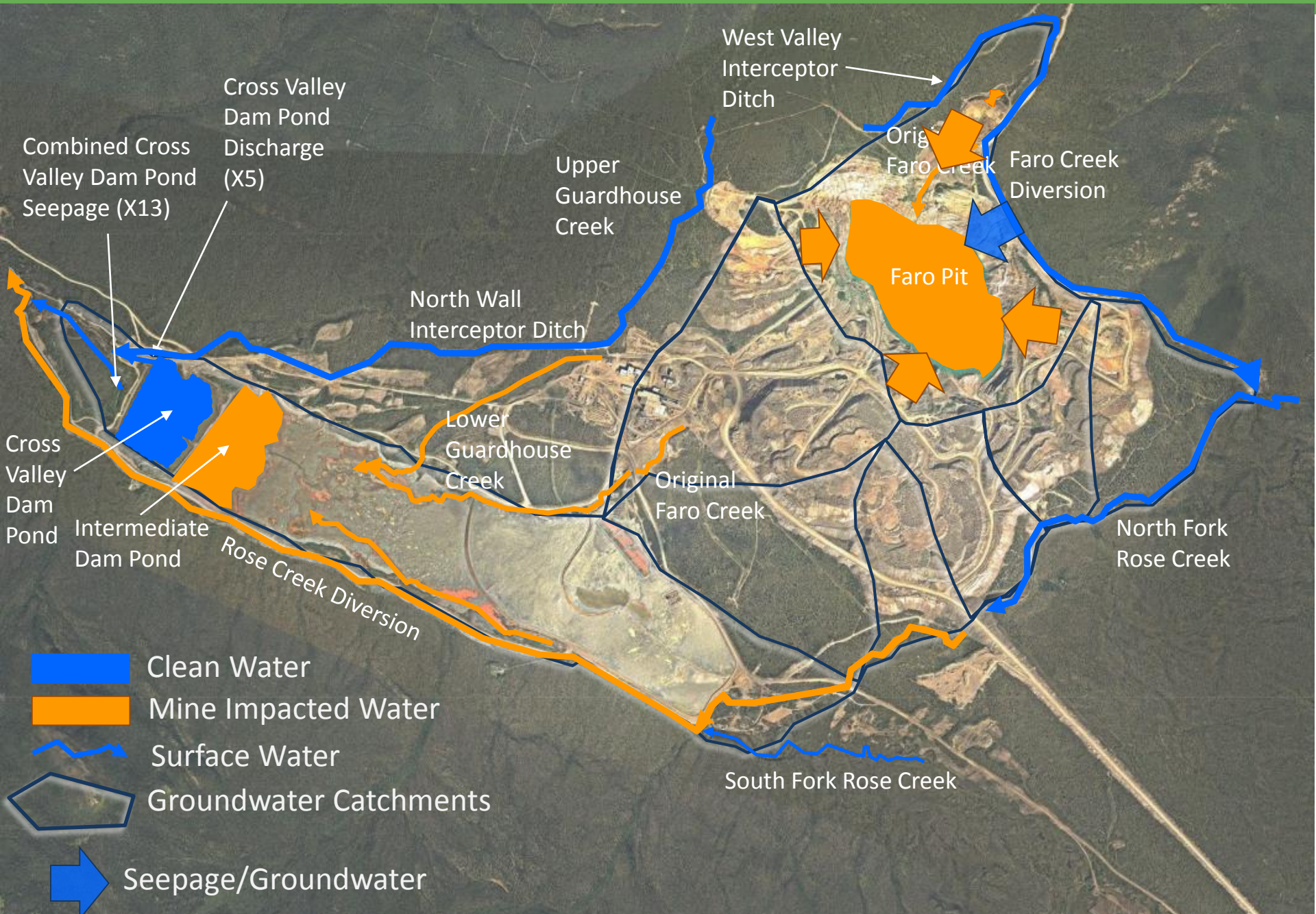
The Site Today: Existing Site Water Movement



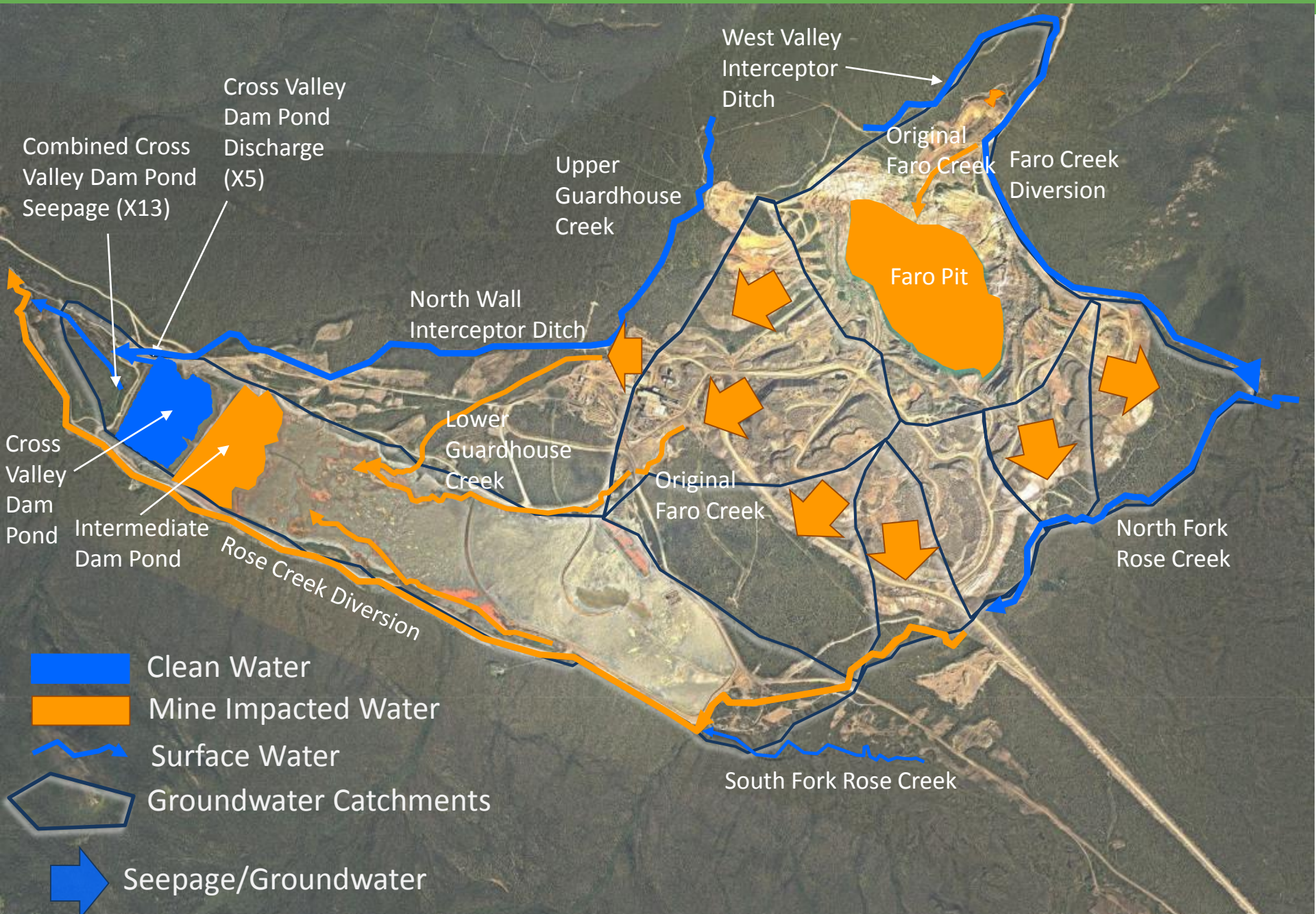
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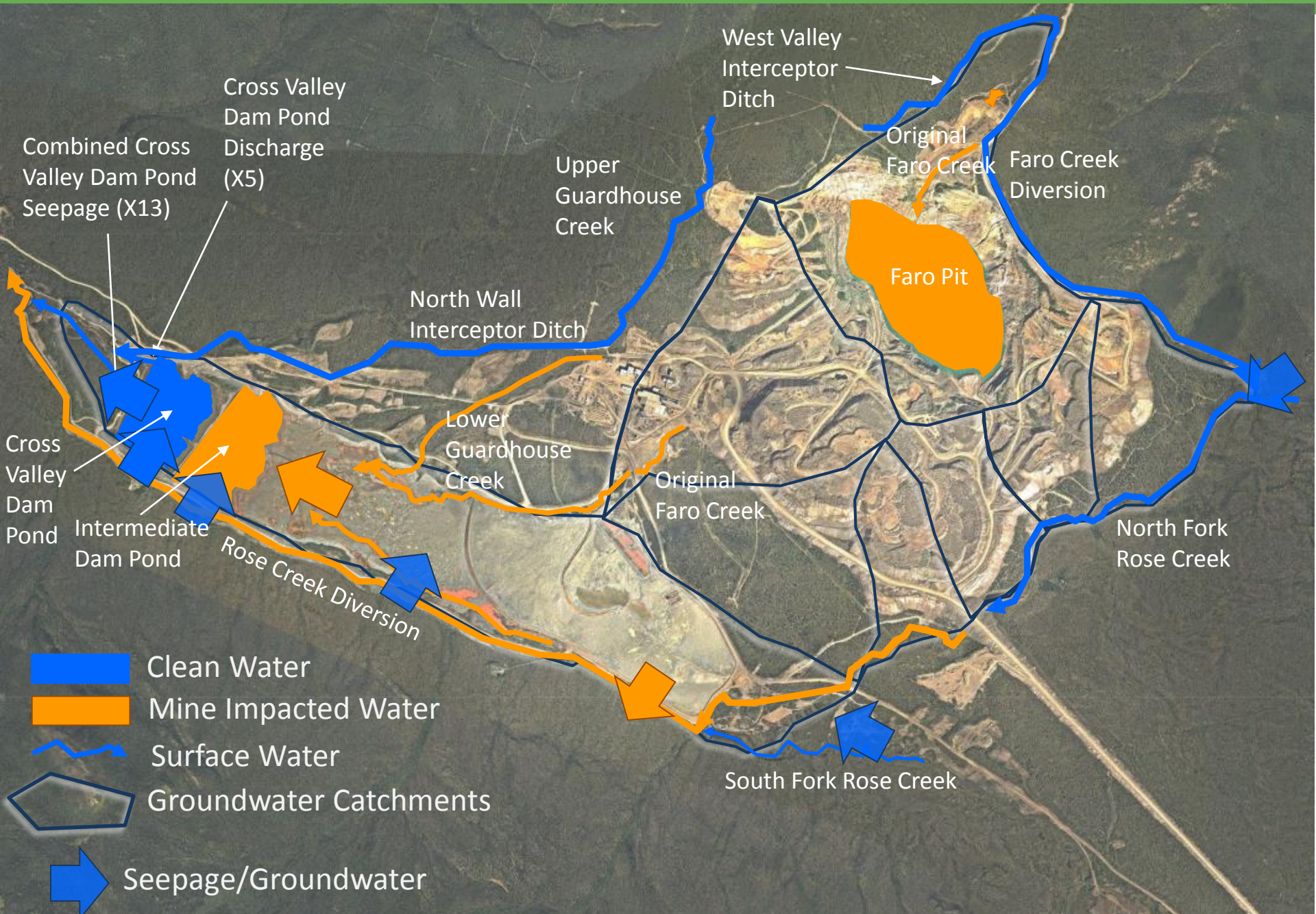
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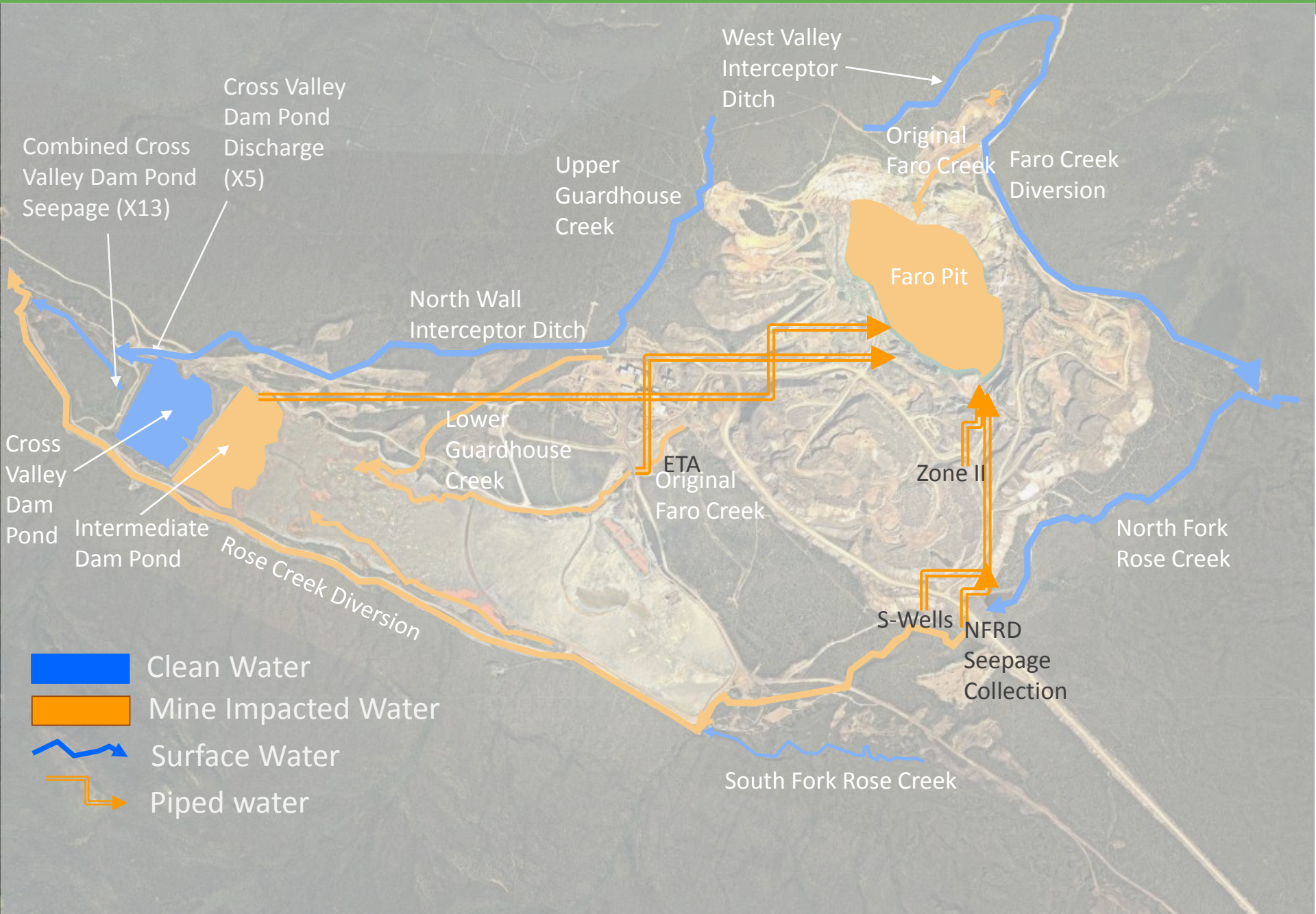
The Site Today: Existing Site Water Movement



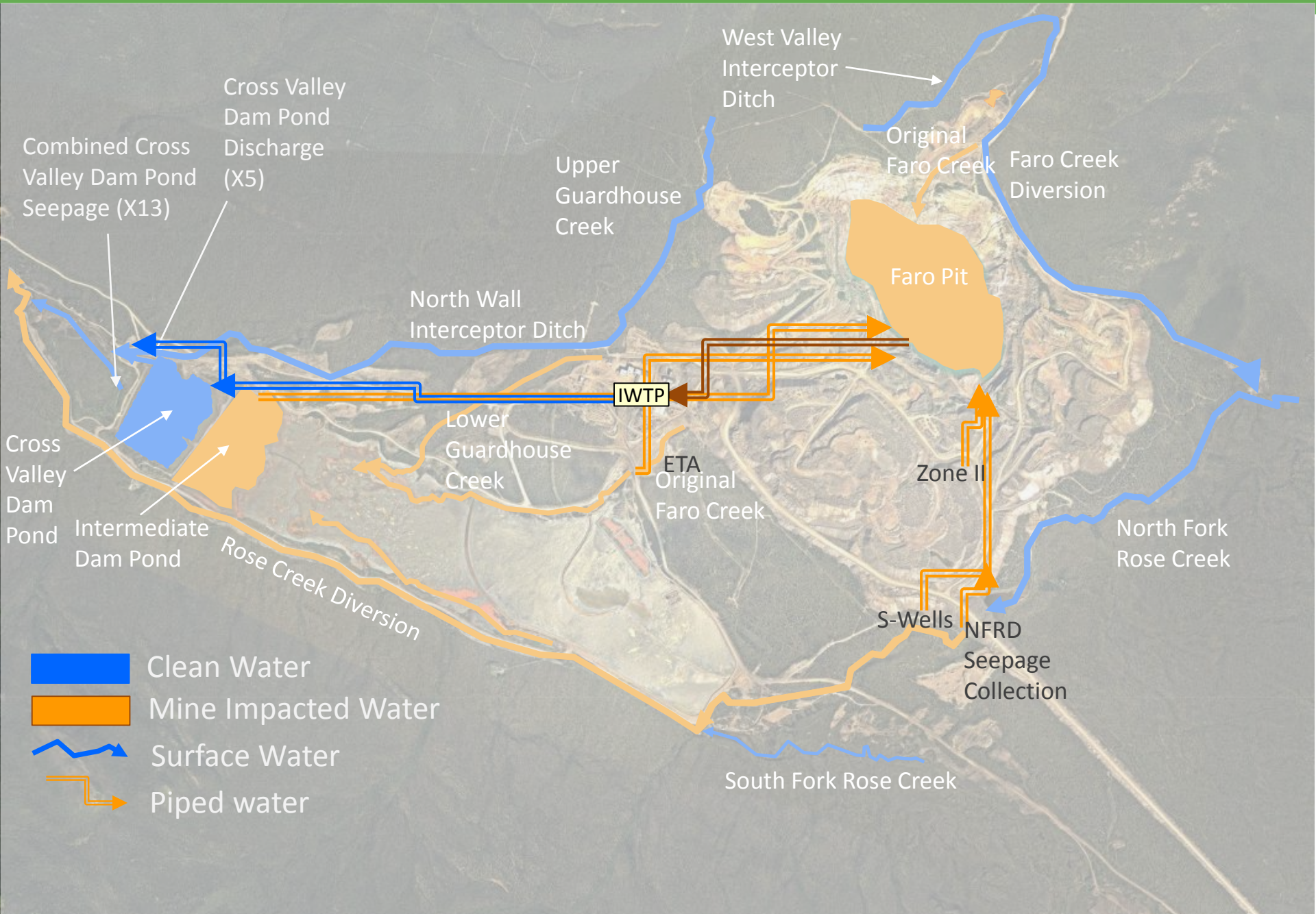
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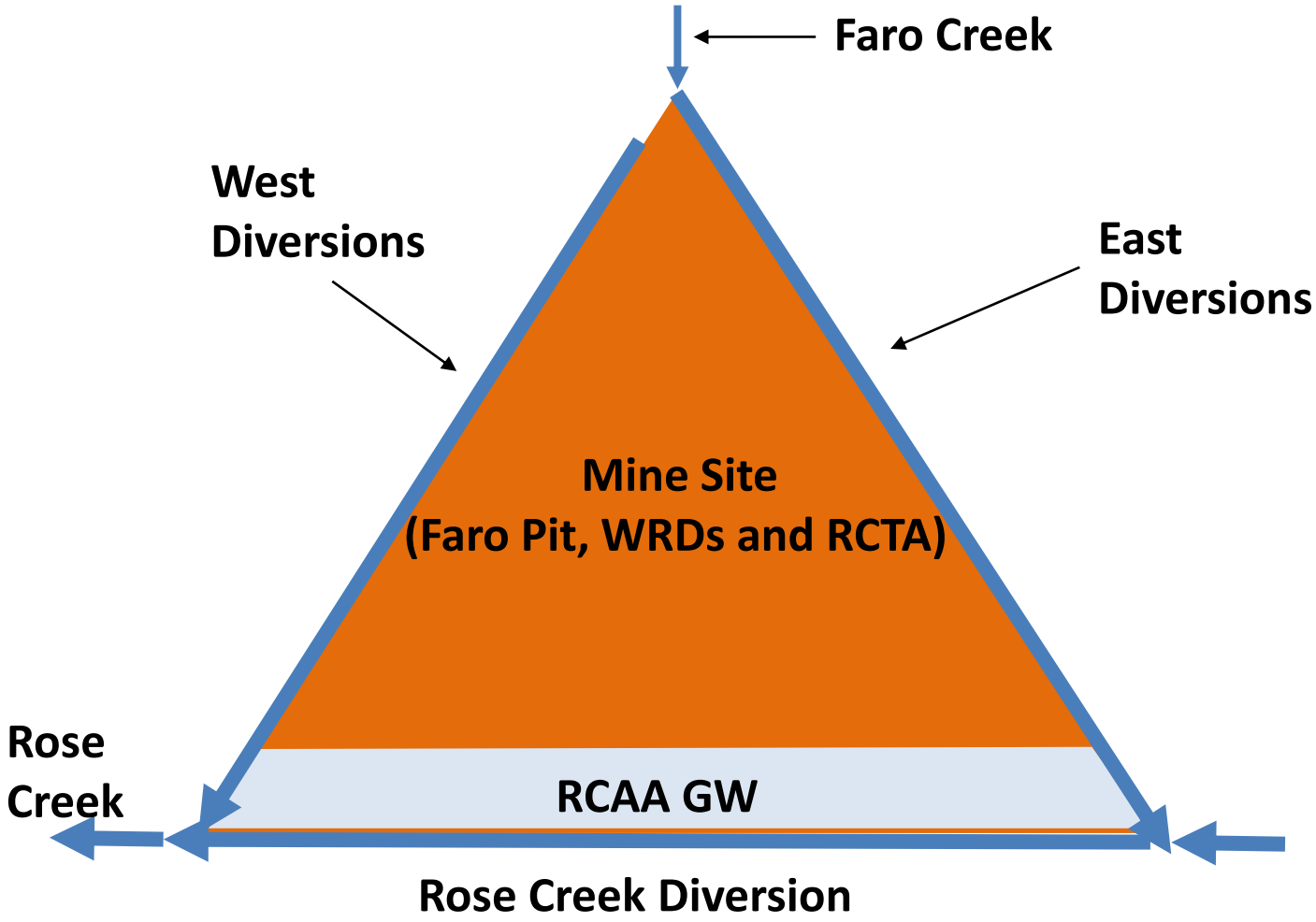
The Site Today: Existing Site Water Movement



The Site Today: Existing Site Water Movement



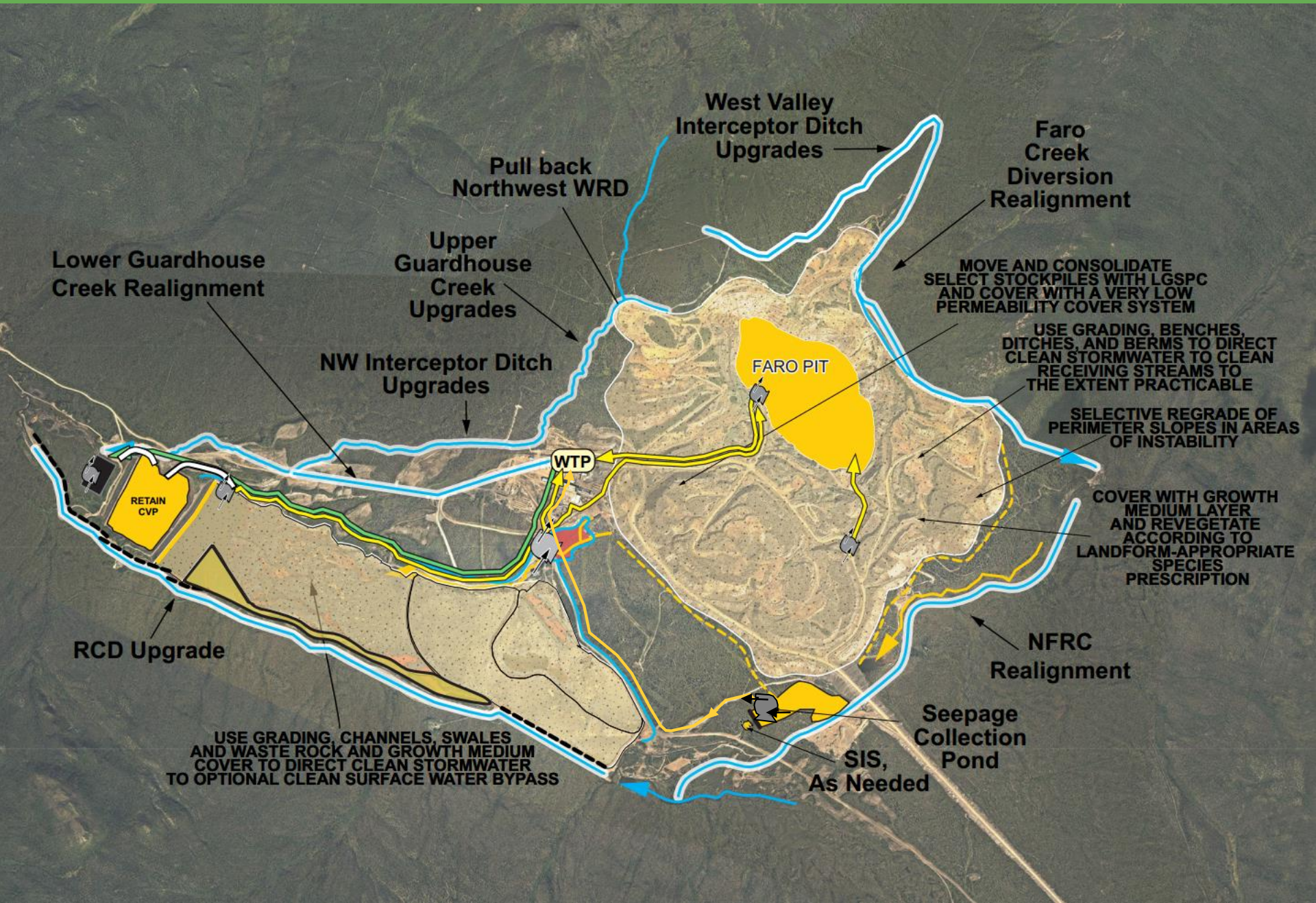
Site-Wide Water Management Strategies



1. Exterior to the Mine Site
   - keep clean water clean

2. Interior to the Mine Site
   - Minimize dirty water as cost-effective
   - Collect and treat remaining

Outcome


West Valley Interceptor Ditch Upgrades
Faro Creek Diversion Realignment
Pull back Northwest WRD
Upper Guardhouse Creek Upgrades
Lower Guardhouse Creek Realignment
NW Interceptor Ditch Upgrades
MOVE AND CONSOLIDATE SELECT STOCKPILES WITH LGSPC AND COVER WITH A VERY LOW PERMEABILITY COVER SYSTEM
USE GRADING, BENCHES, DITCHES, AND BERMS TO DIRECT CLEAN STORMWATER TO CLEAN RECEIVING STREAMS TO THE EXTENT PRACTICABLE
FARO PIT
SELECTIVE REGRADE OF PERIMETER SLOPES IN AREAS OF INSTABILITY
WTP
RETAIN CVP
COVER WITH GROWTH MEDIUM LAYER AND REVEGETATE ACCORDING TO LANDFORM-APPROPRIATE SPECIES PRESCRIPTION
RCD Upgrade
NFRC Realignment
Seepage Collection Pond
SIS, As Needed
USE GRADING, CHANNELS, SWALES AND WASTE ROCK AND GROWTH MEDIUM COVER TO DIRECT CLEAN STORMWATER TO OPTIONAL CLEAN SURFACE WATER BYPASS

Site-Wide Water Management Strategies

- **Keep clean water clean to the extent practicable:**
  - maintain physical separation from existing source areas
  - intercept the impacted sources before they reach clean water
  - relocate the clean water away from developing and future sources if necessary
  - provide waste surfaces resistant to erosion
- **Reduce contaminant loading to the extent practicable**
  - maintain hydraulic isolation
  - construct cover systems
- **Collect impacted seeps and other sources of contamination, to the extent practicable and cost effective:**
  - perform focused collection and treatment of concentrated water before it becomes diluted, and exacerbates collection, conveyance, and treatment
- **Water treatment system to treat impacted waters**
  - maintain a system that robustly handles a wide range of influent demands, and can be expanded over time, if needed

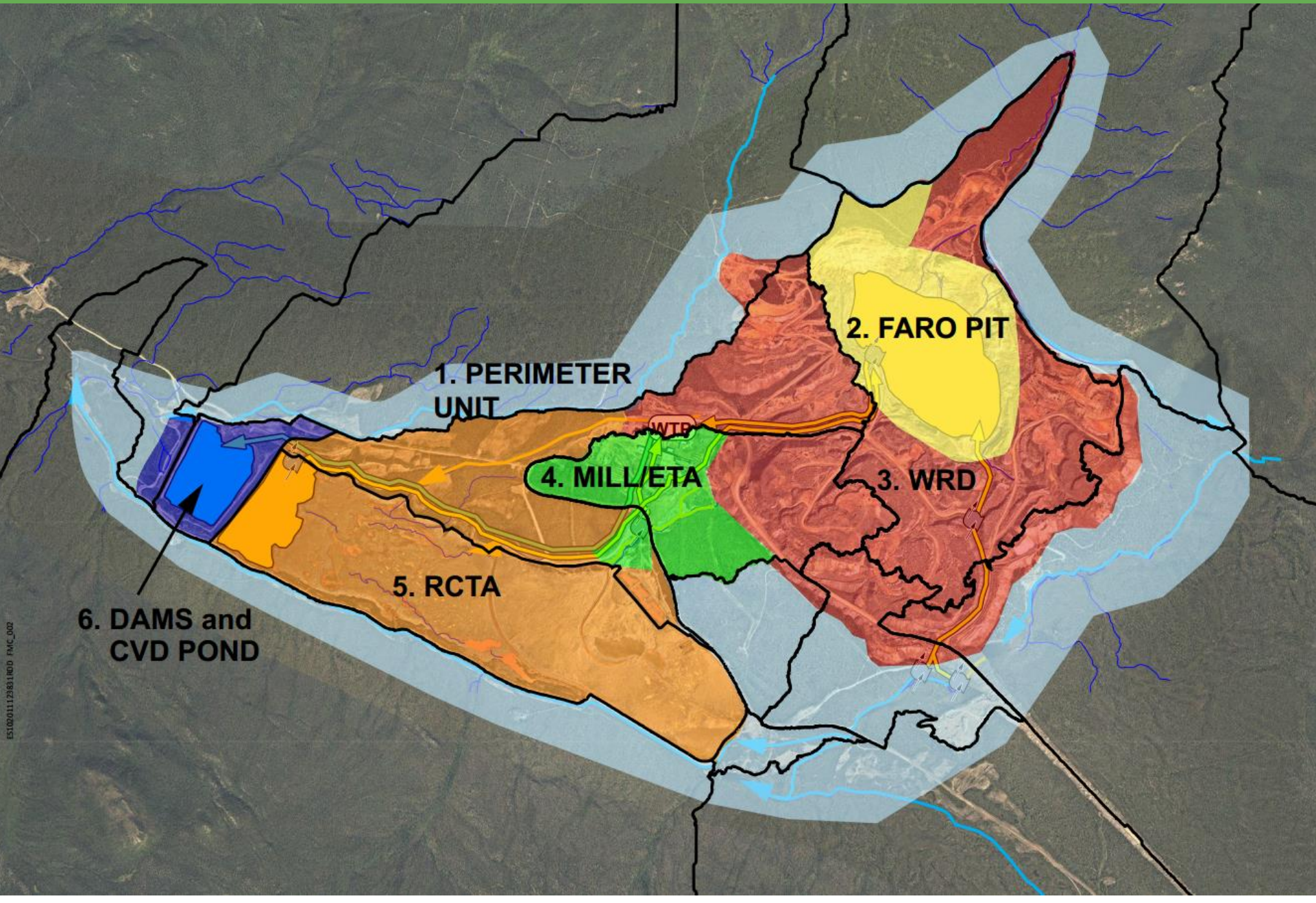
Site Wide Water Management Strategies

- **Manage stormwater (dirty and clean)**
  - prior to, during, post-construction, and long term
  - implement BMPs, as appropriate
  - store and treat stormwater until the remedial work is mature enough to allow direct discharge to receiving streams

- **Appropriate monitoring to track and respond to high risk areas**

- **Adaptive Management, Long-Term Care and Maintenance**

Reclamation Units

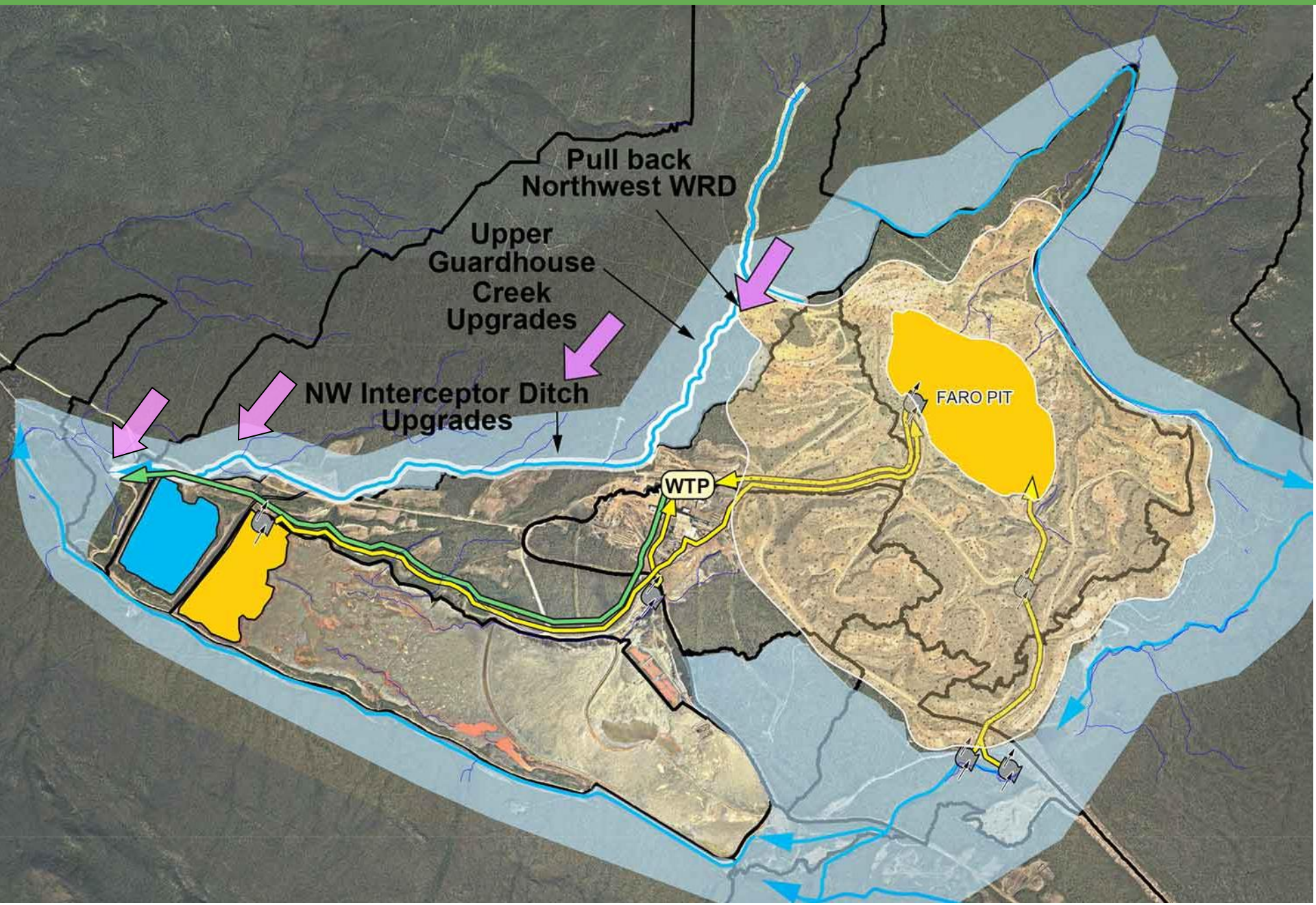


Presentation Approach

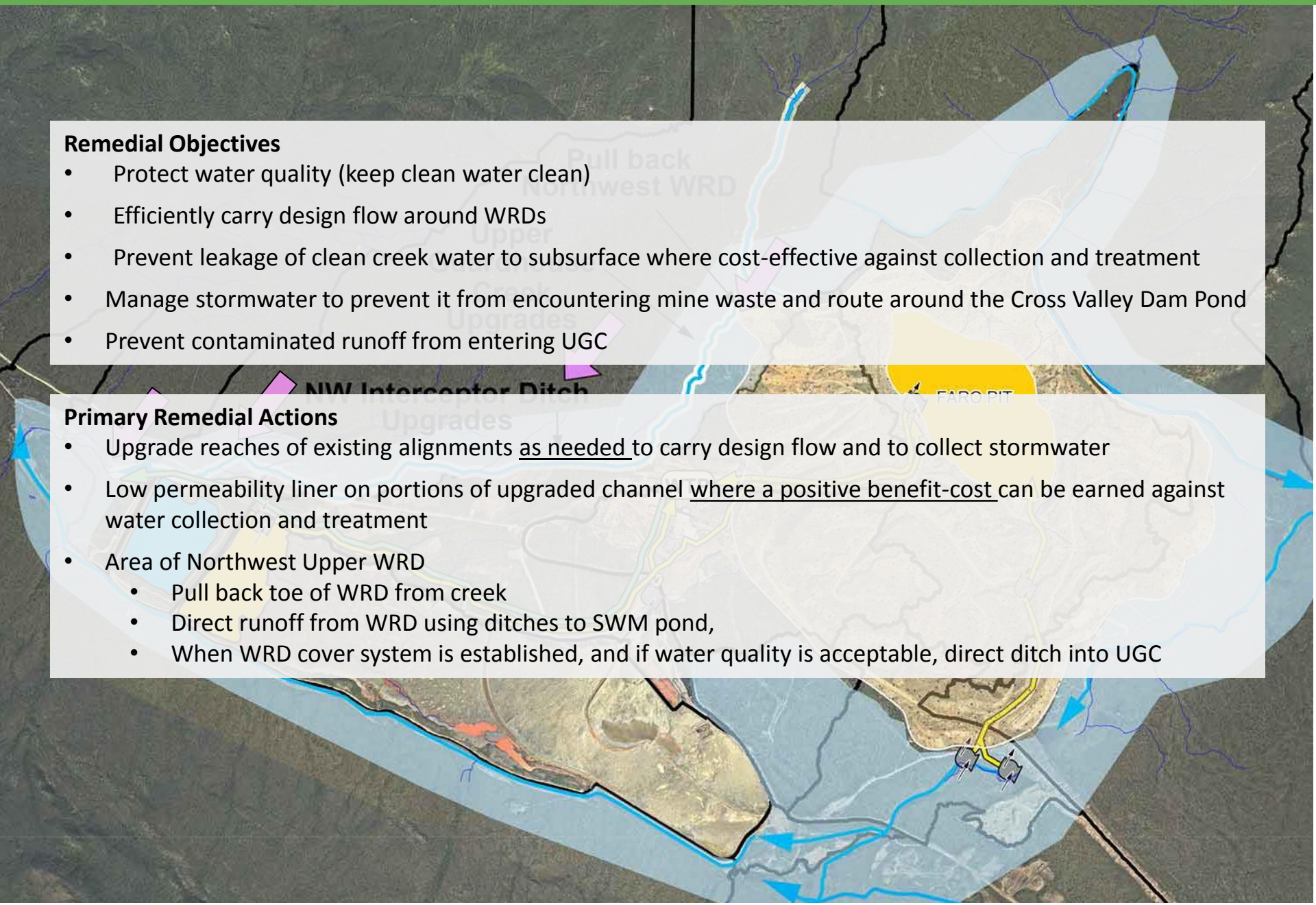
- **Describe fate of all four water types within each RU**
  - Surface Water
  - Stormwater
  - Contaminated Seepage
  - Groundwater

- **Describe for each water type:**
  - Remedial Objectives
  - Primary Remedial Actions
  - Water Management Prior to Remedial Action
  - Water Management During Remedial Action
  - Water Management After Remedial Action

1. Perimeter Unit West– Surface Water and Stormwater



1. Perimeter Unit West– Surface Water and Stormwater



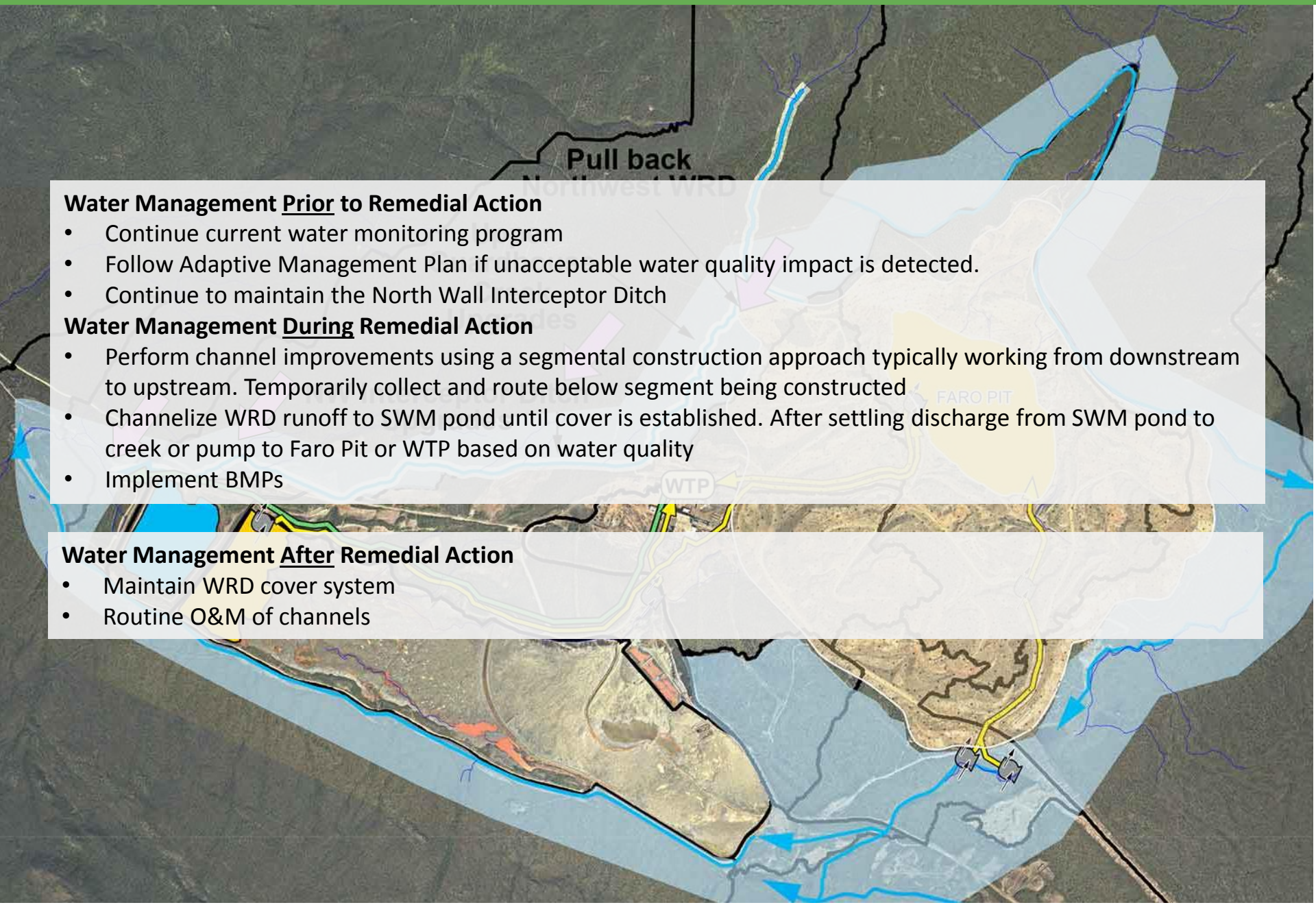
Remedial Objectives

- Protect water quality (keep clean water clean)
- Efficiently carry design flow around WRDs
- Prevent leakage of clean creek water to subsurface where cost-effective against collection and treatment
- Manage stormwater to prevent it from encountering mine waste and route around the Cross Valley Dam Pond
- Prevent contaminated runoff from entering UGC

Primary Remedial Actions

- Upgrade reaches of existing alignments as needed to carry design flow and to collect stormwater
- Low permeability liner on portions of upgraded channel where a positive benefit-cost can be earned against water collection and treatment
- Area of Northwest Upper WRD
  - Pull back toe of WRD from creek
  - Direct runoff from WRD using ditches to SWM pond,
  - When WRD cover system is established, and if water quality is acceptable, direct ditch into UGC

1. Perimeter Unit West– Surface Water and Stormwater



Water Management <u>Prior</u> to Remedial Action

- Continue current water monitoring program
- Follow Adaptive Management Plan if unacceptable water quality impact is detected.
- Continue to maintain the North Wall Interceptor Ditch

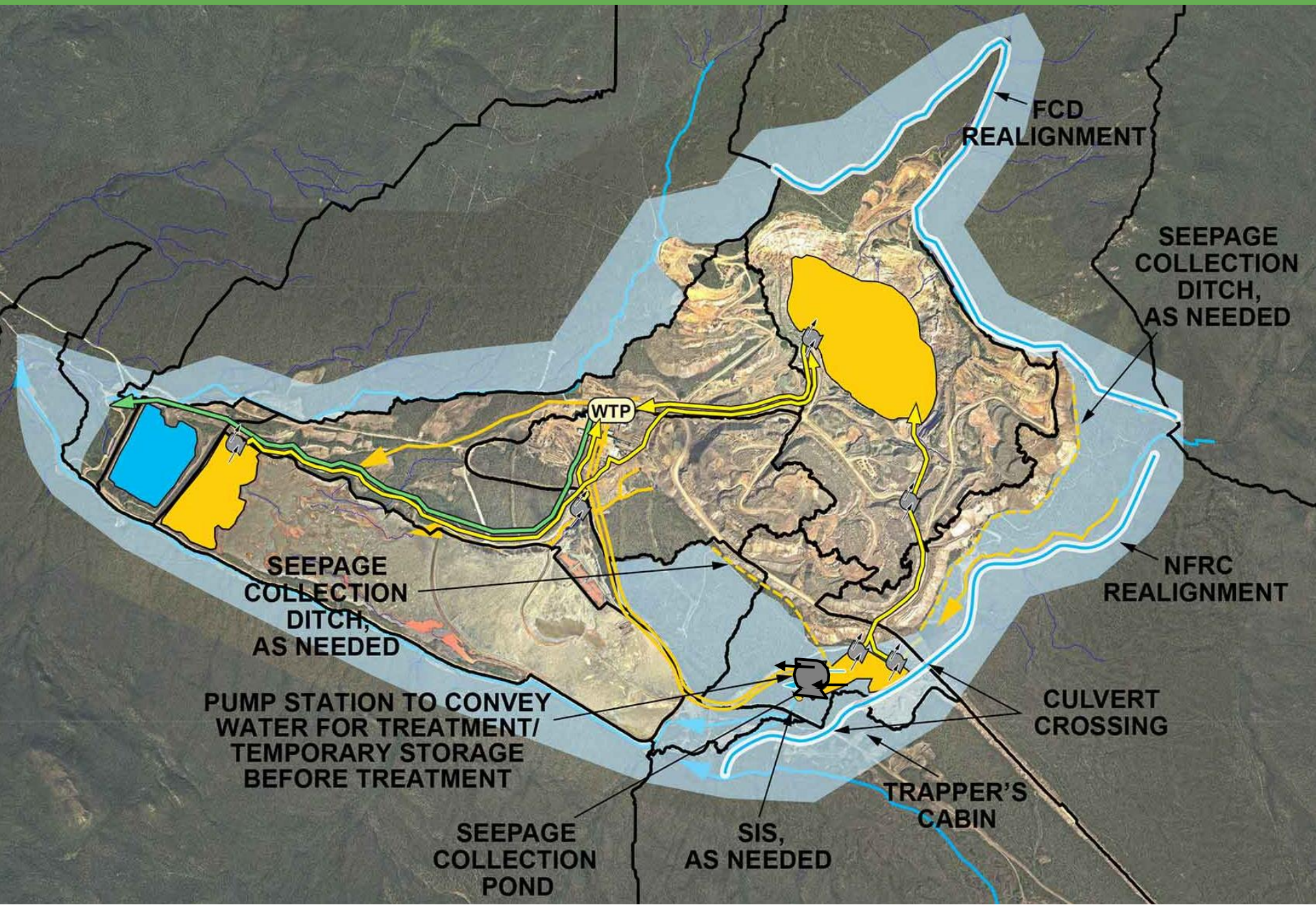
Water Management <u>During</u> Remedial Action

- Perform channel improvements using a segmental construction approach typically working from downstream to upstream. Temporarily collect and route below segment being constructed
- Channelize WRD runoff to SWM pond until cover is established. After settling discharge from SWM pond to creek or pump to Faro Pit or WTP based on water quality
- Implement BMPs

Water Management <u>After</u> Remedial Action

- Maintain WRD cover system
- Routine O&M of channels

1. Perimeter Unit East – Surface Water



1. Perimeter Unit East – Surface Water

Remedial Objectives

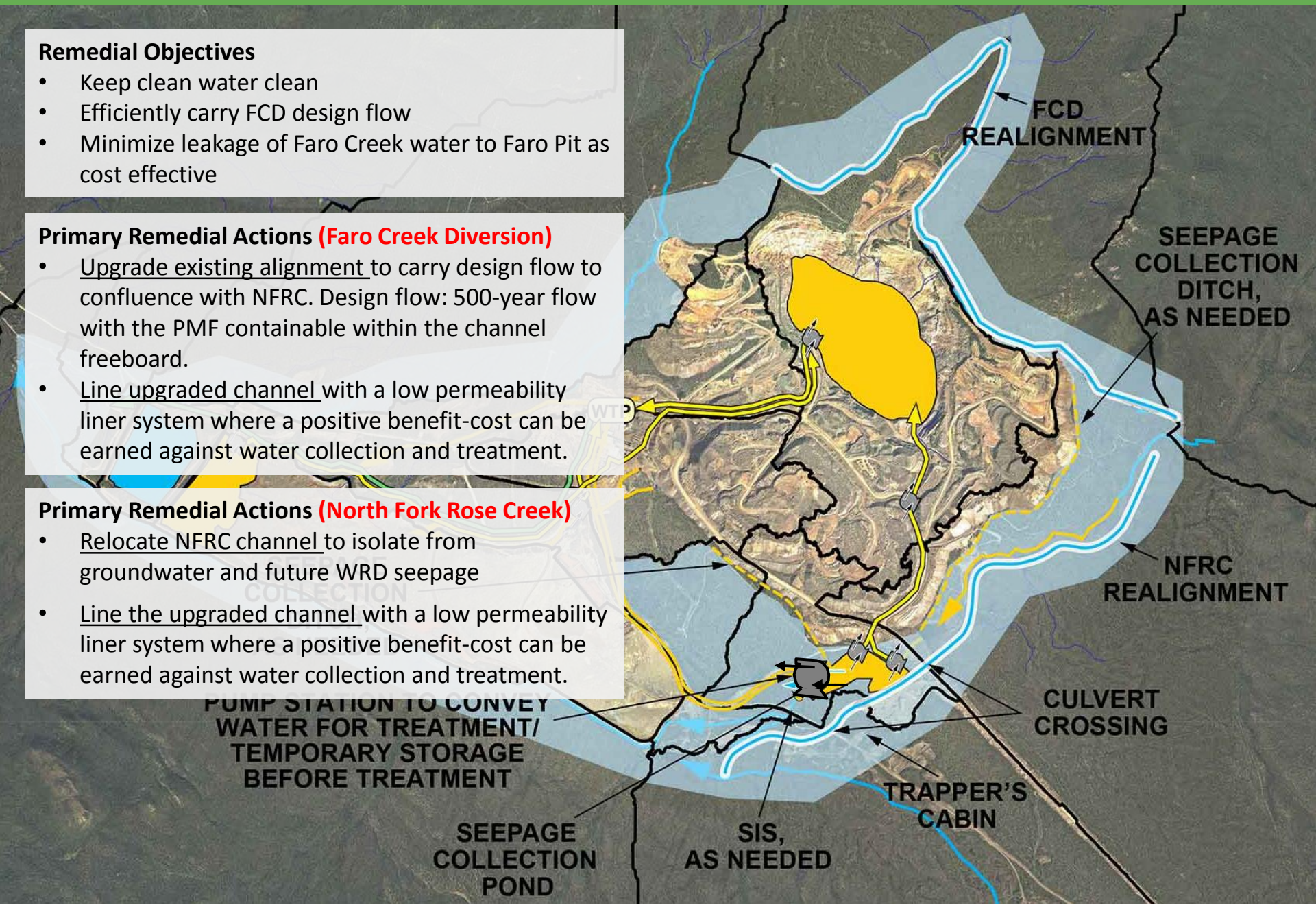
- Keep clean water clean
- Efficiently carry FCD design flow
- Minimize leakage of Faro Creek water to Faro Pit as cost effective

Primary Remedial Actions (Faro Creek Diversion)

- Upgrade existing alignment to carry design flow to confluence with NFRC. Design flow: 500-year flow with the PMF containable within the channel freeboard.
- Line upgraded channel with a low permeability liner system where a positive benefit-cost can be earned against water collection and treatment.

Primary Remedial Actions (North Fork Rose Creek)

- Relocate NFRC channel to isolate from groundwater and future WRD seepage
- Line the upgraded channel with a low permeability liner system where a positive benefit-cost can be earned against water collection and treatment.



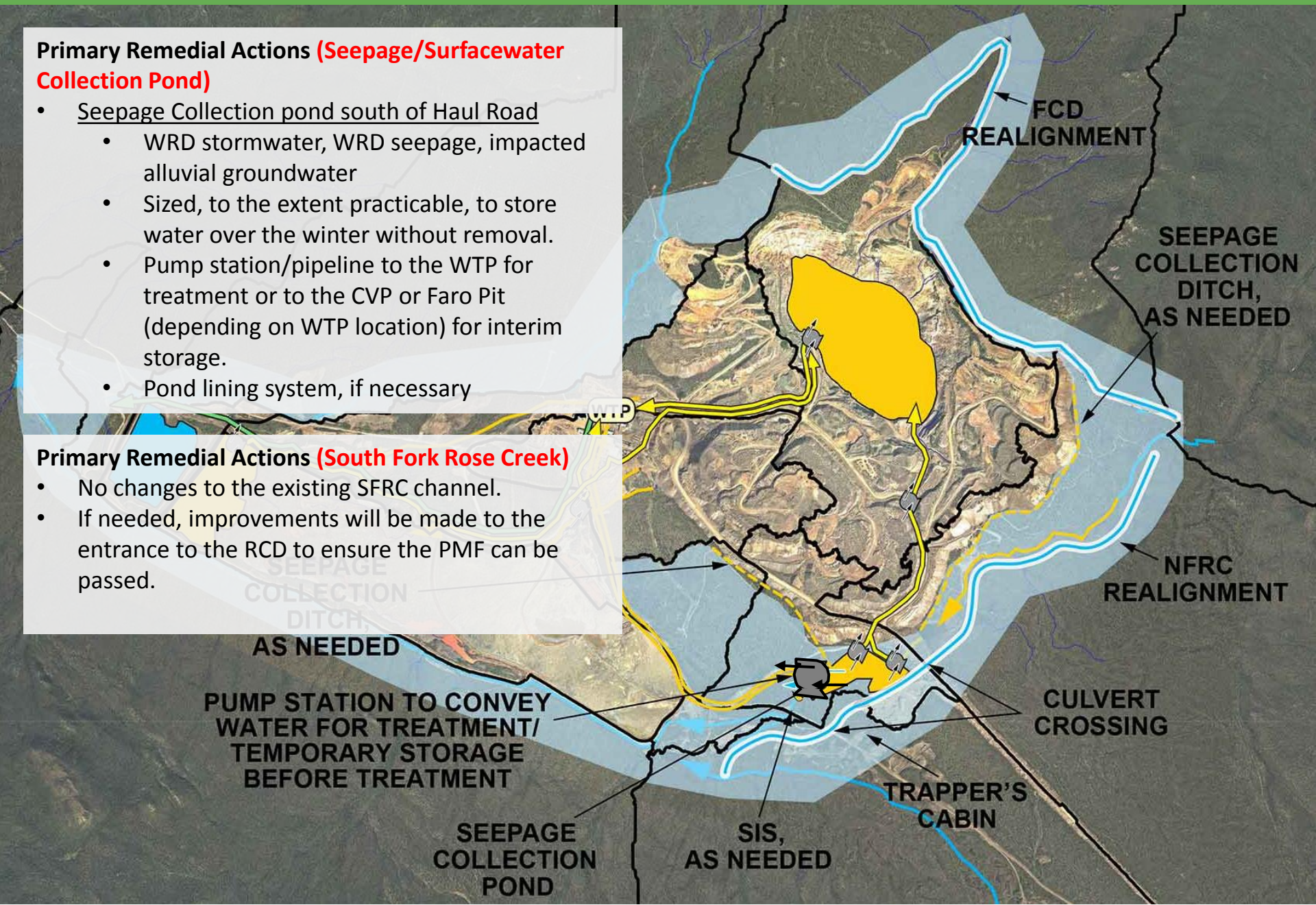
1. Perimeter Unit East – Surface Water

Primary Remedial Actions (Seepage/Surfacewater Collection Pond)

- Seepage Collection pond south of Haul Road
  - WRD stormwater, WRD seepage, impacted alluvial groundwater
  - Sized, to the extent practicable, to store water over the winter without removal.
  - Pump station/pipeline to the WTP for treatment or to the CVP or Faro Pit (depending on WTP location) for interim storage.
  - Pond lining system, if necessary

Primary Remedial Actions (South Fork Rose Creek)

- No changes to the existing SFRC channel.
- If needed, improvements will be made to the entrance to the RCD to ensure the PMF can be passed.



1. Perimeter Unit East – Surface Water

Water Management <u>Prior</u> to Remedial Action

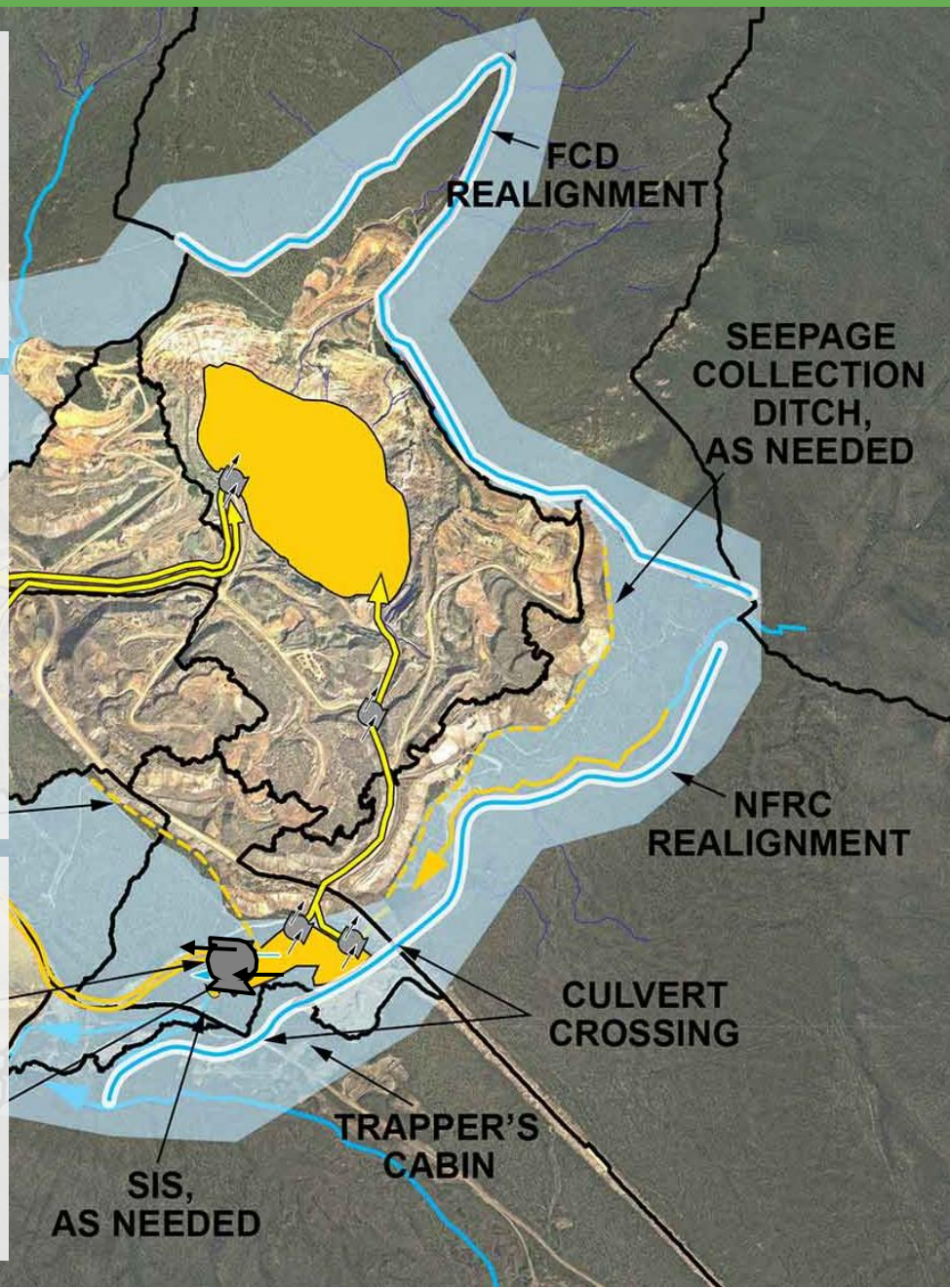
- Continue current water monitoring program
- Continue to monitor pit wall stability
- Continue to operate S-Wells and NFRD SIS
- Follow Adaptive Management Plan
- Implement response plan if FCD failure

Water Management <u>During</u> Remedial Action

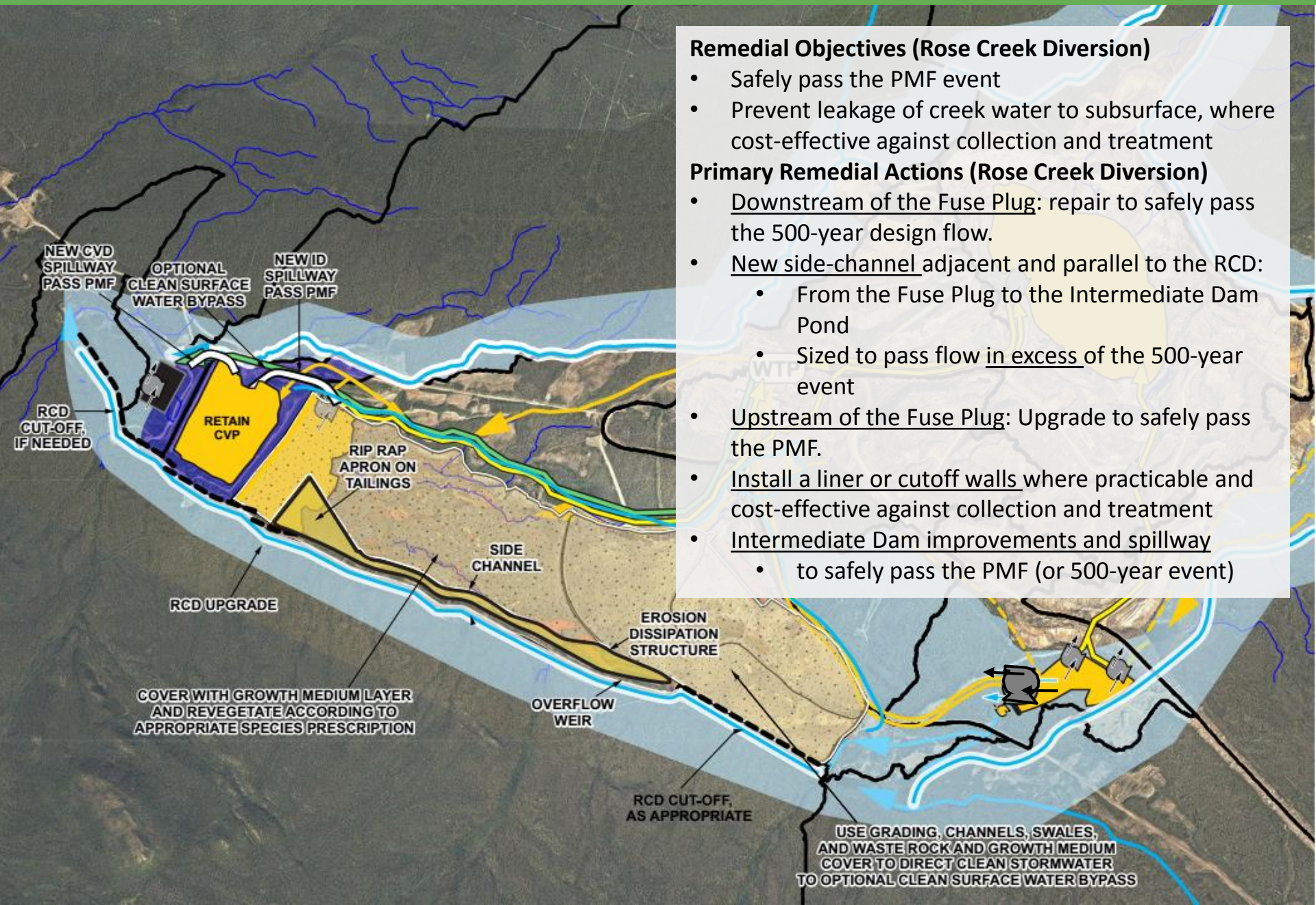
- Phased segmental construction approach typically downstream to upstream
- During Seepage Collection Pond construction: divert NFRC around
- Then use Seepage Collection Pond for stormwater and seepage management for remaining construction phases
- Implement BMPs

Water Management <u>After</u> Remedial Action

- Maintain constructed improvements (diversions, Seepage Collection Pond)
- Continue water monitoring program
- Operation of Seepage Collection Pond: pump to storage in the CVP or Faro Pit or directly to the WTP
- Follow Adaptive Management Plan if unacceptable water quality impact is detected



1. Perimeter Unit South – Surface Water



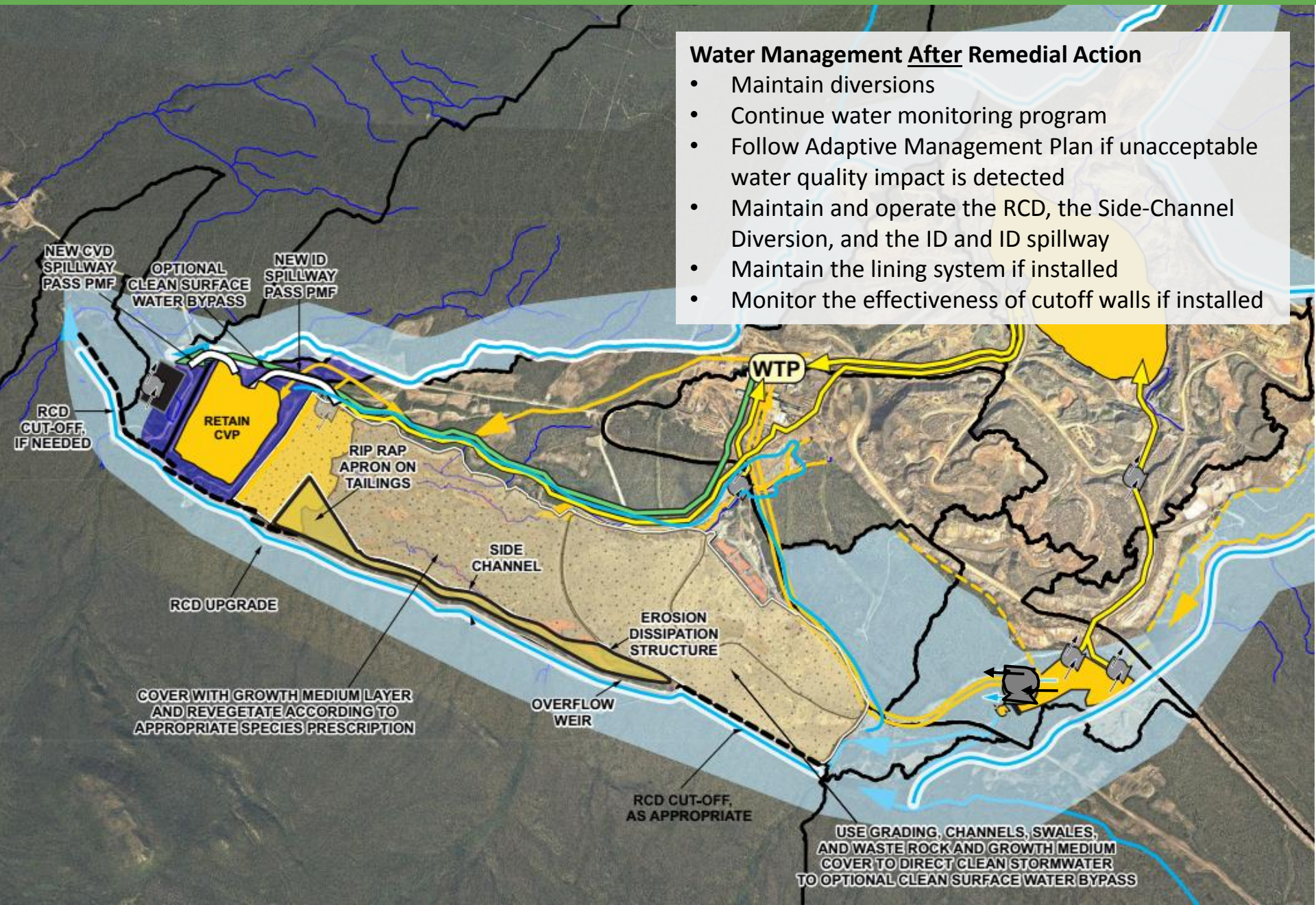
Remedial Objectives (Rose Creek Diversion)

- Safely pass the PMF event
- Prevent leakage of creek water to subsurface, where cost-effective against collection and treatment

Primary Remedial Actions (Rose Creek Diversion)

- Downstream of the Fuse Plug: repair to safely pass the 500-year design flow.
- New side-channel adjacent and parallel to the RCD:
  - From the Fuse Plug to the Intermediate Dam Pond
  - Sized to pass flow in excess of the 500-year event
- Upstream of the Fuse Plug: Upgrade to safely pass the PMF.
- Install a liner or cutoff walls where practicable and cost-effective against collection and treatment
- Intermediate Dam improvements and spillway
  - to safely pass the PMF (or 500-year event)

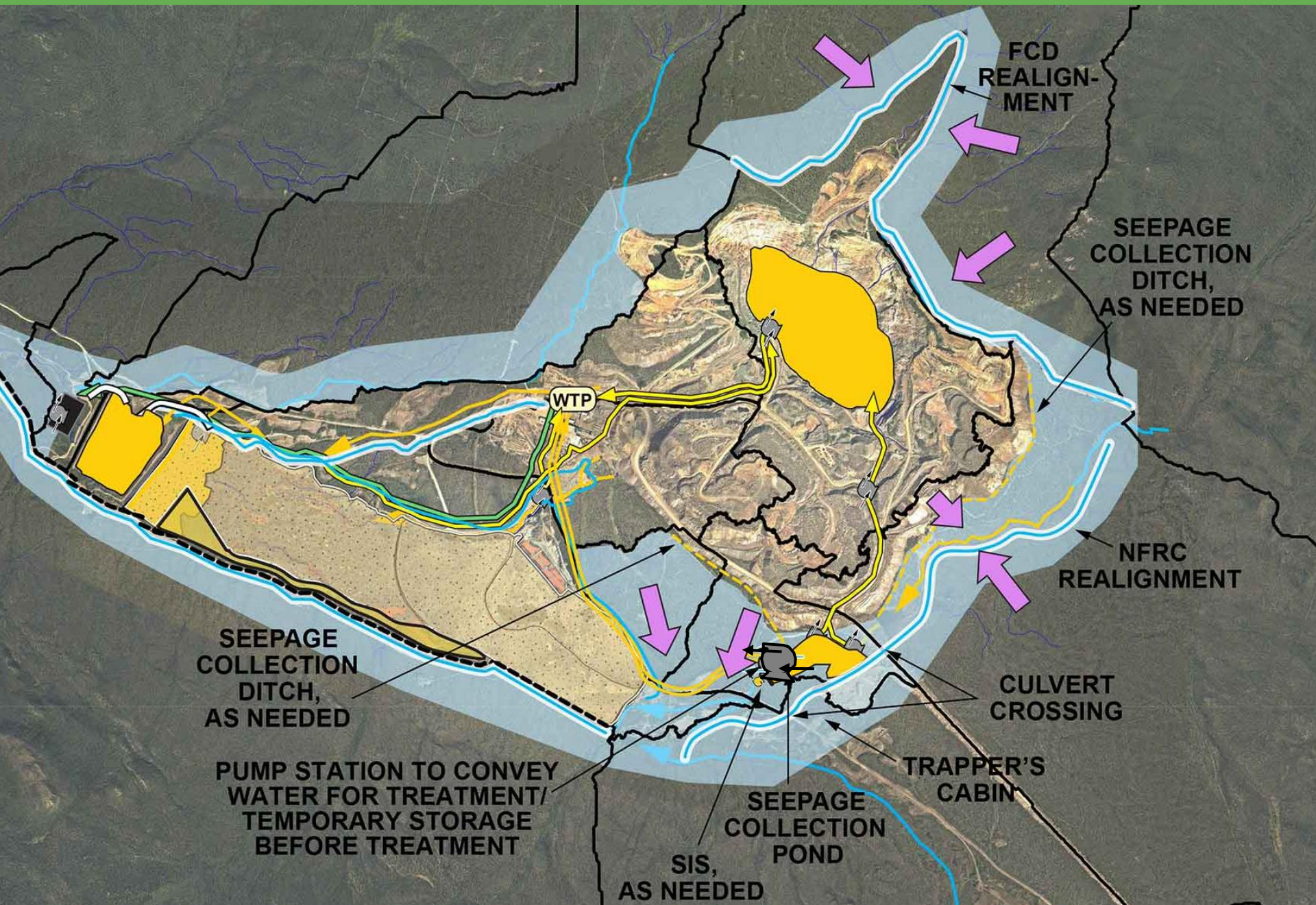
1. Perimeter Unit South – Surface Water



Water Management <u>After</u> Remedial Action

- Maintain diversions
- Continue water monitoring program
- Follow Adaptive Management Plan if unacceptable water quality impact is detected
- Maintain and operate the RCD, the Side-Channel Diversion, and the ID and ID spillway
- Maintain the lining system if installed
- Monitor the effectiveness of cutoff walls if installed

1. Perimeter Unit East – Stormwater



1. Perimeter Unit East – Stormwater

Remedial Objectives

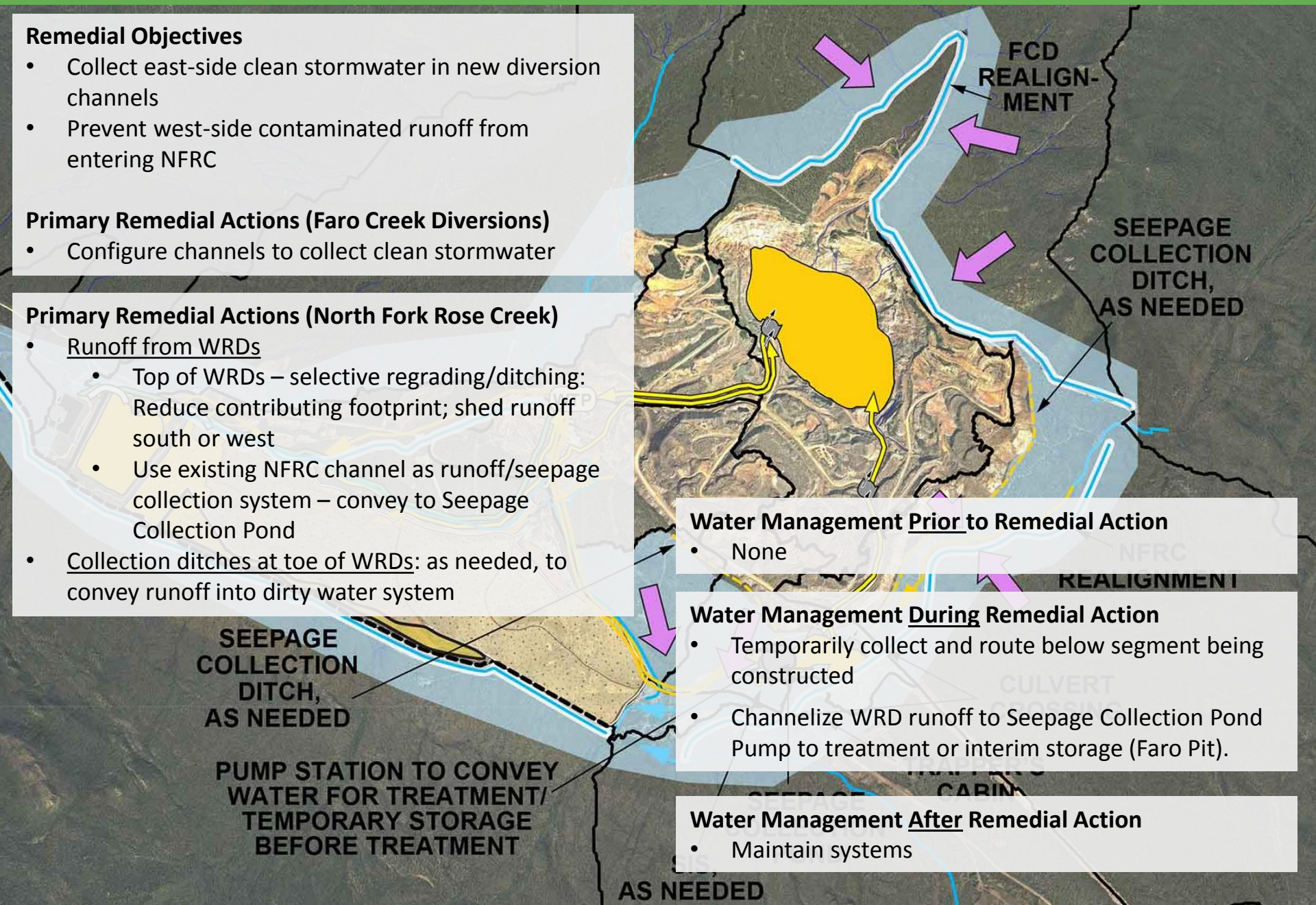
- Collect east-side clean stormwater in new diversion channels
- Prevent west-side contaminated runoff from entering NFRC

Primary Remedial Actions (Faro Creek Diversions)

- Configure channels to collect clean stormwater

Primary Remedial Actions (North Fork Rose Creek)

- Runoff from WRDs
  - Top of WRDs – selective regrading/ditching: Reduce contributing footprint; shed runoff south or west
  - Use existing NFRC channel as runoff/seepage collection system – convey to Seepage Collection Pond
- Collection ditches at toe of WRDs: as needed, to convey runoff into dirty water system



Water Management Prior to Remedial Action

- None

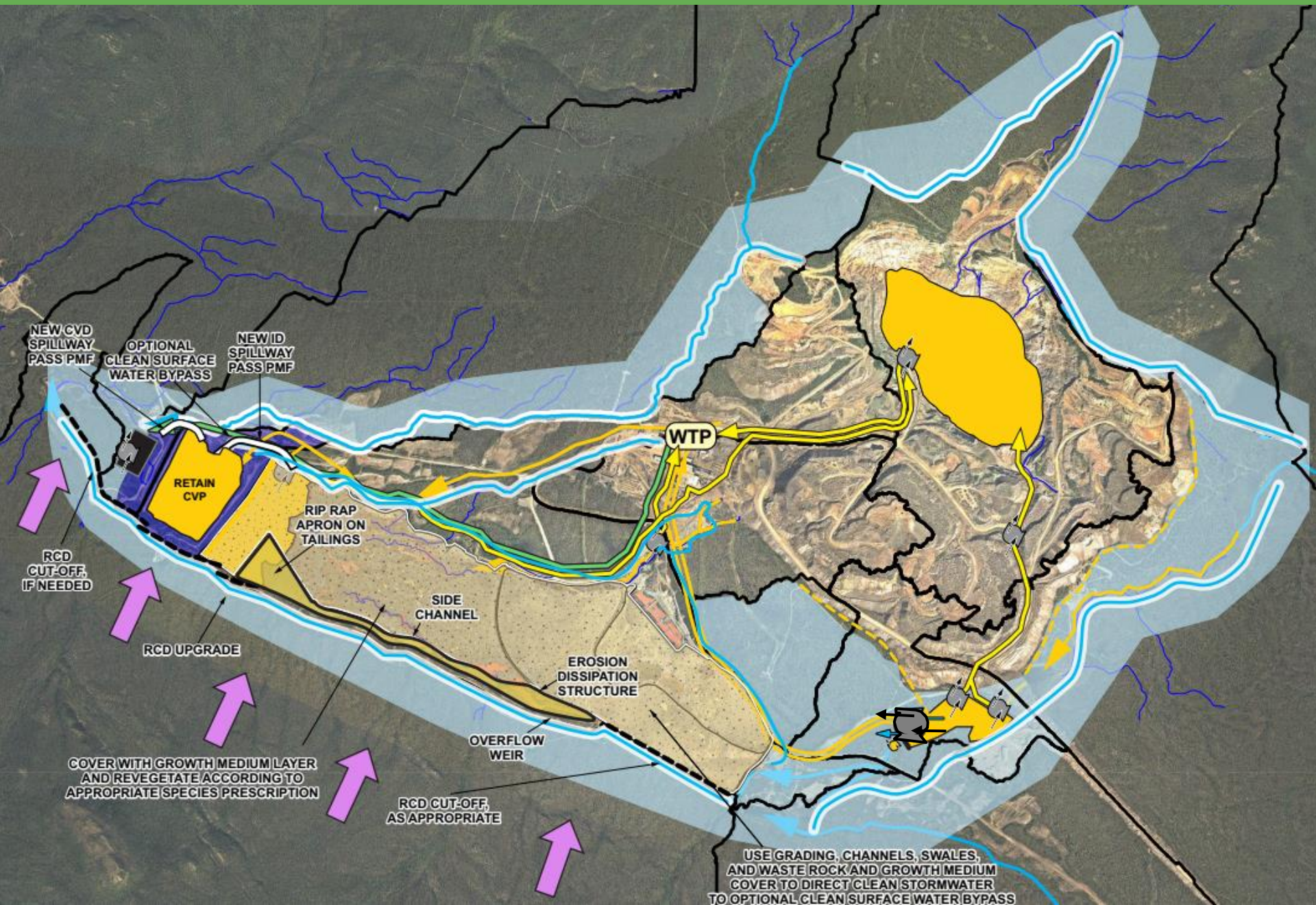
Water Management During Remedial Action

- Temporarily collect and route below segment being constructed
- Channelize WRD runoff to Seepage Collection Pond Pump to treatment or interim storage (Faro Pit).

Water Management After Remedial Action

- Maintain systems

1. Perimeter Unit South – Stormwater



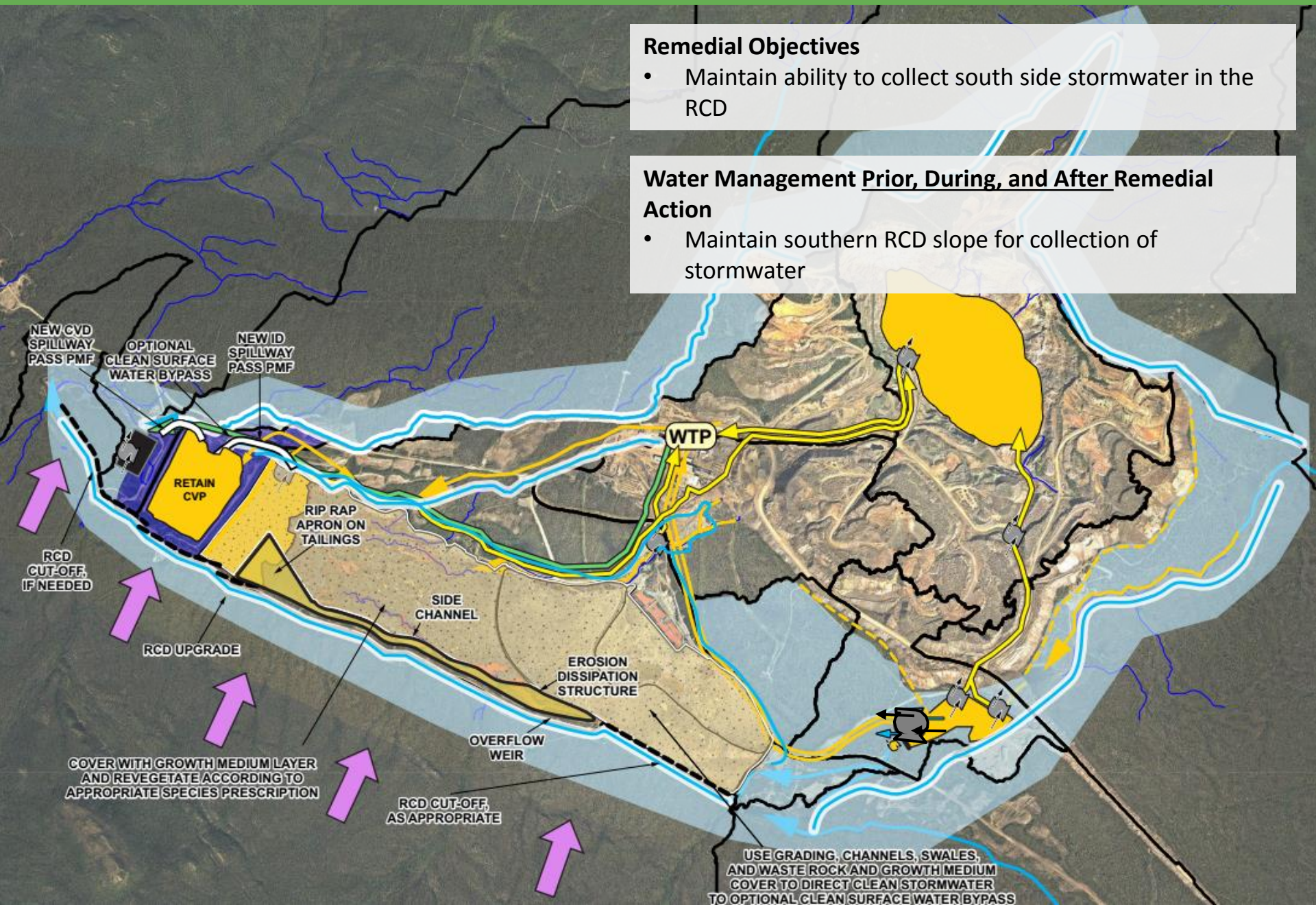
1. Perimeter Unit South – Stormwater

Remedial Objectives

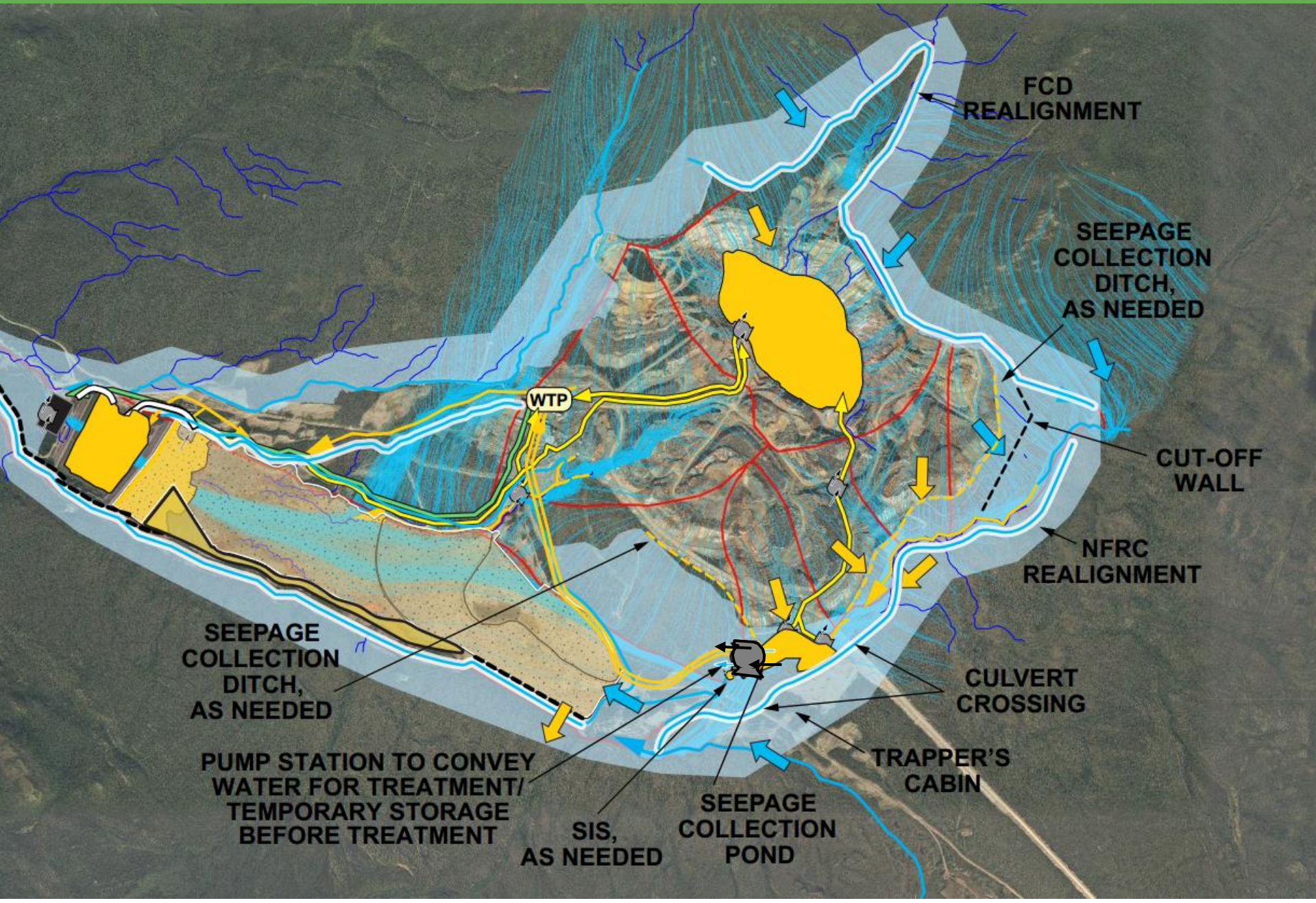
- Maintain ability to collect south side stormwater in the RCD

Water Management <u>Prior, During, and After</u> Remedial Action

- Maintain southern RCD slope for collection of stormwater



1. Perimeter Unit East – Contaminated Seepage



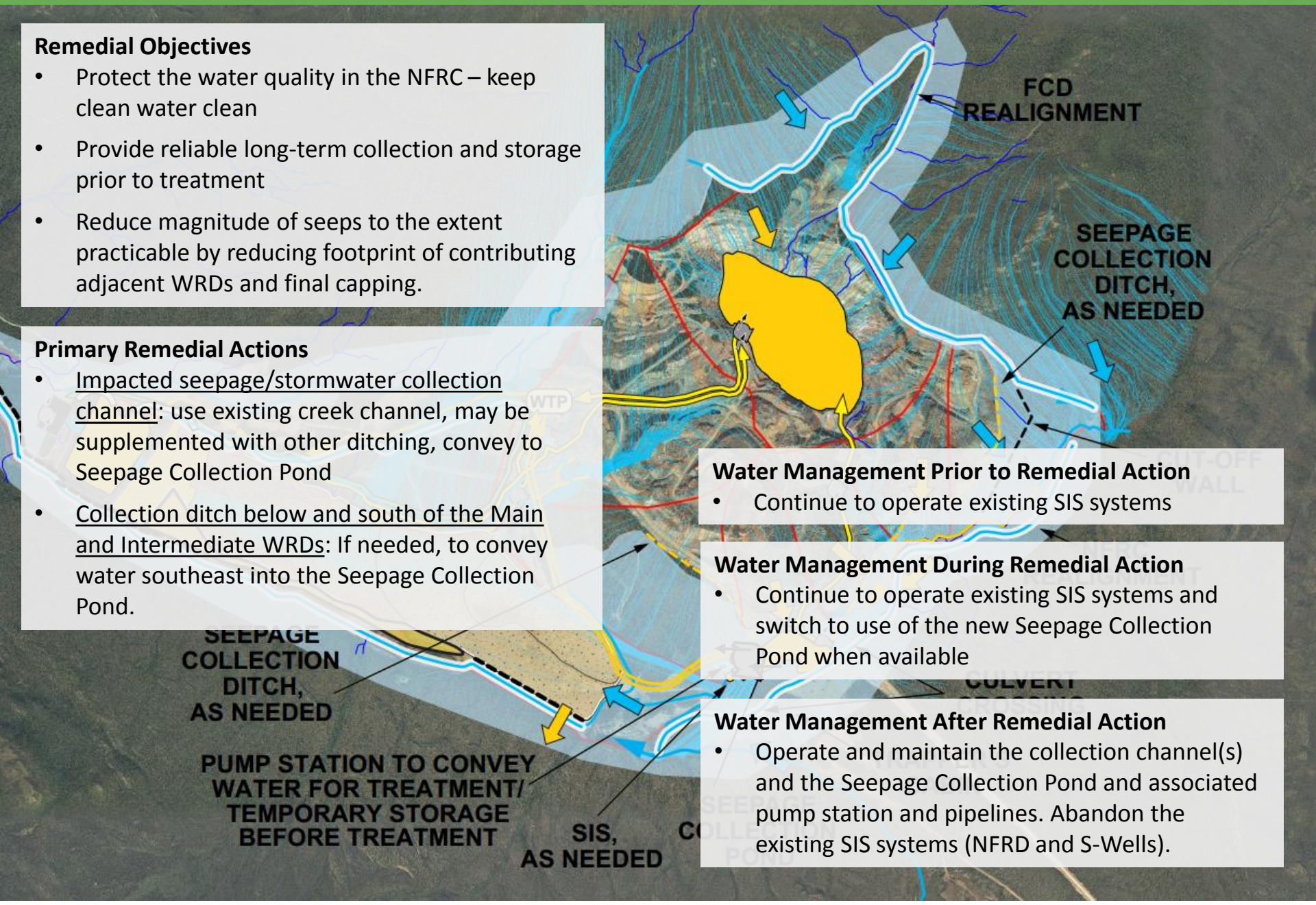
1. Perimeter Unit East – Contaminated Seepage

Remedial Objectives

- Protect the water quality in the NFRC – keep clean water clean
- Provide reliable long-term collection and storage prior to treatment
- Reduce magnitude of seeps to the extent practicable by reducing footprint of contributing adjacent WRDs and final capping.

Primary Remedial Actions

- Impacted seepage/stormwater collection channel: use existing creek channel, may be supplemented with other ditching, convey to Seepage Collection Pond
- Collection ditch below and south of the Main and Intermediate WRDs: If needed, to convey water southeast into the Seepage Collection Pond.



Water Management Prior to Remedial Action

- Continue to operate existing SIS systems

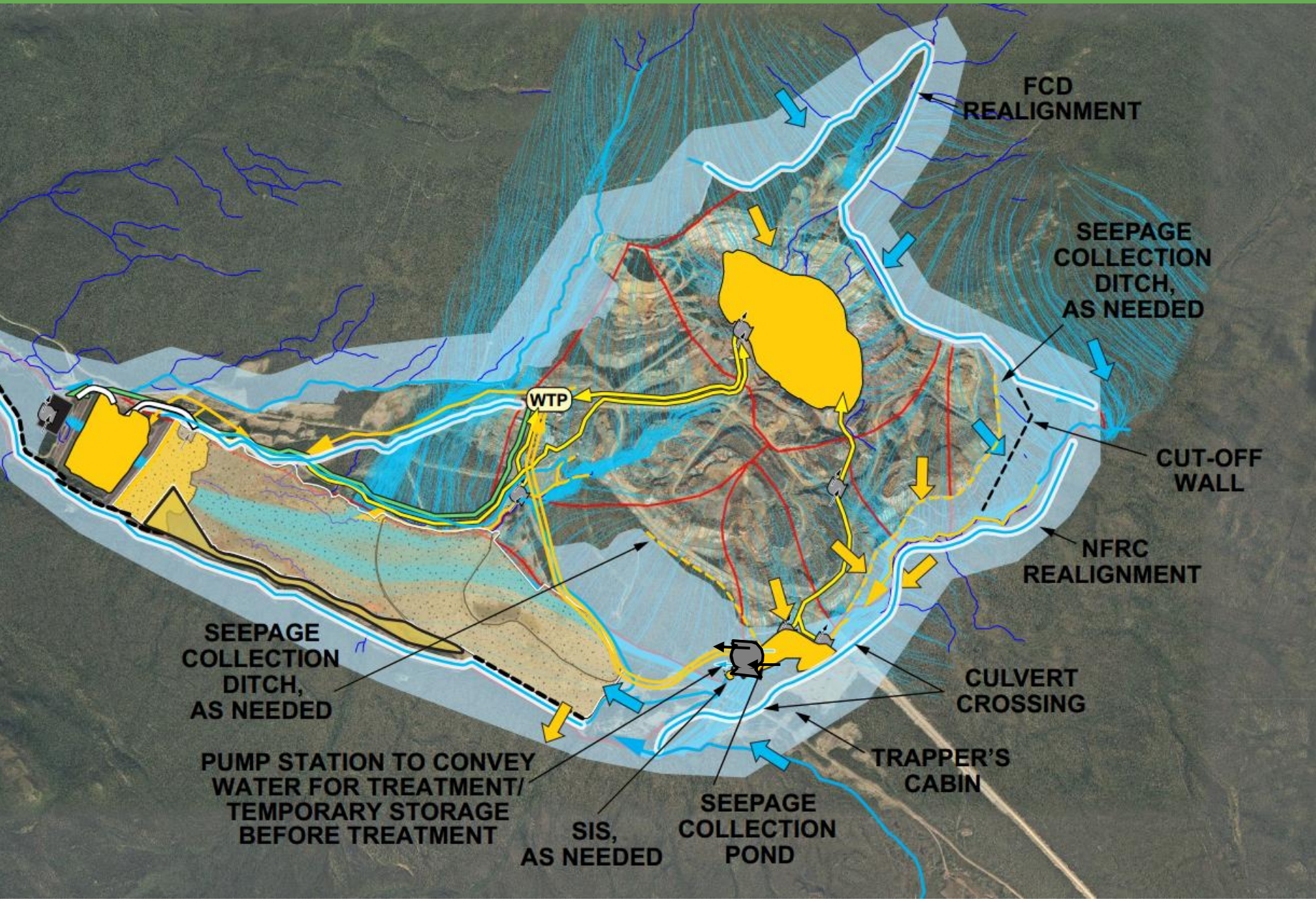
Water Management During Remedial Action

- Continue to operate existing SIS systems and switch to use of the new Seepage Collection Pond when available

Water Management After Remedial Action

- Operate and maintain the collection channel(s) and the Seepage Collection Pond and associated pump station and pipelines. Abandon the existing SIS systems (NFRD and S-Wells).

1. Perimeter Unit East – Groundwater



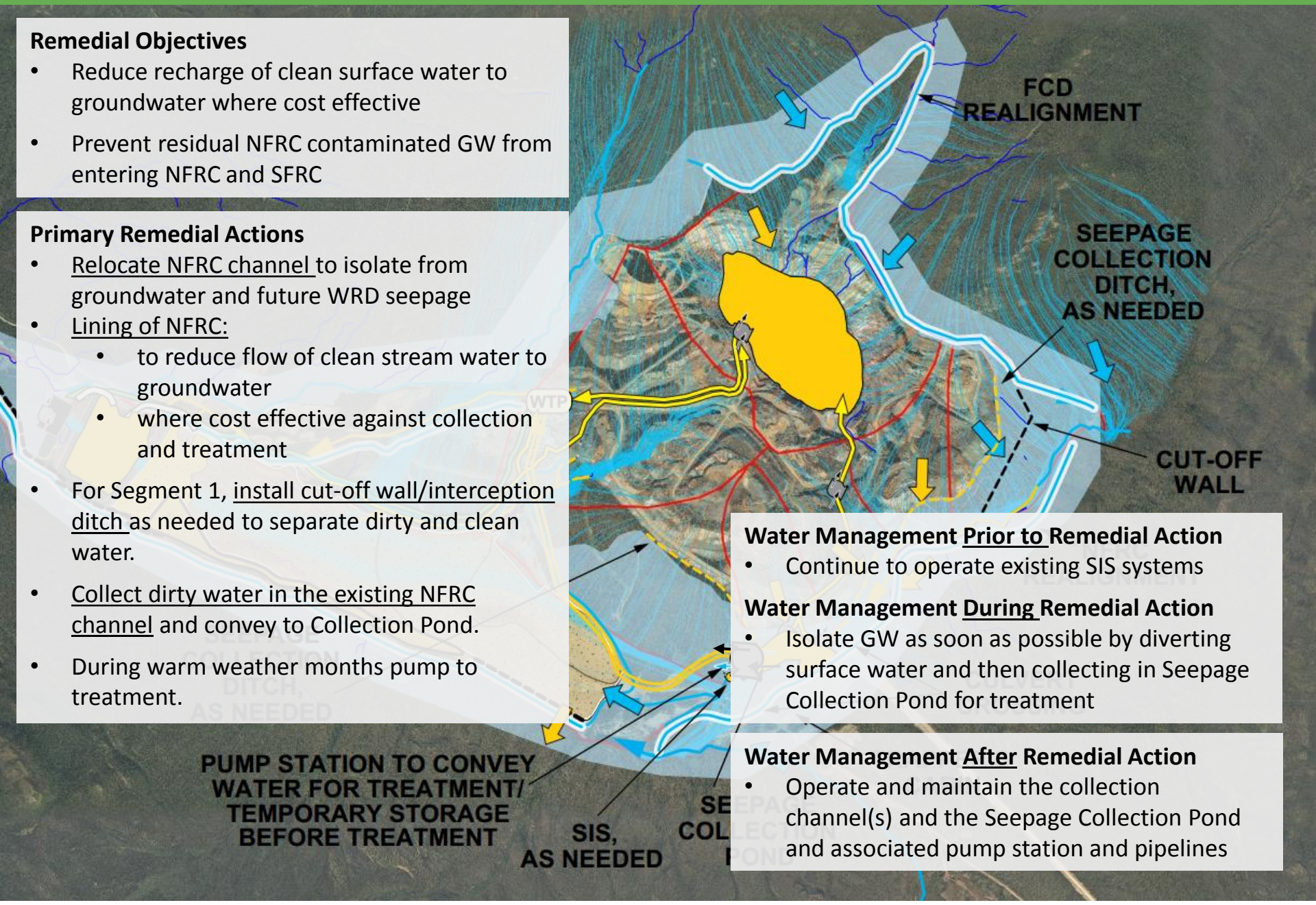
1. Perimeter Unit East – Groundwater

Remedial Objectives

- Reduce recharge of clean surface water to groundwater where cost effective
- Prevent residual NFRC contaminated GW from entering NFRC and SFRC

Primary Remedial Actions

- Relocate NFRC channel to isolate from groundwater and future WRD seepage
- Lining of NFRC:
  - to reduce flow of clean stream water to groundwater
  - where cost effective against collection and treatment
- For Segment 1, install cut-off wall/interception ditch as needed to separate dirty and clean water.
- Collect dirty water in the existing NFRC channel and convey to Collection Pond.
- During warm weather months pump to treatment.



Water Management Prior to Remedial Action

- Continue to operate existing SIS systems

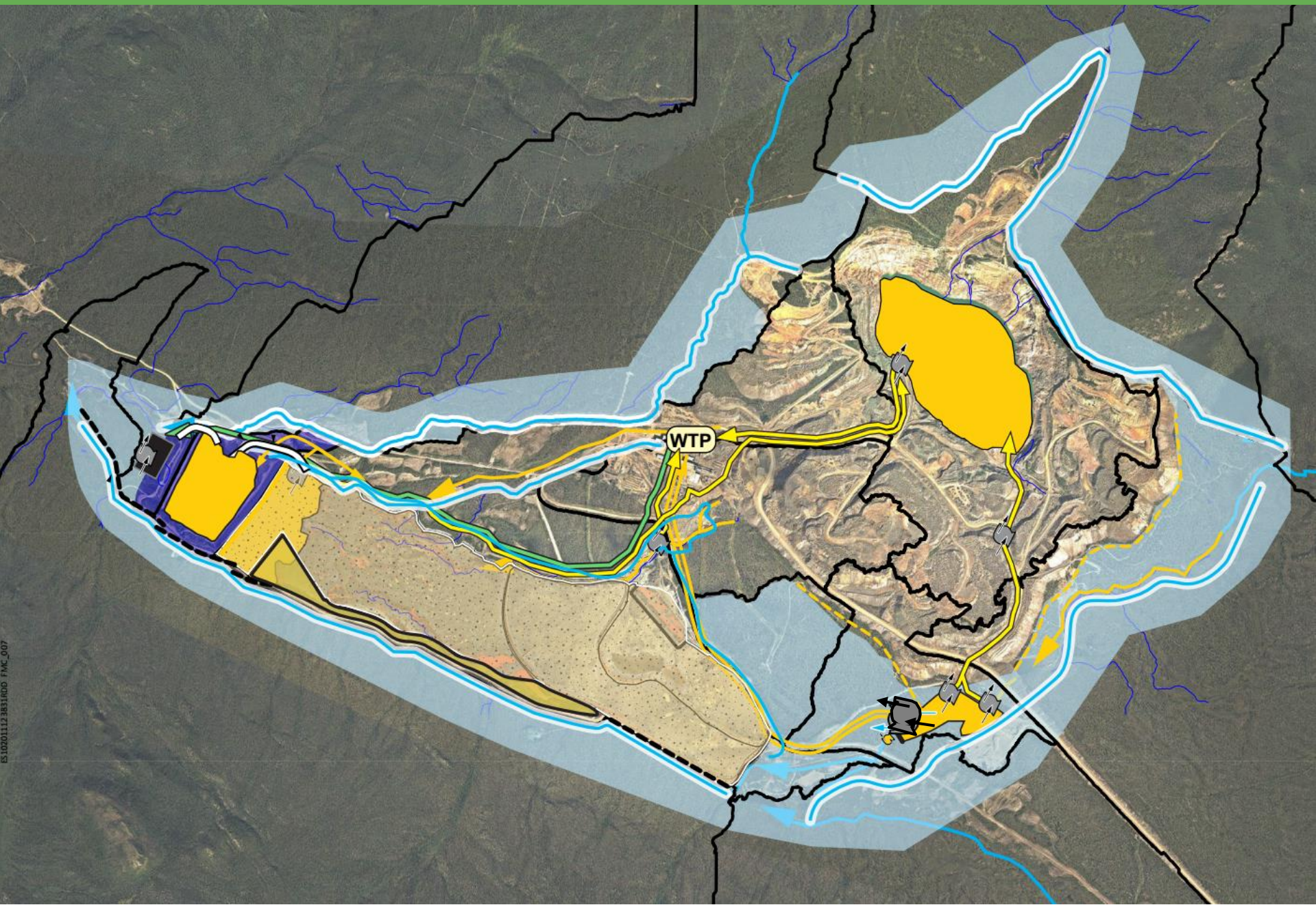
Water Management During Remedial Action

- Isolate GW as soon as possible by diverting surface water and then collecting in Seepage Collection Pond for treatment

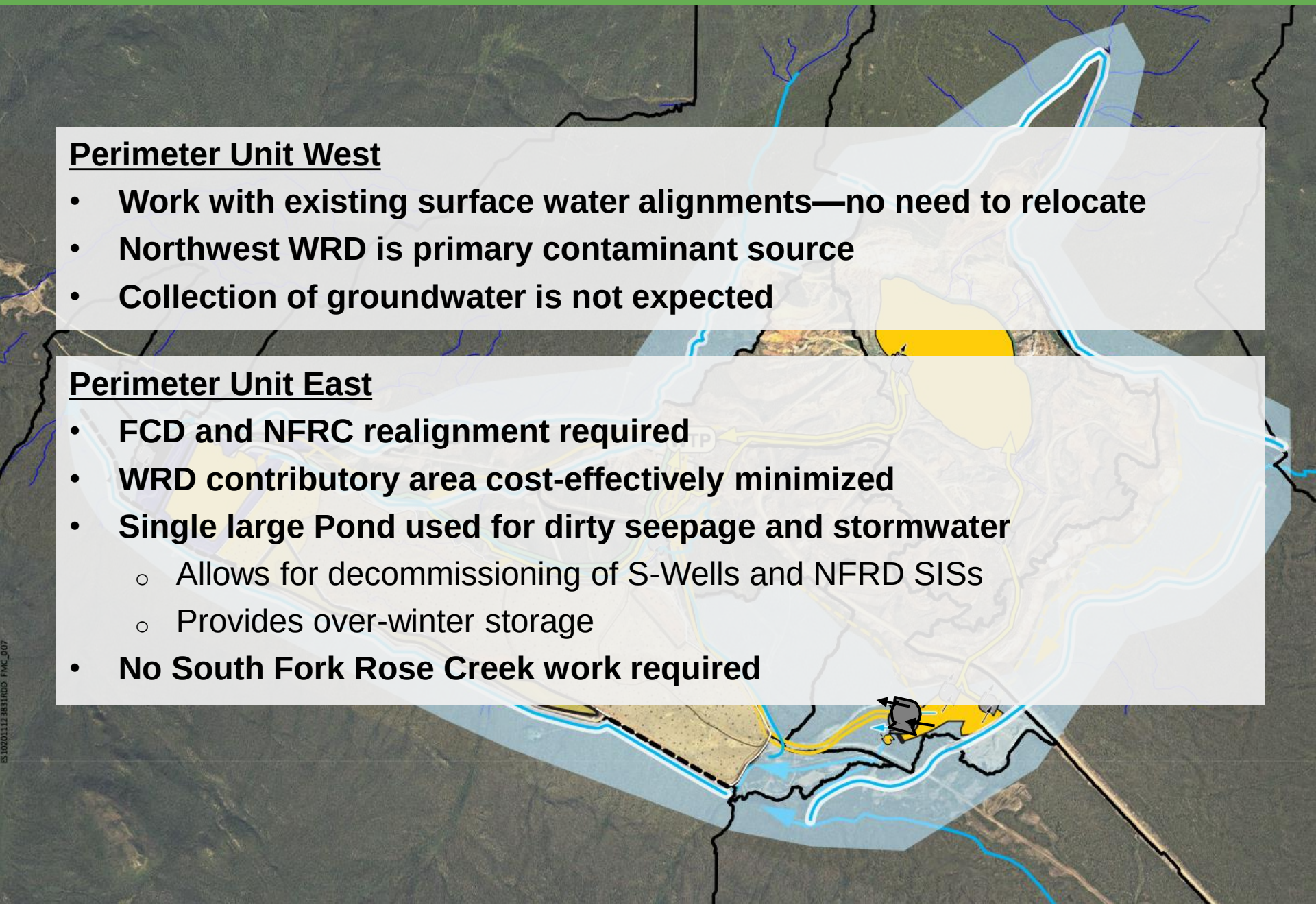
Water Management After Remedial Action

- Operate and maintain the collection channel(s) and the Seepage Collection Pond and associated pump station and pipelines

1. Perimeter Unit – Summary



1. Perimeter Unit – Summary



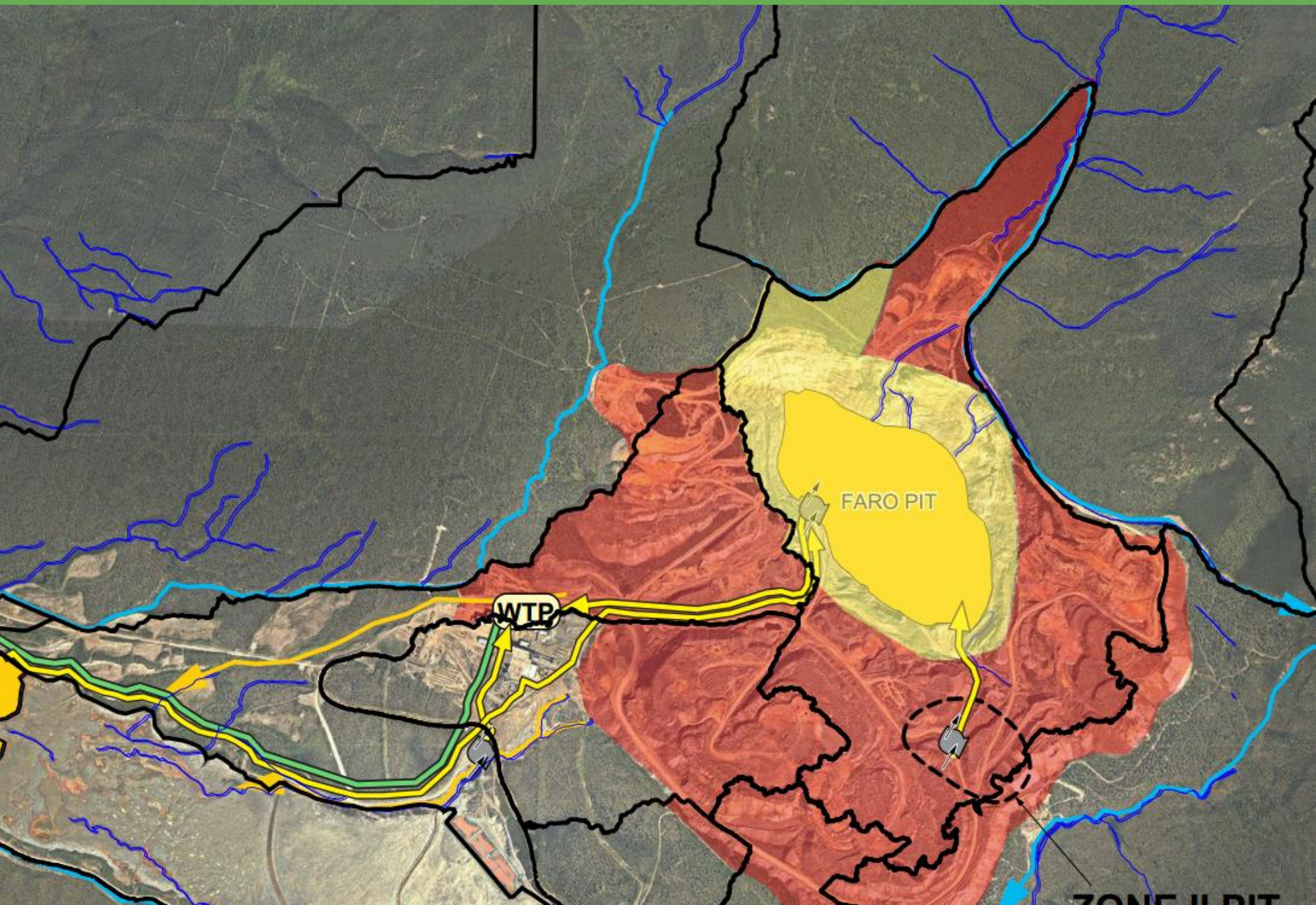
Perimeter Unit West

- **Work with existing surface water alignments—no need to relocate**
- **Northwest WRD is primary contaminant source**
- **Collection of groundwater is not expected**

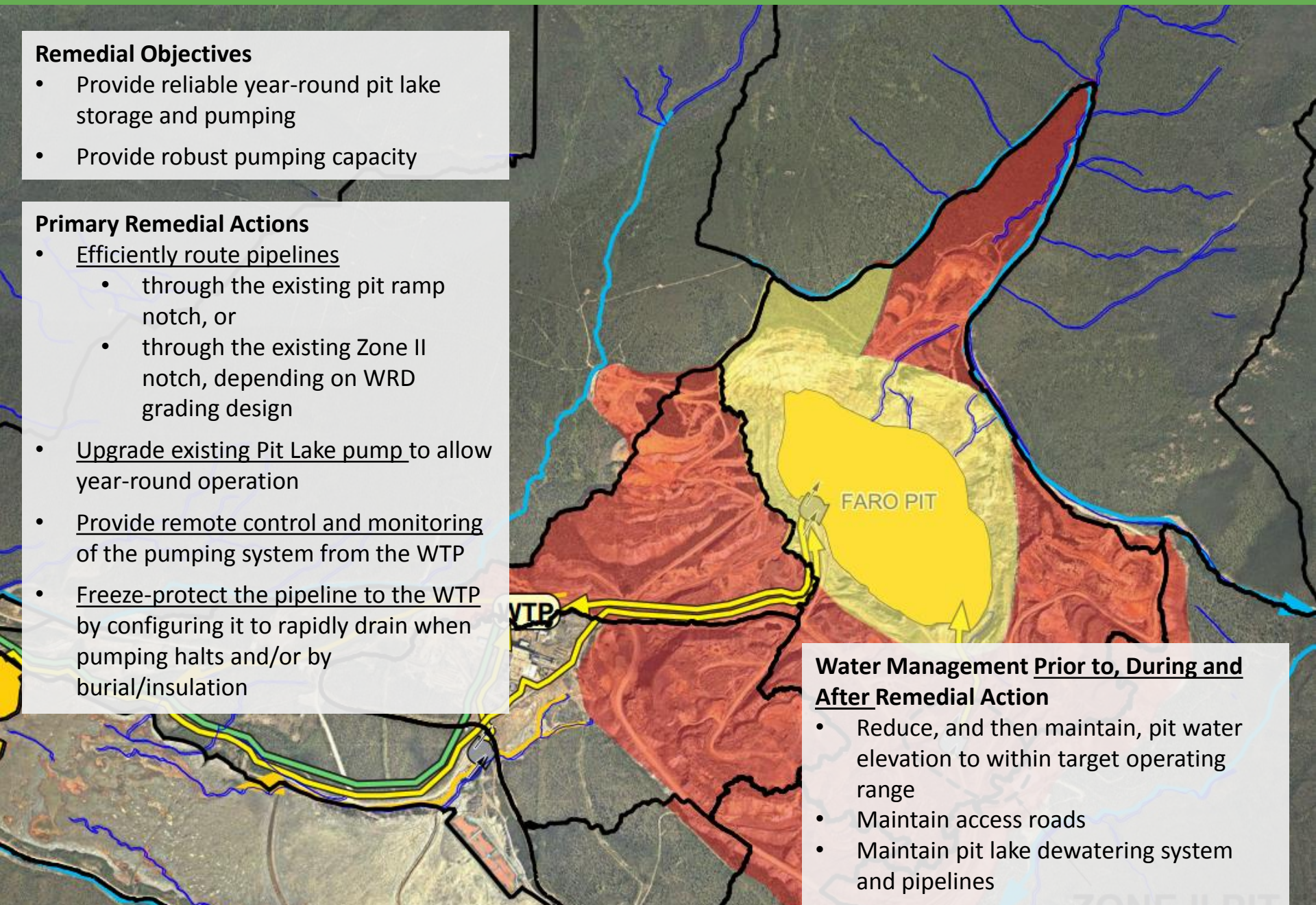
Perimeter Unit East

- **FCD and NFRC realignment required**
- **WRD contributory area cost-effectively minimized**
- **Single large Pond used for dirty seepage and stormwater**
  - Allows for decommissioning of S-Wells and NFRD SISs
  - Provides over-winter storage
- **No South Fork Rose Creek work required**

2. Faro Pit



2. Faro Pit



Remedial Objectives

- Provide reliable year-round pit lake storage and pumping
- Provide robust pumping capacity

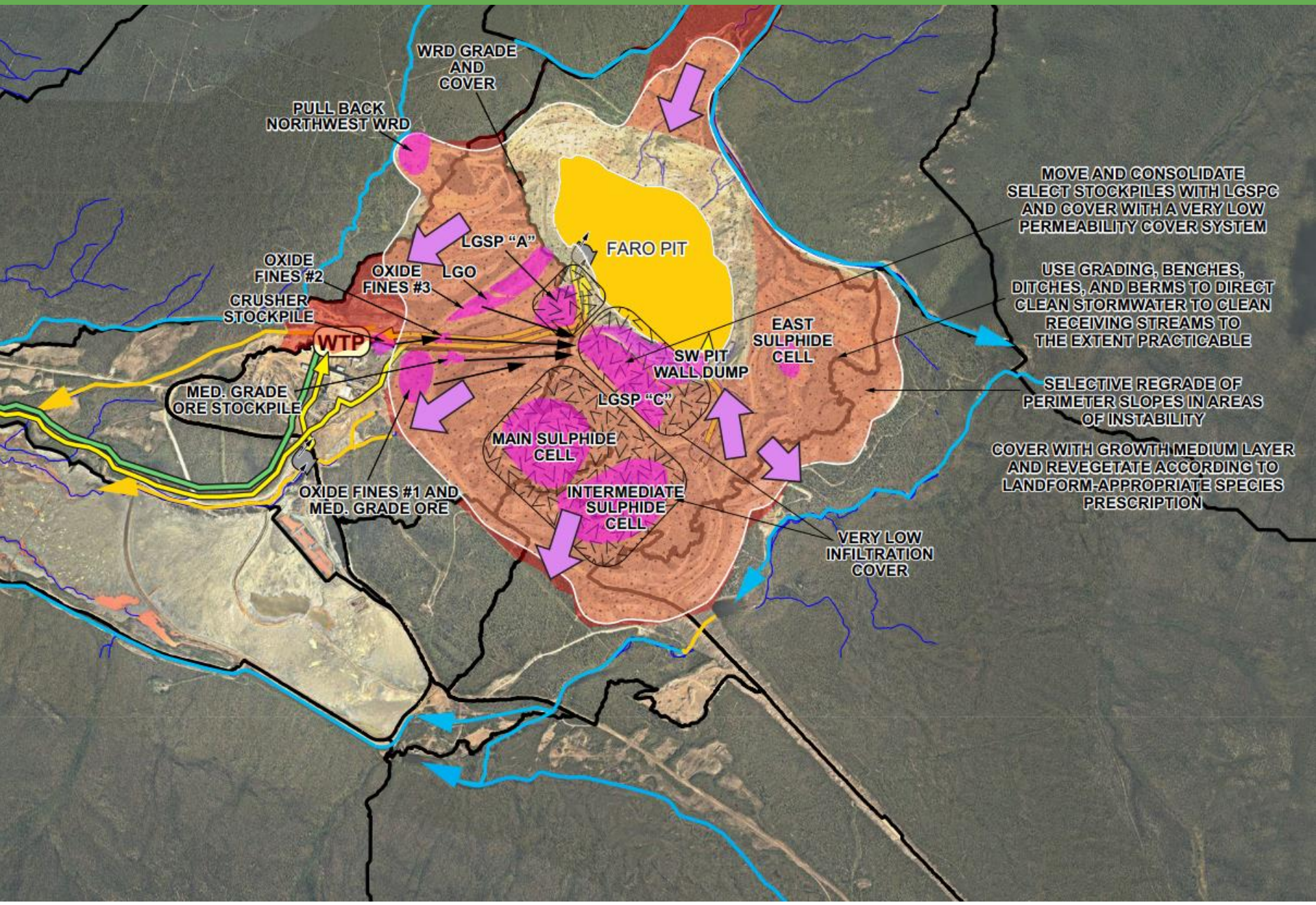
Primary Remedial Actions

- Efficiently route pipelines
  - through the existing pit ramp notch, or
  - through the existing Zone II notch, depending on WRD grading design
- Upgrade existing Pit Lake pump to allow year-round operation
- Provide remote control and monitoring of the pumping system from the WTP
- Freeze-protect the pipeline to the WTP by configuring it to rapidly drain when pumping halts and/or by burial/insulation

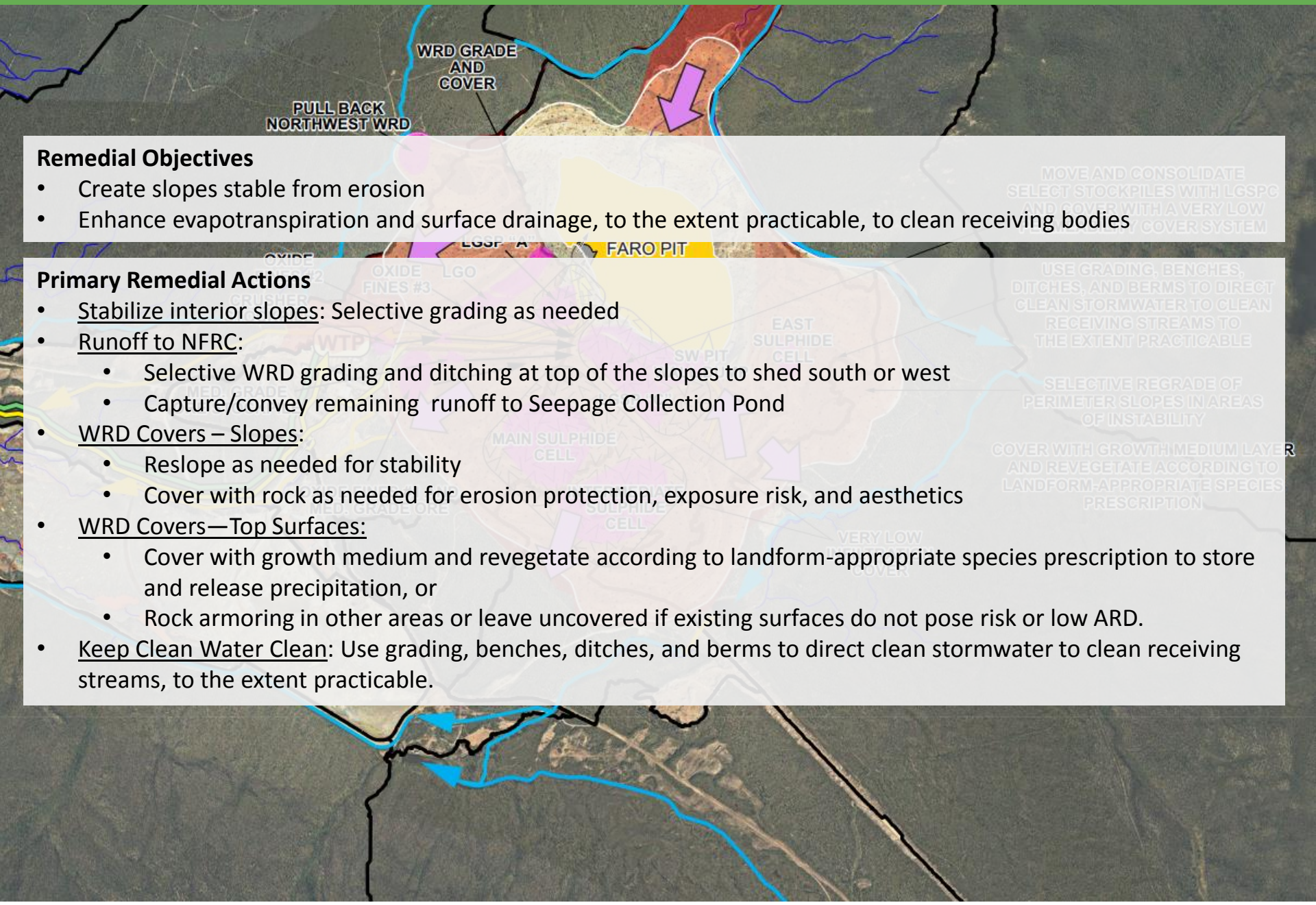
Water Management Prior to, During and After Remedial Action

- Reduce, and then maintain, pit water elevation to within target operating range
- Maintain access roads
- Maintain pit lake dewatering system and pipelines

3. WRD – Stormwater



3. WRD – Stormwater



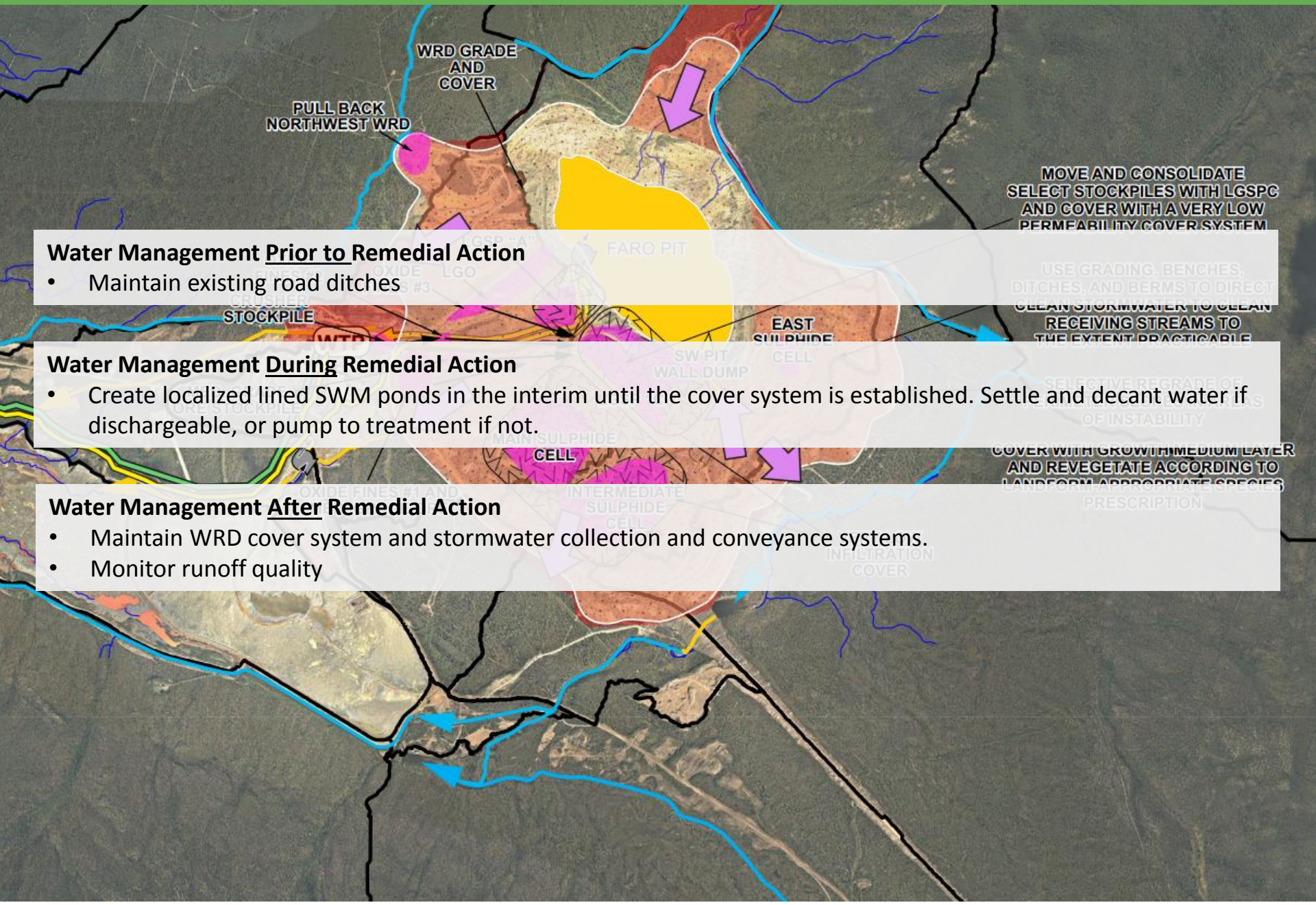
Remedial Objectives

- Create slopes stable from erosion
- Enhance evapotranspiration and surface drainage, to the extent practicable, to clean receiving bodies

Primary Remedial Actions

- Stabilize interior slopes: Selective grading as needed
- Runoff to NFRC:
  - Selective WRD grading and ditching at top of the slopes to shed south or west
  - Capture/convey remaining runoff to Seepage Collection Pond
- WRD Covers – Slopes:
  - Reslope as needed for stability
  - Cover with rock as needed for erosion protection, exposure risk, and aesthetics
- WRD Covers—Top Surfaces:
  - Cover with growth medium and revegetate according to landform-appropriate species prescription to store and release precipitation, or
  - Rock armoring in other areas or leave uncovered if existing surfaces do not pose risk or low ARD.
- Keep Clean Water Clean: Use grading, benches, ditches, and berms to direct clean stormwater to clean receiving streams, to the extent practicable.

3. WRD – Stormwater



Water Management <u>Prior to</u> Remedial Action

- Maintain existing road ditches

Water Management <u>During</u> Remedial Action

- Create localized lined SWM ponds in the interim until the cover system is established. Settle and decant water if dischargeable, or pump to treatment if not.

Water Management <u>After</u> Remedial Action

- Maintain WRD cover system and stormwater collection and conveyance systems.
- Monitor runoff quality

3. WRD – Contaminated Seepage/GW



3. WRD – Contaminated Seepage/GW

Remedial Objectives

- Protect surface water quality
- Reduce seepage generation where cost-effective compared to collection and treatment
- Provide reliable long-term collection and storage prior to treatment

Primary Remedial Actions (Waste Rock Dumps)

- Low Permeability Covers for Select Materials/Areas:
  - Consolidate Oxide Fines and Low Grade Ores and cover with a very low permeability cover system, if cost benefit against collection and treatment
  - Cover sulphide cells and other very high acid generators with very low permeability cover if cost-effective against collection and treatment
- Other Cover Systems based on risk and site-specific conditions:
  - Vegetative store and release cover systems where suitable for successful vegetation establishment.
  - Rock armoring in other areas or leave uncovered if existing surfaces do not pose risk.

Primary Remedial Actions (Seep Collection)

- Seep Collection Locations
  - Faro Pit
  - Zone II Pit
  - NFRC SIS (Seepage Collection Pond)
  - ETA Canyon SIS
  - Lower Guardhouse Creek
  - Ditching at toe of Main Dump (Seepage Collection Pond)
  - Toe of Seepage Collection Pond

3. WRD – Contaminated Seepage/GW



Water Management <u>Prior to and During</u> Remedial Action

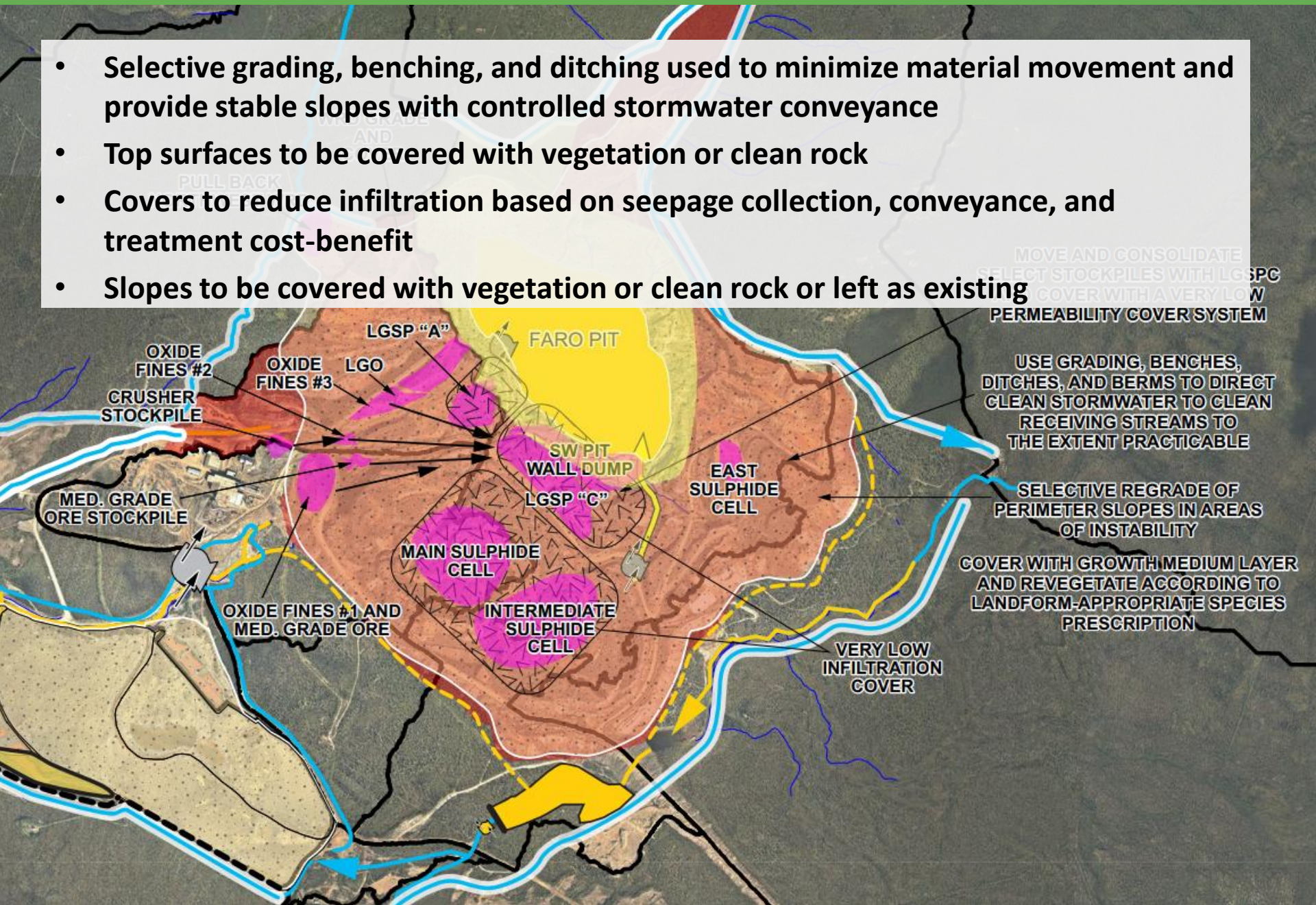
- Continue to operate existing SIS systems
- Channelize seepage to Seepage Collection Pond

Water Management <u>After</u> Remedial Action

- Operate and maintain all WRD covers, ditches and SIS systems

3. WRD - Summary Slide

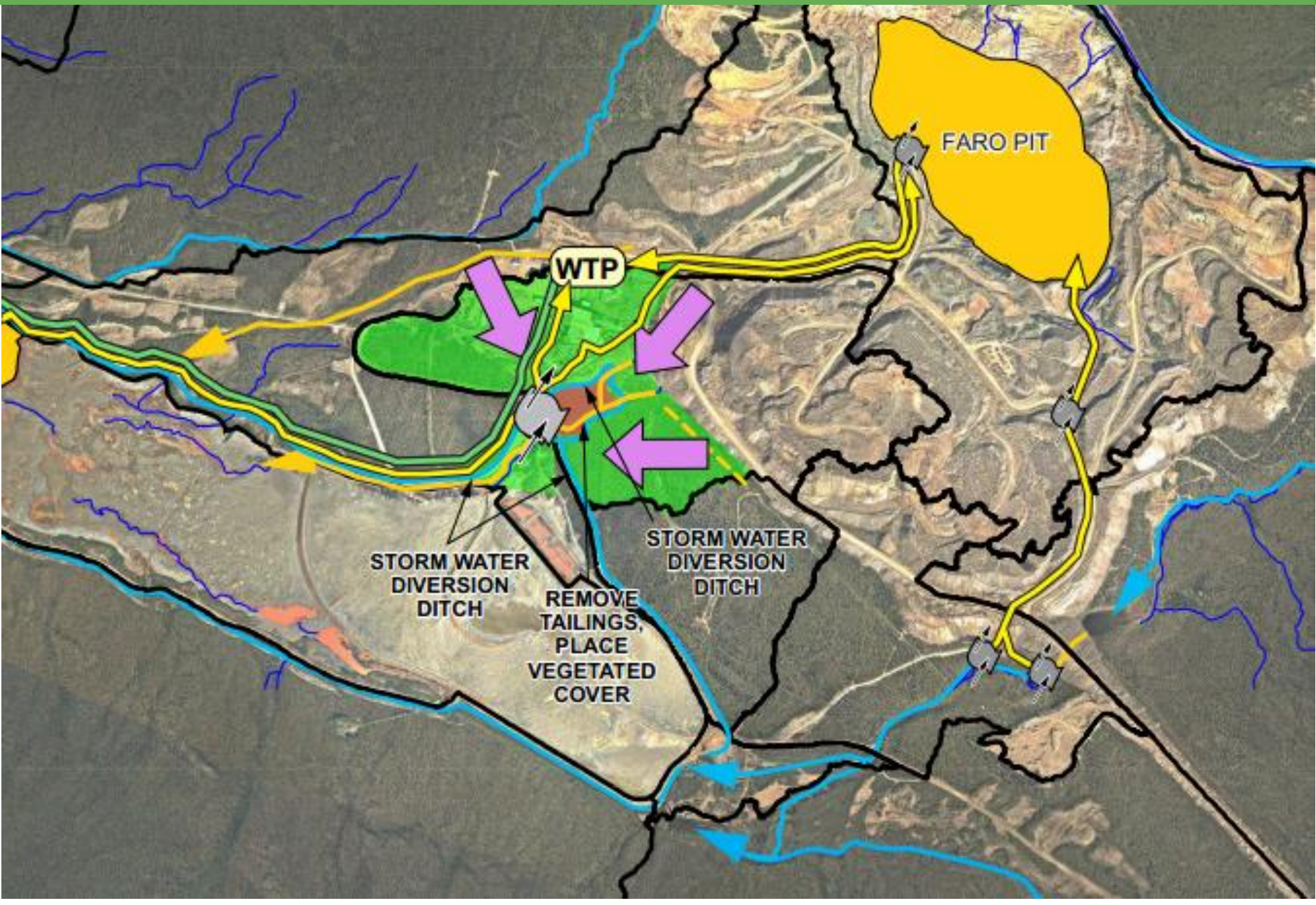
- Selective grading, benching, and ditching used to minimize material movement and provide stable slopes with controlled stormwater conveyance
- Top surfaces to be covered with vegetation or clean rock
- Covers to reduce infiltration based on seepage collection, conveyance, and treatment cost-benefit
- Slopes to be covered with vegetation or clean rock or left as existing



3. WRD – Next Steps

- **Better establish basis of design**
  - Cover requirements
    - Surface covers
    - Slope covers
  - Refine cover performance projections
  - Refine cover/treatment cost-benefit analysis
- **Refine slope stability assessments**
- **Develop preliminary grading plan**
- **Develop preliminary sequencing and stormwater plan**
- **Refine cut/fill and material quantities**
- **Cost estimate**

4. Mill/ETA – Stormwater



4. Mill/ETA – Stormwater

Remedial Objectives

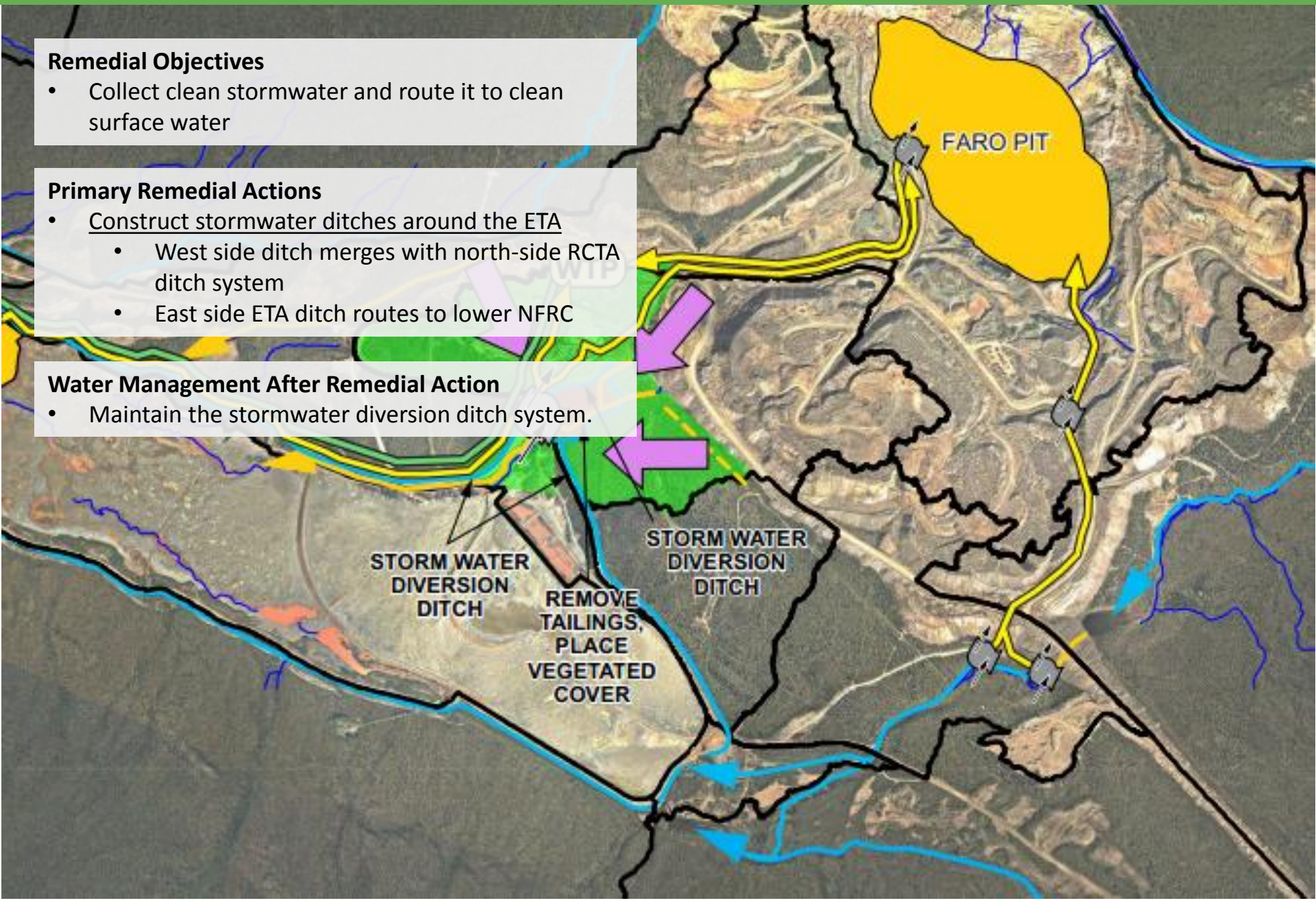
- Collect clean stormwater and route it to clean surface water

Primary Remedial Actions

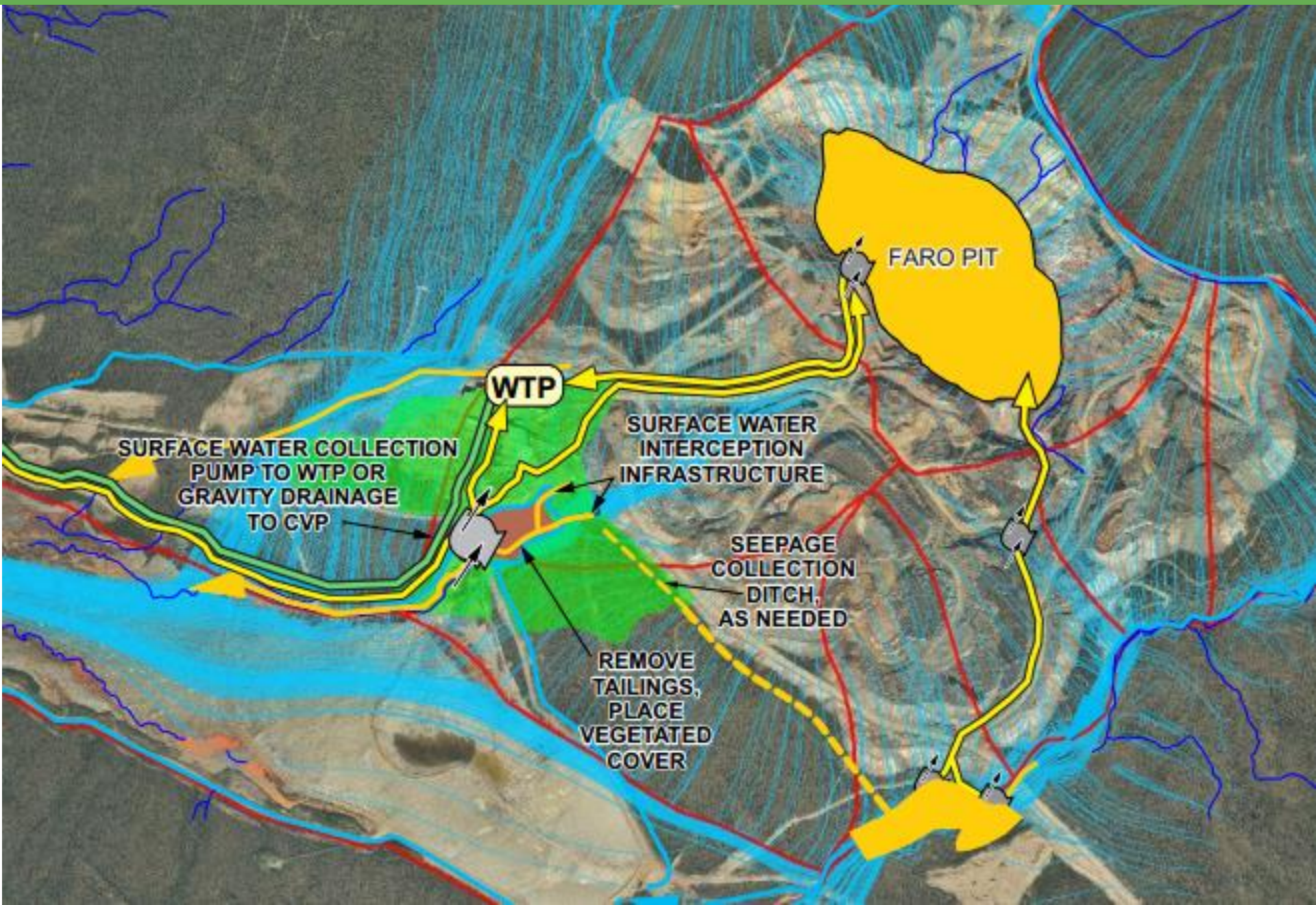
- Construct stormwater ditches around the ETA
  - West side ditch merges with north-side RCTA ditch system
  - East side ETA ditch routes to lower NFRC

Water Management After Remedial Action

- Maintain the stormwater diversion ditch system.



4. Mill/ETA – Contaminated Seepage



4. Mill/ETA – Contaminated Seepage

Remedial Objectives

- Collect seepage and its large contaminant load to reduce downstream contaminant loading and collection costs.
- Collect seepage and prevent it from entering clean stormwater diversions down gradient.

Primary Remedial Actions

- Remove the tailings to the RCTA. Provide vegetated till cover over underlying contaminated alluvium.
- Construct drainage ditches for seepage: from X23 and Mill Canyon through the former ETA to a culvert under the mine access road discharging to Faro Creek Canyon.
- Collect this contaminated water behind a dam constructed in the Canyon where the bedrock narrows. Either pump or drain this water through winterized pipelines to the WTP or the CVP.
- Provide ability to regularly clean the pipelines using pigging or jetting, and the ditches by mucking.
- Potential additional seepage ditch adjacent to WRD toe: If needed, construct a seepage interception ditch to capture shallow seepage and convey it west into the ETA area, and another which conveys it east and into the ditch system constructed below the Intermediate WRD which conveys seepage to the NFRC Seepage Collection Pond. This same ditch system will collect stormwater so the ditch shall be constructed as close to the toe of the WRD as feasible to reduce the volume of stormwater collected.

4. Mill/ETA – Contaminated Seepage



Water Management <u>Prior</u> to Remedial Action

- Maintain and seasonally operate the existing ETA collection system below the Access Road

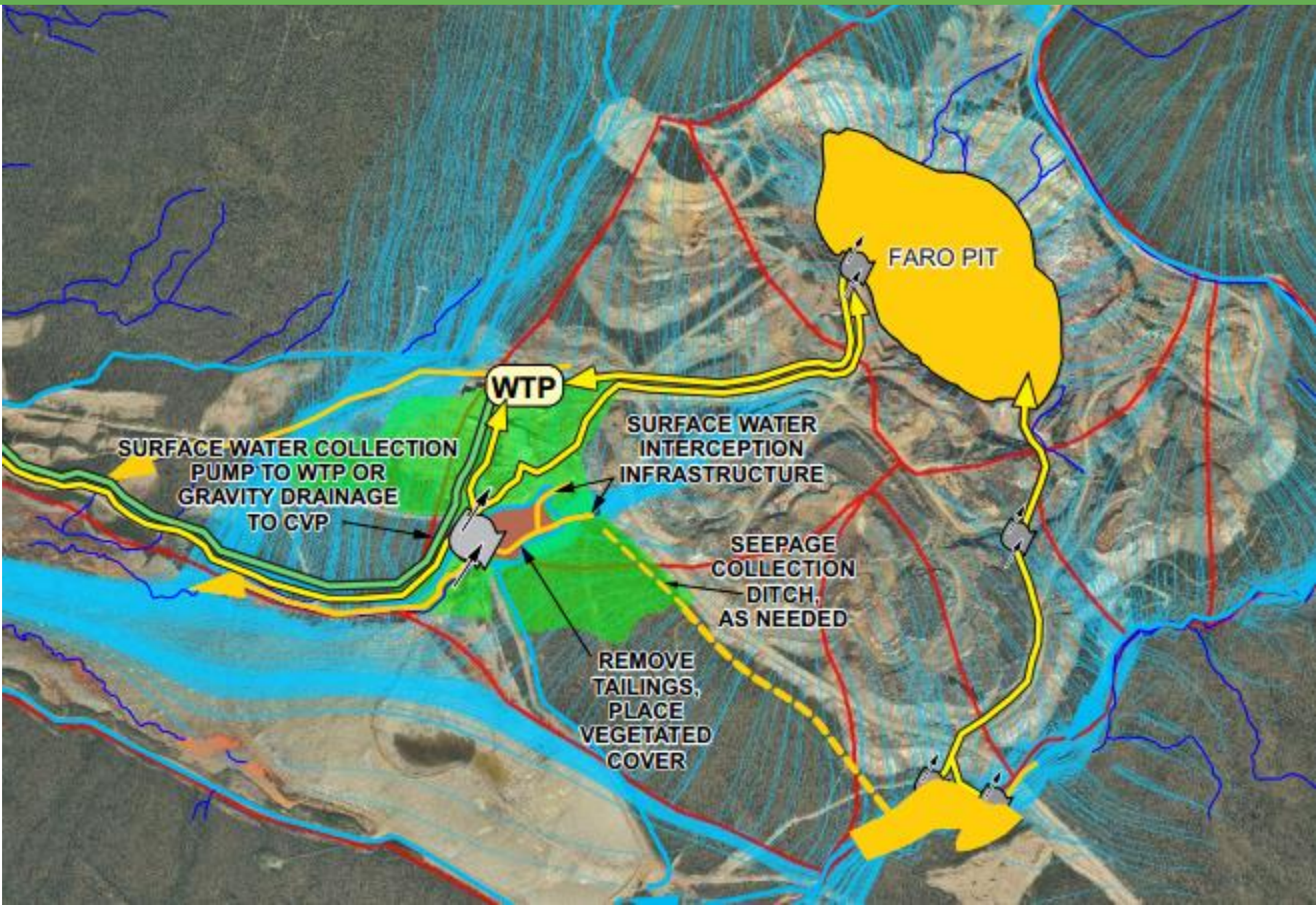
Water Management <u>During</u> Remedial Action

- Maintain and seasonally operate the existing ETA collection system below the Access Road when feasible during construction.

Water Management <u>After</u> Remedial Action

- Maintain and operate the new drainage ditches and dam-based seepage collection system and its associated conveyance systems year-round

4. Mill/ETA – Groundwater



4. Mill/ETA – Groundwater

Remedial Objectives

Prevent contaminated groundwater from entering clean stormwater diversions.

Primary Remedial Actions

- Collect groundwater within the seepage collection ditches and co-manage this water behind the canyon dam with ARD seepage.

Water Management <u>Prior to</u> Remedial Action

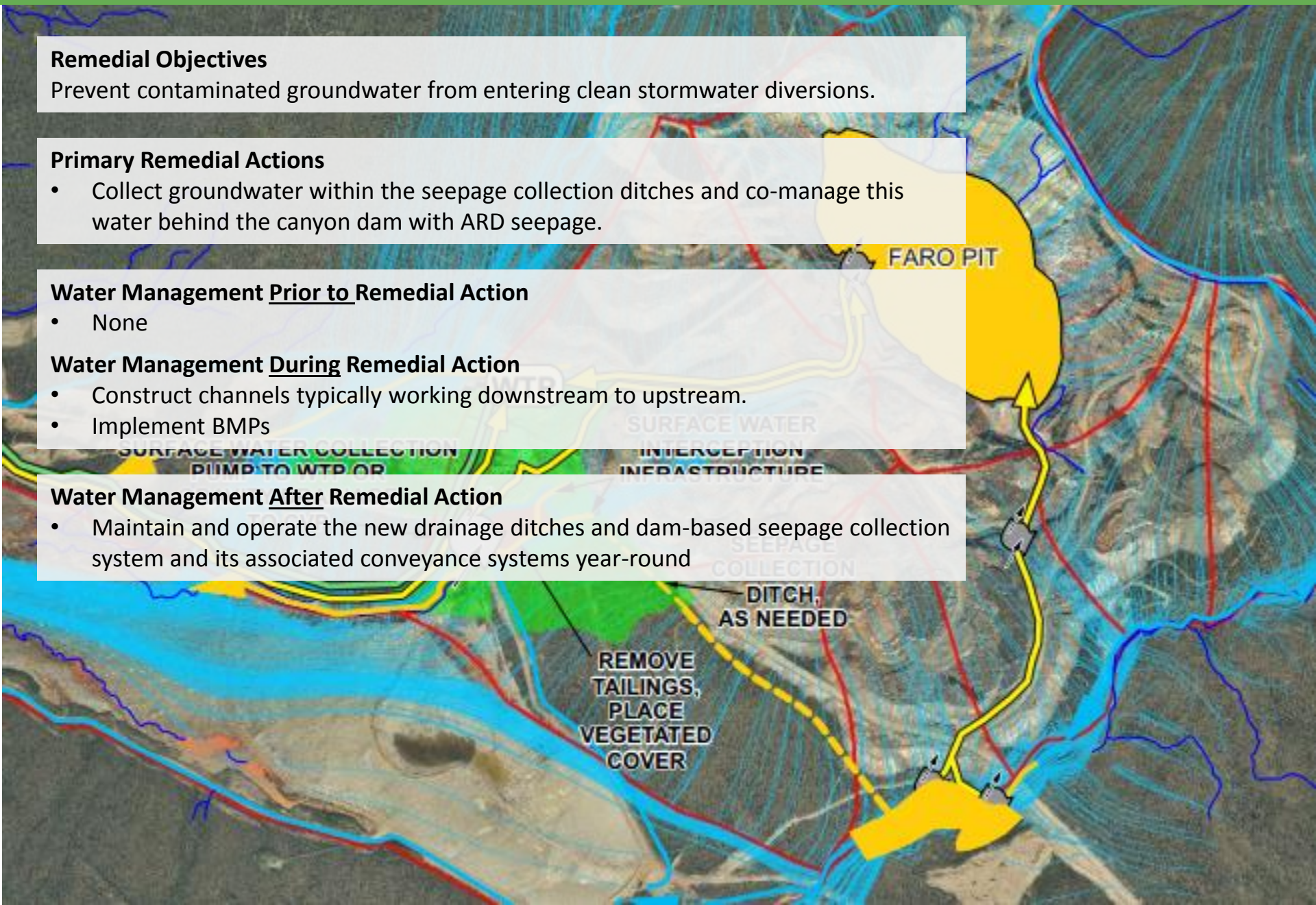
- None

Water Management <u>During</u> Remedial Action

- Construct channels typically working downstream to upstream.
- Implement BMPs

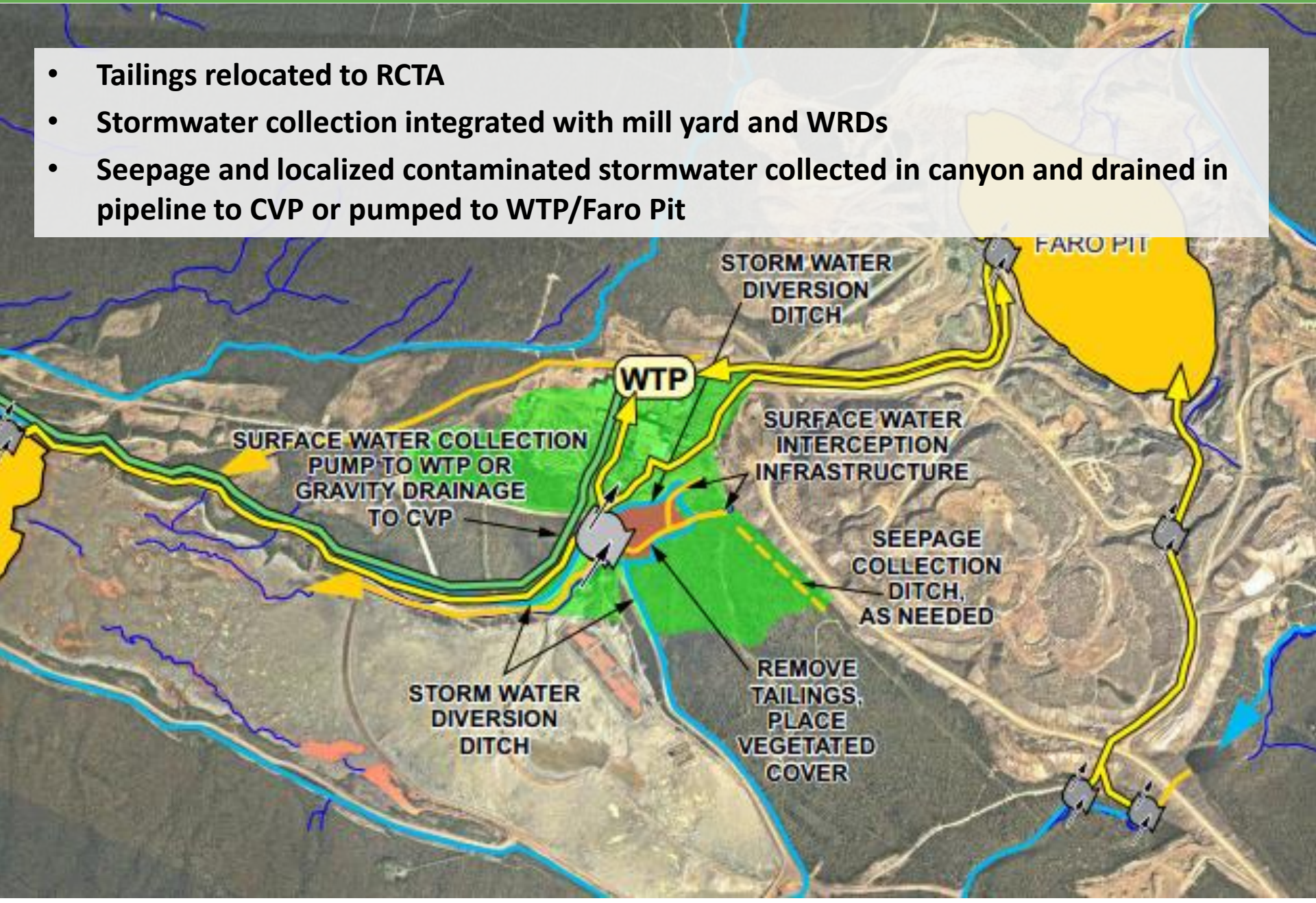
Water Management <u>After</u> Remedial Action

- Maintain and operate the new drainage ditches and dam-based seepage collection system and its associated conveyance systems year-round

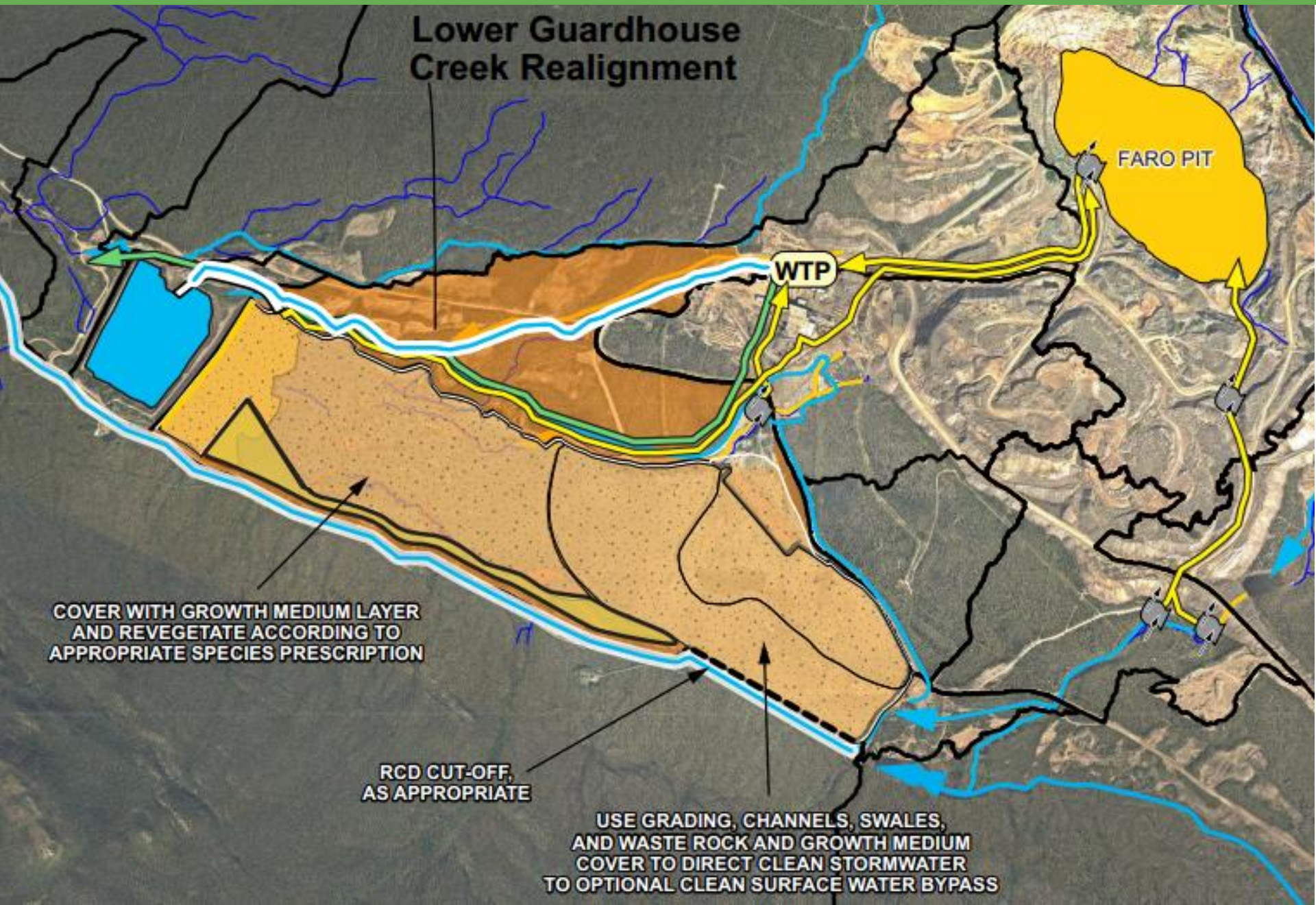


4. Mill/ETA - Summary

- Tailings relocated to RCTA
- Stormwater collection integrated with mill yard and WRDs
- Seepage and localized contaminated stormwater collected in canyon and drained in pipeline to CVP or pumped to WTP/Faro Pit



5. Rose Creek Tailings Area– Surface Water



5. Rose Creek Tailings Area– Surface Water

Remedial Objectives (Lower Guardhouse Creek)

- Near-Term: Use for contaminated water collection system
- Long-Term: Recover water quality
- Efficiently carry design flow around Mill Yard and tailings area

Primary Remedial Actions (Lower Guardhouse Creek)

- Upgrade existing alignment to carry design flow to Cross Valley Pond (CVP) for collection and treatment.
- Design flow to be selected using a failure consequence evaluation.
- When clean, re-route channel into the lower North Wall Interceptor Ditch (NWID).

Water Management Prior to Remedial Action

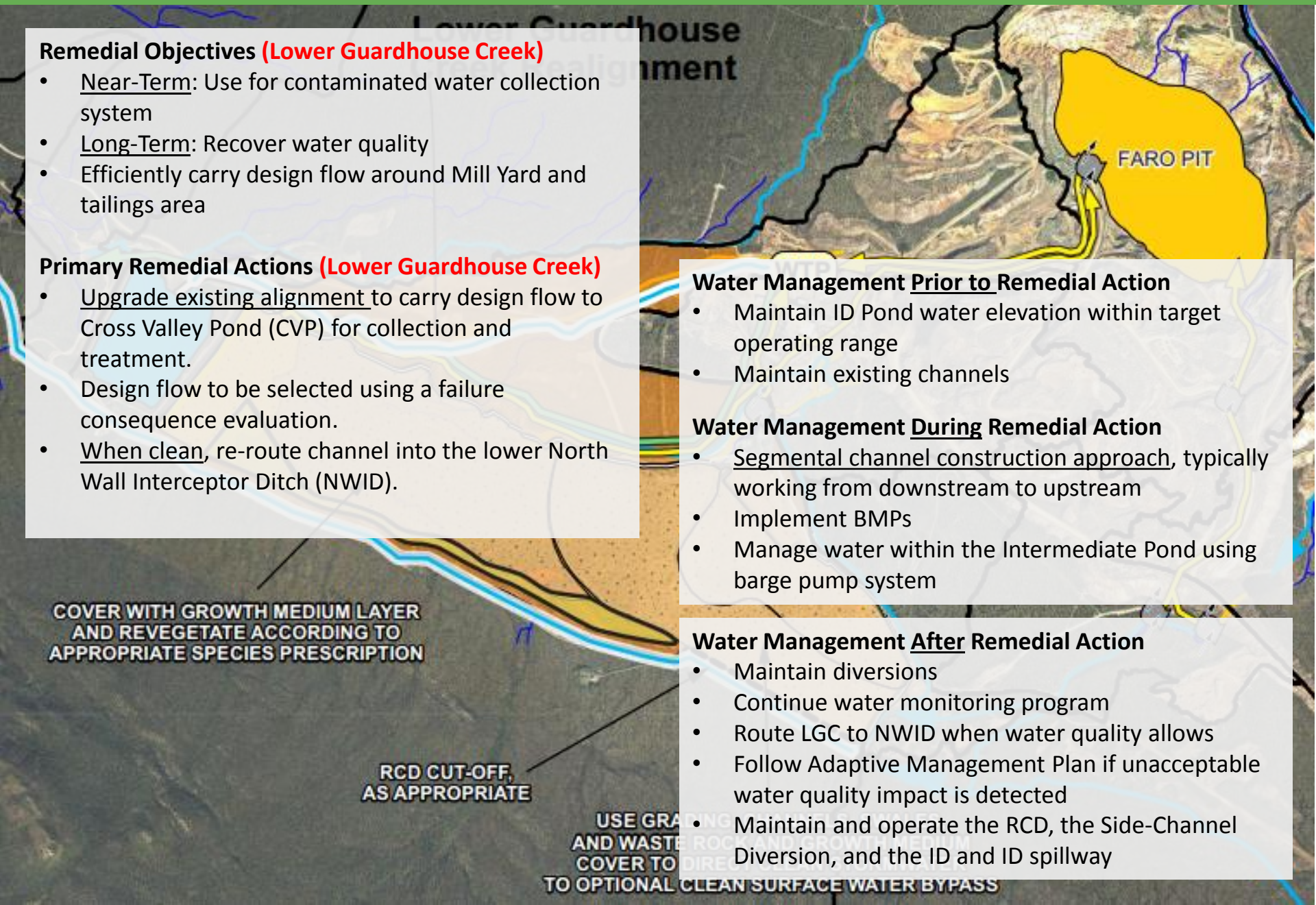
- Maintain ID Pond water elevation within target operating range
- Maintain existing channels

Water Management During Remedial Action

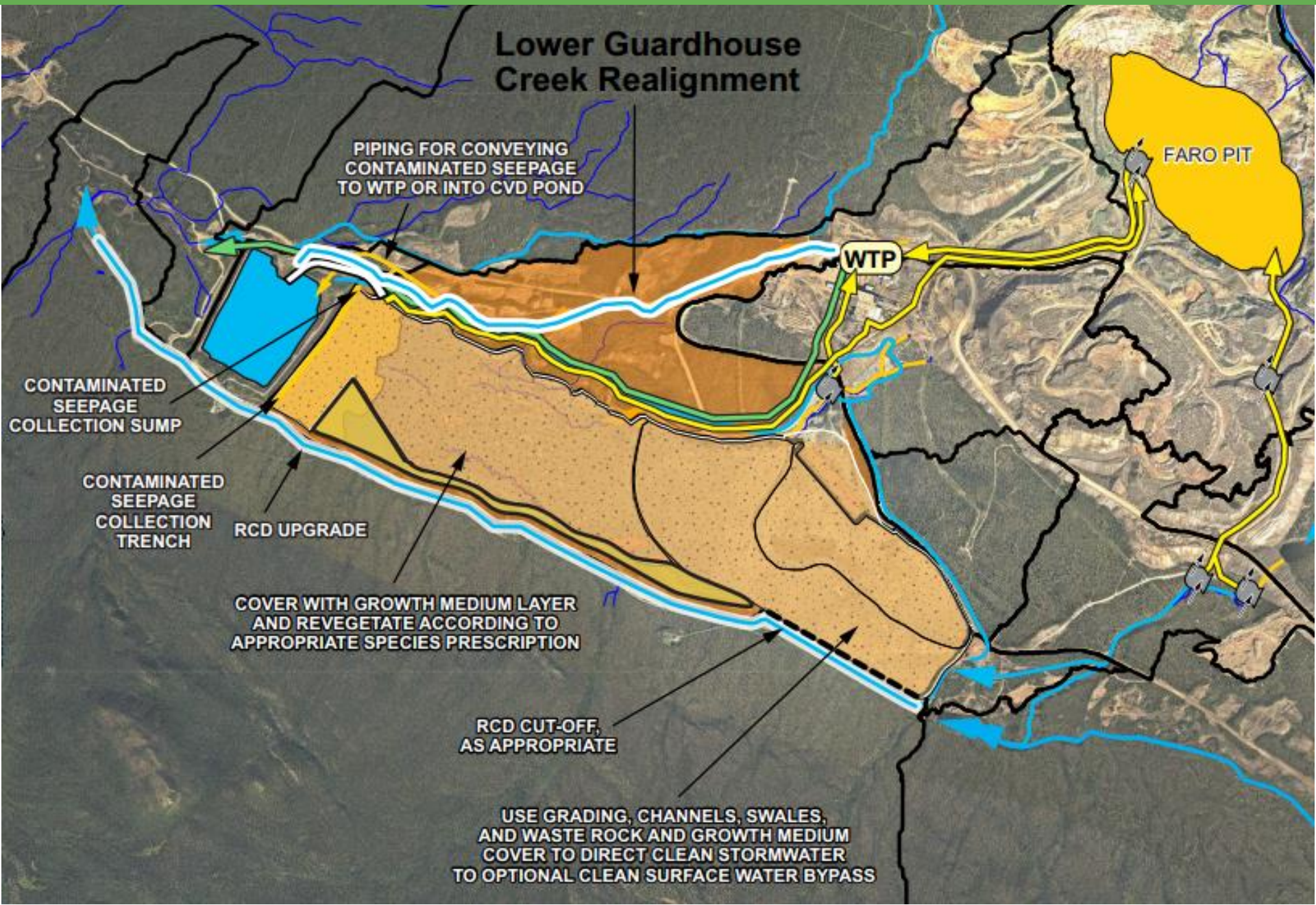
- Segmental channel construction approach, typically working from downstream to upstream
- Implement BMPs
- Manage water within the Intermediate Pond using barge pump system

Water Management After Remedial Action

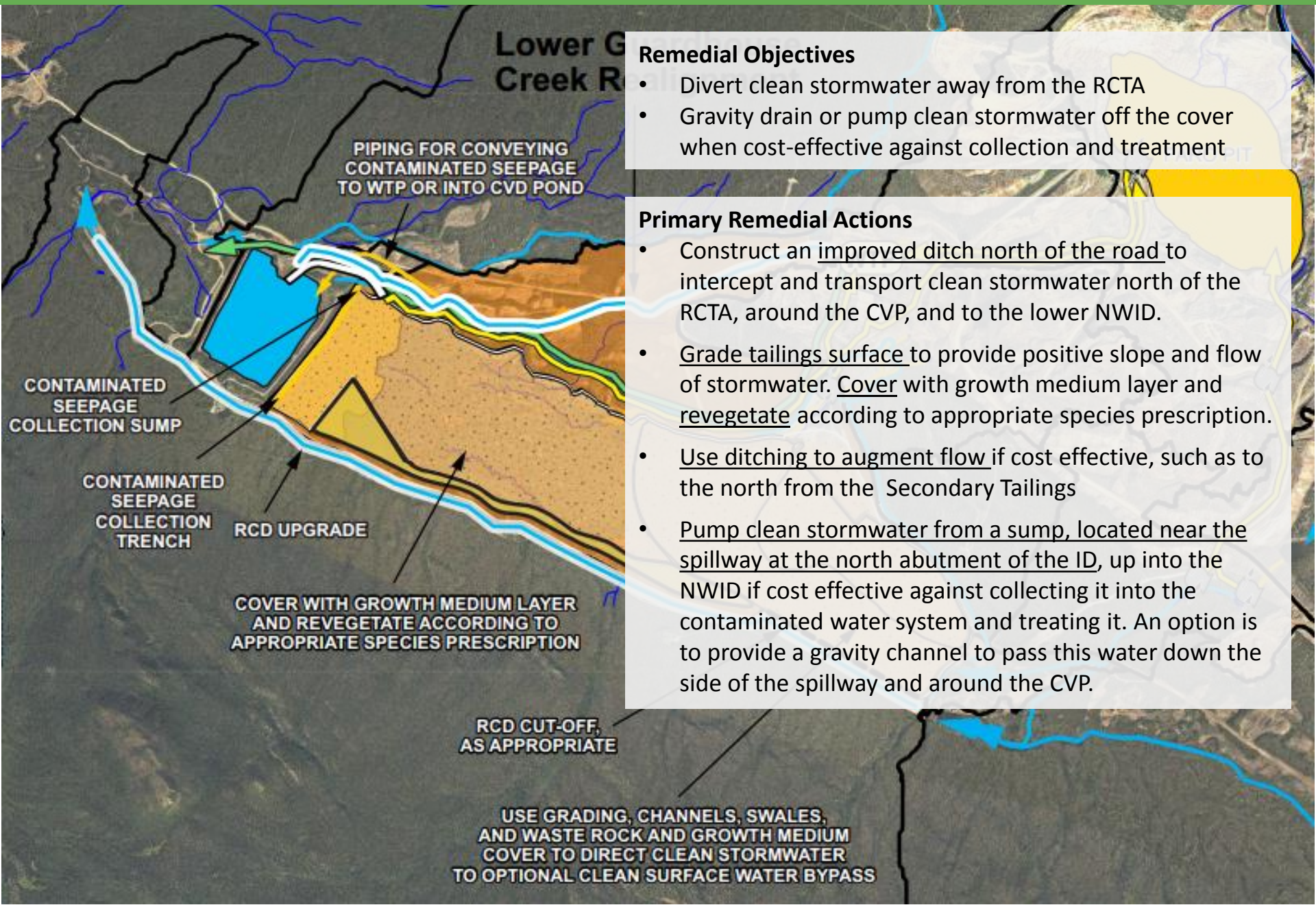
- Maintain diversions
- Continue water monitoring program
- Route LGC to NWID when water quality allows
- Follow Adaptive Management Plan if unacceptable water quality impact is detected
- Maintain and operate the RCD, the Side-Channel Diversion, and the ID and ID spillway



5. RCTA – Stormwater



5. RCTA – Stormwater



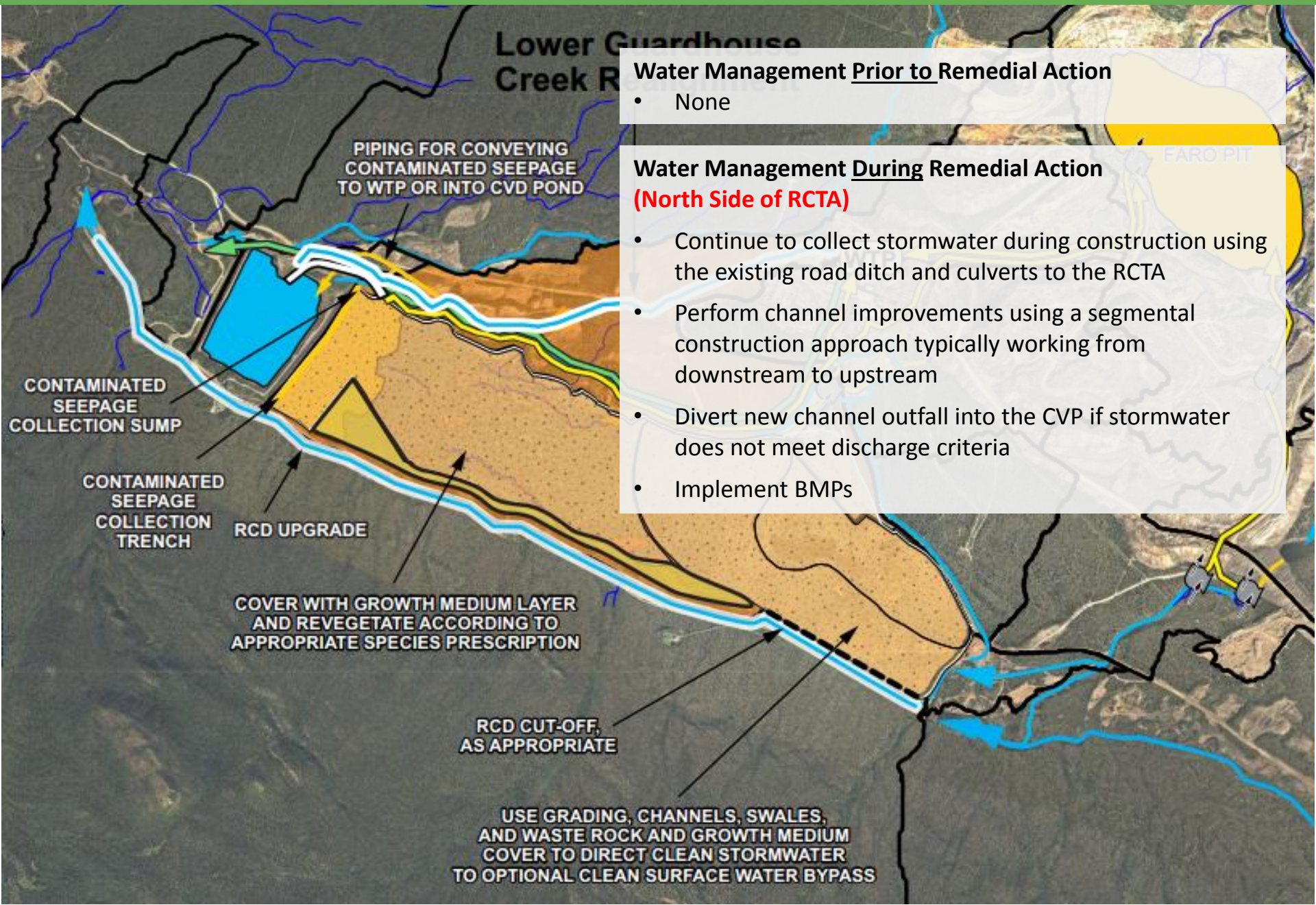
Remedial Objectives

- Divert clean stormwater away from the RCTA
- Gravity drain or pump clean stormwater off the cover when cost-effective against collection and treatment

Primary Remedial Actions

- Construct an improved ditch north of the road to intercept and transport clean stormwater north of the RCTA, around the CVP, and to the lower NWID.
- Grade tailings surface to provide positive slope and flow of stormwater. Cover with growth medium layer and revegetate according to appropriate species prescription.
- Use ditching to augment flow if cost effective, such as to the north from the Secondary Tailings
- Pump clean stormwater from a sump, located near the spillway at the north abutment of the ID, up into the NWID if cost effective against collecting it into the contaminated water system and treating it. An option is to provide a gravity channel to pass this water down the side of the spillway and around the CVP.

5. RCTA – Stormwater



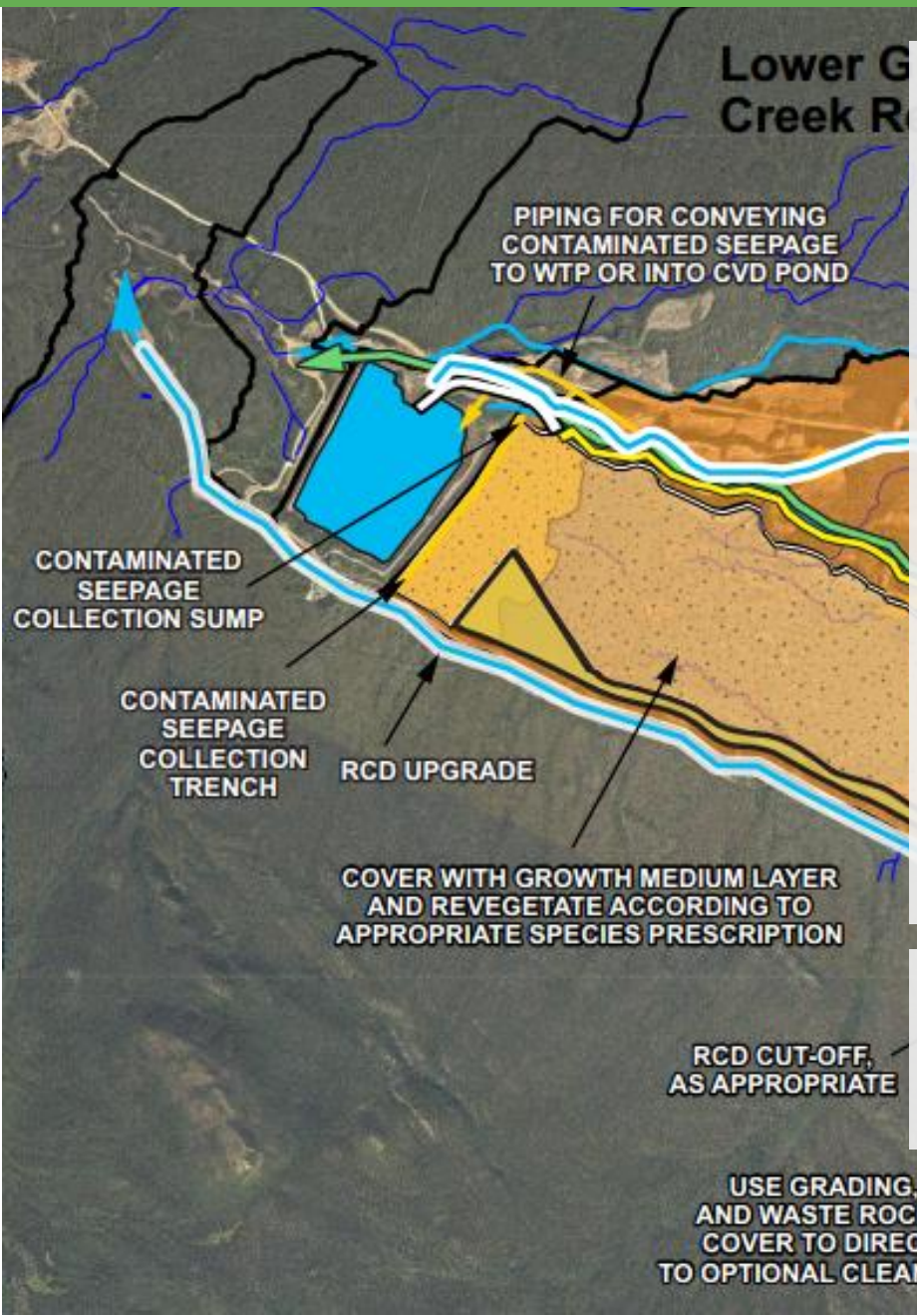
Water Management Prior to Remedial Action

- None

Water Management During Remedial Action
(North Side of RCTA)

- Continue to collect stormwater during construction using the existing road ditch and culverts to the RCTA
- Perform channel improvements using a segmental construction approach typically working from downstream to upstream
- Divert new channel outfall into the CVP if stormwater does not meet discharge criteria
- Implement BMPs

5. RCTA – Stormwater



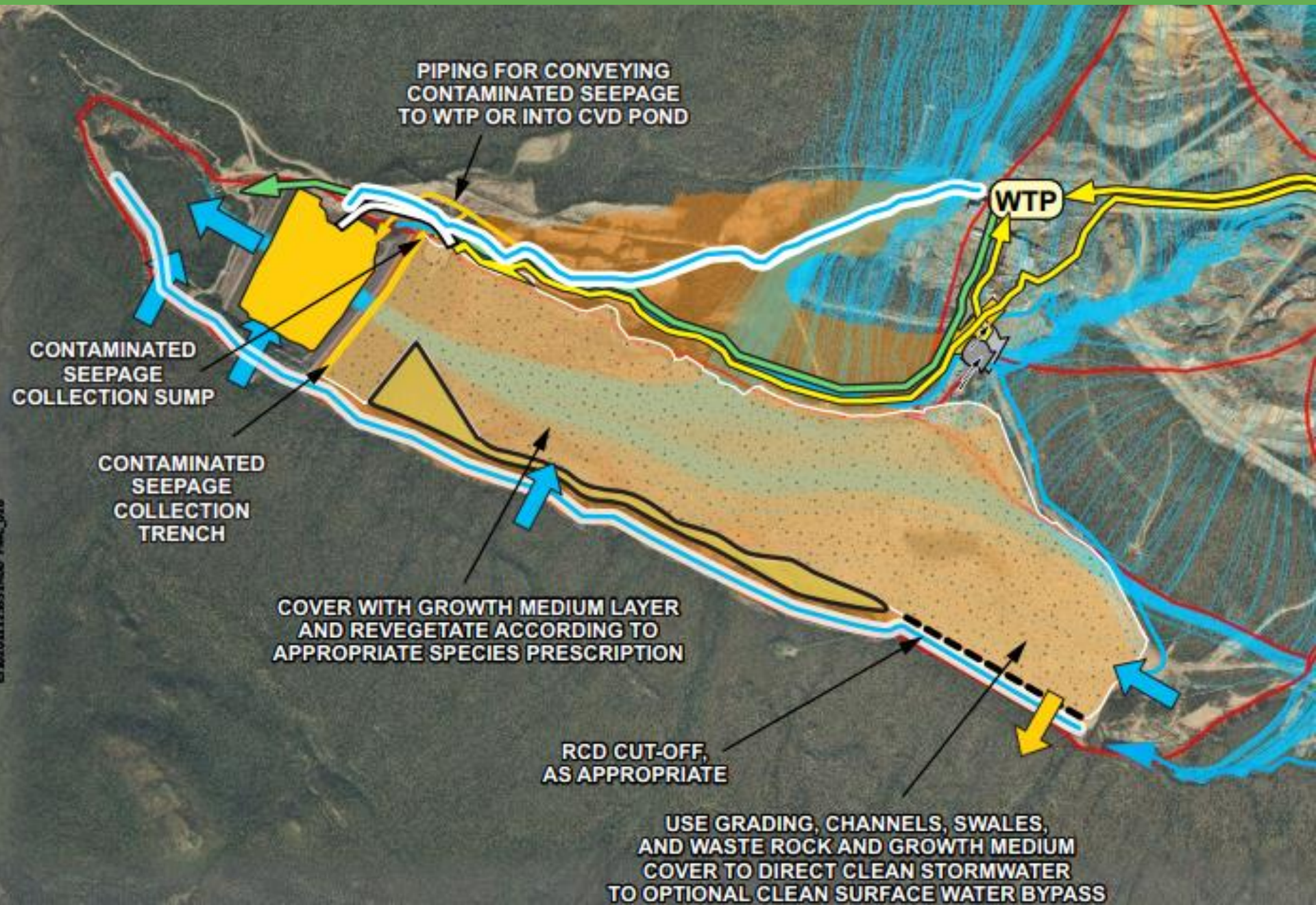
Water Management <u>During</u> Remedial Action (RCTA Surface)

- <u>Sequence surface grading and stormwater management</u> working from upslope to downslope (towards the ID Pond).
- <u>Operate existing barge pump system</u> to pump water to the WTP or alternately to Faro Pit for interim storage.
- <u>Interim Stormwater Management:</u>
  - <u>Seepage collection system located at upstream slope of ID →Pump station in NW corner of tailings → WTP or CVD Pond,</u>
  - <u>Tie stormwater off cover to PS</u> until it is demonstrated that flow off cover is clean
  - When clean, direct to a separate PS for pumping to NWID
- <u>Decommission the barge system</u> after the contaminated seepage collection system located on the upstream slope of the ID is functional.

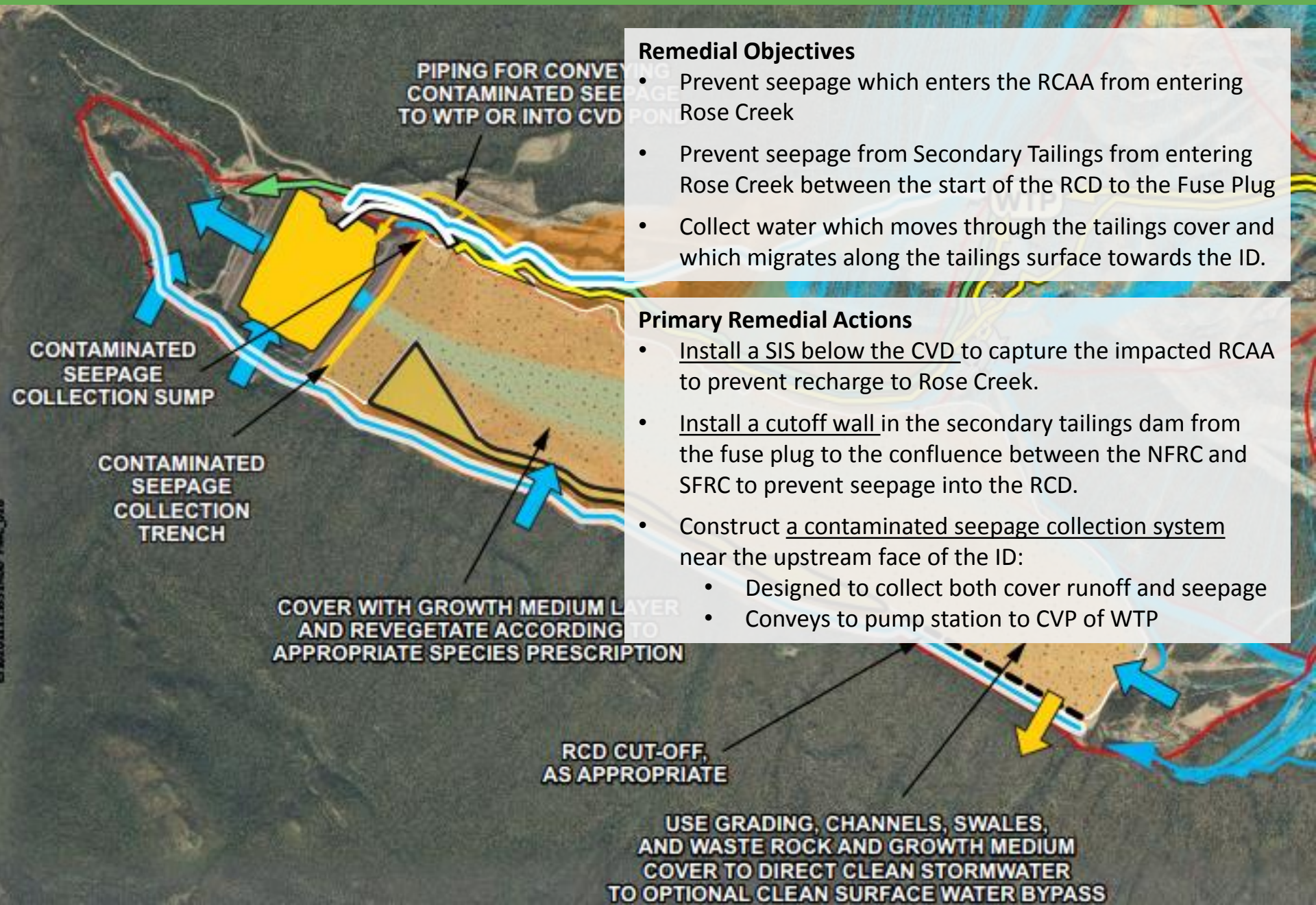
Water Management <u>After</u> Remedial Action

- Maintain and operate the stormwater collection ditch system
- Maintain cover and stormwater management system

5. Rose Creek Tailings Area – Contaminated Seepage



5. Rose Creek Tailings Area – Contaminated Seepage



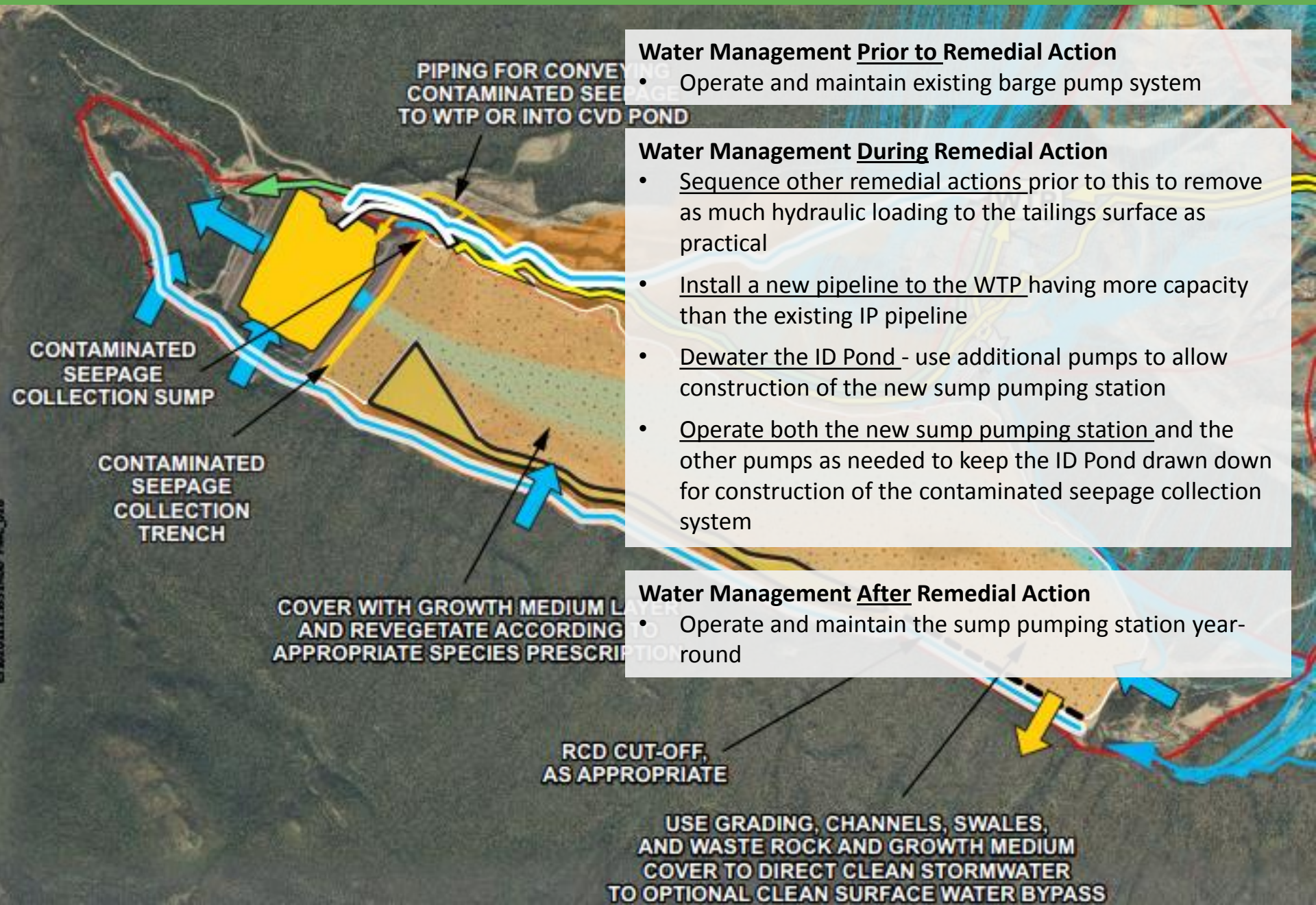
Remedial Objectives

- Prevent seepage which enters the RCAA from entering Rose Creek
- Prevent seepage from Secondary Tailings from entering Rose Creek between the start of the RCD to the Fuse Plug
- Collect water which moves through the tailings cover and which migrates along the tailings surface towards the ID.

Primary Remedial Actions

- Install a SIS below the CVD to capture the impacted RCAA to prevent recharge to Rose Creek.
- Install a cutoff wall in the secondary tailings dam from the fuse plug to the confluence between the NFRC and SFRC to prevent seepage into the RCD.
- Construct a contaminated seepage collection system near the upstream face of the ID:
  - Designed to collect both cover runoff and seepage
  - Conveys to pump station to CVP of WTP

5. Rose Creek Tailings Area – Contaminated Seepage



Water Management Prior to Remedial Action

- Operate and maintain existing barge pump system

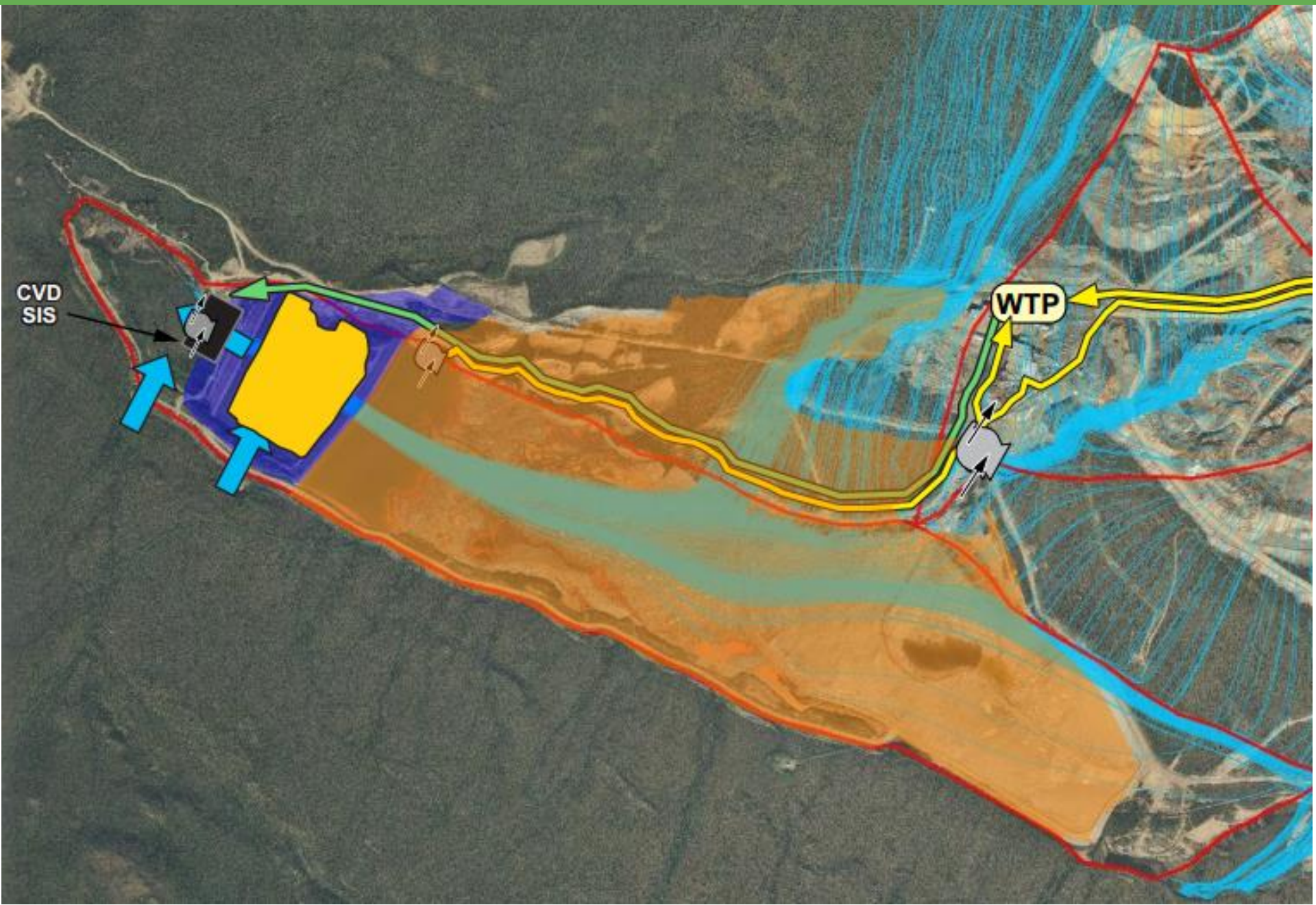
Water Management During Remedial Action

- Sequence other remedial actions prior to this to remove as much hydraulic loading to the tailings surface as practical
- Install a new pipeline to the WTP having more capacity than the existing IP pipeline
- Dewater the ID Pond - use additional pumps to allow construction of the new sump pumping station
- Operate both the new sump pumping station and the other pumps as needed to keep the ID Pond drawn down for construction of the contaminated seepage collection system

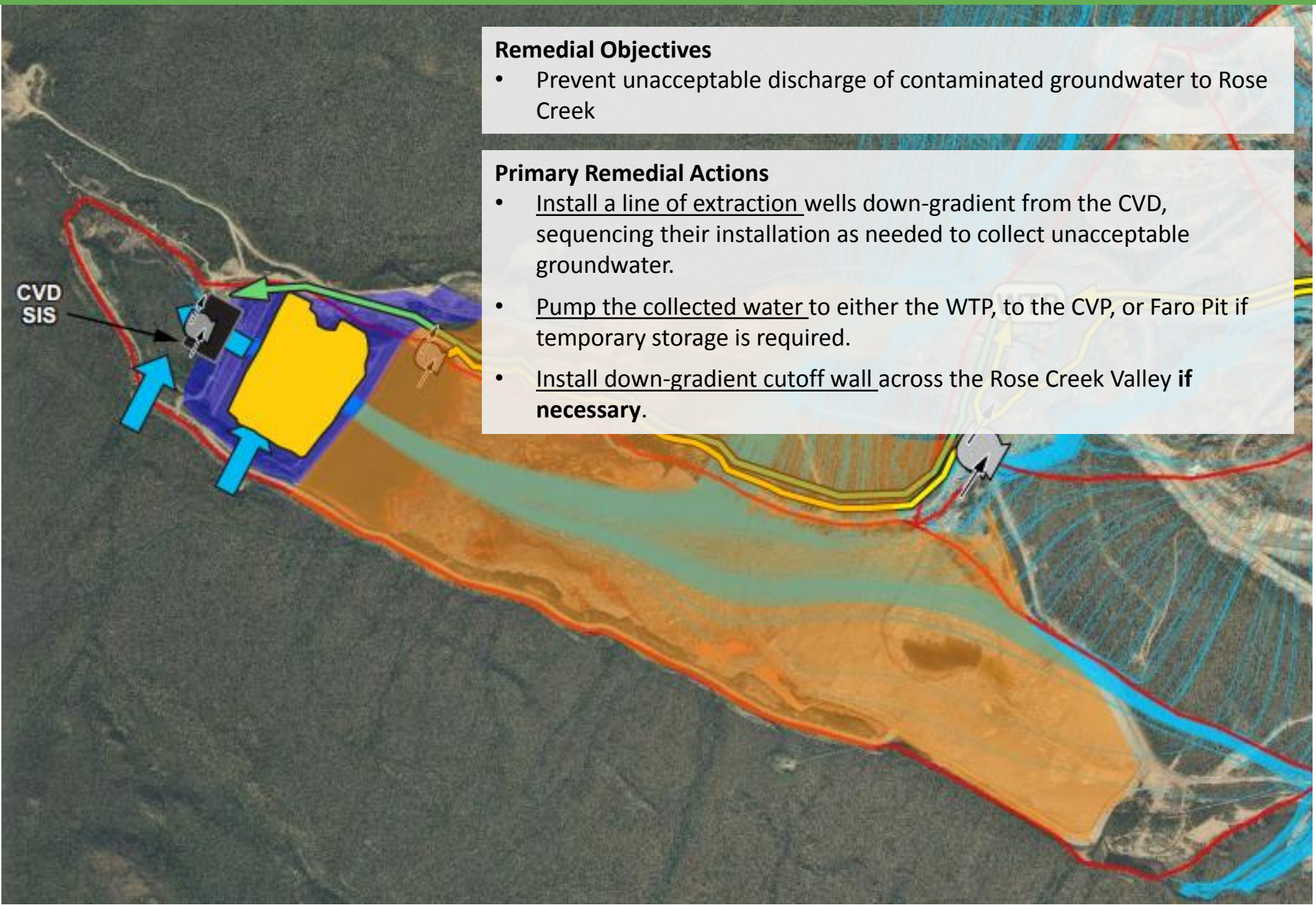
Water Management After Remedial Action

- Operate and maintain the sump pumping station year-round

5. Rose Creek Tailings Area – Groundwater



5. Rose Creek Tailings Area – Groundwater



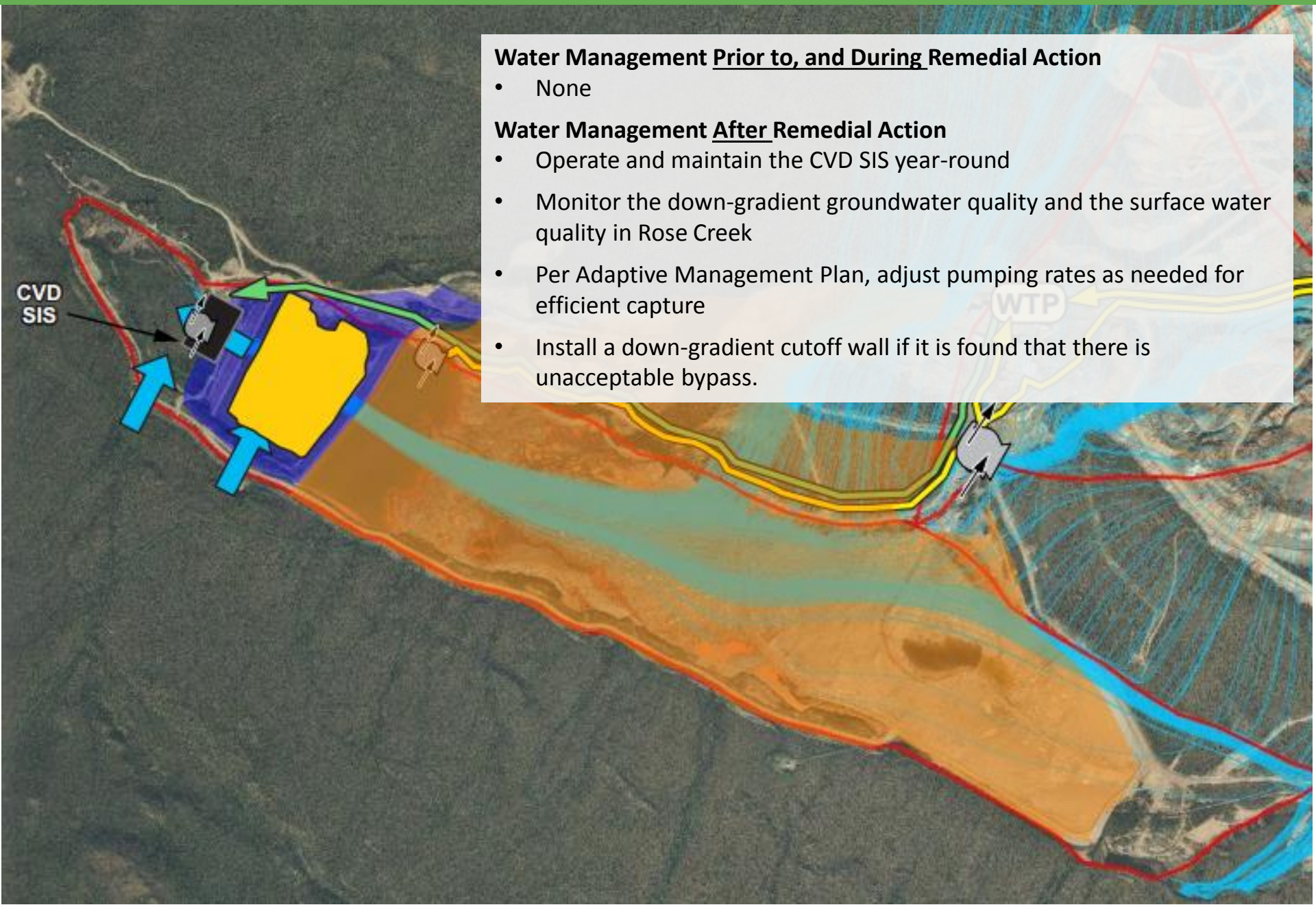
Remedial Objectives

- Prevent unacceptable discharge of contaminated groundwater to Rose Creek

Primary Remedial Actions

- Install a line of extraction wells down-gradient from the CVD, sequencing their installation as needed to collect unacceptable groundwater.
- Pump the collected water to either the WTP, to the CVP, or Faro Pit if temporary storage is required.
- Install down-gradient cutoff wall across the Rose Creek Valley **if necessary**.

5. Rose Creek Tailings Area – Groundwater



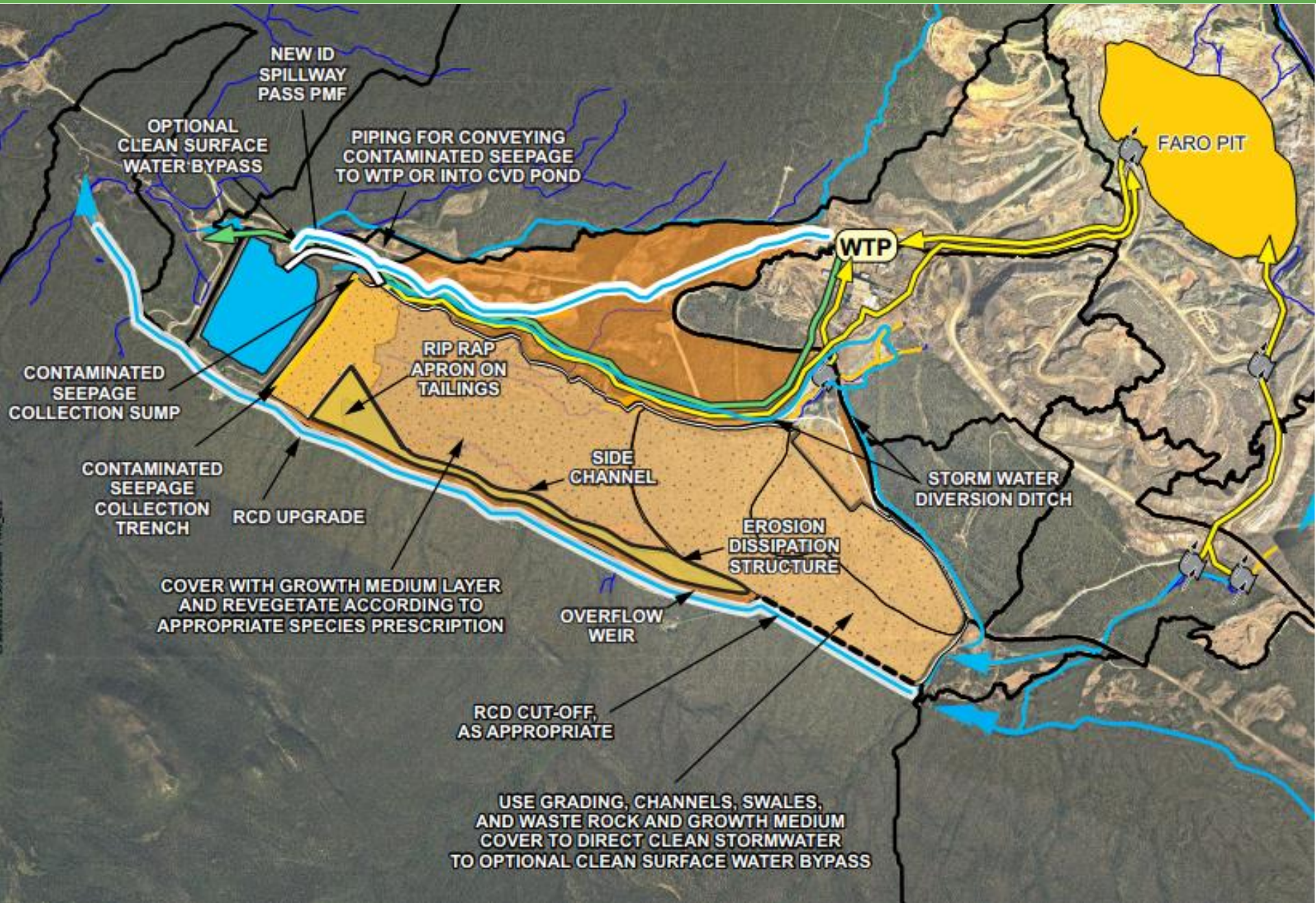
Water Management <u>Prior to, and During</u> Remedial Action

- None

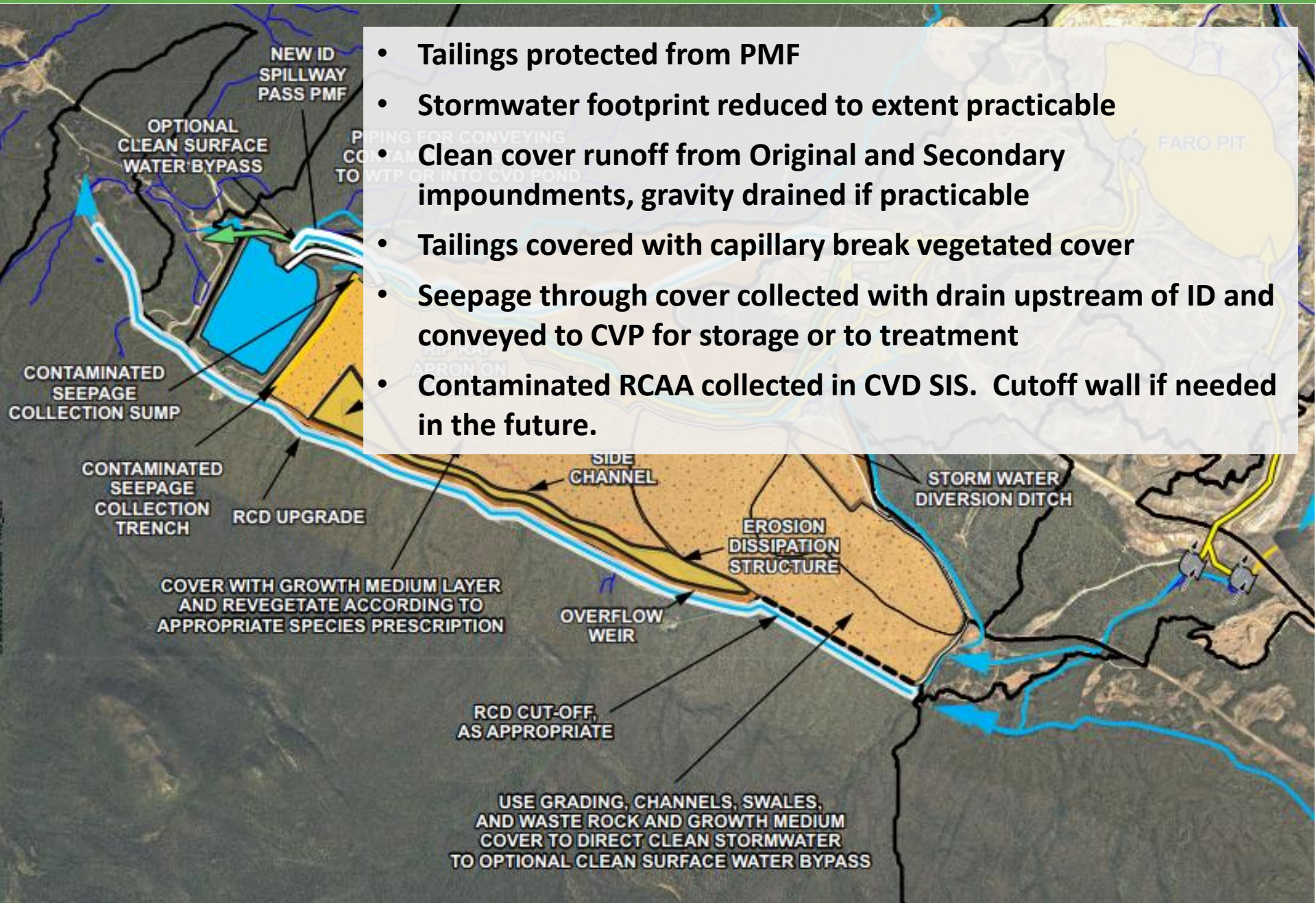
Water Management <u>After</u> Remedial Action

- Operate and maintain the CVD SIS year-round
- Monitor the down-gradient groundwater quality and the surface water quality in Rose Creek
- Per Adaptive Management Plan, adjust pumping rates as needed for efficient capture
- Install a down-gradient cutoff wall if it is found that there is unacceptable bypass.

5. Rose Creek Tailings Area - Summary

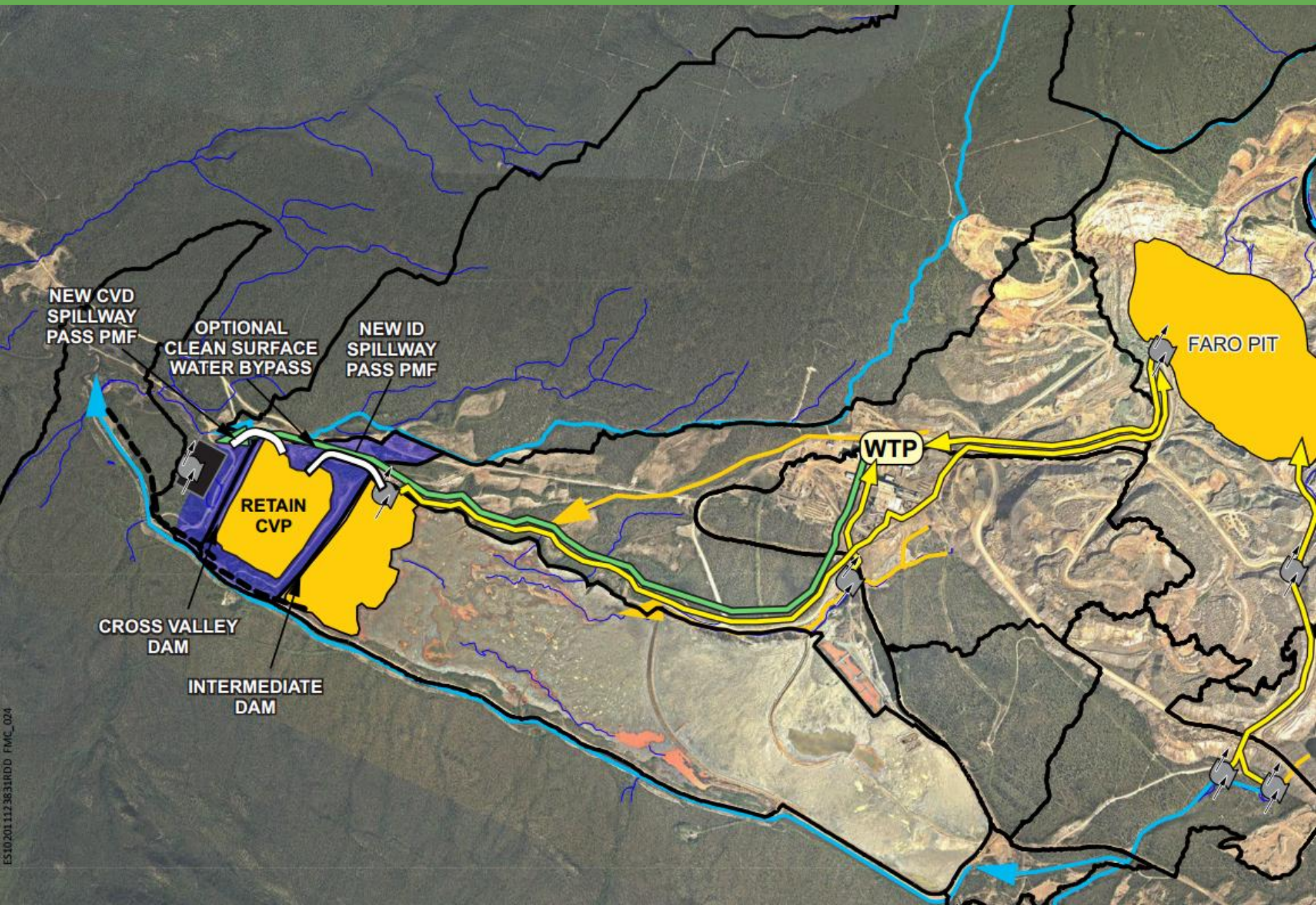


5. Rose Creek Tailings Area - Summary



- Tailings protected from PMF
- Stormwater footprint reduced to extent practicable
- Clean cover runoff from Original and Secondary impoundments, gravity drained if practicable
- Tailings covered with capillary break vegetated cover
- Seepage through cover collected with drain upstream of ID and conveyed to CVP for storage or to treatment
- Contaminated RCAA collected in CVD SIS. Cutoff wall if needed in the future.

6. Dams and CVP – Impoundment



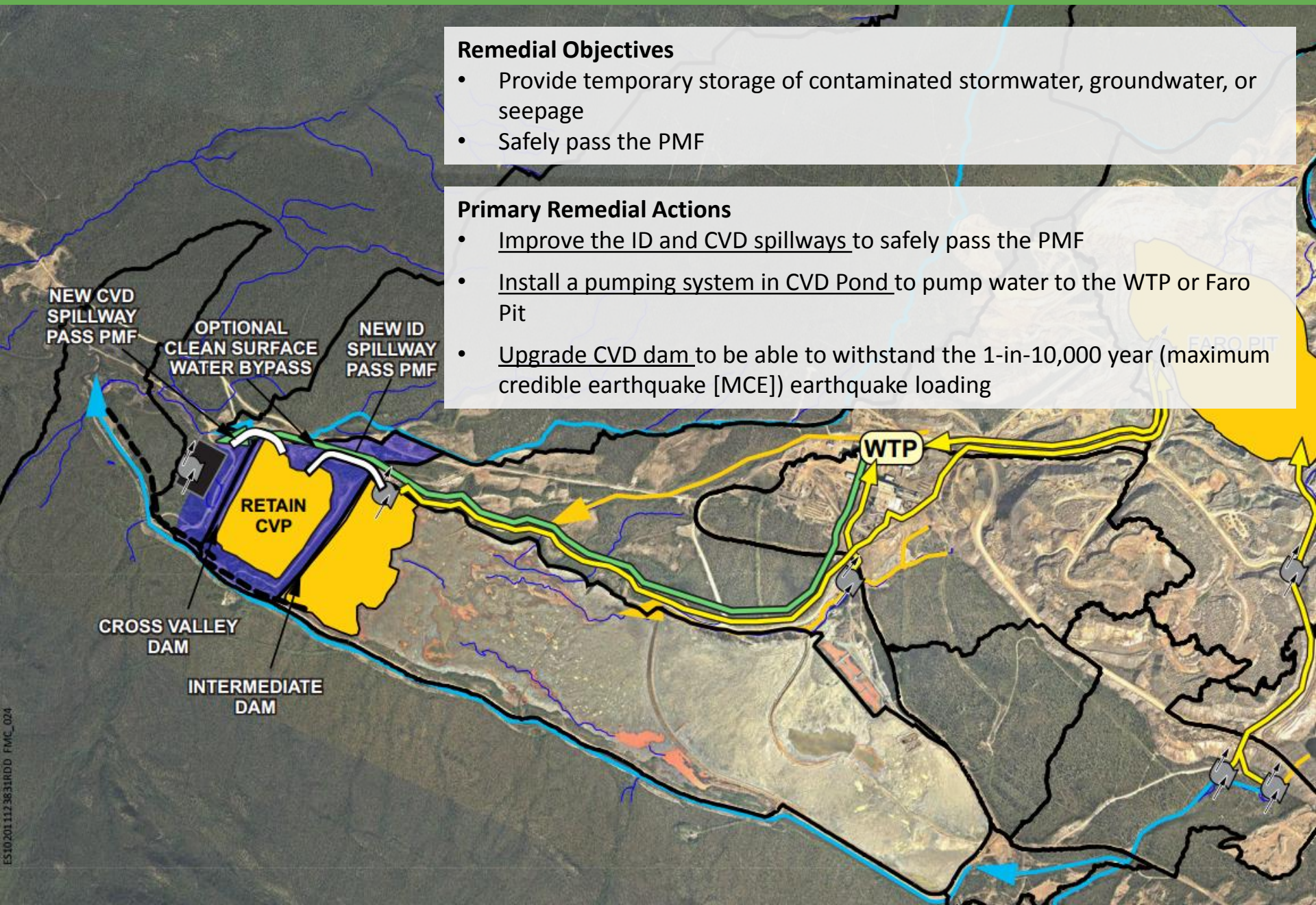
6. Dams and CVP – Impoundment

Remedial Objectives

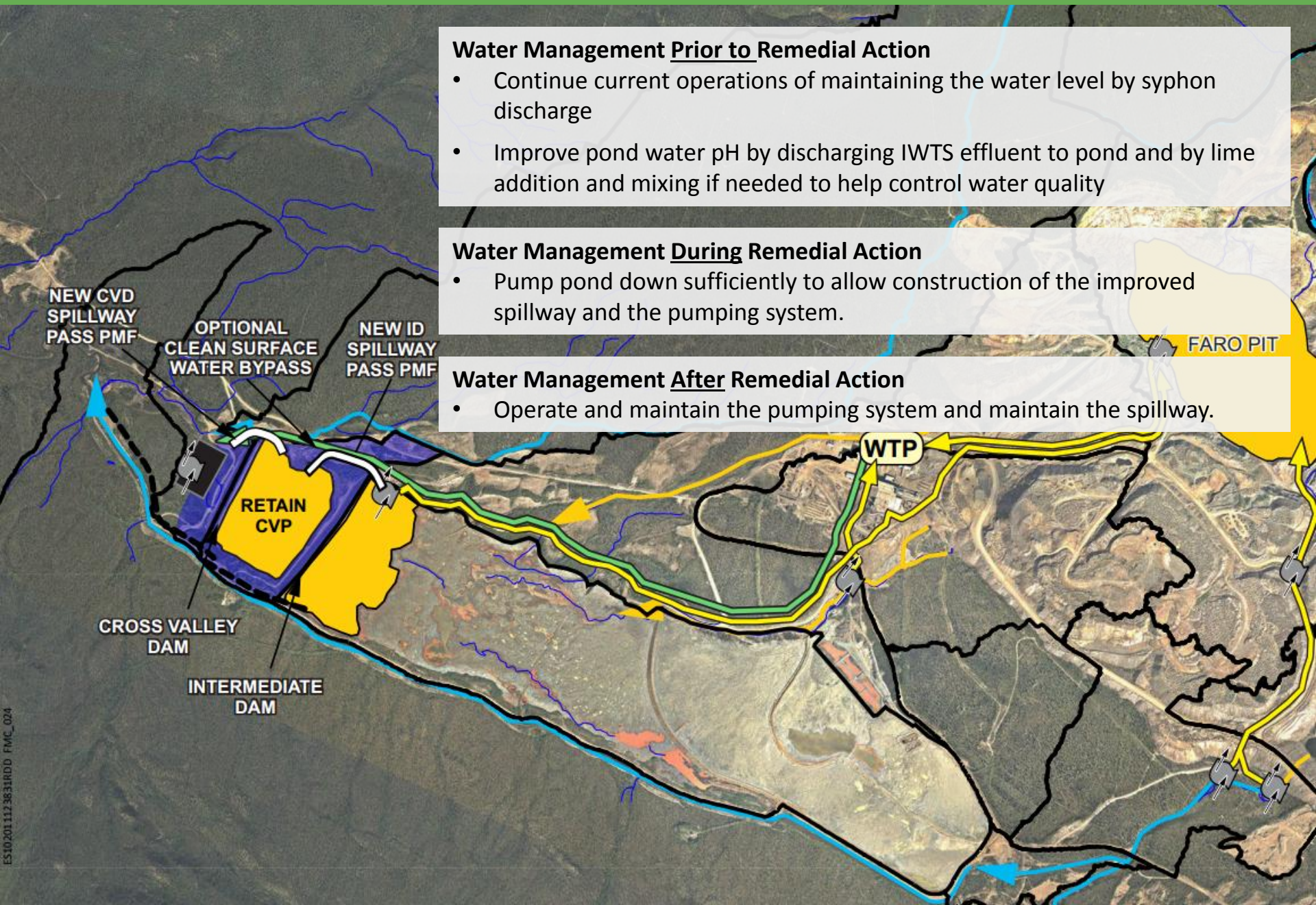
- Provide temporary storage of contaminated stormwater, groundwater, or seepage
- Safely pass the PMF

Primary Remedial Actions

- Improve the ID and CVD spillways to safely pass the PMF
- Install a pumping system in CVD Pond to pump water to the WTP or Faro Pit
- Upgrade CVD dam to be able to withstand the 1-in-10,000 year (maximum credible earthquake [MCE]) earthquake loading



6. Dams and CVP – Impoundment



Water Management <u>Prior to</u> Remedial Action

- Continue current operations of maintaining the water level by syphon discharge
- Improve pond water pH by discharging IWTS effluent to pond and by lime addition and mixing if needed to help control water quality

Water Management <u>During</u> Remedial Action

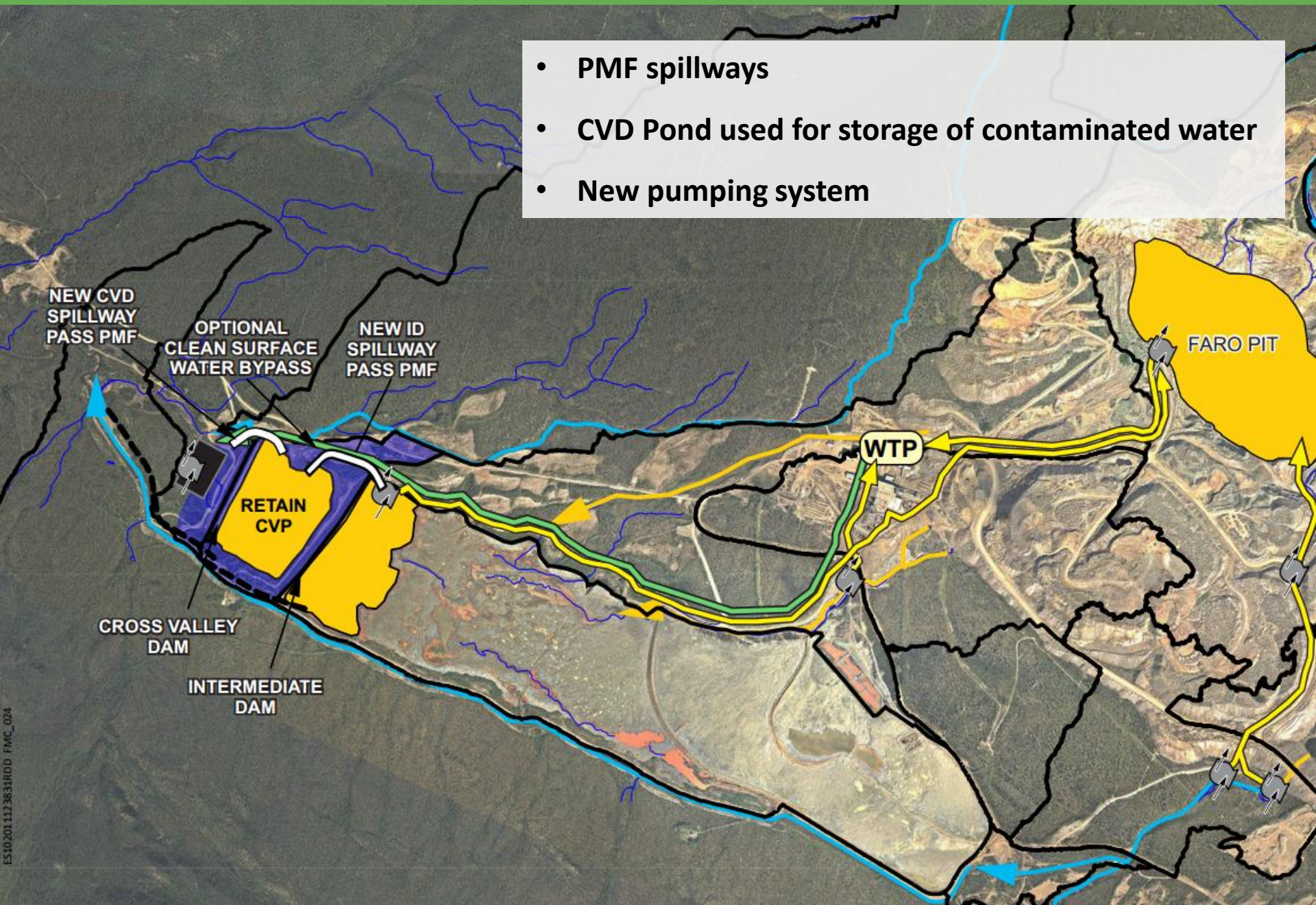
- Pump pond down sufficiently to allow construction of the improved spillway and the pumping system.

Water Management <u>After</u> Remedial Action

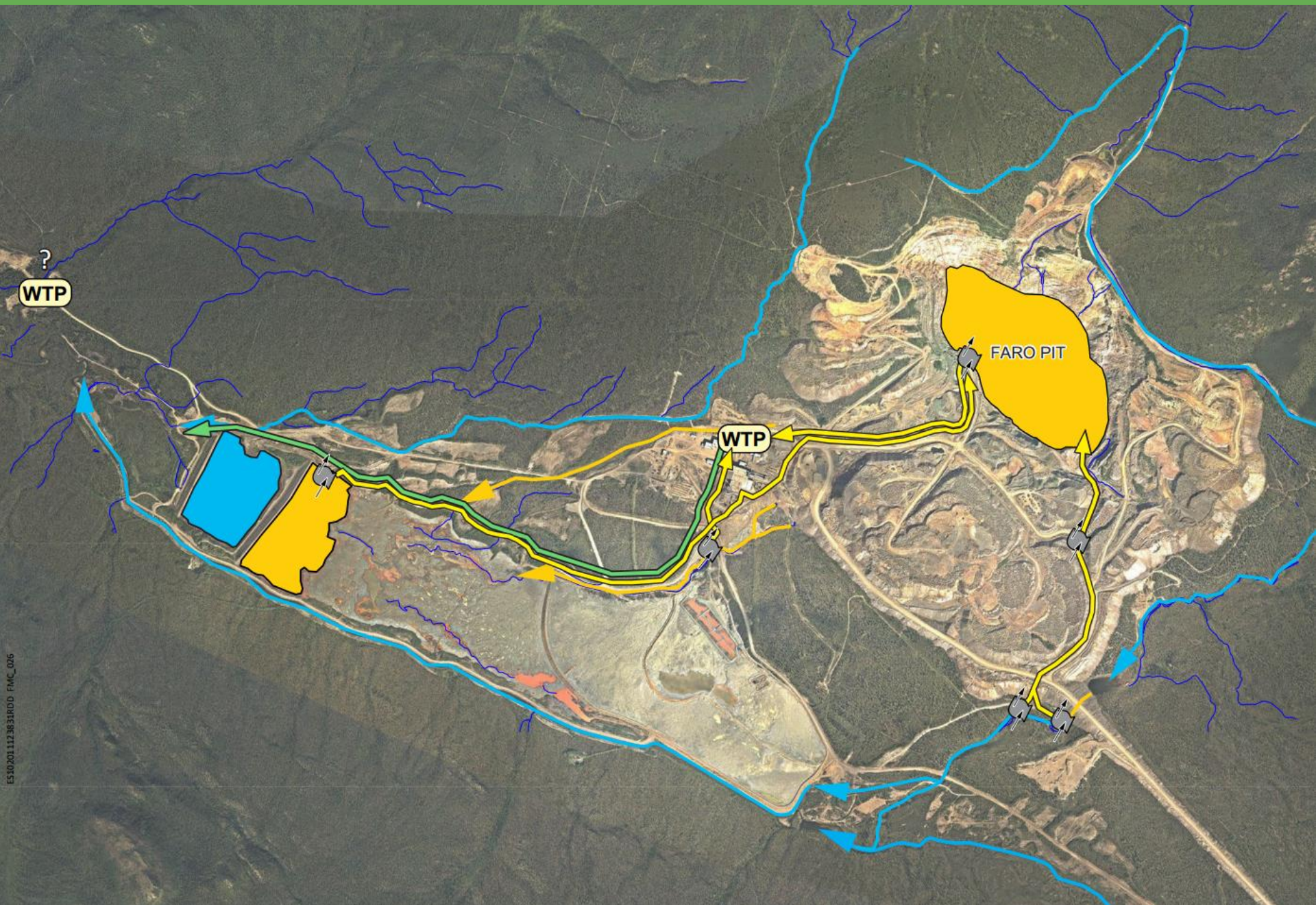
- Operate and maintain the pumping system and maintain the spillway.

6. Dams and CVP – Summary

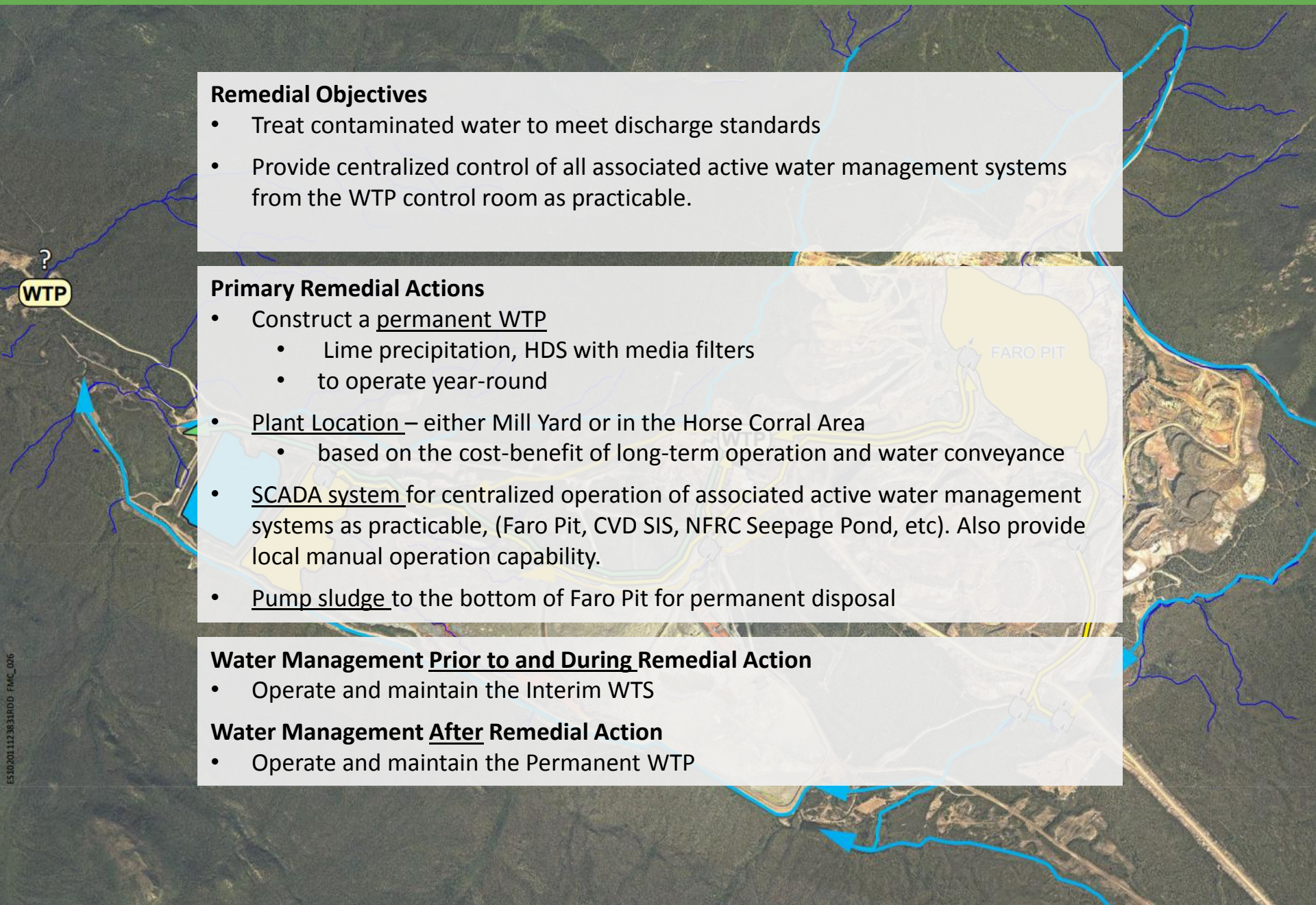
- PMF spillways
- CVD Pond used for storage of contaminated water
- New pumping system



Water Treatment Plant



Water Treatment Plant



Remedial Objectives

- Treat contaminated water to meet discharge standards
- Provide centralized control of all associated active water management systems from the WTP control room as practicable.

Primary Remedial Actions

- Construct a permanent WTP
  - Lime precipitation, HDS with media filters
  - to operate year-round
- Plant Location – either Mill Yard or in the Horse Corral Area
  - based on the cost-benefit of long-term operation and water conveyance
- SCADA system for centralized operation of associated active water management systems as practicable, (Faro Pit, CVD SIS, NFRC Seepage Pond, etc). Also provide local manual operation capability.
- Pump sludge to the bottom of Faro Pit for permanent disposal

Water Management Prior to and During Remedial Action

- Operate and maintain the Interim WTS

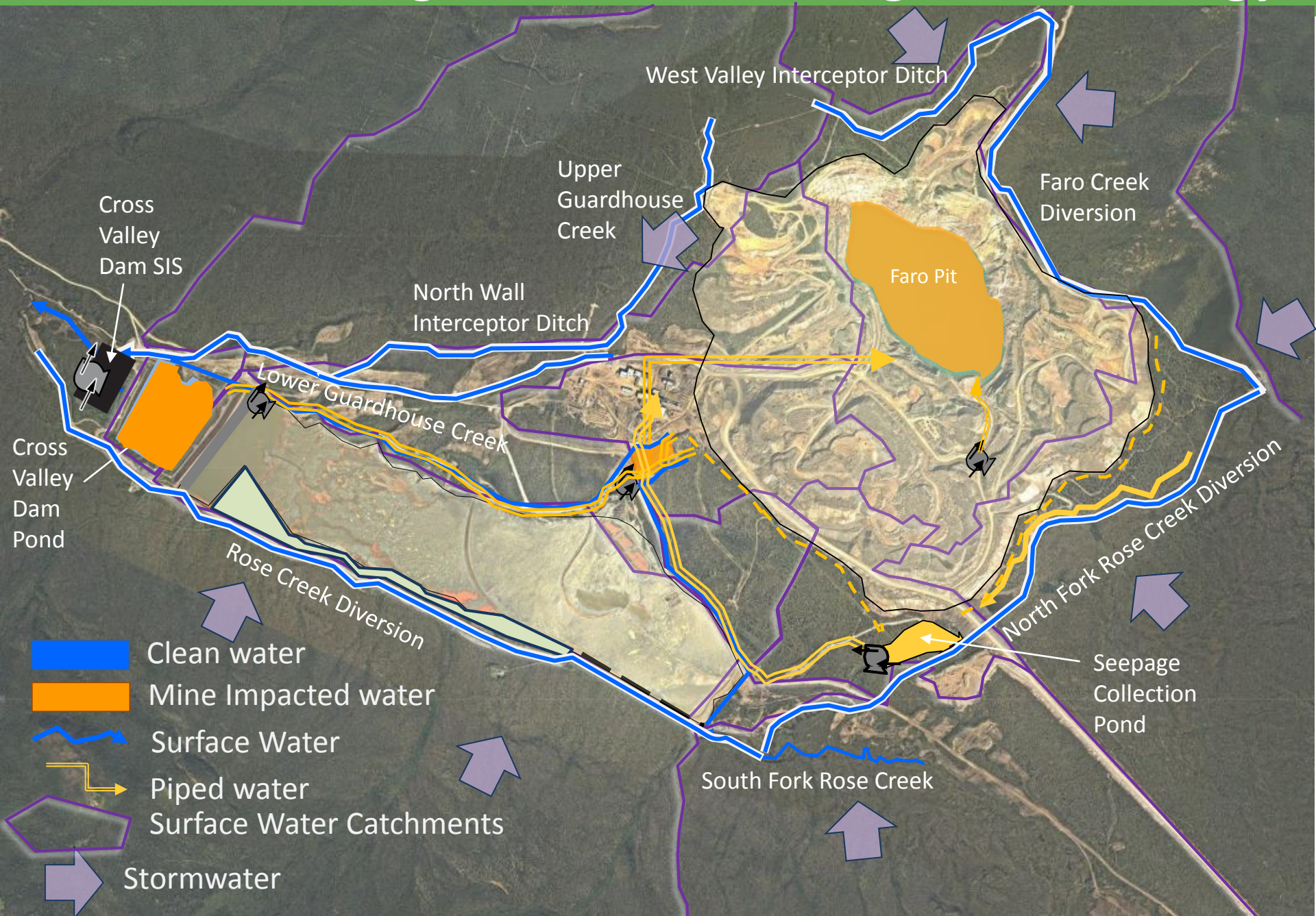
Water Management After Remedial Action

- Operate and maintain the Permanent WTP

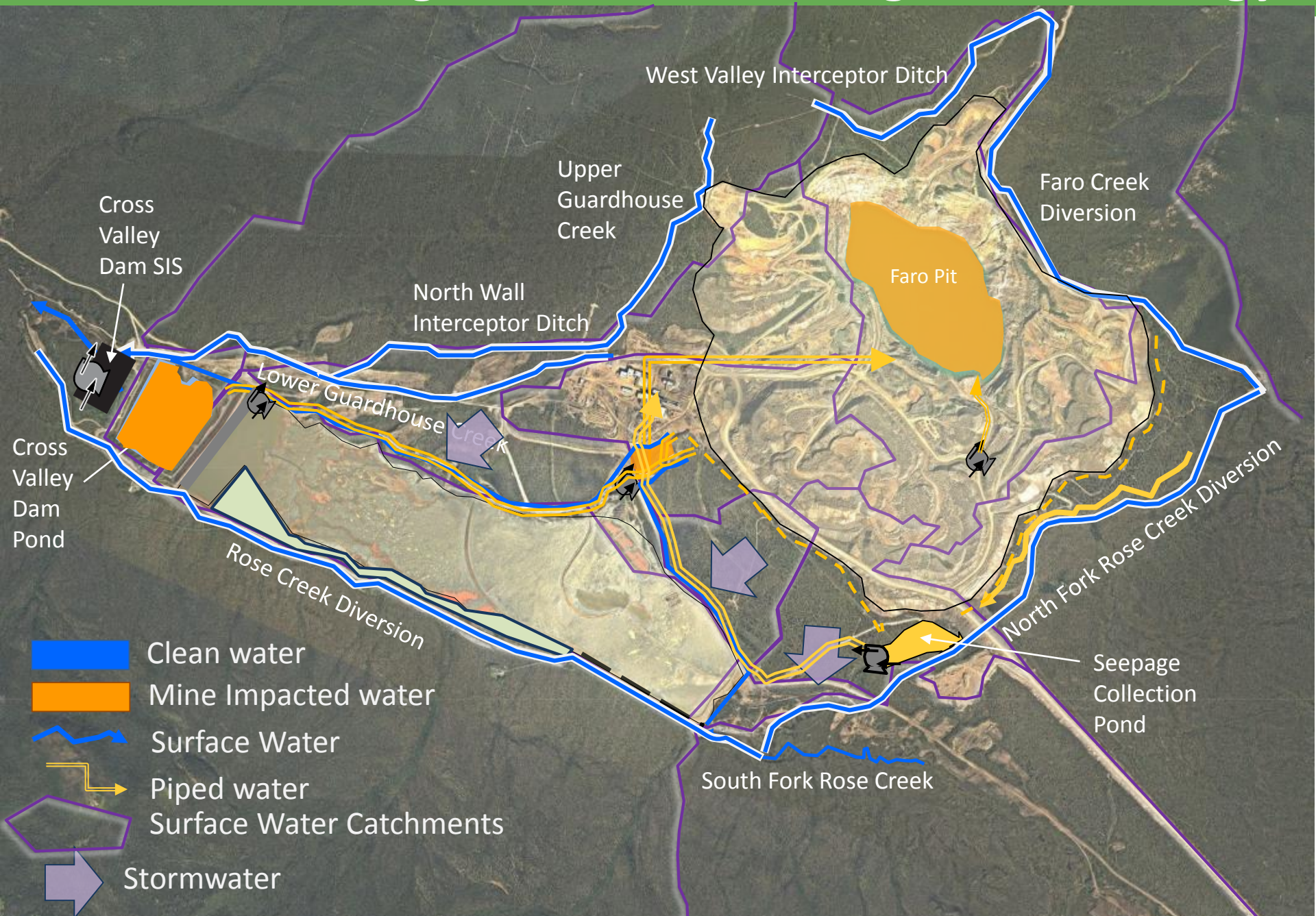
Outcome of Integrated Water Management Strategy



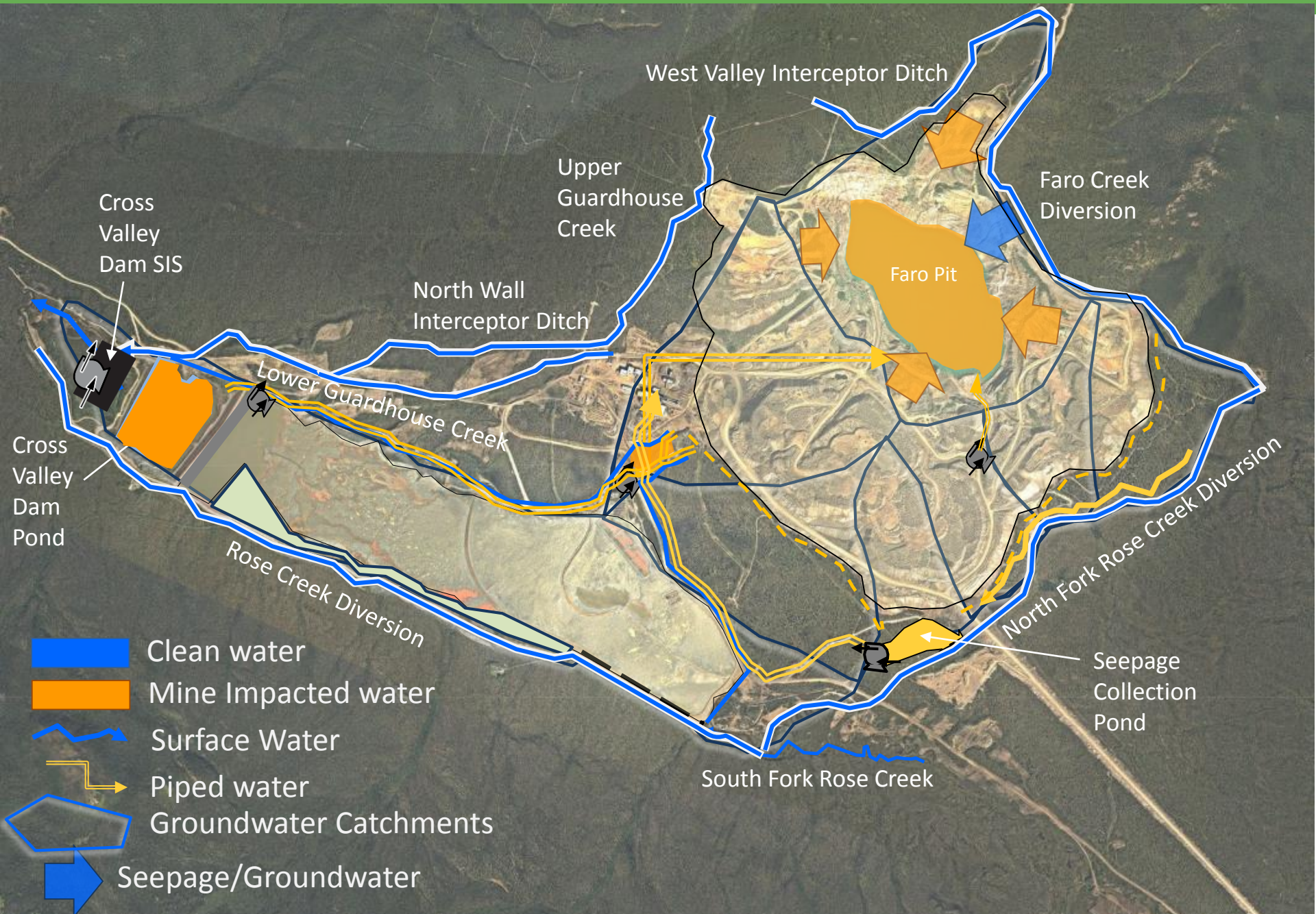
Outcome of Integrated Water Management Strategy



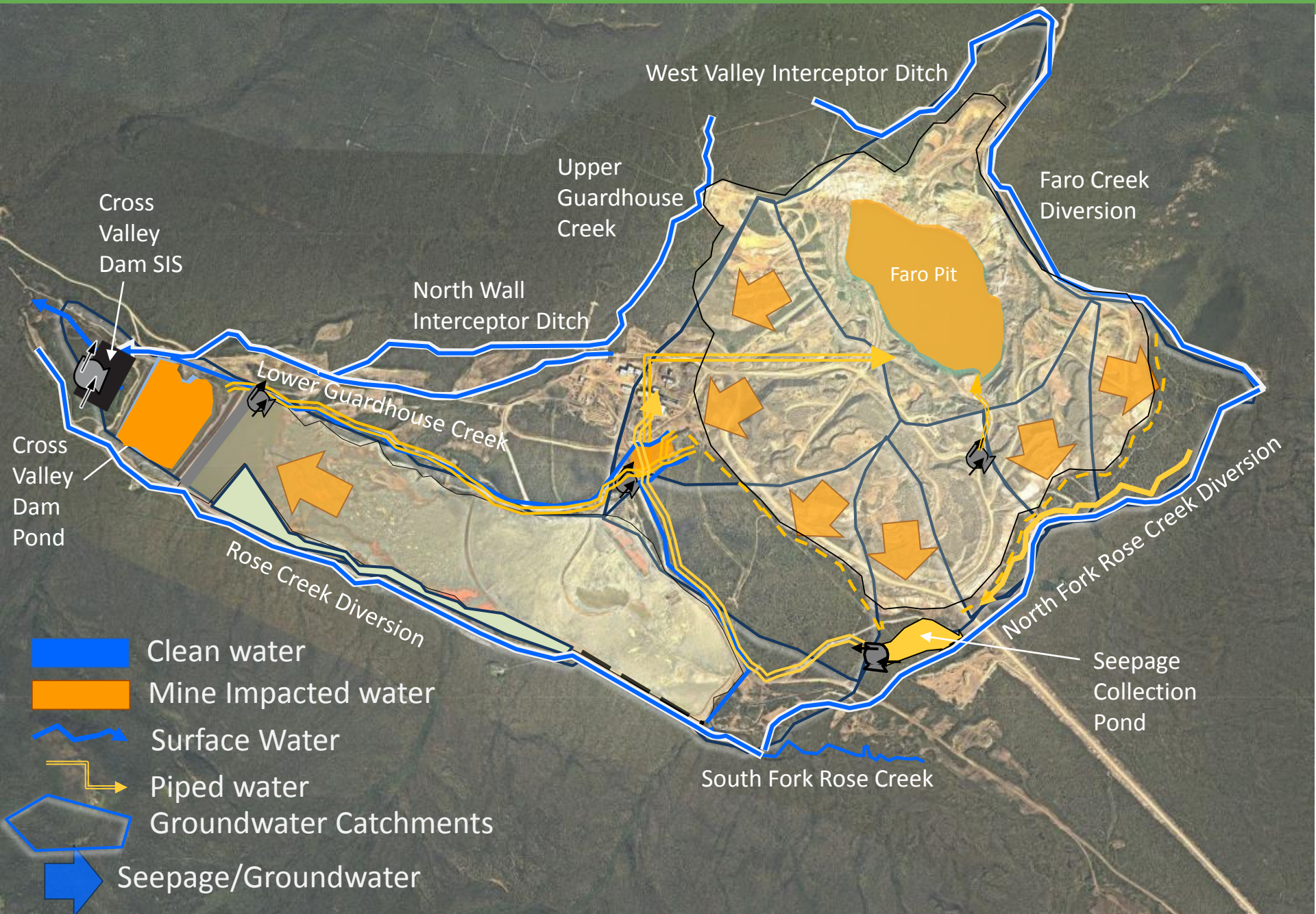
Outcome of Integrated Water Management Strategy



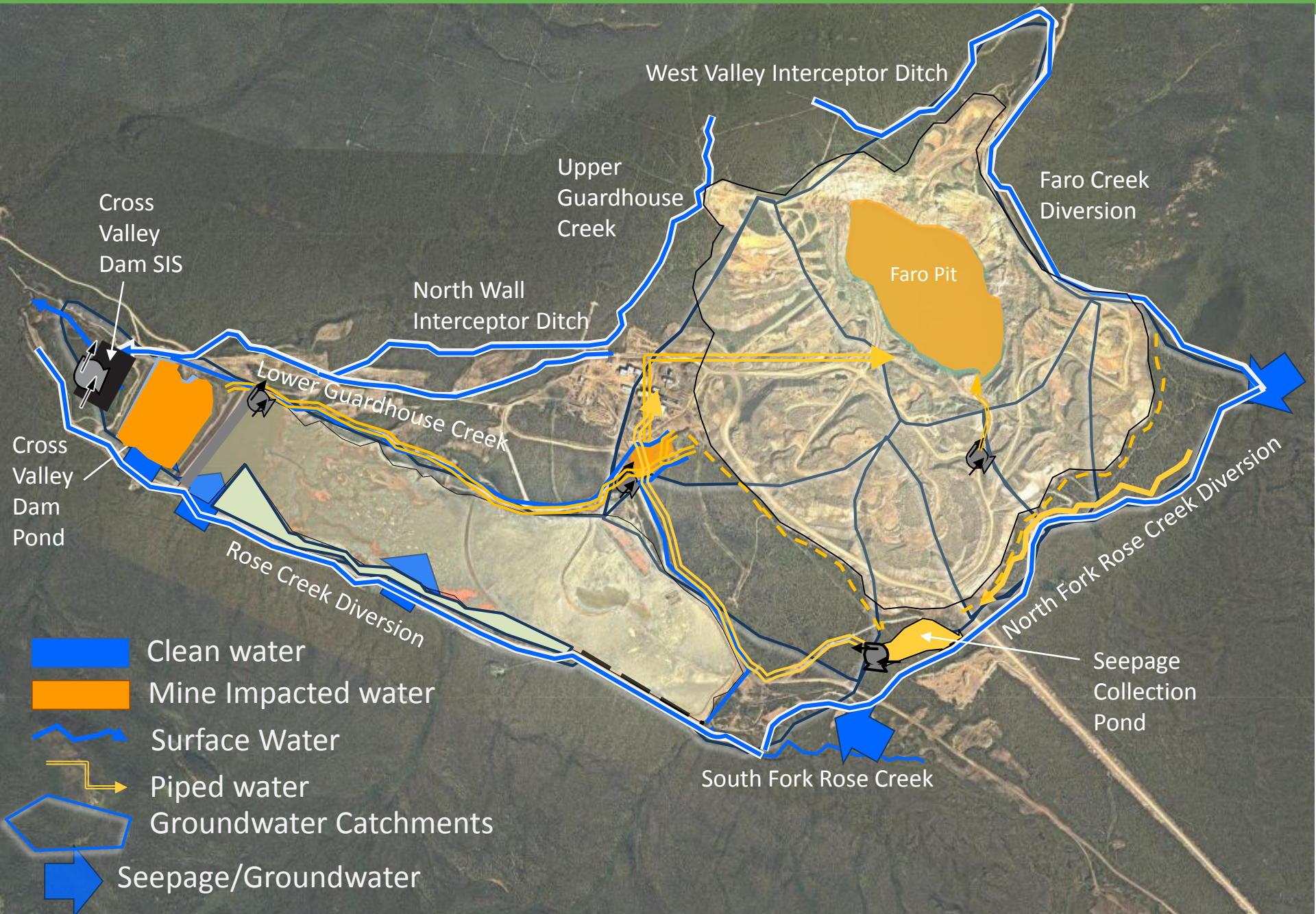
Outcome of Integrated Water Management Strategy



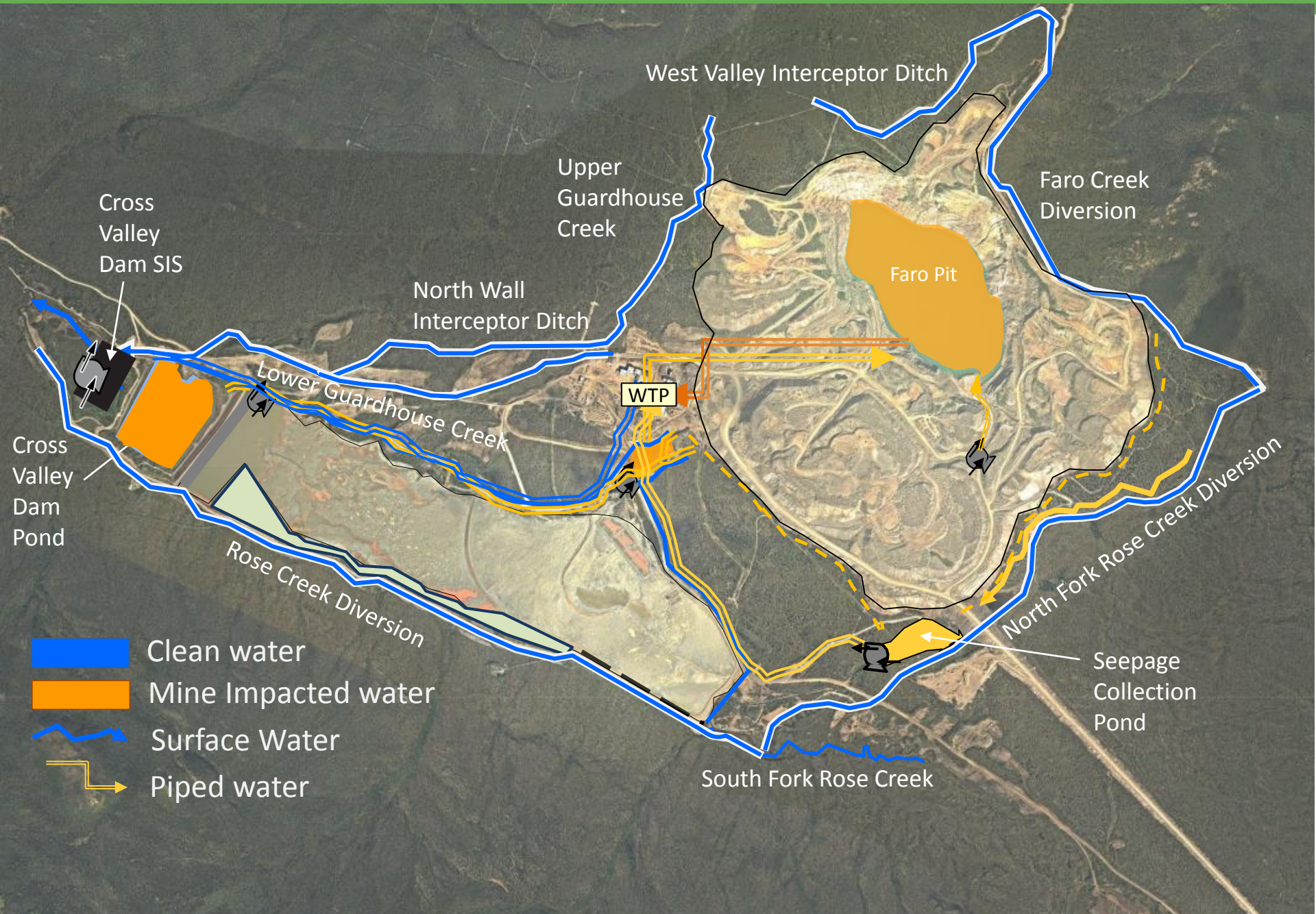
Outcome of Integrated Water Management Strategy



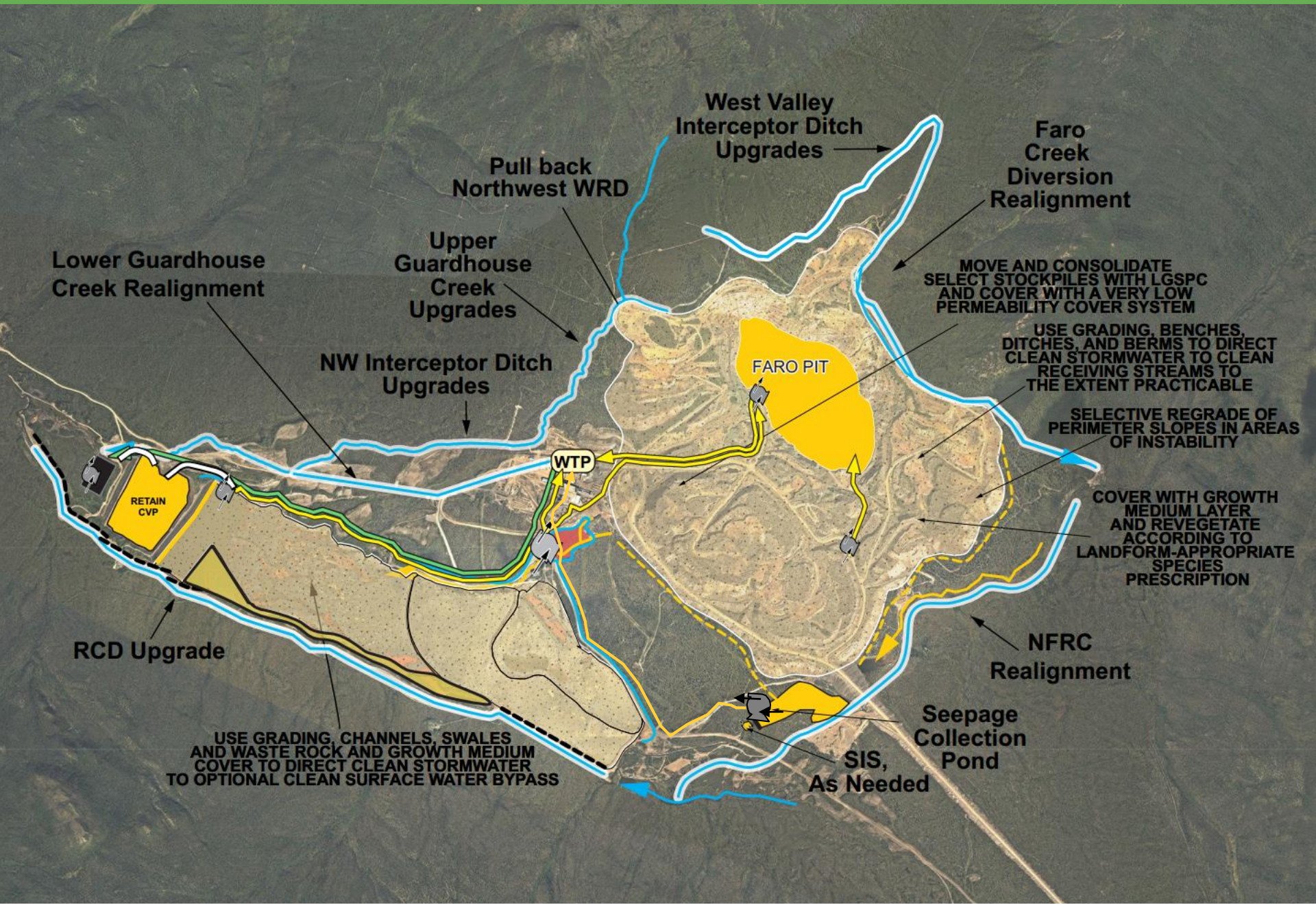
Outcome of Integrated Water Management Strategy



Outcome of Integrated Water Management Strategy



Outcome of Integrated Water Management Strategy



PROJECT DESIGN TEAM

Faro Mine Remediation Project

June 9, 2015



Q&A

Appendix L
Bibliography of CH2M and Team Subcontractor Deliverables

APPENDIX L

Faro Mine Remediation Project Technical Document References

Section 12 – References of this Comprehensive Design Road Map Report (CDRMR), provides a listing of reference documents (prepared by CH2M and others) that are specifically cited in the body of text Sections 1 through 11.

As described in Section 1.2, as an additional way to convey the breadth of the work conducted by CH2M and its team of subcontractors and to assist future engineers and scientists that may work on the Faro Mine Remediation Project, CH2M has compiled its complete bibliography of technical deliverables submitted to YG during the period of performance of the MSA. This complete summary is included in this Appendix. Note that not all contract administration deliverables (such as Task Authorization Requests) are included in this complete summary of technical deliverables.

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CH2M HILL Canada Limited (CH2M HILL). February 2014k. *Task Authorization 015 Cross Valley Dam Seepage Interception System Phase 2 – Basis of Design Report, Faro Mine Remediation Project.* Draft. Prepared for Government of Yukon and the Government of Canada as represented by Aboriginal Affairs and Northern Development Canada. February 14. (30% design)

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