EAGLE GOLD PROJECT

WATER LICENCE QZ14-041

QUARTZ MINING LICENSE QML-0011

2016 ANNUAL REPORT

Version 2017-01

MARCH 2017

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List of Acronyms and Abbreviations

% .... percent

~ .... approximately

ADR .... adsorption, desorption and recovery

BC .... British Columbia

BGC .... BGC Engineering Ltd.

CBA .... Comprehensive Cooperation and Benefits Agreement

CIM .... Canadian Institute of Mining

CDN .... Canadian

EMR .... Yukon Department of Energy, Mines, and Resources

EMSAMP .... Environmental Monitoring, Surveillance and Adaptive Management Plan

FNNND .... First Nation of Na-Cho Nyäk Dun

g/t .... grams per tonne

HLF .... heap leach facility

HPW .... Yukon Department of Highways and Public Works

JDS .... JDS Energy and Mining Inc.

km .... kilometres

LDRS .... leak detection and recovery system

LoM .... Life of Mine

m .... meters

MMER .... Metal Mining Effluent Regulations

Mt .... megatonnes (million tonnes)

N/A .... not applicable

NA. .... data not available

PLS .... pregnant leach solution

Project .... Eagle Gold Project

QA/QC .... quality assurance/quality control

QML .... quartz mining licence

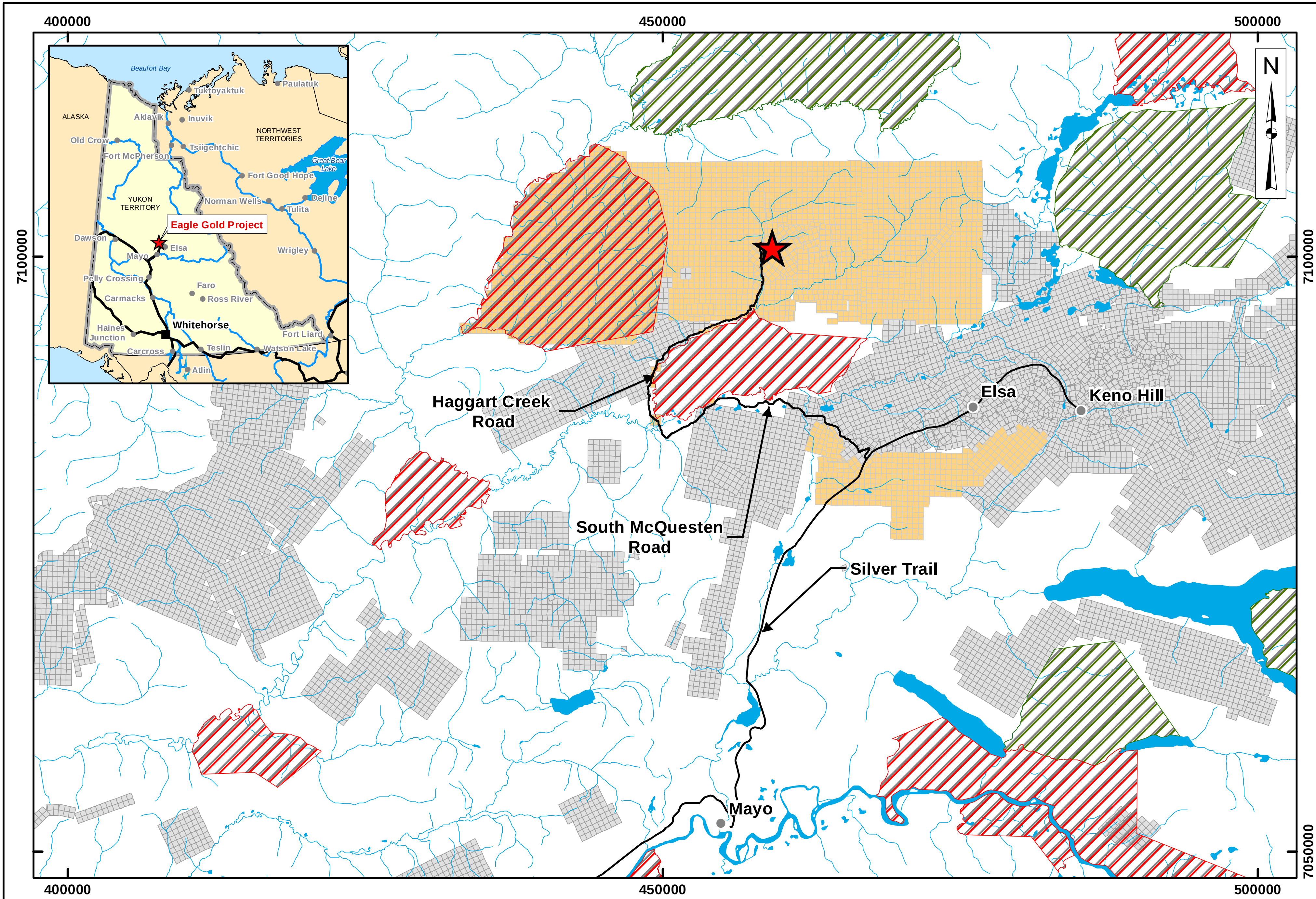
RCP	Reclamation and Closure Plan
RoW	right of way
SGC	StrataGold Corporation
VGC	Victoria Gold Corp.
WRSA	waste rock storage area
WUL	Water Use Licence
YWB	Yukon Water Board

1 INTRODUCTION

StrataGold Corporation (SGC), a directly held-wholly owned subsidiary of Victoria Gold Corp., has proposed to construct, operate, close and reclaim a gold mine in central Yukon. The Eagle Gold Project ('the Project') is located 85 km from Mayo Yukon using existing highway and access roads (Figure 1.1-1). The Project will involve open pit mining and gold extraction using a three stage crushing process, heap leaching, and a carbon adsorption, desorption, and recovery system over the mine life (Figure 1.1-2).

SGC received a Type A Water Use Licence (WUL) QZ14-041 and Quartz Mining License (QML) QML-0011 on December 3, 2015 and March 24, 2016, respectively. To date, no activities associated with the scope of these authorizations have taken place and SGC has not provided written notice of its intent to commence the development of the Project.

The reporting period for this Annual Report is from the effective date of the Type A WUL QZ14-041 (December 3, 2015) to December 31, 2016 which is inclusive of the reporting period required under QML-0011 (March 24, 2016 to December 31, 2016). Subsequent years' annual reports will cover the period to between January 1 and December 31 of each year and will be submitted annually by March 31st in the following year as required by both licenses. The specific requirements for the Annual Report as outlined in the respective licences are summarized in Appendix A.



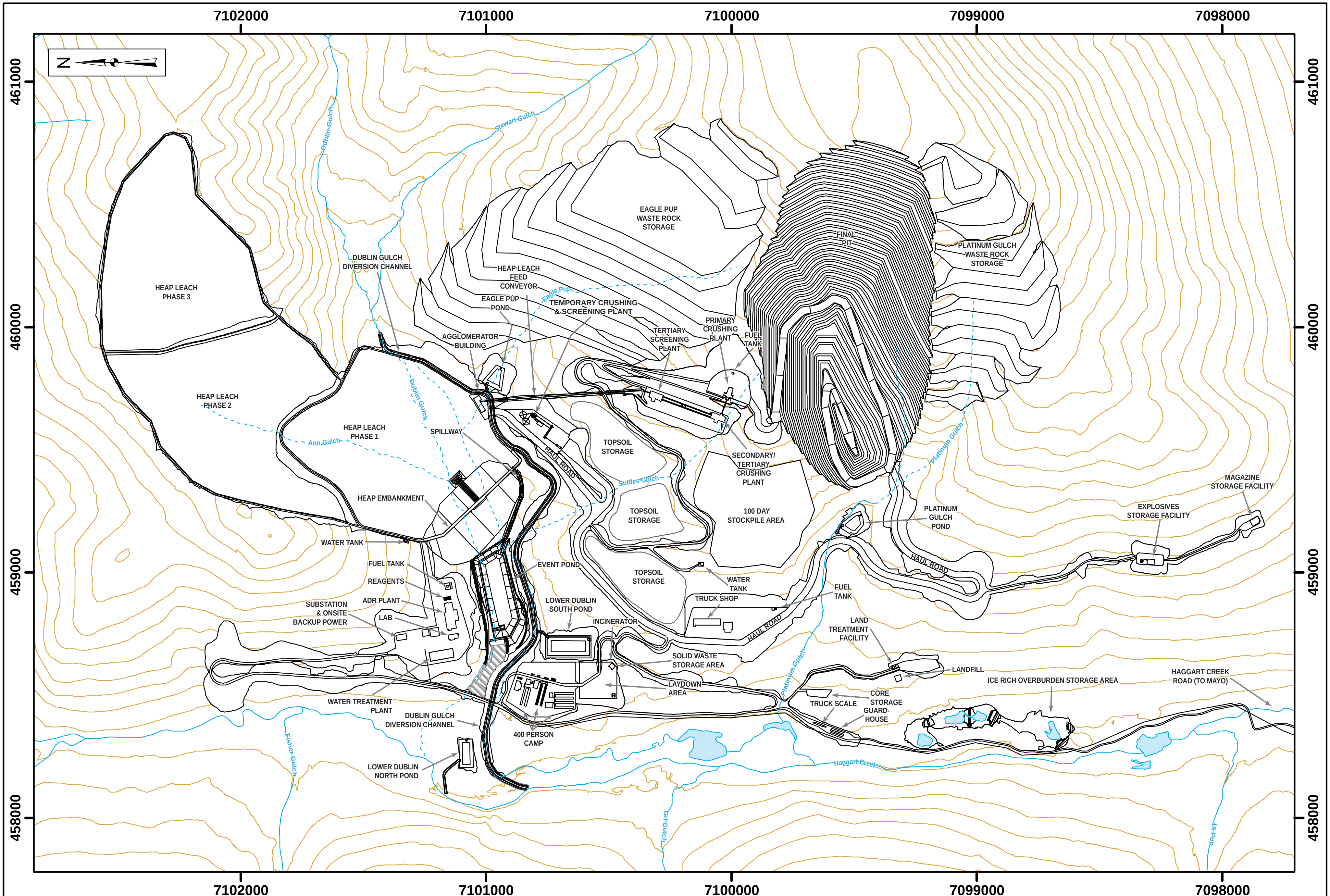
Legend:

Eagle Gold Project	Town / Village	Category A Settlement Land
StrataGold Claims	Road	Category B Settlement Land
Other Claims	Watercourse	

StrataGold Corporation

0 3 6 12 Kilometres

Projection: NAD 83 Zone 8N	Drawn By: HC	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2017/03/28	Figure: 1.1-1	**Project Location**



Legend:

General Arrangement Infrastructure	Watercourse
Reserved Area	Watercourse (Diverted)
Contour (25m)	Waterbody

StrataGold Corporation

0 125 250 500
Metres

Projection: NAD83 UTM Zone 8N

Drawn By: HC

Date: 2017/03/28

Figure: 1.1-2

EAGLE GOLD PROJECT
YUKON TERRITORY

Project General Arrangment

2 SITE ACTIVITIES

A summary of site activities for the reporting period, background information on the Project, and site activities planned 2017 is provided below. Activity at the Project site during the reporting period has involved the continued collection of baseline environmental data as required by Section 113 of the Type A WUL QZ14-041 and ongoing hard rock exploration.

Neither construction nor operation of the Project commenced in 2016.

2.1 EXPLORATION

No exploration associated with the Eagle Deposit was conducted in 2016 as exploration focused on regional targets located within the greater Dublin Gulch property. Full details on the 2016 exploration program will be provided in a separate document that describes the annual reporting required by the regulatory approvals related to the ongoing exploration on the Dublin Gulch property.

2.2 OVERVIEW OF CONSTRUCTION

No development activities authorized by the Type A WUL QZ14-041 nor QML-0011 have taken place, nor has SGC provided written notice of its intent to commence the Undertaking.

A tentative construction schedule, which is highly dependent on a number of variables such as SGC's ability to secure financing on favorable terms and equipment and personnel availability, is presented in Table 2.2-1.

Table 2.2-1: Construction Schedule

Phase	Schedule
Baseline Phase	Prior to commencement of construction
Construction (Development)	Q2 2017 – Q2 2019
Operations (Production) 9.2 years[1]	Q2 2019 – Q1 2029
Reclamation and Closure 10 years[2]	Q2 2029 – Q2 2039
Post-Closure Monitoring	Q3 2039 – TBD

NOTE:

[1] limited to active mining operations (ore loading) and does not include residual leaching phase prior to HLF drain-down

[2] includes drain-down of HLF – estimated to be approximately 10 years conservatively estimated to allow for active water treatment. Reclamation earthworks such as re-contouring, revegetation and facility capping will be complete within 2-3 years of start of reclamation phase.

Construction activities will include:

- Camp expansion including septic field expansion to accommodate the construction and operation workforce, and installation and commissioning of a potable water treatment plant.
- Access road upgrades such as minor realignments, construction of pullouts, grading, resurfacing and drainage improvements.
- Site road construction to provide access to construction and mining areas.

- Water management including the construction of diversions, ditches and other sediment and erosion control measures.
- Clearing, grubbing and bulk earthworks for roads, infrastructure and facilities.
- Waste management including the construction of a solid waste management area and a hazardous waste management area for temporary storage of hazardous waste prior to final disposal in approved facilities.
- Transmission line construction from Silver Trail tap point to site, including clearing and grubbing of right of way (RoW), pole installation, conductors and substation construction.
- Construction of concrete foundations and erection of buildings including installation of mechanical, piping, electrical and instrumentation.
- Initial development of Waste Rock Storage Areas (WRSAs) including clearing and grubbing, bulk earthworks, and rock drain and toe berm construction.
- Development of the Heap Leach Facility (HLF) including a rock filled embankment (dam) and the In-Heap Pond; a composite liner system; solution recovery wells; associated piping network for solution collection and distribution; a leak detection and recovery system (LDRS); and a down-stream Events Pond.

2.3 OVERVIEW OF MINING

No mining or production activities authorized by the Type A WUL QZ14-041 nor the QML-0011 has taken place. Additionally, SGC has not provided written notice of its intent to commence the Undertaking as required by the regulatory approvals for the Project. The discussion provided herein relates only to the mining activities contemplated in the applications for the regulatory approvals and is included for illustrative purposes only.

During operations, the open pit will be developed using standard drill and blast technology. Ore will be transported from the open pit by haul truck and delivered to the first stage crushing plant (the primary crusher), situated on the north side of the open pit rim. Waste rock will be removed from the open pit by haul truck and delivered to one of two WRSAs (Platinum Gulch or Eagle Pup WRSAs) or will be used as haul road and infrastructure construction material.

Ore will be crushed to a passing 80 percent (P80) particle size of 6.4 mm in a 3-stage crushing process. All three crushing stages will be located north of the open pit. Ore will be conveyed between the primary crushing station and the secondary and tertiary crushing stations by covered conveyor or enclosed conveyor gallery. After the tertiary crushing stage, ore will be transported by covered conveyor to the HLF area where the ore will be stacked on the heap leach pad via a series of portable conveyors and finally a radial stacking conveyor.

Gold extraction will utilize cyanide heap leaching technology. Process solution containing cyanide will be applied to the ore to extract gold and will then be collected by the HLF leachate collection and recovery system.

Gold-bearing “pregnant” solution (pregnant leach solution [PLS]) will be pumped from the HLF to the gold recovery plant. Gold will be recovered from the PLS by activated carbon adsorption and desorption, followed by electro-winning onto steel cathodes, and on-site smelting to gold doré. This process is referred to as the adsorption, desorption, and recovery (ADR) process. The gold-barren leach solution that remains after passing through the carbon columns will be re-circulated back to the HLF.

2.3.1 Ore, Waste and Gold Production

For the reporting period, no material has been removed from the proposed open pit and no gold production has occurred. The discussion provided below relates only to the ore, waste and gold production contemplated in the applications for the regulatory approvals and is included for illustrative purposes only.

The total amount of ore and waste to be removed from the open pit over the life of the Project is approximately 91.6 Mt and 132.4Mt, respectively; and the estimated total amount of gold to be produced over the life of mine is 1,676,000 oz (Table 2.3-1). Figure 2.3-1 shows ore and waste to be removed from the open pit by year.

Upon the commencement of open pit development, waste rock is scheduled to go to one of two areas:

- Platinum Gulch WRSA: The Platinum Gulch WRSA will be filled within the first three years of production and contain approximately 13.7 Mt.
- Eagle Pup Waste WRSA: The Eagle Pup WRSA will contain approximately 118.7 Mt of waste rock over the LoM.

Table 2.3-2 provides the various material types removed from the pit by year and to each destination (waste material to Eagle Pup or Platinum Gulch WRSAs and ore to primary crusher, temporary ore stockpile and HLF). The pre-strip material (approx. 5Mt) is included in the Year 0 quantities.

Table 2.3-1: Mine Production Schedule

←Pre-Production		Operations →										
Year	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**
Ore Tonnes (000's)		1,284	9,720	10,607	10,544	10,589	10,634	10,647	10,654	10,302	6,613	**91,594**
Ore Grade		0.890	0.933	0.963	0.889	0.804	0.781	0.785	0.630	0.590	0.581	**0.782**
Contained oz (000's)		37	291	328	301	274	267	269	216	195	123	**2,300**
Expected Recovery		75.7%	74.9%	76.4%	73.3%	73.0%	72.8%	70.6%	70.4%	69.9%	69.1%	**72.8%**
Recovered oz (000's)		28	218	251	221	200	194	190	152	137	85	**1,676**
Ore Mined (000's)		1,284	9,720	10,607	10,544	10,589	10,634	10,647	10,654	10,302	6,613	**91,594**
Waste Mined (000's)	4,805	1,089	17,735	15,214	16,622	17,921	17,841	12,908	12,570	11,767	3,938	**132,410**
Total Mined (000's)	**4,805**	**2,373**	**27,455**	**25,821**	**27,166**	**28,510**	**28,475**	**23,555**	**23,224**	**22,069**	**10,551**	**224,004**

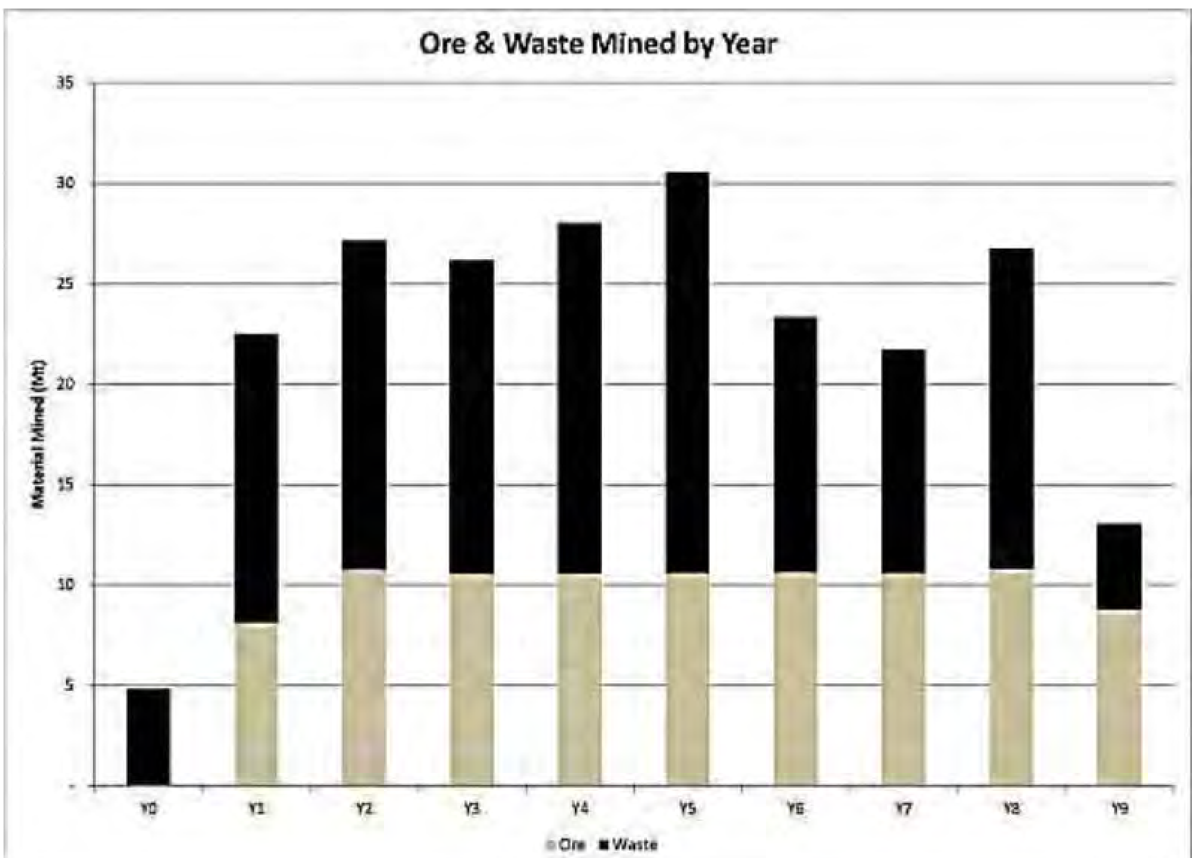


Figure 2.3-1: Ore and Waste Mined by Year

Table 2.3-2: Indicative Tonnes of Ore and Waste Types Mined from the Pit

Destination	Waste Type	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Total
Ore to Primary Crusher	**Total**	**-**	**8,164,923**	**10,784,982**	**10,560,834**	**10,577,611**	**10,624,532**	**10,660,782**	**10,606,367**	**10,796,825**	**8,817,445**	**91,594,300**
	oxide granodiorite	-	5,754,756	6,966,280	5,539,945	4,196,398	4,887,385	1,644,590	1,576,382	1,252,777	193,537	**32,012,052**
	altered granodiorite	-	108,498	96,899	944,469	1,082,230	1,091,744	2,035,268	1,646,217	2,162,124	1,820,768	**10,988,215**
	fresh granodiorite	-	507,317	962,970	3,555,185	5,178,943	4,300,796	6,722,433	7,132,919	7,125,821	6,343,101	**41,829,486**
	oxide metased	-	1,770,830	2,498,774	358,928	63,760	261,143	149,089	118,798	256,103	96,323	**5,573,748**
	fresh metased	-	23,522	260,059	162,307	56,280	83,464	109,401	132,051	-	363,716	**1,190,799**
	ovb	-	-	-	-	-	-	-	-	-	-	**-**
Primary crusher to heap leach		-	8,164,923	7,834,982	7,610,834	7,627,611	7,674,532	7,710,782	7,656,367	7,846,825	5,867,445	**67,994,300**
Primary crusher to 100-day SP		-	-	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	**23,600,000**
Temporary ore stockpile to heap leach		-	-	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	2,950,000	**23,600,000**
Waste to Eagle Pup	**Total**	**3,905,000**	**8,469,132**	**14,058,609**	**10,974,437**	**17,429,108**	**19,897,081**	**12,672,695**	**11,113,069**	**15,939,582**	**4,251,145**	**118,709,858**
	oxide granodiorite	352,859	954,400	4,062,186	1,642,610	3,905,114	4,053,319	938,430	874,540	4,211,731	328,038	**21,323,229**
	altered granodiorite	-	8,951	30,972	601,560	229,110	354,667	1,214,224	918,068	1,026,342	309,088	**4,692,982**
	fresh granodiorite	5,679	157,507	169,308	1,260,939	2,401,825	2,114,709	5,342,899	4,015,937	5,216,601	2,497,816	**23,183,220**
	oxide metased	695,684	3,399,082	4,905,129	2,213,983	4,859,466	2,625,667	3,238,308	3,124,857	3,437,740	739,948	**29,239,865**
	fresh metased	37,527	-	3,798,259	1,941,274	5,435,469	9,443,942	1,349,424	1,066,130	602,736	359,082	**24,033,841**
	ovb	2,813,252	3,949,192	1,092,755	3,314,070	598,123	1,304,776	589,410	1,113,538	1,444,433	17,172	**16,236,721**
Waste to Platinum Gulch	**Total**	**900,000**	**5,900,000**	**2,300,000**	**4,600,000**	**-**	**-**	**-**	**-**	**-**	**-**	13,700,000
	oxide granodiorite	-	-	-	-	-	-	-	-	-	-	**-**
	altered granodiorite	-	-	-	-	-	-	-	-	-	-	**-**
	fresh granodiorite	-	-	-	-	-	-	-	-	-	-	**-**
	oxide metased	900,000	2,082,364	1,350,435	1,859,102	-	-	-	-	-	-	**6,191,901**
	fresh metased	-	1,319,168	949,565	2,372,668	-	-	-	-	-	-	**4,641,401**
	ovb	-	2,498,468	-	368,230	-	-	-	-	-	-	**2,866,699**
Total Waste	**Total**	**4,805,000**	**14,369,132**	**16,358,609**	**15,574,437**	**17,429,108**	**19,897,081**	**12,672,695**	**11,113,069**	**15,939,582**	**4,251,145**	**132,409,858**
	oxide granodiorite	352,859	954,400	4,062,186	1,642,610	3,905,114	4,053,319	938,430	874,540	4,211,731	328,038	**21,323,229**
	altered granodiorite	-	8,951	30,972	601,560	229,110	354,667	1,214,224	918,068	1,026,342	309,088	**4,692,982**
	fresh granodiorite	5,679	157,507	169,308	1,260,939	2,401,825	2,114,709	5,342,899	4,015,937	5,216,601	2,497,816	**23,183,220**
	oxide metased	1,595,684	5,481,446	6,255,564	4,073,085	4,859,466	2,625,667	3,238,308	3,124,857	3,437,740	739,948	**35,431,766**
	fresh metased	37,527	1,319,168	4,747,823	4,313,942	5,435,469	9,443,942	1,349,424	1,066,130	602,736	359,082	**28,675,242**
	ovb	2,813,252	6,447,661	1,092,755	3,682,300	598,123	1,304,776	589,410	1,113,538	1,444,433	17,172	**19,103,420**
Total Material	**Total**	**4,805,000**	**22,534,054**	**27,143,590**	**26,135,271**	**28,006,719**	**30,521,612**	**23,333,477**	**21,719,436**	**26,736,407**	**13,068,590**	**224,004,158**
	oxide granodiorite	352,859	6,709,156	11,028,466	7,182,556	8,101,513	8,940,704	2,583,020	2,450,923	5,464,508	521,576	**53,335,281**
	altered granodiorite	-	117,448	127,871	1,546,029	1,311,340	1,446,411	3,249,492	2,564,285	3,188,466	2,129,856	**15,681,197**
	fresh granodiorite	5,679	664,824	1,132,279	4,816,124	7,580,768	6,415,505	12,065,332	11,148,856	12,342,422	8,840,917	**65,012,705**
	oxide metased	1,595,684	7,252,275	8,754,338	4,432,013	4,923,226	2,886,810	3,387,397	3,243,655	3,693,843	836,271	**41,005,513**
	fresh metased	37,527	1,342,690	5,007,882	4,476,249	5,491,748	9,527,406	1,458,825	1,198,180	602,736	722,798	**29,866,041**
	ovb	2,813,252	6,447,661	1,092,755	3,682,300	598,123	1,304,776	589,410	1,113,538	1,444,433	17,172	**19,103,420**

2.3.2 Heap Leach Facility Construction

The HLF is a valley fill design that incorporates a rock filled embankment (dam) that will provide stability to the base of the heap and the stacked ore. The dam will also provide for the storage and management of cyanide process solutions within the heap, which eliminates the need for downstream pregnant and barren process solution ponds or tanks. The HLF will be progressively developed in three phases: one phase during initial construction (pre-mining), and two phases during mining operations. The phase 1 pad will be constructed in preproduction to accommodate a maximum of three years of ore production. The construction of the Phase 2 pad will start at the beginning of Year 3 of operations, at the latest. The Phase 2 heap stacking will begin in Year 4 and conclude at the end of Year 7 of operation. The Phase 3 pad will be constructed by end of Year 7 to accommodate stacking from Year 8 of operation to Year 10.

2.3.3 Reserves and Mine Life Update

The reserve and mine life update discussed herein has not been presented to any regulatory body for formal consideration within the context of any regulatory approval. The discussion below has been provided to comply with the annual reporting requirements of the existing licenses for the Project.

An updated mineral resource and reserve estimate for the Eagle Pit was prepared in 2016 and publicly disclosed in the “NI 43-101 Feasibility Study Technical Report for the Eagle Project, Yukon Territory, Canada” prepared by JDS Energy & Mining Inc. (JDS), published September 12, 2016. The mineral resource estimate has been classified as “Measured”, “Indicated” and Inferred” according to the Canadian Institute of Mining and Metallurgy (CIM) “CIM Standards on Mineral Resources and Reserves: Definitions and Guidelines” (May 2014). The current Eagle mineral resources (Table 2.3-3) are reported as in-pit resources at a cut-off grade of 0.15 g/t Au.

Table 2.3-3: Constrained Eagle Deposit Mineral Resources Estimate

Classification	Quantity (Mt)	In situ Gold Grade (g/t)	Contained Gold (koz)
Measured	29.4	0.81	761
Indicated	151.3	0.59	2,870
Combined	**180.7**	**0.63**	**3,631**
Inferred	17.4	0.49	276

Source: JDS 2016.

NOTES:

1. Eagle Deposit Mineral Resources estimate only
2. Mineral Resources are estimated at a cut-off of 0.15 g/t Au
3. Gold price used for this estimate was US$1,700/oz
4. High-grade caps were applied as per the text of JDS 2016
5. Specific gravity was estimated for each block based on measurements taken from core specimens
6. Resources are In-pit resources as defined by pit parameters described in the text of JDS 2016
7. Mineral Resources are not Mineral Reserves and do not have demonstrated economic viability. There is no certainty that all or any part of the Mineral Resources estimated will be converted into Mineral Reserves. The estimate of Mineral Resources may be materially affected by environmental, permitting, legal, title, taxation, socio-political, marketing, or other relevant issues

8. The quantity and grade of reported Inferred Resources in this estimation are uncertain in nature and there has been insufficient exploration to define these Inferred Resources as an Indicated or Measured Mineral Resource and it is uncertain if further exploration will result in upgrading them to an Indicated or Measured Mineral Resource category

Mineral reserve estimates (Table 2.3-4) are based on the mineral resource estimate, and developed by determining the optimum and practical mining method. Cut-off grades were then determined based on appropriate design criteria and the adopted mining method (JDS 2016).

Table 2.3-4: Eagle Deposit Mineral Reserve Estimate

Classification	Quantity (Mt)	Diluted Gold Grade(g/t)	Contained Gold (koz)
Proven	27	0.80	685
Probable	90	0.62	1,778
Total	**116**	**0.66**	**2,463**

Source: JDS 2016.

NOTES:
1. Eagle Deposit Mineral Resources estimate only
2. Mineral Reserves are included within Mineral Resources

2.4 PROPOSED DEVELOPMENT & PRODUCTION IN 2017

2.4.1 Exploration

No exploration associated with the Eagle Deposit is planned for 2017. Full details on the 2016 exploration program outside of the Eagle deposit will be provided in a separate document that describes the annual reporting required by the regulatory approvals related to the ongoing exploration on the Dublin Gulch property.

2.4.2 Construction

SGC currently assumes that Project construction will begin in 2017 (Table 2.2-1), pending receipt of Project financing on terms favorable to the Company and its' shareholders and subject to equipment and personnel availability. SGC will provide written notice of its intent to commence the Undertaking in accordance with the regulatory approvals issued for the Project.

2.5 ENGINEERING INSPECTION

As discussed in the letter provided by SGC to the Mineral Resources Branch, Energy, Mines & Resources (EMR) dated September 30, 2016, no activity associated with the construction or operation of the Project took place during the reporting period. Due to this fact, no annual physical stability inspection was completed during the reporting period.

Should the Undertaking commence prior to the next due date for the annual physical stability inspection, the inspection will be completed in accordance with the Section 13.2 of QML-0011.

2.6 SITE QA/QC PROGRAMS

As required by Clause 16 of the Type A WUL QZ14-041 and Schedule D of QML-0011, SGC is required to submit the results and interpretations of the Quality Assurance and Quality Control Program (QA/QC Program) as part of the annual report.

The QA/QC program, developed using recognized QA/QC protocols, is imbedded in the Environmental Monitoring, Surveillance and Adaptive Management Plan (EMSAMP). Components of the QA/QC Program that were implemented during the reporting period are presented in the appended studies.

3 ENVIRONMENTAL MONITORING

The EMSAMP includes environmental monitoring and surveillance objectives, work completed to date, methods, adaptive management, and reporting for environmental resources and Project facilities for the pre-construction, construction, operations, closure and post closure phases of the Project.

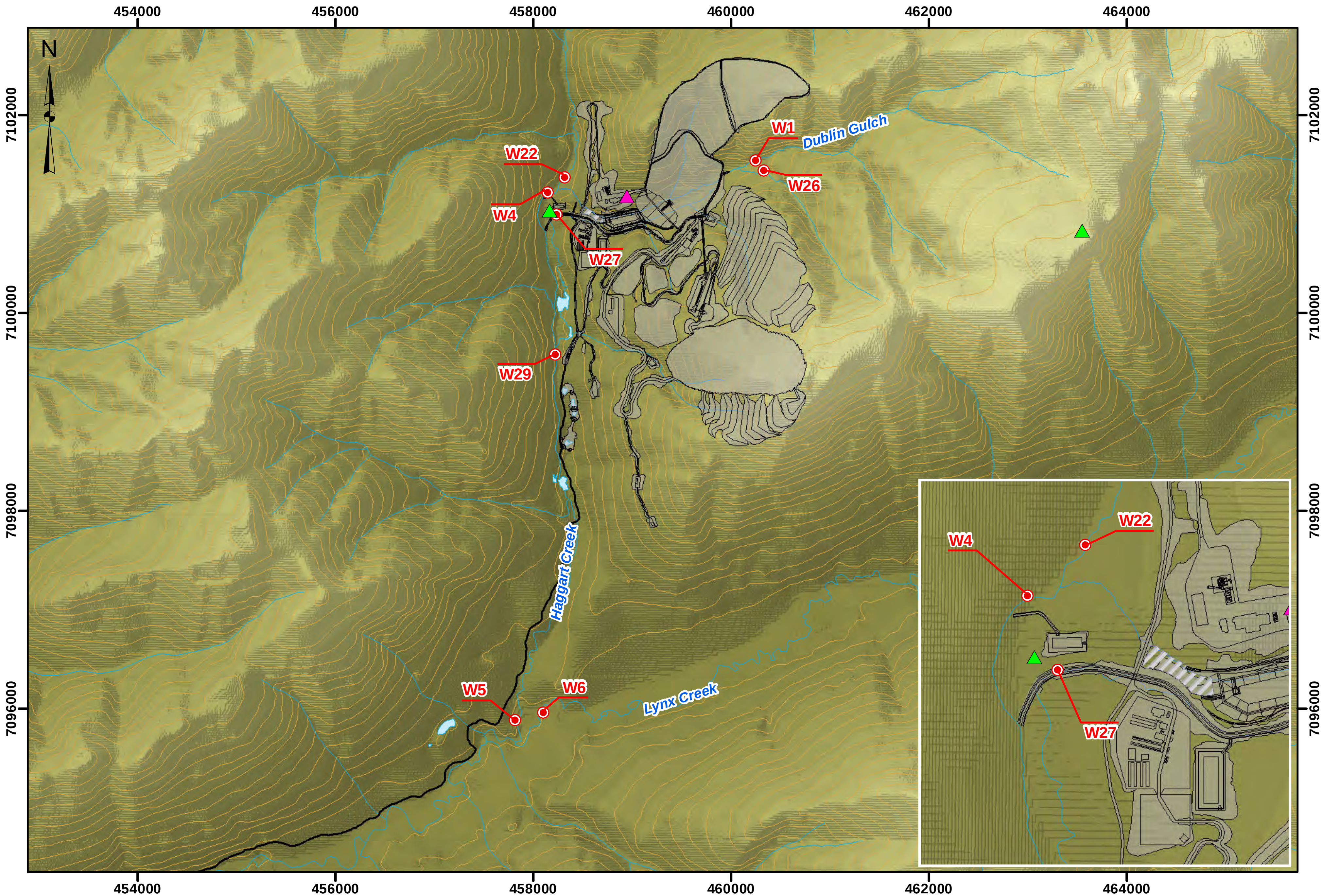
Clause 112 of the Type A WUL QZ14-041 requires SGC to continue baseline data collection until the initiation of the Development Phase of the Project. In accordance with Clause 112 and 113 of the Type A WUL QZ14-041, SGC has continued to collect baseline data, including:

- Meteorological data by the Camp and Potato Hills climate stations;
- Flow monitoring at stations identified in Table 3.1-1 and Figure 3.1-1;
- Sampling and monitoring of field barrels at the Project site; and
- Snow courses.

Figure 3.1-1 presents monitoring locations for the ongoing baseline data collection.

Table 3.1-1: Baseline Hydrology Automated Station Locations

Site	Location Description	Coordinates		
		Zone	North	East
W1	Dublin Gulch above Stewart Gulch	8V	7101545	460249
W4	Haggart Creek below Dublin Gulch	8V	7101223	458144
W5	Haggart Creek above Lynx Creek	8V	7095888	457814
W6	Lynx Creek above Haggart Creek	8V	7095964	458099
W22	Haggart Creek above Dublin Gulch	8V	7101378	458319
W26	Stewart Gulch	8V	7101443	460331
W27	Eagle Creek near camp	8V	7100997	458235
W29	Haggart Creek below Eagle Creek	8V	7099583	458225



Legend:

- Climate Station
- Snow Course Survey
- Streamflow Monitoring Station
- Watercourse
- Contour (100ft)
- General Arrangement
- Reserved Area

StrataGold Corporation

0 0.75 1.5
Kilometers

Projection: NAD83 UTM Zone 8N

Drawn By: HC

Date: 2017/03/30

Figure: 3.1-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Environmental Baseline Monitoring Locations

3.1 CLIMATE

Temperature, rainfall, wind speed and direction, relative humidity, barometric pressure and solar radiation all continue to be measured at 15-minute intervals at the Potato Hills and Camp climate stations. In accordance with the requirements of Type A WUL QZ-14-041, snow pack surveys were conducted in March, April and May 2016.

The Eagle Gold Climate Baseline Report provided as Appendix B presents a summary of all baseline climate data for the Project site since August 2007 to the end of 2015 (the report includes the 2016 snow surveys). Raw data files for 2016 have also been provided electronically.

3.2 SURFACE WATER HYDROLOGY

The continuous streamflow stations identified in Table 3.1-1 and Figure 3.1-1, consisting of a permanent staff gauge, pressure transducer and datalogger to record water level continuously at 15-minute intervals, continued in active operation during the ice-free season in 2016. Discharge measurements were conducted during periodic station visits and related to the corresponding water level at the time of measurement. The Eagle Gold Hydrology Baseline Report presented in Appendix C summarizes all baseline streamflow data collected for the Project site since August 2007 to the end of 2015. Raw data files for 2016 have also been provided electronically.

The Eagle Gold Hydrometeorology Report is provided in Appendix D and presents a hydrometeorological characterization for the Project in terms of expected long-term climatic and hydrologic conditions. The report summarizes and integrates climate and hydrology data collected on the Project as well as regional data.

3.3 GEOCHEMICAL MONITORING

In 2012, a field kinetic test program with eight field barrels (each containing ~225 kg) was initiated to support the development of water quality predictions that reflects geochemical and hydrogeological processes occurring at the Project. The geochemistry of field bin leachates collected up through 2016 were reviewed by Lorax (see Appendix E) and the potential effect of the additional data on the source term model were assessed. In summary, it was found that the source term predictions are still valid and do not require updating; however, SGC continues the sampling and analysis of the leachates.

3.4 SURFACE WATER QUALITY

Appendix F provides the Eagle Gold Project Baseline Water Quality Report (2016 Update). The report updates the 2013 baseline report prepared by Lorax Environmental Ltd. with additional water quality data collection in 2013, 2014 and 2016

3.5 SURFACE WATER BALANCE AND WATER QUALITY MODEL REPORT

The Eagle Gold Project 2017 Water Quality Model Update report is provided as Appendix G. The report presents an update of the surface water balance and water quality models that were prepared for the application for a Type A Water Use Licence submitted in 2014. The models have incorporated updated input parameters and assumptions based on the updated environmental baseline characterization work described in the Climate Baseline Report (Appendix B), the Hydrology Baseline Report (Appendix C), and the Hydrometeorology Report (Appendix D).

3.6 GROUNDWATER

Ongoing monitoring of groundwater flow and quality is not a requirement under the regulatory approvals issued for the Project. However, Clause 158 of QZ14-041 requires SGC to submit to the Yukon Water Board (YWB) the results of a comprehensive characterization of background groundwater quality based on Yukon Environment (2002) *Protocol for Contaminated Sites Regulation under the Environment Act Protocol No. 10: Determining Background Groundwater Quality* at least 30 days prior to the start of the Development Phase of the Project.

During the reporting period, the comprehensive characterization of background groundwater quality was completed and is provided in Appendix H. This report presents the results of the detailed characterization that is based on groundwater quality data collected throughout the project area in 1995, 1996 and from 2009 to 2016, and is included in this Annual Report to comply with clause 158 of the Type A WUL QZ14-041.

3.7 WILDLIFE PROTECTION PLAN

As standard procedure during ongoing exploration work on the Dublin Gulch project, SGC requires all field staff to follow the requirements of the Wildlife Records Program which involves reporting wildlife observations and incidents. Wildlife observations at the Project during the period of this report are presented in Table 3.7-1. Section 3.10.3 describes the one significant wildlife incident that occurred during the reporting period.

Table 3.6-1: Wildlife Observations

Date	Species	No. of individuals	Location	Observation Type	Behaviour
09-Mar-16	Moose (calf & cow)	2	Access Road (400 m south of camp)	Individual	Walking
12-Apr-16	Moose (cow)	1	Camp	Individual	Walking
20-Apr-16	Moose (bull)	1	Platinum Gulch	Individual	Walking
28-Apr-16	Moose (calf & cow)	2	Swede Creek	Individual	Walking
29-Apr-16	Moose (cow)	1	Swede Creek	Individual	Eating in Creek
29-Apr-16	Black bear	1	Km 29-30 along river	Tracks	Walking along river
03-May-16	Black bear	1	200 m NE of the camp dump on hill	Individual	Walking around sniffing. Walked down into the creek
03-May-16	Moose (cow)	1	km 34	Individual	Running on road, went down embankment
12-May-16	Black bear	1	1 km from camp	Individual	Walking on hill
18-May-16	Black bear (adult & cub)	2	200 m from camp, other side of dump	Individual	Walking down into gully
19-May-16	Black bear	1	This side of McQuesten Bridge	Individual	n/a
24-May-16	Black bear	2	Culvert	Individual	n/a
26-May-16	Black bear	1	Between Haldane and McQuesten Bridge	Individual	n/a
30-May-16	Moose (cow)	1	Near the first Dublin Gulch crossing by the upper core yard	Individual	Running away from truck
21-Jul-16	Moose (calf & cow)	2	Near maintenance shop	Tracks	n/a

Date	Species	No. of individuals	Location	Observation Type	Behaviour
22-Jul-16	Moose (bull)	1	n/a	Individual	n/a
27-Jul-16	Black bear	1	Across Creek from office	Individual	n/a
28-Jul-16	Moose (bull)	1	Near gates, close to shop	Individual	n/a
02-Sep-16	Moose (bull)	1	By beaver dam below camp	Individual	Eating in pond
25-Sep-16	Moose (bull)	1	pond going up Dublin Gulch	Individual	Eating in pond
26-Sep-16	Moose	1	Shamrock	Tracks	n/a
27-Sep-16	Black bear	1	Across Dublin Gulch Road on hill	Individual	Walking up hill
29-Sep-16	Wolf	1	Switchback road going up Shamrock	Individual	Walking
25-Nov-16	Wolf	1	Eagle Pup	Individual	Walking up Eagle Pup road
26-Nov-16	Wolf	1	Beside Fire Station Sea Cam	Individual	Sitting by Sea Can

NOTES:
n/a = not available

3.8 CYANIDE MANAGEMENT

No cyanide-related transport, storage, handling, use or disposal, has been conducted during the period of this report.

Storage and use of cyanide onsite will not occur until SGC has complied with Clause 132 and 133 of the Type A WUL QZ-14-041, which require SGC to submit an updated Cyanide Management Plan, to the YWB for review and approval.

3.9 SPILLS AND ACCIDENTS

During the period of this report, one reportable spill occurred March 24, 2016 at Eagle Gold Project site (Table 3.9-1).

Table 3.9-1: Reportable Spills

Date	Volume (L)	Substance	Cause
March 24, 2016	~7,000 L	Diesel	A float switch in the day tank that supplies diesel to onsite generators at the Dublin Gulch camp malfunctioned resulting in the release of diesel in the immediate area of the fuel storage tanks and generator.

The spill described in Table 3.9-1 was reported to the Yukon Spill Report Line as required by the *Spills Regulations* of the *Yukon Environment Act*. Recovery efforts were undertaken on the site, and the site has since been inspected by the EMR Senior Natural Resource Officer for Mayo. Details of the fuel spill including response, containment and recovery and initial site investigation and assessment were presented in a report distributed to the EMR Senior Natural Resource Officer for Mayo in April 2016. A copy of this report was also uploaded to the YWB Waterline website under the Type B Water Use Licence QZ11-013-1. A fuel spill remediation report was submitted to the EMR Senior Natural Resource Office in November 2016 and, based on the confirmation sampling undertaken at that time, some minor additional excavation or remediation may be required in 2017.

3.10 TRAFFIC & ACCESS

3.10.1 Level of Traffic

From Mayo, access to the Project site is along approximately 85 km of existing paved and gravel roads. Roads from Mayo to the site include the Silver Trail (Highway 11) and via the existing South McQuesten Road and the Haggart Creek Road. All but the Haggart Creek Road are government maintained roads. During the period of this report, Project traffic levels were extremely low and consisted of pick-up trucks used during ongoing fieldwork.

3.10.2 Access Control Issues

No access control issues were experienced during the period of this report.

3.10.3 Wildlife Incidents

During the reporting period, there was one wildlife incident involving a beaver dam. The beaver dam caused an increase in the water levels in historic placer settling ponds adjacent to a branch of the Haggart Creek Road. On April 25, 2016, the increased water level ultimately overtopped the road embankment and subsequently incised the road leading to a section approximately 10 m long being entirely eroded away (Figure 3.10-1). Under the direction and authorization of the EMR Senior Natural Resource Officer for Mayo, SGC completed the repair of the road and, pursuant to a Wildlife Act Permit issued to SGC, removed the beaver dams which prompted the animals to vacate the area.

3.10.4 Planned Access Road Work

The Department of Highways and Public Works (HPW) are expected to conduct routine maintenance and snow clearing work along the access roads in 2017. HPW are also planning to upgrade the 27.5 m South McQuesten Bridge beginning July 31, 2017. Work to be completed includes bridge deck removal and replacement on the existing abutments which had been improved during a prior maintenance campaign. The deck replacement is anticipated to take three weeks to complete and may result in the closure of the South McQuesten Road for up to 10 days in August 2017 (HPW 2017).

SGC will also conduct routine maintenance and snow clearing work along the Haggart Creek Road in 2017 in accordance with yearly Work Within the Right of Way Permits issued to SGC by HPW.

Legend:

Washout Location
Site Access Road

Projection: NAD83 UTM Zone 8N	Drawn By: HC	EAGLE GOLD PROJECT YUKON TERRITORY
Date: 2017/03/30	Figure: 3.10-1	Road Washout Location

0 50 100
Meters

3.11 SEDIMENT AND EROSION CONTROL

During the period of this report, sediment and erosion control activities included only those related to the management of surface runoff from exploration drill pads, trails and roads. All activities were constructed or undertaken following best management practices such as pre-planning to minimize potential erosion, use of sediment control structures and construction of drill sumps. New trails and drill pad locations are located to avoid unstable slopes or steep terrain, and minimize clearing and the removal of vegetation to the greatest extent practicable.

3.12 SPILL CONTINGENCY PLAN REVIEW

An update to the Spill Contingency Plan is required annually as part of the Annual Report in accordance with Paragraph 2.5 of Schedule C, Part 2 of QML-0011. SGC has reviewed and updated the Spill Contingency Plan (provided in Appendix I). Updates completed include an:

- update to Section 2.2 and Appendix C of the Spill Contingency Plan to include all reportable thresholds for special wastes substances consistent with Section 3(1)(b) of the *Special Waste Regulations*
- update to Section 3.3 of the Spill Contingency Plan to include spill response steps for each category of material that may be spilled; and
- update to Section 2.3 of the Spill Contingency Plan to include the requirement to report all spills on site.

SGC has also updated contact information, figures and tables, and the availability and location of emergency equipment.

3.13 SOLID WASTE AND HAZARDOUS MATERIALS MANAGEMENT PLAN REVIEW

SGC has completed updates to the Solid Waste and Hazardous Materials Management Plan in accordance with Paragraph 2.4 of Schedule C, Part 2 of QML-0011. The revised Solid Waste and Hazardous Materials Management Plan is included in Appendix J, and includes an update to the permit requirements consistent with the *Environment Act* and *Regulations*.

3.14 DUST CONTROL PLAN REVIEW

SGC has completed updates to the Dust Control Plan in accordance with Paragraph 3.1 of Schedule C, Part 3 of QML-0011. The revised Dust Control Plan is included in Appendix K, and includes an update to the permit requirements consistent with the Environment Act and regulations.

4 PHYSICAL MONITORING

As discussed in the letter provided by SGC to the Mineral Resources Branch, EMR dated September 30, 2016, no activity associated with the construction or operation of the Project took place during the reporting period. Due to this fact, no physical monitoring was completed during the reporting period

Geotechnical site investigation work to increase knowledge of subsurface conditions at the Project site and support ongoing Project design were conducted in 2016. The geotechnical investigation program involved the excavation of 23 test pits, advancement of six HTW-size cored boreholes, and installation of one standpipe piezometer in borehole BH-BGC16-091. Data analyses are in progress.

5 RECLAMATION & CLOSURE

No activities associated with the scope of the Type A WUL QZ14-041 nor QML-0011 have taken place, nor has SGC provided written notice of its intent to commence the Undertaking as required by section 3.2 of QML-0011. As such, annual reporting requirements in relation to temporary and permanent closure, care and maintenance and reclamation activities are not applicable to the Project at this time.

SGC submitted an updated Reclamation and Closure Plan (RCP) for review and approval as required by Section 7.2 of QML-0011 and Clause 171 of the Type A WUL QZ14-041 in November 2016.

The updated RCP included a refined reclamation cost estimates to satisfy Clauses 191 to 193 of the Type A WUL QZ14-041. At the time of preparing this annual report, the review and approval of the RCP pursuant to both QML-0011 and QZ11-041 was ongoing.

5.1 RECLAMATION RESEARCH

SGC has continued a component of the research programs to support closure and reclamation measures. Laberge Environmental Services has been conducting vegetation trials at the Peso Mineral Exploration Site located on claims held by SGC but independent of the Project site, which continue to be monitored. The objective of the revegetation program is to test the viability of incorporating biochar and other soil amendments into the Project with the goal of refining and improving the reclamation and revegetation plan. Results from ongoing monitoring of the revegetation trials are presented in Appendix L.

6 SOCIO-ECONOMIC MONITORING

No activities associated within the scope of the Type A WUL QZ14-041 or QML-0011 have taken place, nor has SGC provided written notice of its intent to commence the Undertaking as required by Section 3.2 of QML-0011. As such, the development and implementation of the formal joint committee has not been initiated.

Victoria Gold Corp. (VGC) and the First Nation of Nacho Nyäk Dun (FNNND) signed a Comprehensive Cooperation and Benefits Agreement (CBA) on October 17, 2011 that applies to Project development and exploration activities conducted by VGC anywhere in FNNND Traditional Territory located south of the Wernecke Mountains.

The objectives of the CBA are to:

- Promote effective and efficient communication between VGC and the FNNND in order to foster the development of a cooperative and respectful relationship and FNNND support of VGC's exploration activities and the Project.
- Provide business and employment opportunities, related to the Project, to the FNNND and its citizens and businesses in order to promote their economic self-reliance.
- Establish a role for the FNNND in the environmental monitoring of the Project and the promotion of environmental stewardship.
- Set out financial provisions to enable the FNNND to participate in the opportunities and benefits related to the Project.
- Establish a forum for VGC and the FNNND to discuss matters related to the Project and resolve issues related to implementation of the CBA.

Consultation with FNNND as required by the CBA has been ongoing during the reporting period.

7 DESCRIPTION OF WATER USE AND DEPOSIT OF WASTE

During the period of this report, no water use or waste deposition for the purposes of the of the Type A WUL QZ14-041 were undertaken.

8 REFERENCES

JDS Energy and Mining Inc. (JDS). 2016. NI 43-101 Feasibility Study Technical Report for the Eagle Project, Yukon Territory, Canada. Prepared for Victoria Gold Corp., published September 12, 2016: Vancouver, BC.

Yukon Department of Highways and Public Works. 2017. South McQuesten Bridge. Available at: http://www.hpw.gov.yk.ca/fr/trans/engineering/1163.html Accessed: March 2017

APPENDIX A

Assessment, Licence and Permit Requirements for Annual Reporting

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Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
QZ14-041	8		The Licensee shall apply the relevant procedures in the Spill Contingency Plan. The Licensee shall review the Spill Contingency Plan annually and shall provide a summary of that review, including any revisions to the plan, as a component of the annual report	Section 3.8
QZ14-041	10		The Licensee shall include a summary of all spills or unauthorized discharges that occurred during the year reported, as part of the annual report	Section 3.8
QZ14-041	16		The Licensee shall submit an Annual Report to the Board not later than March 31 of each year starting in 2017. The reporting period for the Annual Reports shall be from the effective date of this licence until December 31, 2016 for the first report, and from January I to December 31 of each year for all subsequent reports. The report shall include the information required by the Regulation, but not necessarily limited to:	All
QZ14-041	16	a	A description of the water use and waste deposition carried out during the year reported including but not limited to: i. detailed data on the volume of water (including measurements) collected at, conveyed through, transferred between, or released to the environment from the Engineered Structures and any water source used by the project (groundwater wells, water courses); ii. variation of the water volume inventories in water storage facilities (HLF, water storage ponds, sediment control ponds); iii. records of fluid management within the HLF including irrigation completed, process water recovered, any leakage into the leakage detection and recovery system (LDRS), quality and quantity of water collected within the foundation drainage systems, variation of fluid levels in the in heap pond, and records of any water accumulation in or discharge to the Events Pond;	n/a
QZ14-041	16	b	An annual construction report for each Engineered Structure built or modified in the	n/a

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
			reporting year;	
QZ14-041	16	c	A summary report, reviewed and stamped by a Professional Engineer, on the performance of Engineered Structures in service during the reporting year including but not limited to: i. Any operational deficiencies or failures to achieve operational requirements; ii. records of any leakage into the LDRS of the HLF; iii. a detailed record of any major maintenance work carried out including but not limited to; 1. any work required to physically stabilize structures; 2. reporting on ice or snow accumulation and removal conducted within water conveyance channels; 3. reporting on sediment removal from sediment control ponds or water management ponds; 4. repair of any damaged liner or armouring materials; and 5. repair or replacement of any damaged or faulty monitoring or control instrumentation or equipment; iv. Plans to conduct major maintenance work for the following year; v. Status report on any backup equipment and supplies for emergency management of the HLF (generators, pumps, fuel caches. etc.) including records of exercising such equipment;	n/a
QZ14-041	16	d	A summary of mining and production activities concluded in the reporting year including but not limited to: i. the mass/volume of excavation from the Eagle Zone Pit; ii. the mass/volume and nature of materials placed in WRSA's including location of any overburden placed in WRSA's;	n/a, see Section 2.0

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
			iii. the monthly mass/volume of ore in storage in the 100 day ore stockpile; iv. the mass/volume and end of year configuration of ore lifts placed in HLF with the identification of any final benches or slopes as may have been achieved during the year; v. records on the management of excavated overburden including ice rich overburden; vi. records of ore properties for ore placed on the heap (summary of gradation and other characteristic properties as may be collected) and records of any of agglomeration conducted; vii. report on metallurgical performance of the FILE; viii. analysis of whether Mine Plan activities completed in the reporting year are consistent with the Mine Plan and analysis of the effect of any deviations from the plan including but not limited to: 1. changes to the pit excavation designs (slopes, volumes) and indication of whether a change to the expected volume of waste rock to be removed has been identified: 2. changes to construction of WRSAs; 3. deviations in production rates for mining and processing of ore: 4. changes to heap loading, ore density and porosity, and irrigation schedules;	
QZ14-041		e	Records of monitoring conducted as part of the EMSAMP including but not limited to: i. summaries of all data generated as a result of the monitoring requirements of this licence: ii. analysis and interpretation of collected data by a qualified individual or firm and a discussion of any variances from baseline conditions, from the previous years'	Section 3.0

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
			data, or from expected performance, or variances from expected conditions; iii. results and interpretations of QA/QC Programs completed as part of monitoring or part of construction;	
QZ14-041		f	Reporting on monitoring according to Cyanide Management Plan;	n/a, see Section 3 .7
QZ14-041		g	A description of reclamation or reclamation research activities carried out during the year and commentary on whether the annual activities are consistent with the schedule of the RCP; and	Section 5.0
QZ14-041		h	Any other reports which are required by this licence	All
QZ14-041	17		The Licensee shall provide to the Board one unbound, single-sided, paper copy of all reports required by this licence. All reports must be reproducible by standard photocopier.	All
QZ14-041	18		The Licensee shall upload electronic copies of all reports required by this licence to the Yukon Water Board's online licensing registry, Waterline. Electronic copies shall be submitted in one of the following formats: MS Word. MS Excel, or Adobe .pdf format. Water quality results uploaded to Waterline must be presented in MS Excel.	All
QZ14-041	56		Where site conditions require Minor Modifications to submitted final designs during construction, the modifications shall be approved by a Professional Engineer and a record of the modification along with the rationale for the modification shall be submitted to the Board with a copy to the Inspector as part of the annual construction report for the affected Engineered Structure	n/a
QZ14-041	57	a	For all Engineered Structures authorized by this Licence, the Licensee shall produce a construction report detailing the construction of the infrastructure. The construction report shall include: As-built drawings of completed structures;	n/a
QZ14-041	57	b	Results of quality control and quality assurance activities associated with the completed works;	Section 2.6

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
QZ14-041	57	c	Records of any minor or substantive modifications from submitted final designs; and	n/a
QZ14-041	57	d	Certification by a Professional Engineer that the completed works have been constructed in compliance with final designs and construction specifications inclusive of any approved minor or substantive modifications and in compliance with any relevant terms of this licence	n/a
QZ14-041	58		The construction report in clause 57 shall be submitted annually with the annual report required by this licence and shall include all structures completed during the year covered by the annual report.	n/a
QZ14-041	105		The Licensee shall comply with the monitoring programs and studies required by this licence and, unless otherwise specified, shall submit the data that is compiled as a result of these programs and studies as a component of the required annual reports	Section 3.0
QZ14-041	111		The Licensee shall comply with the EMSAMP and Schedules I and 2 of this Licence. The findings of the programs included in the EMSAMP, including any recommendations, shall be submitted as part of the Annual Report. Any changes should be submitted to the Board.	Section 3.0
QZ14-041	112		The Licensee shall update the EMSAMP to reflect the continuation of the collection of baseline data until the initiation of the Development Phase of the Project.	Section 3.0
QZ14-041	113	a	Baseline data to be collected shall include: Meteorological data by the Camp and Potato Hills climate stations;	Section 3.1
QZ14-041	113	b	Flow monitoring at stations identified in Table 2.2-I of Exhibit 1.13.1	Section 3.0 and 3.2
QZ14-041	113	c	Sampling and monitoring of field barrels at the project site; and	Section 3.3
QZ14-041	113	d	Snow courses.	Section 3.1
QZ14-041	123	a	Adaptive Management Plan: The Licensee shall include in the updated EMSAMP updates to the Adaptive Management Program (AMP) to include, but not be limited to: The effluent discharge standards identified in this licence;	n/a

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
QZ14-041	123	b	Updated receiving water quality thresholds for Haggart Creek at W4 and W29 based on the Haggart Creek WQOs;	n/a
QZ14-041	123	c	The revised water quantity thresholds for reduction of flow in Haggart Creek as proposed in Exhibit 1.2.3.1 for open water (36%) and Exhibit 6.1 for November to April (15%);	n/a
QZ14-041	123	d	The AMP for the monitoring of thiocyanate and cyanate at W4 and W29;	n/a
QZ14-041	123	e	Incorporation of trend analysis in the assessment component of the AMP;	n/a
QZ14-041	123	f	Monthly review and reporting of the results of the AMP assessments in the Monthly Reports;	n/a
QZ14-041	123	g	An annual review of the AMP which shall include: i. A summary of the monthly reviews; ii. Assessment of the adequacy and appropriateness of the various components of the AMP (thresholds, indicator and monitoring requirements); and iii. Recommendations for modifications.	n/a
QZ14-041	123	h	Any other revisions necessary for compliance with this licence.	n/a
QZ14-041	124	a	<u>Metal Mining Effluent Regulations Monitoring Programs</u>: The Licensee shall conduct the following Environmental Effects Monitoring Studies in accordance with MMER Schedule 5: Effluent and Water Quality Monitoring Studies; and	n/a
QZ14-041	124	b	Biological Monitoring Studies.	n/a
QZ14-041	125		The results of these studies and programs in clause 124 shall be submitted to the Board as part of the Annual Report along with any additional studies or revisions to studies required under the MMER.	n/a
QZ14-041	130		A summary of activities carried out under any approved plan shall be submitted to the Board as part of the annual report.	Section 3.0, 4.0 and 5.0
QZ14-041	132		<u>Cyanide Management Plan:</u> The Licensee shall submit to the Board for Review and Approval, an updated CMP which includes an	n/a, see Section 3.7

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
			annual independent third-party audit, consistent with the ICMC, of the cyanide management plan and its execution.	
QZ14-041	133		Storage and use of cyanide at the site must not occur until receipt of notice of approval of the updated CMP from the Board.	n/a, see Section 3.7
QZ14-041	157	a	<u>Surface Water Balance and Water Quality Models Updates:</u> The Licensee shall submit to the Board updated Surface Water Balance and Water Quality Models as part of each Annual Report. The updated models shall include, but not be limited to, the following: Updated site data collected as per the EMSAMP;	Section 3.0
QZ14-041	157	b	Updated input from any updates to the HLF Water Balance Model; and	n/a
QZ14-041	157	c	Updated predictions for operations and closure including discussion of any variances identified and implications on site water management	n/a
QZ14-041	178	f	<u>Reclamation and Closure Research Program</u> The Licensee shall submit to the Board, an update to the Reclamation and Closure Research Program provided in Exhibit 1.7.1, Section 10 with the RCP updates described in clause 171. The updated plan shall be implemented once approved and must include, but not necessarily be limited to, the following: Annual reporting on research activities.	Section 5.0
QZ14-041	190		The Licensee shall report in the annual report on whether, based on information available at the time of report including actual progress on execution of the Mine Plan and the best judgement of mine management, the current liability for closure of the mine exceeds or does not exceed the security held at the end of the year for which the annual report has been prepared.	Section 5.0
QML-0011	13.9		On or before March 31st of each year of the term of this License, the Licensee must submit an annual report, in writing, in accordance with Schedule D and any written direction of the Director, covering the period of January 1 to December 31 of the prior year.	All
QML-0011	Schedule C	2.4	**Waste Management**: "Solid Waste and Hazardous Materials Management Plan,	Section 3.7

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
			Version 2014-01" dated May 2014 and prepared by StrataGold Corporation. Subject to the following conditions: (a) an update to the Solid Waste and Hazardous Materials Management Plan must be provided in the 2016 Annual Report, this updated plan must include the following information i. an update to the permit and disposal requirements consistent with the *Environment Act* and regulations.	
QML-0011	Schedule C	2.5	**Spill Contingency**: "Spill Response Plan, Version 2014-01" dated June 2014 and prepared by StrataGold Corporation. Subject to the following conditions: (a) an update to the Spill Contingency Plan must be provided in the 2016 Annual Report, this updated plan must include the following information i. an update to section 2.2 and Appendix C of the Plan to include all reportable thresholds for special wastes substances consistent with section 3(1)(b) of the Special Waste Regulations; ii. spill response steps for each category of material that may be spilled; and iii. an update to the reporting requirements to include the requirement to report all spills on site.	Section 3.8
QML-0011	Schedule C	3.1	**Dust Control:** "Dust Control Plan, Version 2013-01" dated September 2013. Subject to the following conditions: (a) an update to the Dust Control Plan must be provided in the 2016 Annual Report, this updated plan must include the following information	Section 3.1

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
			i. an update to the permit requirements consistent with the Environment Act and regulations.	
QML-0011	Schedule D, **Site Activities**	a	a summary of construction activities associated with the Undertaking;	Section 2.2
QML-0011	Schedule D, **Site Activities**	b	a summary of mining activities;	Section 2.3
QML-0011	Schedule D, **Site Activities**	c	a summary of proposed development and production for the coming year;	Section 2.4
QML-0011	Schedule D, **Site Activities**	d	a map showing the status of all structures, works, and installations associated with the Undertaking;	Figure 2-2
QML-0011	Schedule D, **Site Activities**	e	the total amount of ore and waste removed from the open pit for the year and for the life of the Undertaking;	n/a, see Section 2.3.1
QML-0011	Schedule D, **Site Activities**	f	the total amount of gold produced and removed from the undertaking;	n/a, see Section 2.3.1
QML-0011	Schedule D, **Site Activities**	g	the total amount of waste rock removed from the Undertaking and deposited into each deposit location;	n/a, see Section 2.3.1
QML-0011	Schedule D, **Site Activities**	h	the total amount of waste rock stored in each waste rock storage facility;	n/a, see Section 2.3.1
QML-0011	Schedule D, **Site Activities**	i	details respecting any action taken as a result of the recommendations made by the engineer in relation to the inspection referred to in 13.2 of QML-0011;	n/a
QML-0011	Schedule D, **Site Activities**	j	a summary of any update to estimates of ore reserves and the life of the mine, including reserve category, tonnage and grade;	Section 2.3.3
QML-0011	Schedule D, **Site Activities**	k	the total amount and the average grade of ore stockpiled;	n/a
QML-0011	Schedule D, **Site Activities**	l	the remaining reserve life of the mine;	Section 2.3.3
QML-0011	Schedule D, **Site Activities**	m	results and interpretation from all QA/QC programs for the site;	See Appendices

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
QML-0011	Schedule D, **Site Activities**	n	a summary of heap leach facility construction including: i. the total amount and the average head grade of ore placed on the heap leach pad for the year and the life of the Undertaking; ii. the mass/volume and end of year configuration of ore lifts placed in the heap leach facility with the identification of any final benches or slopes achieved during the year; iii. the records of ore properties for ore placed on the heap and records of any of agglomeration conducted; and iv. report on metallurgical performance of the heap leach facility	n/a
QML-0011	Schedule D, **Environmental Monitoring**	a	a summary of the programs undertaken for environmental monitoring and surveillance as outlined in the Environmental Monitoring, Surveillance and Adaptive Management Plan and the Wildlife Protection Plan, including an analysis of these data and any action taken or adaptive management strategies implemented to monitor or address any changes in environmental performance;	Section 3.0
QML-0011	Schedule D, **Environmental Monitoring**	b	a summary of operating procedures for cyanide-related tasks and their implementation, including the review of proposed process and operational changes and modifications deemed necessary for potential impacts on personnel health and safety and the incorporation of personnel protection measures;	n/a
QML-0011	Schedule D, **Environmental Monitoring**	c	a summary of all safety measures taken (signs, etc.) to identify the presences of cyanide to all personnel;	n/a
QML-0011	Schedule D, **Environmental Monitoring**	d	a summary of all tests and calibration records for HCN monitoring equipment;	n/a
QML-0011	Schedule D,	e	a summary of the results of the waste rock	n/a

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
	Environmental Monitoring		quality assurance/quality control monitoring for the past year;	
QML-0011	Schedule D, **Environmental Monitoring**	f	a summary of invasive plants that have been identified on site and measures taken to control or remove invasive plants;	n/a
QML-0011	Schedule D, **Environmental Monitoring**	g	a summary of ambient air quality monitoring and modelling (which includes emissions related to the gold recovery process) and mitigation measures taken;	n/a, see Section 3.1
QML-0011	Schedule D, **Environmental Monitoring**	h	a summary of spills and accidents that occurred at the site and measures taken respond to any spills or accidents;	Section 3.8
QML-0011	Schedule D, **Environmental Monitoring**	i	a summary of the level of traffic, access control issues, wildlife incidents and other accidents, and any upgrade or maintenance work planned for the upcoming year;	Section 3.9
QML-0011	Schedule D, **Environmental Monitoring**	j	a summary of sound-levels associated with blasting activities;	n/a
QML-0011	Schedule D, **Environmental Monitoring**	k	a summary of any site improvements undertaken to address sediment and erosion control;	n/a, see Section 3.10
QML-0011	Schedule D, **Environmental Monitoring**	l	a summary and interpretation of humidity cell or other geochemical tests undertaken on materials on site, including a. geochemical characterization of the expanded open pit, including kinetic testing to predict metal leaching potential; b. assumptions and conclusions of geochemical predictions and the effectiveness of mitigation measures; c. the segregation of waste rock based on metal leaching potential; and d. results of long-term column tests to study the effects to stability and permeability of the heap leach facility;	Section 3.3
QML-0011	Schedule D, **Environmental Monitoring**	m	a summary of cyanide release or exposure that occurred at the Undertaking, including: i) any hospitalization or fatality related to cyanide; ii) the nature of release and the response or remediation required; and iii) any exceedances to cyanide	n/a

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
			limits in permits or authorizations	
QML-0011	Schedule D, **Physical Monitoring**	a	a summary of any heap leach, waste rock, or open pit stability incidents;	n/a
QML-0011	Schedule D, **Physical Monitoring**	b	a summary of data collected to date as part of the Physical Monitoring Program;	n/a, see section 4.0
QML-0011	Schedule D, **Physical Monitoring**	c	details of results, including data collected, for the Physical Monitoring Program;	n/a, see section 4.0
QML-0011	Schedule D, **Physical Monitoring**	d	a summary report on the performance of Engineered structures in service during the reporting year including but not limited to: a. any operational deficiencies or failures to achieve operational requirements; b. records of any leakage into the LDRS of the HLF; c. a detailed record of any major maintenance work carried out; d. plans to conduct major maintenance work for the following year; and e. status report on any backup equipment and supplies for emergency management of the heap leach facility including records of exercising such equipment.	n/a
QML-0011	Schedule D, **Reclamation and Closure**	a	any temporary closure or permanent closure that has occurred during the year;	n/a
QML-0011	Schedule D, **Reclamation and Closure**	b	a summary of activities related to care and maintenance of the Undertaking, including any temporary closure activities if applicable;	n/a
QML-0011	Schedule D, **Reclamation and Closure**	c	a summary of progressive and ongoing reclamation activities;	n/a
QML-0011	Schedule D, **Reclamation and Closure**	d	a summary of proposed development and production and reclamation activities for the coming year; and.	Section 2.4
QML-0011	Schedule D, **Reclamation and Closure**	e	a summary of reclamation research and results	Section 5.0
QML-0011	Schedule D, **Socio-economic**	a	a summary of action taken by the Licensee with respect to development and implementation of a joint committee that will	n/a. see Section 6.0

Document, License or Permit	Section/ Clause	Paragraph/ Sub-clause/	Requirement	Annual Report Section
	Monitoring		confirm socio-economic indicators, reporting and responding to monitoring results.	

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APPENDIX B

Eagle Gold Climate Baseline Report

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Eagle Gold
Climate Baseline Report

Project No. A413-1
26 October 2016

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LIST OF FIGURES

LIST OF TABLES

1. Introduction

1. Introduction

1.1 Scope of Report

This report presents a summary of all baseline climate data collected for the Eagle Gold Project (Project) since August 2007[1], including that summarized in previous reports to the end of April 2016. The measured data summarized in this report includes estimates of potential evaporation, and the following measured parameters:

- Air Temperature;
- Rainfall;
- Snow Water Equivalent (SWE, from snow surveys);
- Barometric Pressure;
- Relative Humidity;
- Wind Speed and Direction, and;
- Solar Radiation.

Metadata for the two Project climate stations and snow surveys are presented, along with a summary of the gaps in the monitoring record.

1.2 Previous Reports

The climate data collected at the Eagle Gold Project site from 2007 up to and including 2012, has been previously summarized in the following reports:

- *Dublin Gulch Project - Climate and Hydrology Environmental Baseline Report* (2008), prepared by Jacques Whitford AXYS (Burnaby, BC) for StrataGold Corp. (Vancouver, BC), December 2008.
- *Snow Survey Environmental Baseline Report* (2009), prepared by Jacques Whitford Stantec AXYS (Burnaby, BC) for StrataGold Corp. (Vancouver, BC).
- *Eagle Gold Project, Environmental Baseline Report: Climate* (2010), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., February 2010.
- *Eagle Gold Project, Surface Water Balance Model Report* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.

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[1] Historic climate data collected during 1993 to 1996 for the Project area is summarized in *Eagle Gold Project, Environmental Baseline Report: Climate*, prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., March 2012

- *Eagle Gold Project, Environmental Data Summary Report: Climate 2011 Update* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Eagle Gold Project, Environmental Baseline Report: Climate* , prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., March 2012.
- *Victoria Gold Corp., Eagle Gold Project – Climate Baseline Data Summary. VA101-290/6-9*, prepared by Knight Piesold Ltd. (Vancouver, BC) for Victoria Gold Corp., August 2013.

2. Climate Monitoring Locations

Victoria
GOLD CORP

2. Climate Monitoring Locations

2.1 Meteorological Stations

Climatic parameters are measured at the Project site by two weather stations that were originally installed by Stantec (formerly Jacques Whitford AXYS). The Potato Hills station is situated near the eastern basin divide (1420 m), and was installed in August 2007. The second station was originally installed near the camp at 823 m in August 2009, and subsequently moved to its current location in September 2010 at 782 m due to construction of new camp facilities.

The Potato Hills station uses an ONSET Hobo datalogger to measure air temperature, rainfall, wind speed and direction, barometric pressure, relative humidity, snow depth and solar radiation at 15-minute intervals. The recording interval was initially set to record at 60-minute intervals from August 14, 2007 to August 13, 2008 and then was switched to 15-minute intervals as of August 13, 2008 until the present. The snow sensor was added to the station in April 2011.

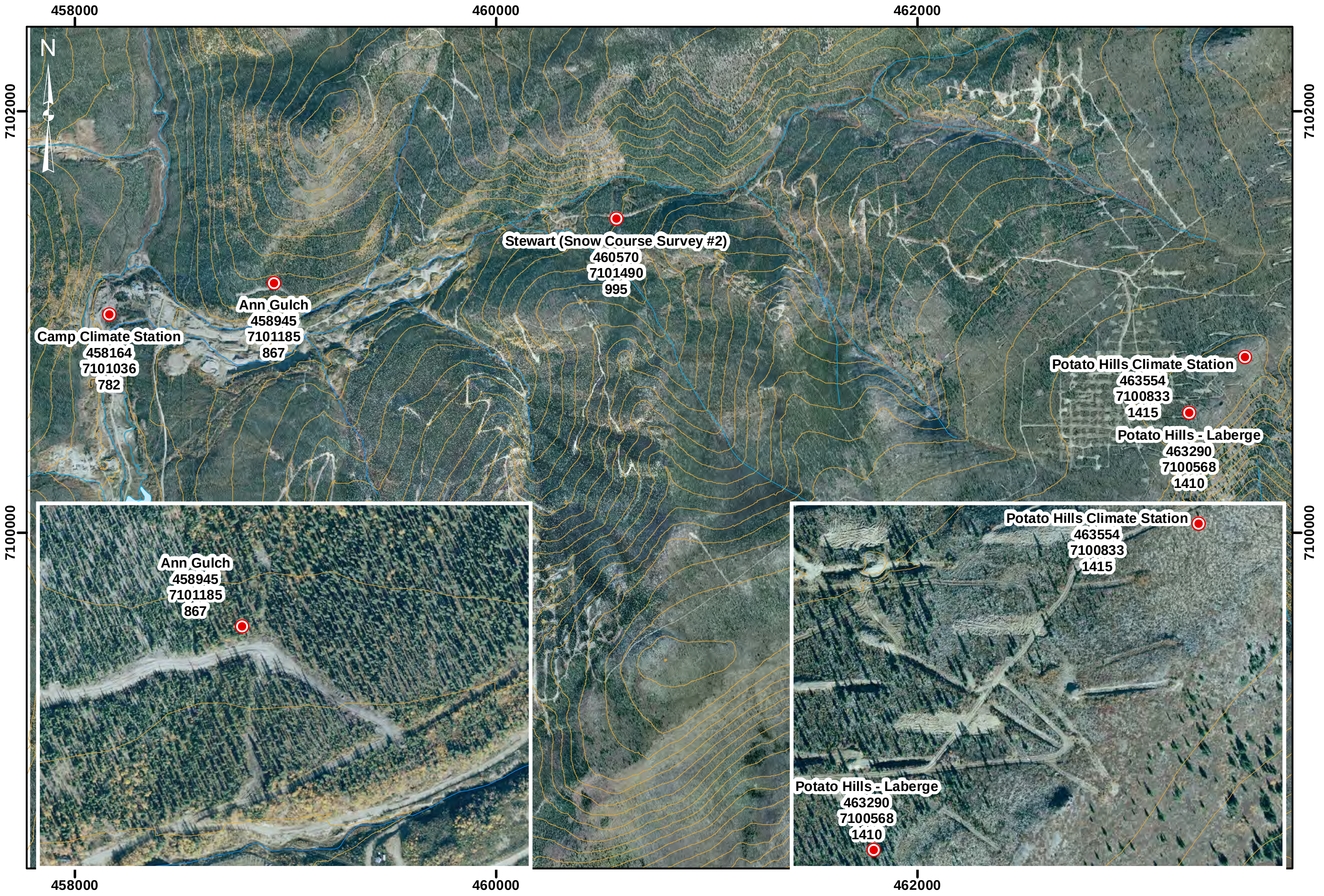
The Camp station includes a Campbell Scientific CR800 datalogger measuring air temperature, rainfall, wind speed and direction, barometric pressure, snow depth, solar radiation and relative humidity. All data are recorded at a 15-minute interval at this location. The snow sensor and pyranometer (measuring solar radiation) were added on April and October 2011, respectively.

Since snow sensor installation, the continuous snow depth data for the Potato Hills station has not been reliable and so this data are not presented in this report. Continuous snow depth data are provided herein for the Camp station, as are records of snow survey measurements for three local stations (Camp, Anne Gulch, Potato Hills) up through spring 2016.

The Project climate stations and snow survey locations are presented in Table 2-1 and Figure 2-1.

Table 2-1:
Climate station and snow survey locations.

Station	Elevation (m asl)	UTM E	UTM N	Record Period
Climate Stations				
Camp Station	782	458,164	7,101,036	2009-present
Potato Hills Station	1420	463,544	7,100,833	2007-present
Snow Surveys				
Camp Snow Survey	782	458,164	7,101,036	2009-present
Anne Gulch	875	458,945	7,101,185	2012-present
Stewart (Snow Survey #2)	995	460,570	7,101,490	Mar. 2012 only
Potato Hills Snow Survey	1420	463,290	7,100,568	2009-present



Legend:

Snow Survey Sites — Watercourse — Contours (25m)

StrataGold Corporation

0 150 300 600
Meters

Projection: NAD83 UTM Zone 8N

Drawn By: HC

Date: 2016/09/20

Figure:

EAGLE GOLD PROJECT
YUKON TERRITORY

SNOW SURVEY LOCATIONS

2.1.1 Data Gaps

This report summarizes data gaps in the baseline climate record for the Potato Hills and Camp climate stations during the period January 2013 to April 2016. Data gaps prior to January 2013 are discussed in previous reports.

Potato Hills Station – In the early months of 2013, there are minor- and short duration (*i.e.*, days to weeks) gaps in the climate. The specific cause of these gaps is unknown, but they are likely caused by intermittent and brief sensor malfunctions. For key parameters (*e.g.*, air temperature), these short gaps were infilled using monthly-specific relationships established between the Camp and Potato Hills climate stations.

From May 2013 to May 2014, the Potato Hills climate record is complete. However, in summer 2014, the datalogger for the Potato Hills climate station experienced a serious malfunction and climate data from May 2014 to July 2015 are not reliable. A HOBO temperature/pressure logger was deployed at the Potato Hills station during this timeframe, and data for these parameters were populated during this time period with data from this device. Finally, from August 2015 to the present, the Potato Hills climate station and the data obtained from it have been reliable, although a wind direction sensor malfunction has resulted in a loss of data for this parameter beginning in May 2014.

Camp Station – For the Camp climate station, there are no data gaps for the period of January 2013 to December 2015.

2.2 Snow Surveys

Snow surveys were completed in 2013, 2014 and 2016, but not in 2015. These surveys were generally conducted at, or near to the date, of annual maximum snowpack. This peak in terms of SWE measurement typically occurs between late-March to mid-April in the Yukon.

Snow surveys are conducted following the guidelines set out in the *Snow Survey Sampling Guide* (BC Ministry of Environment, 1981). At each site, 10 sampling locations along a transect were sampled for depth and snow water equivalent [SWE] using a Federal snow sampler, and then averaged. Snow courses were established at three elevations (*i.e.*, low-, mid- and high-elevation) and oriented to discern effects of aspect on local snow accumulation (Table 2-1 and Figure 2-1).

3. Climate Data Summary

3. Climate Data Summary

3.1 Temperature

Air temperatures at the Project site are consistent with those throughout the Yukon interior. Mean annual air temperature at site is -3.6°C at the Camp station (782 m) and -4.6°C at the Potato Hills station (1420 m) over their respective periods of record.

Mean, maximum and minimum monthly (based on the daily average) temperatures are presented in Table 3-1 for both stations. At the Camp station, monthly average temperature ranges from -20.2°C in January to 13.1°C in July, and -16.1°C to 10.1°C at the Potato Hills station, for the same months. The minimum (maximum) recorded daily average temperatures were -43.8°C (22.0°C) and -36.6°C (22.8°C) at the Camp and Potato Hills stations, respectively. The minimum (maximum) recorded 15-minute temperatures were -46.4°C (31.6°C) and -37.6°C (28.5°C) at the Camp and Potato Hills stations, respectively.

The monthly mean temperatures signatures for both climate stations are shown in Figure 3-1, and the pattern is consistent with the larger regional picture. During the months of March to October inclusive, the standard lapse rate applies, with temperatures decreasing with rising elevation, and are approximately 3°C cooler at the upper station, on average. However, during the winter months of November to February, temperature inversions are common at the Project site, with temperatures roughly 2.5°C cooler on average in the valley bottom than at the height of land.

The spring/summer lapse rate of -4°C/1000 m is consistent with the saturated adiabatic lapse rate of -5.0°C/1000 m. This is likely due to the increased frequency of precipitation during the summer months, when a larger portion of the annual precipitation falls, resulting in warmer and wetter air masses at the Project site. The winter lapse rate of +4°C/1000 m is consistent with that reported by Wahl *et al.* (1987), which states that during a temperature inversion, lapse rates can range from 3-5°C/1000 m of elevation gain.

Table 3-1:
Project site monthly air temperature record.

Climate Station	Elevation (m asl)	Temperature (°C)														
		Year		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Camp Station	782	2009	Mean	-	-	-	-	-	-	-	-	6.2	-2.6	-13.6	-17.3	-
			Maximum	-	-	-	-	-	-	-	-	11.2	2.3	-2.2	-2.8	-
			Minimum	-	-	-	-	-	-	-	-	-4.8	-9.7	-22.6	-31.3	-
		2010	Mean	-17.1	-10.8	-6.9	1.1	8.3	12.1	13.6	12.1	4.4	-3.4	-13.5	-24.1	-2.0
			Maximum	-6.7	1.0	1.4	9.4	16.9	15.7	18.0	20.5	11.8	7.1	4.0	-11.2	20.5
			Minimum	-33.4	-25.0	-17.7	-6.8	1.8	7.2	10.3	6.2	-6.1	-10.5	-28.4	-37.7	-37.7
		2011	Mean	-22.9	-21.3	-15.9	-3.2	7.7	11.5	12.8	9.2	5.1	-2.8	-20.7	M	-
			Maximum	-1.3	-1.4	2.1	2.7	16.1	16.1	18.2	14.3	9.7	0.3	-6.4	M	-
			Minimum	-38.5	-37.8	-30.3	-11.6	-2.2	7.0	9.5	5.7	0.9	-6.8	-39.1	M	-
		2012	Mean	-25.2	-12.2	-13.4	0.4	5.9	13.3	12.6	10.5	5.0	M	-24.1	-25.9	-4.8
			Maximum	-7.2	0.7	-1.4	4.4	12.6	19.4	16.7	15.6	13.6	M	-10.3	-8.5	19.4
			Minimum	-40.4	-24.2	-24.4	-7.6	-0.4	8.7	8.7	4.5	-0.6	M	-37.1	-41.0	-41.0
		2013	Mean	-21.6	-13.3	-15.5	-8.6	5.0	14.2	14.0	11.9	5.5	-2.5	-18.7	-26.7	-4.7
			Maximum	-9.3	-4.4	0.3	2.9	14.1	22.0	18.5	18.0	14.5	4.9	-4.0	-11.6	22.0
			Minimum	-43.8	-20.9	-26.8	-16.6	-2.6	6.0	9.5	4.9	0.9	-9.9	-39.5	-40.7	-43.8
		2014	Mean	-14.9	-23.4	-13.8	-1.8	7.0	11.0	13.4	10.6	3.7	-3.5	-15.8	-15.2	-3.6
			Maximum	-1.8	-6.4	-3.8	4.5	12.9	16.5	18.6	15.1	9.4	3.4	-3.3	-4.6	18.6
			Minimum	-34.1	-36.8	-24.4	-12.4	2.5	5.4	8.7	4.5	-3.8	-11.9	-33.8	-26.4	-36.8
		2015	Mean	-19.4	-18.1	-11.5	-0.1	10.1	11.2	12.2	9.0	2.9	-1.5	-15.1	-15.2	-3.0
			Maximum	-2.9	-1.7	-1.0	4.4	17.5	15.5	16.8	15.4	7.3	3.4	-4.4	-6.0	17.5
			Minimum	-39.1	-38.3	-26.8	-4.8	-0.9	5.6	7.9	1.6	-4.3	-9.3	-33.1	-34.3	-39.1
		All Years	Mean	-20.2	-16.5	-12.9	-2.0	7.3	12.2	13.1	10.6	4.7	-2.7	-17.4	-20.8	-3.6
			Maximum	-1.3	1.0	2.1	9.4	17.5	22.0	18.6	20.5	14.5	7.1	4.0	-2.8	22.0
			Minimum	-43.8	-38.3	-30.3	-16.6	-2.6	5.4	7.9	1.6	-6.1	-11.9	-39.5	-41.0	-43.8
Potato Hills Station	1420	2007	Mean	-	-	-	-	-	-	-	-	1.0	-6.9	-12.0	-15.2	-
			Maximum	-	-	-	-	-	-	-	-	8.0	-1.5	-5.5	-9.4	-
			Minimum	-	-	-	-	-	-	-	-	-6.2	-13.8	-27.7	-24.2	-
		2008	Mean	-17.7	-17.2	-11.3	-4.8	3.3	8.7	8.1	5.3	1.9	-7.7	-10.8	-18.6	-5.1

Climate Station	Elevation (m asl)	Temperature (°C)														
		Year		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
			Maximum	-9.2	-3.4	-2.8	2.7	12.5	14.3	13.4	9.2	6.7	2.4	-5.4	-8.4	14.3
			Minimum	-33.1	-31.9	-29.6	-16.8	-0.6	4.6	2.8	1.7	-7.7	-21.3	-19.6	-27.2	-33.1
		2009	Mean	-19.3	-17.2	-16.7	-4.4	M	M	12.6	7.4	3.3	-5.3	-12.8	-11.9	-
			Maximum	-0.5	-10.4	-7.0	9.4	M	M	22.8	16.2	10.4	-1.9	-4.9	-3.8	-
			Minimum	-34.8	-30.3	-25.2	-13.0	M	M	6.6	3.1	-6.3	-14.2	-19.1	-21.2	-
		2010	Mean	-14.5	-9.7	-9.4	-1.8	5.2	8.8	10.5	9.7	2.3	-5.3	-11.7	-18.2	-2.9
			Maximum	-5.1	-1.8	-2.9	6.3	15.1	13.4	15.2	19.5	8.8	3.1	-1.4	-8.8	19.5
			Minimum	-30.9	-26.4	-16.5	-8.3	-4.0	2.7	6.2	3.4	-9.3	-10.4	-23.1	-25.6	-30.9
		2011	Mean	-15.5	-18.3	-13.9	-5.6	4.8	8.8	10.3	7.0	4.1	-5.7	-18.0	-13.0	-4.6
			Maximum	-5.6	-3.6	-1.4	1.3	15.3	13.9	15.7	11.4	20.4	-1.2	-9.1	-8.8	20.4
			Minimum	-28.0	-30.2	-23.2	-13.0	-7.2	2.2	5.9	5.3	-5.5	-12.1	-29.0	-20.0	-30.2
Potato Hills Station		2012	Mean	-19.8	-11.1	-13.4	-1.9	3.1	11.3	10.9	M	M	-8.4	-18.8	-19.4	-
			Maximum	-6.8	-5.1	-1.7	1.8	9.5	18.5	17.9	M	M	3.3	-8.0	-6.5	-
			Minimum	-30.3	-19.5	-22.6	-8.0	-2.5	5.5	5.5	M	M	-16.8	-24.0	-29.2	-
		2013	Mean	*-17.6*	*-11.3*	-14.2	*-10.4*	*2.8*	12.1	11.6	11.0	3.0	-2.9	-16.0	-19.5	-4.3
			Maximum	-5.5	-4.9	-5.1	*-2.5*	*13.5*	22.2	17.4	19.9	10.2	1.3	-4.7	-3.4	22.2
			Minimum	-36.6	-15.5	-24.8	*-18.4*	*-6.2*	2.0	5.3	1.7	-1.8	-8.5	-28.9	-29.1	-36.6
		2014	Mean	-10.0	-15.9	-11.5	-3.4	*5.6*	8.7	11.8	8.7	2.1	-5.6	-11.6	-11.4	-2.7
			Maximum	0.6	-7.8	-5.1	3.2	*11.5*	17.6	15.6	13.9	8.5	0.9	-5.0	-5.4	17.6
			Minimum	-27.3	-26.3	-19.9	-13.5	*0.4*	1.7	7.4	1.7	-5.2	-12.1	-22.5	-19.2	-27.3
		2015	Mean	-14.4	-13.8	-9.6	*-2.3*	*8.6*	*8.6*	*9.5*	7.1	0.1	-3.7	-13.5	-13.6	-3.1
			Maximum	-3.9	-2.3	-0.5	*1.4*	*16.5*	*13.6*	*14.9*	17.0	4.9	2.0	-4.3	-5.6	17.0
			Minimum	-31.7	-32.7	-24.3	*-6.5*	*-3.2*	*1.9*	*4.4*	-2.0	-6.1	-10.7	-28.3	-25.3	-32.7
		All Years	Mean	-16.1	-14.3	-12.5	-4.4	4.8	9.6	10.7	8.0	2.2	-5.7	-13.9	-15.6	-3.8
			Maximum	0.6	-1.8	-0.5	9.4	16.5	22.2	22.8	19.9	20.4	3.3	-1.4	-3.4	22.8
			Minimum	-36.6	-32.7	-29.6	-18.4	-7.2	1.7	2.8	-2.0	-9.3	-21.3	-29.0	-29.2	-36.6

Notes:
1. Values are calculated from average daily temperatures.
2. Data is considered missing for a month is less than 25 days of data are available for that month.
3. Monthly values in italics for the Potato Hills station, for the period of 2013 through 2015 have been infilled using monthly regression relationships with temperature data from the Camp station.
4. Monthly values in gray for the period of June 2014 to March 2015 were recorded by a standalone HOBO temperature sensor.
5. 'M' denotes data missing due to a sensor malfunction.
6. Monthly temperature lapse rates presented in Section 3.1 are based on a comparison of monthly average temperature data from the Camp and Potato Hills stations.

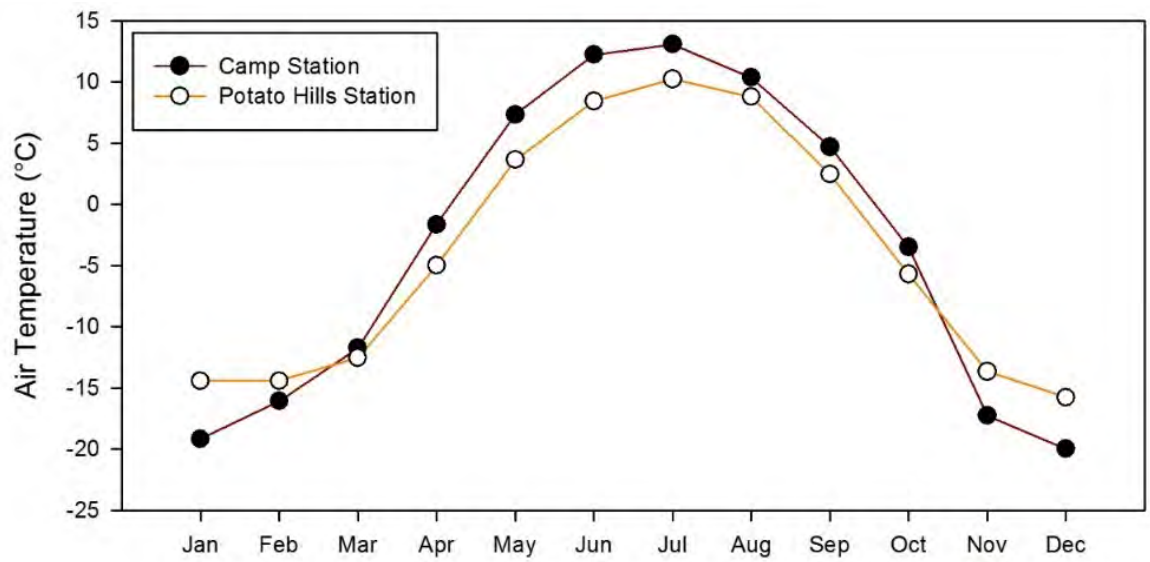


Figure 3-1: Monthly mean air temperature for the Project climate stations for the available period of record.

3.2 Rainfall

The precipitation data is collected at the Project site using tipping bucket rain gauges, which have not been adapted to measure snowfall. Therefore, the precipitation data presented in Table 3-2 is for rainfall only, collected between the months of March and October, inclusive. Generally precipitation falls as snow from November through March, with precipitation falling as a mix of rain and snow in April and October. Rainfall data for March is included in the table below, where the temperature record indicates that precipitation would have fallen as rain (*i.e.*, daily average air temperature was above zero).

Note that the rainfall data for August and September of 2015 were collected using a standalone tipping bucket gauge, as the primary gauge was malfunctioning.

Maximum annual monthly rainfall is realized in the month of July (53.2 mm and 65.6 mm at the Camp and Potato Hills stations, respectively).

Table 3-2:
Project site monthly rainfall data.

Climate Station	Elevation (m asl)	Rainfall (mm)														
		Year		**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Camp Station	782	2009		-	-	-	-	-	-	-	-	35.0	*8.0*	S	S	-
		2010		-	-	5.0	9.0	20.0	62.0	34.0	28.0	25.0	*12.0*	S	S	195.0
		2011		-	-	11.0	10.0	16.0	31.0	75.0	44.0	40.0	*9.0*	S	S	236.0
		2012		-	-	13.0	1.0	22.0	18.0	74.6	29.8	24.0	*4.8*	S	S	187.2
		2013		-	-	8.6	10.4	34.6	25.6	28.4	35.2	58.6	*25.2*	S	S	226.6
		2014		-	-	5.4	8.8	9.2	52.8	43.2	70.4	28.8	*23.2*	S	S	241.8
		2015		-	-	20.8	13.0	8.2	28.8	64.0	62.0	38.6	*13.4*	S	S	248.8
		All Years	Mean	-	-	10.6	8.7	18.3	36.4	53.2	44.9	35.7	*13.7*	S	S	222.6
			Maximum	-	-	20.8	13.0	34.6	62.0	75.0	70.4	58.6	*25.2*	S	S	248.8
			Minimum	-	-	5.0	1.0	8.2	18.0	28.4	28.0	24.0	*4.8*	S	S	187.2
Potato Hills Station	1420	2007		-	-	-	-	-	-	-	24.0	100.8	*2.0*	S	S	-
		2008		S	S	3.4	4.8	58.4	52.0	201.2	130.0	11.2	*1.2*	S	S	462.2
		2009		S	S	S	3.0	-	50.8	12.6	75.4	44.4	*1.2*	S	S	-
		2010		S	S	1.0	6.2	16.4	77.2	45.8	39.4	4.2	*5.4*	S	S	195.6
		2011		S	S	0.2	7.2	21.2	38.0	92.8	83.8	34.4	*0.4*	S	S	278.0
		2012		S	S	S	0.6	9.6	24.2	64.8	37.8	21.0	*4.6*	S	S	162.6
		2013		S	S	2.2	0.2	29.6	33.2	18.0	18.2	63.8	*10.0*	S	S	175.2
		2014		S	S	S	M	M	M	M	M	M	M	S	S	-
		2015		S	S	M	M	M	M	M	48.5	27.1	*10.0*	S	S	-
		All Years	Mean	S	S	S	3.7	27.0	45.9	72.5	57.1	38.4	*4.4*	S	S	254.7
			Maximum	S	S	S	7.2	58.4	77.2	201.2	130.0	100.8	*10.0*	S	S	462.2
			Minimum	S	S	S	0.2	9.6	24.2	12.6	18.2	4.2	*0.4*	S	S	162.6

Notes:
1. Winter precipitation data (October through April in many years) are unreliable due to the majority falling as snow. The months where no rainfall was recorded due to freezing conditions are denoted by an 'S'.
2. Data for the month of October are in italics, as rainfall is not measured for the entire month.
3. 'M' denotes data missing due to a sensor malfunction.

3.3 Snow Water Equivalent and Continuous Snow Depth Data

As discussed in Section 2.2, snow data have been collected at three snow courses[2] at the Project site since 2009. Furthermore, the annual maximum snow water equivalent (SWE) value generally occurs in late-March or early-April at the Project site. Field measurements from site show that snow density is generally lower earlier in the season, corresponding to colder temperatures, but increases through winter as the snow pack deepens, weathers and as snow melt progresses.

Project site snow survey data is summarized in Table 3-3 for period of record 2009 to 2016. Annual maximum SWE values range from 93 mm to 160 mm at the Camp snow course, 98 mm to 117 mm (shorter record) at the Ann Gulch snow course, and vary from 190 mm to 410 mm at the Potato Hills snow course.

The Potato Hills snow survey was conducted in the immediate vicinity of the weather station from 2009 to 2011. However, due to the exposed location, snow redistribution resulted in variable measurements, and therefore the survey was moved to its current and more sheltered location in 2012, several hundred metres to the south-east (Figure 2-1). Note that high snowpacks did not allow access to the Potato Hills snow course in March 2012, and therefore the survey was conducted at Stewart (Snow Survey #2; see Figure 2-1)

[2] See Note 1 in Table 3-3.

Table 3-3:
Project site snow survey data.

Year	Camp Station				Ann Gulch (Snow Survey #2)				Potato Hills Station			
	Survey Date	Depth (cm)	SWE (mm)	Density (%)	Survey Date	Depth (cm)	SWE (mm)	Density (%)	Survey Date	Depth (cm)	SWE (mm)	Density (%)
2009	2009-04-21	69	112	16%	-	-	-	-	2009-04-21	126	410	33%
2010	2010-03-31	50	99	20%	-	-	-	-	2010-03-31	103	278	27%
	2010-04-21	69	112	16%	-	-	-	-	2010-04-21	126	405	32%
2011	2011-03-28	55	93	17%	-	-	-	-	2011-03-28	105	251	24%
2012	2012-03-20	78	161	21%	-	-	-	-	2012-03-20[1]	99	237	0
	2012-04-20	56	79	14%	-	-	-	-	2012-04-22	117	262	22%
2013	-	-	-	-	2013-02-20	70	97	14%	2013-02-28	96	185	19%
	2013-03-02	61	108	18%	2013-03-02	67	115	17%	-	-	-	-
	2013-04-02	59	108	18%	2013-04-02	62	117	19%	2013-04-03	90	190	21%
	2013-05-05	58	106	18%	2013-04-16	62	85	14%	-	-	-	-
	-	-	-	-	2013-05-03	58	105	18%	2013-05-05	117	167	14%
2014	2014-03-12	57	126	22%	2014-03-12	51	94	18%	2014-03-11	98	276	28%
	2014-04-02	55	100	18%	2014-04-02	46	98	21%	2014-04-02	96	275	29%
	-	-	-	-	-	-	-	-	2014-05-08	70	258	37%
2016	2016-03-02	53	118	22%	2016-03-02	53	117	22%	2016-03-02	95	214	22%
	2016-04-09	38	140	37%	2016-04-09	22	115	52%	2016-04-10	107	257	24%
	-	-	-	-	-	-	-	-	2016-05-03	95	226	24%

Notes:
1. Snow survey data for Potato Hills collected on 2012-03-20 is from the Stewart Gulch survey (Snow Survey #2) at 995 m asl (see Figure 2-1).
2. No snow surveys were conducted at site in 2015.

3.3.1 Continuous Snow Depth Data

Continuous snow depth data is summarized for the Camp climate station in Figure 3-2.

The upper panel of Figure 3-2 shows the evolution of the snowpack for the 2012 to 2016 time-period, with pack depth showing initial and appreciable accumulation through the months of November and December, typically reaching maximum depth by mid-March each year. These data then show snow pack depth remains deep and relatively stable to April.

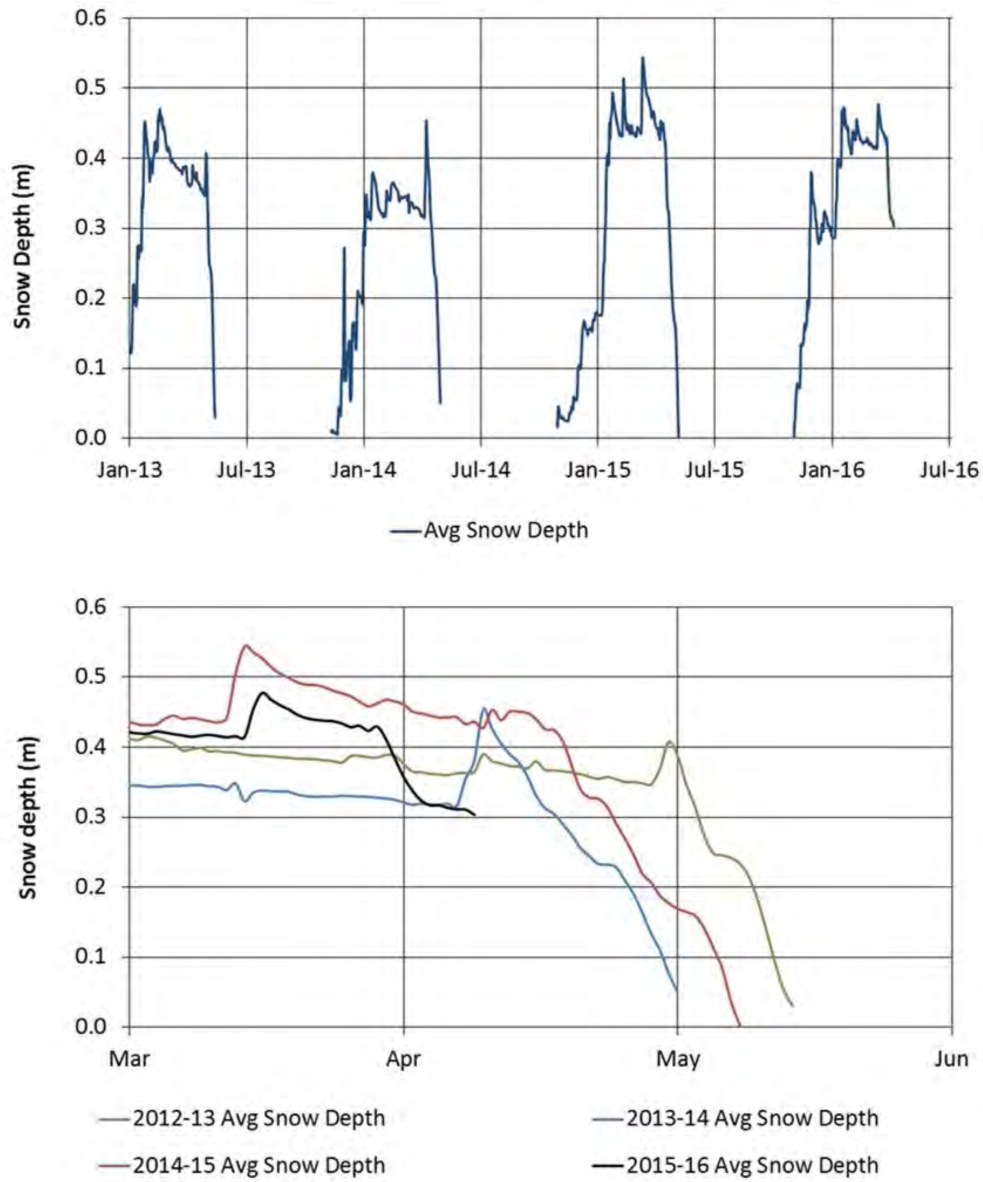


Figure 3-2: Summary of recent (2012-2016) continuous snow depth data for the Camp climate station.

The lower panel of Figure 3-2, illustrates the timing and rate of snowpack loss for the Camp climate station. While variable from year to year, these data show snowpack losses begin in earnest by mid- to late-April each year. Furthermore, the duration of snowmelt is short- and typically a 15 to 20 day process at this station elevation.

3.4 Barometric Pressure

Barometric pressure is monitored 15-minute intervals at both site climate stations. It provides a measure of the weight exerted by the atmosphere on the earth's surface at a point, and provides a direct indication of changes in the synoptic weather pattern (*e.g.*, dropping barometric pressure can indicate the approach of a warm front). As expected, barometric pressure decreases with elevation at site, and is generally elevated during the summer months in comparison to the winter season (Table 3-4). When the Potato Hills climate station experienced a malfunction between May 2014 and July 2015, Table 3-4 was populated with data recorded by a standalone HOBO temperature/pressure logger for this time period. Annual average barometric pressure is 91.8 kPa at the Camp station, and 84.9 kPa at the Potato Hills station.

Table 3-4:
Project site monthly average barometric pressure.

Climate Station	**Elevation (m asl)**	**Barometric Pressure (kPa)**													
		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009	-	-	-	-	-	-	-	91.6	91.3	91.7	90.1	91.9	-
		2010	91.2	91.2	90.5	91.2	91.9	91.5	91.8	91.8	91.8	91.2	91.7	91.9	91.5
		2011	91.8	92.2	91.9	91.6	92.1	91.9	91.8	91.8	91.4	91.3	91.1	91.2	91.7
		2012	91.2	91.5	90.9	91.9	91.8	91.3	92.2	92.2	91.8	92.5	92.1	91.5	91.7
		2013	91.9	91.2	92.3	92.2	92.2	92.4	92.5	92.0	91.4	91.9	92.1	92.5	92.1
		2014	91.7	92.3	92.0	91.6	92.4	92.0	92.2	92.1	92.0	91.3	92.3	91.6	92.0
		2015	92.2	92.5	91.9	91.4	92.5	92.2	92.1	92.0	91.6	91.7	91.3	91.0	91.9
		Average	91.7	91.8	91.6	91.7	92.1	91.9	92.1	91.9	91.6	91.7	91.5	91.6	91.8
Potato Hills Station	1420	2007	-	-	-	-	-	-	-	85.5	85.1	84.1	84.7	84.0	-
		2008	84.1	84.3	84.6	84.9	85.4	85.4	85.2	85.4	85.3	84.4	84.3	85.0	84.9
		2009	84.7	84.8	84.5	85.3	85.4	86.0	85.8	85.4	85.0	85.1	83.4	85.1	85.0
		2010	84.4	84.5	83.9	84.7	85.5	85.2	85.5	85.5	85.3	84.3	84.6	84.4	84.8
		2011	84.9	84.8	84.6	84.6	85.3	85.2	85.2	85.2	84.6	84.5	83.7	84.4	84.8
		2012	83.8	83.3	84.0	84.9	84.5	84.8	85.3	85.5	85.0	85.4	84.8	84.1	84.6
		2013	84.6	84.1	85.1	84.9	85.4	85.8	85.8	85.4	84.7	85.0	84.8	85.0	85.1
		2014	84.6	85.0	84.8	84.7	85.8	85.1	85.6	85.4	85.2	84.5	85.4	84.8	85.1
		2015	85.2	85.6	85.0	M	M	M	85.9	85.3	84.8	84.8	84.2	83.9	-
		Average	84.5	84.6	84.6	85.0	85.3	85.4	85.5	85.4	85.0	84.7	84.4	84.5	84.9

Notes:
1. Monthly values in gray for the period of June 2014 to March 2015 were recorded by a standalone HOBO barometric pressure sensor.
2. 'M' denotes data missing due to a sensor malfunction.

3.5 Relative Humidity

Relative humidity is a measure of the water vapour content of an air parcel, expressed as a percentage of the total water vapour required for the air to be fully saturated at a given temperature. Therefore, at colder temperatures, less water vapour is required to achieve a high relative humidity, and conversely at higher temperatures, more water vapour is required to obtain the same relative humidity value.

Given that air temperatures are well below zero during the winter, relative humidity values are elevated throughout the winter, and lower during the summer. With respect to monthly patterns for relative humidity, the annual minimum is expected to occur in the month of May. All monthly average relative humidity values from both climate stations are provided in Table 3-5 and Figure 3-3. Annual average relative humidity is 70% at the Camp station, and 77% at the Potato Hills station.

Table 3-5:
Project site monthly average relative humidity.

Climate Station	**Elevation (m asl)**	**Relative Humidity (%)**													
		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009	-	-	-	-	-	-	-	82	76	73	80	79	-
		2010	77	76	60	54	49	66	68	66	65	79	80	73	68
		2011	76	71	62	61	56	64	74	77	73	81	75	81	71
		2012	73	75	66	59	57	59	70	70	71	75	70	73	68
		2013	75	80	64	52	61	60	63	70	76	84	77	71	69
		2014	83	71	59	58	53	59	67	76	71	82	78	82	70
		2015	80	78	68	62	49	62	71	75	75	84	80	82	72
		Average	77	75	63	58	54	62	69	74	73	80	77	77	70
Potato Hills Station	1420	2007	-	-	-	-	-	-	-	63	83	88	81	88	-
		2008	82	79	74	69	67	60	77	82	83	91	90	74	77
		2009	76	80	81	70	37	68	53	85	85	82	91	86	75
		2010	86	83	75	65	55	72	75	71	72	90	89	86	76
		2011	85	80	64	75	63	67	77	82	79	90	90	89	78
		2012	93	90	87	73	73	69	74	71	73	84	82	86	80
		2013	87	94	73	65	63	62	67	70	86	92	87	85	78
		2014	91	72	59	66	59	M	M	M	M	M	M	M	-
		2015	M	M	M	M	M	M	85	80	88	96	95	94	-
		Average	86	82	73	69	60	66	72	75	81	89	88	86	77

Notes:
1. 'M' denotes data missing due to a sensor malfunction.

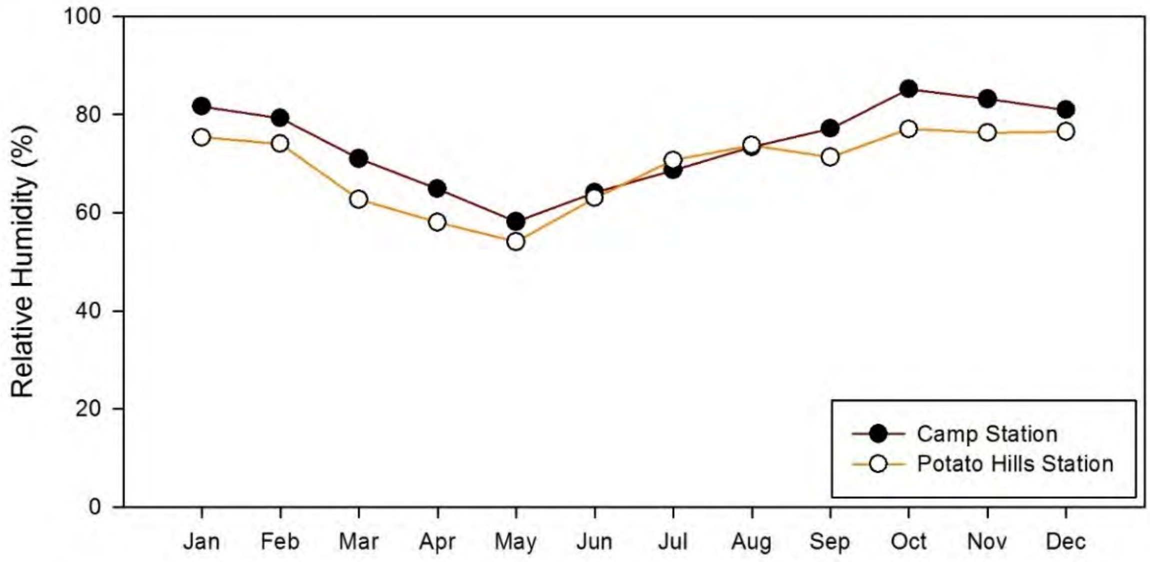


Figure 3-3: Project site average monthly relative humidity.

3.6 Wind Speed and Direction

The predominant wind direction at the site climate stations is from the north, and west-northwest, for the Camp and Potato Hills stations, respectively. Wind speeds average 1.2 m/s at the Camp station, and 2.4 m/s at the Potato Hills station, on an annual basis (Table 3-6; Figure 3-4). The maximum recorded gust speed at the Camp station was 18.2 m/s over a 15 minute interval. At the Potato Hills station, wind speeds averaged 23.5 m/s over a 1 hour period, and during the same event, wind speeds in excess of 20 m/s were recorded for a 4.5 hour period. As shown in Table 3-6, the mean monthly wind speeds for both stations are higher in the spring, summer, and autumn months, and lower in the winter, with annual average monthly minimums occurring in December, and annual maximum winds in April and May.

Table 3-6:
Project site monthly average wind speeds.

Climate Station	Elevation (m asl)	Wind Speed (m/s)												
		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009	-	-	-	-	-	-	-	1.4	1.2	1.2	1.1	0.7	-
		2010	1.2	1.1	2.2	2.0	1.9	1.5	1.4	1.3	1.5	1.2	0.7	1.0	1.4
		2011	0.6	1.2	1.3	1.8	1.7	1.5	1.3	1.2	1.4	0.9	0.9	0.2	1.2
		2012	0.9	1.2	1.6	1.4	1.9	1.3	1.4	1.3	1.5	1.1	1.3	0.7	1.3
		2013	0.8	0.9	1.2	2.2	1.5	1.7	1.5	1.3	1.6	0.8	0.7	0.7	1.2
		2014	0.1	0.8	1.3	1.5	1.8	1.6	1.5	1.2	1.2	1.3	0.9	0.5	1.2
		2015	0.2	0.3	1.1	1.4	1.6	1.6	1.2	1.2	1.3	1.1	0.7	0.0	1.0
		Average	0.6	0.9	1.5	1.7	1.7	1.5	1.4	1.3	1.4	1.1	0.9	0.5	1.2
Potato Hills Station	1420	2007	-	-	-	-	-	-	-	2.3	2.3	3.0	3.0	0.8	-
		2008	2.8	3.7	3.6	3.6	3.6	3.1	3.1	2.8	1.7	1.3	2.6	3.1	2.9
		2009	3.2	2.5	3.2	3.0	3.1	2.7	2.9	2.0	2.0	3.4	2.3	2.1	2.7
		2010	2.1	2.1	3.9	3.6	2.7	2.0	2.6	2.7	3.0	2.8	1.5	1.0	2.5
		2011	2.0	3.2	3.4	3.2	3.4	2.0	1.8	2.3	1.2	0.4	2.0	1.4	2.2
		2012	0.0	0.2	1.4	2.0	2.9	1.8	1.9	2.0	2.9	2.5	2.6	0.7	1.7
		2013	1.7	0.7	2.9	4.8	2.6	2.3	2.5	1.8	2.9	2.2	2.1	2.2	2.4
		2014	1.6	2.6	2.5	3.0	2.7	M	M	M	M	M	M	M	-
		2015	M	M	M	M	M	M	0.9	1.8	2.5	1.4	0.0	0.0	-
		Average	1.9	2.2	3.0	3.3	3.0	2.3	2.2	2.2	2.3	2.1	2.0	1.4	2.4

Notes:
1. Zero value for January 2012 is likely due to icing of the wind sensor.
2. 'M' denotes data missing due to a sensor malfunction.

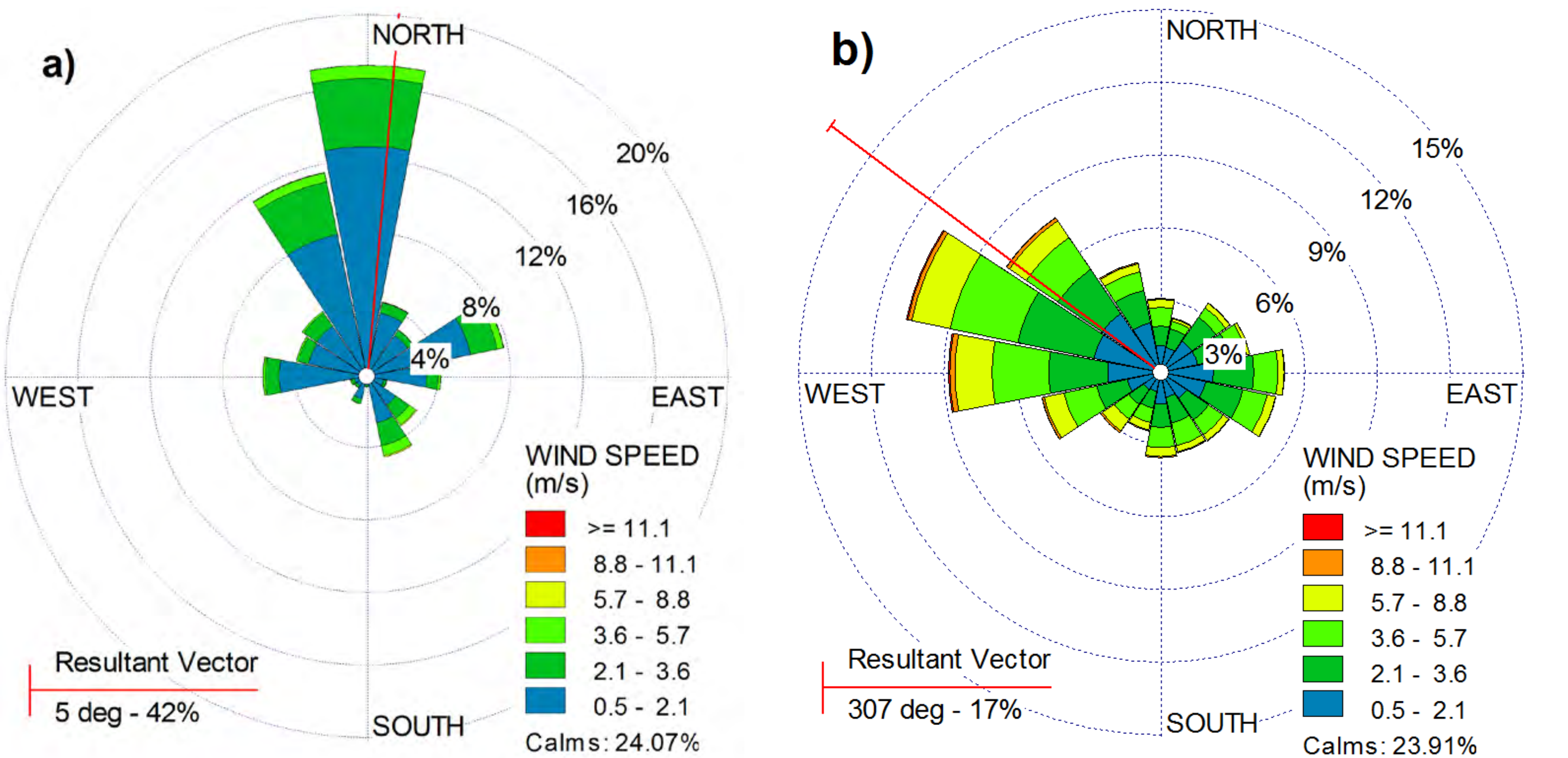


Figure 3-4: Project site wind roses for the Camp station (a) and the Potato Hills station (b). Wind roses are based on hourly averages of 15-minute readings of wind speed and direction.

3.7 Solar Radiation

Solar radiation (or solar irradiance) is a measure of the power per unit area provided by the Sun, in watts per square meter (W/m^2). Given the high-latitude location of the Project site, day length, and therefore solar radiation, fluctuate greatly on a seasonal basis. The average annual minimum of 1 W/m^2 (Camp station) and 3 W/m^2 (Potato Hills station) occur in the month of December, while the average annual maximum of 221 W/m^2 and 224 W/m^2 occur in May at the Camp and Potato Hills stations, respectively. The Camp stations location in the valley bottom results in slightly lower incident solar radiation, presumably due to the shading effect of the surrounding terrain. The monthly average and maximum solar radiation values for both stations, for the full period of record, are presented in Table 3-7.

Table 3-7:
Project site monthly maximum and average incoming solar radiation.

Climate Station	Elevation (m asl)	Maximum Solar Radiation (W/m^2)												
		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2011	-	-	-	-	-	-	-	-	-	194	214	28	-
		2012	28	272	716	917	951	801	1022	832	708	423	172	119	1022
		2013	181	291	718	748	951	920	1005	810	741	461	191	38	1005
		2014	35	123	579	838	937	954	913	791	731	403	203	29	954
		2015	39	398	629	845	950	991	965	867	634	470	215	8	991
		Maximum	181	398	718	917	951	991	1022	867	741	470	215	119	1022
Potato Hills Station	1420	2007	-	-	-	-	-	-	-	954	714	517	206	67	-
		2008	148	484	564	988	1047	1159	1162	1117	863	344	197	51	1162
		2009	179	302	856	976	979	1118	1086	908	768	488	188	69	1118
		2010	109	396	704	971	1069	1112	1079	944	838	472	247	77	1112
		2011	184	377	802	957	1136	1174	1124	1037	767	441	201	131	1174
		2012	31	34	126	1042	1126	1216	1251	934	897	483	163	78	1251
		2013	124	252	938	787	1071	1199	1233	1026	838	564	243	103	1233
		2014	162	356	667	1127	1021	M	M	M	M	M	M	M	-
		2015	M	M	M	M	M	M	662	1096	766	536	101	71	-
		Maximum	184	484	938	1127	1136	1216	1251	1117	897	564	247	131	1251
Climate Station	**Elevation (m asl)**	**Average Solar Radiation (W/m^2)**													
		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2011	-	-	-	-	-	-	-	-	-	40	12	2	-
		2012	3	44	165	263	237	174	184	153	84	42	10	2	113
		2013	4	18	108	181	201	225	198	154	77	36	9	1	101
		2014	2	10	106	162	204	208	183	128	96	23	11	1	95
		2015	2	14	86	155	242	210	176	144	80	32	5	1	96
		Average	3	21	116	190	221	204	186	145	84	35	10	1	101
Potato Hills Station	1420	2007	-	-	-	-	-	-	-	162	87	37	11	2	-
		2008	9	38	98	163	193	222	180	132	83	22	10	3	96
		2009	7	35	95	184	250	228	244	116	81	42	8	3	108
		2010	6	34	96	183	233	210	191	178	115	35	10	3	108
		2011	8	35	106	187	250	221	199	152	100	46	13	7	110
		2012	1	2	6	110	163	189	203	168	93	46	11	3	83
		2013	7	16	112	171	246	245	218	169	82	36	11	3	110
		2014	7	43	122	178	234	M	M	M	M	M	M	M	-
		2015	M	M	M	M	M	M	185	163	89	35	5	1	-
		Average	6	29	91	168	224	219	203	155	91	37	10	3	102

Notes:
1. Solar radiation is zero at night.
2. Maximum values are based on a one-hour recording interval.
3. Zero values are not included in the calculation of averages.
4. ‘M’ denotes data missing due to a sensor malfunction.

3.8 Potential Evaporation

15-minute potential evaporation rates were computed for the Camp station using available climate and the Ref-ET calculator - a compiled, stand-alone computer program that calculates reference evapotranspiration (ASCE, 2005). For the period of available record (Jan 2013 to Apr 2016), a 15-minute climate input file was prepared for the Eagle Gold site. The input variables required by Ref-ET are: maximum air temperature, minimum air temperature, relative humidity, incoming solar radiation, atmospheric pressure and wind speed.

From the assembled climate inputs, Ref-ET returned potential evaporation (PE) computations at daily time-step based on an array of evaporation models (*e.g.*, Penman-Monteith model, Priestley-Taylor formulation). Presented in Figure 3-5 (daily outputs) and Table 3-8 (monthly tabulations) are resulting outputs from Ref-ET for months March to October. May to end-September PE for the Camp station is estimated to be 380 mm, with highest monthly rates of PE expected in May, June, July and August of each year.

Table 3-8:
Potential evaporation (PE) estimates for the Camp station.

		Potential Evaporation (mm)				
Period	**Method**	**2012**	**2013**	**2014**	**2015**	**Average (2012-2015)**
Mar	PM	---	17	21	17	18
	P-T	---	16	19	16	17
Apr	PM	---	40	47	47	45
	P-T	---	40	46	46	44
May	PM	---	78	91	113	94
	P-T	---	82	85	108	92
Jun	PM	---	114	98	97	103
	P-T	---	116	96	97	103
Jul	PM	87	102	91	80	90
	P-T	93	102	90	86	93
Aug	PM	69	74	55	61	65
	P-T	70	73	56	63	65
Sep	PM	36	30	33	27	31
	P-T	26	24	28	23	25
Oct	PM	6	3	10	10	7
	P-T	4	3	4	5	4
Total (Mar-Oct)	PM	---	456	445	453	453
	P-T	---	456	423	445	443
Total (May-Sep)	PM	---	397	367	378	382
	P-T	---	397	354	378	378

Notes:

1. PM and P-T Indicate potential evaporation (PE) estimates based on Penman–Monteith and Priestley–Taylor approaches respectively.
2. PE Estimates computed using Eagle camp/lower 15-min climate data (I.E, air, temperature, relative humidity, wind speed, precipitation solar radiation, atmospheric pressure) and Ref-Et software

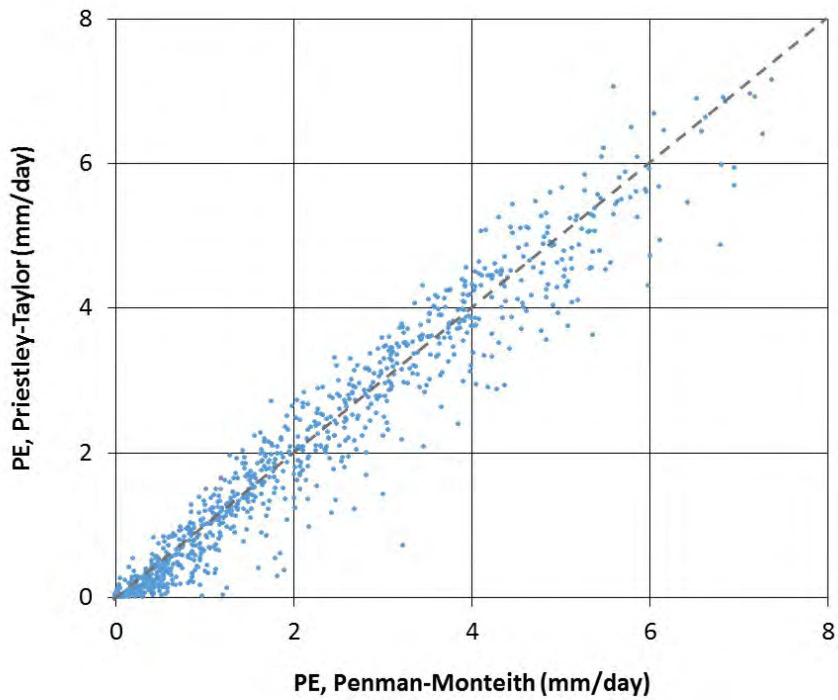


Figure 3-5: Comparison of daily PE estimates (*i.e.*, Penman Monteith versus Priestley-Taylor evaporation models) for the Camp station.

4. Closure

4. Closure

We trust that this report meets your expectations at this time. Please contact the undersigned with any questions or comments.

Sincerely,

LORAX ENVIRONMENTAL SERVICES LTD.

Prepared by:

Colin Fraser, M.Sc., P.Geo.
Senior Hydrologist

Scott Jackson, M.Sc., P.Geo.
Hydrologist

References

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APPENDIX C

Eagle Gold Hydrology Baseline Report

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Eagle Gold
Hydrology Baseline Report

Project No. A413-2
15 December 2016

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1. Introduction

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1. Introduction

1.1 Scope of Report

This report presents a summary of all baseline streamflow data collected for the Eagle Gold Project (Project) since August 2007, including hydrometric information summarized in previous reports to the end of December 2012 (Stantec 2012; Knight Piesold 2013). Previously unpublished data collected for the years of 2013 to 2015 are presented in this report.

An overview of the streamflow monitoring program is provided in Section 2. Methods for the measurement of streamflow and stage (both spot and continuous) are presented in Section 3, along with the approach used to develop the rating curves for each station, the paired stage-discharge measurements and associated rating curve error. Stage record corrections (*e.g.*, due to station relocation, frost jacking of the staff gauge, channel aggradation, *etc*.) are also presented.

In Section 4, streamflow data is presented in the following formats:

- Monthly tables showing average, maximum and minimum 15-minute discharge values (m^3/s);
- Monthly tables showing average discharge (m^3/s), average unit yields ($L/s/km^2$) and total runoff (mm);
- Time-series plots of continous average daily discharge (m^3/s) and spot flow measurements (m^3/s), and;
- Time series plots of average daily unit yields ($L/s/km^2$), by year.

1.2 Previous Reports

The streamflow data collected at the Eagle Gold Project site from 2007 up to and including 2012, has been previously summarized in the following reports:

- *Dublin Gulch Project – Climate and Hydrology Environmental Baseline Report* (2008), prepared by Jacques Whitford AXYS (Burnaby, BC) for Strata Gold Corp. (Vancouver, BC).
- *Eagle Gold Project, Environmental Baseline Report: Hydrology* (2010), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., February 2010.

- *Eagle Gold Project, Environmental Data Summary Report: Hydrology 2011 Update* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Eagle Gold Project, Surface Water Balance Model Report* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Eagle Gold Project, Environmental Baseline Data Report: Hydrology 2011 Update* (2012), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2012.
- *Victoria Gold Corp., Eagle Gold Project – Hydrology Baseline Data Summary. VA101-290/6-10*, prepared by Knight Piésold Ltd. (Vancouver, BC) for Victoria Gold Corp., August 2013.

1.3 Project Area Characteristics

The majority of the Project site lies within the Dublin Gulch watershed, which is a second order tributary to the larger Haggart Creek watershed, which is a major tributary of the South McQuesten River. The South McQuesten River joins the Stewart River, which flows west to its eventual confluence with the Yukon River.

The hydrology of the region is characterized by a dominant snowmelt driven freshet signature, which typically occurs between early May and early June. The recession limb of the freshet tapers to a lower summer flow regime reflective of primarily groundwater, which is punctuated by periodic rainfall driven runoff events, typically one to four days in duration. Base flows are lowest in the winter and flow sub-ice; in the smaller creeks groundwater is depleted and there is no flow under the ice.

In larger tributaries, groundwater discharge maintains limited amounts of streamflow below the ice throughout the winter (*i.e.*, November through end March). Aufeis (*i.e.*, groundwater that seeps and freezes onto- and adjacent to local watercourses) is present in several places throughout streams at the Project site, where sub-ice flow is not present. As with shelf ice in the streams, aufeis melts during the freshet, but may in some cases persist into the early summer.

Historical placer mining activities in the Project site streams have altered the natural channel conditions, and in some cases, have also altered the drainage areas of several sub-watersheds. More information is provided in Stantec (2012).

2. Streamflow Monitoring Program

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2. Streamflow Monitoring Program

2.1 Data Sources

Data collection was originally undertaken by Hallam Knight Piésold (1993 to 1995), then a new program was initiated in 2007 by Jacques Whitford AXYS (now Stantec Consulting Ltd., or Stantec). Field support for this program has been provided by Laberge Environmental Services (Laberge), based out of Whitehorse since the inception of the program. All streamflow data collected at the Project site up to the end of 2012 has been previously summarized in the reports per Section 1.2.

Laberge continues to operate the field program, conducting regular field visits in all seasons. Initial QA/QC of this data and associated development and updates of rating curves were undertaken by Patrick Bryan (P.Eng.), who operates as an independent contractor. At the time report preparation, there are eight continuously recording hydrometric stations operating at the Project site.

2.2 Project Site Hydrometric Stations

The number of continuously recording hydrometric stations has varied over the period of record, but the eight currently operating stations presented in this report update have the most complete records. These stations and the associated metadata are presented in Table 2-1 and shown in Figure 2-1.

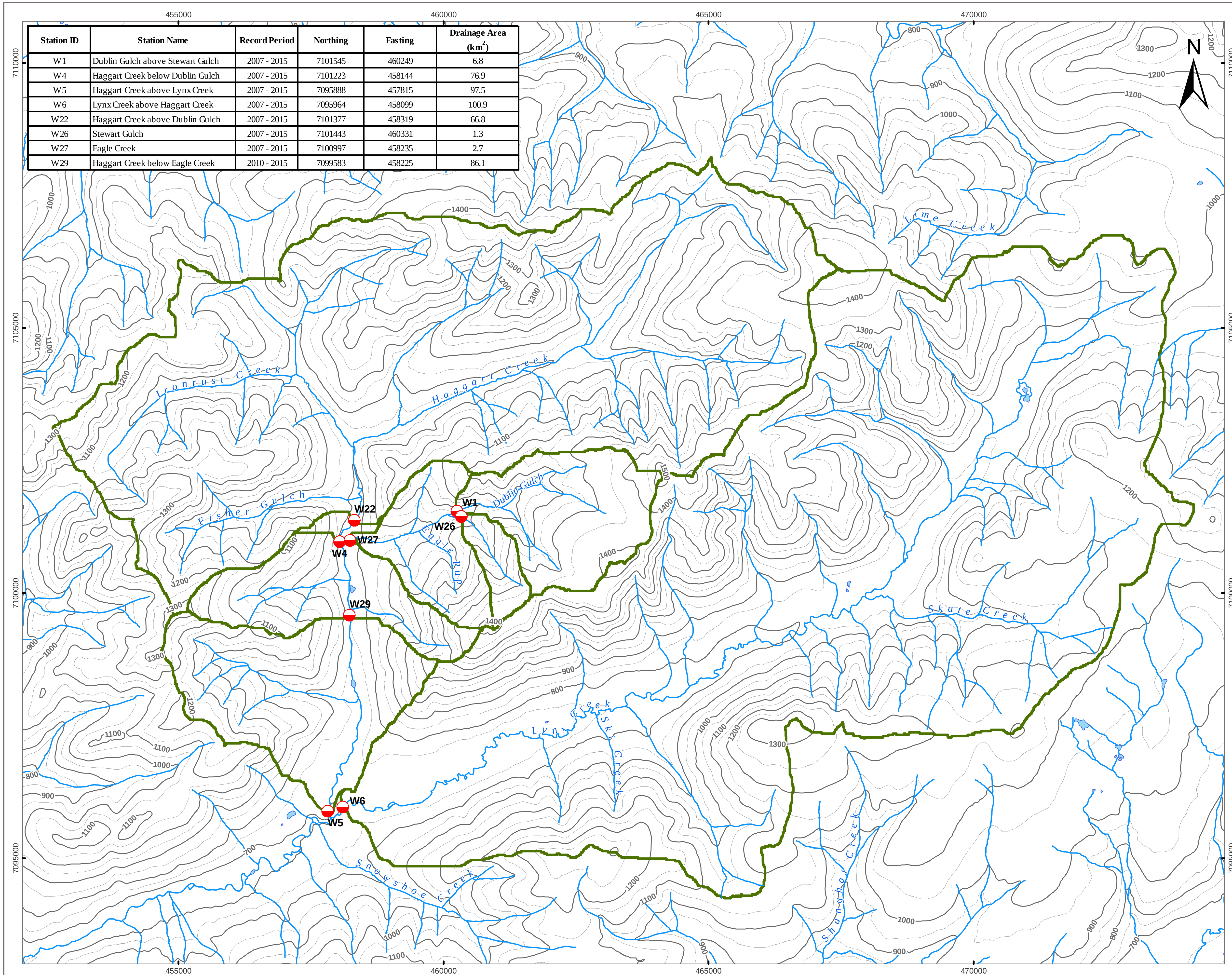
Additional manual streamflow measurements have been collected (often concurrently with water quality samples) at an additional 20 locations at the Project site. Previously collected continuous streamflow records for the Eagle Creek Pond (WECP), W13, W20, W31 span shorter durations (1 to 3 years), and are presented in previous reports.

Table 2-1:
Eagle Gold Project hydrometric stations

Station ID	Station Name	Record Period	Northing	Easting	Drainage Area (km^2)	Median Basin Elevation (m)	Notes
W1	Dublin Gulch above Stewart Gulch	2007 - 2015	7,101,545	460,249	6.8	1,303	Continuous discharge time-series
W4	Haggart Creek below Dublin Gulch	2007 - 2015	7,101,223	458,144	76.9	1,125	Continuous discharge time-series
W5	Haggart Creek above Lynx Creek	2007 - 2015	7,095,888	457,815	97.5	1,091	Continuous discharge time-series
W6	Lynx Creek above Haggart Creek	2007 - 2015	7,095,964	458,099	100.9	1,049	Continuous discharge time-series
W22	Haggart Creek above Dublin Gulch	2007 - 2015	7,101,377	458,319	66.8	1,113	Continuous discharge time-series
W26	Stewart Gulch	2007 - 2015	7,101,443	460,331	1.3	1,183	Continuous discharge time-series, manual data only for 2007 - 2009, 2011.
W27	Eagle Creek	2007 - 2015	7,100,997	458,235	2.7	1,037	Continuous discharge time-series, manual data only for 2007
W29	Haggart Creek below Eagle Creek	2010 - 2015	7,099,583	458,225	86.1	1,112	Manual measurements for 2010, continuous data thereafter

Notes:
1. Source of UTM co-ordinates, drainage area and median basin elevation (Knight-Piésold, 2013).

Station ID	Station Name	Record Period	Northing	Easting	Drainage Area (km^2)
W1	Dublin Gulch above Stewart Gulch	2007 - 2015	7101545	460249	6.8
W4	Haggart Creek below Dublin Gulch	2007 - 2015	7101223	458144	76.9
W5	Haggart Creek above Lynx Creek	2007 - 2015	7095888	457815	97.5
W6	Lynx Creek above Haggart Creek	2007 - 2015	7095964	458099	100.9
W22	Haggart Creek above Dublin Gulch	2007 - 2015	7101377	458319	66.8
W26	Stewart Gulch	2007 - 2015	7101443	460331	1.3
W27	Eagle Creek	2007 - 2015	7100997	458235	2.7
W29	Haggart Creek below Eagle Creek	2010 - 2015	7099583	458225	86.1



LEGEND

- Hydrometric Station
- Watershed Boundary
- Watercourse
- Waterbody
- Contour (100m)
- Contour (50m)

NOTES

Base data source:

STATUS

FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Hydrometric Station Network

PROJECTION	DATUM	CLIENT
Transverse Mercator UTM Zone 8	NAD83	Victoria Gold Corp

Scale: 1:70,000

1,300 650 0

Metres

FILE NO.

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	GM	SJ	DHF	1

OFFICE

DATE

November 25, 2016

Lorax Environmental

Figure 1

Path: P:\@Drafting\Eagle Gold\Drafting Figures\MXD\Hydrometric Stations_20161125.mxd

2.2.1 Hydrometric Station Summary

A brief summary of the hydrometric network history is provided below. Further details are available in the previous baseline reports listed in Section 1.2. Note that a high-magnitude peak flow event occurred in late May of 2013 during the freshet that caused extensive damage to three stations located on Haggart Creek. More information is provided in Appendix A (*Technical Memo Indirect Discharge W-29 2013*), where several methods of estimating the peak discharge associated with this event are presented, resulting in an estimated peak discharge value at W29 of 12 to 15 m^3/s.

W1

- Installed in 2007 with a continuous water level recorder
- Transducer malfunctions in 2013 and 2014 resulted in loss of data
- Highly mobile bed, due in part to historical placer mining activities

W4

- Installed in 2007 with a continuous water level recorder

W5

- Installed in 2007 with a continuous water level recorder
- Staff gauge was knocked over in the 2013 freshet and repaired in July 2013

W6

- Installed in 2007 with a continuous water level recorder
- A portion of the 2014 record is influenced by a beaver dam located downstream of the control section – influence is minimal and it was possible to correct for the artificially elevated stage.

W22

- Installed in 2007 with a continuous water level recorder
- No data was available for 2011 due to a pressure transducer malfunction. The water level record estimated by Stantec was carried forward in this report.
- Staff gauge was knocked over in the 2013 freshet and repaired in July 2013

W26

- Manual measurements from 2007 to 2009, instrumented with a continuous water level recorder in 2009.
- V-notch weir installed in 2009, and replaced with a Parshall flume in August 2011

- Technical issues with datalogger installation in 2011 resulted in loss of continous data – only manual measurements are available for this year.

W27

- Installed in 2007 with a continuous water level recorder, however data is not reported due to apparent sedimentation in the stilling well resulting in a continuously rising water level
- V-notch weir installed in 2009, and replaced with a Parshall flume in August 2011
- Malfunction of pressure transducer in August 2015 resulted in loss of data for remainder of the year

W29

- Manual measurements in 2010, instrumented with a continuous water level recorder in 2011.
- Station was destroyed in the 2013 freshet, and a replacement pressure transducer was deployed on an anchor in the streambed just upstream, and water levels were surveyed at the old location and the temporary installation to determine the required offset. A new stilling well was installed in July 2015 at the original gauge location.

2.2.2 Manual Discharge Measurements

Over time, manual discharge measurements have been conducted using the following methods:

- Velocity area techniques using a current meter;
- Salt dilution;
- Calibrated V-notch weir;
- Calibrated Parshall flume;
- Bucket/Bag and stopwatch, and;
- Float-area method.

The majority of the manual discharge measurements were conducted using the velocity-area method, with approximately one quarter made using the salt dilution technique. Most winter measurements were made while ice encroached on the channel, and therefore salt dilution was the preferred method for winter flow measurements. Typically, one discharge measurement was made at each visit.

2.2.3 Stage Measurements and Corrections

All stations were instrumented with metric staff gauges, mounted to vertical angle iron in the stream channel, and regularly surveyed to nearby benchmarks. Continuously recording HOBO pressure transducers were installed in stilling wells, and set to record water level every 15 minutes. These readings were corrected for fluctuations in barometric pressure in a post-processing step. During each site visit, the water level was noted on the staff gauge. These readings formed the basis for the continuous water level records, which were adjusted to match the manual stage readings. Regular surveys were conducted to determine the staff gauge zero datum and water level, and these measurements were used to correct the station records for changes due to shifts in the channel bed (*i.e.*, aggradation or scour), frost-jacking or station relocation following a high-magnitude flood event.

At each station, an annual offset was developed to bring the staff gauge measurements into line with the reference datum from the 2012 benchmark surveys. W27 was the exception, as no survey information was available for 2012, so 2009 was used as the benchmark reference year for this station following Knight Piésold (2013). In this way, the reference datum at each station was kept consistent for the duration of the record period, regardless of station location or streambed conditions.

At station W6, a beaver dam located downstream of the gauge affected the discharge measurements during the summer of 2014. While the exact dates that the stage was altered (biased higher) due to the dams backwater effect is not known, the unit yields from this station began to diverge from the other large basins on July 15, 2014. A manual discharge measurement made on August 5th was approximately half the value calculated from the water level record (0.449 and 0.993 m^3/s, respectively), and deterioration of the dam was noted at this time. The unit yields came back into alignment with the other basins on August 6, 2014, and the next manual discharge measurement, made on October 17, 2014 (0.973 m^3/s) matched the value calculated from the water level record (1.009 m^3/s), indicating that the dam had been removed. Accordingly, the discharge record for the period July 15 to August 6, 2014 was adjusted downward by half to account for the altered stage record.

3. Streamflow Record Development

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3. Streamflow Record Development

3.1 General Approach

To develop continuous time-series of discharge for the Project streams, spot measurements of stage and discharge are combined with continuous water level records collected by the pressure transducers. Mathematical relationships are derived to describe the relationship between water level and discharge, and then applied to the continuous water level records to estimate discharge. By convention, assembled stage and discharge relationships are commonly referred to as rating curves, where the relationship between stage and discharge are unique and specific to each monitoring station.

3.2 Rating Curve Development

Adjustments for stage (Section 2.2.3) were made prior to the assembly of rating curves. Winter spot flow measurements provided information on the magnitude of winter discharge, but due to ice effects and greater measurement uncertainty for both stage and discharge, these measurements were not employed in the rating curve development process.

Rating curves were developed using the standard rating equation, and the coefficient, offset and exponent were selected to conform to hydraulic theory (*e.g.*, Maidment, 1993) and the stream channel properties.

$$Q = C(h - a)^n$$

Where:

Q = discharge (m^3/s)

C = coefficient (function of channel geometry)

h = stage (m)

a = stage at point of zero flow, offset (m)

n = exponent (function of channel geometry)

The term C is usually 0.5 to 2.5 times the channel width at the control section, and n is often between 1.6 and 3 for moderate gradient streams. The BC RISC standards (RISC, 2009) state that ideally, a rating curve will be based on a minimum of 10 stage-discharge measurements. Given the long duration of monitoring activities at the Project site, all stations meet this guiding criteria, with the exception of W6, where the rating curve is based on nine stage-discharge measurements.

3.3 Rating Curve Error

The overall quality of the discharge record can be assessed by reviewing the average and standard errors calculated from the differences between the measured discharges, and those estimated from the rating equation. A positive rating curve error is defined where the discharge calculated from the rating curve overestimates the value when compared to the measured discharge, and vice-versa for a negative error.

A summary of the error metrics for all stations is presented in Table 3-1, with reporting for each station in Table 3-2 through Table 3-9. Table 3-1 also reports rating curve control percentages by monitoring station. These values indicate the percent of time that a continuously recorded observation (15-minute intervals) falls between the highest and lowest manually recorded measurements for each monitoring station. For example, at the W6 station, 96% of the 15-minute water level measurements are lower than the highest recorded manual stage measurement. Therefore, the measurements used in the rating curve development are able to represent 96% of the entire continuous water level record, and only 4% of the continuous discharge data derived from the rating curve are based on an extrapolation beyond the highest manually recorded stage-discharge measurement.

Overall, the rating curves provide reasonable estimates of discharge across a wide range of flows at most of the Project stations. The rating curve errors presented in Table 3-1 indicate that the average errors are relatively low, ranging from -6% to 1%. The standard error, or the degree of variability about the average error values varies more between stations, from a high or 27% for station W1, to a low of 8% for station W6.

Rating curves for the site hydrometric stations are presented in Figure 3-1 through Figure 3-6, covering the 2012 to 2015 period. The rating equations were compared to those previously developed for each station to ensure that the coefficients and exponents were consistent through time. In general, the rating equations remained consistent with those previously developed. Note that because stations W26 and W27 are instrumented with Parshall flumes, it was deemed unnecessary to construct rating curves for these stations.

Table 3-1:
Rating curve error metric summary for Eagle Gold Project site hydrometric stations

Station	Measurements (n)	Average Error (%)	Standard Error (%)	Rating Curve Control
W1	45	-6%	27%	99%
W4	44	0%	15%	94%
W5	33	1%	12%	98%
W6	30	-2%	8%	96%
W22	49	-1%	18%	99%
W26	18	--	--	99%
W27	50	--	--	99%
W29	22	-2%	10%	95%
Average	36	-2%	15%	97%

Notes:
1. Stations W26 and W27 currently have Parshall flumes installed, and therefore rating curves have not been developed for these sites as part of this baseline streamflow update.

Table 3-2:
Station W1 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Rating Curve Discharge (m^3/s)	Rating Curve Error (%)	Comments
14/08/2007	-	3.500	0.059	0.059	0%	
29/08/2007	-	3.494	0.062	0.055	-12%	
12/09/2007	-	3.513	0.063	0.068	8%	
26/09/2007	-	3.532	0.092	0.084	-9%	
19/10/2007	-	3.514	0.047	0.069	-	Stage affected by snow in channel
20/11/2007	Salt Dilution		0.04	-	-	Stage measurement not available
25/04/2008	Salt Dilution		0.015	-	-	Stage measurement not available
09/06/2008	-		0.072	-	-	Stage measurement not available
12/08/2008	-	3.614	0.177	0.175	-1%	Average of 2 measurements
20/10/2008	-	3.594	0.097	0.148	-	Stage affected by snow in channel
19/07/2009	Current Meter	3.467	0.045	0.039	-14%	
26/07/2009	-	3.454	0.032	0.032	1%	
09/08/2009	-	3.443	0.025	0.028	10%	
20/08/2009	-	3.438	0.044	0.025	-42%	
01/09/2009	Current Meter	3.459	0.074	0.035	-53%	
07/10/2009	Current Meter	3.447	0.055	0.029	-47%	
21/10/2009	-	3.455	0.036	0.033	-9%	
31/03/2010	Salt Dilution		0.021	-	-	Stage measurement not available
04/05/2010	-	3.520	0.055	0.074	-	Stage affected by snow in channel
01/06/2010	-	3.597	0.143	0.152	6%	
15/06/2010	-	3.558	0.113	0.108	-5%	
17/08/2010	-	3.542	0.234	0.092	-60%	
23/09/2010	-	3.509	-	0.065	-	Discharge measurement not available
19/10/2010	Salt Dilution	3.512	0.034	0.067	-	Stage affected by snow in channel
30/03/2011	Salt Dilution	-	0.017	-	-	Stage measurement not available
19/04/2011	Salt Dilution	3.450	0.021	0.031	-	Stage affected by snow in channel
04/05/2011	-	3.484	0.032	0.049	-	Stage affected by snow in channel
17/05/2011	Current Meter	3.593	0.147	0.147	0%	
18/05/2011	Current Meter	3.591	0.172	0.145	-16%	
07/06/2011	Current Meter	3.522	0.073	0.075	3%	
16/08/2011	Current Meter	3.573	0.190	0.124	-35%	
17/10/2011	Current Meter	3.535	0.084	0.086	3%	
16/11/2011	Salt Dilution	-	0.041	-	-	Stage measurement not available
06/12/2011	Salt Dilution	-	0.036	-	-	Stage measurement not available
18/04/2012	Salt Dilution	3.460	0.015	0.035	-	Stage affected by snow in channel
06/05/2012	Current Meter	3.469	0.023	0.040	-	Stage affected by snow in channel
15/08/2012	Current Meter	3.531	0.087	0.083	-5%	
16/10/2012	Current Meter	3.499	0.044	0.058	32%	
20/11/2012	Salt Dilution	-	0.033	-	-	Stage measurement not available
15/04/2013	Salt Dilution	-	0.010	-	-	Stage measurement not available
21/05/2013	Current Meter	0.099	0.051	0.069	34%	
25/07/2013	Current Meter	0.050	0.011	0.019	69%	
14/09/2013	Current Meter	0.064	0.039	0.030	-24%	
19/10/2013	Current Meter	0.065	0.036	0.031	-15%	
06/05/2014	Current Meter	-	0.381	-	-	Stage measurement not available
06/08/2014	Current Meter	0.083	0.055	0.049	-11%	
17/10/2014	-	0.095	-	-	-	Discharge measurement not available
18/06/2015	Current Meter	0.121	0.080	0.101	26%	
31/07/2015	Current Meter	0.159	0.181	0.169	-7%	
			Average Error (%)	-6%		
			Standard Error (%)	27%		

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.

Table 3-3:
Station W4 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Rating Curve Discharge (m^3/s)	Rating Curve Error (%)	Comments
13/08/2007	-	-	0.701	-	-	Stage measurement not available
15/08/2007	-	3.046	0.693	0.665	-4%	
28/08/2007	-	3.033	0.631	0.594	-6%	
11/09/2007	-	3.073	0.810	0.829	2%	
25/09/2007	-	3.091	0.737	-	-	Stage affected by snow in channel
19/10/2007	-	3.048	0.442	-	-	Stage affected by snow in channel
21/11/2007	-	-	0.360	-	-	Stage measurement not available
25/04/2008	Salt Dilution	-	0.050	-	-	Stage measurement not available
09/06/2008	-	3.056	0.740	0.724	-2%	
12/08/2008	-	3.164	1.575	1.543	-2%	
21/10/2008	-	3.104	0.926	-	-	Stage affected by snow in channel
18/07/2009	Current Meter	2.983	0.361	0.362	0%	
26/07/2009	Current Meter	2.966	0.303	0.298	-2%	
09/08/2009	Current Meter	2.973	0.298	0.323	8%	
20/08/2009	Current Meter	2.973	0.344	0.323	-6%	
02/09/2009	Current Meter	3.040	0.834	0.632	-24%	
07/10/2009	Current Meter	3.008	0.449	0.469	5%	
21/10/2009	Current Meter	2.999	0.430	0.429	0%	
04/05/2010	Current Meter	3.078	0.970	0.862	-11%	
15/06/2010	-	3.109	1.122	1.081	-4%	
17/08/2010	-	3.053	0.619	0.706	14%	
23/09/2010	-	3.024	-	-	-	Discharge measurement not available
19/10/2010	-	2.406	0.294	-	-	Stage affected by snow in channel
27/01/2011	Salt Dilution	-	0.187	-	-	Stage measurement not available
30/03/2011	Salt Dilution	-	0.212	-	-	Stage measurement not available
19/04/2011	Salt Dilution	-	0.229	-	-	Stage measurement not available
04/05/2011	Current Meter	3.128	0.445	-	-	Stage affected by snow in channel
17/05/2011	Current Meter	3.295	2.050	3.051	49%	
18/05/2011	Current Meter	3.554	-	-	-	Discharge measurement not available
07/06/2011	Current Meter	3.072	0.724	0.823	14%	
28/06/2011	Current Meter	3.032	0.741	0.589	-21%	
16/08/2011	Current Meter	3.169	1.970	1.590	-19%	
17/10/2011	Current Meter	3.065	0.591	0.778	32%	
16/11/2011	Salt Dilution	-	0.333	-	-	Stage measurement not available
06/12/2011	Salt Dilution	-	0.248	-	-	Stage measurement not available
14/02/2012	Salt Dilution	-	0.169	-	-	Stage measurement not available
17/04/2012	Salt Dilution	2.968	0.167	-	-	Stage affected by snow in channel
04/05/2012	Current Meter	3.069	0.759	0.804	6%	
15/08/2012	Current Meter	3.056	0.738	0.724	-2%	
16/10/2012	Current Meter	3.027	0.478	0.562	18%	
20/11/2012	Salt Dilution	-	0.277	-	-	Stage affected by snow in channel
19/02/2013	Salt Dilution	-	0.216	-	-	Stage measurement not available
21/05/2013	Current Meter	0.318	1.183	1.178	0%	
24/07/2013	Current Meter	0.160	0.322	0.325	1%	
14/09/2013	Current Meter	0.236	0.696	0.673	-3%	
19/10/2013	Current Meter	0.171	0.370	0.368	0%	
07/05/2014	-	0.485	-	-	-	Discharge measurement not available
06/08/2014	Current Meter	0.183	0.416	0.418	1%	
17/10/2014	Current Meter	0.212	0.707	0.551	-22%	
18/06/2015	Current Meter	0.234	0.699	0.663	-5%	
31/07/2015	Current Meter	0.349	1.609	1.402	-13%	
14/10/2015	-	0.251	-	-	-	Discharge measurement not available
				Average Error (%)	0%	
				Standard Error (%)	15%	

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.

Table 3-4:
Station W5 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Rating Curve Discharge (m^3/s)	Rating Curve Error (%)	Comments
12/08/2007	-	-	0.744	-	-	Stage measurement not available
28/08/2007	-	3.510	0.689	0.691	0%	
11/09/2007	-	3.546	0.896	0.914	2%	
25/09/2007	-	3.559	0.873	1.001	15%	
20/10/2007	-	3.699	0.323	-	-	Stage affected by snow in channel
21/11/2007	Salt Dilution	-	0.280	-	-	Stage measurement not available
25/04/2008	Salt Dilution	-	0.282	-	-	Stage measurement not available
10/06/2008	-	3.506	0.653	0.668	2%	
13/08/2008	-	-	1.900	-	-	Stage measurement not available
21/10/2008	-	3.633	1.230	-	-	Stage affected by snow in channel
20/07/2009	Current Meter	3.499	0.452	0.629	39%	
26/07/2009	-	3.476	0.419	0.507	21%	
09/08/2009	-	3.462	0.385	0.439	14%	
20/08/2009	-	3.456	0.458	0.411	-10%	
02/09/2009	Current Meter	3.526	0.895	0.787	-12%	
07/10/2009	Current Meter	3.473	0.605	0.492	-19%	
22/10/2009	-	3.573	0.466	-	-	Stage affected by snow in channel
04/05/2010	-	-	1.166	-	-	Stage measurement not available
30/05/2010	-	3.617	1.486	1.431	-4%	
15/06/2010	-	3.583	1.043	1.17	12%	
17/08/2010	-	3.509	0.674	0.686	2%	
17/05/2011	-	3.864	3.799	3.987	5%	
08/06/2011	-	3.532	0.868	0.824	-5%	
29/06/2011	Current Meter	3.523	0.965	0.769	-20%	
19/08/2011	-	3.609	1.357	1.367	1%	
18/10/2011	-	3.528	0.778	0.799	3%	
04/05/2012	Current Meter	3.579	1.285	1.141	-11%	
18/07/2012	-	3.612	-	-	-	Discharge measurement not available
16/08/2012	Current Meter	3.553	0.963	0.960	0%	
19/09/2012	-	3.503	-	-	-	Discharge measurement not available
17/10/2012	Current Meter	3.532	0.578	-	-	Stage affected by snow in channel
20/11/2012	Salt Dilution	-	0.278	-	-	Stage measurement not available
22/05/2013	Current Meter	0.280	1.877	1.801	-4%	
05/08/2013	-	0.120	-	-	-	Discharge measurement not available
14/09/2013	Current Meter	0.195	0.948	0.918	-3%	
20/10/2013	Current Meter	0.145	0.510	0.528	4%	
05/08/2014	Current Meter	0.152	0.570	0.577	1%	
17/10/2014	Current Meter	0.185	0.864	0.832	-4%	
19/06/2015	Current Meter	0.175	0.735	0.750	2%	
30/07/2015	Current Meter	0.308	2.032	2.150	6%	
14/10/2015	-	0.200	-	-	-	Discharge measurement not available
				Average Error (%)	1%	
				Standard Error (%)	12%	

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.

Table 3-5:
Station W6 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Rating Curve Discharge (m^3/s)	Rating Curve Error (%)	Comments
28/08/2007	-	3.820	0.872	0.850	-2%	
11/09/2007	-	3.901	1.399	1.291	-8%	
25/09/2007	-	3.880	1.059	1.169	10%	
20/10/2007	-	3.787	0.231	-	-	Stage affected by snow in channel
21/11/2007	Salt Dilution	-	0.274	-	-	Stage measurement not available
25/04/2008	Salt Dilution	-	0.335	-	-	Stage measurement not available
10/06/2008	-	3.720	0.433	0.422	-3%	
13/08/2008	-	-	1.810	-	-	Stage measurement not available
21/10/2008	-	3.893	1.179	-		Stage affected by snow in channel
20/07/2009	Current Meter	3.701	0.408	0.356	-13%	
26/07/2009	-	3.715	0.533	0.404	-24%	
09/08/2009	-	3.710	0.343	0.386	13%	
20/08/2009	-	3.753	0.499	0.549	10%	
02/09/2009	Current Meter	3.873	1.161	1.130	-3%	
07/10/2009	Current Meter	-	0.771	-	-	Stage measurement not available
22/10/2009	-	-	0.521	-	-	Stage measurement not available
04/05/2010	-	-	2.474	-	-	Stage measurement not available
30/05/2010	-	3.807	0.824	0.787	-4%	
15/06/2010	-	3.846	1.003	0.983	-2%	
17/08/2010	-	3.763	0.550	0.590	7%	
19/10/2010	-	3.460	0.379	-	-	Stage affected by snow in channel
09/06/2011	-	-	0.962	-	-	Stage measurement not available
29/06/2011	Current Meter	2.905	1.216	-	-	Stage affected by snow in channel
19/08/2011	-	3.894	1.253	1.250	0%	
18/10/2011	-	3.786	0.703	0.690	-2%	
04/05/2012	Current Meter	3.959	1.806	1.656	-8%	
18/07/2012	-	3.987	-	-	-	Discharge measurement not available
16/08/2012	-	3.838	0.929	0.941	1%	
19/09/2012	-	3.817	-	0.836	-	Discharge measurement not available
17/10/2012	-	3.781	-	0.667	-	Discharge measurement not available
22/05/2013	Current Meter	0.453	2.971	2.650	-11%	
25/07/2013	-	0.172	-	-	-	Discharge measurement not available
14/09/2013	Current Meter	0.286	1.171	1.227	5%	
20/10/2013	Current Meter	0.196	0.699	0.652	-7%	
05/08/2014	Current Meter	0.245	0.449	-	-	Beaver dam downstream of gauge site, therefore unreliable stage.
17/10/2014	Current Meter	0.250	0.973	0.980	1%	
19/06/2015	Current Meter	0.201	0.702	0.680	-3%	
30/07/2015	Current Meter	0.271	1.173	1.121	-4%	
				Average Error (%)	-2%	
				Standard Error (%)	8%	

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.

Table 3-6:
Station W22 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Rating Curve Discharge (m^3/s)	Rating Curve Error (%)	Comments
13/08/2007	-	-	0.597	-	-	Stage measurement not available
15/08/2007	-	2.846	0.577	0.515	-11%	
28/08/2007	-	2.831	0.538	0.414	-23%	
11/09/2007	-	2.898	0.684	0.941	38%	
25/09/2007	-	2.877	0.641	0.755	18%	
19/10/2007	-	2.873	0.372	-	-	Stage affected by snow in channel
21/11/2007	Salt Dilution	-	0.343	-	-	Stage measurement not available
25/04/2008	Salt Dilution	-	0.266	-	-	Stage measurement not available
09/06/2008	-	2.866	0.688	0.666	-3%	
12/08/2008	-	2.927	1.237	1.226	-1%	
21/10/2008	-	2.936	0.741		-	Stage affected by snow in channel
21/04/2009	Salt Dilution	1.570	0.191	-	-	Stage affected by snow in channel
18/07/2009	Current Meter	2.809	0.749	0.284	-62%	
26/07/2009	-	2.809	0.294	0.284	-4%	
09/08/2009	-	2.810	0.278	0.289	4%	
20/08/2009	-	2.811	0.276	0.295	7%	
01/09/2009	Current Meter	2.874	0.749	0.730	-2%	
07/10/2009	Current Meter	2.824	0.361	0.370	3%	
31/03/2010	Salt Dilution	-	0.173	-	-	Stage measurement not available
04/05/2010	-	2.873	0.915	0.722	-21%	
15/06/2010	-	2.905	0.791	1.006	27%	
17/08/2010	-	2.847	0.531	0.522	-2%	
23/09/2010	-	2.816	-	-	-	Discharge measurement not available
19/10/2010	-	2.910	0.265	-	-	Stage affected by snow in channel
27/01/2011	Salt Dilution	-	0.158	-	-	Stage measurement not available
30/03/2011	Salt Dilution	-	0.203	-	-	Stage measurement not available
19/04/2011	Salt Dilution	-	0.194	-	-	Stage measurement not available
04/05/2011	Current Meter	2.975	0.418	-	-	Stage affected by snow in channel
17/05/2011	-	2.964	2.010	-	-	Uncertainty in dataset
18/05/2011	-	2.936	4.989	-	-	Uncertainty in dataset
07/06/2011	-	2.856	0.567	-	-	Uncertainty in dataset
28/06/2011	Current Meter	3.099	0.676	-	-	Uncertainty in dataset
16/08/2011	-	2.968	1.655	-	-	Uncertainty in dataset
17/10/2011	Current Meter	2.962	0.523	-	-	Stage affected by snow in channel
16/11/2011	Salt Dilution	-	0.288	-	-	Stage measurement not available
06/12/2011	Salt Dilution	-	0.207	-	-	Stage measurement not available
19/03/2012	Salt Dilution	-	0.154	-	-	Stage measurement not available
17/04/2012	Salt Dilution	2.790	0.117	-	-	Stage affected by snow in channel
04/05/2012	Current Meter	2.876	0.737	0.747	1%	
18/07/2012	-	2.924	1.055	1.195	13%	
15/08/2012	Current Meter	2.860	0.609	0.619	2%	
19/09/2012	-	2.841	-	-	-	Discharge measurement not available
16/10/2012	Current Meter	2.827	0.403	0.389	-4%	
20/11/2012	Salt Dilution	-	0.245	-	-	Stage measurement not available
17/12/2012	Salt Dilution	-	0.258	-	-	Stage measurement not available
19/02/2013	Salt Dilution	-	0.216	-	-	Stage measurement not available
15/04/2013	Salt Dilution	-	0.159	-	-	Stage measurement not available.
21/05/2013	Current Meter	0.215	0.994	0.935	-6%	
24/07/2013	Current Meter	-	0.264	-	-	Stage measurement not available
04/08/2013	-	0.105	-	-	-	Discharge measurement not available
14/09/2013	Current Meter	0.183	0.698	0.699	0%	
19/10/2013	Current Meter	0.113	0.309	0.293	-5%	
06/08/2014	Current Meter	0.135	0.391	0.404	3%	
17/10/2014	Current Meter	0.165	0.587	0.580	-1%	
18/06/2015	Current Meter	0.178	0.633	0.665	5%	
31/07/2015	Current Meter	0.261	1.379	1.326	-4%	
14/10/2015	-	0.191	-	-	-	Discharge measurement not available
				Average Error (%)	-1%	
				Standard Error (%)	18%	

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.

Table 3-7:
Station W26 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Comments
02/06/2010	V-notch weir	0.463	0.030	
15/06/2010	V-notch weir	0.446	0.023	
18/06/2010	V-notch weir	0.446	0.013	
23/09/2010	V-notch weir	0.377	0.010	
19/10/2010	V-notch weir	0.333	0.003	Stage affected by snow in channel
18/05/2011	V-notch weir	-	0.121	Stage measurement not available
19/05/2011	V-notch weir	-	0.142	Stage measurement not available
19/08/2011	V-notch weir	-	0.017	Stage measurement not available
16/10/2011	Flume	0.532	0.007	Stage affected by snow in channel
16/11/2011	Flume	-	0.003	Stage measurement not available
17/07/2012	Flume	0.426	0.020	
15/08/2012	Flume	0.394	0.012	
25/07/2013	Flume	-	0.001	Stage measurement not available
15/09/2013	Flume	0.040	0.004	
06/08/2014	Flume	0.047	0.005	
17/10/2014	Flume	0.059	0.007	
31/07/2015	Flume	0.131	0.024	
14/10/2015	Flume	0.192	0.043	

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.
3. A V-notch weir was installed in 2009, and replaced with a Parshall flume in August 2011.

Table 3-8:
Station W27 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Rating Curve Discharge (m^3/s)	Comments
14/08/2007	Current Meter	-	0.015	-	Stage measurement not available
28/08/2007	-	-	0.039	-	Stage measurement not available
12/09/2007	-	-	0.017	-	Stage measurement not available
26/09/2007	Current Meter	0.146	0.017	-	Stage measurement not available
20/10/2007	-	-	0.011	-	Stage measurement not available
21/11/2007	-	-	0.004	-	Stage measurement not available
26/04/2008	Salt Dilution	-	0.011	-	Stage measurement not available
10/06/2008	-	0.185	0.026	0.023	
13/08/2008	Current Meter	-	0.050	-	Stage measurement not available
21/10/2008	Current Meter	0.250	0.051	0.056	
19/07/2009	-	0.209	0.033	0.034	
26/07/2009	-	0.201	0.033	0.030	
09/08/2009	-	0.187	0.024	0.024	
11/08/2009	-	0.189	0.023	0.025	
20/08/2009	-	0.193	0.026	0.026	
26/08/2009	-	0.221	0.038	0.040	
01/09/2009	-	0.197	0.029	0.028	
22/10/2009	-	-	0.013	-	Stage measurement not available
04/05/2010	Salt Dilution	-0.025	0.072	-	
05/05/2010	Salt Dilution	0.225	0.086	-	Average of 3 measurements
06/05/2010	-	0.209	0.069	-	
01/06/2010	Salt Dilution	0.258	0.035	0.061	Average of 3 measurements
02/06/2010	-	0.261	0.035	0.063	
15/06/2010	-	0.243	0.052	0.052	
16/06/2010	-	0.238	0.049	0.049	
18/06/2010	-	0.227	0.046	0.043	
23/09/2010	-	0.020	0.015	-	Erratic logger data
19/10/2010	-	0.025	0.014	-	Stage affected by snow in channel
30/03/2011	Salt Dilution	-	0.010	-	Stage measurement not available
19/04/2011	Salt Dilution	-	0.009	-	Stage measurement not available
17/05/2011	Current Meter	0.339	0.120	0.127	
18/05/2011	Current Meter	0.363	0.261	-	Erratic logger data
06/06/2011	-	0.165	0.016	0.016	
16/08/2011	-	0.008	0.031	-	Erratic logger data
17/10/2011	-	0.173	0.008	-	Stage affected by snow in channel
19/03/2012	-	-	0.004	-	Unreliable discharge measurement
17/04/2012	-	-	0.007	-	Stage measurement not available
06/05/2012	-	-	0.040	-	Stage affected by snow in channel
18/07/2012	-	0.281	0.025	0.077	
15/08/2012	-	0.207	0.027	0.033	
19/09/2012	-	0.158	0.018	0.014	
16/10/2012	-	-	0.014	-	Stage measurement not available
25/07/2013	Flume	0.127	0.030		
15/09/2013	Flume	0.110	0.023		
19/10/2013	Flume	0.119	0.027		
07/05/2014	Flume	0.130	0.032		
05/08/2014	Flume	0.119	0.027		
17/10/2014	Flume	0.073	0.013		
31/07/2015	Flume	0.187	0.054		
14/10/2015	Flume	0.149	0.038		

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.
3. A V-notch weir was installed in 2009, and replaced with a Parshall flume in August 2011.

Table 3-9:
Station W29 – Discharge Measurement Summary

Date	Method	Stage (m)	Discharge (m^3/s)	Rating Curve Discharge (m^3/s)	Rating Curve Error (%)	Comments
19/10/2010	Current Meter	-	0.359	-	-	Stage measurement not available
30/03/2011	Salt Dilution	-	0.200	-	-	Stage measurement not available
17/05/2011	Current Meter	-	2.309	-	-	Stage measurement not available
08/06/2011	Current Meter	3.639	0.776	0.791	2%	
28/06/2011	Current Meter	3.630	0.839	0.735	-12%	
16/08/2011	-	3.788	1.971	1.986	1%	
17/10/2011	-	3.647	0.722	-	-	Stage affected by snow in channel
16/11/2011	Salt Dilution	-	0.377	-	-	Stage measurement not available
06/12/2011	Salt Dilution	-	0.269	-	-	Stage measurement not available
04/05/2012	Current Meter	3.644	0.859	-	-	Stage affected by snow in channel
14/06/2012	-	3.749	-	1.591	-5%	Discharge measurement not available
18/07/2012	-	3.702	-	-	-	Discharge measurement not available
16/08/2012	Current Meter	3.626	0.711	0.703	-1%	
17/10/2012	Current Meter	3.581	0.447	-	-	Stage affected by snow in channel
20/11/2012	Salt Dilution	-	0.264	-	-	Stage measurement not available
17/12/2012	Salt Dilution	-	0.281	-	-	Stage measurement not available
19/02/2013	Salt Dilution	-	0.350	-	-	
15/04/2013	Current Meter	0.298	0.165	-	-	Stage affected by ice in channel
21/05/2013	Current Meter	0.366	1.513	1.628	8%	
25/07/2013	Current Meter	0.180	0.526	0.476	-9%	
04/08/2013	-	0.151	-	-	-	Discharge measurement not available
14/09/2013	Current Meter	0.275	0.793	0.884	11%	
19/10/2013	Current Meter	0.217	0.566	0.619	9%	
05/08/2014	Current Meter	0.191	0.505	0.516	2%	
17/10/2014	Current Meter	0.274	0.793	-	-	Stage affected by snow in channel
18/06/2015	Current Meter	0.208	0.709	0.582	-18%	
31/07/2015	Current Meter	0.385	1.834	1.534	-16%	
14/10/2015	Salt Dilution	0.274	0.754	-	-	Discharge measurement in error.
				Average Error (%)	-2%	
				Standard Error (%)	10%	

Notes:
1. Measurements highlighted in grey were of low quality, and were not employed in rating curve development.
2. Stage measurements for the period 2007 to 2012 are as reported in Knight Piésold (2013). Stage measurements for the period 2013 to 2015 are the staff gauge readings relative to the staff gauge datum from 2012.

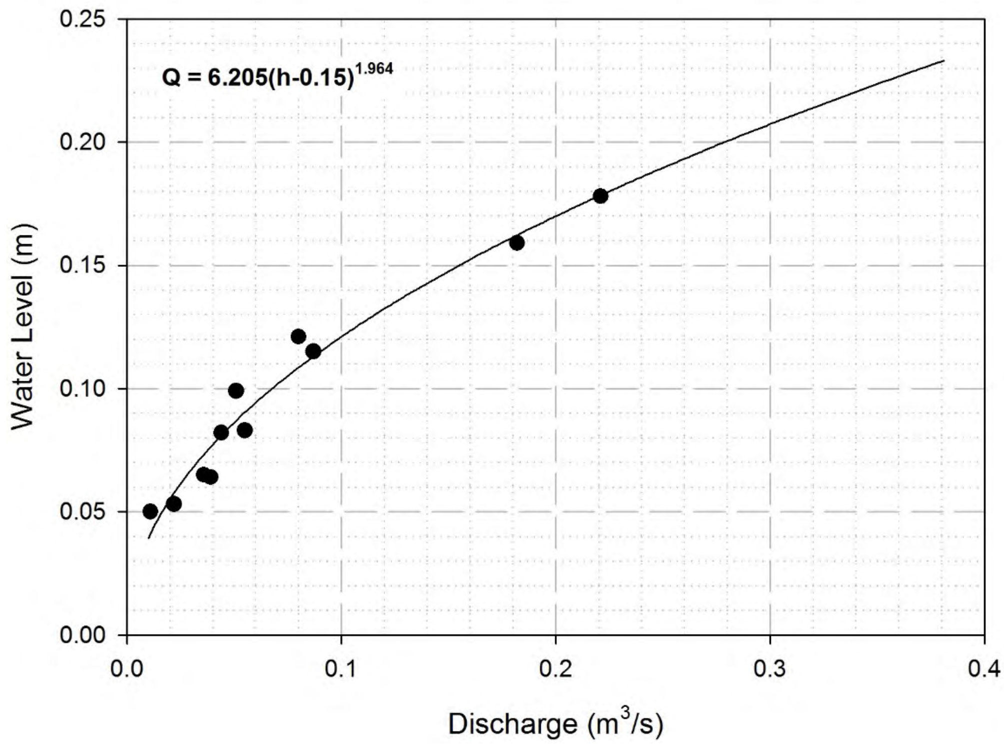

Figure 3-1: Rating curve for station W1 (2012 – 2015)

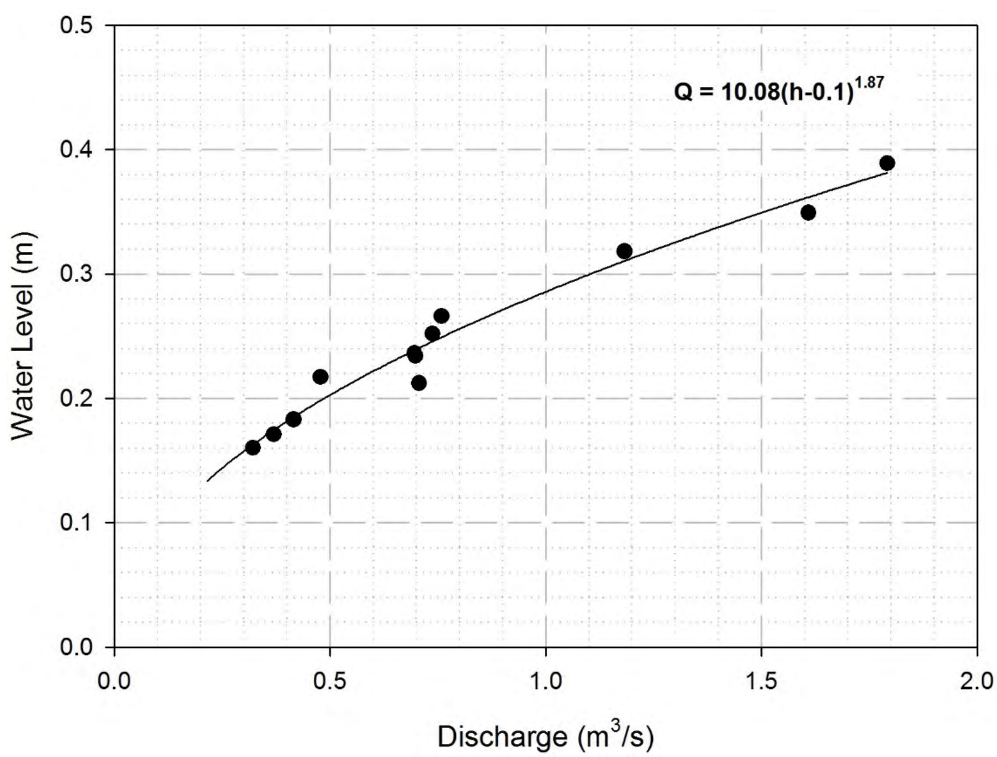

Figure 3-2: Rating curve for station W4 (2012 – 2015)

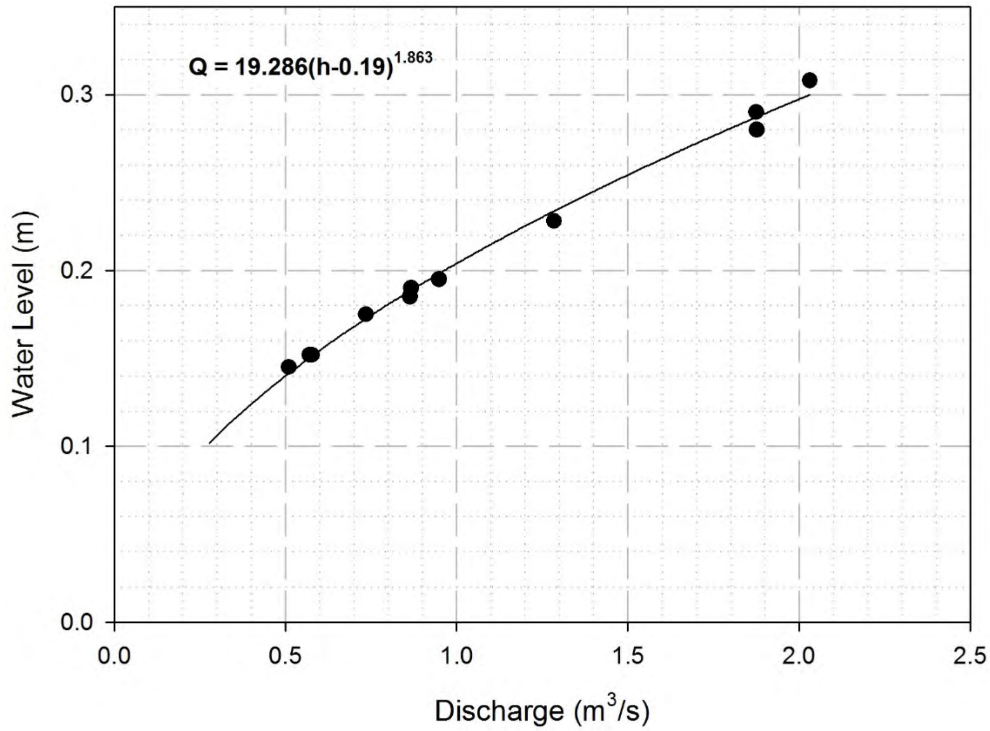

Figure 3-3: Rating curve for station W5 (2012 – 2015)

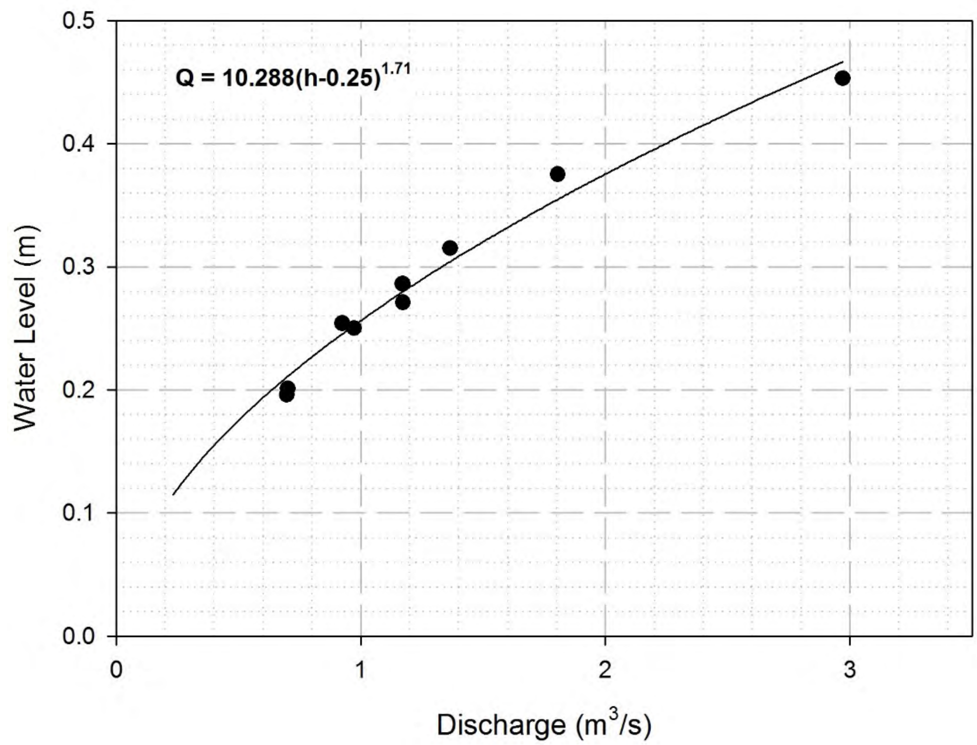

Figure 3-4: Rating curve for station W6 (2012 – 2015)

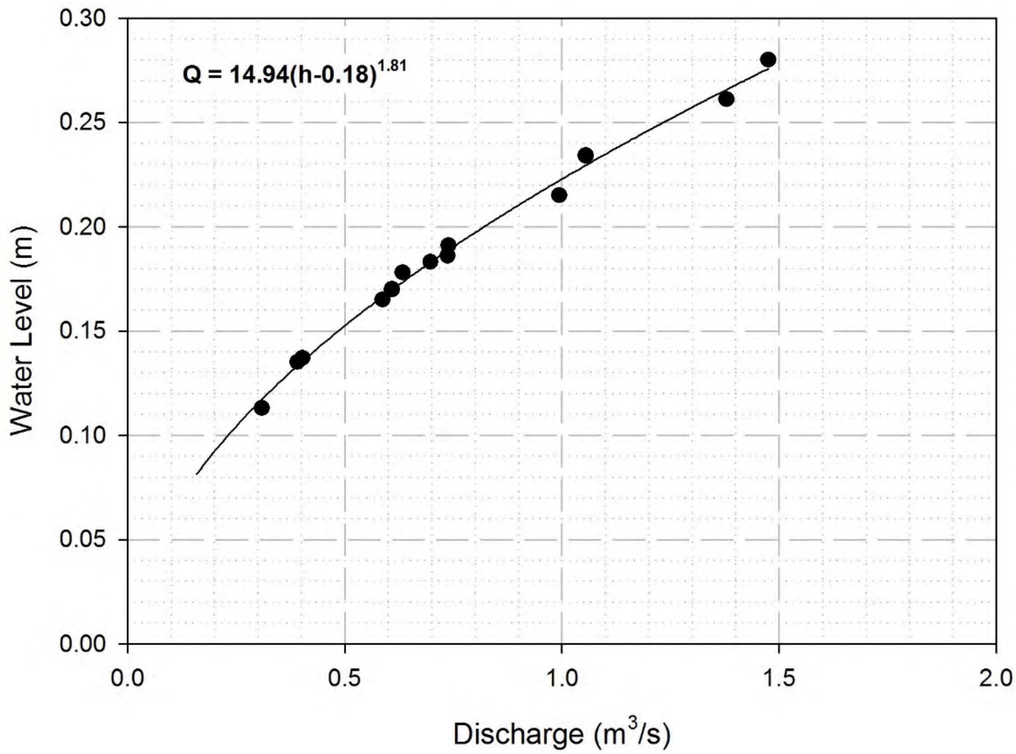

Figure 3-5: Rating curve for station W22 (2012 – 2015)

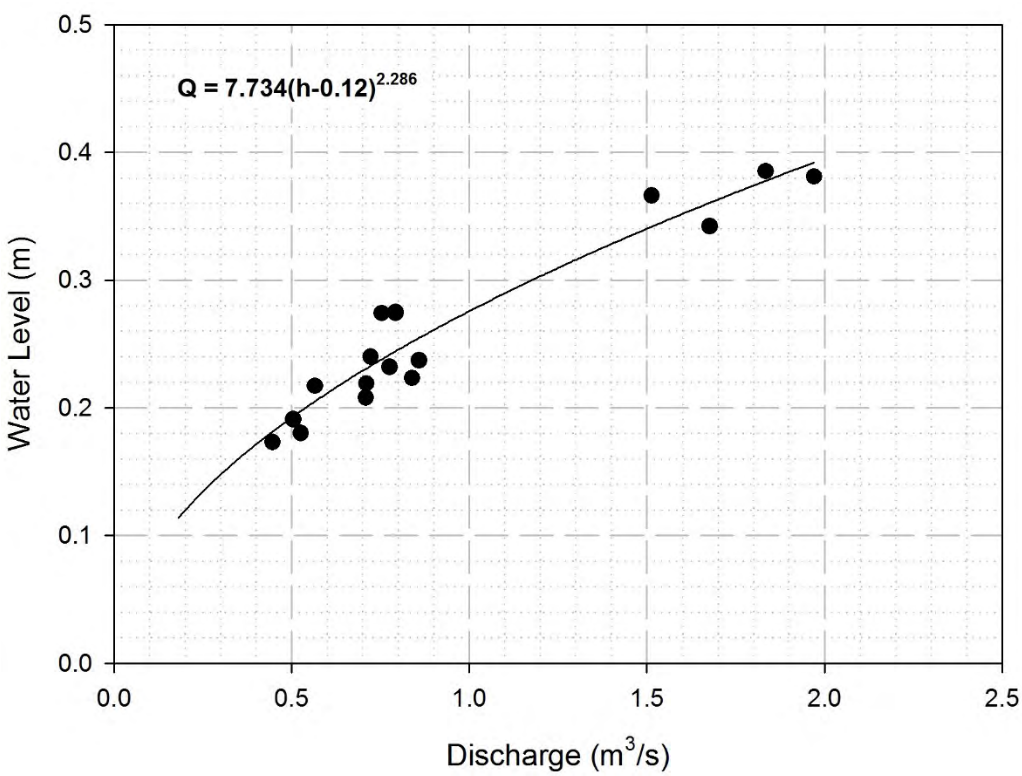

Figure 3-6: Rating curve for station W29 (2012 – 2015)

3.4 Winter Streamflow Interpolation

Due to extensive channel icing and complete freezing to the bed in some cases, reliable continuous water level data is not available for the winter season (mid-October to early May in most years). However, spot flow measurements collected during the winter water quality sampling trips are available for most years. Where these measurements span the majority of the winter season, streamflows were estimated by interpolating between the spot flow measurements. This was done by assuming that mid-winter melt or rain events do not occur at site, and that the streamflows are a result of recession from the open-water season discharge regime to a steady-state baseflow driven by the local groundwater system discharging to the stream channel. This recession curve was defined by the equation (Maidment, 1993):

$$Q_t = Q_0 \, e^{-kt}$$

Where:

Q_t = discharge at time t (m^3/s)

Q_0 = initial discharge (both Q_t and Q_0 are measured within the same straight segment

k = decay rate (negative for declining flows)

t = number of days between spot measurements (interpolation period)

The decay rate k, was unique to each pair of subsequent discharge measurements, and was commonly in the range of -1×10^{-3} to -0.5×10^{-5}.

4. Results

4. Results

4.1 Streamflow Records – Discharge

The computed flow records for all site stations listed in Table 2-1 are presented as average daily discharge time-series and plotted with spot discharge measurements and interpolated baseflows in Figure 4-1 through Figure 4-8. The same flow records are also presented as unit yield plots, with each plot showing annual data for all stations on a single plot (refer to Figure 4-9 to Figure 4-18).

While discharge magnitude varies with watershed area (*i.e.*, larger basin areas result in higher discharge values), it is more often instructive to compare runoff and/or unit yields to remove the influence of watershed area. The variation in runoff and yields across the gauged basins at the Project site is relatively low, with unit yields averaging 14 ± 1.2 L/s/km^2 and an average runoff of 192 ± 35 mm for the open water season (Table 4-1).

W22 displays slightly lower average unit yields (12.8 L/s/km^2) than the other stations, and W27 and W29 yield slightly more water on average (15.0 and 15.4 L/s/km^2, respectively). There appears to be lower than average yields at W26, however, this result is biased lower by the absence of data for the month of May, which is typically the month with the highest proportion of annual runoff. W1 appears to experience the highest overall yields, and in particular, the highest magnitude freshet (in yield terms). Higher than average yields at this station are sustained throughout the seasonal falling limb from September through November.

Table 4-2 through Table 4-17 present the monthly summaries of streamflow as discharge, unit yields and runoff, by station.

Table 4-1:
Summary of monthly average discharge, unit yield and runoff for Project site hydrometric stations.

Station (Discharge Area)	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average/Total
W1 (6.8 km²)	Average Discharge (m^3/s)	--	--	--	*0.02*	*0.25*	*0.08*	0.09	0.08	0.10	*0.08*	*0.07*	--	0.098
	Average Yield (L/s/km^2)	--	--	--	*3.38*	*37.36*	*12.44*	12.69	12.40	14.49	*12.35*	*10.10*	--	14.4
	Runoff (mm)	--	--	--	*3.5*	*79.1*	*26.2*	33.3	28.6	37.5	*22.6*	*4.4*	--	235
W4 (76.9 km²)	Average Discharge (m^3/s)	--	--	--	--	*2.03*	1.02	0.85	0.89	0.91	*0.81*	*1.03*	--	1.076
	Average Yield (L/s/km^2)	--	--	--	--	*26.38*	13.27	11.11	11.53	11.80	*10.48*	*13.34*	--	14.0
	Runoff (mm)	--	--	--	--	*50.5*	31.5	29.8	29.4	30.6	*19.0*	*24.2*	--	215
W5 (97.5 km²)	Average Discharge (m^3/s)	--	--	--	--	*2.68*	*1.30*	1.09	0.99	0.96	*0.97*	--	--	1.332
	Average Yield (L/s/km^2)	--	--	--	--	*27.54*	*13.33*	11.15	10.17	9.89	*9.92*	--	--	13.7
	Runoff (mm)	--	--	--	--	*56.5*	*29.5*	29.9	25.6	25.6	*15.6*	--	--	183
W6 (100.9 km²)	Average Discharge (m^3/s)	--	--	--	--	*3.24*	*1.27*	0.98	1.09	1.19	*0.94*	*0.90*	--	1.430
	Average Yield (L/s/km^2)	--	--	--	--	*32.11*	*12.63*	9.74	10.81	11.77	*9.28*	*1.79*	--	14.2
	Runoff (mm)	--	--	--	--	*62.4*	*24.3*	26.1	27.6	30.5	*15.8*	*0.39*	--	202
W22 (66.8 km²)	Average Discharge (m^3/s)	--	--	--	*0.27*	*1.97*	*0.81*	*0.66*	0.81	0.78	*0.68*	*0.94*	--	0.864
	Average Yield (L/s/km^2)	--	--	--	*3.98*	*29.44*	*12.15*	*9.91*	12.12	11.73	*10.16*	*14.02*	--	12.9
	Runoff (mm)	--	--	--	*4.1*	*60.2*	*30.1*	*24.0*	30.8	30.4	*18.5*	*14.5*	--	213
W26 (1.3 km²)	Average Discharge (m^3/s)	--	--	--	--	--	*0.02*	0.02	0.01	0.01	*0.01*	--	--	0.015
	Average Yield (L/s/km^2)	--	--	--	--	--	*16.54*	12.52	11.15	10.13	*7.42*	--	--	11.5
	Runoff (mm)	--	--	--	--	--	*28.2*	28.3	29.9	24.7	*7.3*	--	--	118
W27 (2.7 km²)	Average Discharge (m^3/s)	--	--	--	--	*0.09*	*0.04*	*0.03*	*0.02*	0.02	*0.02*	--	--	0.040
	Average Yield (L/s/km^2)	--	--	--	--	*34.24*	*16.28*	*12.75*	*9.16*	8.47	*8.82*	--	--	15.0
	Runoff (mm)	--	--	--	--	*57.4*	*39.7*	*25.6*	*23.0*	21.9	*13.2*	--	--	181
W29 (8 km²)	Average Discharge (m^3/s)	--	--	--	--	*2.51*	*1.20*	1.21	1.06	1.11	*0.87*	--	--	1.325
	Average Yield (L/s/km^2)	--	--	--	--	*29.13*	*13.94*	14.09	12.25	12.88	*10.05*	--	--	15.4
	Runoff (mm)	--	--	--	--	*44.0*	*26.1*	37.7	31.3	33.4	*16.3*	--	--	189

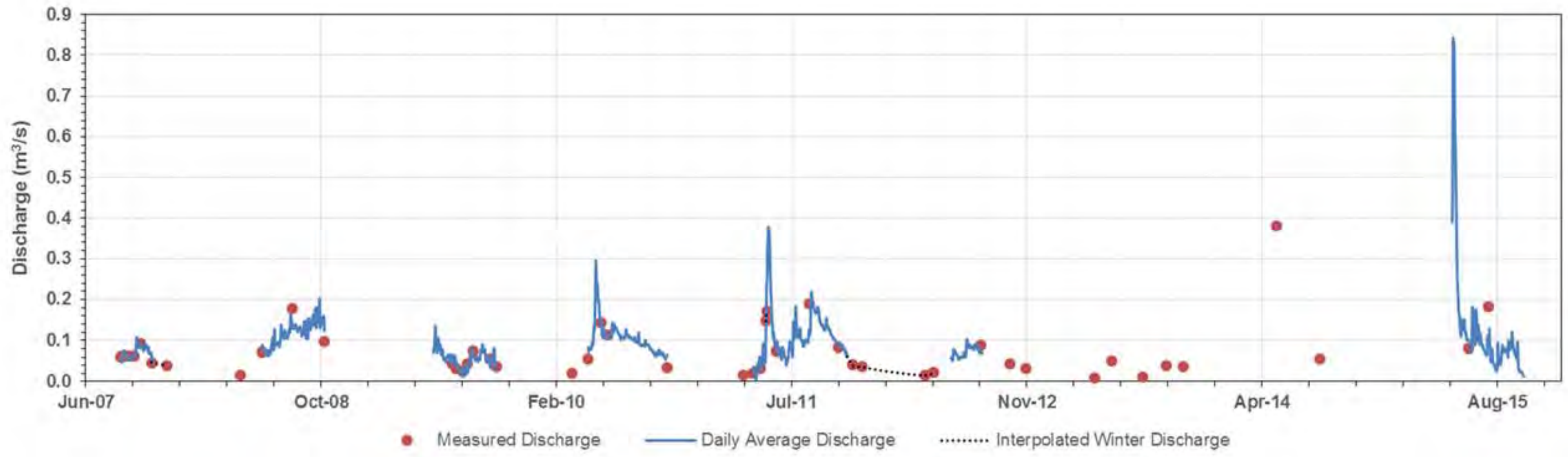

Figure 4-1: W1 Average daily discharge record (2007 to 2015)

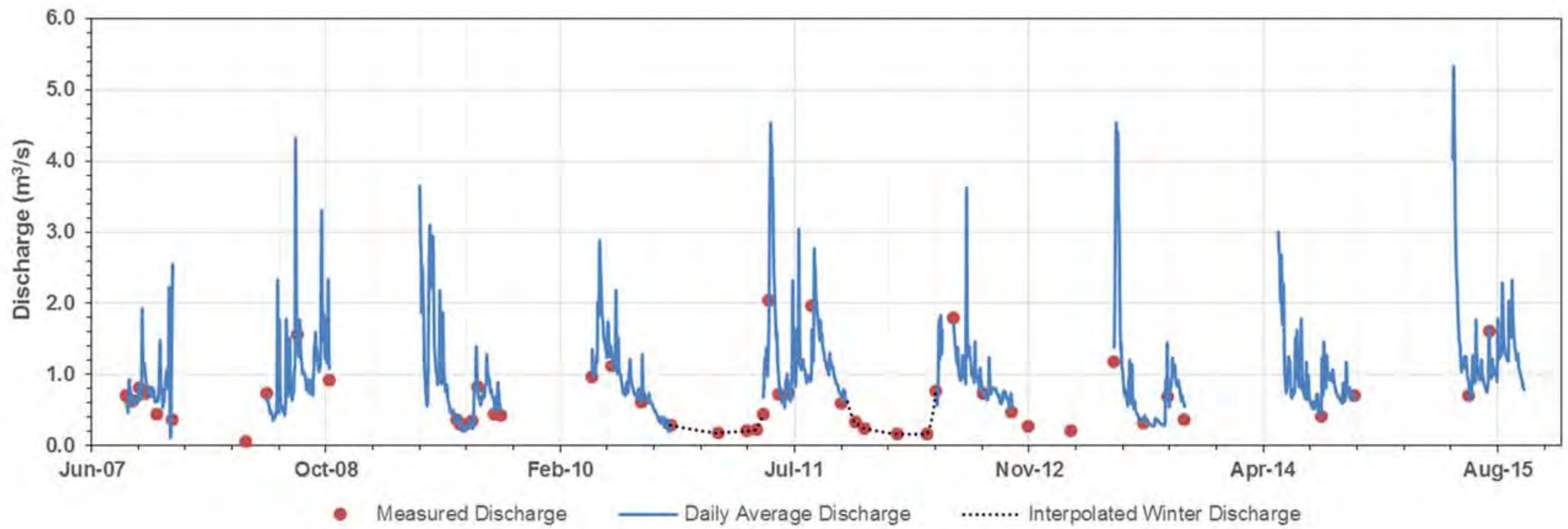

Figure 4-2: W4 Average daily discharge record (2007 to 2015)

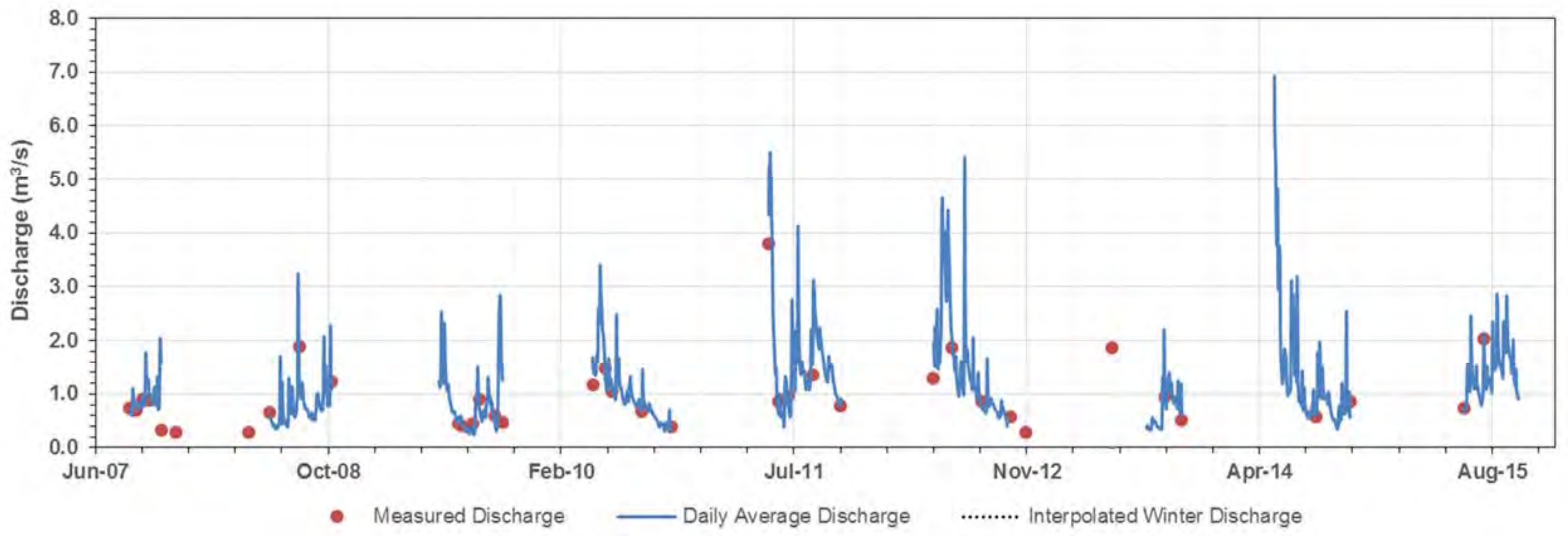

Figure 4-3: W5 Average daily discharge record (2007 to 2015)

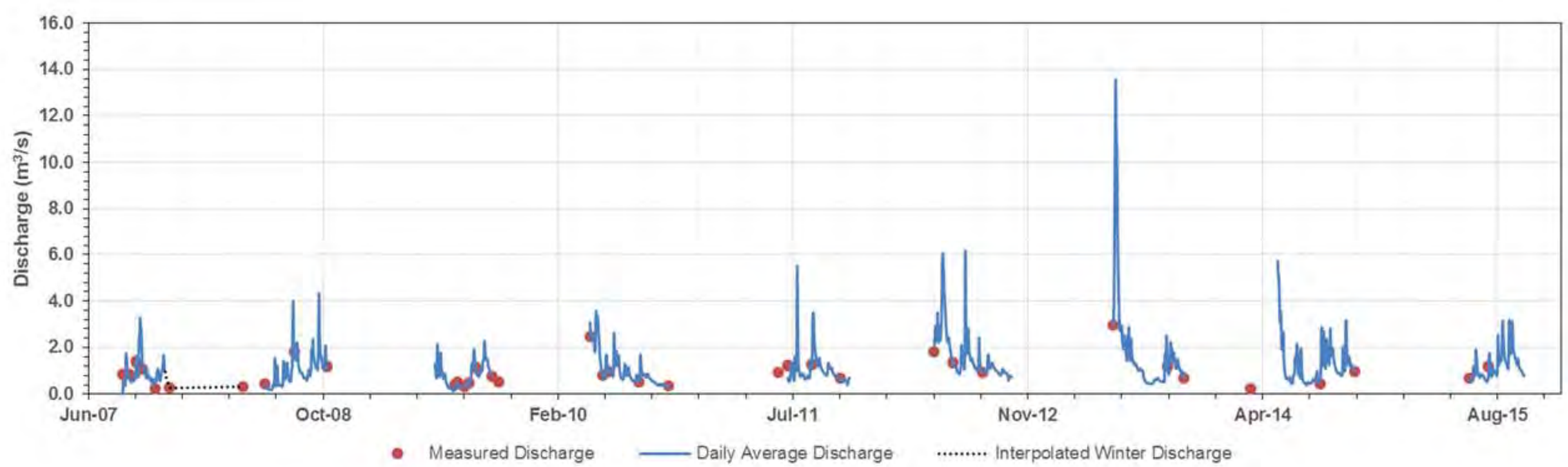

Figure 4-4: W6 Average daily discharge record (2007 to 2015)

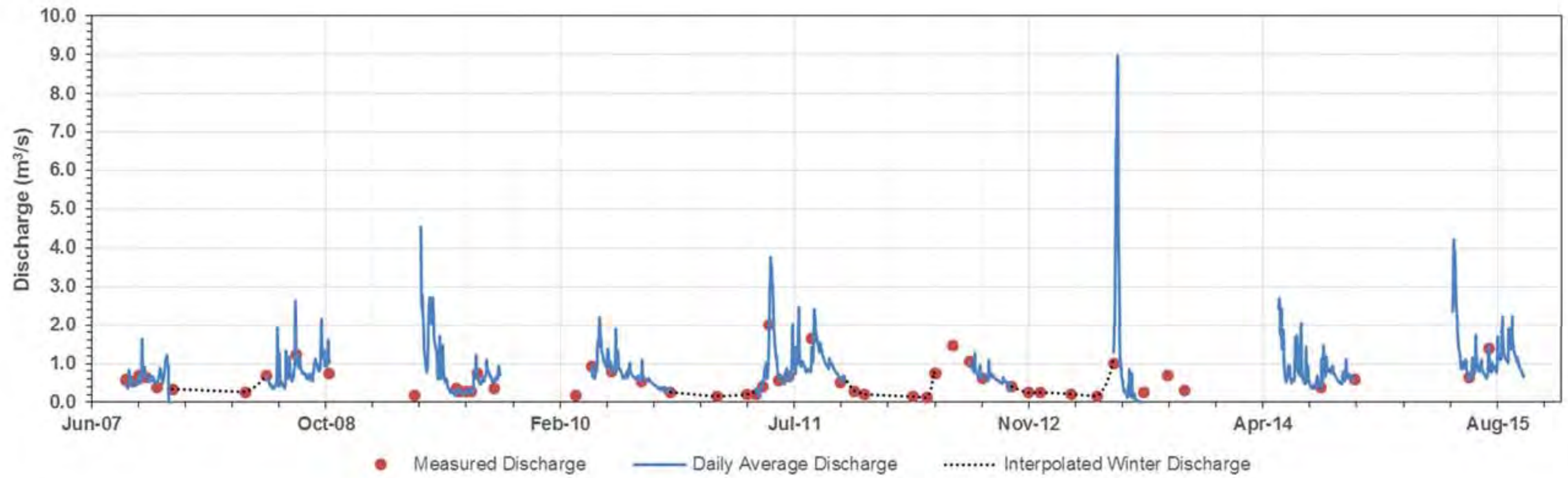

Figure 4-5: W22 Average daily discharge record (2007 to 2015)

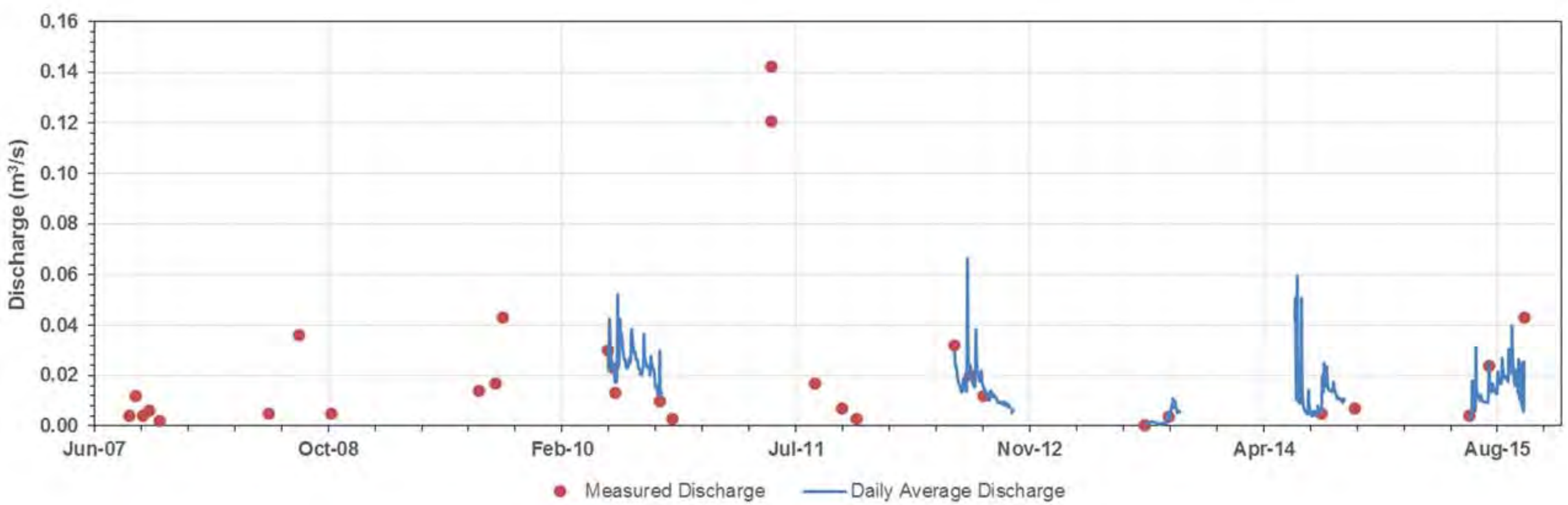

Figure 4-6: W26 Average daily discharge record (2007 to 2015)

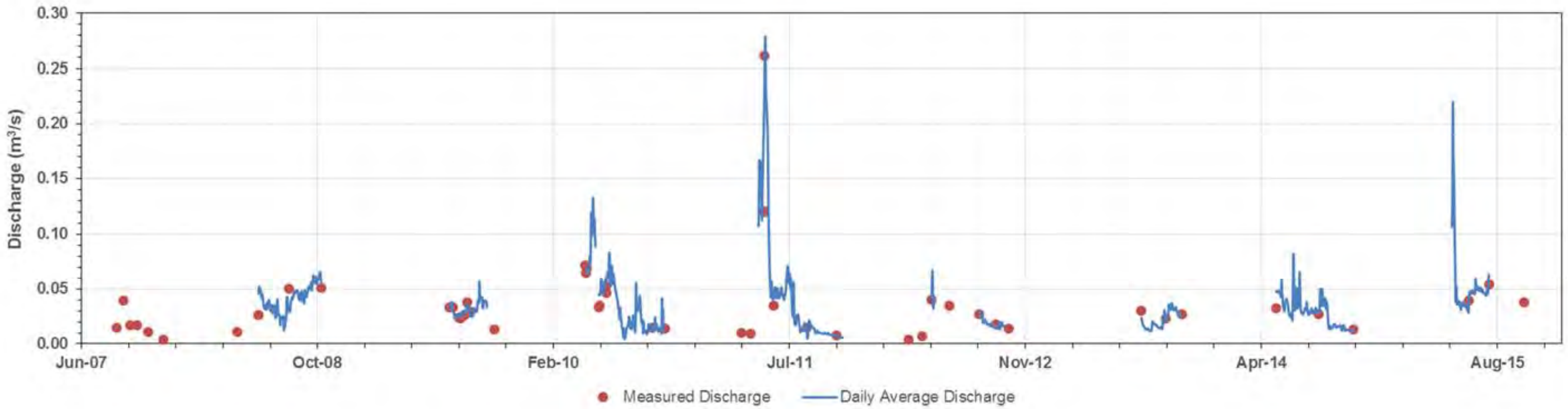

Figure 4-7: W27 Average daily discharge record (2007 to 2015)

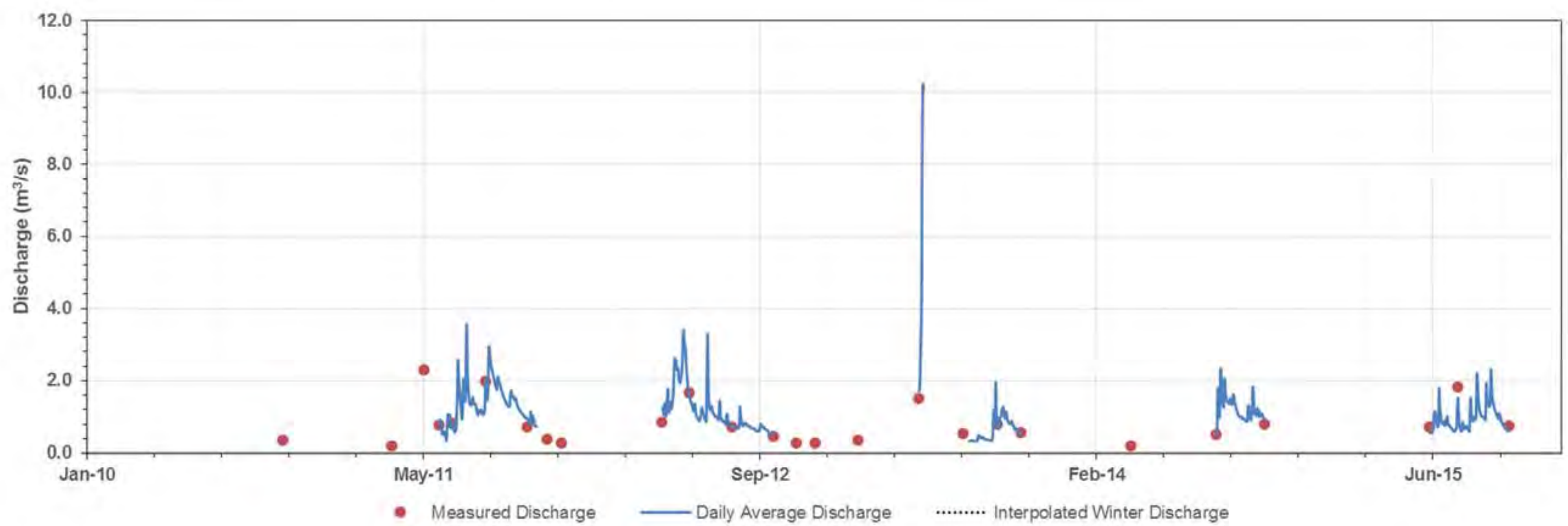

Figure 4-8: W29 Average daily discharge record (2007 to 2015). Note the peak value for May 2013 – refer to Appendix A for further detail on this event.

4.2 Streamflow Records – Unit Yields

Period of record (Figure 4-9) and unit yield plots per year (Figure 4-10 through Figure 4-18) are presented for the eight hydrometric stations in this section.

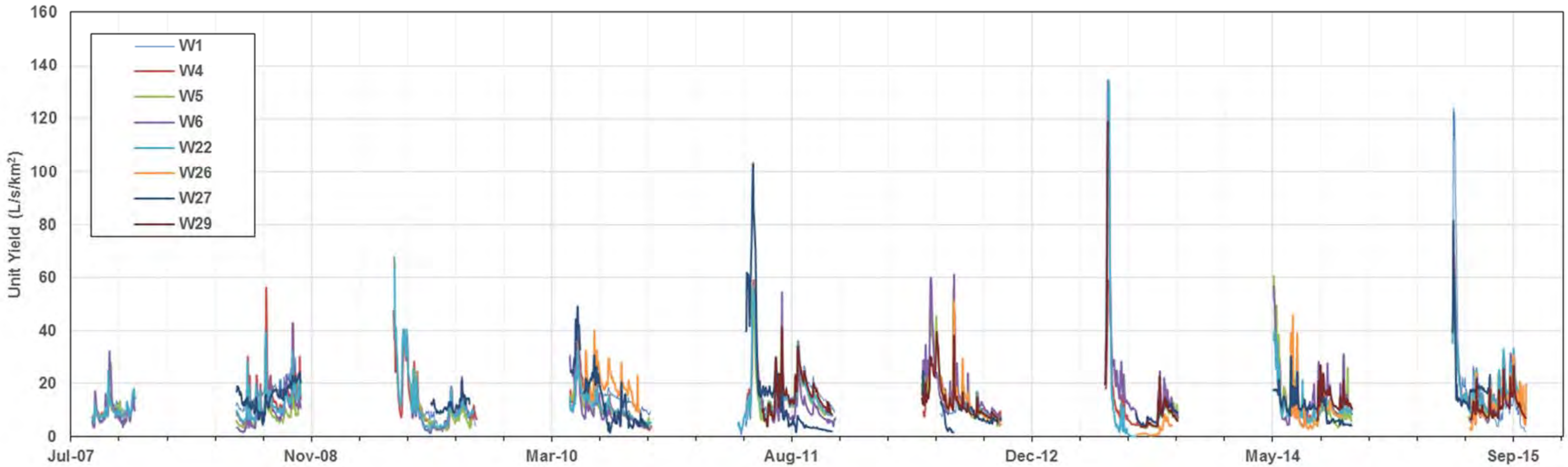

Figure 4-9: Average daily unit yield time-series for Project stations (2007-2015)

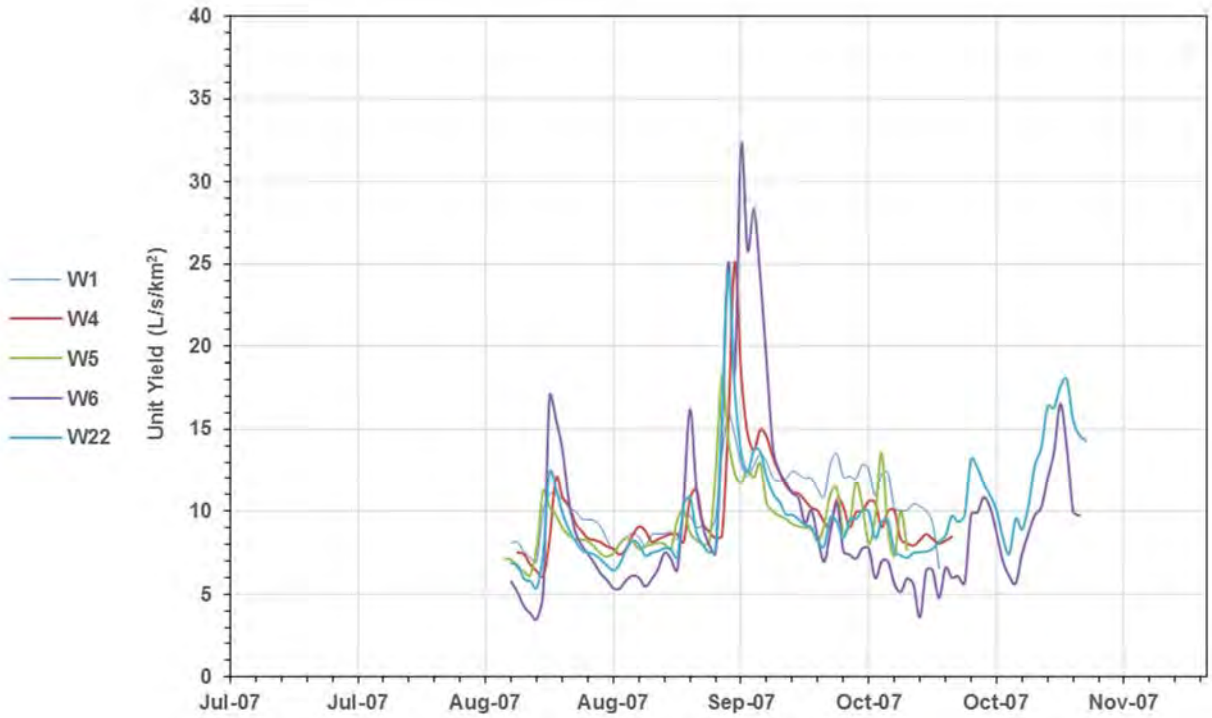

Figure 4-10: Average daily unit yield time-series for Project stations (2007)

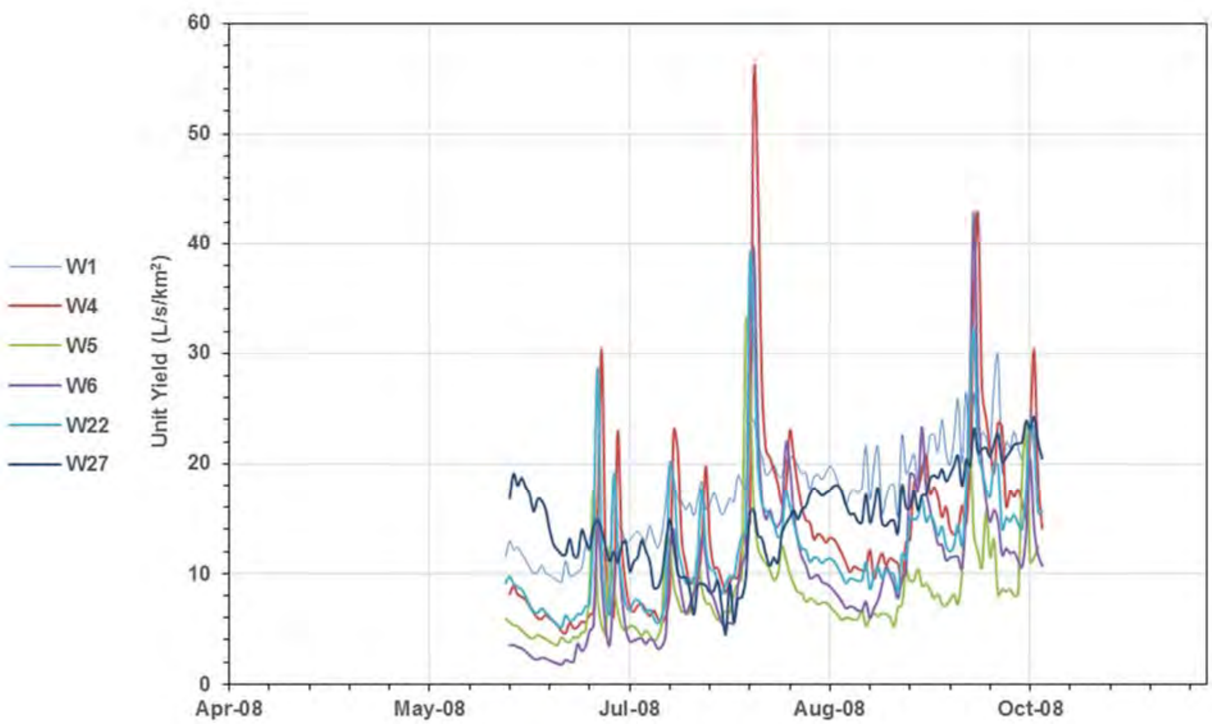

Figure 4-11: Average daily unit yield time-series for Project stations (2008)

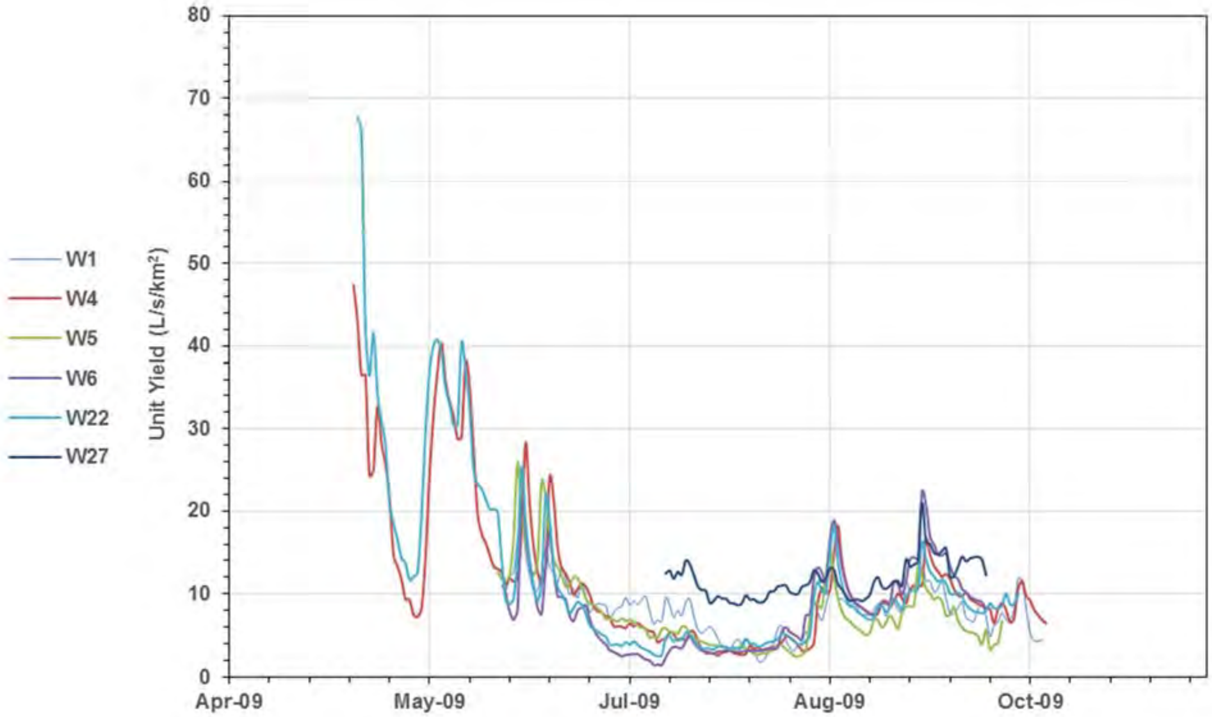

Figure 4-12: Average daily unit yield time-series for Project stations (2009)

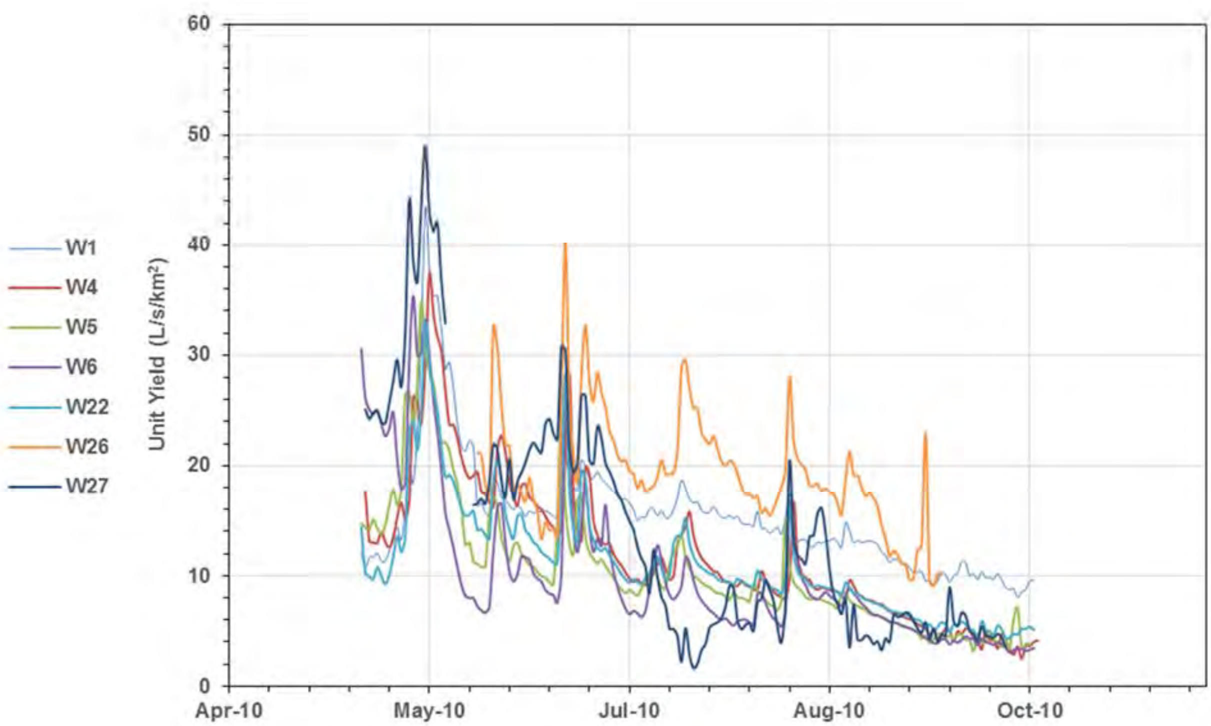

Figure 4-13: Average daily unit yield time-series for Project stations (2010)

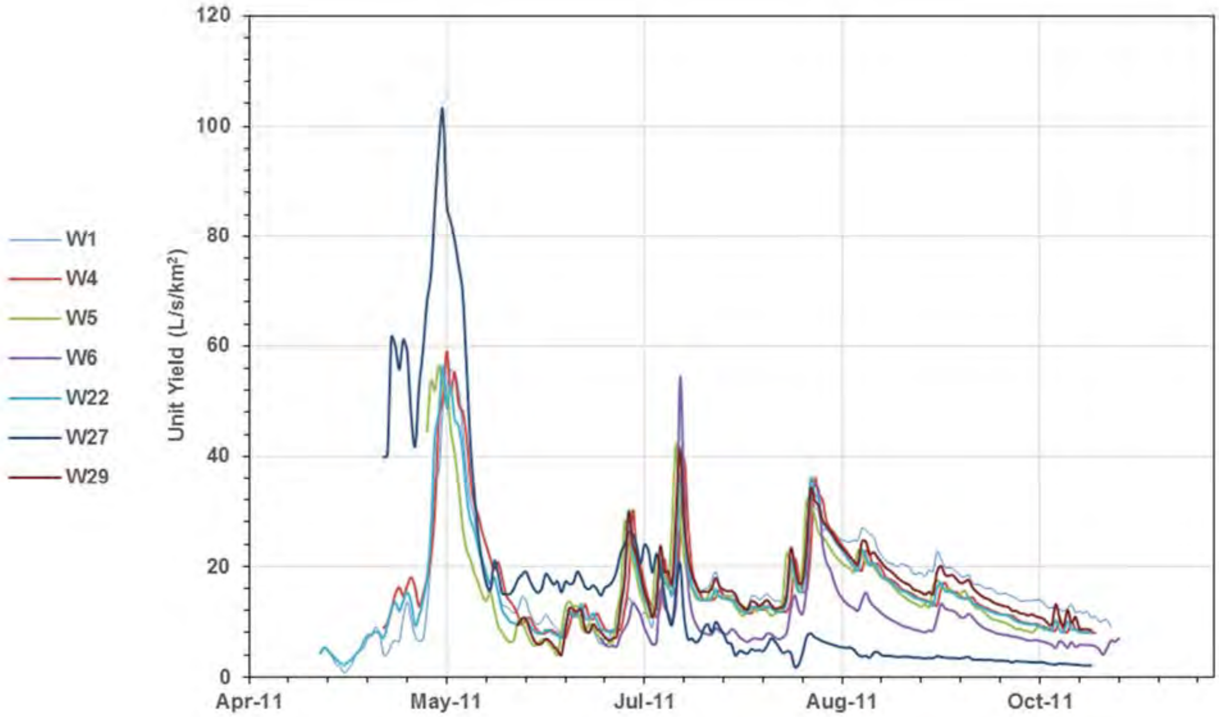

Figure 4-14: Average daily unit yield time-series for Project stations (2011)

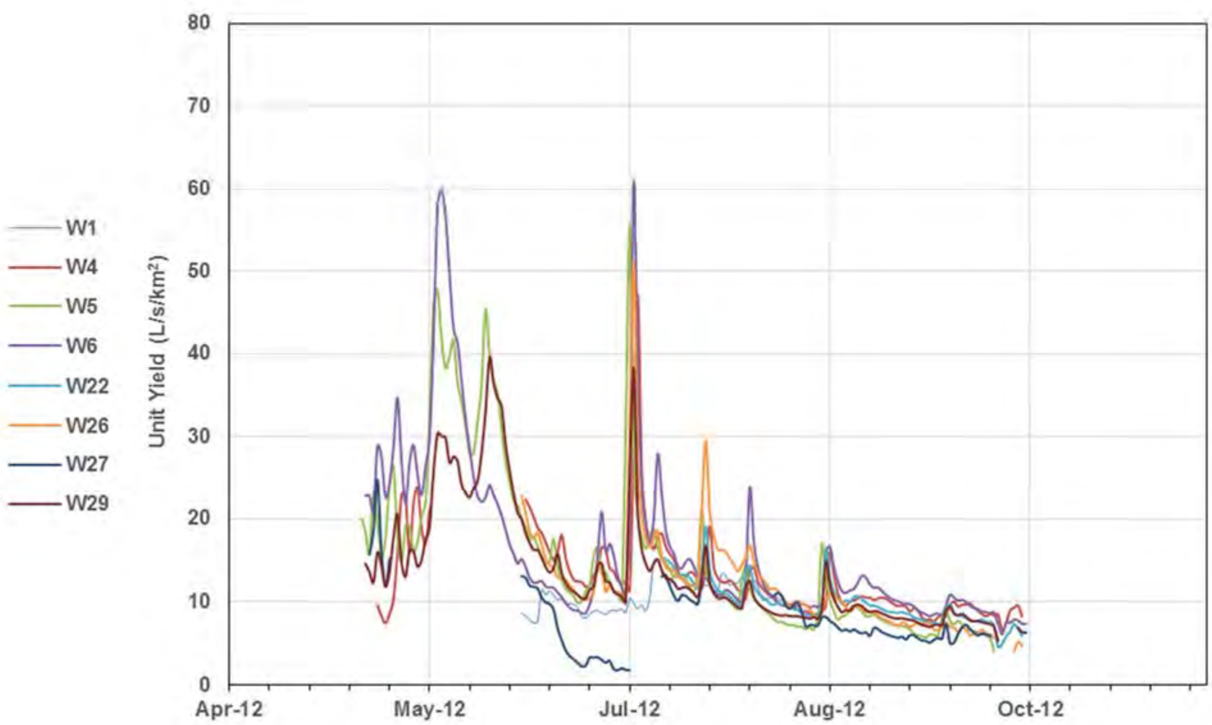

Figure 4-15: Average daily unit yield time-series for Project stations (2012)

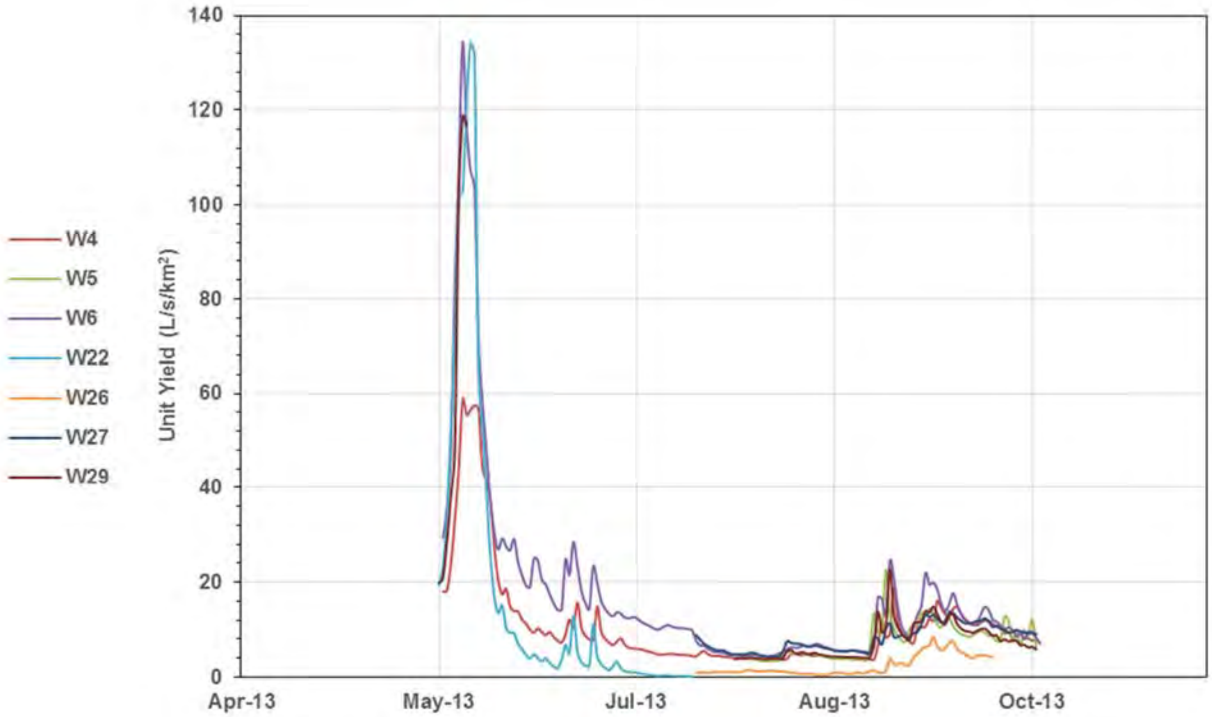

Figure 4-16: Average daily unit yield time-series for Project stations (2013)

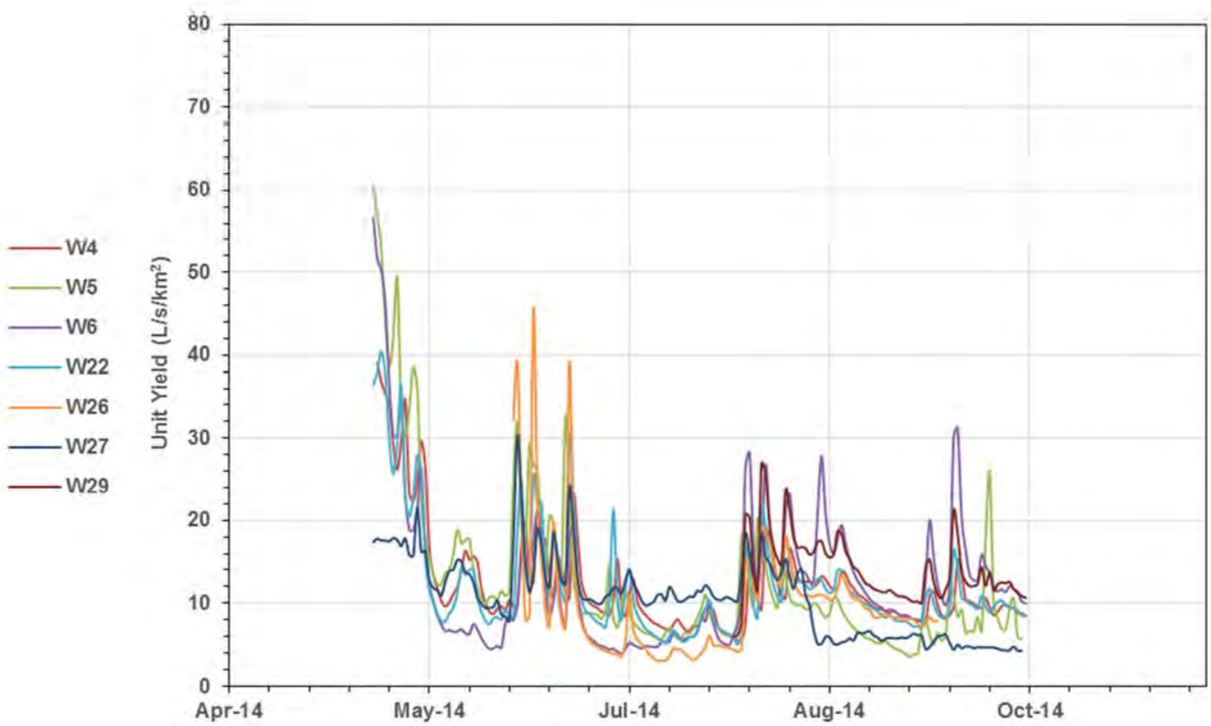

Figure 4-17: Average daily unit yield time-series for Project stations (2014)

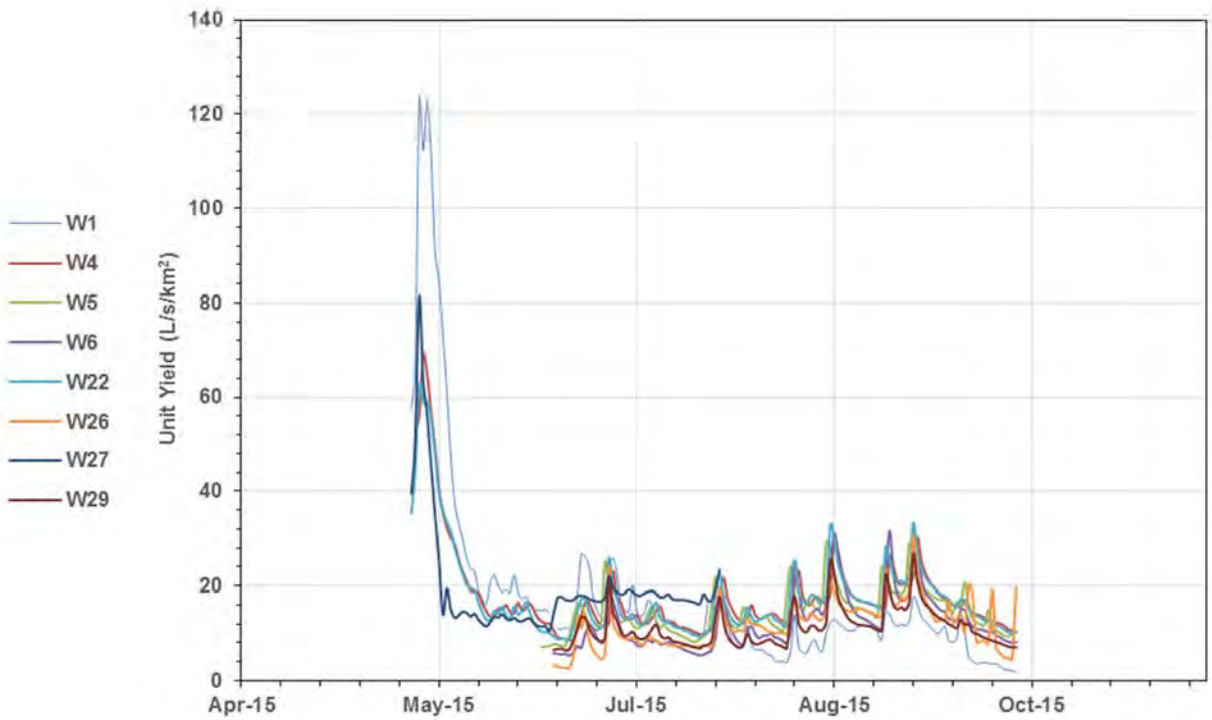

Figure 4-18: Average daily unit yield time-series for Project stations (2015)

4.3 Streamflow Records – Monthly Summary Tables

Monthly summary tables are presented for the eight hydrometric stations in this section.

Table 4-2:
W1 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.06	0.07	0.08	--	--
	Maximum	--	--	--	--	--	--	--	0.10	0.13	0.10	--	--
	Minimum	--	--	--	--	--	--	--	0.04	0.05	0.04	--	--
2008	Average	--	--	--	--	--	0.07	0.10	0.13	0.13	0.15	--	--
	Maximum	--	--	--	--	--	0.11	0.18	0.21	0.25	0.26	--	--
	Minimum	--	--	--	--	--	0.05	0.07	0.09	0.09	0.07	--	--
2009	Average	--	--	--	--	--	0.08	0.05	0.04	0.06	0.05	--	--
	Maximum	--	--	--	--	--	0.24	0.08	0.10	0.11	0.12	--	--
	Minimum	--	--	--	--	--	0.01	0.01	0.00	0.03	0.01	--	--
2010	Average	--	--	--	--	0.15	0.12	0.11	0.10	0.08	0.07	--	--
	Maximum	--	--	--	--	0.34	0.19	0.15	0.16	0.13	0.09	--	--
	Minimum	--	--	--	--	0.06	0.09	0.09	0.08	0.05	0.05	--	--
2011	Average	--	--	--	0.02	0.15	0.07	0.10	0.13	0.14	0.09	0.07	--
	Maximum	--	--	--	0.05	0.48	0.14	0.26	0.29	0.21	0.12	0.09	--
	Minimum	--	--	--	0.00	0.02	0.03	0.03	0.07	0.12	0.06	0.05	--
2012	Average	--	--	--	--	--	0.06	0.08	0.08	--	--	--	--
	Maximum	--	--	--	--	--	0.10	0.12	0.10	--	--	--	--
	Minimum	--	--	--	--	--	0.05	0.05	0.07	--	--	--	--
2013	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2014	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2015	Average	--	--	--	--	0.43	0.12	0.10	0.06	0.08	0.03	--	--
	Maximum	--	--	--	--	1.30	0.29	0.20	0.25	0.17	0.09	--	--
	Minimum	--	--	--	--	0.12	0.07	0.00	0.02	0.03	0.01	--	--
All Years	Average	--	--	--	0.02	0.22	0.09	0.09	0.09	0.10	0.08	0.07	--
	Maximum	--	--	--	0.05	1.30	0.29	0.26	0.29	0.25	0.26	0.09	--
	Minimum	--	--	--	0.00	0.02	0.01	0.00	0.00	0.03	0.01	0.05	--

Table 4-3:
W1 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	*18*	30	*20*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	*0.06*	0.07	*0.08*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	*9.03*	10.85	*11.14*	--	--
	Runoff (mm)	--	--	--	--	--	--	--	*14.0*	28.1	*19.3*	--	--
2008	# days with data	--	--	--	--	--	*22*	31	31	30	*20*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.07*	0.10	0.13	0.13	*0.15*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*10.85*	15.03	19.08	19.55	*22.64*	--	--
	Runoff (mm)	--	--	--	--	--	*20.6*	40.3	51.1	50.7	*39.1*	--	--
2009	# days with data	--	--	--	--	--	*23*	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.08*	0.05	0.04	0.06	*0.05*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*12.19*	7.88	5.18	9.28	*7.21*	--	--
	Runoff (mm)	--	--	--	--	--	*24.2*	21.1	13.9	24.1	*13.1*	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	0.15	0.12	0.11	0.10	0.08	*0.07*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	21.54	17.20	16.72	14.25	11.43	*9.61*	--	--
	Runoff (mm)	--	--	--	--	52.1	44.6	44.8	38.2	29.6	*15.8*	--	--
2011	# days with data	--	--	--	*12*	31	30	31	31	30	31	*5*	--
	Average Discharge (m^3/s)	--	--	--	*0.02*	0.15	0.07	0.10	0.13	0.14	0.09	*0.07*	--
	Average Yield ($L/s/km^2$)	--	--	--	*3.38*	22.18	10.99	15.23	19.57	21.04	13.83	*10.10*	--
	Runoff (mm)	--	--	--	*3.5*	59.4	28.5	40.8	52.4	54.5	37.0	*4.4*	--
2012	# days with data	--	--	--	--	--	*18*	31	*18*	--	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.06*	0.08	*0.08*	--	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*9.33*	11.03	*11.54*	--	--	--	--
	Runoff (mm)	--	--	--	--	--	*14.5*	29.6	*17.9*	--	--	--	--
2013	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2014	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2015	# days with data	--	--	--	--	*18*	29	28	31	30	*14*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*0.43*	0.12	0.10	0.06	0.08	*0.03*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*63.51*	17.26	14.47	8.24	11.71	*3.78*	--	--
	Runoff (mm)	--	--	--	--	*98.8*	43.2	35.0	22.1	30.3	*4.6*	--	--
All Years	Average Discharge (m^3/s)	--	--	--	0.02	0.21	0.09	0.09	0.09	0.10	0.08	0.07	--
	Average Yield ($L/s/km^2$)	--	--	--	3.38	31.61	13.38	13.38	12.70	13.98	11.93	10.10	--
	Runoff (mm)	--	--	--	3.5	210.3	175.7	211.5	209.7	217.4	128.9	4.4	--

Table 4-4:
W4 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.64	0.87	0.77	0.85	--
	Maximum	--	--	--	--	--	--	--	1.05	2.28	2.06	1.15	--
	Minimum	--	--	--	--	--	--	--	0.42	0.56	0.50	0.56	--
2008	Average	--	--	--	--	--	0.48	0.87	1.33	1.03	1.67	--	--
	Maximum	--	--	--	--	--	0.74	4.24	6.65	2.24	5.00	--	--
	Minimum	--	--	--	--	--	0.31	0.38	0.54	0.59	0.61	--	--
2009	Average	--	--	--	--	1.95	1.11	0.41	0.43	0.80	0.65	--	--
	Maximum	--	--	--	--	5.29	3.11	0.71	1.56	1.47	1.23	--	--
	Minimum	--	--	--	--	0.06	0.55	0.09	0.16	0.53	0.30	--	--
2010	Average	--	--	--	--	1.62	1.35	0.88	0.72	0.49	0.31	--	--
	Maximum	--	--	--	--	3.06	2.78	1.34	1.56	0.83	0.50	--	--
	Minimum	--	--	--	--	0.76	0.92	0.64	0.56	0.02	0.02	--	--
2011	Average	--	--	--	--	2.22	0.85	1.30	1.43	1.27	0.77	--	--
	Maximum	--	--	--	--	5.35	1.76	3.74	3.32	1.99	1.22	--	--
	Minimum	--	--	--	--	0.61	0.49	0.57	0.80	0.94	0.56	--	--
2012	Average	--	--	--	--	1.22	1.21	1.27	0.83	0.73	0.66	--	--
	Maximum	--	--	--	--	2.09	1.87	4.83	1.48	0.90	0.85	--	--
	Minimum	--	--	--	--	0.47	0.82	0.78	0.59	0.54	0.40	--	--
2013	Average	--	--	--	--	3.34	1.07	0.42	0.32	0.75	0.75	--	--
	Maximum	--	--	--	--	7.03	3.90	0.82	0.42	1.90	1.00	--	--
	Minimum	--	--	--	--	1.16	0.54	0.29	0.26	0.27	0.46	--	--
2014	Average	--	--	--	--	1.66	1.00	0.67	0.90	0.76	0.73	--	--
	Maximum	--	--	--	--	4.39	2.27	2.03	2.46	1.31	1.04	--	--
	Minimum	--	--	--	--	0.61	0.62	0.49	0.38	0.45	0.58	--	--
2015	Average	--	--	--	--	2.78	1.01	1.02	1.27	1.47	0.96	--	--
	Maximum	--	--	--	--	7.01	1.51	2.32	3.13	2.70	1.37	--	--
	Minimum	--	--	--	--	1.14	0.57	0.69	0.83	1.00	0.72	--	--
All Years	Average	--	--	--	--	2.03	1.02	0.85	0.89	0.91	0.81	0.85	--
	Maximum	--	--	--	--	7.03	3.90	4.83	6.65	2.70	5.00	1.15	--
	Minimum	--	--	--	--	0.06	0.31	0.09	0.16	0.02	0.02	0.56	--

Table 4-5:
W4 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	*18*	30	31	*21*	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	*0.64*	0.87	0.77	*1.03*	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	*8.30*	11.38	9.98	*13.34*	--
	Runoff (mm)	--	--	--	--	--	--	--	*12.9*	29.5	26.7	*24.2*	--
2008	# days with data	--	--	--	--	--	*22*	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.48*	0.87	1.34	1.03	*1.65*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*6.30*	11.29	17.40	13.45	*21.48*	--	--
	Runoff (mm)	--	--	--	--	--	*12.0*	30.2	46.6	34.9	*39.0*	--	--
2009	# days with data	--	--	--	--	31	30	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	2.01	1.11	0.41	0.43	0.80	*0.65*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	26.12	14.42	5.28	5.54	10.34	*8.48*	--	--
	Runoff (mm)	--	--	--	--	70.0	37.4	14.1	14.8	26.8	*15.4*	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	1.61	1.35	0.88	0.72	0.49	*0.31*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	20.96	17.62	11.43	9.40	6.40	*3.98*	--	--
	Runoff (mm)	--	--	--	--	50.7	45.7	30.6	25.2	16.6	*6.5*	--	--
2011	# days with data	--	--	--	--	28	30	31	31	30	31	--	--
	Average Discharge (m^3/s)	--	--	--	--	2.18	0.85	1.30	1.43	1.27	0.77	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	28.41	10.99	16.91	18.60	16.49	9.99	--	--
	Runoff (mm)	--	--	--	--	68.7	28.5	45.3	49.8	42.7	26.8	--	--
2012	# days with data	--	--	--	--	*14*	*18*	31	31	30	*16*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*1.23*	*1.23*	1.27	0.83	0.73	*0.66*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*16.02*	*15.93*	16.53	10.83	9.44	*8.57*	--	--
	Runoff (mm)	--	--	--	--	*19.4*	*24.8*	44.3	29.0	24.5	*11.9*	--	--
2013	# days with data	--	--	--	--	*11*	30	31	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*3.26*	1.07	0.42	0.32	0.75	*0.75*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*42.39*	13.85	5.46	4.12	9.75	*9.72*	--	--
	Runoff (mm)	--	--	--	--	*40.3*	35.9	14.6	11.0	25.3	*15.9*	--	--
2014	# days with data	--	--	--	--	*25*	30	31	31	30	*17*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*1.69*	1.00	0.67	0.90	0.76	*0.72*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*21.93*	13.06	8.73	11.69	9.87	*9.42*	--	--
	Runoff (mm)	--	--	--	--	*47.4*	33.8	23.4	31.3	25.6	*13.8*	--	--
2015	# days with data	--	--	--	--	*18*	30	31	31	30	*14*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*2.81*	1.01	1.02	1.27	1.47	*0.96*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*36.55*	13.18	13.24	16.53	19.11	*12.45*	--	--
	Runoff (mm)	--	--	--	--	*56.8*	34.2	35.5	44.3	49.5	*15.1*	--	--
All Years	Average Discharge (m^3/s)	--	--	--	--	*2.03*	1.02	0.85	0.89	0.91	*0.81*	*1.03*	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*26.38*	13.27	11.11	11.53	11.80	*10.48*	*13.34*	--
	Runoff (mm)	--	--	--	--	*50.5*	31.5	29.8	29.4	30.6	*19.0*	*24.2*	--

Table 4-6:
W5 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.79	0.97	1.08	--	--
	Maximum	--	--	--	--	--	--	--	1.22	2.07	2.13	--	--
	Minimum	--	--	--	--	--	--	--	0.55	0.68	0.68	--	--
2008	Average	--	--	--	--	--	0.43	0.73	0.99	0.70	1.20	--	--
	Maximum	--	--	--	--	--	0.62	3.60	4.57	1.23	4.90	--	--
	Minimum	--	--	--	--	--	0.32	0.34	0.49	0.46	0.41	--	--
2009	Average	--	--	--	--	--	1.43	0.59	0.47	0.77	1.19	--	--
	Maximum	--	--	--	--	--	3.46	0.94	1.67	1.51	2.90	--	--
	Minimum	--	--	--	--	--	0.82	0.23	0.16	0.44	0.16	--	--
2010	Average	--	--	--	--	1.99	1.27	0.99	0.82	0.57	0.42	--	--
	Maximum	--	--	--	--	3.62	3.18	1.43	1.71	0.91	0.92	--	--
	Minimum	--	--	--	--	1.06	0.82	0.74	0.62	0.12	0.08	--	--
2011	Average	--	--	--	--	3.55	0.86	1.68	1.76	1.62	0.98	--	--
	Maximum	--	--	--	--	7.15	1.68	4.93	3.59	2.63	1.59	--	--
	Minimum	--	--	--	--	1.27	0.26	0.45	0.93	1.12	0.55	--	--
2012	Average	--	--	--	--	2.60	2.12	1.63	0.92	0.73	0.62	--	--
	Maximum	--	--	--	--	6.24	5.16	6.88	2.00	1.01	0.79	--	--
	Minimum	--	--	--	--	0.82	0.84	0.87	0.57	0.50	0.34	--	--
2013	Average	--	--	--	--	--	--	--	0.42	0.93	0.89	--	--
	Maximum	--	--	--	--	--	--	--	0.62	3.88	2.32	--	--
	Minimum	--	--	--	--	--	--	--	0.28	0.32	0.58	--	--
2014	Average	--	--	--	--	2.92	1.63	0.77	1.05	0.62	0.93	--	--
	Maximum	--	--	--	--	7.13	4.54	2.81	3.28	1.32	3.35	--	--
	Minimum	--	--	--	--	1.07	0.80	0.49	0.54	0.32	0.50	--	--
2015	Average	--	--	--	--	--	1.07	1.23	1.54	1.76	1.24	--	--
	Maximum	--	--	--	--	--	1.86	2.96	3.81	3.04	3.06	--	--
	Minimum	--	--	--	--	--	0.63	0.73	0.95	1.26	0.88	--	--
All Years	Average	--	--	--	--	2.81	1.32	1.09	0.99	0.96	0.97	--	--
	Maximum	--	--	--	--	17.27	5.16	6.88	4.57	3.88	4.90	--	--
	Minimum	--	--	--	--	0.82	0.26	0.23	0.16	0.12	0.08	--	--

Table 4-7:
W5 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	*18*	30	*20*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	*0.79*	0.97	*1.09*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	*8.06*	9.94	*11.22*	--	--
	Runoff (mm)	--	--	--	--	--	--	--	*12.5*	25.8	*19.4*	--	--
2008	# days with data	--	--	--	--	--	*21*	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.43*	0.73	1.00	0.70	*1.20*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*4.46*	7.44	10.22	7.21	*12.33*	--	--
	Runoff (mm)	--	--	--	--	--	*8.1*	19.9	27.4	18.7	*22.4*	--	--
2009	# days with data	--	--	--	--	--	*23*	31	31	30	*22*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*1.42*	0.59	0.47	0.77	*1.19*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*14.56*	6.04	4.86	7.88	*12.19*	--	--
	Runoff (mm)	--	--	--	--	--	*28.9*	16.2	13.0	20.4	*23.2*	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	1.99	1.27	0.99	0.82	0.57	*0.42*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	20.36	13.06	10.16	8.38	5.83	*4.32*	--	--
	Runoff (mm)	--	--	--	--	49.3	33.8	27.2	22.4	15.1	*7.1*	--	--
2011	# days with data	--	--	--	--	*15*	30	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*3.59*	0.86	1.68	1.76	1.62	*0.98*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*36.82*	8.81	17.24	18.01	16.67	*10.09*	--	--
	Runoff (mm)	--	--	--	--	*47.7*	22.8	46.2	48.2	43.2	*18.3*	--	--
2012	# days with data	--	--	--	--	27	30	31	31	30	*10*	--	--
	Average Discharge (m^3/s)	--	--	--	--	2.59	2.12	1.63	0.92	0.73	*0.61*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	26.52	21.73	16.68	9.47	7.53	*6.29*	--	--
	Runoff (mm)	--	--	--	--	61.9	56.3	44.7	25.4	19.5	*5.4*	--	--
2013	# days with data	--	--	--	--	--	--	--	27	30	*20*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	0.42	0.93	*0.89*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	4.26	9.57	*9.09*	--	--
	Runoff (mm)	--	--	--	--	--	--	--	9.9	24.8	*15.7*	--	--
2014	# days with data	--	--	--	--	*25*	30	31	31	30	*17*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*3.03*	1.63	0.77	1.05	0.62	*0.92*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*31.09*	16.67	7.88	10.81	6.31	*9.41*	--	--
	Runoff (mm)	--	--	--	--	*67.2*	43.2	21.1	29.0	16.4	*13.8*	--	--
2015	# days with data	--	--	--	--	--	*15*	31	31	30	*14*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.98*	1.23	1.54	1.76	*1.23*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*10.01*	12.58	15.81	18.07	*12.63*	--	--
	Runoff (mm)	--	--	--	--	--	*13.0*	33.7	42.3	46.8	*15.3*	--	--
All Years	Average Discharge (m^3/s)	--	--	--	--	*2.68*	*1.30*	1.09	0.99	0.96	*0.97*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*27.54*	*13.33*	11.15	10.17	9.89	*9.92*	--	--
	Runoff (mm)	--	--	--	--	*56.5*	*29.5*	29.9	25.6	25.6	*15.6*	--	--

Table 4-8:
W6 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.78	1.30	0.73	--	--
	Maximum	--	--	--	--	--	--	--	2.06	4.25	1.49	--	--
	Minimum	--	--	--	--	--	--	--	0.30	0.47	0.24	--	--
2008	Average	--	--	--	--	--	0.27	0.74	1.34	1.12	1.67	--	--
	Maximum	--	--	--	--	--	0.55	1.78	4.64	2.65	5.17	--	--
	Minimum	--	--	--	--	--	0.14	0.27	0.46	0.54	0.67	--	--
2009	Average	--	--	--	--	--	1.06	0.32	0.65	1.22	0.96	--	--
	Maximum	--	--	--	--	--	2.27	0.68	1.99	2.51	1.12	--	--
	Minimum	--	--	--	--	--	0.62	0.04	0.27	0.72	0.71	--	--
2010	Average	--	--	--	--	2.21	1.18	0.95	0.78	0.58	0.38	--	--
	Maximum	--	--	--	--	4.32	2.82	1.81	1.84	0.95	0.54	--	--
	Minimum	--	--	--	--	0.75	0.63	0.58	0.51	0.25	0.11	--	--
2011	Average	--	--	--	--	--	0.63	1.18	1.35	1.10	0.71	0.57	--
	Maximum	--	--	--	--	--	1.21	6.75	3.86	1.63	1.17	0.72	--
	Minimum	--	--	--	--	--	0.53	0.52	0.59	0.80	0.34	0.39	--
2012	Average	--	--	--	--	3.35	1.51	1.85	1.18	1.05	0.84	--	--
	Maximum	--	--	--	--	7.53	2.77	7.12	2.68	1.37	1.05	--	--
	Minimum	--	--	--	--	1.51	0.81	0.99	0.91	0.80	0.50	--	--
2013	Average	--	--	--	--	8.68	2.48	1.06	0.55	1.31	1.08	--	--
	Maximum	--	--	--	--	17.95	6.77	1.75	0.74	2.81	2.43	--	--
	Minimum	--	--	--	--	2.50	1.34	0.49	0.41	0.50	0.69	--	--
2014	Average	--	--	--	--	2.11	1.03	0.56	1.66	1.28	1.32	--	--
	Maximum	--	--	--	--	6.64	2.71	1.01	3.69	3.65	2.65	--	--
	Minimum	--	--	--	--	0.57	0.42	0.40	0.83	0.77	0.96	--	--
2015	Average	--	--	--	--	--	0.77	0.88	1.40	1.72	1.04	--	--
	Maximum	--	--	--	--	--	1.27	2.25	3.73	3.69	1.63	--	--
	Minimum	--	--	--	--	--	0.49	0.51	0.71	1.05	0.78	--	--
All Years	Average	--	--	--	--	3.23	1.28	0.94	1.09	1.19	0.94	0.90	--
	Maximum	--	--	--	--	17.95	6.77	7.12	4.64	4.25	5.17	1.79	--
	Minimum	--	--	--	--	0.57	0.14	0.04	0.27	0.25	0.11	0.39	--

Table 4-9:
W6 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	*18*	30	31	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	*0.78*	1.30	0.73	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	*7.70*	12.91	7.19	--	--
	Runoff (mm)	--	--	--	--	--	--	--	*12.0*	33.5	19.2	--	--
2008	# days with data	--	--	--	--	--	*21*	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.28*	0.74	1.34	1.12	*1.66*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*2.74*	7.35	13.31	11.11	*16.41*	--	--
	Runoff (mm)	--	--	--	--	--	*5.0*	19.7	35.7	28.8	*29.8*	--	--
2009	# days with data	--	--	--	--	--	*23*	31	31	30	*7*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*1.07*	0.32	0.65	1.22	*0.96*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*10.60*	3.15	6.41	12.12	*9.48*	--	--
	Runoff (mm)	--	--	--	--	--	*21.1*	8.4	17.2	31.4	*5.7*	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	2.23	1.18	0.95	0.78	0.58	*0.38*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	22.09	11.71	9.37	7.72	5.73	*3.75*	--	--
	Runoff (mm)	--	--	--	--	53.4	30.3	25.1	20.7	14.9	*6.1*	--	--
2011	# days with data	--	--	--	--	--	*2*	31	31	30	31	*7*	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.65*	1.18	1.35	1.10	0.71	*0.57*	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*6.42*	11.69	13.38	10.91	7.02	*5.69*	--
	Runoff (mm)	--	--	--	--	--	*1.1*	31.3	35.8	28.3	18.8	*3.4*	--
2012	# days with data	--	--	--	--	27	30	31	31	30	*17*	--	--
	Average Discharge (m^3/s)	--	--	--	--	3.33	1.51	1.85	1.18	1.05	*0.84*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	32.98	14.92	18.37	11.72	10.38	*8.32*	--	--
	Runoff (mm)	--	--	--	--	76.9	38.7	49.2	31.4	26.9	*12.2*	--	--
2013	# days with data	--	--	--	--	*10*	30	31	31	30	*20*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*8.43*	2.48	1.06	0.55	1.31	*1.08*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*83.51*	24.57	10.46	5.41	12.96	*10.66*	--	--
	Runoff (mm)	--	--	--	--	*72.2*	63.7	28.0	14.5	33.6	*18.4*	--	--
2014	# days with data	--	--	--	--	*25*	30	31	31	30	*17*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*2.20*	1.03	0.56	1.58	1.28	*1.32*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*21.84*	10.25	5.57	15.62	12.71	*13.05*	--	--
	Runoff (mm)	--	--	--	--	*47.2*	26.6	14.9	41.8	32.9	*19.2*	--	--
2015	# days with data	--	--	--	--	--	*12*	31	31	30	*14*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.75*	0.88	1.40	1.72	*1.03*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*7.48*	8.71	13.89	17.06	*10.26*	--	--
	Runoff (mm)	--	--	--	--	--	*7.8*	23.3	37.2	44.2	*12.4*	--	--
All Years	Average Discharge (m^3/s)	--	--	--	--	*3.24*	*1.27*	0.94	1.08	1.19	*0.94*	*1.30*	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*32.11*	*12.63*	9.34	10.71	11.77	*9.28*	*12.88*	--
	Runoff (mm)	--	--	--	--	*62.4*	*24.3*	200.0	246.2	30.5	*15.8*	*15.0*	--

Table 4-10:
W22 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	0.52	0.70	0.61	0.94	--
	Maximum	--	--	--	--	--	--	--	0.93	1.95	1.03	1.34	--
	Minimum	--	--	--	--	--	--	--	0.32	0.43	0.44	0.56	--
2008	Average	--	--	--	--	--	0.46	0.73	0.94	0.79	1.23	--	--
	Maximum	--	--	--	--	--	0.68	3.20	3.93	1.34	2.77	--	--
	Minimum	--	--	--	--	--	0.30	0.32	0.47	0.49	0.47	--	--
2009	Average	--	--	--	--	2.07	0.96	0.27	0.40	0.66	0.64	--	--
	Maximum	--	--	--	--	5.34	2.35	0.47	1.31	1.22	1.01	--	--
	Minimum	--	--	--	--	0.19	0.33	0.06	0.19	0.43	0.37	--	--
2010	Average	--	--	--	--	1.16	1.02	0.75	0.64	0.45	0.34	--	--
	Maximum	--	--	--	--	2.39	2.51	1.11	1.30	0.68	0.47	--	--
	Minimum	--	--	--	--	0.50	0.69	0.58	0.52	0.11	0.11	--	--
2011	Average	--	--	--	0.26	1.60	0.70	1.12	1.24	1.10	0.67	--	--
	Maximum	--	--	--	0.48	4.47	1.35	3.08	2.89	1.73	1.06	--	--
	Minimum	--	--	--	0.13	0.40	0.43	0.50	0.70	0.82	0.49	--	--
2012	Average	--	--	--	--	--	--	0.93	0.70	0.59	0.47	--	--
	Maximum	--	--	--	--	--	--	2.00	1.26	0.76	0.60	--	--
	Minimum	--	--	--	--	--	--	0.73	0.52	0.46	0.19	--	--
2013	Average	--	--	--	--	5.57	0.65	0.06	--	--	--	--	--
	Maximum	--	--	--	--	20.63	4.74	0.36	--	--	--	--	--
	Minimum	--	--	--	--	1.18	0.10	0.00	--	--	--	--	--
2014	Average	--	--	--	--	1.37	0.93	0.55	0.79	0.65	0.65	--	--
	Maximum	--	--	--	--	3.14	2.56	2.74	2.54	1.20	0.90	--	--
	Minimum	--	--	--	--	0.47	0.46	0.31	0.24	0.38	0.52	--	--
2015	Average	--	--	--	--	2.43	0.87	0.90	1.12	1.33	0.84	--	--
	Maximum	--	--	--	--	5.32	1.50	2.10	2.91	2.41	1.21	--	--
	Minimum	--	--	--	--	1.00	0.53	0.57	0.70	0.98	0.62	--	--
All Years	Average	--	--	--	0.26	1.96	0.81	0.66	0.81	0.78	0.68	0.94	--
	Maximum	--	--	--	0.48	20.63	4.74	3.20	3.93	2.41	2.77	1.34	--
	Minimum	--	--	--	0.13	0.19	0.10	0.00	0.19	0.11	0.11	0.56	--

Table 4-11: W22 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	*18*	30	31	*12*	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	*0.52*	0.70	0.61	*0.94*	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	*7.71*	10.49	9.10	*14.02*	--
	Runoff (mm)	--	--	--	--	--	--	--	*12.0*	27.2	24.4	*14.5*	--
2008	# days with data	--	--	--	--	--	*22*	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.47*	0.73	0.94	0.79	*1.23*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*6.99*	10.88	14.14	11.80	*18.39*	--	--
	Runoff (mm)	--	--	--	--	--	*13.3*	29.1	37.9	30.6	*33.4*	--	--
2009	# days with data	--	--	--	--	29	30	31	31	30	*20*	--	--
	Average Discharge (m^3/s)	--	--	--	--	2.10	0.96	0.27	0.40	0.66	*0.64*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	31.46	14.36	4.08	6.05	9.84	*9.56*	--	--
	Runoff (mm)	--	--	--	--	78.8	37.2	10.9	16.2	25.5	*16.5*	--	--
2010	# days with data	--	--	--	--	28	30	31	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	1.16	1.02	0.75	0.64	0.45	*0.34*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	17.36	15.34	11.22	9.61	6.75	*5.07*	--	--
	Runoff (mm)	--	--	--	--	42.0	39.8	30.0	25.7	17.5	*8.3*	--	--
2011	# days with data	--	--	--	*12*	31	30	31	31	30	31	--	--
	Average Discharge (m^3/s)	--	--	--	*0.27*	1.60	0.70	1.12	1.24	1.10	0.67	--	--
	Average Yield ($L/s/km^2$)	--	--	--	*3.98*	23.90	10.42	16.78	18.63	16.52	10.00	--	--
	Runoff (mm)	--	--	--	*4.1*	64.0	27.0	44.9	49.9	42.8	26.8	--	--
2012	# days with data	--	--	--	--	--	--	*14*	31	30	*16*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	*0.93*	0.70	0.59	*0.46*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	*13.95*	10.46	8.89	*6.95*	--	--
	Runoff (mm)	--	--	--	--	--	--	*16.9*	28.0	23.0	*9.6*	--	--
2013	# days with data	--	--	--	--	*11*	30	24	--	--	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	*5.22*	0.65	0.06	--	--	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*78.11*	9.79	0.92	--	--	--	--	--
	Runoff (mm)	--	--	--	--	*74.2*	25.4	1.9	--	--	--	--	--
2014	# days with data	--	--	--	--	25	30	31	31	30	*17*	--	--
	Average Discharge (m^3/s)	--	--	--	--	1.41	0.93	0.55	0.79	0.65	*0.65*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	21.06	13.88	8.20	11.75	9.72	*9.68*	--	--
	Runoff (mm)	--	--	--	--	45.5	36.0	22.0	31.5	25.2	*14.2*	--	--
2015	# days with data	--	--	--	--	*18*	29	31	31	30	*14*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*2.43*	0.86	0.90	1.12	1.33	*0.84*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*36.38*	12.93	13.42	16.79	19.88	*12.51*	--	--
	Runoff (mm)	--	--	--	--	*56.6*	32.4	35.9	45.0	51.5	*15.1*	--	--
All Years	Average Discharge (m^3/s)	--	--	--	*0.27*	*1.97*	*0.81*	*0.66*	0.81	0.78	*0.68*	*0.94*	--
	Average Yield ($L/s/km^2$)	--	--	--	*3.98*	*29.44*	*12.15*	*9.91*	12.12	11.73	*10.16*	*14.02*	--
	Runoff (mm)	--	--	--	*4.1*	*60.2*	*30.1*	*24.0*	30.8	30.4	*18.5*	*14.5*	--

Table 4-12:
W26 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	Average	--	--	--	--	--	0.028	0.029	0.024	0.019	--	--	--
	Maximum	--	--	--	--	--	0.079	0.044	0.041	0.063	--	--	--
	Minimum	--	--	--	--	--	0.013	0.019	0.016	0.010	--	--	--
2011	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2012	Average	--	--	--	--	--	0.019	0.022	0.016	0.010	0.008	--	--
	Maximum	--	--	--	--	--	0.032	0.094	0.024	0.014	0.010	--	--
	Minimum	--	--	--	--	--	0.012	0.013	0.009	0.007	0.004	--	--
2013	Average	--	--	--	--	--	--	0.001	0.001	0.005	0.006	--	--
	Maximum	--	--	--	--	--	--	0.002	0.003	0.012	0.007	--	--
	Minimum	--	--	--	--	--	--	0.001	0.000	0.000	0.004	--	--
2014	Average	--	--	--	--	--	0.022	0.006	0.015	0.012	--	--	--
	Maximum	--	--	--	--	--	0.094	0.019	0.042	0.019	--	--	--
	Minimum	--	--	--	--	--	0.006	0.003	0.005	0.008	--	--	--
2015	Average	--	--	--	--	--	0.009	0.012	0.017	0.021	0.012	--	--
	Maximum	--	--	--	--	--	0.027	0.047	0.031	0.044	0.058	--	--
	Minimum	--	--	--	--	--	0.003	0.005	0.012	0.015	0.005	--	--
All Years	Average	--	--	--	--	--	0.021	0.016	0.014	0.013	0.009	--	--
	Maximum	--	--	--	--	--	0.094	0.094	0.042	0.063	0.058	--	--
	Minimum	--	--	--	--	--	0.003	0.001	0.000	0.000	0.004	--	--

Table 4-13:
W26 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2010	# days with data	--	--	--	--	--	29	31	31	26	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	0.03	0.03	0.02	0.02	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	21.44	22.18	18.71	14.30	--	--	--
	Runoff (mm)	--	--	--	--	--	53.7	59.4	50.1	32.1	--	--	--
2011	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2012	# days with data	--	--	--	--	--	*18*	31	31	30	*12*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.02*	0.02	0.02	0.01	*0.01*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*14.56*	17.00	12.00	7.83	*5.85*	--	--
	Runoff (mm)	--	--	--	--	--	*22.6*	45.5	32.1	20.3	*6.1*	--	--
2013	# days with data	--	--	--	--	--	--	7	31	30	*8*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	0.00	0.00	0.00	*0.01*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	0.98	0.97	3.61	*4.42*	--	--
	Runoff (mm)	--	--	--	--	--	--	0.6	2.6	9.4	*3.1*	--	--
2014	# days with data	--	--	--	--	--	*20*	31	31	25	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.02*	0.01	0.01	0.01	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*17.19*	4.50	11.19	8.98	--	--	--
	Runoff (mm)	--	--	--	--	--	*29.7*	12.0	30.0	19.4	--	--	--
2015	# days with data	--	--	--	--	--	*12*	31	31	30	*14*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.01*	0.01	0.02	0.02	*0.01*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*6.55*	9.00	12.87	16.26	*10.48*	--	--
	Runoff (mm)	--	--	--	--	--	*6.8*	24.1	34.5	42.2	*12.7*	--	--
All Years	Average Discharge (m^3/s)	--	--	--	--	--	*0.02*	0.02	0.01	0.01	*0.01*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*16.54*	12.52	11.15	10.13	*7.42*	--	--
	Runoff (mm)	--	--	--	--	--	*28.2*	28.3	29.9	24.7	*7.3*	--	--

Table 4-14:
W27 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	Average	--	--	--	--	--	--	--	--	--	--	--	--
	Maximum	--	--	--	--	--	--	--	--	--	--	--	--
	Minimum	--	--	--	--	--	--	--	--	--	--	--	--
2008	Average	--	--	--	--	--	0.040	0.030	0.037	0.045	0.058	--	--
	Maximum	--	--	--	--	--	0.061	0.053	0.059	0.062	0.075	--	--
	Minimum	--	--	--	--	--	0.003	0.001	0.001	0.022	0.024	--	--
2009	Average	--	--	--	--	--	--	0.031	0.028	0.034	0.038	--	--
	Maximum	--	--	--	--	--	--	0.048	0.079	0.082	0.046	--	--
	Minimum	--	--	--	--	--	--	0.021	0.021	0.021	0.028	--	--
2010	Average	--	--	--	--	0.090	0.057	0.029	0.025	0.014	0.016	--	--
	Maximum	--	--	--	--	0.146	0.115	0.070	0.076	0.074	0.105	--	--
	Minimum	--	--	--	--	0.011	0.037	0.001	0.006	0.001	0.001	--	--
2011	Average	--	--	--	--	0.160	0.046	0.041	0.014	0.010	0.007	--	--
	Maximum	--	--	--	--	0.335	0.070	0.111	0.044	0.014	0.010	--	--
	Minimum	--	--	--	--	0.037	0.032	0.011	0.003	0.008	0.005	--	--
2012	Average	--	--	--	--	0.047	--	0.030	0.023	0.016	0.017	--	--
	Maximum	--	--	--	--	0.128	--	0.315	0.036	0.040	0.021	--	--
	Minimum	--	--	--	--	0.018	--	0.021	0.015	0.012	0.015	--	--
2013	Average	--	--	--	--	--	--	0.018	0.015	0.025	0.028	--	--
	Maximum	--	--	--	--	--	--	0.030	0.061	0.123	0.035	--	--
	Minimum	--	--	--	--	--	--	0.014	0.010	0.012	0.021	--	--
2014	Average	--	--	--	--	0.042	0.037	0.030	0.031	0.015	0.012	--	--
	Maximum	--	--	--	--	0.088	0.144	0.050	0.097	0.020	0.014	--	--
	Minimum	--	--	--	--	0.027	0.012	0.024	0.012	0.010	0.010	--	--
2015	Average	--	--	--	--	0.081	0.039	0.049	--	--	--	--	--
	Maximum	--	--	--	--	0.304	0.052	0.241	--	--	--	--	--
	Minimum	--	--	--	--	0.005	0.027	0.041	--	--	--	--	--
All Years	Average	--	--	--	--	0.095	0.045	0.033	0.025	0.023	0.025	--	--
	Maximum	--	--	--	--	0.335	0.144	0.315	0.097	0.123	0.105	--	--
	Minimum	--	--	--	--	0.005	0.003	0.001	0.001	0.001	0.001	--	--

Table 4-15: W27 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	# days with data	--	--	--	--	--	--	--	--	--	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	--	--	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	--	--	--	--	--
	Runoff (mm)	--	--	--	--	--	--	--	--	--	--	--	--
2008	# days with data	--	--	--	--	--	*21*	31	31	30	*21*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.040*	0.030	0.036	0.045	*0.058*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*14.77*	10.94	13.22	16.75	*21.50*	--	--
	Runoff (mm)	--	--	--	--	--	*26.8*	29.3	35.4	43.4	*39.0*	--	--
2009	# days with data	--	--	--	--	--	--	*13*	31	30	*7*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	*0.032*	0.028	0.034	*0.038*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	*11.70*	10.42	12.44	*14.01*	--	--
	Runoff (mm)	--	--	--	--	--	--	*13.1*	27.9	32.2	*8.5*	--	--
2010	# days with data	--	--	--	--	*21*	30	31	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*0.090*	0.057	0.029	0.025	0.014	*0.016*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*33.21*	21.18	10.70	9.36	5.31	*5.94*	--	--
	Runoff (mm)	--	--	--	--	*60.3*	54.9	28.6	25.1	13.8	*9.7*	--	--
2011	# days with data	--	--	--	--	27	30	31	31	30	31	--	--
	Average Discharge (m^3/s)	--	--	--	--	0.159	0.045	0.041	0.014	0.010	0.007	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	58.90	16.85	15.25	5.29	3.71	2.64	--	--
	Runoff (mm)	--	--	--	--	137.4	43.7	40.9	14.2	9.6	7.1	--	--
2012	# days with data	--	--	--	--	*6*	--	*11*	*17*	30	*8*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*0.046*	--	*0.030*	*0.023*	0.016	*0.017*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*16.99*	--	*11.16*	*8.59*	5.96	*6.38*	--	--
	Runoff (mm)	--	--	--	--	*8.8*	--	*10.6*	*12.6*	15.5	*4.4*	--	--
2013	# days with data	--	--	--	--	--	--	*7*	31	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	*0.018*	0.015	0.025	*0.028*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	*6.79*	5.58	9.35	*10.46*	--	--
	Runoff (mm)	--	--	--	--	--	--	*4.1*	14.9	24.2	*17.2*	--	--
2014	# days with data	--	--	--	--	*25*	30	31	31	30	*16*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*0.042*	0.037	0.030	0.031	0.016	*0.012*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*15.56*	13.86	11.08	11.41	5.75	*4.57*	--	--
	Runoff (mm)	--	--	--	--	*33.6*	35.9	29.7	30.6	14.9	*6.3*	--	--
2015	# days with data	--	--	--	--	*18*	30	31	--	--	--	--	--
	Average Discharge (m^3/s)	--	--	--	--	*0.081*	0.039	0.049	--	--	--	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*30.12*	14.30	18.14	--	--	--	--	--
	Runoff (mm)	--	--	--	--	*46.8*	37.1	48.6	--	--	--	--	--
All Years	Average Discharge (m^3/s)	--	--	--	--	*0.09*	*0.04*	*0.03*	*0.02*	0.02	*0.02*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*34.24*	*16.28*	*12.75*	*9.16*	8.47	*8.82*	--	--
	Runoff (mm)	--	--	--	--	*57.4*	*39.7*	*25.6*	*23.0*	21.9	*13.2*	--	--

Table 4-16:
W29 Summary statistics for 15-minute discharge record. All values are in m^3/s.

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	Average	--	--	--	--	--	0.72	1.56	1.66	1.61	1.00	--	--
	Maximum	--	--	--	--	--	1.27	4.47	3.31	2.41	1.63	--	--
	Minimum	--	--	--	--	--	0.23	0.44	0.91	1.22	0.62	--	--
2012	Average	--	--	--	--	1.69	1.74	1.22	0.82	0.71	0.64	--	--
	Maximum	--	--	--	--	3.26	3.77	4.50	1.43	0.88	0.79	--	--
	Minimum	--	--	--	--	0.65	0.82	0.79	0.66	0.58	0.43	--	--
2013	Average	--	--	--	--	5.02	--	--	0.38	0.87	0.71	--	--
	Maximum	--	--	--	--	13.60	--	--	0.54	2.82	0.93	--	--
	Minimum	--	--	--	--	1.37	--	--	0.31	0.33	0.45	--	--
2014	Average	--	--	--	--	--	--	--	1.47	1.11	1.06	--	--
	Maximum	--	--	--	--	--	--	--	4.96	2.57	1.70	--	--
	Minimum	--	--	--	--	--	--	--	0.49	0.69	0.86	--	--
2015	Average	--	--	--	--	--	0.79	0.86	0.95	1.25	0.77	--	--
	Maximum	--	--	--	--	--	1.46	2.41	3.02	2.48	1.27	--	--
	Minimum	--	--	--	--	--	0.49	0.54	0.01	0.86	0.58	--	--
All Years	Average	--	--	--	--	2.35	1.21	1.21	1.06	1.11	0.87	--	--
	Maximum	--	--	--	--	13.60	3.77	4.50	4.96	2.82	1.70	--	--
	Minimum	--	--	--	--	0.65	0.23	0.44	0.01	0.33	0.43	--	--

Table 4-17:
W29 Summary statistics for daily discharge, unit yield and runoff

Year	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2011	# days with data	--	--	--	--	--	*23*	31	31	30	31	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.72*	1.56	1.66	1.61	1.00	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*8.39*	18.12	19.31	18.66	11.65	--	--
	Runoff (mm)	--	--	--	--	--	*16.7*	48.5	51.7	48.4	31.2	--	--
2012	# days with data	--	--	--	--	*27*	30	31	31	30	*13*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*1.68*	1.74	1.22	0.82	0.71	*0.62*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*19.52*	20.16	14.19	9.55	8.29	*7.21*	--	--
	Runoff (mm)	--	--	--	--	*45.5*	52.3	38.0	25.6	21.5	*8.1*	--	--
2013	# days with data	--	--	--	--	*8*	--	--	28	30	*19*	--	--
	Average Discharge (m^3/s)	--	--	--	--	*5.30*	--	--	0.38	0.87	*0.71*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*61.54*	--	--	4.40	10.06	*8.21*	--	--
	Runoff (mm)	--	--	--	--	*42.5*	--	--	10.6	26.1	*13.5*	--	--
2014	# days with data	--	--	--	--	--	--	--	27	30	*17*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	--	--	1.44	1.11	*1.06*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	--	--	16.74	12.89	*12.31*	--	--
	Runoff (mm)	--	--	--	--	--	--	--	39.1	33.4	*18.1*	--	--
2015	# days with data	--	--	--	--	--	*12*	31	31	30	*14*	--	--
	Average Discharge (m^3/s)	--	--	--	--	--	*0.78*	0.86	0.95	1.25	*0.77*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	--	*9.04*	9.94	11.09	14.51	*8.90*	--	--
	Runoff (mm)	--	--	--	--	--	*9.4*	26.6	29.7	37.6	*10.8*	--	--
All Years	Average Discharge (m^3/s)	--	--	--	--	*2.51*	*1.20*	1.21	1.06	1.11	*0.87*	--	--
	Average Yield ($L/s/km^2$)	--	--	--	--	*29.13*	*13.94*	14.09	12.25	12.88	*10.05*	--	--
	Runoff (mm)	--	--	--	--	*44.0*	*26.1*	37.7	31.3	33.4	*16.3*	--	--

5. Closure

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5. Closure

We trust that this report meets your expectations at this time. Please contact the undersigned with any questions or comments.

Sincerely,

LORAX ENVIRONMENTAL SERVICES LTD.

Prepared by:

Scott Jackson, M.Sc., P.Geo.
Hydrologist

Colin Fraser, M.Sc., P.Geo.
Hydrologist

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Appendix A: Indirect Discharge Estimate for W29 – May 2013

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Laberge ENVIRONMENTAL SERVICES **Laberge@northwestel.net**

Technical Memo

September 3, 2013

To: Steve Wilbur, Todd Goodsell Victoria Gold Corp

Re : Indirect Discharge Measurement at W-29 and Repair of Stream gauges at W-22, W-5 and W-29

Following is a summary of work completed to repair three gauges that were bowled over during the freshet of 2013 and the results of an indirect discharge measurement at W-29 which was done to estimate the magnitude of that freshet. The analysis of the peak discharge herein was largely done by Pat Bryan P.Eng and is gratefully acknowledged.

After a cold month the upper snow finally presented in the Haggart Creek drainage as a significant freshet flood in the last days of May. The following figure shows air temperature and rainfall at the lower weather station. The overnight lows didn't go above zero until May 10th but by May 26th daytime highs were in the twenties. Light rainfall was recorded on May 26th. 6.6 mm of rain fell at the lower weather station between 11:30 and 20:00 on May 29th. This may have contributed to ripening the snowpack and leading to the maximum observed stage on May 29th around midnight.

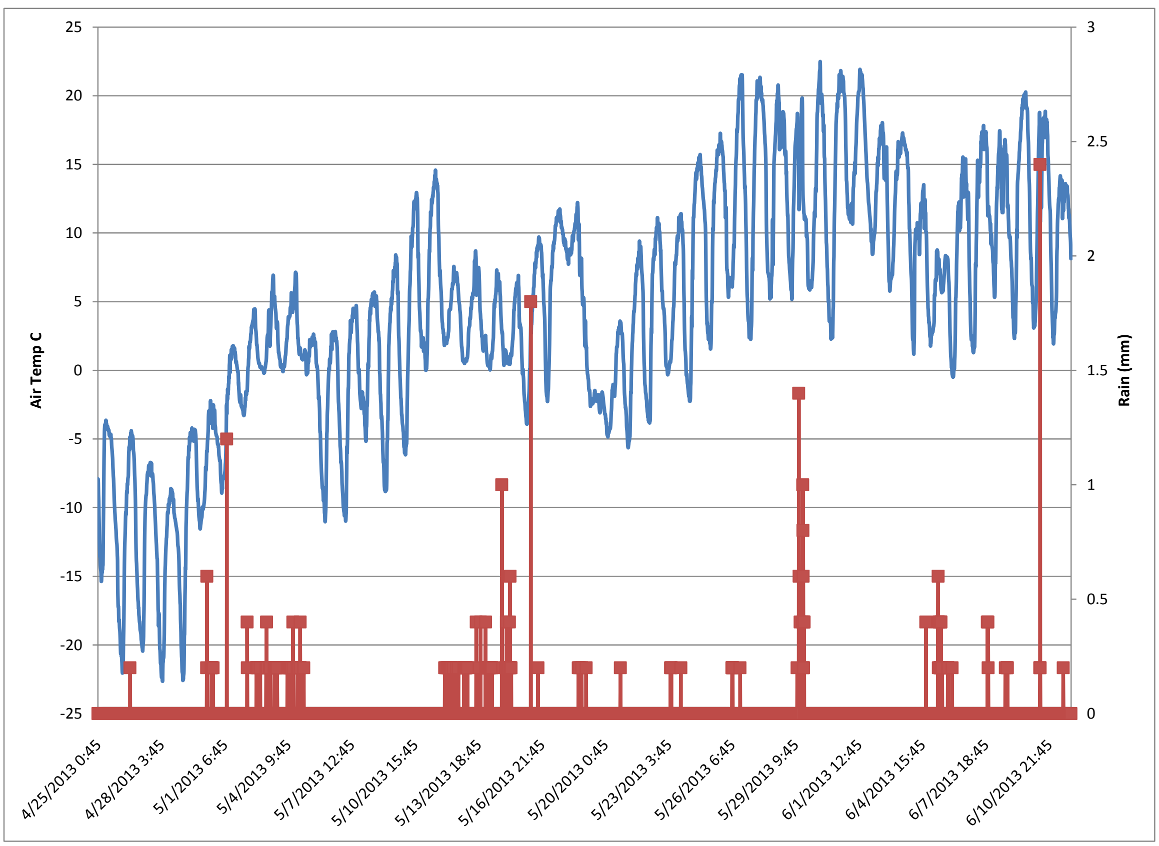


Figure 1 – Air Temperature and Rainfall Lower Weather Station Freshet 2013

The indirect discharge measurements discussed below, generated a best estimate for the flood of 12 m^3/sec or 424 cubic feet per second. This high flow rate with its extreme velocities and depths were too much for the vertical staff gauge/stilling well installations at W-22, W-29 and W-5. All of these gauges were knocked down by the flood. On August 3 – 5th the site gauges were repaired and survey measurements were made at the W29 gauging station for a slope-area determination of peak discharge.

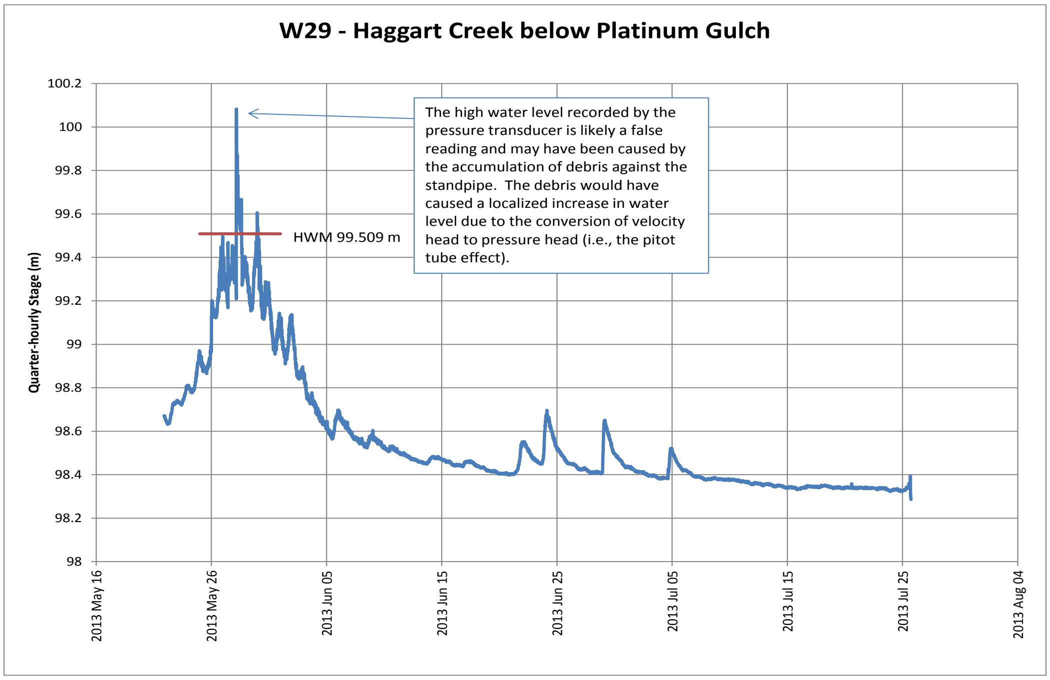


Figure 2 – W-29 Stage during Freshet

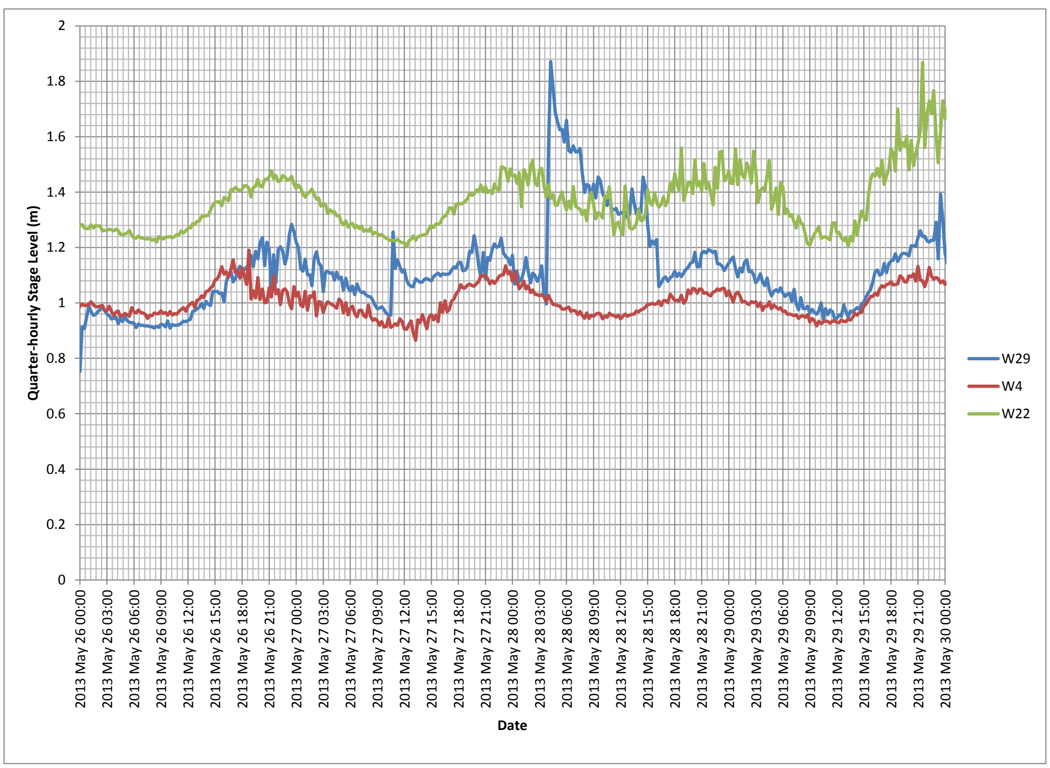


Figure 3 – Comparison of Freshet Water Levels at W-29, W-22 and W-4

As can be seen on Figures 2 and 3 above, sudden rises in water level were recorded by the HOBO on the 27th and 28th at W-29. One of these sudden rises may correspond with the time when the gauge was knocked down. The recorded peak water level likely overestimates the true peak water level in the stream because the stilling well/staff gauge was under a pile of debris and oriented to the flow path creating extra pressure at the datalogger. It should be noted that corresponding spikes in water level were not observed in the Hobo water level records of the two upstream gauges on Haggart Creek.

W-22 Haggart Creek upstream Dublin Gulch

On May 21st the datalogger was deployed and discharge and level surveys were conducted. Another survey was done on July 24th when the datalogger was rescued from the stilling well. The anchors had broken at the top of the vertical post, allowing the stilling well and staff gauge to assume the horizontal position on the stream bed. On August 4th the gauge was repaired and the logger re-deployed. The staff gauge zero was adjusted to 97.856 (historic gauge zero).

Level Survey W-22 August 4, 2013 11:30 hrs					
Stn.	B.S.	H.I	F.S.		Elevation
BM 1	0.624	100.624			100.000
BM 2			0.281		100.343
BM 3			0.673		99.951
Top SG			1.760		98.864
SG Zero					97.864
Staff Rdg				0.305	98.169
Chanage Inst	0.545	100.545			
Top SG			1.681		98.864

Figure 4 – Level Survey Notes W-22

Figure 5 - W-22 after repairs, August 4 2013

The rescued HOBO datalogger at W-22 was downloaded successfully and yielded fairly good data even though the stilling well and staff gauge were submerged. Figure 6 depicts the primary water level at W-22 during the freshet. The spikes visible on May 29th may correspond to the fall of the gauge, with similar high-pressure conditions as at W-29.

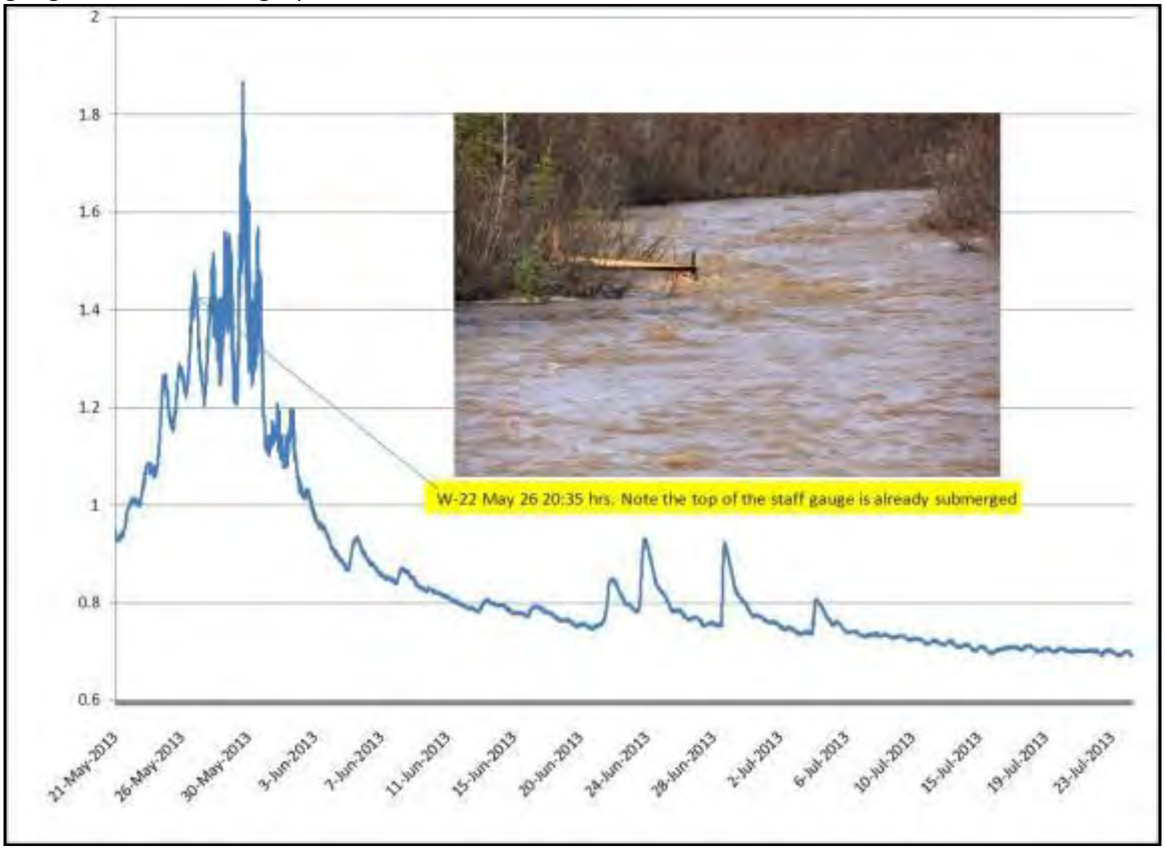


Figure 6 – W-22 Primary Water Level during Freshet

W-29 Haggart Downstream Platinum Gulch

On May 21st the datalogger was deployed and discharge and level surveys were conducted. The site was surveyed on July 24th when the datalogger was extracted from the heap of debris where it was still inside the stilling well. The entire gauge and all components including concrete anchors and even the bank in which they were located had fallen into the creek.

Figure 7 - W-29 July 25, 2013

On August 4th a slope-area survey (discussed below) was completed with the first of five cross-sections located at the former gauge site. There were no suitable micro-sites to re-install a staff gauge/stilling well at this location, so the HOBO was simply deployed on a steel anchor in a pool about 1m upstream of the old gauge site along the right bank.

<u>W-5 Haggart Creek upstream Lynx Creek</u>

On May 21st the datalogger was deployed and discharge and level surveys were conducted. On July 24th the site was visited and the datalogger was rescued from the stilling well. The stream bank had collapsed at the anchors and the braces had broken free at the top of the vertical post. The stilling well and staff gauge were submerged parallel to the flow at the gauge site. On August 5th the gauge was repaired and the logger re-deployed. The staff gauge zero was lowered by 29 mm to make sure the new staff gauge would not be high and dry at low flows.

Level Survey W-5 August 5 2013 12:00 hrs						
Stn.	B.S.	H.I	F.S.	SG	Elevation	
BM 1			0.955		99.936	BM 1 spruce tree dead, sinking into crack in bank
BM 2	0.917	100.891			99.974	Assume BM 2 original 99.974
BM 3			0.860		100.031	
Gauge Zero			2.747		98.144	new gauge zero 0.029 m lower than historic
Staff Rdg				0.326		
Gauge Ht.					98.470	
WL			2.419		98.472	
change Inst	0.901	100.875				BS on BM 2
BM 3			0.844		100.031	

Figure 8 – Level Survey W-5 after gauge repair

Figure 9 – W-5 after repairs. Note that the braces have been moved up onto the bank and that the original 2007 bank has sloughed into the creek.

Figure 10 – W-5 during construction August 2007

Indirect Flow Measurements at W-29

Indirect measurements can be used to piece together the events of a flood which may well have been too dangerous to measure in the first place. To estimate the instantaneous peak of the 2013 freshet flood at site W-29 (Haggart Creek downstream Platinum Gulch) a survey of the high water marks and cross-sections was conducted on August 4th, 2013. The reach was selected because it had the least number of bad attributes for a slope-area measurement. (Ideal hydrometric monitoring conditions are seldom to be found at mineral exploration sites). The reach length was 86.6m with cross sections situated about 22m apart. The longitudinal slope of the channel is approximately 0.013.

Several techniques were used to estimate the maximum instantaneous discharge during the freshet flood of 2013. From the results, the best estimates indicate that the true peak discharge likely fell in the range of 12 m^3/sec to 15 m^3/sec. One of the estimation techniques placed an upper bound on the flood magnitude of 21 m^3/sec. The adopted estimation techniques were:

- Method 1 – Manning's equation (11-15 m^3/sec)
- Method 2 – Extension of the rating curve for W-29 (12 m^3/sec)
- Method 3 – Adjusting the HEC-RAS program to encompass the high water marks (12-15 m^3/sec
- Method 4 – Check Critical Depth (Assuming a Froude number of unity, or Critical Flow, this generates an upper maximum possible discharge) (19-21m^3/sec)

Method 1 – Manning's Equation

Manning's equation in metric units is expressed as $Q = A\ v = A\ k_n / n\ R^{2/3}\ S^{1/2}$ Where Kn = 1, Hydraulic Radius R = Cross Sectional Area/Wetted Perimeter, S = Slope in m/m and importantly, n = roughness coefficient determined by various methods. Throughout this analysis the Jarrett Equation was the primary empirical method used to estimate roughness, but USGS publications and experiential judgment were also used as checks.The Jarrett Equation is discussed below.

Manning's Equation $Q = A\ v = A\ kn / n\ R^{2/3}\ S^{1/2}$										
Cross Section	WS Elevation	Area	Wetted Perimeter	Roughness	Hydraulic Radius	Friction Slope	Velocity	Discharge	R^2/3	S^1/2
	m	m2	WP m	n	R m	S m/m	v m/sec	Q cms		
2	99.3	7.69	10.5	0.064	0.73	0.013	1.4	11.1	0.812519	0.114018
2	99.3	7.69	10.5	0.048	0.73	0.013	1.9	14.8	0.812519	0.114018
5	98.5	8.49	13.4	0.064	0.63	0.013	1.3	11.2	0.737703	0.114018
5	98.5	8.49	13.4	0.048	0.63	0.013	1.8	14.9	0.737703	0.114018

Figure 11 – Table of Manning's calculations

Cross Sections 2 and 5 were considered the best selections for using Manning's. The maximum discharges calculated by the Manning's equation fell in the range of 11 and 15 m^3/sec, largely depending on whether Manning's n was set at 0.048 or 0.064.

Method 2 – Rating Curve

The W29 rating curve was used to provide an independent estimate of the peak instantaneous discharge of the May 2013 flood. Based on six discharge measurements made in the period 2011 to 2013, the rating curve is: Q = 10.3(s.g. – 0.1)^1.96, where s.g. = staff gauge reading in m and Q is discharge in m^3/sec. Four of the discharge/staff gauge pairings were scaled from the KP rating curve. During the July 25, 2013 field visit a HWM of 99.509m was measured. On August 4th a slightly lower value of 98.48 was measured. Staff gauge zero was 98.183 m, so an elevation of 98.48 is equivalent to a staff gauge reading = 99.48 – 98.183 = 1.297 m. Entering this value into the rating curve, a flow estimate of about 15 m3/sec is generated (Q = 10.3(1.297 – 0.1)^1.96 = 14.6 m^3/sec, or a unit discharge of 170 L/s/km^2.

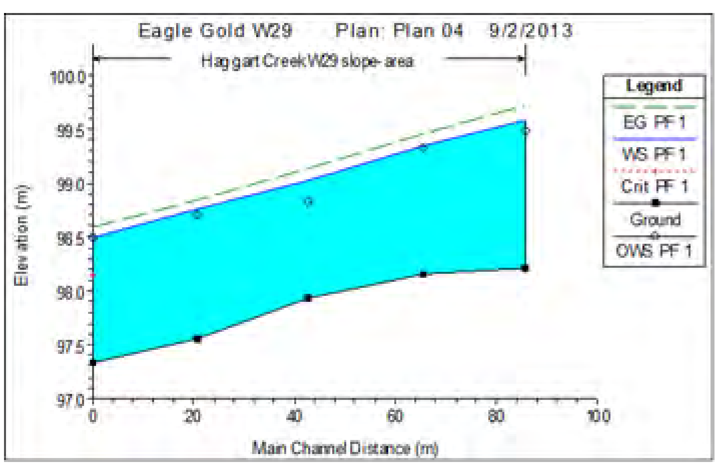
Method 3 – HEC-RAS

The third method entailed running the HEC-RAS backwater program. This is essentially the same as the first method outlined above, with the exception that it incorporates the energy equation in the analysis. The key input to the model was the Manning's n roughness coefficient. As done for Method #1, the coefficient was determined using the USGS estimation relationship developed by Jarrett. The relationship is a function of friction slope (S_f) and hydraulic radius (R in m) and is expressed by the following equation: n = $0.32\ S_f^{0.38}\ R^{-0.16}$

The average standard error of estimate for this relationship is 28%, with a range of -24% to 32%. The equation provides a best estimate of n for the 2013 flood of 0.064. At one standard error below this best estimate, the n value is 0.048 (i.e., 0.064/1.32 = 0.048).

The flow regime was assumed to be subcritical and the water level at the downstream end of the slope-area reach (Cross section #5) was set to 98.496 m, or the average of the elevations of the left-bank and right-bank high water marks (HWMs) at the end of the reach. The discharge rate was then estimated using a trial and error basis, in which the discharge was gradually increased until the resulting water surface profile just enveloped all the upstream HWMs. With an n value of 0.064, the discharge worked out to 12 m^3/s. With the lower n value of 0.048, a discharge rate of 15 m^3/s was required for HEC-RAS to generate a water surface profile that enveloped all HWMs.

The results of the analysis are presented as a series of figures in the accompanying workbook. The results for the model run with an n value of 0.064 are reproduced below. The diamond symbols in the figures below mark the observed HWMs at the various cross sections. The dashed lines represent the energy grade line, or the water surface plus the so-called velocity head. The friction slope, S_f, is the slope of the dashed line.

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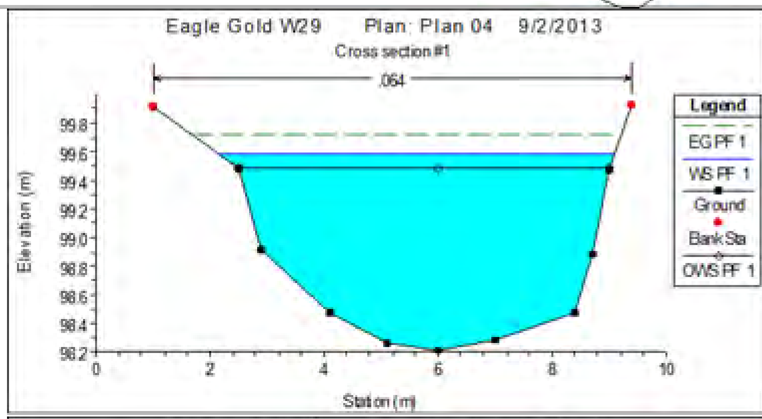
Legend
WS PF 1
Ground
Bank Sta
100
79.8
56.9
34.3
13.4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Cross section #1
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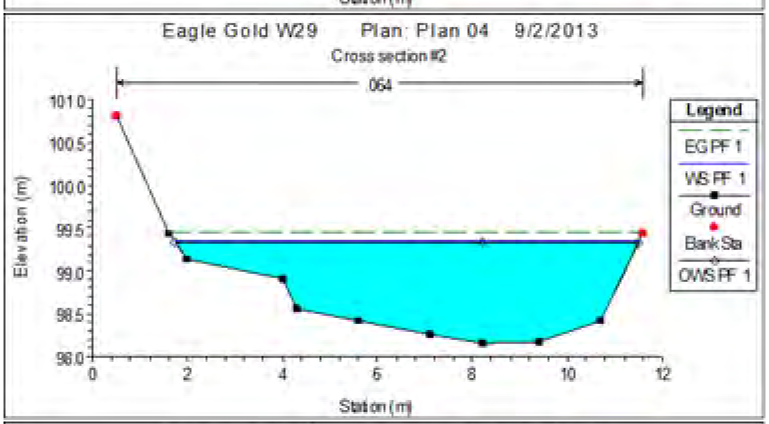
Elevation (m)
Station (m)
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
OWS PF 1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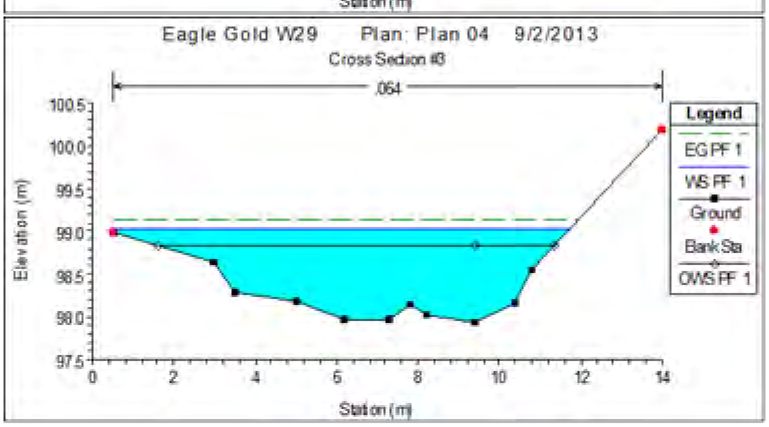
WS PF 1
Ground
Bank Sta
OWS PF 1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Station (m)
Legend
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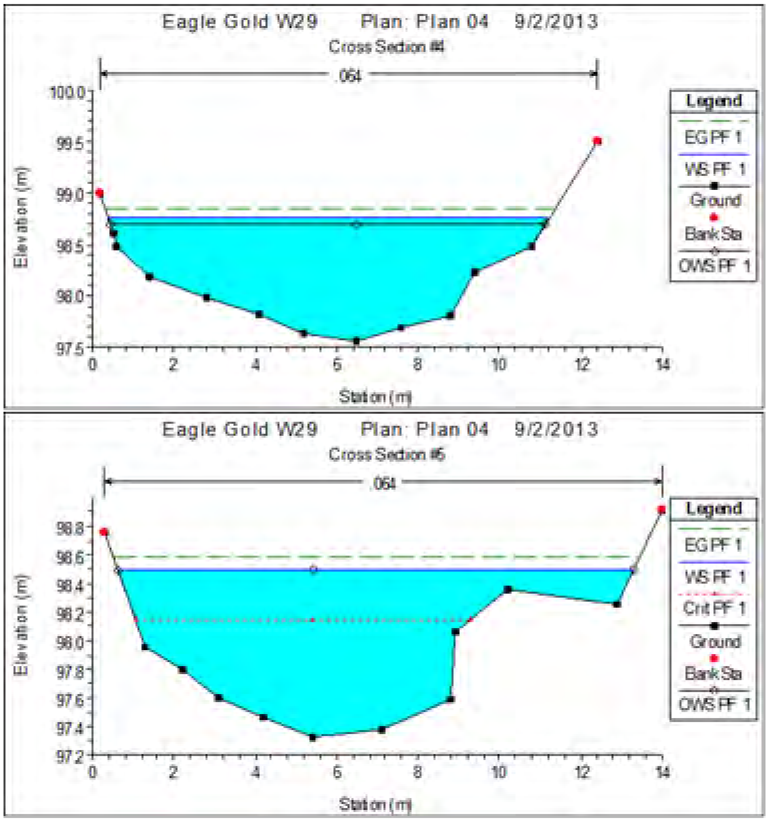
WS PF 1
Ground
Bank Sta
OWS PF 1



<u>Method 4 – Critical Depth</u>

Natural streams rarely experience supercritical flow, except over short distances. This observation can be used to place on upper bound on what the flood magnitude at W29 could have potentially been. In essence, an estimate is made of the discharge rate if the stream was at critical depth (i.e., the stage just before the flow transitions from subcritical to supercritical). This technique has the advantage that the computations are independent of channel roughness and slope. All that is required is the cross-section geometry and the peak water level indicated by the HWMs. The mechanics of applying the technique are set out in the table below. This analysis places an upper bound on the 2013 peak annual flood at W29 of 21 m^3/s. However, the analyses above suggest the true discharge was probably considerably less than this value.

Table - Upper Bound Estimate of 2013 Annual Peak Instantaneous Discharge at W29

Cross Section No.	Peak Water Surface Elevation from High Water Marks [a] (m)	Estimated Cross-sectional Flow Area at Peak Discharge (m^2)	Estimated Top Width of Flow Area at Peak Discharge (m)	Average Channel Velocity If Froude Number = 1 at Peak Discharge (m/s)	Discharge If Froude Number = 1 at Peak Discharge [b] (m^3/s)
5	98.50	8.49	12.67	2.55	21.7
4	98.70	7.94	10.70	2.70	21.4
3	98.83	5.82	9.74	2.42	14.1
2	99.33	7.69	9.76	2.77	21.3
1	99.48	6.39	6.50	3.10	19.8
Notes : a)	Elevation is relative to an arbitrary datum (Benchmark BM-1 was assigned an elevation of 100.000 m). This column provides the average elevation of the left and right bank high water marks at the cross section.				
b)	The computed velocities and discharges in this table assume the stream was flowing at critical depth at each cross section. Natural streams rarely experience supercritical flow, except over short distances. Accordingly, the computed flows in this column probably overestimate the true peak flow rate that occurred in 2013 (i.e., the flow was probably subcritical throughout the reach).				

Figure 12 – Critical Depth

The accompanying workbook “IndiectQ_W29_August-2013_final.xlsx” contains all data associated with the above discussion.

Sincerely,

Ken Nordin AScT CCEP
Laberge Environmental Services September 5, 2013

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APPENDIX D

Eagle Gold Hydrometeorology Report

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Victoria GOLD CORP

Eagle Gold Hydrometeorology Report

Project No. A413-3
13 March 2017

LORAX ENVIRONMENTAL

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1. Introduction

1. Introduction

1.1 Project Description

The Eagle Gold Project (the Project) is owned by StrataGold Corporation, a wholly owned subsidiary of the Victoria Gold Corp. (the "Company"). A Type A Water Use License (QZ14-041) was issued on December 3rd, 2015 to allow the construction, operation and closure of the Project, an open pit heap leach gold mine in central Yukon.

The Project is located in the Central Yukon Territory, approximately 350 km north of Whitehorse and approximately 45 km north of Mayo (Figure 1-1). Much of the mine site lies within the Dublin Gulch watershed, a tributary that reports to Haggart Creek, and which then flows to the South McQuesten River. Ultimately, the South McQuesten River joins the Stewart River, which flows west to its eventual confluence with the Yukon River.

1.2 Regional Setting

The Project is located within the Boreal Cordillera ecozone, which comprises much of the southern Yukon and a large portion of northern British Columbia, and more specifically it is situated within the Yukon Plateau-North ecoregion (Environment Canada, 2013b). As summarized previously by Knight Peisold (2013), the Boreal Cordillera ecozone is characterized by the presence of several mountain ranges that trend in the northwesterly direction and include extensive plateau regions. The plateaus consist of flat or gently rolling upland terrain separated by broad valleys and lowlands.

The location of regional (within approximately 150 km of the Project) climate stations, streamflow gauging stations, and snow courses operated by the Meteorological Service of Canada (MSC), the Water Survey of Canada (WSC), and Yukon Department of Environment (Yukon Environment), respectively, are shown in Figure 1-2, Figure 1-3 and Figure 1-4. Data collected at these monitoring stations, as well as climate and hydrology information collected at the Project site, are the basis for the hydro-meteorology assessments presented in Sections 2 and 3 of this report. Monitoring stations include weather stations and snow courses situated at varying elevations, as well as hydrometric stations gauging basins spanning several orders of magnitude in area (i.e., 100 km^2 to 50,000 km^2.

1.2.1 Climate

Regional climate is characterized by long, cold, dry winters and short, warm, wet summers, with local conditions varying to some degree owing to elevation and aspect. Local air temperature signatures are influenced seasonally by elevation. Typical summer temperatures in valley bottom locations (*i.e.*, elevations 600-800 m in June, July and August) can be expected to be 8°C to 11°C and may be 1°C to 2°C warmer than air temperature signatures recorded at higher elevations (*i.e.*, 1,200 to 1,400 m asl).

Valley bottom temperature regimes in winter (December, January, February) may be expected to range from -25°C to -20°C on average (based on daily averages), noting that temperature inversions occur during winter months and ridgetop temperatures may be 5°C to 10°C higher than measurements recorded at valley bottom stations. These inversions result in a reversal of the normal lapse rate (i.e., decreasing temperature with increasing elevation being the norm), and are commonly caused by cold Arctic air masses pooling in the valley bottoms from late October to early March. This cold air may be trapped by the overlying warm air, and therefore the gradient may not be linear through all elevations, but this is considered to be a reasonable assumption for the purposes of this assessment. Wahl (1987) reports that during a temperature inversion, lapse rates can range from 3-5°C/1000 m of elevation gain when reversed.

In the vicinity of the Project site, mean annual precipitation (MAP) varies with elevation. For example, MAP ranges from 324 mm at the nearby Mayo A station (504 m; situated approximately 50 km to the south of the Eagle Gold Project; Figure 1-2) to 572 mm at the Keno Hill station (1,473 m; ~30 km southeast of the Project). An inspection of available data from regional climate stations indicates both precipitation phases exhibit increases with elevation, with the regional gradients averaging 5%/100 m of elevation gain for rainfall, 10%/100 m for snowfall, and an average MAP gradient of 7%/100 m. On an annual basis, total precipitation in the region is comprised of roughly 60% rainfall and 40% snowfall, albeit variable from station to station. The proportion of annual precipitation falling as snow increases with increasing elevation, comprising approximately 50% to 60% of the annual precipitation totals at the upper elevations. Further, for the component of annual precipitation realized as rainfall – roughly half of all rainfall is expected in June and July.

The two site climate stations located at 782 m (Camp) and 1,420 m (Potato Hills) form the basis of the analyses presented in this report. Estimates of important climatic parameters (air temperature, precipitation and potential evapotranspiration) are also presented for the elevation of 1,125 m, following Knight-Piésold (2013). This corresponds to the approximate mid-point elevation of the drainage area above the Haggart Creek below Dublin Gulch hydrometric station (W4), and approximates the elevation where the majority of Project infrastructure will be located.

1.2.2 Surface Hydrology

The hydrology of the region is characterized by a dominant snowmelt driven freshet signature, which typically occurs between early May and early June. The recession limb of the freshet tapers to a summer low-flow regime reflective of primarily groundwater, which is punctuated by periodic rainfall driven runoff events, typically one to four days in duration. Air temperatures begin to drop below 0°C in September, and many of the smaller tributaries experience zero-flow conditions for the majority of the winter season. In larger tributaries, groundwater discharge may maintain limited amounts of streamflow below the ice throughout the winter (*i.e.*, November through end March). Aufeis (*i.e.*, frozen groundwater that seeps and freezes onto- and adjacent to local watercourses and accumulates within- and adjacent to local watercourses) may accumulate locally in creeks and streams at the Project site and melts during the freshet, but can persist into late June. Historical placer mining activities in the Project site streams have altered the natural channel conditions, and in some cases, have also altered the drainage areas of several sub-watersheds (refer to Stantec, 2012 for more information).

1.3 Previous Reports

In parallel to the preparation of this report, an updated baseline climate report was prepared (Lorax, 2016a). In addition to Lorax (2016a), the climate data collected at the Eagle Gold Project site during the mid-nineties and from 2007 up to and including 2012, has been previously summarized in the following reports:

- Hallam Knight Piésold, 1996. *Dublin Gulch Project – Initial Environmental Evaluation* (1996), prepared by Hallam Knight Piésold (Vancouver, BC) for First Dynasty Mines, Ltd. (Denver, CO), March 1996.
- *Dublin Gulch Project - Climate and Hydrology Environmental Baseline Report* (2008), prepared by Jacques Whitford AXYS (Burnaby, BC) for StrataGold Corp. (Vancouver, BC), December 2008.
- *Snow Survey Environmental Baseline Report* (2009), prepared by Jacques Whitford Stantec AXYS (Burnaby, BC) for StrataGold Corp. (Vancouver, BC).
- *Eagle Gold Project, Environmental Baseline Report: Climate* (2010), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., February 2010.
- *Eagle Gold Project, Surface Water Balance Model Report* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Eagle Gold Project, Environmental Data Summary Report: Climate 2011 Update* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.

- *Eagle Gold Project, Environmental Baseline Report: Climate*, prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., March 2012.
- *Victoria Gold Corp., Eagle Gold Project – Climate Baseline Data Summary. VA101-290/6-9*, prepared by Knight Piesold Ltd. (Vancouver, BC) for Victoria Gold Corp., August 2013.

In parallel to the preparation of this hydro-meteorology report, an updated baseline hydrology report was prepared (Lorax, 2016b). In addition to the recent hydrology baseline report, the streamflow data collected at the Eagle Gold Project site from 2007 up to and including 2012, has been previously summarized in the following reports:

- *Dublin Gulch Project – Climate and Hydrology Environmental Baseline Report* (2008), prepared by Jacques Whitford AXYS (Burnaby, BC) for StrataGold Corp. (Vancouver, BC).
- *Eagle Gold Project, Environmental Baseline Report: Hydrology* (2010), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., February 2010.
- *Eagle Gold Project, Environmental Data Summary Report: Hydrology 2011 Update* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Eagle Gold Project, Environmental Baseline Data Report: Hydrology 2011 Update* (2012), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2012.
- *Victoria Gold Corp., Eagle Gold Project – Hydrology Baseline Data Summary. VA101-290/6-10*, prepared by Knight Piésold Ltd. (Vancouver, BC) for Victoria Gold Corp., August 2013.

The hydro-meteorology data synthesized for the Eagle Gold Project site to date has been previously summarized in the following reports:

- *Eagle Gold Project, Surface Water Balance Model Report* (2011), prepared by Stantec (Burnaby, BC) for Victoria Gold Corp., June 2011.
- *Victoria Gold Corp., Eagle Gold Project – Hydro-meteorology Report. VA101-290/6-8*, prepared by Knight Piésold Ltd. (Vancouver, BC) for Victoria Gold Corp., August 2013.

1.4 Scope of Report

As per *Eagle Gold Project – Hydro-meteorology Report. VA101-290/6-8*, this updated report presents a hydro-meteorological characterization for the Project area, in terms of expected long-term climatic and hydrologic conditions at the site, and in particular, provides the basis for assembly of hydro-meteorological inputs to be used in the design of water management structures and water balance models for the project area.

The report summarizes, integrates, and analyses data collected at the Project site as well as regional data from Environment Canada and Yukon Environment. Specifically, Section 2 provides and reports on the following climate information:

- Regional climate station and snow course stations nearest to the Project, including a summary of regional climate patterns and trends at these stations. Regional climate data summaries focus mainly on air temperature and precipitation (rainfall and snow) variables.
- An inventory of Project site meteorological stations and snow survey stations, including discussion of air temperature, precipitation (*i.e*., mean annual precipitation, rainfall and snow depths and orographic effects) and potential evaporation regimes at the Project site.
- A description of the approach taken to prepare a long-term daily climate record (air temperature, precipitation, evaporation and sublimation) for the Project area. Described in Section 2.5, the long-term daily climate record is computed using site-regional climate relationships and the Mayo, YT weather station as a predictor station, is 60+ years in duration, and fully scalable to various elevations relevant to the Project.
- A summary of relevant climate metrics (*e.g.*, annual precipitation recurrence interval estimates; 24-hour rainfall recurrence interval estimates) ascertained through a synthesis of site- and regional climate data.

Section 3 provides and describes the following with respect to streamflow patterns and processes and hydro-climatic trends:

- An inventory of nearest regional hydrometric stations to the Project, including a summary of regional streamflow patterns and trends at these stations. Regional streamflow summaries focus on the McQuesten River, which is the predictor station used to extend site hydrology records to long-term synthetic datasets.
- An inventory of Project site hydrology stations, including a summarization of site streamflow patterns and trends.
- A description of the ranked regression approach used to prepare long-term daily streamflow records from site data and streamflow data collected at McQuesten River at the mouth. Section 3 and Appendix A also presents representative plots and summary tables for the synthetically derived streamflow records.

- A summary of relevant streamflow metrics (*e.g.*, annual runoff recurrence interval estimates; peak flow and low flow estimates) ascertained through a synthesis of site- and regional hydrometric data.
- A climate change section that presents and discusses climate and streamflow trends observed in the instrumental record in the Yukon over the past half century.

Three appendices are included as part of this hydrometeorology study. Appendix A summarizes the methods used to development the synthetic climate record for site. Appendix B presents detailed ranked regression output for the W4, W5 and W6 hydrometric stations, and Appendix C describes future climate change predictions for Project site.

LEGEND

★ Eagle Gold Project

● Municipality

DATE SAVED:	Dec 08, 2016
DRAWN BY:	GM
REVIEWED:	CF
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 8N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:6,000,000

0 50 100 Kilometers

CLIENT: Victoria Gold Corp

Lorax Environmental

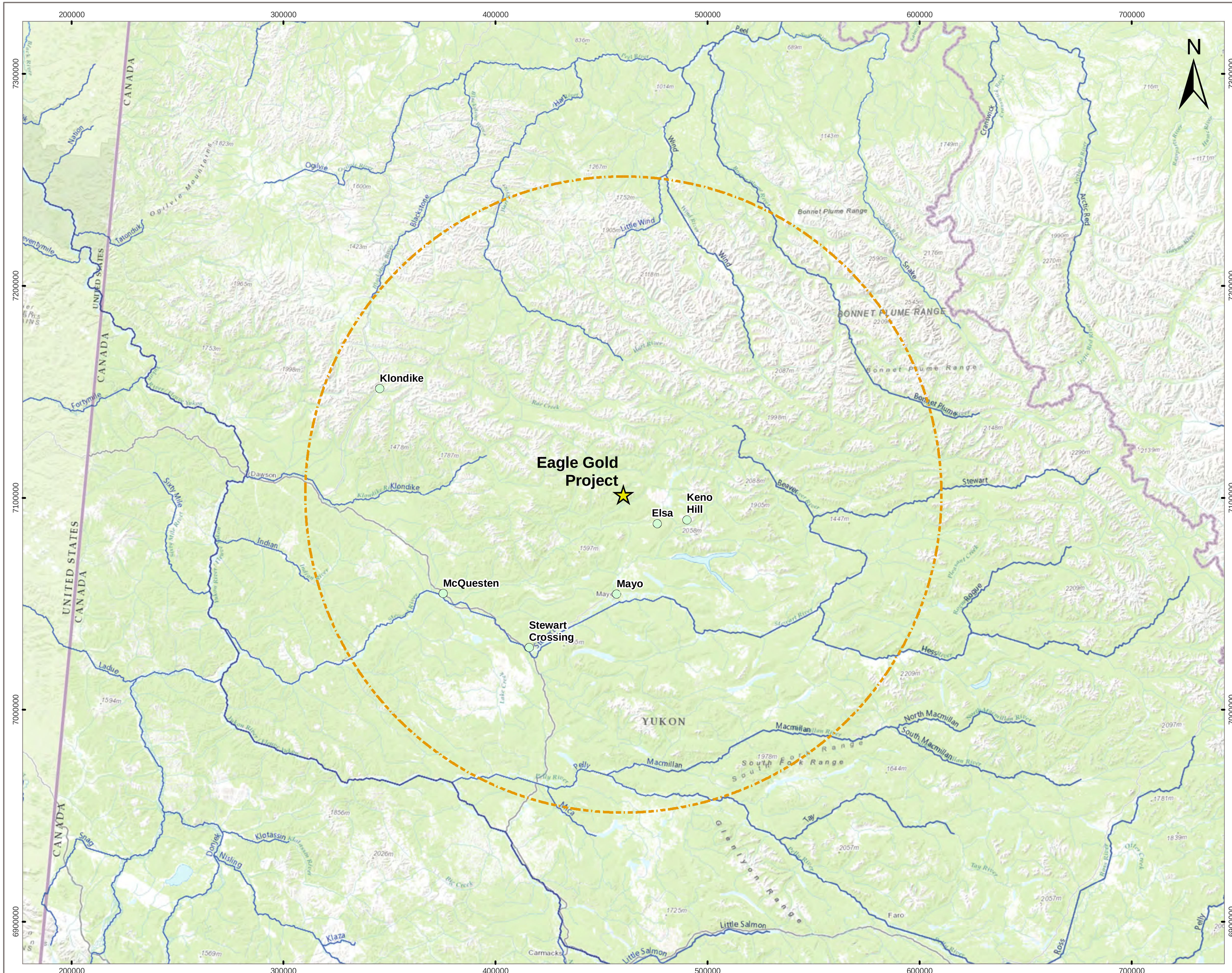
PROJECT: **Eagle Gold Project**

TITLE: Site Location

PROJECT #: A413-5

FIGURE: 1-1

P:\@Drafting\Eagle Gold\Drafting Figures\MXD\Site Location_20161208.mxd



LEGEND

- ★ Eagle Gold Project
- ○ Climate Station
- 150KM Radius Around Eagle Gold

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Regional Climate Stations

PROJECTION	DATUM	CLIENT
Transverse Mercator UTM Zone 8	NAD83	Victoria GOLD CORP

Scale: 1:1,750,000
20 10 0 20
Kilometers

FILE NO.

LORAX ENVIRONMENTAL

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	GM	CF	DHF	1

OFFICE	DATE
	December 08, 2016

Figure 1-2

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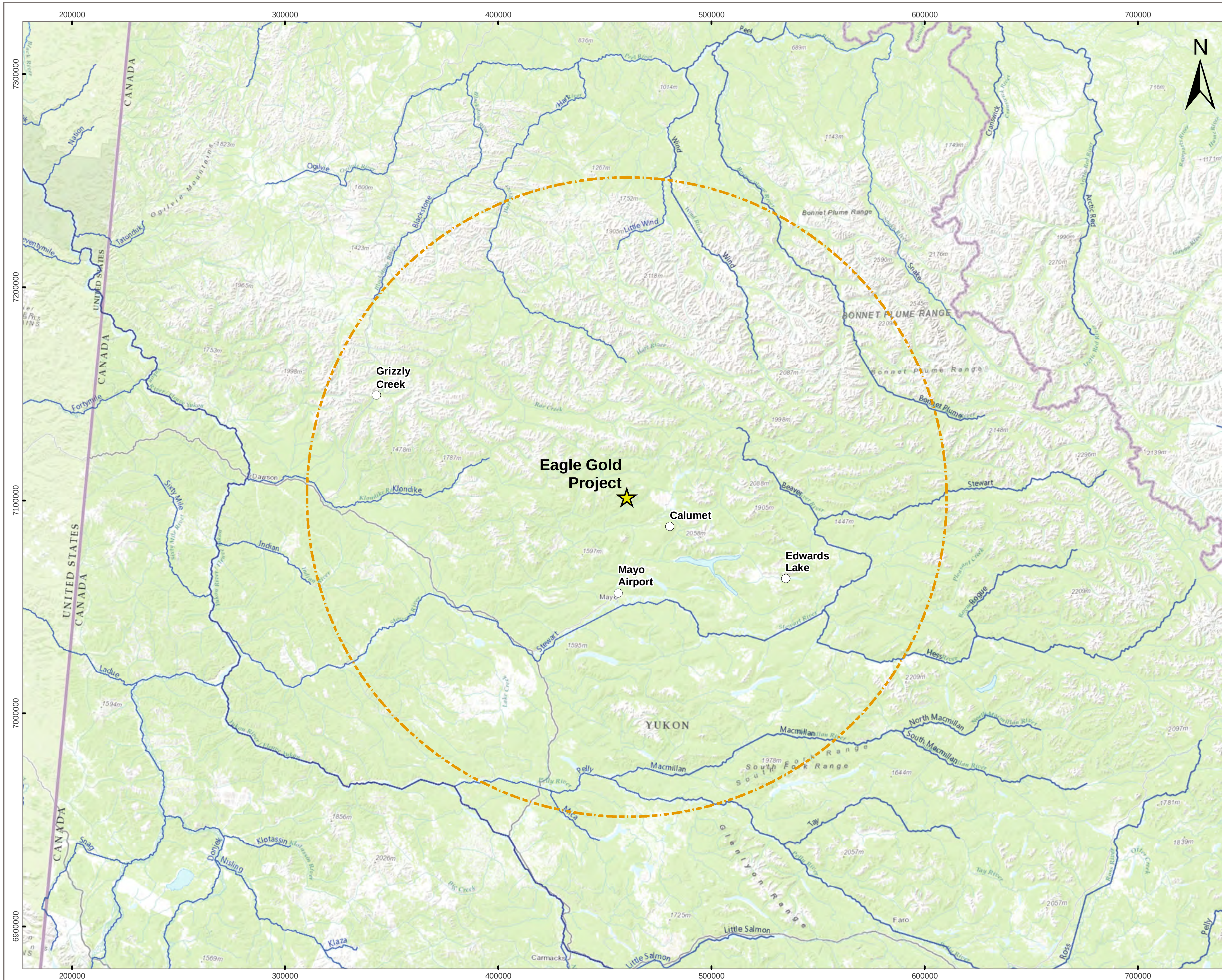

LEGEND

- Eagle Gold Project
- Snow Monitoring Station
- 150KM Radius Around Eagle Gold

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Regional Snow Monitoring Stations

PROJECTION	DATUM	CLIENT
Transverse Mercator UTM Zone 8	NAD83	Victoria Gold Corp

Scale: 1:1,750,000
20 10 0 20
Kilometers

FILE NO.

LORAX ENVIRONMENTAL

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	GM	CF	DHF	1

OFFICE	DATE
	December 08, 2016

Figure 1-3

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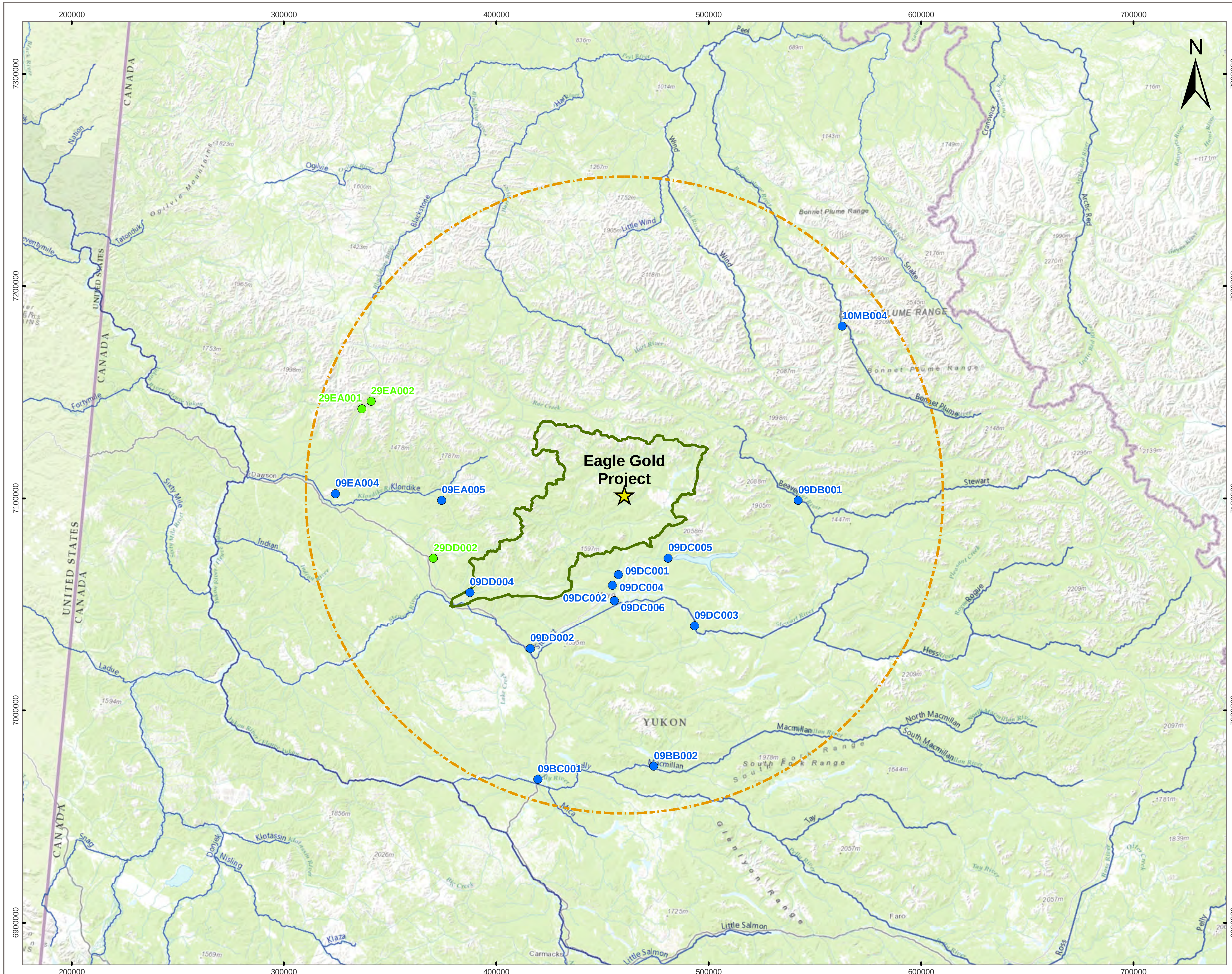

LEGEND

★ Eagle Gold Project

Hydrometric Station

- YHN
- CYHN
- McQuesten Watershed Boundary
- 150km Radius Around Eagle Gold

Site ID	*Station Name*
09BB002	Macmillan River Near The Mouth
09BC001	Pelly River At Pelly Crossing
09DB001	Beaver River Below Matson Creek
09DC001	Mayo River Near Mayo
09DC002	Stewart River At Mayo
09DC003	Stewart River Above Fraser Falls
09DC004	Wareham Lake At Headgate
09DC005	Mayo Lake Near The Outlet
09DC006	Stewart River Near Mayo
09DD002	Stewart River At Stewart Crossing
09DD004	Mcquesten River Near The Mouth
09EA004	North Klondike River Near The Mouth
09EA005	Little South Klondike River Below Ross Creek
10MB004	Bonnet Plume River Above Gillespie Creek
29DD002	Clear Creek Above Barlow Creek
29EA001	Wolf Creek At Km 52 Dempster Highway
29EA002	Grizzly Creek At Km 60.4 Dempster Highway

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Regional Hydrometric Stations

PROJECTION Transverse Mercator UTM Zone 8
DATUM NAD83
CLIENT Victoria Gold Corp

Scale: 1:1,750,000
20 10 0 20
Kilometers

Lorax Environmental

FILE NO.

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	GM	CF	DHF	1

OFFICE
DATE December 08, 2016

Figure 1-4

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2. Climate

Victoria
GOLD CORP

2. Climate

2.1 Data Sources

2.1.1 Regional Climate Stations

Regional climate stations relevant to this assessment are shown in Figure 1-2 and Figure 1-3, and include monitoring information collected at weather stations and snow course stations in Yukon Territory. Station information for relevant weather and snow course stations are also summarized by the information presented in Table 2-1 and Table 2-2.

Regional climate stations considered in this assessment meet the two main requirements of being: 1) within a 150-km radius of the Project site; and 2) show at least five years of usable climate information. With respect to regional weather station data, the Hart River, Moose Creek and Stewart Crossing Tower climate stations were excluded from the assessment owing to their limited period of record.

Table 2-1:
Regional Climate Stations near the Eagle Gold Project

Station ID	Station Name	Latitude (dec.deg)	Longitude (dec.deg)	Elevation (m)	Record Start	Record End
2100500	ELSA	63.92	-135.48	814	1948	1989
2100677	KENO HILL	63.93	-135.20	1,473	1974	1982
2100679	KLONDIKE	64.45	-138.22	973	1966	2010
2100700	MAYO A	63.62	-135.87	504	1953	Active
2100719	MCQUESTEN	63.60	-137.52	457	1986	2014
2101030	STEWART CROSSING	63.38	-136.68	480	1963	2008

Table 2-2:
Yukon Snow Course Stations near the Eagle Gold Project

Station ID	Station Name	Latitude (dec.deg)	Longitude (dec.deg)	Elevation (m)	Record Start	Record End
09DC-SC01A	Mayo Airport A	63.63	-135.88	540	1968	Active
09DC-SC01B	Mayo Airport B	63.63	-135.88	540	1987	Active
09DC-SC02	Edwards Lake	63.70	-134.30	830	1987	Active
09DD-SC01	Calumet	63.92	-135.40	1,310	1975	Active
09EA-SC01	King Solomon Dome	63.87	-138.93	1,080	1975	Active
09EA-SC02	Grizzly Creek	64.43	-138.27	975	1975	Active

2.1.2 Project Site Meteorological Stations

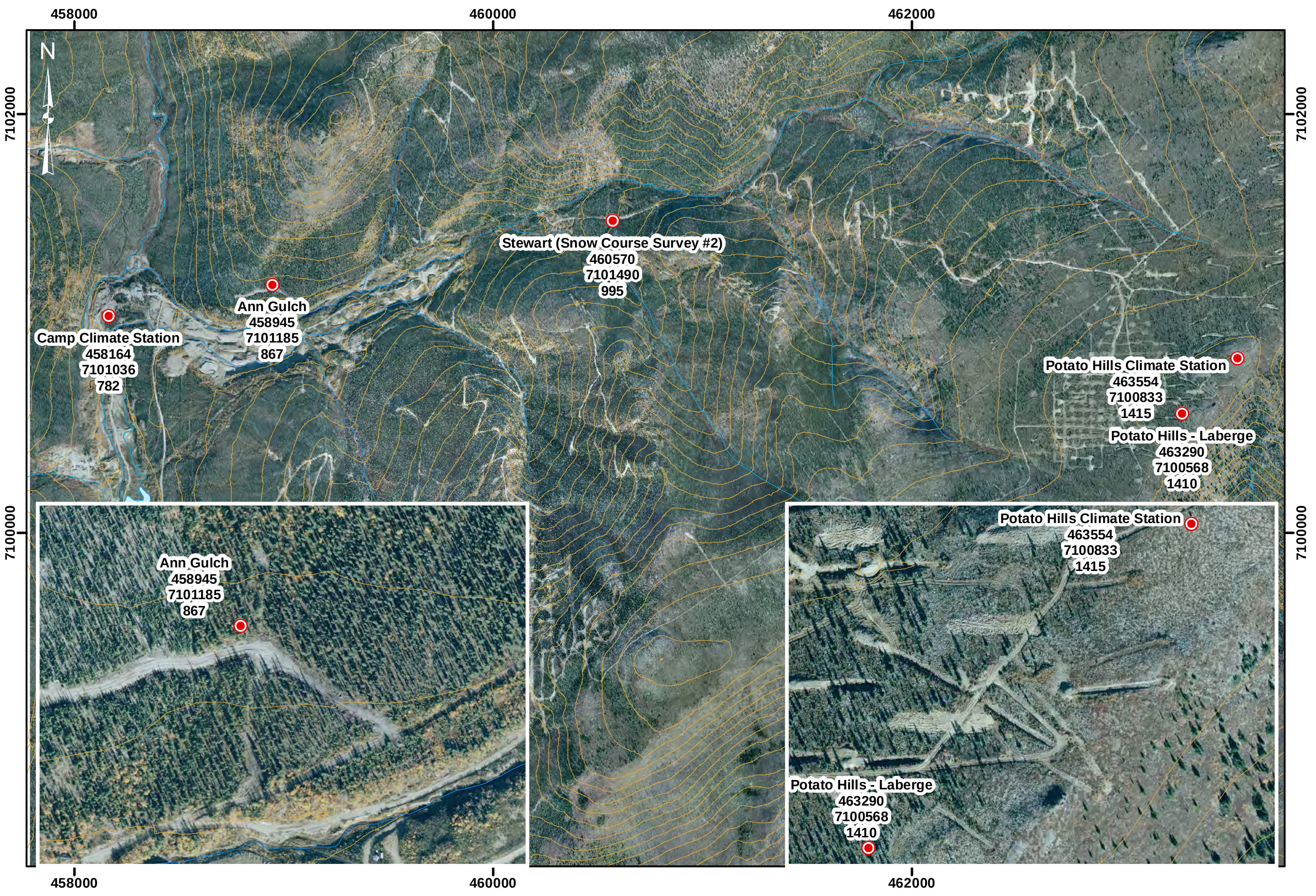
The Project climate stations and snow survey locations are presented in Table 2-3 and Figure 2-1. This table and figure are reproduced from the Eagle Gold Baseline Climate Report (Lorax, 2016a), and for additional detail on methods and instrumentation, the reader is directed to that summary. Climatic parameters are measured at the Project site by two weather stations that were originally installed by Stantec (formerly Jacques Whitford AXYS). The Potato Hills station is situated near the eastern basin divide (1420 m), and was installed in August 2007. The second station was originally installed near the camp at 823 m in August 2009, and subsequently moved to its current location in September 2010 at 782 m due to construction of new camp facilities.

The Potato Hills station uses an ONSET Hobo datalogger to measure air temperature, rainfall, wind speed and direction, barometric pressure, relative humidity, snow depth and solar radiation at 15-minute intervals. The Camp station includes a Campbell Scientific CR800 datalogger measuring air temperature, rainfall, wind speed and direction, barometric pressure, snow depth, solar radiation and relative humidity. All data are recorded at a 15-minute interval at this location. The snow sensor and pyranometer (measuring solar radiation) at the Camp Station were added on April and October 2011, respectively.

Since snow sensor installation, the continuous snow depth data for the Potato Hills station has not been reliable and so this data are not presented in this report. Continuous snow depth data are provided herein for the Camp station, as are records of snow survey measurements for three local stations (Camp, Ann Gulch, Potato Hills) up through spring 2016.

Table 2-3:
Climate station and snow survey locations at the Eagle Gold Project.

Station	Elevation (m asl)	UTM E	UTM N	Record Period
Climate Stations				
Camp Station	782	458,164	7,101,036	2009-present
Potato Hills Station	1420	463,544	7,100,833	2007-present
Snow Surveys				
Camp Snow Survey	782	458,164	7,101,036	2009-present
Ann Gulch Snow Survey	875	458,945	7,101,185	2012-present
Stewart (Snow Survey #2)	995	460,570	7,101,490	Mar. 2012 only
Potato Hills Snow Survey	1420	463,290	7,100,568	2009-present



Legend:

Snow Survey Sites — Watercourse — Contours (25m)

StrataGold Corporation

0 150 300 600
Meters

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD83 UTM Zone 8N	HC	
Date: 2016/09/20	Figure:	SNOW SURVEY LOCATIONS

2.1.3 Project Site Snow Surveys

Over the past 5-7 years, site snow surveys were conducted several times a year, including at, or near to the date, of annual maximum snowpack. This peak in terms of SWE measurement typically occurs between late-March to mid-April in the Yukon. Snow surveys at the Project site were conducted following the guidelines set out in the *Snow Survey Sampling Guide* (BC Ministry of Environment, 1981).

At each site, 10 sampling locations along a transect were sampled for depth and snow water equivalent [SWE] using a Federal snow sampler, and then averaged. Snow courses were established at three elevations (*i.e.*, low-, mid- and high-elevation) and oriented to discern effects of aspect on local snow accumulation (Table 2-3 and Figure 2-1).

2.2 Air Temperature

2.2.1 Regional Temperature Regime

Monthly average air temperature data is shown for nearest regional climate station in Table 2-4 and Figure 2-2. The reported data for these six Environment Canada weather stations are based on their entire periods of record. Results for these stations are typical for Yukon Territory. Mean annual air temperature estimates range from -5.6°C to -1.9°C, with higher mean annual air temperature values occurring at stations showing lower elevation – and vice versa.

Overall, these data show that during the months of March to October inclusive, a standard lapse rate applies, with temperatures decreasing with rising elevation, and are cooler at the upper station, on average (see Figure 2-2; lower panel for July). However, during the winter months of November to February, temperature inversions are common in the region, with temperatures being cooler on average in the valley bottom than at the height of land (see Figure 2-2; lower panel for January).

The spring/summer lapse rate returned by regional data is consistent with the saturated adiabatic lapse rate of -5.0°C/1,000 m. Such cooling temperatures with elevation are likely drivers for the increased frequency of precipitation at higher elevations during the summer months, when a larger portion of the annual precipitation falls. The winter lapse rate for the region shows variability by month but consistency overall with the general approximation reported by Wahl *et al.* (1987), which suggest winter temperature inversion lapse rates on the order of 3-5°C/1,000 m of elevation gain.

Table 2-4:
Period of record[a] monthly average air temperature summary for regional climate stations near the Eagle Gold Project compared to site stations

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Keno Hill (1,473 m)[a]	-16.7	-14.2	-11.5	-4.8	2.1	7.8	10.4	9.1	2.9	-5.3	-11.0	-16.2	-4.0
Klondike (973 m)[a]	-22.6	-18.2	-14.4	-5.9	3.4	9.9	11.6	8.4	2.3	-6.7	-15.9	-18.9	-5.6
Elsa (814 m)[a]	-20.9	-18.0	-11.7	-2.6	6.1	12.5	14.6	11.3	4.8	-4.7	-14.2	-19.4	-4.1
Mayo A (504 m)[a]	-24.9	-19.1	-10.6	0.0	8.2	13.7	15.4	12.6	6.6	-2.0	-15.3	-22.0	-3.1
McQuesten (457 m)[a]	-22.8	-19.1	-12.8	0.1	8.5	13.7	15.0	12.4	6.4	-2.9	-16.4	-24.4	-2.9
Stewart Crossing (480 m)[a]	-21.9	-16.8	-11.5	0.0	8.3	14.0	15.6	12.6	6.4	-2.5	-14.7	-18.6	-1.9
[1]Eagle Gold - Camp (728 m)	-20.2	-16.5	-12.9	-2.0	7.3	12.2	13.1	10.6	4.7	-2.7	-17.4	-20.8	-3.6
[1]Eagle Gold – Potato Hills (1,420 m)	-16.1	-14.3	-12.5	-4.4	4.8	9.6	10.7	8.0	2.2	-5.7	-13.9	-15.6	-3.9

Notes:

All monthly values for regional and site stations are calculated from average daily temperatures.
[a]Period of record for regional climate stations is reported in Table 2-1.
[1]The data reported for Eagle Gold are measured data for the period of record.

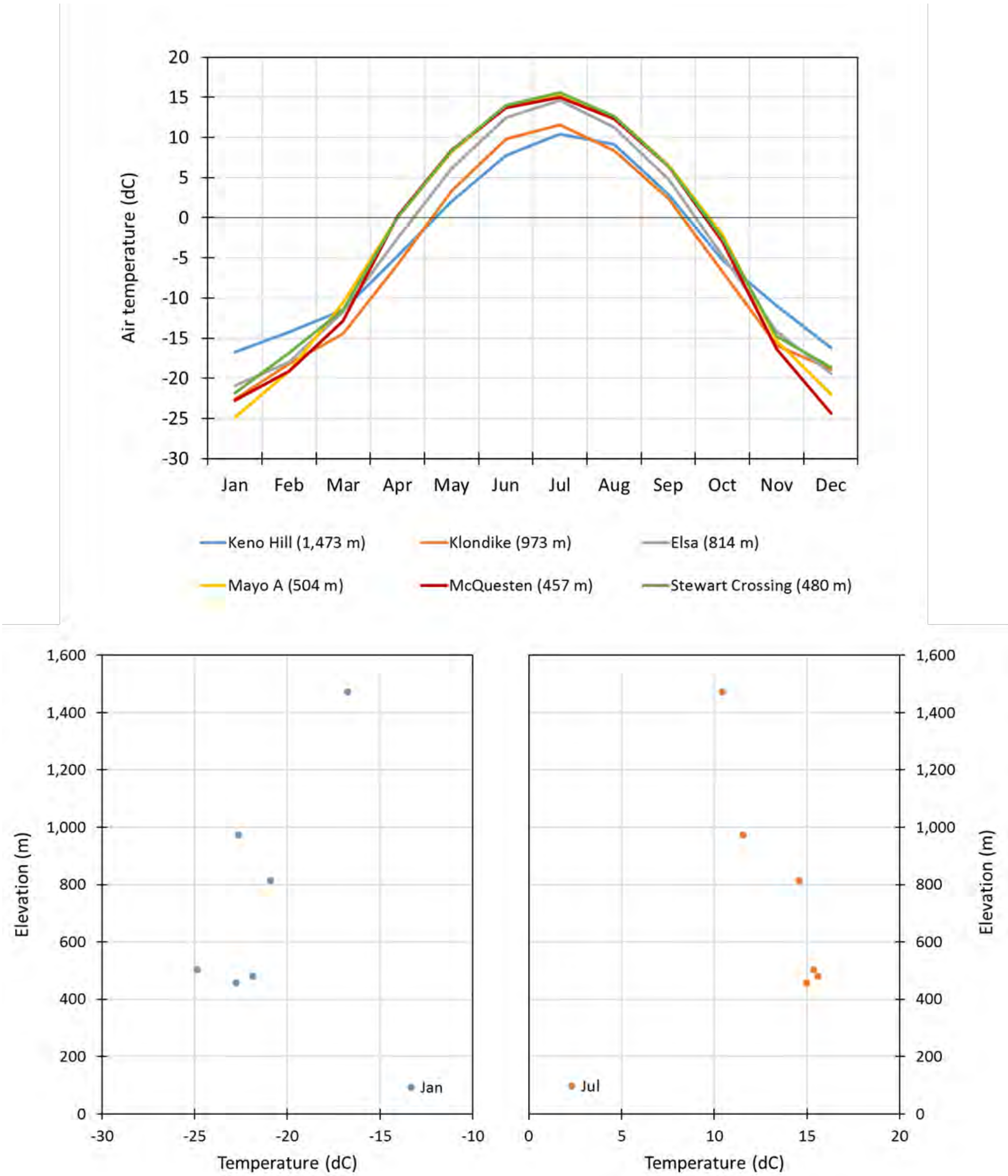


Figure 2-2: Regional air temperature data. The upper panel shows average monthly air temperature signatures for regional climate stations from Table 2-4. The lower panel shows the relationship between air temperature and elevation for January (left) and July (right).

2.2.2 Project Site Temperature Regime

Air temperatures at the Project site are consistent with those throughout the Yukon interior. As indicated in Table 2-5 below, mean annual air temperature at site is -3.6°C at the Camp station (782 m) and -3.9 °C at the Potato Hills station (1420 m) over their respective periods of record. At the Camp station, monthly average temperature ranges from -20.2°C in January to 13.1°C in July, and -16.1°C to 10.7°C at the Potato Hills station, for the same months. The minimum (maximum) recorded daily average temperatures were -43.8°C (22.0°C) and -36.6°C (22.8°C) at the Camp and Potato Hills stations, respectively. The minimum (maximum) recorded 15-minute temperatures were -46.4°C (31.6°C) and -37.6°C (28.5°C) at the Camp and Potato Hills stations, respectively.

The monthly mean temperatures signatures for both climate stations are shown in Figure 2-3, and the pattern is consistent with the larger regional picture. During the months of March to October inclusive, the standard lapse rate applies, with temperatures decreasing with rising elevation, and are approximately 3°C cooler at the upper station, on average. However, during the winter months of November to February, temperature inversions are common at the Project site as per the broader region, with temperatures roughly 2.5°C cooler on average in the valley bottom than at the height of land.

Table 2-5:
Project site monthly air temperature record.

Climate Station	Elevation (m asl)	Temperature (°C)														
		Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009	Mean	-	-	-	-	-	-	-	-	6.2	-2.6	-13.6	-17.3	-
			Maximum	-	-	-	-	-	-	-	-	11.2	2.3	-2.2	-2.8	-
			Minimum	-	-	-	-	-	-	-	-	-4.8	-9.7	-22.6	-31.3	-
		2010	Mean	-17.1	-10.8	-6.9	1.1	8.3	12.1	13.6	12.1	4.4	-3.4	-13.5	-24.1	-2.0
			Maximum	-6.7	1.0	1.4	9.4	16.9	15.7	18.0	20.5	11.8	7.1	4.0	-11.2	20.5
			Minimum	-33.4	-25.0	-17.7	-6.8	1.8	7.2	10.3	6.2	-6.1	-10.5	-28.4	-37.7	-37.7
		2011	Mean	-22.9	-21.3	-15.9	-3.2	7.7	11.5	12.8	9.2	5.1	-2.8	-20.7	M	-
			Maximum	-1.3	-1.4	2.1	2.7	16.1	16.1	18.2	14.3	9.7	0.3	-6.4	M	-
			Minimum	-38.5	-37.8	-30.3	-11.6	-2.2	7.0	9.5	5.7	0.9	-6.8	-39.1	M	-
		2012	Mean	-25.2	-12.2	-13.4	0.4	5.9	13.3	12.6	10.5	5.0	M	-24.1	-25.9	-4.8
			Maximum	-7.2	0.7	-1.4	4.4	12.6	19.4	16.7	15.6	13.6	M	-10.3	-8.5	19.4
			Minimum	-40.4	-24.2	-24.4	-7.6	-0.4	8.7	8.7	4.5	-0.6	M	-37.1	-41.0	-41.0
		2013	Mean	-21.6	-13.3	-15.5	-8.6	5.0	14.2	14.0	11.9	5.5	-2.5	-18.7	-26.7	-4.7
			Maximum	-9.3	-4.4	0.3	2.9	14.1	22.0	18.5	18.0	14.5	4.9	-4.0	-11.6	22.0
			Minimum	-43.8	-20.9	-26.8	-16.6	-2.6	6.0	9.5	4.9	0.9	-9.9	-39.5	-40.7	-43.8
		2014	Mean	-14.9	-23.4	-13.8	-1.8	7.0	11.0	13.4	10.6	3.7	-3.5	-15.8	-15.2	-3.6
			Maximum	-1.8	-6.4	-3.8	4.5	12.9	16.5	18.6	15.1	9.4	3.4	-3.3	-4.6	18.6
			Minimum	-34.1	-36.8	-24.4	-12.4	2.5	5.4	8.7	4.5	-3.8	-11.9	-33.8	-26.4	-36.8
		2015	Mean	-19.4	-18.1	-11.5	-0.1	10.1	11.2	12.2	9.0	2.9	-1.5	-15.1	-15.2	-3.0
			Maximum	-2.9	-1.7	-1.0	4.4	17.5	15.5	16.8	15.4	7.3	3.4	-4.4	-6.0	17.5
			Minimum	-39.1	-38.3	-26.8	-4.8	-0.9	5.6	7.9	1.6	-4.3	-9.3	-33.1	-34.3	-39.1
		All Years	Mean	-20.2	-16.5	-12.9	-2.0	7.3	12.2	13.1	10.6	4.7	-2.7	-17.4	-20.8	-3.6
			Maximum	-1.3	1.0	2.1	9.4	17.5	22.0	18.6	20.5	14.5	7.1	4.0	-2.8	22.0
			Minimum	-43.8	-38.3	-30.3	-16.6	-2.6	5.4	7.9	1.6	-6.1	-11.9	-39.5	-41.0	-43.8

Climate Station	Elevation (m asl)		Temperature (°C)													
		Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Potato Hills Station	1420	2007	Mean	-	-	-	-	-	-	-	-	1.0	-6.9	-12.0	-15.2	-
			Maximum	-	-	-	-	-	-	-	-	8.0	-1.5	-5.5	-9.4	-
			Minimum	-	-	-	-	-	-	-	-	-6.2	-13.8	-27.7	-24.2	-
		2008	Mean	-17.7	-17.2	-11.3	-4.8	3.3	8.7	8.1	5.3	1.9	-7.7	-10.8	-18.6	-5.1
			Maximum	-9.2	-3.4	-2.8	2.7	12.5	14.3	13.4	9.2	6.7	2.4	-5.4	-8.4	14.3
			Minimum	-33.1	-31.9	-29.6	-16.8	-0.6	4.6	2.8	1.7	-7.7	-21.3	-19.6	-27.2	-33.1
		2009	Mean	-19.3	-17.2	-16.7	-4.4	M	M	12.6	7.4	3.3	-5.3	-12.8	-11.9	-
			Maximum	-0.5	-10.4	-7.0	9.4	M	M	22.8	16.2	10.4	-1.9	-4.9	-3.8	-
			Minimum	-34.8	-30.3	-25.2	-13.0	M	M	6.6	3.1	-6.3	-14.2	-19.1	-21.2	-
		2010	Mean	-14.5	-9.7	-9.4	-1.8	5.2	8.8	10.5	9.7	2.3	-5.3	-11.7	-18.2	-2.9
			Maximum	-5.1	-1.8	-2.9	6.3	15.1	13.4	15.2	19.5	8.8	3.1	-1.4	-8.8	19.5
			Minimum	-30.9	-26.4	-16.5	-8.3	-4.0	2.7	6.2	3.4	-9.3	-10.4	-23.1	-25.6	-30.9
		2011	Mean	-15.5	-18.3	-13.9	-5.6	4.8	8.8	10.3	7.0	4.1	-5.7	-18.0	-13.0	-4.6
			Maximum	-5.6	-3.6	-1.4	1.3	15.3	13.9	15.7	11.4	20.4	-1.2	-9.1	-8.8	20.4
			Minimum	-28.0	-30.2	-23.2	-13.0	-7.2	2.2	5.9	5.3	-5.5	-12.1	-29.0	-20.0	-30.2
		2012	Mean	-19.8	-11.1	-13.4	-1.9	3.1	11.3	10.9	M	M	-8.4	-18.8	-19.4	-
			Maximum	-6.8	-5.1	-1.7	1.8	9.5	18.5	17.9	M	M	3.3	-8.0	-6.5	-
			Minimum	-30.3	-19.5	-22.6	-8.0	-2.5	5.5	5.5	M	M	-16.8	-24.0	-29.2	-
		2013	Mean	*-17.6*	*-11.3*	-14.2	*-10.4*	*2.8*	12.1	11.6	11.0	3.0	-2.9	-16.0	-19.5	-4.3
			Maximum	-5.5	-4.9	-5.1	*-2.5*	*13.5*	22.2	17.4	19.9	10.2	1.3	-4.7	-3.4	22.2
			Minimum	-36.6	-15.5	-24.8	*-18.4*	*-6.2*	2.0	5.3	1.7	-1.8	-8.5	-28.9	-29.1	-36.6
		2014	Mean	-10.0	-15.9	-11.5	-3.4	*5.6*	8.7	11.8	8.7	2.1	-5.6	-11.6	-11.4	-2.7
			Maximum	0.6	-7.8	-5.1	3.2	*11.5*	17.6	15.6	13.9	8.5	0.9	-5.0	-5.4	17.6
			Minimum	-27.3	-26.3	-19.9	-13.5	*0.4*	1.7	7.4	1.7	-5.2	-12.1	-22.5	-19.2	-27.3
		2015	Mean	-14.4	-13.8	-9.6	*-2.3*	*8.6*	*8.6*	*9.5*	7.1	0.1	-3.7	-13.5	-13.6	-3.1
			Maximum	-3.9	-2.3	-0.5	*1.4*	*16.5*	*13.6*	*14.9*	17.0	4.9	2.0	-4.3	-5.6	17.0
			Minimum	-31.7	-32.7	-24.3	*-6.5*	*-3.2*	*1.9*	*4.4*	-2.0	-6.1	-10.7	-28.3	-25.3	-32.7
		All Years	Mean	-16.1	-14.3	-12.5	-4.4	4.8	9.6	10.7	8.0	2.2	-5.7	-13.9	-15.6	-3.8
			Maximum	0.6	-1.8	-0.5	9.4	16.5	22.2	22.8	19.9	20.4	3.3	-1.4	-3.4	22.8
			Minimum	-36.6	-32.7	-29.6	-18.4	-7.2	1.7	2.8	-2.0	-9.3	-21.3	-29.0	-29.2	-36.6

Notes:
1. Values are calculated from average daily temperatures.
2. Data is considered missing for a month if less than 25 days of data are available for that month.
3. Monthly values in italics for the Potato Hills station, for the period of 2013 through 2015 have been infilled using monthly regression relationships with temperature data from the Camp station.
4. Monthly values in gray for the period of June 2014 to March 2015 were recorded by a standalone HOBO temperature sensor.
5. ‘M’ denotes data missing due to a sensor malfunction.
6. Monthly temperature lapse rates presented in Section 3.1 are based on a comparison of monthly average temperature data from the Camp and Potato Hills stations.

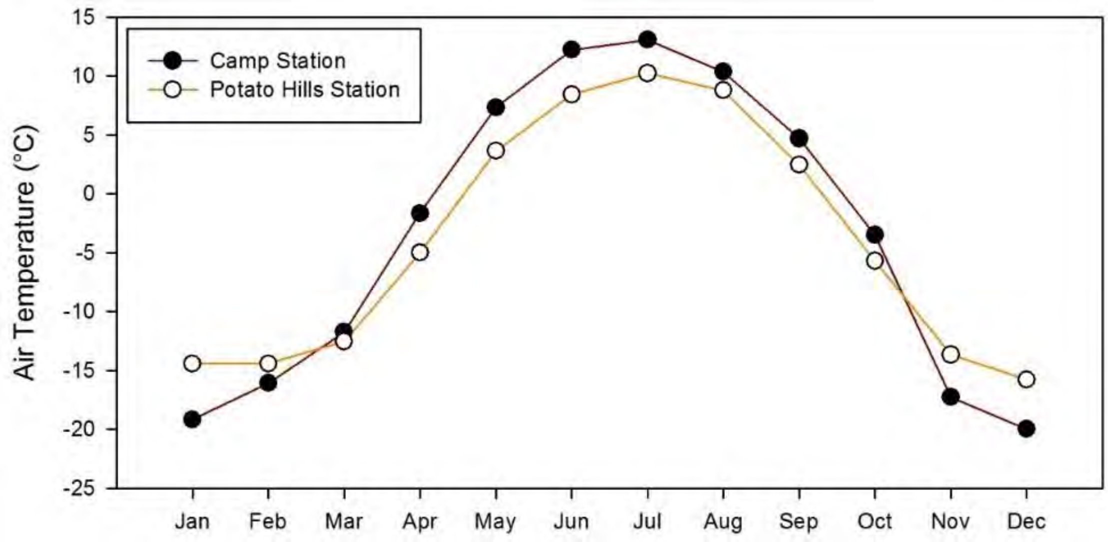


Figure 2-3: Monthly mean air temperature for the Project climate stations for the available period of record.

2.3 Precipitation

2.3.1 MAP at Regional Stations

Key features relating to the precipitation signatures for regional climate stations are summarized by information presented in Table 2-6 and Figure 2-4. Table 2-6 summarizes monthly and annual precipitation data for six regional climate stations for rainfall, snowfall, and total precipitation. The upper panel of Figure 2-4 illustrates the relationship between elevation and MAP for regional stations, whereas the lower panel shows the percentage of annual precipitation reporting on average per month of the year.

For regional climate stations surrounding the Project site, MAP varies appreciably with elevation. For example, MAP ranges from 324 mm at the Mayo A station (504 m; situated approximately 50 km to the south of the Eagle Gold Project; Figure 1-2) to 572 mm at the Keno Hill station (1,473 m; ~30 km southeast of the Project). An inspection of available data from regional climate stations indicates both precipitation phases exhibit increases with elevation, with the regional gradients averaging 5%/100 m of elevation gain for rainfall, 10%/100 m for snowfall, and an average MAP gradient of 7%/100 m (Lorax, 2016a). On an annual basis, total precipitation in the region is comprised of roughly 60% rainfall and 40% snowfall, noting proportions vary to some degree from station to station, but notably by elevation. Across the Yukon the proportion of annual precipitation falling as snow increases with elevation, resulting in a reversal of the rain/snow proportions. Further, for the component of annual precipitation realized as rainfall – roughly half of annual rainfall may be expected in June and July at the Project site.

Table 2-6:
Precipitation Summary for Regional Climate Stations near the Eagle Gold Project

Climate Station	Elevation (m)	Description	Measured Precipitation (mm)												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Keno Hill (1974-1982)	1473	Total Rainfall	0	0	0	0	15	80	88	45	45	3	0	0	275
		% monthly precipitation	0%	0%	0%	0%	75%	100%	100%	98%	68%	5%	0%	0%	48%
		Total Snowfall	39	27	42	37	5	0	0	1	21	57	34	33	297
		% monthly precipitation	100%	100%	100%	100%	25%	0%	0%	2%	32%	95%	100%	100%	52%
		Total Precipitation	39	27	42	37	20	80	88	46	66	60	34	33	572
		% annual	7%	5%	7%	6%	3%	14%	15%	8%	12%	10%	6%	6%	100%
Klondike (1966-2010)	973	Total Rainfall	0	0	0	0	14	51	67	64	41	6	0	0	243
		% monthly precipitation	0%	0%	0%	0%	70%	64%	76%	139%	62%	10%	0%	0%	52%
		Total Snowfall	28	26	28	23	6	0	0	0	7	35	35	40	227
		% monthly precipitation	100%	100%	100%	100%	30%	0%	0%	0%	15%	85%	100%	100%	48%
		Total Precipitation	28	26	28	23	20	51	67	64	48	41	35	40	470
		% annual	6%	6%	6%	5%	4%	11%	14%	14%	10%	9%	7%	9%	100%
Elsa (1948-1989)	814	Total Rainfall	0	0	0	1	28	51	63	53	50	14	0	1	262
		% monthly precipitation	0%	0%	0%	7%	90%	100%	100%	98%	96%	32%	0%	3%	59%
		Total Snowfall	27	23	19	13	3	0	0	1	2	30	29	34	181
		% monthly precipitation	100%	100%	100%	93%	10%	0%	0%	2%	4%	68%	100%	97%	41%
		Total Precipitation	27	23	19	14	31	51	63	54	52	44	29	35	443
		% annual	6%	5%	4%	3%	7%	12%	14%	12%	12%	10%	7%	8%	100%
Mayo A (1925-2016)	504	Total Rainfall	0	0	0	3	20	37	49	44	30	9	0	0	191
		% monthly precipitation	0%	0%	0%	30%	95%	100%	100%	100%	91%	31%	0%	0%	59%
		Total Snowfall	22	17	12	7	1	0	0	0	3	20	26	25	133
		% monthly precipitation	100%	100%	100%	70%	5%	0%	0%	0%	9%	69%	100%	100%	41%
		Total Precipitation	22	17	12	10	21	37	49	44	33	29	26	25	324
		% annual	7%	5%	4%	3%	6%	11%	15%	14%	10%	9%	8%	8%	100%
Stewart Crossing (1963-2007)	480	Total Rainfall	0	0	0	2	26	40	53	46	32	10	0	0	209
		% monthly precipitation	0%	0%	1%	21%	99%	100%	100%	99%	97%	42%	1%	0%	63%
		Total Snowfall	22	13	10	8	0	0	0	0	1	14	28	24	121
		% monthly precipitation	100%	100%	99%	79%	1%	0%	0%	1%	3%	58%	99%	100%	37%
		Total Precipitation	22	13	10	10	26	40	53	46	34	25	28	24	330
		% annual	7%	4%	3%	3%	8%	12%	16%	14%	10%	7%	9%	7%	100%
McQuesten (1986-2014)	457	Total Rainfall	0	0	0	5	26	39	59	42	34	8	0	0	212
		% monthly precipitation	0%	0%	0%	50%	100%	100%	100%	100%	89%	32%	0%	0%	61%
		Total Snowfall	23	14	14	5	0	0	0	0	4	17	31	28	136
		% monthly precipitation	100%	100%	100%	50%	0%	0%	0%	0%	11%	68%	100%	100%	39%
		Total Precipitation	23	14	14	10	26	39	59	42	38	25	31	28	348
		% annual	7%	4%	4%	3%	7%	11%	17%	12%	11%	7%	9%	8%	100%

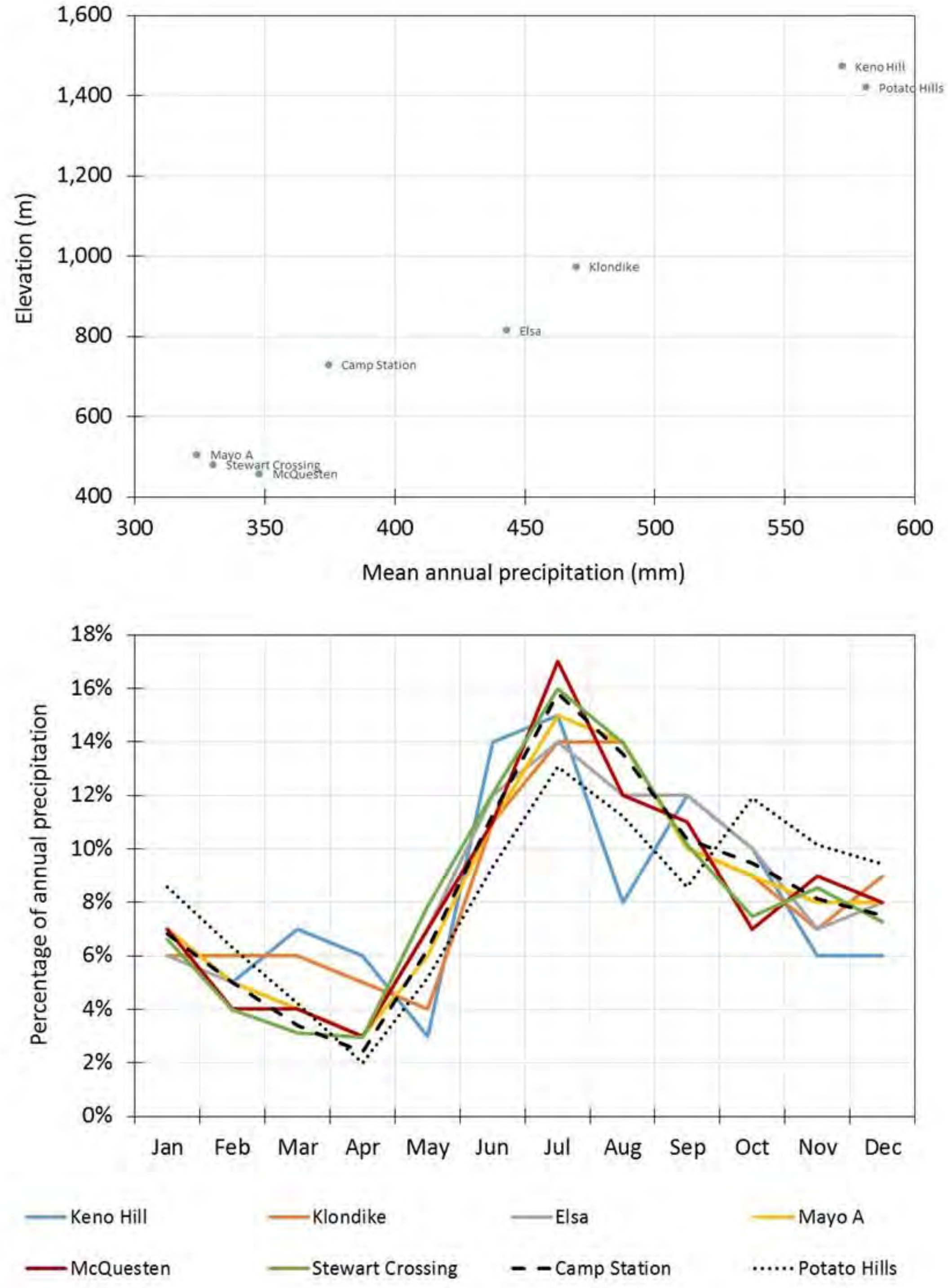


Figure 2-4: Precipitation trends at regional and site climate stations. The upper plot illustrates the regional relationship between elevation and MAP, whereas the lower plot summarizes monthly patterns of precipitation (*i.e.*, percentages of total annual precipitation per month) in the region.

2.3.2 Snowfall – Regional Snow Courses

Data from regional snow courses were included to aid in the evaluation of elevational gradients in winter precipitation totals and to provide context in terms of long-term pattern and variability in snow accumulation near the Project Site. **In** Table **2-7**, April 1 snow water equivalent (SWE) data are summarized for nearest regional snow courses to the Project site. April 1 SWE is of interest in this assessment as data for this time period (*i.e.*, snow sampling during the last week of March) typically represent maximum SWE on an annual basis, as well as provide an indication of the freshet volume that is likely to report following melt.

Table 2-7:
Regional April 1 SWE values, for the full period of record, and the period overlapping with Project site snow survey data.

Snow Survey	Station ID	Elevation (m)	Apr. 1 SWE (mm) Period of Record	Apr. 1 SWE (mm) (2009-14, 2016)
Mayo A	09DC-SC01A	540	97	109
Mayo B	09DC-SC01B	540	105	103
Edwards Lake	09DC-SC02	830	164	164
Calumet	09DD-SC01	1310	197	185
King Solomon Dome	09EA-SC01	1080	162	175
Grizzly Creek	09EA-SC02	975	179	179

April 1 SWE data for regional stations are summarized for full period of record (POR) as well as for years corresponding to collection of snow course data at the Eagle Property in Table 2-7. With respect to magnitude of SWE, POR and recent (baseline) measurements compare favourably and are within 5% of one another. Year to year variability in SWE is shown in the provided time series (Figure 2-5), which indicates April 1 SWE varying typically between 50% normal and 160% of normal over the past 40 years.

Notable exceptions for SWE based on these regional data include: evidence for abnormally high accumulation in 2004 and 2005 at Mayo A and Mayo B snow courses (*i.e.*, 180% of normal; SWE measured was 176 mm compared to 97 mm which is normal); and low accumulation in 1980 and 1981 at Mayo A. Interestingly, low SWE measurements (*i.e.*, below 50% of normal) at Mayo A do not appear to be a function of early melt as March 1 SWE are also very low.

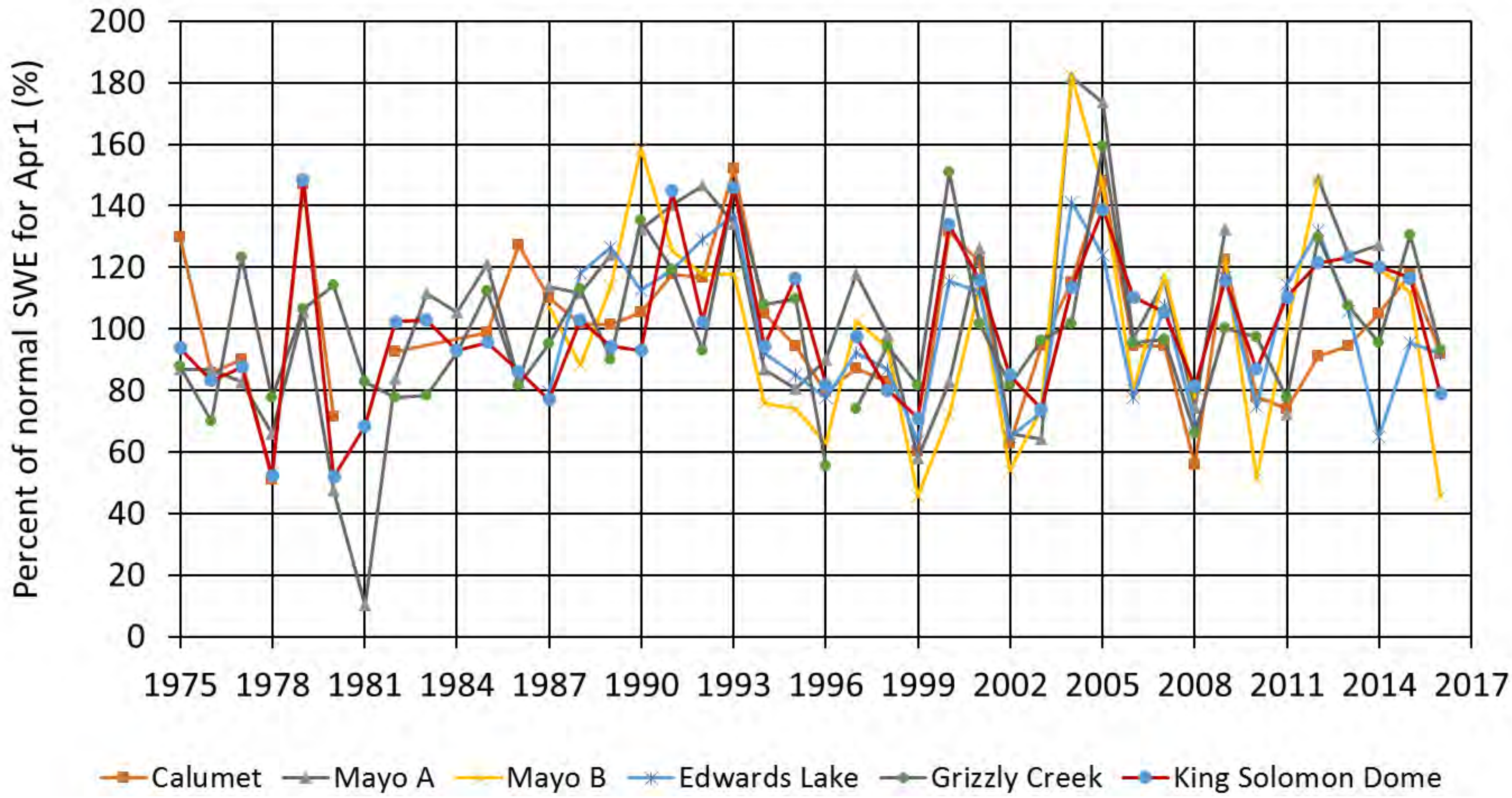


Figure 2-5: Period of record snow course data for regional stations. Snow water equivalent (SWE) data are presented as a percentage of normal (*i.e.*, 100% = average; values greater than 100% indicate above average SWE and vice versa for values lower than 100%.

Data in Table 2-7 indicate that a relationship between SWE and elevation is apparent, which is shown in Figure 2-6. From these data, the orographic gradient for winter precipitation was calculated to be on the order of 10%/100 m. All orographic gradients reported in this study (*i.e*., MAP, rainfall, snowfall) were calculated by applying Equation 1 from the UBC Watershed Model Manual (Quick *et al.*, 1995) to the average differential between precipitation totals and for any two stations being compared.

$$a = \left(\frac{P_2}{P_1}\right)^{1/\frac{\Delta elev}{100}} - 1 \qquad \text{[Equation 1]}$$

where:

- P_1 = precipitation at the lowest gauge (mm)
- P_2 = precipitation at the highest gauge (mm)
- Δelev = difference in elevation between predictor station and elevation of interest (m)
- *a* = % increase in precipitation per 100 m increase in elevation.

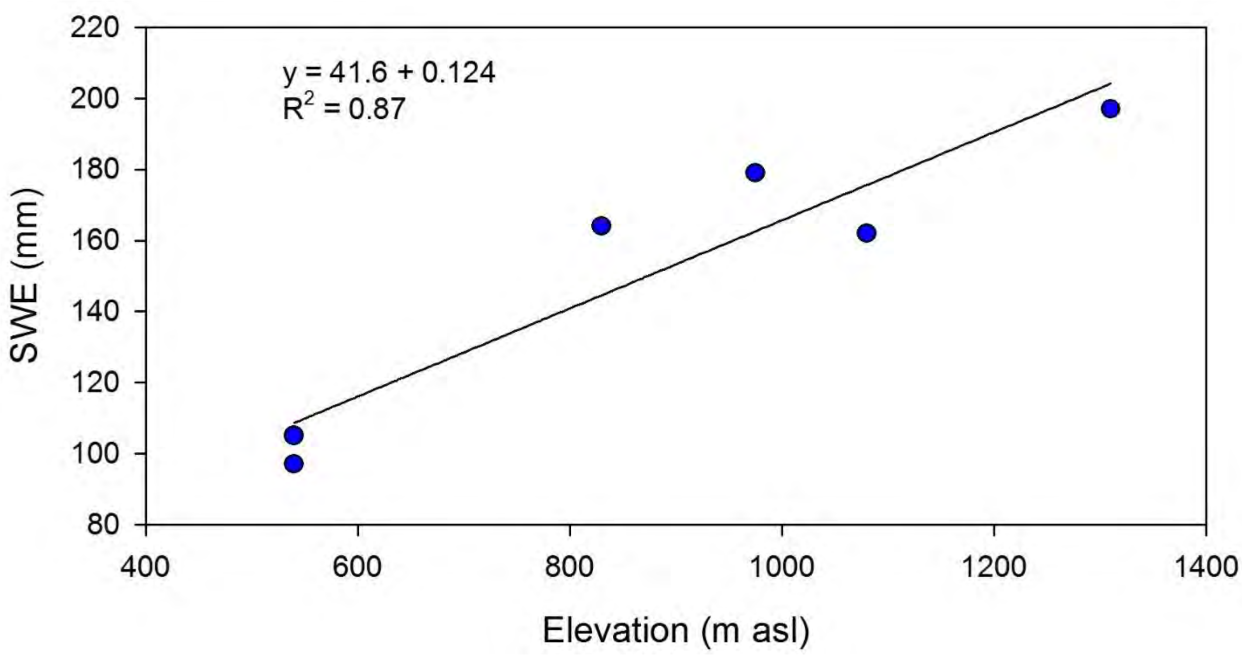


Figure 2-6: Period of record average April 1 SWE for nearest regional snow surveys to Eagle Gold plotted against snow course elevation.

2.3.3 Snow Accumulation and Melt – Project site stations

As discussed in Section 2.2, snow data have been collected at three snow courses at the Project site since 2009. Furthermore, the annual maximum snow water equivalent (SWE) value generally occurs in late-March or early-April at the Project site. Field measurements from site show that snow density is generally lower earlier in the season, corresponding to colder temperatures, but increases through winter as the snow pack deepens, weathers and as snow melt progresses.

Project site snow survey data is summarized in Table 2-8 for period of record 2009 to 2016. Annual maximum SWE values range from 93 mm to 160 mm at the Camp snow course, 98 mm to 117 mm (shorter record) at the Ann Gulch snow course, and vary from 190 mm to 410 mm at the Potato Hills snow course.

The Potato Hills snow survey was conducted in the immediate vicinity of the weather station from 2009 to 2011. However, due to the exposed location, snow redistribution resulted in variable measurements, and therefore the survey was moved to its current and more sheltered location in 2012, several hundred metres to the south-east (Figure 1-3). Note that high snowpacks did not allow access to the Potato Hills snow course in March 2012, and therefore the survey was conducted at Stewart Gulch (Snow Survey #2; Figure 1-3).

Continuous snow depth data are summarized for the Camp climate station in Figure 2-7. The upper panel of Figure 2-7 shows the evolution of the snowpack for the 2012 to 2016 time-period, with pack depth showing initial and appreciable accumulation through the months of November and December, typically reaching maximum depth by mid-March each year. These data then show snow pack depth remains deep and relatively stable to the beginning of April each year.

**Table 2-8:
Project site snow survey data.**

Year	Camp Station				Ann Gulch (Snow Survey #2)				Potato Hills Station			
	Survey Date	Depth (cm)	SWE (mm)	Density (%)	Survey Date	Depth (cm)	SWE (mm)	Density (%)	Survey Date	Depth (cm)	SWE (mm)	Density (%)
2009	2009-04-21	69	112	16%	-	-	-	-	2009-04-21	126	410	33%
2010	2010-03-31	50	99	20%	-	-	-	-	2010-03-31	103	278	27%
	2010-04-21	69	112	16%	-	-	-	-	2010-04-21	126	405	32%
2011	2011-03-28	55	93	17%	-	-	-	-	2011-03-28	105	251	24%
2012	2012-03-20	78	161	21%	-	-	-	-	-	-	-	-
	2012-04-20	56	79	14%	-	-	-	-	2012-04-22	117	262	22%
2013	-	-	-	-	2013-02-20	70	97	14%	2013-02-28	96	185	19%
	2013-03-02	61	108	18%	2013-03-02	67	115	17%	-	-	-	-
	2013-04-02	59	108	18%	2013-04-02	62	117	19%	2013-04-03	90	190	21%
					2013-04-16	62	85	14%	-	-	-	-
	2013-05-05	58	106	18%	2013-05-03	58	105	18%	2013-05-05	117	167	14%
2014	2014-03-12	57	126	22%	2014-03-12	51	94	18%	2014-03-11	98	276	28%
	2014-04-02	55	100	18%	2014-04-02	46	98	21%	2014-04-02	96	275	29%
	-	-	-	-	-	-	-	-	2014-05-08	70	258	37%
2016	2016-03-02	53	118	22%	2016-03-02	53	117	22%	2016-03-02	95	214	22%
	2016-04-09	38	140	37%	2016-04-09	22	115	52%	2016-04-10	107	257	24%
	-	-	-	-	-	-	-	-	2016-05-03	95	226	24%

Notes:

1. Due to accessibility issues, snow survey data for Potato Hills could not be collected on 2012-03-20, so data was collected at the Stewart Gulch survey site (Snow Survey #2) at 995 m asl (Depth = 99 cm, SWE = 237 mm, Density = 24%).
2. No snow surveys were conducted at site in 2015.

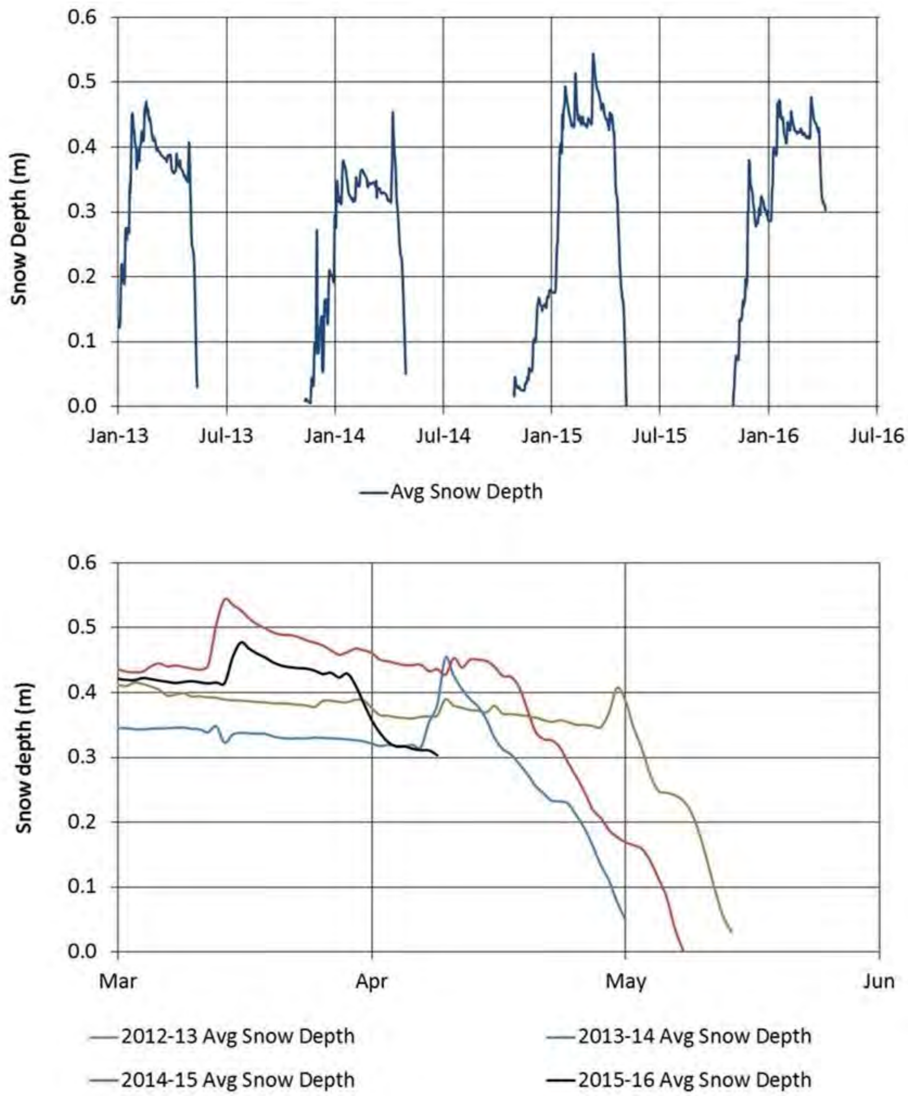


Figure 2-7: Summary of recent (2012-2016) continuous snow depth data for the Camp climate station.

2.3.4 Rainfall – Project Site Stations

The precipitation data is collected at the Project site using tipping bucket rain gauges, which have not been adapted to measure snowfall. Therefore, the precipitation data presented in Table 2-9 for rainfall only, collected between the months of March and October, inclusive. Generally, precipitation falls as snow from November through March, with precipitation falling as a mix of rain and snow in April and October. Rainfall data for March is included in the table below, where the temperature record indicates that precipitation would have fallen as rain (*i.e.*, daily average air temperature was above zero).

Table 2-9:
Project site monthly rainfall data.

Climate Station	Elevation (m asl)	Rainfall (mm)														
		Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009		-	-	-	-	-	-	-	-	35.0	*8.0*	S	S	-
		2010		S	S	5.0	9.0	20.0	62.0	34.0	28.0	25.0	*12.0*	S	S	195.0
		2011		S	S	11.0	10.0	16.0	31.0	75.0	44.0	40.0	*9.0*	S	S	236.0
		2012		S	S	13.0	1.0	22.0	18.0	74.6	29.8	24.0	*4.8*	S	S	187.2
		2013		S	S	8.6	10.4	34.6	25.6	28.4	35.2	58.6	*25.2*	S	S	226.6
		2014		S	S	5.4	8.8	9.2	52.8	43.2	70.4	28.8	*23.2*	S	S	241.8
		2015		S	S	20.8	13.0	8.2	28.8	64.0	62.0	38.6	*13.4*	S	S	248.8
		All Years	Mean	S	S	10.6	8.7	18.3	36.4	53.2	44.9	35.7	*13.7*	S	S	222.6
			Maximum	S	S	20.8	13.0	34.6	62.0	75.0	70.4	58.6	*25.2*	S	S	248.8
			Minimum	S	S	5.0	1.0	8.2	18.0	28.4	28.0	24.0	*4.8*	S	S	187.2
Potato Hills Station	1420	2007		-	-	-	-	-	-	-	24.0	100.8	*2.0*	S	S	-
		2008		S	S	3.4	4.8	58.4	52.0	201.2	130.0	11.2	*1.2*	S	S	462.2
		2009		S	S	S	3.0	-	50.8	12.6	75.4	44.4	*1.2*	S	S	-
		2010		S	S	1.0	6.2	16.4	77.2	45.8	39.4	4.2	*5.4*	S	S	195.6
		2011		S	S	0.2	7.2	21.2	38.0	92.8	83.8	34.4	*0.4*	S	S	278.0
		2012		S	S	S	0.6	9.6	24.2	64.8	37.8	21.0	*4.6*	S	S	162.6
		2013		S	S	2.2	0.2	29.6	33.2	18.0	18.2	63.8	*10.0*	S	S	175.2
		2014		S	S	S	M	M	M	M	M	M	M	S	S	-
		2015		S	S	M	M	M	M	M	48.5	27.1	*10.0*	S	S	-
		All Years	Mean	S	S	S	3.7	27.0	45.9	72.5	57.1	38.4	*4.4*	S	S	254.7
			Maximum	S	S	S	7.2	58.4	77.2	201.2	130.0	100.8	*10.0*	S	S	462.2
			Minimum	S	S	S	0.2	9.6	24.2	12.6	18.2	4.2	*0.4*	S	S	162.6

Notes: Winter precipitation data (October through April in many years) are unreliable due to the majority falling as snow. The months where no rainfall was recorded due to freezing conditions are denoted by an ‘S’. Data for the month of October are in italics, as rainfall is not measured for the entire month. ‘M’ denotes data missing due to a sensor malfunction.

2.3.5 24-hour Rainfall Recurrence Interval Estimates

Estimates of the 24-hour rainfall for various return periods were computed in three ways: The first method used the rainfall Intensity-Duration-Frequency (IDF) curves published by Environment Canada for the Mayo A climate station, and the second method used the longer daily rainfall record from the Mayo A station. For comparison with the estimated rainfall values, the monthly maximum 24-hour rainfall totals are presented in Table 2-10 and Table 2-11, for the Camp and Potato Hills climate stations, respectively.

Previous work by Knight Piésold (2013) based the rainfall recurrence interval estimates on the Rainfall Frequency Atlas of Canada (Hogg and Carr, 1985). While the Atlas is a useful reference, a significant amount of rainfall data has become available since its publication. Environment Canada publishes rainfall IDF curves for the Mayo A station, based on 24-hour rainfall accumulations recorded from 1979 to 2010 (n = 25 years). These estimates were included, and scaled by 4%/100 m to account for the orographic gradients at site (Section 2.5).

The IDF curve for the Mayo A climate station is based on 25 samples of annual 24-hour rainfall, however, this station has a record of maximum annual daily rainfall spanning the period of 1925 to 2015, resulting in a sample size of 92. This longer daily record allows for a more robust analysis to be conducted on the expected frequency and magnitude of rainfall events. These daily data were adjusted by a factor of 1.14 (the Herschfield factor) to account for the fact that the maximum 24-hour precipitation does not necessarily fall within the standard day (midnight to midnight; Herschfield, 1961). An analysis was conducted using the site rainfall data to confirm the Herschfield factor, and on average, the 24-hour totals were 1.18 and 1.16 times higher than the daily totals, for the Camp and Potato Hills stations, respectively. Therefore, the higher ratio of 1.18 was carried forward as a scalar for the Mayo A daily totals. Recurrence interval estimates were derived by fitting the Extreme Value Type I (Gumbel) distribution to these data – the same distribution used for both the IDF curve derivation, and the Rainfall Frequency Atlas of Canada estimates. The IDF estimates and daily rainfall values were scaled by 4%/100 m to account for the orographic gradients at site (Section 2.5).

The values based on the Mayo A daily rainfall totals range from 24% to 57% higher than those derived from the Mayo A 24-hour IDF curve, for the 1:100 year event. The values derived from the scaled Mayo A daily data (highlighted in grey) reported in Table 2-12 are recommended for use in engineering design.

From Table 2-10 and Table 2-11, the maximum 24-hour rainfall totals recorded at the Project site are 22 mm (July 2012; Camp station) and 38.2 mm (August 2008; Potato Hills station). With over six years of data collection, these totals approximately represent only the median 2-yr storm for Camp and the Potato Hills stations. This indicates that both methods (Mayo A and Mayo IDF) likely overestimate the 24-hour rainfall for every recurrence interval.

Table 2-10:
Maximum monthly 24-hour rainfall for the Camp station (782 m). All values in mm.

Month	2009	2010	2011	2012	2013	2014	2015	Max
May	--	9.6	5.6	7.6	6.6	4.0	3.8	9.6
Jun	--	15.2	8.4	6.6	4.6	14.0	7.2	15.2
Jul	--	8.0	17.8	22.0	9.4	11.2	14.0	22.0
Aug	11.2	15.4	14.0	14.0	19.8	13.2	16.8	19.8
Sep	8.6	8.4	8.2	8.8	15.8	8.6	15.4	15.8
Max	11.2	15.4	17.8	22.0	19.8	14.0	16.8	22.0

Table 2-11:
Maximum monthly 24-hour rainfall for the Potato Hills station (1420 m). All values in mm.

Month	2007	2008	2009	2010	2011	2012	2013	Max
May	--	14.8	0.0	7.8	6.2	2.4	7.0	14.8
Jun	--	16.4	14.4	20.4	13.4	7.2	8.0	20.4
Jul	--	27.0	5.0	16.2	17.2	17.0	3.6	27.0
Aug	14.2	38.2	12.6	20.2	19.8	16.2	6.2	38.2
Sep	35.8	4.0	9.2	1.8	12.8	6.8	10.0	35.8
Max	35.8	38.2	14.4	20.4	19.8	17.0	10.0	38.2

Table 2-12:
Recurrence interval estimates of 24-hour storm rainfall depths. All values are in mm.

Exceedance Probability	Return Period	Mayo A	Camp		1125 m		Potato Hills	
		504 m	782 m		1125 m		1420 m	
		IDF	Mayo A Dly[1]	Mayo A IDF[2]	Mayo A Daily[1]	Mayo A IDF[2]	Mayo A Daily[1]	Mayo A IDF[2]
0.5	1:2 (median)	18	22	20	25	23	36	26
0.1	1:10	25	33	28	38	32	54	36
0.04	1:25	29	39	32	44	37	63	42
0.02	1:50	31	43	35	49	40	70	44
0.01	1:100	34	47	38	54	43	77	49
0.005	1:200	39[4]	51	44	58	50	83	56
0.001	1:1000	43[4]	60	48	69	55	99	62

Notes:
[1]Based on the Mayo A annual maximum daily rainfall, multiplied by 1.18, and scaled by elevation.
[2] Based on the Mayo A 24-hour IDF curve estimates, and scaled by elevation.
[4] IDF curve values not provided for these recurrence intervals – values in table based on extrapolation.

2.4 Potential Evaporation

As described in Lorax (2016a) 15-minute potential evaporation rates were computed for the Camp station using available climate and the Ref-ET calculator - a compiled, stand-alone computer program that calculates reference evapotranspiration (ASCE, 2005). For the period of available record (Jan 2013 to Apr 2016), a 15-minute climate input file was prepared for the Eagle Gold site. The input variables required by Ref-ET are: maximum air temperature, minimum air temperature, relative humidity, incoming solar radiation, atmospheric pressure and wind speed.

From the assembled climate inputs, Ref-ET returned potential evaporation (PE) computations for an array of evaporation models (*e.g.*, Penman-Monteith model, Priestley-Taylor formulation), which were aggregated to daily time-step. Presented in Table 2-13 (monthly tabulations) are resulting outputs from Ref-ET for months March to October. May to end-September PE estimates for the Camp station are also reported in Table 2-13 and are estimated to total 380 mm over this period. In terms of monthly magnitudes of PE, highest monthly rates of PE are expected in May, June, July and August of each year.

These estimates were used as the basis for the time-series of evaporation estimates that were developed for the synthetic climate record described in Appendix A.

Table 2-13:
Potential evaporation (PE) estimates for the Camp station.

		Potential Evaporation (mm)				
Period	**Method**	**2012**	**2013**	**2014**	**2015**	**Average (2012-2015)**
Mar	PM	---	17	21	17	18
	P-T	---	16	19	16	17
Apr	PM	---	40	47	47	45
	P-T	---	40	46	46	44
May	PM	---	78	91	113	94
	P-T	---	82	85	108	92
Jun	PM	---	114	98	97	103
	P-T	---	116	96	97	103
Jul	PM	87	102	91	80	90
	P-T	93	102	90	86	93
Aug	PM	69	74	55	61	65
	P-T	70	73	56	63	65
Sep	PM	36	30	33	27	31
	P-T	26	24	28	23	25
Oct	PM	6	3	10	10	7
	P-T	4	3	4	5	4
Total (Mar-Oct)	PM	---	456	445	453	453
	P-T	---	456	423	445	443
Total (May-Sep)	PM	---	397	367	378	382
	P-T	---	397	354	378	378

Notes:

1. PM and P-T Indicate potential evaporation (PE) estimates based on Penman–Monteith and Priestley–Taylor approaches respectively. 2. PE Estimates computed using Eagle camp/lower 15-min climate data (*I.E*, air, temperature, relative humidity, wind speed, precipitation solar radiation, atmospheric pressure) and Ref-Et software

2.5 Synthetic Climate Record Development

While the site climate record spans almost a decade (2007-present), the current mine plan, including the closure and post-closure phases, spans a much-longer period (roughly 30+ years). Therefore, the site climate record from the Camp and Potato Hills stations was extended based on the Mayo A climate station data. The synthetic daily air temperature series was estimated using month and parameter specific lapse rates, which accounted for the seasonal variation in lapse rates. The daily synthetic precipitation record was estimated by adjusting the Mayo A precipitation data using orographic gradients that are consistent with the regional and site data. The regional and site snow course data were used as an additional check on the winter precipitation accumulations. The final daily synthetic climate series span the period of 1948 to 2015, and were produced for the Camp station elevation (782 m), the basin mid-point elevation (1,125 m) and the Potato Hills station elevation (1,420 m; Table 2-14).

Table 2-14:
Monthly average synthetic precipitation estimates for the three reference elevations at the Eagle Gold Project site.

	Camp	% MAP	Mid-point	% MAP	Potato Hills	% MAP
Elevation (m)	728		1125		1420	
Jan	25.6	7%	36.7	8%	49.9	9%
Feb	18.8	5%	27.0	6%	36.7	6%
Mar	12.7	3%	18.1	4%	24.6	4%
Apr	9.0	2%	10.3	2%	11.5	2%
May	23.4	6%	26.8	6%	30.1	5%
Jun	42.3	11%	48.4	10%	54.3	9%
Jul	59.2	16%	67.7	14%	76.0	13%
Aug	50.8	14%	58.1	12%	65.2	11%
Sep	38.8	10%	44.4	9%	49.8	9%
Oct	35.5	9%	50.8	11%	69.1	12%
Nov	30.4	8%	43.4	9%	59.1	10%
Dec	28.2	8%	40.3	9%	54.9	9%
MAP	374.6		471.9		581.2	
Rain	214.4	57%	245.3	52%	275.4	47%
Snow	160.2	43%	226.6	48%	305.8	53%

These estimates provide an update to those provided by Knight Piésold (2013). A comparison of the updated estimates presented in Table 2-15, and it is apparent that while an additional three years of climate data has allowed the long-term estimates to be refined, the values have not changed substantially from those previously presented.

Table 2-15:
Monthly average synthetic precipitation estimates for the three reference elevations at the Eagle Gold Project site.

Knight Piésold Hydrometeorology Report (2013)									
Parameter	**Camp (782 m)**			**1125 m**			**Potato Hills (1420 m)**		
	Annual	Oct-Apr (SWE)	May-Sept (Rain)	Annual	Oct-Apr (SWE)	May-Sept (Rain)	Annual	Oct-Apr (SWE)	May-Sept (Rain)
Potential Evapotranspiration (mm)	439	--	439	--	--		335	--	335
Mean Precipitation (mm)	357	205	152	500	310	190	652	432	220
Mean Annual Runoff (W4; mm)	--	--	--	230	--	--	--	--	--
Lorax Hydrometeorology Report (2016)									
Potential Evapotranspiration (mm)	483	--	382	380	--	344	305	--	309
Mean Precipitation (mm)	375	160	214	472	227	245	581	306	275
Mean Annual Runoff (W4; mm)	--	--	--	247	--	--	--	--	--

3. Hydrology

3. Hydrology

3.1 Regional Streamflow

3.1.1 Regional Hydrometric Stations

Figure 1-4 and Table 3-1 present regional hydrometric stations that are nearest the Eagle Gold Project. The Eagle Gold Project is situated within the McQuesten River watershed. Much of the mine site lies within the Dublin Gulch watershed, a tributary that reports to Haggart Creek, and then to the South McQuesten River (see Figure 1-4). Ultimately, the South McQuesten River joins the North McQuesten River, then reports to the Stewart River and the Yukon River. For reference purposes, the location of the Eagle Gold Project and the drainage basin for the McQuesten River are shown in Figure 1-4.

Regional streamflow data were used to provide context for streams monitored for the Eagle Gold Project. This included helping to define typical ranges and variability in streamflow processes over longer periods of time than possible from the shorter duration project baseline data. Additionally, regional hydrometric data were also used in a frequency analysis to estimate flow extremes (*i.e.*, instantaneous peak flows,

summer/annual 7-day low flows), and served as a predictor stations to enable production of long-term synthetic hydrology datasets. In particular, a ranked regression methodology was used to help derive long-term synthetic streamflow records for the Eagle Gold Project.

Suitable predictor station(s) for a ranked regression analysis meet several of the following conditions: 1) the predictor station has been gauged for several decades or more (*i.e.*, 25 to 40 years of record is ideal); 2) the predictor station remains active, with several years (*e.g.,* 3-5 years) of recent daily flow data overlapping with station data of the site- hydrometric network; and 3) the predictor station is situated in reasonably close proximity to the Project area (*e.g.*, within the same basin or within 150 km of the Project site) and has a relatively small drainage area (compared to the rest of the regional stations) to the stations measured as part of site baseline studies.

Several of the nearest regional hydrometric stations to the Eagle Gold Project gauge large rivers (*e.g.,* drainage basins >15,000 km^2) such as the Pelly River, the Stewart River and Macmillan River, and owing to their basin sizes alone, are assumed to be poor predictor stations for a ranked regression analysis. Several of the regional stations show limited period of record (*e.g.*, 5 to 10 years), are currently inactive, or show limited period of overlap with the site hydrology network. In this regard, the regional streamflow records on Grizzly Creek, Wolf Creek, Little South Klondike Creek, Clear Creek and Bonnet Plume River do not meet the stipulated predictor station requirements.

A hydrometric station has been maintained by the Water Survey of Canada on the McQuesten River (38 years of record). Similar to the analysis undertaken previously by Knight Peisold (KP, 2013), this station was selected as the ranked regression predictor station since the station remains active, is long-duration and also contains the Project site basins (*e.g.,* Haggart Creek, Dublin Gulch). The North Klondike River station remains operational and is a potential predictor station, however, it is notable that the North Klondike basin is farther away (up to ~150 km from the Eagle Gold Project) and gauges streamflow from a different drainage basin.

3.1.2 Regional Streamflow Patterns and Trends

Monthly and annual streamflow data for the McQuesten River (used as the predictor station for Project streams) are presented in Table 3-2.

The hydrology of the region is characterized by a dominant snowmelt driven freshet signature, which typically occurs between early May and early June. The recession limb of the freshet tapers to a lower summer low-flow regime reflective of primarily groundwater, which is punctuated by periodic rainfall driven runoff events, typically one to four days in duration. Base flows are lowest in the winter and flow sub-ice; in the smaller creeks groundwater is depleted and there is no flow under the ice. Air temperatures begin to drop below zero in the autumn months, and many of the smaller tributaries experience zero-flow conditions for the majority of the winter season.

Table 3-1:
Regional hydrometric stations near the Eagle Gold Project

Site ID	Station Name	Latitude (dec.deg.)	Longitude (dec.deg.)	Drainage Area (km^2)	Period of Record
09DB001	Beaver River Below Matson Creek	64.01	-134.14	4,770	1995-present (21 years)
10MB004	Bonnet Plume River Above Gillespie Creek	64.75	-133.68	3,760	1981-1994 (14 years), 2016-present (0 years)
29DD002	Clear Creek Above Barlow Creek	63.75	-137.63	340	1980-present (36 years)
29EA002	Grizzly Creek at km 60.4 Dempster Highway	64.40	-138.30	34	1975-1982 (8 years)
09EA005	Little South Klondike River Below Ross Creek	64.00	-137.57	860	1981-1981 (1 years), 1983-1994 (12 years), 2015-present (1 years)
09BB002	Macmillan River Near the Mouth	62.89	-135.51	13,800	1984-1998 (15 years)
09DC005	Mayo Lake Near the Outlet	63.77	-135.39		1979-present (37 years)
09DC001	Mayo River Near Mayo	63.70	-135.86	2,260	1945-1947 (3 years), 1949-1950 (2 years)
09DD004	Mcquesten River Near the Mouth	63.61	-137.27	4,750	1979-present (37 years)
09EA004	North Klondike River Near the Mouth	64.00	-138.60	1,090	1974-present (42 years)
09BC001	Pelly River at Pelly Crossing	62.83	-136.58	48,900	1952-present (64 years)
09DC003	Stewart River Above Fraser Falls	63.49	-135.13	30,600	1980-1998 (19 years)
09DC002	Stewart River at Mayo	63.59	-135.90	31,600	1949-1979 (31 years)
09DD002	Stewart River at Stewart Crossing	63.38	-136.68	35,000	1958-1958 (1 years), 1960-1973 (14 years)
09DC006	Stewart River Near Mayo	63.59	-135.90	na	1980-present (36 years)
09DC004	Wareham Lake at Headgate	63.66	-135.92	na	1979-2000 (22 years)
29EA001	Wolf Creek at km 52 Dempster Highway	64.37	-138.38	69	1975-1982 (8 years)

Table 3-2:
Monthly hydrometric summaries for the McQuesten River station

Station	Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
McQuesten River (Drainage area 4,750 km^2; 1979-2015) Period of Record = 38 years	Mean (m^3/s)	8.8	7.5	7.1	11.5	122.0	104.0	53.7	43.6	45.8	30.5	16.8	11.6	38.4
	Max (m^3/s)	13.6	11.9	10.3	23.7	224.0	214.0	109.0	86.5	83.7	63.0	33.2	19.9	55.5
	Min (m^3/s)	5.1	4.4	4.2	5.7	75.9	42.0	24.4	17.2	18.2	13.0	8.3	6.3	23.6
	Mean ($L/s/km^2$)	1.9	1.6	1.5	2.4	25.7	21.9	11.3	9.2	9.6	6.4	3.5	2.4	8.1
	Max ($L/s/km^2$)	2.9	2.5	2.2	5.0	47.2	45.1	22.9	18.2	17.6	13.3	7.0	4.2	11.7
	Min ($L/s/km^2$)	1.1	0.9	0.9	1.2	16.0	8.8	5.1	3.6	3.8	2.7	1.7	1.3	5.0

Reported values are based on available period of record per station.

*Water Survey of Canada gauge inactive between 1999 and Aug 2015.

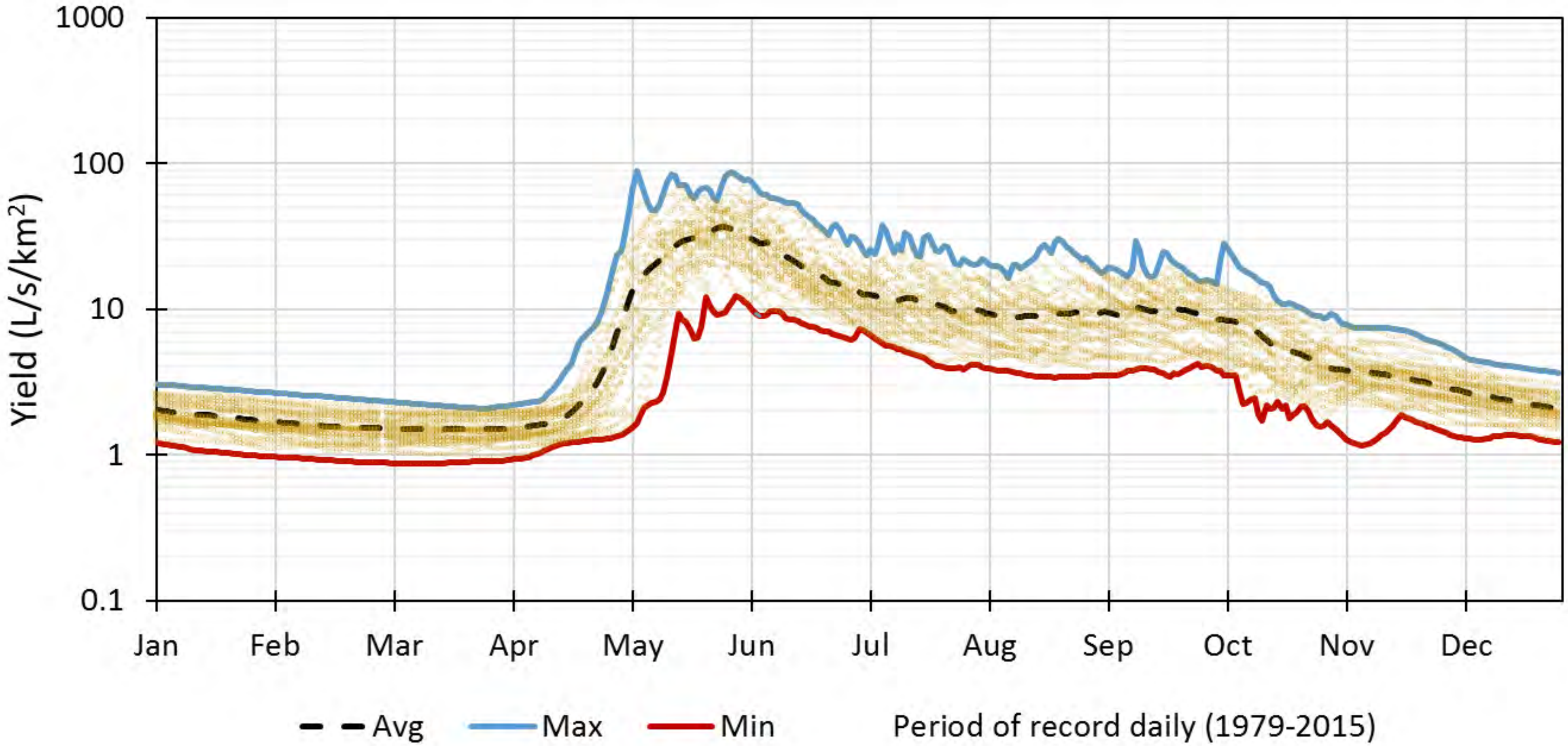


Figure 3-1: Period of record of daily unit discharge (L/s/km^2) for the McQuesten River near the Mouth. Daily observations are shown using brown hollow circles with statistics (daily average daily maximum and daily minimum) values shown by lines.

3.2 Project Area Streamflow

3.2.1 Project Site Hydrometric Stations

The number of continuously recording hydrometric stations at the Project has varied over the period of record. Eight currently operating stations with the most complete records are described in Lorax (2016b) [Eagle Gold Baseline Hydrology Study] and include streamflow monitoring stations in Dublin Gulch, Haggart Creek, Lynx Creek, Stewart Gulch and Eagle Creek. Station locations and the associated metadata are presented in Figure 3-2 and Table 3-3, respectively.,

Lorax (2016b) provides a recent summary of all hydrometric data, and includes a summary of discharge measurement techniques, stage measurements and corrections, QA/QC of field data, approach and methods for hydrometric record assembly, and rating curve development and error. Over time, manual discharge measurements have been conducted using the following methods: velocity area techniques using a current meter; salt dilution; calibrated V-notch weir; calibrated Parshall flume; bucket/bag; and float-area method.

All hydrometric stations at the Eagle Gold Project were instrumented with metric staff gauges, mounted to vertical angle iron in the stream channel, and regularly surveyed to nearby benchmarks. Continuously recording HOBO pressure transducers were installed in stilling wells, and set to record water level every 15 minutes. These readings were corrected for fluctuations in barometric pressure in a post-processing step. During each site visit, the water level was noted on the staff gauge. These readings formed the basis for the continuous water level records, which were adjusted to match the manual stage readings. Regular surveys were conducted to determine the staff gauge zero datum and water level, and these measurements were used to correct the station records for changes due to shifts in the channel bed (*i.e.*, aggradation or scour), frost-jacking or station relocation following a high-magnitude flood event.

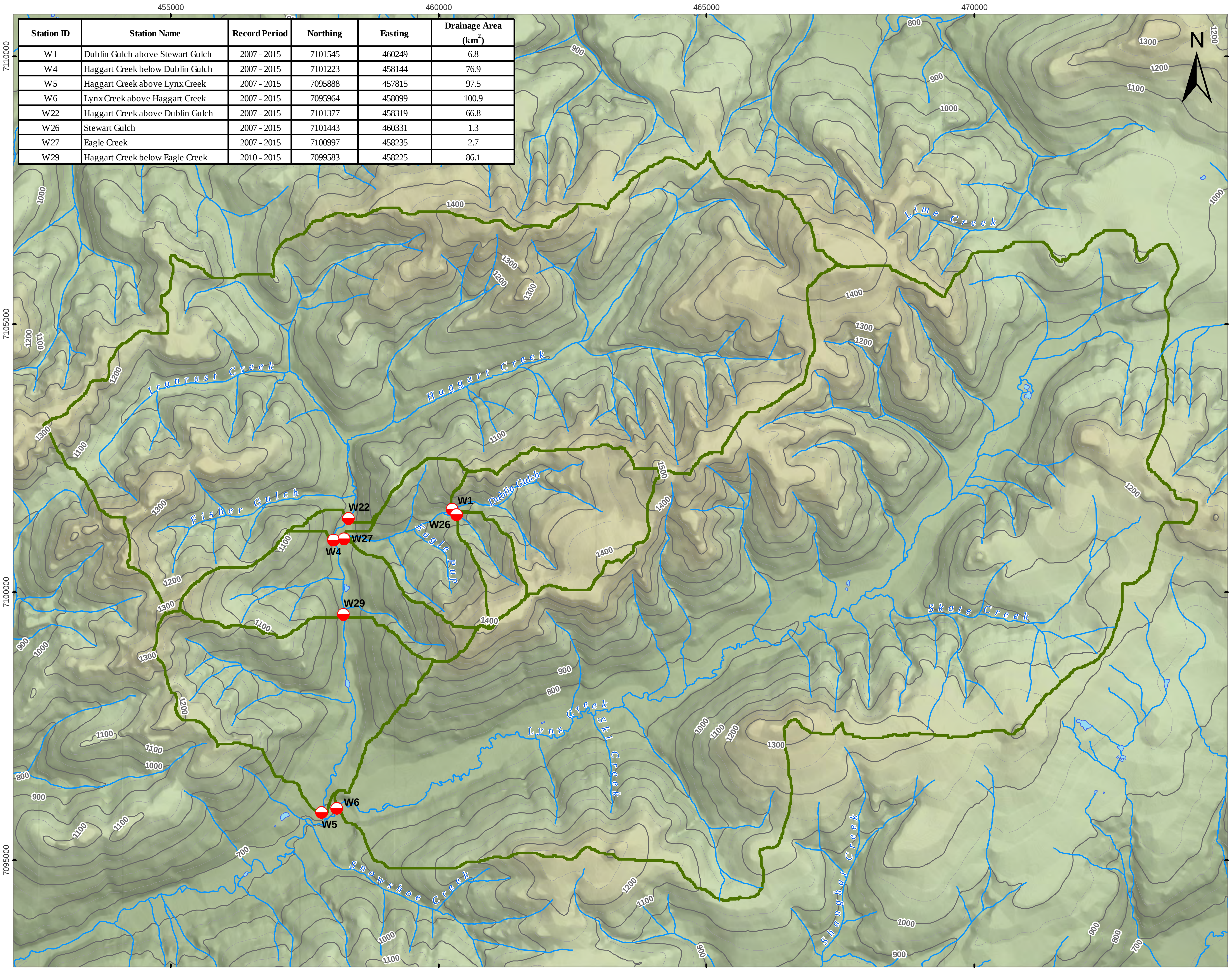
To develop continuous time-series of discharge for the Project streams, spot measurements of stage and discharge were combined with continuous water level records collected by the pressure transducers. Rating curves were derived to describe the relationship between water level and discharge unique and specific to each monitoring station, and then applied to the continuous water level records to estimate discharge.

**Table 3-3:
Eagle Gold Project hydrometric stations**

Station ID	Station Name	Record Period	Northing	Easting	Drainage Area (km^2)	Median Basin Elevation (m)	Notes
W1	Dublin Gulch above Stewart Gulch	2007 - 2015	7,101,545	460,249	6.8	1,303	Continuous discharge time-series
W4	Haggart Creek below Dublin Gulch	2007 - 2015	7,101,223	458,144	76.9	1,125	Continuous discharge time-series
W5	Haggart Creek above Lynx Creek	2007 - 2015	7,095,888	457,815	97.5	1,091	Continuous discharge time-series
W6	Lynx Creek above Haggart Creek	2007 - 2015	7,095,964	458,099	100.9	1,049	Continuous discharge time-series
W22	Haggart Creek above Dublin Gulch	2007 - 2015	7,101,377	458,319	66.8	1,113	Continuous discharge time-series
W26	Stewart Gulch	2007 - 2015	7,101,443	460,331	1.3	1,183	Continuous discharge time-series, manual data only for 2007 - 2009, 2011.
W27	Eagle Creek	2007 - 2015	7,100,997	458,235	2.7	1,037	Continuous discharge time-series, manual data only for 2007
W29	Haggart Creek below Eagle Creek	2010 - 2015	7,099,583	458,225	86.1	1,112	Manual measurements for 2010, continuous data thereafter

Source of Northing, Easting, Drainge Area and Median Basin Elevation: KP 2013.

Station ID	Station Name	Record Period	Northing	Easting	Drainage Area (km^2)
W1	Dublin Gulch above Stewart Gulch	2007 - 2015	7101545	460249	6.8
W4	Haggart Creek below Dublin Gulch	2007 - 2015	7101223	458144	76.9
W5	Haggart Creek above Lynx Creek	2007 - 2015	7095888	457815	97.5
W6	Lynx Creek above Haggart Creek	2007 - 2015	7095964	458099	100.9
W22	Haggart Creek above Dublin Gulch	2007 - 2015	7101377	458319	66.8
W26	Stewart Gulch	2007 - 2015	7101443	460331	1.3
W27	Eagle Creek	2007 - 2015	7100997	458235	2.7
W29	Haggart Creek below Eagle Creek	2010 - 2015	7099583	458225	86.1



LEGEND

- Hydrometric Station
- Watershed Boundary
- Watercourse
- Waterbody
- Contour (100m)
- Contour (50m)

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Hydrometric Station Network

PROJECTION	DATUM	CLIENT
Transverse Mercator UTM Zone 8	NAD83	Victoria Gold Corp

Scale: 1:70,000
700 350 0 700
Metres

FILE NO.

Lorax Environmental

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	GM	SJ	DHF	1

OFFICE	DATE
	December 13, 2016

Figure 3-2

Path: P:\@Drafting\Eagle Gold\Drafting Figures\MXD\Hydrology Baseline Report\Hydrometric Stations_20161213.mxd

3.2.2 Project Station Streamflow Summary

Table 3-4 provides a summary of monthly average discharge, unit yield and runoff for Project site hydrometric stations listed in Table 3-3. In addition, computed flow records for stations W4 and W5 are presented as average daily discharge time-series and plotted with spot discharge measurements and interpolated baseflows in Figure 3-3 and Figure 3-4. Flow records for all stations are presented in this format and as unit yield plots in Lorax (2016b).

Available site data confirm streamflow patterns seen in the regional record. The characteristic snowmelt driven freshet signature, which typically occurs between early May and early June is evident at site hydrology stations. The peak of snowmelt is short-duration, lasting days to weeks, but streamflow yields in the range 50-150 L/s/km^2 are possible at this time of the year. On a monthly basis, average flows are expected to be higher on average in May (25-40 L/s/km^2) than in June (12-16 L/s/km^2).

The recession limb of the freshet tapers to a summer low-flow regime reflective of primarily groundwater, which is punctuated by periodic rainfall driven runoff events, typically one to four days in duration. The low-flow regime at the Project site is defined by streamflow yields of approximately 10-15 L/s/km^2, with rainfall driven runoff reaching yields of 40-60 L/s/km^2 – but for short periods of time and peaks being short-lived.

Air temperatures at the Project site begin to drop below zero in September. Accordingly, many of the smaller tributaries experience low- or zero-flow conditions for the majority of the winter season. Lorax (2016b) provides a summary of winter spot-flow measurements recorded at the Project site. At W4 (76.9 km^2) and W5 (97.5 km^2) hydrometric stations, winter spot flows typically reach minima 2 to 3 L/s/km^2. In contrast at the smaller W1 basin (6.8 km^2), winter minima are slightly lower and approximately 1.5 to 2 L/s/km^2.

Table 3-4:
Summary of monthly average discharge, unit yield and runoff for Project site hydrometric stations.

Station (Discharge Area)	Variable	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average/Total
W1 (6.8 km^2)	Average Discharge (m^3/s)	--	--	--	*0.02*	*0.25*	*0.08*	0.09	0.08	0.10	*0.08*	*0.07*	--	0.098
	Average Yield (L/s/km^2)	--	--	--	*3.38*	*37.36*	*12.44*	12.69	12.40	14.49	*12.35*	*10.10*	--	14.4
	Runoff (mm)	--	--	--	*3.5*	*79.1*	*26.2*	33.3	28.6	37.5	*22.6*	*4.4*	--	235
W4 (76.9 km^2)	Average Discharge (m^3/s)	--	--	--	--	*2.03*	1.02	0.85	0.89	0.91	*0.81*	*1.03*	--	1.076
	Average Yield (L/s/km^2)	--	--	--	--	*26.38*	13.27	11.11	11.53	11.80	*10.48*	*13.34*	--	14.0
	Runoff (mm)	--	--	--	--	*50.5*	31.5	29.8	29.4	30.6	*19.0*	*24.2*	--	215
W5 (97.5 km^2)	Average Discharge (m^3/s)	--	--	--	--	*2.68*	*1.30*	1.09	0.99	0.96	*0.97*	--	--	1.332
	Average Yield (L/s/km^2)	--	--	--	--	*27.54*	*13.33*	11.15	10.17	9.89	*9.92*	--	--	13.7
	Runoff (mm)	--	--	--	--	*56.5*	*29.5*	29.9	25.6	25.6	*15.6*	--	--	183
W6 (100.9 km^2)	Average Discharge (m^3/s)	--	--	--	--	*3.24*	*1.27*	0.98	1.09	1.19	*0.94*	*0.90*	--	1.430
	Average Yield (L/s/km^2)	--	--	--	--	*32.11*	*12.63*	9.74	10.81	11.77	*9.28*	*1.79*	--	14.2
	Runoff (mm)	--	--	--	--	*62.4*	*24.3*	26.1	27.6	30.5	*15.8*	*0.39*	--	202
W22 (66.8 km^2)	Average Discharge (m^3/s)	--	--	--	*0.27*	*1.97*	*0.81*	*0.66*	0.81	0.78	*0.68*	*0.94*	--	0.864
	Average Yield (L/s/km^2)	--	--	--	*3.98*	*29.44*	*12.15*	*9.91*	12.12	11.73	*10.16*	*14.02*	--	12.9
	Runoff (mm)	--	--	--	*4.1*	*60.2*	*30.1*	*24.0*	30.8	30.4	*18.5*	*14.5*	--	213
W26 (1.3 km^2)	Average Discharge (m^3/s)	--	--	--	--	--	*0.02*	0.02	0.01	0.01	*0.01*	--	--	0.015
	Average Yield (L/s/km^2)	--	--	--	--	--	*16.54*	12.52	11.15	10.13	*7.42*	--	--	11.5
	Runoff (mm)	--	--	--	--	--	*28.2*	28.3	29.9	24.7	*7.3*	--	--	118
W27 (2.7 km^2)	Average Discharge (m^3/s)	--	--	--	--	*0.09*	*0.04*	*0.03*	*0.02*	0.02	*0.02*	--	--	0.040
	Average Yield (L/s/km^2)	--	--	--	--	*34.24*	*16.28*	*12.75*	*9.16*	8.47	*8.82*	--	--	15.0
	Runoff (mm)	--	--	--	--	*57.4*	*39.7*	*25.6*	*23.0*	21.9	*13.2*	--	--	181
W29 (8 km^2)	Average Discharge (m^3/s)	--	--	--	--	*2.51*	*1.20*	1.21	1.06	1.11	*0.87*	--	--	1.325
	Average Yield (L/s/km^2)	--	--	--	--	*29.13*	*13.94*	14.09	12.25	12.88	*10.05*	--	--	15.4
	Runoff (mm)	--	--	--	--	*44.0*	*26.1*	37.7	31.3	33.4	*16.3*	--	--	189

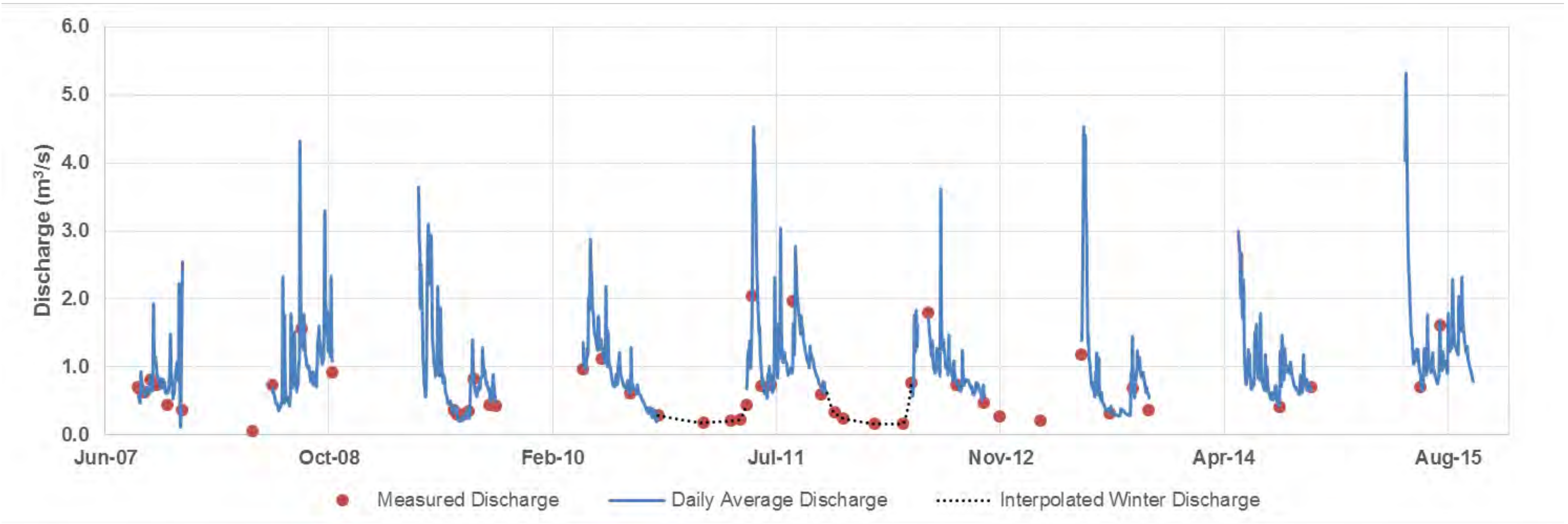


Figure 3-3: W4 Average daily discharge record (2007 to 2015)

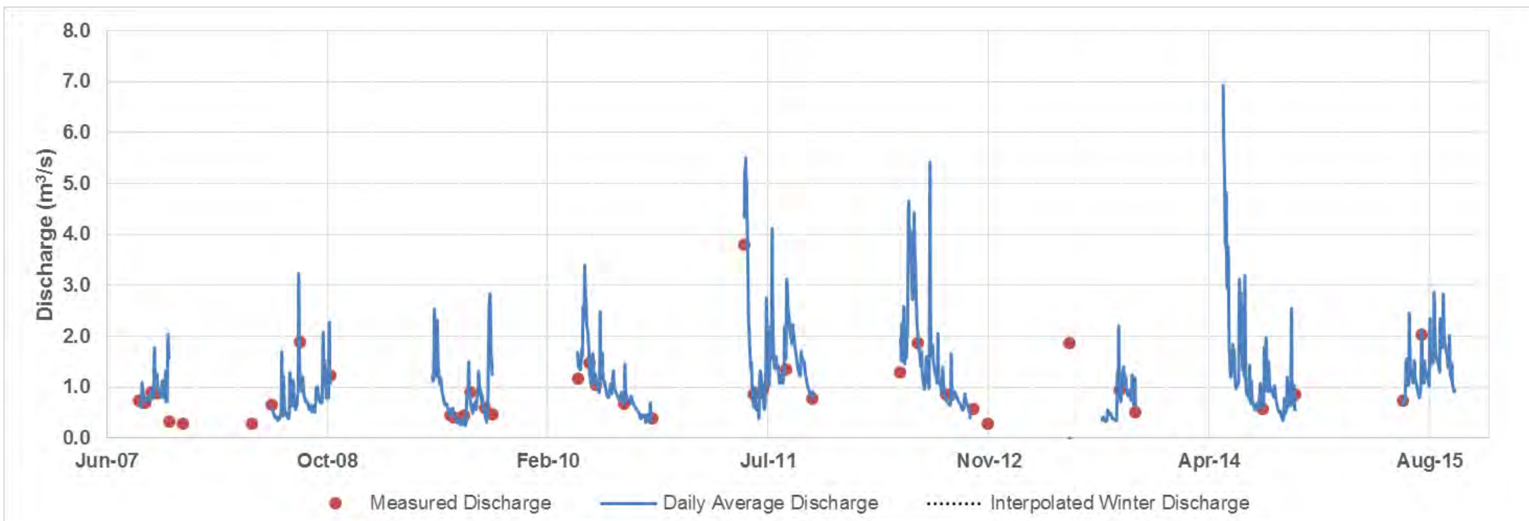


Figure 3-4: W5 Average daily discharge record (2007 to 2015)

3.3 Project Site Synthetic Streamflow Records

The hydrometric monitoring network at the Project site has been in operation since 2007, and provides a high-quality dataset quantifying the timing, variability and magnitude of streamflows. However, to effectively estimate recurrence intervals of key hydrologic parameters (*e.g.*, annual runoff, June-September $7Q_{10}$), longer duration datasets are required. To address this need, site discharge data were used, along with the discharge data from the Water Survey of Canada McQuesten River hydrometric station (09DD004), to generate synthetic daily discharge records for three site stations (W4, W5 and W6) for the period of 1979 to 2015 (37 years).

Appendix B.1 presents the methodology used to generate the synthetic streamflow records, plots of the paired daily streamflow data and comparisons between the synthetic and measured data. The resulting datasets provide a daily record of the expected intra- and inter-annual variability in streamflows at the Project site. These records were used to generate the various streamflow metrics (*e.g.*, annual runoff and low flow recurrence intervals) presented in Section 3.4.

3.4 Streamflow Statistics

3.4.1 Annual and Monthly Streamflow Distribution

The hydrology of the region is characterized by a dominant snowmelt driven freshet signature, which typically occurs between early May and early June. The recession limb of the freshet tapers to a lower summer flow regime reflective of primarily groundwater, which is punctuated by periodic rainfall driven runoff events, typically one to four days in duration. Base flows are lowest in the winter and flow sub-ice; in the smaller creeks groundwater is depleted and there is no flow under the ice.

In larger tributaries, groundwater discharge maintains limited amounts of streamflow below the ice throughout the winter (*i.e.*, November through end March). Aufeis (*i.e.*, groundwater that seeps and freezes onto- and adjacent to local watercourses) occurs sporadically across the Project site and melts during the freshet. A plot of average monthly runoff (Figure 3-5) shows the monthly distribution of discharge in the eight gauged creeks at the Project site, for the open water season.

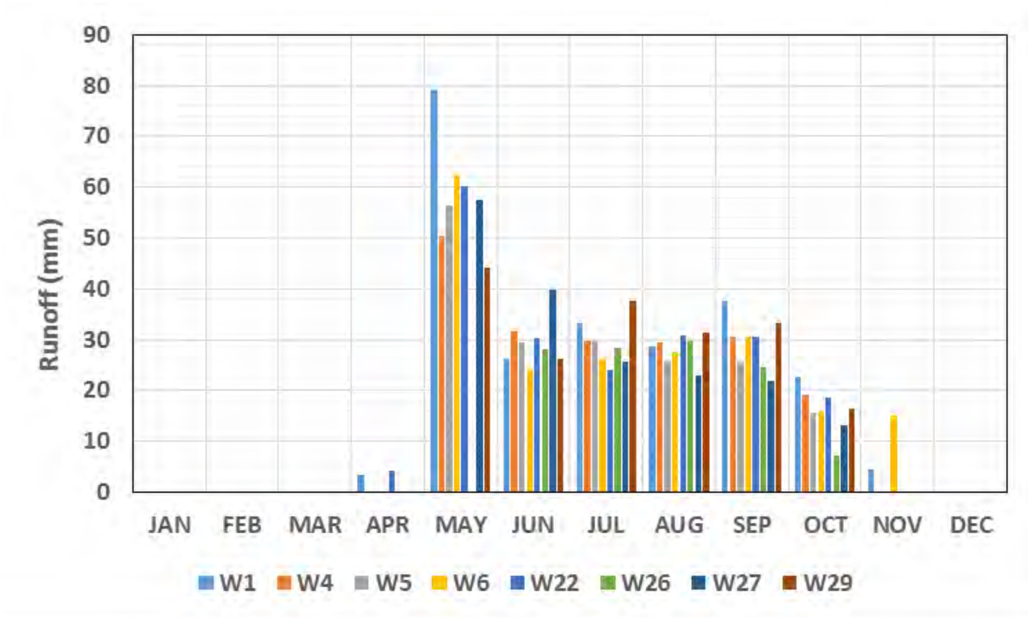


Figure 3-5: Average monthly runoff for Project site gauged basins, from the baseline period of record (2007 to 2015).

As noted in Section 3.2, the monthly unit runoff is quite similar across all Project basins. However, the gauged baseline dataset does not include winter low flows (due largely to the difficulty and measurement uncertainty associated with measuring discharge below ice), and so the synthetic discharge data were analysed to develop estimates of the monthly runoff as a proportion of the annual total. The results are presented in Figure 3-6. As also depicted in Figure 3-9, the highest proportion of the annual runoff total occurs in May as a result of the freshet, tapering throughout the summer and autumn to the annual low period from November to April. Depending on the drainage, the month of May accounts for 24% to 33% of the annual runoff total, with the months of November to April (inclusive) accounting for 13% to 20% of the annual total.

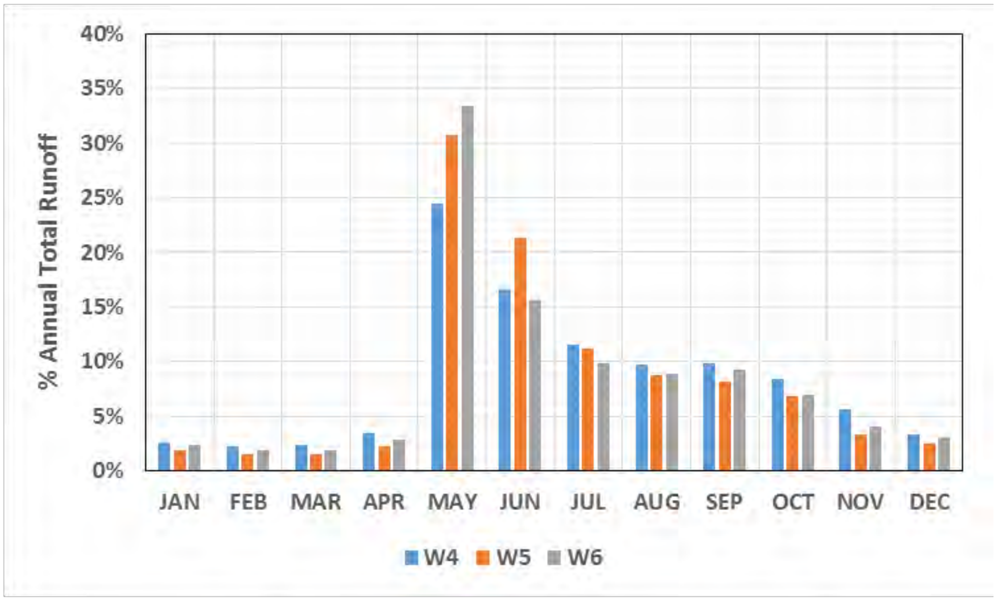


Figure 3-6: Average monthly runoff for Project site gauged basins, from the synthetic discharge record (1979 to 2015).

Similar to the precipitation estimates for extreme wet- and dry-years provided in Section 2.5.5, the synthetic discharge data were analysed to provide recurrence interval estimates for runoff in wet- and dry-years. The same process was followed as for the precipitation recurrence interval estimates, with the GEV distribution providing the best fit to the data, as determined by the Anderson-Darling test (*e.g.*, Meylan *et al.*, 2012). The results are summarised in Table 3-5 below.

Table 3-5:
Recurrence interval estimates for annual runoff at the Eagle Gold Project site. All values are in mm.

Exceedance Probability	Return Period	W4	W5	W6
		Generalized Extreme Value		
0.995	1:200 dry	148	148	153
0.99	1:100 dry	156	155	160
0.98	1:50 dry	164	163	169
0.96	1:25 dry	174	172	179
0.9	1:10 dry	191	188	196
0.5	1:2 (median)	247	243	255
0.1	1:10 wet	322	324	342
0.04	1:25 wet	354	362	384
0.02	1:50 wet	377	390	414
0.01	1:100 wet	397	416	442
0.005	1:200 wet	416	442	471

3.4.2 Peak Flow Recurrence Interval Estimates

A frequency analysis was carried out to estimate the recurrence of discharges of a particular magnitude for all regional hydrometric stations within a 100 km radius of the Project. In a frequency analysis, a time-series of annual flow events are viewed as being a set of events sampled from a population of all events that is infinitely long and therefore continuous. Continuous probability distributions (*e.g.,* Log Pearson 3, Generalized Extreme Value, Log Logistic 3P) are then fitted to the observations and future and/or extreme events (*e.g.,* 1:200 year flood) are estimated from best fitting probability distributions.

Annual time-series of instantaneous maximum discharge values from the regional stations listed in Table 3-6 were compiled. Where the instantaneous maximum value was missing, the maximum daily discharge for that year (assuming a complete record was available) was scaled by the average ratio of instantaneous to daily peak flow from the other years in the station record. This ratio ranged from 1.01 to 1.19. The final datasets were then input to the EasyFit Professional (v5.5) software and a range of distributions were fit. The Log Pearson (Type III) distribution was used for most stations, with the Log Logistic 3P distribution providing the best fit (using the Anderson-Darling test) for several of the smaller drainage basins.

Table 3-6:
Regional peak flow estimates – Eagle Gold Project. All values are in m3/s.

Station ID	Station Name	Drainage Area (km^2)	1:2 year	1:5 year	1:10 year	1:25 year	1:50 year	1:100 year	1:200 year
29DD002	Clear Creek above Barlow Creek	340	14	21	26	33	40	48	57
09DC003	Stewart River above Fraser Falls	30,600	2,144	2,748	3,145	3,644	4,016	4,390	4,767
09DB001	Beaver River Below Matson Creek	4,770	349	465	529	599	644	684	720
09DD004	McQuesten River near the Mouth	4,750	249	318	363	420	461	503	544
09EA004	North Klondike River near the Mouth	1,090	101	134	154	178	195	211	226
10MB004	Bonnet Plume River above Gillespie Creek	3,760	392	482	543	621	681	742	805

The values returned from the regional analysis of instantaneous peak flows were plotted against the drainage basin area, along with the maximum instantaneous measured discharges for the site stations (based on the 15-minute water level readings). These plots are presented in Figure 3-7. The available record from the site stations contains peak flows that range from 72 L/s/km^2 (W26) to 158 L/s/km^2 (W29). Station W1 has recorded a peak flow event of 192 L/s/km^2, but given the known channel instability at this site, lower confidence is placed in this value. Peak flow estimates were also informed by the discharge estimates for the freshet flooding event of May 29, 2013, provided by Laberge (2013). These estimates provide a range of 12 to 15 m^3/s for the W29 station (or 139 to 174 $L/s/km^2$).

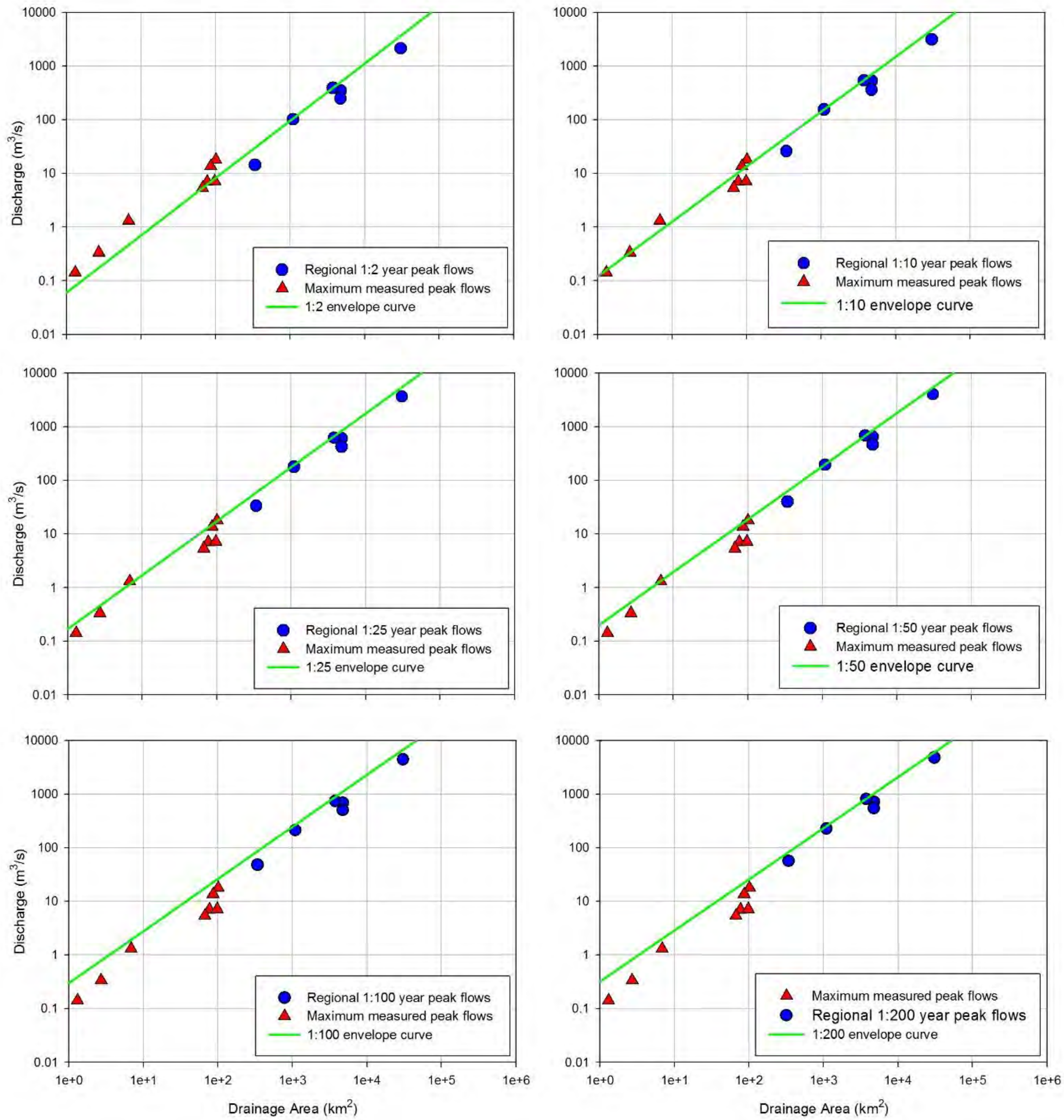


Figure 3-7: Peak flow estimates for regional stations (blue) and maximum recorded instantaneous site discharges (red). The envelope curve is depicted by the green line. Note that the y-axis is logarithmic.

The recurrence interval estimates of annual instantaneous peak flows from the regional stations were fitted with an enveloping power law function to set a reasonable upper bound for extrapolation of the regional values. The enveloping power law functions derived from the regional data for each recurrence interval (*e.g.*, 1:100 year peak flow) were used to estimate the corresponding peak flow for all Project drainages. These predicted values are provided in Table 3-7. The predictive equations derived from this exercise are as follows (where Q is discharge in L/s/km^2, and A is drainage area in km^2):

- 1:2 year: $Q = 60(A^{0.0679})$
- 1:10 year: $Q = 120(A^{0.0257})$
- 1:25 year: $Q = 170(A^{0.0048})$
- 1:50 year: $Q = 200(A^{-0.012})$
- 1:100 year: $Q = 300(A^{-0.029})$
- 1:200 year: $Q = 320(A^{-0.046})$

Table 3-7:
Instantaneous peak yield recurrence interval estimates for Project basins derived from regional analysis (L/s/km^2)

Station	Drainage Area (km^2)	1:2 year	1:10 year	1:25 year	1:50 year	1:100 year	1:200 year	Site Maximum Peak[2] Yield (L/s/km^2)
W1	6.8	68	126	172	195	284	293	192
W4	76.9	81	134	174	190	265	262	91
W5	97.5	82	135	174	189	263	259	73[3]
W6	100.9	82	135	174	189	262	259	178
W22	66.8	80	134	173	190	266	264	--[4]
W26	1.3	61	121	170	199	298	316	109[5]
W27	2.7	64	123	171	198	291	306	124
W29	86.1	81	135	174	190	264	261	158

Notes:
1. Recurrence interval estimates for site hydrometric stations are derived using the predictive equations based on regional peak flow data presented in Section 3.4.2.
2. Values are from monitoring data collected at Project site hydrometric stations.
3. The W5 record did not capture the 2013 freshet event, and the peak flow value is therefore biased low relative to the other stations.
4. There is considerable uncertainty associated with the peak flow value recorded at W22 in the 2013 freshet, thus it has been excluded from the comparison.
5. This value is based on a manual measurement made on May 19, 2011, which likely did not capture the actual instantaneous peak flow.

The estimates presented in Table 3-7 indicate that the maximum discharges measured during the baseline record period generally fall between a 1:10 and 1:50 year recurrence interval, depending on the drainage of interest. Several stations exhibit lower measured peak flow values (*e.g.*, W4, W5 and W26), which are due to incomplete monitoring records that don't include the largest events (*e.g.*, freshet of 2013), or larger uncertainty at the upper end of the rating curves.

3.4.3 7-Day Low Flow Recurrence Interval Estimates

3.4.3.1 7-Day Summer (June to September) Low Flows

As per the peak flow analysis, the same set of regional stations were assessed in a low flow analysis. To process datasets for the low flow analysis, daily discharge data from eight of the selected regional hydrometric stations were downloaded from the Water Survey of Canada data portal and seven-day rolling averages were computed from the daily discharge data. Next, annual minima time-series of the winter and June-September 7-day average low flows (7Q) were assembled for each station. These data were then exported to the EasyFit software for further evaluation.

Through an inspection of the statistics and ranking data output by EasyFit, no single probability distribution could be identified that consistently provided a best fit to the station observations of low flow. However, the Log Pearson 3 (LP3) was consistently in the top four of the highest ranked distributions for each hydrometric station inspected, based on the Anderson-Darling test results. The low flow values returned from this analysis are reported below in Table 3-8, noting that recurrence interval estimates were derived for the $7Q_2$ (median), $7Q_5$, $7Q_{10}$ and $7Q_{20}$ events.

Table 3-8:
June – September minimum 7-day low flow recurrence interval estimates for regional stations. Values are unit yields (L/s/km²).

Exceedance Probability	Return Period	Pelly R. at Pelly Crossing 09BC001	Stewart R. at Mayo 09DC002	Stewart R. abv. Fraser Falls 09DC003	Beaver R. blw. Matson Ck. 09DB001	McQuesten R. near the Mouth 09DD004	N. Klondike R. near the Mouth 09EA004	Little South Klondike R. blw. Ross Ck. 09EA005	Bonnet Plume R. abv. Gillespie Ck. 10MB004
	Basin Area (km^2)	48,900	31,600	30,600	4,770	4,750	1,090	860	3,760
0.5	1:2 (median)	7.13	9.87	9.98	11.27	5.96	10.1	5.02	9.83
0.2	1:5 dry	5.45	8.42	7.68	8.50	4.63	8.11	4.30	7.57
0.1	1:10 dry	4.67	7.74	6.52	7.06	4.06	7.15	3.84	6.65
0.05	1:20 dry	4.09	7.22	5.61	5.95	3.65	6.41	3.49	6.00

Note: Recurrence interval estimates for site hydrometric stations are derived from the Log-Pearson 3 distribution fit to the regional 7-day average streamflow data.

The same analysis was conducted for the three synthetic discharge records described in this report, and the results are presented below in Table 3-9. In summary, the June-September 7Q10 values derived from the site synthetic records are approximately half of those derived from the much larger regional hydrometric station network (2 to 3 L/s/km^2 and 4 to 8 L/s/km^2, respectively).

Table 3-9:
June- September summer low-flow estimates for the Eagle Gold Project site. All values are unit yields, in L/s/km^2.

Exceedance Probability	Return Period	W4	W5	W6
		Log-Pearson 3		
0.5	1:2 (median)	5.2	4.5	4.1
0.8	1:5 dry	3.1	3.3	2.5
0.9	1:10 dry	2.2	2.7	1.9
0.96	1:20 dry	1.5	2.4	1.4

3.4.3.2 7-Day Annual (Winter) Low Flows

The annual (winter) low flow estimates were not derived from the regional hydrometric stations as they were for the June-September values, because it was not possible to collect continuous hydrometric data at the Project site to verify the regional estimates. Instead, all available winter (October through April) spot flow measurements were collated for the entire nine year baseline study period, and averaged by month.

The results are presented in Table 3-10 below. Site data show that yields range from 6.5 – 9.2 L/s/km^2 in October, and decrease steadily to their annual minima by March (2.3 – 2.8 L/s/km^2), before increasing again in April in response to low-elevation snow melt and spring rainfall. Based on the site data alone, and taking the measurement uncertainty into account, winter low flows (where present) at the Project site are expected to be approximately 2 L/s/km^2.

Table 3-10:
Winter spot flow measurements presented as monthly averages for Project area hydrometric stations. Values are unit yields (L/s/km^2).

Station ID	W1	W4	W5	W6	W22	W26	W27	W29
Drainage Area (km^2)	6.8	76.9	97.5	100.9	66.8	1.3	2.7	86.1
JAN	--	*2.4*	--	--	*2.4*	--	--	--
FEB		2.5	--	--	*3.2*	--	--	*4.1*
MAR	2.8	*2.8*	--	*2.3*	2.6	--	2.6	*2.3*
APR	2.2	1.9	--	*3.3*	2.8	--	3.3	*2.3*
MAY	--	--	--	--	--	--	--	--
JUN	--	--	--	--	--	--	--	--
JUL	--	--	--	--	--	--	--	--
AUG	--	--	--	--	--	--	--	--
SEP	--	--	--	--	--	--	--	--
OCT	8.0	6.8	6.5	6.8	6.7	9.2	7.8	7.0
NOV	5.4	4.2	2.9	*2.7*	4.4	2.3	*1.5*	3.7
DEC	*5.3*	*3.2*	--	--	3.5	--	--	3.2

Notes:
[1] Values in italics indicate that only a single measurement for that month was available.

3.5 Climate Change and Trend Analysis

A detailed summary of the global climate models, projected climate change scenarios and data sources, as well as a regional trend analysis of several hydro-climatic variables with relevance to the Eagle Gold Mine is presented in Appendix C.

In summary, the Representative Concentration Pathway (RCP) 6.0 outputs project increases in air temperature from current conditions from about -3°C to an estimated values of -1°C by year 2050. Increases in temperature are predicted for all four seasons, noting the long-term predicted increase in air temperature is most pronounced for winter months. On an annual basis, RCP 6.0 projections indicate increases in total precipitation from current conditions at the Mayo A station (on the order of 325 mm/yr) to estimated values of 375 mm/yr by year 2050. Like air temperature predictions, increases in precipitation are predicted for all four seasons of the year, noting the long-term predicted increases are most apparent for summer (Jun, Jul and Aug) and autumn (Sep, Oct and Nov) seasons.

As outlined in Appendix C.2 of this report, a long-term- synthetic climate record was produced. This climate record was assembled by correlating site- and regional climate data for corresponding periods of record, then using the regional data to compute daily air temperature, precipitation, evaporation and sublimation for a 60+ year timeframe.

Finally, a trend analysis was undertaken using the Mayo A climate data, and the McQuesten River hydrometric data, to place the model projections in a local and historical context. The instrumental record for Yukon monitoring stations near the Project site indicates that recent conditions have been both warmer and wetter than historic conditions. While, the annual average air temperature over the period of site record (2008-2015) was only slightly warmer (-2.2°C) than the 1981-2010 normal (-2.3°C), the average annual precipitation was 16% higher over the site monitoring period (363.3 mm) than the normal period (312.4 mm).

4. Summary

4. Summary

This report presents an update of the hydro-meteorology report prepared by Knight-Piesold (2013). Site monitoring data presented in the updated Climate and Hydrology Baseline Reports (Lorax 2016a; 2016b) are summarized here, and extended using regional climate and streamflow data to generate daily synthetic records of temperature, precipitation and streamflow for Project site stations. The methodology used to generate these synthetic records is presented in Appendices A (Climate) and B (Streamflow). Appendix C presents a summary of climate change predictions and available projection data for the Project site, as well as a regional trend analysis of key climatic and hydrologic parameters to place the projections in a historical context.

The key climate and streamflow parameters of interest for Project design and permitting are as follows:

Climate (at 1,125 m asl)

Mean Annual Temperature	-3.7°C
Mean Annual Precipitation	472 mm (52% rain/48% snow)
Annual potential evapotranspiration	380 mm
1:100 year 24-hour rainfall	54 mm

These climatic parameters can be adjusted to various elevations at the Project site using the month specific lapse rates presented in Table A.1-2 (Appendix A) for temperature, and an orographic lapse rate of +11%/100 m for winter precipitation (October to March) and +4%/100 m for summer precipitation (April to September).

Streamflow

1:100 dry-year runoff (W4)	156 mm
1:2 year (median) runoff (W4)	247 mm
1:100 wet-year runoff (W4)	397 mm
1:2 year peak flow (W4)	81 (L/s/km^2); 6.2 m^3/s
1:100 year peak flow (W4)	265 (L/s/km^2); 20.4 m^3/s
June – September $7Q_{10}$ (W4)	2.2 L/s/km^2

5. Closure

5. Closure

We trust that this report meets your expectations at this time. Please contact the undersigned with any questions or comments.

Sincerely,

LORAX ENVIRONMENTAL SERVICES LTD.

Prepared by:

Colin Fraser, M.Sc., P.Geo.
Senior Hydrologist

Scott Jackson, M.Sc., P.Geo.
Hydrologist

References

Victoria
GOLD CORP

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Appendix A: Synthetic Climate Record Development

Appendix A: Synthetic Climate Record Development

The climate data collected on site since 2007 provides essential input to both the Eagle Gold Project (Project) heap leach water balance model and the site-wide water balance, and is used to characterize long-term climate at the Project site. However, while the site climate record spans almost a decade, the current mine plan, including the closure and post-closure phases, spans a much-longer period. Therefore, a synthetic historical site climate record from the Camp and Potato Hills climate stations was extended back in time based on the Mayo A climate station data.

The synthetic daily air temperature series was estimated using month and parameter specific lapse rates, which accounted for the seasonal variation in lapse rates. The daily synthetic precipitation record was estimated by adjusting the Mayo A precipitation data using orographic gradients that are consistent with regional and site data. The regional and site snow course data were used as an additional check on the winter precipitation accumulations. The final daily synthetic climate series span the period of 1948 to 2015, and were produced for the Camp climate station elevation (782 m), the mid-point elevation (1,125 m) of the Haggart Creek basin (above station W4) and the Potato Hills climate station elevation (1,420 m).

A1.1 Daily Synthetic Climate Record Development

A1.1.1 Temperature

The available daily climate record for the Mayo A station was used for the period 1948 to 2016. This record has very few gaps – most were single days, which were infilled using the average of the preceding and following days. As described in Lorax (2016a), the extended gaps, (13 months in total, 9 of them in 1995 (April to December)) were infilled using predictive equations based on the relationship with temperature data collected at the Pelly Ranch climate station (120 km southwest of Mayo).

To generate the synthetic temperature record for the Camp station elevation (782 m), daily data for the overlapping record period were plotted, and regression relationships developed for each month, and each temperature variable (*i.e.*, daily, maximum, minimum and average temperature). Due to the long climate record, this means that each month (and parameter) specific equation is based on approximately 300 data points, providing confidence in the predictive power of these relationships. Note that the daily maximum and minimum temperatures are based on the 15-minute readings from both stations. The regression relationships are presented in Table A.1-1.

Table A.1-1:
Regression equations for Mayo A to Camp station air temperature.

	Mayo to Camp Relationship - Air Temperature		
Month	**Max_T**	**Min_T**	**Mean_T**
Jan	y = 0.805x - 2.5407	y = 0.8009x - 3.8021	y = 0.8485x - 2.2593
	R^2 = 0.90	R^2 = 0.86	R^2 = 0.91
Feb	y = 0.8163x - 1.8675	y = 0.7844x - 5.0531	y = 0.8902x - 2.4158
	R^2 = 0.90	R^2 = 0.84	R^2 = 0.92
Mar	y = 0.9101x - 1.7054	y = 0.8151x - 5.6403	y = 0.9276x - 2.8817
	R^2 = 0.94	R^2 = 0.84	R^2 = 0.94
Apr	y = 0.9813x - 2.7871	y = 1.1751x - 3.1055	y = 1.0868x - 3.0313
	R^2 = 0.95	R^2 = 0.86	R^2 = 0.94
May	y = 1.0298x - 3.8961	y = 0.7413x - 2.5049	y = 0.9774x - 2.3914
	R^2 = 0.98	R^2 = 0.69	R^2 = 0.93
Jun	y = 0.9853x - 2.4728	y = 0.7784x - 1.525	y = 0.8932x - 0.78
	R^2 = 0.91	R^2 = 0.62	R^2 = 0.84
Jul	y = 0.8951x - 0.5272	y = 0.7848x - 1.2589	y = 0.8283x + 0.108
	R^2 = 0.86	R^2 = 0.53	R^2 = 0.71
Aug	y = 0.9461x - 1.8259	y = 0.7907x - 1.6627	y = 0.9351x - 2.0462
	R^2 = 0.93	R^2 = 0.62	R^2 = 0.86
Sep	y = 0.9501x - 1.9282	y = 0.83x - 2.2457	y = 0.9168x - 2.0529
	R^2 = 0.93	R^2 = 0.71	R^2 = 0.89
Oct	y = 0.9236x - 1.6005	y = 1.0947x - 2.9106	y = 1.0016x - 2.5198
	R^2 = 0.89	R^2 = 0.69	R^2 = 0.85
Nov	y = 0.865x - 2.5182	y = 0.8226x - 4.916	y = 0.8977x - 2.5578
	R^2 = 0.90	R^2 = 0.82	R^2 = 0.89
Dec	y = 0.7753x - 4.098	y = 0.7557x - 4.9816	y = 0.8164x - 3.2141
	R^2 = 0.88	R^2 = 0.82	R^2 = 0.88

An attempt was made to estimate air temperatures at the Potato Hills station using the same methodology, but the frequent occurrence of inversions during the winter resulted in weak relationships. Therefore, the average lapse rates were calculated using the site data for each parameter and month, and these lapse rates were then applied to the synthetic record for the Camp station (Table A.1-2).

Table A.1-2:
Average air temperature lapse rates (°C/100 m) between the Camp and Potato Hills climate stations.

Month	Max_T	Min_T	Mean_T
Jan	0.5	1.2	0.9
Feb	-0.2	0.9	0.4
Mar	-0.7	0.6	-0.1
Apr	-0.7	0.0	-0.5
May	-0.8	0.5	-0.2
Jun	-0.1	0.2	-0.2
Jul	-0.3	0.2	-0.2
Aug	-0.3	0.1	0.0
Sep	0.7	-0.4	-0.2
Oct	-0.6	0.0	-0.3
Nov	0.2	0.8	0.5
Dec	0.5	0.9	0.6

The results of this record extension exercise are presented in Figure A.1-1 for the Camp station, and in Figure A.1-2 for the Potato Hills station. These figures show the average monthly values for the baseline and synthetic data, for the overlapping period of record.

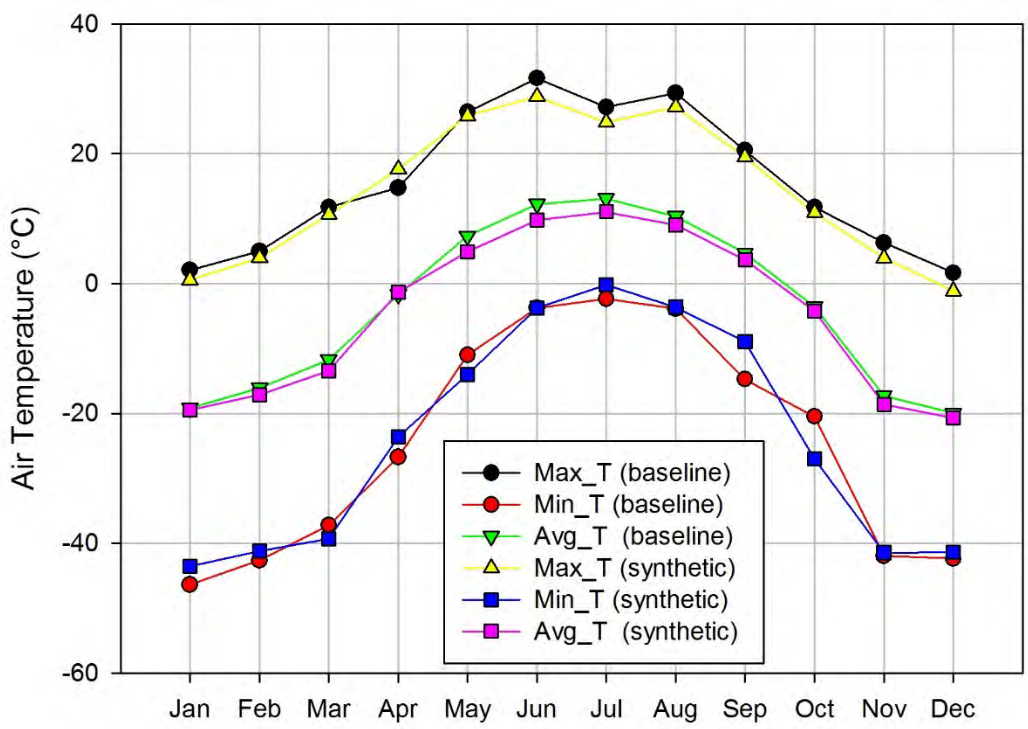


Figure A.1-1: Camp station baseline and synthetic average monthly air temperatures, for the period 2009-2015.

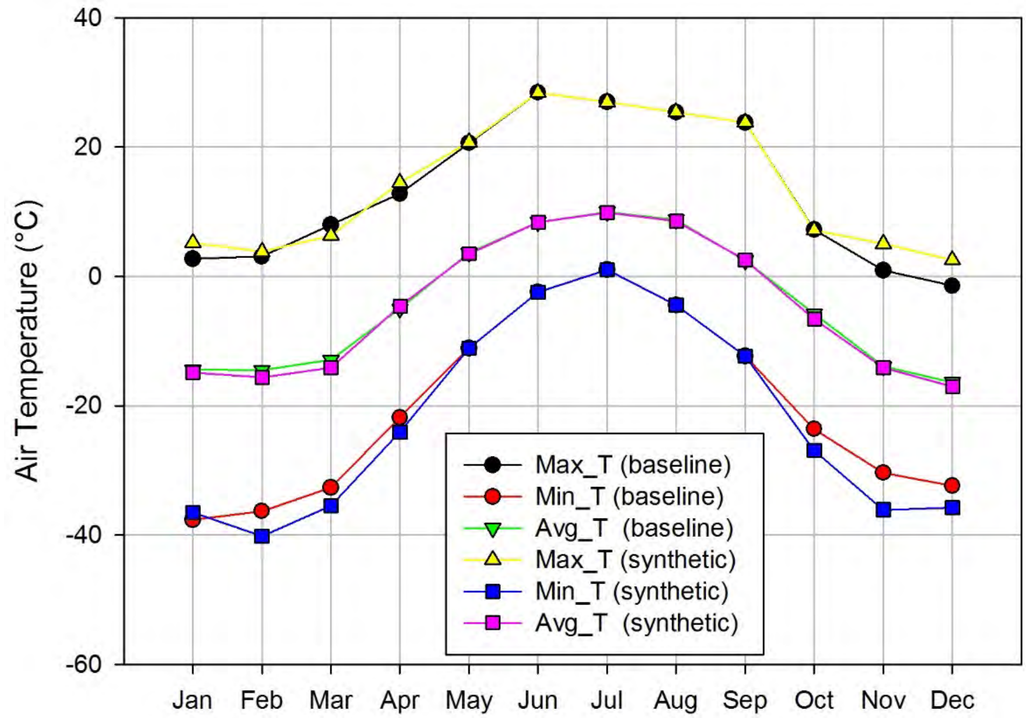


Figure A.1-2: Potato Hills station baseline and synthetic average monthly air temperatures, for the period 2007-2015.

A1.1.2 Precipitation

The synthetic precipitation record is also based on the Mayo A record, and in a similar fashion to the temperature estimates, is also based on an elevational relationship between the site stations and the Mayo A data.

A1.1.2.1 Methods

The months of October to March (inclusive) were used to represent precipitation falling as snow, and the months of April to September for rainfall. Note that both April and October can experience precipitation in both solid and liquid phase, but given that April typically only accounts for 3% of the total annual precipitation, the phase matters relatively little for this month. From the information presented in Figure 2-4, October accounts for 9% of the annual total, with a 31%/69% split between rainfall and snowfall at the Mayo A station. At the Keno Hill station, which is located at a similar elevation to the Potato Hills station, the split is 5% rain and 95% snow for the month of October, and the annual split is 48% rain and 52% snow. Therefore, the assumption that precipitation in October is predominantly snow is supported by the regional long-term data.

A1.1.2.2 Rainfall

All orographic gradients were calculated by applying Equation 1 from the UBC Watershed Model Manual (Quick *et al.*, 1995) to the average differential between summer rainfall totals and end-of-winter snow water equivalent (SWE) values for the two stations being compared. For reference, rainfall and snowfall measured at the regional climate stations considered in this analysis are presented in Figures A.1-3 and A.1-4, respectively.

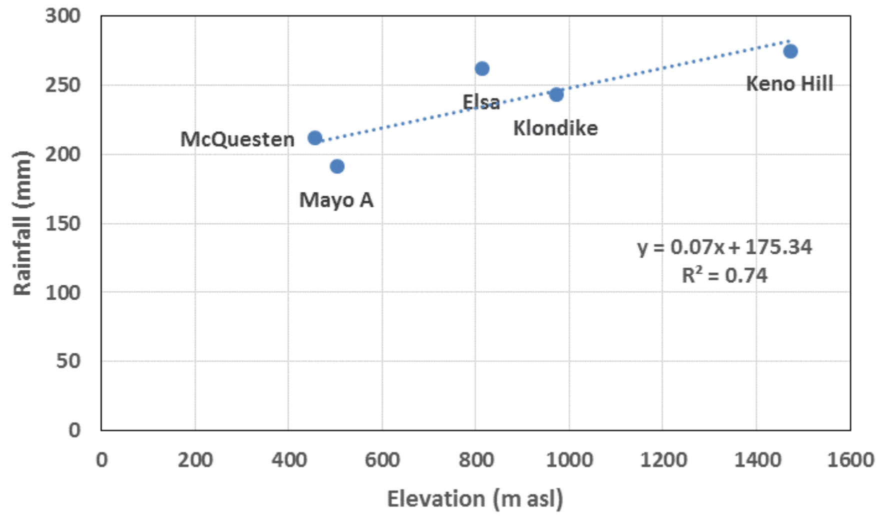


Figure A.1-3: Regional relationship of average annual rainfall totals to climate station elevation.

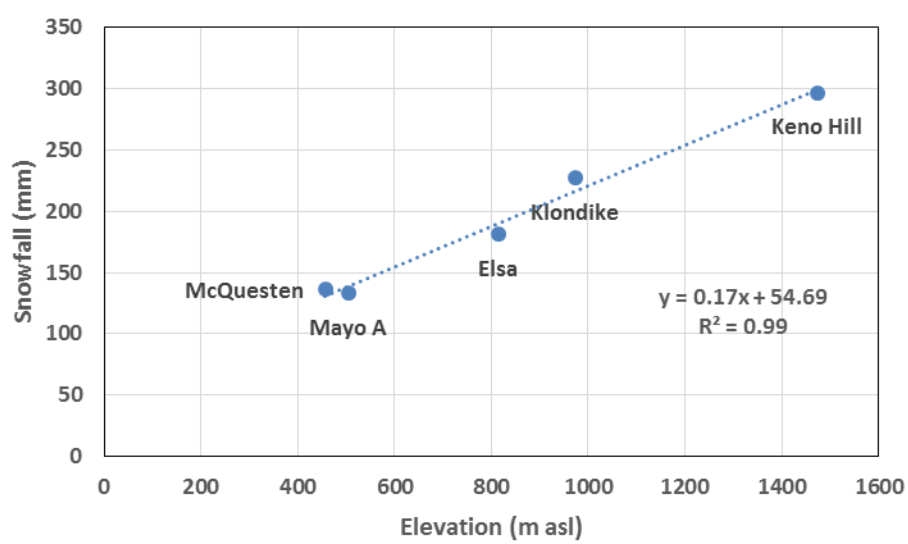


Figure A.1-4: Regional relationship of average annual snowfall totals to climate station elevation.

Rearranged to calculate precipitation at the reference elevation:

$$P_2 = P_1(1 + a)^{\frac{\Delta elev}{100}} \qquad \text{[Equation 2]}$$

To generate daily estimates of precipitation for the Project site, the Mayo A record was scaled to the desired elevations using Equation 2 and the orographic gradients noted in the regional records. The orographic gradient for rainfall was adjusted downward slightly to 4%/100 m to better match the site monitoring data.

A1.1.2.3 Number of days with rain

An estimate of the number of days in each month that experience rainfall during the summer season is required as an input to the heap leach water balance model. To confirm that the synthetic data (based on the Mayo A record) are capable of accurately representing the frequency of rain events at the Project site, the three datasets (Mayo A, Camp and Potato Hills stations) were compared for the overlapping period of record. The results are shown in Figure A.1-5 below. In general, the synthetic data based on the Mayo A record accurately represents the proportion of days in each month at site that experience rain. There is divergence between the site stations and Mayo A in the month of October (for Potato Hills data in particular), as the higher elevation station will receive precipitation as snow, while the lower elevations are still receiving rain.

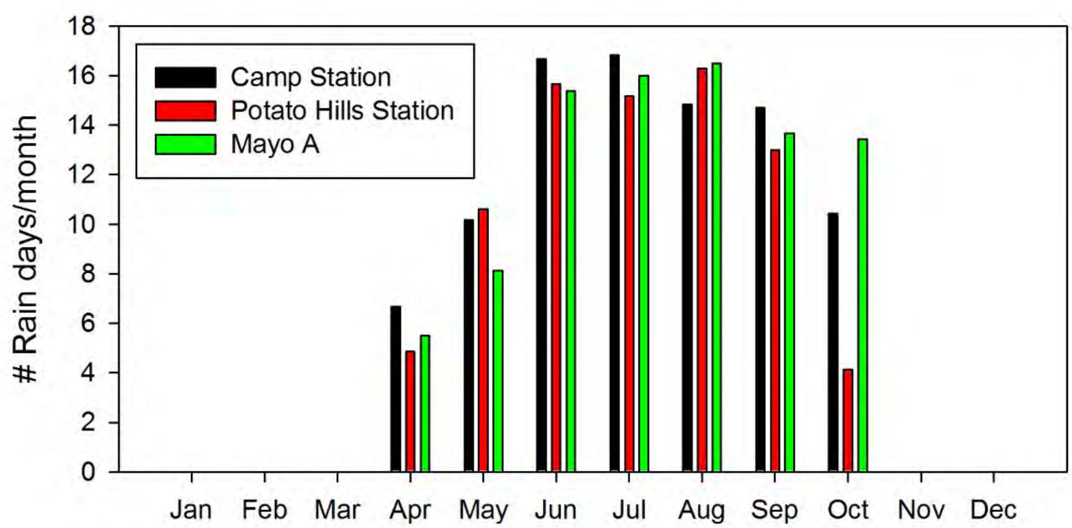


Figure A.1-5: Average number of days with rainfall (2009-2015).

A1.1.2.4 Snowfall

The rain gauges installed at the Project site are not equipped with snowfall adaptors, and thus do not record snowfall. Therefore, the snow water equivalent (SWE) data collected at the site snow surveys were used to calibrate the winter precipitation estimates. These snow course measurements have been carried out at or near both climate stations since 2009 (with the exception of 2015). In addition, data from several regional snow surveys were included in the assessment, mainly to aid in the confirmation of elevational gradients in winter precipitation totals (Table A.1-3).

Table A.1-3:
Maximum annual SWE (in mm) from Project site and Mayo A snow courses and annual orographic gradients.

Year	Mayo A SWE	Camp SWE	Potato Hills SWE	Gradients		
	540 m	782 m	1420 m	Potato:Camp	Potato:Mayo	Average
2009	128	112	410	23%	14%	18%
2010	--	99	278	18%	--	18%
2011[1]	90	93	251	17%	12%	15%
2012	144	160	262	8%	7%	8%
2013[1]	129	108	190	9%	4%	7%
2014	123	126	276	13%	10%	11%
2016[1]	113	140	257	10%	10%	10%
Average	108	120	275	14%	10%	12%

Notes:
[1]Annual maximum SWE measurement taken from the March 1st snow survey, otherwise values are from the April 1st survey.

Based on the regional April 1 SWE data, the orographic gradient for winter precipitation at the Project site was calculated as 10%/100 m, which matches the gradient calculated from the regional snowfall data presented in Figure 2-6.

The overall average gradient for the relatively short period of record is 13%, however, this value is skewed higher by the measurements made in 2009. This survey was conducted on April 21st, and data collected at the Camp station in the following years indicate that snowmelt is well advanced at the lower elevations by this time. Therefore, the 2009 gradient is presumably higher than would be expected if the survey had been conducted at the end of March, which is when the annual maximum SWE is typically realized at valley bottom. Therefore, if this measurement is excluded, the winter precipitation gradient at the Project site is estimated to be 11%/100 m.

This gradient was applied to the Mayo A data to estimate the winter snowfall, and assuming only snowfall during the same winter period, winter precipitation for the Project site. Given the importance of the snowpack water content to the annual water balance, several converging lines of evidence were used to calibrate the winter precipitation estimates.

First, the April 1 SWE data from the Mayo A snow course were compared to the data collected at the Camp station. The values were found to correlate with a 1:1 relationship over the period of record. Thus, the Mayo A SWE data were assumed to provide a reasonable representation of snowpack conditions at the Camp station, and this record was used as a calibration benchmark for the synthetic precipitation series.

A1.1.3 Sublimation

In order to constrain the long-term estimates of winter precipitation for the Project site, the data from the site snow courses were employed. However, the water content of the snowpack will be lower than the winter precipitation total due to sublimation losses over the prior months. Assuming that mid-winter melt events are infrequent and of low-magnitude, these sublimation losses must be accounted for when derived an estimate of total winter precipitation.

Sublimation is the process whereby water changes phase from solid to vapour, without first passing through the liquid phase. Sublimation typically occurs directly from the snow surface (Cline, 1997), and can be accelerated during blowing snow events, where the time and surface area exposure of a snow particle is greatly increased (Pomeroy and Gray, 1995), or from snow intercepted by a canopy (Pomeroy *et al*. 1998). The Wolf Creek Research Basin provides the nearest and most representative detailed information on the expected sublimation losses at the Project site. Pomeroy *et al*. (1999b) report that seasonal sublimation from the boreal forest study site ranged from 38% to 45% of the total snowfall, or 28 to 45 mm over the winter season, depending on the year. Note that the total annual snowfall at this site ranged from approximately 75 mm to 100 mm for the period studied, which is slightly lower than the average April 1st measured SWE (120 mm) at the Camp station. These values are higher than the estimated loss of 20% provided by Knight Piésold (2013), but are within the range of published values for sub-arctic climates.

To constrain the range of potential sublimation rates that may be experienced at the Project site, findings from the Wolf Creek Research basin were compiled for various representative elevations and vegetation types (Table A.1-4). When integrated on a seasonal basis (*i.e.*, winter; October to March, inclusive), sublimation rates range from 0.14 to 0.32 mm/day. Higher rates were noted during the snowmelt period, which typically lasts from 10 to 35 days, depending on the antecedent snowpack, annual climatic conditions and slope aspect. The sublimation rates noted during the melt period ranged from 0.35 to 1.08 mm/day.

Table A.1-4:
Summary of sublimation values from Wolf Creek Research Basin.

Study	Location	Site Type	Sublimation Rate (mm/day)	Representative Season
Janowicz *et al.* (2004)	Wolf Creek, YT	Boreal Forest[1]	0.14	Winter
Janowicz *et al.* (1995)	Wolf Creek, YT	East Slope	0.67	Snowmelt
Janowicz *et al.* (1995)	Wolf Creek, YT	West Slope	1.08	Snowmelt
Janowicz *et al.* (1995)	Wolf Creek, YT	North Slope	0.53	Snowmelt
Janowicz *et al.* (1995)	Wolf Creek, YT	South Slope	0.50	Snowmelt
Janowicz *et al.* (1995)	Wolf Creek, YT	Boreal Forest[1]	0.32	Winter
Pomeroy *et al.* (1999b)	Wolf Creek, YT	Boreal Forest[1]	0.15	Winter
Pomeroy *et al.* (1999b)	Wolf Creek, YT	Boreal Forest[1]	0.25	Winter
Pomeroy *et al.* (2006)	Wolf Creek, YT	Sub-alpine shrub[2]	0.35	Snowmelt
Pomeroy *et al.* (2006)	Wolf Creek, YT	Sub-alpine shrub[2]	0.58	Snowmelt
		Minimum	0.14	
		Mean	0.46	
		Maximum	1.08	

Notes:
1. The boreal forest site is located at 750 m asl.
2. The sub-alpine shrub study site is located at 1,250 m asl.

These rates translate to a range of potential total snowpack losses due to sublimation:

- Winter season – 26 to 58 mm
- Snowmelt period – 5 to 38 mm

Note that Pomeroy and Essery (1999a) describe sublimation rates as high as 2 mm/day in response to high wind events, which result in suspension and saltation of the snow crystals. However, these events are episodic, and while they almost certainly occur at the Project site (particularly at the higher elevations, where fetch lengths are greater, wind speeds higher, and roughness lengths are larger), assuming a constant loss rate of 2 mm/day for the duration of the winter season would result in unrealistically high sublimation losses.

The winter values were carried forward to estimate to potential total winter precipitation (P) as a function of average measured April 1st SWE (Table A.1-5) and potential sublimation losses (S).

$$P = SWE + S \qquad \text{[Equation 3]}$$

For the Camp station, this results in an estimated average winter snowfall (P) of 146 to 178 mm, and 272 to 304 mm for the Potato Hills station. This implies that sublimation losses can range from 10% to 33% of the total annual snowfall at the Project site, with an average of 20% of the total annual snowfall lost to sublimation. This value is consistent with the estimates presented previously by Knight Piésold (2013) and Stantec (2011), and the findings of Janowicz *et al.* (2004).

The Mayo A SWE data were compared to the October – March precipitation totals calculated from the Adjusted and Homogenized Canadian Climate Data (AHCCD, 2016) record for the Mayo A climate station. This data set is publicly available, and applies correction factors to the winter precipitation data to account for gauge under catch due to wind effects (see Yang *et al.*, 2005). Thus, the AHCCD winter precipitation values will be higher than those published in the daily precipitation archive. For the period of record that overlaps with the Mayo A snow course (1968 – 2012), the AHCCD record shows snowfall totals that are 36 mm higher than the corresponding SWE value, on average. This suggests that approximately 30% of the winter snowfall is lost to sublimation at this station.

A1.1.3.1 Site Winter Precipitation Estimates

Following this, the estimated winter precipitation totals were adjusted to account for sublimation losses. In this instance, it was assumed that 20% of winter precipitation is lost to sublimation, which given the information gleaned from the Mayo A data, may be slightly underestimating sublimation losses, and therefore, overestimating the volume of water contained in the snowpack that is available for melt. This is considered to be a conservative assumption from the perspective of the site water balance, and the potential volumes of water that may need to be managed during the freshet season.

The third step required that a long-term data set be used to calibrate the synthetic time-series of winter precipitation for the Potato Hills station. The nearby Calumet snow course is located 25 km southeast of the Project site at an elevation of 1310 m, and spans the period of 1975 to present, providing a reasonable surrogate for snowpack conditions at higher elevations.

The results of this calibration effort for snow accumulation are presented in Table A.1-5.

Overall, the synthetic daily climate record matches the regional and site April 1st SWE measurements very well, providing a high level of confidence in synthetic dataset representativeness of long-term variability in snowpack at the Project site. The final synthetic precipitation estimates are presented as monthly averages in Table A.1-6.

Table A.1-5:
Scaled regional, synthetic and site measurements of winter precipitation totals. All values represent the snow water equivalent as of April 1.

Dataset	full record (1975 - 2016)		overlap (2009 - 2014, 2016)	
	mean	median	mean	median
Camp Station				
Long-term estimate[1]	99	102	108	120
Site measurements[2]	120	112	120	112
Synthetic Oct-Apr total[3]	153	142	153	152
Synthetic minus sublimation[4]	115	113	123	122
Potato Hills Station				
Long-term estimate[5]	221	209	221	209
Site measurements[2]	246	260	246	260
Synthetic Oct-Apr total[3]	281	276	306	302
Synthetic minus sublimation[4]	225	220	245	241

Notes:
[1]Based on the Mayo A snow course record.
[2]Values are the same for both periods.
[3]Based on the daily synthetic precipitation record generated for this station.
[4]Synthetic Oct-Apr total precipitation, adjusted downward by 20% to account for sublimation losses.
[5]Based on the Calumet snow course record, scaled by 11%/100 m to an elevation of 1420 m.

Table A.1-6:
Monthly average synthetic precipitation estimates for the three reference elevations at the Eagle Gold Project site.

	Camp	% MAP	Mid-point	% MAP	Potato Hills	% MAP
Elevation (m)	728		1125		1420	
Jan	25.6	7%	36.7	8%	49.9	9%
Feb	18.8	5%	27.0	6%	36.7	6%
Mar	12.7	3%	18.1	4%	24.6	4%
Apr	9.0	2%	10.3	2%	11.5	2%
May	23.4	6%	26.8	6%	30.1	5%
Jun	42.3	11%	48.4	10%	54.3	9%
Jul	59.2	16%	67.7	14%	76.0	13%
Aug	50.8	14%	58.1	12%	65.2	11%
Sep	38.8	10%	44.4	9%	49.8	9%
Oct	35.5	9%	50.8	11%	69.1	12%
Nov	30.4	8%	43.4	9%	59.1	10%
Dec	28.2	8%	40.3	9%	54.9	9%
MAP	374.6		471.9		581.2	
Rain	214.4	57%	245.3	52%	275.4	47%
Snow	160.2	43%	226.6	48%	305.8	53%

A1.1.4 Potential Evaporation

Hourly potential evaporation (PE) rates were computed using Camp weather station data and the Ref-ET calculator - a compiled, stand-alone computer program that calculates reference evapotranspiration (ASCE, 2005). For the period of available record, an hourly climate input file was prepared from the Camp weather station database. The input variables required by Ref-ET are: air temperature, relative humidity, incoming solar radiation, atmospheric pressure and wind speed.

From the assembled climate inputs, Ref-ET returned potential evaporation (PE) computations at hourly and daily time-step based on an array of evaporation models (*e.g.*, Penman-Monteith model, Priestley-Taylor formulation). To generate a long-term synthetic PE record, daily PE *vs*. daily temperature (Max_T, Min_T and Mean_T) relationships were evaluated, with maximum daily temperature providing the best predictor of potential evaporation rates (Figure). This relationship was then used to estimate the long-term daily PE for the three reference elevations at the Project site. Note that sublimation losses from the snowpack are not included in the monthly PE estimates provided here. Instead, sublimation has been considered during the development of the winter precipitation estimates, as discussed in Section 1.1.2.4.

Maximum air temperature (Max_T) was converted to a potential evapotranspiration time-series for three stations at the VIT Eagle Gold site: Camp, mid-point elevation (1,125 m) and the Potato Hills station, using the polynomial regression equation:

$$PE(Max_T) = 2.965(Max_T)^3 + 0.0026(Max_T)^2 + 0.066(Max_T) + 0.461 \qquad \text{[Equation 4]}$$

The PE estimates generated with this equation were then imported into GoldSim where a random offset was generated in an attempt to match the scatter seen in the data.

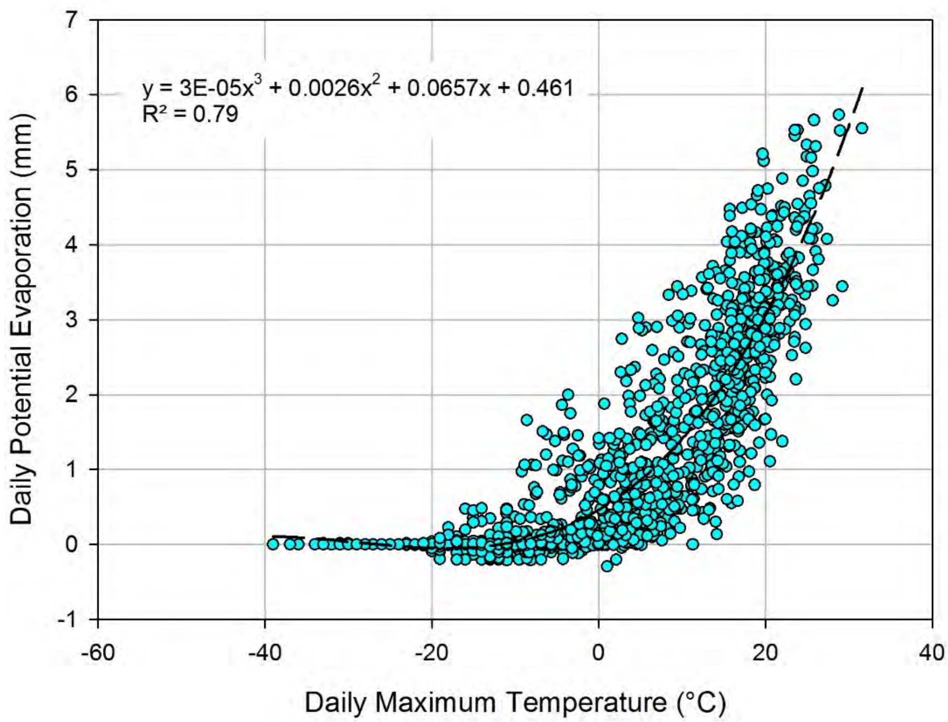


Figure A.1-6: Relationship between daily potential evaporation (Priestly-Taylor formulation) and maximum daily temperature at the Camp weather station.

To replicate the scatter about the line of best fit, the residual errors were calculated, and a normal distribution fit to the residuals, with upper and lower cutoff. The normal distribution had a slight positive skew, and was then added to the calculated PE to better represent observed conditions (Figure A.1-7).

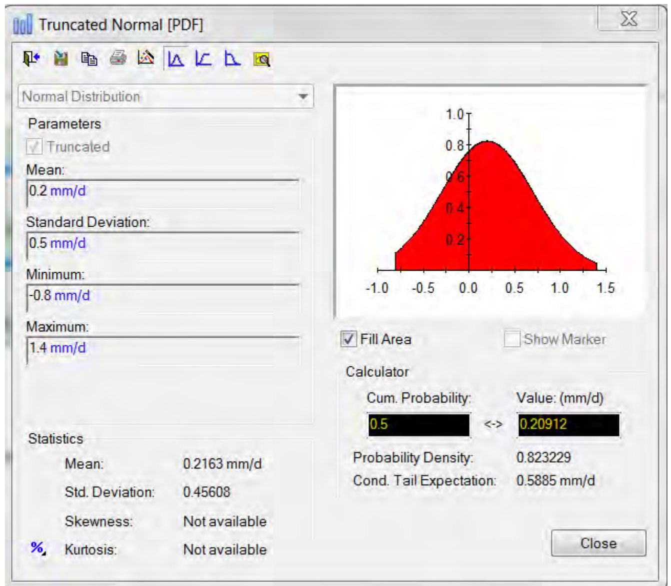
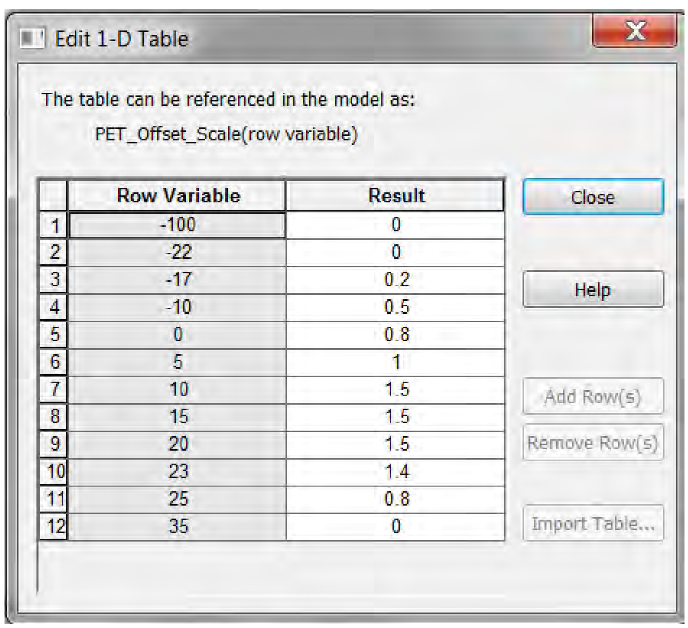


Figure A.1-7: Truncated Normal distribution (non-zero offset) used to generate the first approximation of scatter.

Table A.1-7:
Temperature-dependent scale factor applied to PE in GoldSim.



Edit 1-D Table

The table can be referenced in the model as:

PET_Offset_Scale(row variable)

	Row Variable	Result
1	-100	0
2	-22	0
3	-17	0.2
4	-10	0.5
5	0	0.8
6	5	1
7	10	1.5
8	15	1.5
9	20	1.5
10	23	1.4
11	25	0.8
12	35	0

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Then, a temperature dependent scale factor was applied to account for the lower magnitude of scatter at lower temperatures (see Table A.1-7). Finally, a monthly offset was applied to account for early-season underestimates of PE. This positive offset is a surrogate for the increased influence of longer day lengths, and therefore, increased solar radiation available to drive PE in April and May (see Table A.1-8). Conversely, the offsets are negative for the months of August through October to account for reduced solar radiation inputs.

Table A.1-8:
Monthly offset applied to PE in GoldSim.

Edit 1-D Table

The table can be referenced in the model as:
PET_Monthly_Offset(row variable)

	Row Variable	Result [mm/d]
1	1	0
2	2	0
3	3	0
4	4	0.3
5	5	0.6
6	6	0
7	7	0
8	8	-0.2
9	9	-0.2
10	10	-0.2
11	11	0
12	12	0

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Import Table...

The GoldSim-generated PE was integrated for the 2012 to 2015 period and compared to the PE estimates generated by the Ref-ET program. The 2015 comparison is shown below in Figure A.1-8 (Option 1 is the internal name for the regression that was used, Option 2 was not used). Based on the success of this approach for 2013, 2014 and 2015, a daily record was hind casted in GoldSim using 1948 to 2016 daily maximum temperature values. The final results are presented in Table A.1-9.

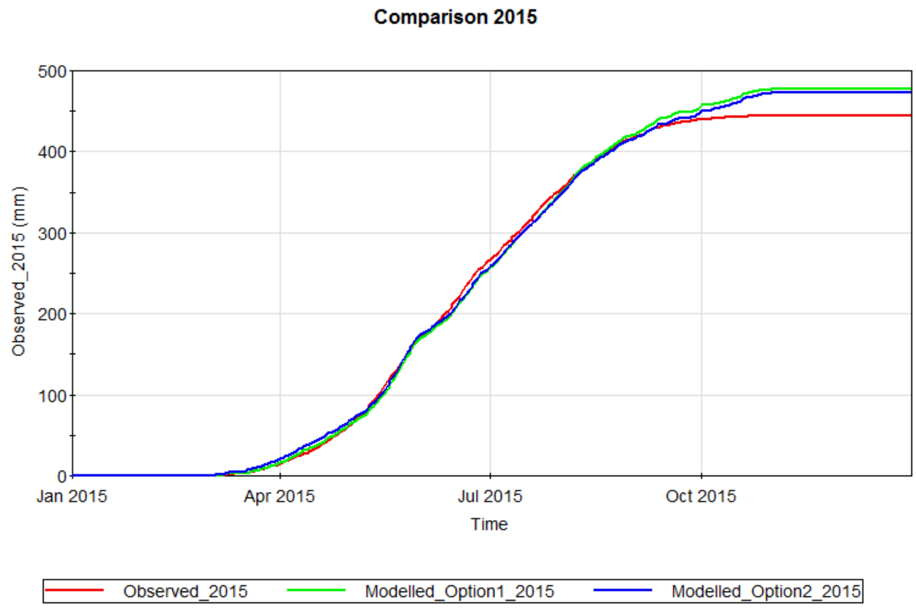

Figure A.1-8: Cumulative PE estimates derived with Ref-ET (Observed_2015), and from the daily maximum temperature records (Option1), for 2015.

Table A.1-9:
Comparison of measured and long-term synthetic estimate of potential evaporation. All values are in mm.

Month	Camp PE	1125 m	Potato PE	Camp Baseline (Penman-Monteith)	Camp Baseline (Priestly-Taylor)
Jan	-	-	-	-	-
Feb	-	-	-	-	-
Mar	12.3	7.6	4.8	30.0	17.0
Apr	41.2	33.1	27.0	45.0	44.0
May	82.6	70.4	61.0	94.0	92.0
Jun	90.6	71.2	56.5	103.0	103.0
Jul	97.3	75.8	59.7	90.0	93.0
Aug	78.0	60.4	46.9	65.0	65.0
Sep	43.6	34.5	27.6	31.0	25.0
Oct	17.2	12.0	9.0	7.0	4.0
Nov	-	-	-	-	-
Dec	-	-	-	-	-
Total	**482.8**	**380.4**	**305.1**	**P-M**	**PT**
Mar-Oct	**462.8**	**365.0**	**292.6**	**465.0**	**443.0**
May-Sep	**392.1**	**312.3**	**251.7**	**383.0**	**378.0**

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Appendix B:
Synthetic flow series for the Eagle Gold Project

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Appendix B: Synthetic flow series for the Eagle Gold Project

APPENDIX B.1: SYNTHETIC STREAMFLOW RECORD DEVELOPMENT

APPENDIX B.2: HAGGART CREEK BELOW DUBLIN GULCH (W4) – SYNTHETIC TIME-SERIES METADATA

APPENDIX B.3: HAGGART CREEK ABOVE LYNX CREEK (W5) – SYNTHETIC TIME-SERIES METADATA

APPENDIX B.4: LYNX CREEK ABOVE HAGGART CREEK (W6) – SYNTHETIC TIME-SERIES METADATA

Appendix B.1: Synthetic Streamflow Record Development

The hydrometric monitoring network at the Project site has been in operation since 2007, and provides a high-quality dataset quantifying the timing, variability and magnitude of streamflows. Longer duration datasets are required to effectively estimate recurrence intervals of key hydrologic parameters (*e.g.*, annual runoff, June-September $7Q_{10}$). Thus, site discharge data were used, along with the discharge data from the Water Survey of Canada McQuesten River hydrometric station (09DD004), to generate synthetic daily discharge records for three site stations (W4, W5 and W6) for the period of 1979 to 2015 (37 years).

The McQuesten River record was chosen for several reasons, the main one being that Haggart Creek is a headwater tributary of the McQuesten River, and therefore the discharge record from the larger basin is expected to be representative of the streamflow regime in the Project area creeks. The method of developing longer term synthetic streamflow records retains the hydrologic character of site-specific basins with shorter term records, while preserving the regional inter-annual variability in streamflows resulting from multi-decadal climate cycles (*e.g.*, PDO, AO) and trends (*e.g.*, increasing winter low flows).

The ranked regression plots and comparative time-series plots for the measured and synthetic streamflows are presented for Haggart Creek below Dublin Gulch (W4; Appendix B.2), Haggart Creek above Lynx Creek (W5; Appendix B.3) and Lynx Creek above Haggart Creek (W6; Appendix B.4).

A1.1.1 Ranked Regression Methodology

Following the Empirical Frequency Pairing (EFP) methodology described by Butt (2013), the overlapping periods of record were selected for the site station and the representative regional stations. Data were discretized by month, and all available daily average flows for each month were ranked. For example, if there were data available for the month of June over nine years, then the number of paired observations was 270. The paired and ranked observations were then plotted, with the regional station set as the predictor variable (x-axis). Due to the limited availability of continuous winter flow data, all data for the months of October through April were grouped to represent the winter low-flow regime. Additionally, all available spot flow measurements representing days without continuous flow data were included in the analysis.

The methodology described in Butt (2013) was modified to improve the predictive power of the EFP method. A piece-wise linear regression approach was employed to estimate flow values that fall between each site-regional data pair. For cases where the minimum/maximum daily flow in the regional record fell outside of the site data record, the relationships were extrapolated using a linear relationship between at least 20 data pairs, and an understanding of the regional peak and low flow unit yields. Peak flow estimates were also informed by the discharge estimates for the freshet flooding event of May 29, 2013 (Laberge, 2013).

An example of the EFP relationship for the W4 hydrometric station is provided in Figure B.1-1. Plots of all monthly and low flow EFP relationships are provided in Appendix A for all Project hydrometric stations. Also, included in Appendix A are flow duration curves for the overlapping period of record (site and synthetic time-series) and comparisons of synthetic winter flows to manual streamflow measurements.

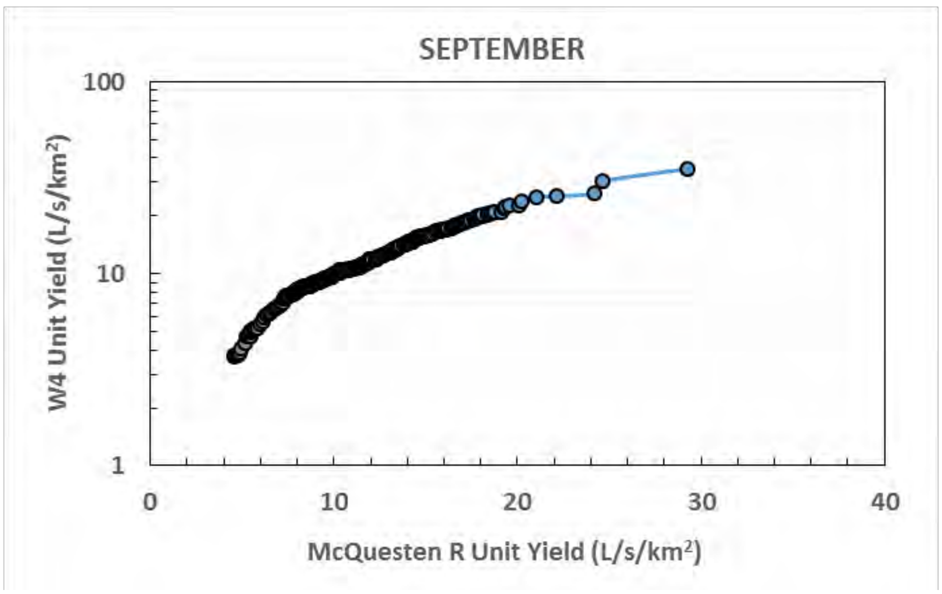

Figure B.1-1: Ranked regression results based on the empirical frequency pairing relationship for September at hydrometric station Haggart Creek below Dublin Gulch (W4).

The synthetic discharge records generated for the three site stations span the period of 1979 to 2015 (37 years), which allows the shorter-term site discharge records to be placed in a broader historical context. An example synthetic record is shown in Figure B.1-2 for Haggart Creek below Dublin Gulch (W4), which shows the synthetically estimated and measured discharge data for this station, for the overlapping period of record (2007 to 2015). Figure B.1-2 compares the same data in flow duration curve format. The two flow duration curves are essentially overprinted, indicating that while the timing or magnitude of the actual events of the measured record do not always match the synthetic record in Figure B.1-3, the magnitude of the discharges and the range of variability for discharge in the measured record is appropriately replicated in the synthetic series.

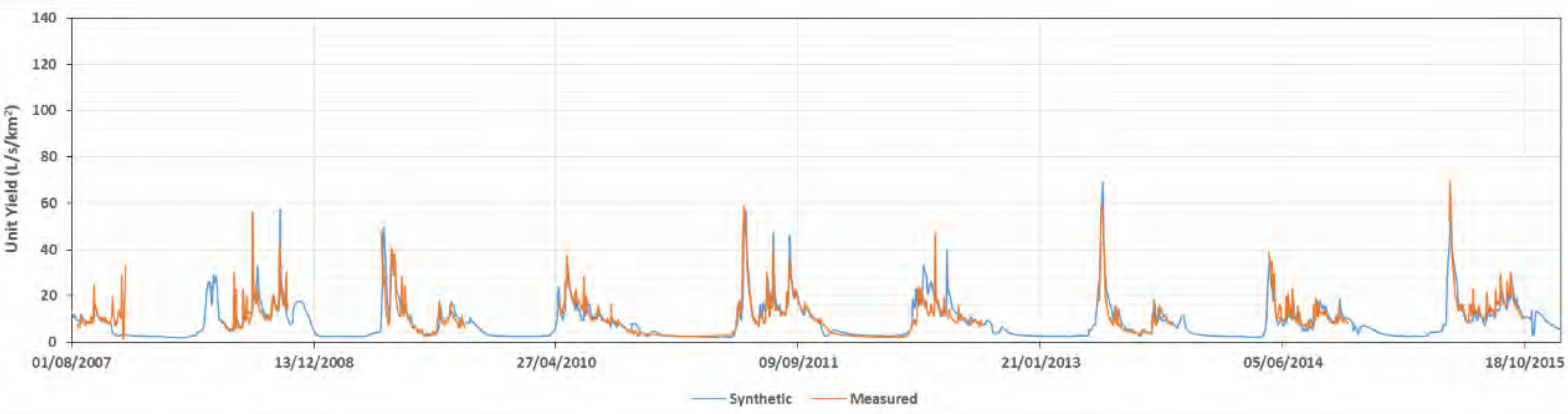

Figure B.1-2: Time-series of daily discharge for the W4 synthetic discharge record for periods of corresponding record at W4 and McQuesten River.

An example of the long-term variability in the annual runoff for the Project area is shown in Figure B.1-4, where the top panel shows the annual runoff time-series, and the bottom panel shows the same data expressed as a standard anomaly, which shows the departure of each annual value from the long-term mean. An anomaly of zero means that the year's runoff value is equal to the long-term mean, a negative value indicates a lower than average runoff, and vice-versa.

It is apparent from the these figures that the baseline record period (2007 to 2015) spans a wetter-than-average period within the longer regional record. The average runoff from the W4 synthetic record is 253 mm for the full time-series, and 275 mm for the 2007-2015 period, with 2007, 2008, 2011, 2012 and 2015 showing higher than average runoff, and 2009 to 2010, and 2013 to 2014 showing slightly lower than average runoff. Based on the synthetic runoff data, the wettest year on record is 1979 (363 mm), and the driest year was 1998 (144 mm), which are approximately equal to a 1:50 wet-year and 1:200 dry year, respectively (refer to Table 3-5 in the main report).

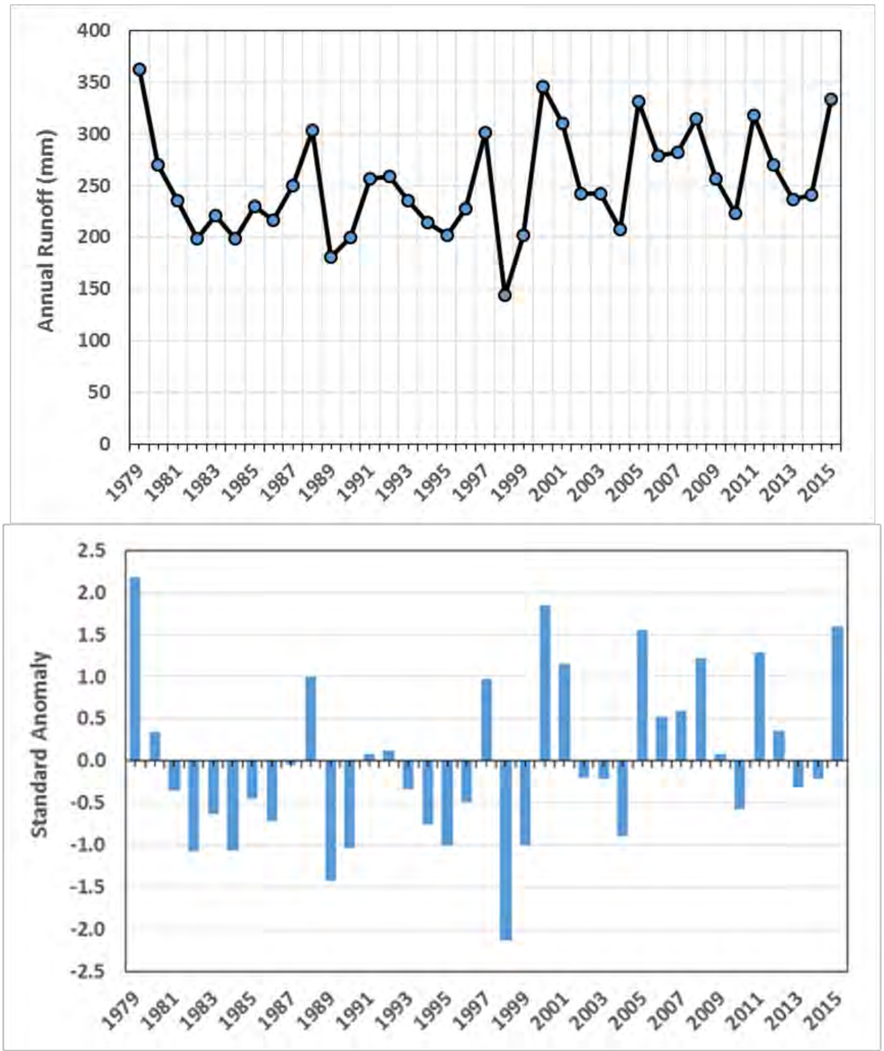

Figure B.1-4: Time-series of annual runoff for the W4 synthetic discharge record (upper panel). The lower panel shows the same data as a standardized anomaly.

References

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Appendix B.2: Haggart Creek below Dublin Gulch (W4) – Synthetic Time-Series Metadata

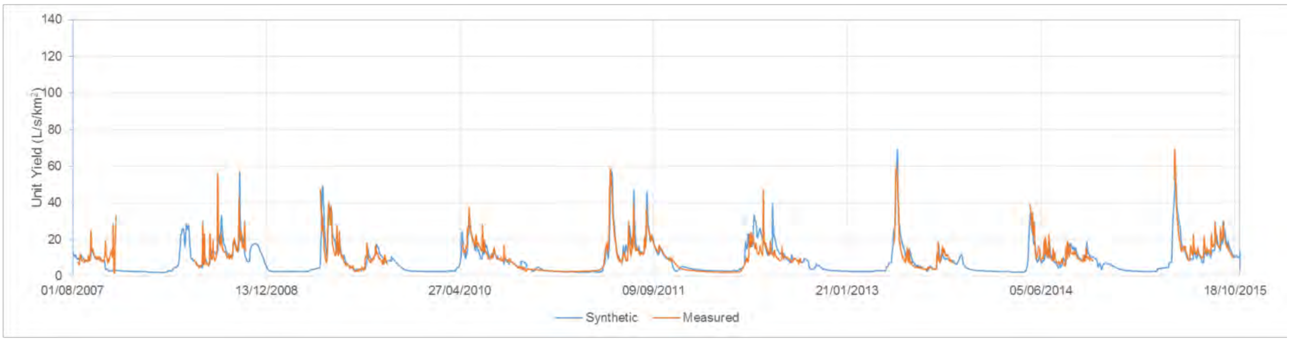

Figure B.2-1: Time series of measured and synthetic discharge for W4 (2007 to 2015).

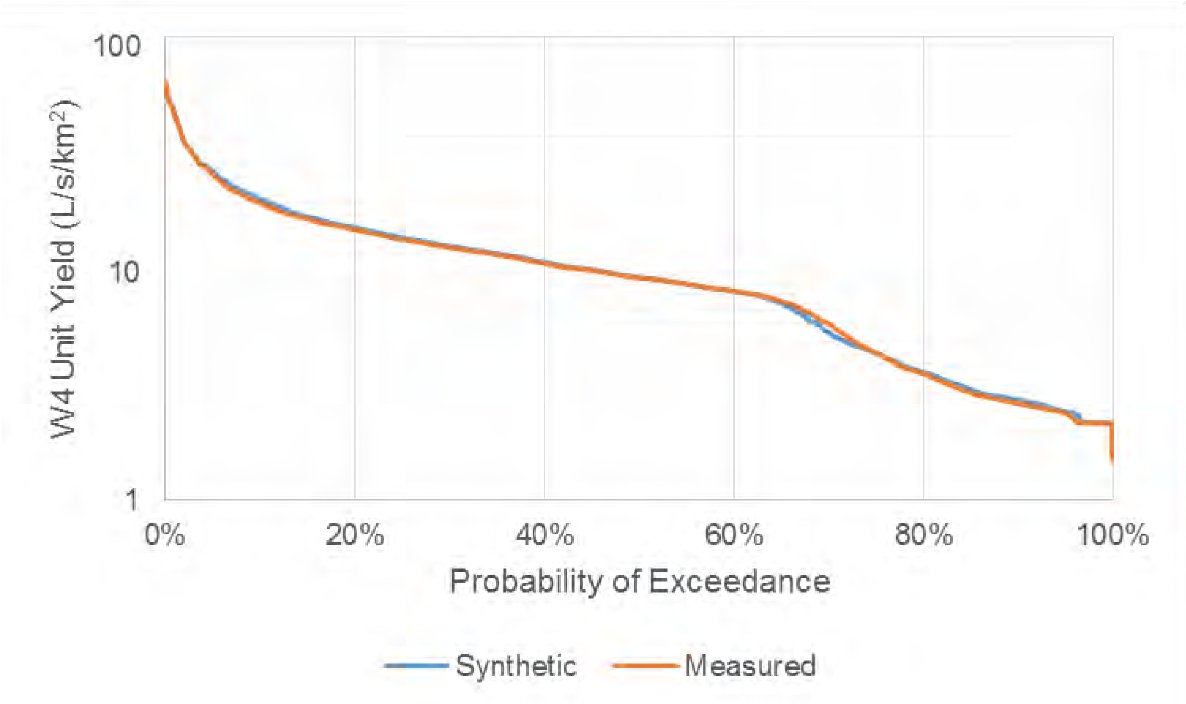

Figure B.2-2: Flow duration curves of measured and synthetic discharge for W4 (2007 to 2015).

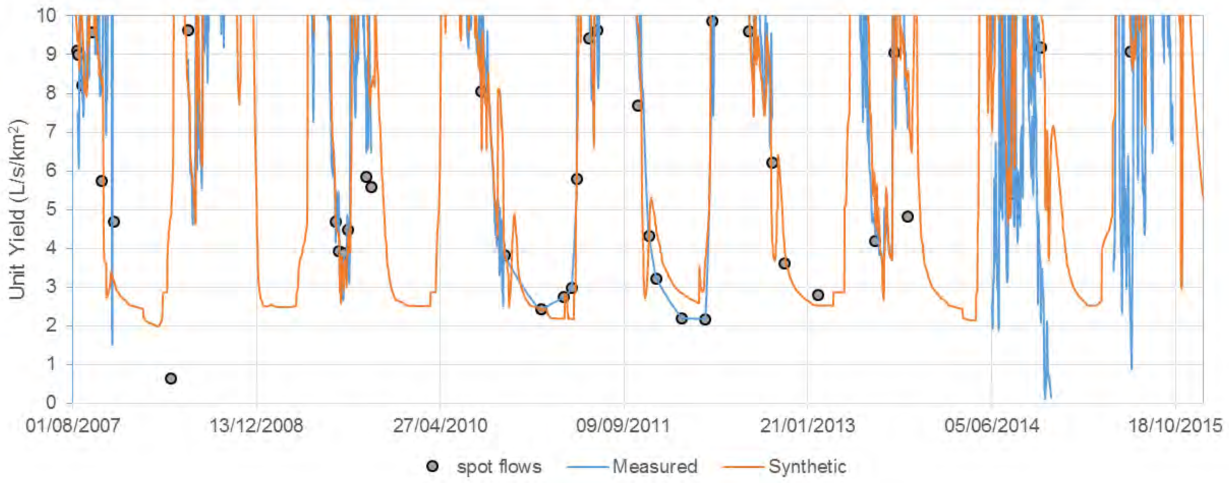

Figure B.2-3: Time series of measured continuous discharge, spot discharge measurements and synthetic discharge for W4 (1979 to 2015). Note that y-axis is scaled to low flows to highlight match between datasets.

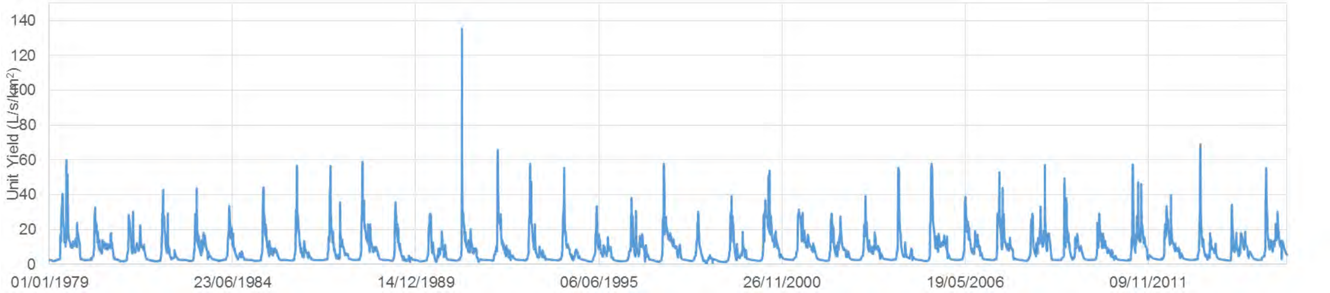

Figure B.2-4: Time series of synthetic discharge for W4 (1979 to 2015).

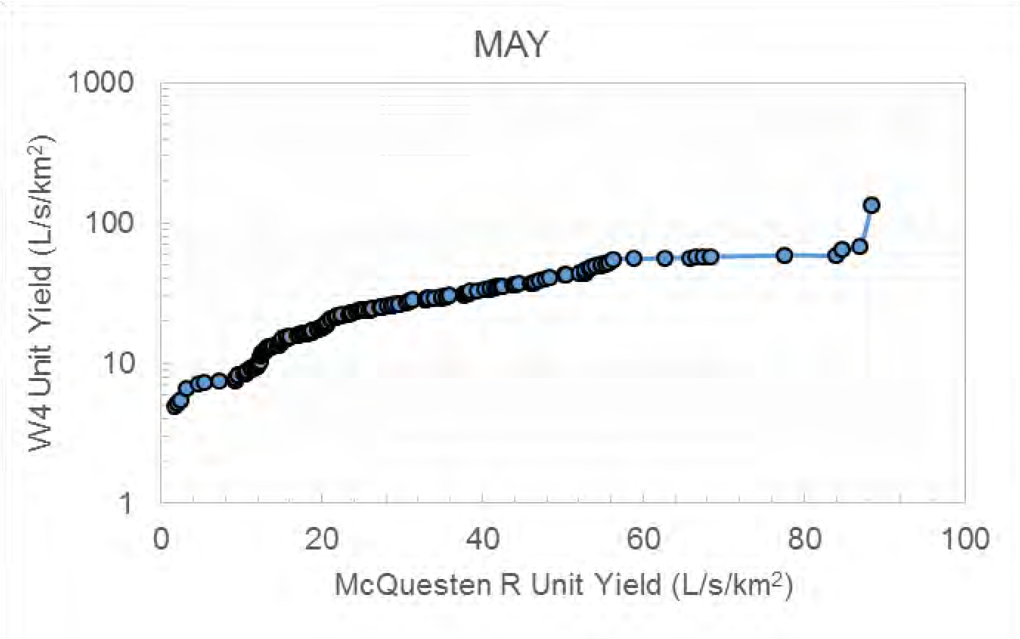

Figure B.2-5: Piece-wise ranked regression plot for W4 (May; 2007 to 2015).

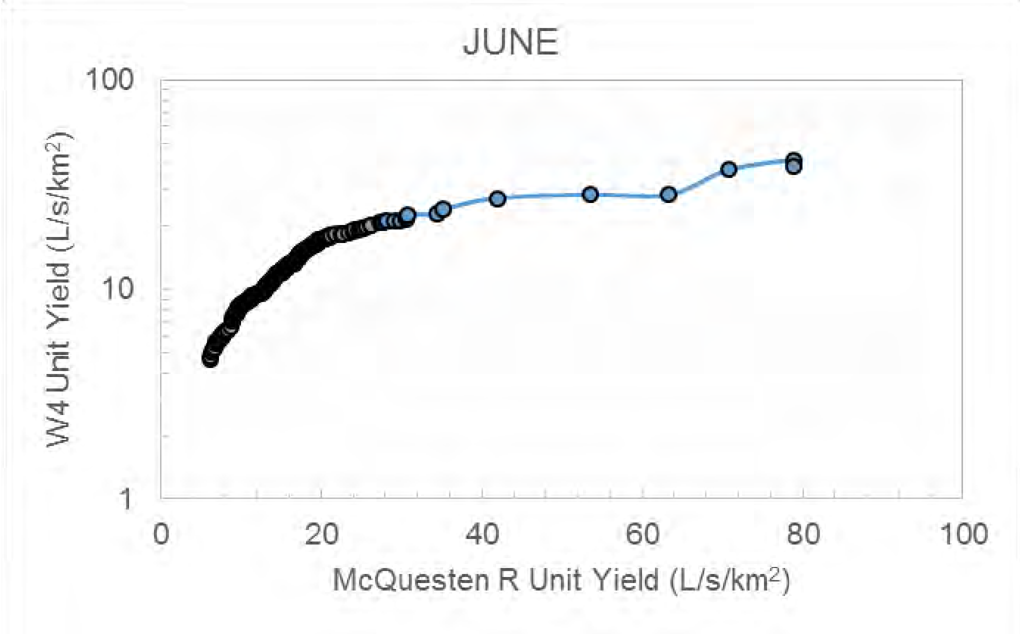

Figure B.2-6: Piece-wise ranked regression plot for W4 (June; 2007 to 2015).

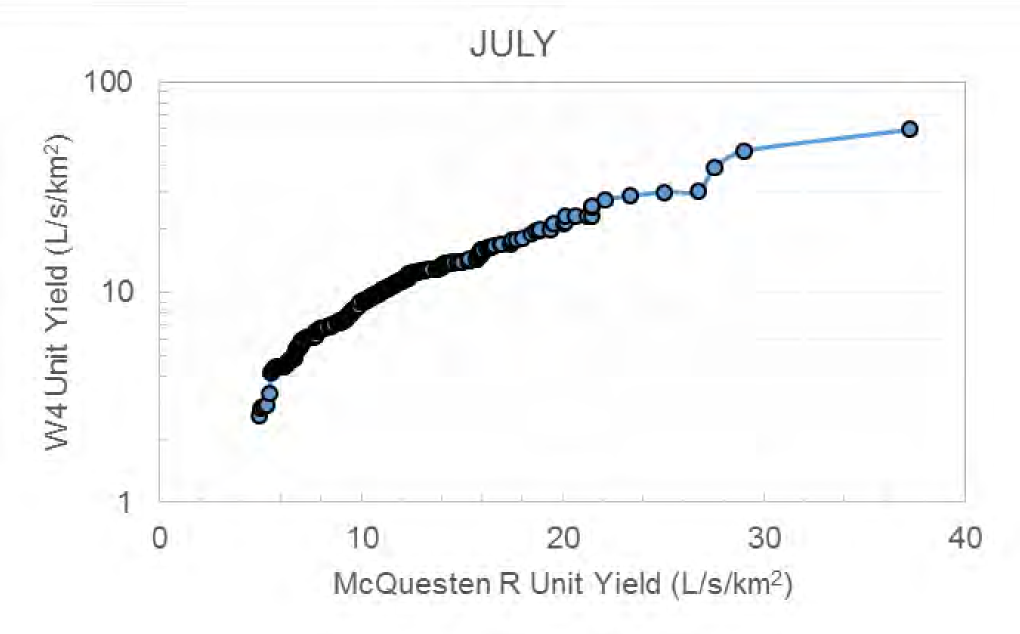

Figure B.2-7: Piece-wise ranked regression plot for W4 (July; 2007 to 2015).

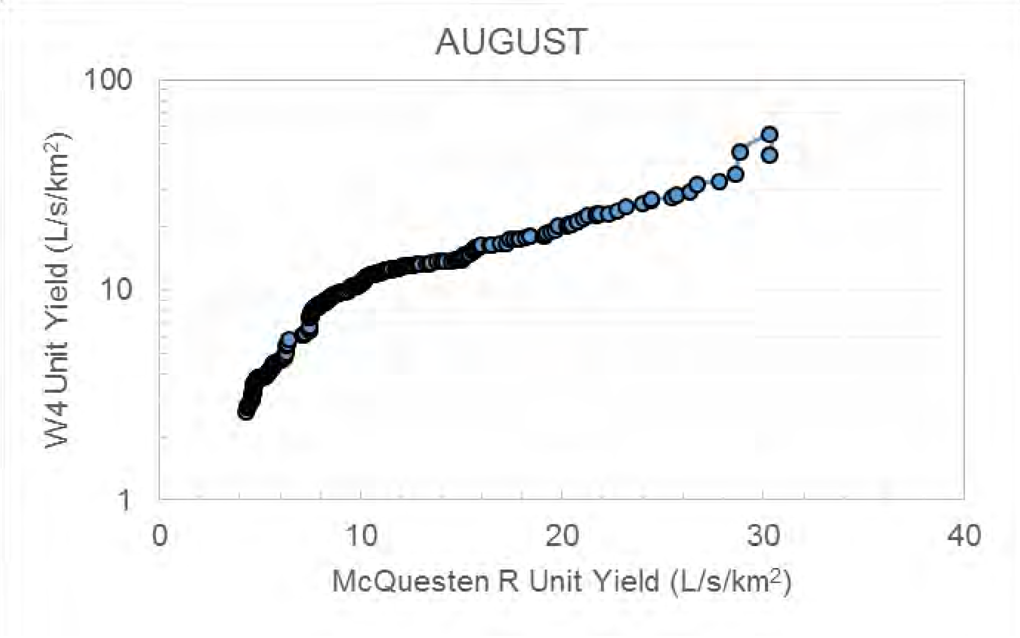

Figure B.2-8: Piece-wise ranked regression plot for W4 (August; 2007 to 2015).

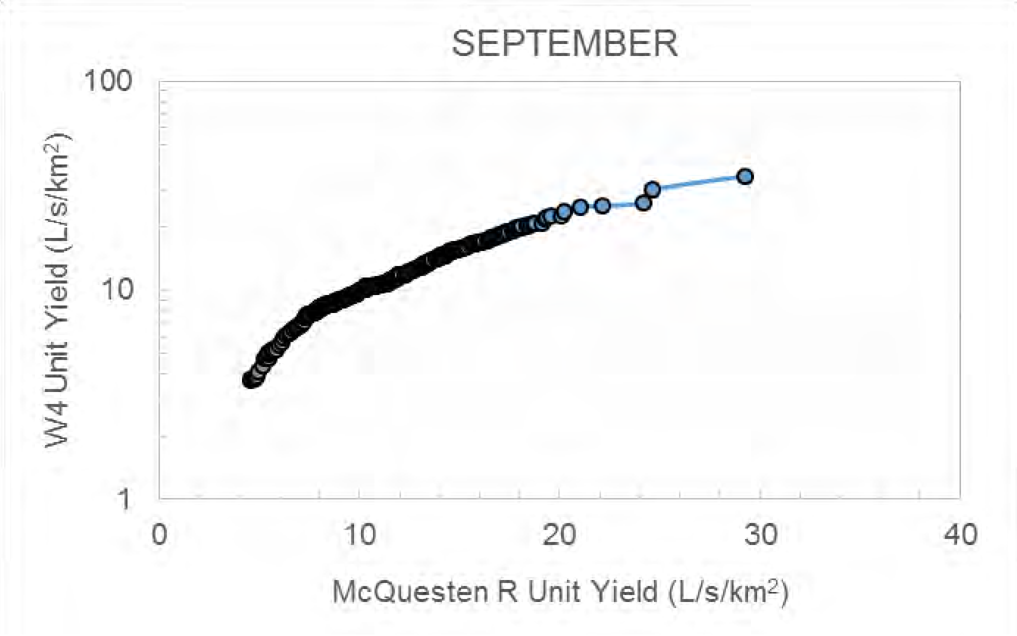

Figure B.2-9: Piece-wise ranked regression plot for W4 (September; 2007 to 2015).

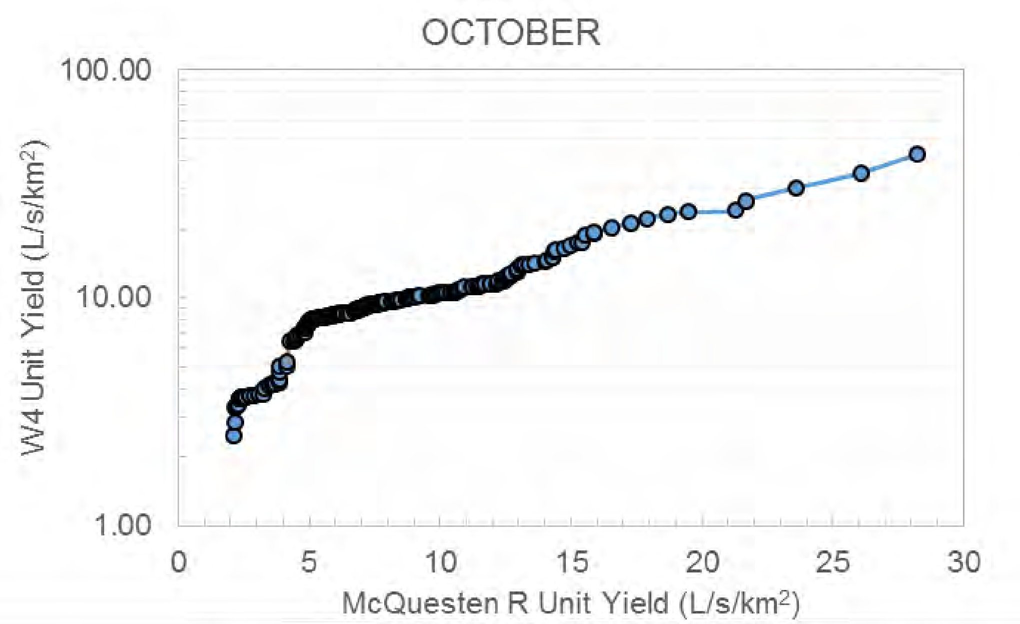

Figure B.2-10: Piece-wise ranked regression plot for W4 (October; 2007 to 2015).

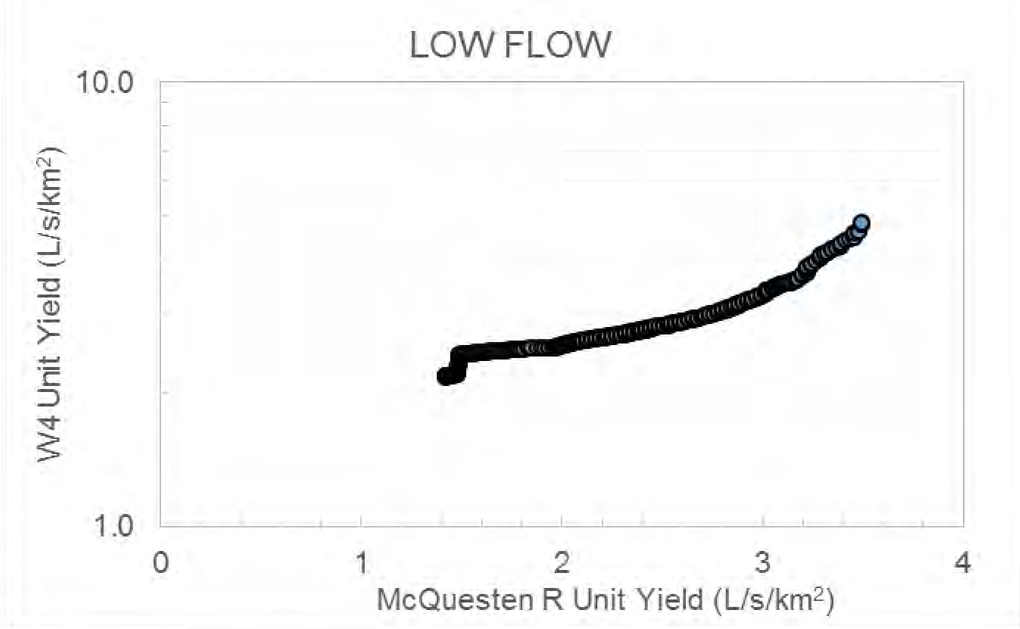

Figure B.2-11: Piece-wise ranked regression plot for W4 (Winter (November to April; 2007 to 2015).

Appendix B.3: Haggart Creek above Lynx Creek (W5) – Synthetic Time-Series Metadata

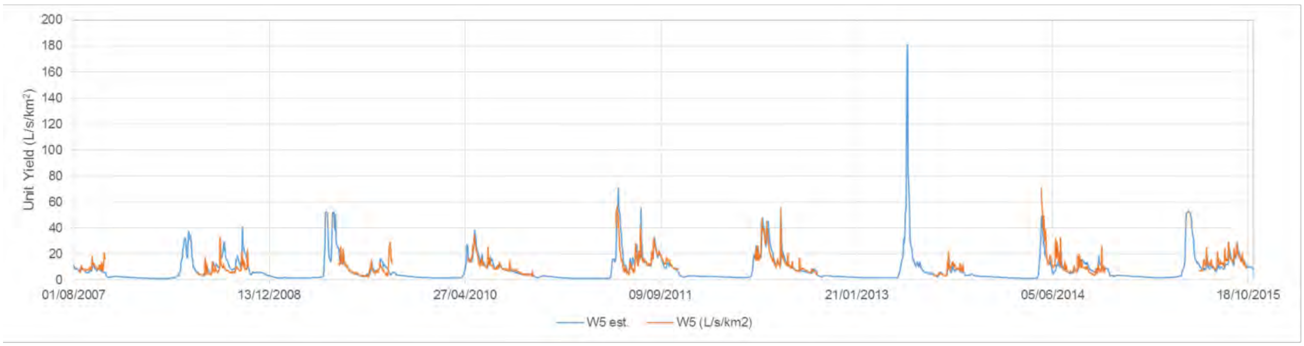

Figure B.3-1: Time series of measured and synthetic discharge for W5 (2007 to 2015).

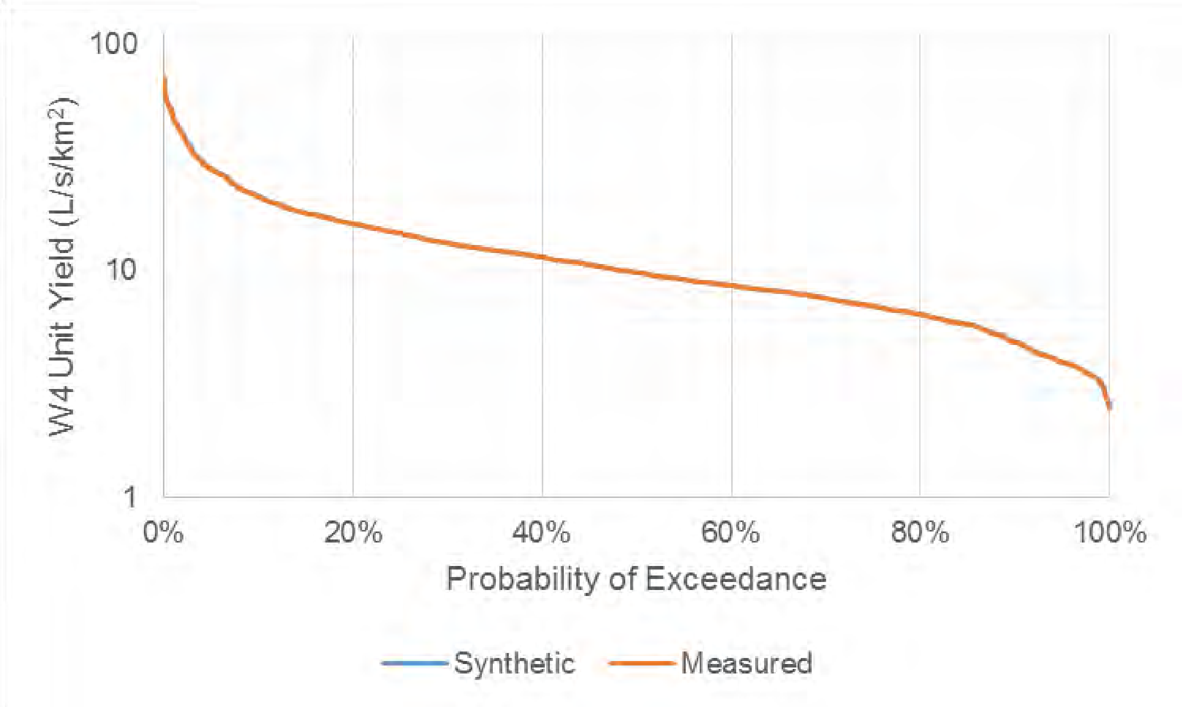

Figure B.3-2: Flow duration curves of measured and synthetic discharge for W5 (2007 to 2015).

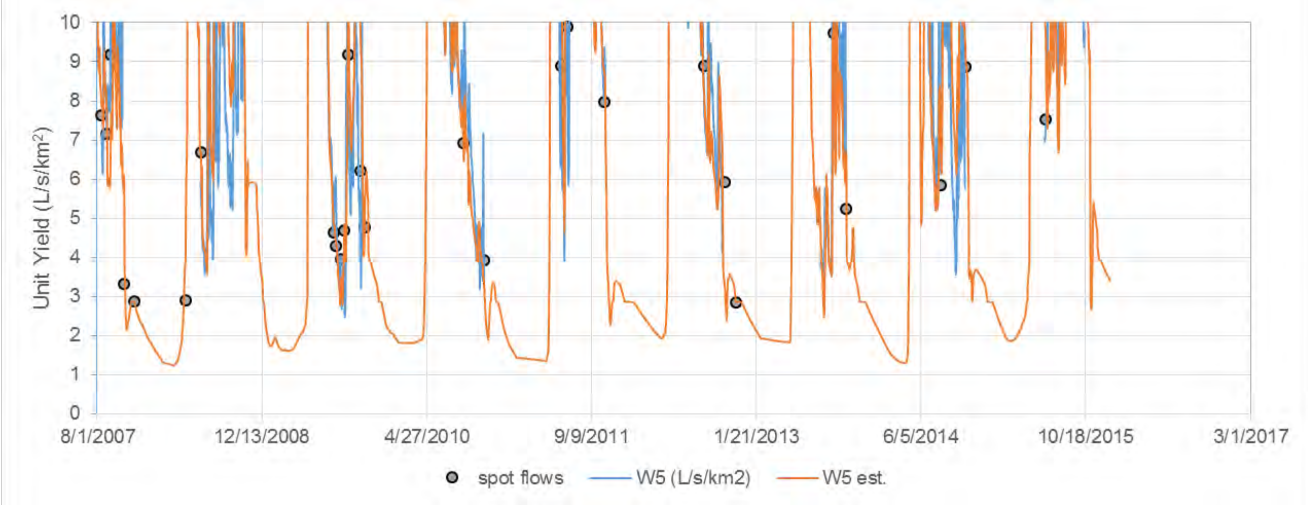

Figure B.3-3: Time series of measured continuous discharge, spot discharge measurements and synthetic discharge for W5 (1979 to 2015). Note that y-axis is scaled to low flows to highlight match between datasets.

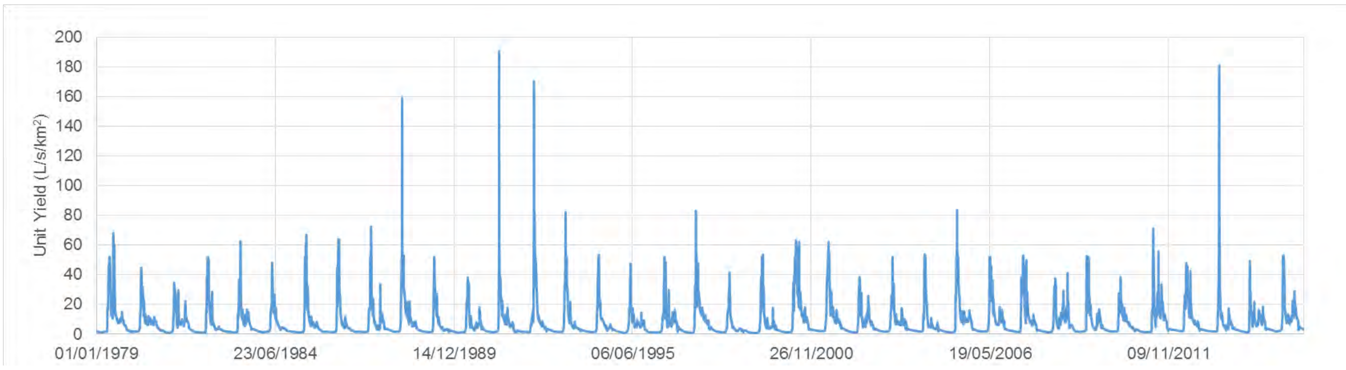

Figure B.3-4: Time series of synthetic discharge for W5 (1979 to 2015).

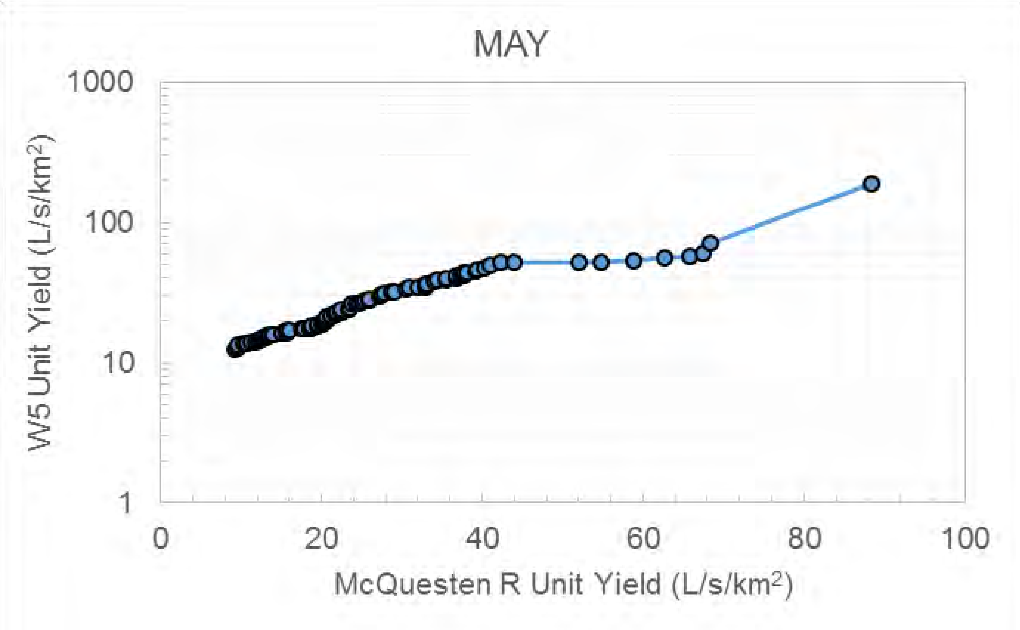

Figure B.3-5: Piece-wise ranked regression plot for W5 (May; 2007 to 2015).

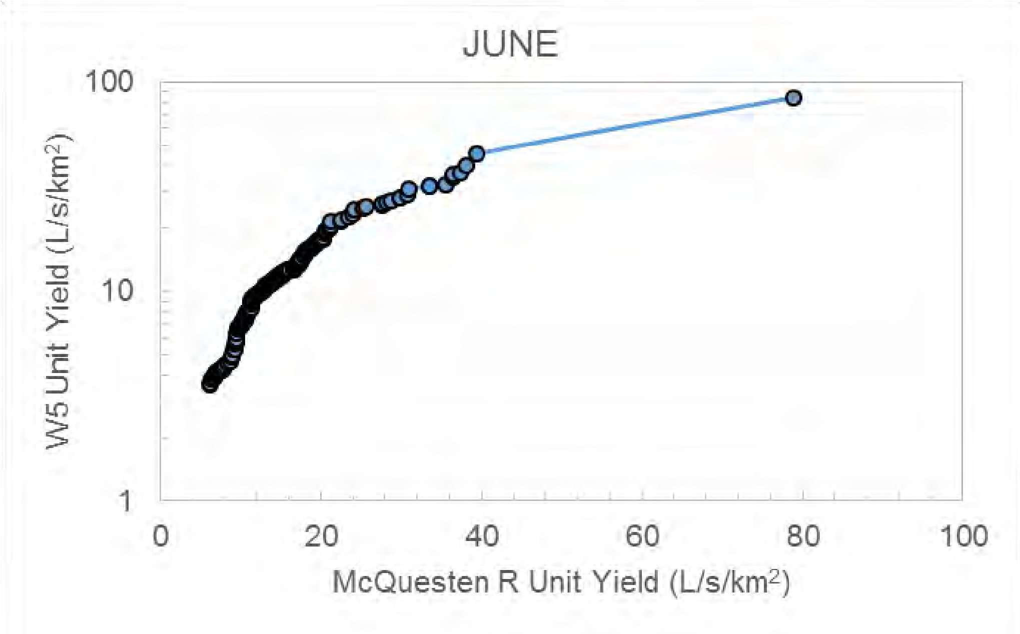

Figure B.3-6: Piece-wise ranked regression plot for W5 (June; 2007 to 2015).

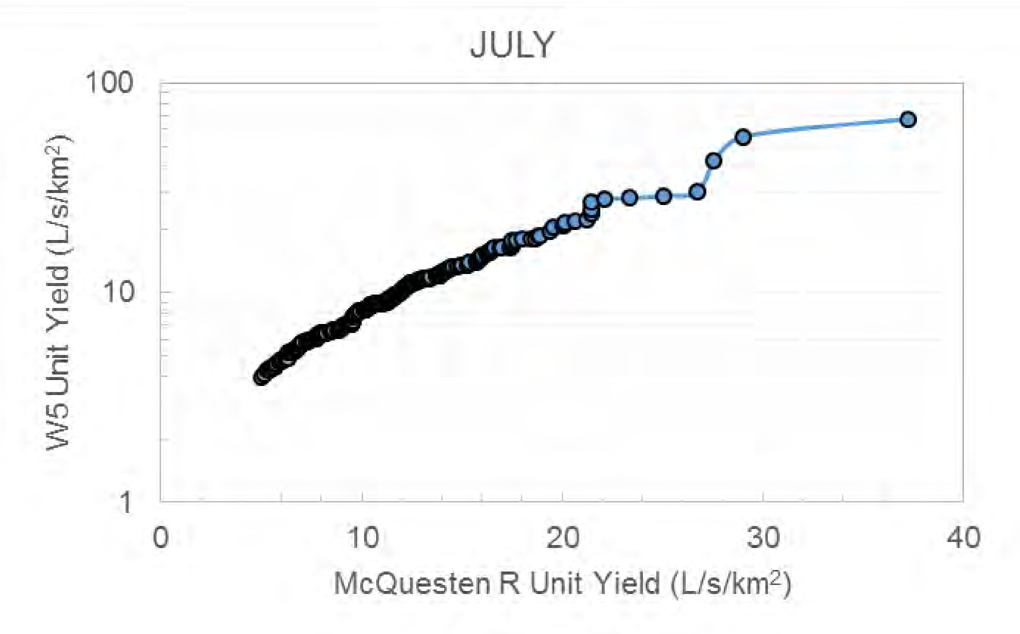

Figure B.3-7: Piece-wise ranked regression plot for W5 (July; 2007 to 2015).

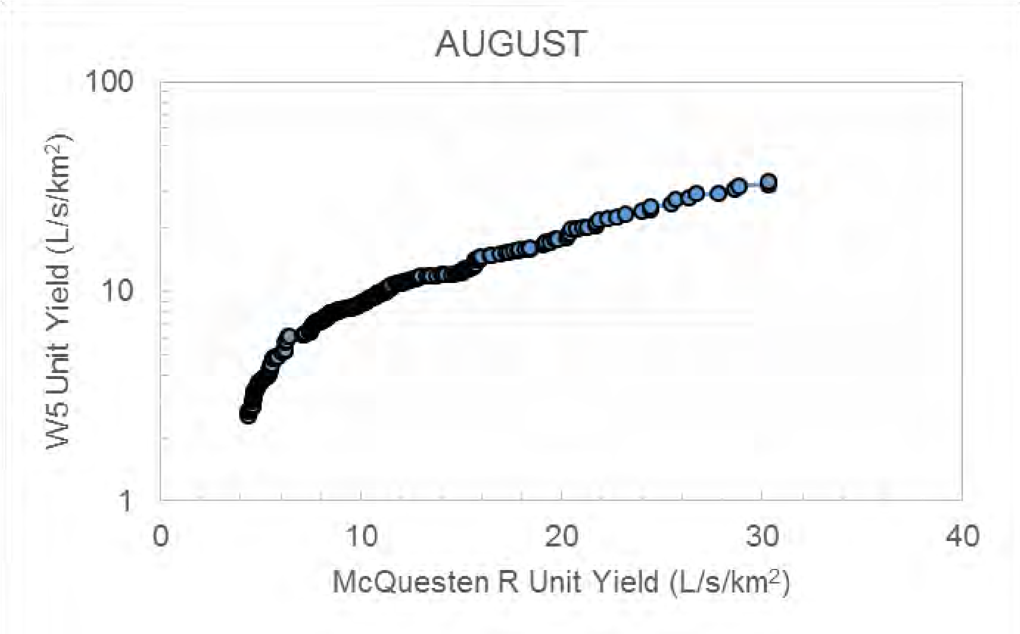

Figure B.3-8: Piece-wise ranked regression plot for W5 (August; 2007 to 2015).

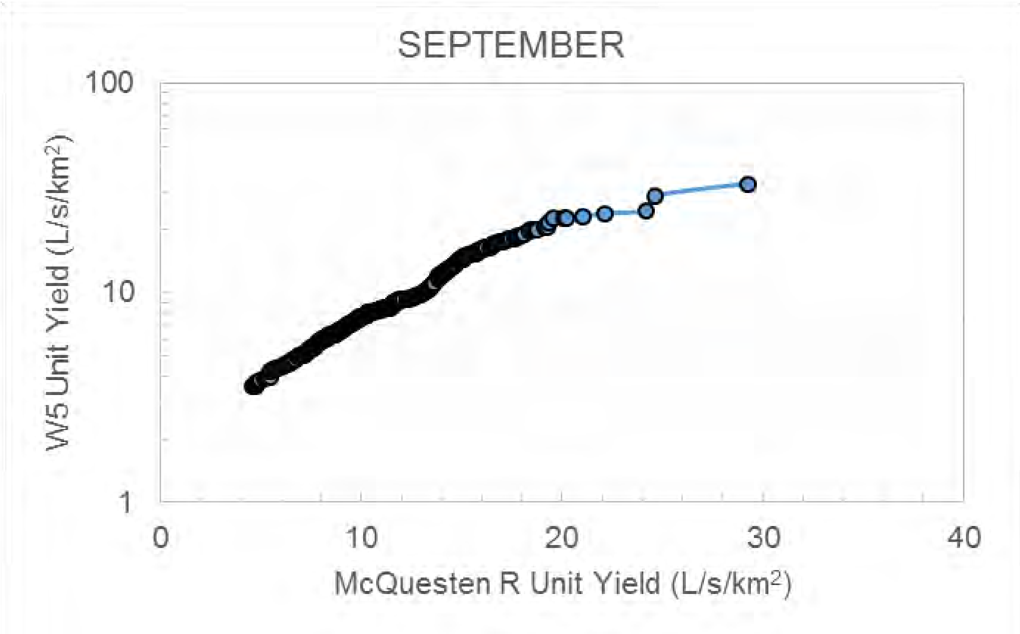

Figure B.3-9: Piece-wise ranked regression plot for W5 (September; 2007 to 2015).

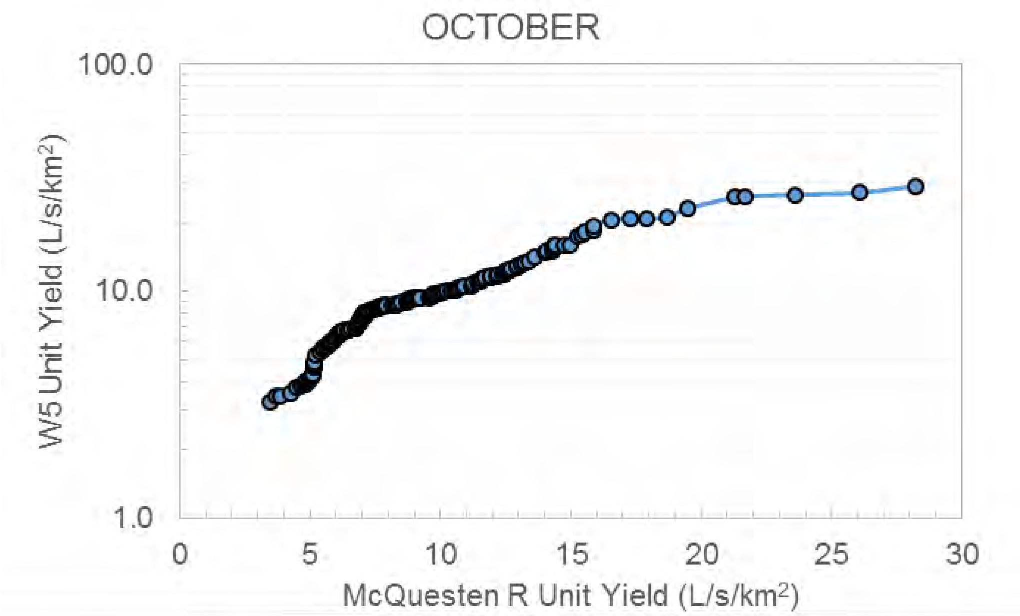

Figure B.3-10: Piece-wise ranked regression plot for W5 (October; 2007 to 2015).

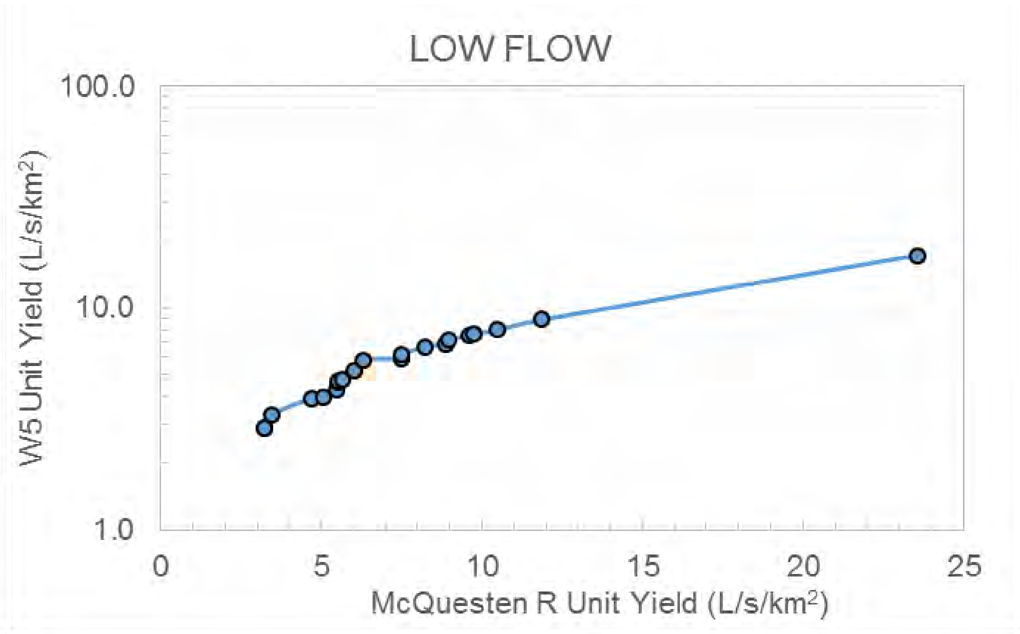

Figure B.3-11: Piece-wise ranked regression plot for W5 (Winter (November to April; 2007 to 2015).

Appendix B.4: Lynx Creek above Haggart Creek (W6) – Synthetic Time-Series Metadata

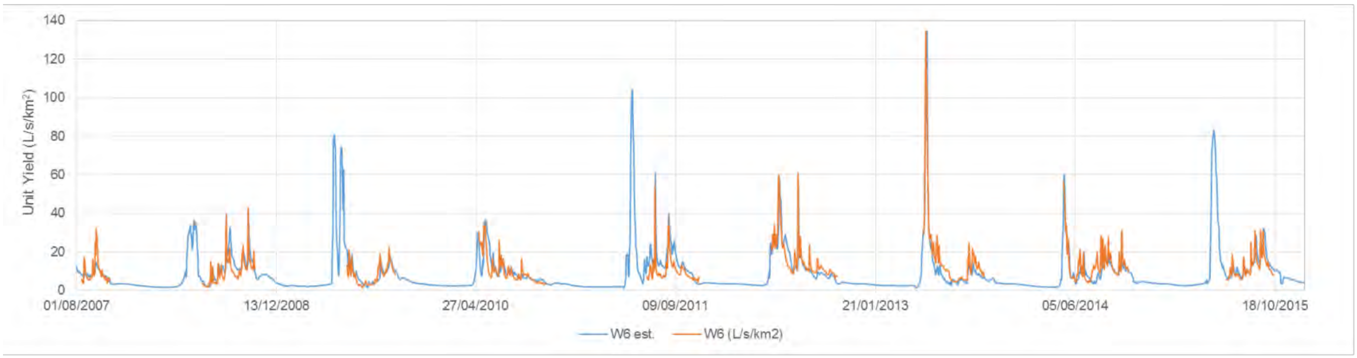

Figure B.4-1: Time series of measured and synthetic discharge for W6 (2007 to 2015).

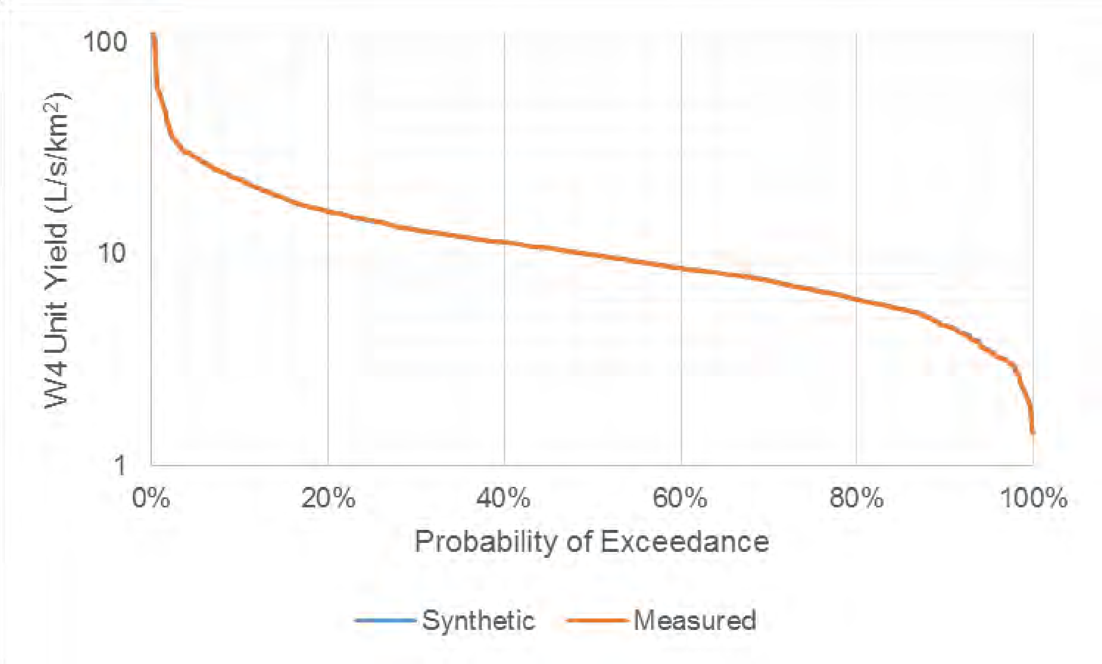

Figure B.4-2: Flow duration curves of measured and synthetic discharge for W6 (2007 to 2015).

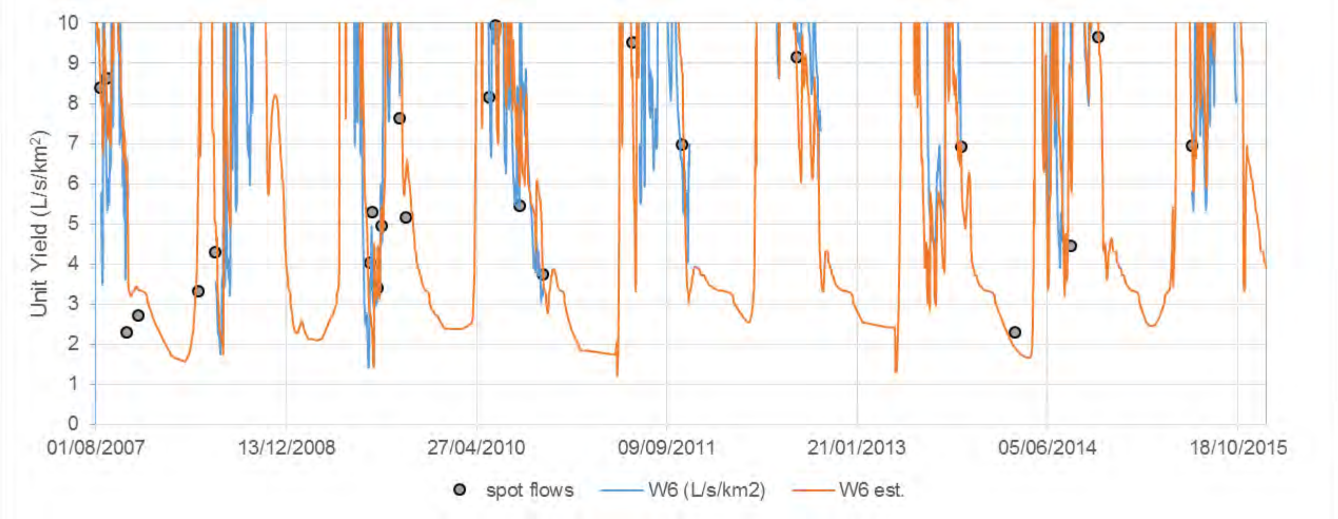

Figure B.4-3: **Time series of measured continuous discharge, spot discharge measurements and synthetic discharge for W6 (1979 to 2015). Note that y-axis is scaled to low flows to highlight match between datasets.**

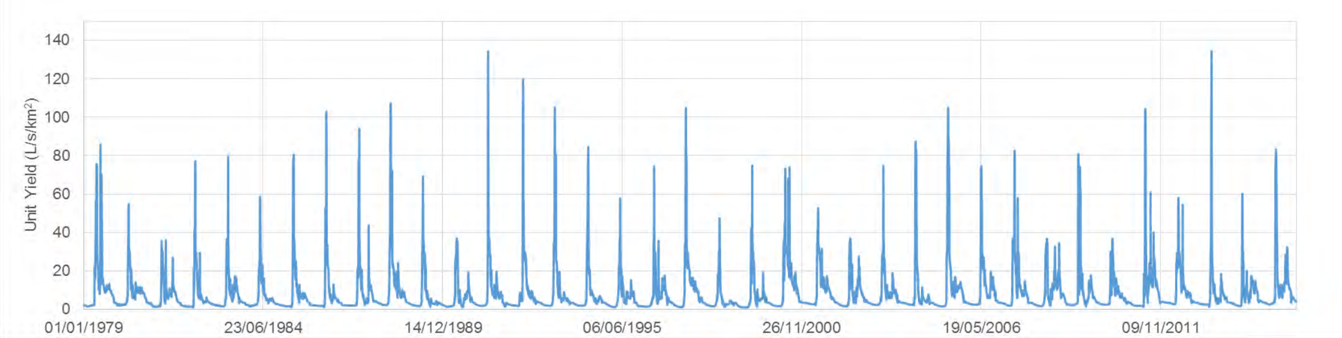

Figure B.4-4: **Time series of synthetic discharge for W6 (1979 to 2015).**

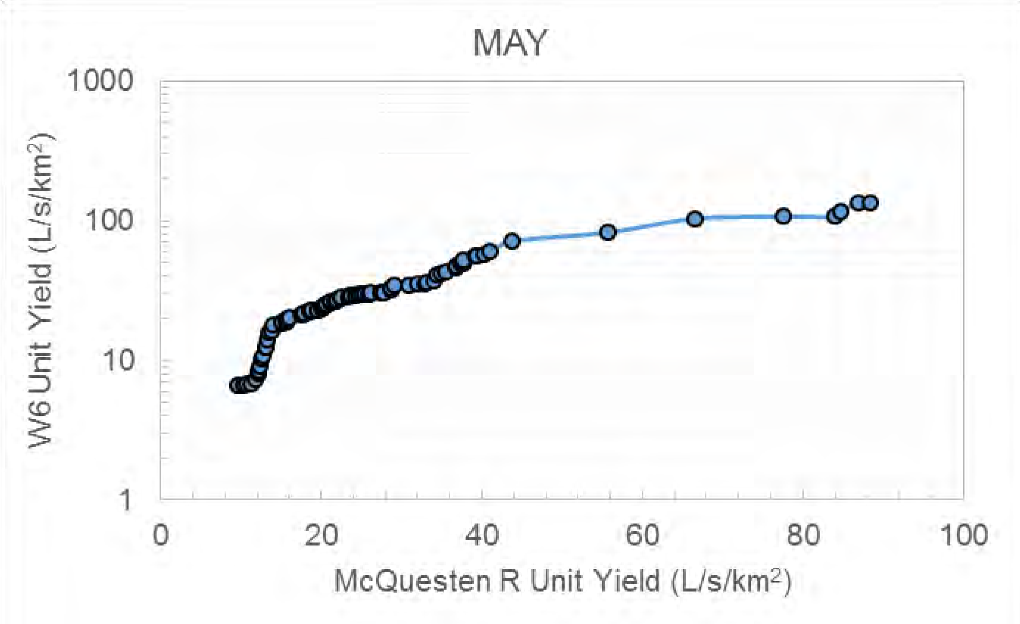

Figure B.4-5: **Piece-wise ranked regression plot for W6 (May; 2007 to 2015).**

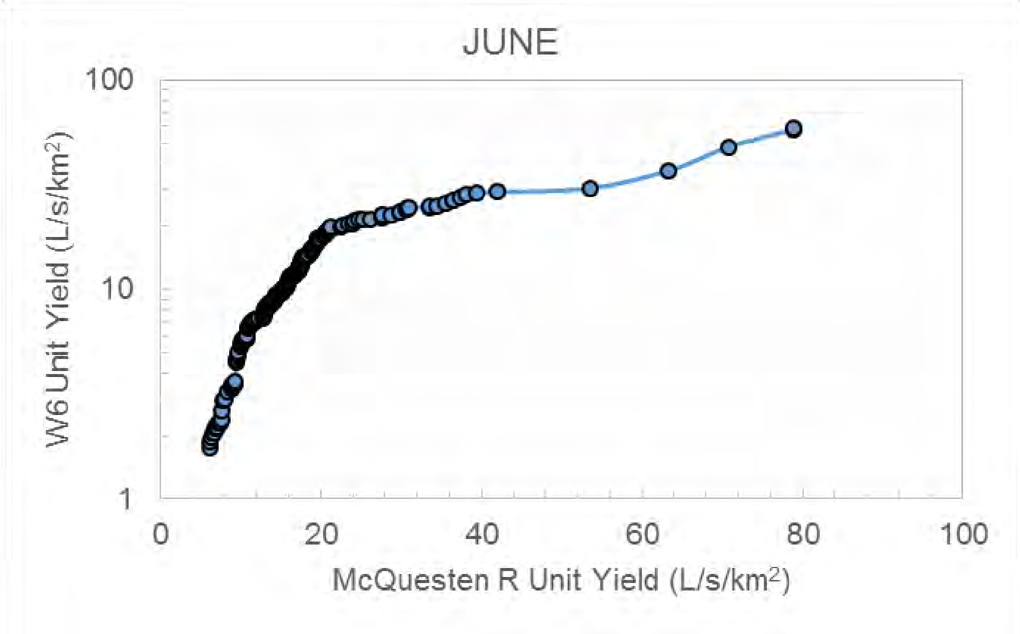

Figure B.4-6: Piece-wise ranked regression plot for W6 (June; 2007 to 2015).

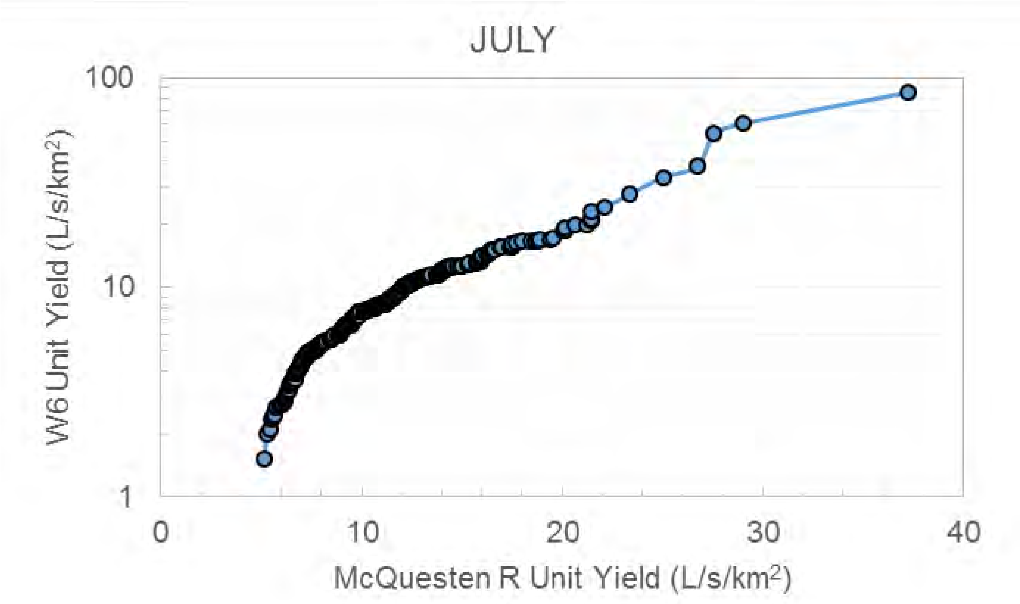

Figure B.4-7: Piece-wise ranked regression plot for W6 (July; 2007 to 2015).

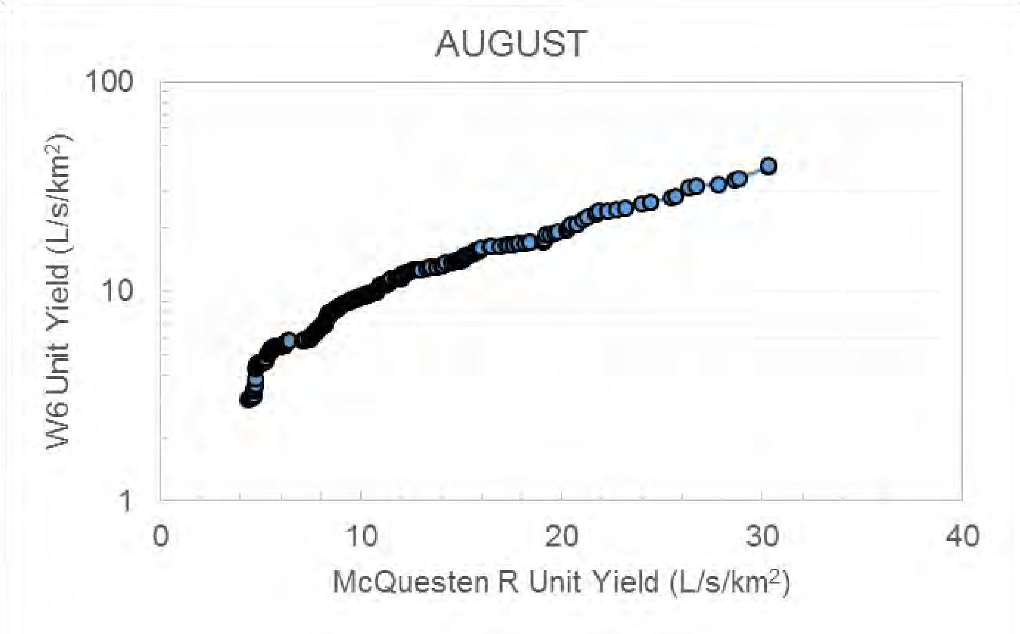

Figure B.4-8: Piece-wise ranked regression plot for W6 (August; 2007 to 2015).

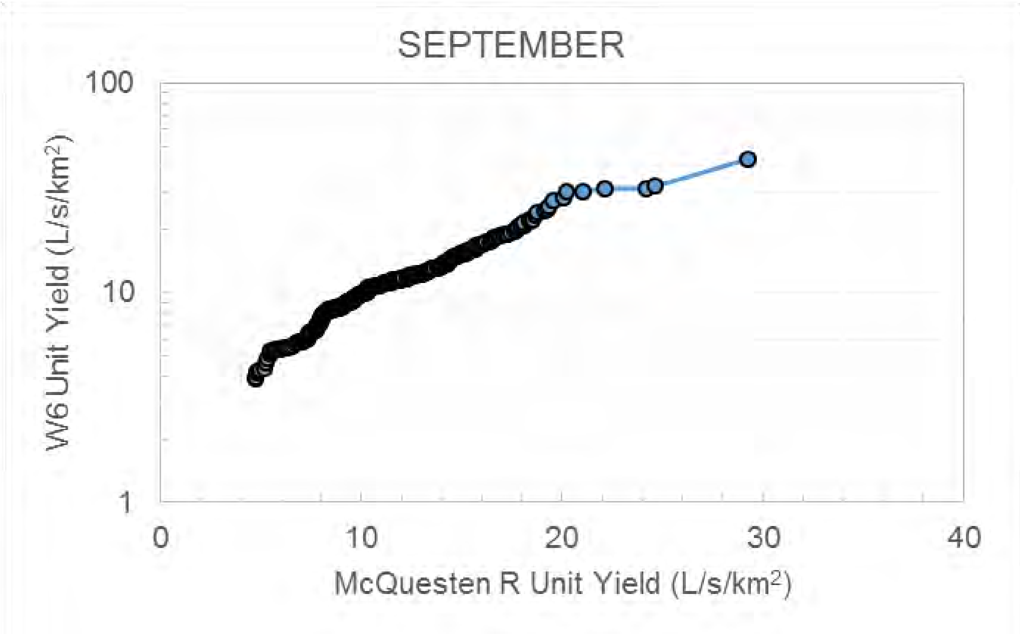

Figure B.4-9: Piece-wise ranked regression plot for W6 (September; 2007 to 2015).

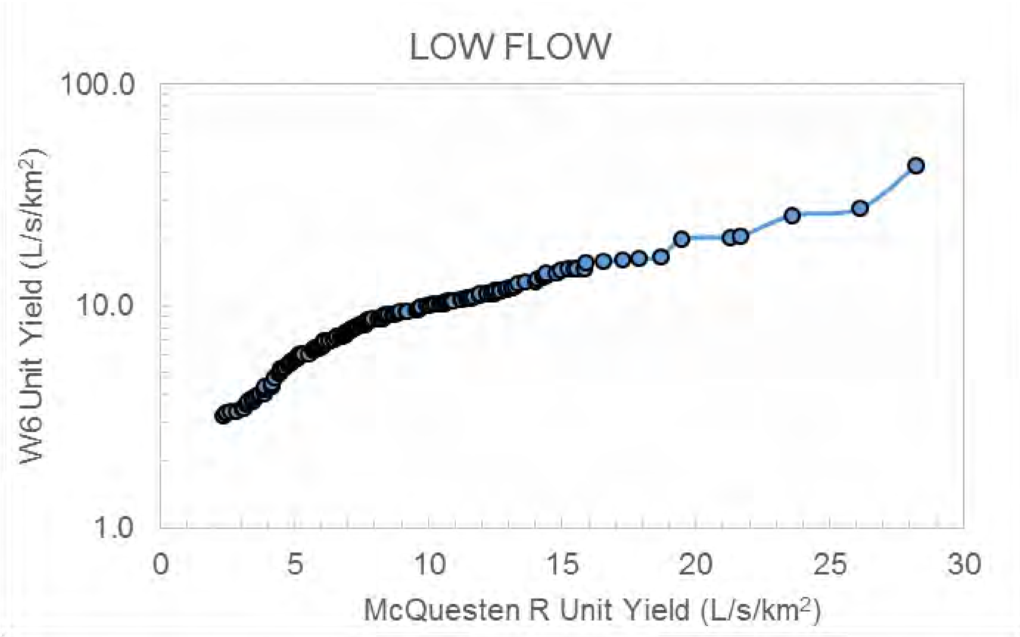

Figure B.4-10: Piece-wise ranked regression plot for W6 (Winter (October to April; 2007 to 2015).

Appendix C: Climate Change

C.1. BACKGROUNDER: CLIMATE MODELS AND CLIMATE CHANGE SCENARIO DATA

C.2. CLIMATE CHANGE SCENARIO DATA AND TRENDS FOR MAYO, YT.

C.3. REGIONAL TREND ANALYSIS

Appendix C: Climate Change

APPENDIX C.1: BACKGROUNDER: CLIMATE MODELS AND CLIMATE CHANGE SCENARIO DATA

APPENDIX C.2: CLIMATE CHANGE SCENARIO DATA AND TRENDS FOR MAYO, YT.

APPENDIX C.3: REGIONAL TREND ANALYSIS

Appendix C.1: Backgrounder: Climate Models and Climate Change Scenario Data

The next sections of this appendix present background information on climate models, climate change scenarios and data sources that are relevant to the Eagle Gold Mine, as well as a regional trend analysis of several hydro-climatic variables.

C1.1 Climate Models

Climate models are mathematical representations of the Earth's climate system. Basic laws of physics and chemistry are represented as mathematical formulae in climate models, and they are initialized to simulate the many physical and chemical processes of the climate system, including: incoming and outgoing radiation, the transfer of heat, evaporation, wind, condensation, and the fluxes of greenhouse gases such as methane and carbon dioxide into the atmosphere.

C1.1.1 Global Climate Models (GCMs)

Sometimes referred to as Atmosphere-Ocean General Circulation Models (AO-GCMs), GCMs simulate the Earth's climate system with horizontal resolution typically on the order of 200 to 600 km, and by utilizing 10 to 30 vertical layers to represent the Earth's atmosphere and oceans. The gridded concept typically utilized in GCMs is illustrated in Figure C.1-1.

IPCC (2013) provides a high-level description of the most robust GCMs in existence today and summarizes specifics related to: 1) model name and vintage; 2) nation/institutional lead; 3) architecture and parameterization of land, atmosphere and ocean components; 4) description of aerosol, atmospheric chemistry and ocean biogeochemistry modules; and 5) scientific publications that describe the various GCMs.

IPCC (2013) also outlines the validation procedures that GCMs are continually subjected to (*e.g.*, validation of their response to known climate events; validation of their ability to simulate climate variability and extreme events). The most advanced GCMs are highly capable of replicating the response of the global climate system to past climate events and atmospheric conditions (*i.e.*, changes in greenhouse gas concentration from year 1900 to present). Figure C.1-2 reproduces an inter-comparison result from the IPCC study and shows observed (measured) and simulated (by 36 different GCMs) global mean surface air temperatures over the last century.

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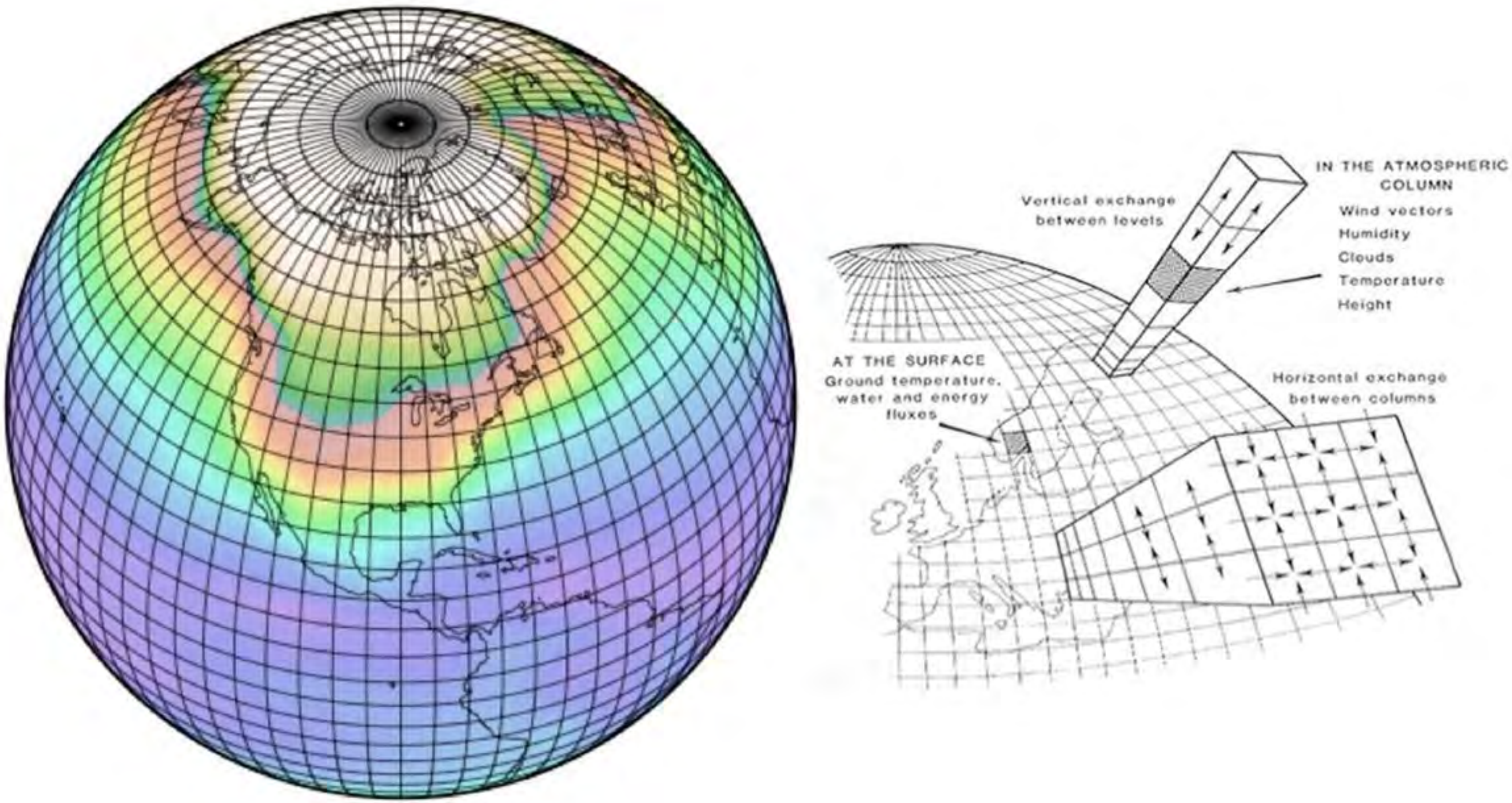

Figure C.1-1: Illustration of the horizontal and vertical grid structure used to represent land surfaces, the atmosphere and the oceans in GCMs (reproduced from Henderson-Sellers, 1995).

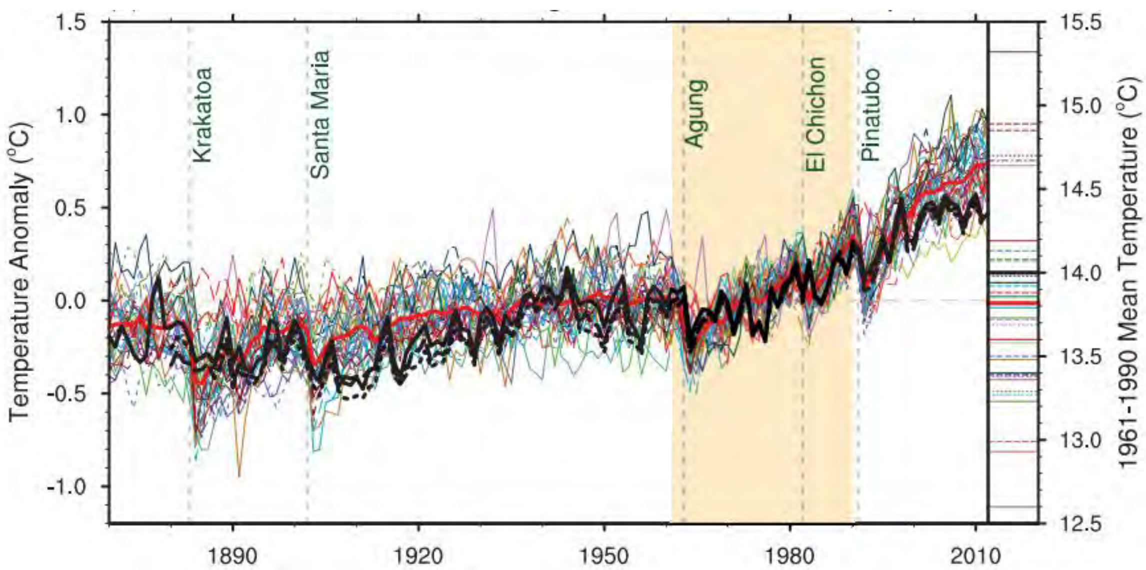

Figure C.1-2: Observed and simulated time series of the anomalies in annual and global mean surface temperature (1870-2012) as reproduced from IPCC (2013). Results are shown for three observatories (heavy red, black lines) and 36 different GCMs. The anomalies shown are differences from the 1961–1990 time-mean of each individual time series. The reference period 1961–1990 is indicated by orange shading; vertical dashed grey lines represent times of major volcanic eruptions.

GCMs that simulate past climate reliably may be used to predict future climate. Because climate models require considerable time and effort to run, the IPCC provides overall coordination and guidance with respect to the future climate scenarios that are modelled using GCMs. Ultimately, modelled output from forward looking climate experiments (*e.g.*, predicted changes in surface air temperature and precipitation) can be used to assess risk, inform decision making and provide data in support of adaptive management strategies

C1.2 Climate Change Scenarios

In the context of climate modelling, climate change scenarios describe a range of future conditions associated with anthropogenic change. The IPCC has commissioned several sets of scenarios for climate research over the past two decades. In the IPCC Third Assessment Report (published in 2001), a specific set of emissions scenarios was commissioned to replace those initially presented in their 1992 publication (IPCC, 1992).

Subsequent to this, the IPCC Special Report on Emissions Scenarios (SRES, 2000) adopted storylines to describe carbon emissions management in the context of differing degrees of political, economic, technological and social engagement on climate change. Examples of the scenarios from SRES (2000) include A2 (high CO_2 emissions, warmer future), B1 (low CO_2 emissions, cooler future compared to A2) and A1B (intermediate emissions scenario).

In the IPCCs most recent publication (IPCC, 2013), climate change scenarios adopt a radiative forcing approach, which is notably different that the alternative future greenhouse gas emissions approach used previously. The associated scenarios described in IPCC (2013) are referred to as Representative Concentration Pathway (RCP) scenarios. Four RCPs were adopted to depict a range of possible future atmospheric greenhouse gas concentrations. The future climates are referred to as RCP 2.6, RCP 4.5, RCP 6.0 and RCP 8.5, with numerical value referencing radiative forcing values (in W/m^2) relative to pre-industrial levels (see Figure C.1-3).

C1.3 Climate Change Scenario Data for State of Alaska and the Canadian North

The Scenarios Network for Alaska and Arctic Planning (SNAP) is a collaborative network of the University of Alaska, state, federal, and local agencies, NGOs, and industry partners. SNAPs mission is to provide timely access to scenarios of future conditions in Alaska and the Arctic for more effective planning by decision- makers, communities, and industry.

Climate change scenario data from the collaborative was used as the basis of the climate change assessment for the 2017 Eagle Gold Mine Hydro-meteorology Report (see https://www.snap.uaf.edu/). SNAP provides several platforms for looking at historic climate trends and climate projections in Alaska and western Canada:

- Downloadable datasets for historic climate data and projected climate data (temperature and precipitation).
- Interactive map - provides climate projections for Alaska and western Canada for each decade through 2100. User can choose what variables, time periods, seasonal averages, and emissions scenarios they'd like to view.
- Community charts – Allows users to view and download temperature and precipitation projections for individual communities in Alaska and the Arctic.
- Sea Ice Atlas – Lets audiences explore historic changes in sea ice coverage and download associated data.
- A host of online tools for viewing extreme temperature and wind events, and modeled future sea ice coverage.

C1.3.1 Available Scenarios

Climate change scenario data are available at SNAP for three of the 4 RCPs (*i.e.*, RCP 4.5, RCP 6.0 and RCP 8.5), noting each RCP is resolved out to the year 2100. For context, the RCP 4.5 pathway assumes global emissions peak around 2040, and that radiative forcing is stabilized shortly after 2100. RCP 4.5 is likely optimistic, and as such SNAP refers to it as a "low" scenario (*i.e.*, typically associated with smaller incremental changes in air temperature compared to other RCPs).

The RCP 6.0 (middle or SNAP "medium" scenario) assumes that a range of technologies and strategies for reducing greenhouse gas emissions are developed, allowing emissions to peak around 2080, then decline, with total radiative forcing stabilized shortly after 2100. Finally, the RCP 8.5 ("high" scenario) is a potential future characterized by continuous increases in greenhouse gas emissions through the 21st century.

As described at SNAP (refer to https://www.snap.uaf.edu/methods/data), available data summaries and/or downloadable datasets for high latitude stations in North America, including the entire Yukon Territory, are based on CMIP5 model outputs for the first ensemble model run.

C1.3.2 SNAP Downscaling Method

Referencing the website (see https://www.snap.uaf.edu/methods/downscaling), GCM output variables of surface temperature and precipitation were downscaled for Yukon Territory via the delta method (Hayhoe 2010, Hay et al 2000) using PRISM 2 km resolution climate normals as baseline climate across three future climate scenarios (*i.e.*, RCP4.5, RCP 6.0, RCP8.5). The delta method of downscaling was implemented by calculating climate anomalies applied as differences for temperature or quotients for precipitation between monthly future GCM data and calculated GCM climate normals (*i.e.*, the delta) at a monthly time step. These coarse resolution anomalies were then interpolated to PRISM spatial resolution (*i.e.*, 2 km) via a spline technique, and then added to (temperature) or multiplied by (precipitation) the PRISM climate normals.

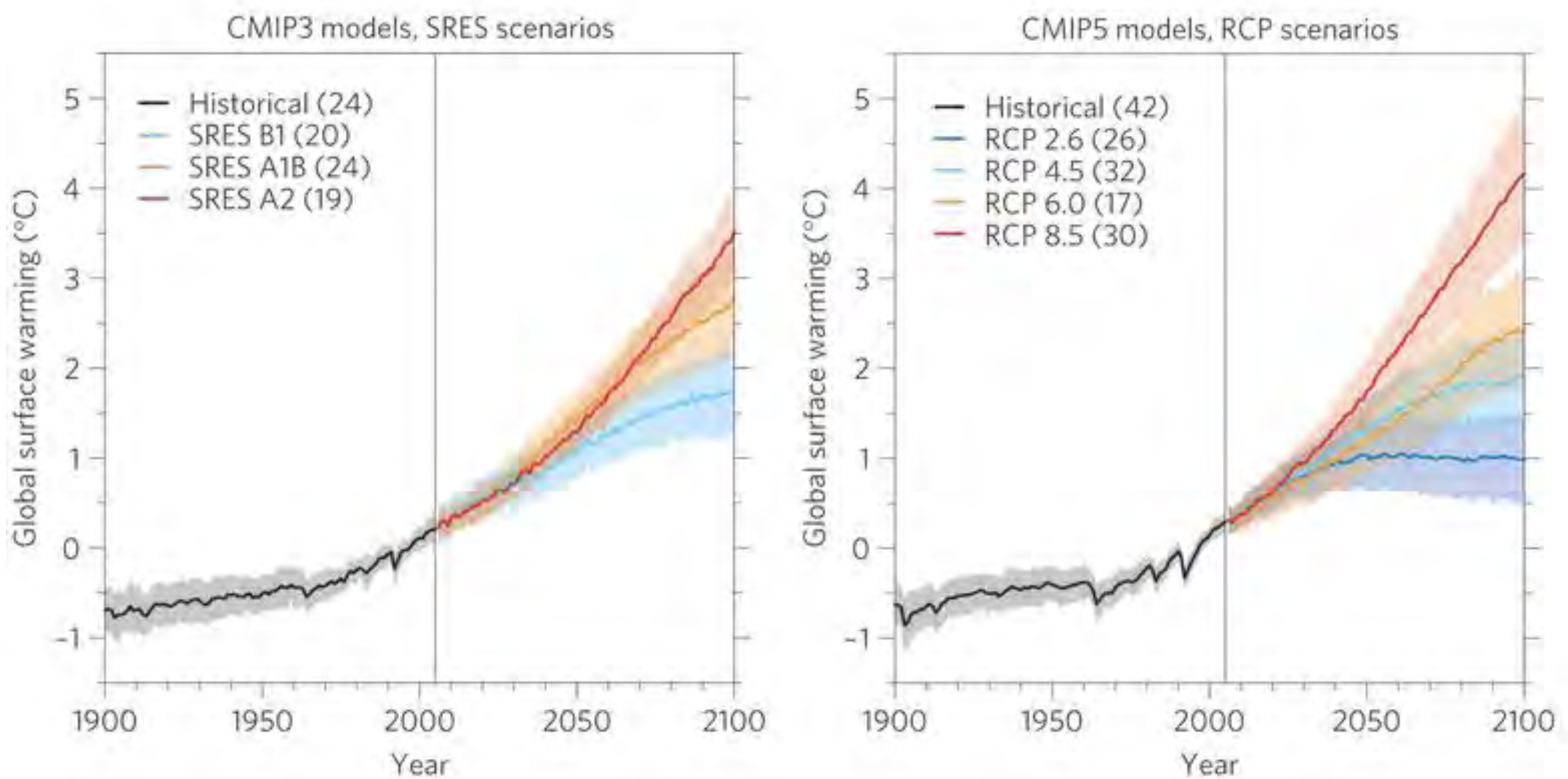

Figure C.1-3: Global temperature change projections for SRES scenarios run by CMIP3 (left) and the RCP scenarios run by CMIP5 (right). Mean global temperature change relative to 1986–2005 is shown as a colored line and one standard deviation shown with colored shading. The number of models run is given in parentheses. Figure reprinted from Knutti and Sedláček (2013).

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Appendix C.2: Climate Change Scenario Data and Trends for Mayo, YT

Climate change scenario data are presented for Mayo, YT below. In Figure C.2-1 (air temperature) and Figure C.2-2 (precipitation), seasonal and annual trends are summarized for historical and decadal time slices out to year 2100 for RCP 6.0. Presented in this format, long-term trends (*i.e.*, increases in temperature and precipitation) are apparent for this location. In contrast and shown in Figure C.2-3 through Figure C.2-8, air temperature and precipitation plots are presented for the RCP 4.5 (low), RCP 6.0 (middle) and RCP 8.5 (high) scenarios as bar charts with X-axis showing month of year. Presented in this format, differences between scenarios and selected future decades are apparent on an annual basis.

Climate change scenario data for Mayo, YT, forecast increases in both air temperature and precipitation. On an annual basis (see Figure C.2-1, green line), RCP 6.0 output indicate increases in air temperature from current conditions (on the order of -3 °C) to an estimated value of -1 °C by year 2050, which lies approximately within the post-closure period for the Project . Further, increases in temperature are predicted for all four seasons, noting the long-term predicted increase in air temperature is most pronounced for winter months. On an annual basis (see Figure C.2-2, green line), RCP 6.0 output indicate increases in total precipitation from current conditions (on the order of 325 mm/yr) to an estimated values of 375 mm by year 2050. Like air temperature predictions, increases in precipitation are predicted for all four seasons of the year, noting the long-term predicted increases are most apparent for summer (Jun, Jul and Aug) and autumn (Sep, Oct and Nov) seasons.

While winters are predicted to remain cold (*i.e.*, well below 0°C), predicted air temperature changes could potentially impart perceptible changes on local water balances going forward. Specific to the operation of a mine, future hydrometeorology changes of interest may include:

- A potential increase in summer evaporation owing to warmer temperatures, or potentially, an overall decrease in summer evaporation owing to the future precipitation regime (*i.e.*, more summer rainfall, higher relative humidity, potential for decrease in net radiation);
- Earlier onset of freshet condition and later freeze up in the autumn owing to warmer temperatures. Overall these changes may translate to a longer ice-free period in local streams.

- Changes to the overall proportion of precipitation realized as either rainfall or snowfall, with increases in air temperature and precipitation in autumn likely to translate to addition rainfall during this season.

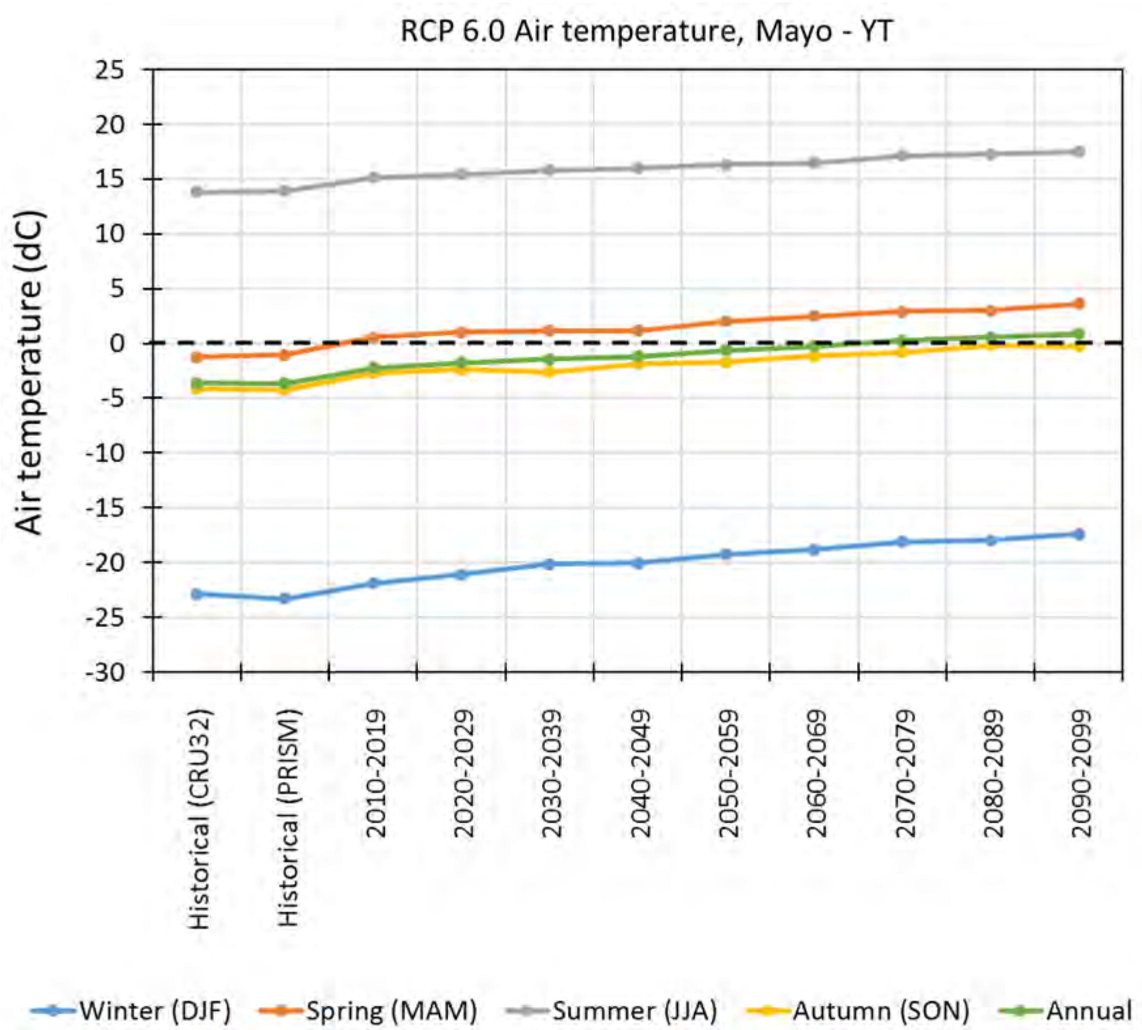


Figure C.2-1: RCP 6.0 air temperature predictions for Mayo, YT. Historical (normal) and decadal averages are shown in the plots.

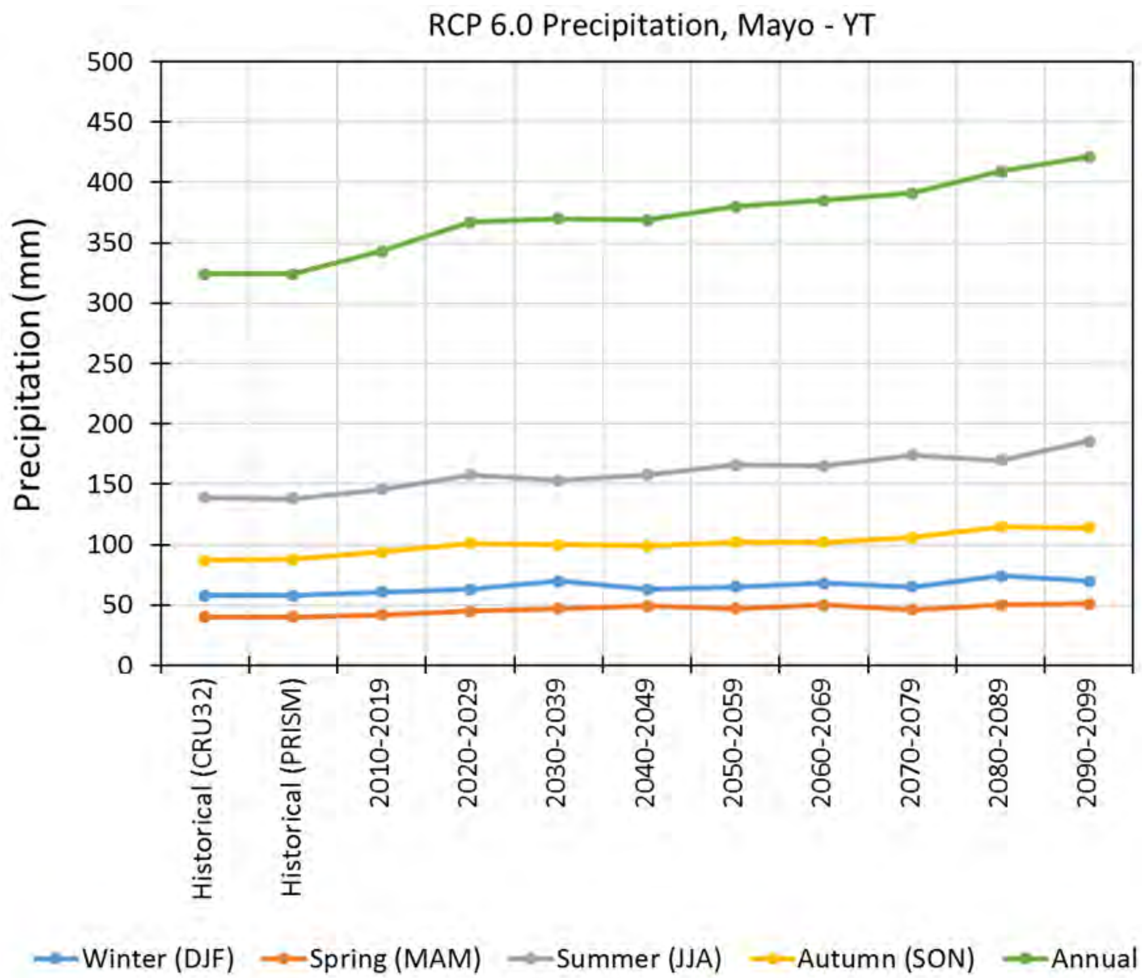


Figure C.2-2: RCP 6.0 precipitation predictions for Mayo, YT. Historical (normal) and decadal averages are shown in the plots.

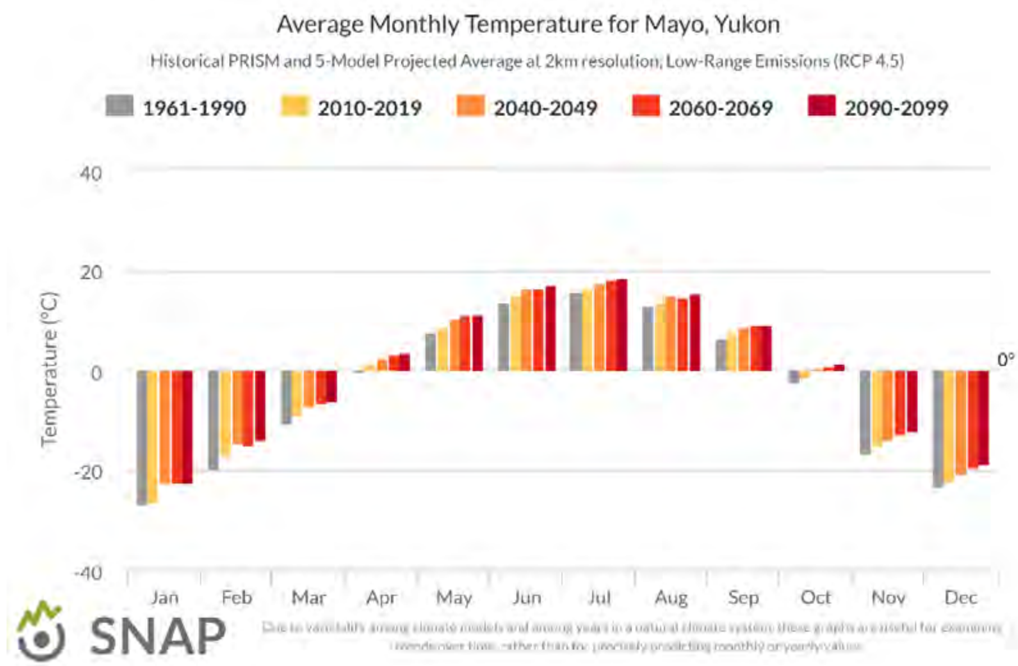


Figure C.2-3: Historical and predicted air temperatures for Mayo, YT under RCP 4.5.

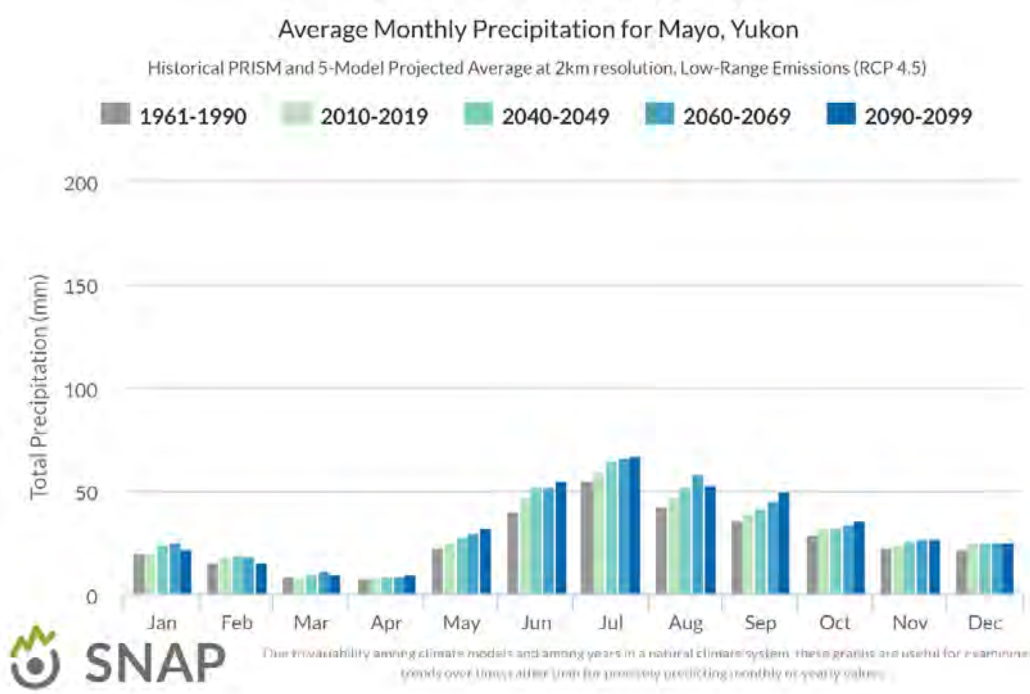


Figure C.2-4: Historical and predicted precipitation depths for Mayo, YT under RCP 4.5.

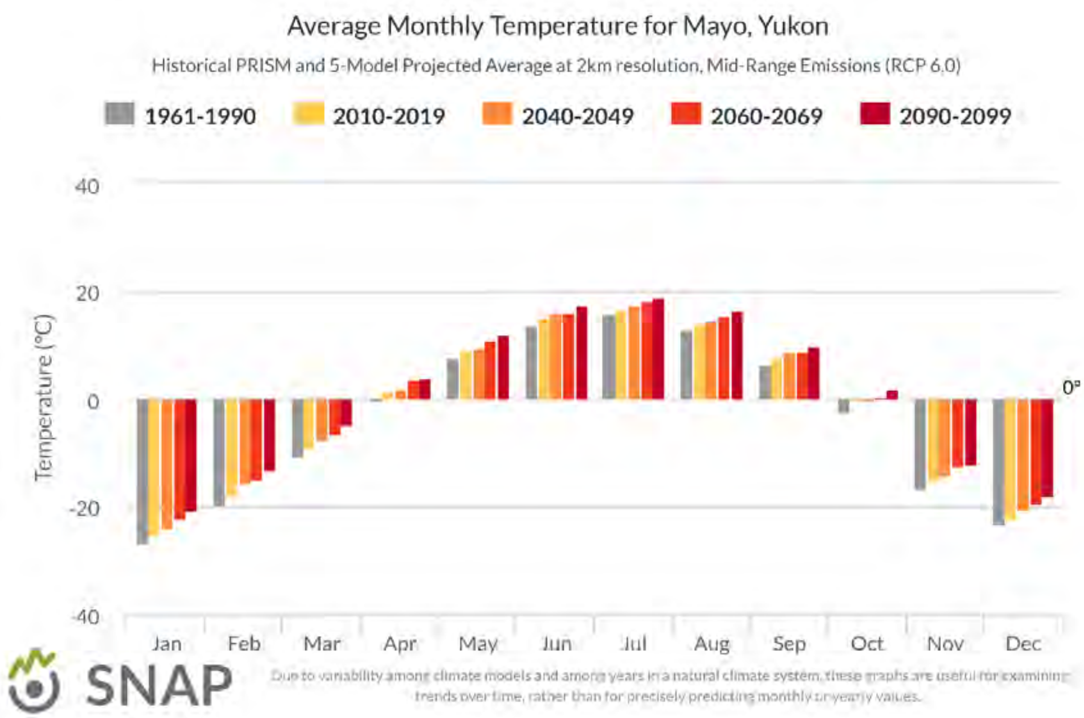


Figure C.2-5: Historical and predicted air temperatures for Mayo, YT under RCP 6.0.

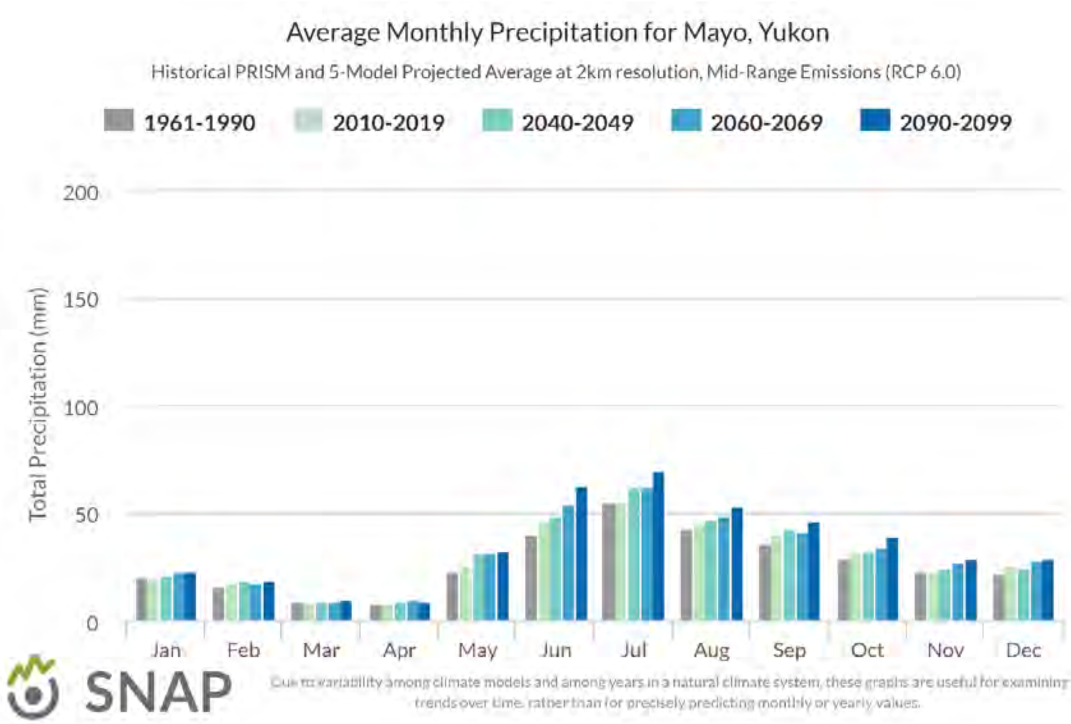


Figure C.2-6: Historical and predicted precipitation depths for Mayo, YT under RCP 6.0.

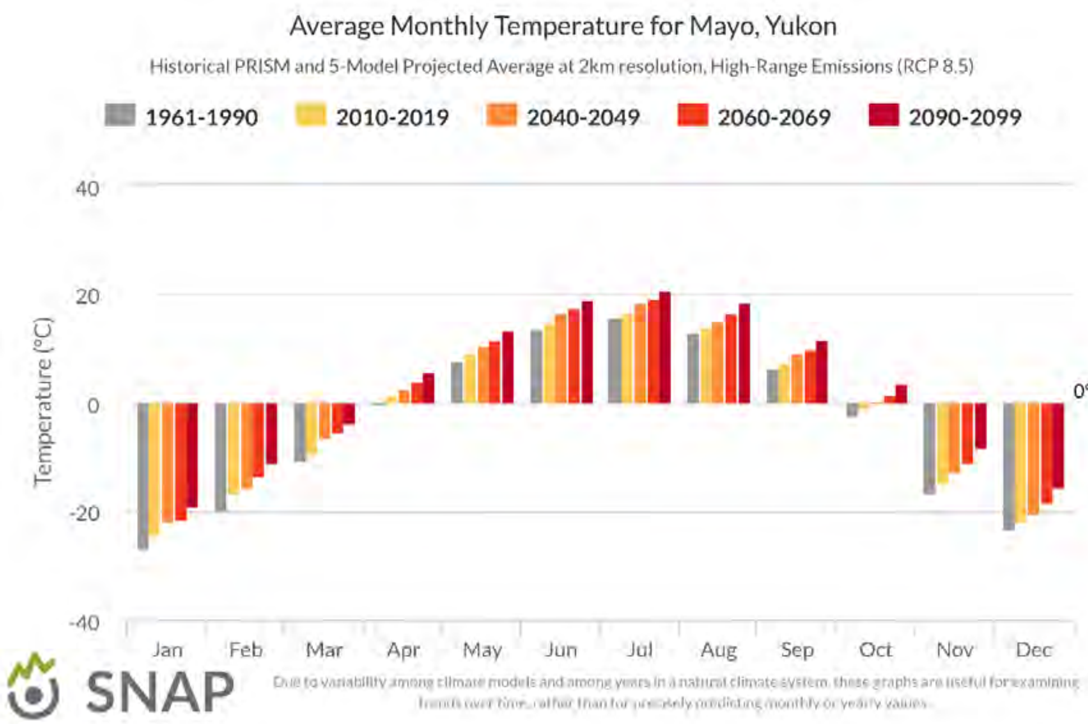


Figure C.2-7: Historical and predicted air temperatures for Mayo, YT under RCP 8.5.

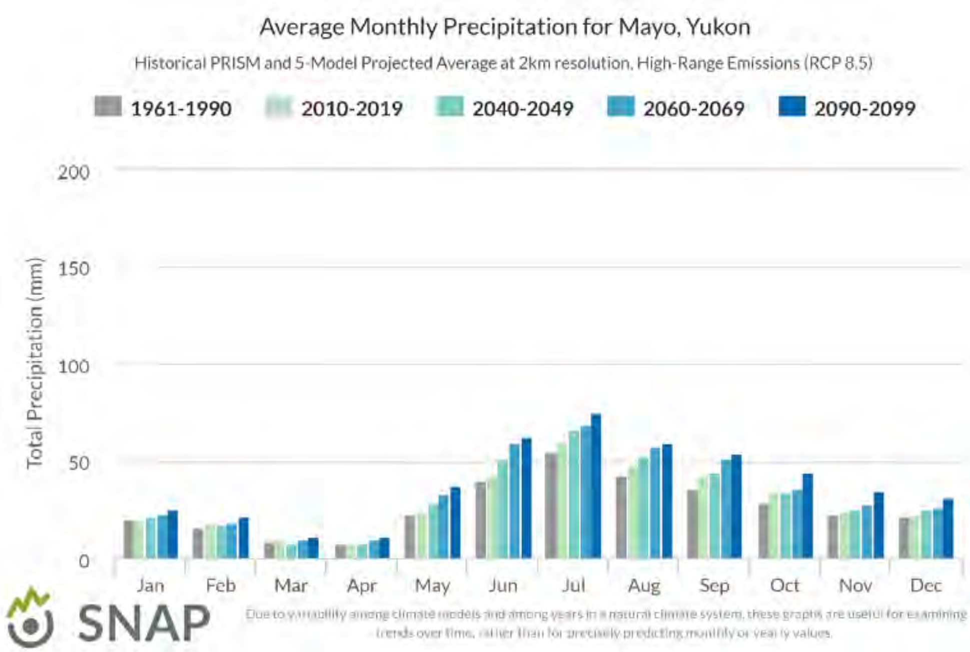


Figure C.2-8: Historical and predicted precipitation depths for Mayo, YT under RCP 8.5.

Appendix C.3: Regional Hydro-climatic Trend Analysis

C3.1 Overview

Regional hydrometric and climate stations with longer record periods are typically used to provide estimates of pertinent streamflow variables (*e.g.*, mean annual precipitation and runoff, 7-day low flows, and peak flow magnitudes) for site-specific streamflow and climate stations with shorter duration records. This requires two important assumptions: 1) the regional hydro-meteorological records are transferable to the site being studied; and 2) the regional (and site specific) data are of sufficient length to adequately represent long-term variability.

The latter assumption often implies that there are no trends present within the data being analyzed. In other words, a metric calculated from the historic record will retain the same value when re-calculated from future data. As the understanding of anthropogenic and climatic influences on streamflow improves, it is apparent that this assumption is often not valid. Therefore, a trend analysis should be undertaken to first quantify the degree to which the streamflow series is changing over time, and then employ this knowledge to ensure that estimates of future streamflow conditions are as robust as possible.

C3.1.1 Objectives and Methods

The objectives of this analysis are two-fold: 1) calculate trends in various streamflow and climate variables for the region in which the Project is situated; and 2) determine whether the calculated trends are statistically significant at $p < 0.05$. The McQuesten River WSC streamflow record (average daily discharge) and the Mayo A climate record (daily average, maximum and minimum temperature) were analyzed in this exercise owing to their proximity to the Project site.

The following variables were assessed in the analysis:

- Air temperature and precipitation metrics, where climate variables (*i.e.*, precipitation totals, average, average maximum and average minimum temperature) were aggregated by season as follows:
    - winter (Dec. – Feb. [DJF]);
    - spring (Mar. –May [MAM]);
    - summer (Jun. – Aug. [JJA]), and;
    - autumn (Sep. – Nov. [SON]).

- An array of streamflow metrics using period of record average daily discharge (m^3/s) data:
    - Maximum annual discharge;
    - Average annual discharge;
    - Minimum annual discharge;
    - Date of maximum annual discharge;
    - Winter baseflow (average of Nov. to Mar. discharge);
    - Annual minimum 7Q (7-day rolling average discharge);
    - Annual minimum 30Q (30-day rolling average discharge);
    - June-Sept. minimum 7Q (7-day rolling average discharge);
    - June-Sept. minimum 30Q (30-day rolling average discharge); and
    - Monthly average discharge (all months).

In the context of mine effluent management, regulatory assessment criteria are typically based on concentrations of effluent and final mixing contact water in the downstream receiving environment. Periods of low flow are commonly assessed for the annual period (usually representative of winter flows in nival and glacial regimes) and during June-September. These indices are commonly based on a rolling 7-day average of discharge (7Q) or, less commonly, a rolling 30-day average (30Q) (Smakhtin, 2001). The minimum 7- or 30-day averages are then tabulated on an annual basis, and recurrence interval analyses conducted (*e.g.*, $7Q_{10}$). Time series of these four low flow indices, as well as winter discharge (Nov to Mar) were examined for this assessment.

Additionally, the following streamflow timing metrics were calculated:

- PULSE_DATE – The date of freshet initiation calculated as the day when the cumulative departure from that years mean annual discharge is most negative (Cayan *et al.*, 2001). The cut-off date is set as August 31, to ensure that autumn rain events in mixed rainfall/snowmelt driven regimes are not inadvertently counted as the freshet date.
- DATE_CM – Date of centre of hydrograph mass (calendar year), calculated following Stewart *et al.* (2005).

Annual time-series for climate and streamflow metrics were analysed for trends using the *zyp* package in R (Bronaugh and Werner, 2013). The full details of the calculations performed by this package are provided in the reference above, but in brief, initial trend slopes were estimated using the Theil-Sen approach. To address serial correlation effects on statistical hypothesis tests for trend, if a trend was noted, the time-series was detrended using the slope (Yue *et al*., 2002). In this approach, the trend and residuals were blended, and the Mann-Kendall's test for trend significance (p-value) was applied. The *zyp* package re-inflates the values that trend significance are calculated from by dividing by (1-AR(1)).

All climate and streamflow trends presented in this section of the report are summarized as annual values (*i.e.*, rate of change per year in the variable of interest).

C3.1.2 Climatic Trends

Climate trends are presented for Mayo, YT in Table C.3-1, with representative plots for air temperature and precipitation metrics shown in Figure C.3-1 and Figure C.3-2 respectively. The trend analysis was focused on the two regional stations that the synthetic climate (Mayo A) and streamflow (McQuesten R.) records are based on. The results of this trend analysis serve to place the GCM projections of climate change into a regional and historical context. The rationale being that if the slope of the trend lines noted in the regional records are similar to those in the GCM projections, greater confidence can be placed in those projections. Overall, these outputs indicate there are significant positive trends for almost all temperature metrics (*i.e.*, MaxT, MinT, AvgT) – whether data are synthesized annually, monthly or by season. Though the direction of change for air temperature is positive, the magnitude of measured change varies by season. For example, the long-term trend in average annual air temperature is 0.32°C/decade whereas the positive trend for winter (DJF) at Mayo is more pronounced at 0.91°C/decade.

An inspection of annual and seasonal precipitation trends at Mayo reveals there are positive trends for summer (JJA), autumn (SON) and annual precipitation metrics, but winter and spring trends are neutral. Summer and autumn precipitation trends are shown as time series in the upper panel of Figure. The lower panel of Figure C.3-2 shows the annual precipitation trend at Mayo in the form of an anomaly plot (*i.e.*, y-axis value of zero is the mean value with positive and negative values equating to standard deviation increases and decreases from the mean value, respectively). In terms of magnitude, the significant positive precipitation trends are as follows: annual (8.1 mm/decade); summer (4.3 mm/decade); and autumn (2.8 mm/decade).

Table C.3-1:
Summary of climate and streamflow trends for Mayo, YT and McQuesten River near the Mouth.

Parameter	Unit	Lower Bound	Trend (value/year)	Trend (value/decade)	Upper Bound	p	Linear	Intercept
MAYO_DJF_P	mm	-0.21	0.04	0.40	0.27	0.75	0.03	50.57
MAYO_MAM_P	mm	-0.10	0.02	0.16	0.13	0.76	0.03	36.08
MAYO_JJA_P	mm	0.09	0.43	4.28	0.75	0.02	0.44	107.48
MAYO_SON_P	mm	0.06	0.28	2.78	0.50	0.02	0.26	70.50
MAYO_ANN_P	mm	0.27	0.81	8.10	1.31	0.00	0.73	271.20
MAYO_DJF_MAXT	°C	0.04	0.09	0.89	0.14	0.00	0.06	-20.73
MAYO_MAM_MAXT	°C	0.01	0.02	0.21	0.04	0.01	0.02	4.93
MAYO_JJA_MAXT	°C	0.01	0.02	0.16	0.03	0.00	0.01	20.05
MAYO_SON_MAXT	°C	-0.02	0.00	-0.03	0.02	0.73	-0.01	1.03
MAYO_ANN_MAXT	°C	0.00	0.02	0.23	0.04	0.02	0.02	1.94
MAYO_DJF_MINT	°C	0.03	0.08	0.81	0.12	0.00	0.07	-31.40
MAYO_MAM_MINT	°C	0.02	0.04	0.39	0.06	0.00	0.03	-8.97
MAYO_JJA_MINT	°C	0.03	0.03	0.35	0.04	0.00	0.03	5.52
MAYO_SON_MINT	°C	-0.01	0.02	0.17	0.04	0.13	0.01	-8.57
MAYO_ANN_MINT	°C	0.02	0.04	0.38	0.06	0.00	0.04	-10.29
MAYO_DJF_AVGT	°C	0.04	0.09	0.91	0.13	0.00	0.07	-26.68
MAYO_MAM_AVGT	°C	0.01	0.03	0.27	0.04	0.01	0.03	-1.75
MAYO_JJA_AVGT	°C	0.02	0.02	0.24	0.03	0.00	0.02	12.87
MAYO_SON_AVGT	°C	-0.01	0.01	0.06	0.03	0.53	0.00	-3.90
MAYO_ANN_AVGT	°C	0.01	0.03	0.32	0.05	0.00	0.03	-4.37
McQ_Q_MAX_Q	m^3/s	-2.38	0.00	0.00	2.42	1.00	-0.03	257.00
McQ_Q_MIN_Q	m^3/s	0.03	0.07	0.69	0.12	0.00	0.07	1.86
McQ_Q_AVG_Q	m^3/s	-0.01	0.21	2.07	0.42	0.07	0.15	23.24
McQ_Q_PULSE_DATE	Julian Day	-0.26	0.00	0.00	0.14	0.78	-0.06	122.00
McQ_Q_MAX_Q_DATE	Julian Day	-0.47	-0.06	-0.56	0.36	0.80	-0.10	148.03
McQ_Q_WINTER_BASEFLOW	m^3/s	0.05	0.10	1.03	0.15	0.00	0.09	1.43
McQ_Q_DATE_CM	Julian Day	-0.14	0.26	2.62	0.76	0.22	0.31	150.49
McQ_Q_ANN_7Q_MIN	m^3/s	0.03	0.07	0.70	0.11	0.00	0.07	1.89
McQ_Q_JUN-SEP_7Q_MIN	m^3/s	-0.05	0.28	2.76	0.59	0.07	0.21	9.48
McQ_Q_JANUARY	m^3/s	0.03	0.09	0.94	0.15	0.00	0.09	2.03
McQ_Q_FEBRUARY	m^3/s	0.01	0.08	0.77	0.12	0.01	0.08	2.21
McQ_Q_MARCH	m^3/s	0.01	0.05	0.55	0.11	0.02	0.05	3.24
McQ_Q_APRIL	m^3/s	-0.07	0.07	0.67	0.18	0.26	0.05	4.91
McQ_Q_MAY	m^3/s	-0.45	0.32	3.22	1.32	0.36	0.40	90.73
McQ_Q_JUNE	m^3/s	-2.05	-0.60	-6.04	0.74	0.39	-0.63	136.59
McQ_Q_JULY	m^3/s	-0.29	0.36	3.61	0.96	0.29	0.11	24.03
McQ_Q_AUGUST	m^3/s	-0.17	0.32	3.16	0.93	0.18	0.43	18.35
McQ_Q_SEPTEMBER	m^3/s	0.15	0.70	7.04	1.26	0.01	0.60	-3.96
McQ_Q_OCTOBER	m^3/s	0.05	0.46	4.62	0.99	0.02	0.33	-5.90
McQ_Q_NOVEMBER	m^3/s	0.00	0.17	1.66	0.36	0.05	0.08	3.78
McQ_Q_DECEMBER	m^3/s	0.09	0.18	1.82	0.28	0.00	0.14	-1.44

Notes:
Units for identified trends are specified in Column 2.
Trends are reported as value/year (Column 5) and value/decade (Column 6).
Significant trends are conditionally formatted such that trends with $p<0.01$ are highlighted pink, trends with $p<0.05$ are highlighted orange and trends with $p<0.1$ are highlighted in green.

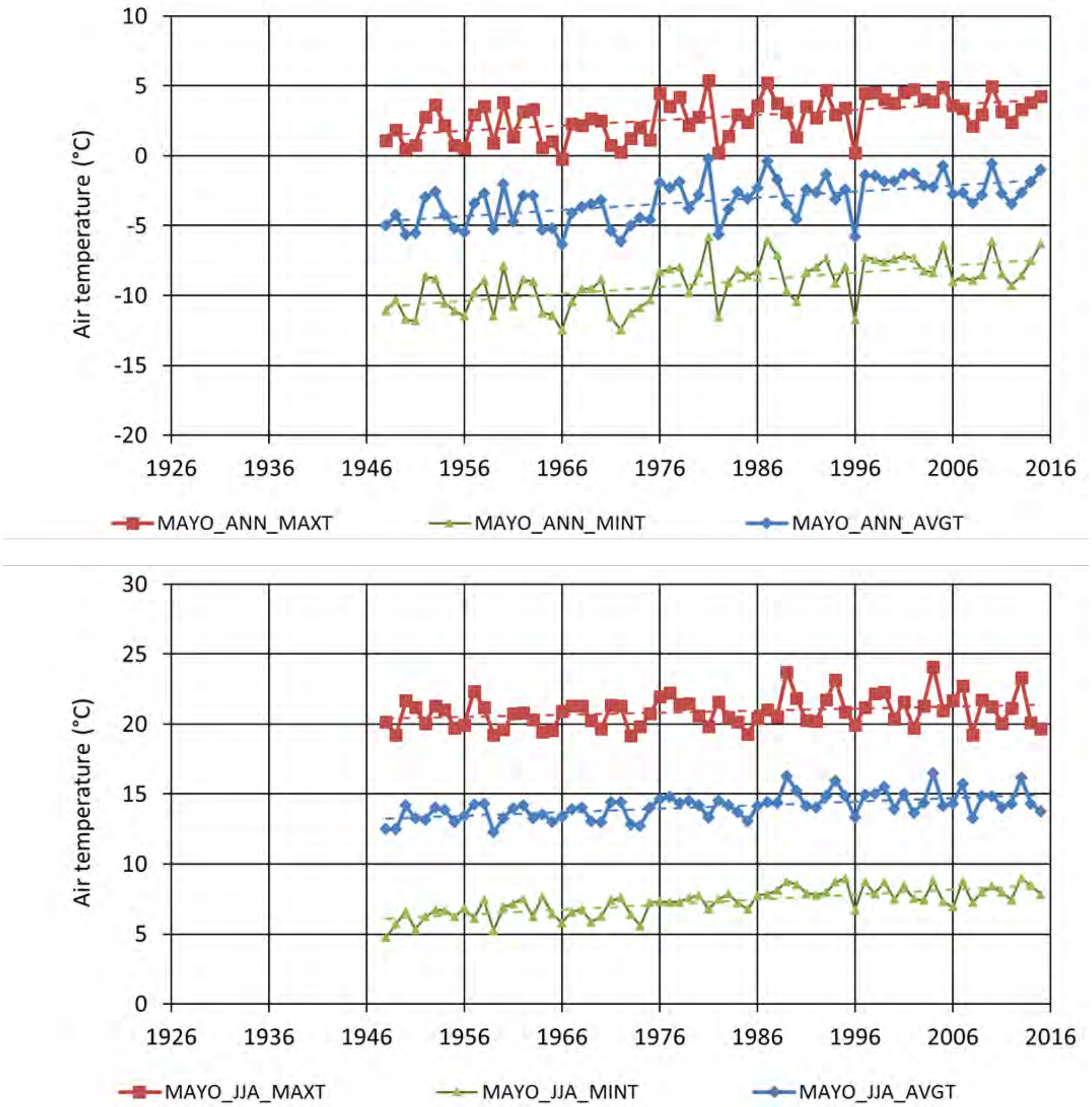
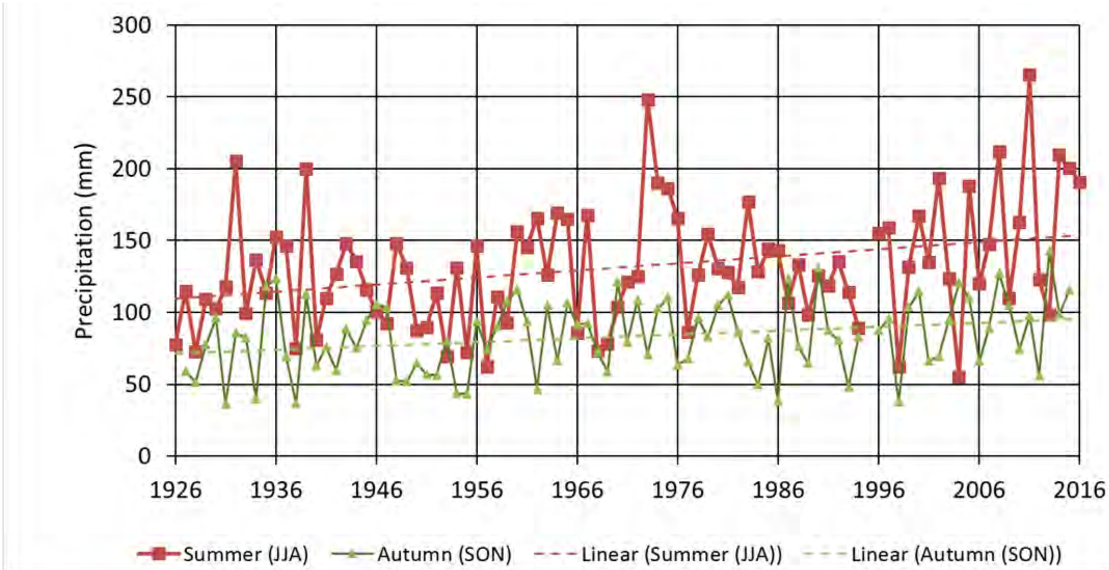


Figure C.3-1: Time-series plots showing representative and significant air temperature trends for Mayo, YT. In the upper plot, trends are shown for annual temperature metrics (maxT, minT, avgT). In the lower plot, trends are shown for summer (JJA) for maximum, minimum and average air temperature metrics.



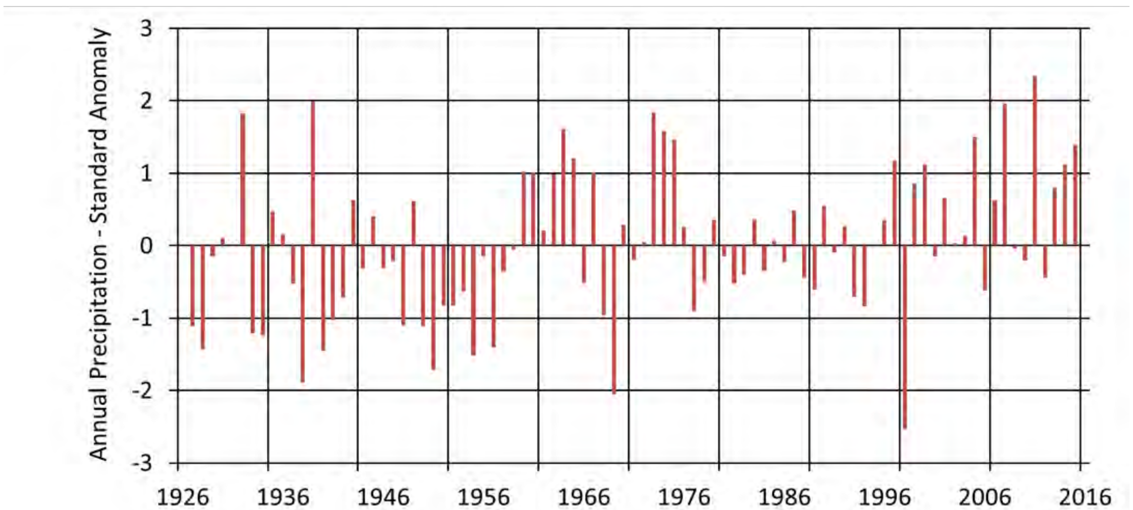
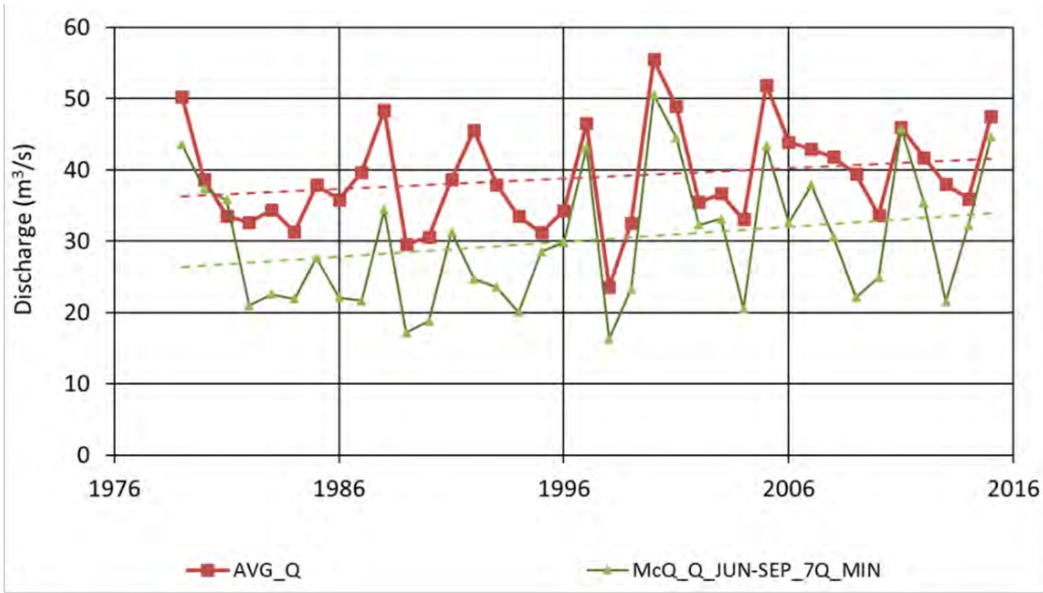


Figure C.3-2: Time-series plots showing significant precipitation trends for Mayo, YT. In the upper plot, trends are shown for summer (JJA) and autumn (SON) precipitation metrics. In the lower plot, trends are shown for annual precipitation in the form of an anomaly plot.

C3.1.3 **Streamflow Trends**

Streamflow trends are presented for the McQuesten River at the Mouth in Table C.3-1. In addition, representative and significant streamflow trends are shown as time-series in Figure C.3-3. Like air temperature trends, several streamflow metrics show significant and positive trends over the relatively short term period (1980 to 2015). For example, while trends are neutral for several months in the ice-free season (*e.g.*, May, June, July and August), positive trends are notable for the following metrics: summer 7Q low flow, winter baseflow and monthly flow metrics for September through March inclusive.



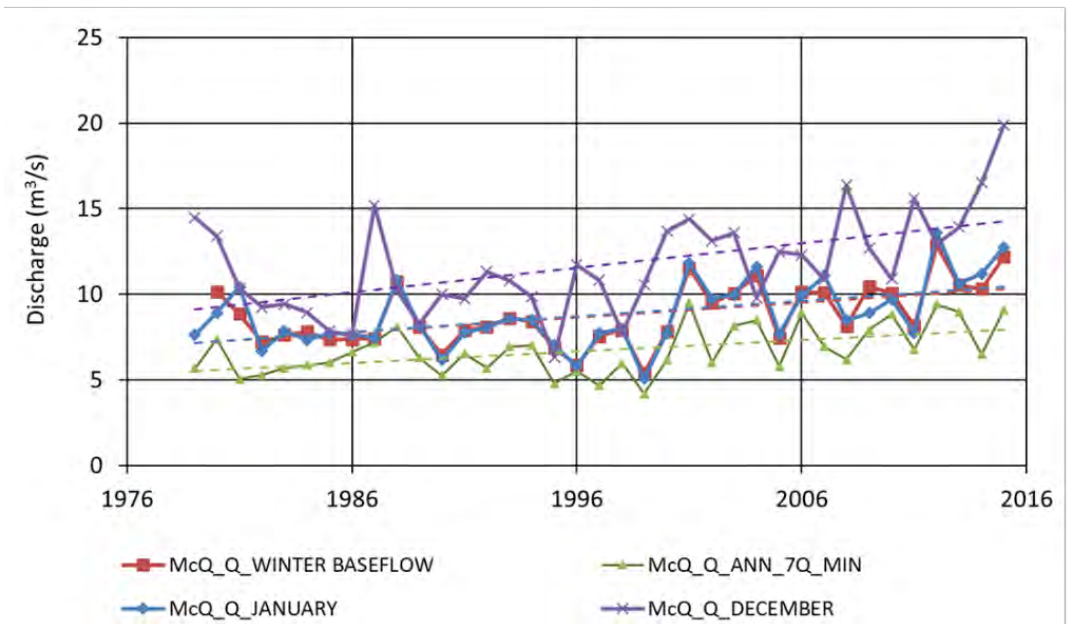


Figure C.3-3: Time-series plots showing representative and significant streamflow trends for McQuesten River at the Mouth. In the upper plot, trends are shown for average annual discharge and summer 7Q low flows. In the lower plot, trends are shown for winter low flow conditions and include series for winter baseflow, winter 7Q flow, January discharge and February discharge.

C3.1.4 **Summary**

While every attempt has been made to ensure that the identified trends are reflective of changes in climate and streamflow that could potentially impact the estimates used in Project design, the calculated trends can be influenced by several factors, including, but not limited to:

- Large scale climate cycles (*e.g.*, Pacific Decadal Oscillation [PDO], El Niño Southern Oscillation [ENSO]; Cayan and Peterson, 1989; Stewart *et al*., 2005), and;
- Changes in measurement techniques, QA/QC practices, precipitation gauges, rating curves, *etc*.

The instrumental record for Yukon monitoring stations near the Project site indicates that recent conditions have been both warmer and wetter than historic conditions. The annual average air temperature over the period of site record (2008-2015) was slightly warmer (-2.2°C) than the 1981-2010 normal (-2.3°C). Average annual precipitation was 16% higher over the site monitoring period (363.3 mm) than the normal period (312.4 mm). Looking forward, climate change scenario data are presented for Mayo, YT in Appendix C. In Figure C.2-1 (air temperature) and Figure C.2-2 (precipitation), seasonal and annual trends are summarized for historic and modelled decadal time slices out to year 2100 for RCP 6.0. Like the instrumental record, climate change scenario data for Mayo, YT, forecast increases in both air temperature and precipitation variables.

References

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APPENDIX E

Eagle Gold Mine - Update on Geochemical Source Terms

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TECHNICAL MEMORANDUM

To:	**Stephen Wilbur, Victoria Gold Corp.**	**Date: March 7, 2017**
From:	**Timo Kirchner & David Flather**	**Project #: A413-1**
Subject:	**Eagle Gold Mine - Update on geochemical source terms**	

For the application of the water use licence (WUL), Victoria Gold Corp. (VIT) retained Lorax Environmental Services Ltd. (Lorax) to provide geochemical source term predictions for the waste rock storage facilities as well as the heap leach pad to be used for the site-wide water quality model. The source term model produced by Lorax was primarily based on laboratory- and field-kinetic testwork conducted on representative samples representing waste rock and ore.

As a condition of the WUL, VIT is required to prepare an updated water quality model that is reflective of updates to climate, hydrology and water quality data collected since submission of the WUL application. To that end, the geochemistry of field bin leachates collected throughout 2016 were reviewed by Lorax and the potential effect of the additional data on the source term model was assessed.

Upon completion of this review it was determined that the source term model results prepared for the Eagle Gold WUL in 2014 are still valid and do not currently require updating as a result of more recent field bin data collected in 2016. The rationale for this conclusion is due to the following reasons:

- The field bin leachate data were only directly used in the source term model to calculate a "first flush" value representing the effect of flushing easily soluble species. The values used for this approach have not changed since the last model iteration;
- Overall, the trends observed in field bin leachates over time were used qualitatively for model validation purposes. While variable, these trends have not changed sufficiently to warrant a re-run of the source term model as a whole.

Should changes to the mine plane be made or new data become available that alters the above conclusions, the source term model will be re-evaluated at that time.

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APPENDIX F

Baseline Water Quality Report (2016 Update) Eagle Gold Project

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Baseline Water Quality Report (2016 Update)

EAGLE GOLD PROJECT

March 2017

Prepared for:
StrataGold Corporation
Vancouver, BC

Prepared by:
Lorax Environmental Services Ltd.
Vancouver, BC

ABBREVIATIONS

%	percent
<	less than
>	greater than
M	micro
µg/L	micrograms per liter
µS/cm	micro siemens per centimeter
CCME	Canadian Council of Ministers of the Environment
CN_{wad}	weak acid dissociable cyanide
DOC	dissolved organic carbon
DQO	data quality objectives
HVAAS	hydride vapour atomic absorption spectrophotometry
ICP-AES	inductively coupled plasma atomic emission spectrophotometry
ICP-MS	inductively coupled plasma mass spectrophotometry
ICP-OES	inductively coupled plasma optical emission spectrophotometry
mg/L	milligrams per litre
MOE	Ministry of Environment
NTU	nephelometric turbidity unit
QA/QC	quality assurance/quality control
RPD	relative percent difference
TDS	total dissolved solids
TKN	total kjeldahl nitrogen
TOC	total organic carbon
TSS	total suspended solids
WQG	water quality guideline

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1 INTRODUCTION

This report compiles updated results for the baseline water quality program conducted for the Victoria Gold Corp (VIT) Eagle Gold Project (the Project). The Eagle Gold Project is a proposed open pit gold mine within the Dublin Gulch watershed, located 45 km north-northeast of the Village of Mayo, Yukon Territory.

The environmental monitoring programs at the project site have occurred since the mid-1990s, and summaries of historical water quality data can be found in previous reports (Stantec 2010, 2011 and 2012). This present report updates the 2013 baseline report submitted by Lorax Environmental Ltd. (Lorax 2013) with additional water quality data collected in 2013, 2014 and 2016. The study area includes Haggart Creek, Dublin Gulch, Eagle Creek and Lynx Creek basins. Project effects are not expected to occur in Lynx Creek and thus the stream is considered a reference area.

1.1 REPORT STRUCTURE

Section 2 outlines the overarching objectives of the baseline water quality program and provides a description of the sampling stations and locations; sampling frequency for each station during 2007 to 2016; sampling and analytical methods; a brief description of data analysis methods and quality assurance/quality control programs. Section 3 presents the results of the baseline water quality program. The section provides a characterization of the baseline water quality in the key project drainages of Dublin Gulch, Eagle Creek, Haggart Creek and the reference basin of Lynx Creek. Not all of the monitoring stations are described in detail, but rather select stations that characterize existing water quality in each of the project basins in the receiving environment of the project area. Water quality monitoring data for all stations are however provided in Appendix A1 and A2.

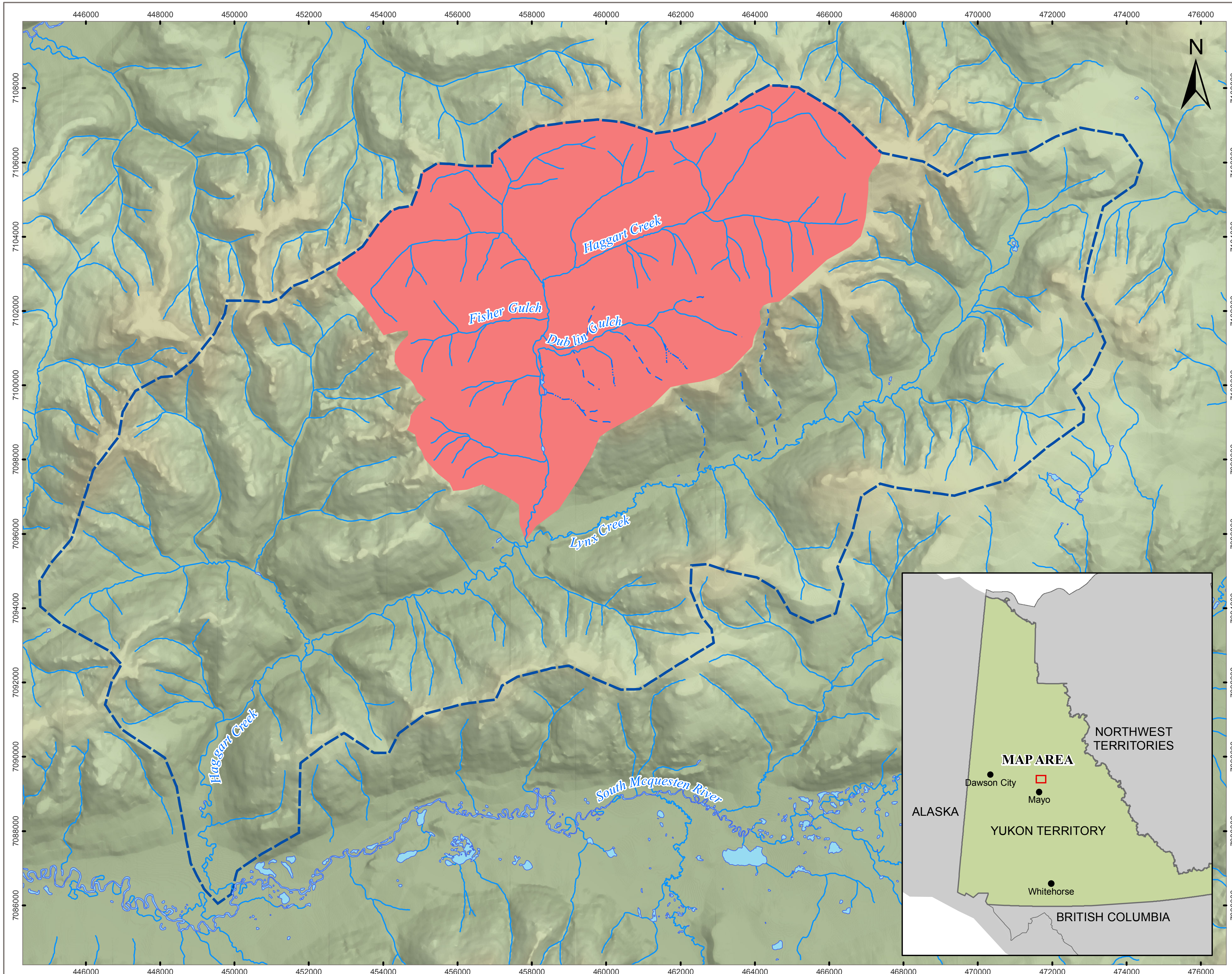
2 BASELINE WATER QUALITY PROGRAM

2.1 OVERVIEW AND OBJECTIVES

The Eagle Gold Project baseline water quality program is designed to:

- Obtain (pre-mining) baseline data on water quality to assess potential changes that could be related to construction, operation, closure, and post-closure phases of the Project;
- Identify parameters with concentrations that are naturally elevated and may therefore require the development of management plans (e.g., site specific objectives); and
- Provide baseline data for receiving aquatic environments to be used as input for the water quality modeling and development of water quality predictions for key mining phases of the project; and

The baseline water quality dataset presented in this report includes previously collected and reported samples from 2007 to 2012 (Lorax 2013), in addition to updates to the water quality dataset which incorporates samples collected in 2013, 2014 and 2016 from aquatic environments located within the project area. No water quality samples were collected in 2015. The study area includes the Haggart Creek, Dublin Gulch, Eagle Creek, and Lynx Creek basins (Figure 2.1 and Figure 2.2). For the period of 2007 to 2016, a total of 21 monitoring stations have been sampled within the study area (Table 2.1 and Table 2.2). Portions of Haggart Creek, Dublin Gulch, and Eagle Creek drainage basins have the potential to be affected by the proposed Project and thus, sites located upstream and downstream of the Project footprint were selected within these basins, where possible. Lynx Creek drains a large catchment to the south of the Project area that will be unaffected by development activities and will serve as reference monitoring location (Figure 2.1).



LEGEND

- Water Quality Regional Assessment
- Water Quality Local Assessment
- Waterbodies
- Watercourse (perennial)
- Watercourse (ephemeral)
- Watercourse (intermittent)

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Baseline Water Quality Local Assessment Area and Regional Assessment Area

PROJECTION	DATUM	CLIENT
Transverse Mercator UTM Zone 8	NAD83	Victoria Gold Corp

Scale: 1:100,000
1,000 500 0 1,000
Metres

FILE NO.

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	GM	DHF	DHF	1

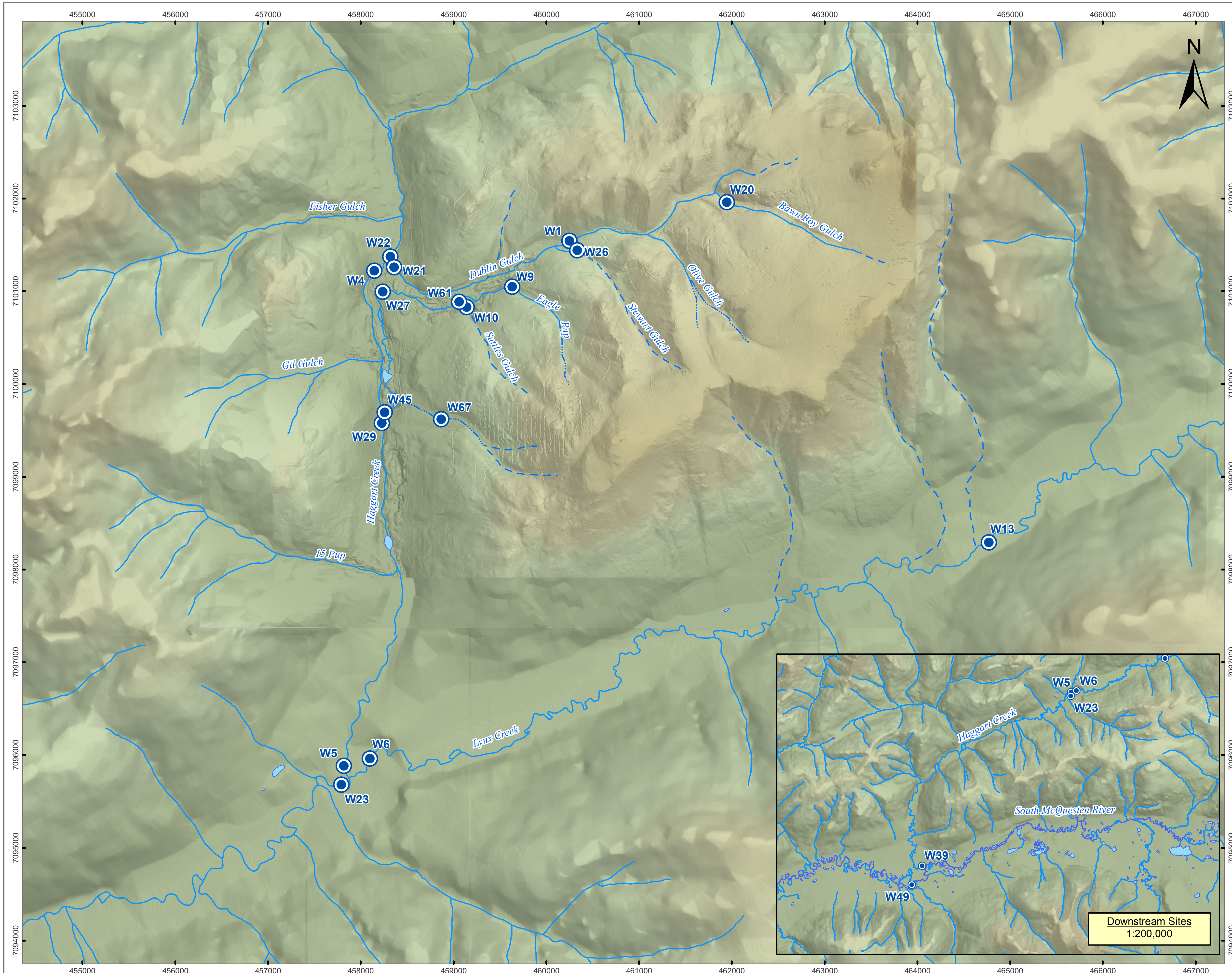
OFFICE

DATE
December 17, 2016

LORAX ENVIRONMENTAL

Figure 2.1

Path: P:\J996 (Victoria Gold Eagle Gold Project)\Drafting\MXDs\Fig 2.1_Baseline WQ Assessment Area_20130917_GM.mxd



LEGEND

- Water Quality Sample Sites
- Waterbodies
- Watercourse (perennial)
- Watercourse (ephemeral)
- Watercourse (intermittent)

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Surface Water Quality Monitoring Stations

PROJECTION	DATUM	CLIENT
Transverse Mercator UTM Zone 8	NAD83	Victoria Gold Corp

Scale: 1:40,000
400 200 0 400
Metres

FILE NO.

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	VV	DHF	DHF	1

OFFICE

DATE
December 17, 2016

Lorax Environmental

Figure 2.2

Path: P:\U996 (Victoria Gold Eagle Gold Project)\Drafting\MXDs\Fig 2.2_Surface Water Quality Stations_20130917_GM.mxd

Table 2.1: Listing of Water Quality Sampling Locations and Rationale by Drainage (2007-2016)

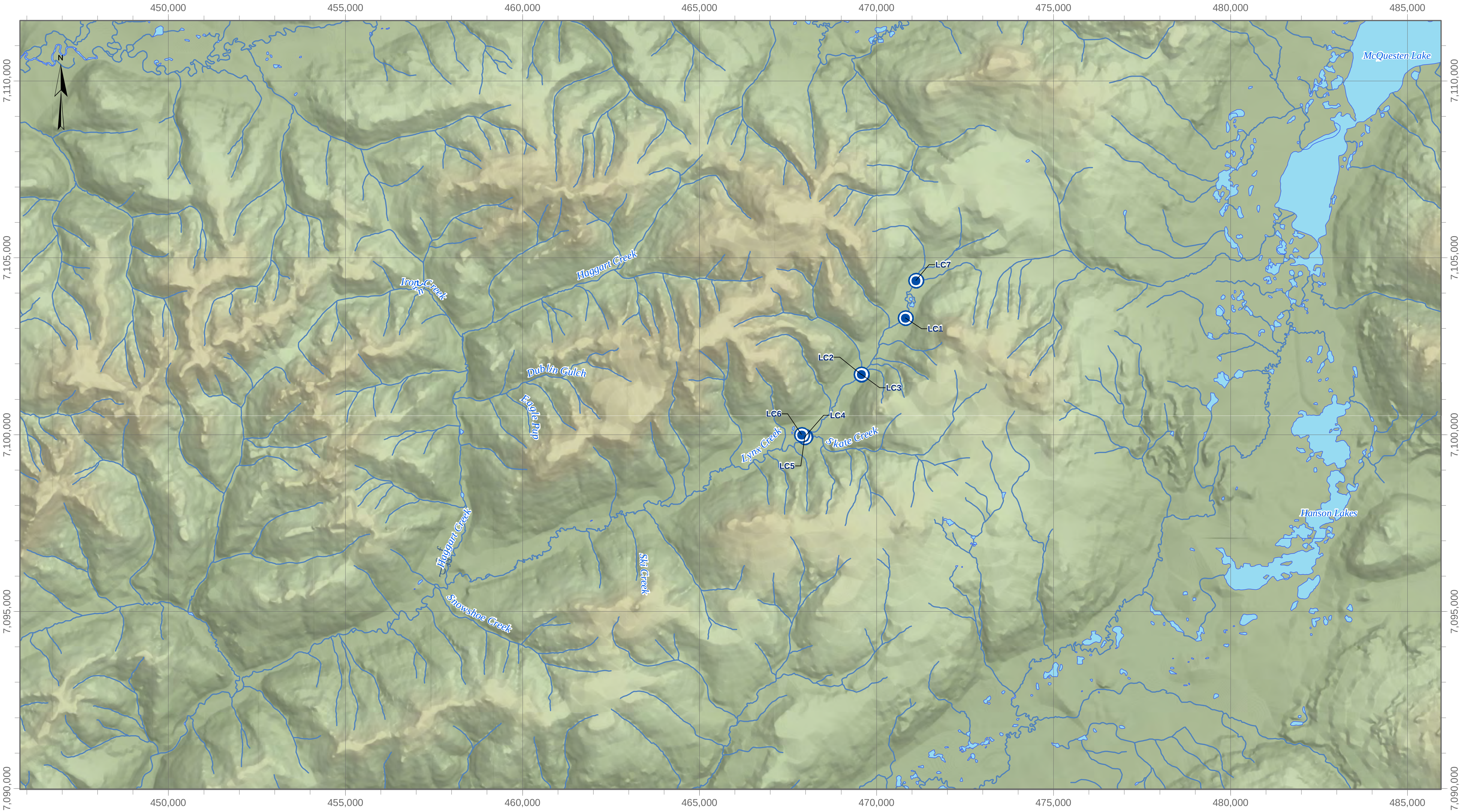
Site	Location	Coordinates		Site Type	Rationale
		North	East		
Haggart Creek Drainage					
W22	Haggart above Dublin Gulch	7101377	458319	Reference	Above Project influence
W4	Haggart below Dublin Gulch	7101223	458144	Exposure	Below Project influence
W68	Haggart upstream of Gill Gulch	7100482	458175	Exposure	Below Project influence
W29	Haggart below Eagle Cr	7099583	458225	Exposure	Below Project influence
W5	Haggart above Lynx Cr	7095887	457815	Exposure	Below Project influence
W23	Haggart below Lynx Cr	7095682	457790	Exposure	Below Project influence
W39	Haggart above S. McQuesten	7086504	449780	Far Field	Below Project influence
Dublin Gulch Drainage					
W20	Bawn Boy Gulch	7101961	461945	Reference	Above Project influence
W1	Dublin above Stewart Gulch	7101545	460249	Reference	Above Project influence
W26	Stewart Gulch	7101443	460331	Reference	Above Project influence
W32	Ann Gulch	7101211	459412	Exposure	Below Project influence
W21	Dublin above Haggart Cr	7101261	458359	Exposure	Below Project influence
Eagle Creek Drainage					
W9	Eagle Pup	7101052	459630	Exposure	Below Project influence
W10	Suttles Gulch	7100841	459161	Exposure	Below Project influence
W61	Eagle Creek below Suttles	7100895	459139	Exposure	Below Project influence
W27	Eagle Creek midway	7100997	458235	Exposure	Below Project influence
W67	Platinum Gulch at Road	7099624	458896	Exposure	Below Project influence
W45	Eagle above Haggart Cr	7099684	458243	Exposure	Below Project influence
Lynx Creek Drainage					
W13	Lynx above Ray Cr	7098295	464770	Reference	No Project influence
W6	Lynx above Haggart Cr	7095964	458099	Reference	No Project influence
LC1[a]	Upper basin of Lynx	7103295	470813	Reference	No Project influence
LC2[a]	Upper basin of Lynx	7101698	469571	Reference	No Project influence
LC3[a]	Upper basin of Lynx	7101702	469572	Reference	No Project influence
LC4[a]	Upper basin of Lynx	7099942	467979	Reference	No Project influence
LC5[a]	Upper basin of Lynx	7099927	467974	Reference	No Project influence
LC6[a]	Upper basin of Lynx	7099997	467888	Reference	No Project influence
LC7[a]	Upper basin of Lynx	7104354	471115	Reference	No Project influence
South McQuesten River Drainage					
W49	S. McQuesten below Haggart	7085495	449221	Far Field	Below Project influence

Table 2.2: Number of Samples Collected During Baseline Water Quality Sampling Program (2007 – 2016)

Site	Location	Total Number of Samples Collected (2007-2016)
Haggart Creek Drainage		
W22	Haggart above Dublin Gulch	**55**
W4	Haggart below Dublin Gulch	**47**
W68	Haggart d/s of Camp	**1**
W29	Haggart below Eagle Creek	**48**
W5	Haggart above Lynx Creek	**32**
W23	Haggart below Lynx Creek	**38**
W39	Haggart above S McQuesten	**12**
Dublin Gulch Drainage		
W20	Bawn Boy Gulch	**16**
W1	Dublin above Stewart Gulch	**58**
W26	Stewart Gulch	**32**
W32	Ann Gulch	**1**
W21	Dublin above Haggart Creek	**45**
Eagle Creek Drainage		
W9	Eagle Pup	**36**
W10	Suttles Gulch	**10**
W61	Eagle Creek below Suttles Gulch	**12**
W27	Eagle Creek midway	**49**
W67	Platinum Gulch at Road	**2**
W45	Eagle Creek above Haggart	**17**
Lynx Creek Drainage		
W13	Lynx above Ray Creek	**3**
W6	Lynx above Haggart Creek	**28**
LC1 to LC7[a]	Upper Lynx Creek samples	**7**
South McQueston River Drainage		
W49	S. McQuesten below Haggart	**21**

a: One-time Upper Lynx Creek sampling (7 stations) collected on August 20, 2012 to provide additional water quality characterization of reference stream (Figure 2.3)

No sampling occurred in 2015



LEGEND

- Sediment Sample
- Water Quality Sample

DATE SAVED:	Sep 19, 2012
DRAWN BY:	VV
REVIEWED:	JT
VERSION:	1

Coordinate System: *NAD 1983 UTM Zone 8N*
Projection: *Transverse Mercator*
Datum: *North American 1983*
Units: *Meter*

1:100,000

0 1 2 Km

CLIENT:

Victoria GOLD CORP

LORAX ENVIRONMENTAL

PROJECT:

Victoria Gold

TITLE:

August 2012 Field Sampling Stations

PROJECT #: J996

FIGURE: 2.3

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2.2 METHODS

2.2.1 Sampling Frequency and Locations

Figure 2.2 illustrates water quality sampling sites within the study area sampled during the period of 2007 to 2012. Table 2.2 describes the number of samples collected at each site for the period of 2007 to 2016; Table 2.3 and Table 2.4 provide a detailed summary of sampling frequency by monitoring station for the period of 2007 to 2012 and 2013 to 2016, respectively.

2.2.2 Field Sampling Methods

Water samples were collected from midstream following methods outlined in the BC Freshwater Biological Sampling Manual (BC Ministry of Water, Land Air Protection 2003). Samples were collected from just below the surface, facing upstream and using pre-cleaned bottles. Sample filtration and/or preservation were performed in the field. Samples were at 4 °C until analysis. Elemental analysis was performed by ALS Environmental located in Vancouver or Burnaby BC and certified by the Canadian Association for Laboratory Accreditation (CALA). *In situ* measurements for pH, temperature, conductivity, and dissolved oxygen were also recorded at each site prior to sample collection.

Table 2.3: Details of Water Quality Sampling Program, 2007 – 2012

Site	2007						2008		2009							2010							2011										2012									
	14 Aug	29 Aug	11 Sep	25 Sep	19 Oct	20 Nov	25 Apr	9 Jun	18-20 Jul	6 Aug	2 Aug	2-5 Sep	16 Sep	5-7 Oct	20-22 Oct	31 Mar	6 May	22 May	2 Jun	11 Jul	18 Aug	20 Sep	27 Jan	24 Feb	30 Mar	19 Apr	17 May	7 Jun	16 Aug	17 Oct	16 Nov	6 Dec	14 Feb	19-20 Mar	17-18 Apr	6-7 May	17-18 July	15-16 Aug	19 Sept	16-17 Oct	20 Nov	17-18 Dec
Haggart Creek Drainage Basin																																										
W22	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W4	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W68																			✓																							
W29										✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	F1			F1					F1	F1					✓		✓	✓	✓	✓
W23	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓															✓	✓	✓	✓	✓
W39																														✓						✓	✓		✓	✓		
Dublin Gulch Drainage Basin																																										
W20	✓	✓	✓					✓	✓	✓	✓		✓	✓	✓																											
W1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W26	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓									F		F	✓	✓		✓	✓	✓				✓	✓		✓	✓		
W32																	✓																									
W21	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eagle Creek Drainage Basin																																										
W9									✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	F1		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W10																								F		F	✓	✓	✓	✓	✓	✓				✓	✓		✓	✓		
W61																													✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
W27	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	F1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W67																	✓	✓																								
W45																														✓	✓	✓			✓	✓	✓		✓	✓		
Lynx Creek Drainage Basin																																										
W13	✓		✓		✓																																					
W6	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓					✓	✓	✓	✓	✓	✓	F1			F1					F1	F1					✓		✓	✓	✓	✓
LC1-7																																							✓			
South McQuesten Drainage Basin																																										
W49																														✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓

Notes:
F – Winter sample was attempted but the creek was frozen to bottom or too little flow remained to allow water collection
F1 – Winter sample was attempted, but a very thick ice and snow layer covered the site and prevented access

Table 2.4: Details of Water Quality Sampling Program - 2013, 2014, 2016

Site	2013						2014				2016
	15 Apr	18- 19 Feb	18-19 Jan	20-22 May	24-26 Jul	19-20 Oct	11 Mar	7-9 May	5-8 Aug	16-18 Oct	13-14 Jul
Haggart Creek Drainage Basin											
W22	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
W4		✓	✓	✓	✓	✓	✓	✓	✓	✓	
W68											
W29	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
W5		✓	✓	✓	✓	✓	✓	✓	✓	✓	
W23		✓	✓	✓	✓	✓	✓	✓	✓	✓	
W39				✓	✓	✓		✓	✓	✓	
Dublin Gulch Drainage Basin											
W20					✓	✓		✓	✓	✓	✓
W1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
W26				✓	✓	✓		✓	✓	✓	
W32											
W21								✓	✓	✓	
Eagle Creek Drainage Basin											
W9		✓	✓	✓							
W10											
W61											
W27			✓		✓	✓	✓	✓	✓	✓	
W67											
W45				✓	✓	✓		✓	✓	✓	
Lynx Creek Drainage Basin											
W13											
W6		✓	✓	✓	✓	✓	✓	✓	✓	✓	
LC1-7											
South McQuesten Drainage Basin											
W49		✓	✓	✓	✓	✓	✓	✓	✓	✓	

2.2.3 Laboratory Methods

Samples were analyzed for a suite of parameters listed in Table 2.5, which include physical parameters (pH, conductivity, hardness, TSS, TDS, turbidity), major anions, nutrients, dissolved organic carbon (DOC), total and weak acid dissociable (WAD) cyanide, and total and dissolved metals.

Conventional parameters, major ions and nutrients, and metals were analyzed using procedures described in APHA Standard Methods for the Examination of Water and Wastewater (2005). Cyanide analysis was carried out using procedures adapted from APHA Method 4500-CN "Cyanide". Total or strong acid dissociable cyanide and weak acid dissociable cyanide are determined by sample distillation and analysis using the chloramine-t colorimetric method. The lowest available limit of detection for metals was achieved by using inductively coupled plasma/mass spectrometry (ICP/MS; EPA Method 6020). Mercury analysis in water was carried out by cold vapor atomic fluorescence spectrophotometry (EPA Method 245.7). This procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride.

For the baseline period of 2007 to 2016, laboratory detection limits have been low enough to allow for comparison of monitoring results with applicable water quality guidelines (WQG), including BC Approved WQG (http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html), Canadian Council of Ministers of the Environment (CCME) and/or Yukon WQG. As indicated in Table 2.5, detection limits for some parameters have varied throughout the 9-year monitoring program. In general, detection limits have improved (decreased) over time for key parameters (e.g. Sb, Cd, Cu, Hg, Se, and Zn) due to improvements in analytical/instrumentation techniques.

Table 2.5: Analytical Parameter List and Range of Detection Limits Achieved

Physical Paramaters		Range of Detection Limits (2007-2016)
Conductivity	µS/cm	2.0
Hardness (as CaCO3)	mg/L	0.5
pH		0.01
TSS	mg/L	3.0
TDS	mg/L	10
Turbidity	NTU	0.1
Major Ions and Nutrients		
Alk_{Total} (as $CaCO_3$)	mg/L	0.5
Ammonia as N	mg/L	0.005, 0.02
Bromide	mg/L	0.05
Chloride	mg/L	0.5, 2.5
Fluoride	mg/L	0.01, 0.1
Nitrate (as N)	mg/L	0.025
Nitrite (as N)	mg/L	0.001, 0.005
TKN	mg/L	0.05
Total Nitrogen	mg/L	0.06
Ortho Phosphate-P	mg/L	0.001
Total Diss Phosphate-P	mg/L	0.002
Total Phosphate as P	mg/L	0.002
Sulfate	mg/L	0.1
Cyanide and Organic Carbon		
CN_{WAD}	mg/L	0.005
CN_{total}	mg/L	0.005
TOC	mg/L	1.0
DOC	mg/L	1.0
Total and Dissolved Metals		
Aluminum	mg/L	0.01, 0.015
Antimony	mg/L	0.0001, 0.0005
Arsenic	mg/L	0.0001
Barium	mg/L	0.001
Beryllium	mg/L	0.0005, 0.001
Bismuth	mg/L	0.0005
Boron	mg/L	0.01
Cadmium	mg/L	0.00001, 0.000017, 0.00005
Calcium	mg/L	0.03
Chromium	mg/L	0.0005, 0.001
Cobalt	mg/L	0.0001, 0.0003
Copper	mg/L	0.0005, 0.001
Iron	mg/L	0.03
Lead	mg/L	0.00005, 0.0005
Lithium	mg/L	0.005
Magnesium	mg/L	0.03
Manganese	mg/L	0.001
Mercury	mg/L	0.00001, 0.00002, 0.00005
Molybdenum	mg/L	0.00005, 0.001
Nickel	mg/L	0.0001, 0.001
Phosphorus	mg/L	0.3
Potassium	mg/L	1.0, 2.0
Selenium	mg/L	0.0001, 0.001
Silicon	mg/L	1
Silver	mg/L	0.00001, 0.00002
Sodium	mg/L	1.0, 2.0
Strontium	mg/L	0.001
Thallium	mg/L	0.0001, 0.0002
Tin	mg/L	0.0001, 0.0005
Titanium	mg/L	0.01
Uranium	mg/L	0.0001
Vanadium	mg/L	0.001, 0.03
Zinc	mg/L	0.001, 0.002, 0.003, 0.005

2.2.4 Data Analysis

Elemental analysis data for all sites have been compiled into summary data sheets for the period of 2007 to 2016 (Appendix A1). Values reported below the detection limit have been adjusted to reflect improved detection limits over time (refer to Section 2.2.3). Previous baseline water quality reports (Stantec 2010, 2011 and 2012) assigned half the detection limit when preparing statistical summaries of the data for non-detected parameters. Given the high variability in detection limits due to enhanced analytical methods over the years, the highest detected concentration measured was used for statistical calculations.

To illustrate the approach, selenium (Se) data from Haggart Creek monitoring station W4 indicated that for the period of 2007 to 2011, concentrations were typically less than 0.001 mg/L. However, in 2012, following improved detection limits for Se, reported concentrations at W4 ranged from 0.00013 mg/L to 0.00021 mg/L. As such, all data previously reported as “<0.001 mg/L” were conservatively converted to the highest detected value of 0.00021 mg/L (compare Appendix A1 and Appendix A2).

Following the conversion of less than detection limit values for all parameters (Appendix A2), monthly summary statistics were compiled for selected sites within all the project drainage basins. Monthly minimum, maximum, mean, 5th percentile, 25th percentile, 50th percentile, 75th percentile and 95th percentile values for key stations in each basin are shown in Appendix A3.

2.2.5 Quality Assurance/Quality Control

The Quality Assurance/Quality Control (QA/QC) program was designed to provide reliable data by preventing sampling error and cross contamination of the collected samples. Nitrile gloves were used during sample collection and replaced at each new site, samples were collected from downstream to upstream to avoid substrate disturbance and sample contamination. Field, travel blanks and laboratory duplicates were also included in the elemental analysis. Laboratory results were review upon arrival to evaluate compliance with laboratory data quality objectives (DQO). Field notes were verified for completeness. The ratios of dissolved to total metals were compared to evaluate potential contamination during sample filtration in the field. Overall, reported data are considered of good quality and met laboratory DQO. All generated tables, summary statistics and graphs were checked for unit conversions, formulas and transcription errors with original data files.

3 WATER QUALITY RESULTS

This section provides a characterization of baseline water quality for key selected stations of Dublin Gulch (W1 and W21), Eagle Creek (W9 and W27), Haggart Creek (W22, W29, W5 and W23) and the reference basin of Lynx Creek (W6). Water quality data including all sampled stations during the period of 2007 to 2016 can be found in Appendix A1 and A2.

The section below describes water quality by drainage catchment and is outlined as follows:

- Section 3.1 characterizes baseline water quality in Dublin Gulch utilizing monitoring data primarily from stations W1 and W21 and supplementing the discussion with data from W20 in Bawn Boy Gulch in the headwaters of Dublin Gulch and W26 in Stewart Gulch, a small tributary of Dublin Gulch.
- Section 3.2 characterizes baseline water quality data for the Eagle Creek drainage using data from stations W9 in Eagle Pup and W27 middle Eagle Creek.
- Section 3.3 provides a summary of water quality in Haggart Creek at several locations both upstream and downstream of the project area. Data from stations W22 (upstream of project influences), W4 and W29 is utilized to characterize baseline conditions in Haggart Creek.
- Section 3.4 provides a brief description of water quality in Lynx Creek using data from station W6 before the confluence with Haggart Creek.

For each drainage discussion, summary statistics of the mean and 95th percentile is provided for each parameter for each month to characterize the seasonal variability in water quality.

3.1 DUBLIN GULCH DRAINAGE

Baseline water quality in Dublin Gulch is characterized using monitoring data from stations W1 and W21 (Figure 2.2). Data from station W20 in the upper reaches of Dublin Gulch in Bawn Boy Gulch is also discussed as it strongly influences trace element concentrations in Dublin Gulch, in particular the arsenic signature throughout the stream. Station W26 in Stewart Gulch is also discussed as naturally elevated As concentrations exist and contribute to the overall As loading in Dublin Gulch.

3.1.1 Summary Statistics

Table 3.1 and Table 3.2 provide mean monthly and 95th percentile monthly values, respectively for station W1 in Dublin Gulch. Mean monthly and 95th percentile monthly values for station W21, downstream of W1 and immediately upstream of the Dublin Gulch confluence with Haggart Creek, are similarly provided in Table 3.3 and Table 3.4, respectively.

Table 3.1: Dublin Gulch W1 Mean Values

	Physical Parameters					Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	132	65	7.7	4.0	80	49	0.0050	0.50	0.086	0.11	0.0010	0.0041	19	0.0050	0.0050	-	0.90
February (n=3)	132	66	7.7	3.0	86	48	0.020	0.50	0.093	0.12	0.0010	0.0051	19	0.0050	0.0050	1.0	1.03
March (n=4)	138	65	7.7	3.0	87	50	0.0052	0.50	0.095	0.12	0.0010	0.0040	20	0.0050	0.0050	1.4	1.17
April (n=4)	138	66	7.5	3.0	96	45	0.0054	0.50	0.095	0.12	0.0010	0.0050	20	0.0050	0.0050	1.6	1.2
May (n=8)	56	29	7.1	28	64	21	0.0055	1.00	0.079	0.031	0.0020	0.0020	5.9	0.0050	0.0070	14.1	14
June (n=4)	83	35	7.8	4.1	53	29	0.0050	0.50	0.063	0.025	0.0010	0.0027	7.7	0.0050	0.0051	-	3.7
July (n=5)	99	46	7.7	3.1	65	39	0.0050	0.50	0.077	0.010	0.0010	0.0029	11	0.0050	0.0050	2.1	1.9
August (n=9)	105	50	7.8	8.3	69	41	0.010	0.50	0.073	0.0086	0.0010	0.0023	12	0.0050	0.0051	2.0	1.8
September (n=7)	108	51	7.6	5.7	72	41	0.0073	0.50	0.079	0.0072	0.0010	0.0022	12	0.0050	0.0050	1.8	1.7
October (n=7)	111	51	7.8	3.6	67	42	0.0071	0.50	0.076	0.042	0.0010	0.0028	14	0.0050	0.0050	1.7	1.8
November (n=3)	124	56	7.7	3.0	79	44	0.0050	0.50	0.068	0.072	0.0010	0.0034	16	0.0050	0.0050	1.8	1.2
December (n=2)	123	58	8.0	3.0	78	44	0.0050	0.50	0.092	0.091	0.0010	0.0032	17	0.0050	0.0050	1.2	1.5

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.027	0.0010	0.030	0.000015	19	0.00037	0.00010	0.00063	0.040	0.000069	5	0.00112	0.000010	0.0019	0.00050	1.5	0.00025	0.000010	1.8	0.000010	0.00057	0.0010	0.0036
February (n=3)	0.014	0.00117	0.029	0.000012	18	0.00025	0.00010	0.00050	0.032	0.000054	5	0.00083	0.000010	0.0021	0.00050	1.2	0.00023	0.000010	1.7	0.000010	0.00065	0.0010	0.0030
March (n=4)	0.015	0.0010	0.028	0.000014	18	0.00031	0.00010	0.00044	0.026	0.000050	5	0.00072	0.000010	0.0021	0.00050	1.4	0.00024	0.000012	1.6	0.000010	0.00055	0.0010	0.0025
April (n=4)	0.018	0.0011	0.031	0.000015	18	0.00036	0.00010	0.00049	0.031	0.000055	5	0.0013	0.000010	0.0021	0.00050	1.4	0.00024	0.000010	1.7	0.000010	0.00066	0.0010	0.0033
May (n=8)	0.74	0.0013	0.040	0.000044	8	0.00192	0.00059	0.0022	1.15	0.00182	2	0.035	0.000011	0.0012	0.0029	1.7	0.00021	0.000025	1.4	0.000019	0.00067	0.0022	0.0067
June (n=4)	0.11	0.0012	0.032	0.000017	11	0.0007	0.00013	0.0007	0.1	0.0003	2	0.004	0.000010	0.0019	0.0006	2.0	0.00024	0.000010	1.6	0.000010	0.00040	0.0010	0.0028
July (n=5)	0.083	0.0011	0.039	0.000013	13	0.00046	0.00012	0.00057	0.13	0.00022	3	0.0034	0.000009	0.0021	0.00060	1.2	0.00017	0.000010	1.6	0.000010	0.00044	0.0010	0.0026
August (n=9)	0.19	0.0012	0.041	0.000022	14	0.00088	0.00022	0.00062	0.31	0.00033	3	0.0073	0.000010	0.0020	0.0010	1.7	0.00021	0.000011	1.6	0.000010	0.00044	0.0014	0.0026
September (n=7)	0.036	0.0011	0.038	0.000021	15	0.00061	0.00012	0.00047	0.062	0.000093	3	0.0019	0.000010	0.0019	0.00050	1.8	0.00023	0.000010	1.6	0.000010	0.00046	0.0010	0.0020
October (n=7)	0.032	0.0011	0.036	0.000018	15	0.00044	0.00012	0.00050	0.056	0.000085	3	0.0018	0.000010	0.0021	0.00053	1.3	0.00018	0.000010	1.6	0.000010	0.00051	0.0010	0.0024
November (n=3)	0.13	0.0012	0.038	0.000018	16	0.00079	0.00019	0.0011	0.23	0.00035	4	0.0068	0.000010	0.0019	0.00072	1.6	0.00023	0.000090	1.6	0.000011	0.00049	0.0011	0.0044
December (n=2)	0.027	0.0010	0.032	0.000010	16	0.00025	0.00010	0.00096	0.040	0.000061	4	0.0013	0.000010	0.0019	0.00050	0.77	0.00019	0.000010	1.6	0.000010	0.00049	0.0010	0.0030

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0040	0.0010	0.030	0.000014	18	0.00030	0.00010	0.00035	0.020	0.000050	4.8	0.00022	0.000010	0.0017	0.00050	1.4	0.00024	0.000010	1.8	0.000010	0.00052	0.0010	0.0020
February (n=3)	0.0029	0.0010	0.030	0.000012	19	0.00023	0.00010	0.00040	0.023	0.000050	4.9	0.00030	0.000010	0.0019	0.00050	1.2	0.00023	0.000010	1.8	0.000010	0.00056	0.0010	0.0023
March (n=4)	0.0031	0.0010	0.029	0.000014	18	0.00030	0.00010	0.00035	0.025	0.000061	4.9	0.00025	0.000010	0.0020	0.00050	1.4	0.00025	0.000010	1.7	0.000010	0.00052	0.0010	0.0020
April (n=4)	0.0035	0.0011	0.032	0.000014	18	0.00031	0.00010	0.00038	0.025	0.000059	5.1	0.00059	0.000010	0.0020	0.00050	1.5	0.00024	0.000010	1.8	0.000010	0.00062	0.0010	0.0022
May (n=8)	0.15	0.00077	0.024	0.000026	8.3	0.00041	0.00014	0.0011	0.12	0.000096	2.0	0.0088	0.000010	0.0010	0.0012	1.6	0.00020	0.000011	1.4	0.000010	0.00046	0.0010	0.0028
June (n=4)	0.026	0.0011	0.031	0.000017	10	0.00063	0.00010	0.00052	0.030	0.000054	2.3	0.00042	0.000010	0.0016	0.00050	2.0	0.00024	0.000010	1.7	0.000010	0.00033	0.0010	0.0027
July (n=5)	0.0092	0.0010	0.038	0.000012	13	0.00026	0.00010	0.00030	0.018	0.000050	3.1	0.00026	0.000009	0.0019	0.00050	1.2	0.00016	0.000010	1.7	0.000010	0.00039	0.0009	0.0010
August (n=9)	0.0080	0.0011	0.038	0.000019	14	0.00041	0.00010	0.00027	0.026	0.000050	3.3	0.00044	0.000010	0.0019	0.00050	1.7	0.00021	0.000010	1.7	0.000010	0.00040	0.0010	0.0015
September (n=7)	0.0060	0.0011	0.036	0.000021	15	0.00059	0.00010	0.00032	0.027	0.000060	3.4	0.00041	0.000010	0.0019	0.00050	1.8	0.00022	0.000010	1.7	0.000010	0.00044	0.0010	0.0017
October (n=7)	0.0044	0.0011	0.036	0.000018	15	0.00034	0.00010	0.00033	0.021	0.000050	3.5	0.00018	0.000010	0.0019	0.00050	1.3	0.00018	0.000010	1.7	0.000010	0.00047	0.0010	0.0016
November (n=3)	0.0035	0.0011	0.034	0.000015	16	0.00053	0.00010	0.00049	0.023	0.000050	4.0	0.00022	0.000010	0.0019	0.00050	1.6	0.00022	0.000010	1.7	0.000010	0.00047	0.0010	0.0023
December (n=2)	0.0034	0.0010	0.033	0.000010	16	0.00010	0.00010	0.00035	0.020	0.000050	4.2	0.00020	0.000010	0.0019	0.00050	0.79	0.00019	0.000010	2.0	0.000010	0.00049	0.0010	0.0020

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.2: Dublin Gulch W1 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	135	66	64	7.8	4.9	81	50	0.0050	0.50	0.090	0.11	0.0010	0.0045	20	0.0050	0.0050	-	1.25
February (n=3)	136	70	63	7.9	3.0	90	51	0.046	0.50	0.099	0.13	0.0010	0.0056	20	0.0050	0.0050	1.0	1.20
March (n=4)	155	71	62	7.9	3.0	103	55	0.0056	0.50	0.10	0.14	0.0010	0.0046	22	0.0050	0.0050	1.4	1.5
April (n=4)	145	70	63	8.0	3.0	101	53	0.0062	0.50	0.10	0.14	0.0010	0.0060	21	0.0050	0.0050	1.8	1.2
May (n=8)	91	47	13	7.5	79	86	35	0.0072	2.5	0.100	0.073	0.0050	0.0032	12	0.0050	0.014	20.1	22
June (n=4)	93	38	32	7.9	6.2	58	31	0.0050	0.50	0.073	0.029	0.0010	0.0029	9.4	0.0050	0.0052	-	4.5
July (n=5)	121	54	41	7.9	3.4	75	45	0.0050	0.50	0.094	0.014	0.0010	0.0036	15	0.0050	0.0050	2.4	2.3
August (n=9)	114	54	44	8.0	31	77	43	0.020	0.50	0.087	0.013	0.0011	0.0029	14	0.0050	0.0053	2.4	2.2
September (n=7)	113	54	48	8.0	16	77	43	0.016	0.50	0.083	0.011	0.0010	0.0029	13	0.0050	0.0050	1.9	1.8
October (n=7)	115	55	48	8.0	5.9	74	44	0.016	0.50	0.090	0.052	0.0010	0.0043	15	0.0050	0.0050	1.8	2.0
November (n=3)	129	59	55	8.0	3.0	82	45	0.0050	0.50	0.093	0.074	0.0010	0.0040	17	0.0050	0.0050	1.8	1.2
December (n=2)	128	60	55	8.0	3.0	82	47	0.0050	0.50	0.092	0.093	0.0010	0.0034	18	0.0050	0.0050	1.2	1.5

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.034	0.0011	0.031	0.000017	19	0.00049	0.00010	0.00075	0.049	0.000086	5	0.00144	0.000010	0.0020	0.00050	1.9	0.00026	0.000010	1.9	0.000010	0.00060	0.0010	0.0041
February (n=3)	0.020	0.00147	0.032	0.000016	18	0.00047	0.00010	0.00050	0.035	0.000061	5	0.00119	0.000010	0.0025	0.00050	1.9	0.00025	0.000010	1.9	0.000010	0.00086	0.0010	0.0030
March (n=4)	0.019	0.0011	0.031	0.000019	20	0.00050	0.00010	0.00050	0.030	0.000050	5	0.00082	0.000010	0.0022	0.00050	2.0	0.00026	0.000018	1.7	0.000010	0.00061	0.0010	0.0030
April (n=4)	0.027	0.0013	0.036	0.000023	19	0.00050	0.00010	0.00050	0.032	0.000067	5	0.0022	0.000010	0.0022	0.00050	2.0	0.00025	0.000010	1.8	0.000010	0.00069	0.0010	0.0039
May (n=8)	2.1	0.0026	0.071	0.000107	13	0.0063	0.00186	0.0057	3.9	0.0066	3	0.109	0.000015	0.0017	0.0085	2.0	0.00024	0.000064	1.6	0.000054	0.00085	0.0063	0.0180
June (n=4)	0.2	0.0016	0.035	0.000018	11	0.0010	0.0002	0.0009	0.2	0.0006	3	0.006	0.000010	0.0022	0.0007	2.0	0.00024	0.000010	1.6	0.000010	0.0005	0.0010	0.003
July (n=5)	0.18	0.0013	0.047	0.000019	15	0.00079	0.00016	0.00069	0.31	0.00053	4	0.0076	0.000010	0.0022	0.00079	2.0	0.00024	0.000010	1.7	0.000010	0.00053	0.0010	0.0030
August (n=9)	0.89	0.0015	0.057	0.000048	15	0.0030	0.00073	0.0018	1.5	0.0016	4	0.034	0.000010	0.0022	0.0031	2.0	0.00024	0.000015	1.6	0.000010	0.00055	0.0032	0.0082
September (n=7)	0.069	0.0012	0.039	0.000040	16	0.0010	0.00016	0.00075	0.11	0.00019	4	0.0041	0.000010	0.0021	0.00050	2.0	0.00024	0.000010	1.7	0.000010	0.00052	0.0010	0.0030
October (n=7)	0.10	0.0012	0.040	0.000040	16	0.00085	0.00016	0.00056	0.18	0.00022	4	0.0069	0.000010	0.0024	0.00067	2.0	0.00024	0.000010	1.7	0.000010	0.00061	0.0010	0.0030
November (n=3)	0.32	0.0012	0.041	0.000019	17	0.00099	0.00029	0.0016	0.55	0.00068	4	0.015	0.000010	0.0020	0.0011	2.0	0.00024	0.00023	1.6	0.000012	0.00061	0.0012	0.0065
December (n=2)	0.033	0.0010	0.033	0.000010	17	0.00030	0.00010	0.0014	0.048	0.000062	4	0.0016	0.000010	0.0020	0.00050	0.81	0.00022	0.000010	1.7	0.000010	0.00052	0.0010	0.0030

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0045	0.0011	0.031	0.000017	19	0.00048	0.00010	0.00049	0.029	0.000050	5	0.00029	0.000010	0.0018	0.00050	1.9	0.00024	0.000010	1.8	0.000010	0.00053	0.0010	0.0029
February (n=3)	0.0030	0.0011	0.031	0.000016	19	0.00046	0.00010	0.00050	0.030	0.000050	5	0.00039	0.000010	0.0020	0.00050	1.9	0.00024	0.000010	1.9	0.000010	0.00060	0.0010	0.0030
March (n=4)	0.0043	0.0010	0.030	0.000018	20	0.00050	0.00010	0.00050	0.030	0.000087	5	0.00052	0.000010	0.0021	0.00050	2.0	0.00027	0.000010	1.7	0.000010	0.00060	0.0010	0.0030
April (n=4)	0.0044	0.0012	0.037	0.000017	19	0.00050	0.00010	0.00050	0.030	0.000081	5	0.0013	0.000010	0.0021	0.00050	2.0	0.00026	0.000010	2.0	0.000010	0.00066	0.0010	0.0030
May (n=8)	0.29	0.0011	0.029	0.000046	13	0.00062	0.00024	0.0020	0.23	0.00024	3	0.0282	0.000010	0.0015	0.0021	2.0	0.00024	0.000015	1.7	0.000010	0.00053	0.0010	0.0055
June (n=4)	0.034	0.0012	0.033	0.000017	11	0.00093	0.00010	0.00054	0.030	0.000064	3	0.00051	0.000010	0.0017	0.00051	2.0	0.00024	0.000010	1.7	0.000010	0.00036	0.0010	0.0030
July (n=5)	0.012	0.0011	0.042	0.000017	15	0.00050	0.00010	0.00036	0.030	0.000050	4	0.00040	0.000010	0.0020	0.00050	2.0	0.00024	0.000010	1.7	0.000010	0.00049	0.0010	0.0010
August (n=9)	0.014	0.0012	0.042	0.000037	15	0.00050	0.00010	0.00041	0.030	0.000050	4	0.0017	0.000010	0.0020	0.00050	2.0	0.00024	0.000010	1.7	0.000010	0.00044	0.0010	0.0030
September (n=7)	0.0082	0.0011	0.038	0.000040	16	0.0010	0.00010	0.00050	0.030	0.000098	4	0.00072	0.000010	0.0021	0.00050	2.0	0.00024	0.000010	1.7	0.000010	0.00049	0.0010	0.0030
October (n=7)	0.0055	0.0012	0.039	0.000040	16	0.00085	0.00010	0.00050	0.030	0.000050	4	0.00031	0.000010	0.0021	0.00050	2.0	0.00024	0.000010	1.7	0.000010	0.00054	0.0010	0.0030
November (n=3)	0.0038	0.0011	0.036	0.000017	17	0.00095	0.00010	0.00075	0.030	0.000050	4	0.00022	0.000010	0.0019	0.00050	2.0	0.00024	0.000010	1.7	0.000010	0.00048	0.0010	0.0030
December (n=2)	0.0035	0.0010	0.033	0.000010	17	0.00010	0.00010	0.00049	0.029	0.000050	4	0.00023	0.000010	0.0019	0.00050	0.82	0.00020	0.000010	2.4	0.000010	0.00051	0.0010	0.0029

Notes: - not available; n = number of samples; * 25th Percentile Hardness Presented TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.3: Dublin Gulch W21 Mean Values

	Physical Parameters					Anions				Nutrients					Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	242	127	7.9	3.0	172	71	0.0050	0.50	0.094	0.13	0.0010	0.0037	56	0.0050	0.0050	-	1.2
February (n=2)	253	132	8.0	3.0	167	70	0.028	0.50	0.11	0.15	0.0010	0.0040	60	0.0050	0.0050	1.4	1.13
March (n=2)	278	145	8.0	3.0	170	79	0.011	0.50	0.100	0.20	0.0010	0.0023	65	0.0050	0.0050	1.4	1.83
April (n=3)	280	144	7.7	5.1	181	72	0.0050	1.25	0.098	0.11	0.0010	0.0020	62	0.0050	0.0050	2.2	3.46
May (n=5)	90	47	7.2	21	83	27	0.0055	0.9	0.083	0.052	0.0018	0.0017	17	0.0050	0.0077	17.3	17
June (n=3)	133	62	7.9	3.0	88	40	0.0050	0.50	0.073	0.025	0.0010	0.0023	24	0.0050	0.0052	2.2	3.3
July (n=3)	146	71	7.9	3.0	102	52	0.0050	0.50	0.067	0.0075	0.0010	0.0022	25	0.0050	0.0050	2.2	1.8
August (n=9)	168	82	8.0	4.9	104	57	0.012	0.50	0.086	0.0061	0.0010	0.0019	29	0.0050	0.0050	2.7	2.1
September (n=6)	168	82	7.6	3.1	109	57	0.0083	0.50	0.091	0.0061	0.0011	0.0017	28	0.0050	0.0068	1.9	1.8
October (n=6)	174	84	7.9	6.7	108	57	0.0083	0.68	0.089	0.059	0.0023	0.0021	32	0.0050	0.0050	1.9	2.3
November (n=3)	219	104	7.8	3.0	134	62	0.0051	0.50	0.098	0.10	0.0010	0.0028	46	0.0050	0.0050	1.8	1.6
December (n=2)	235	120	7.9	3.0	145	79	0.0053	0.50	0.11	0.13	0.0010	0.0019	49	0.0050	0.0050	1.6	1.6

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0042	0.0015	0.025	0.000017	32	0.00050	0.00010	0.00050	0.028	0.000058	11	0.0040	0.000010	0.0015	0.00085	2.0	0.00038	0.000010	2.20	0.000010	0.00094	0.0010	0.0030
February (n=2)	0.0054	0.0016	0.029	0.000014	33	0.00033	0.00010	0.00051	0.038	0.000050	11	0.0027	0.000010	0.0015	0.00081	1.6	0.00031	0.000010	2.2	0.000010	0.00093	0.0010	0.0042
March (n=2)	0.15	0.0016	0.026	0.000017	37	0.00043	0.00010	0.00062	0.041	0.00011	13	0.0050	0.000010	0.0013	0.0010	1.65	0.00032	0.000016	2.4	0.000010	0.00093	0.0010	0.0042
April (n=3)	0.23	0.0018	0.028	0.00017	38	0.00057	0.00017	0.0012	0.35	0.00096	12	0.018	0.000010	0.0012	0.0015	1.9	0.00034	0.000011	2.4	0.000010	0.00098	0.0010	0.068
May (n=5)	0.60	0.0013	0.036	0.000036	12	0.0012	0.00049	0.0028	0.86	0.0014	4	0.023	0.000011	0.0009	0.0027	1.7	0.00030	0.000019	1.6	0.000011	0.00059	0.0015	0.0059
June (n=3)	0.052	0.0014	0.029	0.000017	16	0.00067	0.00013	0.00085	0.070	0.00020	5	0.0020	0.000010	0.0015	0.00085	2.0	0.00038	0.000010	1.9	0.000010	0.00046	0.0010	0.0027
July (n=3)	0.030	0.0015	0.038	0.000015	19	0.00043	0.00010	0.00058	0.047	0.000074	6	0.0020	0.000010	0.0018	0.00056	1.6	0.00030	0.000010	1.9	0.000010	0.00060	0.0010	0.0017
August (n=9)	0.047	0.0015	0.037	0.000019	21	0.00045	0.00011	0.00052	0.074	0.00010	7	0.0036	0.000010	0.0017	0.00058	1.8	0.00033	0.000010	1.9	0.000010	0.00070	0.0010	0.0017
September (n=6)	0.017	0.0013	0.037	0.000021	21	0.00054	0.00012	0.00061	0.034	0.00010	7	0.0037	0.000010	0.0017	0.00061	1.8	0.00034	0.000010	1.9	0.000010	0.00076	0.0010	0.0019
October (n=6)	0.012	0.0013	0.035	0.000019	22	0.00041	0.00012	0.00056	0.030	0.00010	7	0.0037	0.000010	0.0017	0.00066	1.5	0.00028	0.000010	1.9	0.000010	0.00080	0.0010	0.0026
November (n=3)	0.010	0.0014	0.031	0.000015	26	0.00053	0.00013	0.00069	0.028	0.00015	9	0.0055	0.000010	0.0015	0.00084	1.8	0.00032	0.000010	2.0	0.000010	0.00082	0.0010	0.0040
December (n=2)	0.012	0.00097	0.033	0.000010	30	0.00026	0.00010	0.00050	0.057	0.000068	11	0.023	0.000010	0.00095	0.00060	1.31	0.00029	0.000010	2.0	0.000010	0.00082	0.0010	0.0030

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0030	0.0015	0.027	0.000017	33	0.00050	0.00010	0.00050	0.030	0.000050	11	0.0036	0.000010	0.0014	0.00076	2.0	0.00041	0.000010	2.20	0.000010	0.00089	0.0010	0.0030
February (n=2)	0.0030	0.0016	0.030	0.000014	34	0.00030	0.00010	0.00050	0.030	0.000050	11	0.0025	0.000010	0.0014	0.00080	1.6	0.00033	0.000010	2.3	0.000010	0.00093	0.0010	0.0030
March (n=2)	0.0030	0.0016	0.028	0.000018	37	0.00030	0.00010	0.00059	0.030	0.000058	12	0.0045	0.000010	0.0013	0.00094	1.64	0.00034	0.000010	2.4	0.000010	0.00090	0.0010	0.0037
April (n=3)	0.0052	0.0017	0.025	0.00014	37	0.00037	0.00010	0.00064	0.030	0.00013	12	0.013	0.000010	0.0011	0.0012	1.8	0.00036	0.000010	2.7	0.000010	0.00091	0.0010	0.041
May (n=5)	0.17	0.00087	0.023	0.000025	12	0.00039	0.00018	0.0021	0.19	0.00020	4	0.0086	0.000010	0.00077	0.0019	1.6	0.00032	0.000010	1.6	0.000010	0.00046	0.0010	0.0026
June (n=3)	0.017	0.0014	0.029	0.000018	16	0.00067	0.00010	0.00071	0.030	0.000072	5	0.0012	0.000010	0.0014	0.00072	2.0	0.00041	0.000010	2.0	0.000010	0.00043	0.0010	0.0027
July (n=3)	0.0084	0.0014	0.037	0.000015	19	0.00037	0.00010	0.00046	0.024	0.000050	6	0.0012	0.000010	0.0017	0.00051	1.6	0.00032	0.000010	1.9	0.000010	0.00055	0.0010	0.0010
August (n=9)	0.0071	0.0015	0.037	0.000019	21	0.00041	0.00010	0.00042	0.026	0.000050	7	0.0021	0.000010	0.0017	0.00052	1.8	0.00035	0.000010	2.0	0.000010	0.00068	0.0010	0.0014
September (n=6)	0.0050	0.0013	0.035	0.000021	21	0.00059	0.00010	0.00042	0.036	0.000054	7	0.0032	0.000010	0.0017	0.00065	1.8	0.00037	0.000010	2.0	0.000010	0.00075	0.0010	0.0014
October (n=6)	0.0037	0.0013	0.034	0.000019	22	0.00038	0.00010	0.00056	0.024	0.000056	7	0.0033	0.000010	0.0016	0.00060	1.5	0.00029	0.000010	1.9	0.000010	0.00078	0.0010	0.0028
November (n=3)	0.0030	0.0014	0.031	0.000015	27	0.00053	0.00010	0.00040	0.023	0.000050	9	0.0050	0.000010	0.0015	0.00078	1.7	0.00034	0.000010	2.0	0.000010	0.00078	0.0010	0.0025
December (n=2)	0.0022	0.00099	0.030	0.000010	30	0.00010	0.00010	0.00039	0.036	0.000050	11	0.023	0.000010	0.00090	0.00059	1.31	0.00031	0.000010	2.0	0.000010	0.00078	0.0010	0.0020

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.4: Dublin Gulch W21 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	242	127	127	7.9	3.0	172	71	0.0050	0.50	0.094	0.13	0.0010	0.0037	56	0.0050	0.0050	-	1.2
February (n=2)	267	142	121	8.1	3.0	180	73	0.049	0.50	0.11	0.16	0.0010	0.0042	64	0.0050	0.0050	1.4	1.13
March (n=2)	306	160	130	8.1	3.0	205	87	0.016	0.50	0.12	0.22	0.0010	0.0035	70	0.0050	0.0050	1.4	1.83
April (n=3)	312	162	129	8.0	8.8	192	75	0.0050	1.93	0.12	0.16	0.0010	0.0026	71	0.0050	0.0050	2.2	3.46
May (n=5)	161	81	20	7.5	36	121	45	0.0067	2.1	0.10	0.11	0.0042	0.0027	36	0.0050	0.014	23.9	24
June (n=3)	166	76	51	7.9	3.0	107	44	0.0050	0.50	0.080	0.029	0.0010	0.0028	34	0.0050	0.0055	2.2	4.1
July (n=3)	174	82	64	8.1	3.0	111	59	0.0050	0.50	0.071	0.0099	0.0010	0.0028	32	0.0050	0.0050	2.2	2.0
August (n=9)	190	92	70	8.1	13	119	60	0.020	0.50	0.098	0.0092	0.0010	0.0023	38	0.0050	0.0050	3.6	2.7
September (n=6)	179	90	77	8.1	3.6	126	60	0.020	0.50	0.098	0.0082	0.0013	0.0023	34	0.0050	0.013	2.0	1.9
October (n=6)	194	94	77	8.0	19.7	124	59	0.020	1.3	0.12	0.10	0.0066	0.0026	40	0.0050	0.0050	2.0	2.9
November (n=3)	248	117	96	8.0	3.0	153	65	0.0053	0.50	0.11	0.11	0.0010	0.0032	55	0.0050	0.0050	1.8	1.6
December (n=2)	261	139	101	8.0	3.0	160	95	0.0055	0.50	0.12	0.13	0.0010	0.0026	53	0.0050	0.0050	1.6	1.6

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0042	0.0015	0.025	0.000017	32	0.00050	0.00010	0.00050	0.028	0.000058	11	0.0040	0.000010	0.0015	0.00085	2.0	0.00038	0.000010	2.20	0.000010	0.00094	0.0010	0.0030
February (n=2)	0.0075	0.0016	0.030	0.000018	35	0.00048	0.00010	0.00052	0.046	0.000050	12	0.0029	0.000010	0.0015	0.00087	2.0	0.00037	0.000010	2.3	0.000010	0.00093	0.0010	0.0046
March (n=2)	0.28	0.0016	0.031	0.000022	40	0.00049	0.00010	0.00072	0.052	0.00017	14	0.0075	0.000010	0.0014	0.0012	2.0	0.00037	0.000020	2.7	0.000010	0.00093	0.0010	0.0050
April (n=3)	0.52	0.0021	0.032	0.00043	42	0.00096	0.00026	0.0018	0.74	0.0023	14	0.027	0.000010	0.0014	0.0018	2.1	0.00038	0.000013	2.9	0.000010	0.0012	0.0010	0.18
May (n=5)	1.2	0.0018	0.044	0.000060	21	0.0023	0.00089	0.0045	1.7	0.0032	7	0.044	0.000012	0.0013	0.0044	2.0	0.00038	0.000033	1.9	0.000016	0.00063	0.0024	0.0077
June (n=3)	0.10	0.0017	0.031	0.000017	20	0.00095	0.00018	0.00100	0.14	0.00032	7	0.0037	0.000010	0.0017	0.00095	2.0	0.00038	0.000010	1.9	0.000010	0.00049	0.0010	0.0040
July (n=3)	0.043	0.0018	0.039	0.000018	21	0.00050	0.00010	0.00061	0.063	0.00011	7	0.0028	0.000010	0.0020	0.00058	2.0	0.00038	0.000010	1.9	0.000010	0.00066	0.0010	0.0028
August (n=9)	0.17	0.0019	0.041	0.000037	24	0.00064	0.00015	0.00073	0.25	0.00027	8	0.0075	0.000010	0.0021	0.00080	2.0	0.00038	0.000010	1.9	0.000010	0.00081	0.0010	0.0030
September (n=6)	0.021	0.0015	0.038	0.000042	23	0.00088	0.00017	0.00098	0.042	0.00027	7	0.0053	0.000010	0.0018	0.00087	2.0	0.00038	0.000010	1.9	0.000010	0.00083	0.0010	0.0038
October (n=6)	0.018	0.0013	0.037	0.000042	24	0.00088	0.00017	0.00091	0.038	0.00027	8	0.0055	0.000010	0.0019	0.00090	2.0	0.00038	0.000010	1.9	0.000010	0.00091	0.0010	0.0038
November (n=3)	0.013	0.0015	0.033	0.000017	31	0.00095	0.00018	0.00096	0.028	0.00031	10	0.0060	0.000010	0.0015	0.00095	2.0	0.00038	0.000010	2.0	0.000010	0.00091	0.0010	0.0048
December (n=2)	0.013	0.0013	0.034	0.000010	34	0.00034	0.00010	0.00050	0.083	0.000084	13	0.041	0.000010	0.0015	0.00069	1.5	0.00037	0.000010	2.0	0.000010	0.00086	0.0010	0.0030

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0030	0.0015	0.027	0.000017	33	0.00050	0.00010	0.00050	0.030	0.000050	11	0.0036	0.000010	0.0014	0.00076	2.0	0.00041	0.000010	2.20	0.000010	0.00089	0.0010	0.0030
February (n=2)	0.0030	0.0016	0.030	0.000018	37	0.00048	0.00010	0.00050	0.030	0.000050	12	0.0028	0.000010	0.0014	0.00088	2.0	0.00040	0.000010	2.4	0.000010	0.00094	0.0010	0.0030
March (n=2)	0.0030	0.0017	0.030	0.000025	41	0.00048	0.00010	0.00066	0.030	0.000064	14	0.0072	0.000010	0.0015	0.0011	2.0	0.00040	0.000010	2.7	0.000010	0.00092	0.0010	0.0043
April (n=3)	0.0057	0.0020	0.029	0.00034	42	0.00050	0.00010	0.00083	0.030	0.00027	14	0.025	0.000010	0.0012	0.0016	2.0	0.00041	0.000010	3.7	0.000010	0.0011	0.0010	0.11
May (n=5)	0.27	0.0012	0.030	0.000039	21	0.00050	0.00030	0.0028	0.28	0.00034	7	0.018	0.000010	0.0010	0.0027	2.0	0.00041	0.000010	2.0	0.000010	0.00054	0.0010	0.0035
June (n=3)	0.024	0.0017	0.030	0.000021	20	0.00095	0.00010	0.0011	0.030	0.00011	6	0.0022	0.000010	0.0015	0.00084	2.0	0.00041	0.000010	2.0	0.000010	0.00048	0.0010	0.0030
July (n=3)	0.010	0.0017	0.038	0.000017	21	0.00050	0.00010	0.00051	0.030	0.000050	7	0.0018	0.000010	0.0019	0.00053	2.0	0.00041	0.000010	2.0	0.000010	0.00061	0.0010	0.0010
August (n=9)	0.012	0.0019	0.040	0.000037	24	0.00050	0.00010	0.00054	0.030	0.000050	8	0.0036	0.000010	0.0020	0.00058	2.0	0.00041	0.000010	2.1	0.000010	0.00078	0.0010	0.0027
September (n=6)	0.0066	0.0014	0.037	0.000042	24	0.00088	0.00010	0.00050	0.056	0.000067	8	0.0051	0.000010	0.0019	0.00097	2.0	0.00041	0.000010	2.0	0.000010	0.00083	0.0010	0.0025
October (n=6)	0.0045	0.0013	0.037	0.000042	24	0.00088	0.00010	0.0012	0.033	0.000076	8	0.0048	0.000010	0.0018	0.00080	2.0	0.00041	0.000010	2.0	0.000010	0.00088	0.0010	0.0059
November (n=3)	0.0044	0.0014	0.035	0.000017	30	0.00095	0.00010	0.00050	0.030	0.000050	10	0.0053	0.000010	0.0016	0.00086	2.0	0.00041	0.000010	2.0	0.000010	0.00084	0.0010	0.0030
December (n=2)	0.0029	0.0013	0.032	0.000010	34	0.00010	0.00010	0.00049	0.041	0.000050	13	0.039	0.000010	0.0014	0.00067	1.5	0.00040	0.000010	2.0	0.000010	0.00078	0.0010	0.0029

Notes: - not available; n = number of samples; * 25th Percentile Hardness Presented TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

3.1.2 Major Ions

The major ion chemistry of Dublin Gulch is assessed with respect to conductivity, hardness, alkalinity, sulphate and pH. Dublin Gulch is characterized by soft to moderately hard waters, with monthly mean hardness values ranging from 28 to 66 mg/L at station W1 and 47 mg/L to 145 mg/L at station W21 (Table 3.1 and Table 3.3). Values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May and June (Table 3.1 and Table 3.3). Conductivity, hardness and alkalinity at both sites exhibit an approximate two- to three-fold increase in concentration between freshet and other times of the year. Overall, such trends in stream salinity reflect varying proportions of snow-melt driven surface runoff (lower ionic strength) and groundwater inputs (higher ionic strength) as driven by the seasonal water balance. Values at W21 are typically higher than values at W1, and may reflect the contribution from groundwater discharges at lower elevations in the catchment.

The pH in Dublin Gulch remains relatively uniform throughout the year with values generally ranging between 7.0 and 8.0. The neutral to slightly basic pH conditions can be linked to bicarbonate alkalinity. All pH values reported to date have remained within the BC freshwater chronic criterion range for pH of 6.5 to 8.5.

Baseline concentrations for sulphate in Dublin Gulch are generally low, and exhibit a pronounced seasonal signature as observed for other salinity proxies (Table 3.1 and Table 3.3). Sulphate minima during high flow can be attributed to the influence of low ionic strength melt waters, while higher values during the low-flow periods likely reflect an increased proportion of groundwater inputs. Mean monthly sulphate values at W1 and W21 range from freshet minima of approximately 6.0 mg/L and 17 mg/L, respectively to maximum mean values observed during winter low flows of 20 mg/L and 65 mg/L, respectively.).

Unlike the dissolved ions, elevated TSS concentrations in Dublin Gulch generally coincide with the peak snowmelt month of May or during intense rainfall events (Table 3.1 and Table 3.3). At most other flow periods of the year, TSS values in Dublin Gulch were generally below the analytical detection limit of 3.0 mg/L. Peak TSS values measured at W1 and W21 for the period of 2007 to 2016 were 103 mg/L (May 2014) and 37 mg/L (May 2011), respectively.

3.1.3 Nutrients

Nutrients quantified in Dublin Gulch include nitrate (NO_3^-), nitrite (NO_2^-), ammonia (NH_3), total phosphate ($T\text{-}PO_4^{3-}$), and dissolved orthophosphate ($D\text{-}o\text{-}PO_4^{3-}$). In overview, nutrient parameters show low values in Dublin Gulch. Ammonia-N concentrations in Dublin Gulch are low with mean monthly values ranging from <0.005 mg/L to 0.028 mg/L at W1 and W21 (Table 3.1 and Table 3.3). Ammonia-N concentrations are expected to remain low in Dublin Gulch due to the low persistence of ammonia in fully oxygenated freshwaters at neutral pH.

Similar to ammonia, the majority of nitrite-N values have occurred near or below the detection limit value. Baseline nitrate-N concentrations in Dublin Gulch are also low, with mean monthly values ranging from approximately 0.006 to 0.2 mg/L. Minima are evident during high flow periods, reflecting melt water influences. During lower flow periods, Dublin Gulch is characterized by higher nitrate-N concentrations, again likely reflective of a greater proportion of groundwater derived flow.

Primary productivity in freshwaters is typically limited by available phosphorus. Accordingly, measurements of phosphorus compounds in surface waters can provide an indication of trophic status (i.e., productivity regime). Baseline concentrations for dissolved orthophosphate in Dublin Gulch are low, ranging from approximately <0.0020 to 0.005 mg/L (Table 3.1 and Table 3.3).

Total organic carbon (TOC) reflects a combination of dissolved organic carbon (DOC) and particulate phases associated with both aquatic and terrestrial organic matter. Highest values of TOC and DOC are typically observed during high flow periods, likely reflecting contributions of particulate carbon associated with terrestrial runoff and within-stream re-suspension. In contrast, low and uniform values prevail during low flow conditions, during which time TOC is predicted to be present primarily as dissolved phases. Mean monthly baseflow TOC levels in Dublin Gulch are lowest at W1 (1.0 mg/L) and slightly higher at W21 (1.4 mg/L). Freshet flow TOC levels are higher and typically exceed 10 mg/L.

3.1.4 Trace Elements

Baseline trace element concentrations in Dublin Gulch were derived from data collected from August 2007 to July 2016. In general, mean monthly concentrations of total and dissolved trace elements are low (e.g., Sb, Cu, Co, Cr, Pb, Hg, Se, Tl and Zn). However, Dublin Gulch is characterized by elevated total and dissolved As concentrations throughout its reaches with generally low variability in measured concentrations throughout all flow conditions. This is described in greater detail below.

Total Al (Figure 3.1 and Figure 3.2) and total Cd are also observed to be elevated during peak flow months; higher total concentrations are associated with elevated TSS levels. Total and dissolved Al values correlate positively with flow and elevated TSS, with dissolved Al reaching a mean monthly maximum of 0.15 mg/L at W1 to 0.17 mg/L at W21 in May (Table 3.1 and Table 3.3). The correlation between dissolved and total fractions strongly suggests that the dissolved Al fraction is governed by colloidal Al hydroxides that are able to pass through a 0.45 μm filter membrane. During non-peak flow periods, dissolved Al concentrations in Dublin Gulch are typically an order of magnitude lower than total concentrations (Table 3.1 and Table 3.3).

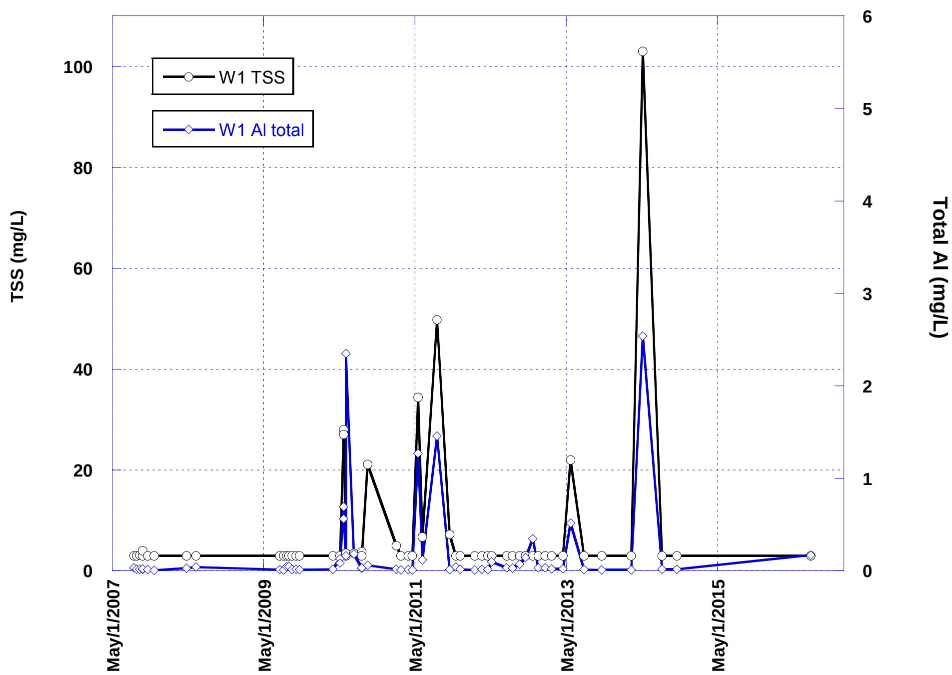

Figure 3.1: TSS versus total Al in Dublin Gulch station W1 (2007 – 2016)

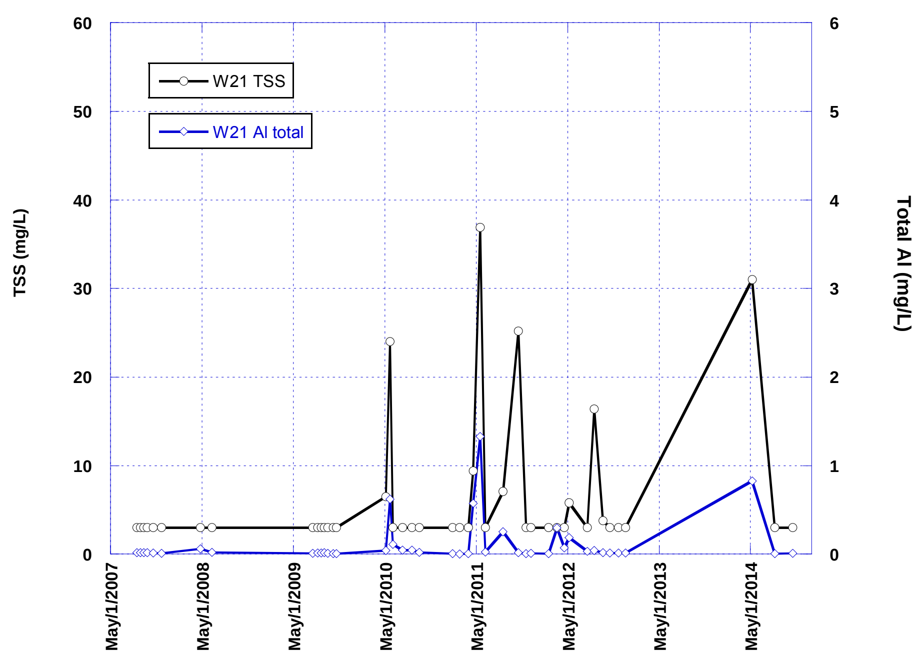

Figure 3.2: TSS versus total Al in Dublin Gulch station W21 (2007 – 2014)

As stated, Dublin Gulch hosts a significant inventory of arsenic, with little difference between total and dissolved fractions. Arsenic concentrations at station W1 and W21 are elevated with mean monthly concentrations narrowly ranging between 0.028 mg/L and approximately 0.041 mg/L (Table 3.1 and Table 3.3). Figure 3.3 illustrates mean monthly total As concentrations at W1 and W21; mean total As (using all data) for each station is also presented on Figure 3.3. While As concentrations are approximately 25% higher during the open water period as compared to winter baseflow conditions, mean total As at W1 (0.036 mg/L) is typically greater than at W21 (0.034 mg/L).

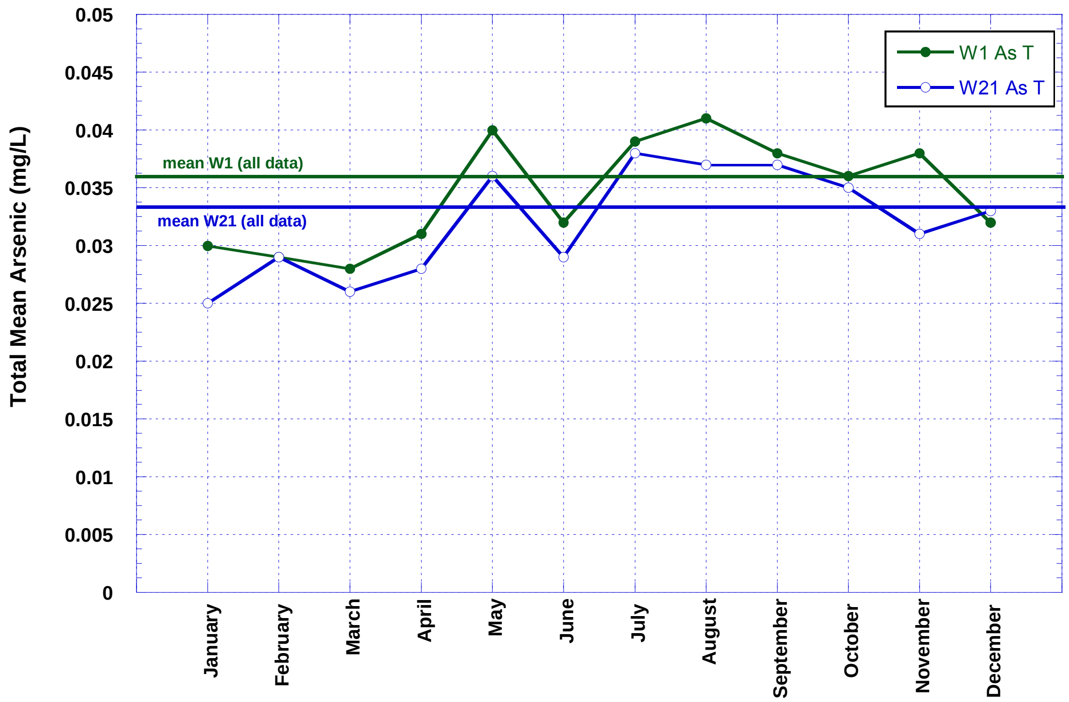

Figure 3.3: Mean Monthly Total As in Dublin Gulch at stations W1 and W21 (2007 – 2016)

It has been speculated that elevated As concentrations in Dublin Gulch are, in part, attributable to historical placer mining disturbance within the Dublin Gulch valley. As indicated by Figure 3.3, the current As monitoring data do not support this posit. Station W21 is located at the mouth of Dublin Gulch and downstream of all placer disturbances in the valley (Figure 2.2). Conversely, station W1 is much further upstream in Dublin Gulch, and while some minor placer disturbance is noted upstream of W1, by far the majority of placer disturbance is between W1 and W21 at the mouth. Despite the historical placer activity, As concentrations do not increase with increasing distance downstream in Dublin Gulch, suggesting that existing disturbances do not contribute additional As loadings to Dublin Gulch.

One of the primary sources of As in Dublin Gulch occurs in its headwaters in Bawn Boy Gulch. Station W20 (Figure 2.2) monitored water quality in Bawn Boy Gulch during the period of August

2007 to October 2009; July 2013 to July 2016). Total and dissolved As at W20 ranged from 0.02 mg/L to 0.082 mg/L (total) and from 0.017 mg/L to 0.0747 mg/L (dissolved) (see Appendix A2).

The lower arsenic concentrations observed at W1/W21 reflect the influence of streams (primarily Olive Gulch and Stewart Gulch) with somewhat lower but still elevated As concentrations. For example Stewart Gulch (W26) is naturally elevated in As, with concentrations typically on the order of 0.02 mg/L (Appendix A1). As such, the elevated baseline arsenic concentrations in Dublin Gulch reflect As-mineralization in the project area and do not appear to be exacerbated by historical placer disturbance in the drainages.

3.2 EAGLE CREEK DRAINAGE

Baseline water quality in the Eagle Creek is characterized using monitoring data from stations W9 in Eagle Pup and W27 (Figure 2.2). Baseline monitoring data from station W9 is important as the largest waste rock facility produced during mining of the Eagle Gold deposit will occupy the Eagle Pup valley. Data from station W27 reflects influences from primarily Eagle Pup and Suttles Gulch (W10) with other minor sources contributing along the drainage. The latter had a significant influence on TSS levels observed in lower Eagle Creek as well as total concentrations of trace elements.

3.2.1 Summary Statistics

Table 3.5 and Table 3.6 provide mean monthly and 95th percentile monthly values, respectively for station W9 on Eagle Pup at the headwaters of Eagle Creek. Mean monthly and 95th percentile monthly values for station W27, downstream of W9 are similarly provided in Table 3.7 and Table 3.8, respectively.

Table 3.5: Eagle Pup Creek W9 Mean Values

	Physical Parameters					Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	449	280	8.1	13	252	202	0.0050	0.50	0.16	0.30	0.0010	0.0045	63	0.0050	0.038	-	1.33
February (n=2)	465	275	8.2	3.9	277	206	0.028	0.50	0.17	0.30	0.0010	0.0045	67	0.0050	0.0050	1.5	1.83
March (n=1)	474	285	8.3	3.0	288	207	0.0050	0.50	0.17	0.30	0.0010	0.0050	69	0.0050	0.0050	1.7	-
April (n=2)	438	251	8.3	9.5	272	186	0.0055	0.50	0.15	0.25	0.0010	0.0036	62	0.0050	0.0050	3.7	2.2
May (n=4)	166	94	7.5	19	135	71	0.0052	1.0	0.11	0.091	0.0020	0.0020	21	0.0050	0.0089	20	14
June (n=3)	372	209	8.2	4.3	221	156	0.0050	0.50	0.15	0.32	0.0010	0.0037	49	0.0050	0.0050	-	2.4
July (n=3)	368	212	8.2	3.8	241	148	0.0050	0.50	0.15	0.26	0.0010	0.0028	45	0.0050	0.0050	2.4	2.1
August (n=6)	398	229	8.2	9.1	247	177	0.010	0.50	0.16	0.25	0.0011	0.0027	49	0.0050	0.0050	2.6	2.4
September (n=4)	403	231	8.0	4.3	238	172	0.011	0.50	0.17	0.25	0.0013	0.0025	52	0.0050	0.0050	2.2	1.8
October (n=4)	398	225	8.1	3.1	228	168	0.0088	0.66	0.16	0.36	0.0019	0.0030	51	0.0050	0.0050	2.2	2.5
November (n=2)	439	243	8.2	3.6	254	183	0.010	0.50	0.20	0.32	0.0010	0.0037	57	0.0050	0.0050	5.2	1.8
December (n=2)	438	255	8.3	5.1	264	196	0.0050	0.50	0.18	0.32	0.0012	0.0028	60	0.0050	0.0050	1.8	2.1

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.056	0.00054	0.019	0.000015	49	0.00037	0.00010	0.00054	0.087	0.00010	35	0.0016	0.000010	0.0009	0.00050	1.7	0.00070	0.000010	3.1	0.000010	0.011	0.0010	0.0030
February (n=2)	0.043	0.00064	0.019	0.000013	49	0.00020	0.00010	0.0013	0.091	0.00013	36	0.0014	0.000010	0.0010	0.00050	1.3	0.00069	0.000010	3.2	0.000010	0.013	0.0010	0.0030
March (n=1)	0.037	0.00053	0.019	0.000013	52	0.00018	0.00010	0.00050	0.045	0.000050	37	0.00086	0.000010	0.0010	0.00050	1.29	0.00069	0.000010	3.1	0.000010	0.013	0.0010	0.0030
April (n=2)	0.51	0.00080	0.025	0.000022	49	0.0011	0.00036	0.0015	0.93	0.0011	33	0.011	0.000010	0.0010	0.0012	1.8	0.00067	0.000013	3.0	0.000017	0.011	0.0016	0.0046
May (n=4)	0.65	0.00062	0.022	0.000044	19	0.0013	0.00042	0.0029	0.90	0.0015	11	0.018	0.000013	0.00066	0.0021	1.9	0.00065	0.000017	2.0	0.000010	0.0034	0.0015	0.0046
June (n=3)	0.038	0.00057	0.016	0.000017	42	0.00050	0.00010	0.00063	0.052	0.00020	25	0.0011	0.000010	0.0017	0.00050	2.0	0.00071	0.000010	3.0	0.000010	0.013	0.0010	0.0023
July (n=3)	0.066	0.00063	0.021	0.000018	43	0.00047	0.00010	0.00067	0.12	0.00015	25	0.0020	0.000010	0.0017	0.00051	1.7	0.00068	0.000010	2.9	0.000010	0.012	0.0010	0.0023
August (n=6)	0.33	0.00071	0.027	0.000023	44	0.00090	0.00026	0.00096	0.53	0.00082	29	0.0084	0.000010	0.0014	0.00084	1.8	0.00069	0.000013	2.9	0.000010	0.011	0.0015	0.0026
September (n=4)	0.037	0.00060	0.021	0.000016	45	0.00056	0.00010	0.00057	0.059	0.000097	28	0.0015	0.000010	0.0015	0.00050	1.8	0.00068	0.000010	3.0	0.000010	0.011	0.0010	0.0018
October (n=4)	0.053	0.00062	0.021	0.000018	44	0.00040	0.00010	0.00053	0.079	0.00012	27	0.0017	0.000010	0.0015	0.00050	1.6	0.00065	0.000010	3.0	0.000010	0.012	0.0010	0.0020
November (n=2)	0.11	0.00066	0.021	0.000018	44	0.00045	0.00012	0.0011	0.20	0.00028	30	0.0034	0.000010	0.0012	0.00055	1.7	0.00067	0.000010	2.8	0.000010	0.011	0.0010	0.0030
December (n=2)	0.034	0.00061	0.019	0.000016	46	0.00045	0.00010	0.00055	0.063	0.00014	32	0.0013	0.000010	0.0011	0.00050	1.26	0.00063	0.000010	2.9	0.000010	0.011	0.0010	0.0030

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0024	0.00058	0.018	0.000015	51	0.00030	0.00010	0.00039	0.020	0.000050	37	0.00013	0.000010	0.0010	0.00050	1.6	0.00074	0.000010	3.1	0.000010	0.012	0.0010	0.0020
February (n=2)	0.0025	0.00059	0.018	0.000011	50	0.00010	0.00010	0.00040	0.020	0.000050	36	0.000171	0.000010	0.0010	0.00050	1.3	0.00074	0.000010	3.3	0.000010	0.013	0.0010	0.0020
March (n=1)	0.0030	0.00056	0.019	0.000013	53	0.00010	0.00010	0.00050	0.030	0.000050	37	0.000084	0.000010	0.0011	0.00050	1.31	0.00079	0.000010	3.3	0.000010	0.014	0.0010	0.0030
April (n=2)	0.0058	0.00053	0.015	0.000014	48	0.00030	0.00010	0.00055	0.030	0.000050	32	0.0013	0.000010	0.00088	0.00050	1.7	0.00072	0.000010	2.9	0.000010	0.010	0.0010	0.0030
May (n=4)	0.11	0.00040	0.012	0.000031	19	0.00042	0.00013	0.0019	0.14	0.00012	11	0.0045	0.000011	0.00057	0.0013	1.8	0.00070	0.000010	2.0	0.000010	0.0031	0.0010	0.0030
June (n=3)	0.0076	0.00058	0.018	0.000017	43	0.00050	0.00010	0.00053	0.030	0.000050	25	0.00016	0.000010	0.0015	0.00050	2.0	0.00079	0.000010	3.0	0.000010	0.013	0.0010	0.0023
July (n=3)	0.0045	0.00057	0.021	0.000017	43	0.00037	0.00010	0.00048	0.023	0.000050	25	0.00020	0.000010	0.0016	0.00050	1.7	0.00073	0.000010	3.0	0.000010	0.011	0.0010	0.0010
August (n=6)	0.0048	0.00058	0.020	0.000016	44	0.00043	0.00010	0.00037	0.027	0.000050	29	0.00079	0.000010	0.0013	0.00050	1.8	0.00077	0.000010	2.9	0.000010	0.011	0.0010	0.0019
September (n=4)	0.0033	0.00060	0.020	0.000017	46	0.00053	0.00010	0.00045	0.025	0.000053	28	0.00034	0.000010	0.0014	0.00050	1.8	0.00075	0.000010	3.0	0.000010	0.011	0.0010	0.0010
October (n=4)	0.0027	0.00061	0.020	0.000023	45	0.00030	0.00010	0.00074	0.025	0.000050	28	0.00021	0.000010	0.0015	0.00050	1.6	0.00071	0.000010	2.9	0.000010	0.011	0.0010	0.0018
November (n=2)	0.0023	0.00064	0.019	0.000014	43	0.00030	0.00010	0.00040	0.020	0.000050	33	0.00016	0.000010	0.0012	0.00050	1.7	0.00076	0.000010	2.9	0.000010	0.011	0.0010	0.0020
December (n=2)	0.0024	0.00062	0.019	0.000013	47	0.00010	0.00010	0.00040	0.020	0.000050	33	0.00027	0.000010	0.0011	0.00050	1.27	0.00068	0.000010	2.9	0.000010	0.011	0.0010	0.0020

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.6: Eagle Pup Creek W9 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	454	284	276	8.1	22	268	211	0.0050	0.50	0.17	0.30	0.0010	0.0049	65	0.0050	0.068	-	2.06
February (n=2)	467	285	265	8.3	4.3	278	210	0.048	0.50	0.17	0.30	0.0010	0.0047	67	0.0050	0.0050	1.5	1.83
March (n=1)	474	285	285	8.3	3.0	288	207	0.0050	0.50	0.17	0.30	0.0010	0.0050	69	0.0050	0.0050	1.7	-
April (n=2)	452	260	241	8.3	15.4	280	194	0.0060	0.50	0.16	0.26	0.0010	0.0046	64	0.0050	0.0050	3.7	2.2
May (n=4)	275	159	46	8.1	38	190	119	0.0057	2.2	0.13	0.14	0.0044	0.0037	37	0.0050	0.018	27	15
June (n=3)	394	220	194	8.3	5.2	230	165	0.0050	0.50	0.16	0.34	0.0010	0.0040	52	0.0050	0.0050	-	2.8
July (n=3)	402	229	200	8.3	5.1	253	156	0.0050	0.50	0.16	0.34	0.0010	0.0037	49	0.0050	0.0050	2.4	2.1
August (n=6)	434	251	204	8.4	30	266	194	0.020	0.50	0.17	0.35	0.0014	0.0040	55	0.0050	0.0050	2.8	3.0
September (n=4)	429	250	215	8.2	7.3	248	183	0.025	0.50	0.17	0.28	0.0021	0.0033	55	0.0050	0.0050	2.3	1.9
October (n=4)	405	238	211	8.3	3.3	249	171	0.018	1.04	0.19	0.39	0.0040	0.0035	55	0.0050	0.0050	2.2	2.8
November (n=2)	450	257	230	8.4	4.1	264	187	0.015	0.50	0.21	0.33	0.0010	0.0039	61	0.0050	0.0050	5.2	1.8
December (n=2)	450	269	241	8.4	7.0	269	207	0.0050	0.50	0.18	0.34	0.0014	0.0038	65	0.0050	0.0050	1.8	2.1

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.056	0.00056	0.020	0.000017	52	0.00049	0.00010	0.00057	0.089	0.00011	37	0.0017	0.000010	0.0010	0.00050	2.0	0.00071	0.000010	3.3	0.000010	0.011	0.0010	0.0030
February (n=2)	0.046	0.00066	0.020	0.000013	49	0.00022	0.00010	0.0019	0.096	0.00013	37	0.0017	0.000010	0.0011	0.00050	1.3	0.00071	0.000010	3.3	0.000010	0.014	0.0010	0.0030
March (n=1)	0.037	0.00053	0.019	0.000013	52	0.00018	0.00010	0.00050	0.045	0.000050	37	0.00086	0.000010	0.0010	0.00050	1.29	0.00069	0.000010	3.1	0.000010	0.013	0.0010	0.0030
April (n=2)	0.94	0.00095	0.034	0.000026	52	0.0016	0.00058	0.0024	1.7	0.0020	35	0.019	0.000010	0.0010	0.0018	2.0	0.00071	0.000016	3.3	0.000022	0.011	0.0021	0.0059
May (n=4)	1.4	0.00078	0.031	0.000085	31	0.0024	0.00086	0.0042	1.9	0.0035	20	0.041	0.000019	0.00080	0.0036	2.0	0.00071	0.000028	2.1	0.000010	0.0060	0.0025	0.0089
June (n=3)	0.048	0.00060	0.017	0.000017	45	0.00050	0.00010	0.00075	0.073	0.00035	26	0.0014	0.000010	0.0017	0.00050	2.0	0.00071	0.000010	3.3	0.000010	0.014	0.0010	0.0030
July (n=3)	0.11	0.00067	0.024	0.000021	45	0.00050	0.00010	0.00075	0.21	0.00027	29	0.0034	0.000010	0.0020	0.00054	2.0	0.00071	0.000010	3.0	0.000010	0.013	0.0010	0.0029
August (n=6)	1.4	0.0011	0.050	0.000043	46	0.0024	0.00079	0.0025	2.1	0.0033	33	0.033	0.000010	0.0019	0.0020	2.0	0.00071	0.000024	3.0	0.000010	0.012	0.0030	0.0071
September (n=4)	0.051	0.00061	0.022	0.000017	47	0.00093	0.00010	0.00070	0.079	0.00013	31	0.0022	0.000010	0.0018	0.00050	2.0	0.00071	0.000010	3.1	0.000010	0.012	0.0010	0.0028
October (n=4)	0.082	0.00066	0.023	0.000027	44	0.00050	0.00010	0.00054	0.14	0.00022	29	0.0029	0.000010	0.0018	0.00050	2.0	0.00071	0.000010	3.1	0.000010	0.012	0.0010	0.0030
November (n=2)	0.16	0.00069	0.021	0.000019	46	0.00049	0.00013	0.0017	0.30	0.00042	32	0.0050	0.000010	0.0013	0.00059	2.0	0.00071	0.000010	2.8	0.000010	0.011	0.0010	0.0030
December (n=2)	0.040	0.00065	0.020	0.000019	48	0.00052	0.00010	0.00060	0.077	0.00020	34	0.0018	0.000010	0.0011	0.00050	1.3	0.00066	0.000010	3.0	0.000010	0.013	0.0010	0.0030

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0029	0.00059	0.018	0.000017	52	0.00048	0.00010	0.00049	0.029	0.000050	38	0.00013	0.000010	0.0011	0.00050	2.0	0.00078	0.000010	3.2	0.000010	0.013	0.0010	0.0029
February (n=2)	0.0029	0.00059	0.018	0.000011	51	0.00010	0.00010	0.00049	0.029	0.000050	38	0.000271	0.000010	0.0010	0.00050	1.4	0.00075	0.000010	3.5	0.000010	0.013	0.0010	0.0029
March (n=1)	0.0030	0.00056	0.019	0.000013	53	0.00010	0.00010	0.00050	0.030	0.000050	37	0.000084	0.000010	0.0011	0.00050	1.31	0.00079	0.000010	3.3	0.000010	0.014	0.0010	0.0030
April (n=2)	0.0082	0.00055	0.016	0.000017	50	0.00048	0.00010	0.00060	0.030	0.000050	33	0.0015	0.000010	0.00090	0.00050	2.0	0.00078	0.000010	3.2	0.000010	0.010	0.0010	0.0030
May (n=4)	0.21	0.00053	0.014	0.000058	31	0.00050	0.00019	0.0024	0.25	0.00024	20	0.011	0.000013	0.00075	0.0020	2.0	0.00079	0.000010	2.1	0.000010	0.0057	0.0010	0.0057
June (n=3)	0.0080	0.00061	0.018	0.000017	45	0.00050	0.00010	0.00058	0.030	0.000051	26	0.00017	0.000010	0.0016	0.00050	2.0	0.00079	0.000010	3.2	0.000010	0.014	0.0010	0.0030
July (n=3)	0.0048	0.00061	0.021	0.000022	45	0.00050	0.00010	0.00053	0.030	0.000050	28	0.00024	0.000010	0.0019	0.00050	2.0	0.00079	0.000010	3.0	0.000010	0.013	0.0010	0.0010
August (n=6)	0.011	0.00061	0.021	0.000017	46	0.00050	0.00010	0.00048	0.030	0.000050	33	0.0028	0.000010	0.0018	0.00050	2.0	0.00079	0.000010	3.0	0.000010	0.012	0.0010	0.0040
September (n=4)	0.0039	0.00063	0.022	0.000019	48	0.00093	0.00010	0.00052	0.030	0.000061	32	0.00066	0.000010	0.0017	0.00050	2.0	0.00079	0.000010	3.1	0.000010	0.012	0.0010	0.0010
October (n=4)	0.0034	0.00064	0.022	0.000045	47	0.00050	0.00010	0.0014	0.030	0.000050	30	0.00032	0.000010	0.0017	0.00050	2.0	0.00079	0.000010	3.1	0.000010	0.012	0.0010	0.0029
November (n=2)	0.0029	0.00064	0.020	0.000017	45	0.00048	0.00010	0.00049	0.029	0.000050	37	0.00026	0.000010	0.0013	0.00050	2.0	0.00079	0.000010	2.9	0.000010	0.011	0.0010	0.0029
December (n=2)	0.0029	0.00064	0.019	0.000015	48	0.00010	0.00010	0.00049	0.029	0.000050	36	0.00044	0.000010	0.0011	0.00050	1.3	0.00068	0.000010	3.0	0.000010	0.013	0.0010	0.0029

Notes: - not available; n = number of samples; * 25th Percentile Hardness Presented; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.7: Eagle Creek W27 Mean Values

	Physical Parameters					Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	355	204	8.2	17	227	142	0.0050	0.50	0.16	0.16	0.0010	0.0053	60	0.0050	0.0050	-	1.9
February (n=1)	369	202	8.3	5.1	229	145	0.050	0.50	0.15	0.20	0.0010	0.0044	63	0.0050	0.0050	1.5	-
March (n=4)	322	174	8.1	4.9	199	120	0.0050	0.50	0.15	0.17	0.0010	0.0035	54	0.0050	0.0050	1.9	1.5
April (n=3)	292	157	8.0	2943	159	87	0.059	0.91	0.13	0.12	0.0020	0.0031	50	0.0050	0.029	3.1	3.2
May (n=5)	159	83	7.5	570	131	55	0.021	0.9	0.10	0.065	0.0018	0.0026	27	0.0050	0.011	20	17
June (n=3)	303	164	8.2	6.3	183	112	0.0050	0.50	0.14	0.049	0.0010	0.0030	50	0.0050	0.0050	-	2.7
July (n=4)	368	212	8.0	840	251	127	0.033	0.50	0.14	0.052	0.0010	0.0034	80	0.0050	0.0050	2.7	2.1
August (n=8)	335	181	8.3	154	205	135	0.018	0.50	0.14	0.041	0.0010	0.0026	48	0.0050	0.0050	4.9	2.6
September (n=7)	358	199	8.1	7.4	218	141	0.0073	0.50	0.15	0.041	0.0010	0.0019	52	0.0050	0.0050	2.3	1.9
October (n=7)	343	194	8.2	26	213	137	0.0080	0.50	0.14	0.094	0.0010	0.0026	55	0.0050	0.0050	2.3	2.3
November (n=3)	394	209	8.2	64	233	146	0.0095	0.50	0.15	0.15	0.0010	0.0035	62	0.0050	0.0050	2.0	2.4
December (n=2)	366	192	8.2	27	228	140	0.0050	0.50	0.16	0.18	0.0010	0.0034	64	0.0050	0.0050	1.6	2.0

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.19	0.0047	0.030	0.000021	45	0.00068	0.00015	0.0016	0.28	0.00060	23	0.010	0.000010	0.0011	0.00071	2.0	0.00075	0.000010	3.0	0.000031	0.0045	0.0010	0.0035
February (n=1)	0.056	0.0045	0.026	0.000012	41	0.00020	0.00010	0.00079	0.11	0.00017	24	0.0024	0.000010	0.0012	0.00061	1.8	0.00051	0.000010	2.8	0.000010	0.0050	0.0010	0.0030
March (n=4)	0.12	0.0043	0.031	0.000059	37	0.00040	0.00016	0.0011	0.25	0.00058	20	0.009	0.000010	0.0012	0.00078	1.9	0.00068	0.000010	2.6	0.000031	0.0032	0.0010	0.0031
April (n=3)	29	0.0090	0.39	0.0018	51	0.061	0.042	0.12	60	0.13	31	1.9	0.00055	0.0018	0.084	8.8	0.00075	0.00076	3.1	0.00064	0.0072	0.075	0.26
May (n=5)	8.3	0.0057	0.15	0.00026	20	0.014	0.0079	0.027	18	0.026	12	0.31	0.000049	0.00068	0.019	3.6	0.00071	0.00018	1.8	0.00016	0.0024	0.017	0.051
June (n=3)	0.13	0.0048	0.034	0.000017	35	0.00067	0.00018	0.0015	0.20	0.00044	18	0.0062	0.000010	0.0011	0.00077	2.1	0.00084	0.000010	2.4	0.000051	0.0025	0.0010	0.0033
July (n=4)	16.5	0.0073	0.175	0.00052	59	0.0301	0.0187	0.064	39.6	0.0468	28	0.77	0.000013	0.0014	0.0445	5.4	0.00099	0.000385	3.0	0.000301	0.0059	0.0347	0.117
August (n=8)	1.3	0.0049	0.053	0.00011	42	0.0024	0.0013	0.0054	2.6	0.0023	21	0.077	0.000010	0.0011	0.0037	2.1	0.00073	0.000026	2.7	0.000042	0.0038	0.0047	0.012
September (n=7)	0.11	0.0048	0.046	0.000038	42	0.00068	0.00017	0.0014	0.22	0.00036	23	0.011	0.000010	0.00100	0.00083	2.1	0.00078	0.000011	2.9	0.000045	0.0040	0.0052	0.0046
October (n=7)	0.37	0.0051	0.052	0.000039	41	0.0009	0.00042	0.0023	0.8	0.0022	22	0.018	0.000010	0.0011	0.0014	2.0	0.00059	0.000017	2.7	0.000034	0.0043	0.0015	0.0052
November (n=3)	0.69	0.0050	0.040	0.000041	46	0.0014	0.00060	0.0027	1.2	0.0012	24	0.032	0.000010	0.0011	0.0018	2.1	0.00073	0.000015	2.9	0.000037	0.0047	0.0023	0.0086
December (n=2)	0.27	0.0047	0.032	0.000017	42	0.00075	0.00025	0.0015	0.50	0.00079	23	0.010	0.000010	0.0012	0.0010	2.0	0.00052	0.000010	2.8	0.000010	0.0047	0.0011	0.0046

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0018	0.0047	0.030	0.000015	44	0.00011	0.00010	0.0009	0.020	0.000056	23	0.0013	0.000010	0.0012	0.00050	2.0	0.0008	0.000010	3.0	0.000010	0.0042	0.0010	0.0023
February (n=1)	0.0025	0.0045	0.025	0.000012	43	0.00029	0.00010	0.00067	0.030	0.000050	23	0.00033	0.000010	0.0011	0.00050	1.8	0.00052	0.000010	2.8	0.000010	0.0050	0.0010	0.0021
March (n=4)	0.0028	0.0042	0.030	0.000014	38	0.00011	0.00010	0.00063	0.025	0.000061	19	0.0040	0.000010	0.0012	0.00051	1.9	0.00077	0.000010	2.6	0.000010	0.0031	0.0010	0.0016
April (n=3)	0.059	0.0035	0.020	0.000066	36	0.00011	0.00012	0.00086	0.038	0.00020	16	0.011	0.000010	0.0013	0.00055	2.3	0.0038	0.000013	2.5	0.000010	0.0031	0.0010	0.0017
May (n=5)	0.12	0.0021	0.026	0.000024	18	0.00030	0.00026	0.0037	0.23	0.00040	9	0.024	0.000010	0.00055	0.0016	1.8	0.00070	0.000012	1.5	0.000010	0.0015	0.0010	0.0034
June (n=3)	0.0054	0.0049	0.035	0.000017	36	0.00012	0.00012	0.0012	0.030	0.00010	18	0.0029	0.000010	0.0011	0.00058	2.1	0.0010	0.000013	2.2	0.000010	0.0024	0.0010	0.0017
July (n=4)	0.0081	0.0045	0.034	0.000016	51	0.00016	0.00013	0.00105	0.025	0.000063	20	0.0055	0.000010	0.0011	0.00063	2.1	0.00074	0.000013	2.9	0.000013	0.0040	0.0013	0.0015
August (n=8)	0.0047	0.0047	0.042	0.000019	39	0.00012	0.00010	0.00089	0.025	0.000063	20	0.0069	0.000010	0.0011	0.00059	1.9	0.00086	0.000010	2.6	0.000010	0.0037	0.0010	0.0015
September (n=7)	0.0025	0.0048	0.045	0.000025	43	0.00012	0.00011	0.00084	0.027	0.000070	23	0.0055	0.000010	0.0010	0.00055	2.1	0.00093	0.000011	2.8	0.000010	0.0040	0.0010	0.0012
October (n=7)	0.0017	0.0047	0.039	0.000018	42	0.00011	0.00011	0.00073	0.021	0.000070	22	0.0039	0.000010	0.0011	0.00052	1.9	0.00067	0.000011	2.7	0.000010	0.0041	0.0010	0.0013
November (n=3)	0.0020	0.0049	0.035	0.000015	45	0.00011	0.00012	0.00069	0.023	0.000099	23	0.0041	0.000010	0.0011	0.00054	2.0	0.00083	0.000013	2.8	0.000010	0.0046	0.0010	0.0040
December (n=2)	0.0018	0.0046	0.029	0.000010	41	0.00010	0.00010	0.00068	0.020	0.000050	22	0.0017	0.000010	0.0012	0.00050	1.9	0.00055	0.000010	2.8	0.000010	0.0045	0.0010	0.0016

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.8: Eagle Pup Creek W27 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	367	205	202	8.2	22	237	146	0.0050	0.50	0.17	0.18	0.0010	0.0077	61	0.0050	0.0050	-	1.9
February (n=1)	369	202	202	8.3	5.1	229	145	0.050	0.50	0.15	0.20	0.0010	0.0044	63	0.0050	0.0050	1.5	-
March (n=4)	352	194	155	8.3	9.3	215	138	0.0050	0.50	0.17	0.20	0.0010	0.0052	59	0.0050	0.0050	1.9	1.8
April (n=3)	349	184	139	8.1	7157	191	92	0.13	1.3	0.14	0.13	0.0028	0.0039	52	0.0050	0.068	3.1	3.2
May (n=5)	214	113	51	7.8	967	172	74	0.039	2.1	0.11	0.090	0.0042	0.0046	40	0.0050	0.024	25	24
June (n=3)	349	193	145	8.3	9.6	215	129	0.0050	0.50	0.15	0.056	0.0010	0.0040	61	0.0050	0.0050	-	2.9
July (n=4)	493	289	168	8.3	2329	346	145	0.073	0.50	0.15	0.12	0.0010	0.0050	164	0.0050	0.0050	2.7	2.2
August (n=8)	368	198	155	8.4	614	225	151	0.035	0.50	0.16	0.097	0.0010	0.0041	53	0.0050	0.0050	9.3	4.3
September (n=7)	373	219	178	8.3	19	238	154	0.016	0.50	0.16	0.071	0.0012	0.0028	55	0.0050	0.0050	2.5	2.1
October (n=7)	379	215	168	8.3	75	243	153	0.019	0.50	0.17	0.12	0.0010	0.0035	60	0.0050	0.0050	2.5	2.9
November (n=3)	409	218	203	8.5	160	244	159	0.017	0.50	0.17	0.17	0.0010	0.0049	62	0.0050	0.0050	2.0	2.4
December (n=2)	384	207	177	8.2	38	236	143	0.0050	0.50	0.16	0.19	0.0010	0.0050	65	0.0050	0.0050	1.6	2.0

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.23	0.0048	0.032	0.000024	45	0.00084	0.00015	0.0016	0.29	0.00066	23	0.014	0.000010	0.0012	0.00079	2.1	0.00083	0.000010	3.0	0.000049	0.0048	0.0010	0.0039
February (n=1)	0.056	0.0045	0.026	0.000012	41	0.00020	0.00010	0.00079	0.11	0.00017	24	0.0024	0.000010	0.0012	0.00061	1.8	0.00051	0.000010	2.8	0.000010	0.0050	0.0010	0.0030
March (n=4)	0.24	0.0054	0.041	0.00016	42	0.00060	0.00025	0.0016	0.53	0.0014	22	0.013	0.000010	0.0014	0.00095	2.0	0.00084	0.000010	2.7	0.000051	0.0042	0.0010	0.0035
April (n=3)	70	0.014	0.89	0.0045	71	0.15	0.11	0.30	148	0.33	48	4.8	0.0010	0.0026	0.21	18	0.00084	0.0019	4.0	0.0015	0.012	0.19	0.64
May (n=5)	15	0.0072	0.23	0.00045	27	0.026	0.013	0.046	32	0.044	17	0.51	0.000093	0.00086	0.032	5.2	0.0010	0.00030	2.0	0.00030	0.0034	0.032	0.088
June (n=3)	0.19	0.0050	0.040	0.000017	42	0.00095	0.00023	0.0016	0.31	0.00050	22	0.0091	0.000010	0.0011	0.00092	2.4	0.00084	0.000011	2.8	0.000051	0.0035	0.0010	0.0048
July (n=4)	49.5	0.0129	0.44	0.00137	101	0.090	0.0575	0.194	122	0.148	45	2.34	0.000019	0.0018	0.134	13.1	0.00136	0.00115	3.8	0.00084	0.0092	0.097	0.348
August (n=8)	5.0	0.0057	0.082	0.00035	52	0.0083	0.0045	0.016	9.6	0.0082	24	0.27	0.000010	0.0013	0.012	2.8	0.00084	0.000077	3.0	0.000051	0.0064	0.015	0.036
September (n=7)	0.32	0.0053	0.051	0.000065	46	0.00097	0.00037	0.0024	0.63	0.00079	24	0.024	0.000010	0.0011	0.0016	2.3	0.00084	0.000013	3.1	0.000051	0.0057	0.021	0.013
October (n=7)	1.2	0.0068	0.09	0.000092	46	0.0022	0.0013	0.0058	2.9	0.0084	25	0.045	0.000010	0.0012	0.0035	2.3	0.00084	0.000041	3.0	0.000051	0.0059	0.0032	0.014
November (n=3)	1.6	0.0053	0.056	0.000081	47	0.0026	0.0012	0.0049	2.7	0.0022	25	0.071	0.000010	0.0012	0.0036	2.2	0.00084	0.000022	3.0	0.000051	0.0053	0.0045	0.015
December (n=2)	0.35	0.0048	0.035	0.000018	42	0.00091	0.00033	0.0017	0.69	0.0010	23	0.013	0.000010	0.0013	0.0012	2.0	0.00056	0.000010	2.8	0.000010	0.0050	0.0011	0.0049

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0024	0.0048	0.033	0.000020	44	0.00012	0.00010	0.0010	0.029	0.000060	23	0.0019	0.000010	0.0013	0.00050	2.1	0.0010	0.000010	3.1	0.000010	0.0043	0.0010	0.0034
February (n=1)	0.0025	0.0045	0.025	0.000012	43	0.00029	0.00010	0.00067	0.030	0.000050	23	0.00033	0.000010	0.0011	0.00050	1.8	0.00052	0.000010	2.8	0.000010	0.0050	0.0010	0.0021
March (n=4)	0.0044	0.0051	0.036	0.000017	41	0.00012	0.00010	0.00070	0.030	0.000083	22	0.0085	0.000010	0.0013	0.00054	2.0	0.0010	0.000010	2.7	0.000010	0.0042	0.0010	0.0021
April (n=3)	0.14	0.0043	0.029	0.00015	40	0.00012	0.00016	0.0010	0.052	0.00046	21	0.015	0.000010	0.0019	0.00057	3.1	0.0091	0.000017	2.7	0.000010	0.0039	0.0010	0.0021
May (n=5)	0.29	0.0029	0.033	0.000037	24	0.00072	0.00045	0.0050	0.45	0.00072	13	0.043	0.000010	0.00080	0.0023	2.0	0.0010	0.000017	1.7	0.000010	0.0022	0.0010	0.0081
June (n=3)	0.0067	0.0051	0.043	0.000017	42	0.00012	0.00016	0.0013	0.030	0.00018	22	0.0046	0.000010	0.0011	0.00062	2.2	0.0010	0.000017	2.7	0.000010	0.0033	0.0010	0.0021
July (n=4)	0.0123	0.0051	0.047	0.000020	80	0.00028	0.00019	0.0015	0.030	0.000093	21	0.011	0.000010	0.0013	0.00093	2.8	0.0010	0.000019	3.6	0.000019	0.0057	0.0019	0.0021
August (n=8)	0.014	0.0055	0.047	0.000038	43	0.00012	0.00010	0.0011	0.030	0.00011	22	0.014	0.000010	0.0012	0.00085	2.1	0.0010	0.000010	2.9	0.000010	0.0061	0.0010	0.0033
September (n=7)	0.0041	0.0052	0.049	0.000050	47	0.00012	0.00015	0.0010	0.030	0.00015	25	0.011	0.000010	0.0011	0.00073	2.3	0.0010	0.000016	3.1	0.000010	0.0056	0.0010	0.0018
October (n=7)	0.0025	0.0050	0.049	0.000040	46	0.00012	0.00015	0.00077	0.030	0.00015	25	0.0073	0.000010	0.0012	0.00056	2.1	0.0010	0.000016	2.9	0.000010	0.0056	0.0010	0.0021
November (n=3)	0.0025	0.0051	0.049	0.000017	46	0.00012	0.00016	0.00074	0.030	0.00018	25	0.0059	0.000010	0.0011	0.00057	2.1	0.0010	0.000017	2.9	0.000010	0.0053	0.0010	0.0083
December (n=2)	0.0024	0.0046	0.033	0.000010	44	0.00010	0.00010	0.00075	0.029	0.000050	24	0.0019	0.000010	0.0013	0.00050	1.9	0.00062	0.000010	2.8	0.000010	0.0048	0.0010	0.0020

Notes: - not available; n = number of samples; * 25th Percentile Hardness Presented TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

3.2.2 Major Ions

The major ion chemistry of Eagle Pup and Eagle Creek is described with respect to conductivity, hardness, alkalinity, sulphate and pH. Eagle Pup is characterized by moderately hard to hard waters, with monthly mean hardness values ranging from 94 to 285 mg/L at station W9. Hardness values in lower Eagle Creek are slightly lower but are characterized as moderately hard to hard with monthly mean hardness ranging from 83 mg/L to 212 mg/L at station W27 (Table 3.5 and Table 3.7). Like the other project area streams, values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May and June (Table 3.5 and Table 3.7) during peak periods of snowmelt runoff.

The pH in Eagle Creek remains relatively uniform throughout the year with values generally ranging between 7.5 and 8.4. Alkalinity values in excess of 150 mg/L are typical and represent significant buffering capacity and dissolution of carbonate mineral phases in the catchment.

Baseline concentrations for sulphate in Eagle Creek are notably higher (e.g., ~60 mg/L during non-freshet flow conditions) than observed in Dublin Gulch (~20 mg/L) for corresponding flow periods. The higher sulphate concentrations in the Eagle Creek drainage likely reflect the presence and weathering of the low-sulphide Eagle Gold deposit.

TSS concentrations observed in the Eagle Creek drainage were highly variable depending upon location in the catchment. The seasonal TSS signature at station W9 was similar to that observed in Dublin Gulch, exhibiting higher concentrations in peak freshet months (e.g. 20 mg/L; Table 3.5) and much lower concentrations during lower flow periods. Conversely, at station W27, the highest mean monthly TSS concentrations corresponded to freshet (April/May) as well as summer (e.g. July and August) flow periods (Table 3.7). Elevated TSS measurements were documented in Suttles Gulch (W10; Appendix A2)) during 2010 and 2011, and were related to meltwater that originated from the disturbance of permafrost (associated with geotechnical and exploration activities). The meltwater initially developed during summer 2010 and became more extensive during summer 2011. The elevated TSS concentrations in Eagle Creek at station W27 had a significant influence on total trace element concentrations as described below.

3.2.3 Nutrients

Nutrient parameters show low values in the Eagle Creek drainage. Ammonia-N concentrations are low with mean monthly values ranging from <0.005 mg/L to 0.011 mg/L at W9 and <0.005 mg/L to 0.059 mg/L at W27 (Table 3.5 and Table 3.7). The majority of nitrite-N values have occurred near or below the detection limit value. Baseline nitrate-N concentrations during low flows in Eagle Creek are higher (e.g. ~0.02 to 0.30 mg/L) than observed in Dublin Gulch (e.g. 0.1 mg/L).

Baseline concentrations for dissolved orthophosphate in Eagle Creek are low, ranging from approximately <0.0020 to 0.005 mg/L (Table 3.5 and Table 3.7).

Mean monthly baseflow TOC levels in Eagle Creek are typically 1.0 mg/L to 2.0 mg/L, while freshet flow TOC levels are on the order of 15 to 20 mg/L (Table 3.5 and Table 3.7).

3.2.4 Trace Elements

Baseline trace element concentrations in upper Eagle Creek at station W9 were derived from data collected from July 2009 to May 2013. Characterization of baseline water quality in lower Eagle Creek at station W27 was developed using data collected from August 2007 to October 2014. Because of the influence of disturbance in Suttles Gulch, the data from W9 and W27 will be described initially individually below.

3.2.4.1 Eagle Pup W9

In general, mean monthly concentrations of total and dissolved trace elements in the upper Eagle Creek basin are low, with concentrations of key parameters of interest (e.g. Cd, Cu, Co, Cr, Pb, Hg, Ni, Se, Tl and Zn) measured at, or below, their respective analytical detection limit (Appendix A2 and Table 3.5). However, total and dissolved arsenic concentrations are naturally elevated in the head waters of Eagle Creek. During low flow conditions, total and dissolved As concentrations are similar and typically range between 0.018 mg/L and 0.022 mg/L with dissolved As accounting for over 95% of total As (Appendix A2; Figure 3.4).

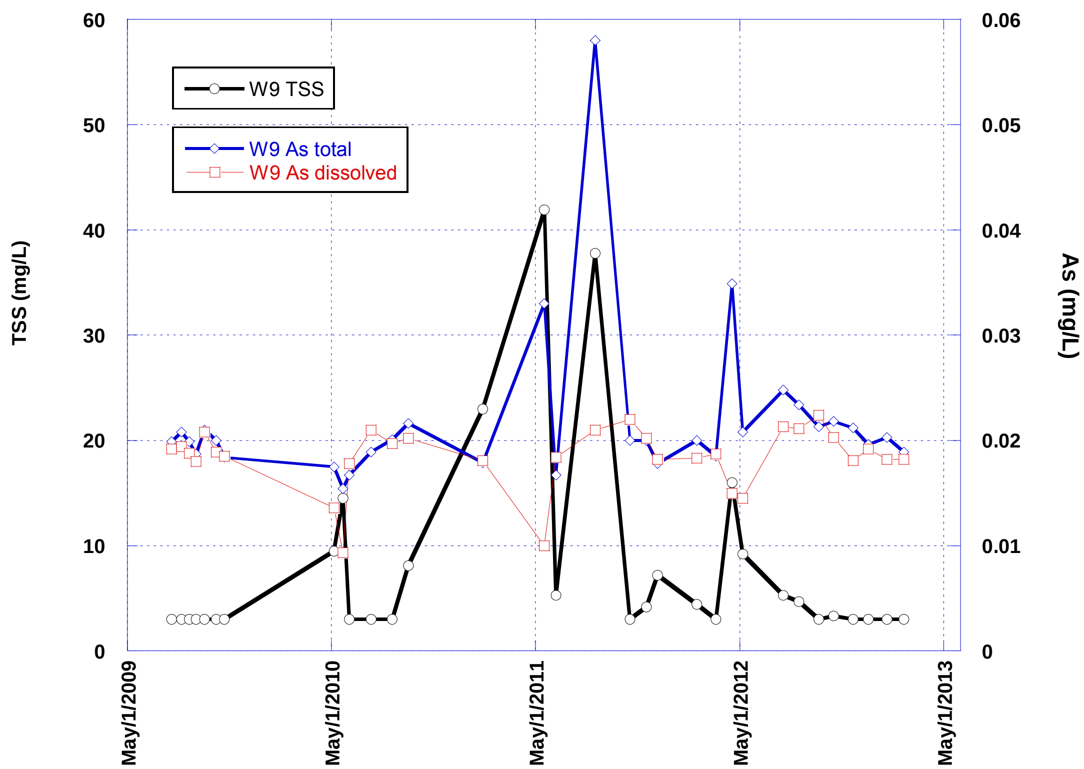

Figure 3.4: Total As and Dissolved As versus TSS in Upper Eagle Creek at station W9 (2009 – 2013)

Episodic periods of higher flow and elevated TSS values result in elevated total As values that have been observed to range from approximately 0.033 mg/L to values approaching 0.06 mg/L (Figure 3.4). These brief periods of elevated total As do not translate into higher dissolved As concentrations which show decreased dissolved As concentrations during freshet months (e.g. 0.012 mg/L) and near consistent low flow dissolved concentrations of approximately 0.02 mg/L (Table 3.5). The dissolved data suggest that solid-phase As associated with higher TSS is primarily responsible for peak concentrations observed (Figure 3.4 and Table 3.5). Although not graphically presented, the periods of elevated TSS also result in higher concentrations of trace elements, namely Al, Cd, Mn and Ag).

3.2.4.2 Eagle Creek W27

Lower Eagle Creek has experienced periods of very elevated TSS since mid-2010 to present. These periods of elevated TSS result in elevated concentrations of total trace elements, in particular Al, As, Cd, Cu, Pb, Hg, Mn, Ni, Ag and Zn (Table 3.7 and Appendix A2). As illustrated in Figure 3.5, total As concentrations during these elevated TSS events can exceed 0.450 mg/L (Figure 3.5) and is directly attributable to solid-phase As in suspended sediments.

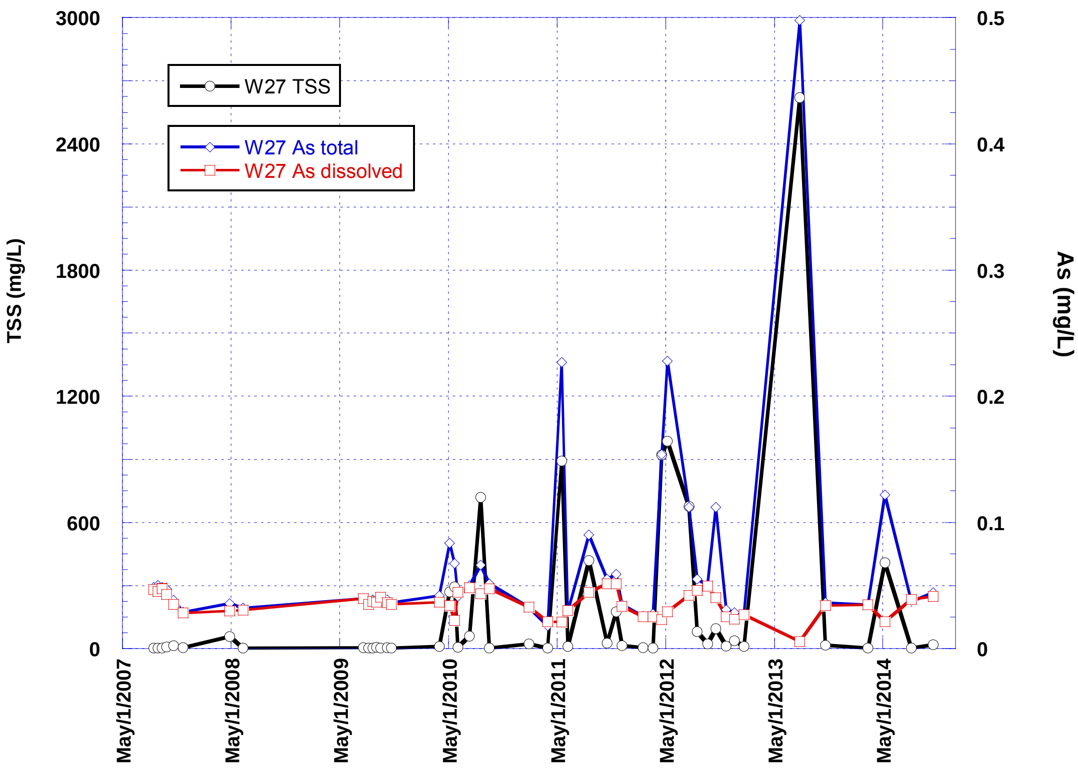

Figure 3.5: Total As and Dissolved As versus TSS in Lower Eagle Creek at station W27 (2007 – 2014)

Conversely, dissolved As concentrations, while higher than observed in the upper reaches of Eagle Creek at W9, remain consistently between 0.025 mg/L and 0.036 mg/L (e.g. during winter low flow) and 0.03 and 0.049 mg/L during summer flow periods (Table 3.7). Based on these results, baseflow As concentrations in upper Eagle Creek basin are approximately 0.02 mg/L and increase further down the catchment to roughly 0.028 mg/L.

3.3 HAGGART CREEK DRAINAGE

Haggart Creek is the largest project affected stream and the primary receiving environment stream for the Eagle Gold Project. The main monitoring stations on Haggart Creek are shown on Figure 2.2 and include stations W22 (upstream of all potential project activities), W4 (immediately downstream of the confluence with Dublin Gulch), W29 (downstream of Dublin Gulch, Eagle Creek, Gil Gulch and Platinum Gulch confluences), W5 and W23 (immediately upstream and downstream, respectively of the confluence with Lynx Creek).

3.3.1 W22 – Upper Haggart Creek above Dublin Gulch

3.3.1.1 Summary Statistics

Table 3.9 and Table 3.10 provide mean monthly and 95th percentile monthly values, respectively for station W22 in Haggart Creek. As previously mentioned, station W22 is located upstream of all future project activities and upstream of the confluence with Dublin Gulch (Figure 2.2). Station W1 in Dublin Gulch and station W22 in upper Haggart Creek have had the greatest number of sampling events of all project water quality monitoring stations at 58 and 55, respectively during the period of 2007 to 2016. Figure 3.6 illustrates the total number of samples by month at W22 for the period of 2007 to 2016. The summer and fall flow periods (e.g. August to October) have received the most sampling intensity.

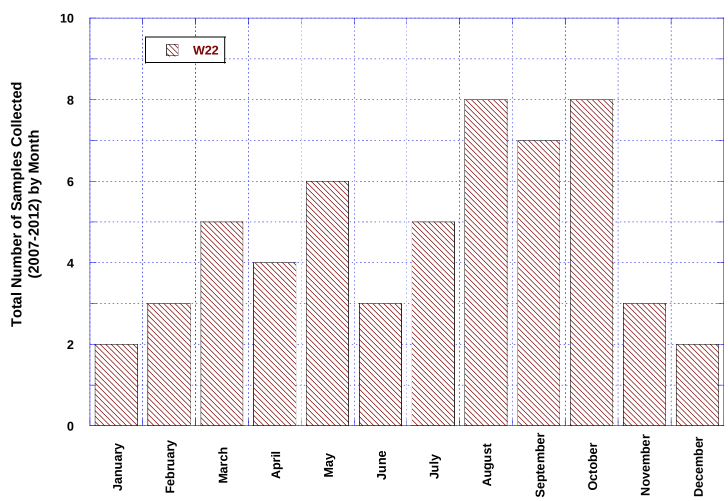

Figure 3.6: Total Number of Samples Collected by Month at W22 (2007 – 2016)

Table 3.9: Haggart Creek W22 Mean Values

	Physical Parameters					Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	379	213	7.9	5.8	250	120	0.0050	0.50	0.11	0.14	0.0010	0.0010	89	0.0050	0.0050	-	1.180
February (n=3)	377	216	8.0	3.0	242	119	0.020	0.50	0.11	0.15	0.0010	0.0013	89	0.0050	0.0050	0.99	1.00
March (n=5)	394	215	7.8	3.1	253	120	0.0226	0.50	0.11	0.14	0.0011	0.0010	93	0.0050	0.0050	1.6	1.10
April (n=4)	389	214	7.7	3.4	248	117	0.0054	0.50	0.12	0.14	0.0010	0.0010	92	0.0050	0.0053	1.3	1.3
May (n=6)	116	63	7.3	25	104	36	0.0054	1.5	0.081	0.030	0.0030	0.0010	21	0.0050	0.0092	24	20
June (n=3)	229	123	7.9	3.2	149	72	0.0050	0.50	0.065	0.077	0.0010	0.0010	48	0.0050	0.0052	-	3.4
July (n=5)	278	150	8.0	3.0	186	88	0.0051	0.50	0.080	0.052	0.0010	0.0010	60	0.0050	0.0050	2.8	2.1
August (n=8)	284	150	8.0	5.2	186	88	0.011	0.50	0.090	0.049	0.0013	0.0010	62	0.0050	0.0051	4.3	3.0
September (n=7)	280	151	7.7	3.0	179	86	0.0077	0.50	0.081	0.067	0.0010	0.0010	56	0.0050	0.0051	2.1	3.9
October (n=8)	289	159	7.9	3.0	187	91	0.0075	0.64	0.092	0.12	0.0021	0.0010	64	0.0050	0.0050	2.2	2.1
November (n=3)	346	180	8.0	3.0	208	102	0.0050	0.50	0.10	0.15	0.0010	0.0010	72	0.0050	0.0050	1.7	1.3
December (n=2)	348	190	8.0	3.0	224	109	0.0050	0.50	0.11	0.16	0.0010	0.0010	79	0.0050	0.0050	1.2	1.5

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.1284	0.00025	0.00111	0.000025	51	0.00054	0.00030	0.00075	0.331	0.000176	21	0.065	0.000010	0.000054	0.00159	1.7	0.00021	0.000010	2.3	0.000010	0.0013	0.0010	0.0055
February (n=3)	0.0179	0.00023	0.00077	0.000018	49	0.00024	0.00023	0.0011	0.122	0.00011	21	0.055	0.000010	0.000065	0.0015	1.5	0.00017	0.000010	2.2	0.000010	0.0013	0.0010	0.0047
March (n=5)	0.018	0.00022	0.00077	0.000018	50	0.00034	0.00018	0.00045	0.10	0.000080	21	0.063	0.000010	0.000060	0.0014	1.7	0.00018	0.000010	2.3	0.000010	0.0014	0.0010	0.0033
April (n=4)	0.024	0.00024	0.00089	0.000020	51	0.00031	0.00026	0.00043	0.13	0.000070	22	0.069	0.000010	0.000068	0.0017	1.6	0.00018	0.000010	2.3	0.000010	0.0014	0.0010	0.0046
May (n=6)	0.46	0.00024	0.0019	0.000060	15	0.0009	0.00085	0.0027	1.15	0.00067	5.6	0.11	0.000011	0.000058	0.0034	1.4	0.00014	0.000017	1.3	0.000010	0.00034	0.0013	0.0080
June (n=3)	0.036	0.00024	0.00078	0.000017	33	0.00067	0.00017	0.00078	0.11	0.000090	10	0.028	0.000010	0.00039	0.00088	2.0	0.00018	0.000010	1.9	0.000010	0.00064	0.0010	0.0030
July (n=5)	0.027	0.00026	0.00087	0.000014	38	0.00038	0.00013	0.00066	0.11	0.000056	13	0.040	0.000010	0.000076	0.00098	1.6	0.00016	0.000010	1.8	0.000010	0.00078	0.0010	0.0023
August (n=8)	0.056	0.00026	0.00091	0.000020	38	0.00044	0.00014	0.00061	0.15	0.000088	13	0.029	0.000010	0.000069	0.00096	1.7	0.00017	0.000010	1.8	0.000010	0.00077	0.0010	0.0019
September (n=7)	0.017	0.00025	0.00077	0.000021	39	0.00053	0.00015	0.00072	0.081	0.000065	13	0.036	0.000010	0.00020	0.00099	1.8	0.00017	0.000010	1.9	0.000010	0.00074	0.0010	0.0023
October (n=8)	0.017	0.00025	0.00074	0.000017	40	0.00035	0.00014	0.00056	0.072	0.000065	14	0.029	0.000010	0.00020	0.00086	1.3	0.00016	0.000010	1.8	0.000010	0.00094	0.0010	0.0028
November (n=3)	0.0095	0.00026	0.00069	0.000016	43	0.00053	0.00018	0.00071	0.058	0.00011	17	0.035	0.000010	0.00038	0.0010	1.7	0.00018	0.000010	1.9	0.000010	0.0011	0.0010	0.0056
December (n=2)	0.016	0.00021	0.00076	0.000027	45	0.00026	0.00017	0.00050	0.086	0.000050	18	0.055	0.000010	0.000067	0.0011	1.06	0.00017	0.000010	1.95	0.000010	0.0012	0.0010	0.0060

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0024	0.00022	0.00064	0.000019	51	0.00030	0.00019	0.00036	0.023	0.000050	21	0.054	0.000010	0.000050	0.00129	1.6	0.00019	0.000010	2.3	0.000010	0.0012	0.0010	0.0035
February (n=3)	0.0026	0.00024	0.00066	0.000021	51	0.00023	0.00021	0.00040	0.030	0.000050	22	0.054	0.000010	0.000052	0.0015	1.5	0.00020	0.000010	2.3	0.000010	0.0014	0.0010	0.0040
March (n=5)	0.0024	0.00022	0.00074	0.000018	51	0.00034	0.00017	0.00038	0.026	0.000050	21	0.071	0.000010	0.000055	0.0014	1.7	0.00019	0.000010	2.2	0.000010	0.0013	0.0010	0.0028
April (n=4)	0.0025	0.00023	0.00065	0.000019	50	0.00030	0.00022	0.00037	0.027	0.000050	21	0.063	0.000010	0.000053	0.0016	1.6	0.00019	0.000010	2.2	0.000010	0.0014	0.0010	0.0044
May (n=6)	0.14	0.00015	0.00069	0.000041	16	0.00036	0.00035	0.0020	0.25	0.000066	5.6	0.051	0.000010	0.000050	0.0024	1.4	0.00015	0.000010	1.3	0.000010	0.00028	0.0010	0.0049
June (n=3)	0.017	0.00024	0.00076	0.000017	33	0.00067	0.00015	0.00065	0.076	0.000052	10	0.035	0.000010	0.00037	0.00083	2.0	0.00019	0.000010	1.9	0.000010	0.00061	0.0010	0.0027
July (n=5)	0.010	0.00024	0.00078	0.000014	38	0.00034	0.00011	0.00046	0.052	0.000050	13	0.035	0.000010	0.000067	0.00083	1.6	0.00016	0.000010	1.8	0.000010	0.00071	0.0010	0.0011
August (n=8)	0.012	0.00025	0.00078	0.000019	38	0.00040	0.00011	0.00049	0.048	0.000050	13	0.027	0.000010	0.000056	0.00087	1.7	0.00018	0.000010	1.8	0.000010	0.00075	0.0010	0.0021
September (n=7)	0.012	0.00025	0.00070	0.000021	39	0.00051	0.00013	0.00056	0.049	0.000050	13	0.033	0.000010	0.00020	0.00098	1.8	0.00018	0.000010	1.8	0.000010	0.00073	0.0010	0.0017
October (n=8)	0.0052	0.00023	0.00071	0.000017	41	0.00031	0.00013	0.00044	0.033	0.000062	14	0.042	0.000010	0.00019	0.00083	1.3	0.00016	0.000010	1.7	0.000010	0.00092	0.0010	0.0020
November (n=3)	0.0033	0.00025	0.00064	0.000015	45	0.00053	0.00016	0.00044	0.025	0.000050	17	0.034	0.000010	0.00037	0.00099	1.7	0.00018	0.000010	1.9	0.000010	0.0011	0.0010	0.0030
December (n=2)	0.0025	0.00023	0.00061	0.000016	46	0.00049	0.00015	0.00038	0.026	0.000050	19	0.050	0.000010	0.000056	0.0011	1.09	0.00018	0.000010	2.00	0.000010	0.0012	0.0010	0.0034

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.10: Haggart Creek W22 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	390	217	208	7.9	8.2	263	122	0.0050	0.50	0.109	0.15	0.0010	0.0010	89	0.0050	0.0050	-	1.3
February (n=3)	403	228	199	8.1	3.0	263	124	0.046	0.5	0.12	0.16	0.0010	0.0019	93	0.0050	0.0050	0.99	1.17
March (n=5)	413	224	204	8.1	3.5	267	126	0.0747	0.5	0.12	0.17	0.0014	0.0011	99	0.0050	0.0050	1.8	1.2
April (n=4)	401	219	207	8.0	4.2	254	120	0.0062	0.50	0.13	0.16	0.0010	0.0010	95	0.0050	0.0060	1.5	1.3
May (n=6)	162	89	36	7.6	66	129	49	0.0064	2.5	0.10	0.048	0.0050	0.0010	33	0.0050	0.019	28	26
June (n=3)	245	134	111	8.0	3.5	170	79	0.0050	0.50	0.075	0.101	0.0010	0.0010	54	0.0050	0.0055	-	4.1
July (n=5)	313	161	136	8.1	3.0	190	100	0.0055	0.50	0.104	0.067	0.0010	0.0010	71	0.0050	0.0050	2.8	2.2
August (n=8)	321	170	117	8.2	14	210	98	0.020	0.50	0.111	0.061	0.0022	0.0010	74	0.0050	0.0054	7.2	5.9
September (n=7)	308	170	132	8.1	3.0	200	95	0.0183	0.50	0.097	0.092	0.0010	0.0010	66	0.0050	0.0054	2.2	4.4
October (n=8)	302	166	149	8.1	3.0	206	94	0.0180	1.17	0.12	0.15	0.006	0.0010	70	0.0050	0.0050	2.57	2.4
November (n=3)	367	186	174	8.3	3.0	220	108	0.0050	0.50	0.11	0.16	0.0010	0.0010	77	0.0050	0.0050	1.680	1.3
December (n=2)	365	199	181	8.1	3.0	238	117	0.0050	0.50	0.11	0.17	0.0010	0.0010	85	0.0050	0.0050	1.15	1.5

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.2387	0.00029	0.0015	0.000031	51	0.00057	0.00047	0.00097	0.602	0.000289	21	0.096	0.000010	0.00006	0.00223	2.0	0.00023	0.000010	2.4	0.000010	0.0014	0.0010	0.0077
February (n=3)	0.036	0.00026	0.0008	0.000024	53	0.00046	0.00039	0.0021	0.22	0.000190	23	0.089	0.000010	0.00008	0.0020	1.9	0.00018	0.000010	2.3	0.000010	0.0015	0.0010	0.0057
March (n=5)	0.043	0.00024	0.0010	0.000020	52	0.00050	0.00026	0.00050	0.24	0.000112	22	0.114	0.000010	0.00007	0.0017	2.0	0.00018	0.000010	2.4	0.000010	0.0014	0.0010	0.0044
April (n=4)	0.041	0.00026	0.0010	0.000027	54	0.00050	0.00037	0.00050	0.17	0.00011	23	0.096	0.000010	0.00008	0.0022	2.0	0.00020	0.000010	2.5	0.000010	0.0015	0.0010	0.0062
May (n=6)	1.1	0.00034	0.004	0.00010	21	0.0019	0.0019	0.0044	3.0	0.0018	8	0.24	0.000014	0.00008	0.0056	2.0	0.00018	0.000032	1.9	0.000011	0.00047	0.0021	0.014
June (n=3)	0.054	0.00028	0.0010	0.000017	36	0.00095	0.00026	0.00099	0.16	0.00015	11	0.050	0.000010	0.00091	0.00099	2.0	0.00018	0.000010	1.9	0.000010	0.00074	0.0010	0.0046
July (n=5)	0.061	0.00028	0.0010	0.000017	39	0.00050	0.00018	0.00080	0.17	0.000073	15	0.079	0.000010	0.00009	0.00119	2.0	0.00018	0.000010	1.9	0.000010	0.00089	0.0010	0.0030
August (n=8)	0.24	0.00029	0.0013	0.000040	42	0.00069	0.00030	0.0013	0.51	0.00025	16	0.044	0.000010	0.00009	0.0016	2.0	0.00018	0.000010	1.9	0.000010	0.00098	0.0010	0.0035
September (n=7)	0.029	0.00029	0.0008	0.000040	43	0.00085	0.00024	0.00096	0.11	0.000125	15	0.055	0.000010	0.00072	0.0011	2.0	0.00018	0.000010	1.9	0.000010	0.00090	0.0010	0.0043
October (n=8)	0.030	0.00028	0.0008	0.000038	43	0.00083	0.00022	0.00085	0.10	0.000123	15	0.040	0.000010	0.00069	0.00098	2.0	0.00018	0.000010	1.9	0.000010	0.00102	0.0010	0.0042
November (n=3)	0.012	0.00029	0.0007	0.000017	46	0.00095	0.00026	0.0010	0.074	0.000154	18	0.043	0.000010	0.00091	0.0012	2.0	0.00018	0.000010	1.9	0.000010	0.0012	0.0010	0.0096
December (n=2)	0.021	0.00021	0.0008	0.000039	48	0.00036	0.00020	0.00050	0.105	0.00005	20	0.078	0.000010	0.00007	0.0012	1.18	0.00018	0.000010	2.1	0.000010	0.0014	0.0010	0.0078

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0029	0.00022	0.0007	0.000021	52	0.00048	0.00027	0.00049	0.029	0.000050	21	0.076	0.000010	0.00005	0.00167	2.0	0.00019	0.000010	2.3	0.000010	0.0013	0.0010	0.0039
February (n=3)	0.0030	0.00025	0.0007	0.000031	54	0.00046	0.00037	0.00050	0.030	0.000050	23	0.093	0.000010	0.00006	0.0022	1.9	0.00021	0.000010	2.5	0.000010	0.0015	0.0010	0.0053
March (n=5)	0.0030	0.00024	0.0009	0.000020	53	0.00050	0.00027	0.00050	0.030	0.000050	22	0.161	0.000010	0.00007	0.0017	2.0	0.00019	0.000010	2.3	0.000010	0.0014	0.0010	0.0032
April (n=4)	0.0030	0.00024	0.0007	0.000024	52	0.00050	0.00032	0.00050	0.030	0.000050	22	0.088	0.000010	0.00006	0.0020	2.0	0.00020	0.000010	2.3	0.000010	0.0014	0.0010	0.0057
May (n=6)	0.24	0.00019	0.001	0.000062	22	0.00050	0.00053	0.0027	0.32	0.000093	8	0.076	0.000010	0.00005	0.0029	2.0	0.00019	0.000010	1.9	0.000010	0.00043	0.0010	0.0070
June (n=3)	0.024	0.00027	0.0009	0.000017	35	0.00095	0.00024	0.00080	0.118	0.000055	11	0.075	0.000010	0.00091	0.00106	2.0	0.00019	0.000010	1.9	0.000010	0.00072	0.0010	0.0039
July (n=5)	0.017	0.00027	0.0009	0.000017	40	0.00050	0.00014	0.00059	0.095	0.000050	15	0.066	0.000010	0.00008	0.00110	2.0	0.00019	0.000010	1.9	0.000010	0.00085	0.0010	0.0016
August (n=8)	0.029	0.00027	0.0009	0.000038	42	0.00050	0.00015	0.0009	0.091	0.00005	16	0.042	0.000010	0.00007	0.0012	2.0	0.00019	0.000010	1.9	0.000010	0.00094	0.0010	0.0051
September (n=7)	0.021	0.00028	0.0008	0.000040	43	0.00085	0.00022	0.00082	0.067	0.000050	15	0.043	0.000010	0.00072	0.00106	2.0	0.00019	0.000010	1.9	0.000010	0.00085	0.0010	0.0033
October (n=8)	0.0076	0.00026	0.0008	0.000038	43	0.00083	0.00021	0.00059	0.048	0.000110	15	0.066	0.000010	0.00069	0.00097	2.0	0.00019	0.000010	1.9	0.000010	0.00098	0.0010	0.0037
November (n=3)	0.0041	0.00027	0.0007	0.000017	45	0.00095	0.00024	0.00061	0.030	0.000050	17	0.041	0.000010	0.00091	0.00117	2.0	0.00019	0.000010	1.9	0.000010	0.0012	0.0010	0.0039
December (n=2)	0.0032	0.00023	0.0006	0.000020	47	0.00084	0.00017	0.00049	0.030	0.000050	19	0.071	0.000010	0.00006	0.0012	1.20	0.00018	0.000010	2.1	0.000010	0.0013	0.0010	0.0038

Notes: - not available; n = number of samples; *25th Percentile Hardness Presented; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

3.3.1.2 Major Ions

The major ion chemistry of upper Haggart Creek is described with respect to conductivity, hardness, alkalinity, sulphate and pH. Upper Haggart Creek at station W22 is characterized by moderately hard to hard waters, with monthly mean hardness values ranging from approximately 63 to 216 mg/L (Table 3.9). Like the other project area streams, values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May and June during peak periods of snowmelt-driven runoff (Table 3.9).

The pH in upper Haggart Creek remains relatively uniform throughout the year with mean values generally ranging between 7.3 and 8.0. Alkalinity values are typically in excess of 85 mg/L suggesting a well-buffered system. Lower alkalinity values are only experienced during freshet periods.

Baseline concentrations for sulphate in upper Haggart Creek are notably higher (e.g., ~60 to 93 mg/L) during non-freshet flow conditions as compared to peak snowmelt periods where values typically less than 25 mg/L sulphate are observed.

TSS concentrations in upper Haggart Creek exhibit freshet maxima, generally coinciding with the peak snowmelt month of May (Table 3.9). At most other flow periods of the year, TSS values in upper Haggart Creek were generally below the analytical detection limit of 3.0 mg/L. The peak TSS value measured at W22 for the period of 2007 to 2016 was approximately 80 mg/L (May 2011; Appendix A2).

3.3.1.3 Nutrients

Nutrient parameters show low values in upper Haggart Creek. Ammonia-N concentrations are low with mean monthly values ranging from <0.005 mg/L to 0.022 mg/L at W22 (Table 3.9). Similar to ammonia, the majority of nitrite-N values have occurred near or below the detection limit value. Baseline nitrate-N concentrations in upper Haggart Creek are also low, with mean monthly values ranging from approximately 0.03 to 0.16 mg/L. Minima are evident during high flow periods, reflecting melt water influences.

Like other project area streams, baseline concentrations for dissolved orthophosphate in upper Haggart Creek are low, ranging from approximately <0.0010 to 0.0013 mg/L (Table 3.9).

Mean monthly baseflow TOC levels in upper Haggart Creek are low and generally less than 1.5 mg/L. Freshet flow TOC levels are much higher at approximately 25 mg/L, reflecting the addition of terrestrial-derived runoff and organic detritus.

3.3.1.4 Trace Elements

In general, mean monthly concentrations of total and dissolved trace elements are low for all parameters monitored with the exception of Al, Mn and to a lesser extent Cd during the peak freshet month of May (Table 3.9). Most parameters are present at concentrations at or below their respect analytical detection limit. Unlike Dublin Gulch and Eagle Creek drainages, arsenic concentrations in upper Haggart Creek at W22 are low; mean monthly concentrations range from a high of 0.004 mg/L during freshet periods to values typically less than 0.0008 mg/L for the remaining flow periods.

3.3.2 W4 – Upper Haggart Creek below Dublin Gulch

3.3.2.1 Summary Statistics

Table 3.11 and Table 3.12 provide mean monthly and 95th percentile monthly values, respectively for station W4 in Haggart Creek. The chemistry and water quality of Haggart Creek changes following the addition of Dublin Gulch waters that enter Haggart Creek downstream of W22 and immediately upstream of station W4. Recall that baseline water quality in Dublin Gulch has been characterized as being soft to moderately hard water, nutrient poor and naturally elevated in arsenic. Other trace elements in Dublin Gulch are present at generally low concentrations. As such, water quality at W4 is similar to that observed at W22 with the exception of higher concentrations of arsenic.

Table 3.11: Haggart Creek W4 Mean Values

	Physical Parameters					Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	373	208	7.9	5.4	244	121	0.0050	0.50	0.10	0.14	0.0010	0.0010	87	0.0050	0.0050	-	1.000
February (n=3)	378	209	8.0	3.0	239	117	0.020	2.09	0.11	0.15	0.0010	0.0014	86	0.0050	0.0050	0.94	0.95
March (n=5)	389	209	7.9	3.0	248	119	0.0051	1.79	0.11	0.15	0.0010	0.0011	91	0.0050	0.0050	1.3	1.03
April (n=3)	380	206	7.8	3.3	248	116	0.0050	0.50	0.12	0.13	0.0010	0.0010	88	0.0050	0.0050	1.5	1.3
May (n=6)	107	56	7.3	32	101	34	0.0055	1.5	0.082	0.031	0.0030	0.0011	19	0.0050	0.0089	24	19
June (n=3)	222	119	8.0	4.2	141	69	0.0050	0.50	0.067	0.070	0.0010	0.0010	46	0.0050	0.0050	-	3.4
July (n=4)	273	145	8.0	3.6	178	86	0.0050	0.50	0.081	0.046	0.0010	0.0010	59	0.0050	0.0050	2.8	2.1
August (n=6)	263	138	8.4	5.1	168	82	0.010	0.50	0.083	0.047	0.0010	0.0010	54	0.0050	0.0051	4.1	3.3
September (n=5)	267	143	7.7	3.0	177	82	0.0050	0.50	0.089	0.065	0.0010	0.0010	57	0.0050	0.0051	2.0	3.7
October (n=5)	278	152	8.0	3.1	177	88	0.0050	1.21	0.110	0.13	0.0049	0.0010	61	0.0050	0.0050	2.2	2.3
November (n=3)	336	173	7.9	3.1	192	100	0.0050	0.50	0.10	0.14	0.0010	0.0010	69	0.0050	0.0050	3.0	1.4
December (n=2)	340	184	7.9	3.1	220	111	0.0050	0.50	0.11	0.16	0.0010	0.0010	77	0.0050	0.0050	1.2	1.5

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0633	0.00027	0.00146	0.000020	49	0.00036	0.00023	0.00059	0.169	0.000112	20	0.050	0.000010	0.000109	0.00127	1.6	0.00023	0.000010	2.3	0.000010	0.0014	0.0010	0.0042
February (n=3)	0.0189	0.00028	0.00142	0.000019	48	0.00024	0.00021	0.0020	0.119	0.00006	21	0.053	0.000010	0.000110	0.0014	1.5	0.00022	0.000010	3.3	0.000010	0.0015	0.0010	0.0045
March (n=5)	0.014	0.00026	0.00128	0.000016	50	0.00034	0.00015	0.00041	0.09	0.000051	21	0.044	0.000010	0.000098	0.0012	1.7	0.00020	0.000010	3.2	0.000010	0.0015	0.0010	0.0031
April (n=3)	0.035	0.00026	0.00181	0.000017	49	0.00040	0.00018	0.00041	0.12	0.000108	21	0.049	0.000010	0.000096	0.0013	1.7	0.00020	0.000010	2.2	0.000010	0.0014	0.0010	0.0036
May (n=6)	0.60	0.00045	0.0091	0.000060	14	0.0011	0.00094	0.0029	1.34	0.00100	5.2	0.11	0.000012	0.000231	0.0036	1.5	0.00016	0.000016	1.4	0.000010	0.00042	0.0013	0.0082
June (n=3)	0.038	0.00039	0.00292	0.000017	30	0.00067	0.00013	0.00069	0.11	0.000084	10	0.018	0.000010	0.00054	0.00089	2.0	0.00021	0.000010	2.0	0.000010	0.00060	0.0010	0.0025
July (n=4)	0.031	0.00036	0.00342	0.000014	36	0.00035	0.00011	0.00057	0.09	0.000054	13	0.023	0.000010	0.000227	0.00091	1.5	0.00017	0.000010	1.8	0.000010	0.00081	0.0010	0.0025
August (n=6)	0.066	0.00039	0.00423	0.000021	36	0.00042	0.00014	0.00072	0.16	0.000097	12	0.028	0.000010	0.000240	0.00098	1.6	0.00019	0.000010	1.9	0.000010	0.00074	0.0010	0.0023
September (n=5)	0.018	0.00040	0.00417	0.000022	37	0.00054	0.00013	0.00064	0.081	0.000050	12	0.030	0.000010	0.00039	0.00094	1.8	0.00020	0.000010	1.9	0.000010	0.00074	0.0010	0.0020
October (n=5)	0.026	0.00038	0.00412	0.000011	39	0.00033	0.00012	0.00071	0.086	0.000059	13	0.027	0.000010	0.00040	0.00086	1.1	0.00015	0.000010	1.7	0.000010	0.00096	0.0010	0.0031
November (n=3)	0.0085	0.00039	0.00305	0.000015	43	0.00053	0.00014	0.00076	0.057	0.00006	16	0.034	0.000010	0.00048	0.0010	1.7	0.00020	0.000010	1.9	0.000010	0.0011	0.0010	0.0033
December (n=2)	0.019	0.00029	0.00188	0.000015	44	0.00022	0.00015	0.00050	0.082	0.000085	18	0.039	0.000010	0.000133	0.0010	1.08	0.00018	0.000010	2.01	0.000010	0.0012	0.0010	0.0037

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0025	0.00026	0.00121	0.000017	50	0.00030	0.00019	0.00037	0.025	0.000050	20	0.046	0.000010	0.000092	0.00111	1.6	0.00020	0.000010	2.3	0.000010	0.0014	0.0010	0.0033
February (n=3)	0.0027	0.00027	0.00124	0.000020	50	0.00023	0.00018	0.00040	0.029	0.000050	21	0.050	0.000010	0.000107	0.0013	1.5	0.00020	0.000010	3.6	0.000010	0.0014	0.0010	0.0036
March (n=5)	0.0021	0.00025	0.00117	0.000016	50	0.00034	0.00013	0.00032	0.028	0.000050	21	0.040	0.000010	0.000096	0.0012	1.7	0.00020	0.000010	3.0	0.000010	0.0014	0.0010	0.0027
April (n=3)	0.0046	0.00026	0.00139	0.000015	49	0.00037	0.00015	0.00040	0.030	0.000050	20	0.044	0.000010	0.000089	0.0011	1.7	0.00019	0.000010	2.1	0.000010	0.0014	0.0010	0.0035
May (n=6)	0.14	0.00029	0.00565	0.000038	14	0.00035	0.00031	0.0020	0.22	0.000073	5.1	0.042	0.000010	0.000214	0.0023	1.4	0.00015	0.000010	1.4	0.000010	0.00034	0.0010	0.0053
June (n=3)	0.017	0.00036	0.00300	0.000017	32	0.00067	0.00015	0.00061	0.060	0.000050	10	0.016	0.000010	0.00049	0.00079	2.0	0.00020	0.000010	2.0	0.000010	0.00058	0.0010	0.0024
July (n=4)	0.009	0.00034	0.00324	0.000014	37	0.00030	0.00010	0.00047	0.035	0.000050	13	0.021	0.000010	0.000200	0.00075	1.5	0.00016	0.000010	1.8	0.000010	0.00074	0.0010	0.0015
August (n=6)	0.013	0.00037	0.00410	0.000020	36	0.00037	0.00011	0.00177	0.048	0.000098	12	0.024	0.000010	0.000230	0.00085	1.7	0.00018	0.000010	1.9	0.000010	0.00071	0.0010	0.0024
September (n=5)	0.011	0.00037	0.00397	0.000022	37	0.00052	0.00013	0.00055	0.046	0.000050	12	0.028	0.000010	0.00038	0.00084	1.8	0.00019	0.000010	1.9	0.000010	0.00073	0.0010	0.0015
October (n=5)	0.0056	0.00036	0.00381	0.000012	39	0.00028	0.00013	0.00050	0.025	0.000055	13	0.025	0.000010	0.00040	0.00081	1.1	0.00016	0.000010	1.7	0.000010	0.00093	0.0010	0.0026
November (n=3)	0.0031	0.00036	0.00303	0.000015	43	0.00053	0.00016	0.00044	0.026	0.000050	16	0.033	0.000010	0.00048	0.00087	1.7	0.00019	0.000010	1.9	0.000010	0.0011	0.0010	0.0026
December (n=2)	0.0025	0.00028	0.00176	0.000012	45	0.00010	0.00013	0.00035	0.023	0.000050	18	0.036	0.000010	0.000129	0.0009	1.10	0.00019	0.000010	2.04	0.000010	0.0012	0.0010	0.0028

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.12: Haggart Creek W4 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	383	212	204	7.9	7.6	258	122	0.0050	0.50	0.109	0.14	0.0010	0.0010	88	0.0050	0.0050	-	1.0
February (n=3)	395	224	194	8.1	3.1	256	123	0.046	3.3	0.12	0.16	0.0010	0.0019	89	0.0050	0.0050	0.94	1.05
March (n=5)	417	226	201	8.1	3.0	269	127	0.0053	4.6	0.12	0.16	0.0010	0.0012	97	0.0050	0.0050	1.3	1.2
April (n=3)	400	218	196	8.0	3.8	263	123	0.0050	0.50	0.13	0.15	0.0010	0.0010	92	0.0050	0.0050	1.5	1.3
May (n=6)	160	83	27	7.7	79	132	48	0.0064	2.5	0.10	0.053	0.0050	0.0015	32	0.0050	0.018	27	26
June (n=3)	236	127	108	8.0	6.3	150	77	0.0050	0.50	0.076	0.089	0.0010	0.0010	51	0.0050	0.0051	-	4.1
July (n=4)	316	162	127	8.0	4.5	190	97	0.0050	0.50	0.101	0.057	0.0010	0.0011	71	0.0050	0.0050	2.8	2.6
August (n=6)	284	156	108	9.5	13	188	89	0.020	0.50	0.092	0.053	0.0010	0.0010	61	0.0050	0.0055	7.1	6.3
September (n=5)	288	159	131	8.0	3.0	193	90	0.0050	0.50	0.097	0.078	0.0010	0.0010	61	0.0050	0.0052	2.2	3.7
October (n=5)	296	163	141	8.1	3.4	197	91	0.0050	3.35	0.15	0.20	0.017	0.0010	69	0.0050	0.0050	2.55	2.4
November (n=3)	358	179	166	8.3	3.4	205	105	0.0050	0.50	0.11	0.15	0.0010	0.0010	74	0.0050	0.0050	3.010	1.4
December (n=2)	356	195	173	8.1	3.2	232	122	0.0050	0.50	0.11	0.16	0.0010	0.0010	84	0.0050	0.0050	1.20	1.5

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.1161	0.00029	0.0015	0.000023	50	0.00049	0.00035	0.00066	0.294	0.000168	21	0.071	0.000010	0.00013	0.00177	2.0	0.00024	0.000010	2.4	0.000010	0.0015	0.0010	0.0052
February (n=3)	0.031	0.00029	0.0017	0.000027	51	0.00046	0.00034	0.0046	0.19	0.000081	22	0.081	0.000010	0.00013	0.0019	1.9	0.00023	0.000010	3.9	0.000010	0.0015	0.0010	0.0054
March (n=5)	0.024	0.00028	0.0015	0.000017	55	0.00050	0.00019	0.00050	0.12	0.000054	23	0.055	0.000010	0.00012	0.0013	2.0	0.00021	0.000012	4.8	0.000010	0.0016	0.0010	0.0036
April (n=3)	0.061	0.00032	0.0029	0.000019	52	0.00050	0.00021	0.00053	0.18	0.00018	22	0.063	0.000010	0.00014	0.0014	2.0	0.00021	0.000010	2.4	0.000010	0.0015	0.0010	0.0041
May (n=6)	1.4	0.00063	0.019	0.00011	21	0.0022	0.0022	0.0048	3.3	0.0025	8	0.27	0.000015	0.00057	0.0062	2.0	0.00021	0.000027	2.0	0.000012	0.00052	0.0025	0.015
June (n=3)	0.061	0.00046	0.0039	0.000017	33	0.00095	0.00017	0.00097	0.14	0.00014	11	0.025	0.000010	0.00094	0.00100	2.0	0.00021	0.000010	2.0	0.000010	0.00069	0.0010	0.0030
July (n=4)	0.058	0.00041	0.0058	0.000017	40	0.00050	0.00012	0.00071	0.12	0.000059	15	0.034	0.000010	0.00033	0.00112	2.0	0.00021	0.000010	2.0	0.000010	0.00095	0.0010	0.0030
August (n=6)	0.23	0.00046	0.0059	0.000043	39	0.00070	0.00029	0.0014	0.46	0.00024	13	0.036	0.000010	0.00033	0.0015	2.0	0.00021	0.000010	2.0	0.000010	0.00085	0.0010	0.0030
September (n=5)	0.025	0.00046	0.0053	0.000043	40	0.00090	0.00016	0.00077	0.10	0.000050	14	0.035	0.000010	0.00086	0.0010	2.0	0.00021	0.000010	2.0	0.000010	0.00088	0.0010	0.0030
October (n=5)	0.038	0.00045	0.0061	0.000016	42	0.00085	0.00016	0.00133	0.11	0.000075	15	0.031	0.000010	0.00087	0.00097	1.8	0.00020	0.000010	1.9	0.000010	0.00108	0.0010	0.0032
November (n=3)	0.010	0.00046	0.0044	0.000017	46	0.00095	0.00017	0.0012	0.072	0.000064	18	0.042	0.000010	0.00093	0.0011	2.0	0.00021	0.000010	2.0	0.000010	0.0012	0.0010	0.0037
December (n=2)	0.023	0.00030	0.0025	0.000016	47	0.00032	0.00017	0.00050	0.099	0.00012	19	0.046	0.000010	0.00017	0.0011	1.16	0.00020	0.000010	2.1	0.000010	0.0013	0.0010	0.0039

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0030	0.00026	0.0015	0.000017	51	0.00048	0.00026	0.00049	0.029	0.000050	20	0.064	0.000010	0.00010	0.00144	2.0	0.00020	0.000010	2.3	0.000010	0.0014	0.0010	0.0036
February (n=3)	0.0030	0.00029	0.0016	0.000026	53	0.00046	0.00030	0.00050	0.030	0.000050	22	0.079	0.000010	0.00013	0.0019	1.9	0.00022	0.000010	4.5	0.000010	0.0015	0.0010	0.0045
March (n=5)	0.0030	0.00027	0.0014	0.000017	54	0.00050	0.00017	0.00050	0.034	0.000050	22	0.052	0.000010	0.00012	0.0013	2.0	0.00020	0.000010	4.6	0.000010	0.0015	0.0010	0.0030
April (n=3)	0.0085	0.00031	0.0020	0.000019	51	0.00050	0.00020	0.00050	0.030	0.000050	22	0.059	0.000010	0.00013	0.0012	2.0	0.00020	0.000010	2.3	0.000010	0.0015	0.0010	0.0044
May (n=6)	0.23	0.00054	0.014	0.000057	20	0.00050	0.00049	0.0026	0.29	0.000105	8	0.070	0.000010	0.00053	0.0028	2.0	0.00020	0.000010	2.0	0.000010	0.00045	0.0010	0.0080
June (n=3)	0.024	0.00039	0.0040	0.000017	34	0.00095	0.00024	0.00071	0.084	0.000050	11	0.024	0.000010	0.00093	0.00090	2.0	0.00020	0.000010	2.0	0.000010	0.00068	0.0010	0.0030
July (n=4)	0.015	0.00039	0.0054	0.000017	40	0.00050	0.00010	0.00059	0.042	0.000050	15	0.032	0.000010	0.00030	0.00104	2.0	0.00020	0.000010	2.0	0.000010	0.00088	0.0010	0.0026
August (n=6)	0.032	0.00040	0.0060	0.000042	41	0.00050	0.00013	0.0061	0.088	0.00027	13	0.029	0.000010	0.00032	0.0011	2.0	0.00020	0.000010	2.0	0.000010	0.00081	0.0010	0.0057
September (n=5)	0.017	0.00039	0.0053	0.000043	41	0.00090	0.00022	0.00074	0.062	0.000050	14	0.032	0.000010	0.00086	0.00091	2.0	0.00020	0.000010	2.0	0.000010	0.00087	0.0010	0.0027
October (n=5)	0.0077	0.00039	0.0056	0.000016	42	0.00082	0.00022	0.00060	0.030	0.000070	15	0.029	0.000010	0.00087	0.00089	1.8	0.00019	0.000010	1.9	0.000010	0.00102	0.0010	0.0043
November (n=3)	0.0043	0.00039	0.0046	0.000017	44	0.00095	0.00024	0.00060	0.030	0.000050	17	0.041	0.000010	0.00093	0.00098	2.0	0.00020	0.000010	2.0	0.000010	0.0012	0.0010	0.0030
December (n=2)	0.0029	0.00029	0.0024	0.000013	47	0.00010	0.00015	0.00049	0.029	0.000050	19	0.043	0.000010	0.00016	0.0010	1.18	0.00020	0.000010	2.1	0.000010	0.0013	0.0010	0.0030

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

3.3.2.2 Major Ions

The major ion chemistry of Haggart Creek downstream of Dublin Gulch at W4 is similar to that observed at W22 with waters characterized as moderately hard to hard. Monthly mean hardness values range from approximately 56 to 209 mg/L (Table 3.11) with minima coinciding with freshet periods in May and June during snowmelt runoff (Table 3.11).

The pH in Haggart Creek at W4 is well buffered and relatively uniform throughout the year with values ranging between 7.3 and 8.0. Alkalinity values are lowest in the high flow periods (e.g. approximately 35 mg/L) and greatest low flow periods (e.g. approximately 120 mg/L) (Table 3.11).

Sulphate concentrations at W4 in Haggart Creek are slightly lower than observed at W22 as a result of the addition of low sulphate loadings from Dublin Gulch. The lowest sulphate concentrations are observed during May and June (e.g. 20 mg/L to 45 mg/L); higher sulphate concentrations are measured during non-freshet flow conditions (e.g. ~60 mg/L to ~90 mg/L).

TSS concentrations in Haggart Creek at W4 are similar to those observed at W22 with the exception that higher TSS values at W4 occur as a result of suspended solids loadings from Dublin Gulch during peak snowmelt months of May and June (compare TSS values in Table 3.9 and Table 3.11). At most other flow periods of the year, TSS values are generally below the analytical detection limit of 3.0 mg/L, with the exception of episodic summer rainfall events that increase suspended sediments loads in the Eagle Creek drainage and to a lesser extent in the Haggart Creek drainage.

3.3.2.3 Nutrients

Not surprisingly, nutrient parameters in Haggart Creek at W4 are low with ammonia-N, nitrate-N and orthophosphate values being very similar in concentration to those observed at W22.

3.3.2.4 Trace Elements

Trace element concentrations in Haggart Creek at W4 are very similar to those observed at station W22 with the sole exception of As. Specifically, mean monthly concentrations of total and dissolved trace elements are low for all parameters monitored with the exception of Al, Mn and to a lesser extent Cd during the peak freshet month of May (Table 3.11). Arsenic concentrations at W4 are roughly four times that observed at W22. The reason for the increased As concentrations at W4 is due to significant natural As loadings entering from Dublin Gulch. Winter low flow mean monthly As concentrations range from 0.0013 mg/L to 0.0018 mg/L (December to March; Table 3.11) to summer flow concentrations of approximately 0.0042 mg/L. 95th percentile values for total As at W4 for the same winter low flow and summer low flow conditions range from 0.0015 mg/L to 0.0025 mg/L and from 0.0044 mg/L to 0.0061 mg/L, respectively (Table 3.12).

3.3.3 W29 –Haggart Creek below Eagle Creek

3.3.3.1 Summary Statistics

Table 3.13 and Table 3.14 provide mean monthly and 95th percentile monthly values, respectively for station W29 in Haggart Creek. As previously mentioned, station W29 in Haggart Creek is located downstream of all future project activities and includes loading inputs from Dublin Gulch and Eagle Creek that also includes ephemeral loadings from Platinum Gulch (Figure 2.2).

3.3.3.1 Major Ions

Haggart Creek at W29 is characterized as moderately hard to hard water. Monthly mean hardness values range from approximately 67 to 232 mg/L (Table 3.13) with minima coinciding with freshet periods in May and June during snowmel runoff. Hardness values and alkalinity are slightly higher at station W29 relative to W22 and W4 upstream in Haggart Creek; the greater alkalinity and hardness at W29 is a result of Ca, Mg inputs from Eagle Creek (Table 3.13).

The pH in Haggart Creek at W29 is well buffered and relatively uniform throughout the year with values ranging between 7.4 and 8.1. Alkalinity values are lowest in the high flow periods (e.g. approximately 40 mg/L) and greatest during low flow periods (e.g. approximately 130 mg/L) (Table 3.13).

Sulphate concentrations at W29 in Haggart Creek are slightly higher than observed at W4 for the low flow months (e.g. January to April) and reflect higher sulphate loadings from Eagle Creek. During peak flow periods. sulphate concentrations in Haggart Creek from W22 down to W29 are not significantly different and typically range from approximately 20 mg/L to 60 mg/L (see Table 3.9, Table 3.11 and Table 3.13

TSS concentrations in Haggart Creek at W29 are higher than those observed at W22 and W4 during the peak flow periods and likely reflect the higher TSS loadings associated with Eagle Creek, particularly since 2010 (Appendix A2). At most other flow periods of the year, TSS values are generally below the analytical detection limit of 3.0 mg/L with the exception of episodic summer rainfall events that increase suspended sediments loads in the Eagle Creek drainage and to a lesser extent in the Haggart Creek drainage.

3.3.3.2 Nutrients

Nutrient parameters in Haggart Creek at W29 are low with ammonia-N, nitrate-N and orthophosphate values being very similar in concentration to those observed at W22.

Table 3.13: Haggart Creek W29 Mean Values

	Physical Parameters					Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	403	227	8.1	3.0	265	133	0.0050	0.50	0.11	0.14	0.0010	0.0011	94	0.0050	0.0050	-	1.3
February (n=3)	401	219	8.1	3.0	255	129	0.020	0.57	0.12	0.15	0.0010	0.0013	92	0.0050	0.0050	1.1	1.06
March (n=3)	420	232	7.9	3.1	272	133	0.0054	0.62	0.12	0.14	0.0010	0.0010	98	0.0050	0.0050	1.3	1.3
April (n=4)	406	225	8.1	5.2	269	125	0.0050	0.9	0.12	0.13	0.0010	0.0011	94	0.0050	0.0050	1.5	1.2
May (n=6)	128	67	7.4	72	110	41	0.0065	1.5	0.085	0.029	0.0030	0.0014	23	0.0050	0.010	18.8	19
June (n=2)	232	128	8.0	3.0	149	74	0.0073	0.50	0.073	0.072	0.0010	0.0010	48	0.0050	0.0050	-	2.9
July (n=3)	283	153	8.1	3.0	189	93	0.0050	0.50	0.086	0.045	0.0010	0.0010	59	0.0050	0.0050	2.8	2.3
August (n=8)	290	156	8.1	7.1	189	96	0.0076	0.50	0.096	0.044	0.0011	0.0010	59	0.0050	0.0054	4.2	3.8
September (n=4)	306	171	7.7	3.0	200	97	0.0088	0.50	0.099	0.072	0.0010	0.0010	64	0.0050	0.0050	2.3	3.1
October (n=8)	307	172	8.0	3.5	197	99	0.009	0.50	0.096	0.11	0.0010	0.0011	66	0.0050	0.0050	2.1	2.0
November (n=3)	384	195	8.0	3.0	225	115	0.0050	1.2	0.11	0.14	0.0010	0.0011	78	0.0050	0.0050	1.7	2.0
December (n=2)	367	202	8.0	3.0	237	120	0.0050	0.50	0.11	0.15	0.0010	0.0010	83	0.0050	0.0050	1.3	1.6

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0259	0.00058	0.0021	0.000020	55	0.00029	0.00016	0.00061	0.078	0.00013	22	0.051	0.000010	0.00017	0.00122	1.7	0.00023	0.000010	2.6	0.000010	0.0019	0.0010	0.0049
February (n=3)	0.0092	0.00057	0.0022	0.000017	52	0.00016	0.00014	0.00050	0.057	0.000056	22	0.052	0.000010	0.00013	0.00124	1.5	0.00021	0.000010	2.5	0.000010	0.0019	0.0010	0.0038
March (n=3)	0.0112	0.00061	0.0023	0.000015	57	0.00016	0.00011	0.00069	0.050	0.000097	24	0.047	0.000010	0.00014	0.0012	1.6	0.00022	0.000010	2.6	0.000010	0.0019	0.0010	0.0031
April (n=4)	0.17	0.00064	0.0045	0.000019	54	0.00040	0.00019	0.00075	0.28	0.00041	22	0.052	0.000010	0.00018	0.0019	1.7	0.00022	0.000010	2.9	0.000010	0.0019	0.0010	0.0044
May (n=6)	1.4	0.0011	0.016	0.000080	17	0.0022	0.0014	0.0052	2.6	0.0034	6	0.12	0.000011	0.00020	0.0048	1.5	0.00018	0.000036	1.4	0.000015	0.00061	0.0025	0.0116
June (n=2)	0.045	0.00060	0.0045	0.000017	33	0.00027	0.00011	0.00075	0.095	0.00014	11	0.015	0.000010	0.00024	0.00087	2.0	0.00024	0.000010	2.0	0.000010	0.00079	0.0010	0.0020
July (n=3)	0.038	0.00069	0.0055	0.000014	39	0.00022	0.00011	0.00068	0.11	0.00012	13	0.029	0.000010	0.00028	0.00089	1.3	0.00018	0.000010	1.9	0.000010	0.0011	0.0010	0.0024
August (n=8)	0.10	0.00082	0.0061	0.000017	39	0.00036	0.00017	0.00084	0.22	0.00032	14	0.029	0.000010	0.00028	0.0010	1.6	0.00021	0.000010	1.9	0.000010	0.0011	0.0010	0.0025
September (n=4)	0.016	0.00058	0.0053	0.000014	44	0.00024	0.00010	0.00086	0.062	0.00015	14	0.033	0.000010	0.00038	0.00099	1.5	0.00022	0.000010	1.9	0.000010	0.0011	0.0010	0.0026
October (n=8)	0.039	0.00064	0.0047	0.000022	42	0.00021	0.00012	0.00059	0.111	0.00017	15	0.034	0.000010	0.00027	0.00086	1.4	0.00020	0.000010	1.9	0.000010	0.0013	0.0010	0.0027
November (n=3)	0.010	0.00060	0.0033	0.000015	48	0.00016	0.00011	0.00051	0.041	0.000062	19	0.042	0.000010	0.00022	0.00095	1.5	0.00021	0.000010	2.6	0.000010	0.0016	0.0010	0.0030
December (n=2)	0.015	0.00053	0.0025	0.000013	48	0.00018	0.00012	0.00050	0.051	0.000061	19	0.045	0.000010	0.00017	0.0010	1.2	0.00019	0.000010	2.1	0.000010	0.0016	0.0010	0.0040

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0023	0.00055	0.0020	0.000018	55	0.00012	0.00014	0.00038	0.020	0.000050	22	0.046	0.000010	0.00012	0.00108	1.7	0.00023	0.000010	2.4	0.000010	0.0017	0.0010	0.0029
February (n=3)	0.0025	0.00056	0.0020	0.000016	52	0.00011	0.00013	0.00040	0.023	0.000050	22	0.050	0.000010	0.00013	0.00121	1.5	0.00021	0.000010	2.5	0.000010	0.0019	0.0010	0.0033
March (n=3)	0.0025	0.00061	0.0023	0.000015	55	0.00011	0.00010	0.00042	0.023	0.000050	23	0.042	0.000010	0.00013	0.0011	1.5	0.00022	0.000010	2.5	0.000010	0.0018	0.0010	0.0022
April (n=4)	0.0025	0.00059	0.0023	0.000016	54	0.00012	0.00010	0.00043	0.025	0.000050	22	0.045	0.000010	0.00016	0.0011	1.7	0.00024	0.000010	2.8	0.000010	0.0016	0.0010	0.0023
May (n=6)	0.21	0.00050	0.0053	0.000039	17	0.00029	0.00035	0.0025	0.31	0.00036	6	0.051	0.000010	0.00013	0.0024	1.5	0.00019	0.000010	1.4	0.000010	0.00047	0.0010	0.0040
June (n=2)	0.016	0.00059	0.0045	0.000017	33	0.00014	0.00010	0.00063	0.042	0.000053	11	0.013	0.000010	0.00023	0.00072	2.0	0.00026	0.000010	2.0	0.000010	0.00074	0.0010	0.0016
July (n=3)	0.010	0.00067	0.0053	0.000012	39	0.00011	0.00010	0.00051	0.032	0.000050	13	0.025	0.000010	0.00025	0.00083	1.3	0.00019	0.000010	1.8	0.000010	0.00099	0.0010	0.0011
August (n=8)	0.014	0.00074	0.0051	0.000015	39	0.00013	0.00011	0.00062	0.046	0.000074	14	0.025	0.000010	0.00026	0.00085	1.6	0.00022	0.000010	1.9	0.000010	0.0011	0.0010	0.0015
September (n=4)	0.0070	0.00057	0.0050	0.000014	46	0.00012	0.00010	0.00065	0.035	0.00010	14	0.031	0.000010	0.00035	0.00091	1.6	0.00023	0.000010	2.0	0.000010	0.0011	0.0010	0.0020
October (n=8)	0.0048	0.00063	0.0042	0.000021	43	0.00012	0.00010	0.00040	0.024	0.000050	15	0.029	0.000010	0.00024	0.00072	1.4	0.00021	0.000010	1.9	0.000010	0.0013	0.0010	0.0017
November (n=3)	0.0022	0.00060	0.0032	0.000013	48	0.00011	0.00010	0.00030	0.017	0.000050	18	0.040	0.000010	0.00020	0.00091	1.4	0.00022	0.000010	2.5	0.000010	0.0015	0.0010	0.0019
December (n=2)	0.0028	0.00053	0.0023	0.000015	49	0.00010	0.00010	0.00038	0.020	0.000050	19	0.043	0.000010	0.00015	0.00096	1.2	0.00022	0.000010	2.2	0.000010	0.0015	0.0010	0.0025

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.14: Haggart Creek W29 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	409	229	225	8.1	3.0	275	133	0.0050	0.50	0.12	0.14	0.0010	0.0011	94	0.0050	0.0050	-	1.4
February (n=3)	424	238	208	8.2	3.0	271	134	0.046	0.68	0.13	0.16	0.0010	0.0019	96	0.0050	0.0050	1.1	1.27
March (n=3)	439	248	217	8.2	3.3	290	139	0.0062	0.83	0.13	0.15	0.0010	0.0011	103	0.0050	0.0050	1.3	1.3
April (n=4)	428	236	205	8.1	10	283	130	0.0050	1.3	0.12	0.14	0.0010	0.0012	98	0.0050	0.0050	2.0	1.3
May (n=6)	180	95	41	7.8	162	137	57	0.0096	2.5	0.10	0.045	0.0050	0.0027	35	0.0050	0.020	27.3	25
June (n=2)	249	138	117	8.0	3.0	158	82	0.0094	0.50	0.085	0.082	0.0010	0.0010	55	0.0050	0.0050	-	3.5
July (n=3)	330	170	138	8.1	3.0	199	107	0.0050	0.50	0.106	0.056	0.0010	0.0010	72	0.0050	0.0050	2.8	2.6
August (n=8)	351	184	112	8.2	20	223	118	0.016	0.50	0.13	0.058	0.0013	0.0012	74	0.0050	0.0065	7.0	7.2
September (n=4)	320	181	159	8.1	3.0	222	104	0.018	0.50	0.10	0.087	0.0010	0.0010	66	0.0050	0.0050	2.8	3.1
October (n=8)	332	182	155	8.2	4.9	212	104	0.021	0.50	0.12	0.11	0.0010	0.0013	72	0.0050	0.0050	2.5	2.5
November (n=3)	399	201	186	8.3	3.0	239	117	0.0050	1.5	0.12	0.15	0.0010	0.0012	81	0.0050	0.0050	1.7	2.0
December (n=2)	379	210	193	8.1	3.0	249	128	0.0050	0.50	0.11	0.16	0.0010	0.0010	89	0.0050	0.0050	1.3	1.6

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0415	0.00064	0.0024	0.000022	55	0.00030	0.00021	0.00070	0.121	0.00015	23	0.069	0.000010	0.00020	0.00163	2.0	0.00024	0.000010	2.6	0.000010	0.0020	0.0010	0.0065
February (n=3)	0.0145	0.00062	0.0025	0.000022	56	0.00026	0.00021	0.00050	0.084	0.000061	24	0.071	0.000010	0.00016	0.0017	1.9	0.00024	0.000010	2.6	0.000010	0.0020	0.0010	0.0043
March (n=3)	0.0160	0.00068	0.0024	0.000017	61	0.00025	0.00013	0.0010	0.068	0.00014	25	0.062	0.000010	0.00016	0.0013	1.9	0.00024	0.000010	3.0	0.000010	0.0022	0.0010	0.0034
April (n=4)	0.36	0.00074	0.0070	0.000023	57	0.00064	0.00034	0.0013	0.65	0.00092	24	0.068	0.000010	0.00020	0.0028	2.0	0.00024	0.000010	3.4	0.000010	0.0020	0.0010	0.0068
May (n=6)	2.7	0.0016	0.027	0.00013	23	0.0040	0.0028	0.0081	5.0	0.0069	9	0.25	0.000015	0.00030	0.0075	2.0	0.00024	0.000059	2.0	0.000028	0.00073	0.0048	0.019
June (n=2)	0.070	0.00062	0.0052	0.000017	36	0.00027	0.00011	0.00092	0.14	0.00017	12	0.018	0.000010	0.00025	0.00097	2.0	0.00024	0.000010	2.0	0.000010	0.00086	0.0010	0.0029
July (n=3)	0.060	0.00079	0.0070	0.000017	41	0.00027	0.00012	0.00083	0.13	0.00014	16	0.043	0.000010	0.00037	0.00112	1.9	0.00023	0.000010	2.0	0.000010	0.0012	0.0010	0.0030
August (n=8)	0.34	0.0013	0.010	0.000025	46	0.00089	0.00037	0.0018	0.72	0.00096	18	0.036	0.000010	0.00038	0.0017	2.0	0.00024	0.000011	2.2	0.000010	0.0016	0.0010	0.0038
September (n=4)	0.022	0.00071	0.0066	0.000017	49	0.00027	0.00010	0.0011	0.072	0.00032	15	0.037	0.000010	0.00058	0.0011	2.0	0.00024	0.000010	2.0	0.000010	0.0013	0.0010	0.0033
October (n=8)	0.104	0.00071	0.0062	0.000050	43	0.00030	0.00019	0.00077	0.27	0.00037	16	0.040	0.000010	0.00035	0.00103	2.0	0.00024	0.000010	2.0	0.000010	0.0014	0.0010	0.0035
November (n=3)	0.012	0.00065	0.0042	0.000017	50	0.00025	0.00011	0.00052	0.042	0.000083	20	0.051	0.000010	0.00024	0.0010	1.9	0.00024	0.000010	3.0	0.000010	0.0017	0.0010	0.0030
December (n=2)	0.020	0.00056	0.0030	0.000016	51	0.00022	0.00014	0.00050	0.063	0.000068	21	0.054	0.000010	0.00021	0.0011	1.3	0.00019	0.000010	2.2	0.000010	0.0016	0.0010	0.0043

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=2)	0.0029	0.00061	0.0025	0.000018	55	0.00014	0.00017	0.00049	0.029	0.000050	22	0.063	0.000010	0.00013	0.00142	2.0	0.00026	0.000010	2.5	0.000010	0.0018	0.0010	0.0037
February (n=3)	0.0030	0.00062	0.0025	0.000019	57	0.00014	0.00019	0.00050	0.030	0.000050	24	0.071	0.000010	0.00015	0.00162	1.9	0.00025	0.000010	2.5	0.000010	0.0020	0.0010	0.0042
March (n=3)	0.0030	0.00066	0.0027	0.000017	59	0.00014	0.00010	0.00050	0.030	0.000050	24	0.055	0.000010	0.00013	0.0012	1.9	0.00026	0.000010	2.8	0.000010	0.0020	0.0010	0.0025
April (n=4)	0.0030	0.00064	0.0027	0.000017	56	0.00014	0.00011	0.00050	0.030	0.000050	23	0.066	0.000010	0.00019	0.0012	2.0	0.00026	0.000010	3.2	0.000010	0.0018	0.0010	0.0030
May (n=6)	0.58	0.00065	0.010	0.000059	23	0.00081	0.00059	0.0035	0.72	0.0010	9	0.083	0.000010	0.00021	0.0031	2.0	0.00026	0.000011	2.0	0.000010	0.00066	0.0012	0.0064
June (n=2)	0.021	0.00062	0.0048	0.000017	36	0.00014	0.00010	0.00074	0.053	0.000056	12	0.015	0.000010	0.00023	0.00076	2.0	0.00026	0.000010	2.0	0.000010	0.00083	0.0010	0.0020
July (n=3)	0.014	0.00077	0.0070	0.000016	42	0.00014	0.00010	0.00060	0.035	0.000050	16	0.040	0.000010	0.00033	0.00106	1.9	0.00025	0.000010	2.0	0.000010	0.0011	0.0010	0.0011
August (n=8)	0.036	0.00091	0.0072	0.000018	45	0.00014	0.00013	0.0012	0.095	0.00012	18	0.028	0.000010	0.00034	0.0012	2.0	0.00026	0.000010	2.1	0.000010	0.0013	0.0010	0.0021
September (n=4)	0.0090	0.00069	0.0059	0.000017	52	0.00014	0.00010	0.00089	0.040	0.00021	15	0.036	0.000010	0.00055	0.00092	2.0	0.00026	0.000010	2.0	0.000010	0.0012	0.0010	0.0037
October (n=8)	0.0075	0.00068	0.0058	0.000050	46	0.00014	0.00010	0.00049	0.030	0.000050	16	0.039	0.000010	0.00031	0.00087	2.0	0.00026	0.000010	2.0	0.000010	0.0014	0.0010	0.0031
November (n=3)	0.0029	0.00069	0.0042	0.000017	49	0.00014	0.00010	0.00047	0.028	0.000050	19	0.047	0.000010	0.00024	0.00093	1.9	0.00025	0.000010	2.8	0.000010	0.0015	0.0010	0.0020
December (n=2)	0.0030	0.00057	0.0029	0.000019	50	0.00010	0.00010	0.00049	0.029	0.000050	20	0.052	0.000010	0.00018	0.0010	1.3	0.00024	0.000010	2.2	0.000010	0.0016	0.0010	0.0030

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

3.3.3.3 Trace Elements

Water quality in Eagle Creek has a notable influence on water quality conditions in Haggart Creek at W29. The high TSS loadings occurring in Eagle Creek, particularly during freshet conditions, result in elevated concentrations of total trace elements, in particular Al, As, Cd, Cu, Pb, and Mn (Table 3.13 and Appendix A2). The most significant trace metal increases are associated with total arsenic. As illustrated in Figure 3.7, total As concentrations are typically greater at W29 as compared to W4 during most flow periods of the year and can be particularly elevated during peak flow events. As with the other trace metal parameters, the elevated total As concentrations can be associated with the increased TSS loadings derived from Eagle Creek.

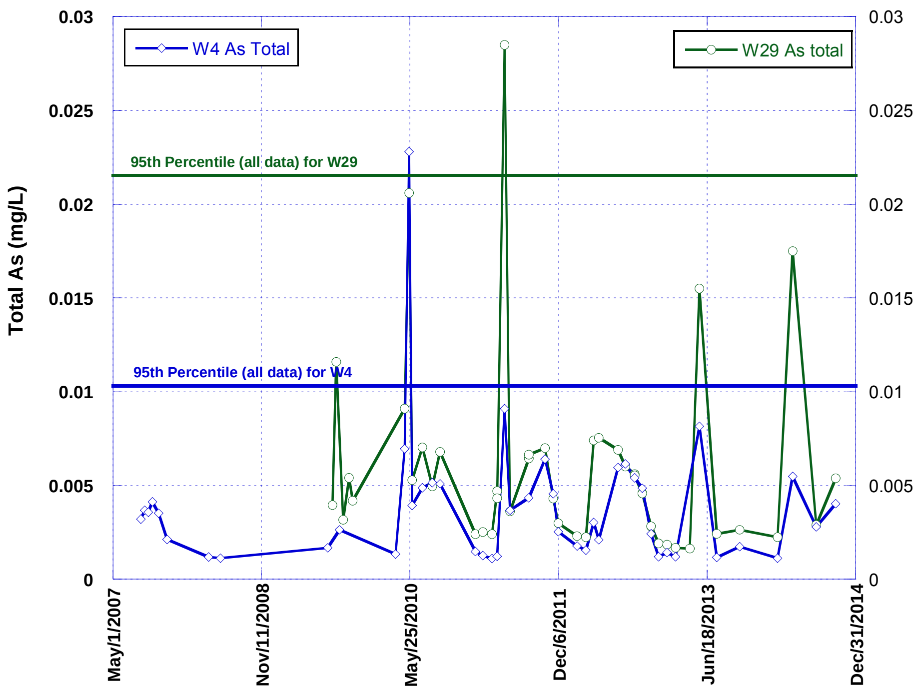

Figure 3.7: Comparison of Total As Concentrations at W4 and W29 (2007 – 2014)

The arsenic profile of Haggart Creek from station W22 downstream to station W23, immediately below the confluence of Lynx Creek is illustrated in Figure 3.8. Mean As concentrations were calculated using all monitoring results for each station. As shown, mean arsenic concentrations in Haggart Creek at station W22 (0.0009 mg/L) increase to values of approximately 0.0038 mg/L at W4 following inputs from Dublin Gulch. At station W29, mean arsenic concentrations in Haggart Creek increase following inputs from Eagle Creek to values of approximately 0.006 mg/L. Farther downstream at station W5, mean arsenic concentrations decrease to values of roughly 0.0045 mg/L. Although Lynx Creek is an undisturbed catchment, arsenic is also naturally elevated in drainage waters with a mean arsenic concentration of 0.0064 mg/L and as a result, arsenic concentrations at W23, below the confluence with Lynx Creek, are observed to increase to 0.0056 mg/L when compared to station W5.

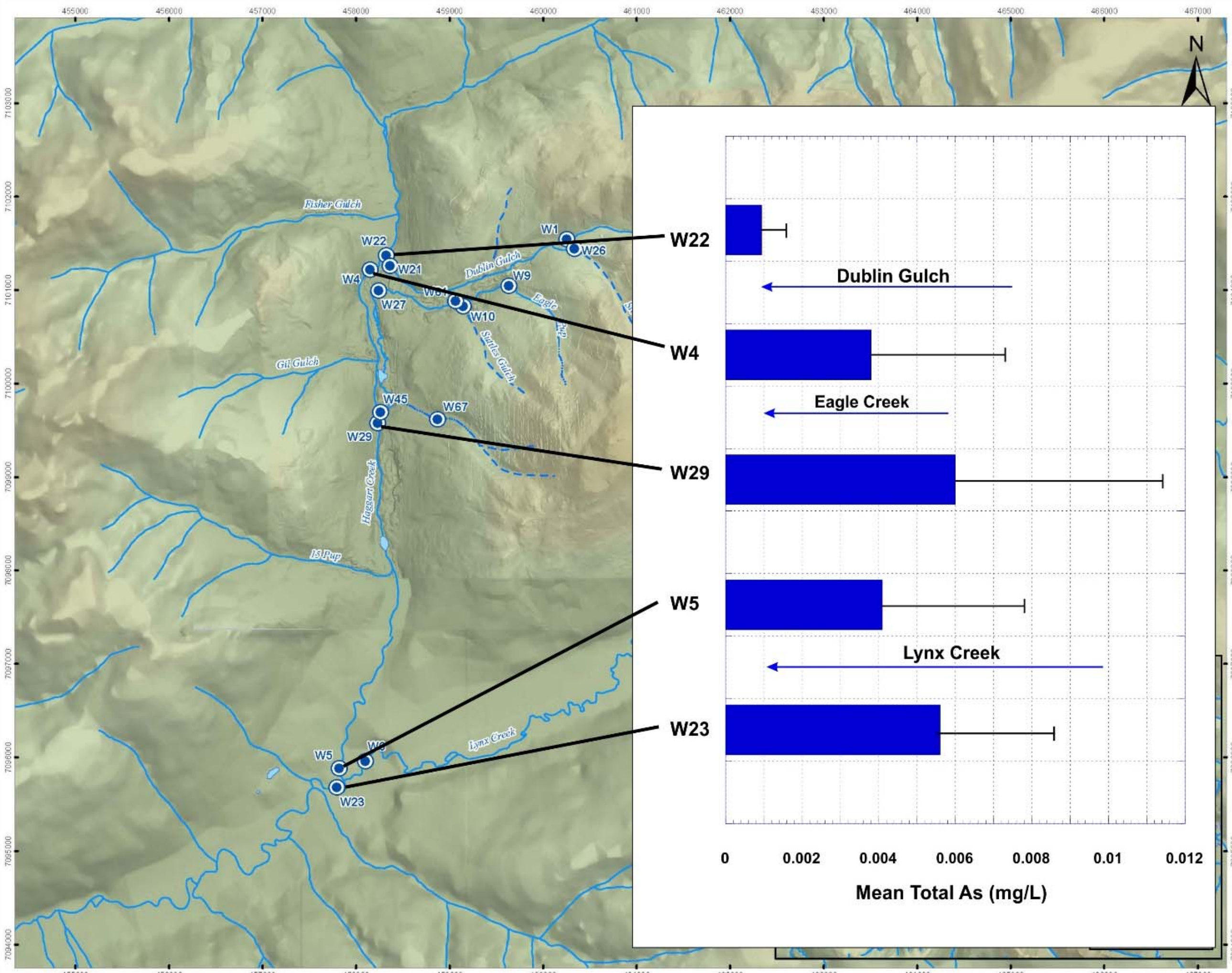

Figure 3.8: Downstream Profile of Mean Total As (all data) for Stations W22, W4, W29, W5 and W23

3.4 LYNX CREEK DRAINAGE

Lynx Creek is an undisturbed catchment that drains into Haggart Creek downstream of the project area. Monitoring in Lynx Creek has occurred primarily at station W6, at the mouth of Lynx Creek and immediately prior to entering Haggart Creek (Figure 2.2). Results from a one-time sampling event in August 2012 at several locations in upper Lynx basin are also presented.

3.4.1 Summary Statistics

Table 3.15 and Table 3.16 provide mean monthly and 95th percentile monthly values, respectively for station W6 in lower Lynx Creek. Station W6 has been monitored since August 2007 but has been sampled less frequently than the other stations described. Limited winter sampling has occurred in the months of January to March at W6 and therefore winter low flow water quality is less well characterized than the other project area receiving streams.

Table 3.15: Lynx Creek W6 Mean Values

	Physical Parameters					Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	361	194	8.1	3.0	242	121	0.0050	0.50	0.09	0.26	0.0010	0.0033	83	0.0050	0.0050	-	1.670
February (n=1)	367	201	8.0	3.0	238	124	0.005	0.50	0.09	0.27	0.0010	0.0031	83	0.0050	0.0050	-	1.89
March (n=1)	395	215	7.5	3.0	272	118	0.0050	0.50	0.10	0.30	0.0010	0.0030	87	-	-	2.0	2.03
April (n=1)	384	202	7.4	3.0	243	-	0.0050	-	-	0.24	0.0010	0.0041	-	0.0050	0.0050	-	-
May (n=4)	105	56	7.4	32.1	95	35	0.0077	1.00	0.066	0.029	0.0020	0.0010	17	0.0050	0.0050	26	18
June (n=2)	258	137	8.1	3.0	165	82	0.0057	0.50	0.084	0.048	0.0010	0.0013	46	0.0050	0.0059	-	6.7
July (n=4)	285	154	8.0	4.1	189	98	0.0050	0.50	0.080	0.062	0.0015	0.0013	55	0.0050	0.0050	5.8	3.3
August (n=5)	1092	160	6.7	3.1	197	101	0.0082	0.9	0.11	0.071	0.0018	0.0013	55	0.0050	0.0050	3.9	4.0
September (n=5)	275	151	8.0	3.3	182	93	0.0050	0.50	0.088	0.11	0.0010	0.0011	51	0.0053	0.0056	3.4	6.4
October (n=5)	277	169	8.0	3.0	195	102	0.0054	0.50	0.10	0.17	0.0010	0.0016	61	0.0050	0.0050	2.9	4.4
November (n=2)	358	191	7.8	3.0	226	109	0.0056	0.50	0.087	0.21	0.0010	0.0031	72	0.0050	0.0050	2.8	-
December (n=1)	368	195	7.9	3.0	242	124	0.0069	0.50	0.10	0.25	0.0010	0.0049	83	0.0050	0.0050	2.2	-

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Ag	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0127	0.00034	0.00642	0.000017	66	0.00023	0.00010	0.00078	0.047	0.000125	10	0.015	0.000010	0.000931	0.00050	1.4	0.00051	0.000010	2.6	0.000010	0.0011	0.0010	0.0030
February (n=1)	0.0093	0.00030	0.00628	0.000013	61	0.00010	0.00010	0.0006	0.023	0.00005	10	0.013	0.000010	0.000881	0.0005	1.3	0.00052	0.000010	2.5	0.000010	0.0011	0.0010	0.0030
March (n=1)	0.009	0.00039	0.00553	0.000015	69	0.00010	0.00010	0.00051	0.02	0.000050	11	0.011	0.000010	0.000878	0.0005	1.4	0.00055	0.000010	2.5	0.000010	0.0012	0.0010	0.0030
April (n=1)	0.0032	0.00025	0.0058	0.000017	64	0.00050	0.00010	0.00035	0.030	0.000050	11	0.014	-	0.00070	0.00050	2.0	0.00046	0.000010	2.3	0.000010	0.00097	0.0010	0.0010
May (n=4)	0.61	0.00043	0.0086	0.000068	17	0.00115	0.00059	0.0032	0.98	0.00084	3	0.068	0.000010	0.00035	0.0025	1.5	0.00035	0.000016	1.3	0.000011	0.00028	0.0015	0.0071
June (n=2)	0.036	0.00044	0.0055	0.000017	44	0.00075	0.00015	0.00096	0.073	0.00020	6	0.0057	0.000010	0.00090	0.00083	2.0	0.00046	0.000010	1.9	0.000010	0.00056	0.0010	0.0024
July (n=4)	0.067	0.00043	0.0059	0.000018	48	0.00040	0.00012	0.0012	0.15	0.00011	7	0.011	0.000010	0.00090	0.00077	1.5	0.00041	0.000010	1.9	0.000010	0.00066	0.0010	0.0027
August (n=5)	0.037	0.00044	0.0067	0.000020	51	0.0013	0.00014	0.0011	0.071	0.00012	8	0.010	0.000010	0.00086	0.00072	1.7	0.00042	0.000010	1.9	0.000010	0.00069	0.0010	0.0031
September (n=5)	0.046	0.00046	0.0065	0.000019	47	0.00053	0.00012	0.0013	0.10	0.00014	7	0.013	0.000010	0.00089	0.00089	1.8	0.00043	0.000011	2.0	0.000010	0.00062	0.0010	0.0023
October (n=5)	0.018	0.00042	0.0063	0.000016	54	0.00050	0.00014	0.00082	0.048	0.00017	8	0.010	0.000010	0.00090	0.00081	1.5	0.00042	0.000010	2.0	0.000010	0.00080	0.0010	0.0033
November (n=2)	0.015	0.00042	0.0060	0.000015	62	0.00055	0.00015	0.00074	0.035	0.00019	9	0.011	0.000010	0.00094	0.00073	1.6	0.00046	0.000010	2.2	0.000010	0.00093	0.0010	0.012
December (n=1)	0.019	0.00045	0.0065	0.000026	63	0.00093	0.00010	0.0012	0.043	0.00034	10	0.015	0.000010	0.00087	0.00050	1.4	0.00045	0.000010	2.5	0.000010	0.00100	0.0010	0.0050

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Ag	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0025	0.00029	0.00645	0.000013	62	0.00010	0.00010	0.00042	0.010	0.000050	10	0.013	0.000010	0.000849	0.00050	1.3	0.00054	0.000010	2.3	0.000010	0.0010	0.0010	0.0010
February (n=1)	0.0024	0.00029	0.00624	0.000012	64	0.00010	0.00010	0.00044	0.010	0.000050	10	0.013	0.000010	0.000879	0.0005	1.3	0.00052	0.000010	2.5	0.000010	0.0011	0.0010	0.0011
March (n=1)	0.0030	0.00034	0.00543	0.000014	69	0.00020	0.00010	0.00048	0.010	0.000054	11	0.011	0.000010	0.000816	0.0005	1.3	0.00057	0.000010	2.5	0.000010	0.0011	0.0010	0.0016
April (n=1)	0.0019	0.00028	0.0058	0.000016	64	0.00050	0.00010	0.00037	0.019	0.000050	10	0.014	-	0.00074	0.00050	2.0	0.00049	0.000010	2.3	0.000010	0.00097	0.0010	0.0012
May (n=4)	0.119	0.00030	0.0041	0.000038	17	0.00034	0.00017	0.0021	0.18	0.00008	3	0.030	0.000010	0.00030	0.0015	1.5	0.00034	0.000010	1.3	0.000010	0.00022	0.0010	0.0028
June (n=2)	0.012	0.00042	0.0054	0.000016	44	0.00075	0.00010	0.00088	0.028	0.000050	7	0.0039	0.000010	0.00088	0.00071	2.0	0.00049	0.000010	2.0	0.000010	0.00053	0.0010	0.0032
July (n=4)	0.013	0.00041	0.0058	0.000017	50	0.00030	0.00010	0.00086	0.042	0.000050	7	0.0083	0.000010	0.00078	0.00066	1.5	0.00042	0.000010	1.9	0.000010	0.00060	0.0010	0.0010
August (n=5)	0.015	0.00042	0.0065	0.000014	51	0.0013	0.00010	0.00089	0.032	0.000050	8	0.0090	0.000010	0.00080	0.00063	1.7	0.00045	0.000010	2.0	0.000010	0.00067	0.0010	0.0014
September (n=5)	0.017	0.00042	0.0063	0.000017	49	0.00052	0.00010	0.0010	0.047	0.000050	7	0.011	0.000010	0.00083	0.00074	1.8	0.00046	0.000010	2.0	0.000010	0.00060	0.0010	0.0021
October (n=5)	0.0074	0.00039	0.0062	0.000014	55	0.00034	0.00010	0.00073	0.024	0.000050	8	0.010	0.000010	0.00085	0.00069	1.3	0.00044	0.000010	2.0	0.000010	0.00078	0.0010	0.0017
November (n=2)	0.0033	0.00039	0.0057	0.000017	61	0.00055	0.00010	0.00059	0.015	0.000050	9	0.010	0.000010	0.00095	0.00068	1.6	0.00047	0.000010	2.2	0.000010	0.00090	0.0010	0.0021
December (n=1)	0.0018	0.00035	0.0063	0.000023	62	0.00026	0.00010	0.00067	0.010	0.000053	10	0.013	0.000010	0.00087	0.00050	1.4	0.00049	0.000010	2.7	0.000010	0.0010	0.0010	0.0032

Notes: - not available; n = number of samples; TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

Table 3.16: Lynx Creek W6 95th Percentile Values

	Physical Parameters						Anions				Nutrients				Cyanide		Organics	
	Cond.	Hardness (as CaCO3)	Hardness (as CaCO3)**	pH	TSS	TDS	Alkalinity, Total (as CaCO3)	Ammonia as N	Chloride	Fluoride	Nitrate (as N)	Nitrite (as N)	Ortho Phosphate as P	Sulfate	Cyanide, Weak Acid Diss	Cyanide, Total	TOC	DOC
	µS/cm	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	361	194	194	8.1	3.0	242	121	0.0050	0.50	0.09	0.26	0.0010	0.0033	83	0.0050	0.0050	-	1.670
February (n=1)	367	201	201	8.0	3.0	238	124	0.005	0.50	0.09	0.27	0.0010	0.0031	83	0.0050	0.0050	-	1.89
March (n=1)	395	215	215	7.5	3.0	272	118	0.0050	0.50	0.10	0.30	0.0010	0.0030	87	-	-	2.0	2.0
April (n=1)	384	202	202	7.4	3.0	243	-	0.0050	-	-	0.24	0.0010	0.0041	-	0.0050	0.0050	-	-
May (n=4)	134	71	38	7.6	71.8	118	44	0.0120	2.20	0.096	0.038	0.0044	0.0010	22	0.0050	0.0050	26	24
June (n=2)	280	144	129	8.1	3.0	171	84	0.0062	0.50	0.093	0.070	0.0010	0.0016	51	0.0050	0.0067	-	7.9
July (n=4)	323	166	134	8.1	6.7	199	110	0.0050	0.50	0.100	0.11	0.0028	0.0018	66	0.0050	0.0050	5.8	3.5
August (n=5)	3469	167	148	8.2	3.2	215	111	0.018	2.1	0.19	0.095	0.0043	0.0015	60	0.0050	0.0050	4.0	4.4
September (n=5)	313	180	132	8.1	3.9	207	104	0.0050	0.50	0.097	0.23	0.0010	0.0015	60	0.0064	0.0073	3.6	6.4
October (n=5)	329	180	161	8.1	3.0	208	106	0.0064	0.50	0.11	0.19	0.0010	0.0020	67	0.0050	0.0050	4.6	4.5
November (n=2)	372	194	187	7.8	3.0	233	113	0.0060	0.50	0.096	0.22	0.0010	0.0035	75	0.0050	0.0050	2.8	-
December (n=1)	368	195	195	7.9	3.0	242	124	0.0069	0.50	0.10	0.25	0.0010	0.0049	83	0.0050	0.0050	2.2	-

	Total Metals																						
	T-Al	T-Sb	T-As	T-Cd	T-Ca	T-Cr	T-Co	T-Cu	T-Fe	T-Pb	T-Mg	T-Mn	T-Hg	T-Mo	T-Ni	T-K	T-Se	T-Au	T-Na	T-Tl	T-U	T-V	T-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0127	0.00034	0.00642	0.000017	66	0.00023	0.00010	0.00078	0.047	0.000125	10	0.015	0.000010	0.000931	0.00050	1.4	0.00051	0.000010	2.6	0.000010	0.0011	0.0010	0.0030
February (n=1)	0.009	0.00030	0.00628	0.000013	61	0.00010	0.00010	0.0006	0.02	0.00005	10	0.013	0.000010	0.000881	0.0005	1.3	0.00052	0.000010	2.5	0.000010	0.0011	0.0010	0.0030
March (n=1)	0.009	0.00039	0.0055	0.000015	69	0.00010	0.00010	0.00051	0.02	0.00005	11	0.01	0.000010	0.000878	0.0005	1.4	0.00055	0.000010	2.5	0.000010	0.0012	0.0010	0.0030
April (n=1)	0.0032	0.00025	0.0058	0.000017	64	0.00050	0.00010	0.00035	0.030	0.000050	11	0.014	-	0.00070	0.00050	2.0	0.00046	0.000010	2.3	0.000010	0.00097	0.0010	0.0010
May (n=4)	1.13	0.00062	0.0124	0.000115	21	0.00183	0.00104	0.0043	1.80	0.0014	5	0.120	0.000010	0.00053	0.0033	2.0	0.00046	0.000026	1.9	0.000014	0.00038	0.0025	0.0125
June (n=2)	0.050	0.00047	0.0056	0.000017	48	0.00098	0.00019	0.0012	0.089	0.00032	7	0.0063	0.000010	0.00099	0.00095	2.0	0.00046	0.000010	1.9	0.000010	0.00063	0.0010	0.0036
July (n=4)	0.15	0.00047	0.0059	0.000023	54	0.00050	0.00018	0.0017	0.33	0.00019	8	0.017	0.000010	0.0011	0.0013	2.0	0.00046	0.000010	2.1	0.000010	0.00080	0.0010	0.0036
August (n=5)	0.073	0.00046	0.0069	0.000026	54	0.0041	0.00019	0.0014	0.14	0.00029	8	0.015	0.000010	0.00093	0.00096	2.0	0.00046	0.000010	2.0	0.000010	0.00074	0.0010	0.0047
September (n=5)	0.090	0.00049	0.0068	0.000025	57	0.00090	0.00018	0.0017	0.17	0.00031	8	0.018	0.000010	0.00099	0.0011	2.0	0.00046	0.000014	2.1	0.000010	0.00076	0.0010	0.0037
October (n=5)	0.027	0.00047	0.0067	0.000019	56	0.0010	0.00019	0.00098	0.063	0.00034	8	0.013	0.000010	0.0010	0.00096	2.0	0.00046	0.000010	2.1	0.000010	0.00084	0.0010	0.0037
November (n=2)	0.015	0.00046	0.0063	0.000017	63	0.00096	0.00019	0.00074	0.038	0.00032	10	0.014	0.000010	0.00099	0.00094	2.0	0.00046	0.000010	2.2	0.000010	0.0010	0.0010	0.021
December (n=1)	0.019	0.00045	0.0065	0.000026	63	0.00093	0.00010	0.0012	0.043	0.00034	10	0.015	0.000010	0.00087	0.00050	1.4	0.00045	0.000010	2.5	0.000010	0.00100	0.0010	0.0050

	Dissolved Metals																						
	D-Al	D-Sb	D-As	D-Cd	D-Ca	D-Cr	D-Co	D-Cu	D-Fe	D-Pb	D-Mg	D-Mn	D-Hg	D-Mo	D-Ni	D-K	D-Se	D-Au	D-Na	D-Tl	D-U	D-V	D-Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
January (n=1)	0.0025	0.00029	0.00645	0.000013	62	0.00010	0.00010	0.00042	0.010	0.000050	10	0.013	0.000010	0.000849	0.00050	1.3	0.00054	0.000010	2.3	0.000010	0.0010	0.0010	0.0010
February (n=1)	0.0024	0.00029	0.00624	0.000012	64	0.00010	0.00010	0.00044	0.010	0.000050	10	0.013	0.000010	0.000879	0.0005	1.3	0.00052	0.000010	2.5	0.000010	0.0011	0.0010	0.0011
March (n=1)	0.0030	0.00034	0.00543	0.000014	69	0.00020	0.00010	0.00048	0.010	0.000054	11	0.01	0.000010	0.000816	0.0005	1.3	0.00057	0.000010	2.5	0.000010	0.0011	0.0010	0.0016
April (n=1)	0.0019	0.00028	0.0058	0.000016	64	0.00050	0.00010	0.00037	0.019	0.000050	10	0.014	-	0.00074	0.00050	2.0	0.00049	0.000010	2.3	0.000010	0.00097	0.0010	0.0012
May (n=4)	0.170	0.00041	0.0048	0.000055	22	0.00050	0.00024	0.0026	0.22	0.00015	5	0.049	0.000010	0.00047	0.0016	2.0	0.00049	0.000010	2.0	0.000010	0.00032	0.0010	0.0042
June (n=2)	0.014	0.00043	0.0058	0.000016	46	0.00098	0.00010	0.00099	0.036	0.000050	7	0.0040	0.000010	0.00099	0.00085	2.0	0.00049	0.000010	2.0	0.000010	0.00061	0.0010	0.0032
July (n=4)	0.026	0.00045	0.0064	0.000020	53	0.00050	0.00010	0.0012	0.078	0.000050	8	0.011	0.000010	0.00092	0.0010	2.0	0.00049	0.000010	2.1	0.000010	0.00072	0.0010	0.0010
August (n=5)	0.033	0.00043	0.0067	0.000016	54	0.0041	0.00010	0.0013	0.043	0.000050	8	0.013	0.000010	0.00084	0.00085	2.0	0.00049	0.000010	2.0	0.000010	0.00074	0.0010	0.0028
September (n=5)	0.026	0.00047	0.0067	0.000019	58	0.00090	0.00010	0.0012	0.068	0.000050	8	0.015	0.000010	0.00098	0.00086	2.0	0.00049	0.000010	2.1	0.000010	0.00074	0.0010	0.0033
October (n=5)	0.0110	0.00042	0.0069	0.000018	58	0.00087	0.00010	0.00078	0.033	0.000050	9	0.013	0.000010	0.00098	0.00084	1.9	0.00049	0.000010	2.2	0.000010	0.00084	0.0010	0.0029
November (n=2)	0.0033	0.00043	0.0059	0.000018	62	0.00096	0.00010	0.00074	0.019	0.000050	10	0.013	0.000010	0.00099	0.00084	2.0	0.00049	0.000010	2.2	0.000010	0.00094	0.0010	0.0031
December (n=1)	0.0018	0.00035	0.0063	0.000023	62	0.00026	0.00010	0.00067	0.010	0.000053	10	0.013	0.000010	0.00087	0.00050	1.4	0.00049	0.000010	2.7	0.000010	0.0010	0.0010	0.0032

Notes: - not available; n = number of samples; * 25th Percentile Hardness Presented TSS = Total suspended Solids; TDS = Total Dissolved Solids; P = Phosphate; N = Nitrogen; DOC = Dissolved Organic Carbon; TOC = Total Organic Carbon

3.4.2 Major Ions

The major ion chemistry of Lynx Creek is described with respect to conductivity, hardness, alkalinity, sulphate and pH. Lower Lynx Creek at station W6 is characterized by moderately hard to hard waters, with monthly mean hardness values ranging from approximately 56 to 215 mg/L (Table 3.15). Like the other streams described, values for conductivity, hardness, and alkalinity demonstrate pronounced seasonal fluctuations, with minima coinciding with freshet periods in May during peak periods of snowmelt-driven runoff (Table 3.15).

Baseline concentrations for sulphate in lower Lynx Creek are approximately ~55 to 85 mg/L) during non-freshet flow conditions as compared to peak snowmelt periods where values of between 17 and 46 mg/L sulphate are observed.

TSS concentrations in Lynx Creek are generally lower than observed in the Haggart Creek and Dublin Gulch catchments, even during peak flow conditions. During most flow periods of the year TSS values in Lynx Creek were generally below the analytical detection limit of 3.0 mg/L.

3.4.3 Nutrients

Nutrient parameters show low values in Lynx Creek. Ammonia-N concentrations are low with mean monthly values ranging from <0.005 mg/L to 0.009 mg/L at W6 (Table 3.15). Similar to ammonia, the majority of nitrite-N values have occurred near or below the detection limit value. Baseline nitrate-N concentrations in Lynx Creek are also low, with mean monthly values ranging from approximately 0.03 to 0.30 mg/L.

Baseline concentrations for dissolved orthophosphate in Lynx Creek are low, ranging from approximately <0.0010 to 0.005 mg/L (Table 3.15).

3.4.4 Trace Elements

In general, mean monthly concentrations of total and dissolved trace elements are low for all parameters monitored with most parameters present at concentrations at or below their respect analytical detection limit (Table 3.15); arsenic is however an exception. Detectible arsenic concentrations at W6 in lower Lynx Creek range from values of 0.0055 mg/L to 0.012 mg/L; these values are consistent with concentrations observed at station W29 in Haggart Creek. Although no anthropogenic disturbances occur in the Lynx watershed, the presence of arsenic in drainage waters indicates that arsenic mineralization in the broader project area is prevalent and not just limited to the Dublin Gulch catchment. This posit is supported by extensive sampling of individual drainages in the upper Lynx watershed that occurred in August 2012. Some tributaries in upper Lynx Creek showed elevated dissolved As concentrations (values ranging from 0.0012 to 0.0086 mg/L) indicating that As mobility is not limited to the immediate project area or Dublin Gulch and tributaries in particular. Table 3.17 provides a summary of the As concentrations measured at each station. Sampling locations are indicated on Figure 2.2 and include stations LC1 to LC7

Table 3.17: Summary of Upper Lynx Creek As Concentrations (mg/L)

Parameter	LC1	LC2	LC3	LC4	LC5	LC6	LC7
As(total)	0.0027	0.0015	0.0058	0.0018	0.0085	0.0014	0.0042
As(dissolved)	0.0016	0.0012	0.0055	0.0017	0.0086	0.0014	0.0012

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APPENDIX A1

Raw Water Quality Data (provided electronically)

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APPENDIX A2

Detection Limit Corrected Data (provided electronically)

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APPENDIX A3

Summary Statistic Tables for Select Stations (provided electronically)

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APPENDIX G

Eagle Gold Project 2017 Water Quality Model Update Report

Eagle Gold Project

2017 Water Quality Model Update Report

Project No. A413-4
29 March 2017

Prepared by:
Lorax Environmental Services Ltd.
Vancouver, BC

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1. Introduction

1.1 Project Description

The Eagle Gold Project (the Project) is owned by StrataGold Corporation, a wholly owned subsidiary of the Victoria Gold Corp. (the "Company"). A Type A Water Use License (QZ14-041) was issued on December 3rd, 2015 to allow the construction, operation and closure of the Project, an open pit heap leach gold mine in central Yukon.

The Project is located in the Central Yukon Territory, approximately 350 km north of Whitehorse and approximately 45 km north of Mayo. Much of the mine site lies within the Dublin Gulch watershed, a tributary that reports to Haggart Creek, and which then flows to the South McQuesten River. Ultimately, the South McQuesten River joins the Stewart River, which flows west to its eventual confluence with the Yukon River.

Water Use License QZ14-041 has specific conditions related to water balance and water quality modeling updates for the Eagle Gold Project. Specifically:

> *The Licensee shall submit to the Board updated Surface Water Balance and Water Quality Models as part of each Annual Report. The updated models shall include, but not be limited to, the following:*
>
> *a. Updated site data collected as per the EMSAMP;*
> *b. Updated input from any updates to the HLF Water Balance Model; and*
> *c. Updated predictions for operations and closure including discussion of any variances identified and implications on site water management.*

1.2 Scope of Report

This report presents an update of the site-wide water balance model (WBM) and water quality model (WQM) that was previously presented in the two reports listed below:

- Knight Piésold Ltd. 2014. *Surface Water Balance Model Report*. Report Prepared for Victoria Gold Corporation. (Knight Piésold, 2014)

- Lorax Environmental Service Ltd. 2014. *Eagle Gold Project – Water Quality Model*. Report Prepared for Victoria Gold Corporation. (Lorax 2014a).

Section 2 presents the updated input parameters and assumptions used to update the water balance and water quality models. Section 3 presents the results of the updated models and a brief discussion. Finally, the updates and subsequent results are summarized in Section 4.

2. Model Inputs and Assumptions

2.1 Water Balance Model Inputs and Assumptions

For the purposes of this update, the Goldsim model structure, parameterization and assumptions are largely unchanged from those presented in the previous water balance model report submitted in support of the WUL application (Knight Piésold, 2014), with some exceptions, as described below.

2.1.1 Hydro-meteorological Updates

Following the issuance of WUL QZ14-041, the collection of baseline climate and streamflow data has continued at the Project site. This additional data has been incorporated into the site monitoring records, and the results are presented in the *Climate Baseline Report* (Lorax 2016a) and the *Hydrology Baseline Report* (Lorax 2016b). These data were analyzed in conjunction with regional climate and streamflow records to estimate the necessary input parameters for use in the updated WBM. The results of this effort are presented in the *Hydro-meteorology Report* (Lorax 2017a). A summary of the updated values of interest is presented in Table 2.1-1, along with the previous estimates derived by Knight Piésold (2013). These estimates are considered representative of the reference elevation of 1,125 m asl, which is the mid-point of the Haggart Creek below Dublin Gulch hydrometric station (W4; 76.9 km^2), which contains the proposed Project footprint.

Table 2.1-1:
Comparison of 2014 and updated runoff and precipitation estimates at the Eagle Gold Project site.

Knight Piésold Hydrometeorology Report (2013)									
Parameter	**Camp (782 m)**			**1125 m**			**Potato Hills (1420 m)**		
	Annual	Oct-Apr (SWE)	May-Sept (Rain)	Annual	Oct-Apr (SWE)	May-Sept (Rain)	Annual	Oct-Apr (SWE)	May-Sept (Rain)
Potential Evapotranspiration (mm)	439	--	439	--	--		335	--	335
Mean Precipitation (mm)	357	205	152	500	310	190	652	432	220
Mean Annual Runoff (W4; mm)	--	--	--	230	--	--	--	--	--
Lorax Hydrometeorology Report (2017a)									
Potential Evapotranspiration (mm)	483	--	382	380	--	344	305	--	309
Mean Precipitation (mm)	375	160	214	472	227	245	581	306	275
Mean Annual Runoff (W4; mm)	--	--	--	247	--	--	--	--	--

Overall, the incorporation of additional baseline climate data and updated synthetic precipitation and runoff estimates have resulted in minimal changes to the understanding of the Project site water balance. As in the previous WBM, annual runoff at the W4 hydrometric station is assumed to represent the effective precipitation at the Project site, and forms the primary driver of the WBM. The summary of the changes relevant to the WBM parameterization is as follows:

- Mean annual precipitation (MAP) at the 1,125 m elevation has decreased by 6%, from 500 mm to 472 mm;
- Mean annual runoff (MAR) for the W4 hydrometric station has increased by 7% from 230 mm to 247 mm;
- The annual orographic precipitation gradient has decreased from +10%/100 m for to +7%/100 m, and;
- The monthly distribution of annual runoff used to distribute the MAR value for W4 has changed slightly, as outlined in Table 2.1-2.

Table 2.1-2:
Comparison of 2014 and updated monthly runoff distributions for the Eagle Gold Project site.

Month	2014 values		2017 values	
	Distribution	Precipitation (mm)	Distribution	Precipitation (mm)
JAN	2%	3.6	3%	6.5
FEB	1%	2.8	2%	5.4
MAR	1%	3.0	2%	5.7
APR	2%	4.8	3%	8.4
MAY	30%	69.6	24%	60.5
JUN	21%	48.0	17%	41.1
JUL	12%	27.3	11%	28.4
AUG	10%	23.9	10%	23.9
SEP	10%	23.2	10%	24.2
OCT	6%	13.1	8%	20.7
NOV	3%	6.9	6%	14.0
DEC	2%	4.9	3%	8.2
Total		231		247

Overall, the changes listed above result in minor alterations to the WBM inputs. Winter flows in the larger drainages tend to be higher than previous estimates, and freshet magnitudes are slightly lower.

Table 2.1-3:
Comparison of 2014 and updated monthly runoff distributions

Basin	Elevation (m)	Area (km^2)	2014 Annual Runoff (mm)	2017 Annual Runoff (mm)	% change MAR from 2014 WBM
Upper Dublin Gulch (W1)	1303	6.8	274	279	2%
Stewart Gulch (W26)[1]	1183	1.3	219	212	-4%
Haggart Ck u/s Dublin Gulch (W22)	1113	66.8	228	245	7%
Haggart Ck d/s Dublin Gulch (W4)	1125	76.9	231	247	7%
Ann Gulch	1029	0.89	211	231	10%
Eagle Pup[1]	1116	8.88	206	202	-2%
Suttles Gulch[1]	994	0.22	183	186	2%
Platinum Gulch[1]	1070	0.77	197	196	0%
Haggart Ck (btwn W29 and W5)	1091	0.68	224	241	8%
Lynx Ck u/s Haggart Ck (W6)	1049	100.9	215	235	9%

Note:
[1]The runoff presented for these nodes was modified by the winter low flow factor of 0.1.

Additional site monitoring confirms the reductions in winter flows within the smaller (and higher elevation) drainages at the Project site, and thus the multiplier of 0.1 for these drainages was carried forward in the WBM update.

The updated annual runoff volumes are higher overall in the larger basins, with the increases ranging from 2% to 10% above the values used in the 2014 WBM (Table 2.1-3). However, the increase in winter flow estimates for the smaller basins that are modified by the winter low flow factor, in concert with the slight reductions in freshet volumes, has resulted in small decreases in annual runoff for the Stewart Gulch (W26) and the Eagle Pup drainages, on the order of -4% and -2%, respectively. Annual runoff for Suttles Gulch has increased slightly by 2%, and runoff from Platinum Gulch remains effectively unchanged.

All other climatic and streamflow inputs and assumptions remain unchanged from the previous WBM version.

2.1.2 Heap Leach Facility Water Balance Model Updates

All inputs, assumptions and parameterizations for the HLF WBM were carried forward from the previous iteration, with two exceptions as discussed below. During the WUL hearings, this model was adjusted to better reflect actual water management practices during the draindown phase. No external makeup water will be added as rinse water to the heap leach facility during the draindown phase, while treated draindown water will be recycled back onto the heap. Meteoric water falling on the HLF footprint is still added to the water balance. This adjustment results in less buildup of solution within the in-heap pond, and the updated HLF WBM indicates that the event pond is not utilized as a result of this change.

The previous HLF WBM assumed a constant drain-down pump-to-treatment rate of 10 L/s; this was modified in the 2017 WBM/WQM to a monthly schedule that better matched the receiving environment flows to maximize the effect of natural dilution. The recycling modifications in this iteration of the HLF WBM do not affect the previous pump-to-treatment assumptions, and they are carried forward in the present model.

2.2 Water Quality Model Inputs and Assumptions

The Eagle Gold Project water quality model (WQM) is a mass-conserving mixing model that predicts water quality for 38 parameters at key monitoring and compliance points in the receiving waters affected by mine activity. The model was designed on the GoldSim® platform and utilizes a GoldSim® water balance model (WBM). As described in Section 2.1, the WBM has been updated to reflect additional data collected in 2013 to 2016. Both the WBM and the WQM use a monthly time-step for 50 years, spanning the construction phase, operations, closure and several years into post-closure. Below is a brief description of water quality model inputs including seepage contact water source terms, Mine Water Treatment Plant (MWTP) and Passive Treatment Systems (PTS) effluent discharge requirements and background water quality for non-contact flows.

2.2.1 Seepage Contact Water

Contact water comes from the following sources:

- Waste rock storage facilities in Eagle Pup and Platinum Gulch;
- Pit wall runoff and pit-wall depressurization wells that report to pit;
- Heap leach facility (during post-operations and drain-down only); and
- Runoff-seepage from developed and undeveloped portions of the project footprint.

Input source concentrations for all contact waters are the same as described in *Eagle Gold Geochemical Source Term Predictions – Model Description and Results* (Lorax 2014b) and in *Eagle Gold Project – Water Quality Model* (Lorax 2014a). As part of the WQM update, the geochemical source terms used as inputs in Lorax (2014a) were assessed in light of the updated data collection. The geochemistry of field bin leachates collected throughout 2016 were reviewed, and the potential effect on the additional data on the source term model was assessed. Upon completion of this review it was determined that the source term model results prepared for the Eagle Gold WUL in 2014 (Lorax 2014b) are still valid and do not currently require updating as a result of more recent field bin data collected in 2016. The rationale for this conclusion is due to the following reasons:

- The field bin leachate data were only directly used in the source term model to calculate a "first flush" value representing the effect of the initial flush of easily soluble species. These values were calculated based on the 75th percentile value in the first year of field bin data. Hence, the values used for this approach have not changed since the last model iteration;
- Overall, the trends observed in field bin leachates over time were used qualitatively for model validation purposes. While variable, these trends have not changed sufficiently to warrant a re-run of the source term model.

2.2.2 MWTP and PTS Effluent Quality Standards

Effluent quality standards were developed during the Water Use License application process for the MWTP during operations and PTS for the closure phase. The effluent quality standards for each component are utilized in the model representing treatment flows and chemistry.

Table 2.2-1:
MWTP Water Quality Used in Model

Parameter	*MWTP Effluent Quality Standards (mg/L)*
pH	6.5 to 8
TSS	15
Cl	250
SO_4	1850
Nitrate-N	19.5
Nitrite-N	0.12
NH_3-N	7.5
CN_{WAD}	0.03
Al (diss)	0.4
Sb	0.13
As	0.053
Cd	0.00125
Cu	0.026
Co	0.026
Fe	6.4
Pb	0.05
Hg	0.00008
Mn	7.7
Mo	0.45
Ni	0.5
Se	0.025
Ag	0.01
U	0.09
Zn	0.23

Table 2.2-2:
Eagle Pup (EG) and Platinum Gulch (PG) PTS Water Quality Used in Model

Parameter	*WRSA PTS Effluent Quality Standards (mg/L)*
pH	6.5 to 8
TSS	15
Cl	250
SO_4	2000
Nitrate-N	30
Nitrite-N	0.3
NH_3-N	13
CN_{WAD}	not applicable
Al (diss)	0.5
Sb	0.2
As	0.085
Cd	0.001
Cu	0.02
Co	0.05
Fe	5
Pb	0.03
Hg	0.00015
Mn	5
Mo	0.5
Ni	0.2
Se	0.04
Ag	0.02
U	0.15
Zn	0.05

Table 2.2-3:
Heap Leach Facility (HLF) PTS Water Quality Used in Model

Parameter	*HLF PTS Effluent Quality Standards (mg/L)*
pH	6.5 to 8
TSS	15
Cl	250
SO_4	2000
Nitrate-N	40
Nitrite-N	0.3
NH_3-N	18
CN_{WAD}	0.09
Al (diss)	1
Sb	0.2
As	0.085
Cd	0.003
Cu	0.07
Co	0.08
Fe	15
Pb	0.12
Hg	0.00015
Mn	10
Mo	0.8
Ni	0.5
Se	0.04
Ag	0.02
U	0.2
Zn	0.3

2.2.3 Background Water Quality Inputs

Background flows and water quality from runoff (e.g. non-contact water) and background receiving environment water chemistry are fully characterized and included in the model. Baseline water quality data collected from project area streams from 2013 to 2016 have been incorporated into the water quality baseline dataset. An updated *Baseline Water Quality Report* (Lorax 2017b) has been prepared and the background water quality values employed in the WQM have been updated to reflect the new data.

2.2.4 Modeling Approach

Flows from background sources and mine facilities are taken directly from the WBM, with the exception of the seepage from the waste rock facilities. As with 14WQM, infiltration through the waste rock is provided to the WQM; the model then uses a function that attenuates the flow within the waste rock pile in a manner consistent with observed waste rock seepage hydrographs from other sites.

Water quality parameters tracked by the model are listed in Table 2.2-4. Each parameter is treated as a conservative tracer which is mixed at model nodes (confluences) by the following equation:

$$C_r = \frac{\sum_i Q_i C_i}{\sum_i Q_i}$$

where C_r is the resultant concentration, Q_i are the source flows into the mixing point and C_i are the concentrations associated with the source flows. The only exceptions to this flow-weighted instantaneous mixing scheme are for the Lower Dublin South Pond (LDSP) and for the open pit lake which are represented by constituent transport flow cells in GoldSim. The water quality for each of these two facilities is handled slightly differently during operations and draindown/closure:

1. During operations, the water quality of both the LDSP and the open pit (drained via sump from a small holding pond) are assumed to be the same as those of their respective flow-weighted source flows (this is to ensure there is no load delay to the receiver, which can occur in GoldSim flow cells that quickly fill and drain).
2. During post-operations (draindown, closure) the LDSP and open pit lake accumulate and release contaminant load relatively slowly, and their water qualities are determined by the finite volume flow cell concentration (not the input concentration as before).

This difference in methodology has a very small impact in the particular case of the LDSP; it simply reduces artificial spikes in concentration during operations which are artifacts of the filling/draining activities of the pond, and ensures loading is sent to the receiving environment consistent with how flow/loading arrives at the pond.

Table 2.2-4:
Eagle Gold Project Water Quality Model Parameters

Parameter	Cont'd	Cont'd
NH_4	Al	Mn
Cl	Sb	Hg
F	As	Mo
NO_3	Ba	Ni
NO_2	B	K
N	Cd	Se
P	Ca	Si
SO_4	Cr	Ag
WADCN	Co	Na
	Cu	Tl
	Fe	U
	Pb	V
	Mg	Zn

As previously indicated, the WQM simulates 50 years of mine life, beginning in operation and ending several years into post-closure. The model time step is monthly, and the three principal mine periods for reporting are:

1. Operations (Phase 1 through Phase 5 corresponding to mine –years 1 to 12) with LDSP treated in the MWTP; in Phase 5 the heap is rinsed during cyanide destruction;
2. Early Closure (Phase 6 corresponding to mine -years 13 to 20): LDSP decommissioned and the heap drain-down is controlled with the MTWP operating to treat heap seepage. Eagle Pup WRSA and Platinum Gulch WRSA are passively treated before discharge to receiving waters;
3. Late Closure (Years 20+): Waste rock and heap seepages are passively treated before discharge to receiving waters.

Source terms were developed for the 75th percentile and median cases. To remain conservative, the discussion is based on the results of the 75th percentile source terms coupled with the median WBM flow scenario.

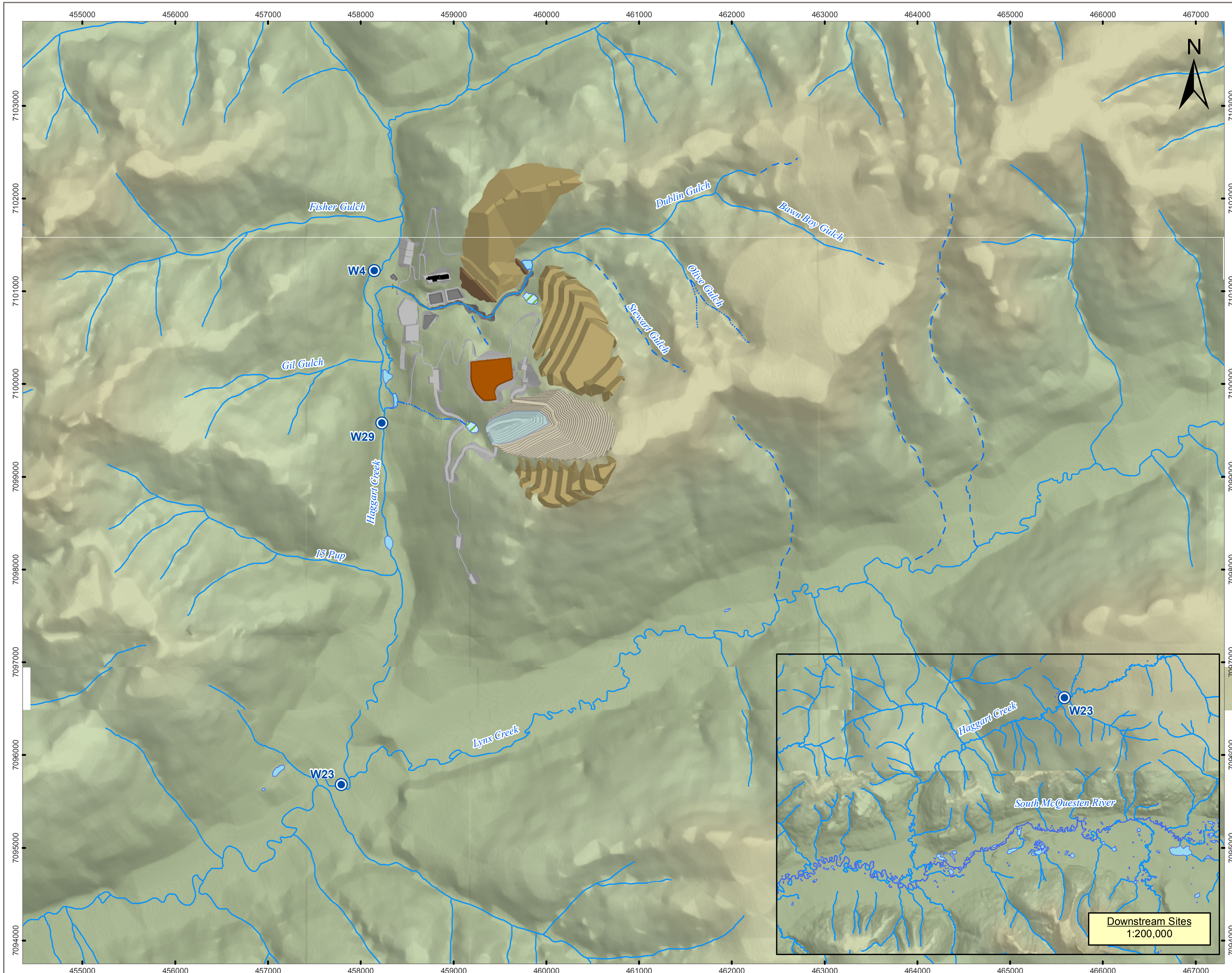
Water quality from mine discharge during operations is driven by the contact water reporting to the Lower Dublin South Pond. Contact water from the Eagle Pup and Platinum Gulch WRSAs, the temporary ore stockpile, and the sump water from the open pit all report to the LDSP at some point during operations. Excess water from the LDSP is treated through the MWTP to meet the discharge criteria in Table 2.2-1 and discharged to Haggart Creek upstream of W4.

After the LDSP is decommissioned (year 12), both the Eagle Pup and Platinum Gulch waste rock seeps are treated by passive systems to meet the discharge criteria in Table 2.2-2. During this time period, HLF drain-down water reports to the MWTP and is treated to meet discharge criteria in Table 2.2-1.

The late closure period begins with the decommissioning of the MWTP and the full application of passive treatment for all contact mine waters (year 20+). At this time, the HLF has little excess water to drain, and post-closure monthly discharge is driven largely by infiltration. After year 20, the HLF seep is treated solely through a PTS to values indicated in Table 2.2-3.

The WQM provides monthly predictions of water quality at key locations in Haggart Creek (Figure 2.2-1), namely:

- W4 in Haggart Creek just downstream of the chief compliance point (i.e., MWTP discharge);
- W29 in Haggart Creek downstream of all project influences; and
- W23 in Haggart Creek, immediately downstream of the confluence with Lynx Creek.



LEGEND

- Water Quality Prediction Nodes
- Watercourse (perennial)
- Watercourse (ephemeral)
- Watercourse (intermittent)

NOTES
Base data source:

STATUS
FOR INTERNAL USE ONLY

EAGLE GOLD PROJECT
YUKON TERRITORY

Surface Water Quality Prediction Nodes from WQM

PROJECTION	DATUM	CLIENT
Transverse Mercator UTM Zone 8	NAD83	Victoria Gold Corp

Scale: 1:40,000
400 200 0 400
Metres

FILE NO.

PROJECT	DWN	CKD	APVD	REV
Eagle Gold	VV	DHF	DHF	1

OFFICE
DATE
March 22, 2017

Lorax Environmental

Figure 2.2-1

3. Results and Discussion

The results of the 17WQM update are presented in this section, along with discussion on the reasons for any changes in water quality predictions resulting from the model update. Results are presented in downstream order for the receiving environment three Haggart Creek stations (W4), (W29) and (W23), for the main parameters of interest, namely As and Se. Time-series of all predicted parameters are provided in Appendix A of this report and all raw output data is provided in Appendix B (electronically).

3.1 Station W4 – Haggart Creek

Station W4 in Haggart Creek is located just downstream of the chief compliance location for the Eagle Gold project (i.e., discharge from the MWTP). Water quality objectives for W4 were developed during the licensing process and are presented in Table 3.1-1.

Table 3.1-1:
Water Quality Objectives for Haggart Creek at W4

Parameter List		WQ Objectives at W4
Dissolved Parameters	SO_4	309
	Cl	150
	Nitrate-N	3
	Nitrite-N	0.02
	NH_3-N	1.13
	CN_{WAD}	0.005
	Al (diss)	0.1
Total Metalloids and Metals	Sb	0.02
	As	0.0085
	Cd	0.000197
	Cu	0.005
	Co	0.004
	Fe	1.0
	Pb	0.0077
	Hg	0.00002
	Mn	1.17
	Mo	0.073
	Ni	0.116
	Se	0.002
	Ag	0.0015
	U	0.015
	Zn	0.038

All values as mg/L

Figure 3.1-1 summarizes the updated 2017 water quality model (17WQM) predictions for As at W4 in Haggart Creek and compares the output to the 2014 water quality model (14WQM) predictions. The updated model predicts lower peak As concentrations at W4 as compared to the previous 2014 model. The driver for this predicted decrease is the increase in MAR (+7%) as discussed in Section 2.1.1, which provides additional dilution at W4. Also of influence is the slight decrease in the orographic gradient at the Project site, that effectively reduces the volume of water reporting to the mine components, which tend to be located at the higher elevations, relative to the lower elevations. In the updated 2017 WQM, As concentrations are predicted to remain well below the water quality guideline of 0.0085 mg/L (Figure 3.1-1) at W4. Indeed, the maximum predicted As concentration at anytime during the mine life is approximately 0.005 mg/L and compares to previous peak As concentrations predicted in 14WQM of roughly 0.008 mg/L (Figure 3.1-1).

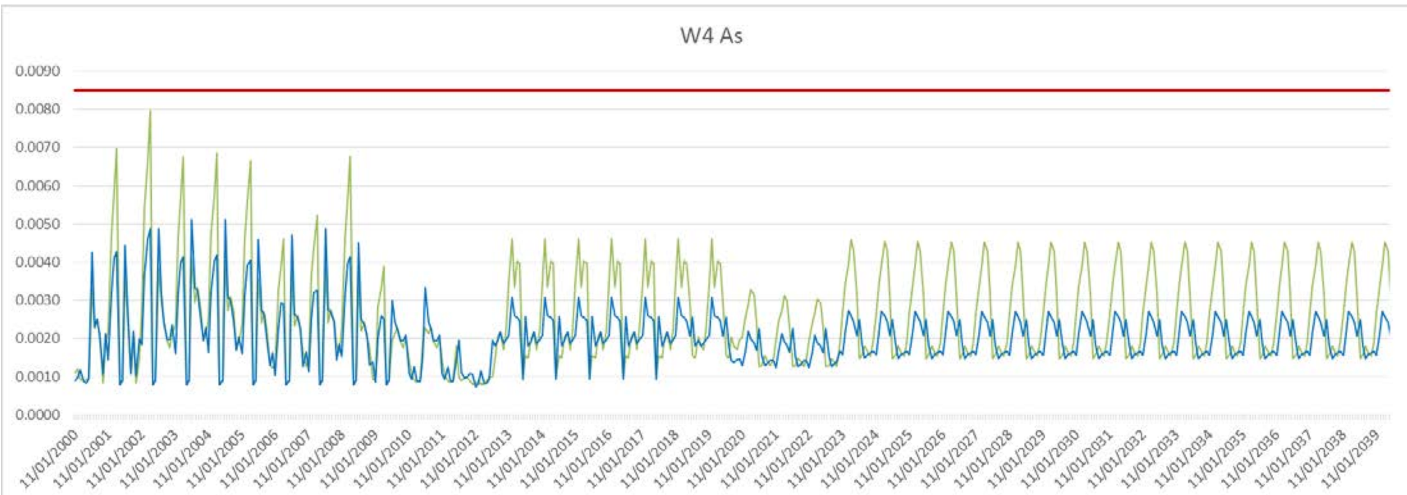


Figure 3.1-1: Comparison of 17WQM Predictions for Total As to 14WQM Output at W4 in Haggart Creek. Green line denotes 14WQM output and Blue line is 17WQM updated predictions. Water Quality Objective denoted by Red line.

Similar results are observed for Se at W4 in Haggart Creek (Figure 3.1-2). During early operations, Se treatment is not necessary and concentrations are driven by the background concentrations in Haggart Creek and hence model predictions do not diverge significantly. The primary source of Se is associated with the HLF. Once treatment of the HLF is required, Se concentrations increase at station W4. However, with the slightly increased flows, a similar dilution effect is observed at W4, and 17WQM predictions for Se are generally lower than 14WQM predictions. Updated predictions indicate that Se concentrations throughout the life of mine are well below water quality objectives at W4.

Table 3.1-2 summarizes the maximum 17WQM predicted concentrations for all parameters at W4 in Haggart Creek. As illustrated, all parameters are predicted to be below their respective water quality objective. No suggested changes to proposed site water management strategies are therefore warranted as a result of the modeling updates. 17WQM output for all parameters can be found in Appendix A and Appendix B.

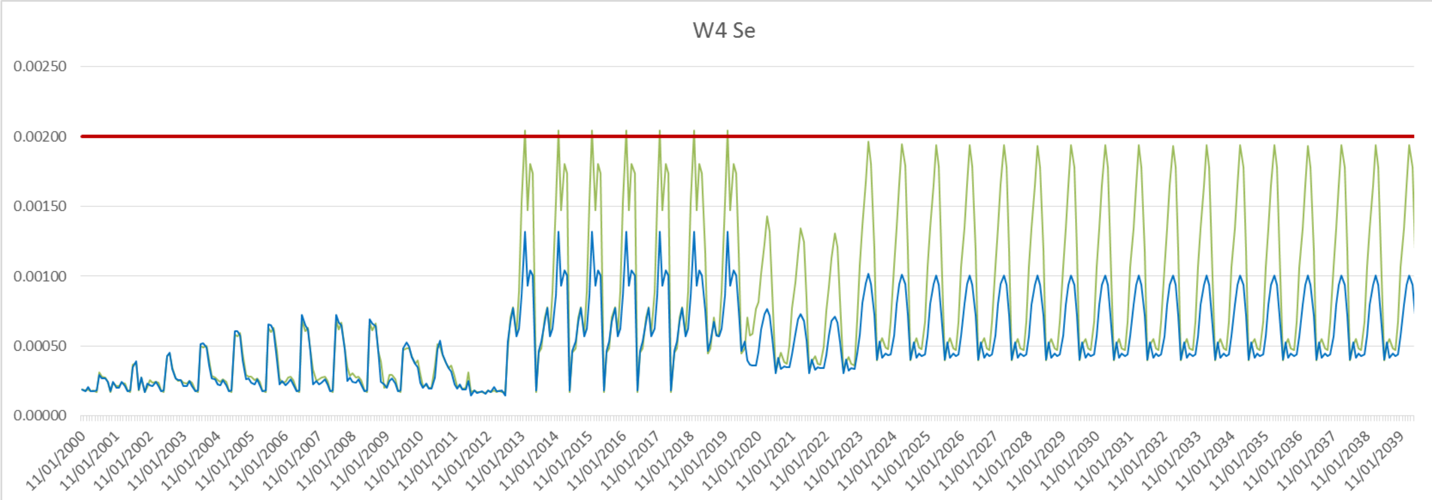


Figure 3.1-2: Comparison of 17WQM Predictions for Total Se with 14WQM Output at W4 in Haggart Creek. Green line denotes 14WQM output and Blue line is 17WQM updated predictions. Water Quality Objective denoted by Red line.

Table 3.1-2:
Maximum 17WQM Predicted Concentrations Compared to Water Quality Objectives at W4 for Haggart Creek

Parameter List		Maximum Predicted Concentration at W4	WQ Objectives at W4
Dissolved Parameters	SO_4	103	309
	Cl	2	150
	Nitrate-N	0.47	3
	Nitrite-N	0.006	0.02
	NH_3-N	0.023	1.13
	CN_{WAD}	0.0024	0.005
	Al (diss)	0.14	0.1
Total Metalloids and Metals	Sb	0.007	0.02
	As	0.005	0.0085
	Cd	0.000072	0.000197
	Cu	0.0028	0.005
	Co	0.0009	0.004
	Fe	0.36	1.0
	Pb	0.0026	0.0077
	Hg	0.000013	0.00002
	Mn	0.114	1.17
	Mo	0.003	0.073
	Ni	0.0036	0.116
	Se	0.0013	0.002
	Ag	0.00006	0.0015
	U	0.002	0.015
	Zn	0.008	0.038

All values as mg/L

3.2 Station W29 – Haggart Creek

A comparison of 17WQM predictions for total As at W29 to 14WQM output is graphically presented in Figure 3.2-1. Peak As concentrations at W29 are predicted to be slightly higher in 17WQM as a result of higher background concentrations calculated for Dublin Gulch following incorporation of baseline surface water quality monitoring data in 2013 to 2016. In the 2017 and 2014 WQMs, Dublin Gulch water is diverted around the proposed HLF and enters Haggart Creek downstream of W4 and upstream of W29. Predicted peak As concentrations occur in May of each model year. Revised background total As concentrations assumed for Dublin Gulch are based on the mean of measured As concentrations at W1 for the period of 2007 to 2016. For the 14WQM, the monthly mean total As concentration for May was 0.028 mg/L and compares to a revised monthly mean total As concentration for May in the 17WQM of 0.040 mg/L. As such, changes to the predicted peak As concentrations at W29 in 17WQM are driven solely by revised background As concentrations in Dublin Gulch. Despite the increase in total As assumed for May, peak concentrations are approximately 0.0085 mg/L.

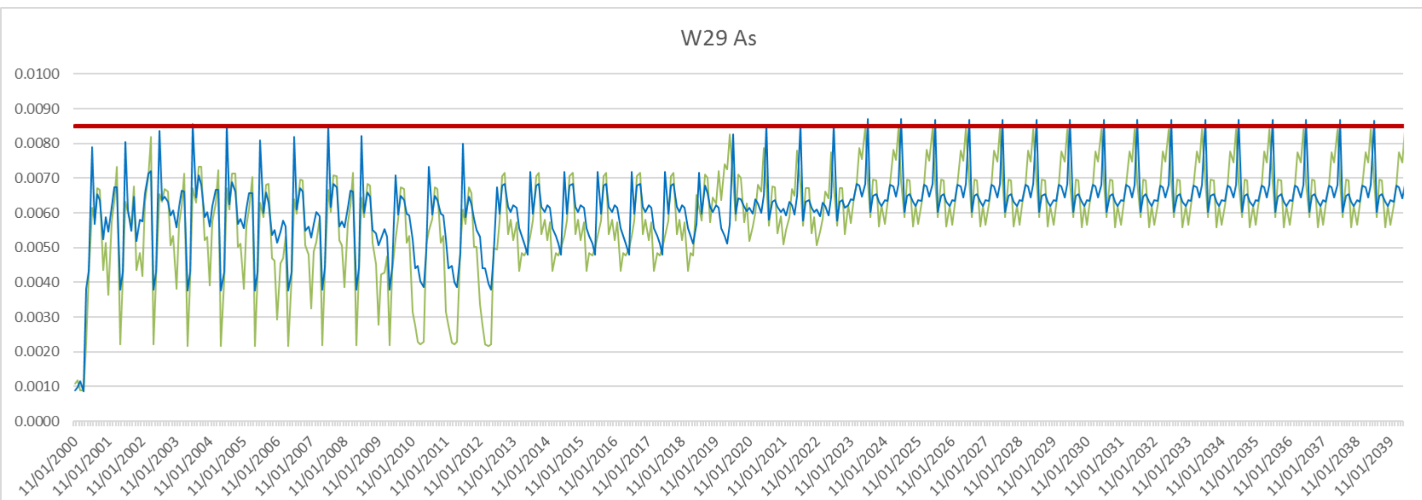


Figure 3.2-1: Comparison of 17WQM Predictions for As to 14WQM Output at W29 in Haggart Creek. Green line denotes 14WQM output and Blue line is 17WQM updated predictions. Water Quality Objective denoted by Red line.

Unlike As, the predicted total Se concentrations at W29 are similar to what was observed at station W4 in Haggart Creek. The primary reason for this is that background Se in all catchments at the project site is very low (less than 0.0003 mg/L) including Dublin Gulch (see Lorax 2017b). As such, the slightly higher predicted background flows in the 2017 WBM result in greater dilution and therefore lower predicted total Se concentrations. Full excel output data for all parameters at station W29 is presented in Appendix B.

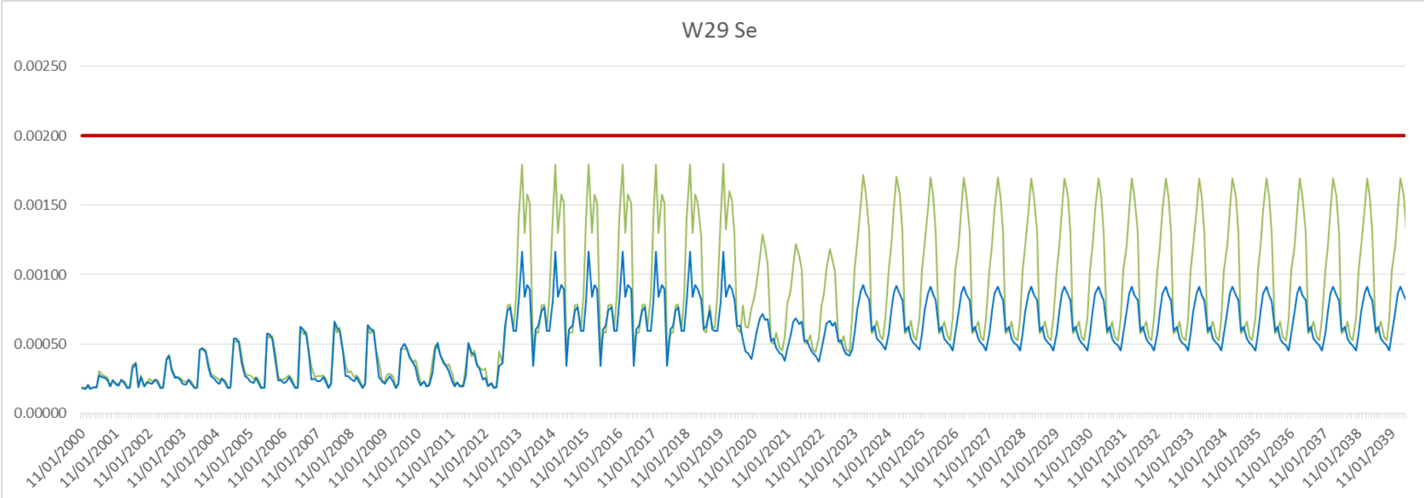


Figure 3.2-2: Comparison of 17WQM Predictions for Total Se with 14WQM Output at W29 in Haggart Creek. Green line denotes 14WQM output and Blue line is 17WQM updated predictions. Water Quality Objective denoted by Red line.

3.3 Station W23 – Far-Field Haggart Creek

A comparison of 17WQM predictions for total As at W23 in Haggart Creek to 14WQM output is graphically presented in Figure 3.3-1. Consistent with predictions at W29 for total As, peak As concentrations at W23 are predicted to be slightly higher in 17WQM as a result of higher background concentrations calculated for Dublin Gulch. Predicted peak As concentrations occur in May of each model year and approach 0.008 mg/L. Changes to the predicted peak As concentrations at W23 in 17WQM are driven solely by revised background As concentrations in Dublin Gulch.

As predicted for the other upstream locations in Haggart Creek, the revised 17WQM predictions for total Se are lower as compared to 14WQM results (Figure 3.3-2). The slightly higher 17WBM flows, coupled with naturally low background Se concentrations results in lower predicted peak Se concentrations at W23. Maximum predicted total Se concentrations in the updated model do not exceed 0.0007 mg/L (Appendix B).

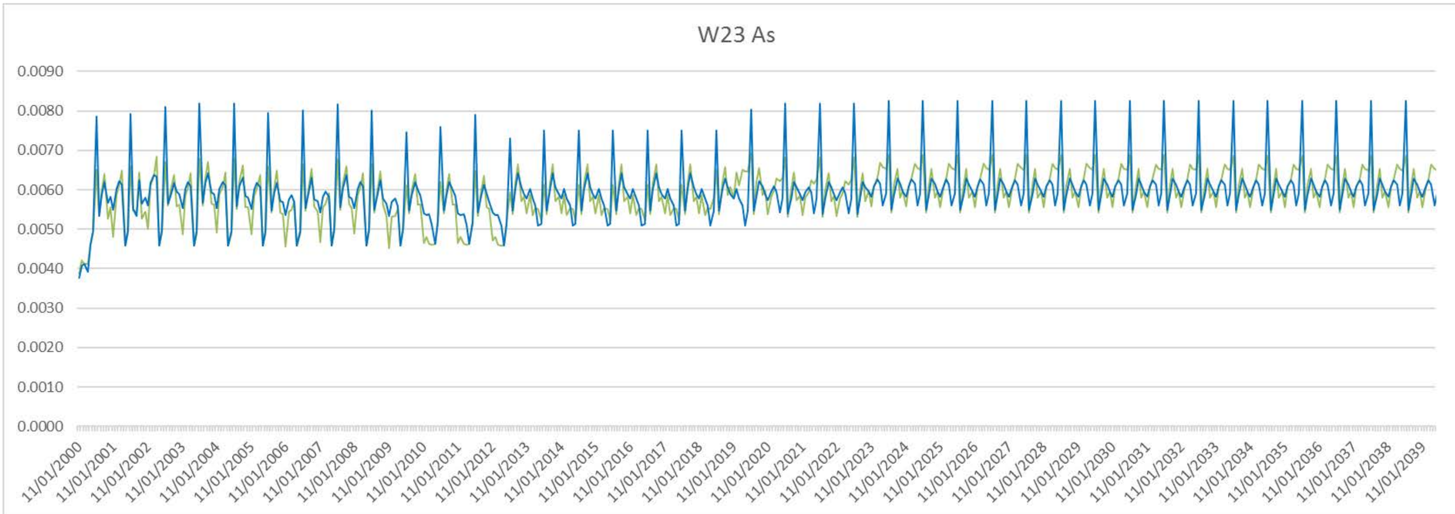


Figure 3.3-1: Comparison of 17WQM Predictions for As to 14WQM Output at W23 in Haggart Creek. Green line denotes 14WQM output and Blue line is 17WQM updated predictions.

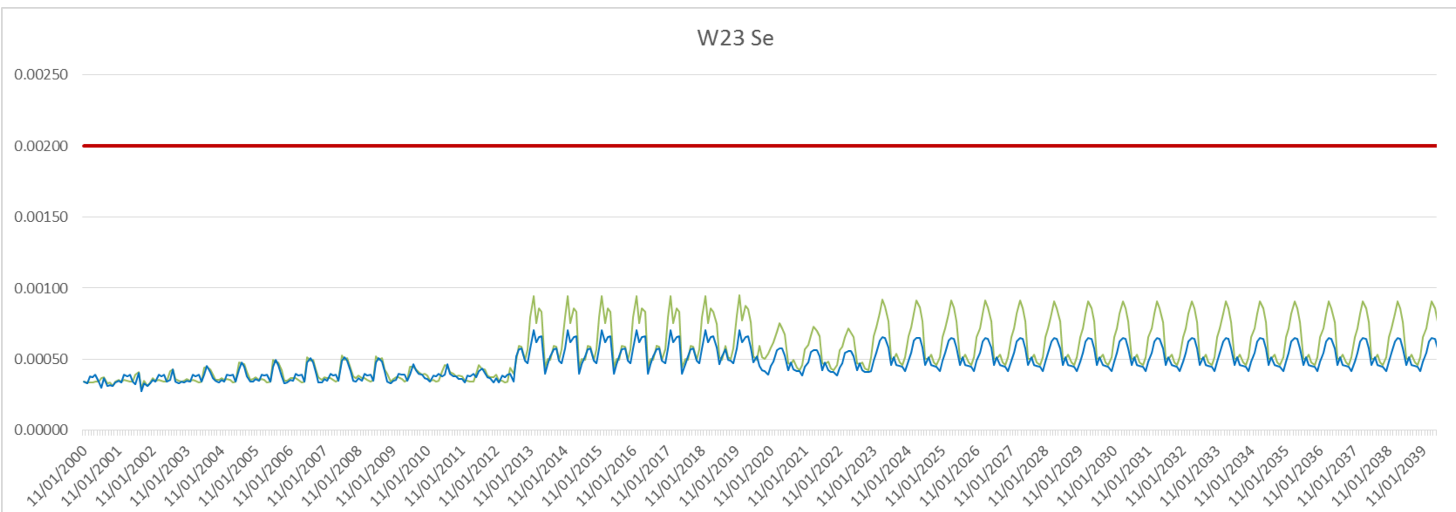


Figure 3.3-2: Comparison of 17WQM Predictions for Total Se with 14WQM Output at W29 in Haggart Creek. Green line denotes 14WQM output and Blue line is 17WQM updated predictions. Water Quality Objective denoted by Red line.

4. Closure

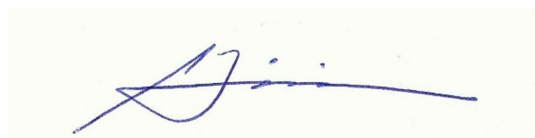
We trust that this report meets your expectations. Please contact the undersigned with any questions or comments.

Sincerely,

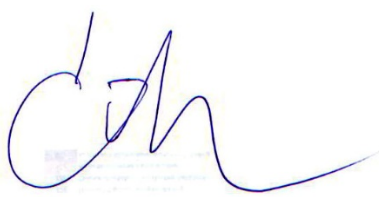
LORAX ENVIRONMENTAL SERVICES LTD.

Prepared by:

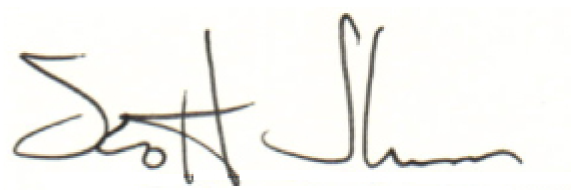
David Flather, M.Sc.
Principal



Scott Tinis, Ph.D.
Senior Numerical Modeller



Colin Fraser, M.Sc., P.Geo.
Senior Hydrologist



Scott Jackson, M.Sc., P.Geo.
Hydrologist

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Appendix A:
Water Quality Model Plots for all Parameters

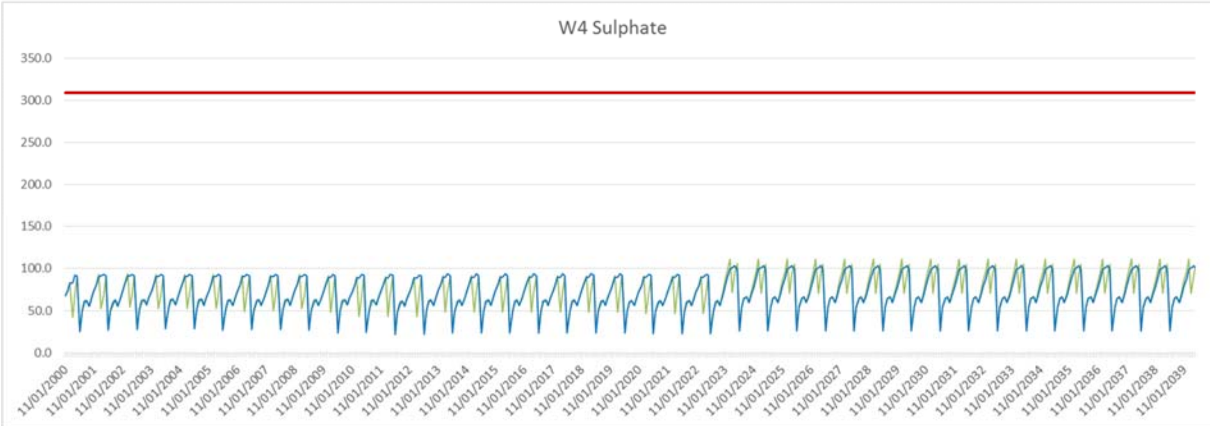
Appendix A:

A.1. Haggart Creek below Dublin Gulch (W4) – Water Quality Predictions

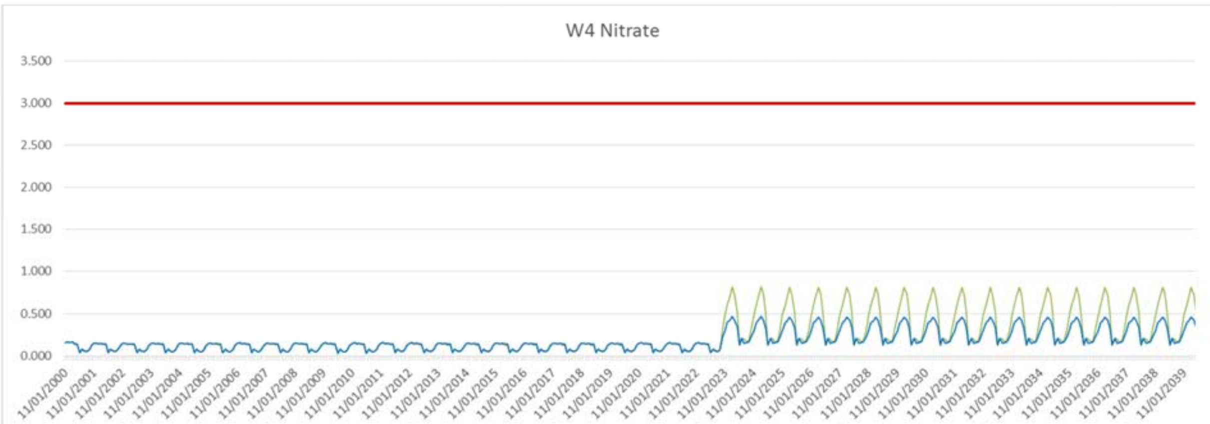
A.2. Haggart Creek below Eagle Creek (W29) – Water Quality Predictions

A.3. Haggart Creek below Lynx Creek (W23) – Water Quality Predictions

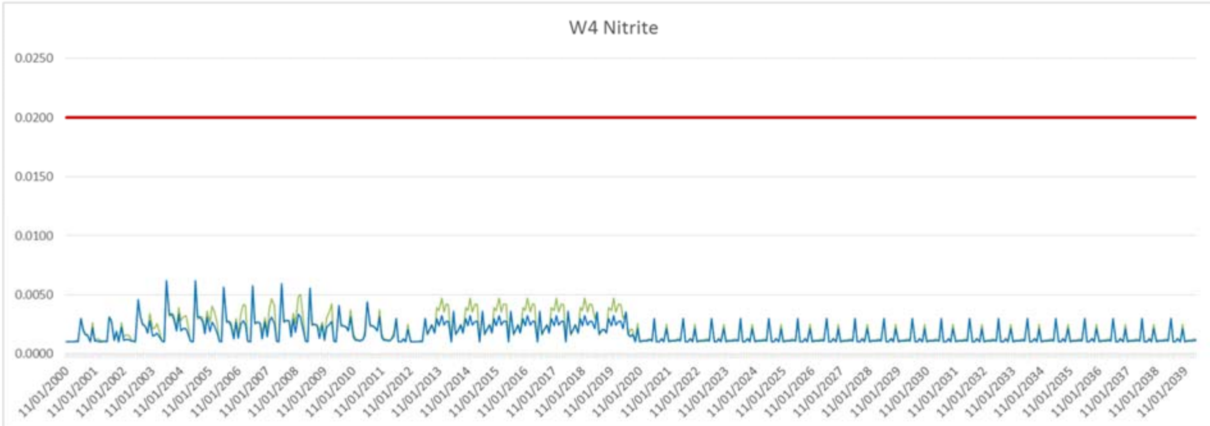
A.1. Haggart Creek below Dublin Gulch (W4) – Water Quality Predictions



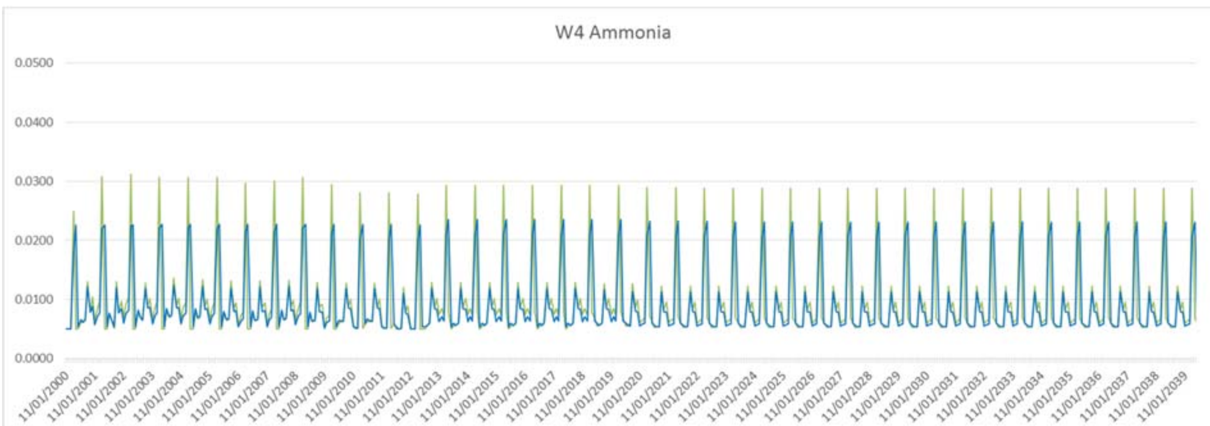
A.1-1: Time series of predicted sulphate concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



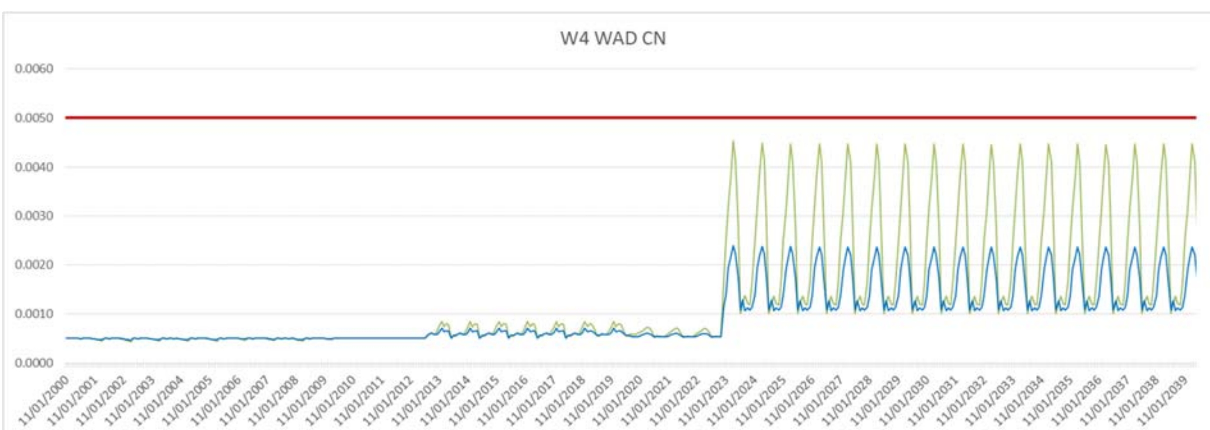
A.1-2: Time series of predicted nitrate concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



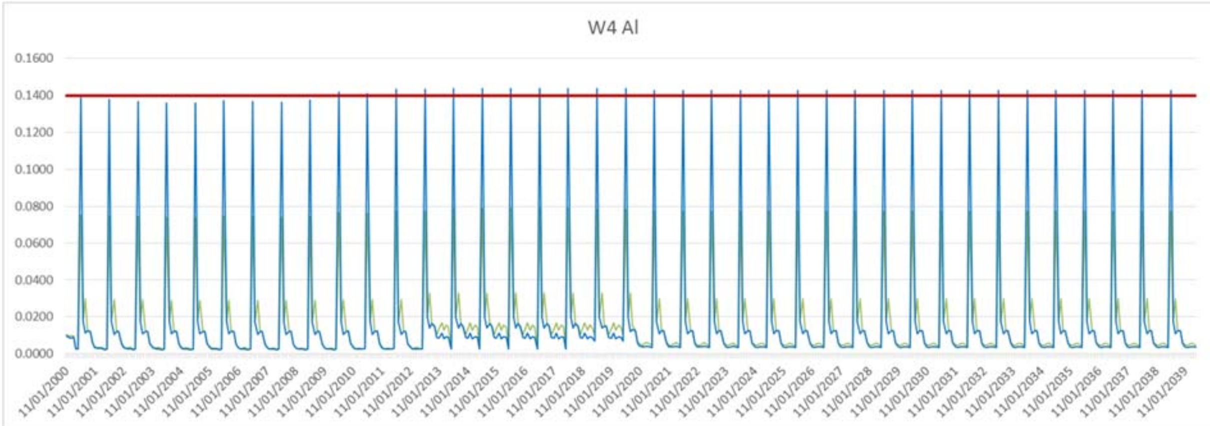
A.1-3: Time series of predicted nitrite concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



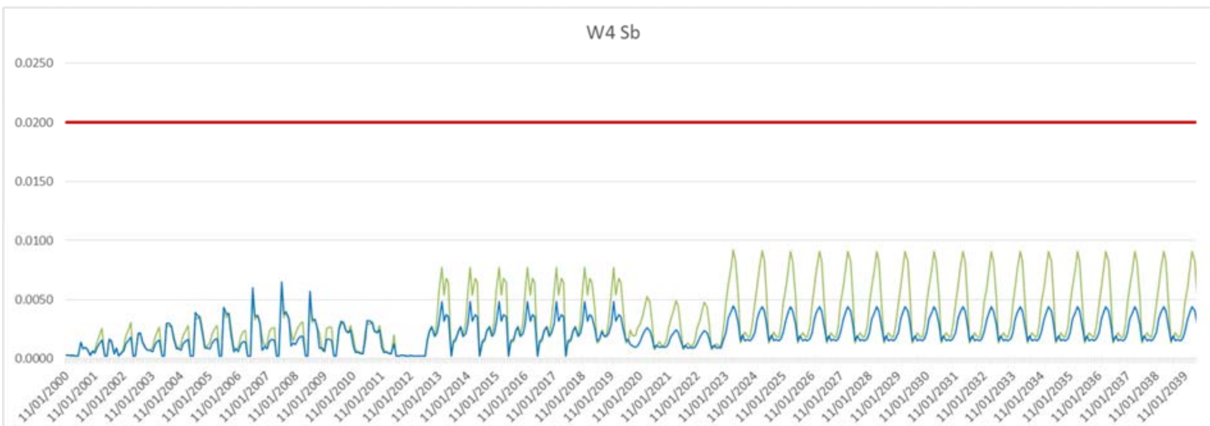
A.1-4: Time series of predicted ammonia concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



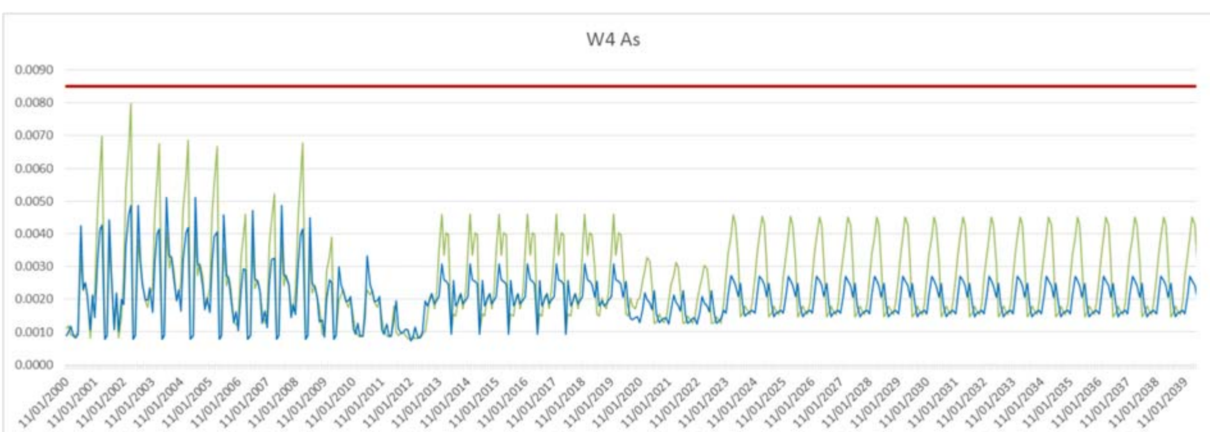
A.1-5: Time series of predicted WAD-CN concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



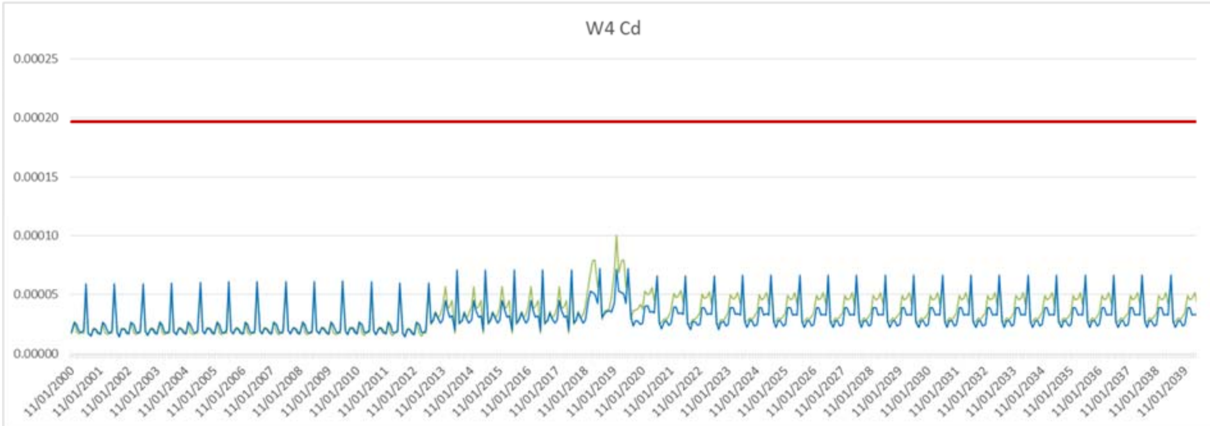
A.1-6: Time series of predicted aluminum concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



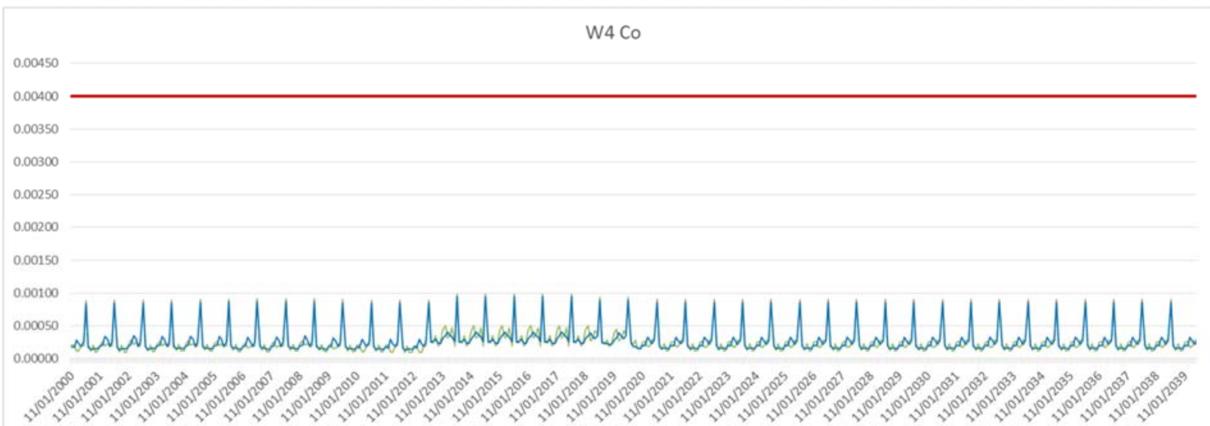
A.1-7: Time series of predicted antimony concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



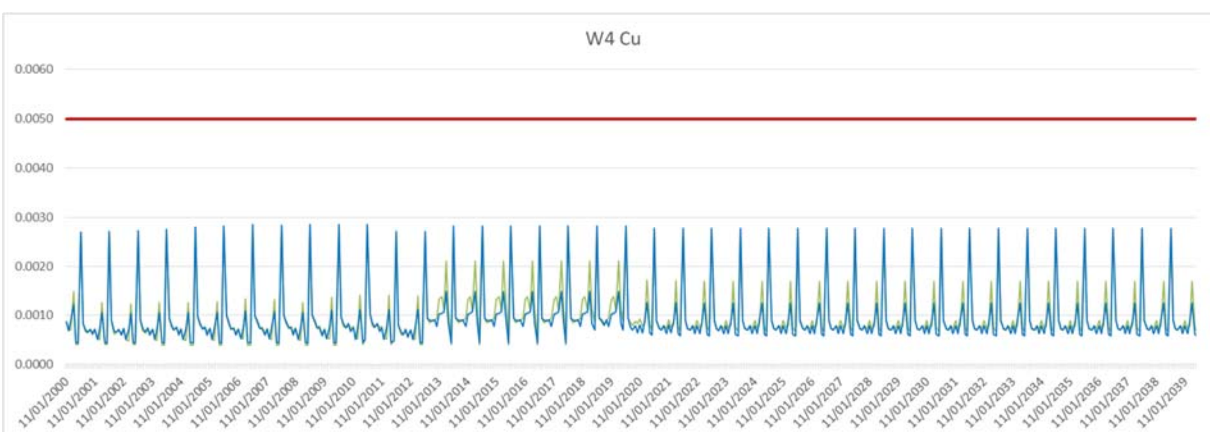
A.1-8: Time series of predicted arsenic concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



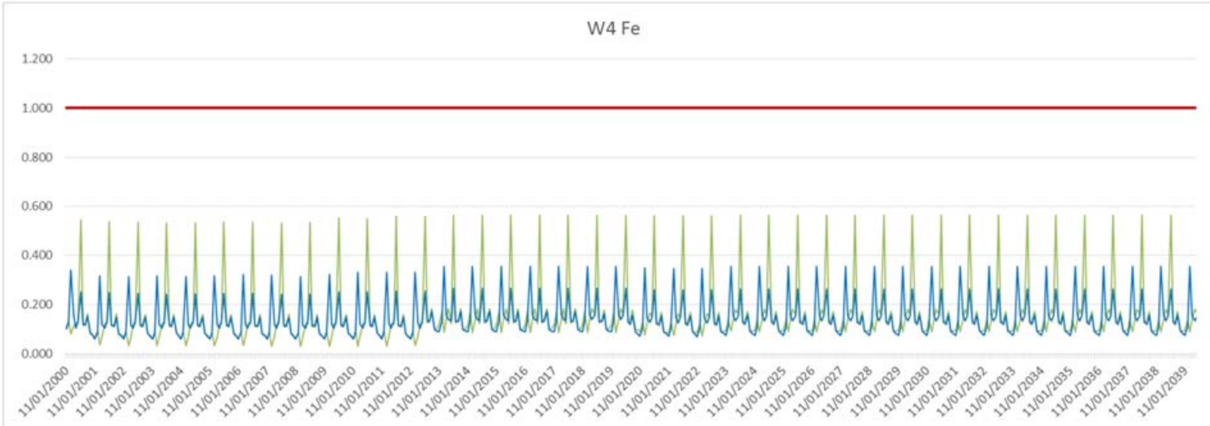
A.1-9: Time series of predicted cadmium concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



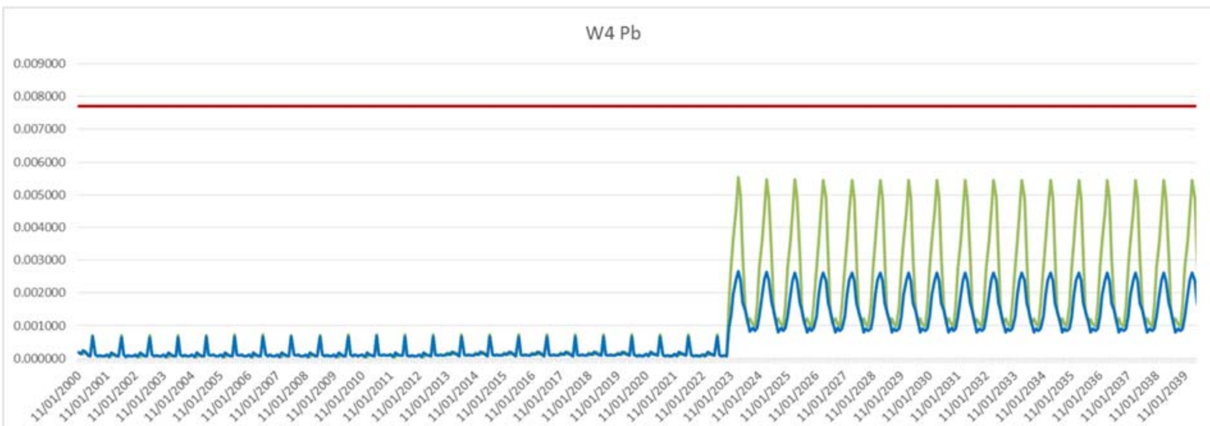
A.1-10: Time series of predicted cobalt concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



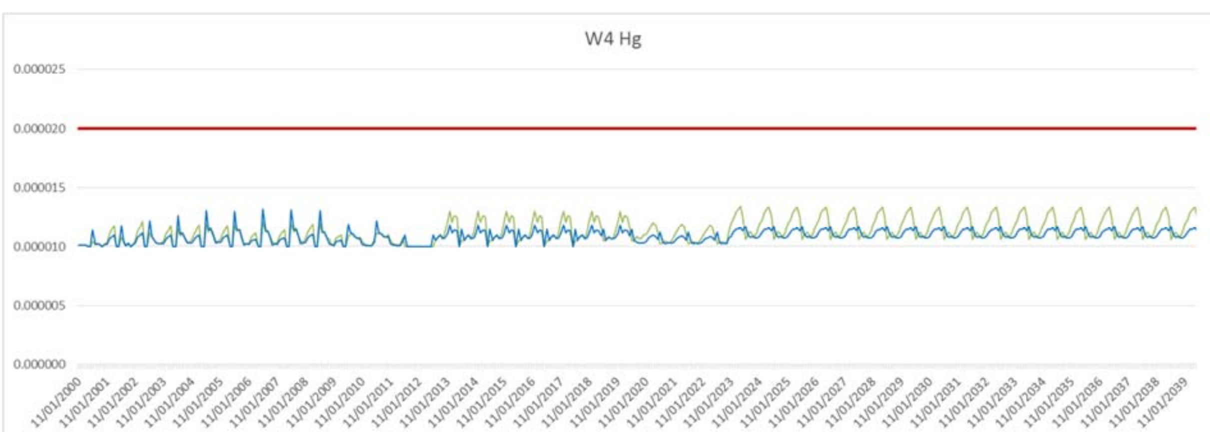
A.1-11: Time series of predicted copper concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



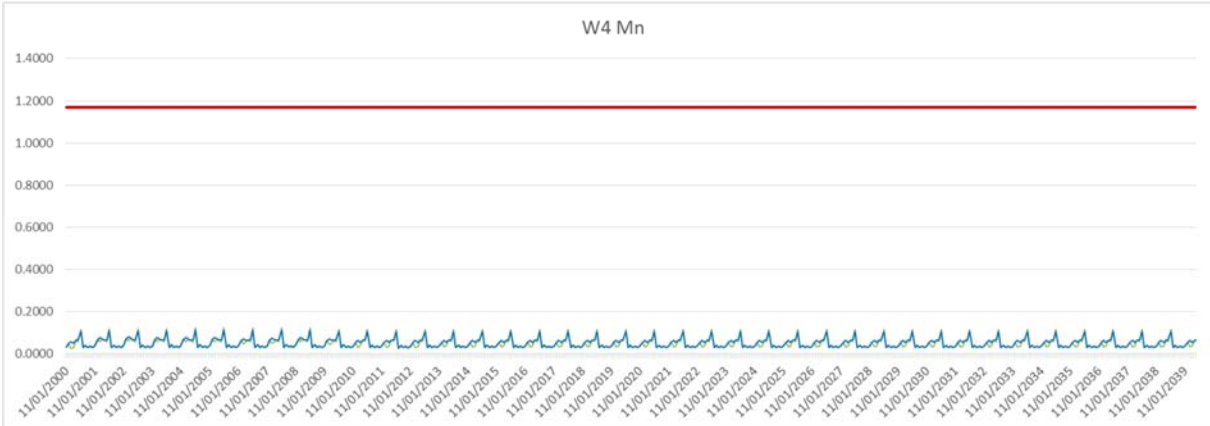
A.1-12: Time series of predicted iron concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



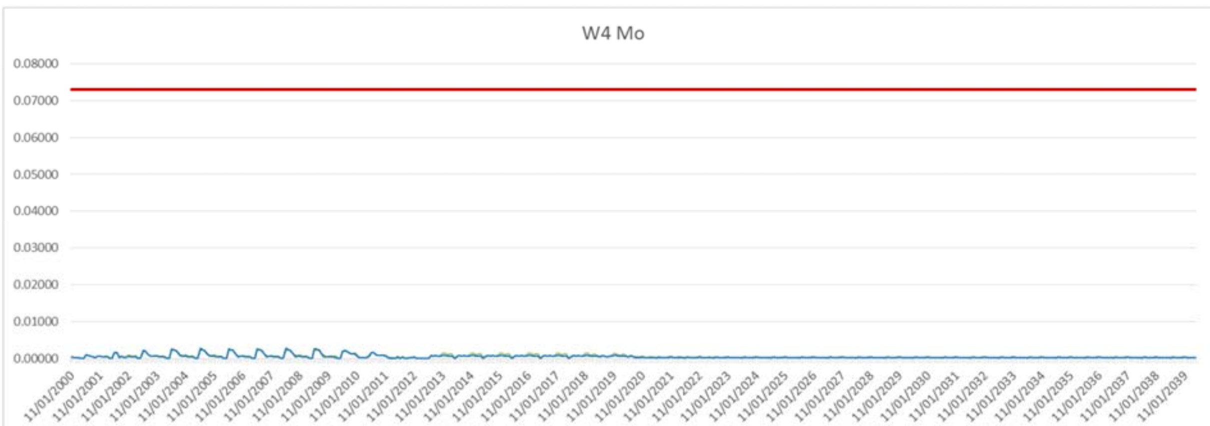
A.1-13: Time series of predicted lead concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



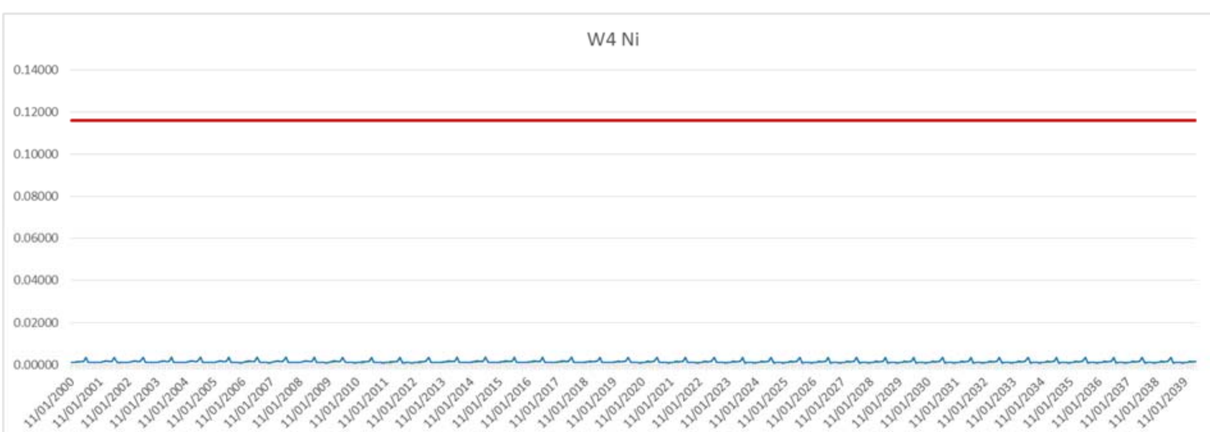
A.1-14: Time series of predicted mercury concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



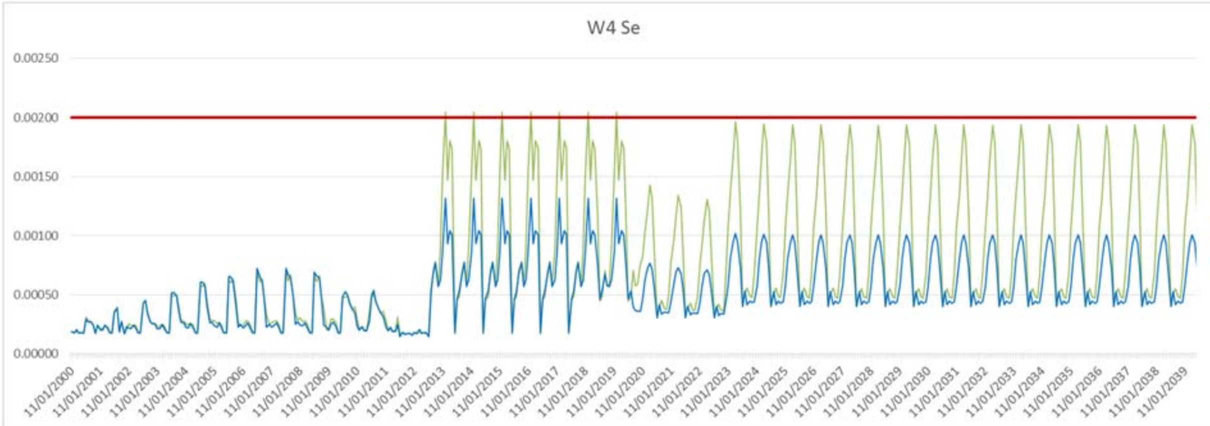
A.1-15: Time series of predicted manganese concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



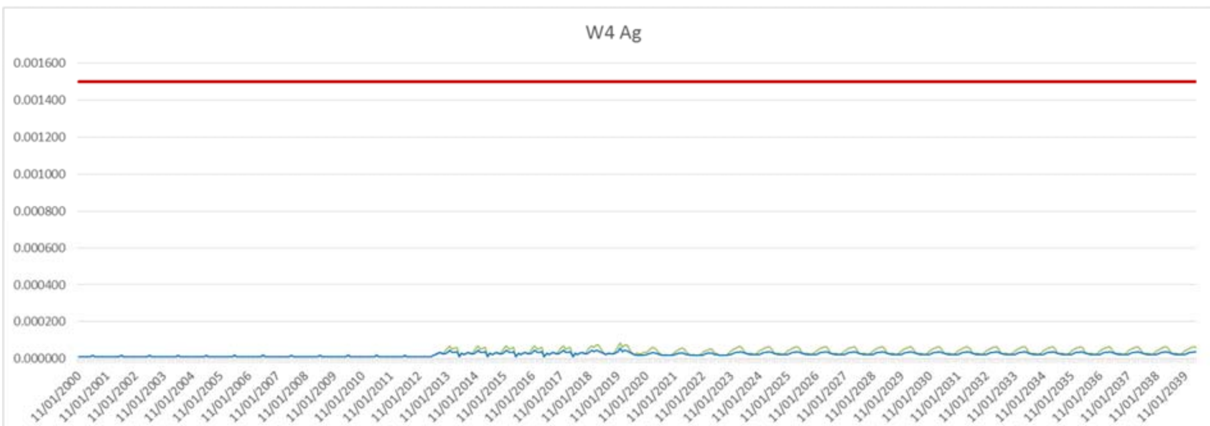
A.1-16: Time series of predicted molybdenum concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



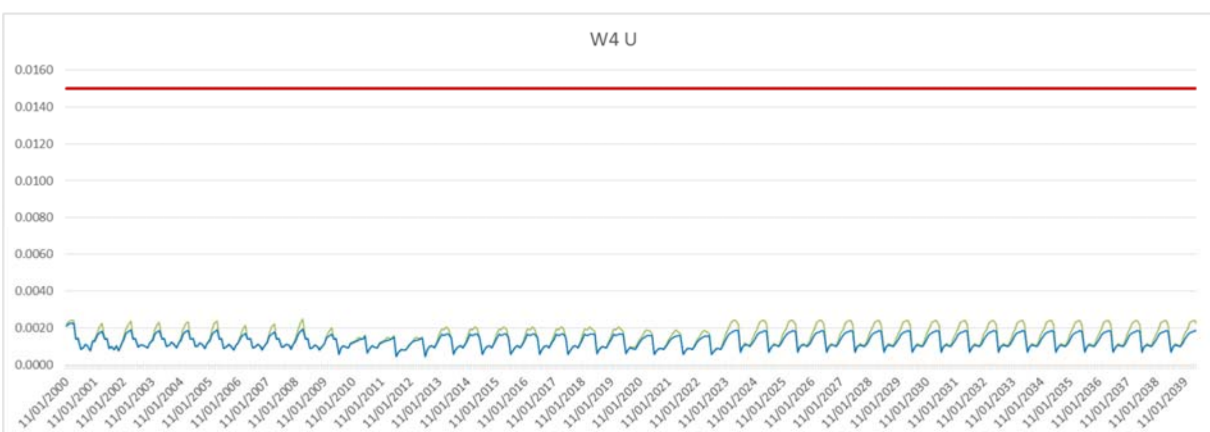
A.1-17: Time series of predicted nickel concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



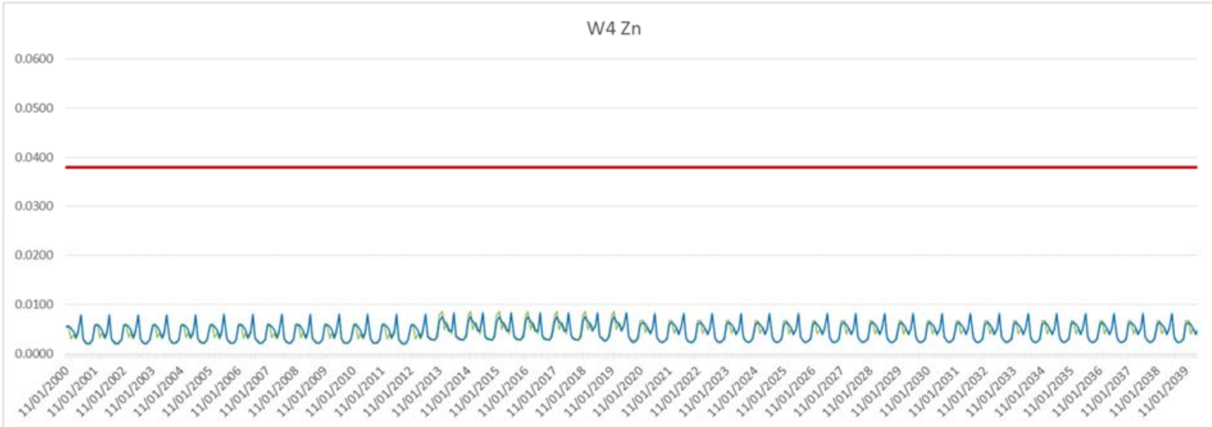
A.1-18: Time series of predicted selenium concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



A.1-19: Time series of predicted silver concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

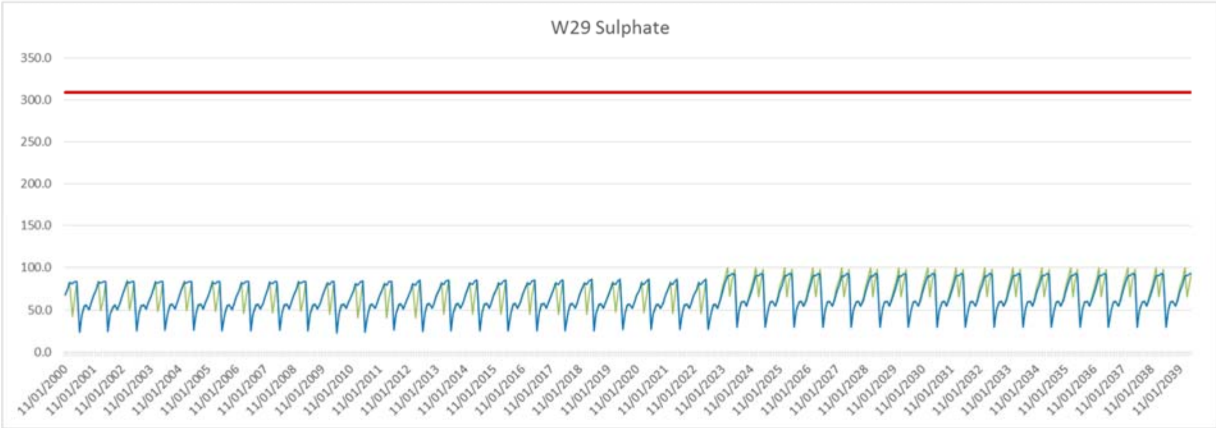


A.1-20: Time series of predicted uranium concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

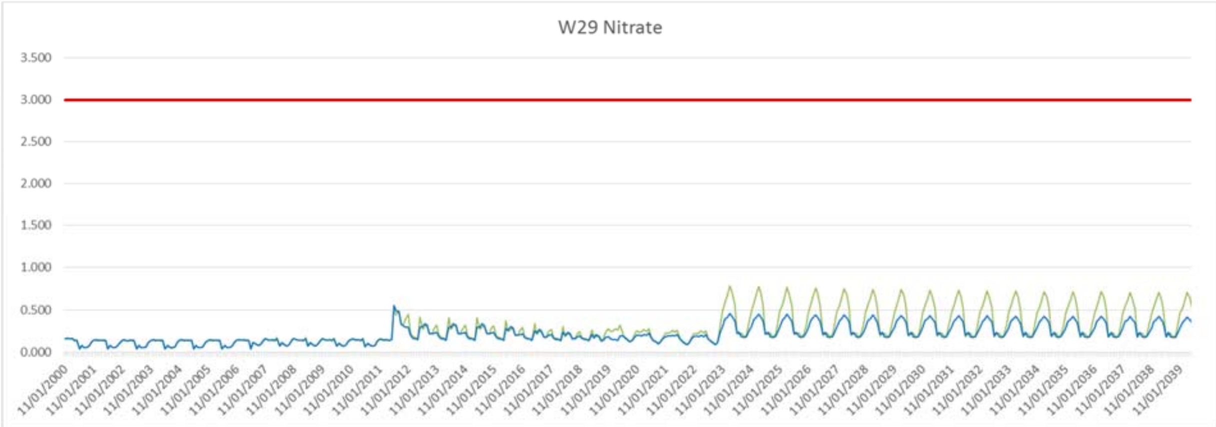


A.1-21: Time series of predicted zinc concentrations for W4. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

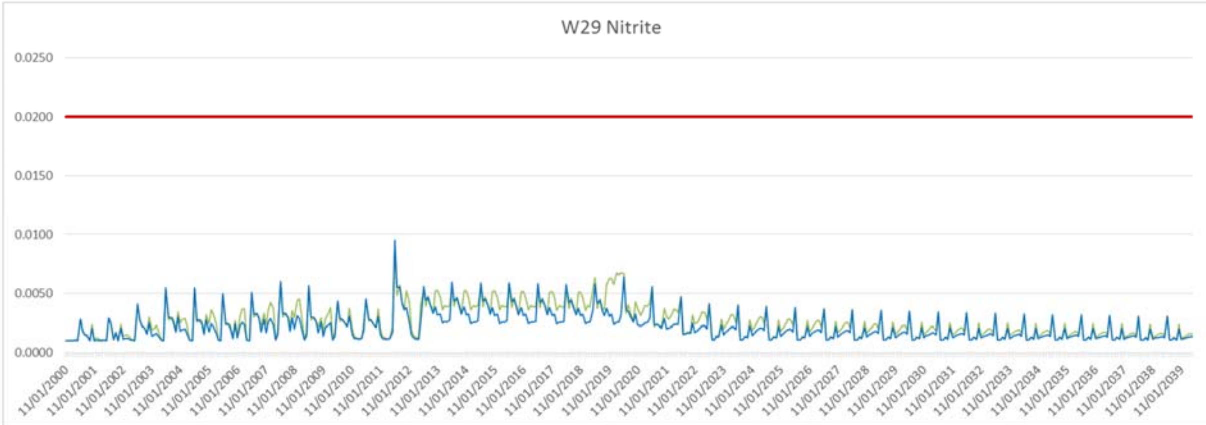
A.2. Haggart Creek below Eagle Creek (W29) – Water Quality Predictions



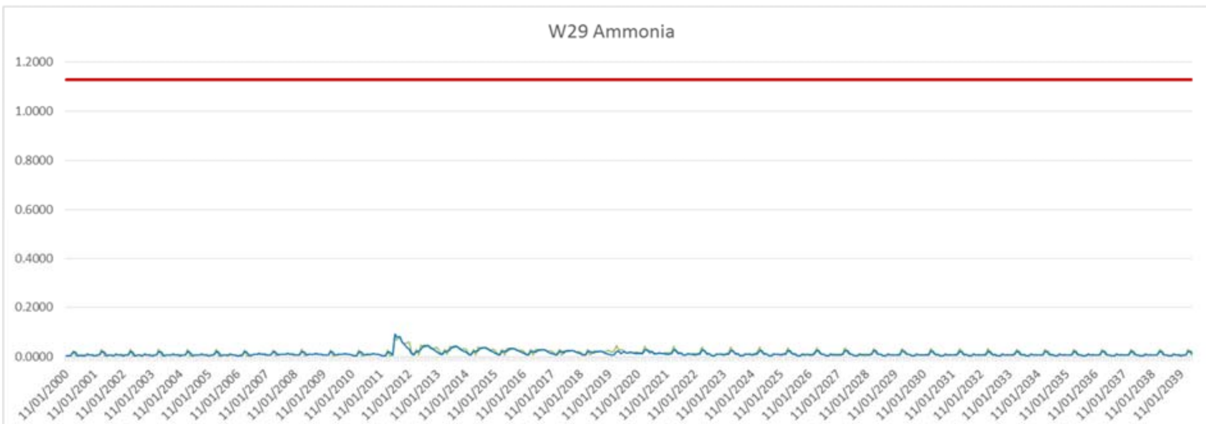
A.2-1: Time series of predicted sulphate concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



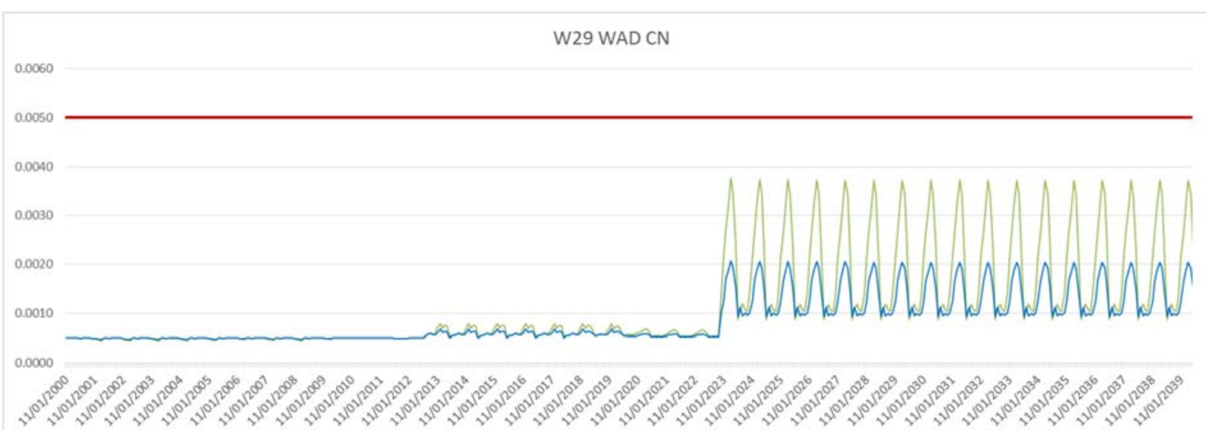
A.2-2: Time series of predicted nitrate concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



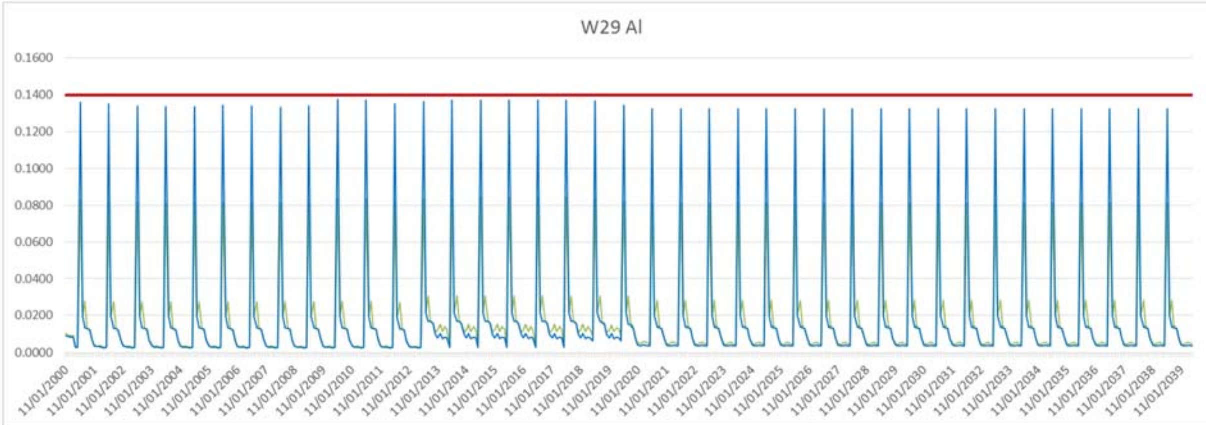
A.2-3: Time series of predicted nitrite concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



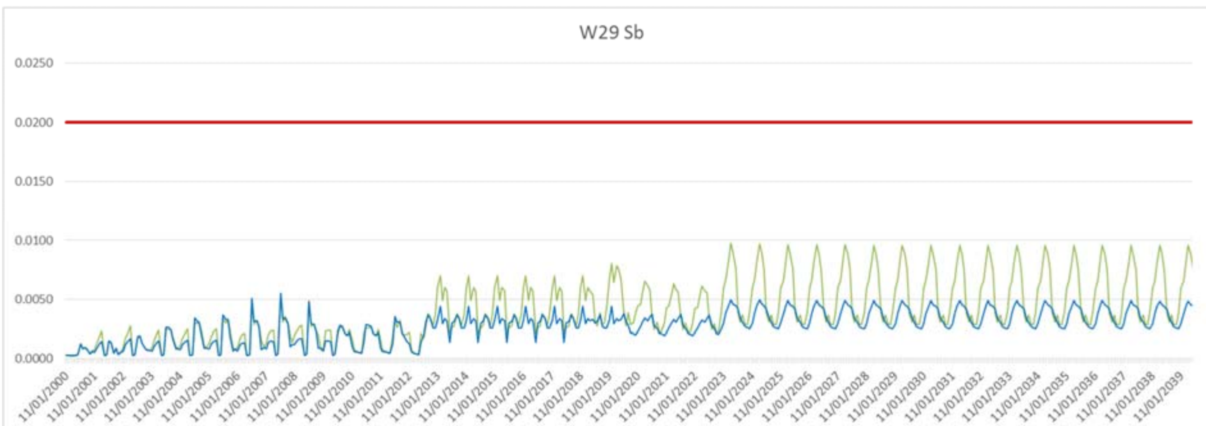
A.2-4: Time series of predicted ammonia concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



A.2-5: Time series of predicted WAD-CN concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

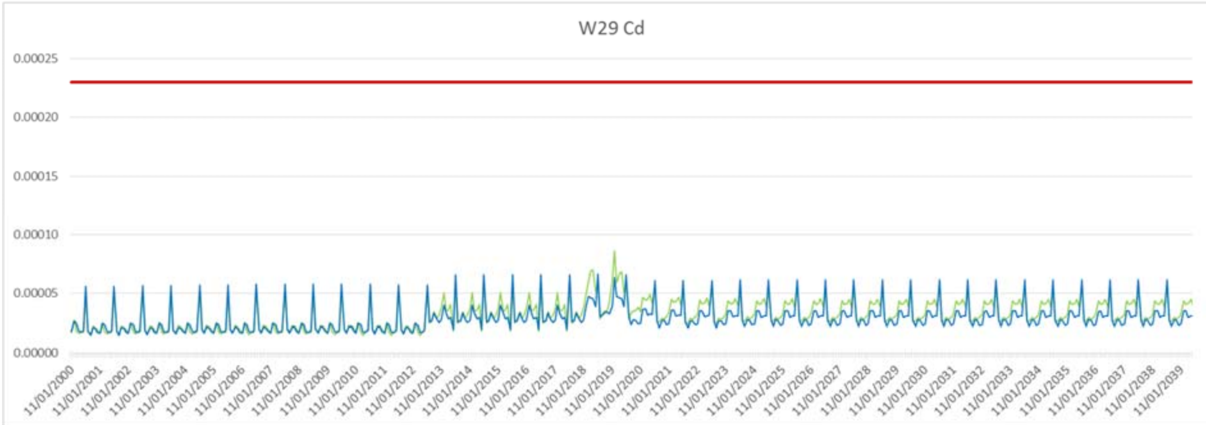


A.2-6: Time series of predicted aluminum concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

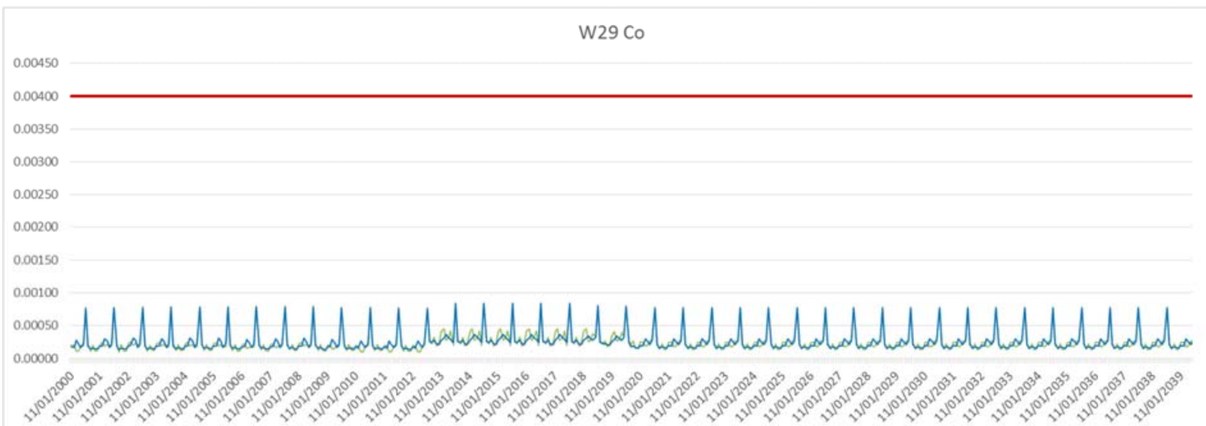


A.2-7: Time series of predicted antimony concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

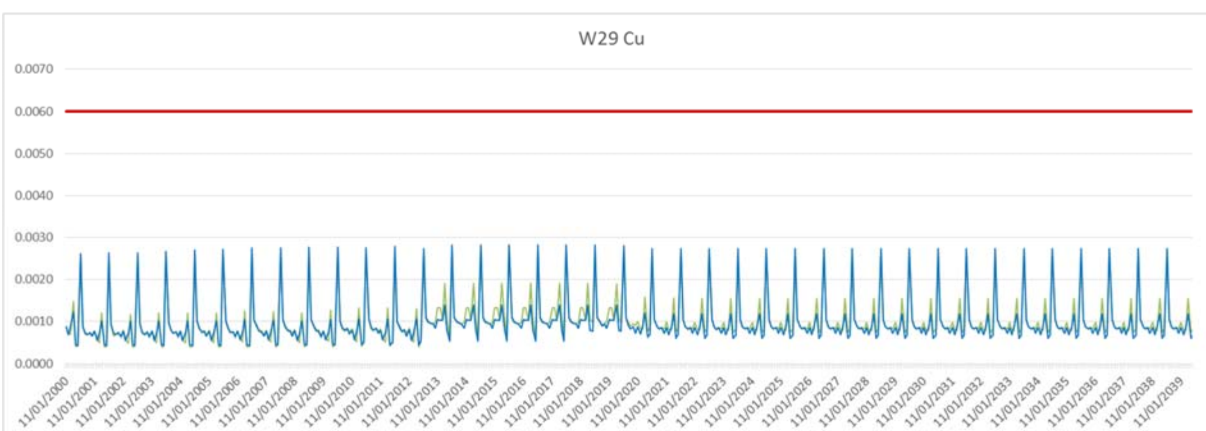
A.2-8: Time series of predicted arsenic concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



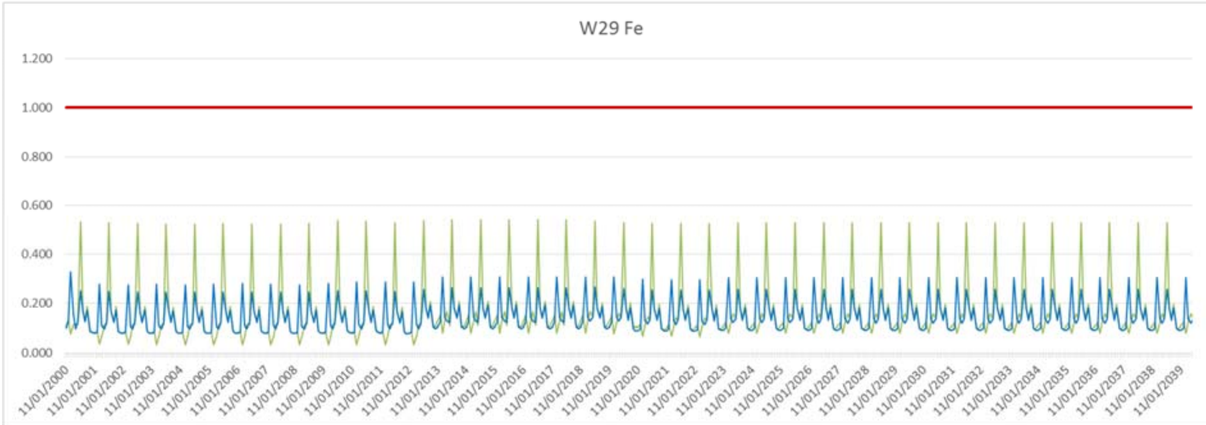
A.2-9: Time series of predicted cadmium concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



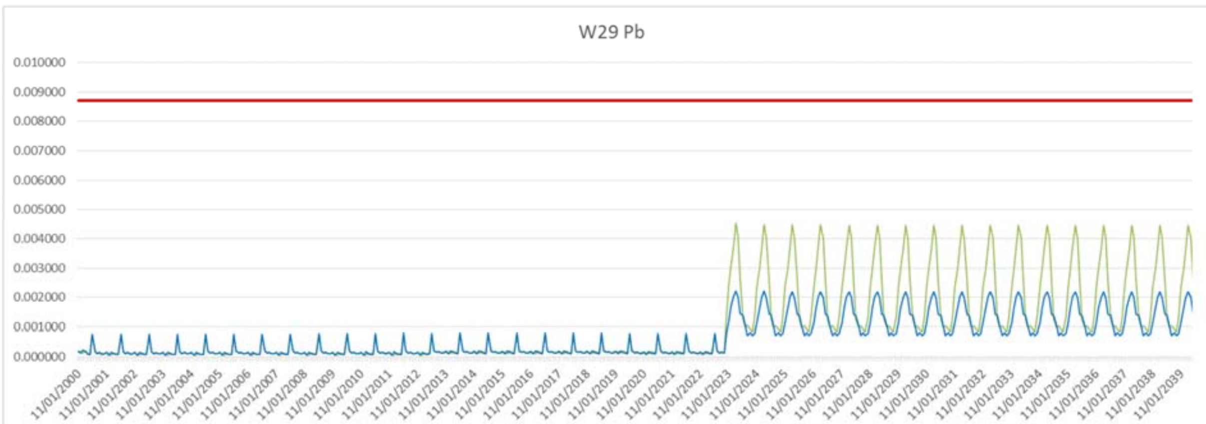
A.2-10: Time series of predicted cobalt concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



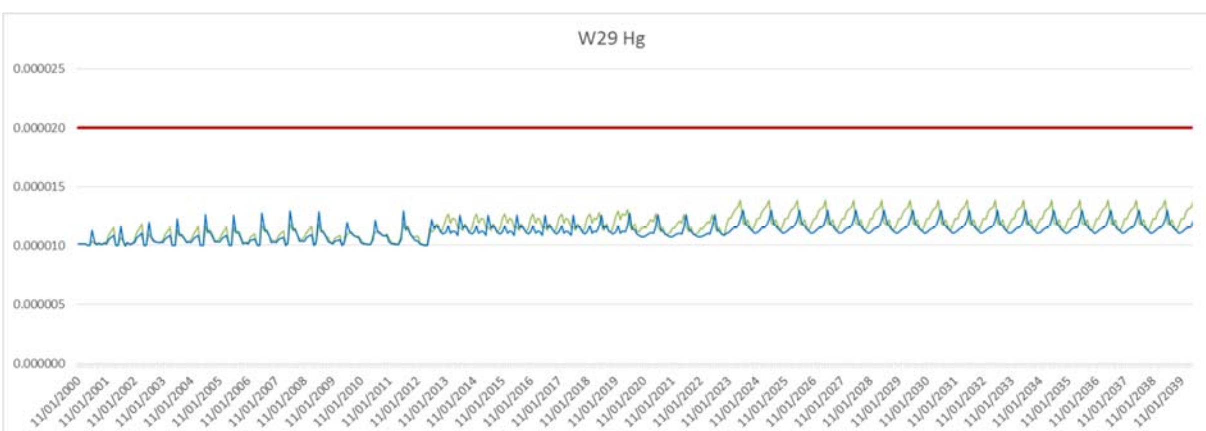
A.2-11: Time series of predicted copper concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



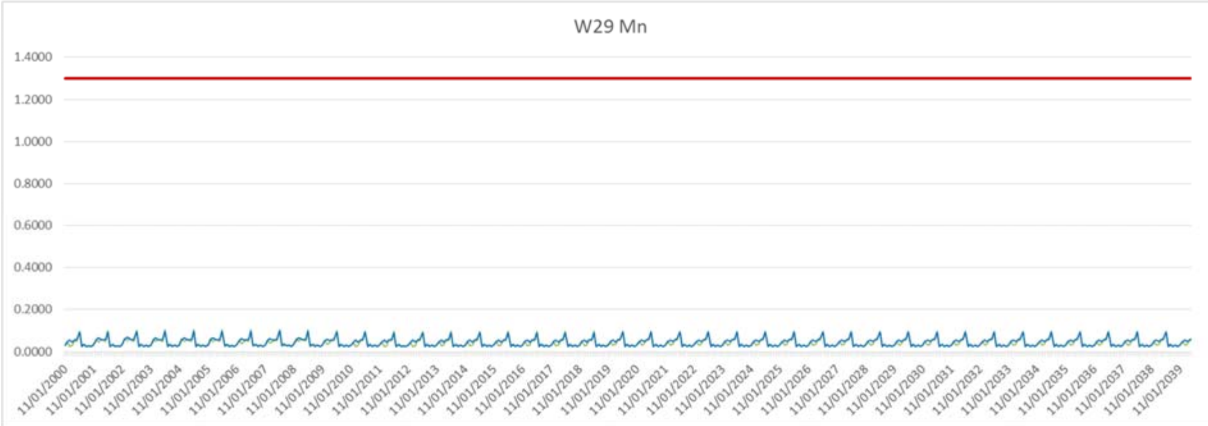
A.2-12: Time series of predicted iron concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



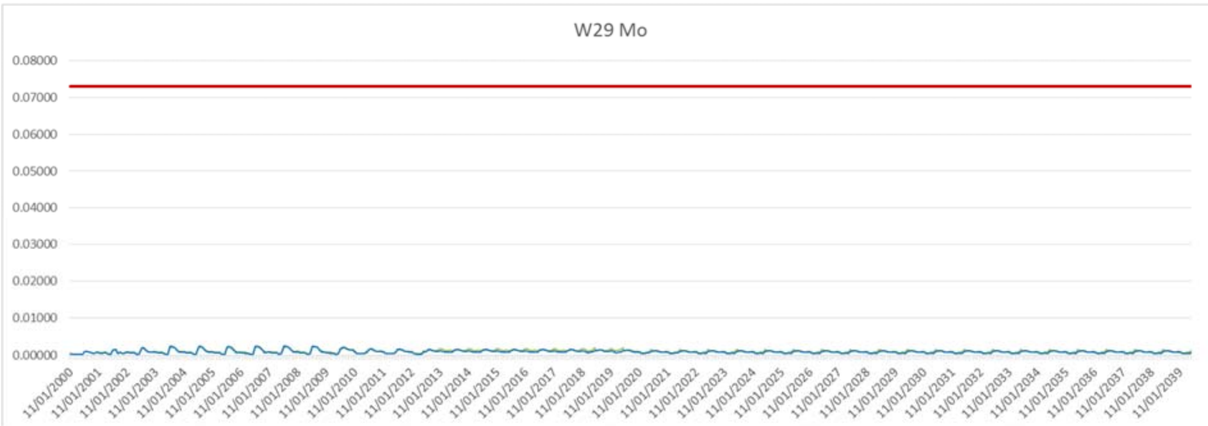
A.2-13: Time series of predicted lead concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



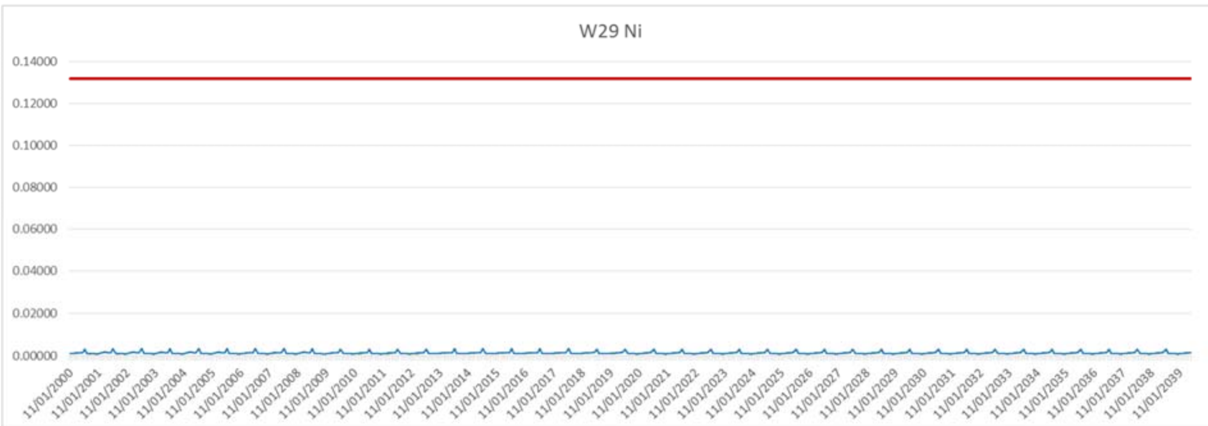
A.2-14: Time series of predicted mercury concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



A.2-15: Time series of predicted manganese concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

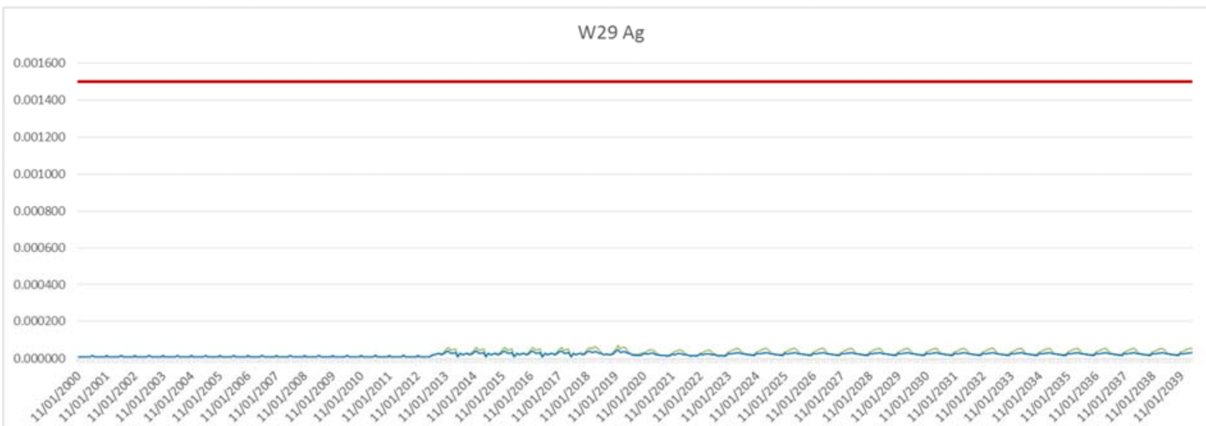


A.2-16: Time series of predicted molybdenum concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

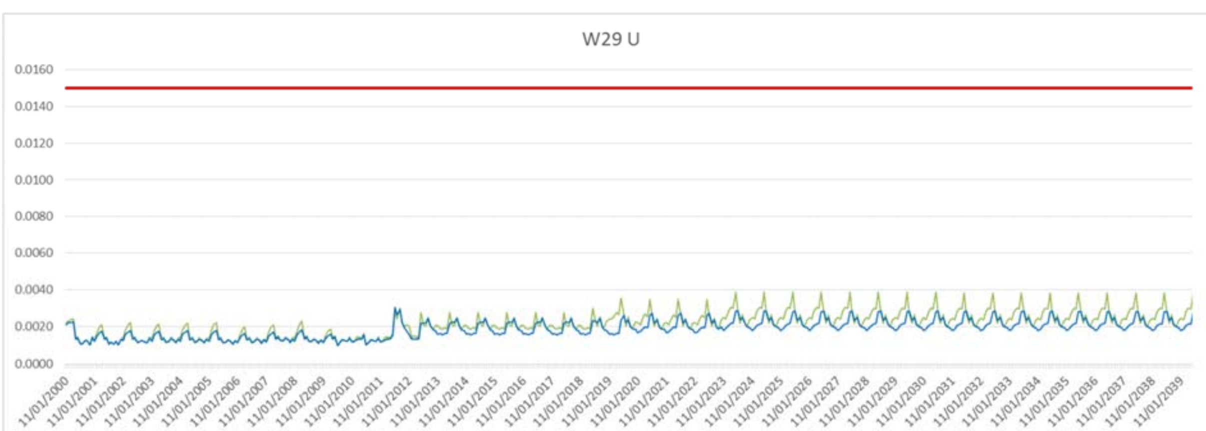


A.2-17: Time series of predicted nickel concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

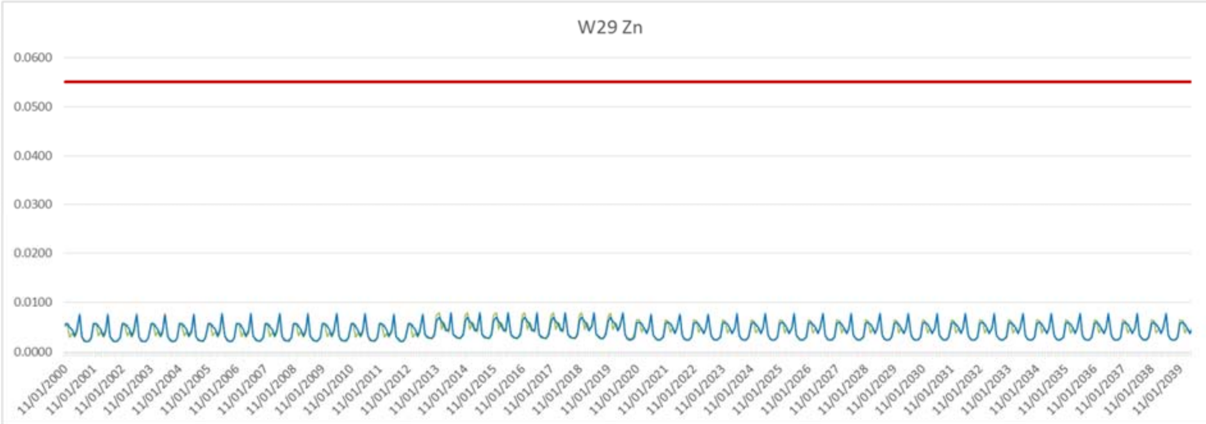
A.2-18: Time series of predicted selenium concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



A.2-19: Time series of predicted silver concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

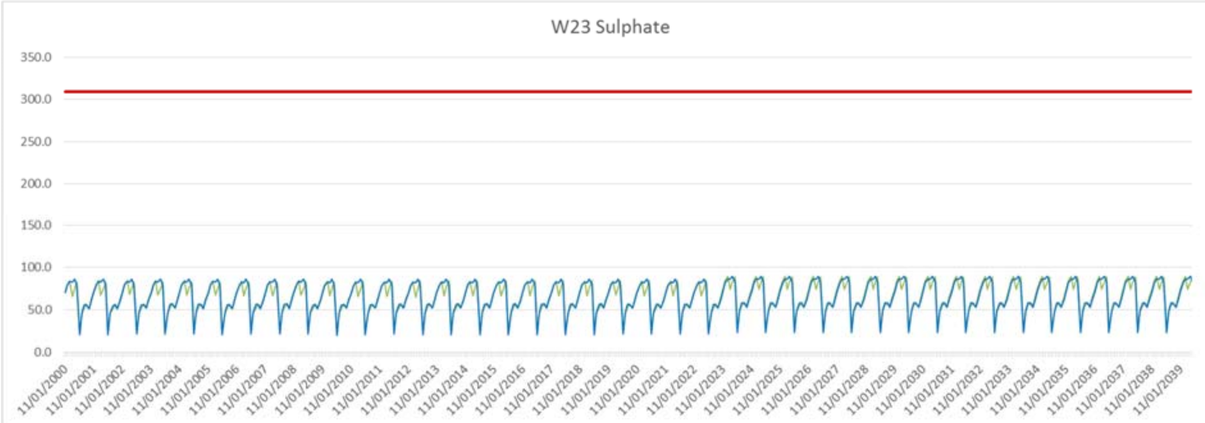


A.2-20: Time series of predicted uranium concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

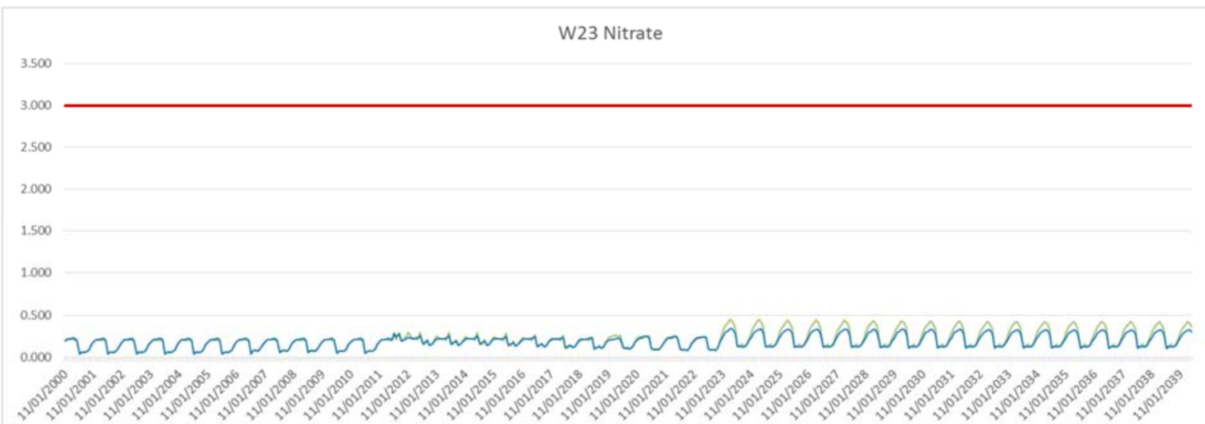


A.2-21: Time series of predicted zinc concentrations for W29. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

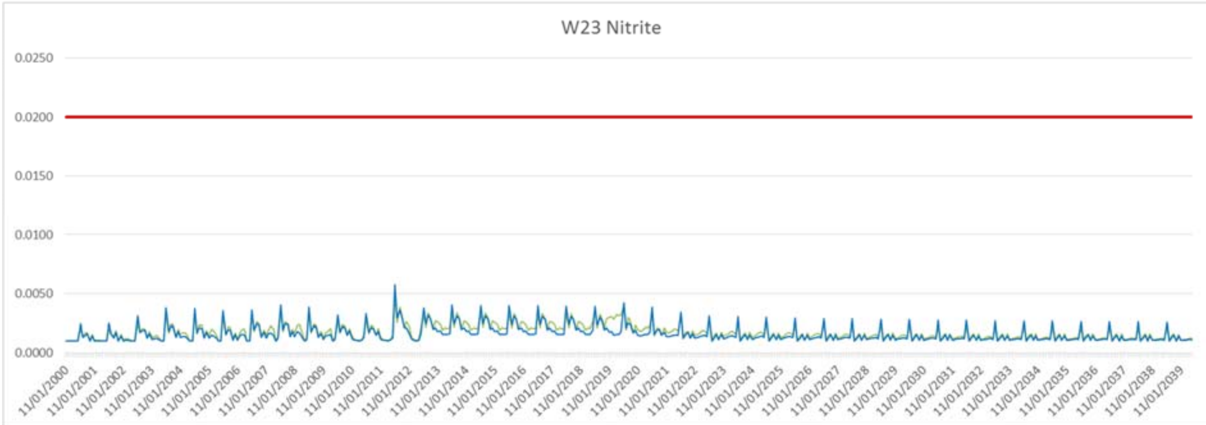
A.3. Haggart Creek below Lynx Creek (W23) – Water Quality Predictions



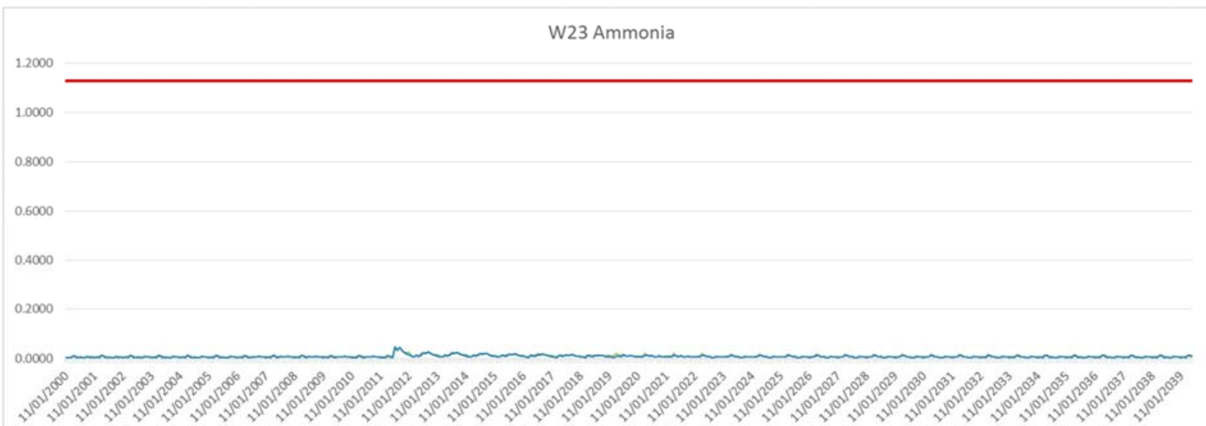
A.3-1: Time series of predicted sulphate concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



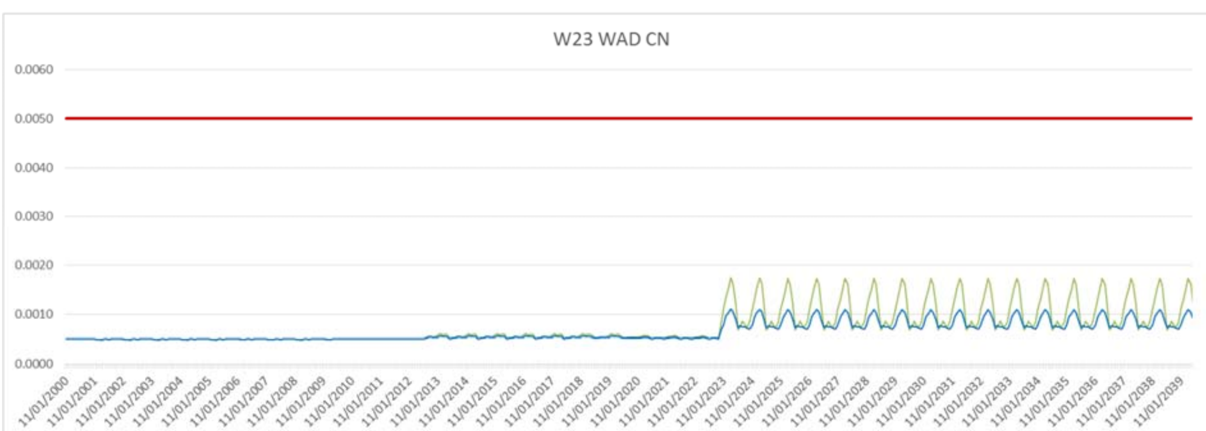
A.3-2: Time series of predicted nitrate concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



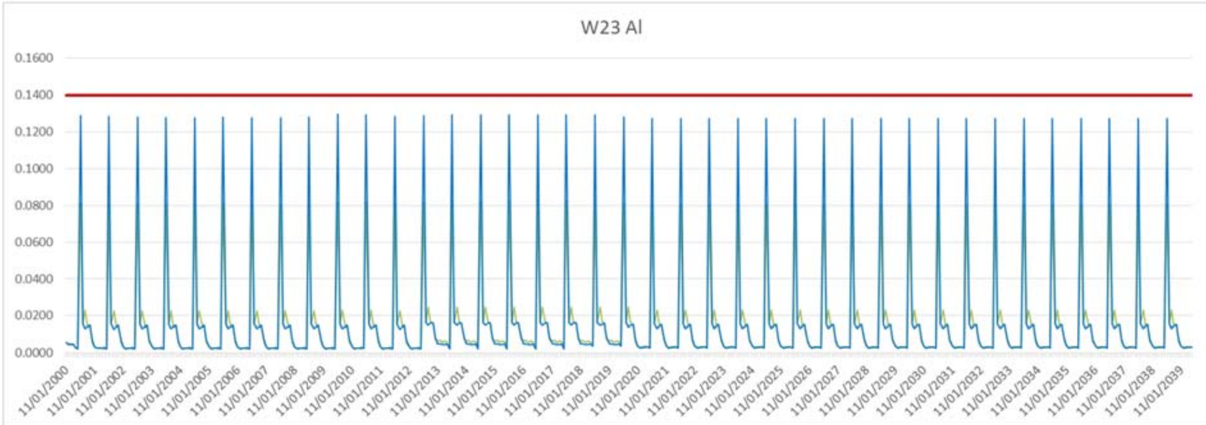
A.3-3: Time series of predicted nitrite concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



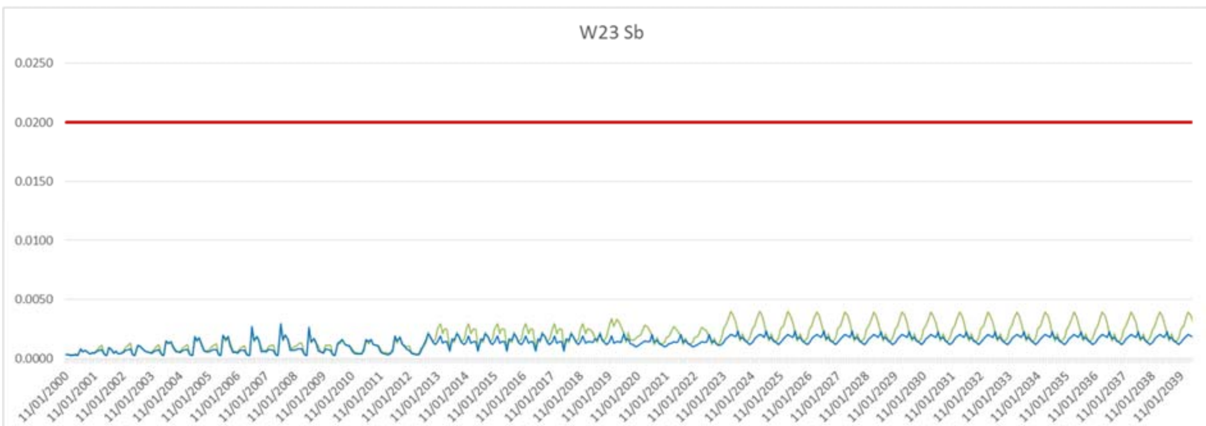
A.3-4: Time series of predicted ammonia concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



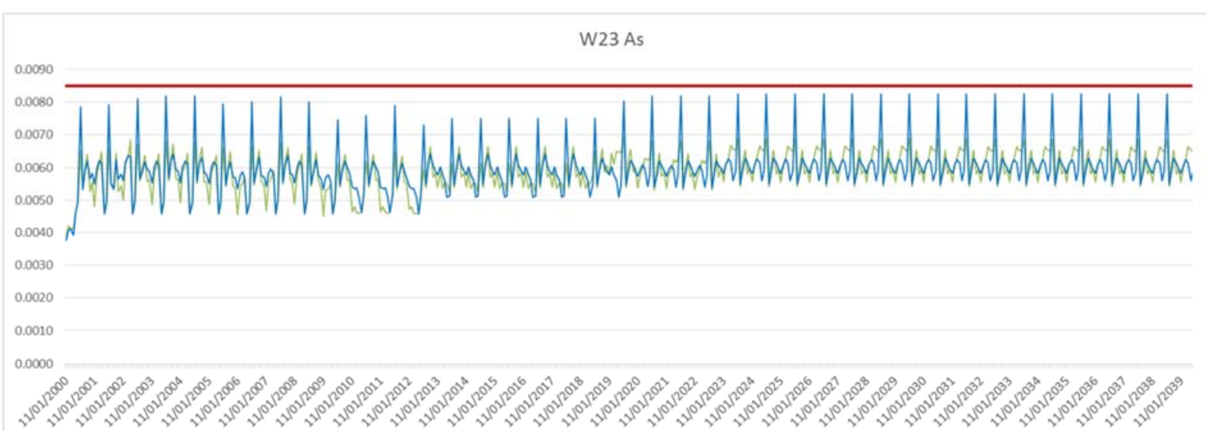
A.3-5: Time series of predicted WAD-CN concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



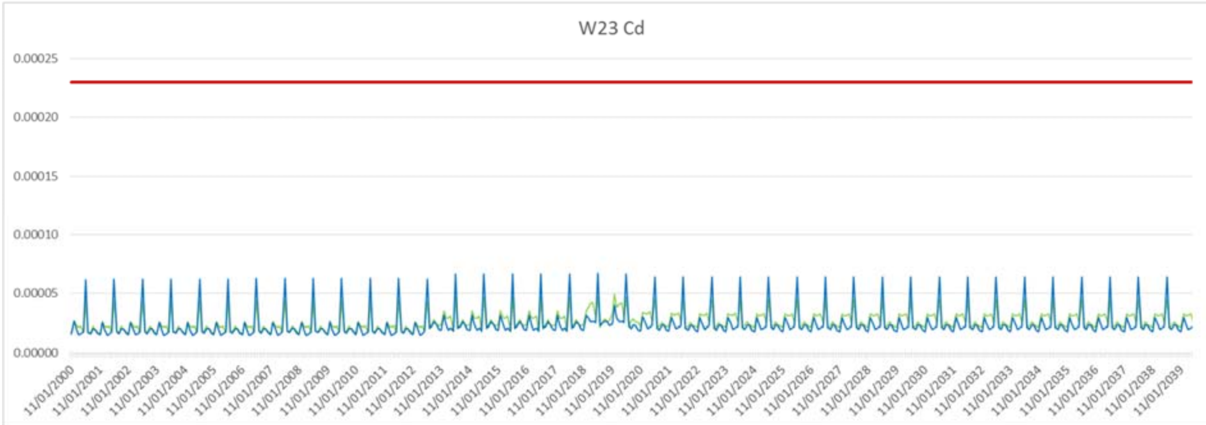
A.3-6: Time series of predicted aluminum concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



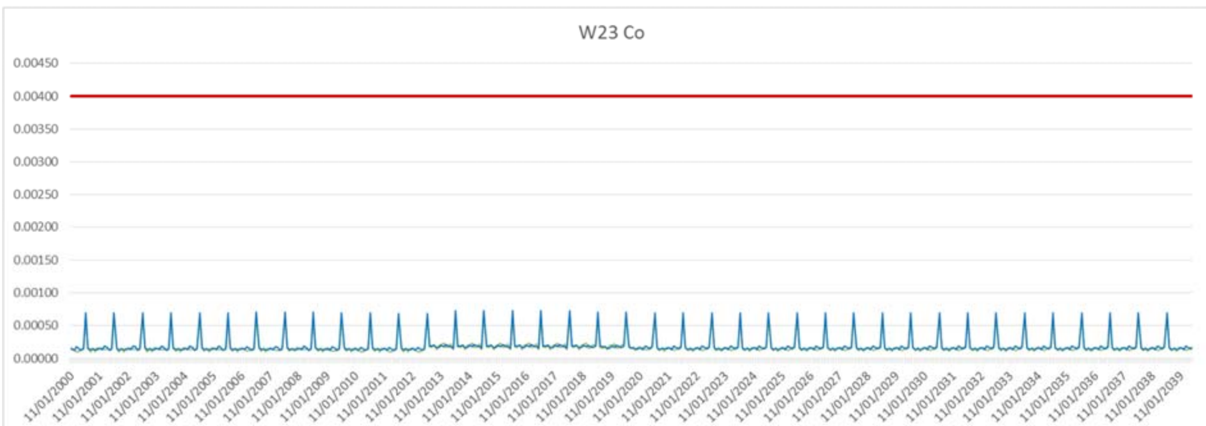
A.3-7: Time series of predicted antimony concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



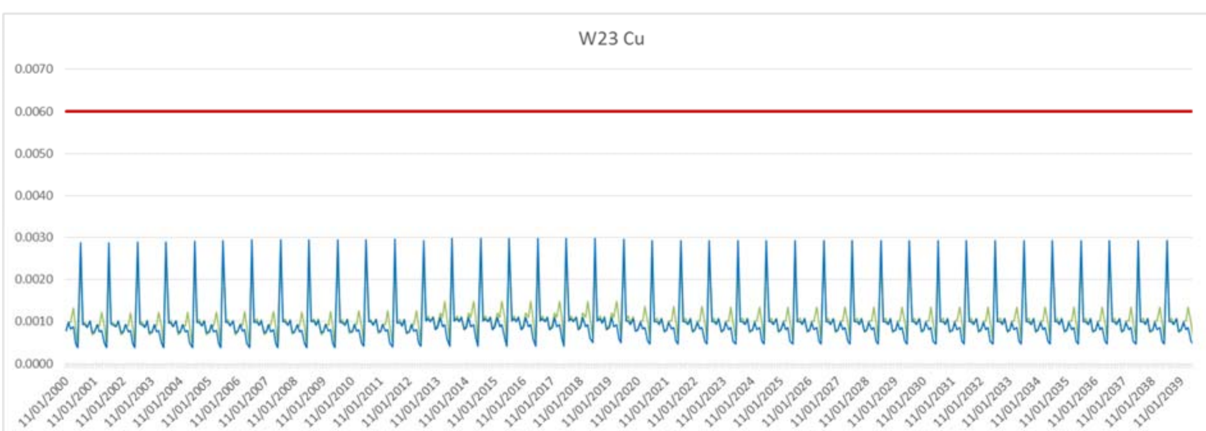
A.3-8: Time series of predicted arsenic concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



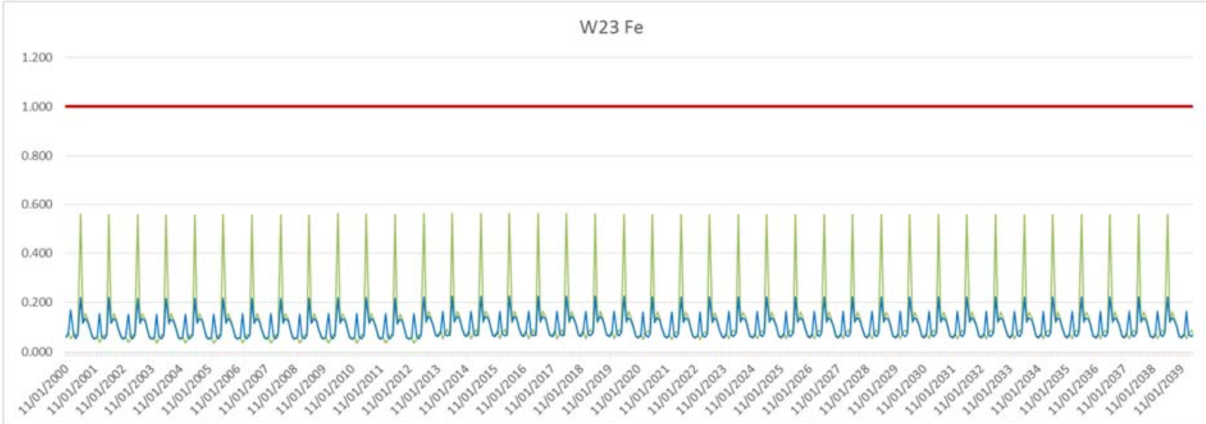
A.3-9: Time series of predicted cadmium concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



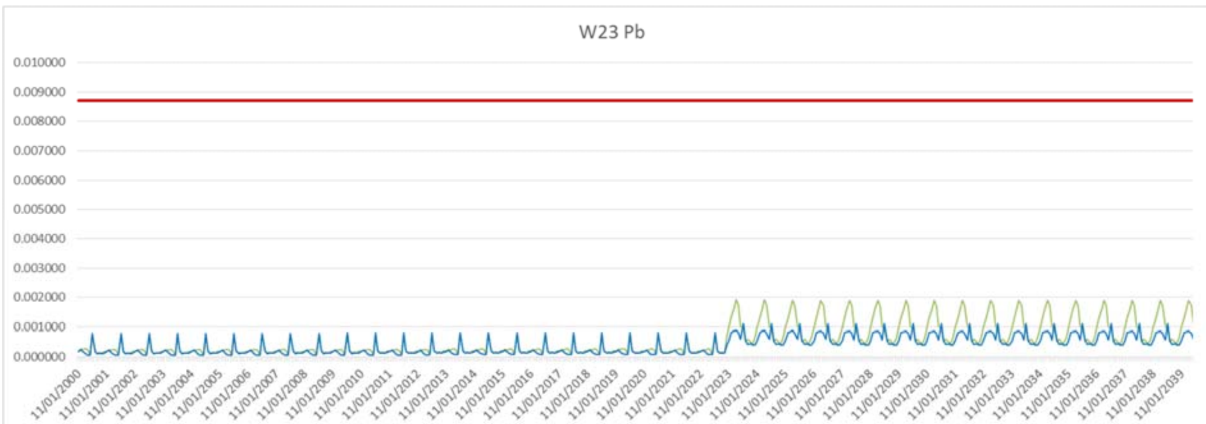
A.3-10: Time series of predicted cobalt concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



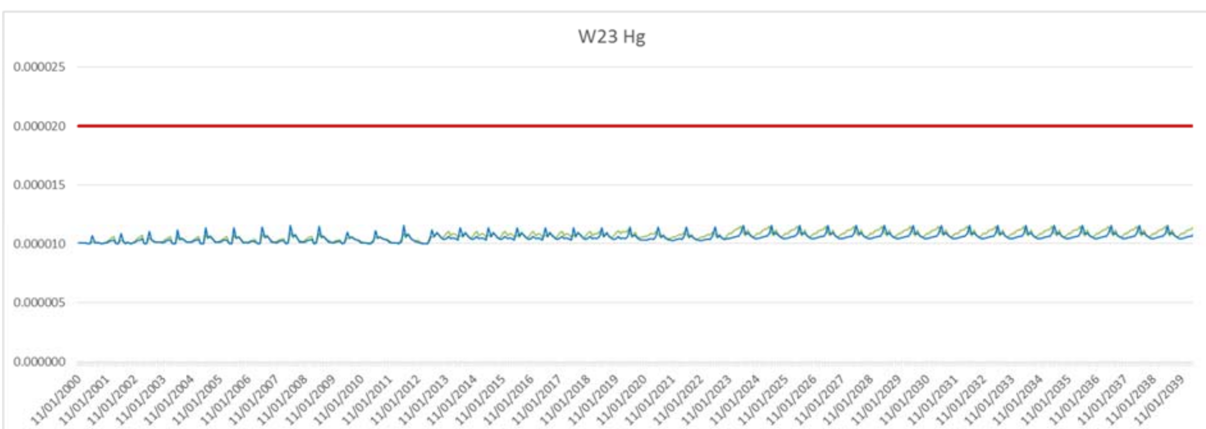
A.3-11: Time series of predicted copper concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



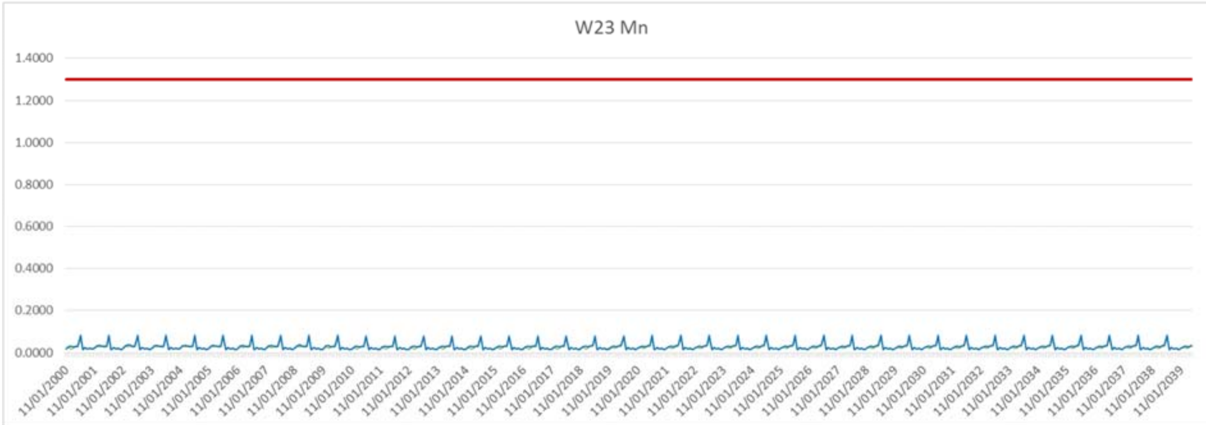
A.3-12: Time series of predicted iron concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



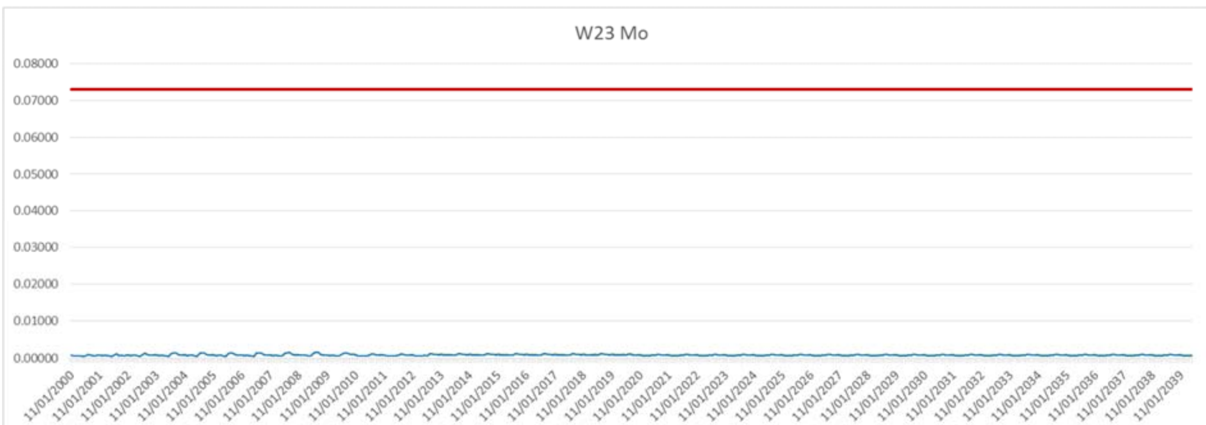
A.3-13: Time series of predicted lead concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



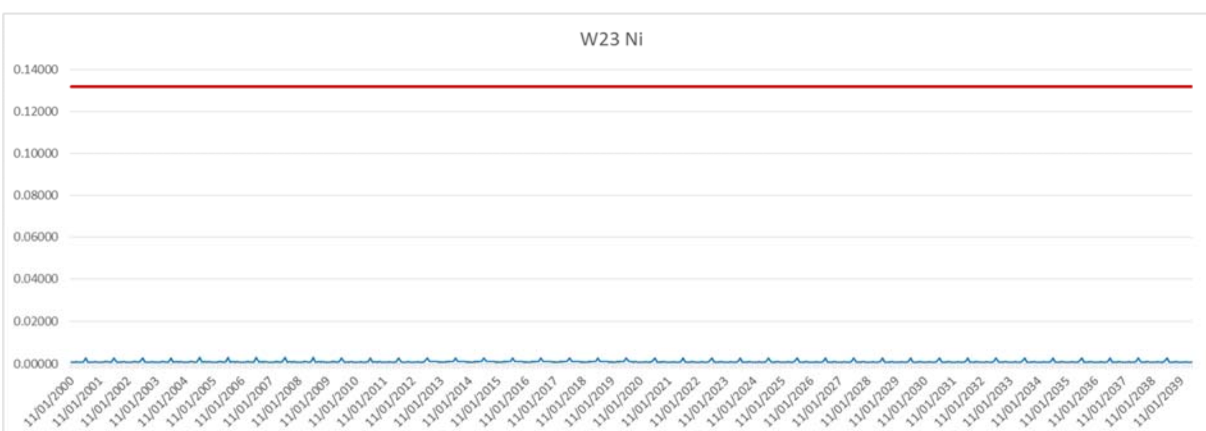
A.3-14: Time series of predicted mercury concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



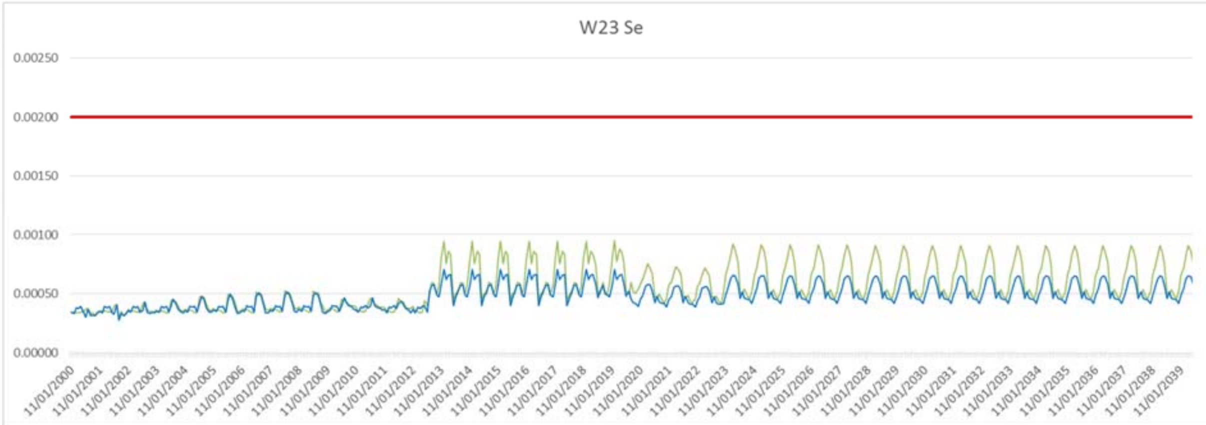
A.3-15: Time series of predicted manganese concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



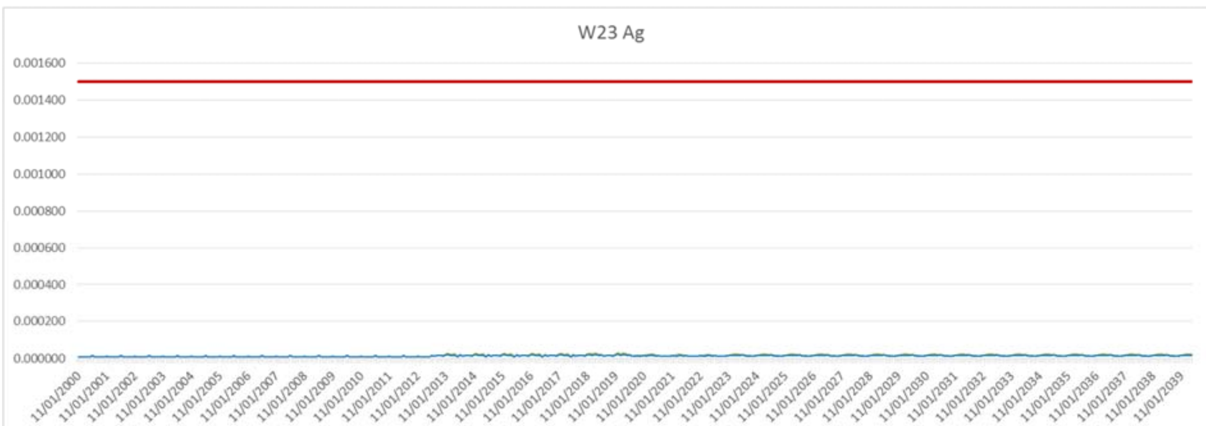
A.3-16: Time series of predicted molybdenum concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



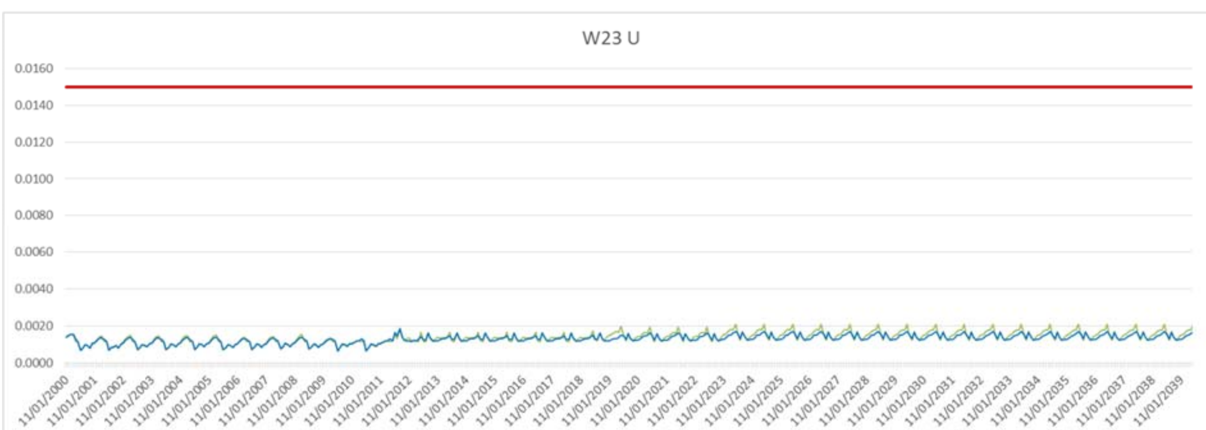
A.3-17: Time series of predicted nickel concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



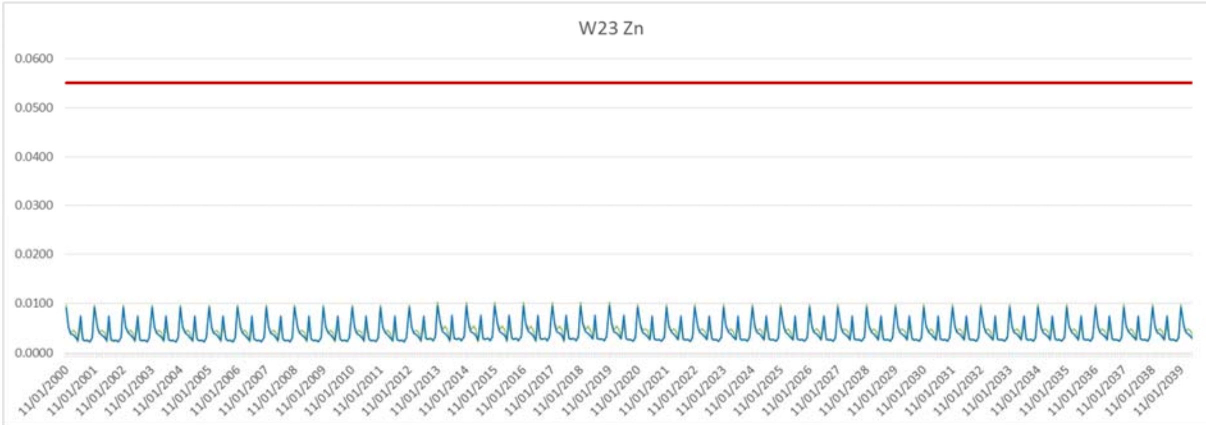
A.3-18: Time series of predicted selenium concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



A.3-19: Time series of predicted silver concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



A.3-20: Time series of predicted uranium concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.



A.3-21: Time series of predicted zinc concentrations for W23. The values from the 2014 WUL 2014 model are in green, and the updated 2017 values are in blue. Water Quality Objective is shown by red line.

Appendix B: Water Quality Model Output for all Parameters

Provided electronically

APPENDIX H

Eagle Gold Project Groundwater Quality Characterization Report

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EAGLE GOLD PROJECT

Groundwater Quality
Characterization Report

Issued for Use

Prepared for:

Victoria Gold Corp.
1050 West Pender Street
Suite 910
Vancouver, BC
Canada, V6E 3S7
Tel: +1 604-682-5122
Fax: +1 604-682-5232

Prepared by:

Core Geoscience Services Inc.
11 Dolly Varden Drive
Whitehorse, YT Y1A 6A1
(867) 334-8864
info@coregeo.ca

In collaboration with:
Watterson Geoscience Inc.

Document Release Date:

January 20, 2017

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1. Introduction

Core Geoscience Services Inc. (Coregeo) in collaboration with Watterson Geoscience Inc. (WGI) were retained by Victoria Gold DBA StrataGold Corporation (Victoria) to characterize background Groundwater Quality at the proposed Eagle Gold Mine as required by Clause 158 of Victoria's Water License QZ14-041. This Clause reads as follows:

> "The Licensee shall carryout [sic] and submit to the Board, 30 days prior to the start of the Development Phase of the Project, the results of a comprehensive characterization of background groundwater quality. The characterization shall be based on Yukon Environment (2002) *Protocol for Contaminated Sites Regulation under the Environment Act Protocol No. 10: Determining Background Groundwater Quality.*

The following pertinent documents were reviewed for this groundwater quality characterization work:

Table 1: Documents Reviewed

Document Name	Author	Published/Issued Date
Eagle Gold Project - Environmental Baseline Data Report: Hydrogeology 2011 - 2012 Update, Final Report	Stantec Consulting Ltd.	June, 2012
Eagle Gold Project - 2012 Groundwater Data Report	BGC Engineering Inc.	July 7, 2013
Victoria Gold Corporation - Eagle Gold Project - Numerical Hydrogeological Model, Final	BGC Engineering Inc.	April 17, 2014
Guidance on the Site-Specific Application of Water Quality Guidelines in Canada: Procedures for Deriving Numerical Water Quality Objectives	Canadian Council of Ministers of the Environment	2003
Protocol For The Contaminated Sites Regulation Under The Environmental Act: Protocol No. 10: Determining Background Groundwater Quality	Yukon Environment	March 1, 2011
Reasons For Decision - Water Use Licence: #QZ14-041	Yukon Water Board	December 3, 2015
Type A Water Licence for Quartz Mining: #QZ14-041	Yukon Water Board	December 3, 2015

No site visit was conducted by Coregeo or WGI, as this was a statistical desktop study. WGI met with Victoria at Victoria's corporate office to discuss Yukon Water Board requirements, reporting needs, receive digital data files and to gain site and sampling knowledge.

1.2 PROPERTY DESCRIPTION

The project licensed under QZ14-041 is the Eagle Gold Project (Project), which is a proposed open pit gold mine within the Dublin Gulch Watershed in north-central Yukon. Victoria Gold Corp.'s Dublin Gulch property is located in the Mayo Mining District, central Yukon, approximately 45 kilometers north of Mayo and 370 kilometers due north of Whitehorse. The proposed Eagle gold mine will produce ore from a conventional open pit operation with a three-stage crushing plant, in-valley heap leach and carbon-in-leach adsorption-desorption gold recovery plant.

The Project is situated within the Mayo Lake-Ross River Ecoregion, which encompasses the Stewart, MacMillan, and Pelly plateaus, a physiographic subdivision of the Yukon Plateau. Terrain consists of rolling upland plateaus and small mountain groups with nearly level tablelands dissected by deeply cut, broad U-shaped valleys (Stantec, 2012).

The Project study area includes Eagle Pup, Suttles and Platinum Gulches, which drain to Haggart Creek via Eagle Creek, and the Bawn Boy, Cascallen, Olive, Stewart, and Ann Gulches, which drain to Haggart Creek via Dublin Gulch. Haggart Creek drains to the South McQuesten River, which is a tributary of the Yukon River via the Stewart River.

More detailed descriptions of the geological, geographical and hydrogeological settings are provided by Stantec (2012) and BGC (2013). A map adapted from Stantec 2012 showing the various basins and drainages along with groundwater monitoring well locations within the Project study area is included as Figure 1.

1.3 STUDY RATIONALE

The rationale for the Clause 158 requirement is provided in the Reasons for Decision document (Yukon Water Board, 2015). In this document, the Yukon Water Board cites Yukon Government's intervention, which recommended a licence clause requiring the completion of a thorough characterization of background groundwater quality at the site prior to construction.

Yukon Government stated that the qualitative analyses presented by StrataGold during the licensing process indicated apparent variations in water quality by drainage basin and recommended that a determination of statistical difference between drainage basins be conducted now to help at some future time to “differentiate between [potential] mine impacts and the natural variations in the background.”. Therefore, Yukon Government recommended using statistical background analysis methodology presented in the Contaminated Sites Regulation Protocol No. 10 to complete this work.

1.4 Protocol No. 10 and Background Concentration Calculations

Protocol No. 10 provides the following specific guidance for calculating statistical background concentrations as follows:

> "Where the data collected from the background monitoring wells fall within a single statistical population, the representative local background concentration is the 95th percentile of the data set. Where data variability is large and the data do not fall within a single population, conservative estimates should be used to determine local background concentration, or additional background wells should be installed and sampled to increase the size of the data set."

Among other definitions, Protocol 10 defines background concentration as follows:

> *"Background concentration" means the concentration of a substance in an environmental medium in a geographic area, not including any contribution from local human-made point sources of contamination.*

Significant historical groundwater quality characterization work has been completed at the site. The groundwater resources described in Stantec (2012) include a description of baseline groundwater conditions at the site, with comparisons to Yukon Contaminated Sites Regulation – Aquatic Water (CSR AW) standards.

It should be noted that although some placer mining activities have taken place within the lower reaches of Dublin Gulch and Eagle Creek (Stantec, 2012) and mining exploration activities have been conducted at the site, these activities are unlikely to have affected the natural background groundwater quality. Further, we are not aware of any other significant human caused incidents (e.g. major spills) recorded within the Eagle Gold project area that would be expected to affect groundwater.

Importantly, Stantec (2011) and BGC (2013) concluded that elevated concentrations above the CSR AW standards and the Canadian Council of Ministers of the Environment – Fresh Water (CCME FW)] guidelines do not imply that the groundwater at the site has been affected by anthropogenic activities, but that background concentrations of these parameters at the Project site are higher than typically found in unaffected groundwater at other sites in Canada and are merely reflective of natural site conditions.

Therefore, the lack of significant on-site mining disturbances and no evidence of local human-made point sources of contamination indicate that observed elevated concentrations result from naturally occurring baseline groundwater conditions. Because of this, all groundwater monitoring data analyzed in this study represents "background concentrations" as it is assumed to not include any "contribution from local human-made point sources of contamination".

The Stantec (2012) and BGC (2013) studies also identified natural variability in parameter concentration (subpopulations) at the site. Particular attention was given to evaluating various geographic areas (drainage gulches or basins), seasonality and geological unit in which the well was completed.

Stantec (2012) stated that laboratory analytical results for select dissolved metal parameters (i.e., aluminum, arsenic, cadmium, chromium, copper, iron, lead, selenium, silver, strontium, uranium, and zinc) "exhibit no discernible seasonal trends or variations". Similarly, BGC (2013) provided piper plots that showed that "groundwater quality through the sub-basins stays fairly consistent throughout the year without significant differences in groundwater composition between the summer and winter conditions."

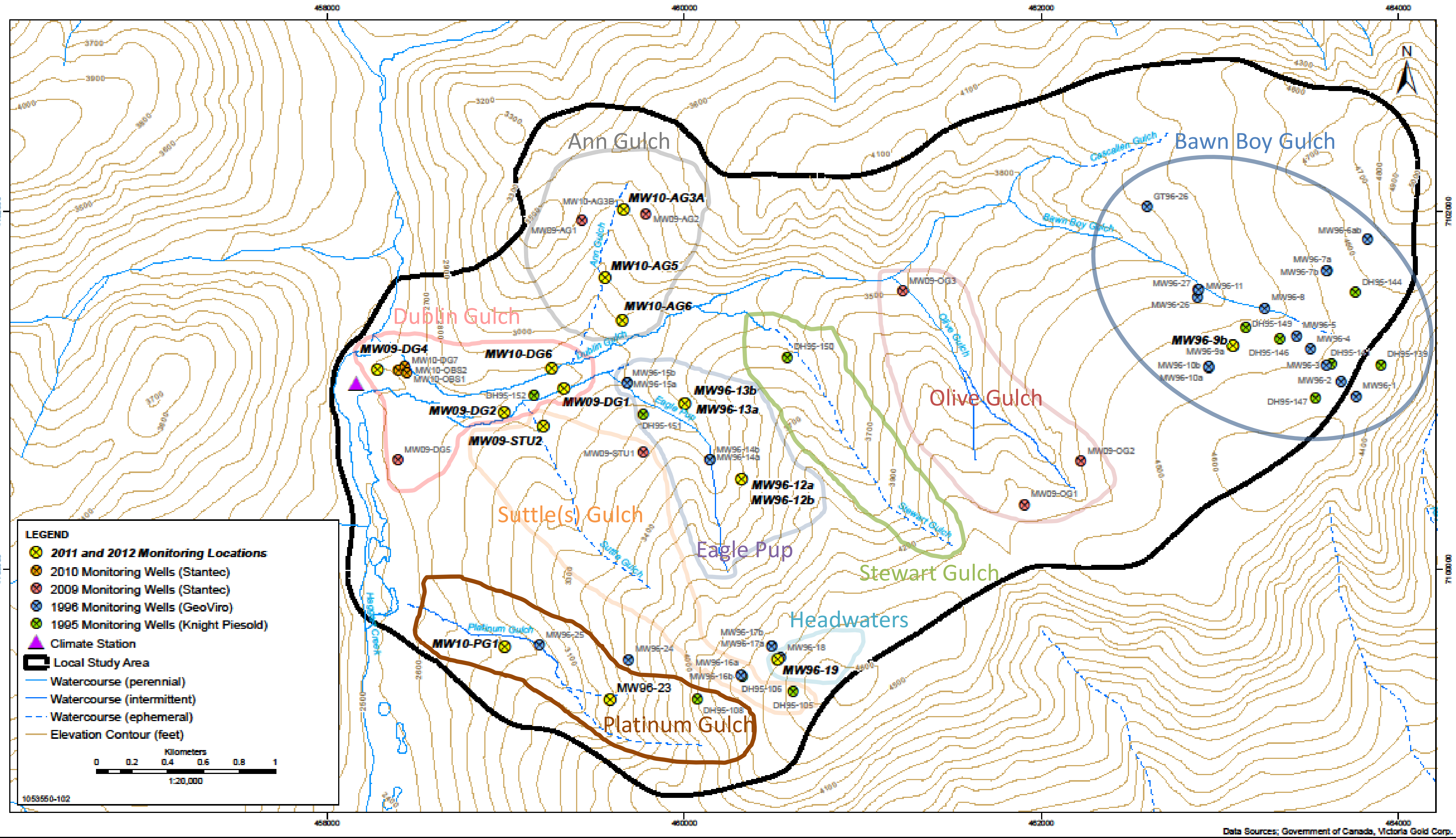
With respect to geology, Stantec (2012) observed that "no apparent correlation was identified between bedrock geological units and metals concentrations that either exceeded the CSR AW standard or were below the CSR AW standards."

2. METHODOLOGY

2.1 GENERAL STUDY APPROACH

As discussed above, potential variations due to seasonality and by bedrock geological units were not discernible by Stantec (2012) or BGC (2012). For these reasons, this study focused on presenting statistical comparisons between drainage gulch or basin sub-groups and presents 95th percentile data on the groundwater data population as a whole. Stantec's and BGC's discussion and detailed analyses focused on parameters that exceeded Canadian Council of Ministers of the Environment – Freshwater Aquatic Life (CCME-FAL) or CSR AW. The parameters identified in Stantec (2012) and BGC (2012) included fluoride, arsenic, aluminum, chromium, cadmium, copper, lead, mercury, iron, selenium, iron, silver and uranium are highlighted and discussed in additional detail in this report. Statistics for all remaining lab-reported parameters have also been calculated and are presented in the appendices.

Consistent with Stantec (2012), the groundwater monitoring wells and associated water quality data were grouped according to the drainage sub-basins in which they are located (Figure 1).



Stantec
4370 Dominion Street
Burnaby, British Columbia
V5G 4L7
Tel. (604) 436 3014
Fax. (604) 436 3752

Victoria GOLD CORP

Figure: 1
EAGLE GOLD MONITORING WELL LOCATION MAP
EAGLE GOLD PROPERTY
YUKON TERRITORY

Note: Not every well shown on this map was sampled for this report

PROJECTION: UTM - ZONE 8	DRAWN BY: RS
DATUM: NAD 83	CHECKED BY: TL
DATE: 05-JUN-12	FIGURE NO. 1

All data and documents were provided by Victoria to Watterson Geoscience Inc. and/or Core Geoscience Services Inc. in a digital (Microsoft Excel) format. Twenty-eight (28) files were compiled into a master data file from which 213 groundwater samples from 36 wells collected between 1995 and 2016 were identified. ALS Laboratories conducted all analyses on samples collected between 2009 and 2016, while the analytical laboratory that conducted the 1995-1996 analyses could not be determined from the information provided. The raw groundwater quality data sources used in this study are summarized in Table 2:

Table 2: Eagle Gold Groundwater Characterization Data Sources

File Name	Number of Groundwater Samples	Date of Report Issuance	Analytical Laboratory
app_b_tables B-1 to B-3	32	Various 1995-1996	Unknown
L798225_XLR	6	2009-07-28	ALS Laboratory Group
L815386_XLR	4	2009-09-18	ALS Laboratory Group
L812430_XLR	12	2009-09-24	ALS Laboratory Group
L829307_XLR	8	2009-10-26	ALS Laboratory Group
L923152_XLR	11	2010-09-02	ALS Laboratory Group
L946390_XLR	10	2010-11-03	ALS Laboratory Group
L1008190_XLR	11	2011-06-03	ALS Laboratory Group
L1016937_XLR	9	2011-06-13	ALS Laboratory Group
L1048234_XLR	10	2011-08-22	ALS Laboratory Group
L1073407_XLR	9	2011-11-01	ALS Laboratory Group
L1086893_XLR	8	2011-12-06	ALS Laboratory Group
L1094446_XLR	9	2011-12-10	ALS Laboratory Group
L1108531_XLR	4	2012-02-13	ALS Laboratory Group
L1125898_XLR	8	2012-03-23	ALS Laboratory Group
L1127086_XLR	1	2012-03-27	ALS Laboratory Group
L1144418_XLR	7	2012-05-23	ALS Laboratory Group
L1195890_XLR	8	2012-08-17	ALS Laboratory Group
L1226369_XLR	8	2012-10-19	ALS Laboratory Group
L1274727_XLR	7	2013-03-04	ALS Laboratory Group
L1306318_XLR	3	2013-06-04	ALS Laboratory Group
L1453356_XLR	4	2014-05-28	ALS Laboratory Group
L1499179_XLR	3	2014-08-27	ALS Laboratory Group
L1535070_XLR	6	2014-10-30	ALS Laboratory Group
L1339478_XLR	5	2015-02-05	ALS Laboratory Group
L1380836_XLR	6	2015-02-05	ALS Laboratory Group
L1341520_XLR	2	2015-02-05	ALS Laboratory Group
L1799287_XLR	2	2016-07-29	ALS Laboratory Group
Total	**213**		

The distribution of sampling events by sub-basin and each sub-basin's representation as a total of the complete data set are shown in Table 3. The Dublin Gulch sub-basin, which is fed by all site sub-basins except for Platinum Gulch, has the greatest representation at just over 30% of the data, followed by Ann Gulch at 20.2%, Eagle Pup at 14.6%, Platinum Gulch at 12.7%, and all other sub-basins at less than 10% of the total number of samples. The data distribution is spatially and quantitatively (temporally) representative of the major project site infrastructure development areas (e.g. open pit, heap leach facility) and is representative of upgradient and downgradient groundwater quality in the proposed project areas.

Table 3: Data Representation by Drainage Areas

Sub-basin	**Number of Sample Events from Basin in to Master Dataset**	**Master Dataset Representation (%)**
Ann Gulch	43 of 213	20.2%
Bawn Boy Gulch	20 of 213	9.4%
Dublin Gulch	64 of 213	30.1%
Eagle Pup	31 of 213	14.6%
Headwaters	2 of 213	0.9%
Olive Gulch	6 of 213	2.6%
Platinum Gulch	27 of 213	12.7%
Stewart Gulch	4 of 213	1.7%
Suttles Gulch	16 of 213	7.5%
Total	**213 of 213**	**100%**

Table 4 shows the distribution of sample events by Well ID and the relative percentage of samples from each well as a percentage of the complete data set. No data from any well comprises more than 10% of the entire data set. Wells with the greatest representation were MW09-DG4 at 9.9%, MW96-13A at 9.4%, MW10-AG3A at 8%, MW10-PG1 at 8%, MW09-DG2 at 7%, MW10-DG6 at 6.6%, MW10-AG5 and MW10-AG6 at 6.1% and all remaining wells with less than 5% of the total (213) samples.

Table 4: Data Representation by Well Identification (ID)

Well ID	Sub-basin	Number of Samples	Percentage of Total
MW10-AG3A	Ann Gulch	17	8.0%
MW10-AG5	Ann Gulch	13	6.1%
MW10-AG6	Ann Gulch	13	6.1%
DH95-138	Bawn Boy Gulch	1	0.5%
DH95-139	Bawn Boy Gulch	3	1.4%
DH95-141	Bawn Boy Gulch	4	1.9%
DH95-148	Bawn Boy Gulch	1	0.5%
DH95-149	Bawn Boy Gulch	2	0.9%
MW96-1	Bawn Boy Gulch	2	0.9%
MW96-26	Bawn Boy Gulch	2	0.9%
MW96-8	Bawn Boy Gulch	3	1.4%
MW96-9B	Bawn Boy Gulch	2	0.9%
DH95-152	Dublin Gulch	6	2.8%
MW09-DG1	Dublin Gulch	5	2.3%
MW09-DG2	Dublin Gulch	15	7.0%
MW09-DG4	Dublin Gulch	21	9.9%
MW09-DG5	Dublin Gulch	1	0.5%
MW10-DG6	Dublin Gulch	14	6.6%
MW10-DG7	Dublin Gulch	2	0.9%
MW96-12A	Eagle Pup	1	0.5%
MW96-13A	Eagle Pup	20	9.4%
MW96-13B	Eagle Pup	3	1.4%
MW96-15A	Eagle Pup	4	1.9%
MW96-15B	Eagle Pup	3	1.4%
MW96-18	Headwaters	1	0.5%
MW96-19	Headwaters	1	0.5%
MW09-OG2	Olive Gulch	3	1.4%
MW09-OG3	Olive Gulch	3	1.4%
DH95-108	Platinum Gulch	1	0.5%
MW10-PG1	Platinum Gulch	17	8.0%
MW96-23	Platinum Gulch	9	4.2%
DH95-150	Stewart Gulch	4	1.9%
DH95-105	Suttles Gulch	3	1.4%
DH95-106	Suttles Gulch	5	2.3%
DH95-151	Suttles Gulch	3	1.4%
MW09-STU2	Suttles Gulch	5	2.3%
	Total	**213**	**100.0%**

2.2 DATA COMPILATION

Overall, data files provided to Coregeo and WGI for compilation into a master dataset for statistical analyses were relatively free of errors, with only a minor number of erroneous or mislabelled entries.

The following steps were used to compile and harmonize the various data files into a master composite data file suitable for statistical analysis:

1. Apparent duplicate data files with different names (e.g. L1453356_XLR and L1453356_XLR_GW) were present in some folders. These files were examined but appeared to contain identical content and were identical in size. In cases where these apparent duplicate files existed, the simpler file name (no …_GW affix) was selected and imported into the master database.
2. All quality assurance and quality control (QA/QC) data were removed prior to compositing and entering the data into the master database (for example duplicates, blanks and other non-groundwater sample entries such as permafrost and surface water). Samples identified as “FB” were interpreted as field blanks and samples identified as “DB” or “BD” were interpreted as blind duplicates and were removed from the database.
3. The data column “Nitrate and Nitrite (as N)” found within the 2016 data file “L1799287_XLR” was not presented within the master database. This measurement appeared to be a simple addition of the Nitrate and Nitrite columns. As only two occurrences for “Nitrate and Nitrite (as N)” existed within the entire dataset, and these parameters were not identified in Stantec (2012) and BGC (2012), these points were removed.
4. The well identification key and notes provided within the file “2009 to 2012 Raw Chemistry Data Delivery Info Sheet” and “2011 and 2012 Raw Chemistry Data Delivery Info Sheet” were used to harmonize well Identifications (IDs) within the master database.
5. Small naming discrepancies such as MW09-DG1 vs MW09-DG-1 were interpreted to be the same well and were harmonized with the most common naming scheme that occurred within the dataset.
6. Major naming discrepancies were interpreted and corrected. Monitoring well MW46-23 (a single instance reported but not present on the project map) was corrected to MW96-23. Well GS96-26 was interpreted and corrected to MW96-26. Data reported as MW09-DG06 was corrected to MW10-DG6.
7. A number of wells were reported where a nested well existed but without an affix (e.g. MW96-9 was reported where MW96-9A and MW96-9B exists). Notes provided in the file “2009 to 2012 Raw Chemistry Data Delivery Info Sheet” and “2011 and 2012 Raw Chemistry Data Delivery Info Sheet” were used to identify where the sample was

collected. In some cases, where it was not possible to identify the sample location from the well number, the water chemistry parameters values were examined for similarities and allocated to the appropriate well.

8. A single sample from file “L1195890_XLR” with the well ID of SG2 could not be identified as a groundwater sample and was not included within the master database.

2.3 Data Preparation

The following data preparation steps were performed on the raw compiled database prior to data analysis:

1. All data was converted to number format, as many data cells were stored as text format.
2. All cell notes were deleted.
3. All cell formatting was cleared.
4. Headers rows were consolidated into a single header and abbreviated to include units.
5. All non-zero blank cells were deleted, i.e. entries that contained “—“ and “ ’ ”.
6. Other obvious random non-numerical data errors were corrected, such as double decimals (e.g. 8..06 was corrected to 8.06).
7. All values below method detection limit (MDL) were converted to ½ of the detection limit value in accordance with standard industry practice.
8. All values above method detection limit (i.e. turbidity, at >4000 NTU) were converted to the detection limit value (4000 NTU).

In conclusion, the steps taken during the data correction and compilation process were meant to maintain the integrity of the raw data while removing inherited errors and formatting issues that could compromise the data analysis. Except for rare specific instances described in the above notes where data were modified or removed, all raw groundwater water quality data were incorporated into the master database without modification.

The quality and character of the data (defined in terms of spatial coverage, multiple sampling events over a range of seasons and times of the year, consistency in sampling technique and analytical laboratory) provided by Victoria for this study meets or exceeds the requirements established in Protocol No. 10, where applicable.

As a final step, prior to conducting the statistical analysis, a simple data integrity test was conducted on the compiled master database. The following steps were completed to verify the quality and accuracy of the data and that no errors were made during data translation, transposing and correction.

1. The compiled database was copied into a blank spreadsheet.
2. All headers were removed, leaving an X-Y data matrix.

3. X and Y coordinates were generated using a random number generator to identify locations to check data integrity.
4. The generated X-Y coordinates values were compared to the raw data file values, and confirmed if they were same or not.

Twenty-five (25) randomly generated entries were crosschecked for the entire compiled master dataset, and five (5) additional entries were checked from the 1995-1996 dataset as these entries required additional data manipulation during the compilation stages. All 30 crosschecked data cells were confirmed to be the same within the master compiled database when compared to the original data files, verifying the integrity of the database.

As noted above, in accordance with standard industry practice, values reported below method detection limit (MDL) were converted to ½ of the MDL. Laboratory analytical methods and increasingly sensitive equipment have resulted in lower detection limits over the past decades. Given the temporal range of data available (1995-2016), the potential for bias because of significantly disparate MDLs was examined. The MDLs for all highlighted parameters were reviewed at three intervals from oldest to most recent (1995-1996, 2009, and 2016). These three MDLs intervals were examined because the 1995-1996 dataset was the oldest, the 2016 dataset was the most recent and 2009 was the first year of data provided that had raw laboratory files. As a point of reference, the CCME-FAL guidelines and Yukon CSR AW criteria are presented along with a calculated maximum absolute difference between MDLs in Table 5. The MDLs are consistent over the data range with only a few parameters (selenium, mercury, chromium, and cadmium) reporting lower MDL in the most recent (2016) dataset. Comparing the maximum absolute difference with the applicable regulatory guidelines and criteria shows that all highlighted parameters' MDLs maximum differences are consistently smaller than or fall within the guideline or criteria range (cadmium), except for mercury. The exception for mercury is the result of the improved laboratory MDLs over the recent years and in this case for the 2016 sampling program. For this study, values reported as less than the MDL were adjusted to half of the detection limit's value.

Table 5: Highlighted Parameter Method Detection Limits - Comparison with Regulatory Guidelines/Criteria and Maximum Absolute Differences

Exceedance Parameter (mg/L)	Analyses Parameter	1995 -1996 * Lower MDL (mg/L)	2009 Lower MDL (mg/L)	2016 Lower MDL (mg/L)	Maximum Absolute Difference (mg/L)	CCME FAL[1] (mg/L)	Yukon CSR AW [2] (mg/L)
Aluminum	Total Metal	0.003	0.001	0.0030	0.002	0.005-0.1 [3]	NA
Arsenic	Total Metal	0.0001	0.0001	0.00010	0.0000	0.00500	0.05000
Cadmium	Total Metal	0.000017	0.000017	0.0000050	0.000012	0.0000006 - 0.000240 [4]	0.0001 - 0.0006 [5]
Chromium	Total Metal	0.0005	0.0005	0.00010	0.0004	0.0089 [6]	0.09 [7]
Copper	Total Metal	0.0005	0.0001	0.00050	0.0004	0.002 - 0.017 [8]	0.02 - 0.09 [9]
Fluoride	General (Anion + Nutrient)	0.02	0.02	0.02	0.00	0.120	2.0 - 3.0 [10]
Iron	Total Metal	0.03	0.03	0.010	0.02	0.30000	NA
Lead	Total Metal	0.00005	0.00005	0.000050	0.0000	0.001 - 0.060 [11]	0.04 - 0.16 [12]
Mercury	Total Metal	0.00001	0.00005	0.0000050	0.000045	0.000026	0.001
Selenium	Total Metal	0.001	0.001	0.000050	0.00095	0.001	0.01
Silver	Total Metal	0.00001	0.00001	0.000010	0.0000	0.0001	0.0005 - 0.015 [13]
Uranium	Total Metal	0.00001	0.00001	0.000010	0.0000	0.015	3
Zinc	Total Metal	0.003	0.0010	0.0030	0.0020	0.03	0.075 - 2.4 [14]

** 1995-1996 raw files not provided. MDLs were adopted from working files provided*

CCME FAL and Yukon CRS AW values and notes adapted from Eagle Gold Project - Environmental Baseline Data Report: Hydrogeology 2011 - 2012 Update, Final Report, Stantec, 2012

***See Appendix E (Groundwater Exceedance Parameters Chemistry Notes) for numerical superscript note references. These notes describe acronyms and variable guideline/standard calculation equations.**

2.4 Data Analysis

Once the master data file was compiled as described, the data were statistically analyzed using ®XLStat, which is a suite of statistical add-ins for Microsoft Excel.

Among many other statistical analysis tools, ®XLStat offers five (5) methods for quantile computation. The empirical distribution function with averaging method, which was determined to be appropriate for this dataset was used, and is given by the following equation:

$$y = \frac{1}{2}\left(x_{(j)} + x_{(j+1)}\right) \text{ if } g = 0$$
$$y = x_{(j+1)} \text{ if } g > 0$$

where N items of quantitative data {x1, x2, … xN} are available, and:

y is the p-quantile
j is the integer part of N*p
g is the fractional part
g = N*p – j

Box plots, which provide a visual representation of the data's distribution and central tendencies, were produced for all parameters site-wide, and by sub-basin. Similarly, the 95th percentile and summary statistics were calculated for both site-wide and by sub-basin.

3. Results

3.1 Groundwater Data

The complete groundwater database (compiled as described in Section 2) including all reported parameters is presented in Appendix F.

3.2 Box Plots

Box plots for all highlighted parameters, which provide a visual representation of the data and facilitate comparison between sub-basin data and site-wide data, are provided as Figure 2. Box plots for all parameters calculated using all (site-wide) data are included as Appendix A. Box plots for all parameters calculated by sub-basin are included as Appendix B.

Figure 2: Boxplots for Highlighted Parameters

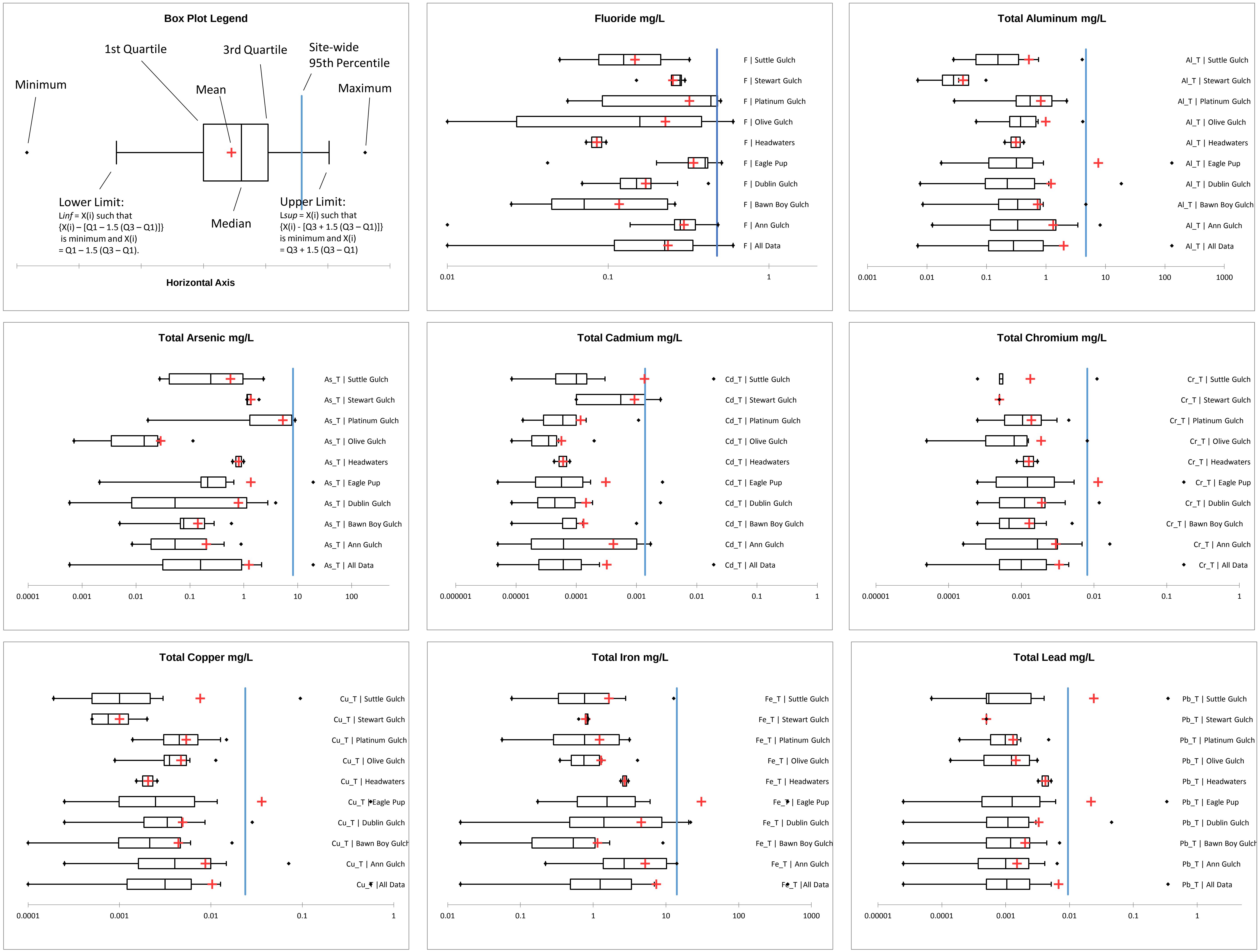
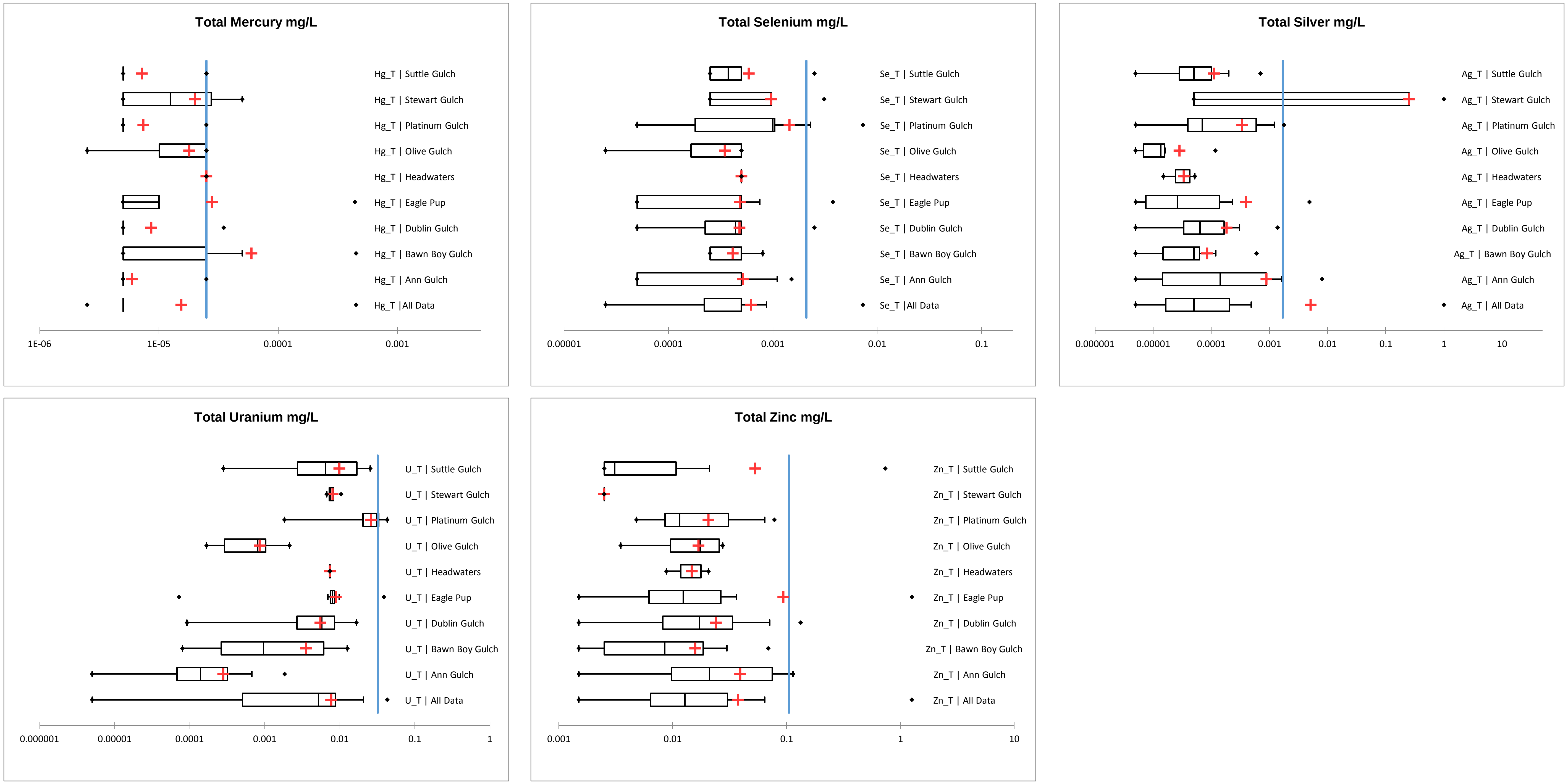


Figure 2: Boxplots for Highlighted Parameters (Continued)



The plots included in Figure 2 provide a visual comparison between statistical distributions of total concentration for the highlighted parameters within each sub-basin and the site-wide distribution, which is depicted in the bottom series of each plot. A box plot legend is provided as the first plot in Figure 2 and all units are in mg/L. Also shown on Figure 2 are the highlighted parameters' site-wide calculated 95th percentile (background) values, for comparison.

Most parameters show a strong positive skew and are not normally distributed. This is typical of environmental and geochemical data (e.g. Reimman and Filzmoser, 1999). While geochemical data are also not commonly lognormal (Reimman and Filzmoser, 1999), plotting the data on a logarithmic axis improves box plot interpretability. It is assumed that the 95th percentile measurement, which is specified by Protocol No. 10 for the determination of background concentration, was selected with the typical (non-normal) distribution of geochemical data in mind.

Very few parameters show a low degree of variability in central tendency between sub-basins as shown by the interquartile range (the range of values between the 25th percentile and 75th percentile). The most consistent interquartile range is shown by total lead, which varies and spans approximately an order of magnitude among sub-basins and has a site-wide interquartile range very similar to most sub-basins. For total lead, only Stewart Gulch (N=4) and Headwaters (N=2) have narrow interquartile ranges, which likely reflect the few data points available for these areas.

More commonly, a large degree of variation is seen within sub-basins for most parameters. Interquartile range width varies substantially by sub-basin, with the sub-basins with the largest interquartile range width typically larger than the site-wide interquartile range. For example, fluoride shows a broad interquartile range in Olive Gulch (N= 6) and arsenic has broad interquartile range in Dublin Gulch (N=64). The range of variability within each sub-basin is often independent of sample size. For example, the interquartile range for total cadmium in Stewart Gulch (N=4) is approximately twice as large as the interquartile range for total cadmium in Dublin Gulch (N=64).

Site-wide central tendencies and background concentrations provide a reasonable site-wide overview but have an obvious averaging effect on regional variation and extremes. As noted above, for a given parameter, the site-wide interquartile range is typically somewhat narrower than the maximum interquartile range for some of the sub-basins, and site-wide background concentration (i.e., the 95th percentile) is typically higher than the upper limit (the end mark on the box plot whisker as determined by the equation Lsup = X(i) such that {X(i) – [Q3+1.5 (Q3-Q1)]} is minimum and X(i) = Q3+1.5(Q3-Q1).The only exception to this is total silver in Stewart Gulch, which shows the interquartile range extending approximately two orders of magnitude above the site-wide background concentration, but not above the maxima.

Major variations between site-wide central tendencies and individual sub-basins are highlighted in the following examples:

- Total aluminum, which shows an interquartile range in Stewart Gulch approximately an order of magnitude lower than the site-wide range.
- Total arsenic, which shows an interquartile range approximately an order of magnitude lower than the site-wide range in Olive Gulch, and approximately an order of magnitude higher in Platinum Gulch than the site-wide range.
- Total cadmium, which shows an interquartile range approximately an order of magnitude higher in Stewart Gulch than the site-wide range, and a broader interquartile range that spans to approximately an order of magnitude higher than the site-wide range.
- Total copper, which shows an interquartile range of approximately an order of magnitude lower in Suttles and Stewart Gulch than the site-wide range.
- Total silver, which shows an interquartile range in Stewart Gulch extending approximately three orders of magnitude higher than the site-wide interquartile range.
- Total uranium, which shows an interquartile range of approximately an order of magnitude lower than the site-wide range in Ann Gulch and approximately an order of magnitude higher in Platinum Gulch than the site-wide range.

This variability between sub-basins suggests caution in applying the site-wide backgrounds to specific areas, which may show substantial variation in local groundwater quality. Especially for the above noted variation from the site-wide tendencies, application of site-wide background concentrations is unlikely to be representative of the uniquely higher or lower elemental background concentration within these sub-basins.

3.3 Background Values

The required 95th percentile background values for all data (site-wide) were calculated for all reported parameters and are tabulated together with summary statistics (minimum, 5th percentile, 10th percentile 1st quartile, median, third quartile, 90th percentile, 95th percentile, 99th percentile, and maximum) in Appendix C. In addition, 95th percentile background values were calculated for each sub-basin and are included in Appendix D.

A statistical summary of all general chemistry parameters calculated on a site-wide basis is presented in Table 6. Importantly, background (95th percentile) values for all general chemistry parameters did not exceed either CCME-FAL or CSR AW except for total cyanide. For total cyanide, the CCME-FAL guideline is equal to the most frequent MDL (0.005 mg/L) and the background value of 0.07 mg/L is driven by five (out of 79 total) measurements above the MDL, which were measured in various wells from Stewart, Bawn Boy, Suttles, and Platinum Gulches.

It is also worth noting that all concentrations above the CCME-FAL guideline for total cyanide were from the 1995-1996 data. Three of the five cyanide values that exceed CCME-FAL correspond with a single sampling event (1995-09-27) and occur within different wells in different sub-basins. The absence of any other detections of cyanide since 1995-1996 suggest that these anomalous values may be an artifact from the sampling and or laboratory processes that occurred at that time.

Statistical summaries of the highlighted parameters based on total (unfiltered) and dissolved concentrations respectively, were calculated on a site-wide basis and are provided in Table 7 and Table 8. All site-wide background values for the highlighted parameters (except mercury), calculated on total concentrations exceeding CCME-FAL guidelines, are shown in Table 7. In contrast substantially lower background values (based on dissolved concentrations) occur for a number of highlighted parameters, especially aluminum, copper, lead, iron, and silver as shown in Table 8.

Background values for highlighted parameters by sub-basin were calculated for both total and dissolved concentrations and are presented as Table 7 and Table 8. Both tables display a wide range of calculated background values for each sub-basin for every parameter. For example, Eagle Pup has the highest background value for total aluminum at 90.30 mg/L while Stewart Gulch has the lowest value at 0.10 mg/L, which is within the CCME-FAL guideline range of 0.005-0.1 mg/L. These values are substantially higher, and lower, respectively than the site-wide background value for total aluminum of 4.69 mg/L, which is similar to the majority of the sub-basins.

Of all of the sub-basins, Eagle Pup has the most parameters with the overall highest background concentration values including total aluminum, chromium, copper, iron and zinc. Platinum Gulch has three parameters with the highest background concentration including total arsenic, selenium, and uranium. Stewart Gulch had the highest total mercury and silver background concentration, while Suttles Gulch had the highest total cadmium and lead concentrations with Olive Gulch demonstrating the highest background total fluoride concentration.

Except for aluminum and chromium, the pattern by sub-basin of elevated *total* background concentrations for each parameter was not followed with respect to *dissolved* background concentrations. For example, Ann Gulch had the highest dissolved cadmium, iron, and zinc background concentrations, Platinum Gulch had the highest dissolved arsenic, selenium, and uranium background concentrations, Suttles Gulch had the highest dissolved copper and lead background concentrations, Eagle Pup had the highest dissolved aluminum and chromium, and Stewart Gulch had the highest silver background concentration.

Table 6: Site-wide General Chemistry Statistics

Parameter	Number of Observations	Minimum	Maximum	Median	95th Percentile	Std. deviation	CCME FAL[1]	Yukon CSR AW [2]
Conductivity (uS/cm)	212	19.8	1140.0	446.0	876.0	238.9	NA	NA
Hardness (as CaCO3) (mg/L)	212	9	648	262	496	145	NA	NA
pH	212	6.1	8.8	7.8	8.3	0.4	6.5 - 9	NA
Total Suspended Solids (mg/L)	212	1.5	128000.0	28.8	487.0	9716.9	NA	NA
Total Dissolved Solids (mg/L)	212	22.1	934.0	248.5	655.0	177.9	NA	NA
Turbidity (NTU)	201	0.6	4000.0	19.7	284.0	430.1	NA	NA
Acidity (as CaCO3) (mg/L)	15	0.5	309.0	3.4	309.0	114.8	NA	NA
Alkalinity, Bicarbonate (as CaCO3) (mg/L)	64	13.4	348	151	313	91	NA	NA
Alkalinity, Carbonate (as CaCO3) (mg/L)	44	0.5	6	1	6	1	NA	NA
Alkalinity, Hydroxide (as CaCO3) (mg/L)	44	0.5	1	1	1	0	NA	NA
Alkalinity, Total (as CaCO3) (mg/L)	176	7.0	464	168	343	97	NA	NA
Ammonia as N (mg/L)	208	0.0010	0.4120	0.0132	0.2270	0.0795	0.073 - 190 [3]	1.31-18.5 [4]
Bromide (Br) (mg/L)	126	0.025	0.250	0.025	0.250	0.072	NA	NA
Chloride (Cl) (mg/L)	212	0.25	8.80	0.25	2.50	0.87	120.00	NA
Fluoride (F) (mg/L)	212	0.010	0.598	0.225	0.482	0.141	0.120	2.0 - 3.0 [5]
Nitrate (as N) (mg/L)	212	0.00	1.20	0.03	0.36	0.13	2.940	400.000
Nitrite (as N) (mg/L)	212	0.001	0.103	0.001	0.008	0.010	0.060	0.2 - 2.0 [6]
Total Kjeldahl Nitrogen (mg/L)	170	0.00	5.00	0.15	0.63	0.58	NA	NA
Total Nitrogen (mg/L)	117	0.00	5.00	0.26	0.75	0.49	NA	NA
Ortho Phosphate as P (mg/L)	211	0.00	0.41	0.00	0.10	0.05	NA	NA
Total Dissolved Phosphate As P (mg/L)	135	0.00	0.50	0.00	0.10	0.05	NA	NA
Total Phosphate as P (mg/L)	211	0.00	9.52	0.04	0.30	1.10	NA	NA
Sulfate (SO4) (mg/L)	212	1.0	480.0	67.7	317.0	86.2	NA	1000.000
Anion Sum (mg/L)	28	0.17	9.87	5.50	8.96	2.29	NA	NA
Cation Sum (mg/L)	28	0.26	10.80	5.58	10.70	2.51	NA	NA
Cation Anion Balance (mg/L)	28	0.00	21.20	1.75	11.70	4.45	NA	NA
Cyanide, Weak Acid Diss (mg/L)	39	0.0025	0.0025	0.0025	0.0025	0.0000	0.005 [7]	0.05 [8]
Cyanide, Total (mg/L)	79	0.0005	0.0130	0.0025	0.0070	0.0020	0.005 [7]	0.05 [8]
Total Organic Carbon (mg/L)	179	0.25	36.10	1.99	8.64	3.80	NA	NA
Dissolved Organic Carbon (mg/L)	7	0.63	9.96	1.30	9.96	3.27	NA	NA

CCME FAL and Yukon CRS AW values and notes adapted from Eagle Gold Project - Environmental Baseline Data Report: Hydrogeology 2011 - 2012 Update, Final Report, Stantec, 2012

***See Appendix E (<u>Groundwater General Chemistry Notes</u>) for numerical superscript note references. These notes describe acronyms and variable guideline/standard calculation equations.**

Table 7: Site-Wide Statistical Summary for Highlighted Parameters

Parameter (mg/L)	Number of Observations	Minimum	Maximum	Median	95th Percentile	Std. deviation	CCME FAL[1] (mg/L)	Yukon CSR AW [2] (mg/L)
Aluminum	211	0.007	131.000	0.284	4.690	11.011	0.005-0.1 [3]	NA
Arsenic	211	0.0006	19.3000	0.1570	8.1800	2.5707	0.005	0.05
Cadmium	211	0.00001	0.01910	0.00006	0.00139	0.00139	0.0000006 - 0.000240 [4]	0.0001 - 0.0006 [5]
Chromium	211	0.000	0.172	0.001	0.008	0.015	0.0089 [6]	0.09 [7]
Copper	211	0.0001	0.5590	0.0032	0.0237	0.0481	0.002 - 0.017 [8]	0.02 - 0.09 [9]
Fluoride	212	0.010	0.598	0.225	0.482	0.141	0.120	2.0 - 3.0 [10]
Iron	211	0.02	472.00	1.25	14.10	39.87	0.30000	NA
Lead	211	0.0000	0.3500	0.0010	0.0095	0.0381	0.001 - 0.060 [11]	0.04 - 0.16 [12]
Mercury	192	0.00000	0.00045	0.00001	0.00003	0.00005	0.000026	0.001
Selenium	211	0.0000	0.0073	0.0005	0.0021	0.0009	0.001	0.01
Silver	211	0.00001	1.00200	0.00005	0.00169	0.06896	0.0001	0.0005 - 0.015 [13]
Uranium	211	0.0000	0.0429	0.0052	0.0321	0.0098	0.015	3
Zinc	211	0.002	1.260	0.013	0.105	0.122	0.03	0.075 - 2.4 [14]

CCME FAL and Yukon CRS AW values and notes adapted from Eagle Gold Project - Environmental Baseline Data Report: Hydrogeology 2011 - 2012 Update, Final Report, Stantec, 2012

Note: All parameters reported as total concentration, where applicable.

***See Appendix E (Groundwater General Chemistry Notes) for numerical superscript note references. These notes describe acronyms and variable guideline/standard calculation equations.**

Table 8: Site-Wide Statistical Summary for Highlighted Parameters

Parameter (mg/L)	Number of Observations	Minimum	Maximum	Median	95th Percentile	Std. deviation
Aluminum	212	0.001	1.350	0.029	0.103	0.133
Arsenic	212	0.0003	9.6200	1.0033	8.0800	2.2158
Cadmium	212	0.00000	0.00250	0.00017	0.00124	0.00041
Chromium	212	0.000	0.005	0.000	0.008	0.000
Copper	212	0.0001	0.0618	0.0014	0.0038	0.0044
Fluoride	N/A	N/A	N/A	N/A	N/A	N/A
Iron	212	0.01	13.70	1.19	9.73	2.96
Lead	212	0.0000	0.0020	0.0002	0.0005	0.0003
Mercury	161	0.00000	0.00003	0.00001	0.00003	0.00001
Selenium	212	0.0000	0.0088	0.0006	0.0020	0.0010
Silver	212	0.00001	0.00200	0.00003	0.00005	0.00015
Uranium	212	0.0000	0.0402	0.0069	0.0307	0.0092
Zinc	212	0.001	0.120	0.014	0.101	0.025

Note: All parameters reported as dissolved concentration, where applicable.

Table 9: 95th Percentile Values by Sub-basin for Highlighted Parameters

Parameter (mg/L)	Ann Gulch	Bawn Boy Gulch	Dublin Gulch	Eagle Pup	Headwaters	Olive Gulch	Platinum Gulch	Stewart Gulch	Suttles Gulch	CCME FAL[1] (mg/L)	Yukon CSR AW[2] (mg/L)
Aluminum	5.790	3.785	6.660	90.300	0.423	4.160	2.120	0.098	4.070	0.005-0.1 [3]	NA
Arsenic	0.7710	0.4355	3.3800	5.5700	0.9930	0.1140	8.7800	1.9100	2.3100	0.00500	0.05000
Cadmium	0.00147	0.00060	0.00056	0.00259	0.00008	0.00020	0.00028	0.00250	0.01910	0.0000006 - 0.000240 [4]	0.0001 - 0.0006 [5]
Chromium	0.013	0.005	0.006	0.133	0.002	0.008	0.003	0.001	0.011	0.0089 [6]	0.09 [7]
Copper	0.0290	0.0160	0.0188	0.4100	0.0026	0.0113	0.0127	0.0020	0.0950	0.002 - 0.017 [8]	0.02 - 0.09 [9]
Fluoride	0.447	0.260	0.320	0.507	0.097	0.598	0.499	0.300	0.320	0.120	2.0 - 3.0 [10]
Iron	13.80	6.35	18.10	332.00	3.04	4.07	2.66	0.86	12.80	0.30000	NA
Lead	0.0041	0.0070	0.0150	0.2720	0.0052	0.0031	0.0046	0.0005	0.3500	0.001 - 0.060 [11]	0.04 - 0.16 [12]
Mercury	0.00001	0.00045	0.00003	0.00004	0.00003	0.00003	0.00003	0.00005	0.00003	0.000026	0.001
Selenium	0.0014	0.0007	0.0010	0.0017	0.0005	0.0005	0.0072	0.0031	0.0025	0.001	0.01
Silver	0.00377	0.00040	0.00093	0.00239	0.00005	0.00012	0.00121	1.00200	0.00070	0.0001	0.0005 - 0.015 [13]
Uranium	0.0010	0.0126	0.0093	0.0299	0.0074	0.0021	0.0399	0.0104	0.0254	0.015	3
Zinc	0.107	0.068	0.058	1.010	0.021	0.028	0.064	0.003	0.735	0.03	0.075 - 2.4 [14]

CCME FAL and Yukon CRS AW values and notes adapted from Eagle Gold Project - Environmental Baseline Data Report: Hydrogeology 2011 - 2012 Update, Final Report, Stantec, 2012

Note: All parameters reported as total concentration, where applicable.

***See Appendix E (Groundwater General Chemistry Notes) for numerical superscript note references. These notes describe acronyms and variable guideline/standard calculation equations.**

Table 10: 95th Percentile Values by Sub-basin for Highlighted Parameters

Parameter (mg/L)	Ann Gulch	Bawn Boy Gulch	Dublin Gulch	Eagle Pup	Headwaters	Olive Gulch	Platinum Gulch	Stewart Gulch	Suttles Gulch
Aluminum	0.121	0.193	0.016	0.592	0.003	0.025	0.012	0.006	0.627
Arsenic	0.7540	0.3905	3.3600	0.1830	0.0828	0.0837	8.8400	1.9900	1.3300
Cadmium	0.00149	0.00015	0.00016	0.00014	0.00003	0.00009	0.00013	0.00250	0.00100
Chromium	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.001
Copper	0.0050	0.0030	0.0037	0.0026	0.0002	0.0037	0.0030	0.0005	0.0063
Fluoride	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	12.70	1.42	9.73	0.73	0.02	0.92	0.18	0.83	2.69
Lead	0.0003	0.0008	0.0005	0.0006	0.0001	0.0003	0.0005	0.0005	0.0020
Mercury	0.00001	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	No Data	0.00003
Selenium	0.0015	0.0008	0.0010	0.0005	0.0005	0.0005	0.0078	0.0031	0.0025
Silver	0.00007	0.00035	0.00005	0.00003	0.00001	0.00001	0.00005	0.00200	0.00050
Uranium	0.0002	0.0130	0.0087	0.0086	0.0073	0.0018	0.0397	0.0104	0.0243
Zinc	0.114	0.030	0.037	0.067	0.010	0.025	0.039	0.003	0.010

Note: All parameters reported as dissolved concentration, where applicable.

4. DISCUSSION

4.1 CALCULATED BACKGROUND CONCENTRATION BASED ON TOTAL VS. DISSOLVED PARAMETERS

As stated by CCME (2003), unless otherwise specified, a guideline value refers to a total concentration of a substance in an unfiltered sample. Total concentrations will apply unless it can be demonstrated that:

(a) The relationship between the variable fractions and their toxicity is firmly established; and

(b) Analytical techniques have been developed that unequivocally identify the toxic fraction of a variable in a consistent manner using routine field-verified measurements.

With respect to Victoria's highlighted parameters, elements which constitute major rock-forming minerals typically have lower solubility under normal groundwater conditions (e.g. silicon, aluminum, iron) and may be over-represented (in terms of toxicity) by total values in samples with high total suspended solids (TSS). In addition, it has been shown that a wide range of trace elements and heavy metals may be adsorbed or be bound within suspended particles such as clays, hydrous iron and manganese oxides and organic matter (e.g. Jain and Ram, 1999). These elements, such as arsenic, cadmium, copper, lead, and silver, may similarly be over-represented (in terms of toxicity) by total values in samples with high TSS. As a result, comparison of dissolved values (rather than total) with regulatory standards and/or guidelines may be appropriate in some cases. A comparison of site-wide background values based on dissolved concentrations show that copper, lead and silver are at or below CCME-FAL guidelines and the remaining highlighted parameters are above CCME-FAL guidelines.

A measurable difference between total and dissolved background concentrations is apparent in the Eagle Gold data set, and the degree of difference between total and dissolved concentration varies substantially by individual element. In addition, an examination of background concentrations by sub-basin showed wide spatial variability in background concentration. Sub-basins featuring a specific element with high background total concentrations did not necessarily correlate with a high dissolved background concentration of the same element.

Following standard groundwater sample collection techniques, groundwater sampling can result in samples with high turbidity and TSS , which may reflect well age and condition, poor well development and/or disturbance of sediment (lying at the bottom of the well) during well purging. Further, total metal concentrations measured in these turbid samples does not reflect potential impact to surface waters. As a result, others (Stantec, 2012) also compared dissolved concentrations with regulatory standards and guidelines.

To assess the effect of high TSS values on the data set, plots of categorized TSS (<10 mg/L, 10-100 mg/L, 100-1000 mg/L, and >1000 mg/L) were developed for iron, aluminum, arsenic, and cadmium, and are shown below in Figure 3.

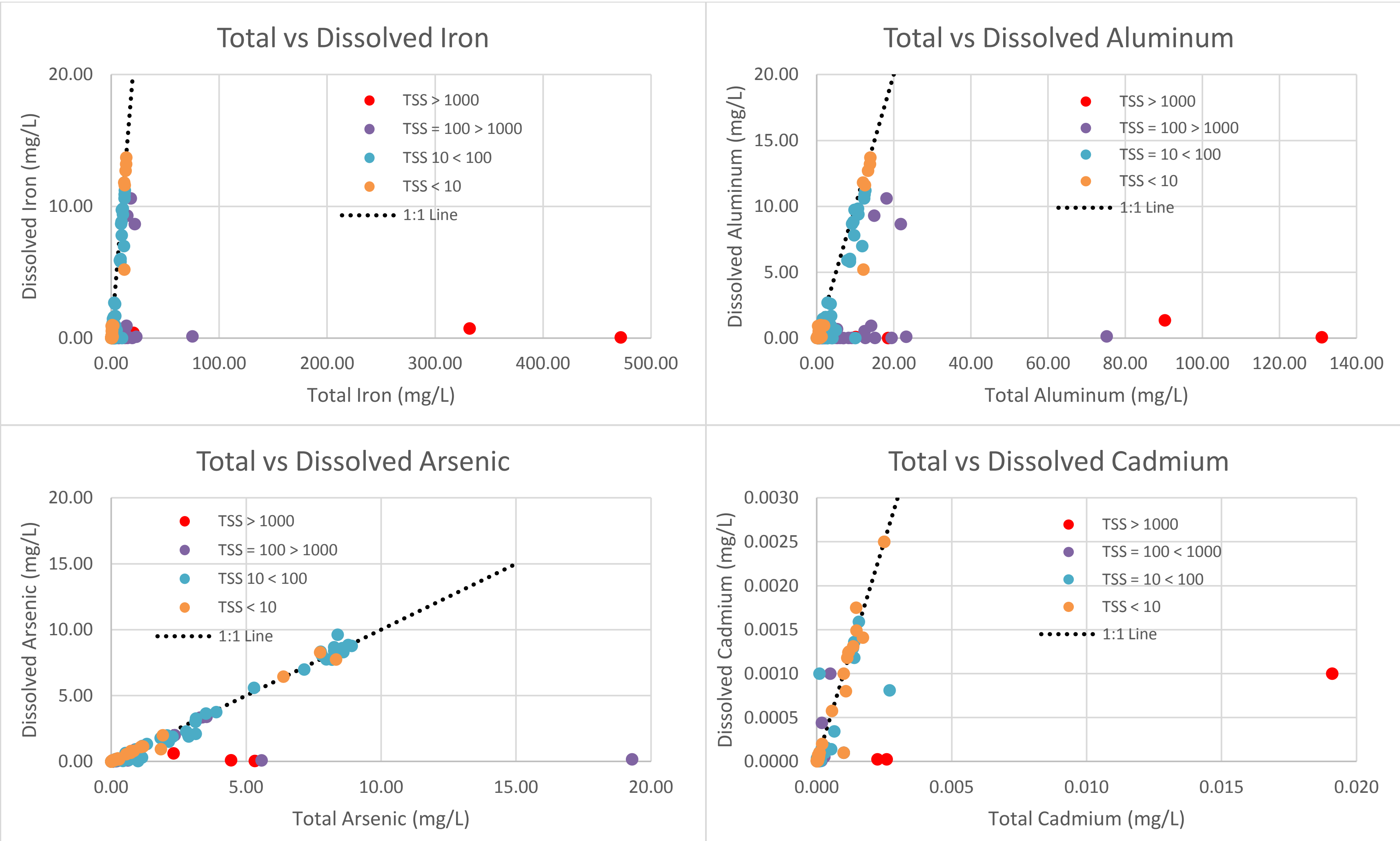


Figure 3: Relationship between Total and Dissolved Concentrations for the same Parameter

As shown by these parameters, samples with elevated TSS often constitute the highest total concentrations within the data set, which in turn will have a major effect on calculating the 95th percentile background value. Thus for samples with high TSS, it may be relevant to use calculated background concentration values (95th percentiles) based on dissolved concentrations rather than total concentrations.

4.2 Compliance with Protocol No. 10

In addition to describing the methods required to statistically determine background water quality, Protocol #10 also provides specific guidance regarding the background groundwater wells and data set from which background is calculated:

- Groundwater wells should be sampled a minimum of two times to address temporal variability and provide a robust data set.
- Where groundwater flow conditions and/or quality are expected to vary seasonally, the sampling strategy should address seasonal effects.
- Appropriate quality assurance and quality control methods should be used in order to maximize comparability between the background wells and the nominal contaminated site, such as by taking samples from similar depths and using the same sample collection mechanisms.
- Samples must be analysed using analytical methods identical to those used with the samples from the nominal contaminated site, and preferably by the same laboratory.

While reference to a contaminated site in the third and fourth bullets is not relevant here, based on the sampling protocols, resultant data set and statistical analyses conducted for this report, we believe that to the greatest extent possible, the data provided by Victoria and used in this study comply with the Protocol No. 10 guidelines.

5. Summary and Conclusions

A comprehensive characterization of background groundwater quality was completed in accordance with Clause 158 of Victoria's Water License QZ14-041. This study included a statistical analysis of all available groundwater quality data from the Eagle Gold project area. In keeping with the rationale described within the Reasons for Decision document, and the methods described within CSR Protocol No. 10, the present background groundwater quality values at the 95th percentile were determined. To elucidate in the observed background groundwater quality across the Project area, groundwater quality data are presented and described by sub-basin and on a site-wide basis.

The following points summarize the results and conclusions of this study:

- The quality and character of groundwater data provided by Victoria (in terms of spatial coverage, multiple sampling events over a range of seasons and times of the year, consistency in sampling technique and analytical laboratory) meets or exceeds the requirements established in Protocol No. 10, where applicable.
- Stantec (2012) and BGC (2013) concluded that, in general, there were no discernible effects from well completion zone or seasonality in the data.
- Background concentration calculation and presentation methods are intended to illustrate groundwater quality variation at the site and to provide a baseline for future evaluation of groundwater data.
- Background highlighted parameters concentrations (95^{th} percentiles) demonstrated a high degree of spatial variability at the sub-basin and site-wide scales.
- Except for cyanide during the 1995-96 sampling events, the site-wide background concentrations of all general chemistry parameters did not exceed applicable CCME-FAL guideline values for these parameters.
- Although site-wide background calculations may provide a useful overall reference, substantial variation in background concentrations between sub-basins for some elements indicates that the site-wide background values may not be the best representative value in all situations.
- A comparison between total and dissolved background concentrations demonstrated the role that turbidity and TSS has on the overall sample results, especially when TSS is greater than 100 mg/L for the common rock forming elements (i.e. aluminum, iron). For the most part, total water chemistry data was suitable to support background parameter calculations; however, where wells produce samples with elevated turbidity or TSS, dissolved parameters may provide a better comparison with guidelines especially with respect to toxicity for aquatic life.

6. Closure

Coregeo and WGI have made every effort to address the intent of Clause 158 of Victoria's Water License QZ14-041 and have provided background groundwater quality calculations based on available data for the Eagle Gold project. If you require any additional information regarding this report, please contact us at (867) 334-8864 or (250) 550-8560.

Core Geoscience Services Inc.
11 Dolly Varden Drive
Whitehorse, YT Y1A 6A1
(867) 334-8864
info@coregeo.ca

Watterson Geoscience Inc.
695 Pheasant Road
Vernon, BC V1B 3B1
(250) 550-8560
dan@wattersongeoscience.com

7. References

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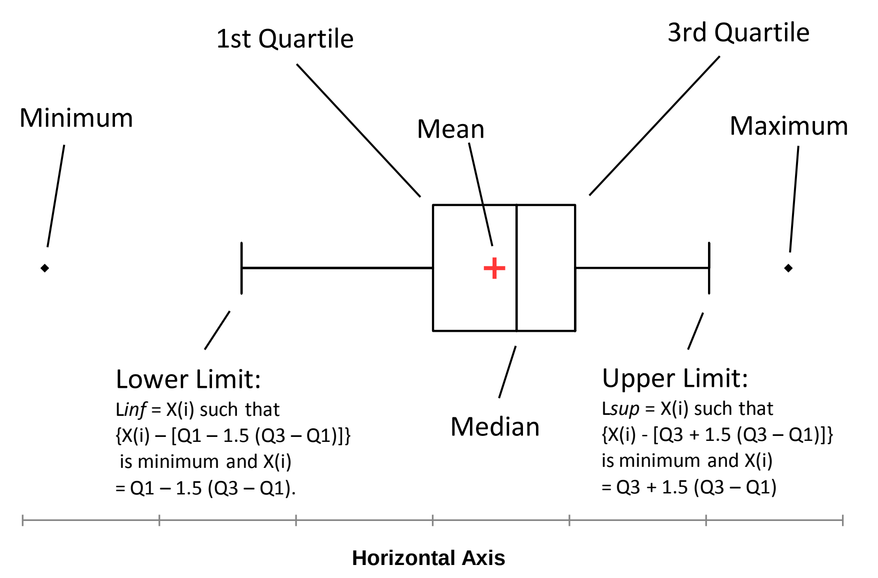
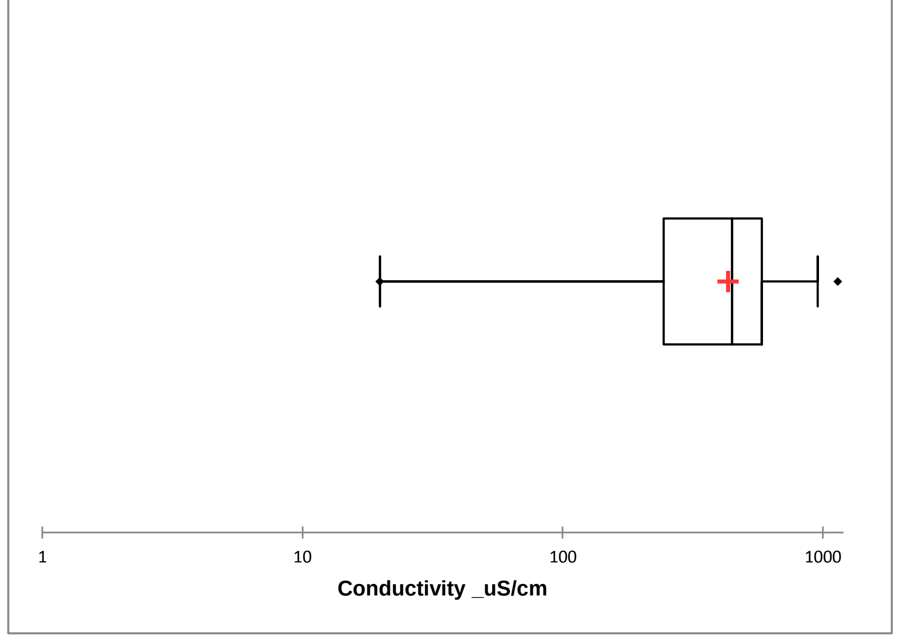
APPENDIX A:
Site-wide Boxplots – All Parameters

** ANIONS & NUTRIENTS **

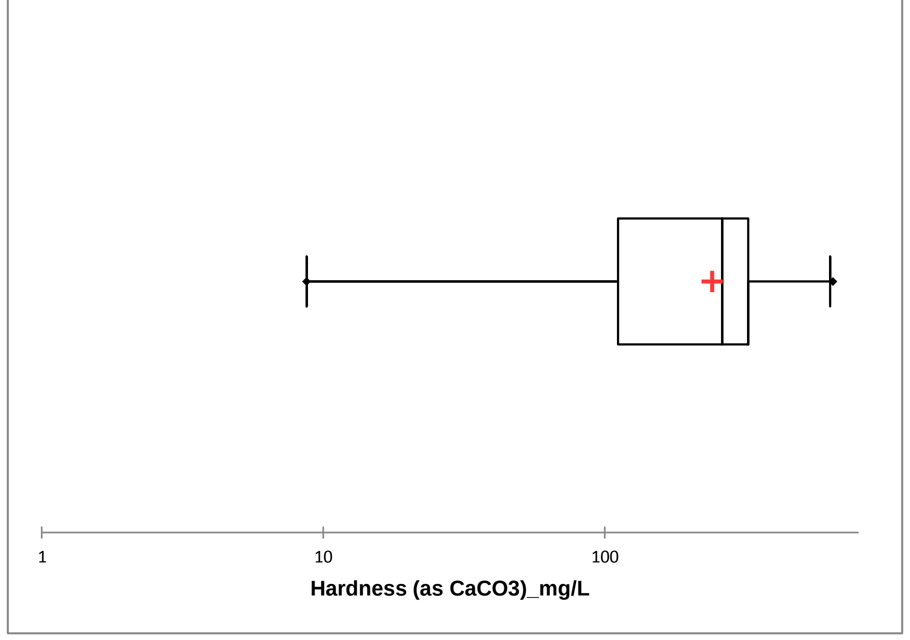
Box Plot Legend



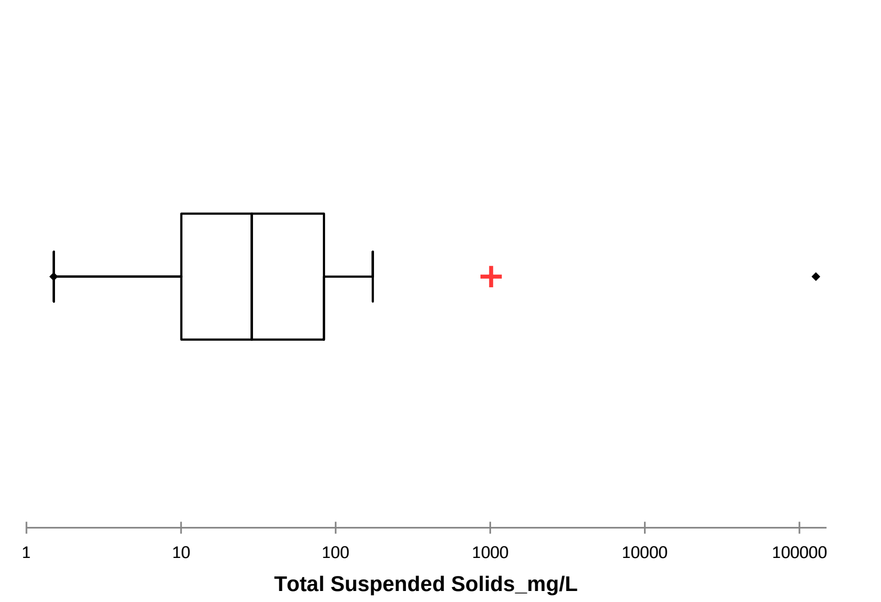
Box plot (Conductivity _uS/cm)



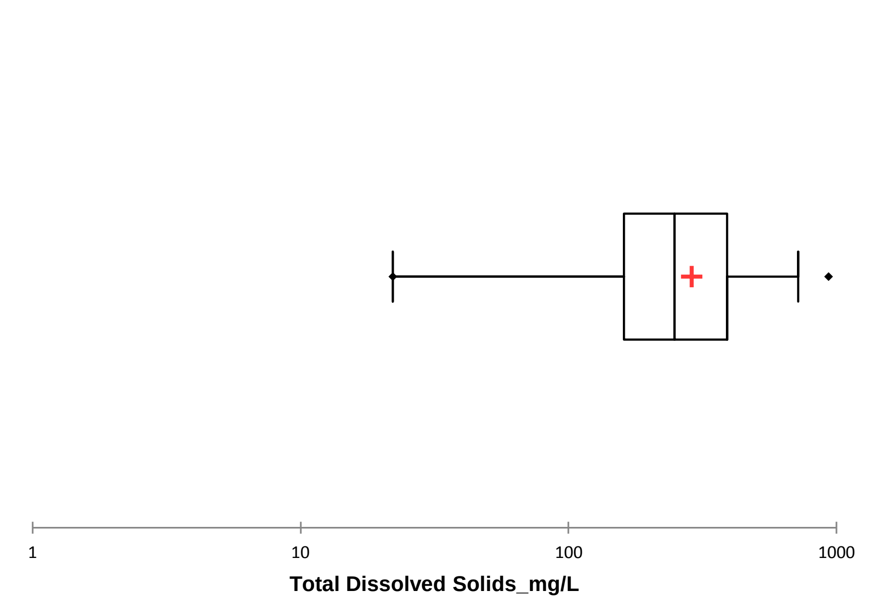
Box plot (Hardness (as CaCO3)_mg/L)



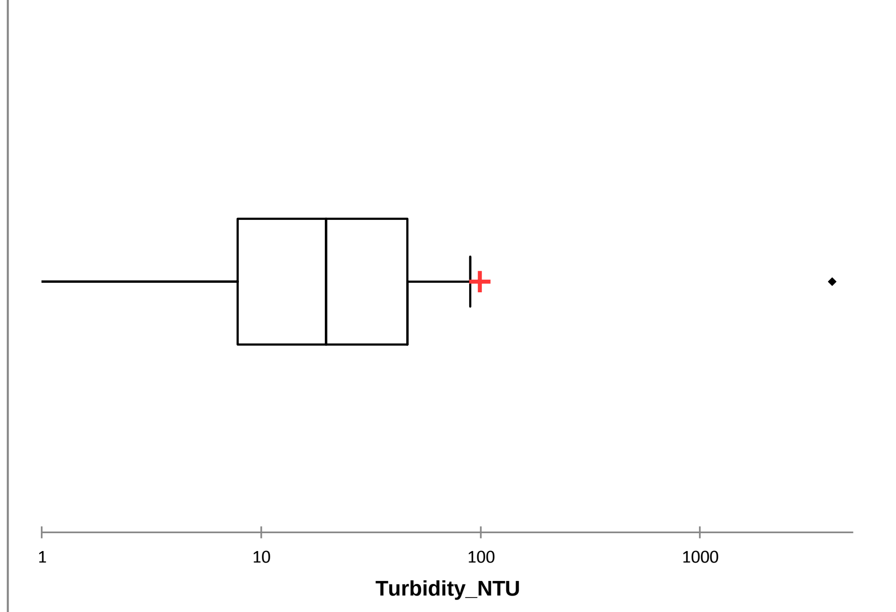
Box plot (Total Suspended Solids_mg/L)



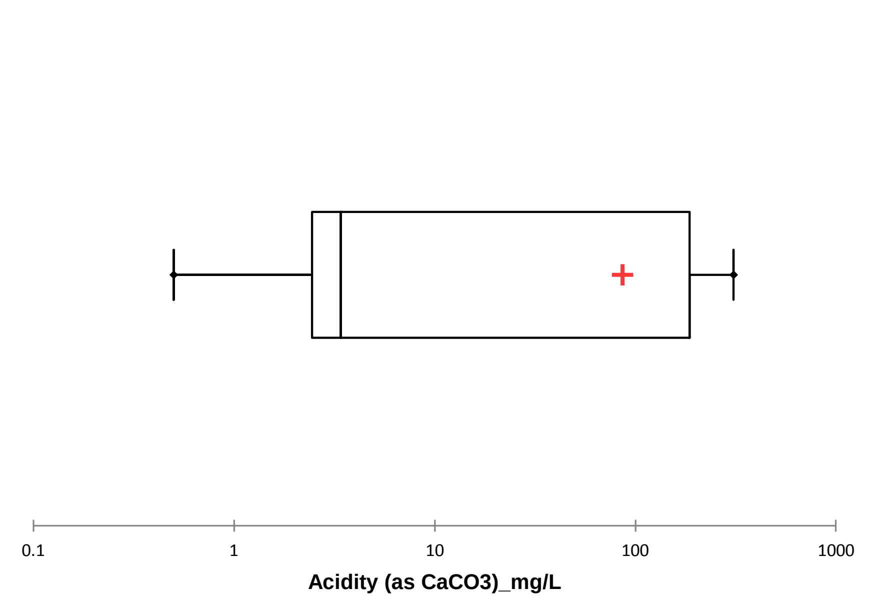
Box plot (Total Dissolved Solids_mg/L)



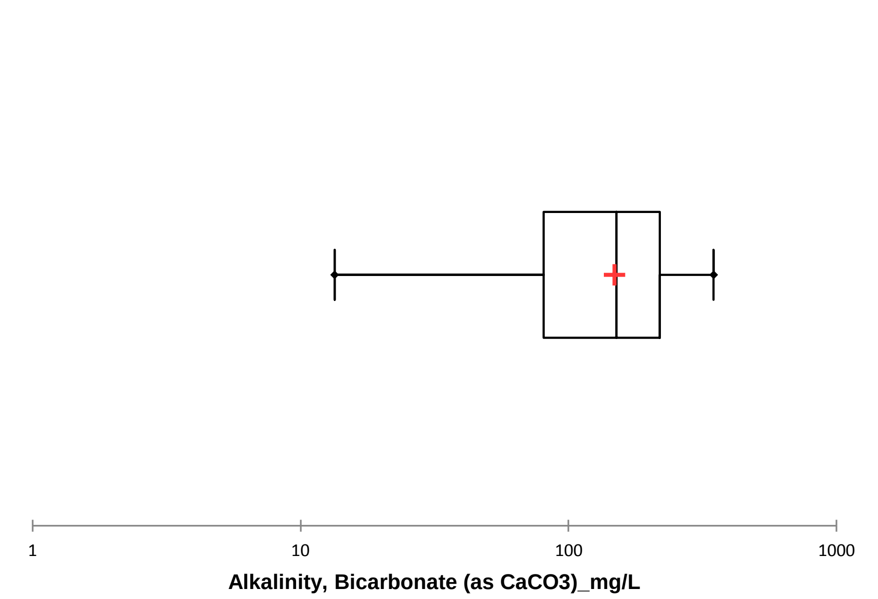
Box plot (Turbidity_NTU)



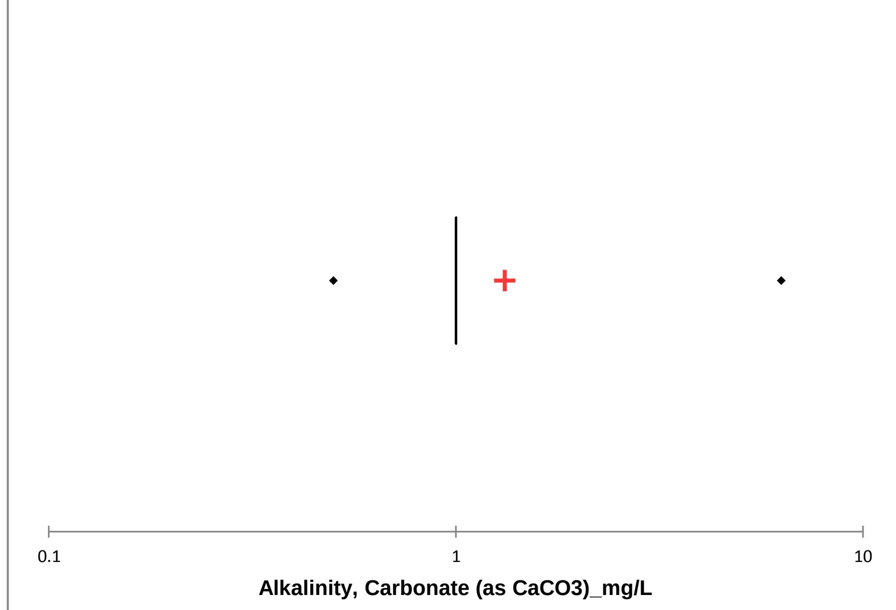
Box plot (Acidity (as CaCO3)_mg/L)

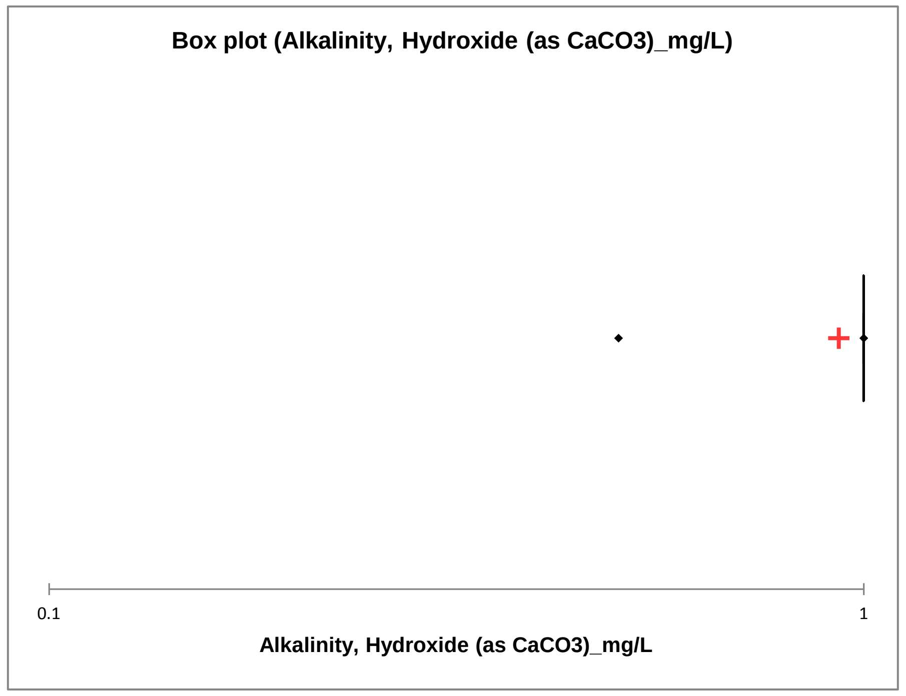


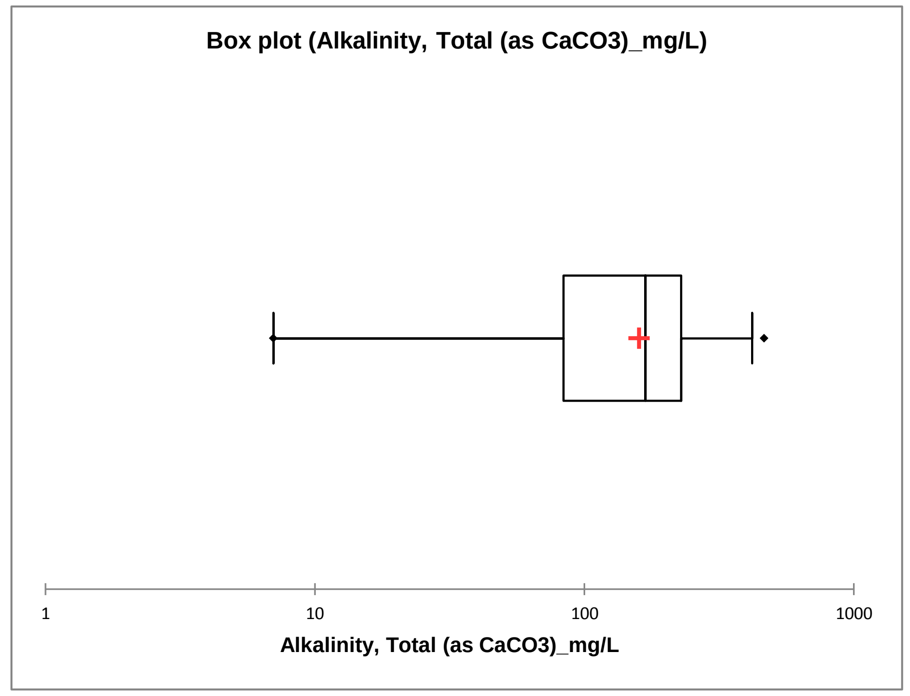
Box plot (Alkalinity, Bicarbonate (as CaCO3)_mg/L)



Box plot (Alkalinity, Carbonate (as CaCO3)_mg/L)




Box plot (Alkalinity, Hydroxide (as CaCO3)_mg/L)
0.1
1
Alkalinity, Hydroxide (as CaCO3)_mg/L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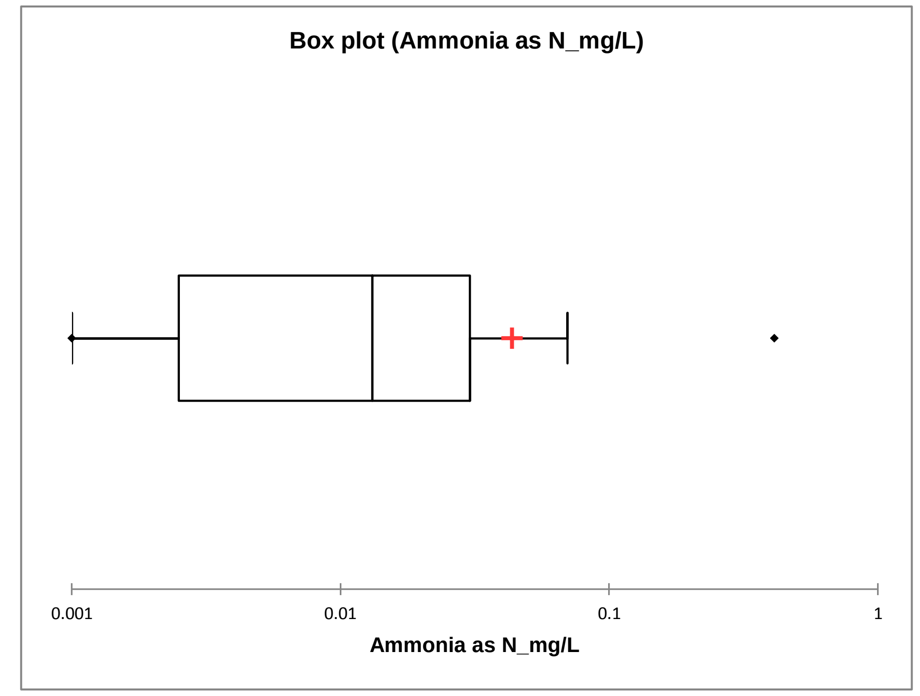
10
100
1000
Alkalinity, Total (as CaCO3)_mg/L


Box plot (Ammonia as N_mg/L)
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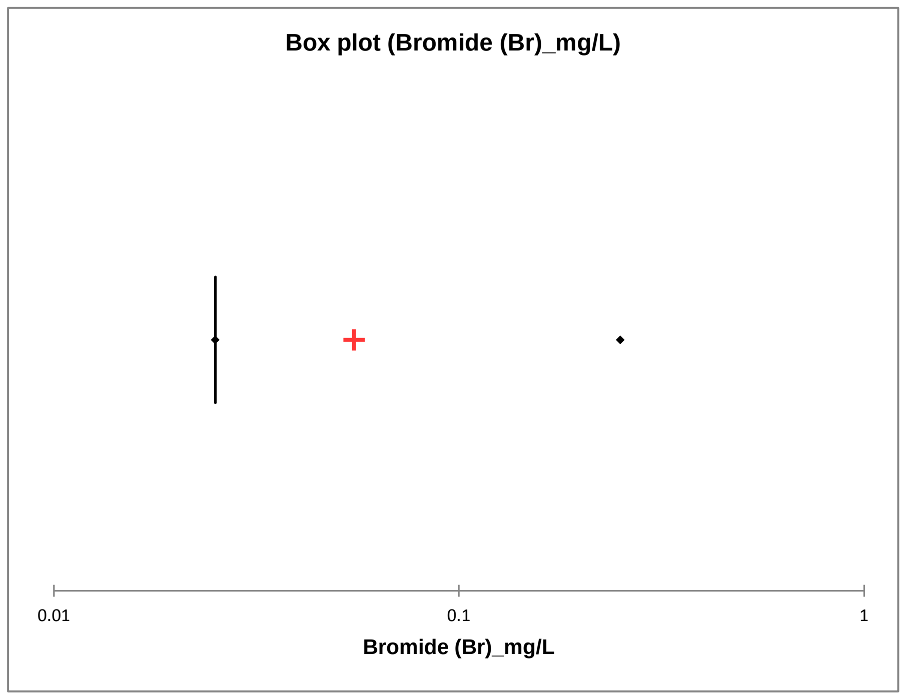
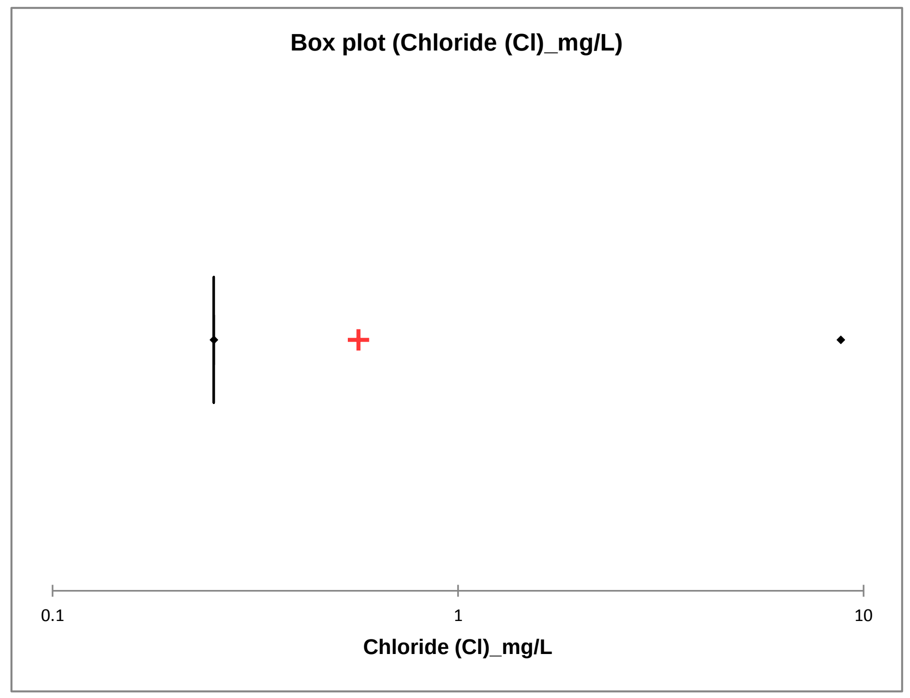
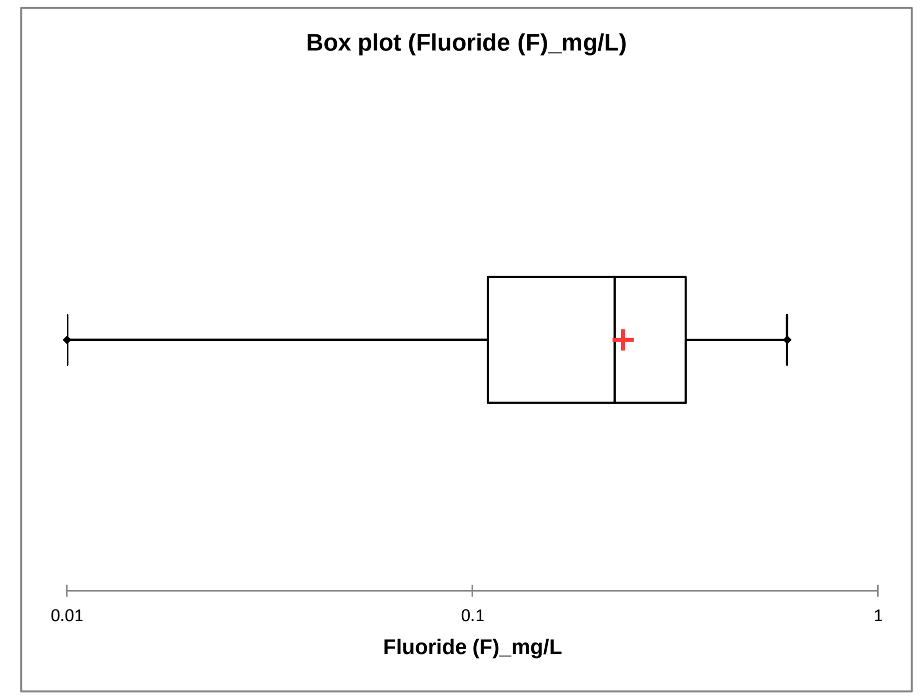
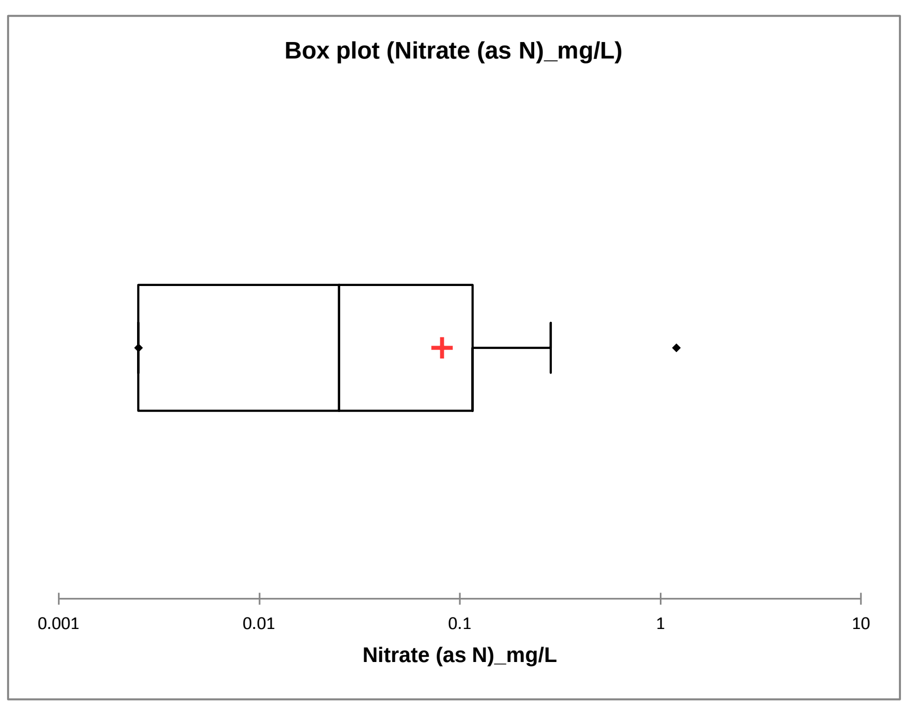
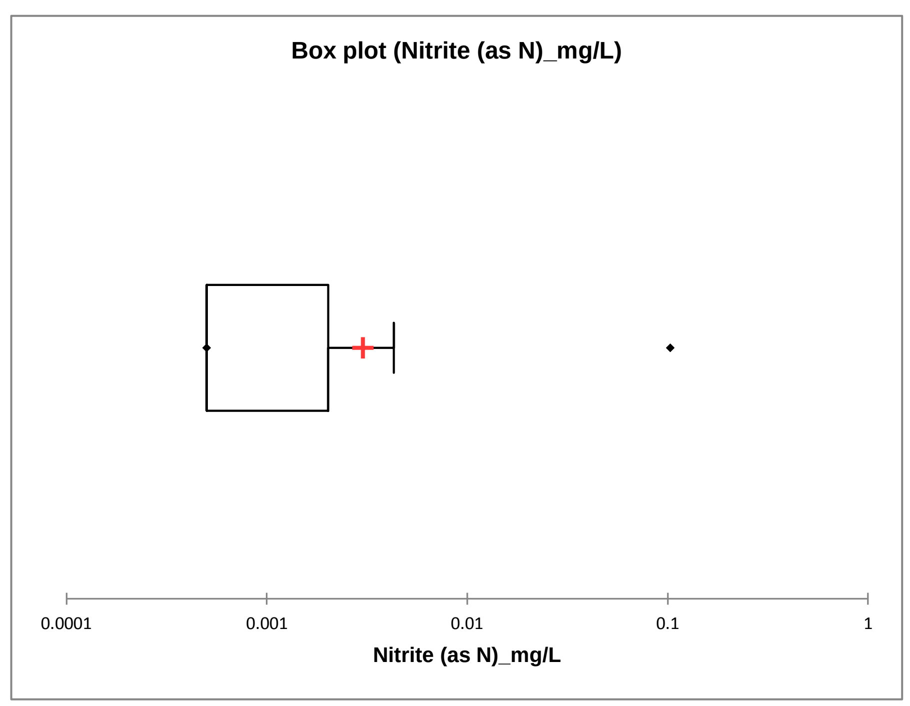
0.01
0.1
1
Ammonia as N_mg/L

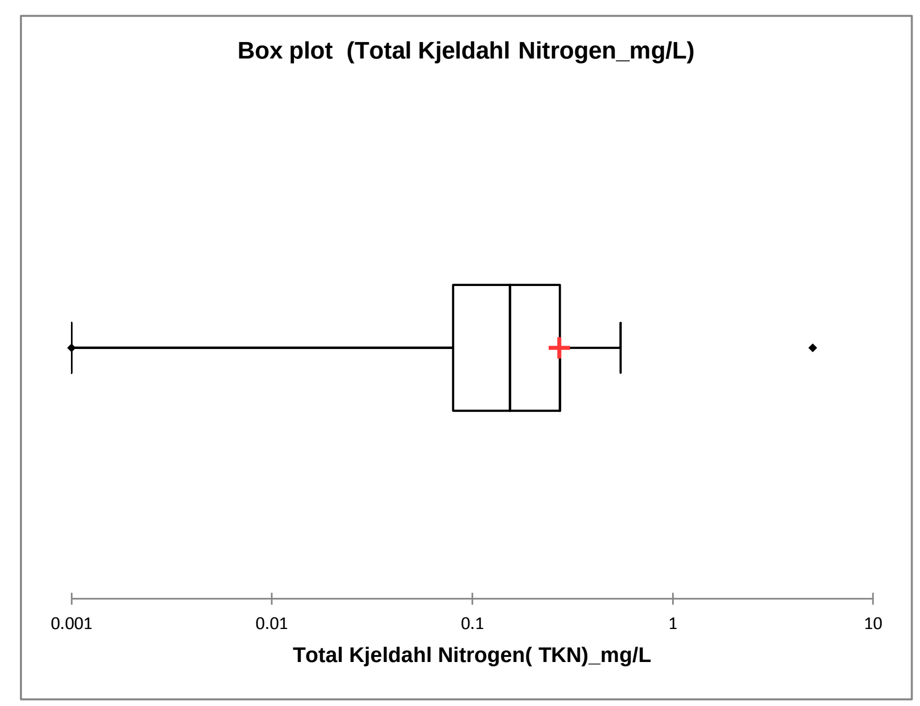

Box plot (Bromide (Br)_mg/L)
0.01
0.1
1
Bromide (Br)_mg/L

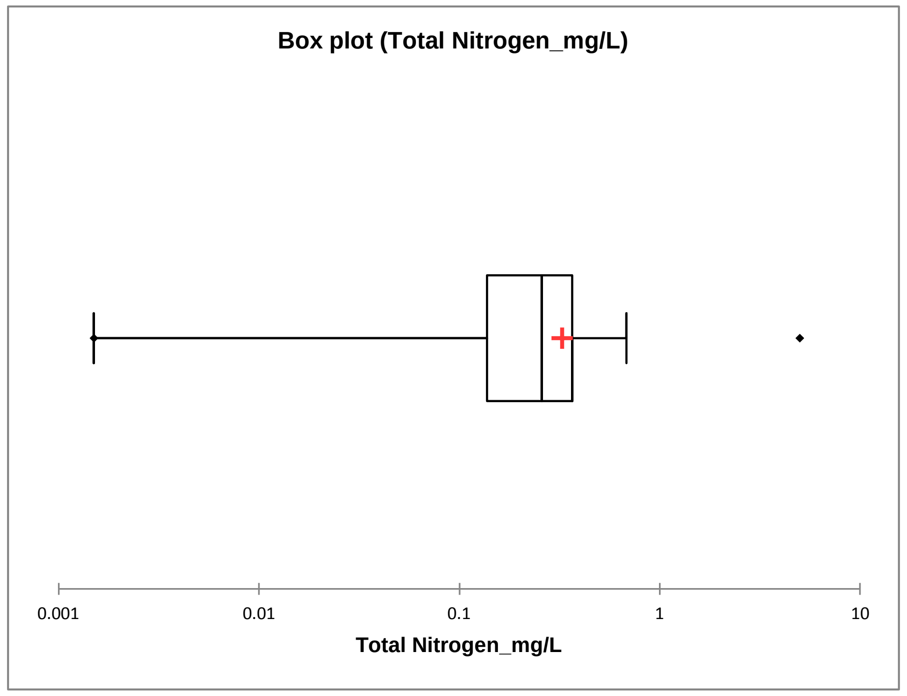

Box plot (Chloride (Cl)_mg/L)
0.1
1
10
Chloride (Cl)_mg/L

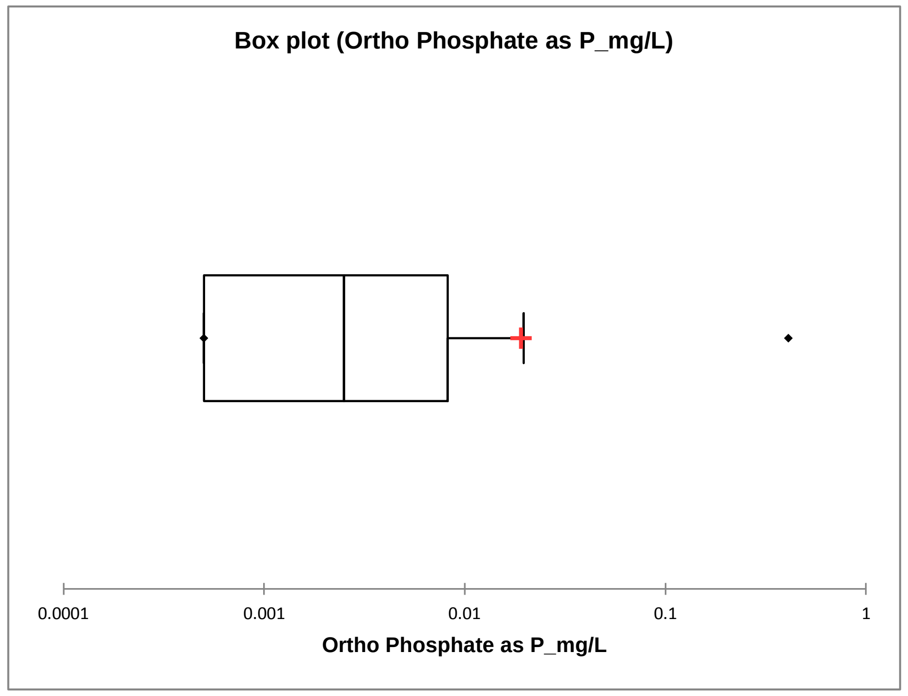

Box plot (Fluoride (F)_mg/L)
0.01
0.1
1
Fluoride (F)_mg/L

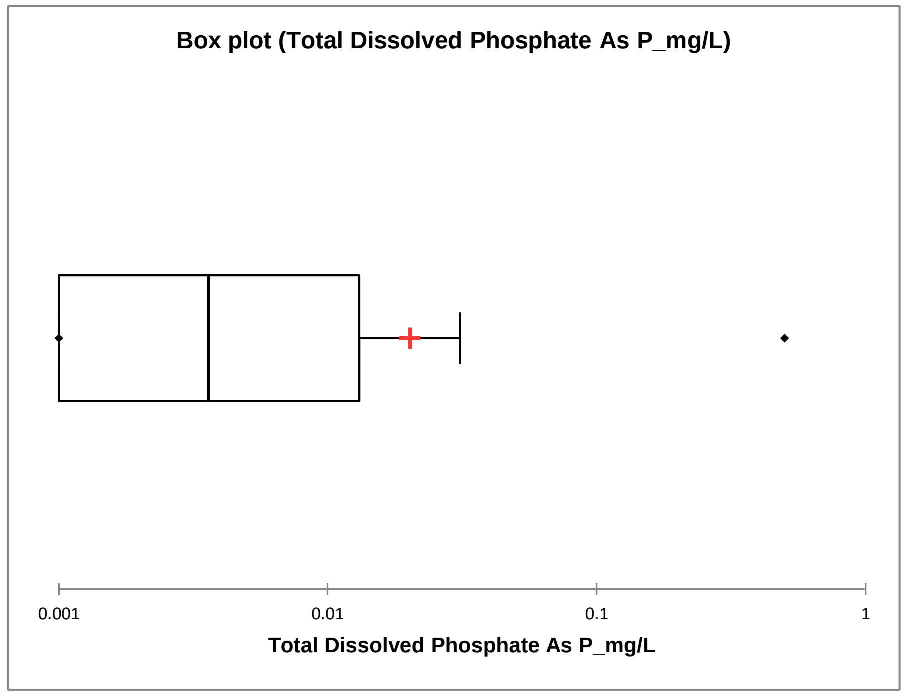

Box plot (Nitrate (as N)_mg/L)
0.001
0.01
0.1
1
10
Nitrate (as N)_mg/L

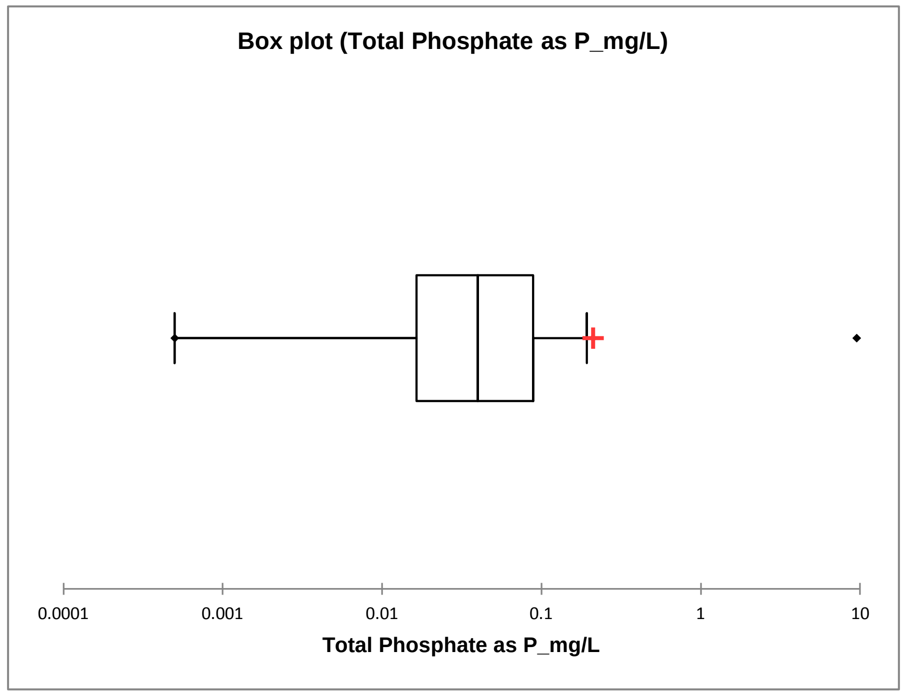

Box plot (Nitrite (as N)_mg/L)
0.0001
0.001
0.01
0.1
1
Nitrite (as N)_mg/L

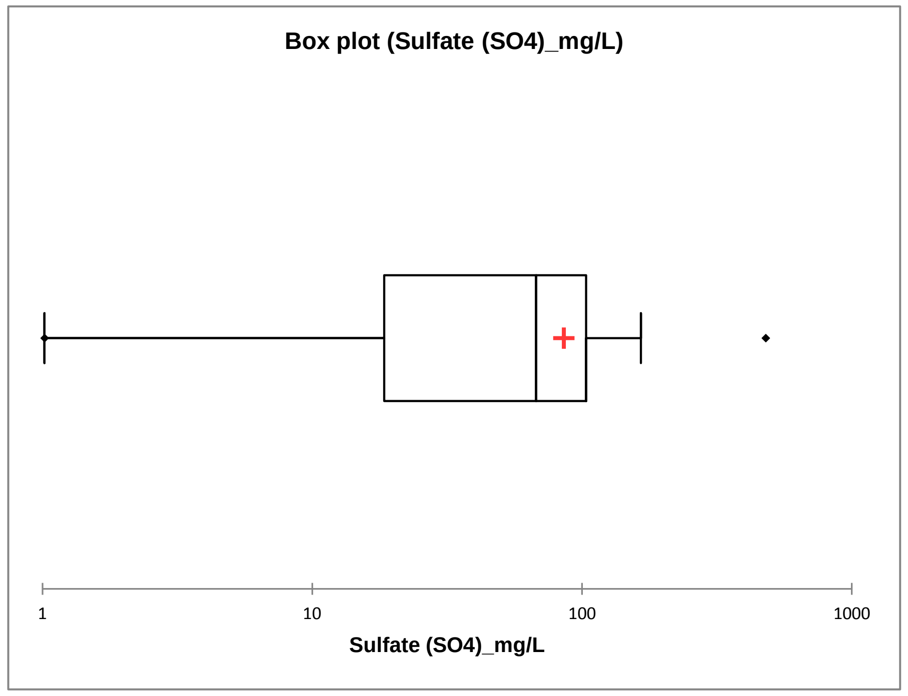

Box plot (Total Kjeldahl Nitrogen_mg/L)
0.001
0.01
0.1
1
10
Total Kjeldahl Nitrogen(TKN)_mg/L

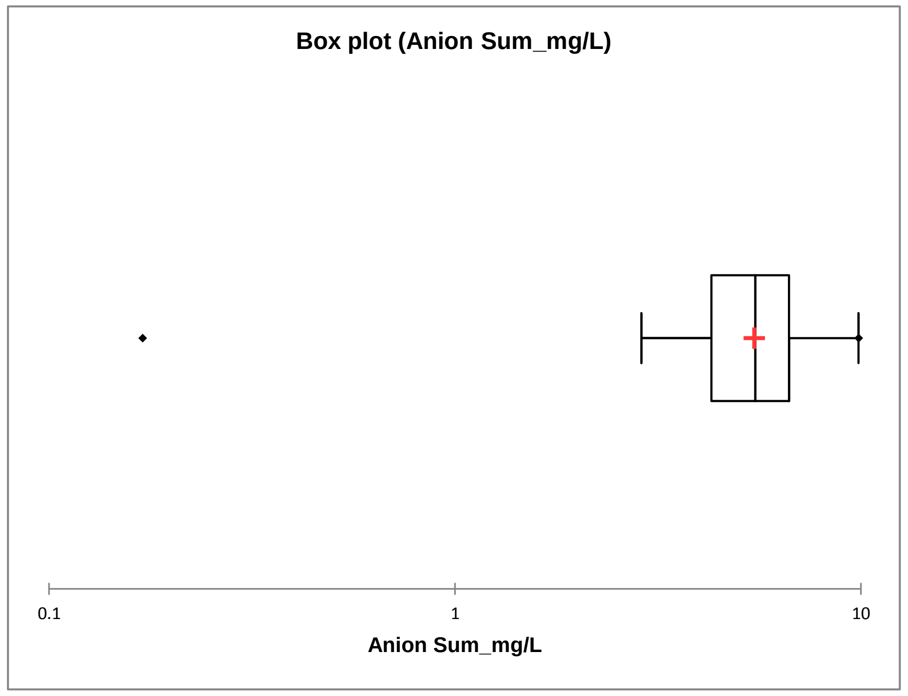

Box plot (Total Nitrogen_mg/L)
0.001
0.01
0.1
1
10
Total Nitrogen_mg/L

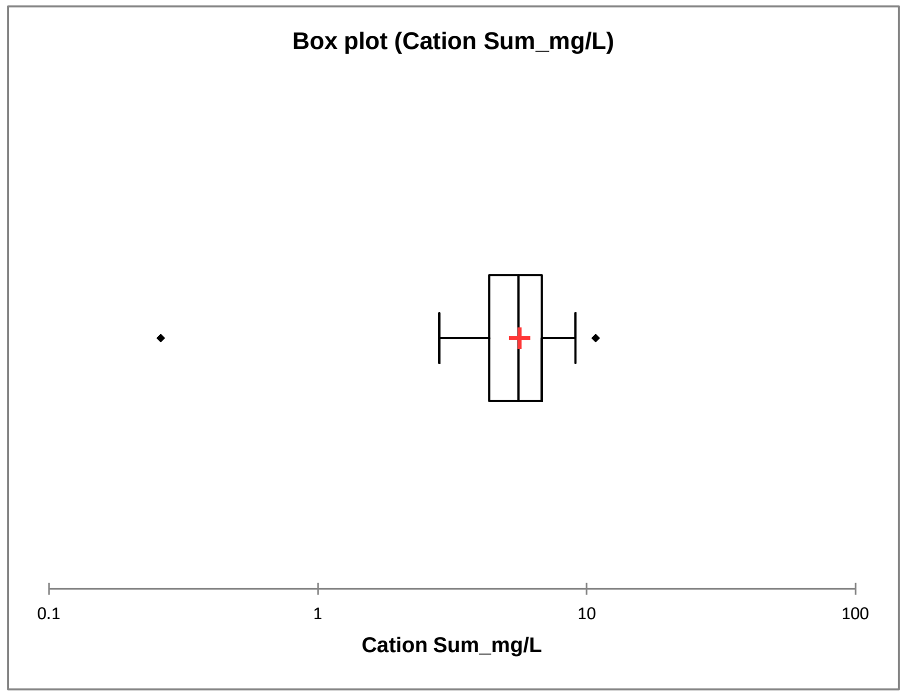

Box plot (Ortho Phosphate as P_mg/L)
0.0001
0.001
0.01
0.1
1
Ortho Phosphate as P_mg/L

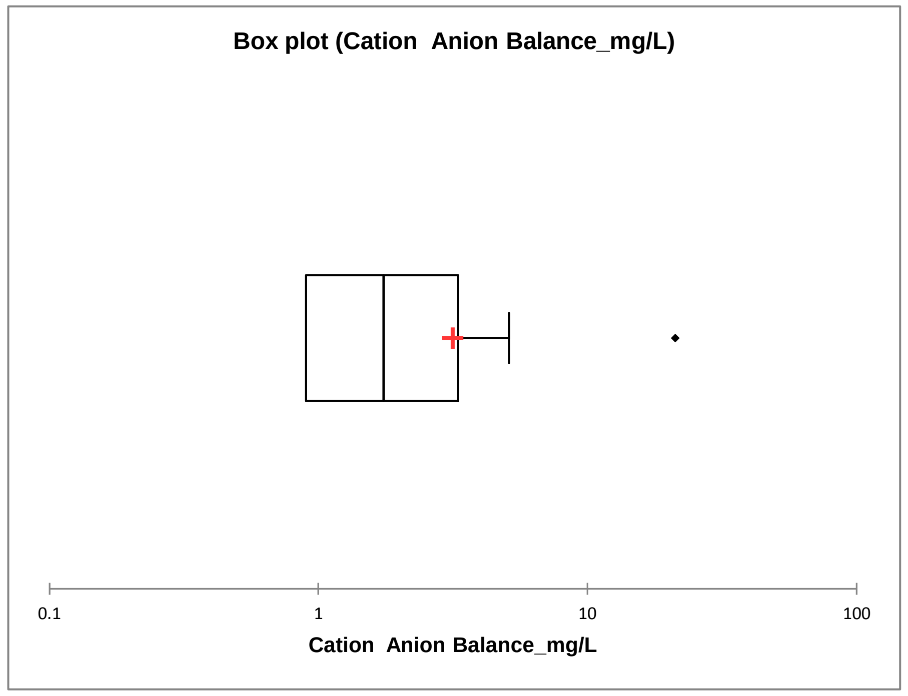

Box plot (Total Dissolved Phosphate As P_mg/L)
0.001
0.01
0.1
1
Total Dissolved Phosphate As P_mg/L

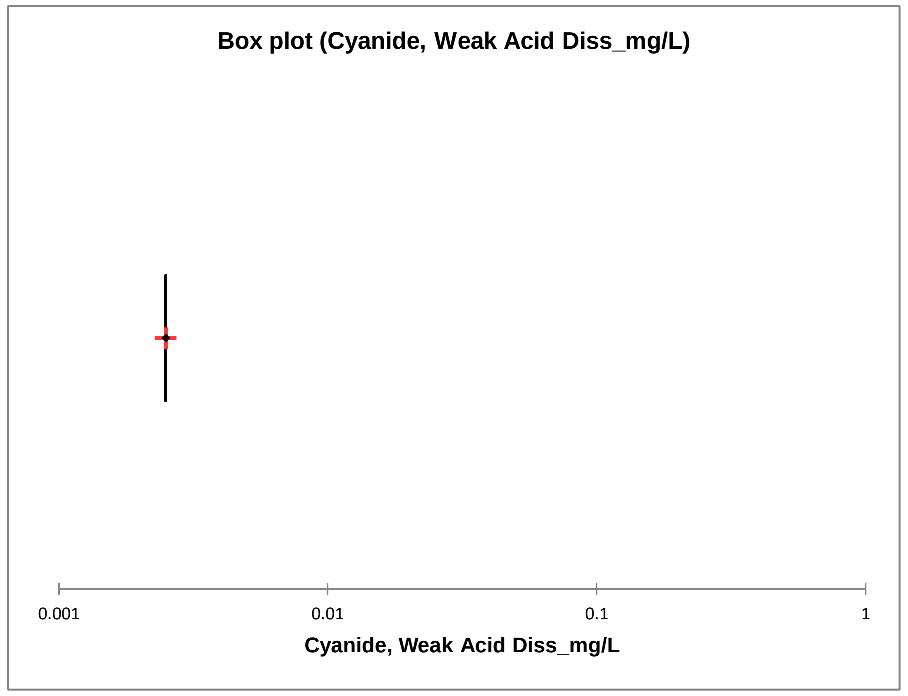

Box plot (Total Phosphate as P_mg/L)
0.0001
0.001
0.01
0.1
1
10
Total Phosphate as P_mg/L

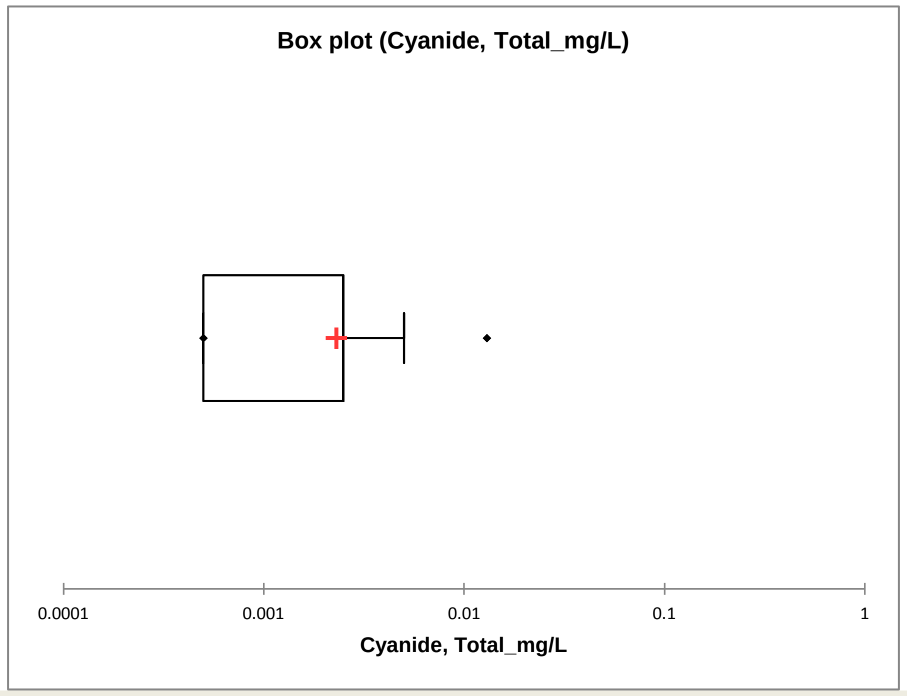

Box plot (Sulfate (SO4)_mg/L)
1
10
100
1000
Sulfate (SO4)_mg/L

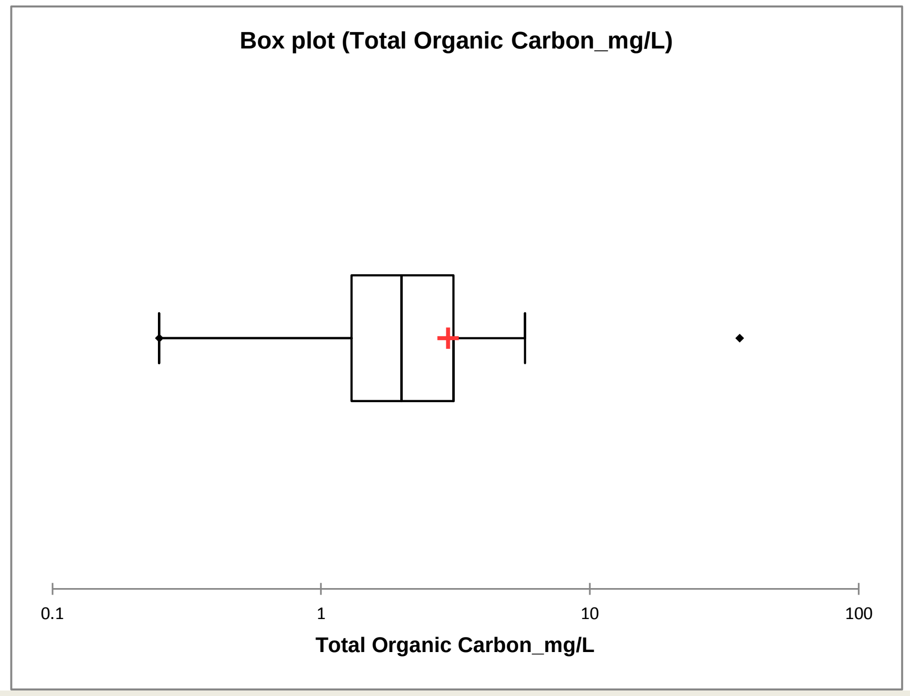

Box plot (Anion Sum_mg/L)
0.1
1
10
Anion Sum_mg/L

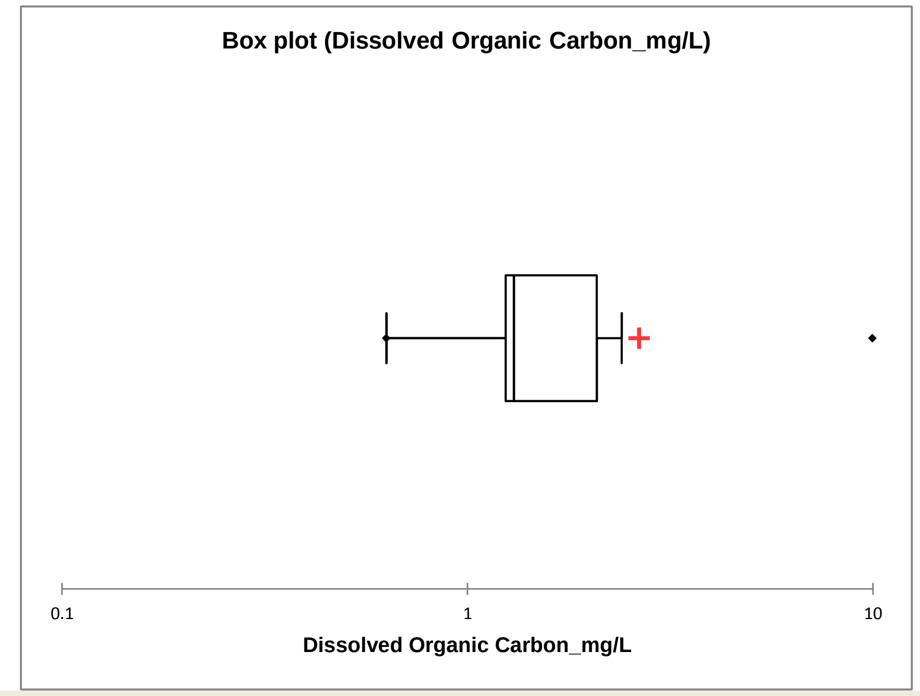

Box plot (Cation Sum_mg/L)
0.1
1
10
100
Cation Sum_mg/L


Box plot (Cation Anion Balance_mg/L)
0.1
1
10
100
Cation Anion Balance_mg/L

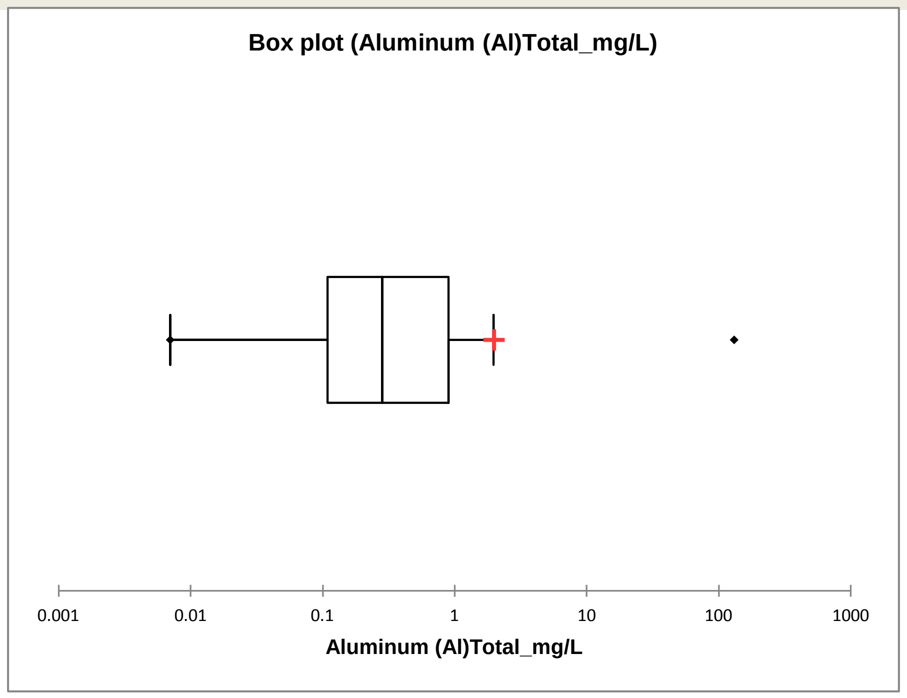

Box plot (Cyanide, Weak Acid Diss_mg/L)
0.001
0.01
0.1
1
Cyanide, Weak Acid Diss_mg/L

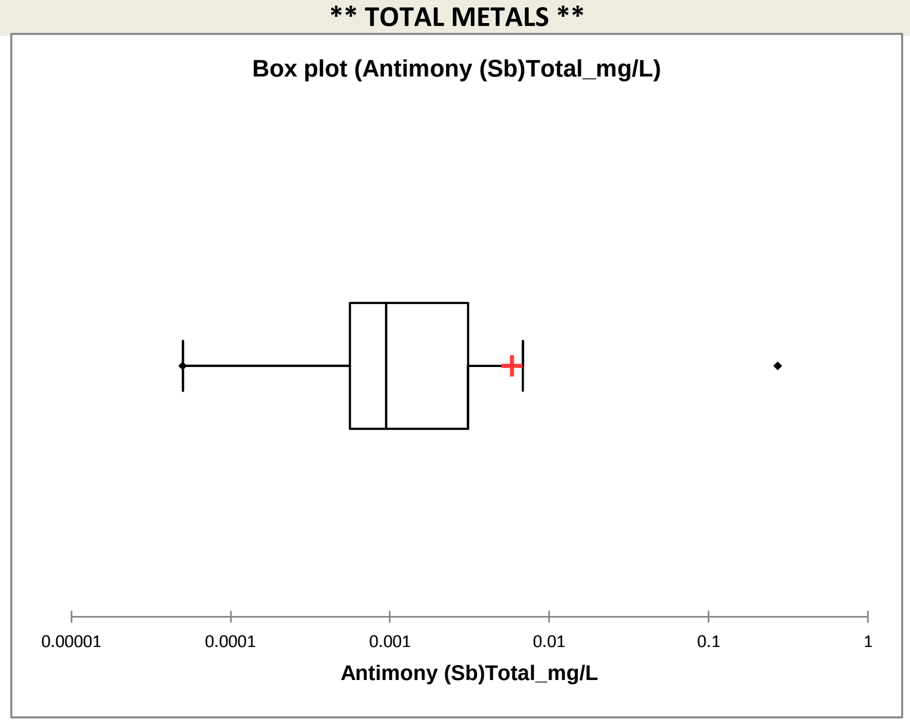


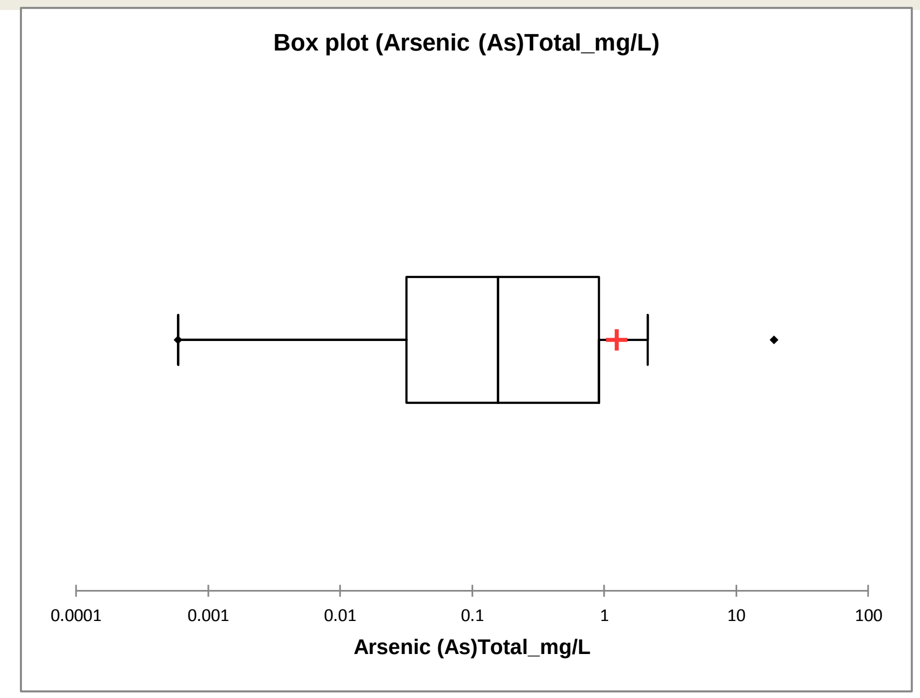


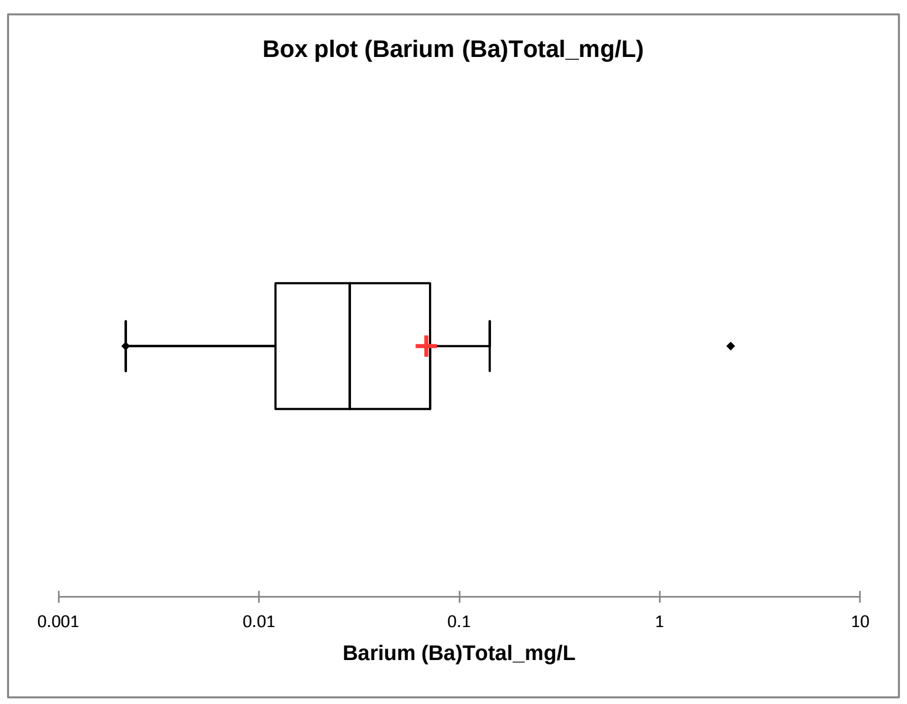


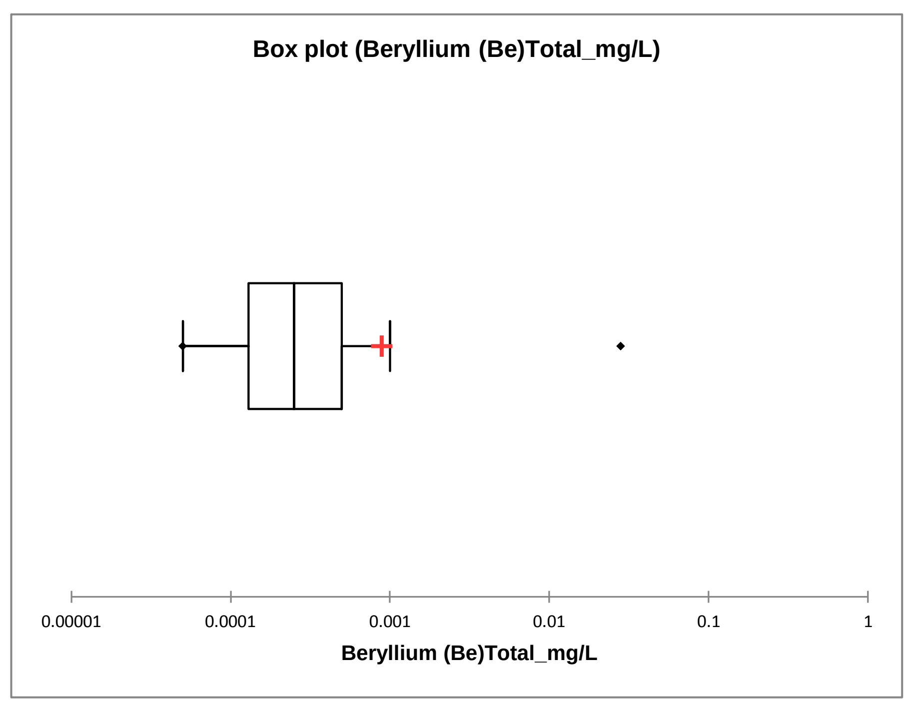
**** TOTAL METALS ****

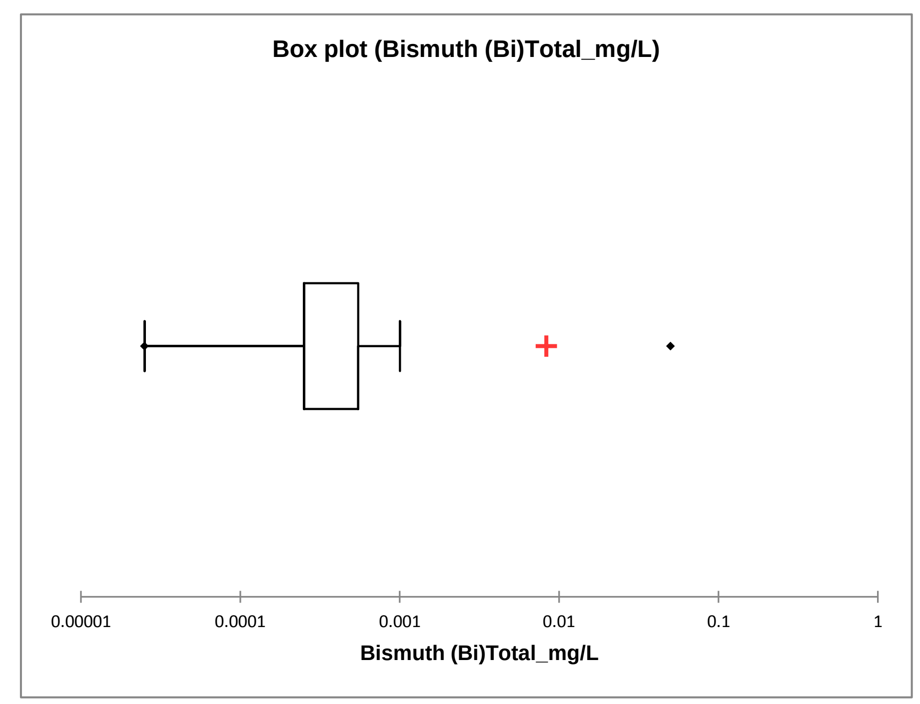




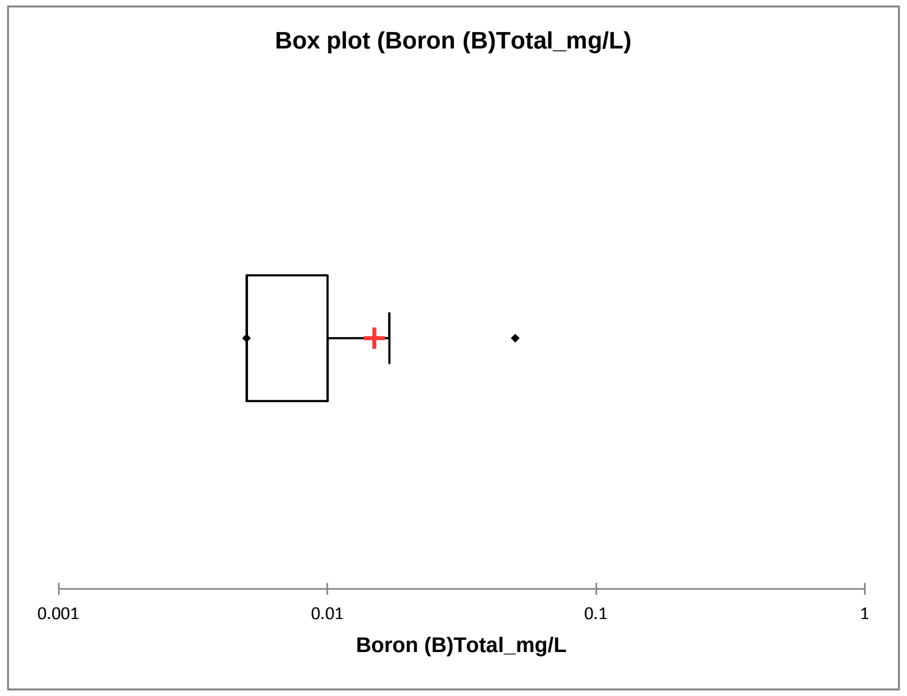


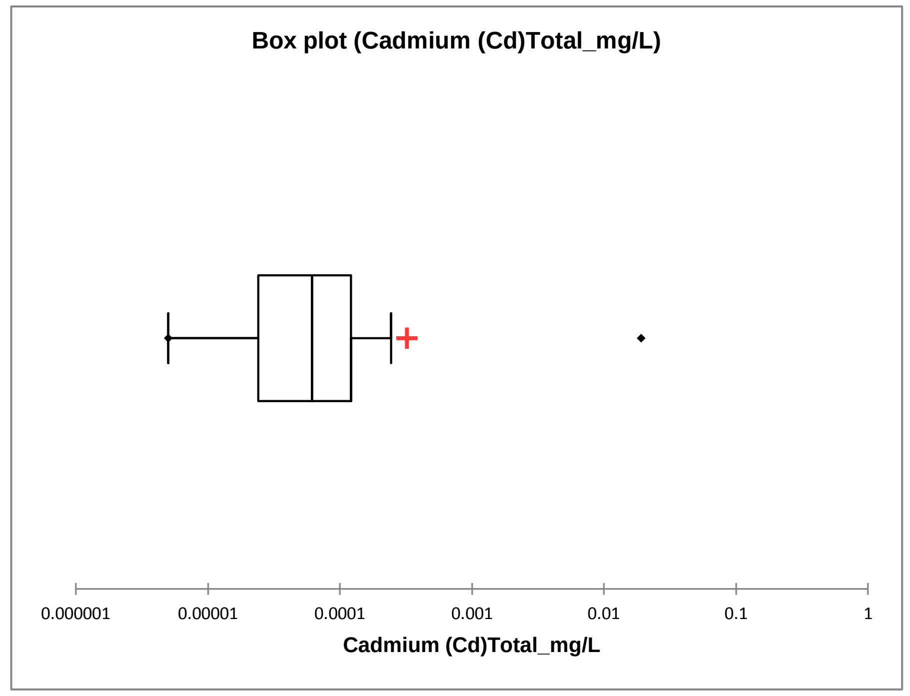


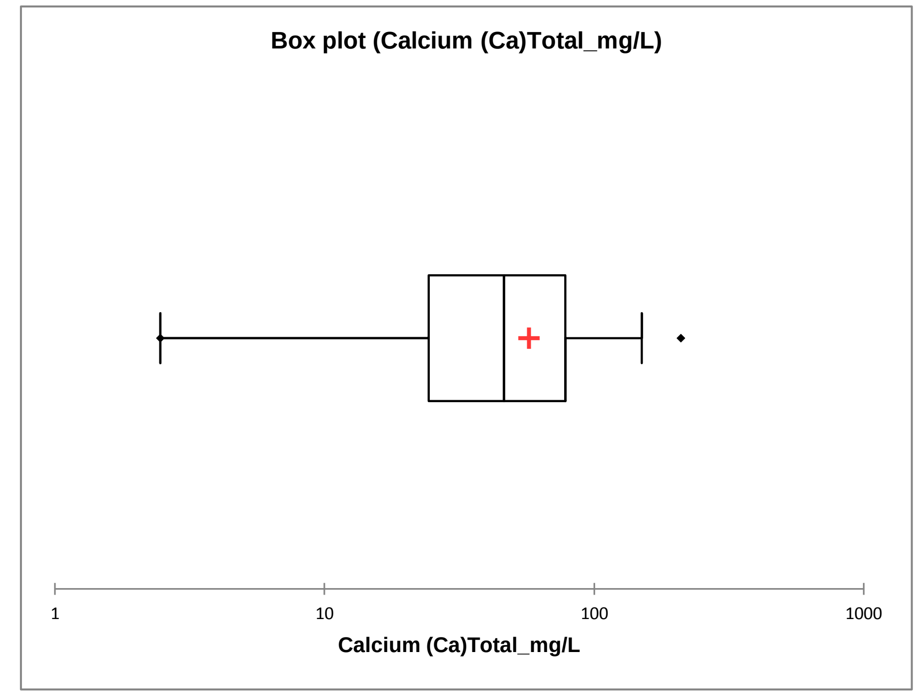


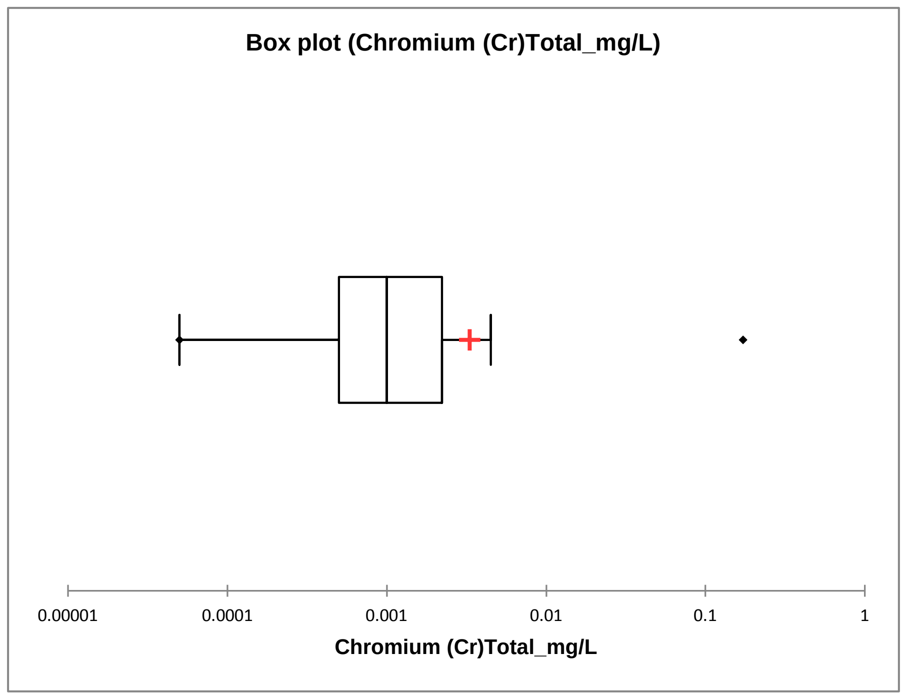


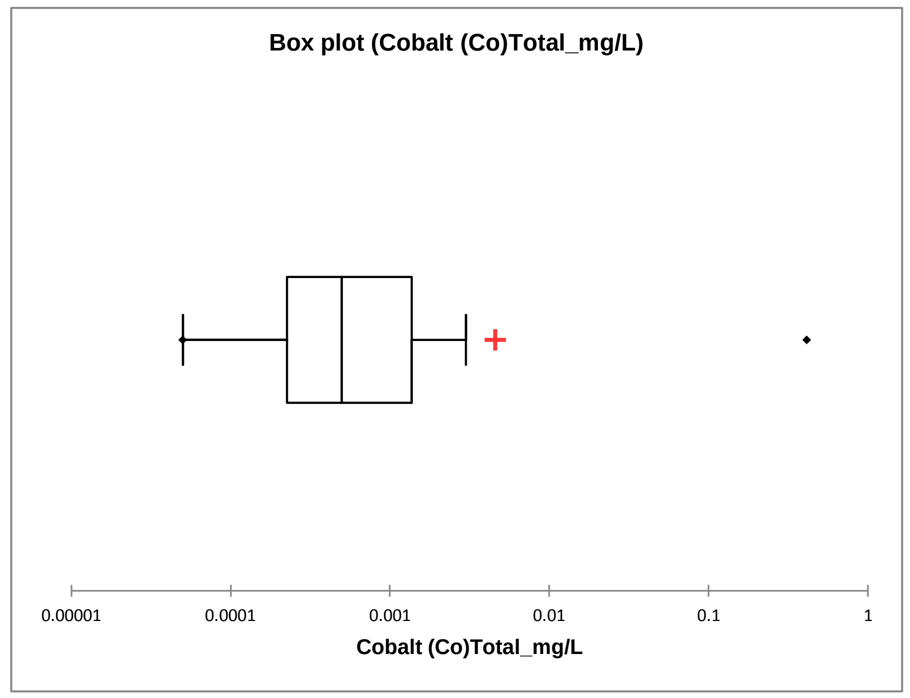
APPENDIX A:
Site Wide Boxplots – All Parameters

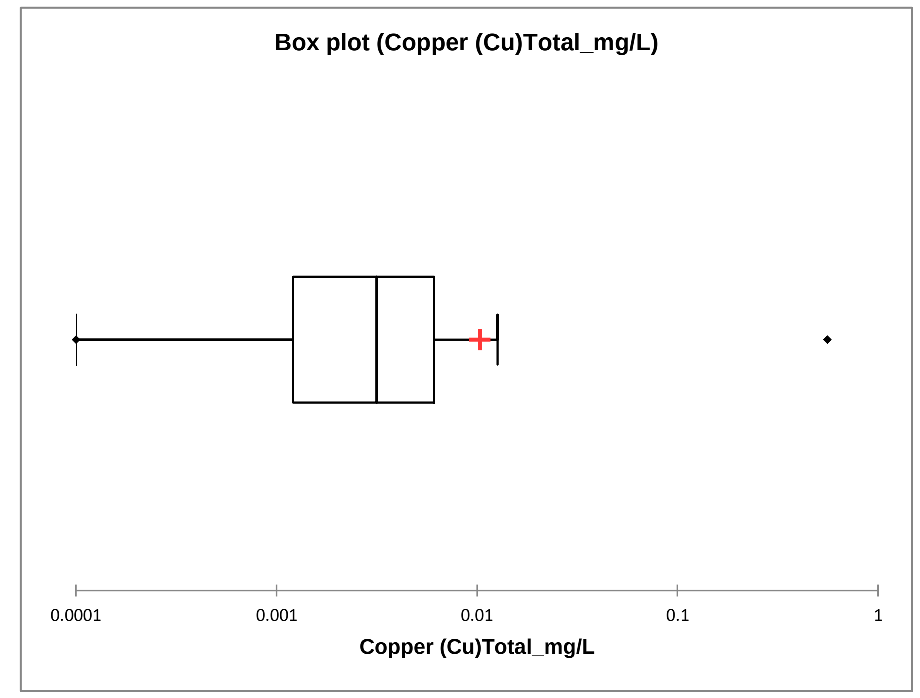


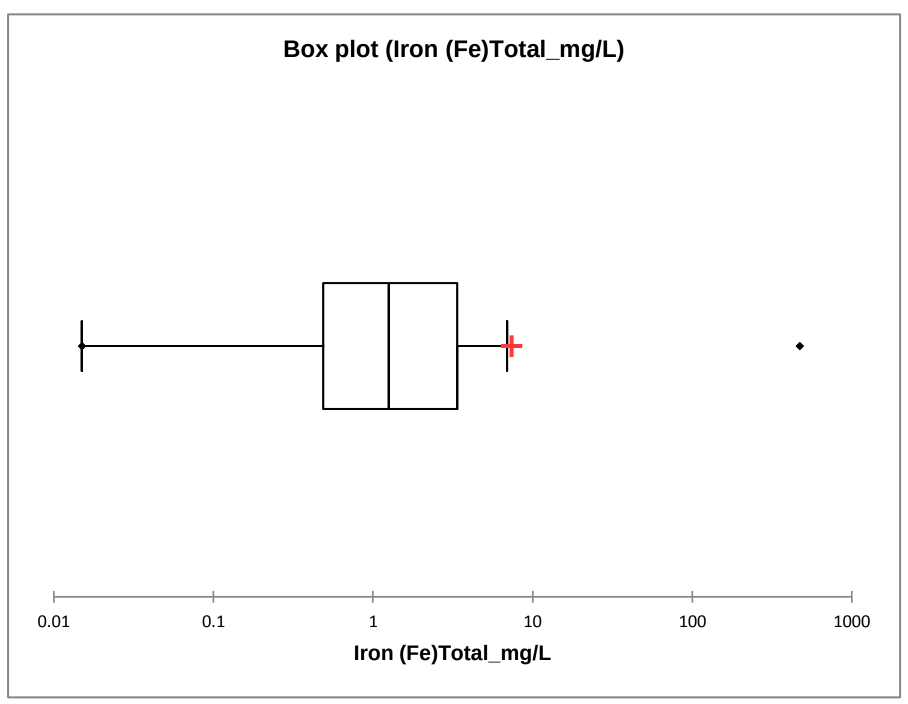


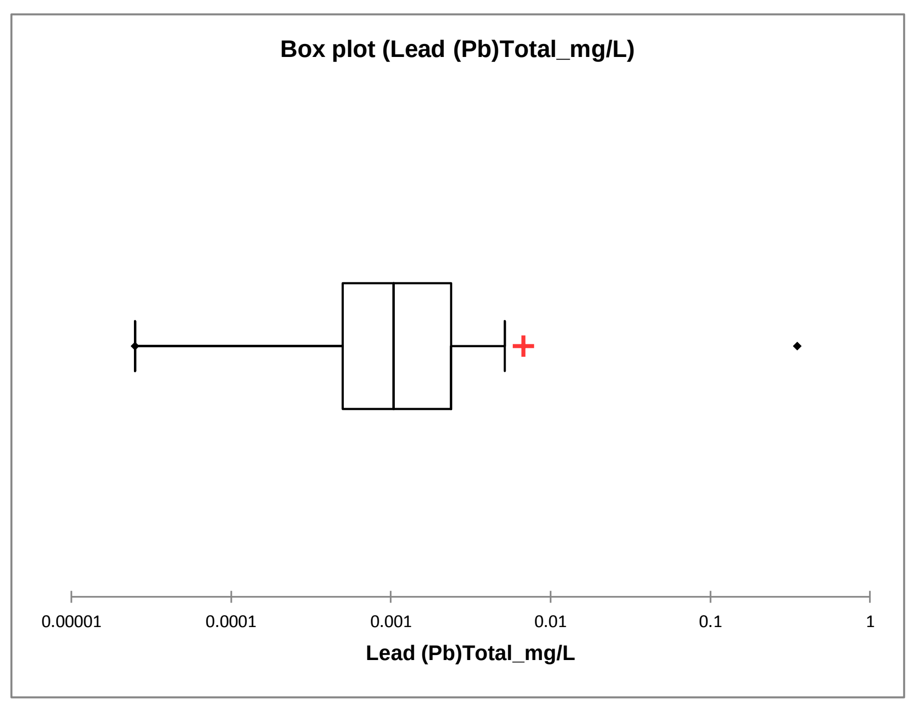


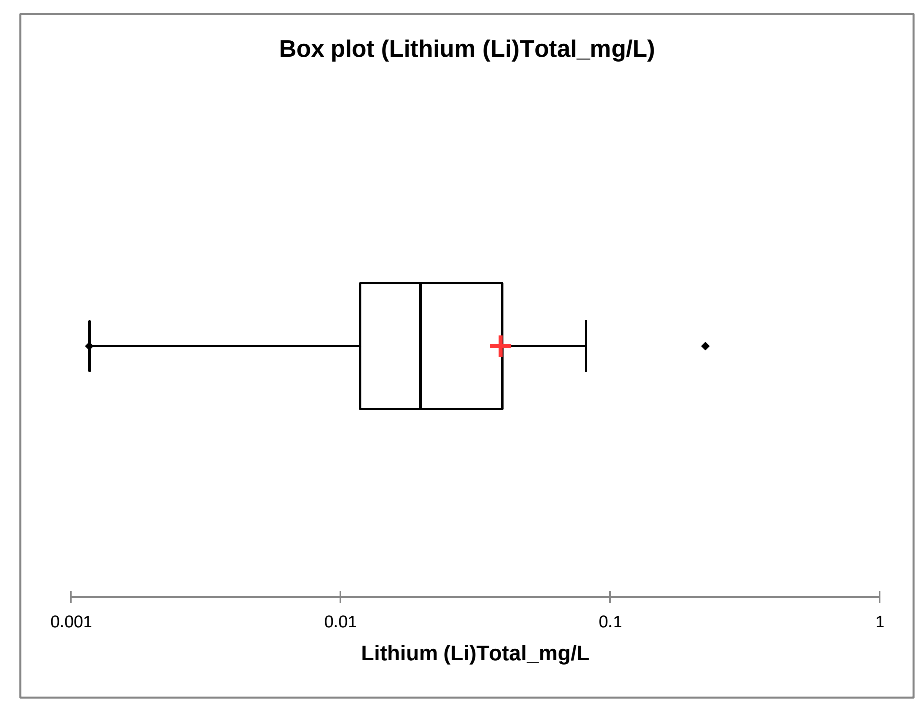


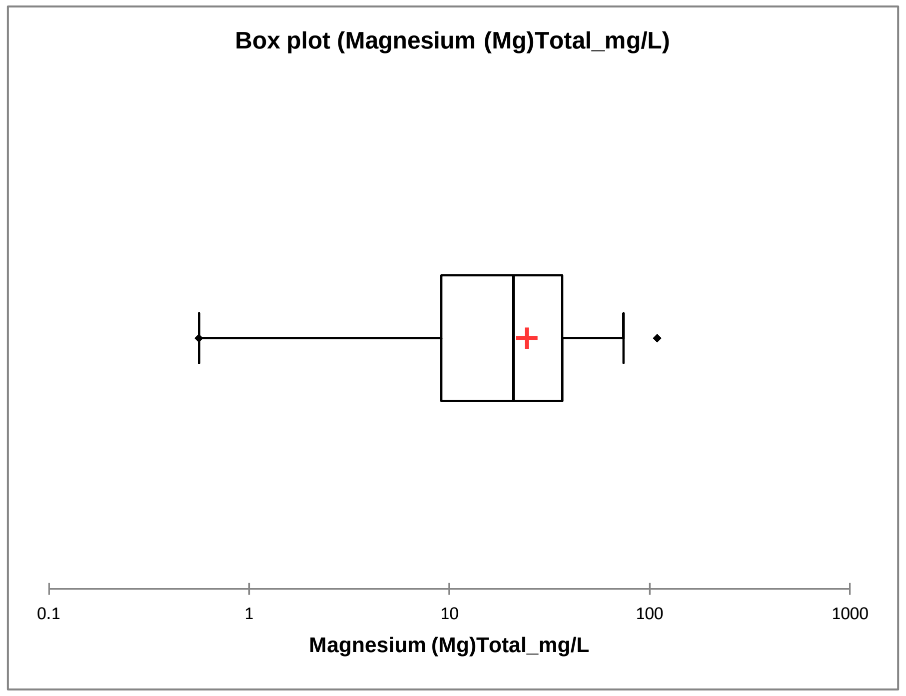


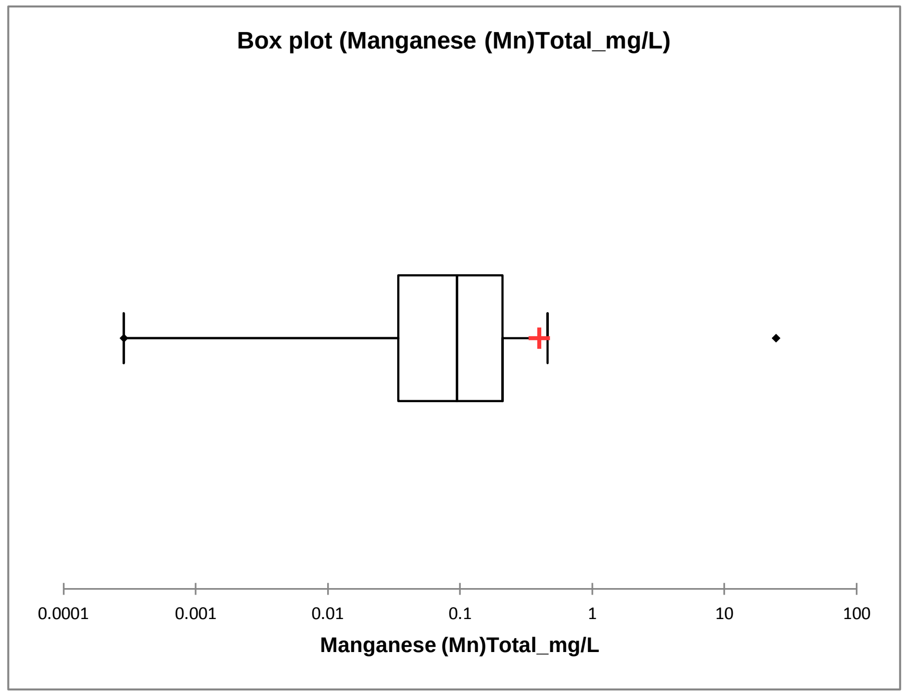


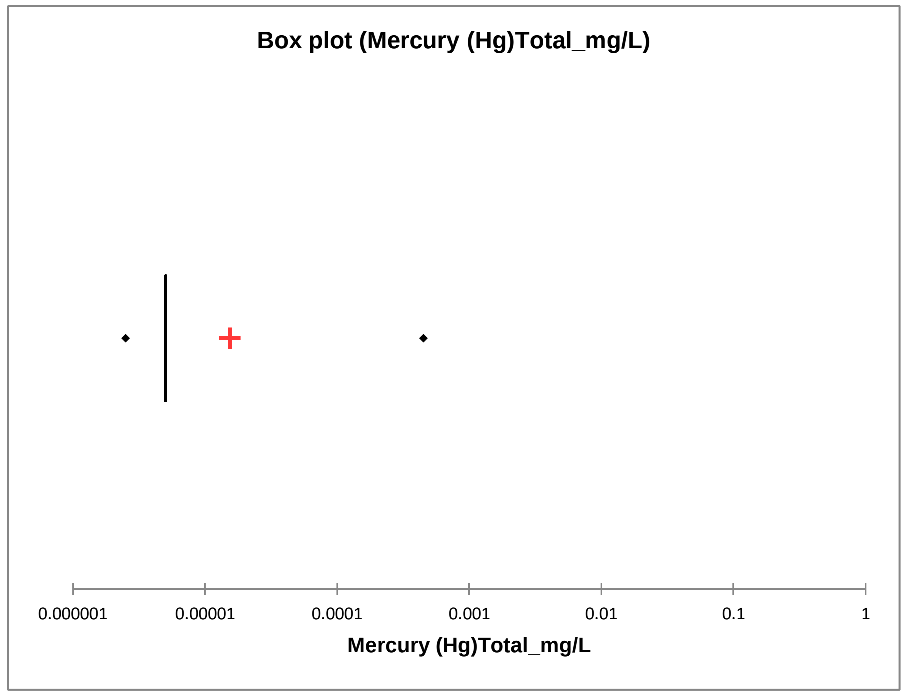


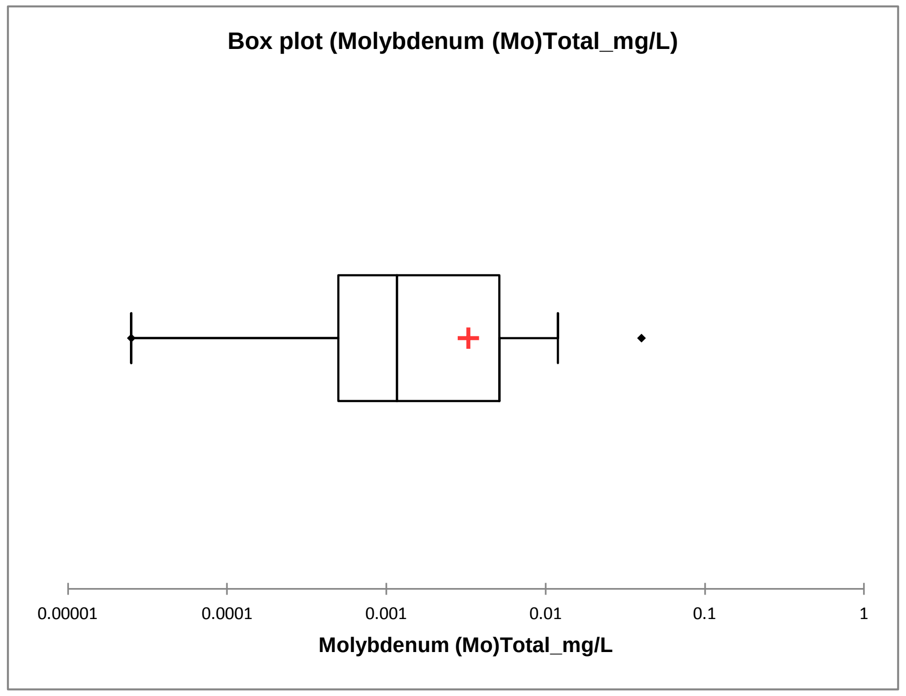


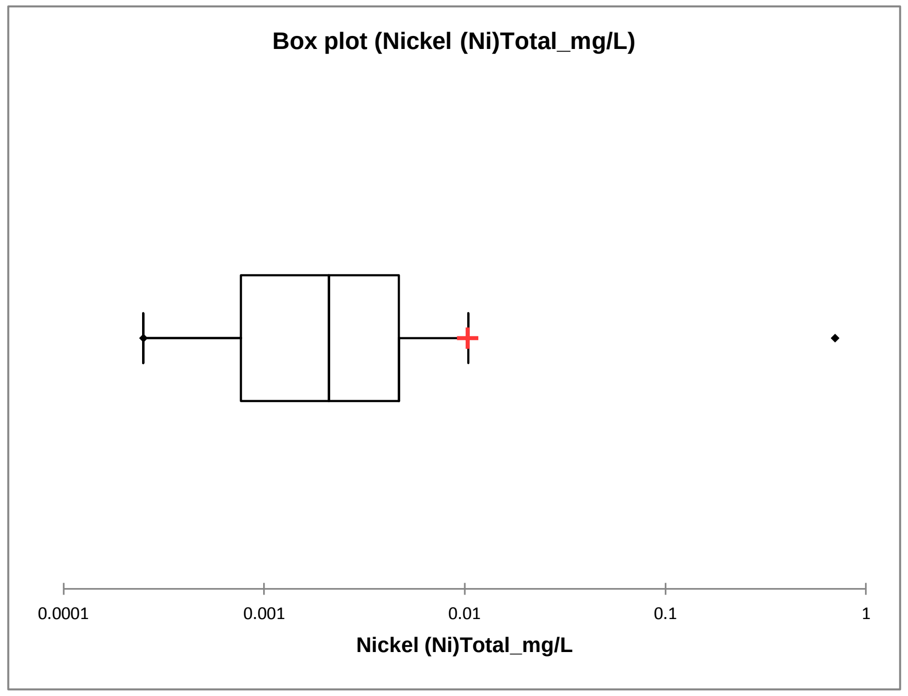


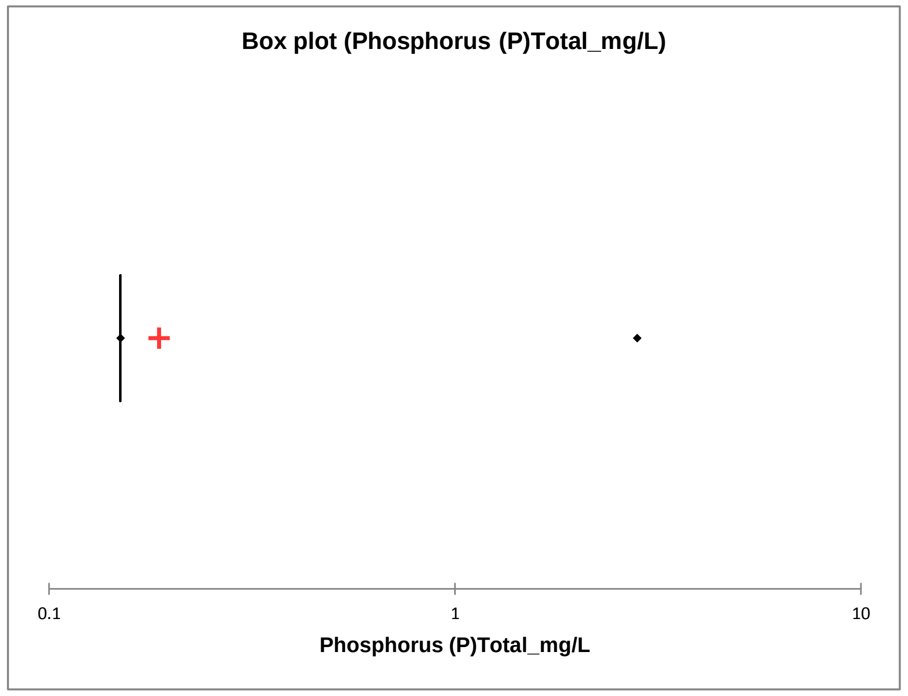

Box plot (Magnesium (Mg)Total_mg/L)
0.1
1
10
100
1000
Magnesium (Mg)Total_mg/L

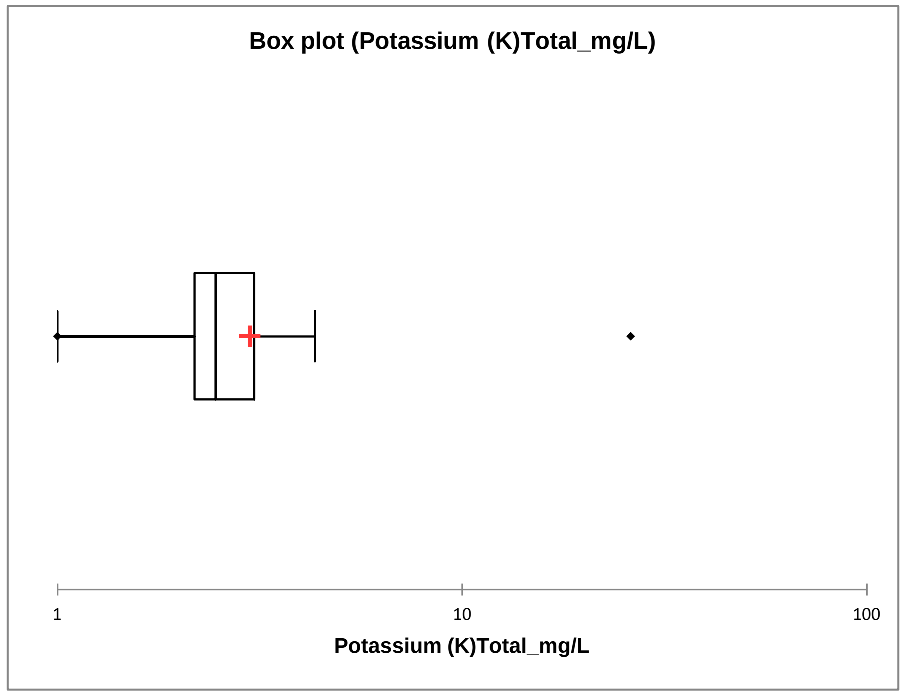

Box plot (Manganese (Mn)Total_mg/L)
0.0001
0.001
0.01
0.1
1
10
100
Manganese (Mn)Total_mg/L

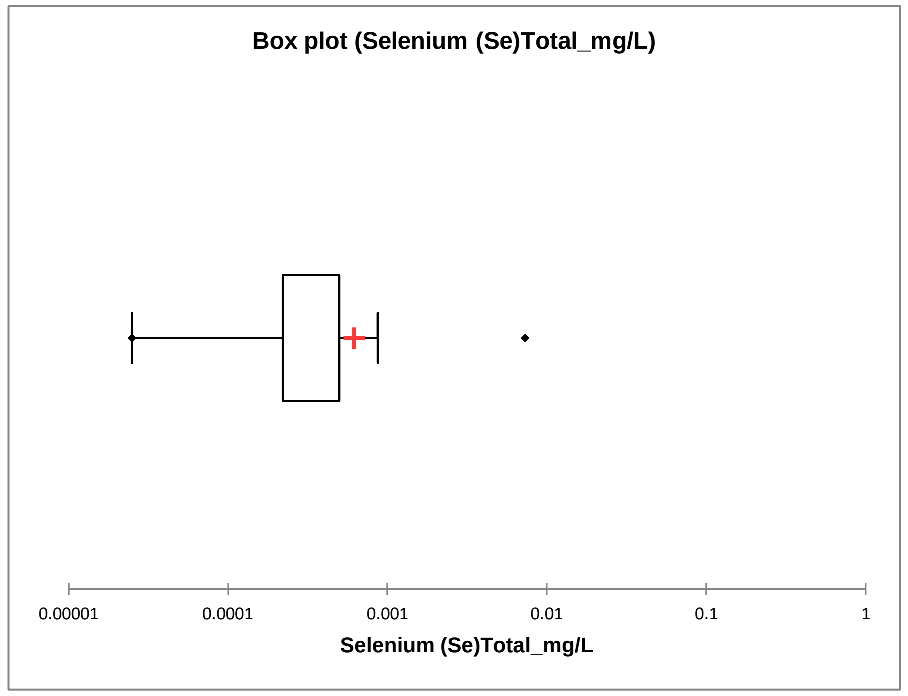

Box plot (Mercury (Hg)Total_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
Mercury (Hg)Total_mg/L

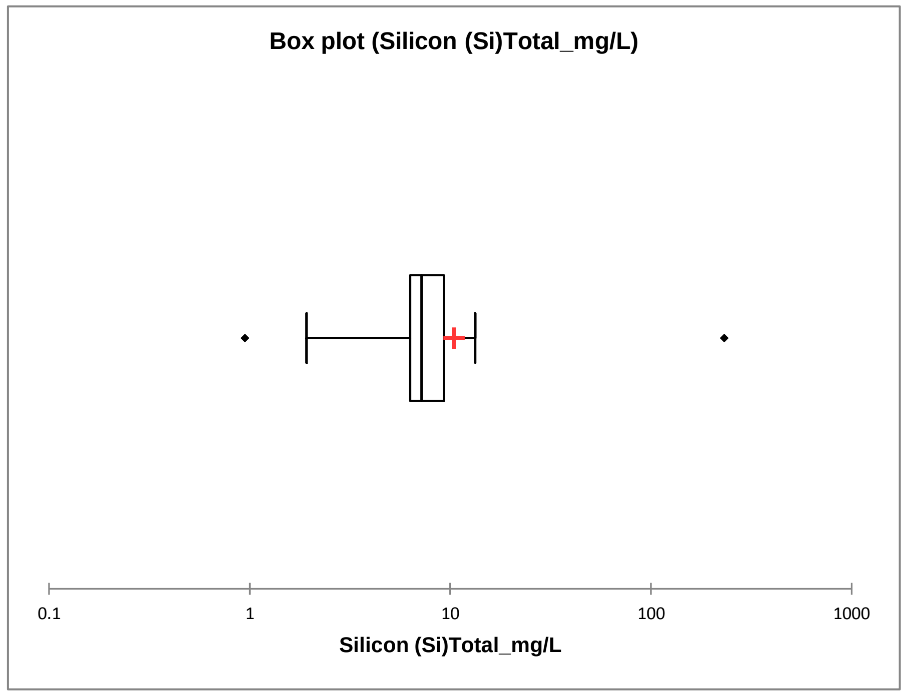

Box plot (Molybdenum (Mo)Total_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Molybdenum (Mo)Total_mg/L

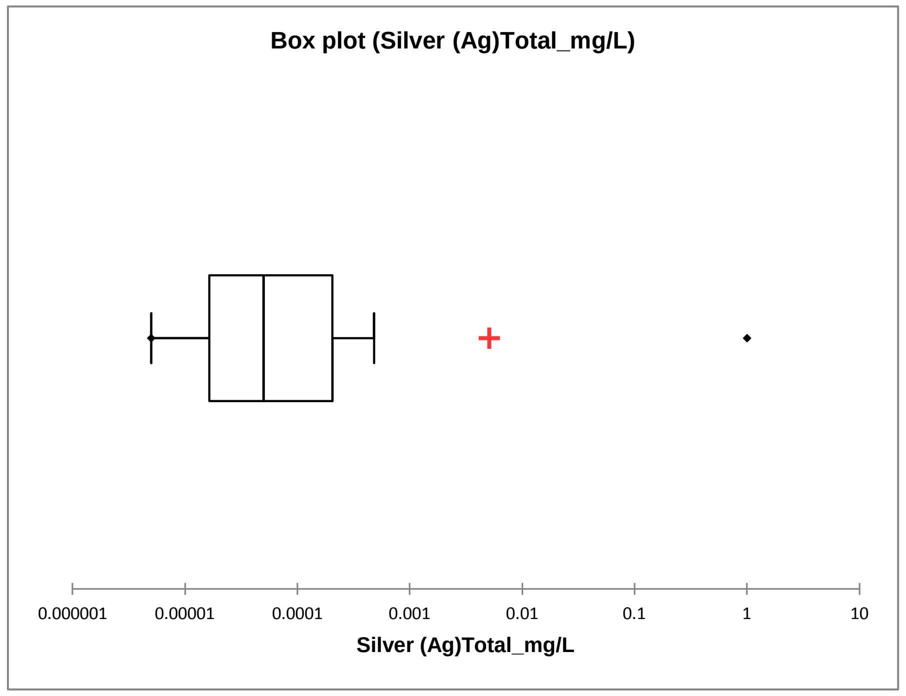

Box plot (Nickel (Ni)Total_mg/L)
0.0001
0.001
0.01
0.1
1
Nickel (Ni)Total_mg/L

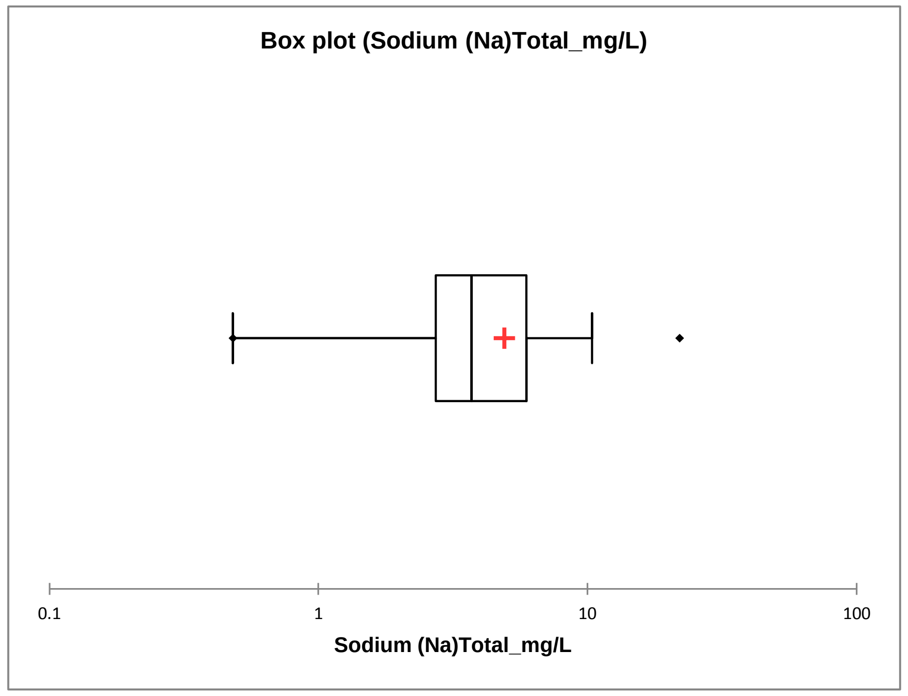

Box plot (Phosphorus (P)Total_mg/L)
0.1
1
10
Phosphorus (P)Total_mg/L

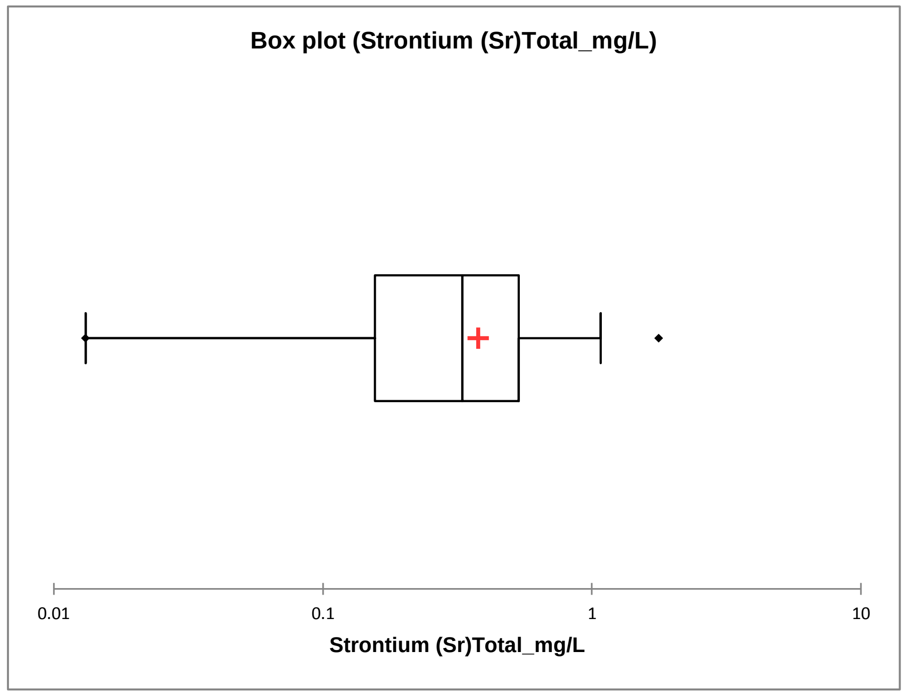

Box plot (Potassium (K)Total_mg/L)
1
10
100
Potassium (K)Total_mg/L

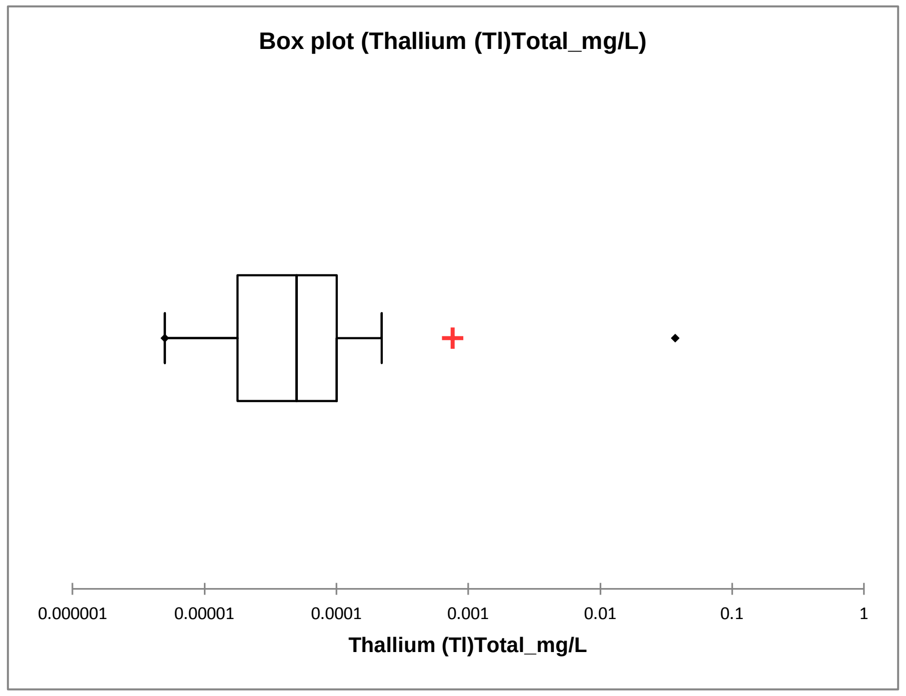

Box plot (Selenium (Se)Total_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Selenium (Se)Total_mg/L

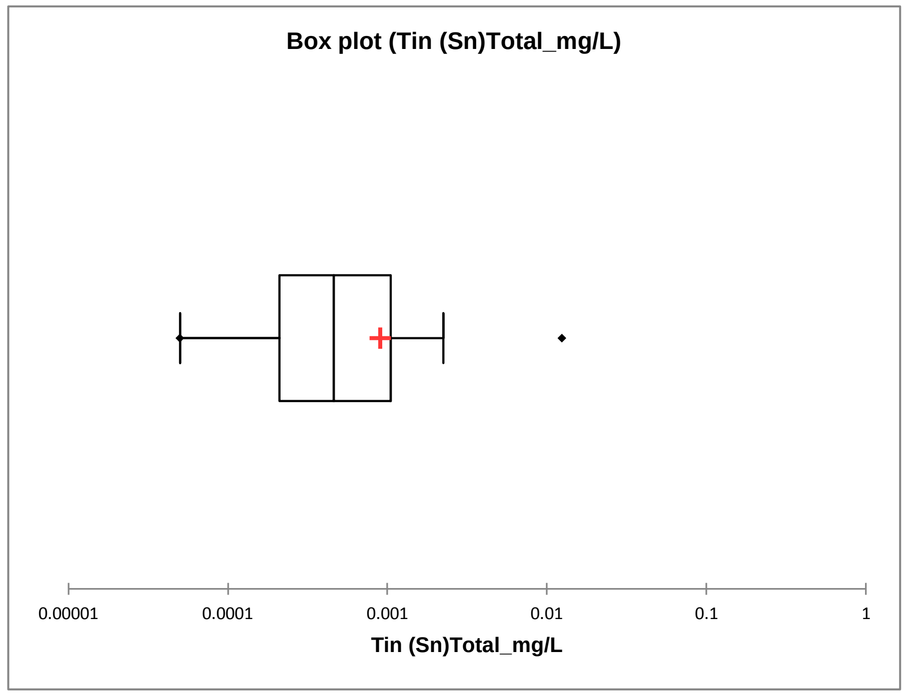

Box plot (Silicon (Si)Total_mg/L)
0.1
1
10
100
1000
Silicon (Si)Total_mg/L

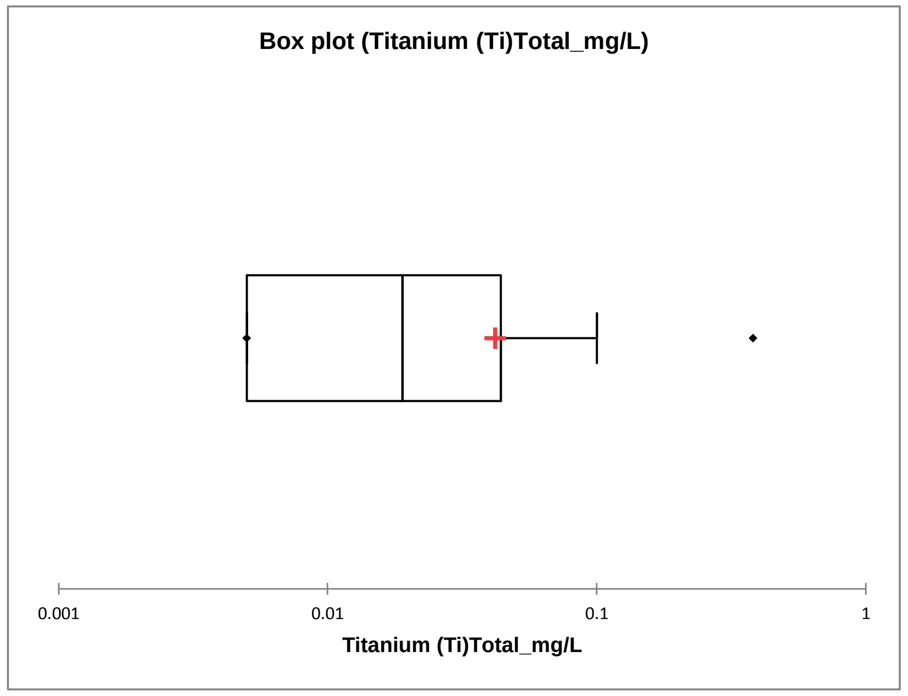

Box plot (Silver (Ag)Total_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
10
Silver (Ag)Total_mg/L

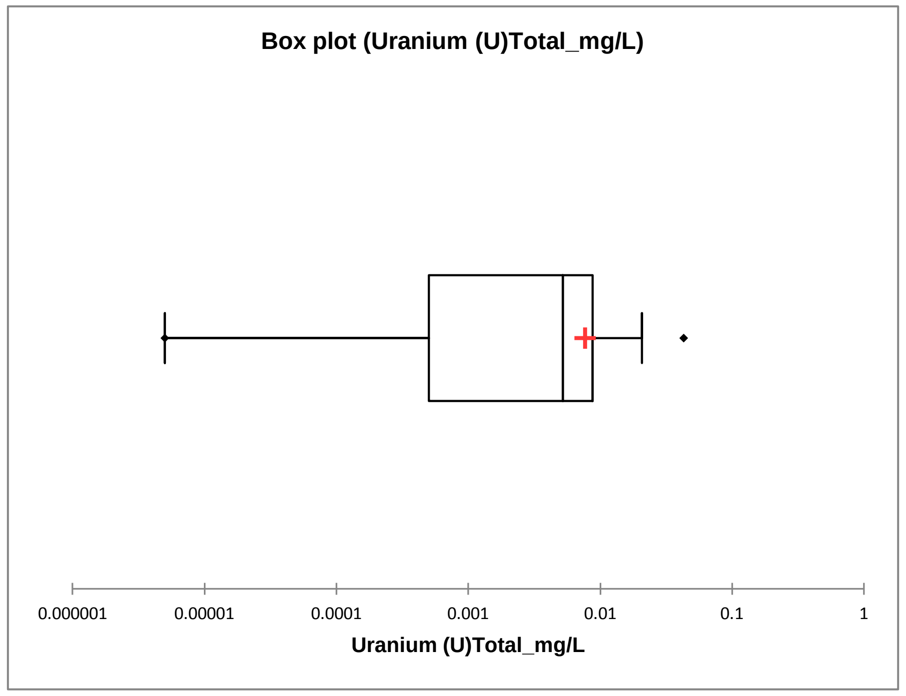

Box plot (Sodium (Na)Total_mg/L)
0.1
1
10
100
Sodium (Na)Total_mg/L

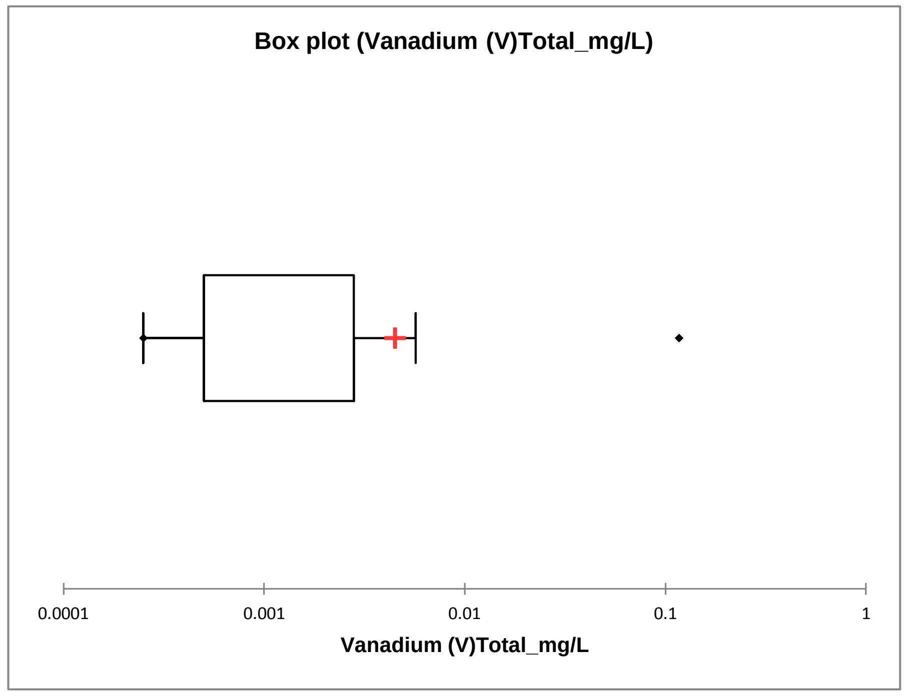

Box plot (Strontium (Sr)Total_mg/L)
0.01
0.1
1
10
Strontium (Sr)Total_mg/L

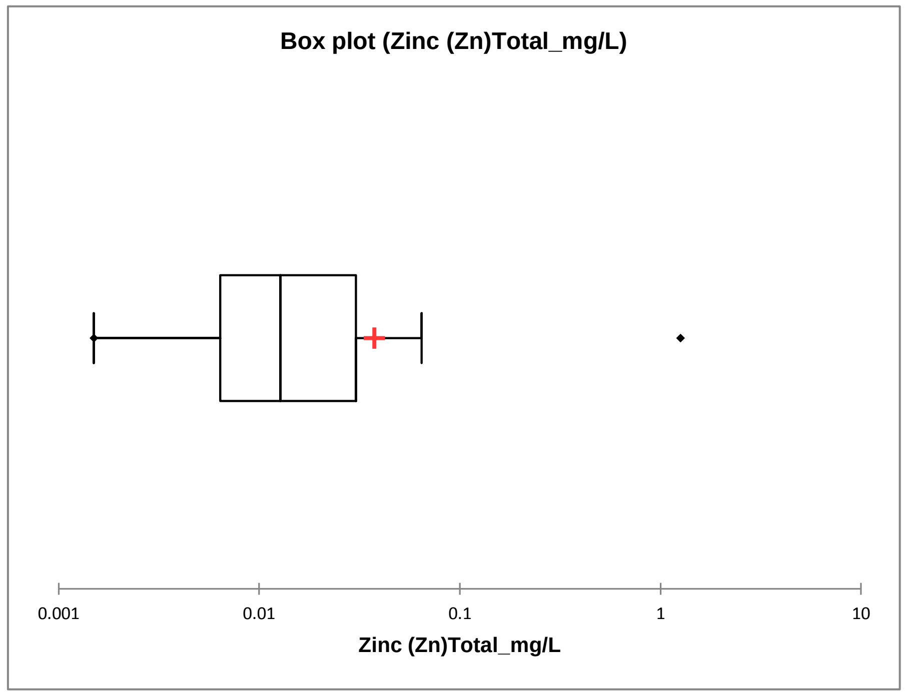

Box plot (Thallium (Tl)Total_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
Thallium (Tl)Total_mg/L


Box plot (Tin (Sn)Total_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Tin (Sn)Total_mg/L

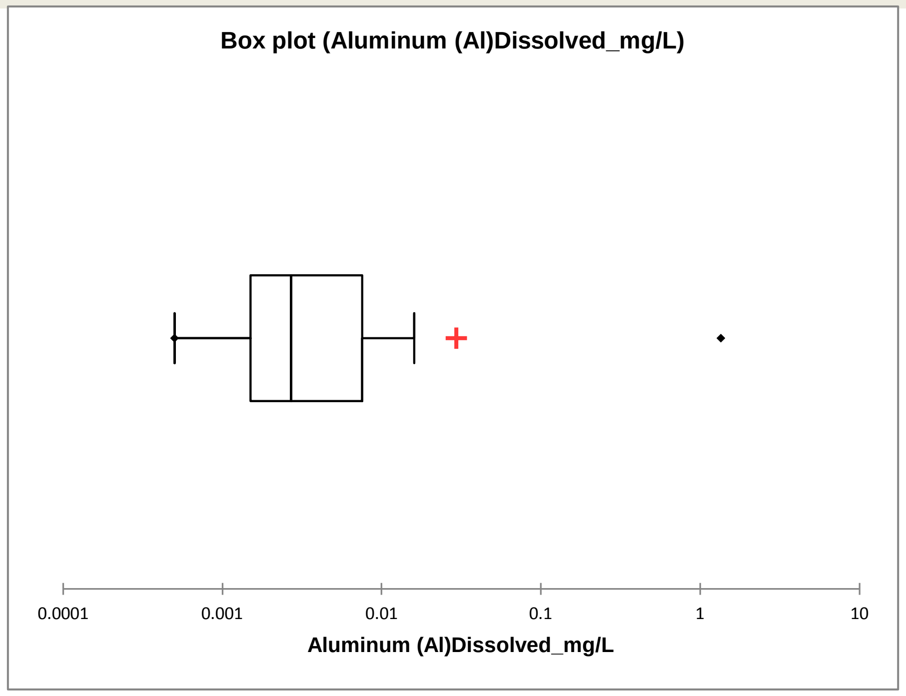

Box plot (Titanium (Ti)Total_mg/L)
0.001
0.01
0.1
1
Titanium (Ti)Total_mg/L

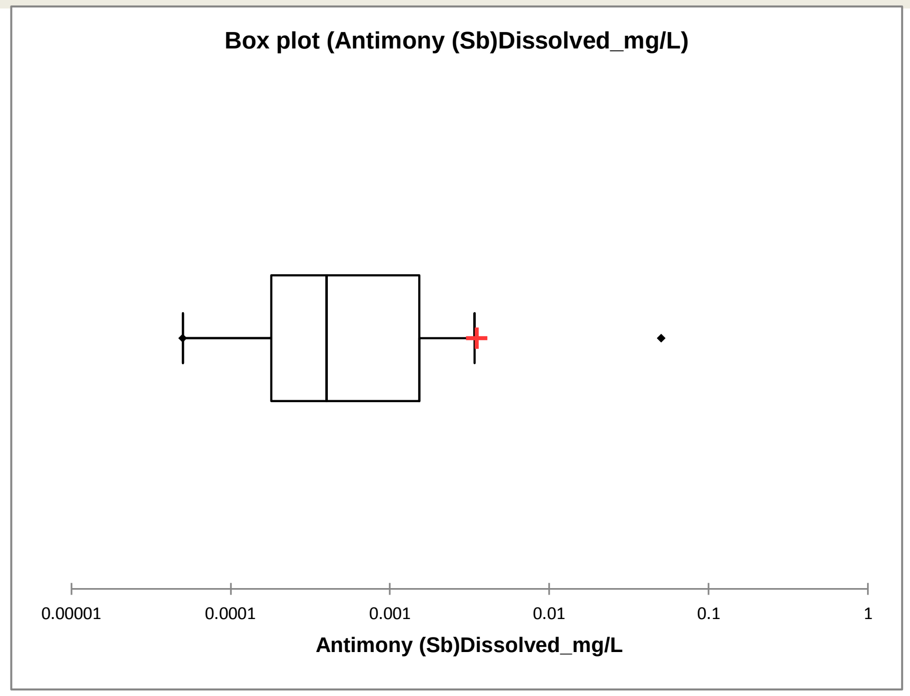

Box plot (Uranium (U)Total_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
Uranium (U)Total_mg/L

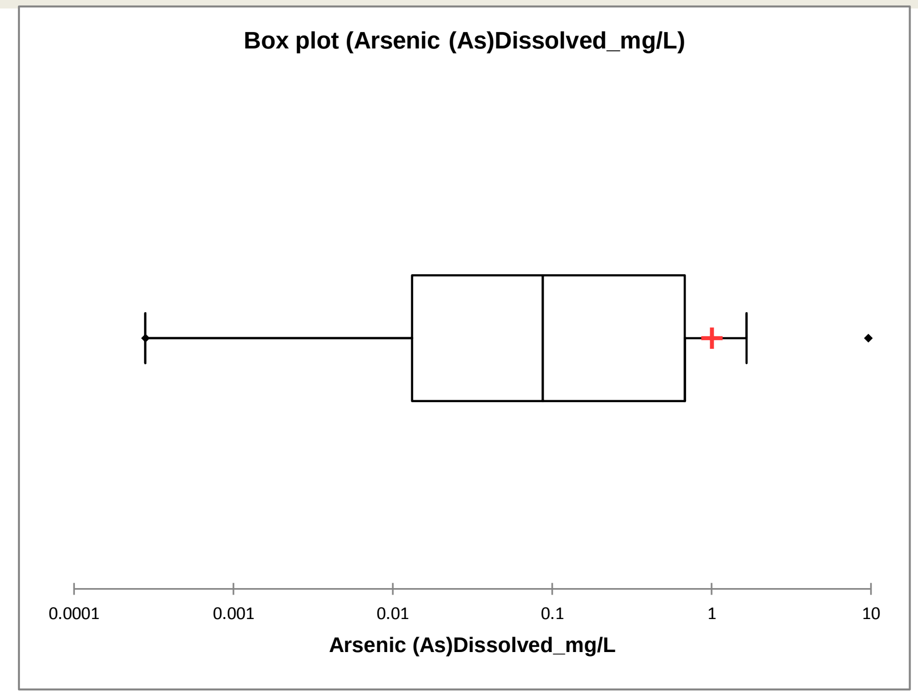

Box plot (Vanadium (V)Total_mg/L)
0.0001
0.001
0.01
0.1
1
Vanadium (V)Total_mg/L

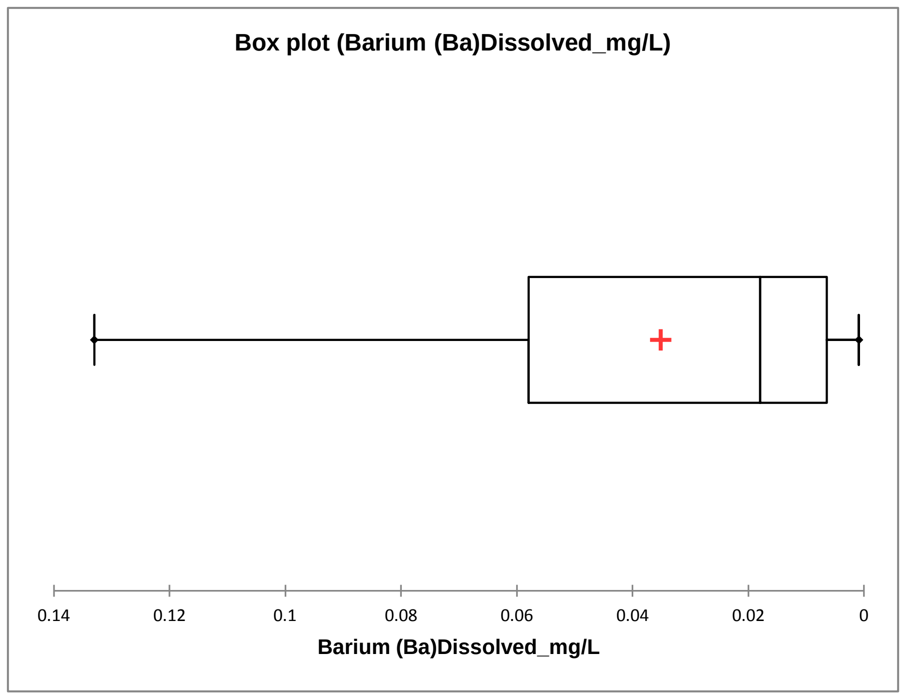

Box plot (Zinc (Zn)Total_mg/L)
0.001
0.01
0.1
1
10
Zinc (Zn)Total_mg/L

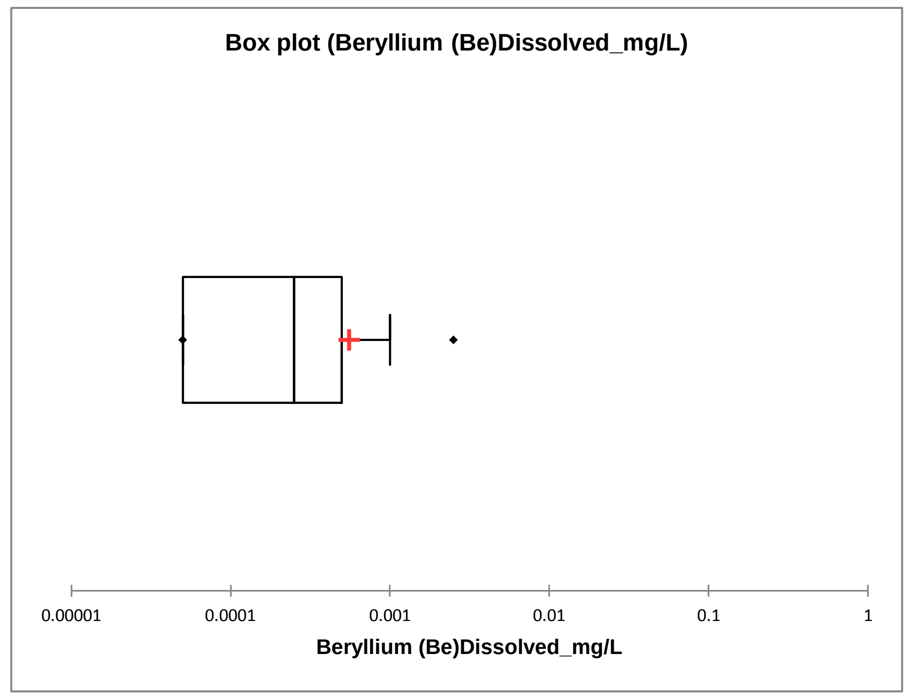
**** DISSOLVED METALS ****

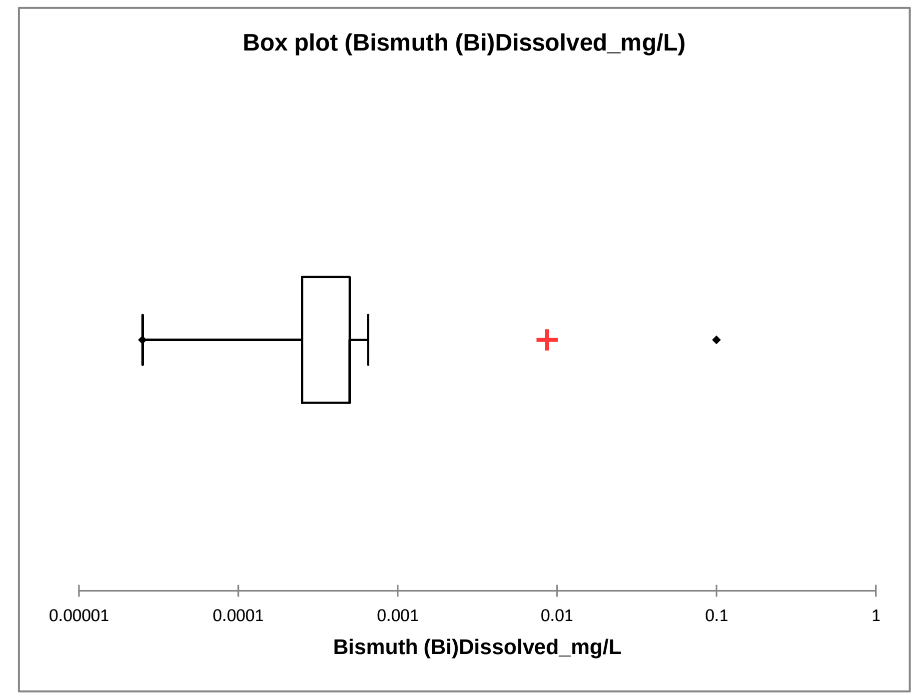


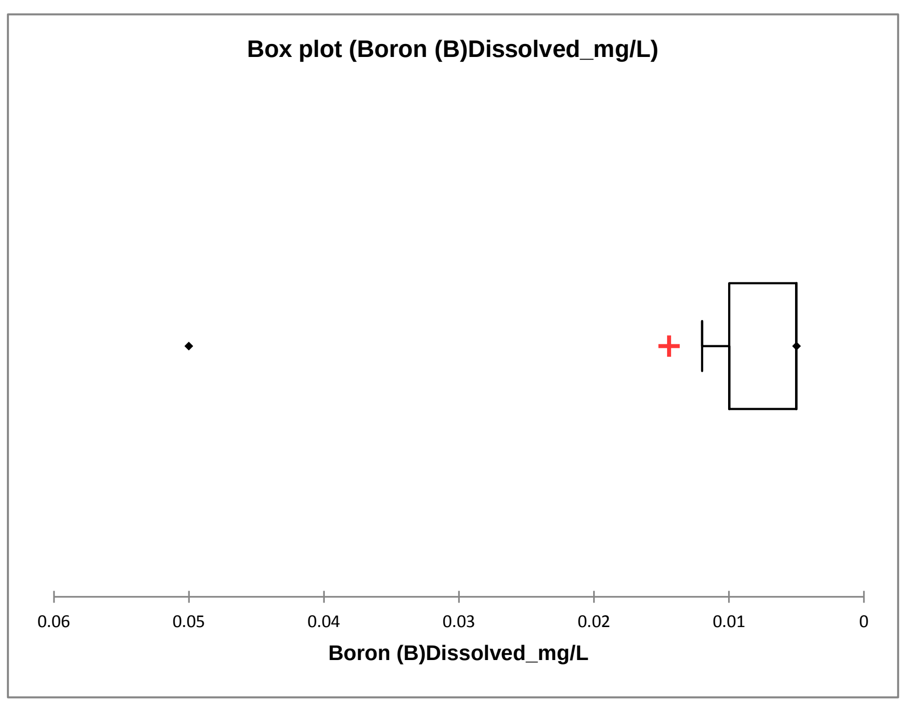


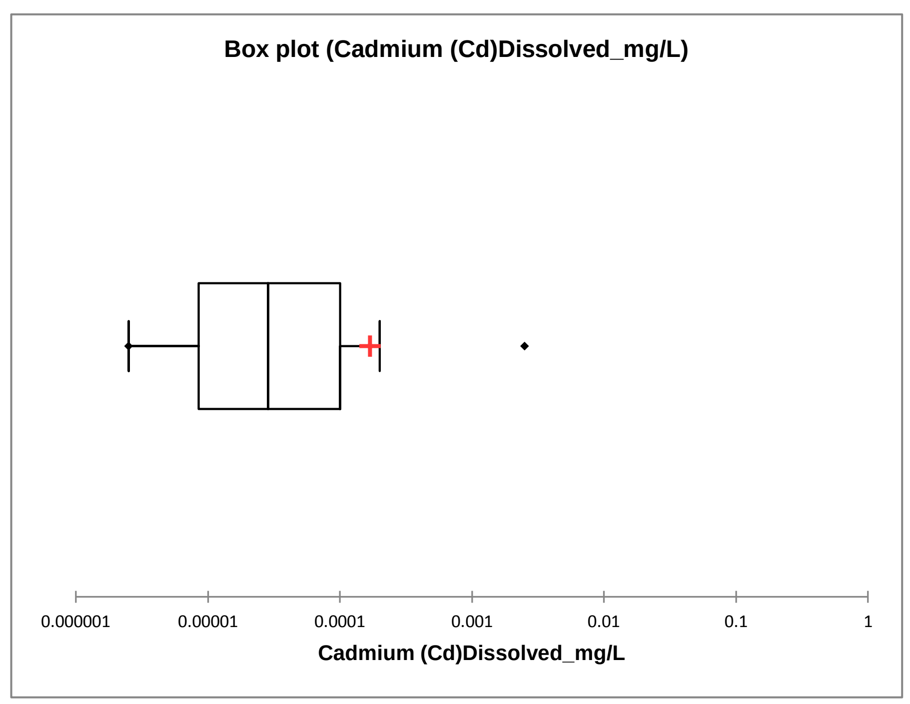


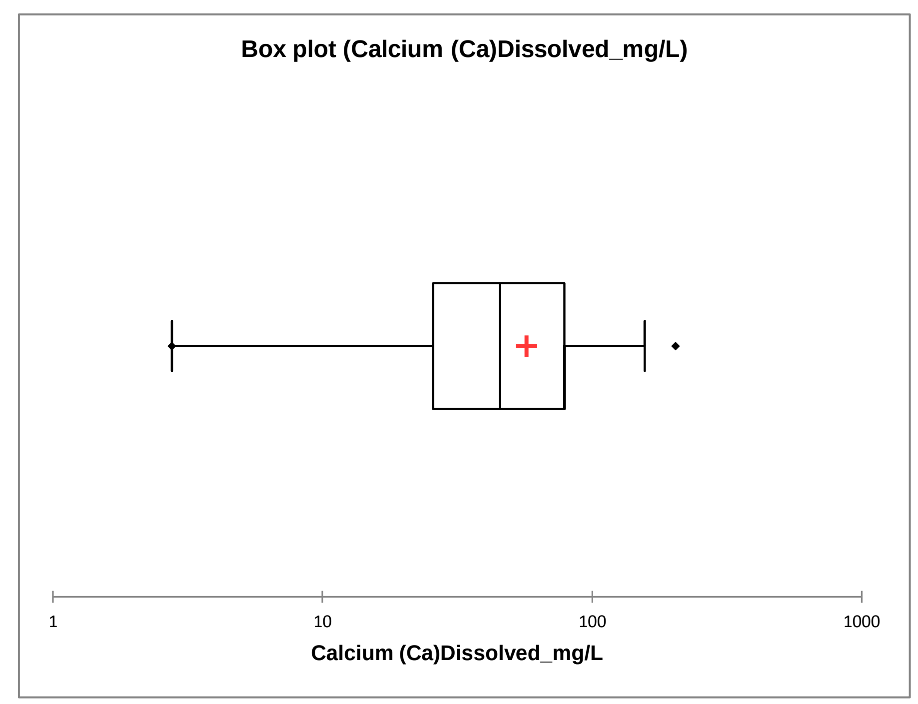


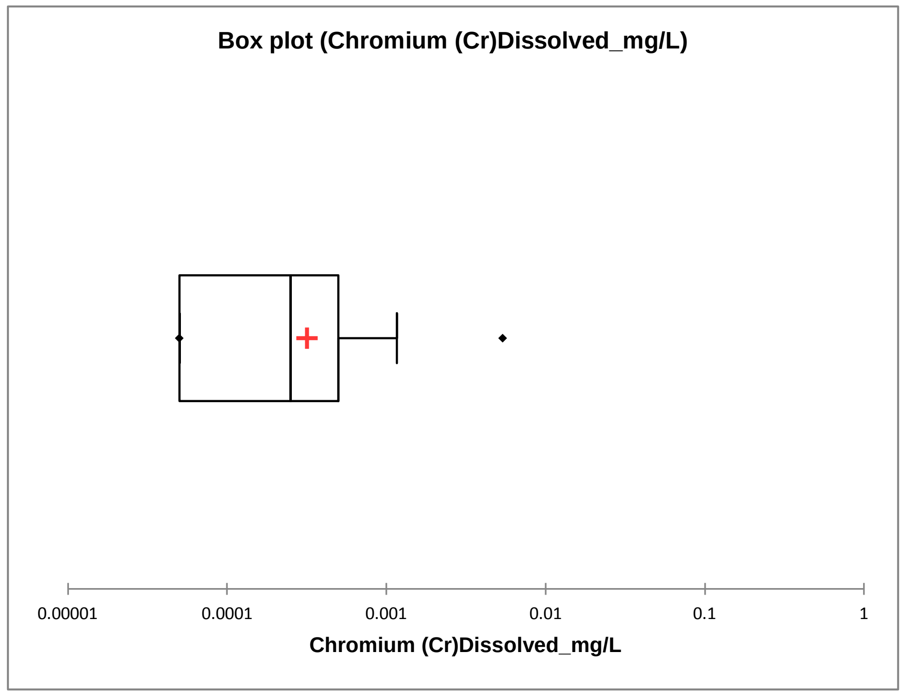


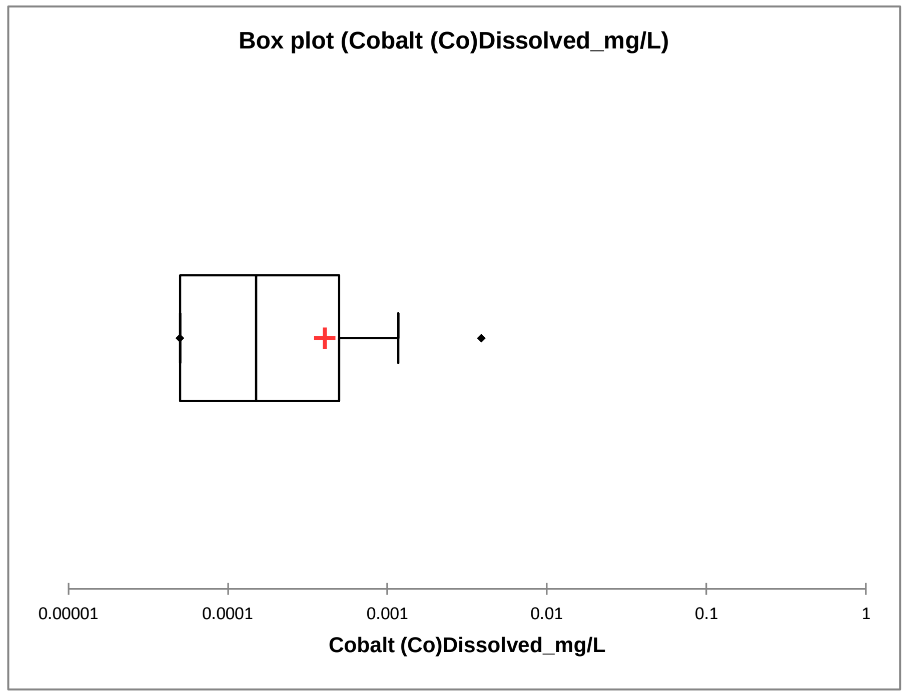


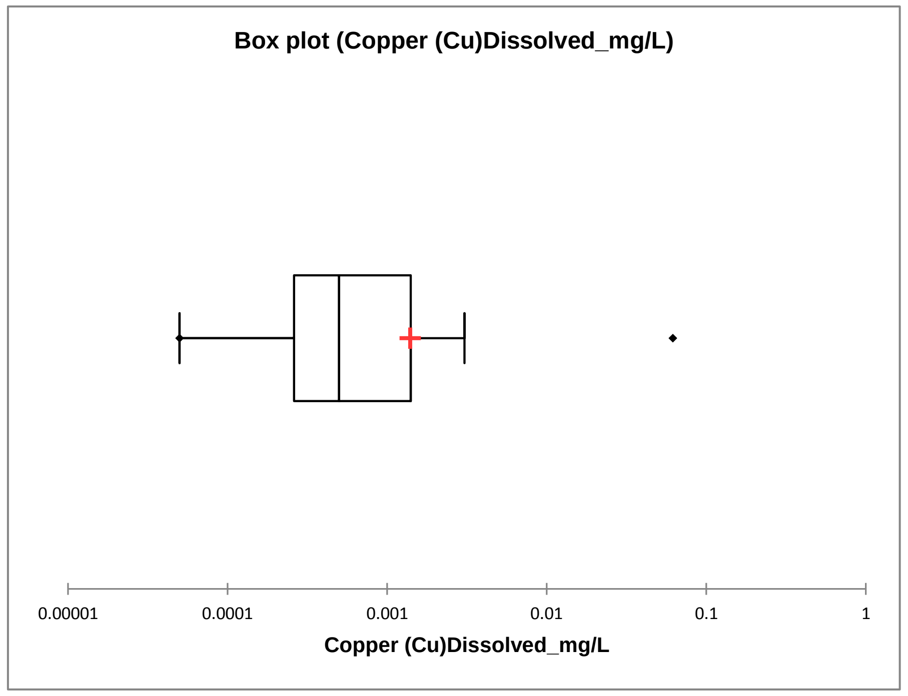


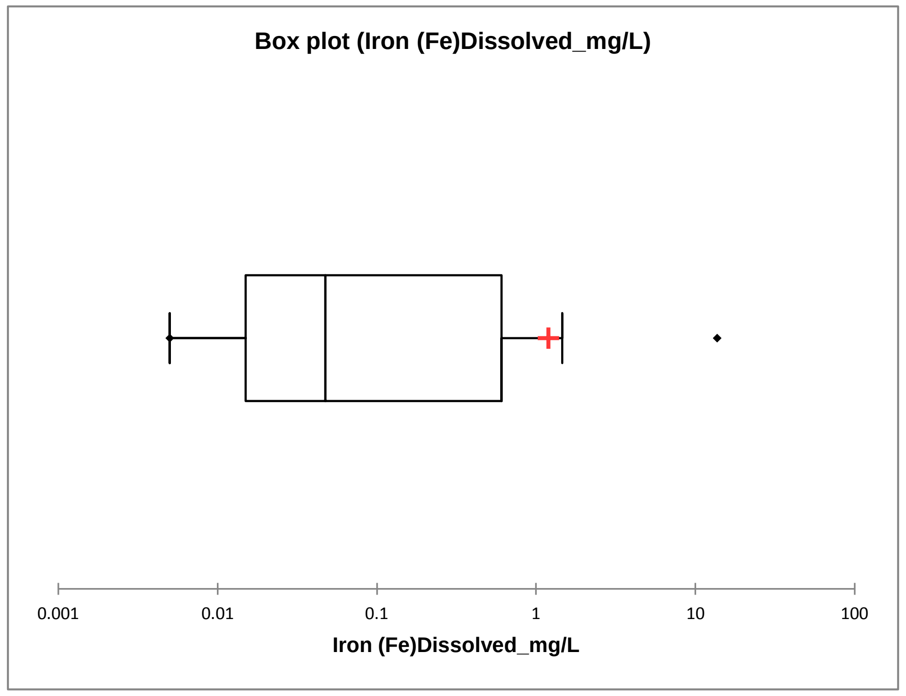


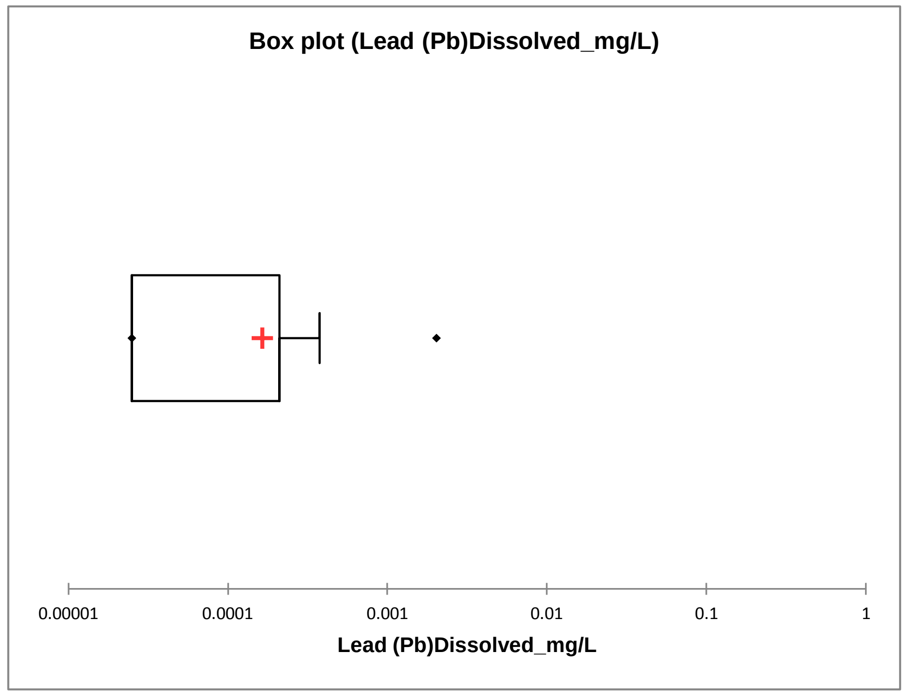


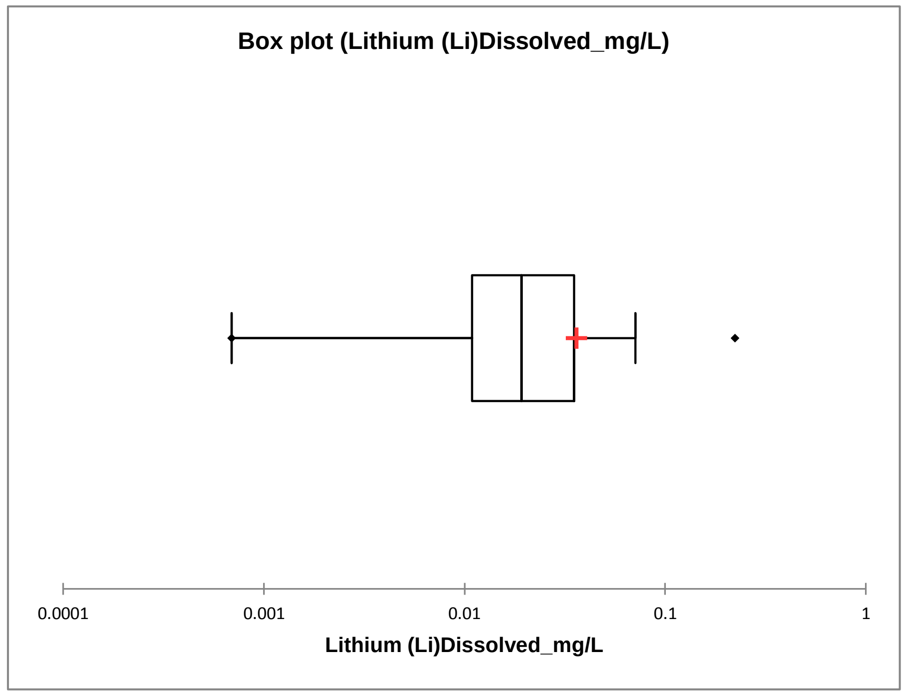

Box plot (Chromium (Cr)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Chromium (Cr)Dissolved_mg/L

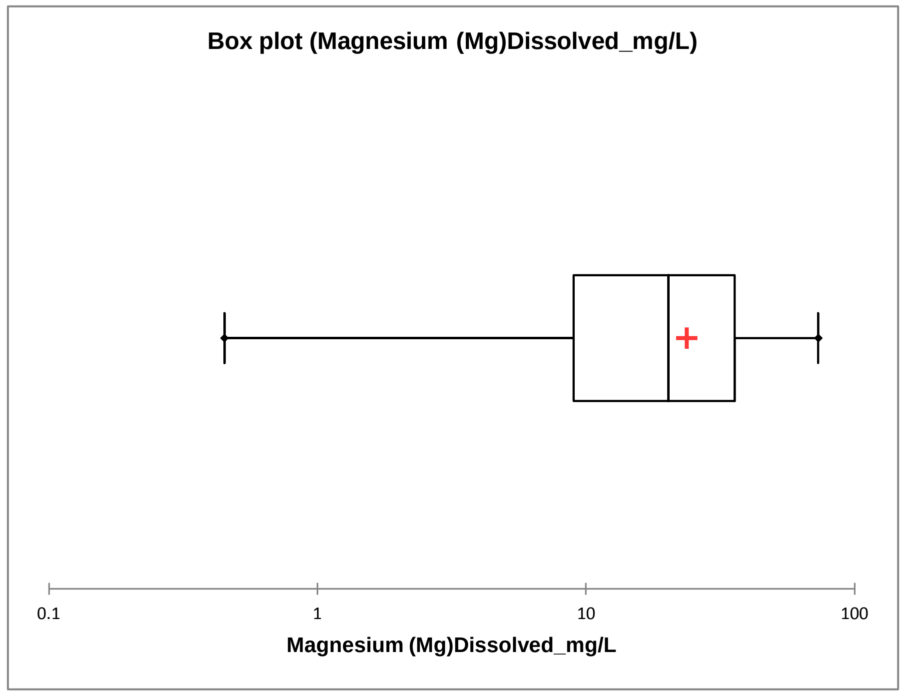

Box plot (Cobalt (Co)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Cobalt (Co)Dissolved_mg/L

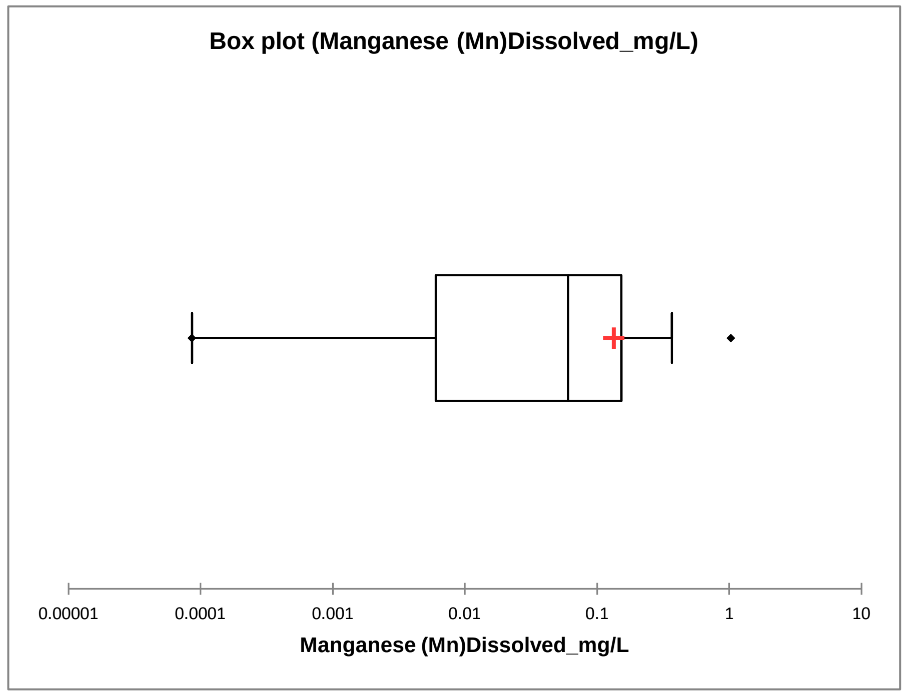

Box plot (Copper (Cu)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Copper (Cu)Dissolved_mg/L

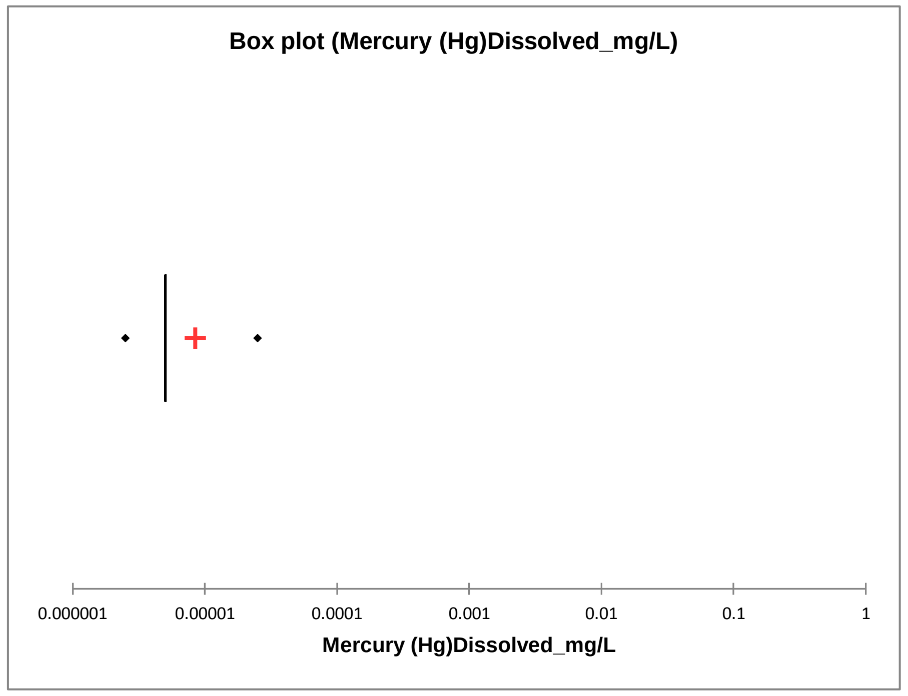

Box plot (Iron (Fe)Dissolved_mg/L)
0.001
0.01
0.1
1
10
100
Iron (Fe)Dissolved_mg/L

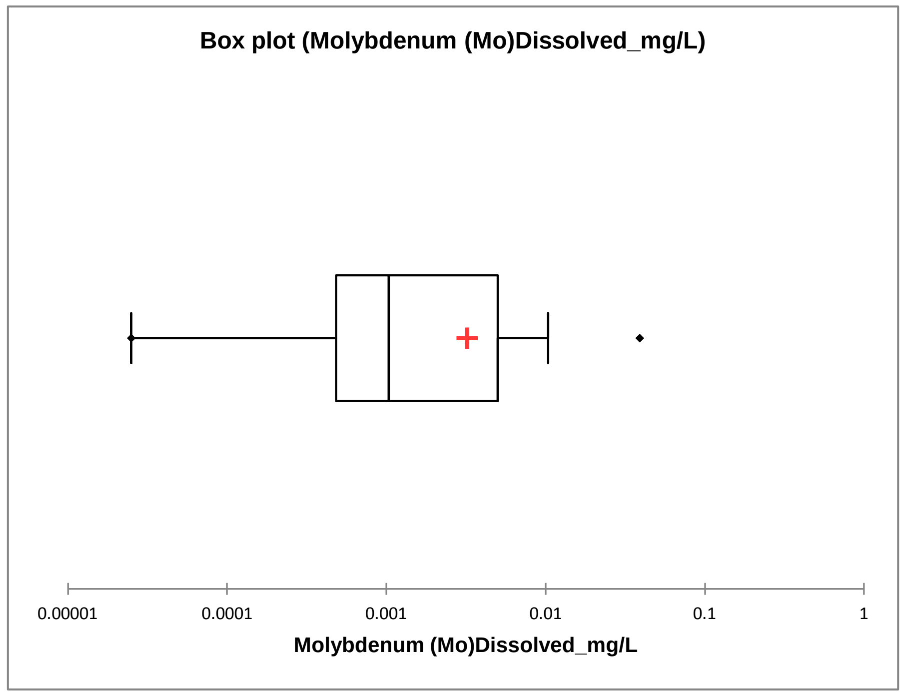

Box plot (Lead (Pb)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Lead (Pb)Dissolved_mg/L

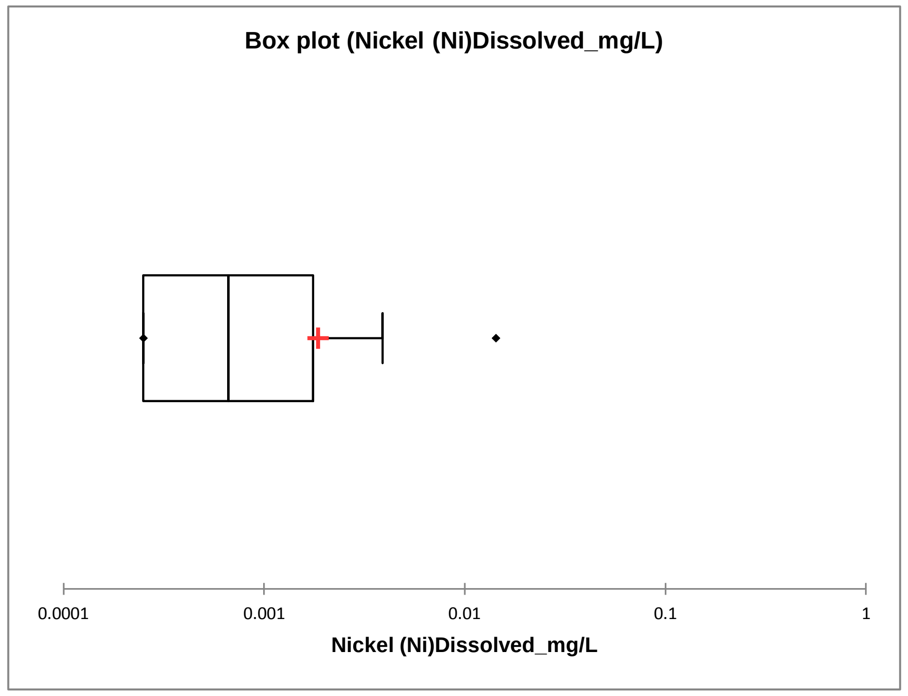

Box plot (Lithium (Li)Dissolved_mg/L)
0.0001
0.001
0.01
0.1
1
Lithium (Li)Dissolved_mg/L

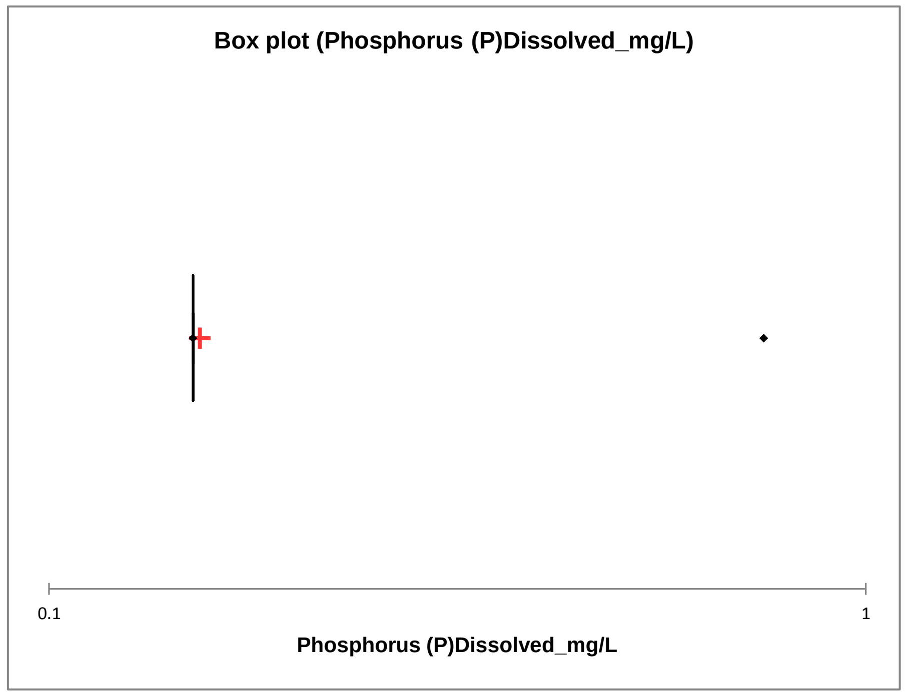

Box plot (Magnesium (Mg)Dissolved_mg/L)
0.1
1
10
100
Magnesium (Mg)Dissolved_mg/L

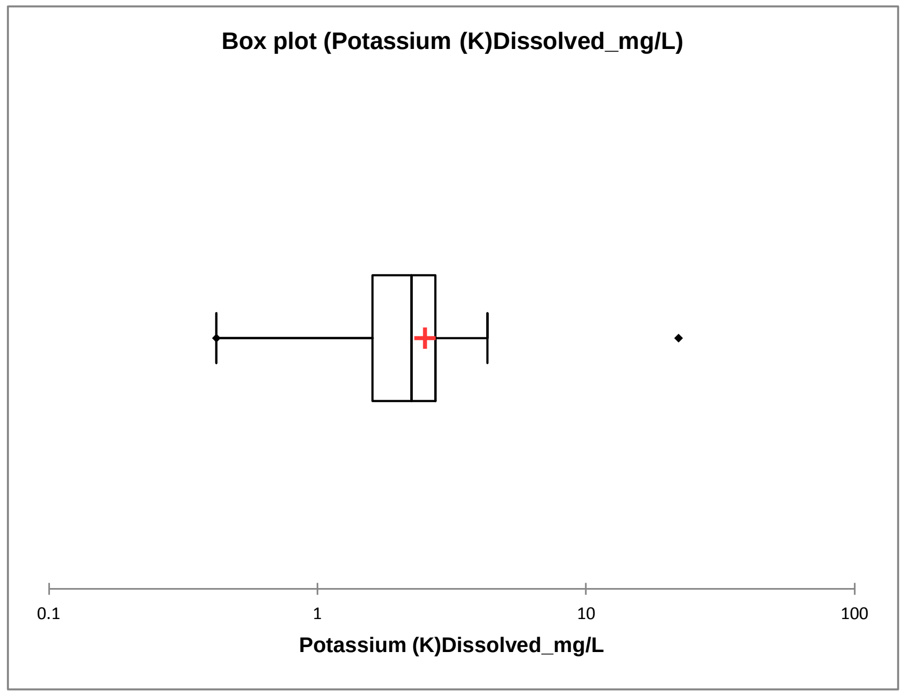

Box plot (Manganese (Mn)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
10
Manganese (Mn)Dissolved_mg/L

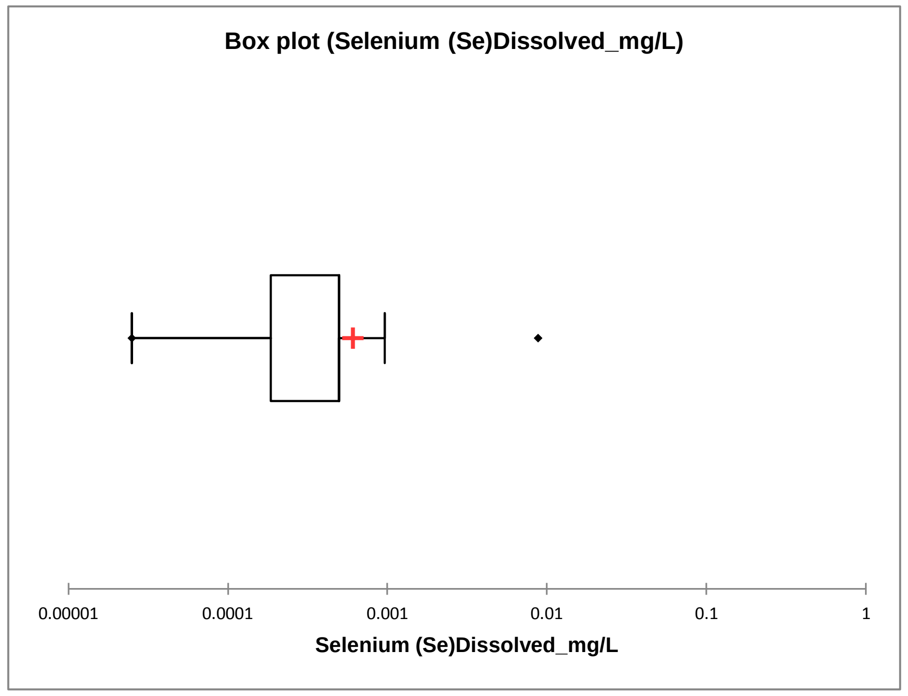

Box plot (Mercury (Hg)Dissolved_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
Mercury (Hg)Dissolved_mg/L

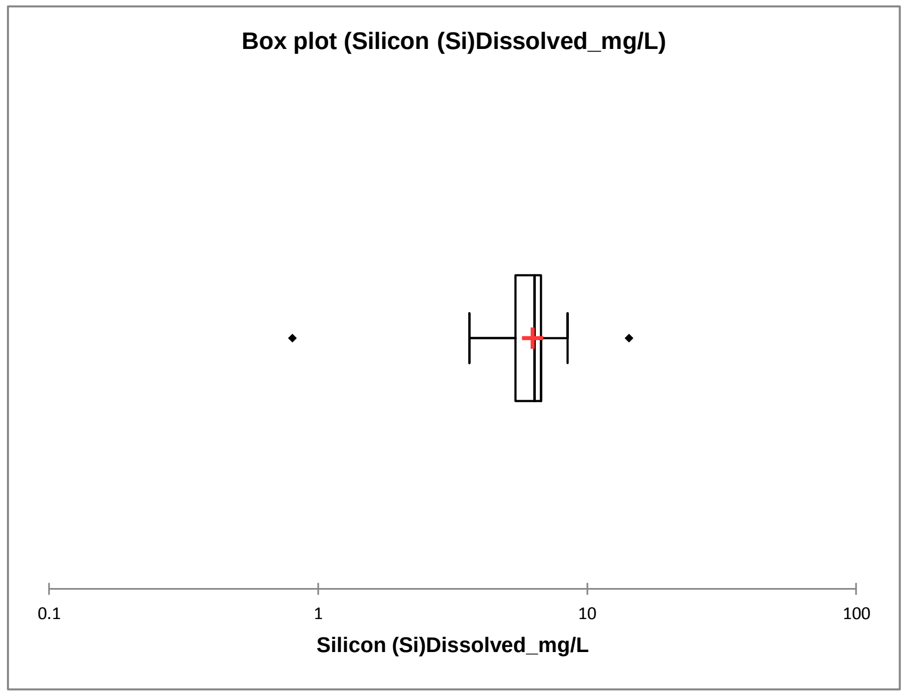

Box plot (Molybdenum (Mo)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Molybdenum (Mo)Dissolved_mg/L

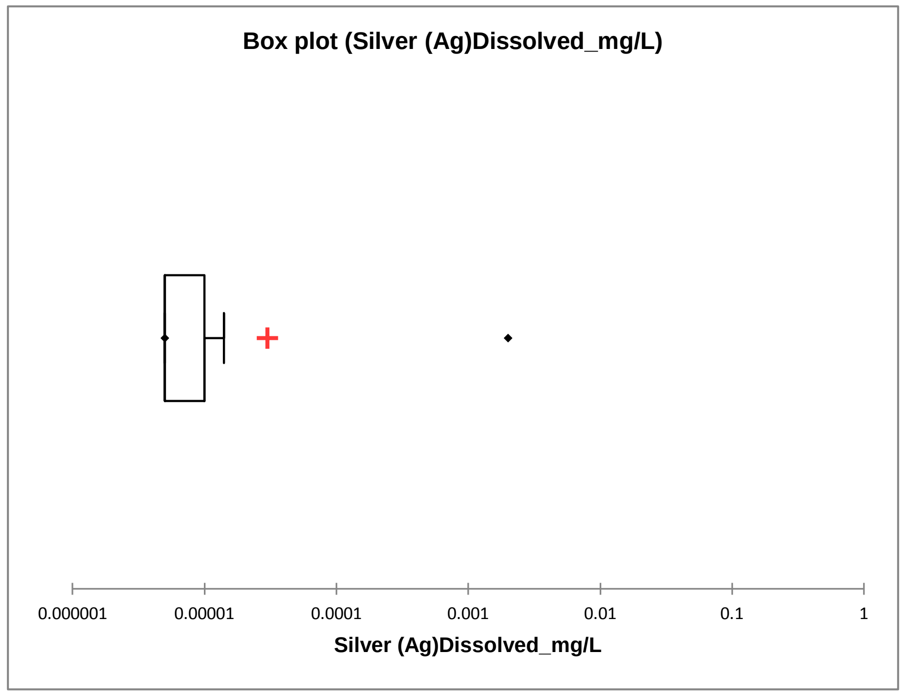

Box plot (Nickel (Ni)Dissolved_mg/L)
0.0001
0.001
0.01
0.1
1
Nickel (Ni)Dissolved_mg/L

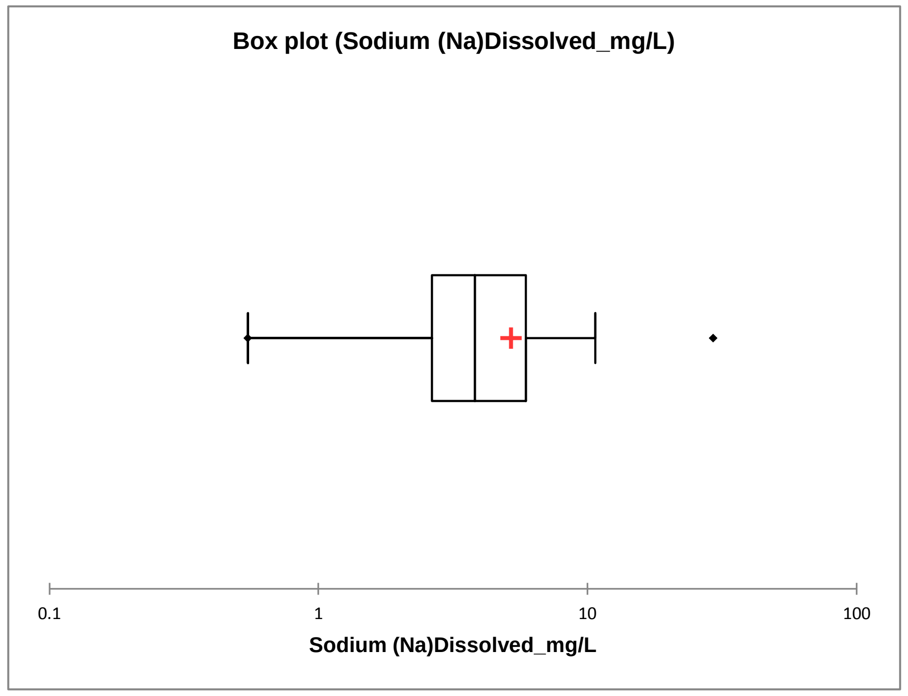

Box plot (Phosphorus (P)Dissolved_mg/L)
0.1
1
Phosphorus (P)Dissolved_mg/L


Box plot (Potassium (K)Dissolved_mg/L)
0.1
1
10
100
Potassium (K)Dissolved_mg/L

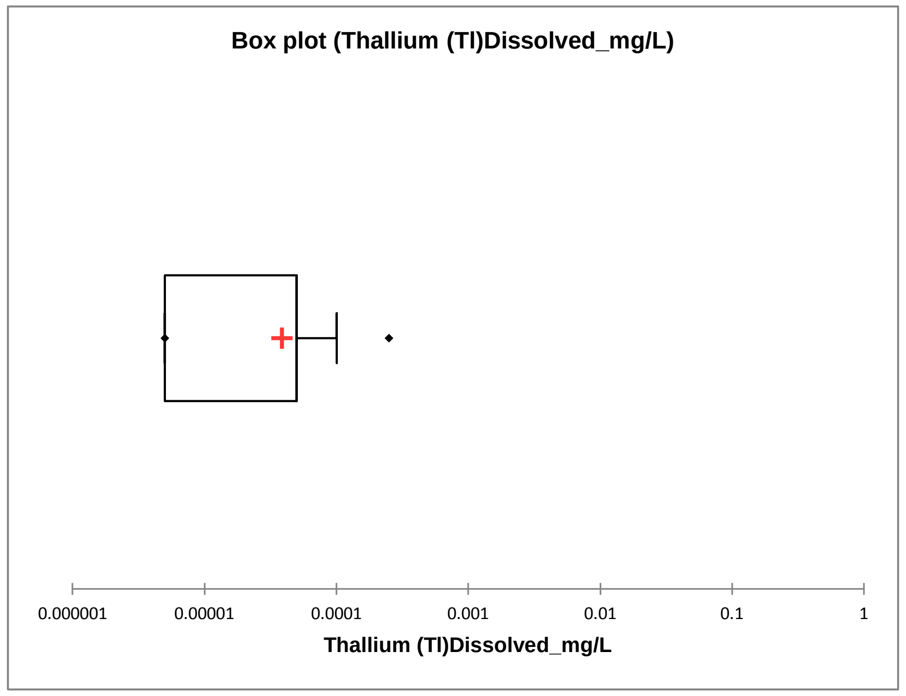

Box plot (Selenium (Se)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Selenium (Se)Dissolved_mg/L

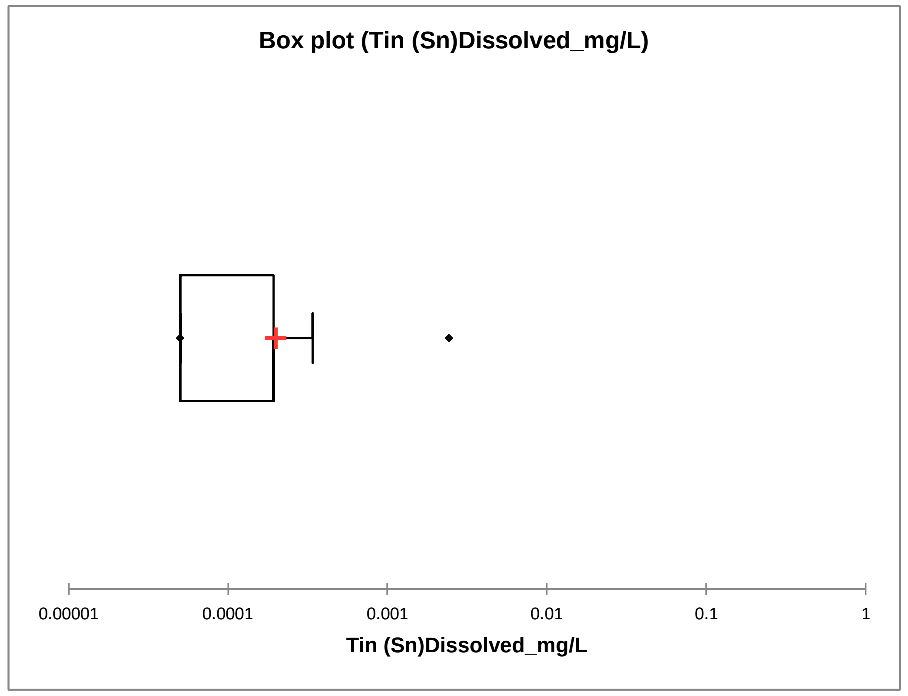

Box plot (Silicon (Si)Dissolved_mg/L)
0.1
1
10
100
Silicon (Si)Dissolved_mg/L

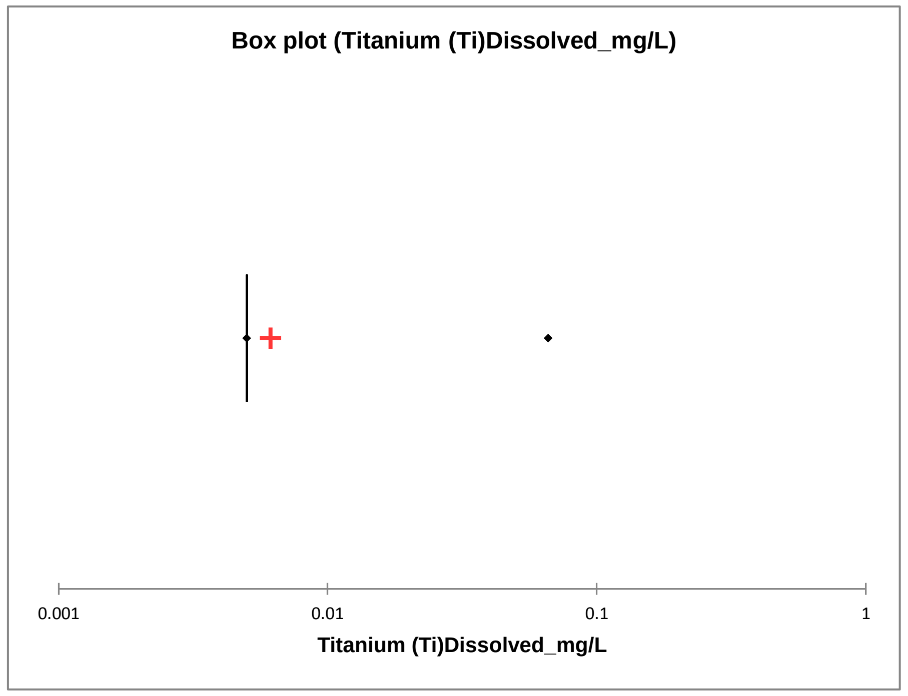

Box plot (Silver (Ag)Dissolved_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
Silver (Ag)Dissolved_mg/L

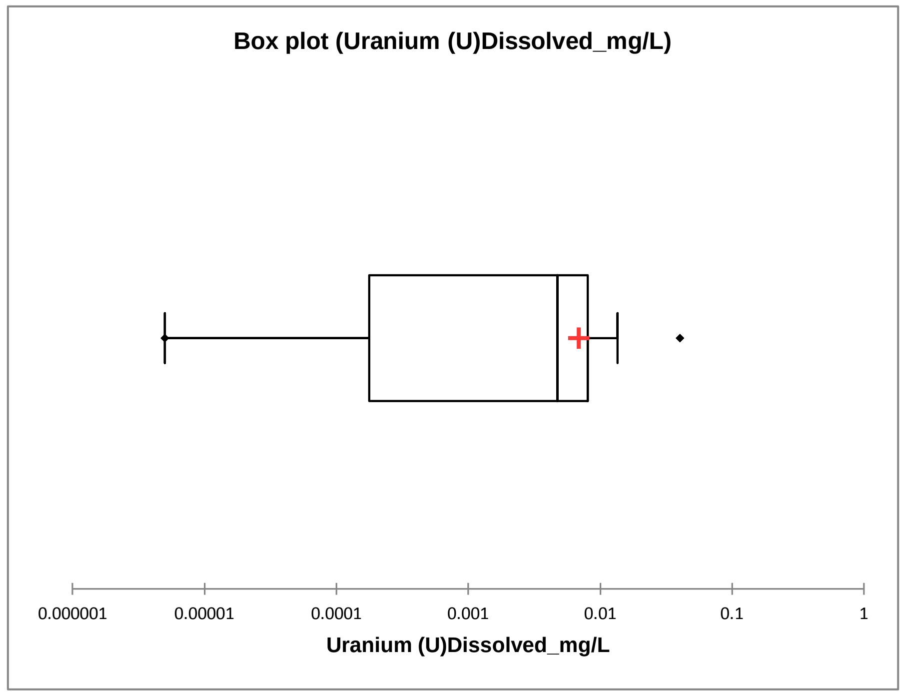

Box plot (Sodium (Na)Dissolved_mg/L)
0.1
1
10
100
Sodium (Na)Dissolved_mg/L

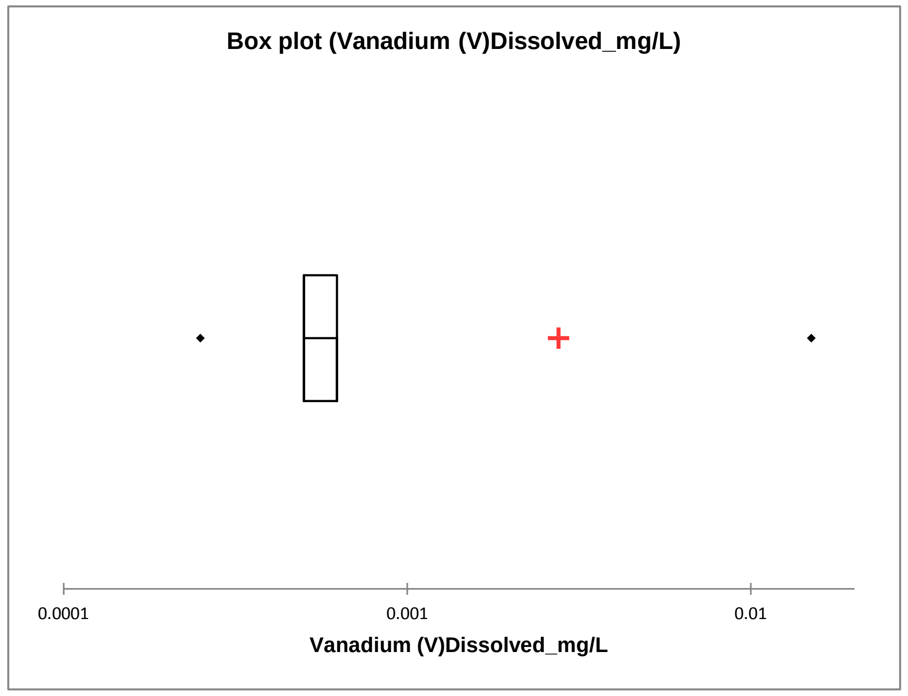

Box plot (Strontium (Sr)Dissolved_mg/L)
0.01
0.1
1
10
Strontium (Sr)Dissolved_mg/L

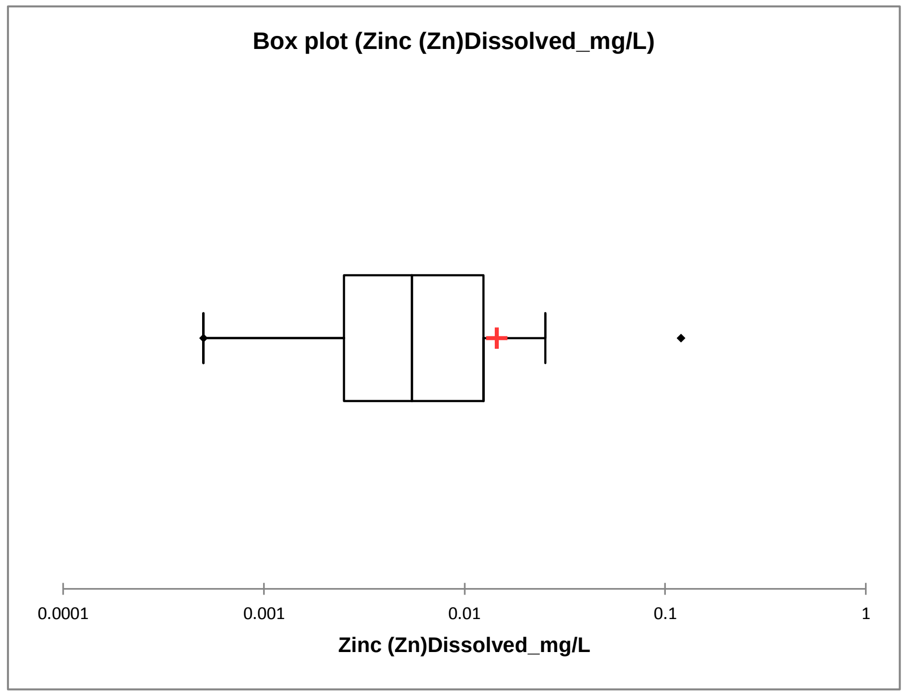

Box plot (Thallium (Tl)Dissolved_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
Thallium (Tl)Dissolved_mg/L


Box plot (Tin (Sn)Dissolved_mg/L)
0.00001
0.0001
0.001
0.01
0.1
1
Tin (Sn)Dissolved_mg/L


Box plot (Titanium (Ti)Dissolved_mg/L)
0.001
0.01
0.1
1
Titanium (Ti)Dissolved_mg/L


Box plot (Uranium (U)Dissolved_mg/L)
0.000001
0.00001
0.0001
0.001
0.01
0.1
1
Uranium (U)Dissolved_mg/L

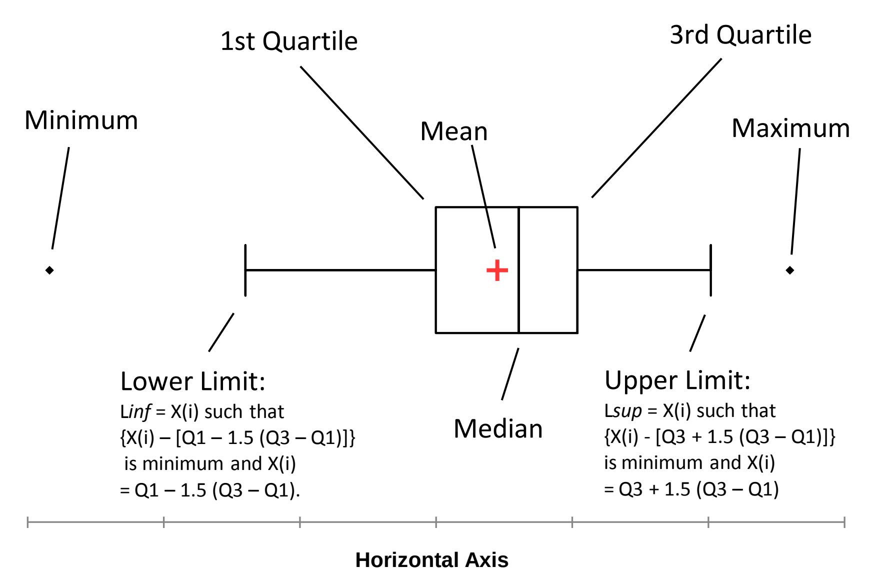

Box plot (Vanadium (V)Dissolved_mg/L)
0.0001
0.001
0.01
Vanadium (V)Dissolved_mg/L


Box plot (Zinc (Zn)Dissolved_mg/L)
0.0001
0.001
0.01
0.1
1
Zinc (Zn)Dissolved_mg/L

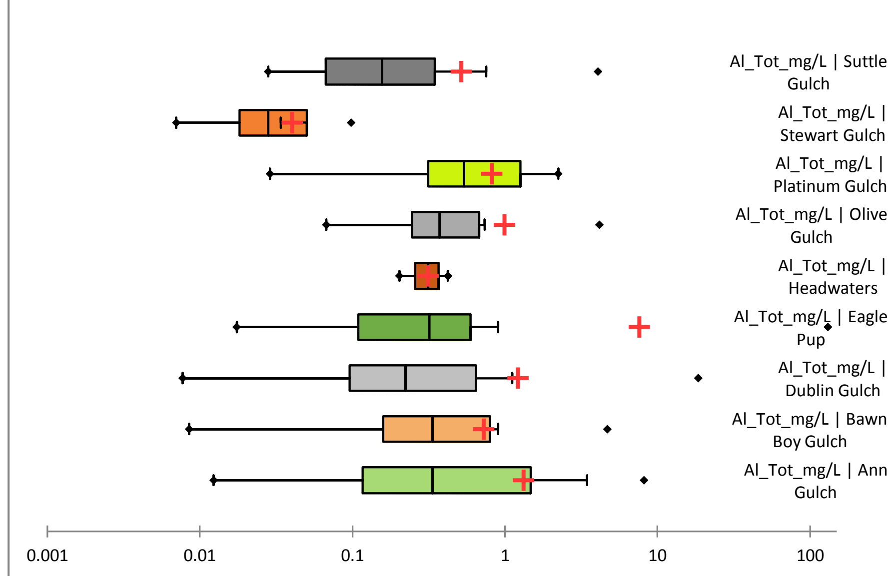
APPENDIX B:
Boxplots by Drainage Basin – All Parameters

** TOTAL METALS BY Sub-basin **

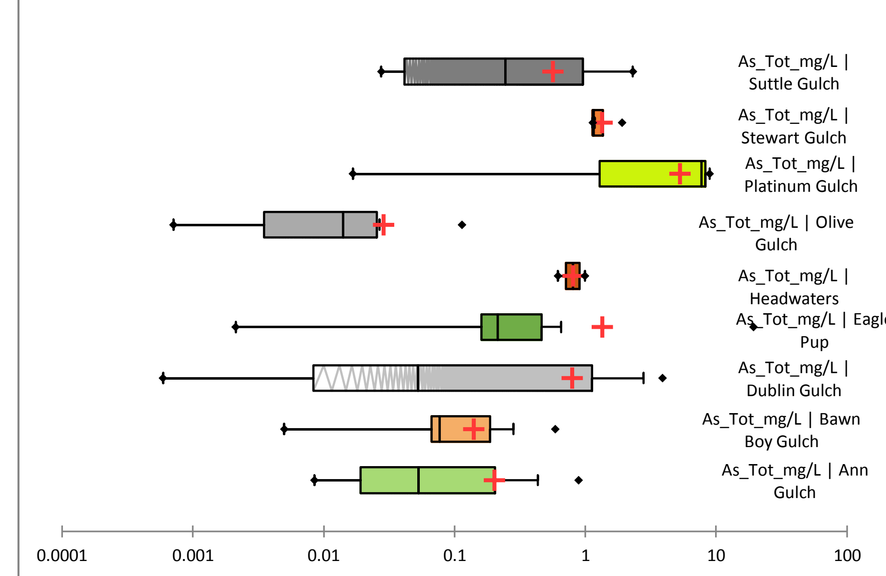
Box Plot Legend



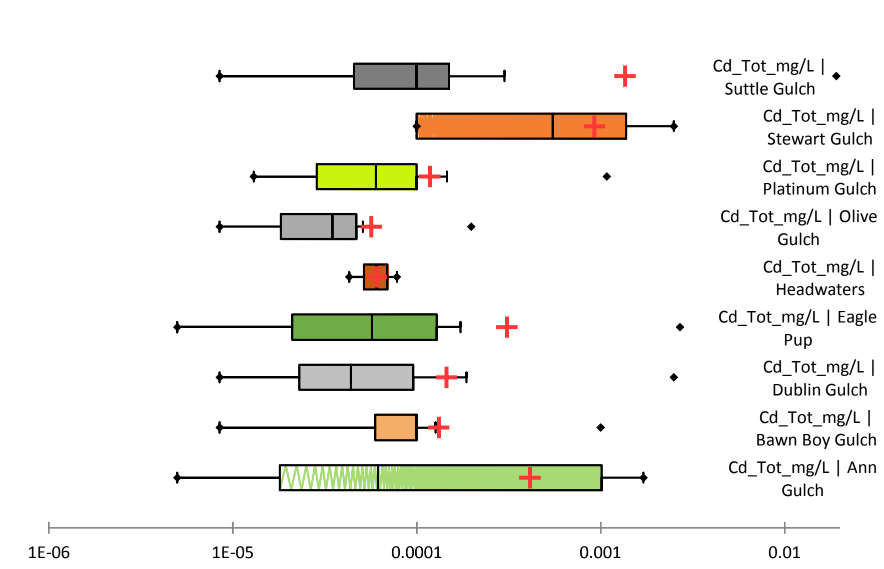
Box plots (Al Total (mg/L) by Sub-basin)



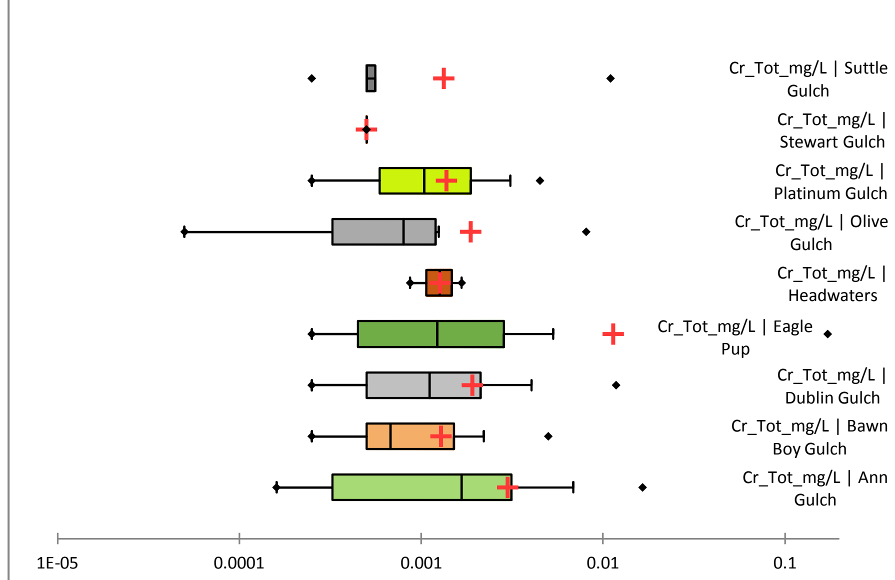
Box plots (As Total (mg/L) by Sub-basin)



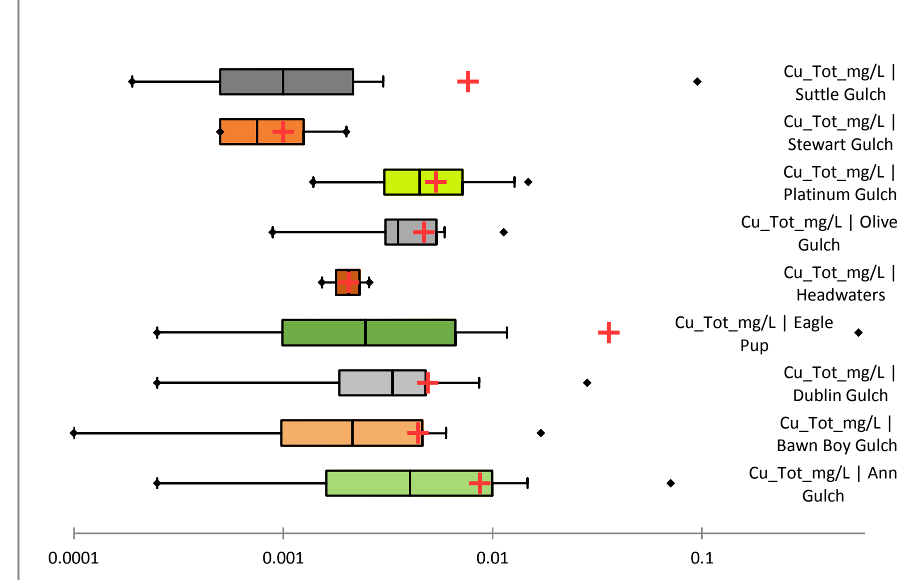
Box plots (Cd Total (mg/L) by Sub-basin)



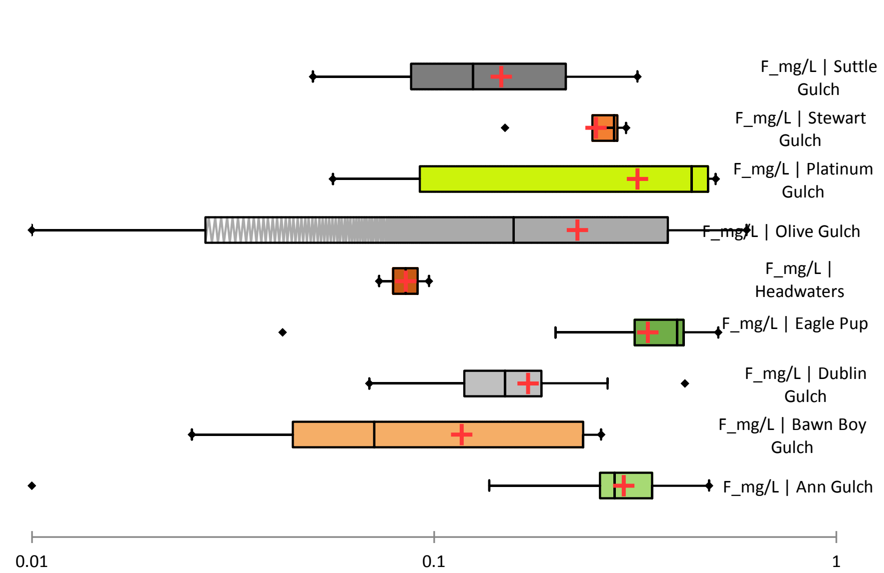
Box plots (Cr Total (mg/L) by Sub-basin)



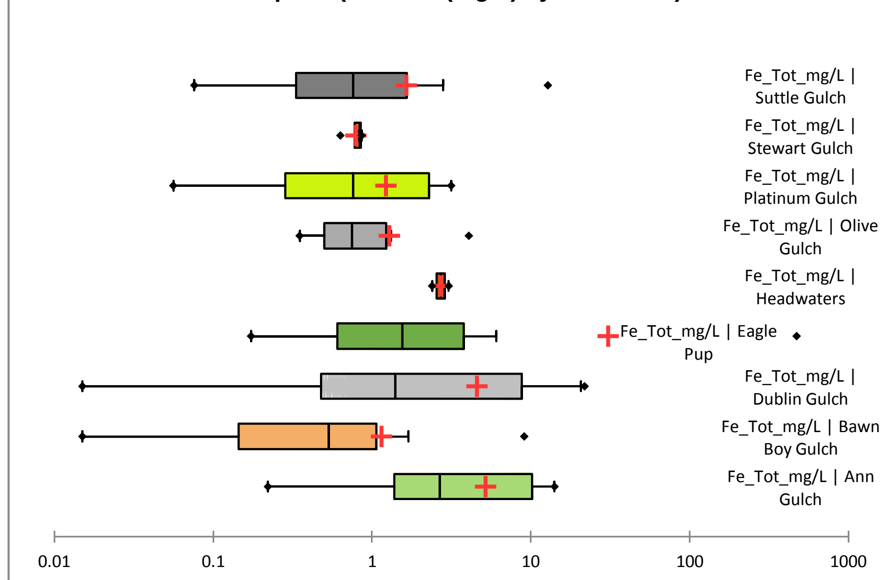
Box plots (Cu Total (mg/L) by Sub-basin)



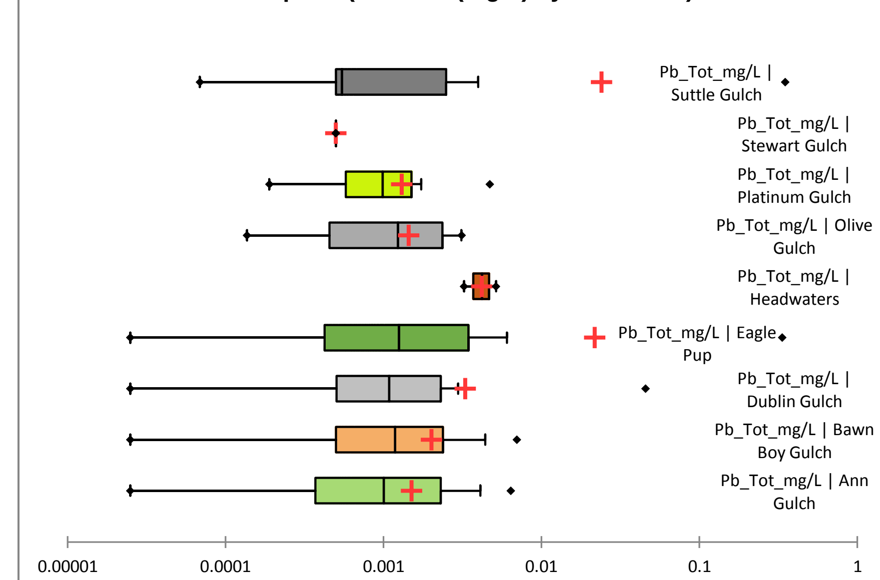
Box plots (F Total (mg/L) by Sub-basin)

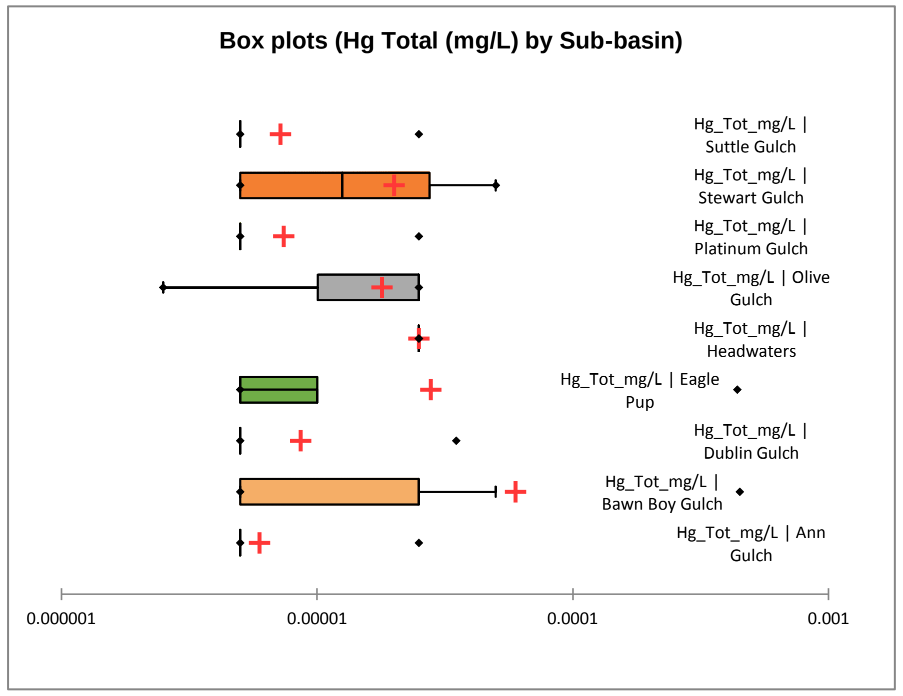


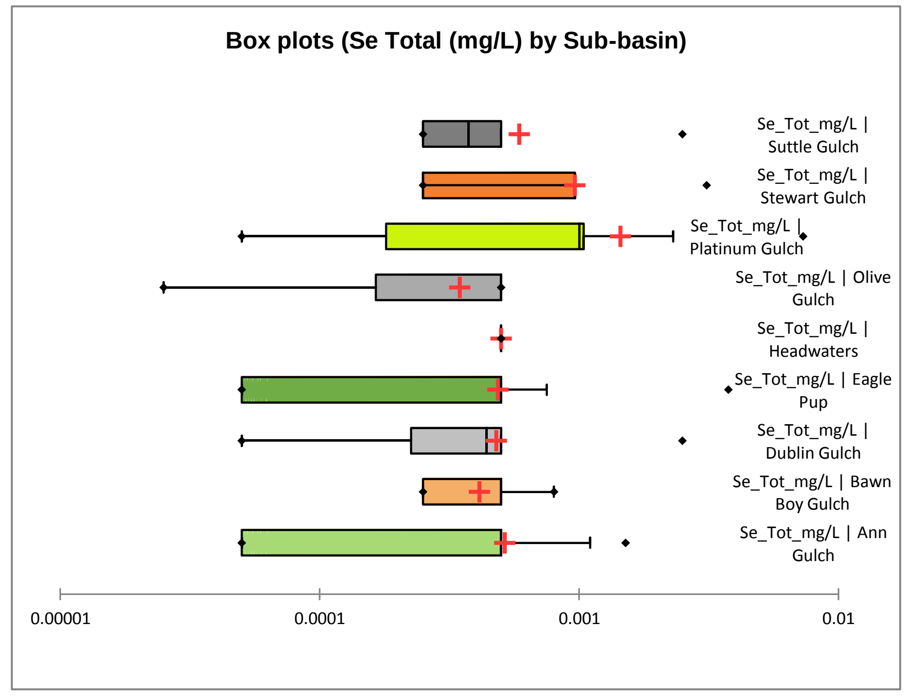
Box plots (Fe Total (mg/L) by Sub-basin)

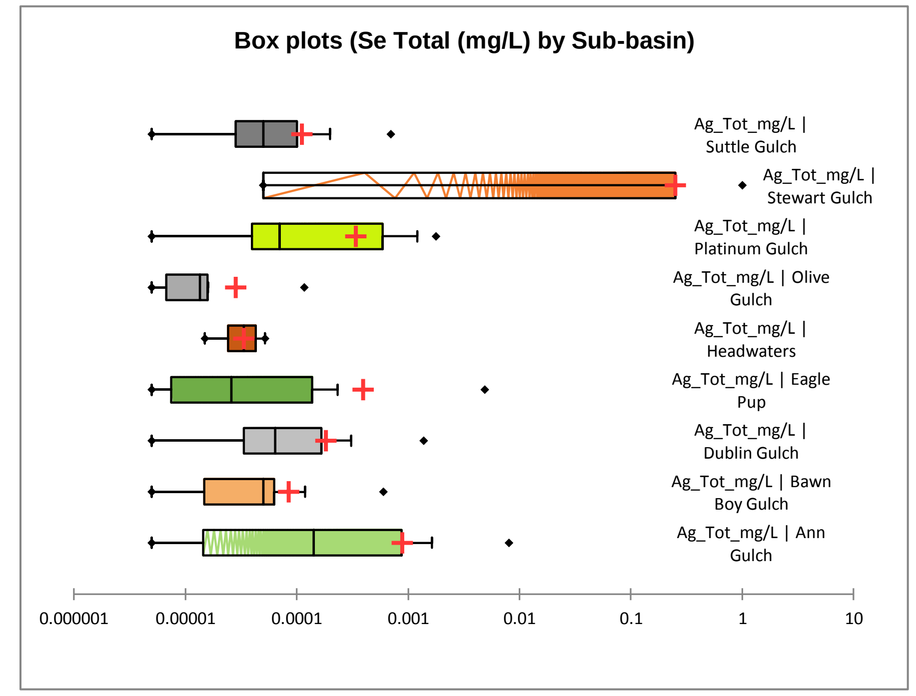


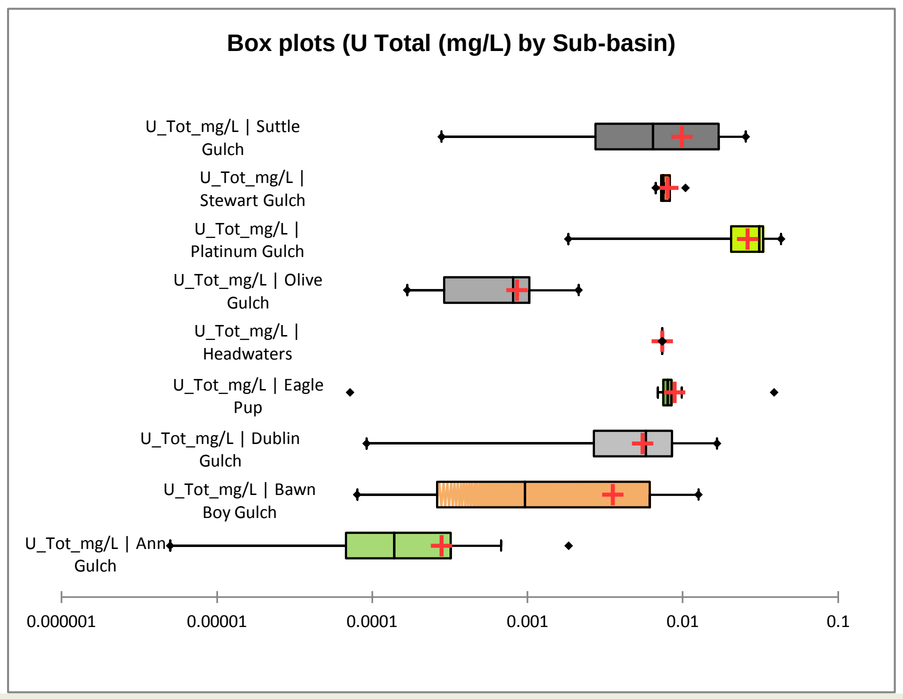
Box plots (Pb Total (mg/L) by Sub-basin)

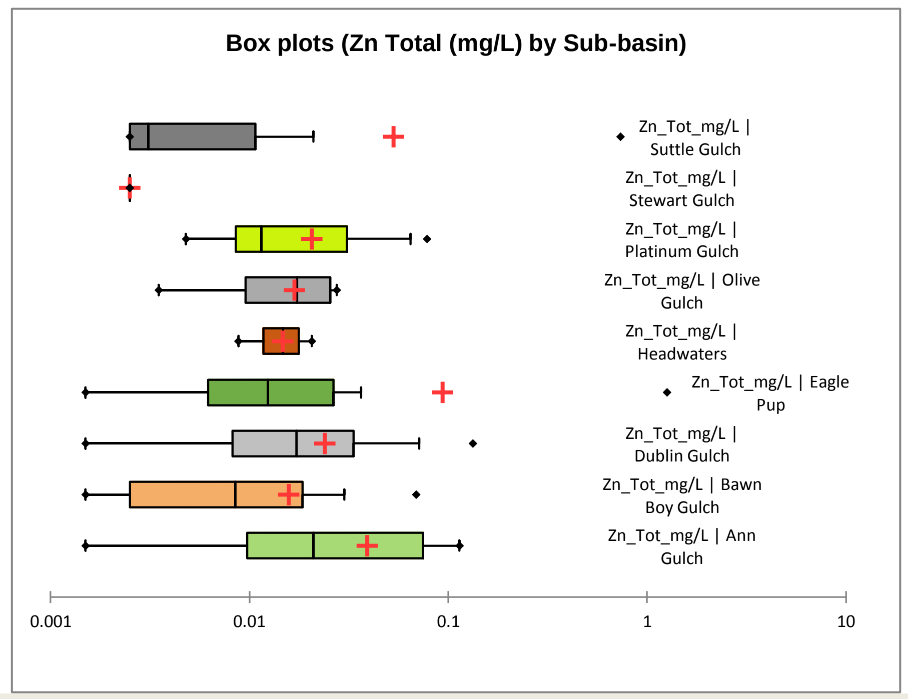




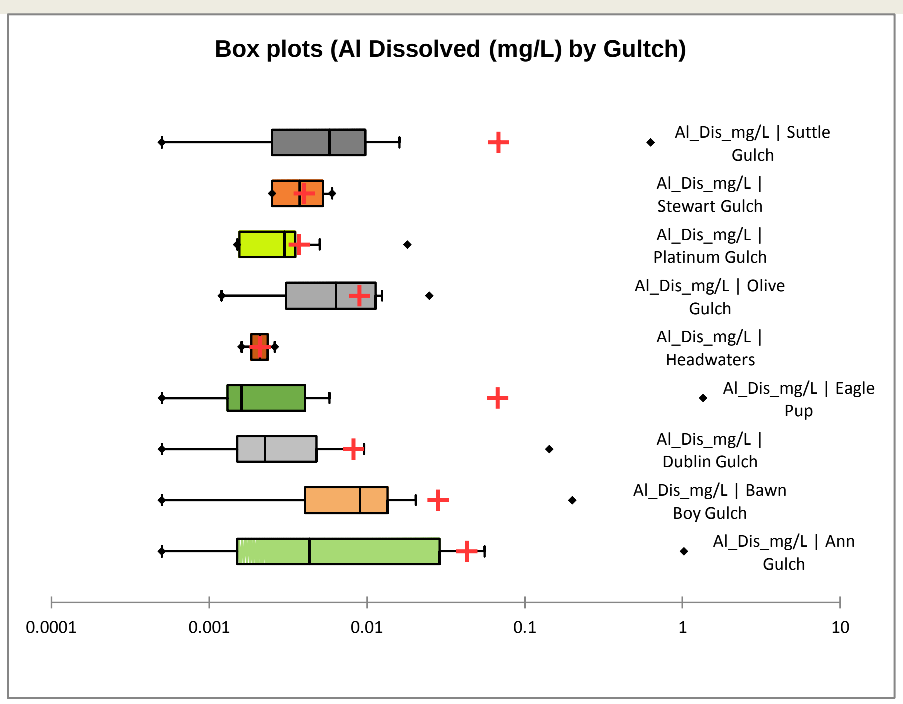


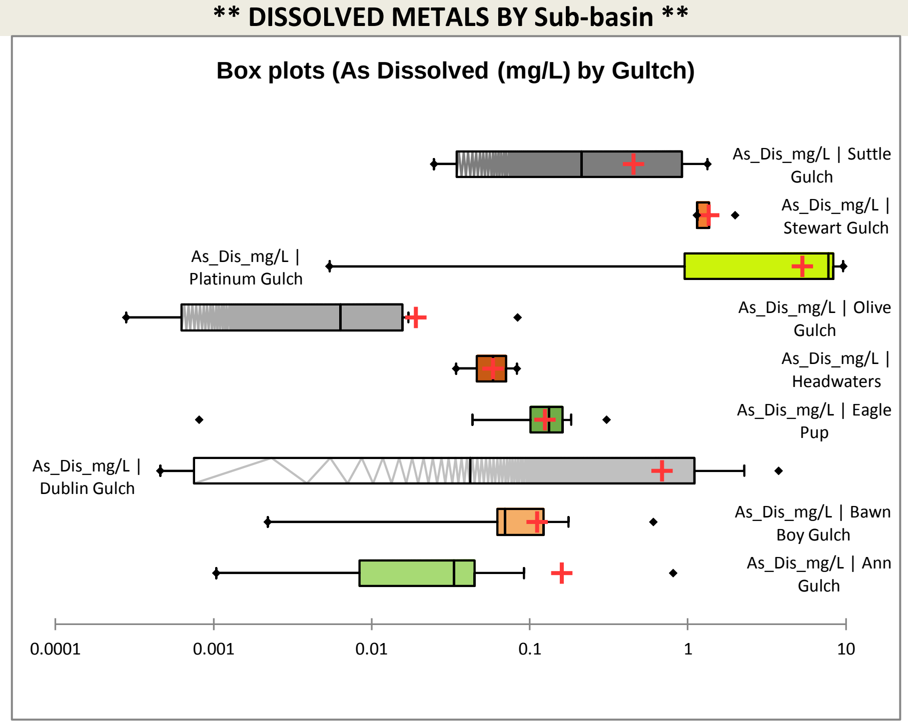


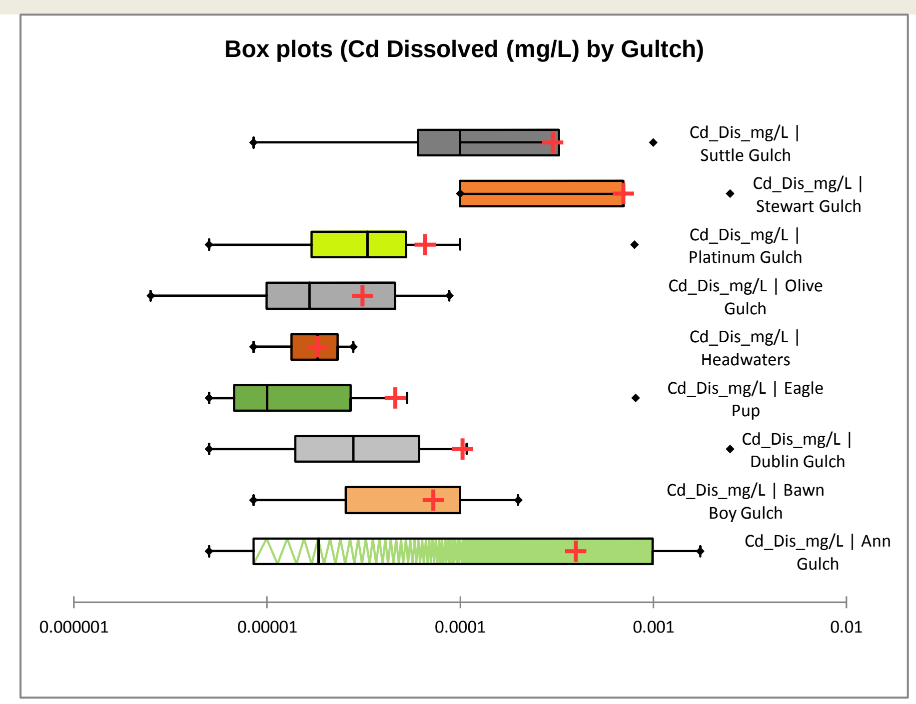




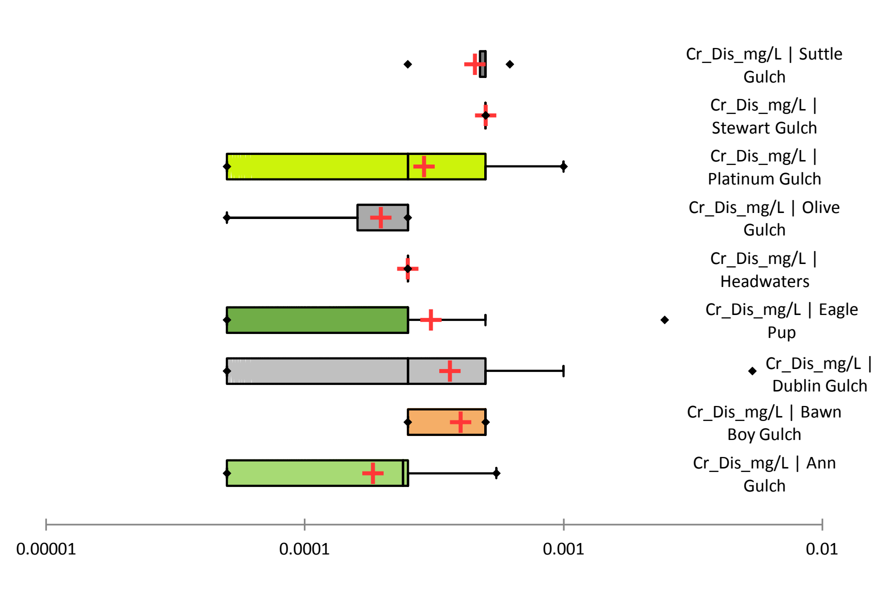
** DISSOLVED METALS BY Sub-basin **



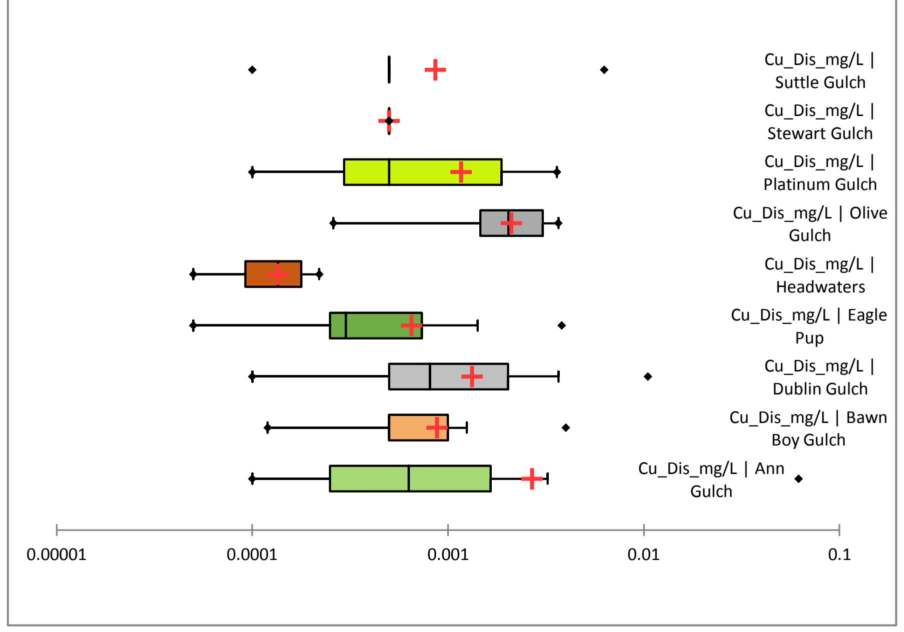




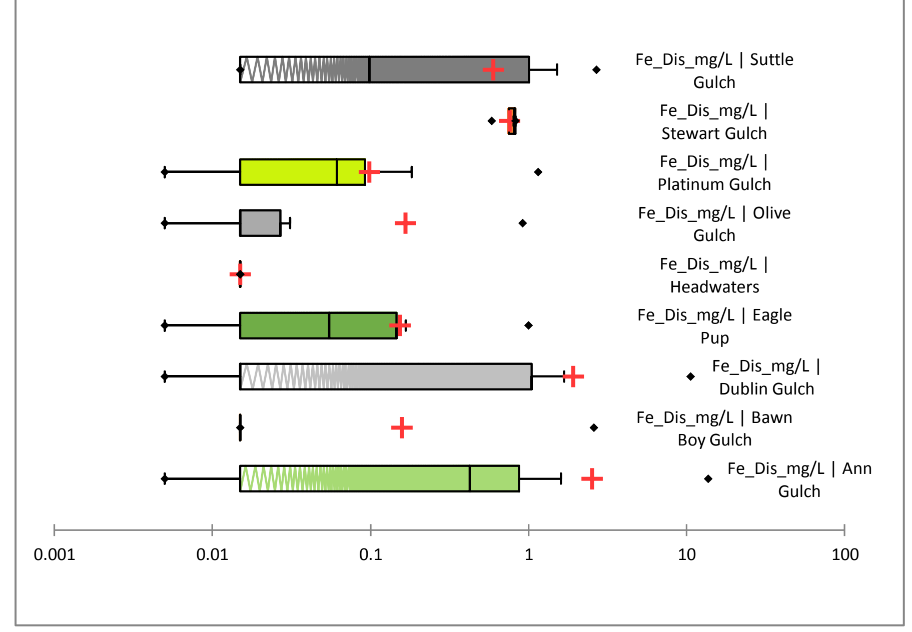
Box plots (Cr Dissolved (mg/L) by Sub-basin)



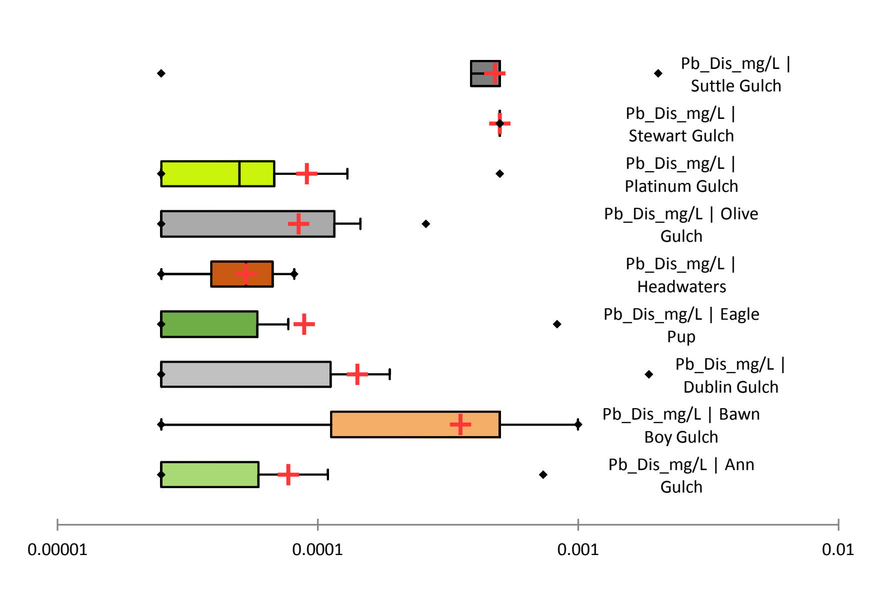
Box plots (Cu Dissolved (mg/L) by Sub-basin)



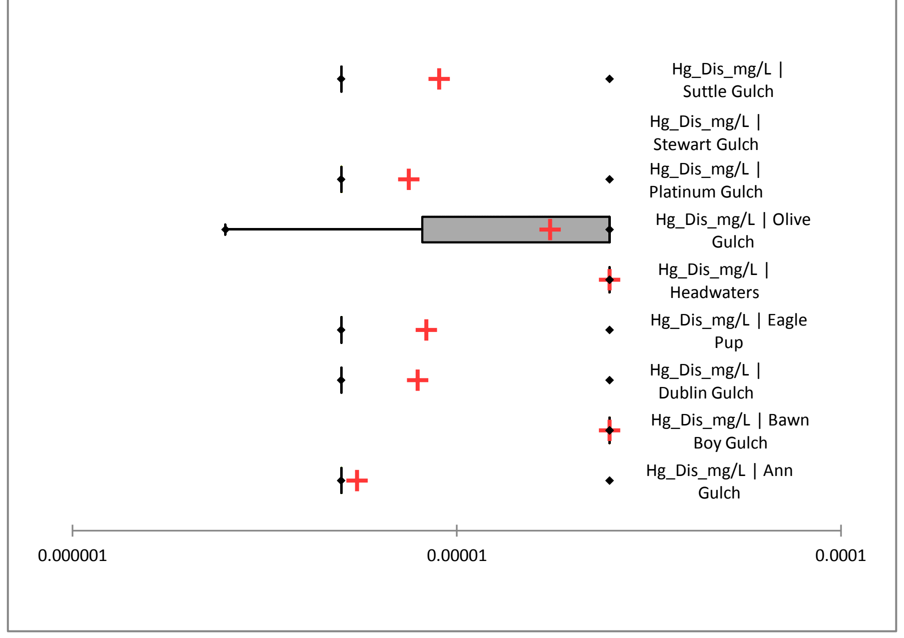
Box plots (Fe Dissolved (mg/L) by Sub-basin)



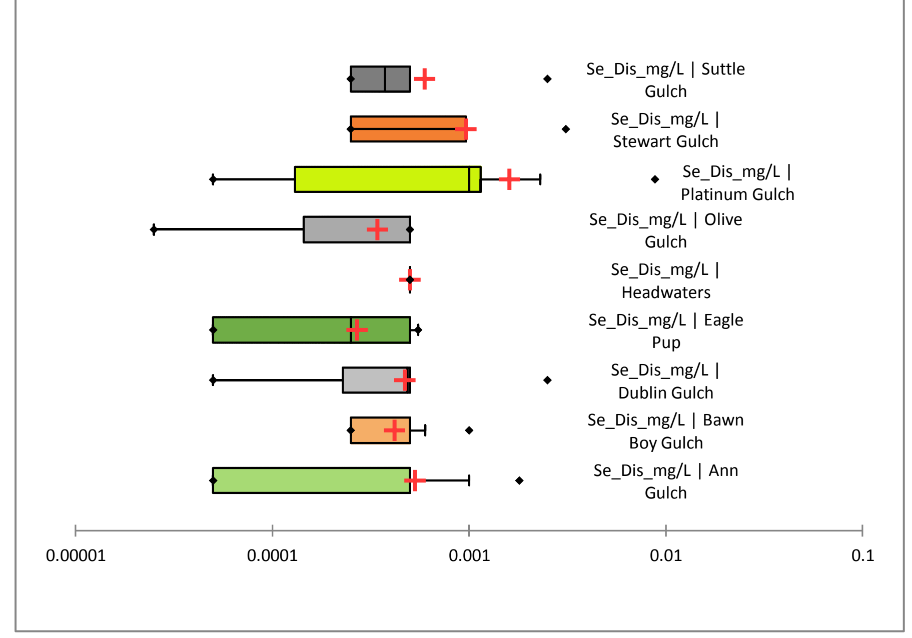
Box plots (Pb Dissolved (mg/L) by Sub-basin)



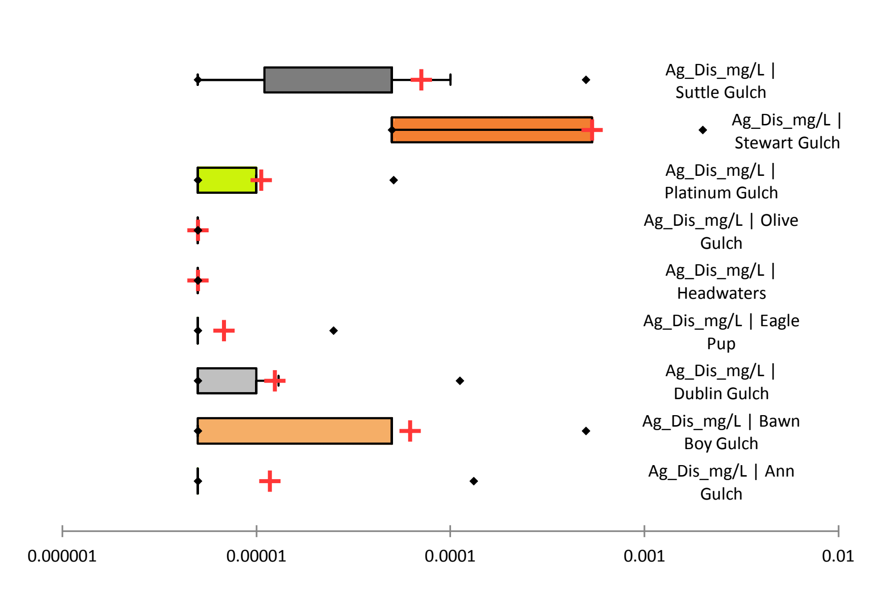
Box plots (Hg Dissolved (mg/L) by Sub-basin)



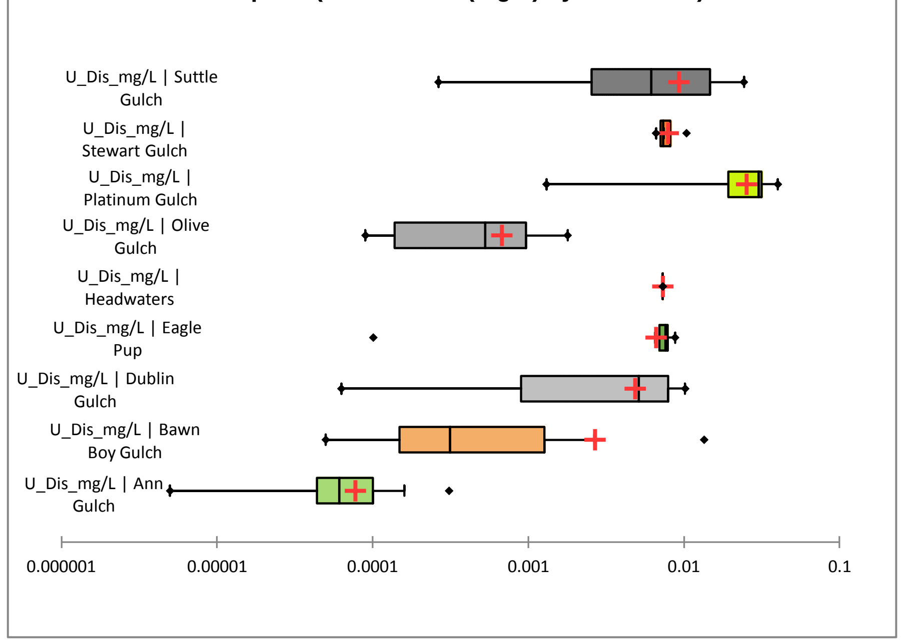
Box plots (Se Dissolved (mg/L) by Sub-basin)



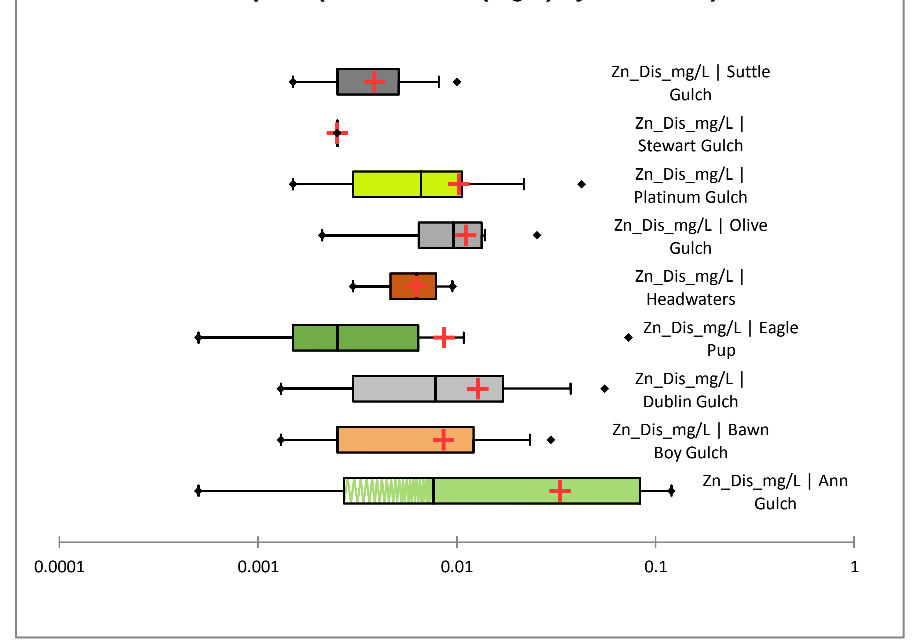
Box plots (Ag Dissolved (mg/L) by Sub-basin)



Box plots (U Dissolved (mg/L) by Sub-basin)



Box plots (Zn Dissolved (mg/L) by Sub-basin)



APPENDICES C1 & C2:
Site-wide Summary Statistics and 95th Percentiles

APPENDIX C1:
Site Wide Summary Statistics and 95th Percentiles

Parameter	Observations	Obs. with missing data	Obs. without missing data	Minimum	Maximum	Mean	Std. deviation
Conductivity _uS/cm	213	1	212	19.800	1140.000	431.934	238.942
Hardness (as CaCO3)_mg/L	213	1	212	8.720	648.000	241.184	145.089
pH	213	1	212	6.080	8.800	7.725	0.422
Total Suspended Solids_mg/L	213	1	212	1.500	128000.000	1014.568	9716.880
Total Dissolved Solids_mg/L	213	1	212	22.100	934.000	288.133	177.892
Turbidity_NTU	213	12	201	0.630	4000.000	99.105	430.069
Acidity (as CaCO3)_mg/L	213	198	15	0.500	309.000	86.313	114.806
Alkalinity, Bicarbonate (as CaCO3)_mg/L	213	149	64	13.400	348.000	148.452	90.538
Alkalinity, Carbonate (as CaCO3)_mg/L	213	169	44	0.500	6.300	1.318	1.333
Alkalinity, Hydroxide (as CaCO3)_mg/L	213	169	44	0.500	1.000	0.932	0.174
Alkalinity, Total (as CaCO3)_mg/L	213	37	176	7.000	464.000	159.485	96.938
Ammonia as N_mg/L	213	5	208	0.001	0.412	0.044	0.080
Bromide (Br)_mg/L	213	87	126	0.025	0.250	0.055	0.072
Chloride (Cl)_mg/L	213	1	212	0.250	8.800	0.568	0.869
Fluoride (F)_mg/L	213	1	212	0.010	0.598	0.235	0.141
Nitrate (as N)_mg/L	213	1	212	0.003	1.200	0.081	0.135
Nitrite (as N)_mg/L	213	1	212	0.001	0.103	0.003	0.010
Total Kjeldahl Nitrogen_mg/L	213	43	170	0.001	5.000	0.272	0.576
Total Nitrogen_mg/L	213	96	117	0.002	5.000	0.326	0.491
Ortho Phosphate as P_mg/L	213	2	211	0.001	0.410	0.019	0.054
Total Dissolved Phosphate As P_mg/L	213	78	135	0.001	0.500	0.020	0.053
Total Phosphate as P_mg/L	213	2	211	0.001	9.520	0.211	1.100
Sulfate (SO4)_mg/L	213	1	212	1.020	480.000	85.652	86.214
Anion Sum_mg/L	213	185	28	0.170	9.870	5.458	2.294
Cation Sum_mg/L	213	185	28	0.260	10.800	5.629	2.505
Cation Anion Balance_mg/L	213	185	28	0.000	21.200	3.154	4.446
Cyanide, Weak Acid Diss_mg/L	213	174	39	0.003	0.003	0.003	0.000
Cyanide, Total_mg/L	213	134	79	0.001	0.013	0.002	0.002
Total Organic Carbon_mg/L	213	34	179	0.250	36.100	2.967	3.801
Dissolved Organic Carbon_mg/L	213	206	7	0.630	9.960	2.649	3.270
Aluminum (Al)Total_mg/L	213	2	211	0.007	131.000	1.987	11.011
Antimony (Sb)Total_mg/L	213	2	211	0.000	0.271	0.006	0.021
Arsenic (As)Total_mg/L	213	2	211	0.001	19.300	1.242	2.571
Barium (Ba)Total_mg/L	213	2	211	0.002	2.260	0.068	0.210
Beryllium (Be)Total_mg/L	213	2	211	0.000	0.028	0.001	0.003

Parameter	Observations	Obs. with missing data	Obs. without missing data	Minimum	Maximum	Mean	Std. deviation
Bismuth (Bi)Total_mg/L	213	12	201	0.000	0.050	0.008	0.018
Boron (B)Total_mg/L	213	2	211	0.005	0.050	0.015	0.018
Cadmium (Cd)Total_mg/L	213	2	211	0.000	0.019	0.000	0.001
Calcium (Ca)Total_mg/L	213	2	211	2.460	210.000	57.346	39.795
Chromium (Cr)Total_mg/L	213	2	211	0.000	0.172	0.003	0.015
Cobalt (Co)Total_mg/L	213	2	211	0.000	0.412	0.005	0.036
Copper (Cu)Total_mg/L	213	2	211	0.000	0.559	0.010	0.048
Iron (Fe)Total_mg/L	213	2	211	0.015	472.000	7.375	39.873
Lead (Pb)Total_mg/L	213	2	211	0.000	0.350	0.007	0.038
Lithium (Li)Total_mg/L	213	34	179	0.001	0.226	0.039	0.052
Magnesium (Mg)Total_mg/L	213	2	211	0.560	109.000	24.362	19.398
Manganese (Mn)Total_mg/L	213	2	211	0.000	24.600	0.397	2.131
Mercury (Hg)Total_mg/L	213	21	192	0.000	0.000	0.000	0.000
Molybdenum (Mo)Total_mg/L	213	2	211	0.000	0.040	0.003	0.005
Nickel (Ni)Total_mg/L	213	2	211	0.000	0.701	0.010	0.067
Phosphorus (P)Total_mg/L	213	12	201	0.150	2.810	0.187	0.272
Potassium (K)Total_mg/L	213	34	179	1.000	26.100	2.987	2.474
Selenium (Se)Total_mg/L	213	2	211	0.000	0.007	0.001	0.001
Silicon (Si)Total_mg/L	213	44	169	0.947	232.000	10.435	20.603
Silver (Ag)Total_mg/L	213	2	211	0.000	1.002	0.005	0.069
Sodium (Na)Total_mg/L	213	34	179	0.481	22.000	4.908	3.692
Strontium (Sr)Total_mg/L	213	12	201	0.013	1.770	0.378	0.301
Thallium (Tl)Total_mg/L	213	13	200	0.000	0.037	0.001	0.003
Tin (Sn)Total_mg/L	213	34	179	0.000	0.012	0.001	0.001
Titanium (Ti)Total_mg/L	213	23	190	0.005	0.381	0.042	0.065
Uranium (U)Total_mg/L	213	2	211	0.000	0.043	0.008	0.010
Vanadium (V)Total_mg/L	213	2	211	0.000	0.117	0.004	0.011
Zinc (Zn)Total_mg/L	213	2	211	0.002	1.260	0.037	0.122
Aluminum (Al)Dissolved_mg/L	213	1	212	0.001	1.350	0.029	0.133
Antimony (Sb)Dissolved_mg/L	213	1	212	0.000	0.050	0.003	0.009
Arsenic (As)Dissolved_mg/L	213	1	212	0.000	9.620	1.003	2.216
Barium (Ba)Dissolved_mg/L	213	1	212	0.001	0.133	0.035	0.037
Beryllium (Be)Dissolved_mg/L	213	1	212	0.000	0.003	0.001	0.001
Bismuth (Bi)Dissolved_mg/L	213	11	202	0.000	0.100	0.009	0.020
Boron (B)Dissolved_mg/L	213	1	212	0.005	0.050	0.014	0.018

Parameter	Observations	Obs. with missing data	Obs. without missing data	Minimum	Maximum	Mean	Std. deviation
Cadmium (Cd)Dissolved_mg/L	213	1	212	0.000	0.003	0.000	0.000
Calcium (Ca)Dissolved_mg/L	213	1	212	2.760	204.000	57.127	40.286
Chromium (Cr)Dissolved_mg/L	213	1	212	0.000	0.005	0.000	0.000
Cobalt (Co)Dissolved_mg/L	213	1	212	0.000	0.004	0.000	0.001
Copper (Cu)Dissolved_mg/L	213	1	212	0.000	0.062	0.001	0.004
Iron (Fe)Dissolved_mg/L	213	1	212	0.005	13.700	1.194	2.957
Lead (Pb)Dissolved_mg/L	213	1	212	0.000	0.002	0.000	0.000
Lithium (Li)Dissolved_mg/L	213	33	180	0.001	0.223	0.036	0.050
Magnesium (Mg)Dissolved_mg/L	213	1	212	0.450	73.300	23.705	18.118
Manganese (Mn)Dissolved_mg/L	213	1	212	0.000	1.030	0.134	0.212
Mercury (Hg)Dissolved_mg/L	213	52	161	0.000	0.000	0.000	0.000
Molybdenum (Mo)Dissolved_mg/L	213	1	212	0.000	0.039	0.003	0.005
Nickel (Ni)Dissolved_mg/L	213	1	212	0.000	0.014	0.002	0.003
Phosphorus (P)Dissolved_mg/L	213	11	202	0.150	0.750	0.153	0.042
Potassium (K)Dissolved_mg/L	213	1	212	0.420	22.100	2.513	1.886
Selenium (Se)Dissolved_mg/L	213	1	212	0.000	0.009	0.001	0.001
Silicon (Si)Dissolved_mg/L	213	43	170	0.802	14.300	6.269	1.524
Silver (Ag)Dissolved_mg/L	213	1	212	0.000	0.002	0.000	0.000
Sodium (Na)Dissolved_mg/L	213	1	212	0.546	29.300	5.196	4.571
Strontium (Sr)Dissolved_mg/L	213	11	202	0.013	1.710	0.359	0.283
Thallium (Tl)Dissolved_mg/L	213	33	180	0.000	0.000	0.000	0.000
Tin (Sn)Dissolved_mg/L	213	33	180	0.000	0.002	0.000	0.000
Titanium (Ti)Dissolved_mg/L	213	1	212	0.005	0.066	0.006	0.005
Uranium (U)Dissolved_mg/L	213	1	212	0.000	0.040	0.007	0.009
Vanadium (V)Dissolved_mg/L	213	1	212	0.000	0.015	0.003	0.005
Zinc (Zn)Dissolved_mg/L	213	1	212	0.001	0.120	0.014	0.025

APPENDIX C2:
Site Wide Summary Statistics and 95th Percentiles

Anions & Nutrients

Percentile	Conductivity uS/cm	Hardness as CaCO3 mg/L	pH	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity NTU	Acidity as CaCO3 mg/L	Alkalinity, Bicarbonate as CaCO3 mg/L	Alkalinity, Carbonate as CaCO3 mg/L	Alkalinity, Hydroxide as CaCO3 mg/L	Alkalinity, Total as CaCO3 mg/L	Ammonia as N mg/L
Maximum 100%	1140.000	648.000	8.800	128000.000	934.000	4000.000	309.000	348.000	6.300	1.000	464.000	0.412
99%	940.000	564.000	8.400	4210.000	720.000	2000.000	309.000	348.000	6.300	1.000	419.000	0.361
95%	876.000	496.000	8.290	487.000	655.000	284.000	309.000	313.000	6.100	1.000	343.000	0.227
90%	779.000	450.000	8.170	287.000	568.000	119.000	255.000	250.000	1.000	1.000	256.000	0.152
3rd Quartile 75%	583.000	324.000	8.020	84.350	391.000	46.300	192.000	220.000	1.000	1.000	228.000	0.031
Median 50%	446.000	262.000	7.805	28.750	248.500	19.700	3.400	151.000	1.000	1.000	168.000	0.013
1st Quartile 25%	244.000	109.000	7.500	10.050	160.500	7.800	2.300	79.800	1.000	1.000	83.350	0.003
10%	120.000	58.900	7.070	5.200	79.000	3.460	1.600	22.600	1.000	0.500	26.000	0.003
5%	61.500	24.800	6.920	4.000	43.000	1.960	1.600	18.100	0.500	0.500	20.000	0.003
1%	40.000	15.700	6.590	1.500	37.000	1.190	1.600	17.900	0.500	0.500	10.100	0.003
Minimum 0%	19.800	8.720	6.080	1.500	22.100	0.630	0.500	13.400	0.500	0.500	7.000	0.001

Percentile	Bromide Br mg/L	Chloride Cl mg/L	Fluoride F mg/L	Nitrate as N mg/L	Nitrite as N mg/L	Total Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Ortho Phosphate as P mg/L	Total Dissolved Phosphate As P mg/L	Total Phosphate as P mg/L	Sulfate SO4 mg/L	Anion Sum mg/L
Maximum 100%	0.250	8.800	0.598	1.200	0.103	5.000	5.000	0.410	0.500	9.520	480.000	9.870
99%	0.250	3.130	0.507	0.494	0.059	5.000	1.210	0.320	0.200	9.110	382.000	9.870
95%	0.250	2.500	0.482	0.356	0.008	0.634	0.748	0.097	0.100	0.295	317.000	8.960
90%	0.250	1.250	0.436	0.212	0.005	0.498	0.650	0.034	0.068	0.200	155.000	8.580
3rd Quartile 75%	0.025	0.250	0.337	0.116	0.002	0.274	0.366	0.008	0.013	0.089	105.000	6.665
Median 50%	0.025	0.250	0.225	0.025	0.001	0.154	0.258	0.003	0.004	0.040	67.700	5.495
1st Quartile 25%	0.025	0.250	0.109	0.003	0.001	0.080	0.137	0.001	0.001	0.016	18.500	4.200
10%	0.025	0.250	0.065	0.003	0.001	0.025	0.053	0.001	0.001	0.005	9.160	2.880
5%	0.025	0.250	0.046	0.003	0.001	0.025	0.002	0.001	0.001	0.003	4.000	0.430
1%	0.025	0.250	0.025	0.003	0.001	0.001	0.002	0.001	0.001	0.001	1.240	0.430
Minimum 0%	0.025	0.250	0.010	0.003	0.001	0.001	0.002	0.001	0.001	0.001	1.020	0.170

Percentile	Cation Sum mg/L	Cation Anion Balance mg/L	Cyanide, Weak Acid Diss mg/L	Cyanide, Total mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L
Maximum 100%	10.800	21.200	0.003	0.013	36.100	9.960
99%	10.800	21.200	0.003	0.013	23.000	9.960
95%	10.700	11.700	0.003	0.007	8.640	9.960
90%	9.100	9.700	0.003	0.003	5.500	9.960
3rd Quartile 75%	6.835	3.300	0.003	0.003	3.130	2.400
Median 50%	5.575	1.750	0.003	0.003	1.990	1.300
1st Quartile 25%	4.295	0.900	0.003	0.001	1.290	1.200
10%	2.830	0.300	0.003	0.001	0.850	1.200
5%	0.420	0.200	0.003	0.001	0.690	1.200
1%	0.420	0.200	0.003	0.001	0.250	1.200
Minimum 0%	0.260	0.000	0.003	0.001	0.250	0.630

Total Metal

Percentile	(Aluminum (Al)Total mg/L)	(Antimony (Sb)Total mg/L)	(Arsenic (As)Total mg/L)	(Barium (Ba)Total mg/L)	(Beryllium (Be)Total mg/L)	(Bismuth (Bi)Total mg/L)	(Boron (B)Total mg/L)	(Cadmium (Cd)Total mg/L)	(Calcium (Ca)Total mg/L)	(Chromium (Cr)Total mg/L)	(Cobalt (Co)Total mg/L)	(Copper (Cu)Total mg/L)
Maximum 100%	131.000	0.271	19.300	2.260	0.028	0.050	0.050	0.019	210.000	0.172	0.412	0.559
99%	18.500	0.051	8.780	0.359	0.007	0.050	0.050	0.003	168.000	0.017	0.014	0.095
95%	4.690	0.036	8.180	0.142	0.003	0.050	0.050	0.001	137.000	0.008	0.005	0.024
90%	2.500	0.008	3.890	0.125	0.003	0.050	0.050	0.001	110.000	0.005	0.003	0.013
3rd Quartile 75%	0.905	0.003	0.928	0.072	0.001	0.001	0.010	0.000	78.500	0.002	0.001	0.006
Median 50%	0.284	0.001	0.157	0.028	0.000	0.000	0.005	0.000	46.400	0.001	0.001	0.003
1st Quartile 25%	0.107	0.001	0.031	0.012	0.000	0.000	0.005	0.000	22.900	0.001	0.000	0.001
10%	0.042	0.000	0.008	0.007	0.000	0.000	0.005	0.000	12.800	0.000	0.000	0.001
5%	0.022	0.000	0.004	0.005	0.000	0.000	0.005	0.000	7.810	0.000	0.000	0.001
1%	0.009	0.000	0.001	0.003	0.000	0.000	0.005	0.000	4.910	0.000	0.000	0.000
Minimum 0%	0.007	0.000	0.001	0.002	0.000	0.000	0.005	0.000	2.460	0.000	0.000	0.000

APPENDIX C2:
Site Wide Summary Statistics and 95th Percentiles

Percentile	(Iron (Fe)Total mg/L)	(Lead (Pb)Total mg/L)	(Lithium (Li)Total mg/L)	(Magnesium (Mg)Total mg/L)	(Manganese (Mn)Total mg/L)	(Mercury (Hg)Total mg/L)	(Molybdenum (Mo)Total mg/L)	(Nickel (Ni)Total mg/L)	(Phosphorus (P)Total mg/L)	(Potassium (K)Total mg/L)	(Selenium (Se)Total mg/L)	(Silicon (Si)Total mg/L)
Maximum 100%	472.000	0.350	0.226	109.000	24.600	0.000450	0.040	0.701	2.810	26.100	0.0073	232.000
99%	75.200	0.272	0.218	73.800	1.130	0.000440	0.032	0.025	0.750	19.300	0.0051	144.000
95%	14.100	0.009	0.206	62.000	0.873	0.000025	0.010	0.014	0.150	5.630	0.0021	15.400
90%	12.100	0.005	0.093	44.700	0.510	0.000025	0.007	0.010	0.150	5.100	0.0012	12.400
3rd Quartile 75%	3.570	0.002	0.041	36.800	0.213	0.000005	0.005	0.005	0.150	3.100	0.0005	9.280
Median 50%	1.250	0.001	0.020	20.900	0.095	0.000005	0.001	0.002	0.150	2.460	0.0005	7.170
1st Quartile 25%	0.483	0.001	0.012	9.100	0.033	0.000005	0.001	0.001	0.150	2.180	0.0002	6.290
10%	0.221	0.000	0.007	3.120	0.012	0.000005	0.000	0.001	0.150	1.000	0.0001	5.310
5%	0.104	0.000	0.003	1.400	0.007	0.000005	0.000	0.000	0.150	1.000	0.0001	5.020
1%	0.015	0.000	0.003	0.880	0.003	0.000005	0.000	0.000	0.150	1.000	0.0001	1.920
Minimum 0%	0.015	0.000	0.001	0.560	0.000	0.000003	0.000	0.000	0.150	1.000	0.0000	0.947

Percentile	(Silver (Ag)Total mg/L)	(Sodium (Na)Total mg/L)	(Strontium (Sr)Total mg/L)	(Thallium (Tl)Total mg/L)	(Tin (Sn)Total mg/L)	(Titanium (Ti)Total mg/L)	(Uranium (U)Total mg/L)	(Vanadium (V)Total mg/L)	(Zinc (Zn)Total mg/L)
Maximum 100%	1.0020	22.000	1.770	0.0370	0.0124	0.381	0.0429	0.117	1.260
99%	0.0066	21.400	1.670	0.0050	0.0059	0.365	0.0387	0.015	0.735
95%	0.0017	12.800	0.940	0.0050	0.0044	0.164	0.0321	0.015	0.105
90%	0.0009	8.600	0.642	0.0050	0.0020	0.106	0.0282	0.015	0.068
3rd Quartile 75%	0.0002	6.000	0.535	0.0001	0.0011	0.044	0.0087	0.003	0.030
Median 50%	0.0001	3.700	0.329	0.0001	0.0005	0.019	0.0052	0.001	0.013
1st Quartile 25%	0.0000	2.710	0.156	0.0000	0.0002	0.005	0.0005	0.001	0.006
10%	0.0000	2.280	0.065	0.0000	0.0001	0.005	0.0001	0.001	0.003
5%	0.0000	1.000	0.035	0.0000	0.0001	0.005	0.0001	0.001	0.003
1%	0.0000	0.974	0.023	0.0000	0.0001	0.005	0.0000	0.001	0.002
Minimum 0%	0.0000	0.481	0.013	0.0000	0.0001	0.005	0.0000	0.000	0.002

Dissolved Metal

Percentile	(Aluminum (Al)Dissolved mg/L)	(Antimony (Sb)Dissolved mg/L)	(Arsenic (As)Dissolved mg/L)	(Barium (Ba)Dissolved mg/L)	(Beryllium (Be)Dissolved mg/L)	(Bismuth (Bi)Dissolved mg/L)	(Boron (B)Dissolved mg/L)	(Cadmium (Cd)Dissolved mg/L)	(Calcium (Ca)Dissolved mg/L)	(Chromium (Cr)Dissolved mg/L)	(Cobalt (Co)Dissolved mg/L)	(Copper (Cu)Dissolved mg/L)
Maximum 100%	1.350	0.0503	9.620	0.133	0.0025	0.100	0.050	0.003	204.0	0.0054	0.004	0.062
99%	0.627	0.0436	8.770	0.128	0.0025	0.050	0.050	0.002	178.0	0.0015	0.003	0.006
95%	0.103	0.0225	8.080	0.119	0.0025	0.050	0.050	0.001	141.0	0.0005	0.002	0.004
90%	0.030	0.0063	3.330	0.102	0.0025	0.050	0.050	0.000	112.0	0.0005	0.001	0.003
3rd Quartile 75%	0.008	0.0015	0.699	0.058	0.0005	0.001	0.010	0.000	79.0	0.0005	0.001	0.001
Median 50%	0.003	0.0004	0.087	0.018	0.0003	0.000	0.005	0.000	45.6	0.0003	0.000	0.001
1st Quartile 25%	0.002	0.0002	0.013	0.006	0.0001	0.000	0.005	0.000	25.2	0.0001	0.000	0.000
10%	0.001	0.0001	0.001	0.005	0.0001	0.000	0.005	0.000	12.2	0.0001	0.000	0.000
5%	0.001	0.0001	0.001	0.002	0.0001	0.000	0.005	0.000	7.9	0.0001	0.000	0.000
1%	0.001	0.0001	0.000	0.002	0.0001	0.000	0.005	0.000	5.0	0.0001	0.000	0.000
Minimum 0%	0.001	0.0001	0.000	0.001	0.0001	0.000	0.005	0.000	2.8	0.0001	0.000	0.000

Percentile	(Iron (Fe)Dissolved mg/L)	(Lead (Pb)Dissolved mg/L)	(Lithium (Li)Dissolved mg/L)	(Magnesium (Mg)Dissolved mg/L)	(Manganese (Mn)Dissolved mg/L)	(Mercury (Hg)Dissolved mg/L)	(Molybdenum (Mo)Dissolved mg/L)	(Nickel (Ni)Dissolved mg/L)	(Phosphorus (P)Dissolved mg/L)	(Potassium (K)Dissolved mg/L)	(Selenium (Se)Dissolved mg/L)	(Silicon (Si)Dissolved mg/L)
Maximum 100%	13.700	0.002	0.223	73.300	1.030	0.000025	0.039	0.014	0.750	22.100	0.0088	14.300
99%	12.700	0.001	0.223	70.200	0.937	0.000025	0.032	0.011	0.150	7.160	0.0070	12.600
95%	9.730	0.001	0.197	61.200	0.717	0.000025	0.010	0.008	0.150	5.400	0.0020	8.950
90%	5.200	0.001	0.077	45.300	0.404	0.000025	0.007	0.005	0.150	4.800	0.0010	7.925
3rd Quartile 75%	0.609	0.000	0.035	35.750	0.154	0.000005	0.005	0.002	0.150	2.745	0.0005	6.730
Median 50%	0.048	0.000	0.019	20.300	0.060	0.000005	0.001	0.001	0.150	2.240	0.0005	6.370
1st Quartile 25%	0.015	0.000	0.011	8.965	0.006	0.000005	0.000	0.000	0.150	1.595	0.0002	5.410
10%	0.015	0.000	0.005	2.840	0.001	0.000005	0.000	0.000	0.150	1.000	0.0001	4.630
5%	0.005	0.000	0.003	1.140	0.001	0.000005	0.000	0.000	0.150	0.760	0.0001	4.330
1%	0.005	0.000	0.002	0.760	0.000	0.000003	0.000	0.000	0.150	0.460	0.0001	1.810
Minimum 0%	0.005	0.000	0.001	0.450	0.000	0.000003	0.000	0.000	0.150	0.420	0.0000	0.802

Percentile	(Silver (Ag)Dissolved mg/L)	(Sodium (Na)Dissolved mg/L)	(Strontium (Sr)Dissolved mg/L)	(Thallium (Tl)Dissolved mg/L)	(Tin (Sn)Dissolved mg/L)	(Titanium (Ti)Dissolved mg/L)	(Uranium (U)Dissolved mg/L)	(Vanadium (V)Dissolved mg/L)	(Zinc (Zn)Dissolved mg/L)
Maximum 100%	0.002	29.300	1.710	0.00025	0.0024	0.066	0.040	0.015	0.120
99%	0.001	23.900	1.300	0.00020	0.0019	0.027	0.037	0.015	0.114
95%	0.000	14.300	0.936	0.00010	0.0010	0.012	0.031	0.015	0.101
90%	0.000	8.920	0.630	0.00010	0.0005	0.005	0.024	0.015	0.035
3rd Quartile 75%	0.000	5.920	0.513	0.00005	0.0002	0.005	0.008	0.001	0.012
Median 50%	0.000	3.805	0.322	0.00005	0.0001	0.005	0.005	0.001	0.005
1st Quartile 25%	0.000	2.635	0.153	0.00001	0.0001	0.005	0.000	0.001	0.003
10%	0.000	2.100	0.061	0.00001	0.0001	0.005	0.000	0.001	0.002
5%	0.000	1.440	0.034	0.00001	0.0001	0.005	0.000	0.001	0.002
1%	0.000	1.000	0.022	0.00001	0.0001	0.005	0.000	0.001	0.001
Minimum 0%	0.000	0.546	0.013	0.00001	0.0001	0.005	0.000	0.000	0.001

APPENDIX D:
Summary Statistics and 95th Percentiles by Sub-basin

** ANIONS & NUTRIENTS **

Percentile	Conductivity uS/cm | Ann Gulch	Conductivity uS/cm | Bawn Boy Gulch	Conductivity uS/cm | Dublin Gulch	Conductivity uS/cm | Eagle Pup	Conductivity uS/cm | Headwaters	Conductivity uS/cm | Olive Gulch	Conductivity uS/cm | Platinum Gulch	Conductivity uS/cm | Stewart Gulch	Conductivity uS/cm | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	289.0	633.0	939.0	751.0	568.0	418.0	1140.0	825.0	760.0
99%	289.0	633.0	939.0	751.0	568.0	418.0	1140.0	825.0	760.0
95%	282.0	457.5	909.0	654.0	568.0	418.0	955.0	825.0	760.0
90%	278.0	234.0	877.0	467.0	568.0	418.0	940.0	825.0	755.0
3rd Quartile 75%	269.0	143.0	779.0	458.0	568.0	336.0	597.0	816.5	667.0
Median 50%	224.0	72.6	562.0	447.0	566.5	197.0	581.0	800.5	493.5
1st Quartile 25%	189.0	61.2	523.0	431.0	568.0	42.7	415.0	739.5	280.5
10%	107.0	56.9	379.0	262.0	568.0	42.7	287.0	793.0	267.0
5%	61.5	51.7	356.0	181.0	568.0	42.7	276.0	793.0	267.0
1%	49.4	53.4	178.0	181.0	568.0	42.7	276.0	793.0	267.0
Minimum 0%	19.8	50.0	173.0	120.0	565.0	40.0	201.0	686.0	35.6

Percentile	Hardness (as CaCO3) mg/L | Ann Gulch	Hardness (as CaCO3) mg/L | Bawn Boy Gulch	Hardness (as CaCO3) mg/L | Dublin Gulch	Hardness (as CaCO3) mg/L | Eagle Pup	Hardness (as CaCO3) mg/L | Headwaters	Hardness (as CaCO3) mg/L | Olive Gulch	Hardness (as CaCO3) mg/L | Platinum Gulch	Hardness (as CaCO3) mg/L | Stewart Gulch	Hardness (as CaCO3) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	149	281	549	445	315	236	648	511	456
99%	149.0	281.0	549.0	445.0	315.0	236.0	648.0	511.0	456.0
95%	146.0	216.0	506.0	410.0	315.0	236.0	634.0	511.0	456.0
90%	143.0	120.0	496.0	275.0	315.0	236.0	564.0	511.0	452.0
3rd Quartile 75%	138.0	61.8	420.5	272.0	315.0	183.0	331.0	482.5	408.5
Median 50%	97.6	28.2	323.5	266.0	314.0	94.6	316.0	452.0	237.5
1st Quartile 25%	82.5	24.9	297.5	258.0	315.0	15.7	189.0	448.5	131.0
10%	63.9	23.6	218.0	160.0	315.0	15.7	144.0	450.0	99.0
5%	24.9	20.9	195.0	83.9	315.0	15.7	140.0	450.0	99.0
1%	20.3	23.2	91.1	83.9	315.0	15.7	140.0	450.0	99.0
Minimum 0%	8.7	18.6	86.3	68.7	313.0	15.5	88.6	447.0	21.2

Percentile	pH | Ann Gulch	pH | Bawn Boy Gulch	pH | Dublin Gulch	pH | Eagle Pup	pH | Headwaters	pH | Olive Gulch	pH | Platinum Gulch	pH | Stewart Gulch	pH | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	8.30	8.80	8.32	8.51	7.64	7.96	8.30	7.86	8.02
99%	8.30	8.80	8.32	8.51	7.64	7.96	8.30	7.86	8.02
95%	8.16	8.30	8.17	8.40	7.64	7.96	8.21	7.86	8.02
90%	8.11	7.76	8.08	8.35	7.64	7.96	8.16	7.86	7.99
3rd Quartile 75%	8.03	7.64	7.91	8.27	7.64	7.30	8.08	7.63	7.93
Median 50%	7.80	7.43	7.74	8.11	7.62	7.20	8.00	7.38	7.72
1st Quartile 25%	7.00	7.17	7.54	7.90	7.64	6.99	7.84	7.30	7.54
10%	6.80	7.03	7.31	7.75	7.64	6.99	7.78	7.35	7.07
5%	6.72	6.98	7.24	7.60	7.64	6.99	7.77	7.35	7.07
1%	6.68	7.01	7.16	7.60	7.64	6.99	7.77	7.35	7.07
Minimum 0%	6.59	6.94	7.06	7.42	7.60	6.56	7.66	7.25	6.08

Percentile	Total Suspended Solids mg/L | Ann Gulch	Total Suspended Solids mg/L | Bawn Boy Gulch	Total Suspended Solids mg/L | Dublin Gulch	Total Suspended Solids mg/L | Eagle Pup	Total Suspended Solids mg/L | Headwaters	Total Suspended Solids mg/L | Olive Gulch	Total Suspended Solids mg/L | Platinum Gulch	Total Suspended Solids mg/L | Stewart Gulch	Total Suspended Solids mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	385.0	1140.0	2350.0	128000.0	133.0	89.3	143.0	9.0	4210.0
99%	385.0	1140.0	2350.0	128000.0	133.0	89.3	143.0	9.0	4210.0
95%	304.0	1070.0	505.0	61000.0	133.0	89.3	127.0	9.0	4210.0
90%	287.0	683.0	345.0	487.0	133.0	89.3	93.2	9.0	168.0
3rd Quartile 75%	90.0	114.5	70.7	174.0	133.0	66.3	72.5	7.5	97.0
Median 50%	25.6	37.4	27.8	34.0	88.2	27.8	29.8	5.5	23.9
1st Quartile 25%	8.7	18.7	11.0	11.0	133.0	8.0	10.8	3.5	10.0
10%	3.3	4.5	7.1	7.3	133.0	8.0	7.8	5.0	7.0
5%	3.2	4.0	5.0	4.8	133.0	8.0	6.7	5.0	7.0
1%	1.5	4.0	4.3	4.8	133.0	8.0	6.7	5.0	7.0
Minimum 0%	1.5	4.0	1.5	1.5	43.3	5.8	5.0	2.0	4.0

Percentile	Total Dissolved Solids mg/L | Ann Gulch	Total Dissolved Solids mg/L | Bawn Boy Gulch	Total Dissolved Solids mg/L | Dublin Gulch	Total Dissolved Solids mg/L | Eagle Pup	Total Dissolved Solids mg/L | Headwaters	Total Dissolved Solids mg/L | Olive Gulch	Total Dissolved Solids mg/L | Platinum Gulch	Total Dissolved Solids mg/L | Stewart Gulch	Total Dissolved Solids mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	196.0	478.0	715.0	461.0	391.0	255.0	934.0	653.0	496.0
99%	196.0	478.0	715.0	461.0	391.0	255.0	934.0	653.0	496.0
95%	189.0	334.0	673.0	433.0	391.0	255.0	739.0	653.0	496.0
90%	181.0	158.0	663.0	260.0	391.0	255.0	720.0	653.0	492.0
3rd Quartile 75%	172.0	89.0	556.0	251.0	391.0	221.0	419.0	615.5	426.5
Median 50%	152.0	49.0	361.0	239.0	388.0	123.0	395.0	574.0	365.5
1st Quartile 25%	116.0	41.5	342.0	231.0	391.0	40.0	265.0	569.0	195.0
10%	84.0	38.5	254.0	137.0	391.0	40.0	185.0	570.0	161.0
5%	68.0	37.5	217.0	98.0	391.0	40.0	170.0	570.0	161.0
1%	67.0	38.0	122.0	98.0	391.0	40.0	170.0	570.0	161.0
Minimum 0%	22.1	37.0	94.0	79.0	385.0	24.1	133.0	568.0	79.0

Percentile	Turbidity NTU | Ann Gulch	Turbidity NTU | Bawn Boy Gulch	Turbidity NTU | Dublin Gulch	Turbidity NTU | Eagle Pup	Turbidity NTU | Headwaters	Turbidity NTU | Olive Gulch	Turbidity NTU | Platinum Gulch	Turbidity NTU | Stewart Gulch	Turbidity NTU | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	168.0	290.0	895.0	4000.0	47.7	33.5	75.2	11.3	2000.0
99%	168.0	290.0	895.0	4000.0	47.7	33.5	75.2	11.3	2000.0
95%	135.0	290.0	346.5	4000.0	47.7	33.5	57.2	11.3	2000.0
90%	119.0	284.0	145.5	679.0	47.7	33.5	36.7	11.3	48.0
3rd Quartile 75%	56.6	40.9	57.7	61.2	47.7	31.1	25.3	10.4	26.3
Median 50%	19.2	26.4	22.2	29.3	47.7	11.0	11.3	8.4	20.6
1st Quartile 25%	10.1	8.5	6.5	8.0	47.7	5.2	4.9	6.2	8.8
10%	7.1	3.4	1.8	4.4	47.7	5.2	2.0	7.4	4.5
5%	5.3	3.4	1.3	4.1	47.7	5.2	2.0	7.4	4.5
1%	3.7	3.4	0.7	4.1	47.7	5.2	2.0	7.4	4.5
Minimum 0%	2.2	2.0	0.6	1.8	47.7	4.2	1.4	5.0	3.2

Percentile	Acidity (as CaCO3)mg/L | Ann Gulch	Acidity (as CaCO3)mg/L | Bawn Boy Gulch	Acidity (as CaCO3)mg/L | Dublin Gulch	Acidity (as CaCO3)mg/L | Eagle Pup	Acidity (as CaCO3)mg/L | Headwaters	Acidity (as CaCO3)mg/L | Olive Gulch	Acidity (as CaCO3)mg/L | Platinum Gulch	Acidity (as CaCO3)mg/L | Stewart Gulch	Acidity (as CaCO3)mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	93.90	-1.00	240.00	309.00	-1.00	-1.00	180.00	-1.00	-1.00
99%	93.90	-1.00	240.00	309.00	-1.00	-1.00	180.00	-1.00	-1.00
95%	93.90	-1.00	240.00	309.00	-1.00	-1.00	180.00	-1.00	-1.00
90%	93.90	-1.00	240.00	309.00	-1.00	-1.00	180.00	-1.00	-1.00
3rd Quartile 75%	93.90	-1.00	192.00	255.00	-1.00	-1.00	180.00	-1.00	-1.00
Median 50%	47.75	-1.00	4.90	2.60	-1.00	-1.00	91.05	-1.00	-1.00
1st Quartile 25%	93.90	-1.00	3.00	2.30	-1.00	-1.00	180.00	-1.00	-1.00
10%	93.90	-1.00	3.00	2.30	-1.00	-1.00	180.00	-1.00	-1.00
5%	93.90	-1.00	3.00	2.30	-1.00	-1.00	180.00	-1.00	-1.00
1%	93.90	-1.00	3.00	2.30	-1.00	-1.00	180.00	-1.00	-1.00
Minimum 0%	1.60	-1.00	2.90	0.50	-1.00	-1.00	2.10	-1.00	-1.00

Percentile	Alkalinity, Bicarbonate (as CaCO3) mg/L | Ann Gulch	Alkalinity, Bicarbonate (as CaCO3) mg/L | Bawn Boy Gulch	Alkalinity, Bicarbonate (as CaCO3) mg/L | Dublin Gulch	Alkalinity, Bicarbonate (as CaCO3) mg/L | Eagle Pup	Alkalinity, Bicarbonate (as CaCO3) mg/L | Headwaters	Alkalinity, Bicarbonate (as CaCO3) mg/L | Olive Gulch	Alkalinity, Bicarbonate (as CaCO3) mg/L | Platinum Gulch	Alkalinity, Bicarbonate (as CaCO3) mg/L | Stewart Gulch	Alkalinity, Bicarbonate (as CaCO3) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	96.1	83.8	320.0	251.0	139.0	103.0	178.0	-1.0	348.0
99%	96.1	83.8	320.0	251.0	139.0	103.0	178.0	-1.0	348.0
95%	96.1	83.8	320.0	251.0	139.0	103.0	178.0	-1.0	348.0
90%	95.6	83.8	313.0	250.0	139.0	103.0	178.0	-1.0	348.0
3rd Quartile 75%	93.8	81.9	230.0	244.0	139.0	103.0	175.0	-1.0	338.0
Median 50%	75.3	22.6	210.0	241.0	139.0	64.5	159.5	-1.0	306.5
1st Quartile 25%	28.0	19.0	157.0	107.0	139.0	103.0	146.5	-1.0	149.2
10%	18.1	19.0	65.8	88.9	139.0	103.0	138.0	-1.0	285.0
5%	18.1	19.0	65.8	88.9	139.0	103.0	138.0	-1.0	285.0
1%	18.1	19.0	65.8	88.9	139.0	103.0	138.0	-1.0	285.0
Minimum 0%	18.0	17.9	50.7	62.2	139.0	26.0	130.0	-1.0	13.4

Percentile	Alkalinity, Carbonate (as CaCO3) mg/L | Ann Gulch	Alkalinity, Carbonate (as CaCO3) mg/L | Bawn Boy Gulch	Alkalinity, Carbonate (as CaCO3) mg/L | Dublin Gulch	Alkalinity, Carbonate (as CaCO3) mg/L | Eagle Pup	Alkalinity, Carbonate (as CaCO3) mg/L | Headwaters	Alkalinity, Carbonate (as CaCO3) mg/L | Olive Gulch	Alkalinity, Carbonate (as CaCO3) mg/L | Platinum Gulch	Alkalinity, Carbonate (as CaCO3) mg/L | Stewart Gulch	Alkalinity, Carbonate (as CaCO3) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	1.0	1.0	1.0	6.3	1.0	1.0	1.0	-1.0	1.0
99%	1.0	1.0	1.0	6.3	1.0	1.0	1.0	-1.0	1.0
95%	1.0	1.0	1.0	6.3	1.0	1.0	1.0	-1.0	1.0
90%	1.0	1.0	1.0	6.3	1.0	1.0	1.0	-1.0	1.0
3rd Quartile 75%	1.0	1.0	1.0	6.1	1.0	1.0	1.0	-1.0	1.0
Median 50%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-1.0	1.0
1st Quartile 25%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	-1.0	1.0
10%	1.0	1.0	0.5	1.0	1.0	1.0	1.0	-1.0	1.0
5%	1.0	1.0	0.5	1.0	1.0	1.0	1.0	-1.0	1.0
1%	1.0	1.0	0.5	1.0	1.0	1.0	1.0	-1.0	1.0
Minimum 0%	1.0	0.5	0.5	1.0	1.0	1.0	1.0	-1.0	1.0

Percentile	Alkalinity, Hydroxide (as CaCO3) mg/L | Ann Gulch	Alkalinity, Hydroxide (as CaCO3) mg/L | Bawn Boy Gulch	Alkalinity, Hydroxide (as CaCO3) mg/L | Dublin Gulch	Alkalinity, Hydroxide (as CaCO3) mg/L | Eagle Pup	Alkalinity, Hydroxide (as CaCO3) mg/L | Headwaters	Alkalinity, Hydroxide (as CaCO3) mg/L | Olive Gulch	Alkalinity, Hydroxide (as CaCO3) mg/L | Platinum Gulch	Alkalinity, Hydroxide (as CaCO3) mg/L | Stewart Gulch	Alkalinity, Hydroxide (as CaCO3) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	1.000
99%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	1.000
95%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	1.000
90%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	1.000
3rd Quartile 75%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	1.000
Median 50%	1.000	1.000	1.000	1.000	1.000	1.000	1.000	-1.000	1.000
1st Quartile 25%	1.000	1.000	1.000	0.500	1.000	1.000	1.000	-1.000	1.000
10%	1.000	1.000	0.500	0.500	1.000	1.000	1.000	-1.000	1.000
5%	1.000	1.000	0.500	0.500	1.000	1.000	1.000	-1.000	1.000
1%	1.000	1.000	0.500	0.500	1.000	1.000	1.000	-1.000	1.000
Minimum 0%	1.000	0.500	0.500	0.500	1.000	1.000	1.000	-1.000	1.000

Percentile	Alkalinity, Total (as CaCO3) mg/L | Ann Gulch	Alkalinity, Total (as CaCO3) mg/L | Bawn Boy Gulch	Alkalinity, Total (as CaCO3) mg/L | Dublin Gulch	Alkalinity, Total (as CaCO3) mg/L | Eagle Pup	Alkalinity, Total (as CaCO3) mg/L | Headwaters	Alkalinity, Total (as CaCO3) mg/L | Olive Gulch	Alkalinity, Total (as CaCO3) mg/L | Platinum Gulch	Alkalinity, Total (as CaCO3) mg/L | Stewart Gulch	Alkalinity, Total (as CaCO3) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	106.0	83.8	419.0	303.0	141.0	144.0	187.0	464.0	348.0
99%	106.0	83.8	419.0	303.0	141.0	144.0	187.0	464.0	348.0
95%	104.0	82.9	343.0	266.0	141.0	144.0	183.0	464.0	348.0
90%	101.0	81.8	313.0	258.0	141.0	144.0	181.0	464.0	344.0
3rd Quartile 75%	95.9	54.9	230.0	252.0	141.0	108.0	176.0	435.5	262.0
Median 50%	79.1	28.3	213.0	245.0	140.0	64.5	174.0	400.5	137.5
1st Quartile 25%	31.8	21.1	186.0	241.0	141.0	20.5	156.0	392.0	100.0
10%	16.9	19.4	150.0	186.0	141.0	20.5	130.0	394.0	92.1
5%	10.1	18.5	135.0	107.0	141.0	20.5	124.0	394.0	92.1
1%	10.1	19.0	91.7	107.0	141.0	20.5	124.0	394.0	92.1
Minimum 0%	7.0	17.9	65.8	88.9	139.0	20.0	60.2	390.0	88.9

Percentile	Ammonia as N mg/L | Ann Gulch	Ammonia as N mg/L | Bawn Boy Gulch	Ammonia as N mg/L | Dublin Gulch	Ammonia as N mg/L | Eagle Pup	Ammonia as N mg/L | Headwaters	Ammonia as N mg/L | Olive Gulch	Ammonia as N mg/L | Platinum Gulch	Ammonia as N mg/L | Stewart Gulch	Ammonia as N mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.044	0.070	0.412	0.099	0.361	0.034	0.235	0.042	0.152
99%	0.044	0.070	0.412	0.099	0.361	0.034	0.235	0.042	0.152
95%	0.030	0.070	0.340	0.053	0.361	0.034	0.168	0.042	0.152
90%	0.027	0.061	0.235	0.036	0.361	0.034	0.151	0.042	0.143
3rd Quartile 75%	0.024	0.030	0.194	0.023	0.361	0.015	0.033	0.032	0.081
Median 50%	0.013	0.003	0.010	0.010	0.205	0.010	0.028	0.020	0.018
1st Quartile 25%	0.007	0.003	0.003	0.007	0.361	0.003	0.003	0.010	0.003
10%	0.003	0.003	0.003	0.006	0.361	0.003	0.003	0.019	0.003
5%	0.003	0.003	0.003	0.003	0.361	0.003	0.003	0.019	0.003
1%	0.003	0.003	0.003	0.003	0.361	0.003	0.003	0.019	0.003
Minimum 0%	0.003	0.003	0.003	0.003	0.048	0.003	0.003	0.001	0.003

Percentile	Bromide (Br) mg/L | Ann Gulch	Bromide (Br) mg/L | Bawn Boy Gulch	Bromide (Br) mg/L | Dublin Gulch	Bromide (Br) mg/L | Eagle Pup	Bromide (Br) mg/L | Headwaters	Bromide (Br) mg/L | Olive Gulch	Bromide (Br) mg/L | Platinum Gulch	Bromide (Br) mg/L | Stewart Gulch	Bromide (Br) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.212	0.025	0.250	0.025	0.025	0.025	0.250	-1.000	0.250
99%	0.212	0.025	0.250	0.025	0.025	0.025	0.250	-1.000	0.250
95%	0.147	0.025	0.250	0.025	0.025	0.025	0.250	-1.000	0.250
90%	0.062	0.025	0.250	0.025	0.025	0.025	0.250	-1.000	0.250
3rd Quartile 75%	0.025	0.025	0.089	0.025	0.025	0.025	0.025	-1.000	0.125
Median 50%	0.025	0.025	0.025	0.025	0.025	0.025	0.025	-1.000	0.125
1st Quartile 25%	0.025	0.025	0.025	0.025	0.025	0.025	0.025	-1.000	0.025
10%	0.025	0.025	0.025	0.025	0.025	0.025	0.025	-1.000	0.025
5%	0.025	0.025	0.025	0.025	0.025	0.025	0.025	-1.000	0.025
1%	0.025	0.025	0.025	0.025	0.025	0.025	0.025	-1.000	0.025
Minimum 0%	0.025	0.025	0.025	0.025	0.025	0.025	0.025	-1.000	0.025

Percentile	Chloride (Cl) mg/L | Ann Gulch	Chloride (Cl) mg/L | Bawn Boy Gulch	Chloride (Cl) mg/L | Dublin Gulch	Chloride (Cl) mg/L | Eagle Pup	Chloride (Cl) mg/L | Headwaters	Chloride (Cl) mg/L | Olive Gulch	Chloride (Cl) mg/L | Platinum Gulch	Chloride (Cl) mg/L | Stewart Gulch	Chloride (Cl) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.60	3.30	2.50	0.72	0.25	0.25	3.13	1.10	8.80
99%	0.60	3.30	2.50	0.72	0.25	0.25	3.13	1.10	8.80
95%	0.25	2.55	2.50	0.66	0.25	0.25	2.50	1.10	8.80
90%	0.25	1.40	2.50	0.25	0.25	0.25	2.50	1.10	2.50
3rd Quartile 75%	0.25	0.25	1.09	0.25	0.25	0.25	0.52	0.68	1.18
Median 50%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
1st Quartile 25%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
10%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
5%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
1%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Minimum 0%	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Percentile	Fluoride (F) mg/L | Ann Gulch	Fluoride (F) mg/L | Bawn Boy Gulch	Fluoride (F) mg/L | Dublin Gulch	Fluoride (F) mg/L | Eagle Pup	Fluoride (F) mg/L | Headwaters	Fluoride (F) mg/L | Olive Gulch	Fluoride (F) mg/L | Platinum Gulch	Fluoride (F) mg/L | Stewart Gulch	Fluoride (F) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.482	0.260	0.420	0.508	0.097	0.598	0.501	0.300	0.320
99%	0.482	0.260	0.420	0.508	0.097	0.598	0.501	0.300	0.320
95%	0.447	0.260	0.320	0.507	0.097	0.598	0.499	0.300	0.320
90%	0.436	0.255	0.310	0.426	0.097	0.598	0.494	0.300	0.290
3rd Quartile 75%	0.361	0.239	0.185	0.418	0.097	0.414	0.482	0.290	0.215
Median 50%	0.281	0.071	0.150	0.401	0.085	0.158	0.436	0.280	0.125
1st Quartile 25%	0.254	0.043	0.118	0.312	0.097	0.025	0.084	0.215	0.085
10%	0.218	0.031	0.100	0.092	0.097	0.025	0.063	0.280	0.050
5%	0.137	0.027	0.099	0.061	0.097	0.025	0.056	0.280	0.050
1%	0.080	0.028	0.080	0.061	0.097	0.025	0.056	0.280	0.050
Minimum 0%	0.010	0.025	0.069	0.042	0.073	0.010	0.056	0.150	0.050

Percentile	Nitrate (as N) mg/L | Ann Gulch	Nitrate (as N) mg/L | Bawn Boy Gulch	Nitrate (as N) mg/L | Dublin Gulch	Nitrate (as N) mg/L | Eagle Pup	Nitrate (as N) mg/L | Headwaters	Nitrate (as N) mg/L | Olive Gulch	Nitrate (as N) mg/L | Platinum Gulch	Nitrate (as N) mg/L | Stewart Gulch	Nitrate (as N) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.276	0.399	1.200	0.364	0.030	0.144	0.479	0.003	0.369
99%	0.276	0.399	1.200	0.364	0.030	0.144	0.479	0.003	0.369
95%	0.217	0.272	0.376	0.305	0.030	0.144	0.428	0.003	0.369
90%	0.209	0.145	0.262	0.177	0.030	0.144	0.423	0.003	0.136
3rd Quartile 75%	0.158	0.111	0.123	0.032	0.030	0.125	0.212	0.003	0.065
Median 50%	0.006	0.067	0.047	0.009	0.019	0.060	0.030	0.003	0.012
1st Quartile 25%	0.003	0.007	0.013	0.003	0.030	0.014	0.003	0.003	0.003
10%	0.003	0.003	0.003	0.003	0.030	0.014	0.003	0.003	0.003
5%	0.003	0.003	0.003	0.003	0.030	0.014	0.003	0.003	0.003
1%	0.003	0.003	0.003	0.003	0.030	0.014	0.003	0.003	0.003
Minimum 0%	0.003	0.003	0.003	0.003	0.009	0.003	0.003	0.003	0.003

Percentile	Nitrite (as N) mg/L | Ann Gulch	Nitrite (as N) mg/L | Bawn Boy Gulch	Nitrite (as N) mg/L | Dublin Gulch	Nitrite (as N) mg/L | Eagle Pup	Nitrite (as N) mg/L | Headwaters	Nitrite (as N) mg/L | Olive Gulch	Nitrite (as N) mg/L | Platinum Gulch	Nitrite (as N) mg/L | Stewart Gulch	Nitrite (as N) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.003	0.103	0.013	0.002	0.002	0.004	0.012	0.002	0.007
99%	0.003	0.103	0.013	0.002	0.002	0.004	0.012	0.002	0.007
95%	0.002	0.090	0.008	0.002	0.002	0.004	0.008	0.002	0.007
90%	0.001	0.068	0.005	0.001	0.002	0.004	0.007	0.002	0.005
3rd Quartile 75%	0.001	0.017	0.004	0.001	0.002	0.003	0.003	0.002	0.003
Median 50%	0.001	0.002	0.001	0.001	0.001	0.002	0.001	0.002	0.001
1st Quartile 25%	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
10%	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
5%	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
1%	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
Minimum 0%	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Percentile	Total Kjeldahl Nitrogen mg/L | Ann Gulch	Total Kjeldahl Nitrogen mg/L | Bawn Boy Gulch	Total Kjeldahl Nitrogen mg/L | Dublin Gulch	Total Kjeldahl Nitrogen mg/L | Eagle Pup	Total Kjeldahl Nitrogen mg/L | Headwaters	Total Kjeldahl Nitrogen mg/L | Olive Gulch	Total Kjeldahl Nitrogen mg/L | Platinum Gulch	Total Kjeldahl Nitrogen mg/L | Stewart Gulch	Total Kjeldahl Nitrogen mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.668	0.592	1.200	5.000	0.320	2.300	1.210	-1.000	0.507
99%	0.668	0.592	1.200	5.000	0.320	2.300	1.210	-1.000	0.507
95%	0.372	0.592	0.607	5.000	0.320	2.300	0.634	-1.000	0.507
90%	0.258	0.363	0.383	0.784	0.320	2.300	0.609	-1.000	0.507
3rd Quartile 75%	0.179	0.193	0.322	0.463	0.320	0.301	0.193	-1.000	0.488
Median 50%	0.122	0.092	0.184	0.143	0.282	0.168	0.119	-1.000	0.335
1st Quartile 25%	0.055	0.002	0.100	0.053	0.320	0.081	0.083	-1.000	0.167
10%	0.025	0.001	0.055	0.025	0.320	0.081	0.063	-1.000	0.167
5%	0.025	0.001	0.025	0.025	0.320	0.081	0.057	-1.000	0.167
1%	0.025	0.001	0.025	0.025	0.320	0.081	0.057	-1.000	0.167
Minimum 0%	0.025	0.001	0.025	0.025	0.244	0.025	0.025	-1.000	0.056

Percentile	Total Nitrogen mg/L | Ann Gulch	Total Nitrogen mg/L | Bawn Boy Gulch	Total Nitrogen mg/L | Dublin Gulch	Total Nitrogen mg/L | Eagle Pup	Total Nitrogen mg/L | Headwaters	Total Nitrogen mg/L | Olive Gulch	Total Nitrogen mg/L | Platinum Gulch	Total Nitrogen mg/L | Stewart Gulch	Total Nitrogen mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.810	-1.000	1.210	5.000	-1.000	0.272	1.200	-1.000	0.680
99%	0.810	-1.000	1.210	5.000	-1.000	0.272	1.200	-1.000	0.680
95%	0.748	-1.000	0.650	2.875	-1.000	0.272	1.200	-1.000	0.680
90%	0.338	-1.000	0.540	0.749	-1.000	0.272	0.723	-1.000	0.680
3rd Quartile 75%	0.292	-1.000	0.400	0.532	-1.000	0.272	0.330	-1.000	0.680
Median 50%	0.175	-1.000	0.301	0.288	-1.000	0.149	0.143	-1.000	0.335
1st Quartile 25%	0.076	-1.000	0.241	0.064	-1.000	0.272	0.126	-1.000	0.335
10%	0.002	-1.000	0.162	0.002	-1.000	0.272	0.066	-1.000	0.335
5%	0.002	-1.000	0.091	0.002	-1.000	0.272	0.066	-1.000	0.335
1%	0.002	-1.000	0.057	0.002	-1.000	0.272	0.066	-1.000	0.335
Minimum 0%	0.002	-1.000	0.022	0.002	-1.000	0.025	0.057	-1.000	0.251

Percentile	Ortho Phosphate as P mg/L | Ann Gulch	Ortho Phosphate as P mg/L | Bawn Boy Gulch	Ortho Phosphate as P mg/L | Dublin Gulch	Ortho Phosphate as P mg/L | Eagle Pup	Ortho Phosphate as P mg/L | Headwaters	Ortho Phosphate as P mg/L | Olive Gulch	Ortho Phosphate as P mg/L | Platinum Gulch	Ortho Phosphate as P mg/L | Stewart Gulch	Ortho Phosphate as P mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.017	0.081	0.084	0.026	0.003	0.002	0.410	0.031	0.062
99%	0.017	0.081	0.084	0.026	0.003	0.002	0.410	0.031	0.062
95%	0.013	0.057	0.008	0.008	0.003	0.002	0.347	0.031	0.062
90%	0.013	0.034	0.005	0.006	0.003	0.002	0.320	0.031	0.024
3rd Quartile 75%	0.005	0.027	0.002	0.005	0.003	0.002	0.160	0.022	0.007
Median 50%	0.001	0.014	0.001	0.004	0.002	0.001	0.078	0.009	0.004
1st Quartile 25%	0.001	0.005	0.001	0.002	0.003	0.001	0.020	0.003	0.002
10%	0.001	0.003	0.001	0.001	0.003	0.001	0.007	0.006	0.001
5%	0.001	0.001	0.001	0.001	0.003	0.001	0.001	0.006	0.001
1%	0.001	0.002	0.001	0.001	0.003	0.001	0.001	0.006	0.001
Minimum 0%	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Percentile	Total Dissolved Phosphate As P mg/L | Ann Gulch	Total Dissolved Phosphate As P mg/L | Bawn Boy Gulch	Total Dissolved Phosphate As P mg/L | Dublin Gulch	Total Dissolved Phosphate As P mg/L | Eagle Pup	Total Dissolved Phosphate As P mg/L | Headwaters	Total Dissolved Phosphate As P mg/L | Olive Gulch	Total Dissolved Phosphate As P mg/L | Platinum Gulch	Total Dissolved Phosphate As P mg/L | Stewart Gulch	Total Dissolved Phosphate As P mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.019	0.005	0.031	0.035	0.001	0.003	0.500	-1.000	0.013
99%	0.019	0.005	0.031	0.035	0.001	0.003	0.500	-1.000	0.013
95%	0.016	0.005	0.026	0.008	0.001	0.003	0.350	-1.000	0.013
90%	0.015	0.005	0.019	0.007	0.001	0.003	0.180	-1.000	0.013
3rd Quartile 75%	0.010	0.005	0.006	0.004	0.001	0.002	0.103	-1.000	0.013
Median 50%	0.005	0.005	0.002	0.003	0.001	0.001	0.084	-1.000	0.012
1st Quartile 25%	0.001	0.005	0.001	0.003	0.001	0.001	0.056	-1.000	0.012
10%	0.001	0.005	0.001	0.003	0.001	0.001	0.019	-1.000	0.012
5%	0.001	0.005	0.001	0.001	0.001	0.001	0.009	-1.000	0.012
1%	0.001	0.005	0.001	0.001	0.001	0.001	0.013	-1.000	0.012
Minimum 0%	0.001	0.005	0.001	0.001	0.001	0.001	0.005	-1.000	0.008

Percentile	Total Phosphate as P mg/L | Ann Gulch	Total Phosphate as P mg/L | Bawn Boy Gulch	Total Phosphate as P mg/L | Dublin Gulch	Total Phosphate as P mg/L | Eagle Pup	Total Phosphate as P mg/L | Headwaters	Total Phosphate as P mg/L | Olive Gulch	Total Phosphate as P mg/L | Platinum Gulch	Total Phosphate as P mg/L | Stewart Gulch	Total Phosphate as P mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.137	1.590	0.489	9.520	0.259	0.073	0.500	0.295	9.170
99%	0.137	1.590	0.489	9.520	0.259	0.073	0.500	0.295	9.170
95%	0.110	1.190	0.224	9.110	0.259	0.073	0.330	0.295	9.170
90%	0.087	0.667	0.165	0.283	0.259	0.073	0.280	0.295	0.200
3rd Quartile 75%	0.057	0.114	0.082	0.083	0.259	0.049	0.200	0.276	0.051
Median 50%	0.023	0.062	0.030	0.024	0.180	0.024	0.108	0.144	0.028
1st Quartile 25%	0.010	0.041	0.011	0.011	0.259	0.006	0.063	0.017	0.025
10%	0.004	0.021	0.004	0.008	0.259	0.006	0.029	0.032	0.019
5%	0.002	0.019	0.002	0.005	0.259	0.006	0.020	0.032	0.019
1%	0.001	0.020	0.001	0.005	0.259	0.006	0.020	0.032	0.019
Minimum 0%	0.001	0.018	0.001	0.004	0.101	0.004	0.009	0.002	0.011

Percentile	Sulfate (SO4) mg/L | Ann Gulch	Sulfate (SO4) mg/L | Bawn Boy Gulch	Sulfate (SO4) mg/L | Dublin Gulch	Sulfate (SO4) mg/L | Eagle Pup	Sulfate (SO4) mg/L | Headwaters	Sulfate (SO4) mg/L | Olive Gulch	Sulfate (SO4) mg/L | Platinum Gulch	Sulfate (SO4) mg/L | Stewart Gulch	Sulfate (SO4) mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	92.4	256.0	341.0	133.0	165.0	81.4	480.0	97.8	138.0
99%	92.4	256.0	341.0	133.0	165.0	81.4	480.0	97.8	138.0
95%	84.3	160.2	328.0	121.0	165.0	81.4	391.0	97.8	138.0
90%	78.7	39.2	319.0	20.5	165.0	81.4	382.0	97.8	133.0
3rd Quartile 75%	66.0	12.9	142.0	18.5	165.0	67.7	150.0	94.3	122.0
Median 50%	47.9	8.9	99.1	18.3	165.0	35.0	146.0	90.6	88.8
1st Quartile 25%	21.6	4.7	92.7	17.8	165.0	1.0	76.3	90.1	45.5
10%	13.3	2.9	64.0	9.5	165.0	1.0	29.1	90.4	40.6
5%	9.8	2.5	39.7	5.5	165.0	1.0	27.7	90.4	40.6
1%	7.5	2.5	25.2	5.5	165.0	1.0	27.7	90.4	40.6
Minimum 0%	1.2	2.4	23.8	2.9	165.0	1.0	22.8	89.8	1.3

Percentile	Anion Sum mg/L | Ann Gulch	Anion Sum mg/L | Bawn Boy Gulch	Anion Sum mg/L | Dublin Gulch	Anion Sum mg/L | Eagle Pup	Anion Sum mg/L | Headwaters	Anion Sum mg/L | Olive Gulch	Anion Sum mg/L | Platinum Gulch	Anion Sum mg/L | Stewart Gulch	Anion Sum mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	3.13	-1.00	9.87	8.96	-1.00	4.60	6.85	-1.00	-1.00
99%	3.13	-1.00	9.87	8.96	-1.00	4.60	6.85	-1.00	-1.00
95%	3.13	-1.00	9.87	8.96	-1.00	4.60	6.85	-1.00	-1.00
90%	3.13	-1.00	9.87	8.96	-1.00	4.60	6.85	-1.00	-1.00
3rd Quartile 75%	3.02	-1.00	6.94	5.74	-1.00	4.60	6.72	-1.00	-1.00
Median 50%	2.89	-1.00	6.64	5.48	-1.00	2.52	6.56	-1.00	-1.00
1st Quartile 25%	1.53	-1.00	4.68	5.30	-1.00	4.60	6.50	-1.00	-1.00
10%	2.88	-1.00	4.35	4.98	-1.00	4.60	6.52	-1.00	-1.00
5%	2.88	-1.00	4.35	4.98	-1.00	4.60	6.52	-1.00	-1.00
1%	2.88	-1.00	4.35	4.98	-1.00	4.60	6.52	-1.00	-1.00
Minimum 0%	0.17	-1.00	4.05	3.92	-1.00	0.43	6.47	-1.00	-1.00

Percentile	Cation Sum mg/L | Ann Gulch	Cation Sum mg/L | Bawn Boy Gulch	Cation Sum mg/L | Dublin Gulch	Cation Sum mg/L | Eagle Pup	Cation Sum mg/L | Headwaters	Cation Sum mg/L | Olive Gulch	Cation Sum mg/L | Platinum Gulch	Cation Sum mg/L | Stewart Gulch	Cation Sum mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	2.990	-1.000	10.800	9.100	-1.000	4.920	6.940	-1.000	-1.000
99%	2.990	-1.000	10.800	9.100	-1.000	4.920	6.940	-1.000	-1.000
95%	2.990	-1.000	10.800	9.100	-1.000	4.920	6.940	-1.000	-1.000
90%	2.990	-1.000	10.800	9.100	-1.000	4.920	6.940	-1.000	-1.000
3rd Quartile 75%	2.920	-1.000	7.090	5.610	-1.000	4.920	6.820	-1.000	-1.000
Median 50%	2.840	-1.000	6.790	5.540	-1.000	2.670	6.695	-1.000	-1.000
1st Quartile 25%	1.545	-1.000	4.370	5.320	-1.000	4.920	6.600	-1.000	-1.000
10%	2.830	-1.000	4.220	5.130	-1.000	4.920	6.690	-1.000	-1.000
5%	2.830	-1.000	4.220	5.130	-1.000	4.920	6.690	-1.000	-1.000
1%	2.830	-1.000	4.220	5.130	-1.000	4.920	6.690	-1.000	-1.000
Minimum 0%	0.260	-1.000	4.090	4.770	-1.000	0.420	6.510	-1.000	-1.000

Percentile	Cation Anion Balance mg/L | Ann Gulch	Cation Anion Balance mg/L | Bawn Boy Gulch	Cation Anion Balance mg/L | Dublin Gulch	Cation Anion Balance mg/L | Eagle Pup	Cation Anion Balance mg/L | Headwaters	Cation Anion Balance mg/L | Olive Gulch	Cation Anion Balance mg/L | Platinum Gulch	Cation Anion Balance mg/L | Stewart Gulch	Cation Anion Balance mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	21.20	-1.00	11.70	9.70	-1.00	3.30	1.70	-1.00	-1.00
99%	21.20	-1.00	11.70	9.70	-1.00	3.30	1.70	-1.00	-1.00
95%	21.20	-1.00	11.70	9.70	-1.00	3.30	1.70	-1.00	-1.00
90%	21.20	-1.00	11.70	9.70	-1.00	3.30	1.70	-1.00	-1.00
3rd Quartile 75%	13.15	-1.00	3.80	2.90	-1.00	3.30	1.30	-1.00	-1.00
Median 50%	3.45	-1.00	1.30	1.80	-1.00	2.60	0.80	-1.00	-1.00
1st Quartile 25%	1.40	-1.00	0.50	1.10	-1.00	3.30	0.35	-1.00	-1.00
10%	1.80	-1.00	0.30	0.90	-1.00	3.30	0.70	-1.00	-1.00
5%	1.80	-1.00	0.30	0.90	-1.00	3.30	0.70	-1.00	-1.00
1%	1.80	-1.00	0.30	0.90	-1.00	3.30	0.70	-1.00	-1.00
Minimum 0%	1.00	-1.00	0.20	0.80	-1.00	1.90	0.00	-1.00	-1.00

Percentile	Cyanide, Weak Acid Diss mg/L | Ann Gulch	Cyanide, Weak Acid Diss mg/L | Bawn Boy Gulch	Cyanide, Weak Acid Diss mg/L | Dublin Gulch	Cyanide, Weak Acid Diss mg/L | Eagle Pup	Cyanide, Weak Acid Diss mg/L | Headwaters	Cyanide, Weak Acid Diss mg/L | Olive Gulch	Cyanide, Weak Acid Diss mg/L | Platinum Gulch	Cyanide, Weak Acid Diss mg/L | Stewart Gulch	Cyanide, Weak Acid Diss mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
99%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
95%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
90%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
3rd Quartile 75%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
Median 50%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
1st Quartile 25%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
10%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
5%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
1%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000
Minimum 0%	0.0025	-1.0000	0.0025	0.0025	-1.0000	-1.0000	0.0025	-1.0000	-1.0000

Percentile	Cyanide, Total mg/L | Ann Gulch	Cyanide, Total mg/L | Bawn Boy Gulch	Cyanide, Total mg/L | Dublin Gulch	Cyanide, Total mg/L | Eagle Pup	Cyanide, Total mg/L | Headwaters	Cyanide, Total mg/L | Olive Gulch	Cyanide, Total mg/L | Platinum Gulch	Cyanide, Total mg/L | Stewart Gulch	Cyanide, Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.003	0.008	0.003	0.003	-1.000	-1.000	0.007	0.013	0.009
99%	0.003	0.008	0.003	0.003	-1.000	-1.000	0.007	0.013	0.009
95%	0.003	0.008	0.003	0.003	-1.000	-1.000	0.007	0.013	0.009
90%	0.003	0.006	0.003	0.003	-1.000	-1.000	0.007	0.013	0.005
3rd Quartile 75%	0.003	0.001	0.003	0.003	-1.000	-1.000	0.003	0.007	0.004
Median 50%	0.003	0.001	0.003	0.003	-1.000	-1.000	0.003	0.001	0.001
1st Quartile 25%	0.003	0.001	0.003	0.003	-1.000	-1.000	0.003	0.001	0.001
10%	0.003	0.001	0.001	0.003	-1.000	-1.000	0.003	0.001	0.001
5%	0.003	0.001	0.001	0.003	-1.000	-1.000	0.003	0.001	0.001
1%	0.003	0.001	0.001	0.003	-1.000	-1.000	0.003	0.001	0.001
Minimum 0%	0.003	0.001	0.001	0.003	-1.000	-1.000	0.003	0.001	0.001

Percentile	Total Organic Carbon mg/L | Ann Gulch	Total Organic Carbon mg/L | Bawn Boy Gulch	Total Organic Carbon mg/L | Dublin Gulch	Total Organic Carbon mg/L | Eagle Pup	Total Organic Carbon mg/L | Headwaters	Total Organic Carbon mg/L | Olive Gulch	Total Organic Carbon mg/L | Platinum Gulch	Total Organic Carbon mg/L | Stewart Gulch	Total Organic Carbon mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	10.90	7.28	7.05	21.30	8.18	2.81	36.10	-1.00	23.00
99%	10.90	7.28	7.05	21.30	8.18	2.81	36.10	-1.00	23.00
95%	8.78	7.28	5.74	11.90	8.18	2.81	8.64	-1.00	23.00
90%	4.60	7.28	4.73	5.54	8.18	2.81	4.57	-1.00	23.00
3rd Quartile 75%	2.31	4.46	3.21	3.79	8.18	2.17	2.82	-1.00	5.17
Median 50%	1.56	1.76	2.35	1.36	4.71	1.88	1.99	-1.00	2.51
1st Quartile 25%	1.06	0.89	1.72	0.80	8.18	1.62	1.53	-1.00	2.42
10%	0.74	0.85	1.43	0.53	8.18	1.62	1.07	-1.00	2.42
5%	0.68	0.85	1.12	0.25	8.18	1.62	1.01	-1.00	2.42
1%	0.63	0.85	1.12	0.25	8.18	1.62	1.01	-1.00	2.42
Minimum 0%	0.56	0.80	1.09	0.25	1.24	1.41	0.92	-1.00	2.32

Percentile	Dissolved Organic Carbon mg/L | Ann Gulch	Dissolved Organic Carbon mg/L | Bawn Boy Gulch	Dissolved Organic Carbon mg/L | Dublin Gulch	Dissolved Organic Carbon mg/L | Eagle Pup	Dissolved Organic Carbon mg/L | Headwaters	Dissolved Organic Carbon mg/L | Olive Gulch	Dissolved Organic Carbon mg/L | Platinum Gulch	Dissolved Organic Carbon mg/L | Stewart Gulch	Dissolved Organic Carbon mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	9.96	-1.00	2.40	1.77	-1.00	-1.00	1.28	-1.00	-1.00
99%	9.96	-1.00	2.40	1.77	-1.00	-1.00	1.28	-1.00	-1.00
95%	9.96	-1.00	2.40	1.77	-1.00	-1.00	1.28	-1.00	-1.00
90%	9.96	-1.00	2.40	1.77	-1.00	-1.00	1.28	-1.00	-1.00
3rd Quartile 75%	9.96	-1.00	2.40	1.77	-1.00	-1.00	1.28	-1.00	-1.00
Median 50%	9.96	-1.00	1.30	1.20	-1.00	-1.00	1.28	-1.00	-1.00
1st Quartile 25%	9.96	-1.00	1.30	1.77	-1.00	-1.00	1.28	-1.00	-1.00
10%	9.96	-1.00	1.30	1.77	-1.00	-1.00	1.28	-1.00	-1.00
5%	9.96	-1.00	1.30	1.77	-1.00	-1.00	1.28	-1.00	-1.00
1%	9.96	-1.00	1.30	1.77	-1.00	-1.00	1.28	-1.00	-1.00
Minimum 0%	9.96	-1.00	1.20	0.63	-1.00	-1.00	1.28	-1.00	-1.00

** TOTAL METALS **

Percentile	Aluminum (Al)Total mg/L | Ann Gulch	Aluminum (Al)Total mg/L | Bawn Boy Gulch	Aluminum (Al)Total mg/L | Dublin Gulch	Aluminum (Al)Total mg/L | Eagle Pup	Aluminum (Al)Total mg/L | Headwaters	Aluminum (Al)Total mg/L | Olive Gulch	Aluminum (Al)Total mg/L | Platinum Gulch	Aluminum (Al)Total mg/L | Stewart Gulch	Aluminum (Al)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	8.150	4.690	18.500	131.000	0.423	4.160	2.230	0.098	4.070
99%	8.150	4.690	18.500	131.000	0.423	4.160	2.230	0.098	4.070
95%	5.790	3.785	6.660	90.300	0.423	4.160	2.120	0.098	4.070
90%	3.550	1.890	3.780	1.790	0.423	4.160	2.110	0.098	1.420
3rd Quartile 75%	1.480	0.799	0.696	0.621	0.423	0.736	1.260	0.066	0.424
Median 50%	0.334	0.334	0.223	0.318	0.313	0.373	0.540	0.028	0.157
1st Quartile 25%	0.115	0.148	0.085	0.107	0.423	0.243	0.235	0.015	0.061
10%	0.039	0.093	0.031	0.081	0.423	0.243	0.057	0.022	0.042
5%	0.020	0.045	0.022	0.030	0.423	0.243	0.052	0.022	0.042
1%	0.017	0.082	0.009	0.030	0.423	0.243	0.052	0.022	0.042
Minimum 0%	0.012	0.009	0.008	0.017	0.203	0.067	0.029	0.007	0.028

Percentile	Antimony (Sb)Total mg/L | Ann Gulch	Antimony (Sb)Total mg/L | Bawn Boy Gulch	Antimony (Sb)Total mg/L | Dublin Gulch	Antimony (Sb)Total mg/L | Eagle Pup	Antimony (Sb)Total mg/L | Headwaters	Antimony (Sb)Total mg/L | Olive Gulch	Antimony (Sb)Total mg/L | Platinum Gulch	Antimony (Sb)Total mg/L | Stewart Gulch	Antimony (Sb)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.053	0.030	0.008	0.271	0.022	0.003	0.003	0.001	0.018
99%	0.053	0.030	0.008	0.271	0.022	0.003	0.003	0.001	0.018
95%	0.050	0.025	0.007	0.046	0.022	0.003	0.002	0.001	0.018
90%	0.042	0.013	0.006	0.007	0.022	0.003	0.002	0.001	0.005
3rd Quartile 75%	0.026	0.003	0.004	0.002	0.022	0.002	0.001	0.001	0.003
Median 50%	0.001	0.001	0.001	0.000	0.019	0.001	0.001	0.000	0.002
1st Quartile 25%	0.000	0.001	0.001	0.000	0.022	0.001	0.001	0.000	0.001
10%	0.000	0.001	0.000	0.000	0.022	0.001	0.001	0.000	0.000
5%	0.000	0.001	0.000	0.000	0.022	0.001	0.001	0.000	0.000
1%	0.000	0.001	0.000	0.000	0.022	0.001	0.001	0.000	0.000
Minimum 0%	0.000	0.001	0.000	0.000	0.016	0.000	0.000	0.000	0.000

Percentile	Arsenic (As)Total mg/L | Ann Gulch	Arsenic (As)Total mg/L | Bawn Boy Gulch	Arsenic (As)Total mg/L | Dublin Gulch	Arsenic (As)Total mg/L | Eagle Pup	Arsenic (As)Total mg/L | Headwaters	Arsenic (As)Total mg/L | Olive Gulch	Arsenic (As)Total mg/L | Platinum Gulch	Arsenic (As)Total mg/L | Stewart Gulch	Arsenic (As)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.888	0.589	3.890	19.300	0.993	0.114	8.910	1.910	2.310
99%	0.888	0.589	3.890	19.300	0.993	0.114	8.910	1.910	2.310
95%	0.771	0.436	3.380	5.570	0.993	0.114	8.780	1.910	2.310
90%	0.758	0.275	3.130	4.440	0.993	0.114	8.600	1.910	1.320
3rd Quartile 75%	0.210	0.189	1.150	0.482	0.993	0.027	8.320	1.545	0.989
Median 50%	0.053	0.077	0.053	0.213	0.806	0.014	7.740	1.160	0.244
1st Quartile 25%	0.019	0.066	0.008	0.145	0.993	0.002	0.502	1.140	0.041
10%	0.012	0.041	0.003	0.046	0.993	0.002	0.188	1.140	0.028
5%	0.011	0.012	0.002	0.011	0.993	0.002	0.165	1.140	0.028
1%	0.009	0.018	0.001	0.011	0.993	0.002	0.165	1.140	0.028
Minimum 0%	0.008	0.005	0.001	0.002	0.618	0.001	0.017	1.140	0.028

Percentile	Barium (Ba)Total mg/L | Ann Gulch	Barium (Ba)Total mg/L | Bawn Boy Gulch	Barium (Ba)Total mg/L | Dublin Gulch	Barium (Ba)Total mg/L | Eagle Pup	Barium (Ba)Total mg/L | Headwaters	Barium (Ba)Total mg/L | Olive Gulch	Barium (Ba)Total mg/L | Platinum Gulch	Barium (Ba)Total mg/L | Stewart Gulch	Barium (Ba)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.041	0.164	0.359	2.260	0.030	0.106	0.170	0.034	0.081
99%	0.041	0.164	0.359	2.260	0.030	0.106	0.170	0.034	0.081
95%	0.032	0.150	0.169	2.030	0.030	0.106	0.058	0.034	0.081
90%	0.021	0.098	0.139	0.126	0.030	0.106	0.054	0.034	0.065
3rd Quartile 75%	0.014	0.040	0.124	0.078	0.030	0.085	0.035	0.034	0.041
Median 50%	0.010	0.029	0.080	0.063	0.028	0.084	0.020	0.031	0.025
1st Quartile 25%	0.006	0.015	0.017	0.057	0.030	0.015	0.012	0.027	0.020
10%	0.005	0.005	0.009	0.042	0.030	0.015	0.010	0.028	0.016
5%	0.003	0.005	0.007	0.010	0.030	0.015	0.010	0.028	0.016
1%	0.003	0.005	0.007	0.010	0.030	0.015	0.010	0.028	0.016
Minimum 0%	0.002	0.005	0.003	0.003	0.025	0.009	0.010	0.026	0.015

Percentile	Beryllium (Be)Total mg/L | Ann Gulch	Beryllium (Be)Total mg/L | Bawn Boy Gulch	Beryllium (Be)Total mg/L | Dublin Gulch	Beryllium (Be)Total mg/L | Eagle Pup	Beryllium (Be)Total mg/L | Headwaters	Beryllium (Be)Total mg/L | Olive Gulch	Beryllium (Be)Total mg/L | Platinum Gulch	Beryllium (Be)Total mg/L | Stewart Gulch	Beryllium (Be)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0010	0.0025	0.0039	0.0280	0.0003	0.0003	0.0025	0.0025	0.0025
99%	0.0010	0.0025	0.0039	0.0280	0.0003	0.0003	0.0025	0.0025	0.0025
95%	0.0005	0.0025	0.0025	0.0208	0.0003	0.0003	0.0010	0.0025	0.0025
90%	0.0005	0.0025	0.0015	0.0018	0.0003	0.0003	0.0005	0.0025	0.0025
3rd Quartile 75%	0.0003	0.0025	0.0005	0.0004	0.0003	0.0003	0.0005	0.0025	0.0025
Median 50%	0.0003	0.0025	0.0003	0.0003	0.0003	0.0003	0.0003	0.0025	0.0025
1st Quartile 25%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0003	0.0001	0.0025	0.0003
10%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0003	0.0001	0.0025	0.0003
5%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0003	0.0001	0.0025	0.0003
1%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0003	0.0001	0.0025	0.0003
Minimum 0%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0001	0.0001	0.0025	0.0003

Percentile	Bismuth (Bi)Total mg/L | Ann Gulch	Bismuth (Bi)Total mg/L | Bawn Boy Gulch	Bismuth (Bi)Total mg/L | Dublin Gulch	Bismuth (Bi)Total mg/L | Eagle Pup	Bismuth (Bi)Total mg/L | Headwaters	Bismuth (Bi)Total mg/L | Olive Gulch	Bismuth (Bi)Total mg/L | Platinum Gulch	Bismuth (Bi)Total mg/L | Stewart Gulch	Bismuth (Bi)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0003	0.0500	0.0500	0.0066	0.0003	0.0007	0.0500	0.0500	0.0500
99%	0.0003	0.0500	0.0500	0.0066	0.0003	0.0007	0.0500	0.0500	0.0500
95%	0.0003	0.0500	0.0500	0.0057	0.0003	0.0007	0.0012	0.0500	0.0500
90%	0.0003	0.0500	0.0013	0.0030	0.0003	0.0007	0.0010	0.0500	0.0500
3rd Quartile 75%	0.0003	0.0500	0.0005	0.0003	0.0003	0.0003	0.0006	0.0500	0.0500
Median 50%	0.0003	0.0500	0.0003	0.0003	0.0003	0.0003	0.0005	0.0500	0.0500
1st Quartile 25%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0500	0.0003
10%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0500	0.0003
5%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0500	0.0003
1%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0500	0.0003
Minimum 0%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0500	0.0003

Percentile	Boron (B)Total mg/L | Ann Gulch	Boron (B)Total mg/L | Bawn Boy Gulch	Boron (B)Total mg/L | Dublin Gulch	Boron (B)Total mg/L | Eagle Pup	Boron (B)Total mg/L | Headwaters	Boron (B)Total mg/L | Olive Gulch	Boron (B)Total mg/L | Platinum Gulch	Boron (B)Total mg/L | Stewart Gulch	Boron (B)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.050	0.050	0.050	0.050	0.005	0.005	0.050	0.050	0.050
99%	0.050	0.050	0.050	0.050	0.005	0.005	0.050	0.050	0.050
95%	0.050	0.050	0.050	0.025	0.005	0.005	0.050	0.050	0.050
90%	0.005	0.050	0.050	0.011	0.005	0.005	0.050	0.050	0.050
3rd Quartile 75%	0.005	0.050	0.010	0.005	0.005	0.005	0.010	0.050	0.050
Median 50%	0.005	0.050	0.005	0.005	0.005	0.005	0.005	0.050	0.050
1st Quartile 25%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
10%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
5%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
1%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
Minimum 0%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005

Percentile	Cadmium (Cd)Total mg/L | Ann Gulch	Cadmium (Cd)Total mg/L | Bawn Boy Gulch	Cadmium (Cd)Total mg/L | Dublin Gulch	Cadmium (Cd)Total mg/L | Eagle Pup	Cadmium (Cd)Total mg/L | Headwaters	Cadmium (Cd)Total mg/L | Olive Gulch	Cadmium (Cd)Total mg/L | Platinum Gulch	Cadmium (Cd)Total mg/L | Stewart Gulch	Cadmium (Cd)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0017	0.0010	0.0025	0.0027	0.0001	0.0002	0.0011	0.0025	0.0191
99%	0.0017	0.0010	0.0025	0.0027	0.0001	0.0002	0.0011	0.0025	0.0191
95%	0.0015	0.0006	0.0006	0.0026	0.0001	0.0002	0.0003	0.0025	0.0191
90%	0.0014	0.0002	0.0002	0.0005	0.0001	0.0002	0.0003	0.0025	0.0010
3rd Quartile 75%	0.0011	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0018	0.0002
Median 50%	0.0001	0.0001	0.0000	0.0001	0.0001	0.0000	0.0001	0.0006	0.0001
1st Quartile 25%	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
10%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
5%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
1%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
Minimum 0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

Percentile	Calcium (Ca)Total mg/L | Ann Gulch	Calcium (Ca)Total mg/L | Bawn Boy Gulch	Calcium (Ca)Total mg/L | Dublin Gulch	Calcium (Ca)Total mg/L | Eagle Pup	Calcium (Ca)Total mg/L | Headwaters	Calcium (Ca)Total mg/L | Olive Gulch	Calcium (Ca)Total mg/L | Platinum Gulch	Calcium (Ca)Total mg/L | Stewart Gulch	Calcium (Ca)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	45.10	110.00	150.00	73.00	91.00	57.50	210.00	85.90	84.40
99%	45.10	110.00	150.00	73.00	91.00	57.50	210.00	85.90	84.40
95%	44.20	82.75	142.00	73.00	91.00	57.50	208.00	85.90	84.40
90%	43.60	40.65	137.00	58.70	91.00	57.50	168.00	85.90	81.80
3rd Quartile 75%	40.80	20.75	82.50	37.00	91.00	45.00	113.00	82.25	76.70
Median 50%	19.80	14.19	76.00	34.70	89.25	25.48	109.00	78.45	56.10
1st Quartile 25%	14.20	8.11	62.00	33.60	91.00	6.47	61.90	77.35	43.65
10%	11.00	7.13	43.50	18.20	91.00	6.47	46.40	78.30	40.20
5%	5.08	6.35	38.10	9.45	91.00	6.47	43.40	78.30	40.20
1%	4.50	6.71	22.50	9.45	91.00	6.47	43.40	78.30	40.20
Minimum 0%	2.46	5.98	22.10	8.77	87.50	4.91	30.20	76.40	5.07

Percentile	Chromium (Cr)Total mg/L | Ann Gulch	Chromium (Cr)Total mg/L | Bawn Boy Gulch	Chromium (Cr)Total mg/L | Dublin Gulch	Chromium (Cr)Total mg/L | Eagle Pup	Chromium (Cr)Total mg/L | Headwaters	Chromium (Cr)Total mg/L | Olive Gulch	Chromium (Cr)Total mg/L | Platinum Gulch	Chromium (Cr)Total mg/L | Stewart Gulch	Chromium (Cr)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0165	0.0050	0.0118	0.1720	0.0017	0.0081	0.0045	0.0005	0.0110
99%	0.0165	0.0050	0.0118	0.1720	0.0017	0.0081	0.0045	0.0005	0.0110
95%	0.0133	0.0050	0.0062	0.1330	0.0017	0.0081	0.0031	0.0005	0.0110
90%	0.0069	0.0036	0.0048	0.0050	0.0017	0.0081	0.0030	0.0005	0.0022
3rd Quartile 75%	0.0031	0.0016	0.0022	0.0030	0.0017	0.0013	0.0019	0.0005	0.0006
Median 50%	0.0017	0.0007	0.0011	0.0012	0.0013	0.0008	0.0010	0.0005	0.0005
1st Quartile 25%	0.0003	0.0005	0.0005	0.0004	0.0017	0.0003	0.0006	0.0005	0.0005
10%	0.0003	0.0004	0.0003	0.0003	0.0017	0.0003	0.0005	0.0005	0.0003
5%	0.0003	0.0003	0.0003	0.0003	0.0017	0.0003	0.0003	0.0005	0.0003
1%	0.0003	0.0003	0.0003	0.0003	0.0017	0.0003	0.0003	0.0005	0.0003
Minimum 0%	0.0002	0.0003	0.0003	0.0003	0.0009	0.0001	0.0003	0.0005	0.0003

Percentile	Cobalt (Co)Total mg/L | Ann Gulch	Cobalt (Co)Total mg/L | Bawn Boy Gulch	Cobalt (Co)Total mg/L | Dublin Gulch	Cobalt (Co)Total mg/L | Eagle Pup	Cobalt (Co)Total mg/L | Headwaters		Cobalt (Co)Total mg/L | Platinum Gulch	Cobalt (Co)Total mg/L | Stewart Gulch	Cobalt (Co)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0069	0.0030	0.0078	0.4120	0.0018	0.0014	0.0061	0.0005	0.0140
99%	0.0069	0.0030	0.0078	0.4120	0.0018	0.0014	0.0061	0.0005	0.0140
95%	0.0063	0.0030	0.0044	0.3220	0.0018	0.0014	0.0037	0.0005	0.0140
90%	0.0043	0.0029	0.0026	0.0024	0.0018	0.0014	0.0027	0.0005	0.0011
3rd Quartile 75%	0.0023	0.0006	0.0011	0.0011	0.0018	0.0011	0.0007	0.0005	0.0005
Median 50%	0.0015	0.0005	0.0004	0.0003	0.0016	0.0007	0.0004	0.0005	0.0005
1st Quartile 25%	0.0004	0.0005	0.0002	0.0001	0.0018	0.0003	0.0002	0.0005	0.0005
10%	0.0002	0.0002	0.0001	0.0001	0.0018	0.0003	0.0002	0.0005	0.0001
5%	0.0001	0.0001	0.0001	0.0001	0.0018	0.0003	0.0002	0.0005	0.0001
1%	0.0001	0.0001	0.0001	0.0001	0.0018	0.0003	0.0002	0.0005	0.0001
Minimum 0%	0.0001	0.0001	0.0001	0.0001	0.0015	0.0002	0.0001	0.0005	0.0001

Percentile	Copper (Cu)Total mg/L | Ann Gulch	Copper (Cu)Total mg/L | Bawn Boy Gulch	Copper (Cu)Total mg/L | Dublin Gulch	Copper (Cu)Total mg/L | Eagle Pup	Copper (Cu)Total mg/L | Headwaters	Copper (Cu)Total mg/L | Olive Gulch	Copper (Cu)Total mg/L | Platinum Gulch	Copper (Cu)Total mg/L | Stewart Gulch	Copper (Cu)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0709	0.0170	0.0283	0.5590	0.0026	0.0113	0.0148	0.0020	0.0950
99%	0.0709	0.0170	0.0283	0.5590	0.0026	0.0113	0.0148	0.0020	0.0950
95%	0.0290	0.0160	0.0188	0.4100	0.0026	0.0113	0.0127	0.0020	0.0950
90%	0.0228	0.0133	0.0094	0.0117	0.0026	0.0113	0.0117	0.0020	0.0090
3rd Quartile 75%	0.0101	0.0051	0.0050	0.0070	0.0026	0.0059	0.0075	0.0015	0.0024
Median 50%	0.0040	0.0021	0.0033	0.0025	0.0021	0.0035	0.0045	0.0008	0.0010
1st Quartile 25%	0.0016	0.0010	0.0018	0.0009	0.0026	0.0030	0.0030	0.0005	0.0005
10%	0.0006	0.0005	0.0007	0.0006	0.0026	0.0030	0.0020	0.0005	0.0002
5%	0.0006	0.0003	0.0005	0.0003	0.0026	0.0030	0.0015	0.0005	0.0002
1%	0.0003	0.0005	0.0003	0.0003	0.0026	0.0030	0.0015	0.0005	0.0002
Minimum 0%	0.0003	0.0001	0.0003	0.0003	0.0015	0.0009	0.0014	0.0005	0.0002

Percentile	Iron (Fe)Total mg/L | Ann Gulch	Iron (Fe)Total mg/L | Bawn Boy Gulch	Iron (Fe)Total mg/L | Dublin Gulch	Iron (Fe)Total mg/L | Eagle Pup	Iron (Fe)Total mg/L | Headwaters	Iron (Fe)Total mg/L | Olive Gulch	Iron (Fe)Total mg/L | Platinum Gulch	Iron (Fe)Total mg/L | Stewart Gulch	Iron (Fe)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	14.100	9.090	21.800	472.000	3.040	4.070	3.150	0.860	12.800
99%	14.100	9.090	21.800	472.000	3.040	4.070	3.150	0.860	12.800
95%	13.800	6.345	18.100	332.000	3.040	4.070	2.660	0.860	12.800
90%	12.600	2.645	12.300	23.200	3.040	4.070	2.660	0.860	2.800
3rd Quartile 75%	10.800	1.125	8.940	3.830	3.040	1.320	2.330	0.853	1.735
Median 50%	2.665	0.534	1.400	1.550	2.715	0.746	0.761	0.836	0.762
1st Quartile 25%	1.370	0.142	0.469	0.594	3.040	0.482	0.259	0.730	0.316
10%	0.767	0.059	0.242	0.271	3.040	0.482	0.099	0.827	0.175
5%	0.317	0.030	0.119	0.222	3.040	0.482	0.095	0.827	0.175
1%	0.241	0.045	0.015	0.222	3.040	0.482	0.095	0.827	0.175
Minimum 0%	0.221	0.015	0.015	0.173	2.390	0.350	0.056	0.632	0.076

Percentile	Lead (Pb)Total mg/L | Ann Gulch	Lead (Pb)Total mg/L | Bawn Boy Gulch	Lead (Pb)Total mg/L | Dublin Gulch	Lead (Pb)Total mg/L | Eagle Pup	Lead (Pb)Total mg/L | Headwaters	Lead (Pb)Total mg/L | Olive Gulch	Lead (Pb)Total mg/L | Platinum Gulch	Lead (Pb)Total mg/L | Stewart Gulch	Lead (Pb)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0064	0.0070	0.0457	0.3350	0.0052	0.0031	0.0047	0.0005	0.3500
99%	0.0064	0.0070	0.0457	0.3350	0.0052	0.0031	0.0047	0.0005	0.3500
95%	0.0041	0.0070	0.0150	0.2720	0.0052	0.0031	0.0046	0.0005	0.3500
90%	0.0036	0.0057	0.0062	0.0061	0.0052	0.0031	0.0030	0.0005	0.0160
3rd Quartile 75%	0.0023	0.0026	0.0024	0.0037	0.0052	0.0026	0.0015	0.0005	0.0030
Median 50%	0.0010	0.0012	0.0011	0.0013	0.0042	0.0012	0.0010	0.0005	0.0005
1st Quartile 25%	0.0004	0.0005	0.0005	0.0004	0.0052	0.0003	0.0006	0.0005	0.0005
10%	0.0002	0.0005	0.0003	0.0002	0.0052	0.0003	0.0005	0.0005	0.0003
5%	0.0001	0.0003	0.0001	0.0002	0.0052	0.0003	0.0002	0.0005	0.0003
1%	0.0001	0.0005	0.0000	0.0002	0.0052	0.0003	0.0002	0.0005	0.0003
Minimum 0%	0.0000	0.0000	0.0000	0.0000	0.0032	0.0001	0.0002	0.0005	0.0001

Percentile	Lithium (Li)Total mg/L | Ann Gulch	Lithium (Li)Total mg/L | Bawn Boy Gulch	Lithium (Li)Total mg/L | Dublin Gulch	Lithium (Li)Total mg/L | Eagle Pup	Lithium (Li)Total mg/L | Headwaters	Lithium (Li)Total mg/L | Olive Gulch	Lithium (Li)Total mg/L | Platinum Gulch	Lithium (Li)Total mg/L | Stewart Gulch	Lithium (Li)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0812	0.0087	0.2260	0.1110	0.0025	0.0109	0.0200	-1.0000	0.0578
99%	0.0812	0.0087	0.2260	0.1110	0.0025	0.0109	0.0200	-1.0000	0.0578
95%	0.0757	0.0087	0.2130	0.1060	0.0025	0.0109	0.0182	-1.0000	0.0578
90%	0.0712	0.0087	0.2100	0.0302	0.0025	0.0109	0.0159	-1.0000	0.0578
3rd Quartile 75%	0.0638	0.0066	0.1110	0.0210	0.0025	0.0080	0.0144	-1.0000	0.0570
Median 50%	0.0422	0.0025	0.0205	0.0196	0.0025	0.0077	0.0130	-1.0000	0.0545
1st Quartile 25%	0.0342	0.0025	0.0117	0.0177	0.0025	0.0056	0.0115	-1.0000	0.0517
10%	0.0312	0.0025	0.0106	0.0061	0.0025	0.0056	0.0110	-1.0000	0.0517
5%	0.0181	0.0025	0.0094	0.0025	0.0025	0.0056	0.0110	-1.0000	0.0517
1%	0.0148	0.0025	0.0092	0.0025	0.0025	0.0056	0.0110	-1.0000	0.0517
Minimum 0%	0.0012	0.0025	0.0085	0.0025	0.0025	0.0025	0.0099	-1.0000	0.0025

Percentile	Magnesium (Mg)Total mg/L | Ann Gulch	Magnesium (Mg)Total mg/L | Bawn Boy Gulch	Magnesium (Mg)Total mg/L | Dublin Gulch	Magnesium (Mg)Total mg/L | Eagle Pup	Magnesium (Mg)Total mg/L | Headwaters	Magnesium (Mg)Total mg/L | Olive Gulch	Magnesium (Mg)Total mg/L | Platinum Gulch	Magnesium (Mg)Total mg/L | Stewart Gulch	Magnesium (Mg)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	15.30	5.73	73.80	109.00	20.90	22.90	34.50	73.60	59.70
99%	15.30	5.73	73.80	109.00	20.90	22.90	34.50	73.60	59.70
95%	14.00	5.71	60.20	96.60	20.90	22.90	33.60	73.60	59.70
90%	13.50	5.11	44.50	62.00	20.90	22.90	26.60	73.60	55.80
3rd Quartile 75%	12.00	3.23	37.10	44.40	20.90	17.20	11.10	68.65	51.80
Median 50%	9.89	1.94	32.00	43.00	20.45	8.27	10.60	63.10	18.55
1st Quartile 25%	8.79	1.18	28.20	40.90	20.90	1.13	10.20	62.35	4.45
10%	6.31	1.07	26.50	26.50	20.90	1.13	6.75	62.50	4.21
5%	3.01	0.97	23.90	9.14	20.90	1.13	5.79	62.50	4.21
1%	2.41	1.06	7.97	9.14	20.90	1.13	5.79	62.50	4.21
Minimum 0%	0.56	0.88	7.53	8.77	20.00	0.83	4.95	62.20	1.83

Percentile	Manganese (Mn)Total mg/L | Ann Gulch	Manganese (Mn)Total mg/L | Bawn Boy Gulch	Manganese (Mn)Total mg/L | Dublin Gulch	Manganese (Mn)Total mg/L | Eagle Pup	Manganese (Mn)Total mg/L | Headwaters	Manganese (Mn)Total mg/L | Olive Gulch	Manganese (Mn)Total mg/L | Platinum Gulch	Manganese (Mn)Total mg/L | Stewart Gulch	Manganese (Mn)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.457	0.377	1.130	24.600	0.370	0.107	1.050	0.860	0.522
99%	0.457	0.377	1.130	24.600	0.370	0.107	1.050	0.860	0.522
95%	0.452	0.351	0.912	19.000	0.370	0.107	0.705	0.860	0.522
90%	0.428	0.303	0.873	0.830	0.370	0.107	0.508	0.860	0.460
3rd Quartile 75%	0.369	0.107	0.381	0.214	0.370	0.093	0.187	0.465	0.161
Median 50%	0.116	0.030	0.046	0.100	0.356	0.056	0.176	0.069	0.073
1st Quartile 25%	0.064	0.007	0.021	0.082	0.370	0.050	0.095	0.068	0.060
10%	0.021	0.003	0.008	0.072	0.370	0.050	0.009	0.069	0.031
5%	0.013	0.001	0.007	0.027	0.370	0.050	0.008	0.069	0.031
1%	0.010	0.003	0.006	0.027	0.370	0.050	0.008	0.069	0.031
Minimum 0%	0.004	0.000	0.002	0.012	0.341	0.018	0.005	0.067	0.026

Percentile	Mercury (Hg)Total mg/L | Ann Gulch	Mercury (Hg)Total mg/L | Bawn Boy Gulch	Mercury (Hg)Total mg/L | Dublin Gulch	Mercury (Hg)Total mg/L | Eagle Pup	Mercury (Hg)Total mg/L | Headwaters	Mercury (Hg)Total mg/L | Olive Gulch	Mercury (Hg)Total mg/L | Platinum Gulch	Mercury (Hg)Total mg/L | Stewart Gulch	Mercury (Hg)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.00003	0.00045	0.00004	0.00044	0.00003	0.00003	0.00003	0.00005	0.00003
99%	0.00003	0.00045	0.00004	0.00044	0.00003	0.00003	0.00003	0.00005	0.00003
95%	0.00001	0.00045	0.00003	0.00004	0.00003	0.00003	0.00003	0.00005	0.00003
90%	0.00001	0.00032	0.00003	0.00003	0.00003	0.00003	0.00003	0.00005	0.00002
3rd Quartile 75%	0.00001	0.00003	0.00001	0.00002	0.00003	0.00003	0.00001	0.00004	0.00001
Median 50%	0.00001	0.00003	0.00001	0.00001	0.00003	0.00003	0.00001	0.00001	0.00001
1st Quartile 25%	0.00001	0.00001	0.00001	0.00001	0.00003	0.00001	0.00001	0.00001	0.00001
10%	0.00001	0.00001	0.00001	0.00001	0.00003	0.00001	0.00001	0.00001	0.00001
5%	0.00001	0.00001	0.00001	0.00001	0.00003	0.00001	0.00001	0.00001	0.00001
1%	0.00001	0.00001	0.00001	0.00001	0.00003	0.00001	0.00001	0.00001	0.00001
Minimum 0%	0.00001	0.00001	0.00001	0.00001	0.00003	0.00000	0.00001	0.00001	0.00001

Percentile	Molybdenum (Mo)Total mg/L | Ann Gulch	Molybdenum (Mo)Total mg/L | Bawn Boy Gulch	Molybdenum (Mo)Total mg/L | Dublin Gulch	Molybdenum (Mo)Total mg/L | Eagle Pup	Molybdenum (Mo)Total mg/L | Headwaters	Molybdenum (Mo)Total mg/L | Olive Gulch	Molybdenum (Mo)Total mg/L | Platinum Gulch	Molybdenum (Mo)Total mg/L | Stewart Gulch	Molybdenum (Mo)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0016	0.0400	0.0121	0.0092	0.0048	0.0024	0.0389	0.0080	0.0160
99%	0.0016	0.0400	0.0121	0.0092	0.0048	0.0024	0.0389	0.0080	0.0160
95%	0.0011	0.0249	0.0020	0.0063	0.0048	0.0024	0.0315	0.0080	0.0160
90%	0.0011	0.0089	0.0016	0.0061	0.0048	0.0024	0.0291	0.0080	0.0150
3rd Quartile 75%	0.0006	0.0075	0.0013	0.0058	0.0048	0.0023	0.0077	0.0065	0.0115
Median 50%	0.0003	0.0020	0.0011	0.0053	0.0046	0.0015	0.0053	0.0050	0.0007
1st Quartile 25%	0.0001	0.0007	0.0005	0.0010	0.0048	0.0009	0.0051	0.0050	0.0005
10%	0.0000	0.0005	0.0002	0.0007	0.0048	0.0009	0.0048	0.0050	0.0002
5%	0.0000	0.0005	0.0001	0.0005	0.0048	0.0009	0.0047	0.0050	0.0002
1%	0.0000	0.0005	0.0001	0.0005	0.0048	0.0009	0.0047	0.0050	0.0002
Minimum 0%	0.0000	0.0005	0.0001	0.0004	0.0045	0.0009	0.0030	0.0050	0.0001

Percentile	Nickel (Ni)Total mg/L | Ann Gulch	Nickel (Ni)Total mg/L | Bawn Boy Gulch	Nickel (Ni)Total mg/L | Dublin Gulch	Nickel (Ni)Total mg/L | Eagle Pup	Nickel (Ni)Total mg/L | Headwaters	Nickel (Ni)Total mg/L | Olive Gulch	Nickel (Ni)Total mg/L | Platinum Gulch	Nickel (Ni)Total mg/L | Stewart Gulch	Nickel (Ni)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.017	0.025	0.018	0.701	0.009	0.005	0.013	0.001	0.024
99%	0.017	0.025	0.018	0.701	0.009	0.005	0.013	0.001	0.024
95%	0.016	0.017	0.014	0.688	0.009	0.005	0.007	0.001	0.024
90%	0.012	0.009	0.010	0.007	0.009	0.005	0.007	0.001	0.007
3rd Quartile 75%	0.009	0.005	0.004	0.004	0.009	0.004	0.002	0.001	0.002
Median 50%	0.006	0.001	0.003	0.001	0.009	0.004	0.001	0.001	0.001
1st Quartile 25%	0.002	0.001	0.001	0.000	0.009	0.002	0.001	0.001	0.001
10%	0.001	0.001	0.001	0.000	0.009	0.002	0.001	0.001	0.001
5%	0.000	0.000	0.001	0.000	0.009	0.002	0.001	0.001	0.001
1%	0.000	0.001	0.001	0.000	0.009	0.002	0.001	0.001	0.001
Minimum 0%	0.000	0.000	0.000	0.000	0.008	0.001	0.001	0.001	0.000

Percentile	Phosphorus (P)Total mg/L | Ann Gulch	Phosphorus (P)Total mg/L | Bawn Boy Gulch	Phosphorus (P)Total mg/L | Dublin Gulch	Phosphorus (P)Total mg/L | Eagle Pup	Phosphorus (P)Total mg/L | Headwaters	Phosphorus (P)Total mg/L | Olive Gulch	Phosphorus (P)Total mg/L | Platinum Gulch	Phosphorus (P)Total mg/L | Stewart Gulch	Phosphorus (P)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.150	0.590	0.750	2.810	0.150	0.150	0.150	0.150	0.150
99%	0.150	0.590	0.750	2.810	0.150	0.150	0.150	0.150	0.150
95%	0.150	0.370	0.650	2.780	0.150	0.150	0.150	0.150	0.150
90%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
3rd Quartile 75%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Median 50%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
1st Quartile 25%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
10%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
5%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
1%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Minimum 0%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150

Percentile	Potassium (K)Total mg/L | Ann Gulch	Potassium (K)Total mg/L | Bawn Boy Gulch	Potassium (K)Total mg/L | Dublin Gulch	Potassium (K)Total mg/L | Eagle Pup	Potassium (K)Total mg/L | Headwaters	Potassium (K)Total mg/L | Olive Gulch	Potassium (K)Total mg/L | Platinum Gulch	Potassium (K)Total mg/L | Stewart Gulch	Potassium (K)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	5.20	1.00	6.60	26.10	3.70	2.60	3.90	-1.00	5.30
99%	5.20	1.00	6.60	26.10	3.70	2.60	3.90	-1.00	5.30
95%	4.31	1.00	6.46	19.30	3.70	2.60	3.30	-1.00	5.30
90%	3.27	1.00	5.70	2.64	3.70	2.60	3.10	-1.00	5.30
3rd Quartile 75%	2.70	1.00	5.00	2.40	3.70	2.32	2.80	-1.00	5.10
Median 50%	2.39	1.00	2.93	2.28	3.60	2.05	2.61	-1.00	4.90
1st Quartile 25%	2.10	1.00	2.33	2.10	3.70	1.00	2.38	-1.00	4.50
10%	1.89	1.00	2.20	1.00	3.70	1.00	2.10	-1.00	4.50
5%	1.40	1.00	2.08	1.00	3.70	1.00	1.00	-1.00	4.50
1%	1.32	1.00	1.00	1.00	3.70	1.00	1.00	-1.00	4.50
Minimum 0%	1.00	1.00	1.00	1.00	3.50	1.00	1.00	-1.00	1.00

Percentile	Selenium (Se)Total mg/L | Ann Gulch	Selenium (Se)Total mg/L | Bawn Boy Gulch	Selenium (Se)Total mg/L | Dublin Gulch	Selenium (Se)Total mg/L | Eagle Pup	Selenium (Se)Total mg/L | Headwaters	Selenium (Se)Total mg/L | Olive Gulch	Selenium (Se)Total mg/L | Platinum Gulch	Selenium (Se)Total mg/L | Stewart Gulch	Selenium (Se)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0015	0.0008	0.0025	0.0038	0.0005	0.0005	0.0073	0.0031	0.0025
99%	0.0015	0.0008	0.0025	0.0038	0.0005	0.0005	0.0073	0.0031	0.0025
95%	0.0014	0.0007	0.0010	0.0017	0.0005	0.0005	0.0072	0.0031	0.0025
90%	0.0013	0.0006	0.0010	0.0008	0.0005	0.0005	0.0051	0.0031	0.0019
3rd Quartile 75%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0011	0.0017	0.0005
Median 50%	0.0005	0.0005	0.0004	0.0005	0.0005	0.0005	0.0010	0.0003	0.0004
1st Quartile 25%	0.0001	0.0003	0.0002	0.0001	0.0005	0.0001	0.0002	0.0003	0.0003
10%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0001	0.0001	0.0003	0.0003
5%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0001	0.0001	0.0003	0.0003
1%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0001	0.0001	0.0003	0.0003
Minimum 0%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0000	0.0001	0.0003	0.0003

Percentile	Silicon (Si)Total mg/L | Ann Gulch	Silicon (Si)Total mg/L | Bawn Boy Gulch	Silicon (Si)Total mg/L | Dublin Gulch	Silicon (Si)Total mg/L | Eagle Pup	Silicon (Si)Total mg/L | Headwaters	Silicon (Si)Total mg/L | Olive Gulch	Silicon (Si)Total mg/L | Platinum Gulch	Silicon (Si)Total mg/L | Stewart Gulch	Silicon (Si)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	21.60	18.70	49.00	232.00	4.34	14.50	11.10	-1.00	7.93
99%	21.60	18.70	49.00	232.00	4.34	14.50	11.10	-1.00	7.93
95%	16.80	18.70	15.40	144.00	4.34	14.50	10.80	-1.00	7.93
90%	15.40	18.70	12.40	9.78	4.34	14.50	10.80	-1.00	7.93
3rd Quartile 75%	10.50	12.02	7.39	7.71	4.34	9.43	9.85	-1.00	7.56
Median 50%	8.70	7.51	6.43	6.83	4.17	7.98	7.28	-1.00	7.53
1st Quartile 25%	7.68	6.65	5.59	6.29	4.34	7.75	5.56	-1.00	7.31
10%	6.90	6.56	5.25	5.82	4.34	7.75	5.14	-1.00	7.31
5%	6.72	6.56	5.15	5.77	4.34	7.75	4.83	-1.00	7.31
1%	6.72	6.56	5.02	5.77	4.34	7.75	4.83	-1.00	7.31
Minimum 0%	1.92	6.50	4.44	4.99	3.99	6.50	4.52	-1.00	0.95

Percentile	Silver (Ag)Total mg/L | Ann Gulch	Silver (Ag)Total mg/L | Bawn Boy Gulch	Silver (Ag)Total mg/L | Dublin Gulch	Silver (Ag)Total mg/L | Eagle Pup	Silver (Ag)Total mg/L | Headwaters	Silver (Ag)Total mg/L | Olive Gulch	Silver (Ag)Total mg/L | Platinum Gulch	Silver (Ag)Total mg/L | Stewart Gulch	Silver (Ag)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0080	0.0006	0.0014	0.0049	0.0001	0.0001	0.0018	1.0020	0.0007
99%	0.0080	0.0006	0.0014	0.0049	0.0001	0.0001	0.0018	1.0020	0.0007
95%	0.0038	0.0004	0.0009	0.0024	0.0001	0.0001	0.0012	1.0020	0.0007
90%	0.0023	0.0002	0.0007	0.0017	0.0001	0.0001	0.0009	1.0020	0.0003
3rd Quartile 75%	0.0009	0.0001	0.0002	0.0001	0.0001	0.0000	0.0006	0.5010	0.0001
Median 50%	0.0001	0.0001	0.0001	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001
1st Quartile 25%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
10%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
5%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
1%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000
Minimum 0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

Percentile	Sodium (Na)Total mg/L | Ann Gulch	Sodium (Na)Total mg/L | Bawn Boy Gulch	Sodium (Na)Total mg/L | Dublin Gulch	Sodium (Na)Total mg/L | Eagle Pup	Sodium (Na)Total mg/L | Headwaters	Sodium (Na)Total mg/L | Olive Gulch	Sodium (Na)Total mg/L | Platinum Gulch	Sodium (Na)Total mg/L | Stewart Gulch	Sodium (Na)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	3.80	6.90	22.00	3.41	4.80	4.80	18.80	-1.00	5.80
99%	3.80	6.90	22.00	3.41	4.80	4.80	18.80	-1.00	5.80
95%	3.60	6.90	20.30	3.27	4.80	4.80	14.40	-1.00	5.80
90%	3.50	6.90	8.20	3.05	4.80	4.80	13.50	-1.00	5.80
3rd Quartile 75%	3.30	2.60	6.20	2.58	4.80	3.90	11.40	-1.00	5.50
Median 50%	3.09	2.35	4.76	2.40	4.75	3.21	8.60	-1.00	5.50
1st Quartile 25%	2.80	2.15	4.02	2.22	4.80	2.60	8.12	-1.00	5.10
10%	2.60	2.00	3.35	1.00	4.80	2.60	7.73	-1.00	5.10
5%	1.14	2.00	3.07	1.00	4.80	2.60	7.70	-1.00	5.10
1%	0.97	2.00	1.00	1.00	4.80	2.60	7.70	-1.00	5.10
Minimum 0%	0.48	1.00	1.00	1.00	4.70	2.11	5.80	-1.00	1.00

Percentile	Strontium (Sr)Total mg/L | Ann Gulch	Strontium (Sr)Total mg/L | Bawn Boy Gulch	Strontium (Sr)Total mg/L | Dublin Gulch	Strontium (Sr)Total mg/L | Eagle Pup	Strontium (Sr)Total mg/L | Headwaters	Strontium (Sr)Total mg/L | Olive Gulch	Strontium (Sr)Total mg/L | Platinum Gulch	Strontium (Sr)Total mg/L | Stewart Gulch	Strontium (Sr)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.195	0.372	1.080	0.940	0.619	0.280	1.220	0.612	1.770
99%	0.195	0.372	1.080	0.940	0.619	0.280	1.220	0.612	1.770
95%	0.194	0.349	0.966	0.788	0.619	0.280	1.060	0.612	1.770
90%	0.170	0.283	0.670	0.586	0.619	0.280	0.930	0.612	1.690
3rd Quartile 75%	0.160	0.153	0.594	0.343	0.619	0.200	0.555	0.587	1.265
Median 50%	0.118	0.097	0.418	0.334	0.610	0.109	0.531	0.555	0.603
1st Quartile 25%	0.070	0.041	0.326	0.321	0.619	0.032	0.502	0.547	0.537
10%	0.060	0.034	0.302	0.204	0.619	0.032	0.219	0.548	0.336
5%	0.020	0.033	0.277	0.066	0.619	0.032	0.210	0.548	0.336
1%	0.020	0.034	0.274	0.066	0.619	0.032	0.210	0.548	0.336
Minimum 0%	0.013	0.032	0.115	0.063	0.600	0.030	0.208	0.545	0.029

Percentile	Thallium (Tl)Total mg/L | Ann Gulch	Thallium (Tl)Total mg/L | Bawn Boy Gulch	Thallium (Tl)Total mg/L | Dublin Gulch	Thallium (Tl)Total mg/L | Eagle Pup	Thallium (Tl)Total mg/L | Headwaters	Thallium (Tl)Total mg/L | Olive Gulch	Thallium (Tl)Total mg/L | Platinum Gulch	Thallium (Tl)Total mg/L | Stewart Gulch	Thallium (Tl)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.000	0.037	0.005	0.003	0.000	0.000	0.000	0.005	0.005
99%	0.000	0.037	0.005	0.003	0.000	0.000	0.000	0.005	0.005
95%	0.000	0.037	0.000	0.003	0.000	0.000	0.000	0.005	0.005
90%	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.005	0.005
3rd Quartile 75%	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.005	0.005
Median 50%	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.005	0.005
1st Quartile 25%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
10%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
5%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
1%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000
Minimum 0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000

Percentile	Tin (Sn)Total mg/L | Ann Gulch	Tin (Sn)Total mg/L | Bawn Boy Gulch	Tin (Sn)Total mg/L | Dublin Gulch	Tin (Sn)Total mg/L | Eagle Pup	Tin (Sn)Total mg/L | Headwaters	Tin (Sn)Total mg/L | Olive Gulch	Tin (Sn)Total mg/L | Platinum Gulch	Tin (Sn)Total mg/L | Stewart Gulch	Tin (Sn)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0017	0.0048	0.0051	0.0124	0.0045	0.0009	0.0059	-1.0000	0.0002
99%	0.0017	0.0048	0.0051	0.0124	0.0045	0.0009	0.0059	-1.0000	0.0002
95%	0.0013	0.0048	0.0022	0.0044	0.0045	0.0009	0.0052	-1.0000	0.0002
90%	0.0010	0.0048	0.0017	0.0022	0.0045	0.0009	0.0045	-1.0000	0.0002
3rd Quartile 75%	0.0006	0.0015	0.0012	0.0020	0.0045	0.0006	0.0013	-1.0000	0.0002
Median 50%	0.0003	0.0007	0.0006	0.0006	0.0030	0.0004	0.0007	-1.0000	0.0001
1st Quartile 25%	0.0002	0.0004	0.0003	0.0002	0.0045	0.0003	0.0003	-1.0000	0.0001
10%	0.0001	0.0003	0.0001	0.0001	0.0045	0.0003	0.0002	-1.0000	0.0001
5%	0.0001	0.0003	0.0001	0.0001	0.0045	0.0003	0.0002	-1.0000	0.0001
1%	0.0001	0.0003	0.0001	0.0001	0.0045	0.0003	0.0002	-1.0000	0.0001
Minimum 0%	0.0001	0.0001	0.0001	0.0001	0.0015	0.0001	0.0001	-1.0000	0.0001

Percentile	Titanium (Ti)Total mg/L | Ann Gulch	Titanium (Ti)Total mg/L | Bawn Boy Gulch	Titanium (Ti)Total mg/L | Dublin Gulch	Titanium (Ti)Total mg/L | Eagle Pup	Titanium (Ti)Total mg/L | Headwaters	Titanium (Ti)Total mg/L | Olive Gulch	Titanium (Ti)Total mg/L | Platinum Gulch	Titanium (Ti)Total mg/L | Stewart Gulch	Titanium (Ti)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.291	0.053	0.247	0.381	0.031	0.348	0.139	0.005	0.034
99%	0.291	0.053	0.247	0.381	0.031	0.348	0.139	0.005	0.034
95%	0.234	0.053	0.138	0.365	0.031	0.348	0.133	0.005	0.034
90%	0.164	0.048	0.106	0.063	0.031	0.348	0.100	0.005	0.030
3rd Quartile 75%	0.071	0.037	0.036	0.040	0.031	0.030	0.063	0.005	0.020
Median 50%	0.021	0.021	0.018	0.016	0.025	0.023	0.024	0.005	0.014
1st Quartile 25%	0.005	0.012	0.008	0.005	0.031	0.012	0.011	0.005	0.005
10%	0.005	0.012	0.005	0.005	0.031	0.012	0.005	0.005	0.005
5%	0.005	0.012	0.005	0.005	0.031	0.012	0.005	0.005	0.005
1%	0.005	0.012	0.005	0.005	0.031	0.012	0.005	0.005	0.005
Minimum 0%	0.005	0.005	0.005	0.005	0.018	0.005	0.005	0.005	0.005

Percentile	Uranium (U)Total mg/L | Ann Gulch	Uranium (U)Total mg/L | Bawn Boy Gulch	Uranium (U)Total mg/L | Dublin Gulch	Uranium (U)Total mg/L | Eagle Pup	Uranium (U)Total mg/L | Headwaters	Uranium (U)Total mg/L | Olive Gulch	Uranium (U)Total mg/L | Platinum Gulch	Uranium (U)Total mg/L | Stewart Gulch	Uranium (U)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.002	0.013	0.017	0.039	0.007	0.002	0.043	0.010	0.025
99%	0.002	0.013	0.017	0.039	0.007	0.002	0.043	0.010	0.025
95%	0.001	0.013	0.009	0.030	0.007	0.002	0.040	0.010	0.025
90%	0.001	0.012	0.009	0.010	0.007	0.002	0.035	0.010	0.023
3rd Quartile 75%	0.000	0.007	0.009	0.009	0.007	0.001	0.033	0.009	0.018
Median 50%	0.000	0.001	0.006	0.008	0.007	0.001	0.031	0.007	0.006
1st Quartile 25%	0.000	0.000	0.003	0.007	0.007	0.000	0.013	0.007	0.003
10%	0.000	0.000	0.001	0.001	0.007	0.000	0.005	0.007	0.002
5%	0.000	0.000	0.000	0.000	0.007	0.000	0.005	0.007	0.002
1%	0.000	0.000	0.000	0.000	0.007	0.000	0.005	0.007	0.002
Minimum 0%	0.000	0.000	0.000	0.000	0.007	0.000	0.002	0.007	0.000

Percentile	Vanadium (V)Total mg/L | Ann Gulch	Vanadium (V)Total mg/L | Bawn Boy Gulch	Vanadium (V)Total mg/L | Dublin Gulch	Vanadium (V)Total mg/L | Eagle Pup	Vanadium (V)Total mg/L | Headwaters	Vanadium (V)Total mg/L | Olive Gulch	Vanadium (V)Total mg/L | Platinum Gulch	Vanadium (V)Total mg/L | Stewart Gulch	Vanadium (V)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.011	0.015	0.015	0.117	0.001	0.006	0.015	0.015	0.015
99%	0.011	0.015	0.015	0.117	0.001	0.006	0.015	0.015	0.015
95%	0.010	0.015	0.015	0.088	0.001	0.006	0.003	0.015	0.015
90%	0.006	0.015	0.008	0.003	0.001	0.006	0.002	0.015	0.015
3rd Quartile 75%	0.003	0.015	0.002	0.002	0.001	0.001	0.002	0.015	0.015
Median 50%	0.001	0.015	0.001	0.001	0.001	0.001	0.001	0.015	0.015
1st Quartile 25%	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.015	0.001
10%	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.015	0.001
5%	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.015	0.001
1%	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.015	0.001
Minimum 0%	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.015	0.001

Percentile	Zinc (Zn)Total mg/L | Ann Gulch	Zinc (Zn)Total mg/L | Bawn Boy Gulch	Zinc (Zn)Total mg/L | Dublin Gulch	Zinc (Zn)Total mg/L | Eagle Pup	Zinc (Zn)Total mg/L | Headwaters	Zinc (Zn)Total mg/L | Olive Gulch	Zinc (Zn)Total mg/L | Platinum Gulch	Zinc (Zn)Total mg/L | Stewart Gulch	Zinc (Zn)Total mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.114	0.069	0.133	1.260	0.021	0.028	0.078	0.003	0.735
99%	0.114	0.069	0.133	1.260	0.021	0.028	0.078	0.003	0.735
95%	0.107	0.068	0.058	1.010	0.021	0.028	0.064	0.003	0.735
90%	0.105	0.049	0.047	0.126	0.021	0.028	0.039	0.003	0.038
3rd Quartile 75%	0.085	0.019	0.034	0.027	0.021	0.027	0.034	0.003	0.011
Median 50%	0.021	0.009	0.017	0.012	0.015	0.017	0.012	0.003	0.003
1st Quartile 25%	0.009	0.003	0.008	0.006	0.021	0.009	0.009	0.003	0.003
10%	0.005	0.003	0.003	0.004	0.021	0.009	0.005	0.003	0.003
5%	0.004	0.002	0.003	0.003	0.021	0.009	0.005	0.003	0.003
1%	0.004	0.003	0.002	0.003	0.021	0.009	0.005	0.003	0.003
Minimum 0%	0.002	0.002	0.002	0.002	0.009	0.004	0.005	0.003	0.003

** DISSOLVED METALS **

Percentile	Aluminum (Al)Dissolved mg/L | Ann Gulch	Aluminum (Al)Dissolved mg/L | Bawn Boy Gulch	Aluminum (Al)Dissolved mg/L | Dublin Gulch	Aluminum (Al)Dissolved mg/L | Eagle Pup	Aluminum (Al)Dissolved mg/L | Headwaters	Aluminum (Al)Dissolved mg/L | Olive Gulch	Aluminum (Al)Dissolved mg/L | Platinum Gulch	Aluminum (Al)Dissolved mg/L | Stewart Gulch	Aluminum (Al)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	1.020	0.200	0.143	1.350	0.003	0.025	0.018	0.006	0.627
99%	1.020	0.200	0.143	1.350	0.003	0.025	0.018	0.006	0.627
95%	0.121	0.193	0.016	0.592	0.003	0.025	0.012	0.006	0.627
90%	0.056	0.118	0.008	0.012	0.003	0.025	0.009	0.006	0.383
3rd Quartile 75%	0.030	0.014	0.005	0.004	0.003	0.013	0.004	0.006	0.011
Median 50%	0.004	0.009	0.002	0.002	0.002	0.006	0.003	0.004	0.006
1st Quartile 25%	0.002	0.004	0.002	0.001	0.003	0.003	0.002	0.003	0.003
10%	0.002	0.001	0.001	0.001	0.003	0.003	0.002	0.003	0.001
5%	0.001	0.001	0.001	0.001	0.003	0.003	0.002	0.003	0.001
1%	0.001	0.001	0.001	0.001	0.003	0.003	0.002	0.003	0.001
Minimum 0%	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.003	0.001

Percentile	Antimony (Sb)Dissolved mg/L | Ann Gulch	Antimony (Sb)Dissolved mg/L | Bawn Boy Gulch	Antimony (Sb)Dissolved mg/L | Dublin Gulch	Antimony (Sb)Dissolved mg/L | Eagle Pup	Antimony (Sb)Dissolved mg/L | Headwaters	Antimony (Sb)Dissolved mg/L | Olive Gulch	Antimony (Sb)Dissolved mg/L | Platinum Gulch	Antimony (Sb)Dissolved mg/L | Stewart Gulch	Antimony (Sb)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.050	0.031	0.007	0.003	0.019	0.002	0.002	0.002	0.010
99%	0.050	0.031	0.007	0.003	0.019	0.002	0.002	0.002	0.010
95%	0.044	0.022	0.006	0.002	0.019	0.002	0.001	0.002	0.010
90%	0.042	0.008	0.006	0.001	0.019	0.002	0.001	0.002	0.005
3rd Quartile 75%	0.022	0.001	0.004	0.000	0.019	0.001	0.001	0.001	0.004
Median 50%	0.000	0.001	0.001	0.000	0.017	0.000	0.000	0.000	0.003
1st Quartile 25%	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.001
10%	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000
5%	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000
1%	0.000	0.000	0.000	0.000	0.019	0.000	0.000	0.000	0.000
Minimum 0%	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.000	0.000

Percentile	Arsenic (As)Dissolved mg/L | Ann Gulch	Arsenic (As)Dissolved mg/L | Bawn Boy Gulch	Arsenic (As)Dissolved mg/L | Dublin Gulch	Arsenic (As)Dissolved mg/L | Eagle Pup	Arsenic (As)Dissolved mg/L | Headwaters	Arsenic (As)Dissolved mg/L | Olive Gulch	Arsenic (As)Dissolved mg/L | Platinum Gulch	Arsenic (As)Dissolved mg/L | Stewart Gulch	Arsenic (As)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.807	0.605	3.750	0.306	0.083	0.084	9.620	1.990	1.330
99%	0.807	0.605	3.750	0.306	0.083	0.084	9.620	1.990	1.330
95%	0.754	0.391	3.360	0.183	0.083	0.084	8.840	1.990	1.330
90%	0.738	0.174	3.020	0.170	0.083	0.084	8.770	1.990	1.120
3rd Quartile 75%	0.046	0.134	1.105	0.161	0.083	0.017	8.330	1.570	0.921
Median 50%	0.033	0.069	0.042	0.132	0.059	0.006	7.730	1.145	0.213
1st Quartile 25%	0.008	0.062	0.001	0.099	0.083	0.000	0.394	1.140	0.033
10%	0.006	0.027	0.001	0.001	0.083	0.000	0.184	1.140	0.027
5%	0.004	0.004	0.001	0.001	0.083	0.000	0.179	1.140	0.027
1%	0.002	0.006	0.000	0.001	0.083	0.000	0.179	1.140	0.027
Minimum 0%	0.001	0.002	0.000	0.001	0.034	0.000	0.005	1.140	0.025

Percentile	Barium (Ba)Dissolved mg/L | Ann Gulch	Barium (Ba)Dissolved mg/L | Bawn Boy Gulch	Barium (Ba)Dissolved mg/L | Dublin Gulch	Barium (Ba)Dissolved mg/L | Eagle Pup	Barium (Ba)Dissolved mg/L | Headwaters	Barium (Ba)Dissolved mg/L | Olive Gulch	Barium (Ba)Dissolved mg/L | Platinum Gulch	Barium (Ba)Dissolved mg/L | Stewart Gulch	Barium (Ba)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.012	0.037	0.133	0.064	0.021	0.102	0.125	0.034	0.064
99%	0.012	0.037	0.133	0.064	0.021	0.102	0.125	0.034	0.064
95%	0.010	0.033	0.124	0.062	0.021	0.102	0.026	0.034	0.064
90%	0.007	0.030	0.121	0.061	0.021	0.102	0.022	0.034	0.058
3rd Quartile 75%	0.006	0.026	0.114	0.058	0.021	0.073	0.014	0.032	0.027
Median 50%	0.005	0.019	0.068	0.056	0.020	0.035	0.010	0.029	0.019
1st Quartile 25%	0.003	0.005	0.016	0.049	0.021	0.006	0.009	0.027	0.015
10%	0.002	0.005	0.006	0.010	0.021	0.006	0.008	0.028	0.011
5%	0.002	0.005	0.006	0.003	0.021	0.006	0.007	0.028	0.011
1%	0.002	0.005	0.005	0.003	0.021	0.006	0.007	0.028	0.011
Minimum 0%	0.001	0.005	0.002	0.002	0.019	0.006	0.007	0.026	0.005

Percentile	Beryllium (Be)Dissolved mg/L | Ann Gulch	Beryllium (Be)Dissolved mg/L | Bawn Boy Gulch	Beryllium (Be)Dissolved mg/L | Dublin Gulch	Beryllium (Be)Dissolved mg/L | Eagle Pup	Beryllium (Be)Dissolved mg/L | Headwaters	Beryllium (Be)Dissolved mg/L | Olive Gulch	Beryllium (Be)Dissolved mg/L | Platinum Gulch	Beryllium (Be)Dissolved mg/L | Stewart Gulch	Beryllium (Be)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0005	0.0025	0.0025	0.0005	0.0003	0.0003	0.0025	0.0025	0.0025
99%	0.0005	0.0025	0.0025	0.0005	0.0003	0.0003	0.0025	0.0025	0.0025
95%	0.0005	0.0025	0.0025	0.0003	0.0003	0.0003	0.0010	0.0025	0.0025
90%	0.0003	0.0025	0.0005	0.0003	0.0003	0.0003	0.0005	0.0025	0.0025
3rd Quartile 75%	0.0003	0.0025	0.0003	0.0003	0.0003	0.0003	0.0005	0.0025	0.0025
Median 50%	0.0001	0.0025	0.0003	0.0001	0.0003	0.0003	0.0003	0.0025	0.0025
1st Quartile 25%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0001	0.0001	0.0025	0.0003
10%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0001	0.0001	0.0025	0.0003
5%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0001	0.0001	0.0025	0.0003
1%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0001	0.0001	0.0025	0.0003
Minimum 0%	0.0001	0.0003	0.0001	0.0001	0.0003	0.0001	0.0001	0.0025	0.0003

Percentile	Bismuth (Bi)Dissolved mg/L | Ann Gulch	Bismuth (Bi)Dissolved mg/L | Bawn Boy Gulch	Bismuth (Bi)Dissolved mg/L | Dublin Gulch	Bismuth (Bi)Dissolved mg/L | Eagle Pup	Bismuth (Bi)Dissolved mg/L | Headwaters	Bismuth (Bi)Dissolved mg/L | Olive Gulch	Bismuth (Bi)Dissolved mg/L | Platinum Gulch	Bismuth (Bi)Dissolved mg/L | Stewart Gulch	Bismuth (Bi)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0003	0.0500	0.1000	0.0015	0.0003	0.0003	0.0500	0.1000	0.0500
99%	0.0003	0.0500	0.1000	0.0015	0.0003	0.0003	0.0500	0.1000	0.0500
95%	0.0003	0.0500	0.0500	0.0015	0.0003	0.0003	0.0005	0.1000	0.0500
90%	0.0003	0.0500	0.0006	0.0005	0.0003	0.0003	0.0005	0.1000	0.0500
3rd Quartile 75%	0.0003	0.0500	0.0003	0.0003	0.0003	0.0003	0.0005	0.0750	0.0500
Median 50%	0.0003	0.0500	0.0003	0.0003	0.0003	0.0003	0.0003	0.0500	0.0500
1st Quartile 25%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0500	0.0003
10%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0500	0.0003
5%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0500	0.0003
1%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0500	0.0003
Minimum 0%	0.0003	0.0003	0.0003	0.0003	0.0003	0.0000	0.0003	0.0500	0.0003

Percentile	Boron (B)Dissolved mg/L | Ann Gulch	Boron (B)Dissolved mg/L | Bawn Boy Gulch	Boron (B)Dissolved mg/L | Dublin Gulch	Boron (B)Dissolved mg/L | Eagle Pup	Boron (B)Dissolved mg/L | Headwaters	Boron (B)Dissolved mg/L | Olive Gulch	Boron (B)Dissolved mg/L | Platinum Gulch	Boron (B)Dissolved mg/L | Stewart Gulch	Boron (B)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.050	0.050	0.050	0.050	0.005	0.005	0.050	0.050	0.050
99%	0.050	0.050	0.050	0.050	0.005	0.005	0.050	0.050	0.050
95%	0.050	0.050	0.050	0.025	0.005	0.005	0.050	0.050	0.050
90%	0.005	0.050	0.050	0.010	0.005	0.005	0.050	0.050	0.050
3rd Quartile 75%	0.005	0.050	0.010	0.005	0.005	0.005	0.010	0.050	0.050
Median 50%	0.005	0.050	0.005	0.005	0.005	0.005	0.005	0.050	0.050
1st Quartile 25%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
10%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
5%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
1%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005
Minimum 0%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.050	0.005

Percentile	Cadmium (Cd)Dissolved mg/L | Ann Gulch	Cadmium (Cd)Dissolved mg/L | Bawn Boy Gulch	Cadmium (Cd)Dissolved mg/L | Dublin Gulch	Cadmium (Cd)Dissolved mg/L | Eagle Pup	Cadmium (Cd)Dissolved mg/L | Headwaters	Cadmium (Cd)Dissolved mg/L | Olive Gulch	Cadmium (Cd)Dissolved mg/L | Platinum Gulch	Cadmium (Cd)Dissolved mg/L | Stewart Gulch	Cadmium (Cd)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0018	0.0002	0.0025	0.0008	0.0000	0.0001	0.0008	0.0025	0.0010
99%	0.0018	0.0002	0.0025	0.0008	0.0000	0.0001	0.0008	0.0025	0.0010
95%	0.0015	0.0002	0.0002	0.0001	0.0000	0.0001	0.0001	0.0025	0.0010
90%	0.0014	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0025	0.0010
3rd Quartile 75%	0.0012	0.0001	0.0001	0.0000	0.0000	0.0001	0.0001	0.0013	0.0006
Median 50%	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
1st Quartile 25%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
10%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
1%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
Minimum 0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

Percentile	Calcium (Ca)Dissolved mg/L | Ann Gulch	Calcium (Ca)Dissolved mg/L | Bawn Boy Gulch	Calcium (Ca)Dissolved mg/L | Dublin Gulch	Calcium (Ca)Dissolved mg/L | Eagle Pup	Calcium (Ca)Dissolved mg/L | Headwaters	Calcium (Ca)Dissolved mg/L | Olive Gulch	Calcium (Ca)Dissolved mg/L | Platinum Gulch	Calcium (Ca)Dissolved mg/L | Stewart Gulch	Calcium (Ca)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	44.4	105.0	157.0	68.2	92.7	57.3	204.0	85.0	81.6
99%	44.4	105.0	157.0	68.2	92.7	57.3	204.0	85.0	81.6
95%	43.6	81.2	144.0	58.0	92.7	57.3	200.0	85.0	81.6
90%	42.8	41.8	142.0	47.0	92.7	57.3	178.0	85.0	78.8
3rd Quartile 75%	41.0	20.3	83.0	36.7	92.7	45.9	115.0	81.5	74.3
Median 50%	20.0	8.7	77.3	35.2	92.4	25.2	109.0	77.7	58.4
1st Quartile 25%	13.9	8.0	62.0	33.9	92.7	5.0	59.7	77.1	41.4
10%	13.1	6.7	42.4	18.5	92.7	5.0	46.6	77.4	34.0
5%	5.1	6.1	38.5	12.2	92.7	5.0	45.3	77.4	34.0
1%	4.5	6.1	23.3	12.2	92.7	5.0	45.3	77.4	34.0
Minimum 0%	2.8	6.0	22.1	9.8	92.1	5.0	27.9	76.7	5.3

Percentile	Chromium (Cr)Dissolved mg/L | Ann Gulch	Chromium (Cr)Dissolved mg/L | Bawn Boy Gulch	Chromium (Cr)Dissolved mg/L | Dublin Gulch	Chromium (Cr)Dissolved mg/L | Eagle Pup	Chromium (Cr)Dissolved mg/L | Headwaters	Chromium (Cr)Dissolved mg/L | Olive Gulch	Chromium (Cr)Dissolved mg/L | Platinum Gulch	Chromium (Cr)Dissolved mg/L | Stewart Gulch	Chromium (Cr)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.001	0.001	0.005	0.002	0.000	0.000	0.001	0.001	0.001
99%	0.001	0.001	0.005	0.002	0.000	0.000	0.001	0.001	0.001
95%	0.001	0.001	0.001	0.001	0.000	0.000	0.001	0.001	0.001
90%	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001
3rd Quartile 75%	0.000	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001
Median 50%	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.001
1st Quartile 25%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
10%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
5%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
1%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000
Minimum 0%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000

Percentile	Cobalt (Co)Dissolved mg/L | Ann Gulch	Cobalt (Co)Dissolved mg/L | Bawn Boy Gulch	Cobalt (Co)Dissolved mg/L | Dublin Gulch	Cobalt (Co)Dissolved mg/L | Eagle Pup	Cobalt (Co)Dissolved mg/L | Headwaters	Cobalt (Co)Dissolved mg/L | Olive Gulch	Cobalt (Co)Dissolved mg/L | Platinum Gulch	Cobalt (Co)Dissolved mg/L | Stewart Gulch	Cobalt (Co)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0026	0.0020	0.0034	0.0003	0.0013	0.0008	0.0039	0.0005	0.0013
99%	0.0026	0.0020	0.0034	0.0003	0.0013	0.0008	0.0039	0.0005	0.0013
95%	0.0025	0.0017	0.0009	0.0003	0.0013	0.0008	0.0030	0.0005	0.0013
90%	0.0022	0.0010	0.0005	0.0002	0.0013	0.0008	0.0012	0.0005	0.0005
3rd Quartile 75%	0.0018	0.0005	0.0002	0.0001	0.0013	0.0004	0.0003	0.0005	0.0005
Median 50%	0.0003	0.0005	0.0001	0.0001	0.0012	0.0003	0.0002	0.0005	0.0005
1st Quartile 25%	0.0001	0.0001	0.0001	0.0001	0.0013	0.0001	0.0001	0.0005	0.0004
10%	0.0001	0.0001	0.0001	0.0001	0.0013	0.0001	0.0001	0.0005	0.0001
5%	0.0001	0.0001	0.0001	0.0001	0.0013	0.0001	0.0001	0.0005	0.0001
1%	0.0001	0.0001	0.0001	0.0001	0.0013	0.0001	0.0001	0.0005	0.0001
Minimum 0%	0.0001	0.0001	0.0001	0.0001	0.0012	0.0001	0.0001	0.0005	0.0001

Percentile	Copper (Cu)Dissolved mg/L | Ann Gulch	Copper (Cu)Dissolved mg/L | Bawn Boy Gulch	Copper (Cu)Dissolved mg/L | Dublin Gulch	Copper (Cu)Dissolved mg/L | Eagle Pup	Copper (Cu)Dissolved mg/L | Headwaters	Copper (Cu)Dissolved mg/L | Olive Gulch	Copper (Cu)Dissolved mg/L | Platinum Gulch	Copper (Cu)Dissolved mg/L | Stewart Gulch	Copper (Cu)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0618	0.0040	0.0105	0.0038	0.0002	0.0037	0.0036	0.0005	0.0063
99%	0.0618	0.0040	0.0105	0.0038	0.0002	0.0037	0.0036	0.0005	0.0063
95%	0.0050	0.0030	0.0037	0.0026	0.0002	0.0037	0.0030	0.0005	0.0063
90%	0.0044	0.0016	0.0025	0.0014	0.0002	0.0037	0.0028	0.0005	0.0010
3rd Quartile 75%	0.0017	0.0010	0.0021	0.0008	0.0002	0.0034	0.0020	0.0005	0.0005
Median 50%	0.0006	0.0005	0.0008	0.0003	0.0001	0.0020	0.0005	0.0005	0.0005
1st Quartile 25%	0.0003	0.0005	0.0005	0.0003	0.0002	0.0013	0.0003	0.0005	0.0005
10%	0.0003	0.0003	0.0003	0.0002	0.0002	0.0013	0.0003	0.0005	0.0002
5%	0.0001	0.0002	0.0003	0.0001	0.0002	0.0013	0.0001	0.0005	0.0002
1%	0.0001	0.0002	0.0001	0.0001	0.0002	0.0013	0.0001	0.0005	0.0002
Minimum 0%	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003	0.0001	0.0005	0.0001

Percentile	Iron (Fe)Dissolved mg/L | Ann Gulch	Iron (Fe)Dissolved mg/L | Bawn Boy Gulch	Iron (Fe)Dissolved mg/L | Dublin Gulch	Iron (Fe)Dissolved mg/L | Eagle Pup	Iron (Fe)Dissolved mg/L | Headwaters	Iron (Fe)Dissolved mg/L | Olive Gulch	Iron (Fe)Dissolved mg/L | Platinum Gulch	Iron (Fe)Dissolved mg/L | Stewart Gulch	Iron (Fe)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	13.700	2.590	10.600	1.000	0.015	0.918	1.150	0.827	2.690
99%	13.700	2.590	10.600	1.000	0.015	0.918	1.150	0.827	2.690
95%	12.700	1.425	9.730	0.732	0.015	0.918	0.182	0.827	2.690
90%	11.600	0.159	8.670	0.645	0.015	0.918	0.099	0.827	1.520
3rd Quartile 75%	0.937	0.015	1.075	0.149	0.015	0.031	0.093	0.824	1.091
Median 50%	0.425	0.015	0.015	0.055	0.015	0.015	0.061	0.812	0.099
1st Quartile 25%	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.695	0.015
10%	0.015	0.015	0.005	0.015	0.015	0.015	0.015	0.804	0.015
5%	0.005	0.015	0.005	0.012	0.015	0.015	0.015	0.804	0.015
1%	0.005	0.015	0.005	0.012	0.015	0.015	0.015	0.804	0.015
Minimum 0%	0.005	0.015	0.005	0.005	0.015	0.005	0.005	0.585	0.015

Percentile	Lead (Pb)Dissolved mg/L | Ann Gulch	Lead (Pb)Dissolved mg/L | Bawn Boy Gulch	Lead (Pb)Dissolved mg/L | Dublin Gulch	Lead (Pb)Dissolved mg/L | Eagle Pup	Lead (Pb)Dissolved mg/L | Headwaters	Lead (Pb)Dissolved mg/L | Olive Gulch	Lead (Pb)Dissolved mg/L | Platinum Gulch	Lead (Pb)Dissolved mg/L | Stewart Gulch	Lead (Pb)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0007	0.0010	0.0019	0.0008	0.0001	0.0003	0.0005	0.0005	0.0020
99%	0.0007	0.0010	0.0019	0.0008	0.0001	0.0003	0.0005	0.0005	0.0020
95%	0.0003	0.0008	0.0005	0.0006	0.0001	0.0003	0.0005	0.0005	0.0020
90%	0.0002	0.0005	0.0005	0.0002	0.0001	0.0003	0.0003	0.0005	0.0005
3rd Quartile 75%	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0005	0.0005
Median 50%	0.0000	0.0005	0.0000	0.0000	0.0001	0.0000	0.0001	0.0005	0.0005
1st Quartile 25%	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0003
10%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0000
5%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0000
1%	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0005	0.0000
Minimum 0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	0.0000

Percentile	Lithium (Li)Dissolved mg/L | Ann Gulch	Lithium (Li)Dissolved mg/L | Bawn Boy Gulch	Lithium (Li)Dissolved mg/L | Dublin Gulch	Lithium (Li)Dissolved mg/L | Eagle Pup	Lithium (Li)Dissolved mg/L | Headwaters	Lithium (Li)Dissolved mg/L | Olive Gulch	Lithium (Li)Dissolved mg/L | Platinum Gulch	Lithium (Li)Dissolved mg/L | Stewart Gulch	Lithium (Li)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0781	0.0074	0.2230	0.0330	0.0025	0.0102	0.0180	-1.0000	0.0570
99%	0.0781	0.0074	0.2230	0.0330	0.0025	0.0102	0.0180	-1.0000	0.0570
95%	0.0710	0.0074	0.2130	0.0287	0.0025	0.0102	0.0179	-1.0000	0.0570
90%	0.0669	0.0074	0.2040	0.0208	0.0025	0.0102	0.0166	-1.0000	0.0570
3rd Quartile 75%	0.0542	0.0055	0.0967	0.0202	0.0025	0.0070	0.0123	-1.0000	0.0527
Median 50%	0.0365	0.0025	0.0197	0.0189	0.0025	0.0058	0.0113	-1.0000	0.0526
1st Quartile 25%	0.0327	0.0025	0.0109	0.0169	0.0025	0.0025	0.0108	-1.0000	0.0443
10%	0.0287	0.0025	0.0093	0.0025	0.0025	0.0025	0.0087	-1.0000	0.0443
5%	0.0168	0.0025	0.0088	0.0025	0.0025	0.0025	0.0050	-1.0000	0.0443
1%	0.0133	0.0025	0.0083	0.0025	0.0025	0.0025	0.0050	-1.0000	0.0443
Minimum 0%	0.0007	0.0025	0.0076	0.0025	0.0025	0.0019	0.0050	-1.0000	0.0025

Percentile	Magnesium (Mg)Dissolved mg/L | Ann Gulch	Magnesium (Mg)Dissolved mg/L | Bawn Boy Gulch	Magnesium (Mg)Dissolved mg/L | Dublin Gulch	Magnesium (Mg)Dissolved mg/L | Eagle Pup	Magnesium (Mg)Dissolved mg/L | Headwaters	Magnesium (Mg)Dissolved mg/L | Olive Gulch	Magnesium (Mg)Dissolved mg/L | Platinum Gulch	Magnesium (Mg)Dissolved mg/L | Stewart Gulch	Magnesium (Mg)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	13.80	5.75	73.30	66.70	20.30	22.60	33.50	72.60	60.10
99%	13.80	5.75	73.30	66.70	20.30	22.60	33.50	72.60	60.10
95%	13.20	5.45	62.10	64.40	20.30	22.60	32.60	72.60	60.10
90%	12.90	4.77	49.00	45.40	20.30	22.60	28.80	72.60	59.00
3rd Quartile 75%	11.80	2.66	36.80	44.40	20.30	16.60	10.70	67.80	51.65
Median 50%	9.43	1.44	32.05	43.00	20.30	7.68	10.50	62.85	16.65
1st Quartile 25%	8.58	1.12	28.10	39.90	20.30	0.76	9.71	62.10	4.11
10%	7.42	1.07	24.70	25.80	20.30	0.76	6.59	62.70	3.42
5%	2.95	0.94	23.30	13.00	20.30	0.76	5.85	62.70	3.42
1%	2.24	1.07	7.97	13.00	20.30	0.76	5.85	62.70	3.42
Minimum 0%	0.45	0.81	7.55	10.70	20.30	0.71	4.59	61.50	1.93

Percentile	Manganese (Mn)Dissolved mg/L | Ann Gulch	Manganese (Mn)Dissolved mg/L | Bawn Boy Gulch	Manganese (Mn)Dissolved mg/L | Dublin Gulch	Manganese (Mn)Dissolved mg/L | Eagle Pup	Manganese (Mn)Dissolved mg/L | Headwaters	Manganese (Mn)Dissolved mg/L | Olive Gulch	Manganese (Mn)Dissolved mg/L | Platinum Gulch	Manganese (Mn)Dissolved mg/L | Stewart Gulch	Manganese (Mn)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.4560	0.3210	0.9920	0.2300	0.3260	0.0780	1.0300	0.0840	0.1980
99%	0.4560	0.3210	0.9920	0.2300	0.3260	0.0780	1.0300	0.0840	0.1980
95%	0.4310	0.3115	0.8410	0.1390	0.3260	0.0780	0.6920	0.0840	0.1980
90%	0.4040	0.2025	0.7910	0.0724	0.3260	0.0780	0.4730	0.0840	0.1880
3rd Quartile 75%	0.2910	0.0337	0.2285	0.0693	0.3260	0.0766	0.1700	0.0770	0.1155
Median 50%	0.1035	0.0068	0.0205	0.0606	0.3125	0.0438	0.1660	0.0690	0.0635
1st Quartile 25%	0.0073	0.0025	0.0030	0.0182	0.3260	0.0134	0.0760	0.0680	0.0315
10%	0.0011	0.0015	0.0013	0.0023	0.3260	0.0134	0.0006	0.0680	0.0270
5%	0.0007	0.0012	0.0010	0.0011	0.3260	0.0134	0.0003	0.0680	0.0270
1%	0.0004	0.0014	0.0008	0.0011	0.3260	0.0134	0.0003	0.0680	0.0270
Minimum 0%	0.0003	0.0011	0.0006	0.0001	0.2990	0.0009	0.0001	0.0680	0.0210

Percentile	Mercury (Hg)Dissolved mg/L | Ann Gulch	Mercury (Hg)Dissolved mg/L | Bawn Boy Gulch	Mercury (Hg)Dissolved mg/L | Dublin Gulch	Mercury (Hg)Dissolved mg/L | Eagle Pup	Mercury (Hg)Dissolved mg/L | Headwaters	Mercury (Hg)Dissolved mg/L | Olive Gulch	Mercury (Hg)Dissolved mg/L | Platinum Gulch	Mercury (Hg)Dissolved mg/L | Stewart Gulch	Mercury (Hg)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	-1.000000	0.000025
99%	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	-1.000000	0.000025
95%	0.000005	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	-1.000000	0.000025
90%	0.000005	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	-1.000000	0.000025
3rd Quartile 75%	0.000005	0.000025	0.000005	0.000005	0.000025	0.000025	0.000005	-1.000000	0.000005
Median 50%	0.000005	0.000025	0.000005	0.000005	0.000025	0.000025	0.000005	-1.000000	0.000005
1st Quartile 25%	0.000005	0.000025	0.000005	0.000005	0.000025	0.000003	0.000005	-1.000000	0.000005
10%	0.000005	0.000025	0.000005	0.000005	0.000025	0.000003	0.000005	-1.000000	0.000005
5%	0.000005	0.000025	0.000005	0.000005	0.000025	0.000003	0.000005	-1.000000	0.000005
1%	0.000005	0.000025	0.000005	0.000005	0.000025	0.000003	0.000005	-1.000000	0.000005
Minimum 0%	0.000005	0.000025	0.000005	0.000005	0.000025	0.000003	0.000005	-1.000000	0.000005

Percentile	Molybdenum (Mo)Dissolved mg/L | Ann Gulch	Molybdenum (Mo)Dissolved mg/L | Bawn Boy Gulch	Molybdenum (Mo)Dissolved mg/L | Dublin Gulch	Molybdenum (Mo)Dissolved mg/L | Eagle Pup	Molybdenum (Mo)Dissolved mg/L | Headwaters	Molybdenum (Mo)Dissolved mg/L | Olive Gulch	Molybdenum (Mo)Dissolved mg/L | Platinum Gulch	Molybdenum (Mo)Dissolved mg/L | Stewart Gulch	Molybdenum (Mo)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0006	0.0390	0.0136	0.0081	0.0043	0.0028	0.0360	0.0060	0.0170
99%	0.0006	0.0390	0.0136	0.0081	0.0043	0.0028	0.0360	0.0060	0.0170
95%	0.0005	0.0239	0.0022	0.0076	0.0043	0.0028	0.0315	0.0060	0.0170
90%	0.0005	0.0085	0.0015	0.0062	0.0043	0.0028	0.0302	0.0060	0.0170
3rd Quartile 75%	0.0005	0.0080	0.0012	0.0056	0.0043	0.0025	0.0073	0.0055	0.0155
Median 50%	0.0002	0.0020	0.0010	0.0052	0.0042	0.0012	0.0051	0.0050	0.0005
1st Quartile 25%	0.0000	0.0008	0.0005	0.0008	0.0043	0.0008	0.0048	0.0050	0.0005
10%	0.0000	0.0006	0.0001	0.0005	0.0043	0.0008	0.0047	0.0050	0.0002
5%	0.0000	0.0005	0.0001	0.0005	0.0043	0.0008	0.0045	0.0050	0.0002
1%	0.0000	0.0005	0.0001	0.0005	0.0043	0.0008	0.0045	0.0050	0.0002
Minimum 0%	0.0000	0.0005	0.0000	0.0004	0.0041	0.0002	0.0030	0.0050	0.0001

Percentile	Nickel (Ni)Dissolved mg/L | Ann Gulch	Nickel (Ni)Dissolved mg/L | Bawn Boy Gulch	Nickel (Ni)Dissolved mg/L | Dublin Gulch	Nickel (Ni)Dissolved mg/L | Eagle Pup	Nickel (Ni)Dissolved mg/L | Headwaters	Nickel (Ni)Dissolved mg/L | Olive Gulch	Nickel (Ni)Dissolved mg/L | Platinum Gulch	Nickel (Ni)Dissolved mg/L | Stewart Gulch	Nickel (Ni)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0143	0.0111	0.0096	0.0017	0.0071	0.0032	0.0068	0.0010	0.0074
99%	0.0143	0.0111	0.0096	0.0017	0.0071	0.0032	0.0068	0.0010	0.0074
95%	0.0101	0.0077	0.0048	0.0015	0.0071	0.0032	0.0050	0.0010	0.0074
90%	0.0092	0.0031	0.0043	0.0011	0.0071	0.0032	0.0049	0.0010	0.0016
3rd Quartile 75%	0.0074	0.0010	0.0033	0.0006	0.0071	0.0027	0.0010	0.0010	0.0010
Median 50%	0.0014	0.0006	0.0008	0.0003	0.0068	0.0023	0.0005	0.0008	0.0008
1st Quartile 25%	0.0003	0.0005	0.0005	0.0003	0.0071	0.0006	0.0003	0.0005	0.0005
10%	0.0003	0.0003	0.0003	0.0003	0.0071	0.0006	0.0003	0.0005	0.0005
5%	0.0003	0.0003	0.0003	0.0003	0.0071	0.0006	0.0003	0.0005	0.0005
1%	0.0003	0.0003	0.0003	0.0003	0.0071	0.0006	0.0003	0.0005	0.0005
Minimum 0%	0.0003	0.0003	0.0003	0.0003	0.0065	0.0003	0.0003	0.0005	0.0003

Percentile	Phosphorus (P)Dissolved mg/L | Ann Gulch	Phosphorus (P)Dissolved mg/L | Bawn Boy Gulch	Phosphorus (P)Dissolved mg/L | Dublin Gulch	Phosphorus (P)Dissolved mg/L | Eagle Pup	Phosphorus (P)Dissolved mg/L | Headwaters	Phosphorus (P)Dissolved mg/L | Olive Gulch	Phosphorus (P)Dissolved mg/L | Platinum Gulch	Phosphorus (P)Dissolved mg/L | Stewart Gulch	Phosphorus (P)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.150	0.150	0.750	0.150	0.150	0.150	0.150	0.150	0.150
99%	0.150	0.150	0.750	0.150	0.150	0.150	0.150	0.150	0.150
95%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
90%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
3rd Quartile 75%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Median 50%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
1st Quartile 25%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
10%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
5%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
1%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150
Minimum 0%	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150

Percentile	Potassium (K)Dissolved mg/L | Ann Gulch	Potassium (K)Dissolved mg/L | Bawn Boy Gulch	Potassium (K)Dissolved mg/L | Dublin Gulch	Potassium (K)Dissolved mg/L | Eagle Pup	Potassium (K)Dissolved mg/L | Headwaters	Potassium (K)Dissolved mg/L | Olive Gulch	Potassium (K)Dissolved mg/L | Platinum Gulch	Potassium (K)Dissolved mg/L | Stewart Gulch	Potassium (K)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	2.900	7.270	22.100	2.840	3.700	2.260	3.400	3.880	5.300
99%	2.900	7.270	22.100	2.840	3.700	2.260	3.400	3.880	5.300
95%	2.500	4.505	5.800	2.700	3.700	2.260	3.000	3.880	5.300
90%	2.400	1.460	5.500	2.370	3.700	2.260	2.910	3.880	5.100
3rd Quartile 75%	2.310	1.000	5.000	2.240	3.700	2.200	2.600	3.825	4.365
Median 50%	2.200	1.000	2.850	2.100	3.450	1.000	2.370	3.655	1.485
1st Quartile 25%	1.560	0.720	2.250	1.970	3.700	1.000	2.120	3.075	0.715
10%	1.040	0.530	2.180	1.000	3.700	1.000	1.000	3.540	0.460
5%	1.000	0.480	2.130	1.000	3.700	1.000	1.000	3.540	0.460
1%	1.000	0.520	1.890	1.000	3.700	1.000	1.000	3.540	0.460
Minimum 0%	1.000	0.440	1.000	1.000	3.200	0.585	1.000	2.610	0.420

Percentile	Selenium (Se)Dissolved mg/L | Ann Gulch	Selenium (Se)Dissolved mg/L | Bawn Boy Gulch	Selenium (Se)Dissolved mg/L | Dublin Gulch	Selenium (Se)Dissolved mg/L | Eagle Pup	Selenium (Se)Dissolved mg/L | Headwaters	Selenium (Se)Dissolved mg/L | Olive Gulch	Selenium (Se)Dissolved mg/L | Platinum Gulch	Selenium (Se)Dissolved mg/L | Stewart Gulch	Selenium (Se)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0018	0.0010	0.0025	0.0006	0.0005	0.0005	0.0088	0.0031	0.0025
99%	0.0018	0.0010	0.0025	0.0006	0.0005	0.0005	0.0088	0.0031	0.0025
95%	0.0015	0.0008	0.0010	0.0005	0.0005	0.0005	0.0078	0.0031	0.0025
90%	0.0014	0.0006	0.0010	0.0005	0.0005	0.0005	0.0070	0.0031	0.0020
3rd Quartile 75%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0013	0.0017	0.0005
Median 50%	0.0005	0.0005	0.0005	0.0003	0.0005	0.0005	0.0010	0.0003	0.0004
1st Quartile 25%	0.0001	0.0003	0.0002	0.0001	0.0005	0.0000	0.0001	0.0003	0.0003
10%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0000	0.0001	0.0003	0.0003
5%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0000	0.0001	0.0003	0.0003
1%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0000	0.0001	0.0003	0.0003
Minimum 0%	0.0001	0.0003	0.0001	0.0001	0.0005	0.0000	0.0001	0.0003	0.0003

Percentile	Silicon (Si)Dissolved mg/L | Ann Gulch	Silicon (Si)Dissolved mg/L | Bawn Boy Gulch	Silicon (Si)Dissolved mg/L | Dublin Gulch	Silicon (Si)Dissolved mg/L | Eagle Pup	Silicon (Si)Dissolved mg/L | Headwaters	Silicon (Si)Dissolved mg/L | Olive Gulch	Silicon (Si)Dissolved mg/L | Platinum Gulch	Silicon (Si)Dissolved mg/L | Stewart Gulch	Silicon (Si)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	9.59	14.30	8.44	8.16	3.77	9.03	6.62	-1.00	7.68
99%	9.59	14.30	8.44	8.16	3.77	9.03	6.62	-1.00	7.68
95%	9.51	14.30	7.37	8.05	3.77	9.03	6.61	-1.00	7.68
90%	9.01	14.30	6.92	6.77	3.77	9.03	6.60	-1.00	7.68
3rd Quartile 75%	8.06	10.65	6.41	6.55	3.77	7.71	6.50	-1.00	7.62
Median 50%	6.70	6.99	5.53	6.42	3.71	6.70	6.22	-1.00	7.49
1st Quartile 25%	6.32	6.62	4.95	5.94	3.77	6.12	4.60	-1.00	7.28
10%	6.02	6.61	4.79	4.58	3.77	6.12	4.33	-1.00	7.28
5%	5.28	6.61	4.53	4.41	3.77	6.12	4.31	-1.00	7.28
1%	5.28	6.61	4.39	4.41	3.77	6.12	4.31	-1.00	7.28
Minimum 0%	0.80	6.25	3.39	3.87	3.64	6.04	3.83	-1.00	1.81

Percentile	Silver (Ag)Dissolved mg/L | Ann Gulch	Silver (Ag)Dissolved mg/L | Bawn Boy Gulch	Silver (Ag)Dissolved mg/L | Dublin Gulch	Silver (Ag)Dissolved mg/L | Eagle Pup	Silver (Ag)Dissolved mg/L | Headwaters	Silver (Ag)Dissolved mg/L | Olive Gulch	Silver (Ag)Dissolved mg/L | Platinum Gulch	Silver (Ag)Dissolved mg/L | Stewart Gulch	Silver (Ag)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0001	0.0005	0.0001	0.0000	0.0000	0.0000	0.0001	0.0020	0.0005
99%	0.0001	0.0005	0.0001	0.0000	0.0000	0.0000	0.0001	0.0020	0.0005
95%	0.0001	0.0004	0.0001	0.0000	0.0000	0.0000	0.0001	0.0020	0.0005
90%	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0020	0.0001
3rd Quartile 75%	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0010	0.0001
Median 50%	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
1st Quartile 25%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
10%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
5%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
1%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
Minimum 0%	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

Percentile	Sodium (Na)Dissolved mg/L | Ann Gulch	Sodium (Na)Dissolved mg/L | Bawn Boy Gulch	Sodium (Na)Dissolved mg/L | Dublin Gulch	Sodium (Na)Dissolved mg/L | Eagle Pup	Sodium (Na)Dissolved mg/L | Headwaters	Sodium (Na)Dissolved mg/L | Olive Gulch	Sodium (Na)Dissolved mg/L | Platinum Gulch	Sodium (Na)Dissolved mg/L | Stewart Gulch	Sodium (Na)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	3.70	13.40	29.30	3.19	4.40	4.90	17.80	4.02	6.85
99%	3.70	13.40	29.30	3.19	4.40	4.90	17.80	4.02	6.85
95%	3.60	11.16	23.60	3.14	4.40	4.90	14.30	4.02	6.85
90%	3.40	7.76	20.00	2.97	4.40	4.90	13.20	4.02	6.00
3rd Quartile 75%	3.20	3.70	6.50	2.58	4.40	3.80	11.70	4.00	5.30
Median 50%	3.10	2.26	4.92	2.30	4.30	2.95	8.40	3.95	5.06
1st Quartile 25%	2.71	1.98	4.00	2.20	4.40	2.09	7.89	3.73	3.80
10%	2.55	1.82	3.50	1.00	4.40	2.09	7.04	3.91	2.98
5%	1.13	1.59	3.24	1.00	4.40	2.09	5.80	3.91	2.98
1%	0.93	1.74	1.00	1.00	4.40	2.09	5.80	3.91	2.98
Minimum 0%	0.55	1.44	1.00	1.00	4.20	2.07	3.98	3.54	1.00

Percentile	Strontium (Sr)Dissolved mg/L | Ann Gulch	Strontium (Sr)Dissolved mg/L | Bawn Boy Gulch	Strontium (Sr)Dissolved mg/L | Dublin Gulch	Strontium (Sr)Dissolved mg/L | Eagle Pup	Strontium (Sr)Dissolved mg/L | Headwaters	Strontium (Sr)Dissolved mg/L | Olive Gulch	Strontium (Sr)Dissolved mg/L | Platinum Gulch	Strontium (Sr)Dissolved mg/L | Stewart Gulch	Strontium (Sr)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.169	0.363	1.100	0.544	0.608	0.268	1.160	0.602	1.710
99%	0.169	0.363	1.100	0.544	0.608	0.268	1.160	0.602	1.710
95%	0.165	0.341	0.929	0.526	0.608	0.268	1.060	0.602	1.710
90%	0.162	0.302	0.684	0.345	0.608	0.268	0.984	0.602	1.600
3rd Quartile 75%	0.154	0.155	0.582	0.328	0.608	0.179	0.546	0.577	1.190
Median 50%	0.112	0.061	0.390	0.322	0.573	0.096	0.513	0.549	0.570
1st Quartile 25%	0.070	0.039	0.323	0.302	0.608	0.031	0.470	0.546	0.537
10%	0.054	0.033	0.286	0.193	0.608	0.031	0.203	0.546	0.335
5%	0.018	0.032	0.265	0.087	0.608	0.031	0.198	0.546	0.335
1%	0.018	0.032	0.246	0.087	0.608	0.031	0.198	0.546	0.335
Minimum 0%	0.013	0.032	0.112	0.074	0.538	0.027	0.196	0.546	0.028

Percentile	Thallium (Tl)Dissolved mg/L | Ann Gulch	Thallium (Tl)Dissolved mg/L | Bawn Boy Gulch	Thallium (Tl)Dissolved mg/L | Dublin Gulch	Thallium (Tl)Dissolved mg/L | Eagle Pup	Thallium (Tl)Dissolved mg/L | Headwaters	Thallium (Tl)Dissolved mg/L | Olive Gulch	Thallium (Tl)Dissolved mg/L | Platinum Gulch	Thallium (Tl)Dissolved mg/L | Stewart Gulch	Thallium (Tl)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.00010	0.00005	0.00025	0.00010	0.00005	0.00005	0.00020	-1.00000	0.00005
99%	0.00010	0.00005	0.00025	0.00010	0.00005	0.00005	0.00020	-1.00000	0.00005
95%	0.00010	0.00005	0.00010	0.00005	0.00005	0.00005	0.00010	-1.00000	0.00005
90%	0.00005	0.00005	0.00010	0.00005	0.00005	0.00005	0.00010	-1.00000	0.00005
3rd Quartile 75%	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00010	-1.00000	0.00005
Median 50%	0.00003	0.00005	0.00005	0.00001	0.00005	0.00005	0.00005	-1.00000	0.00005
1st Quartile 25%	0.00001	0.00005	0.00001	0.00001	0.00005	0.00001	0.00001	-1.00000	0.00005
10%	0.00001	0.00005	0.00001	0.00001	0.00005	0.00001	0.00001	-1.00000	0.00005
5%	0.00001	0.00005	0.00001	0.00001	0.00005	0.00001	0.00001	-1.00000	0.00005
1%	0.00001	0.00005	0.00001	0.00001	0.00005	0.00001	0.00001	-1.00000	0.00005
Minimum 0%	0.00001	0.00005	0.00001	0.00001	0.00005	0.00001	0.00001	-1.00000	0.00005

Percentile	Tin (Sn)Dissolved mg/L | Ann Gulch	Tin (Sn)Dissolved mg/L | Bawn Boy Gulch	Tin (Sn)Dissolved mg/L | Dublin Gulch	Tin (Sn)Dissolved mg/L | Eagle Pup	Tin (Sn)Dissolved mg/L | Headwaters	Tin (Sn)Dissolved mg/L | Olive Gulch	Tin (Sn)Dissolved mg/L | Platinum Gulch	Tin (Sn)Dissolved mg/L | Stewart Gulch	Tin (Sn)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.00025	0.00055	0.00243	0.00097	0.00149	0.00055	0.00188	-1.00000	0.00005
99%	0.00025	0.00055	0.00243	0.00097	0.00149	0.00055	0.00188	-1.00000	0.00005
95%	0.00025	0.00055	0.00128	0.00059	0.00149	0.00055	0.00129	-1.00000	0.00005
90%	0.00021	0.00055	0.00065	0.00025	0.00149	0.00055	0.00106	-1.00000	0.00005
3rd Quartile 75%	0.00005	0.00030	0.00016	0.00019	0.00149	0.00050	0.00052	-1.00000	0.00005
Median 50%	0.00005	0.00019	0.00005	0.00005	0.00091	0.00010	0.00010	-1.00000	0.00005
1st Quartile 25%	0.00005	0.00005	0.00005	0.00005	0.00149	0.00005	0.00005	-1.00000	0.00005
10%	0.00005	0.00005	0.00005	0.00005	0.00149	0.00005	0.00005	-1.00000	0.00005
5%	0.00005	0.00005	0.00005	0.00005	0.00149	0.00005	0.00005	-1.00000	0.00005
1%	0.00005	0.00005	0.00005	0.00005	0.00149	0.00005	0.00005	-1.00000	0.00005
Minimum 0%	0.00005	0.00005	0.00005	0.00005	0.00033	0.00005	0.00005	-1.00000	0.00005

Percentile	Titanium (Ti)Dissolved mg/L | Ann Gulch	Titanium (Ti)Dissolved mg/L | Bawn Boy Gulch	Titanium (Ti)Dissolved mg/L | Dublin Gulch	Titanium (Ti)Dissolved mg/L | Eagle Pup	Titanium (Ti)Dissolved mg/L | Headwaters	Titanium (Ti)Dissolved mg/L | Olive Gulch	Titanium (Ti)Dissolved mg/L | Platinum Gulch	Titanium (Ti)Dissolved mg/L | Stewart Gulch	Titanium (Ti)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.066	0.005	0.025	0.033	0.005	0.005	0.014	0.005	0.018
99%	0.066	0.005	0.025	0.033	0.005	0.005	0.014	0.005	0.018
95%	0.005	0.005	0.013	0.027	0.005	0.005	0.012	0.005	0.018
90%	0.005	0.005	0.012	0.005	0.005	0.005	0.012	0.005	0.011
3rd Quartile 75%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Median 50%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
1st Quartile 25%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
10%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
5%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
1%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Minimum 0%	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005

Percentile	Uranium (U)Dissolved mg/L | Ann Gulch	Uranium (U)Dissolved mg/L | Bawn Boy Gulch	Uranium (U)Dissolved mg/L | Dublin Gulch	Uranium (U)Dissolved mg/L | Eagle Pup	Uranium (U)Dissolved mg/L | Headwaters	Uranium (U)Dissolved mg/L | Olive Gulch	Uranium (U)Dissolved mg/L | Platinum Gulch	Uranium (U)Dissolved mg/L | Stewart Gulch	Uranium (U)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0003	0.0135	0.0102	0.0088	0.0073	0.0018	0.0402	0.0104	0.0243
99%	0.0003	0.0135	0.0102	0.0088	0.0073	0.0018	0.0402	0.0104	0.0243
95%	0.0002	0.0130	0.0087	0.0086	0.0073	0.0018	0.0397	0.0104	0.0243
90%	0.0002	0.0115	0.0085	0.0081	0.0073	0.0018	0.0370	0.0104	0.0237
3rd Quartile 75%	0.0001	0.0017	0.0080	0.0079	0.0073	0.0010	0.0318	0.0089	0.0166
Median 50%	0.0001	0.0003	0.0051	0.0076	0.0073	0.0005	0.0302	0.0074	0.0062
1st Quartile 25%	0.0000	0.0001	0.0009	0.0069	0.0073	0.0001	0.0111	0.0069	0.0025
10%	0.0000	0.0001	0.0006	0.0005	0.0073	0.0001	0.0044	0.0073	0.0017
5%	0.0000	0.0001	0.0004	0.0001	0.0073	0.0001	0.0042	0.0073	0.0017
1%	0.0000	0.0001	0.0001	0.0001	0.0073	0.0001	0.0042	0.0073	0.0017
Minimum 0%	0.0000	0.0001	0.0001	0.0001	0.0073	0.0001	0.0013	0.0066	0.0003

Percentile	Vanadium (V)Dissolved mg/L | Ann Gulch	Vanadium (V)Dissolved mg/L | Bawn Boy Gulch	Vanadium (V)Dissolved mg/L | Dublin Gulch	Vanadium (V)Dissolved mg/L | Eagle Pup	Vanadium (V)Dissolved mg/L | Headwaters	Vanadium (V)Dissolved mg/L | Olive Gulch	Vanadium (V)Dissolved mg/L | Platinum Gulch	Vanadium (V)Dissolved mg/L | Stewart Gulch	Vanadium (V)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.0010	0.0150	0.0150	0.0025	0.0005	0.0005	0.0150	0.0150	0.0150
99%	0.0010	0.0150	0.0150	0.0025	0.0005	0.0005	0.0150	0.0150	0.0150
95%	0.0005	0.0150	0.0150	0.0025	0.0005	0.0005	0.0010	0.0150	0.0150
90%	0.0005	0.0150	0.0010	0.0005	0.0005	0.0005	0.0010	0.0150	0.0150
3rd Quartile 75%	0.0005	0.0150	0.0005	0.0005	0.0005	0.0005	0.0010	0.0150	0.0150
Median 50%	0.0005	0.0150	0.0005	0.0005	0.0005	0.0005	0.0005	0.0150	0.0150
1st Quartile 25%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.0005	0.0150	0.0005
10%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.0005	0.0150	0.0005
5%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.0005	0.0150	0.0005
1%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.0005	0.0150	0.0005
Minimum 0%	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.0005	0.0150	0.0005

Percentile	Zinc (Zn)Dissolved mg/L | Ann Gulch	Zinc (Zn)Dissolved mg/L | Bawn Boy Gulch	Zinc (Zn)Dissolved mg/L | Dublin Gulch	Zinc (Zn)Dissolved mg/L | Eagle Pup	Zinc (Zn)Dissolved mg/L | Headwaters	Zinc (Zn)Dissolved mg/L | Olive Gulch	Zinc (Zn)Dissolved mg/L | Platinum Gulch	Zinc (Zn)Dissolved mg/L | Stewart Gulch	Zinc (Zn)Dissolved mg/L | Suttle Gulch
N	43	20	64	31	2	6	27	4	16
Maximum 100%	0.1200	0.0297	0.0554	0.0730	0.0095	0.0253	0.0424	0.0025	0.0100
99%	0.1200	0.0297	0.0554	0.0730	0.0095	0.0253	0.0424	0.0025	0.0100
95%	0.1140	0.0297	0.0374	0.0668	0.0095	0.0253	0.0388	0.0025	0.0100
90%	0.1090	0.0265	0.0346	0.0150	0.0095	0.0253	0.0330	0.0025	0.0081
3rd Quartile 75%	0.1010	0.0123	0.0173	0.0072	0.0095	0.0138	0.0117	0.0025	0.0052
Median 50%	0.0076	0.0025	0.0078	0.0025	0.0063	0.0096	0.0066	0.0025	0.0025
1st Quartile 25%	0.0024	0.0025	0.0030	0.0015	0.0095	0.0061	0.0030	0.0025	0.0025
10%	0.0015	0.0025	0.0015	0.0010	0.0095	0.0061	0.0023	0.0025	0.0025
5%	0.0015	0.0019	0.0015	0.0005	0.0095	0.0061	0.0015	0.0025	0.0025
1%	0.0015	0.0025	0.0013	0.0005	0.0095	0.0061	0.0015	0.0025	0.0025
Minimum 0%	0.0005	0.0013	0.0013	0.0005	0.0030	0.0021	0.0015	0.0025	0.0015

APPENDIX E:
Canadian Council of Ministers of the Environment – Fresh Water (CCME-FAL) and Yukon Contaminated Sites Regulation – Aquatic Water (CSR AW) Calculation Notes

APPENDIX E:

Canadian Council of Ministers of the Environment – Fresh Water (CCME-FAL) and Yukon Contaminated Sites Regulation – Aquatic Water (CSR AW) Calculation Notes

Groundwater General Chemistry Notes:

[1] CCME FAL - Canadian Council of Ministers of the Environment Freshwater Aquatic Life guidelines (December 2007)

[2] Yukon CSR AW - Yukon Contaminated Sites Regulation Freshwater Aquatic Life Standards (2002)

[3] Ammonia Guideline (CCME):

Total ammonia (mg/L total ammonia-N) guideline based on temperature and pH shown in the table below.

The range shown is based on maximum temperature and pH of 25+ °C and pH = 10, minimum temperature and pH of 0°C and pH = 6.

Table 1: Ammonia Guideline Values Based on pH and Temperature (C)

		pH							
Temperature (°C)		6	6.5	7	7.5	8	8.5	9	10
	0	190	60	19	6.02	1.92	0.616	0.206	0.035
	5	126	39.7	12.6	3.98	1.27	0.413	0.141	0.028
	10	83.9	26.6	8.47	2.68	0.855	0.282	0.1	0.024
	15	57.3	18.1	5.74	1.83	0.588	0.197	0.073	0.021
	20	39.5	12.5	3.96	1.27	0.41	0.141	0.055	0.02
	25	27.6	8.72	2.77	0.888	0.291	0.103	0.044	0.018
	25+	19.5	6.17	1.97	0.631	0.211	0.077	0.035	0.017

Note that the present guideline values (mg/L total ammonia-N) are converted from mg/L NH3 by multiplying the corresponding guideline value by 0.8224.

[4] Yukon CSR AW standard for ammonia is pH dependent:

pH < 7.0 = 18.4 mg/L; pH 7.0 - 7.5 = 18.5 mg/L; pH 7.5 - 8.0 = 11.3 mg/L; pH ≥8.5 = 1.31 mg/L

[5] Yukon CSR AW standard for fluoride is hardness dependent:

If hardness < 50 mg/L the standard value = 2 mg/L, if hardness ≥ 50 mg/L standard value = 3 mg/L.

[6] Yukon CSR AW standard for Nitrite as N is chloride (Cl) dependent:

Cl< 2mg/L = 0.2 mg/L; Cl 2 - <4 mg/L = 0.4 mg/L; Cl 4 - <6 mg/L = 0.6 mg/L; Cl 6 - <8 mg/L = 0.8 mg/L; Cl 8 - <10 mg/L = 1.0 mg/L; Cl ≥ 10 mg/L = 2.0 mg/L.

[7] CCME Guideline is for free cyanide.

[8] Yukon CSR AW standard is for Weak Acid Dissociable (WAD) cyanide.

APPENDIX E:

Canadian Council of Ministers of the Environment – Fresh Water (CCME-FAL) and Yukon Contaminated Sites Regulation – Aquatic Water (CSR AW) Calculation Notes

Groundwater Exceedance Parameters Chemistry Notes:

[1] CCME FAL - Canadian Council of Ministers of the Environment Freshwater Aquatic Life guidelines (December 2007).
[2] Yukon CSR AW - Yukon Contaminated Sites Regulation Freshwater Aquatic Life Standards (2002).
[3] Aluminum guideline (CCME): 0.005 mg/L when pH < 6.5 and 0.1 mg/L when pH ≥ 6.5.
[4] Cadmium Guideline (CCME): cadmium concentration (mg/L) =
(10^{0.86[log(hardness in mg/L)]-3.2})/1000: range shown based on hardness of 1 to 1000 mg/L.
[5] Cadmium Standard (Yukon CSR AW):
0.0001 mg/L when [CaCO3] is ≤ 30 mg/L
0.0003 mg/L when [CaCO3] is 30 - < 90 mg/L
0.0005 mg/L when [CaCO3] is 90 - < 150 mg/L
0.0006 mg/L when [CaCO3] is 150 - < 210 mg/L
[6] Chromium Guideline (CCME): No guideline exists for total chromium;
however the guideline for trivalent chromium is 0.0089 mg/L.
[7] Chromium Standard (Yukon CSR AW): No standard exists for total chromium;
however the standard for trivalent chromium is 0.090 mg/L.
[8] Copper Guideline (CCME): The minimum guideline is 0.002 mg/L, regardless of hardness.
Copper concentration (mg/L) = e^(0.8545[ln(hardness in mg/L)]-1.465) * 0.2/1000
Range shown is based on hardness of 1 to 1000 mg/L.
[9] Copper Standard (Yukon CSR AW):
0.020 mg/L when [CaCO3] is < 50 mg/L
0.030 mg/L when [CaCO3] is 50 - < 75 mg/L
0.040 mg/L when [CaCO3] is 75 - < 100 mg/L
0.050 mg/L when [CaCO3] is 100 - < 125 mg/L
0.060 mg/L when [CaCO3] is 125 - < 150 mg/L
0.070 mg/L when [CaCO3] is 150 - < 175 mg/L
0.080 mg/L when [CaCO3] is 175 - < 200 mg/L
0.090 mg/L when [CaCO3] is ≥ 200 mg/L
[10] Yukon CSR AW standard for fluoride is hardness dependent:
If hardness < 50 mg/L the standard value = 2 mg/L, if hardness ≥ 50 mg/L standard value = 3 mg/L.
[11] Lead Guideline (CCME):
The CCME guideline = minimum of 0.001 mg/L regardless of water hardness
Lead guideline (mg/L) = (e^(1.273[ln(hardness in mg/L)]-4.705))/1000
Range shown is based on hardness of 1 to 1000 mg/L.
[12] Lead Standard (Yukon CSR AW):
0.040 mg/L when [CaCO3] is < 50 mg/L
0.050 mg/L when [CaCO3] is 50 - < 100 mg/L
0.060 mg/L when [CaCO3] is 100 - < 200 mg/L
0.110 mg/L when [CaCO3] is 200 - < 300 mg/L
0.160 mg/L when [CaCO3] is ≥ 300 mg/L

APPENDIX E:

Canadian Council of Ministers of the Environment – Fresh Water (CCME-FAL) and Yukon Contaminated Sites Regulation – Aquatic Water (CSR AW) Calculation Notes

[13] Silver Standard (Yukon CSR AW):

0.0005 mg/L when [CaCO3] is ≤ 100 mg/L

0.015 mg/L when [CaCO3] is > 100 mg/L

[14] Zinc Standard (Yukon CSR AW):

0.075 mg/L when [CaCO3] is < 90 mg/L

0.150 mg/L when [CaCO3] is 90 - < 100 mg/L

0.900 mg/L when [CaCO3] is 100 - < 200 mg/L

1.650 mg/L when [CaCO3] is 200 - < 300 mg/L

2.400 mg/L when [CaCO3] is > 300 - < 400 mg/L

APPENDIX F:
Compiled Groundwater Monitoring Data – 1995-2016

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Compiled Groundwater Monitoring Data – 1995-2016

	A	B	C	D	E	F
1	File	Project	Report To	ALS File No.	Date Received	Date
2	L1339478 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1339478	29/07/2013	05/02/2015
3	L1306318 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1306318	23/05/2013	04/06/2013
4	app b tables B1 to B3					
5	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
6	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
7	L798225 XLR	1053550.02/C2404	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L798225	28/07/2009	12/08/2009
8	app b tables B1 to B3					
9	app b tables B1 to B3					
10	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
11	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
12	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
13	L1499179 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1499179	08/08/2014	27/08/2014
14	L1499179 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1499179	08/08/2014	27/08/2014
15	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
16	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
17	app b tables B1 to B3					
18	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
19	L1274727 XLR	GROUND WATER	Christiane Buie, STRATAGOLD CORPORATION	L1274727	04/03/2013	15/03/2013
20	L1535070 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1535070	20/10/2014	30/10/2014
21	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
22	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012
23	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
24	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
25	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
26	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
27	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
28	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
29	L1306318 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1306318	23/05/2013	04/06/2013
30	app b tables B1 to B3					
31	L1380836 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1380836	21/10/2013	05/02/2015
32	app b tables B1 to B3					
33	L1499179 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1499179	08/08/2014	27/08/2014
34	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
35	L1535070 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1535070	20/10/2014	30/10/2014
36	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
37	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
38	L1453356 XLR	GROUNDWATER	Mark Ayranto, STRATAGOLD CORPORATION	L1453356	09/05/2014	28/05/2014
39	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
40	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
41	app b tables B1 to B3					
42	L1306318 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1306318	23/05/2013	04/06/2013
43	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
44	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
45	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	29/08/2012
46	app b tables B1 to B3					

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APPENDIX F:
Compiled Groundwater Monitoring Data – 1995-2016

	A	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	File	Well ID	Location	Date Sampled	Quarter 1-Jan-Mar, 2-Apr-Jun, 3 Jly-Sep, 4 Oct-Dec	Time Sampled	ALS Sample ID	Matrix	Conductivity uS/cm	Hardness (as CaCO3) mg/L	pH	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity NTU	Acidity (as CaCO3) mg/L
2	L1339478 XLR	MW96-13B	Eagle Pup	26/07/2013	Q3	12:55	L13394787	Water	442.00	246.00	7.87	128000.00	260.00	4000.00	
3	L1306318 XLR	MW96-13B	Eagle Pup	22/05/2013	Q2	09:00	L13063182	Water	431.00	241.00	8.34	61000.00	230.00	4000.00	
4	app b tables B1 to B3	DH95-105	Suttles Gulch	21/08/1995	Q3				520.00	456.00	7.99	4210.00	367.00	2000.00	
5	L1016937 XLR	MW09-DG2	Dublin Gulch	09/06/2011	Q2	15:30	L10169376	Water	528.00	302.00	7.81	2350.00	420.00	895.00	
6	L1048234 XLR	MW09-DG2	Dublin Gulch	18/08/2011	Q3	11:30	L10482342	Water	582.00	279.00	7.86	2220.00	397.00	706.00	
7	L798225 XLR	MW96-13B	Eagle Pup	27/07/2009	Q3	11:00	L7982254	Water	181	148	8.01	1310	98	679	
8	app b tables B1 to B3	DH95-149	Bawn Boy Gulch	21/09/1996	Q3				72.60	31.00	7.41	1140.00	41.00	284.00	
9	app b tables B1 to B3	DH95-149	Bawn Boy Gulch	22/07/1996	Q3				72.50	26.60	7.44	1000.00	43.00	290.00	
10	L1048234 XLR	MW09-DG4	Dublin Gulch	18/08/2011	Q3	08:00	L10482341	Water	591.00	331.00	7.90	549.00	395.00	370.00	
11	L1016937 XLR	MW09-DG4	Dublin Gulch	09/06/2011	Q2	09:10	L10169371	Water	559.00	323.00	7.89	505.00	397.00	323.00	
12	L812430 XLR	MW96-13A	Eagle Pup	27/08/2009	Q3	00:00	L8124304	Water	203	83.9	7.73	487	108		
13	L1499179 XLR	MW09-DG1	Dublin Gulch	06/08/2014	Q3	16:45	L14991791	Water	356.00	207.00	7.55	480.00	223.00	89.50	3.40
14	L1499179 XLR	MW10-DG6	Dublin Gulch	06/08/2014	Q3	15:50	L14991792	Water	747.00	497.00	7.21	451.00	556.00	119.00	6.40
15	L1008190 XLR	MW96-12A	Eagle Pup	19/05/2011	Q2	16:45	L100819013	Water	120.00	68.70	7.86	438.00	79.00	131.00	
16	L946390 XLR	MW10-AG6	Ann Gulch	19/10/2010	Q4	18:30	L9463904	Water	210.00	114.00	7.61	385.00	126.00	164.00	
17	app b tables B1 to B3	DH95-141	Bawn Boy Gulch	27/09/1995	Q3				131.00	58.90	7.64	366.00	75.00	67.10	
18	L1016937 XLR	MW10-DG6	Dublin Gulch	09/06/2011	Q2	09:45	L10169375	Water	846.00	484.00	7.47	345.00	624.00	174.00	
19	L1274727 XLR	MW10-AG6	Ann Gulch	01/03/2013	Q1	11:05	L12747276	Water	207.00	104.00	7.72	330.00	117.00	121.00	
20	L1535070 XLR	MW96-15A	Eagle Pup	18/10/2014	Q4	16:20	L15350705	Water	751.00	445.00	7.88	313.00	461.00	616.00	309.00
21	L1094446 XLR	MW10-AG3A	Ann Gulch	07/12/2011	Q4	14:30	L10944464	Water	271.00	146.00	8.11	304.00	173.00	86.50	
22	L1226369 XLR	MW10-AG3A	Ann Gulch	17/10/2012	Q4	14:45	L122636910	Water	265.00	140.00	8.06	289.00	175.00	168.00	
23	L1094446 XLR	MW10-AG6	Ann Gulch	07/12/2011	Q4	11:00	L10944463	Water	196.00	97.50	7.90	287.00	119.00	114.00	
24	L1125898 XLR	MW10-AG6	Ann Gulch	18/03/2012	Q1	10:30	L11258987	Water	215.00	102.00	8.10	285.00	127.00	135.00	
25	L1048234 XLR	MW10-DG6	Dublin Gulch	18/08/2011	Q3	11:50	L10482343	Water	899.00	506.00	7.67	275.00	673.00	171.00	
26	L923152 XLR	MW10-AG6	Ann Gulch	19/08/2010	Q3	12:00	L9231523	Water	278.00	91.00	7.98	265.00	116.00	119.00	
27	L1016937 XLR	MW10-AG6	Ann Gulch	09/06/2011	Q2	12:10	L10169373	Water	184.00	88.20	7.64	231.00	100.00	109.00	
28	L946390 XLR	MW96-13A	Eagle Pup				L94639010	Water	262.00	160.00	8.15	198.00	137.00	61.20	
29	L1306318 XLR	MW96-13A	Eagle Pup	21/05/2013	Q2	18:00	L13063183	Water	460.00	269.00	8.35	174.00	242.00	86.20	
30	app b tables B1 to B3	DH95-105	Suttles Gulch	27/09/1995	Q3				491.00	241.00	7.66	168.00	380.00	48.00	
31	L1380836 XLR	MW09-DG1	Dublin Gulch	19/10/2013	Q4	13:46	L13808365	Water	314.00	195.00	7.90	164.00	209.00	47.10	3.00
32	app b tables B1 to B3	DH95-106	Suttles Gulch	21/08/1995	Q3				273.00	118.00	6.08	160.00	176.00	43.00	
33	L1499179 XLR	MW96-15A	Eagle Pup	06/08/2014	Q3	17:20	L14991793	Water	423.00	258.00	7.60	149.00	258.00	158.00	2.30
34	L812430 XLR	MW96-1	Bawn Boy Gulch	27/08/2009	Q3	00:00	L8124301	Water	282	151	7.36	148	190		
35	L1535070 XLR	MW96-13A	Eagle Pup	18/10/2014	Q4	17:30	L15350704	Water	477.00	259.00	8.29	145.00	253.00	39.70	255.00
36	L1048234 XLR	MW10-AG6	Ann Gulch	18/08/2011	Q3	12:40	L10482344	Water	160.00	75.30	7.66	143.00	105.00	70.90	
37	L1048234 XLR	MW96-23	Platinum Gulch	18/08/2011	Q3	19:45	L10482348	Water	1140.00	648.00	8.02	143.00	934.00	57.20	
38	L1453356 XLR	MW96-13A	Eagle Pup	07/05/2014	Q2	17:00	L14533564	Water	458.00	268.00	8.37	134.00	251.00	50.40	
39	L812430 XLR	MW96-18	Headwaters	27/08/2009	Q3	00:00	L8124306	Water	568	315	7.64	133	385		
40	L1073407 XLR	MW96-23	Platinum Gulch	16/10/2011	Q4	19:00	L10734071	Water	276.00	144.00	8.09	127.00	185.00	75.20	
41	app b tables B1 to B3	DH95-148	Bawn Boy Gulch	27/09/1995	Q3				72.60	29.80	7.20	123.00	49.00	51.00	
42	L1306318 XLR	MW09-DG4	Dublin Gulch	22/05/2013	Q2	08:30	L13063181	Water	588.00	324.00	8.17	119.00	391.00	68.80	
43	L1086893 XLR	MW09-DG4	Dublin Gulch	17/11/2011	Q4	08:30	L10868931	Water	557.00	311.00	8.18	118.00	358.00	28.20	
44	L812430 XLR	MW96-26	Bawn Boy Gulch	27/08/2009	Q3	00:00	L8124308	Water	180	81.6	7.33	106	125		
45	L1195890 XLR	MW09-DG4	Dublin Gulch	15/08/2012	Q3	08:30	L11958901	Water	562.00	324.00	7.96	103.00	397.00	6.48	
46	app b tables B1 to B3	DH95-106	Suttles Gulch	27/09/1995	Q3				267.00	129.00	7.95	99.00	192.00	23.60	

	A	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	File	Alkalinity, Bicarbonate (as CaCO3) mg/L	Alkalinity, Carbonate (as CaCO3) mg/L	Alkalinity, Hydroxide (as CaCO3) mg/L	Alkalinity, Total (as CaCO3) mg/L	Ammonia as N mg/L	Bromide (Br) mg/L	Chloride (Cl) mg/L	Fluoride (F) mg/L	Nitrate (as N) mg/L	Nitrite (as N) mg/L	Total Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Ortho Phosphate as P mg/L	Total Dissolved Phosphate As P mg/L
2	L1339478 XLR				252.00	0.01		0.25	0.43	0.02	0.00	5.00	0.75	0.01	0.01
3	L1306318 XLR	221.00	6.10	0.50	227.00	0.02		0.25	0.42	0.03	0.00	5.00	5.00	0.00	0.01
4	app b tables B1 to B3				117.00	0.02		8.80	0.14	0.00	0.00			0.06	
5	L1016937 XLR	212.00				0.02	0.03	0.25	0.16	0.11	0.00	0.28	0.40	0.00	0.00
6	L1048234 XLR				230.00	0.02	0.03	0.25	0.19	0.12	0.00	0.34	0.40	0.00	0.00
7	L798225 XLR	88.9	1.00	1.00	88.9	0.00	0.03	0.25	0.092	0.174	0.00	0.03		0.00	
8	app b tables B1 to B3				27.50	0.00		0.25	0.06	0.07	0.06			0.02	
9	app b tables B1 to B3				29.10	0.03		0.25	0.04	0.07	0.00			0.01	
10	L1048234 XLR				228.00	0.01	0.03	0.58	0.13	0.28	0.00	0.38	0.54	0.00	0.00
11	L1016937 XLR	219.00				0.02	0.03	0.25	0.11	0.04	0.00	0.34	0.38	0.00	0.00
12	L812430 XLR	107	1.00	1.00	107	0.0076	0.03	0.25	0.061	0.177	0.00	0.091		0.00	
13	L1499179 XLR				176.00	0.01		0.25	0.18	0.02	0.00	0.30	0.32	0.01	0.01
14	L1499179 XLR				150.00	0.21		0.25	0.31	0.05	0.00	0.61	0.65	0.00	0.01
15	L1008190 XLR	62.20				0.00	0.03	0.25	0.09	0.36	0.00	0.12		0.00	
16	L946390 XLR					0.02	0.03	0.25	0.36	0.21	0.00	0.03		0.01	0.01
17	app b tables B1 to B3				30.60			1.80	0.26	0.01	0.08	0.00		0.02	
18	L1016937 XLR	166.00				0.19	0.13	1.25	0.27	0.01	0.00	0.45	0.45	0.00	0.02
19	L1274727 XLR				82.10	0.01		0.25	0.41	0.14	0.00	0.18	0.31	0.01	0.01
20	L1535070 XLR					0.04		0.25	0.32	0.03	0.00			0.01	
21	L1094446 XLR	96.10	1.00	1.00	96.10	0.03	0.03	0.25	0.28	0.00	0.00	0.07	0.08	0.00	0.00
22	L1226369 XLR				96.60	0.04		0.25	0.28	0.00	0.00	0.24	0.24	0.00	0.00
23	L1094446 XLR	82.90	1.00	1.00	82.90	0.01	0.03	0.25	0.44	0.20	0.00	0.09	0.29	0.01	0.02
24	L1125898 XLR				92.40	0.01	0.03	0.25	0.42	0.21	0.00	0.13	0.34	0.01	0.01
25	L1048234 XLR				185.00	0.21	0.25	2.50	0.42	0.03	0.01	0.34	0.27	0.00	0.03
26	L923152 XLR	72.50	1.00	1.00	72.50	0.01	0.03	0.25	0.44	0.17	0.00	0.03	0.18	0.01	0.01
27	L1016937 XLR	78.00				0.02	0.03	0.25	0.37	0.28	0.00	0.47	0.75	0.00	0.01
28	L946390 XLR					0.05	0.03	0.25	0.10	0.30	0.00	0.58		0.03	0.03
29	L1306318 XLR	250.00	6.10	0.50	256.00	0.01		0.25	0.42	0.02	0.00	0.20	0.19	0.00	0.01
30	app b tables B1 to B3				146.00	0.00		1.10	0.16	0.00	0.00			0.01	
31	L1380836 XLR				156.00	0.01		0.25	0.17	0.10	0.00	0.20	0.30	0.01	0.01
32	app b tables B1 to B3				88.90	0.01		0.25	0.07	0.05	0.00			0.00	
33	L1499179 XLR				192.00	0.01		0.25	0.20	0.31	0.00	0.14	0.45	0.00	0.00
34	L812430 XLR	83.8	1.00	1.00	83.8	0.0606	0.03	0.25	0.062	0.0054	0.00	0.126		0.00	
35	L1535070 XLR					0.01		0.25	0.39	0.00	0.00			0.00	
36	L1048234 XLR				77.20	0.03	0.10	0.60	0.46	0.24	0.00	0.67	0.81	0.00	0.01
37	L1048234 XLR				177.00	0.05	0.25	2.50	0.10	0.07	0.01	1.21	1.20	0.05	0.05
38	L1453356 XLR				245.00	0.01		0.25	0.42	0.00	0.00			0.00	
39	L812430 XLR	139	1.00	1.00	139	0.361	0.03	0.25	0.073	0.0085	0.00	0.32		0.0027	
40	L1073407 XLR				124.00	0.00	0.14	0.52	0.08	0.21	0.00	0.13	0.34	0.01	0.09
41	app b tables B1 to B3				30.40			1.00	0.09	0.00	0.03	0.00		0.00	
42	L1306318 XLR	235.00	0.50	0.50	235.00	0.00		2.30	0.12	1.20	0.00	0.26	1.21	0.00	0.00
43	L1086893 XLR				218.00	0.01	0.09	0.25	0.13	0.10	0.00	0.18	0.29	0.00	0.00
44	L812430 XLR	81.6	0.50	0.50	81.6	0.00	0.03	0.25	0.131	0.00	0.00	0.363		0.0808	
45	L1195890 XLR				228.00	0.00		0.75	0.07	0.36	0.00	0.10	0.46	0.00	0.00
46	app b tables B1 to B3				99.00	0.00		1.00	0.09	0.03	0.00			0.00	

	A	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1	File	Total Phosphate as P mg/L	Sulfate (SO4) mg/L	Anion Sum mg/L	Cation Sum mg/L	Cation Anion Balance mg/L	Cyanide, Weak Acid Diss mg/L	Cyanide, Total mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L	Aluminum (Al)Total mg/L	Antimony (Sb)Total mg/L	Arsenic (As)Total mg/L	Barium (Ba)Total mg/L	Beryllium (Be)Total mg/L
2	L1339478 XLR	9.52	18.00	5.42	5.13	2.80			11.90		131.00	0.00	5.32	2.03	0.03
3	L1306318 XLR	9.11	18.00						21.30		90.30	0.00	4.44	2.26	0.02
4	app b tables B1 to B3	9.17	131.00					0.00			4.07	0.02	2.31	0.08	0.00
5	L1016937 XLR	0.26	87.60						3.21		18.50	0.00	0.16	0.36	0.00
6	L1048234 XLR	0.49	93.70						6.21		10.10	0.00	0.12	0.18	0.00
7	L798225 XLR	0.283	5.52						5.54		0.527	0.00057	0.012	0.0159	0.00
8	app b tables B1 to B3	1.59	3.40					0.00			0.61	0.00	0.19	0.16	0.00
9	app b tables B1 to B3	0.79	3.20					0.00			0.46	0.00	0.28	0.14	0.00
10	L1048234 XLR	0.19	100.00						7.05		6.85	0.00	0.06	0.20	0.00
11	L1016937 XLR	0.17	101.00						3.14		4.70	0.00	0.05	0.17	0.00
12	L812430 XLR	0.121	6.12						2.56		2.5	0.00204	0.0457	0.0421	0.00
13	L1499179 XLR	0.08	39.70	4.35	4.37	0.20			4.73	2.40	3.78	0.00	0.11	0.14	0.00
14	L1499179 XLR	0.28	266.00	8.56	10.80	11.70			1.95	1.30	6.66	0.00	3.53	0.02	0.00
15	L1008190 XLR	0.01	2.94						2.55		0.13	0.00	0.00	0.00	0.00
16	L946390 XLR	0.11	23.40						1.76		8.15	0.00	0.19	0.04	0.00
17	app b tables B1 to B3	0.10	14.00					0.01			0.90	0.00	0.15	0.03	0.00
18	L1016937 XLR	0.18	319.00						1.45		3.87	0.00	3.29	0.02	0.00
19	L1274727 XLR	0.11	25.20				0.00	0.00	2.31		3.55	0.00	0.13	0.02	0.00
20	L1535070 XLR	0.01	133.00	8.96	9.10	0.80			1.36		0.62	0.27	19.30	0.23	0.01
21	L1094446 XLR	0.08	47.40						1.40		1.97	0.00	0.02	0.01	0.00
22	L1226369 XLR	0.07	49.20				0.00	0.00	1.99		8.14	0.00	0.03	0.04	0.00
23	L1094446 XLR	0.10	22.60						2.01		4.54	0.00	0.15	0.02	0.00
24	L1125898 XLR	0.14	25.70				0.00	0.00	1.71		5.79	0.00	0.21	0.03	0.00
25	L1048234 XLR	0.15	317.00						2.04		2.45	0.00	3.38	0.01	0.00
26	L923152 XLR	0.05	16.30						1.41		3.45	0.00	0.07	0.02	0.00
27	L1016937 XLR	0.09	20.20						4.60		3.07	0.00	0.10	0.02	0.00
28	L946390 XLR	0.11	10.50						3.21		0.57	0.00	0.01	0.01	0.00
29	L1306318 XLR	0.08	18.60						3.13		1.54	0.00	0.38	0.08	0.00
30	app b tables B1 to B3	0.08	138.00					0.01			0.75	0.00	0.89	0.02	0.00
31	L1380836 XLR	0.10	44.40	4.05	4.09	0.50			2.73		1.72	0.00	0.09	0.10	0.00
32	app b tables B1 to B3	0.03	40.60					0.00			1.42	0.00	0.04	0.03	0.00
33	L1499179 XLR	0.35	53.30	4.98	5.32	3.30			2.22	1.77	0.91	0.05	5.57	0.13	0.00
34	L812430 XLR	0.088	64.4						3.18		0.815	0.0037	0.0183	0.0178	0.00
35	L1535070 XLR	0.00	18.30	5.51	5.32	1.70			0.80		1.40	0.00	0.18	0.07	0.00
36	L1048234 XLR	0.08	13.70						7.32		1.44	0.00	0.06	0.02	0.00
37	L1048234 XLR	0.18	480.00						8.64		1.43	0.00	2.35	0.05	0.00
38	L1453356 XLR	0.05	18.40	5.30	5.61	2.90			0.92	0.63	1.79	0.00	0.18	0.08	0.00
39	L812430 XLR	0.259	165						1.24		0.203	0.0215	0.618	0.0251	0.00
40	L1073407 XLR	0.15	27.70					0.00	1.85		1.26	0.00	0.50	0.06	0.00
41	app b tables B1 to B3	0.04	4.00					0.00			0.65	0.01	0.12	0.06	0.00
42	L1306318 XLR	0.08	100.00						4.27		0.58	0.00	0.01	0.13	0.00
43	L1086893 XLR	0.06	96.20						2.72		1.12	0.00	0.01	0.14	0.00
44	L812430 XLR	0.543	8.89						7.28		2.88	0.0299	0.267	0.059	0.00
45	L1195890 XLR	0.03	102.00				0.00	0.00	1.57		0.41	0.00	0.00	0.12	0.00
46	app b tables B1 to B3	0.02	44.00					0.00			0.58	0.00	0.04	0.03	0.00

	A	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI
1	File	Bismuth (Bi)Total mg/L	Boron (B)Total mg/L	Cadmium (Cd)Total mg/L	Calcium (Ca)Total mg/L	Chromium (Cr)Total mg/L	Cobalt (Co)Total mg/L	Copper (Cu)Total mg/L	Iron (Fe)Total mg/L	Lead (Pb)Total mg/L	Lithium (Li)Total mg/L	Magnesium (Mg)Total mg/L	Manganese (Mn)Total mg/L	Mercury (Hg)Total mg/L
2	L1339478 XLR	0.01	0.03	0.00	73.00	0.17	0.32	0.56	472.00	0.34	0.11	109.00	19.00	
3	L1306318 XLR	0.01	0.03	0.00	73.00	0.13	0.41	0.41	332.00	0.27	0.11	96.60	24.60	0.00
4	app b tables B1 to B3	0.05	0.05	0.02	84.40	0.01	0.01	0.10	12.80	0.35		20.30	0.52	0.00
5	L1016937 XLR	0.00	0.02	0.00	75.20	0.00	0.00	0.03	20.60	0.05	0.03	44.50	1.13	0.00
6	L1048234 XLR	0.00	0.02	0.00	71.40	0.00	0.00	0.02	8.94	0.03	0.04	44.40	0.51	0.00
7	L798225 XLR	0.00	0.01	0.000061	9.45	0.00109	0.00099	0.00168	1.61	0.00608	0.00	9.14	0.0766	
8	app b tables B1 to B3	0.05	0.05	0.00	20.20	0.00	0.00	0.02	0.83	0.01		3.06	0.28	0.00
9	app b tables B1 to B3	0.05	0.05	0.00	18.40	0.00	0.00	0.02	0.47	0.00		2.72	0.21	0.00
10	L1048234 XLR	0.00	0.01	0.00	78.50	0.01	0.01	0.03	19.40	0.02	0.02	31.10	0.38	0.00
11	L1016937 XLR	0.00	0.01	0.00	79.60	0.01	0.01	0.02	15.10	0.02	0.02	29.00	0.29	0.00
12	L812430 XLR	0.00	0.01	0.000172	18.2	0.00434	0.00393	0.00631	6.06	0.0171	0.0061	30.6	0.234	0.00
13	L1499179 XLR	0.00	0.01	0.00	44.40	0.00	0.00	0.01	5.58	0.01	0.01	26.30	0.09	0.00
14	L1499179 XLR	0.00	0.01	0.00	136.00	0.01	0.01	0.01	21.80	0.01	0.21	36.80	1.08	0.00
15	L1008190 XLR	0.00	0.01	0.00	8.77	0.00	0.00	0.00	0.17	0.00	0.00	8.77	0.01	0.00
16	L946390 XLR		0.05	0.00	22.50	0.02	0.01	0.03	14.10	0.01	0.05	15.30	0.09	0.00
17	app b tables B1 to B3	0.05	0.05	0.00	18.60	0.00	0.00	0.00	0.96	0.01		3.34	0.04	0.00
18	L1016937 XLR	0.00	0.01	0.00	137.00	0.01	0.00	0.01	18.10	0.00	0.20	33.30	0.90	0.00
19	L1274727 XLR	0.00	0.01	0.00	21.20	0.01	0.00	0.02	6.92	0.00	0.05	13.50	0.06	0.00
20	L1535070 XLR	0.00	0.01	0.00	66.60	0.01	0.00	0.01	75.20	0.00	0.03	64.00	0.83	
21	L1094446 XLR	0.00	0.01	0.00	44.20	0.00	0.00	0.01	4.84	0.00	0.03	9.50	0.20	0.00
22	L1226369 XLR	0.00	0.01	0.00	45.10	0.02	0.01	0.02	12.40	0.01	0.05	11.50	0.45	0.00
23	L1094446 XLR	0.00	0.01	0.00	20.30	0.01	0.01	0.02	8.26	0.00	0.05	12.90	0.06	0.00
24	L1125898 XLR	0.00	0.01	0.00	22.20	0.01	0.01	0.03	12.60	0.00	0.05	14.00	0.08	0.00
25	L1048234 XLR	0.00	0.01	0.00	142.00	0.00	0.00	0.00	14.90	0.00	0.21	36.40	0.91	0.00
26	L923152 XLR	0.00	0.01	0.00	19.30	0.01	0.00	0.01	5.29	0.00	0.05	12.00	0.04	0.00
27	L1016937 XLR	0.00	0.01	0.00	18.40	0.01	0.00	0.01	5.28	0.00	0.04	11.30	0.04	0.00
28	L946390 XLR		0.05	0.00	17.00	0.00	0.00	0.00	1.55	0.01	0.01	26.50	0.09	0.00
29	L1306318 XLR	0.00	0.01	0.00	34.10	0.00	0.00	0.01	4.61	0.00	0.02	41.70	0.17	0.00
30	app b tables B1 to B3	0.05	0.05	0.00	70.10	0.00	0.00	0.01	0.93	0.02		16.80	0.21	0.00
31	L1380836 XLR	0.00	0.01	0.00	38.10	0.00	0.00	0.02	2.12	0.01	0.01	23.90	0.32	0.00
32	app b tables B1 to B3	0.05	0.05	0.00	43.10	0.00	0.00	0.00	0.75	0.00		4.21	0.04	0.00
33	L1499179 XLR	0.00	0.01	0.00	47.10	0.00	0.00	0.01	23.20	0.00	0.01	34.00	1.08	0.00
34	L812430 XLR	0.00	0.01	0.000127	55.5	0.00221	0.00059	0.00417	1.69	0.0044	0.0087	2.01	0.103	0.00
35	L1535070 XLR	0.00	0.01	0.00	33.00	0.00	0.00	0.00	3.03	0.00	0.02	41.40	0.09	
36	L1048234 XLR	0.00	0.01	0.00	16.40	0.00	0.00	0.01	2.77	0.00	0.04	10.10	0.03	0.00
37	L1048234 XLR	0.00	0.01	0.00	208.00	0.00	0.01	0.01	3.15	0.00	0.02	34.50	1.05	0.00
38	L1453356 XLR	0.00	0.01	0.00	34.50	0.00	0.00	0.00	5.26	0.00	0.02	43.00	0.15	0.00
39	L812430 XLR	0.00	0.01	0.000043	87.5	0.00087	0.00148	0.00153	2.39	0.00324	0.00	20	0.341	0.00
40	L1073407 XLR	0.00	0.01	0.00	46.40	0.00	0.00	0.01	2.23	0.00	0.01	7.70	0.07	0.00
41	app b tables B1 to B3	0.05	0.05	0.00	9.97	0.01	0.00	0.01	0.59	0.00		1.87	0.07	0.00
42	L1306318 XLR	0.00	0.01	0.00	76.60	0.00	0.00	0.00	1.81	0.00	0.01	28.30	0.04	0.00
43	L1086893 XLR	0.00	0.01	0.00	76.00	0.00	0.00	0.01	3.57	0.01	0.01	29.00	0.08	0.00
44	L812430 XLR	0.00	0.01	0.000077	22.9	0.00139	0.00284	0.0116	9.09	0.00296	0.0068	5.69	0.377	0.00
45	L1195890 XLR	0.00	0.01	0.00	75.70	0.00	0.00	0.00	1.18	0.00	0.01	29.40	0.02	0.00
46	app b tables B1 to B3	0.05	0.05	0.00	43.40	0.00	0.00	0.00	0.35	0.00		4.27	0.46	0.00

	A	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV
1	File	Molybdenum (Mo)Total mg/L	Nickel (Ni)Total mg/L	Phosphorus (P)Total mg/L	Potassium (K)Total mg/L	Selenium (Se)Total mg/L	Silicon (Si)Total mg/L	Silver (Ag)Total mg/L	Sodium (Na)Total mg/L	Strontium (Sr)Total mg/L	Thallium (Tl)Total mg/L	Tin (Sn)Total mg/L	Titanium (Ti)Total mg/L	Uranium (U)Total mg/L
2	L1339478 XLR	0.01	0.70	2.81	26.10	0.00	232.00	0.00	3.41	0.94	0.00	0.00	0.37	0.04
3	L1306318 XLR	0.00	0.69	2.78	19.30	0.00	144.00	0.00	3.27	0.79	0.00	0.00	0.38	0.03
4	app b tables B1 to B3	0.00	0.02	0.15		0.00		0.00		0.71			0.03	0.01
5	L1016937 XLR	0.00	0.02	0.67	6.60	0.00	49.00	0.00	5.50	0.53	0.00	0.00	0.25	0.02
6	L1048234 XLR	0.00	0.01	0.65	5.10	0.00	31.60	0.00	5.20	0.53	0.00	0.00	0.14	0.01
7	L798225 XLR	0.000493	0.00318	0.15	1.00	0.00	6.14	0.000016	1.00	0.0634	0.00	0.00153	0.03	0.000386
8	app b tables B1 to B3	0.00	0.01	0.15		0.00		0.00		0.13	0.01			0.01
9	app b tables B1 to B3	0.00	0.01	0.15		0.00		0.00		0.13	0.01			0.01
10	L1048234 XLR	0.00	0.02	0.15	4.20	0.00	15.20	0.00	4.20	0.32	0.00	0.00	0.18	0.01
11	L1016937 XLR	0.00	0.01	0.15	3.70	0.00	12.40	0.00	4.20	0.29	0.00	0.00	0.13	0.01
12	L812430 XLR	0.000956	0.0135	0.15	3.3	0.00	8.41	0.00014	1.00	0.15	0.00	0.00109	0.087	0.00128
13	L1499179 XLR	0.00	0.00	0.15	3.30	0.00	15.10	0.00	3.15	0.31	0.00	0.00	0.13	0.01
14	L1499179 XLR	0.00	0.01	0.15	6.46	0.00	15.40	0.00	5.86	0.60	0.00	0.00	0.10	0.00
15	L1008190 XLR	0.00	0.00	0.15	1.00	0.00	5.79	0.00	1.00	0.07	0.00	0.00	0.01	0.00
16	L946390 XLR	0.00	0.02		5.20	0.00		0.01	3.00		0.00	0.00	0.28	0.00
17	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.13			0.02	0.01
18	L1016937 XLR	0.00	0.01	0.15	6.50	0.00	12.00	0.00	6.20	0.59	0.00	0.00	0.08	0.00
19	L1274727 XLR	0.00	0.01	0.15	2.95	0.00	16.80	0.00	2.75	0.13	0.00	0.00	0.23	0.00
20	L1535070 XLR	0.00	0.01	0.15	2.59	0.00	9.93	0.00	2.98	0.63	0.00	0.00	0.05	0.01
21	L1094446 XLR	0.00	0.00	0.15	2.83	0.00	10.60	0.00	3.09	0.16	0.00	0.00	0.08	0.00
22	L1226369 XLR	0.00	0.01	0.15	4.33	0.00	21.60	0.00	3.32	0.20	0.00	0.00	0.16	0.00
23	L1094446 XLR	0.00	0.01	0.15	3.27	0.00	15.40	0.00	2.70	0.12	0.00	0.00	0.23	0.00
24	L1125898 XLR	0.00	0.01	0.15	4.31	0.00	16.60	0.01	2.78	0.14	0.00	0.00	0.29	0.00
25	L1048234 XLR	0.00	0.00	0.15	6.30	0.00	10.40	0.00	6.70	0.63	0.00	0.00	0.05	0.00
26	L923152 XLR	0.00	0.01	0.15	3.30	0.00	14.00	0.00	2.80	0.11	0.00	0.00	0.12	0.00
27	L1016937 XLR	0.00	0.01	0.15	2.90	0.00	12.30	0.00	2.60	0.12	0.00	0.00	0.15	0.00
28	L946390 XLR	0.00	0.00		1.00	0.00		0.00	1.00		0.00	0.00	0.03	0.00
29	L1306318 XLR	0.01	0.00	0.15	2.64	0.00	9.27	0.00	2.32	0.33	0.00	0.00	0.04	0.01
30	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.55			0.02	0.01
31	L1380836 XLR	0.00	0.00	0.15	2.20	0.00	8.37	0.00	3.07	0.28	0.00	0.00	0.06	0.01
32	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		1.15			0.03	0.02
33	L1499179 XLR	0.00	0.01	0.15	1.83	0.00	6.95	0.00	2.92	0.37	0.00	0.00	0.06	0.01
34	L812430 XLR	0.00309	0.00267	0.15	1.00	0.00	8.21	0.000119	2.7	0.326	0.00	0.00477	0.048	0.000384
35	L1535070 XLR	0.01	0.00	0.15	2.28	0.00	9.10	0.00	2.08	0.32	0.00	0.00	0.05	0.01
36	L1048234 XLR	0.00	0.00	0.15	2.50	0.00	9.31	0.00	3.10	0.09	0.00	0.00	0.06	0.00
37	L1048234 XLR	0.03	0.01	0.15	3.90	0.00	7.82	0.00	14.40	1.06	0.00	0.00	0.07	0.04
38	L1453356 XLR	0.00	0.00	0.15	2.59	0.00	9.62	0.00	2.30	0.34	0.00	0.00	0.04	0.01
39	L812430 XLR	0.00448	0.0084	0.15	3.5	0.00	3.99	0.00	4.7	0.619	0.00	0.00153	0.018	0.00733
40	L1073407 XLR	0.01	0.01	0.15	2.20	0.00	6.39	0.00	5.80	0.22	0.00	0.01	0.04	0.00
41	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.07			0.01	0.00
42	L1306318 XLR	0.00	0.00	0.15	2.26	0.00	5.55	0.00	4.07	0.32	0.00	0.00	0.02	0.01
43	L1086893 XLR	0.00	0.00	0.15	2.60	0.00	6.77	0.00	4.10	0.33	0.00	0.00	0.05	0.01
44	L812430 XLR	0.00976	0.0253	0.59	1.00	0.00	18.7	0.00	6.9	0.239	0.00	0.00044	0.053	0.00113
45	L1195890 XLR	0.00	0.00	0.15	2.21	0.00	5.50	0.00	3.98	0.33	0.00	0.00	0.02	0.01
46	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		1.38			0.01	0.02

	A	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
1	File	Vanadium (V)Total mg/L	Zinc (Zn)Total mg/L	Aluminum (Al)Dissolved mg/L	Antimony (Sb)Dissolved mg/L	Arsenic (As)Dissolved mg/L	Barium (Ba)Dissolved mg/L	Beryllium (Be)Dissolved mg/L	Bismuth (Bi)Dissolved mg/L	Boron (B)Dissolved mg/L	Cadmium (Cd)Dissolved mg/L	Calcium (Ca)Dissolved mg/L	Chromium (Cr)Dissolved mg/L	Cobalt (Co)Dissolved mg/L
2	L1339478 XLR	0.12	1.26	0.07	0.00	0.04	0.05	0.00	0.00	0.03	0.00	32.80	0.00	0.00
3	L1306318 XLR	0.09	1.01	1.35	0.00	0.10	0.06	0.00	0.00	0.03	0.00	32.00	0.00	0.00
4	app b tables B1 to B3	0.02	0.74	0.02	0.01	0.62	0.01	0.00	0.05	0.05	0.00	70.50	0.00	0.00
5	L1016937 XLR	0.01	0.13	0.01	0.01	0.03	0.06	0.00	0.00	0.01	0.00	62.80	0.00	0.00
6	L1048234 XLR	0.01	0.10	0.08	0.01	0.04	0.06	0.00	0.00	0.01	0.00	55.90	0.00	0.00
7	L798225 XLR	0.00	0.0076	0.00	0.00013	0.00087	0.00299	0.00	0.00	0.01	0.00	18.5	0.00	0.00
8	app b tables B1 to B3	0.02	0.03	0.01	0.00	0.10	0.03	0.00	0.05	0.05	0.00	9.79	0.00	0.00
9	app b tables B1 to B3	0.02	0.02	0.01	0.00	0.11	0.03	0.00	0.05	0.05	0.00	8.42	0.00	0.00
10	L1048234 XLR	0.01	0.05	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	82.70	0.00	0.00
11	L1016937 XLR	0.01	0.03	0.01	0.00	0.00	0.11	0.00	0.00	0.01	0.00	82.90	0.00	0.00
12	L812430 XLR	0.0032	0.0271	0.0017	0.00015	0.00095	0.00276	0.00	0.00	0.01	0.00	12.2	0.00	0.00
13	L1499179 XLR	0.00	0.04	0.10	0.00	0.03	0.08	0.00	0.00	0.01	0.00	42.40	0.00	0.00
14	L1499179 XLR	0.01	0.04	0.00	0.00	3.39	0.01	0.00	0.00	0.01	0.00	142.00	0.00	0.00
15	L1008190 XLR	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	9.83	0.00	0.00
16	L946390 XLR	0.01	0.04	1.02	0.00	0.03	0.01	0.00		0.05	0.00	23.40	0.00	0.00
17	app b tables B1 to B3	0.02	0.01	0.20	0.00	0.16	0.01	0.00	0.05	0.05	0.00	15.00	0.00	0.00
18	L1016937 XLR	0.00	0.02	0.01	0.00	3.33	0.01	0.00	0.00	0.01	0.00	141.00	0.00	0.00
19	L1274727 XLR	0.01	0.02	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	21.40	0.00	0.00
20	L1535070 XLR	0.00	0.03	0.00	0.00	0.17	0.05	0.00	0.00	0.01	0.00	68.20	0.00	0.00
21	L1094446 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	43.80	0.00	0.00
22	L1226369 XLR	0.01	0.04	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	41.60	0.00	0.00
23	L1094446 XLR	0.01	0.02	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	20.20	0.00	0.00
24	L1125898 XLR	0.01	0.03	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	21.50	0.00	0.00
25	L1048234 XLR	0.00	0.02	0.01	0.00	3.36	0.01	0.00	0.00	0.01	0.00	144.00	0.00	0.00
26	L923152 XLR	0.00	0.04	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	18.70	0.00	0.00
27	L1016937 XLR	0.00	0.02	0.01	0.00	0.03	0.01	0.00	0.00	0.01	0.00	18.40	0.00	0.00
28	L946390 XLR	0.00	0.01	0.00	0.00	0.00	0.01	0.00		0.05	0.00	17.50	0.00	0.00
29	L1306318 XLR	0.00	0.02	0.00	0.00	0.15	0.06	0.00	0.00	0.01	0.00	36.10	0.00	0.00
30	app b tables B1 to B3	0.02	0.04	0.01	0.00	0.91	0.01	0.00	0.05	0.05	0.00	69.10	0.00	0.00
31	L1380836 XLR	0.00	0.03	0.00	0.00	0.03	0.07	0.00	0.00	0.01	0.00	38.50	0.00	0.00
32	app b tables B1 to B3	0.02	0.00	0.01	0.01	0.04	0.02	0.00	0.05	0.05	0.00	41.20	0.00	0.00
33	L1499179 XLR	0.00	0.01	0.00	0.00	0.09	0.05	0.00	0.00	0.01	0.00	47.00	0.00	0.00
34	L812430 XLR	0.0019	0.0185	0.0075	0.00026	0.00615	0.00696	0.00	0.00	0.01	0.00	57.4	0.00	0.00
35	L1535070 XLR	0.00	0.01	0.00	0.00	0.15	0.06	0.00	0.00	0.01	0.00	33.90	0.00	0.00
36	L1048234 XLR	0.00	0.02	0.01	0.00	0.04	0.00	0.00	0.00	0.01	0.00	15.40	0.00	0.00
37	L1048234 XLR	0.00	0.04	0.00	0.00	2.00	0.01	0.00	0.00	0.01	0.00	204.00	0.00	0.00
38	L1453356 XLR	0.00	0.01	0.59	0.00	0.17	0.06	0.00	0.00	0.01	0.00	34.50	0.00	0.00
39	L812430 XLR	0.00	0.0088	0.0026	0.0192	0.0828	0.0213	0.00	0.00	0.01	0.00	92.7	0.00	0.00127
40	L1073407 XLR	0.00	0.08	0.00	0.00	0.39	0.02	0.00	0.00	0.01	0.00	45.30	0.00	0.00
41	app b tables B1 to B3	0.02	0.01	0.05	0.00	0.08	0.03	0.00	0.05	0.05	0.00	8.96	0.00	0.00
42	L1306318 XLR	0.00	0.01	0.00	0.00	0.00	0.13	0.00	0.00	0.01	0.00	81.40	0.00	0.00
43	L1086893 XLR	0.00	0.03	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	76.90	0.00	0.00
44	L812430 XLR	0.0012	0.025	0.0027	0.0312	0.0862	0.0192	0.00	0.00	0.01	0.000036	24.2	0.00	0.00146
45	L1195890 XLR	0.00	0.01	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	79.50	0.00	0.00
46	app b tables B1 to B3	0.02	0.00	0.63	0.00	0.03	0.02	0.00	0.05	0.01	0.00	41.60	0.00	0.00

	A	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU
1	File	Copper (Cu)Dissolved mg/L	Iron (Fe)Dissolved mg/L	Lead (Pb)Dissolved mg/L	Lithium (Li)Dissolved mg/L	Magnesium (Mg)Dissolved mg/L	Manganese (Mn)Dissolved mg/L	Mercury (Hg)Dissolved mg/L	Molybdenum (Mo)Dissolved mg/L	Nickel (Ni)Dissolved mg/L	Phosphorus (P)Dissolved mg/L	Potassium (K)Dissolved mg/L	Selenium (Se)Dissolved mg/L
2	L1339478 XLR	0.00	0.06	0.00	0.02	39.90	0.00		0.01	0.00	0.15	2.84	0.00
3	L1306318 XLR	0.00	0.73	0.00	0.02	39.10	0.03	0.00	0.01	0.00	0.15	2.57	0.00
4	app b tables B1 to B3	0.00	0.02	0.00		16.70	0.15		0.00	0.00	0.15	2.07	0.00
5	L1016937 XLR	0.00	0.40	0.00	0.02	35.20	0.05	0.00	0.00	0.00	0.15	2.80	0.00
6	L1048234 XLR	0.00	0.14	0.00	0.02	33.80	0.05	0.00	0.00	0.00	0.15	2.80	0.00
7	L798225 XLR	0.00033	0.02	0.00	0.00	24.8	0.00137		0.000675	0.00	0.15	1.00	0.00
8	app b tables B1 to B3	0.00	0.02	0.00		1.59	0.01		0.00	0.00	0.15	0.61	0.00
9	app b tables B1 to B3	0.00	0.02	0.00		1.36	0.01		0.00	0.00	0.15	1.74	0.00
10	L1048234 XLR	0.00	0.02	0.00	0.01	30.20	0.01	0.00	0.00	0.00	0.15	2.20	0.00
11	L1016937 XLR	0.00	0.02	0.00	0.01	28.10	0.01	0.00	0.00	0.00	0.15	2.30	0.00
12	L812430 XLR	0.00026	0.02	0.00	0.00	13	0.0023	0.00	0.000711	0.00	0.15	1.00	0.00
13	L1499179 XLR	0.00	0.09	0.00	0.01	24.70	0.01	0.00	0.00	0.00	0.15	2.47	0.00
14	L1499179 XLR	0.00	8.65	0.00	0.20	34.40	0.76	0.00	0.00	0.00	0.15	5.18	0.00
15	L1008190 XLR	0.00	0.02	0.00	0.00	10.70	0.00	0.00	0.00	0.00	0.15	1.00	0.00
16	L946390 XLR	0.00	0.94	0.00	0.04	13.50	0.01	0.00	0.00	0.00		2.40	0.00
17	app b tables B1 to B3	0.00	0.02	0.00		2.48	0.01		0.01	0.00	0.15	0.90	0.00
18	L1016937 XLR	0.00	10.60	0.00	0.17	31.80	0.72	0.00	0.00	0.00	0.15	5.60	0.00
19	L1274727 XLR	0.00	0.01	0.00	0.04	12.40	0.00	0.00	0.00	0.00	0.15	1.61	0.00
20	L1535070 XLR	0.00	0.13	0.00	0.03	66.70	0.23		0.00	0.00	0.15	2.23	0.00
21	L1094446 XLR	0.00	0.43	0.00	0.03	8.85	0.11	0.00	0.00	0.00	0.15	2.32	0.00
22	L1226369 XLR	0.00	0.53	0.00	0.03	8.76	0.10	0.00	0.00	0.00	0.15	2.28	0.00
23	L1094446 XLR	0.00	0.02	0.00	0.04	11.50	0.00	0.00	0.00	0.00	0.15	1.53	0.00
24	L1125898 XLR	0.00	0.02	0.00	0.04	11.90	0.00	0.00	0.00	0.00	0.15	1.58	0.00
25	L1048234 XLR	0.00	9.29	0.00	0.20	35.40	0.80	0.00	0.00	0.00	0.15	5.40	0.00
26	L923152 XLR	0.00	0.02	0.00	0.04	10.70	0.01	0.00	0.00	0.00	0.15	2.10	0.00
27	L1016937 XLR	0.00	0.02	0.00	0.04	10.20	0.00	0.00	0.00	0.00	0.15	1.00	0.00
28	L946390 XLR	0.00	0.02	0.00	0.00	28.20	0.00	0.00	0.00	0.00		1.00	0.00
29	L1306318 XLR	0.00	0.03	0.00	0.02	43.30	0.07	0.00	0.01	0.00	0.15	2.11	0.00
30	app b tables B1 to B3	0.00	0.08	0.00		16.60	0.19		0.00	0.00	0.15	1.45	0.00
31	L1380836 XLR	0.00	0.01	0.00	0.01	24.10	0.02	0.00	0.00	0.00	0.15	1.89	0.00
32	app b tables B1 to B3	0.00	0.02	0.00		3.76	0.03		0.02	0.00	0.15	0.80	0.00
33	L1499179 XLR	0.00	0.11	0.00	0.01	34.10	0.04	0.00	0.00	0.00	0.15	1.38	0.00
34	L812430 XLR	0.00012	0.02	0.00	0.0074	1.79	0.0607	0.00	0.00286	0.00	0.15	1.00	0.00
35	L1535070 XLR	0.00	0.10	0.00	0.02	42.30	0.06		0.01	0.00	0.15	1.93	0.00
36	L1048234 XLR	0.00	0.02	0.00	0.04	8.95	0.00	0.00	0.00	0.00	0.15	1.00	0.00
37	L1048234 XLR	0.00	0.03	0.00	0.02	33.50	1.03	0.00	0.03	0.01	0.15	3.40	0.00
38	L1453356 XLR	0.00	0.68	0.00	0.02	44.10	0.07	0.00	0.00	0.00	0.15	2.16	0.00
39	L812430 XLR	0.00	0.02	0.00	0.00	20.3	0.326	0.00	0.00432	0.00705	0.15	3.7	0.00
40	L1073407 XLR	0.00	0.09	0.00	0.01	7.39	0.04	0.00	0.01	0.00	0.15	1.00	0.00
41	app b tables B1 to B3	0.00	0.06	0.00		1.52	0.00		0.00	0.00	0.15	0.76	0.00
42	L1306318 XLR	0.00	0.01	0.00	0.01	29.30	0.00	0.00	0.00	0.00	0.15	2.24	0.00
43	L1086893 XLR	0.00	0.02	0.00	0.01	28.80	0.00	0.00	0.00	0.00	0.15	2.30	0.00
44	L812430 XLR	0.004	0.02	0.00	0.0057	5.15	0.302	0.00	0.00832	0.0111	0.15	1.00	0.00
45	L1195890 XLR	0.00	0.01	0.00	0.01	30.40	0.00	0.00	0.00	0.00	0.15	2.06	0.00
46	app b tables B1 to B3	0.00	0.02	0.00		3.92	0.03		0.02	0.00	0.15	0.46	0.00

APPENDIX F:
Compiled Groundwater Monitoring Data – 1995-2016

	A	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE
1	File	Silicon (Si)Dissolved mg/L	Silver (Ag)Dissolved mg/L	Sodium (Na)Dissolved mg/L	Strontium (Sr)Dissolved mg/L	Thallium (Tl)Dissolved mg/L	Tin (Sn)Dissolved mg/L	Titanium (Ti)Dissolved mg/L	Uranium (U)Dissolved mg/L	Vanadium (V)Dissolved mg/L	Zinc (Zn)Dissolved mg/L
2	L1339478 XLR	6.75	0.00	2.81	0.33	0.00	0.00	0.01	0.01	0.00	0.01
3	L1306318 XLR	8.05	0.00	2.29	0.31	0.00	0.00	0.03	0.01	0.00	0.00
4	app b tables B1 to B3		0.00	4.72	0.56			0.01	0.00	0.02	0.00
5	L1016937 XLR	8.44	0.00	5.20	0.42	0.00	0.00	0.02	0.01	0.00	0.01
6	L1048234 XLR	5.96	0.00	4.30	0.39	0.00	0.00	0.01	0.01	0.00	0.01
7	L798225 XLR	4.43	0.00	1.00	0.118	0.00	0.00	0.01	0.000511	0.00	0.0014
8	app b tables B1 to B3		0.00	1.89	0.07			0.005	0.00	0.02	0.00
9	app b tables B1 to B3		0.00	2.21	0.06			0.005	0.00	0.02	0.00
10	L1048234 XLR	5.08	0.00	4.10	0.33	0.00	0.00	0.01	0.01	0.00	0.00
11	L1016937 XLR	4.82	0.00	4.20	0.30	0.00	0.00	0.01	0.01	0.00	0.00
12	L812430 XLR	4.73	0.00	1.00	0.0874	0.00	0.00	0.01	0.000134	0.00	0.0011
13	L1499179 XLR	6.12	0.00	3.24	0.28	0.00	0.00	0.01	0.00	0.00	0.01
14	L1499179 XLR	6.88	0.00	5.94	0.61	0.00	0.00	0.01	0.00	0.00	0.00
15	L1008190 XLR	5.21	0.00	1.00	0.07	0.00	0.00	0.01	0.00	0.00	0.00
16	L946390 XLR		0.00	2.80		0.00	0.00	0.07	0.00	0.00	0.01
17	app b tables B1 to B3		0.00	8.92	0.09			0.01	0.01	0.02	0.00
18	L1016937 XLR	6.94	0.00	6.40	0.57	0.00	0.00	0.01	0.00	0.00	0.00
19	L1274727 XLR	6.20	0.00	2.71	0.13	0.00	0.00	0.01	0.00	0.00	0.01
20	L1535070 XLR	6.38	0.00	2.98	0.54	0.00	0.00	0.01	0.01	0.00	0.00
21	L1094446 XLR	6.92	0.00	3.26	0.15	0.00	0.00	0.01	0.00	0.00	0.00
22	L1226369 XLR	6.77	0.00	3.16	0.17	0.00	0.00	0.01	0.00	0.00	0.00
23	L1094446 XLR	6.22	0.00	2.58	0.12	0.00	0.00	0.01	0.00	0.00	0.00
24	L1125898 XLR	6.09	0.00	2.62	0.13	0.00	0.00	0.01	0.00	0.00	0.01
25	L1048234 XLR	6.92	0.00	6.50	0.62	0.00	0.00	0.01	0.00	0.00	0.00
26	L923152 XLR	6.24	0.00	2.80	0.10	0.00	0.00	0.01	0.00	0.00	0.01
27	L1016937 XLR	6.02	0.00	2.70	0.10	0.00	0.00	0.01	0.00	0.00	0.01
28	L946390 XLR		0.00	1.00		0.00	0.00	0.01	0.00	0.00	0.00
29	L1306318 XLR	6.55	0.00	2.37	0.33	0.00	0.00	0.01	0.01	0.00	0.01
30	app b tables B1 to B3		0.00	4.14	0.54			0.01	0.01	0.02	0.01
31	L1380836 XLR	4.39	0.00	3.01	0.26	0.00	0.00	0.01	0.00	0.00	0.01
32	app b tables B1 to B3		0.00	5.20	1.09			0.01	0.01	0.02	0.00
33	L1499179 XLR	4.41	0.00	2.97	0.35	0.00	0.00	0.01	0.01	0.00	0.00
34	L812430 XLR	7.34	0.00	2.5	0.319	0.00	0.00034	0.01	0.000298	0.00	0.0013
35	L1535070 XLR	6.00	0.00	2.13	0.31	0.00	0.00	0.01	0.01	0.00	0.00
36	L1048234 XLR	6.45	0.00	2.90	0.08	0.00	0.00	0.01	0.00	0.00	0.01
37	L1048234 XLR	4.88	0.00	14.30	1.06	0.00	0.00	0.01	0.04	0.00	0.01
38	L1453356 XLR	8.16	0.00	2.36	0.33	0.00	0.00	0.03	0.01	0.00	0.00
39	L812430 XLR	3.77	0.00	4.4	0.608	0.00	0.00033	0.01	0.00732	0.00	0.003
40	L1073407 XLR	3.83	0.00	5.80	0.22	0.00	0.00	0.01	0.00	0.00	0.04
41	app b tables B1 to B3		0.00	2.81	0.06			0.01	0.00	0.02	0.00
42	L1306318 XLR	4.79	0.00	4.11	0.33	0.00	0.00	0.01	0.01	0.00	0.01
43	L1086893 XLR	5.16	0.00	4.10	0.33	0.00	0.00	0.01	0.01	0.00	0.02
44	L812430 XLR	12.6	0.00	6.6	0.213	0.00	0.00	0.01	0.000543	0.00	0.0297
45	L1195890 XLR	4.98	0.00	3.81	0.33	0.00	0.00	0.01	0.01	0.00	0.00
46	app b tables B1 to B3		0.00	6.85	1.29			0.01	0.02	0.02	0.00

	A	B	C	D	E	F
1	File	Project	Report To	ALS File No.	Date Received	Date
47	app b tables B1 to B3					
48	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
49	L1144418 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1144418	08/05/2012	23/05/2012
50	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
51	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
52	L1799287 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1799287	15/07/2016	29/07/2016
53	app b tables B1 to B3					
54	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
55	L1108531 XLR	123110377 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1108531	28/01/2012	13/02/2012
56	L1274727 XLR	GROUND WATER	Christiane Buie, STRATAGOLD CORPORATION	L1274727	04/03/2013	15/03/2013
57	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
58	L1380836 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1380836	21/10/2013	05/02/2015
59	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
60	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
61	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
62	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
63	L1341520 XLR	GROUNDWATER	Todd Goodsell Environmental Manager, STRATAGOLD CORPORATION	L1341520	26/07/2013	05/02/2015
64	L1144418 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1144418	08/05/2012	23/05/2012
65	app b tables B1 to B3					
66	L798225 XLR	1053550.02/C2404	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L798225	28/07/2009	12/08/2009
67	L815386 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L815386	08/09/2009	18/09/2009
68	app b tables B1 to B3					
69	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	01/09/2012
70	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
71	L1144418 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1144418	08/05/2012	23/05/2012
72	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
73	L1380836 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1380836	21/10/2013	05/02/2015
74	app b tables B1 to B3					
75	L1535070 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1535070	20/10/2014	30/10/2014
76	L798225 XLR	1053550.02/C2404	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L798225	28/07/2009	12/08/2009
77	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
78	L1274727 XLR	GROUND WATER	Christiane Buie, STRATAGOLD CORPORATION	L1274727	04/03/2013	15/03/2013
79	L798225 XLR	1053550.02/C2404	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L798225	28/07/2009	12/08/2009
80	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
81	L815386 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L815386	08/09/2009	18/09/2009
82	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
83	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
84	L1274727 XLR	GROUND WATER	Christiane Buie, STRATAGOLD CORPORATION	L1274727	04/03/2013	15/03/2013
85	L1341520 XLR	GROUNDWATER	Todd Goodsell Environmental Manager, STRATAGOLD CORPORATION	L1341520	26/07/2013	05/02/2015
86	L1380836 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1380836	21/10/2013	05/02/2015
87	L1535070 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1535070	20/10/2014	30/10/2014
88	L1339478 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1339478	29/07/2013	05/02/2015
89	L1535070 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1535070	20/10/2014	30/10/2014
90	L1274727 XLR	GROUND WATER	Christiane Buie, STRATAGOLD CORPORATION	L1274727	04/03/2013	15/03/2013
91	L1108531 XLR	123110377 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1108531	28/01/2012	13/02/2012

	A	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	File	Well ID	Location	Date Sampled	Quarter 1-Jan-Mar, 2-Apr-Jun, 3 Jly-Sep, 4 Oct-Dec	Time Sampled	ALS Sample ID	Matrix	Conductivity uS/cm	Hardness (as CaCO3) mg/L	pH	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity NTU	Acidity (as CaCO3) mg/L
47	app b tables B1 to B3	DH95-105	Suttles Gulch	22/07/1996	Q3				496.00	187.00	7.89	95.00	364.00	29.00	
48	L1048234 XLR	MW10-PG1	Platinum Gulch	18/08/2011	Q3	20:30	L10482349	Water	623.00	329.00	8.02	93.20	433.00	28.60	
49	L1144418 XLR	MW10-AG6	Ann Gulch	06/05/2012	Q2	11:00	L11444186	Water	105.00	45.20	7.70	91.80	73.00	49.70	
50	L1073407 XLR	MW10-AG6	Ann Gulch	16/10/2011	Q4	20:00	L10734075	Water	170.00		7.60	90.00	106.00	40.70	
51	L923152 XLR	MW09-DG4	Dublin Gulch	19/08/2010	Q3	08:00	L92315211	Water	549.00	298.00	7.69	89.60	368.00	30.30	
52	L1799287 XLR	MW09-OG2	Olive Gulch	14/07/2016	Q3	0.92	L17992871	Water	40.00	15.50	7.28	89.30	24.10	33.50	
53	app b tables B1 to B3	DH95-108	Platinum Gulch	21/08/1995	Q3				201.00	88.60	7.84	85.00	133.00	26.70	
54	L1048234 XLR	MW10-AG3A	Ann Gulch	18/08/2011	Q3	14:15	L10482346	Water	289.00	140.00	8.13	84.50	191.00	25.80	
55	L1108531 XLR	MW09-DG4	Dublin Gulch	25/01/2012	Q1	16:30	L11085311	Water	570.00	320.00	7.98	84.20	357.00	43.60	
56	L1274727 XLR	MW96-13A	Eagle Pup	01/03/2013	Q1	15:50	L12747273	Water	449.00	275.00	8.10	78.70	229.00	45.50	
57	L1016937 XLR	MW10-PG1	Platinum Gulch	09/06/2011	Q2	17:50	L10169379	Water	591.00	333.00	7.95	77.30	394.00	25.30	
58	L1380836 XLR	MW09-DG4	Dublin Gulch	19/10/2013	Q4	08:54	L13808361	Water	474.00	343.00	7.83	76.70	372.00	50.80	2.90
59	L1086893 XLR	MW10-PG1	Platinum Gulch	17/11/2011	Q4	16:50	L10868936	Water	619.00	319.00	8.30	76.20	413.00	25.80	
60	L1094446 XLR	MW10-PG1	Platinum Gulch	08/12/2011	Q4	10:30	L10944466	Water	593.00	331.00	8.07	72.50	417.00	20.80	
61	L1086893 XLR	MW10-AG6	Ann Gulch	17/11/2011	Q4	11:45	L10868933	Water	196.00	95.00	8.07	72.20	116.00	38.60	
62	L1125898 XLR	MW10-PG1	Platinum Gulch	18/03/2012	Q1	16:30	L11258989	Water	590.00	312.00	8.21	71.30	400.00	36.70	
63	L1341520 XLR	MW09-DG4	Dublin Gulch	25/07/2013	Q3	21:45	L13415201	Water	587.00	332.00	7.28	70.70	361.00	31.60	
64	L1144418 XLR	MW10-PG1	Platinum Gulch	07/05/2012	Q2	09:30	L11444188	Water	591.00	334.00	7.78	69.80	419.00	23.10	
65	app b tables B1 to B3	DH95-141	Bawn Boy Gulch	24/05/1996	Q2				142.00	62.10	7.64	67.00	87.00	26.80	
66	L798225 XLR	MW96-8	Bawn Boy Gulch	27/07/2009	Q3	10:00	L7982252	Water	62.5	24	7.38	66.5	49	30.8	
67	L815386 XLR	MW09-OG2	Olive Gulch	04/09/2009	Q3	00:00	L8153862	Water	332	169	7.3	66.3	205	31.1	
68	app b tables B1 to B3	DH95-138	Bawn Boy Gulch	27/09/1995	Q3				60.90	25.00	7.64	65.00	39.00	30.80	
69	L1195890 XLR	MW10-AG6	Ann Gulch	15/08/2012	Q3	13:45	L11958907	Water	143.00	81.00	7.80	63.30	91.00	38.40	
70	L1125898 XLR	MW09-DG6	Dublin Gulch	18/03/2012	Q1	16:00	L11258982	Water	909.00	510.00	7.98	58.00	692.00	120.00	
71	L1144418 XLR	MW09-DG4	Dublin Gulch	06/05/2012	Q2	12:00	L11444181	Water	561.00	326.00	7.71	57.80	361.00	22.10	
72	L946390 XLR	MW09-DG4	Dublin Gulch	20/10/2010	Q4	10:00	L9463908	Water	532.00	318.00	7.80	56.80	343.00	25.40	
73	L1380836 XLR	MW10-AG3A	Ann Gulch	19/10/2013	Q4	12:00	L13808362	Water	244.00	131.00	8.08	55.30	161.00	28.20	1.60
74	app b tables B1 to B3	DH95-106	Suttles Gulch	22/05/1996	Q2				287.00	134.00	7.78	55.00	203.00	15.30	
75	L1535070 XLR	MW10-DG6	Dublin Gulch	19/10/2014	Q4	09:30	L15350706	Water	837.00	489.00	7.06	54.00	601.00	69.40	192.00
76	L798225 XLR	DH95-152	Dublin Gulch	27/07/2009	Q3	12:10	L7982256	Water	779	409	8.08	53	463	54.7	
77	L923152 XLR	MW10-DG6	Dublin Gulch	19/08/2010	Q3	13:00	L9231524	Water	694.00	396.00	7.16	50.60	522.00	69.30	
78	L1274727 XLR	MW10-AG5	Ann Gulch	28/02/2013	Q1	17:15	L12747277	Water	195.00	79.40	6.72	46.70	133.00	65.70	
79	L798225 XLR	MW96-15B	Eagle Pup	27/07/2009	Q3	11:30	L7982255	Water	453	260	8.17	44	231	50.8	
80	L829307 XLR	MW96-19	Headwaters	05/10/2009	Q4	12:00	L8293074	Water	565.00	313.00	7.60	43.30	391.00	47.70	
81	L815386 XLR	MW09-DG4	Dublin Gulch	04/09/2009	Q3	00:00	L8153863	Water	545	310	7.31	42.8	342	11.5	
82	L1125898 XLR	MW09-DG4	Dublin Gulch	18/03/2012	Q1	16:15	L11258981	Water	556.00	310.00	8.14	42.70	347.00	19.70	
83	L812430 XLR	MW96-9B	Bawn Boy Gulch	27/08/2009	Q3	00:00	L8124303	Water	53.4	23.2	6.94	42.3	44		
84	L1274727 XLR	MW10-AG3A	Ann Gulch	28/02/2013	Q1	16:35	L12747279	Water	267.00	132.00	8.03	42.00	169.00	21.80	
85	L1341520 XLR	MW10-PG1	Platinum Gulch	25/07/2013	Q3	21:00	L13415202	Water	574.00	305.00	7.66	40.70	377.00	11.20	
86	L1380836 XLR	MW96-15A	Eagle Pup	19/10/2013	Q4	11:31	L13808367	Water	352.00	225.00	8.10	40.00	212.00	30.80	2.60
87	L1535070 XLR	MW10-AG3A	Ann Gulch	19/10/2014	Q4	12:00	L15350702	Water	282.00	139.00	7.88	39.30	161.00	17.50	93.90
88	L1339478 XLR	MW09-DG1	Dublin Gulch	26/07/2013	Q3	10:30	L13394782	Water	361.00	201.00	7.54	38.70	228.00	15.60	
89	L1535070 XLR	MW10-PG1	Platinum Gulch	18/10/2014	Q4	15:30	L15350703	Water	620.00	327.00	7.77	38.00	401.00	20.20	180.00
90	L1274727 XLR	MW10-PG1	Platinum Gulch	01/03/2013	Q1	16:50	L12747278	Water	573.00	308.00	7.83	36.70	391.00	11.30	
91	L1108531 XLR	MW09-DG6	Dublin Gulch	26/01/2012	Q1	08:30	L11085312	Water	914.00	549.00	7.58	35.60	663.00	50.70	

APPENDIX F:

Compiled Groundwater Monitoring Data – 1995-2016

	A	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	File	Alkalinity, Bicarbonate (as CaCO3) mg/L	Alkalinity, Carbonate (as CaCO3) mg/L	Alkalinity, Hydroxide (as CaCO3) mg/L	Alkalinity, Total (as CaCO3) mg/L	Ammonia as N mg/L	Bromide (Br) mg/L	Chloride (Cl) mg/L	Fluoride (F) mg/L	Nitrate (as N) mg/L	Nitrite (as N) mg/L	Total Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Ortho Phosphate as P mg/L	Total Dissolved Phosphate As P mg/L
47	app b tables B1 to B3				129.00	0.01		0.25	0.14	0.00	0.00			0.02	
48	L1048234 XLR				180.00	0.03	0.03	0.25	0.50	0.01	0.00	0.26	0.33	0.19	0.16
49	L1144418 XLR				46.00	0.00	0.03	0.25	0.34	0.16	0.00	0.16	0.31	0.01	0.01
50	L1073407 XLR				74.90		0.03	0.25	0.48	0.18	0.00				
51	L923152 XLR	206.00	1.00	1.00	206.00	0.00	0.03	0.25	0.14	0.11	0.00	0.16	0.27	0.00	0.00
52	L1799287 XLR				20.00	0.00		0.25	0.03	0.14	0.00	0.13	0.27	0.00	0.00
53	app b tables B1 to B3				60.20	0.01		0.60	0.07	0.27	0.00			0.00	
54	L1048234 XLR				101.00	0.03	0.15	0.25	0.28	0.01	0.00	0.27	0.21	0.00	0.00
55	L1108531 XLR				214.00	0.01	0.03	0.25	0.14	0.08	0.00	0.10	0.18	0.00	0.00
56	L1274727 XLR				243.00	0.05		0.25	0.41	0.02	0.00	0.32	0.35	0.00	0.00
57	L1016937 XLR	176.00				0.04	0.03	0.25	0.46	0.00	0.00	0.15	0.15	0.16	0.13
58	L1380836 XLR				240.00	0.06		0.64	0.11	0.38	0.00	0.18	0.56	0.00	0.01
59	L1086893 XLR				176.00	0.03	0.03	0.25	0.50	0.00	0.00	0.06	0.06	0.17	0.10
60	L1094446 XLR	174.00	1.00	1.00	174.00	0.02	0.03	0.25	0.49	0.00	0.00	0.07	0.07	0.04	0.08
61	L1086893 XLR				80.20	0.01	0.03	0.25	0.45	0.19	0.00	0.13	0.32	0.01	0.01
62	L1125898 XLR				187.00	0.03	0.03	0.25	0.49	0.00	0.00	0.07	0.07	0.41	0.50
63	L1341520 XLR				225.00	0.00		1.09	0.12	0.68	0.00			0.00	
64	L1144418 XLR				183.00	0.03	0.03	0.25	0.49	0.00	0.00	0.13	0.13	0.08	0.08
65	app b tables B1 to B3				50.50	0.04		0.25	0.25	0.06	0.02			0.02	
66	L798225 XLR	17.9	1.00	1.00	17.9	0.00	0.03	0.25	0.046	0.0976	0.00	0.03		0.0077	
67	L815386 XLR	103	1.00	1.00	103	0.01	0.03	0.25	0.282	0.0255	0.0043	0.301		0.00	
68	app b tables B1 to B3				23.20			0.50	0.10	0.00	0.10	0.00		0.02	
69	L1195890 XLR				66.60	0.01		0.25	0.37	0.14	0.00	0.12	0.26	0.01	0.01
70	L1125898 XLR				193.00	0.24	0.25	2.50	0.31	0.03	0.01	0.49	0.49	0.00	0.00
71	L1144418 XLR				224.00	0.00	0.03	1.12	0.13	0.49	0.00	0.18	0.68	0.00	0.00
72	L946390 XLR					0.00	0.03	0.25	0.10	0.07	0.00	0.14		0.00	0.00
73	L1380836 XLR				93.50	0.02		0.25	0.28	0.04	0.00	0.12	0.16	0.00	0.00
74	app b tables B1 to B3				100.00	0.02		0.25	0.05	0.00	0.01			0.00	
75	L1535070 XLR					0.19		0.25	0.33	0.00	0.00			0.00	
76	L798225 XLR	313	1.00	1.00	313	0.406	0.03	1.5	0.13	0.262	0.0127	0.607		0.0115	
77	L923152 XLR	135.00	0.50	0.50	135.00	0.15	0.25	2.50	0.23	0.03	0.01	0.30	0.30	0.00	0.00
78	L1274727 XLR				16.90	0.02		0.25	0.25	0.01	0.00	0.21	0.22	0.00	0.00
79	L798225 XLR	241	1.00	1.00	241	0.0077	0.03	0.25	0.372	0.0071	0.00	0.03		0.0058	
80	L829307 XLR				141.00	0.05	0.03	0.25	0.10	0.03	0.00	0.24		0.00	0.00
81	L815386 XLR	205	1.00	1.00	205	0.01	0.03	0.25	0.08	0.116	0.00	0.117		0.00	
82	L1125898 XLR				227.00	0.00	0.03	0.25	0.13	0.06	0.00	0.03	0.06	0.00	0.00
83	L812430 XLR	22.6	1.00	1.00	22.6	0.0297	0.03	0.25	0.025	0.145	0.00	0.159		0.0016	
84	L1274727 XLR				87.10	0.03		0.25	0.27	0.01	0.00	0.16	0.17	0.00	0.00
85	L1341520 XLR				175.00	0.03		0.25	0.48	0.00	0.00			0.08	
86	L1380836 XLR				186.00	0.10		0.25	0.04	0.02	0.00	0.42	0.44	0.00	0.00
87	L1535070 XLR					0.02		0.25	0.25	0.00	0.00			0.00	
88	L1339478 XLR				195.00	0.01		0.25	0.16	0.02	0.00	0.18	0.16	0.00	0.00
89	L1535070 XLR					0.03		0.25	0.46	0.05	0.01			0.10	
90	L1274727 XLR				170.00	0.03		0.25	0.48	0.00	0.00	0.11	0.11	0.32	0.10
91	L1108531 XLR				186.00	0.23	0.25	2.50	0.32	0.03	0.01	0.25	0.25	0.00	0.01

	A	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1	File	Total Phosphate as P mg/L	Sulfate (SO4) mg/L	Anion Sum mg/L	Cation Sum mg/L	Cation Anion Balance mg/L	Cyanide, Weak Acid Diss mg/L	Cyanide, Total mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L	Aluminum (Al)Total mg/L	Antimony (Sb)Total mg/L	Arsenic (As)Total mg/L	Barium (Ba)Total mg/L	Beryllium (Be)Total mg/L
47	app b tables B1 to B3	0.20	133.00					0.00			0.27	0.00	0.61	0.02	0.00
48	L1048234 XLR	0.22	150.00						3.90		0.51	0.00	7.80	0.02	0.00
49	L1144418 XLR	0.06	7.54				0.00	0.00	4.07		1.65	0.00	0.08	0.01	0.00
50	L1073407 XLR		18.00												
51	L923152 XLR	0.03	97.40						1.99		0.28	0.00	0.00	0.12	0.00
52	L1799287 XLR	0.07	1.02	0.43	0.42	1.90			1.94		4.16	0.00	0.01	0.08	0.00
53	app b tables B1 to B3	0.06	33.80					0.01			0.42	0.00	0.02	0.17	0.00
54	L1048234 XLR	0.04	49.10						1.80		1.13	0.00	0.01	0.02	0.00
55	L1108531 XLR	0.04	96.30						1.77		0.70	0.00	0.01	0.12	0.00
56	L1274727 XLR	0.08	18.50				0.00	0.00	3.79		0.55	0.00	0.66	0.08	0.00
57	L1016937 XLR	0.23	147.00						1.53		2.11	0.00	8.78	0.04	0.00
58	L1380836 XLR	0.02	101.00	6.94	7.09	1.00			2.07		1.11	0.00	0.01	0.14	0.00
59	L1086893 XLR	0.15	149.00						1.01		2.12	0.00	7.76	0.04	0.00
60	L1094446 XLR	0.18	148.00						36.10		1.58	0.00	8.39	0.03	0.00
61	L1086893 XLR	0.04	21.60						1.34		1.27	0.00	0.06	0.01	0.00
62	L1125898 XLR	0.50	143.00				0.00	0.00	1.16		1.26	0.00	8.56	0.02	0.00
63	L1341520 XLR	0.05	99.10	6.64	6.88	1.80			3.71		0.95	0.00	0.01	0.13	0.00
64	L1144418 XLR	0.19	148.00				0.00	0.00	1.07		2.23	0.00	8.60	0.04	0.00
65	app b tables B1 to B3	0.05	12.70					0.00			4.69	0.00	0.20	0.01	0.00
66	L798225 XLR	0.066	8.99						0.92		0.0085	0.00055	0.0709	0.0267	0.00
67	L815386 XLR	0.049	67.7						2.17		0.495	0.0026	0.0215	0.0849	0.00
68	app b tables B1 to B3	0.18	5.40					0.01			0.80	0.00	0.08	0.02	0.00
69	L1195890 XLR	0.04	13.30				0.00	0.00	2.94		1.77	0.00	0.07	0.01	0.00
70	L1125898 XLR	0.13	339.00				0.00	0.00	2.80		0.96	0.00	3.13	0.01	0.00
71	L1144418 XLR	0.03	98.60				0.00	0.00	1.53		0.27	0.00	0.00	0.14	0.00
72	L946390 XLR	0.02	91.80						2.96		0.19	0.00	0.00	0.13	0.00
73	L1380836 XLR	0.01	48.80	2.90	2.85	1.00			2.03		0.87	0.00	0.02	0.01	0.00
74	app b tables B1 to B3	0.02	51.90					0.00			0.19	0.00	0.03	0.03	0.00
75	L1535070 XLR	0.05	290.00	9.87	10.70	3.80			1.53		0.29	0.00	3.14	0.01	0.00
76	L798225 XLR	0.101	125						5.74		0.112	0.00077	0.53	0.0236	0.00
77	L923152 XLR	0.05	246.00						2.24		0.52	0.00	2.27	0.02	0.00
78	L1274727 XLR	0.06	73.30				0.00	0.00	1.78		0.12	0.05	0.89	0.01	0.00
79	L798225 XLR	0.047	17.8						2.14		0.0302	0.00064	0.117	0.0516	0.00
80	L829307 XLR	0.10	165.00						8.18		0.42	0.02	0.99	0.03	0.00
81	L815386 XLR	0.0228	94.1						1.43		0.223	0.00092	0.00496	0.12	0.00
82	L1125898 XLR	0.02	96.50				0.00	0.00	1.74		0.88	0.00	0.01	0.13	0.00
83	L812430 XLR	0.0428	2.51						0.8		0.802	0.00203	0.0673	0.0397	0.00
84	L1274727 XLR	0.02	48.00				0.00	0.00	2.00		1.02	0.00	0.03	0.01	0.00
85	L1341520 XLR	0.20	144.00	6.52	6.51	0.00			2.01		1.01	0.00	8.26	0.02	0.00
86	L1380836 XLR	0.08	9.49	3.92	4.77	9.70			9.96		0.35	0.01	0.44	0.08	0.00
87	L1535070 XLR	0.00	47.70	2.88	2.99	1.80			1.30		0.29	0.00	0.01	0.01	0.00
88	L1339478 XLR	0.04	37.00	4.68	4.22	5.10			3.45		0.45	0.00	0.12	0.09	0.00
89	L1535070 XLR	0.09	155.00	6.85	6.94	0.70			3.68		0.71	0.00	8.18	0.02	0.00
90	L1274727 XLR	0.10	143.00				0.00	0.00	2.35		1.10	0.00	8.91	0.02	0.00
91	L1108531 XLR	0.07	329.00						1.63		0.16	0.00	3.12	0.01	0.00

	A	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI
1	File	Bismuth (Bi)Total mg/L	Boron (B)Total mg/L	Cadmium (Cd)Total mg/L	Calcium (Ca)Total mg/L	Chromium (Cr)Total mg/L	Cobalt (Co)Total mg/L	Copper (Cu)Total mg/L	Iron (Fe)Total mg/L	Lead (Pb)Total mg/L	Lithium (Li)Total mg/L	Magnesium (Mg)Total mg/L	Manganese (Mn)Total mg/L	Mercury (Hg)Total mg/L
47	app b tables B1 to B3	0.05	0.05	0.00	69.50	0.00	0.00	0.00	0.43	0.01		16.40	0.21	0.00
48	L1048234 XLR	0.00	0.01	0.00	110.00	0.00	0.00	0.01	0.76	0.00	0.01	10.30	0.18	0.00
49	L1144418 XLR	0.00	0.01	0.00	10.50	0.00	0.00	0.01	3.09	0.00	0.03	6.31	0.02	0.00
50	L1073407 XLR													
51	L923152 XLR	0.00	0.01	0.00	72.20	0.00	0.00	0.00	0.70	0.00	0.01	26.90	0.02	0.00
52	L1799287 XLR	0.00	0.01	0.00	6.47	0.01	0.00	0.01	4.07	0.00	0.01	1.93	0.06	0.00
53	app b tables B1 to B3	0.05	0.05	0.00	30.20	0.00	0.00	0.01	2.43	0.00		4.95	0.10	0.00
54	L1048234 XLR	0.00	0.01	0.00	41.80	0.00	0.00	0.01	2.61	0.00	0.03	9.05	0.13	0.00
55	L1108531 XLR	0.00	0.01	0.00	81.10	0.00	0.00	0.00	1.40	0.00	0.01	28.90	0.03	0.00
56	L1274727 XLR	0.00	0.01	0.00	34.20	0.00	0.00	0.01	3.83	0.01	0.02	44.20	0.30	0.00
57	L1016937 XLR	0.00	0.01	0.00	116.00	0.00	0.00	0.01	2.66	0.00	0.01	11.60	0.19	0.00
58	L1380836 XLR	0.00	0.01	0.00	81.80	0.00	0.00	0.01	2.88	0.00	0.01	32.10	0.04	0.00
59	L1086893 XLR	0.00	0.01	0.00	107.00	0.00	0.00	0.01	2.37	0.00	0.01	11.10	0.19	0.00
60	L1094446 XLR	0.00	0.01	0.00	114.00	0.00	0.00	0.01	1.90	0.00	0.01	11.00	0.18	0.00
61	L1086893 XLR	0.00	0.01	0.00	19.30	0.00	0.00	0.01	2.15	0.00	0.04	11.30	0.01	0.00
62	L1125898 XLR	0.00	0.01	0.00	110.00	0.00	0.00	0.00	1.52	0.00	0.01	10.50	0.17	0.00
63	L1341520 XLR	0.00	0.01	0.00	79.50	0.00	0.00	0.01	2.74	0.00	0.01	31.10	0.05	
64	L1144418 XLR	0.00	0.01	0.00	113.00	0.00	0.00	0.01	2.66	0.00	0.01	11.10	0.19	0.00
65	app b tables B1 to B3	0.05	0.05	0.00	20.10	0.00	0.00	0.00	1.40	0.00		3.75	0.03	0.00
66	L798225 XLR	0.00	0.01	0.00	7.81	0.00	0.00	0.0001	0.02	0.00	0.00	1.06	0.000286	
67	L815386 XLR	0.00	0.01	0.000198	44	0.00125	0.00084	0.0059	0.936	0.00263	0.0073	14.6	0.107	0.00
68	app b tables B1 to B3	0.05	0.05	0.00	8.83	0.01	0.00	0.01	1.00	0.00		1.43	0.03	0.00
69	L1195890 XLR	0.00	0.01	0.00	15.50	0.00	0.00	0.01	2.72	0.00	0.04	9.68	0.02	0.00
70	L1125898 XLR	0.00	0.01	0.00	143.00	0.01	0.00	0.00	11.80	0.00	0.21	35.50	0.88	0.00
71	L1144418 XLR	0.00	0.01	0.00	83.70	0.00	0.00	0.00	0.82	0.00	0.01	29.80	0.01	0.00
72	L946390 XLR		0.05	0.00	75.80	0.00	0.00	0.00	0.54	0.00	0.01	26.80	0.02	0.00
73	L1380836 XLR	0.00	0.01	0.00	38.50	0.00	0.00	0.01	2.33	0.00	0.03	8.38	0.13	0.00
74	app b tables B1 to B3	0.05	0.05	0.00	48.00	0.00	0.00	0.00	0.28	0.00		4.62	0.07	0.00
75	L1535070 XLR	0.00	0.01	0.00	131.00	0.00	0.00	0.00	9.16	0.00	0.19	31.80	0.75	
76	L798225 XLR	0.00	0.011	0.000148	66.1	0.00	0.0003	0.00295	0.901	0.00104	0.0929	57.8	0.0744	
77	L923152 XLR	0.00	0.01	0.00	112.00	0.00	0.00	0.00	7.95	0.00	0.18	28.10	0.70	0.00
78	L1274727 XLR	0.00	0.01	0.00	13.40	0.00	0.00	0.00	12.40	0.00	0.07	11.70	0.40	0.00
79	L798225 XLR	0.00	0.01	0.00	33.6	0.00	0.00	0.00092	0.271	0.000251	0.018	40.9	0.1	
80	L829307 XLR	0.00	0.01	0.00	91.00	0.00	0.00	0.00	3.04	0.01	0.00	20.90	0.37	0.00
81	L815386 XLR	0.00	0.01	0.000038	79.6	0.00142	0.00067	0.00283	0.784	0.00193	0.0117	26.8	0.0684	0.00
82	L1125898 XLR	0.00	0.01	0.00	76.50	0.00	0.00	0.00	2.33	0.00	0.01	27.90	0.04	0.00
83	L812430 XLR	0.00	0.01	0.000049	6.71	0.0019	0.00055	0.00315	1.25	0.00419	0.00	1.4	0.027	0.00
84	L1274727 XLR	0.00	0.01	0.00	40.80	0.00	0.00	0.00	2.47	0.00	0.04	9.10	0.17	0.00
85	L1341520 XLR	0.00	0.01	0.00	110.00	0.00	0.00	0.00	0.76	0.00	0.01	10.60	0.18	
86	L1380836 XLR	0.00	0.01	0.00	48.00	0.00	0.00	0.06	2.96	0.00	0.01	25.90	0.09	0.00
87	L1535070 XLR	0.00	0.01	0.00	38.70	0.00	0.00	0.00	1.19	0.00	0.03	8.39	0.13	
88	L1339478 XLR	0.00	0.01	0.00	39.00	0.00	0.00	0.01	1.49	0.00	0.01	24.30	0.07	
89	L1535070 XLR	0.00	0.01	0.00	109.00	0.00	0.00	0.00	0.70	0.00	0.01	10.80	0.19	
90	L1274727 XLR	0.00	0.01	0.00	107.00	0.00	0.00	0.00	0.85	0.00	0.01	10.90	0.18	0.00
91	L1108531 XLR	0.00	0.01	0.00	142.00	0.00	0.00	0.00	9.49	0.00	0.21	34.20	0.87	0.00

	A	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV
1	File	Molybdenum (Mo)Total mg/L	Nickel (Ni)Total mg/L	Phosphorus (P)Total mg/L	Potassium (K)Total mg/L	Selenium (Se)Total mg/L	Silicon (Si)Total mg/L	Silver (Ag)Total mg/L	Sodium (Na)Total mg/L	Strontium (Sr)Total mg/L	Thallium (Tl)Total mg/L	Tin (Sn)Total mg/L	Titanium (Ti)Total mg/L	Uranium (U)Total mg/L
47	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.57	0.01			0.01
48	L1048234 XLR	0.00	0.00	0.15	2.60	0.00	7.00	0.00	8.20	0.51	0.00	0.00	0.04	0.03
49	L1144418 XLR	0.00	0.00	0.15	2.12	0.00	11.30	0.00	2.88	0.06	0.00	0.00	0.08	0.00
50	L1073407 XLR													
51	L923152 XLR	0.00	0.00	0.15	2.30	0.00	5.15	0.00	3.80	0.32	0.00	0.00	0.01	0.01
52	L1799287 XLR	0.00	0.01	0.15	2.00	0.00	14.50	0.00	2.61	0.05	0.00	0.00	0.35	0.00
53	app b tables B1 to B3	0.00	0.01	0.15		0.00		0.00		0.21			0.01	0.00
54	L1048234 XLR	0.00	0.00	0.15	2.70	0.00	8.69	0.00	3.30	0.16	0.00	0.00	0.05	0.00
55	L1108531 XLR	0.00	0.00	0.15	2.50	0.00	6.08	0.00	4.04	0.33	0.00	0.00	0.04	0.01
56	L1274727 XLR	0.01	0.00	0.15	2.34	0.00	7.64	0.00	2.41	0.33	0.00	0.00	0.02	0.01
57	L1016937 XLR	0.01	0.00	0.15	3.30	0.00	10.80	0.00	8.60	0.54	0.00	0.00	0.13	0.03
58	L1380836 XLR	0.00	0.00	0.15	2.46	0.00	7.39	0.00	3.96	0.35	0.00	0.00	0.06	0.01
59	L1086893 XLR	0.01	0.00	0.15	3.10	0.00	10.80	0.00	8.80	0.52	0.00	0.00	0.14	0.03
60	L1094446 XLR	0.01	0.00	0.15	2.61	0.00	9.71	0.00	7.97	0.58	0.00	0.00	0.09	0.03
61	L1086893 XLR	0.00	0.00	0.15	2.10	0.00	9.36	0.00	2.60	0.12	0.00	0.00	0.06	0.00
62	L1125898 XLR	0.01	0.00	0.15	2.53	0.00	9.98	0.00	7.73	0.54	0.00	0.00	0.06	0.03
63	L1341520 XLR	0.00	0.00	0.15	2.36	0.00	6.25	0.00	4.22	0.35	0.00	0.00	0.04	0.01
64	L1144418 XLR	0.01	0.00	0.15	2.91	0.00	10.40	0.00	8.06	0.56	0.00	0.00	0.08	0.03
65	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		0.14	0.04			0.01
66	L798225 XLR	0.000704	0.00	0.15	1.00	0.00	6.56	0.00	2	0.0483	0.00	0.00	0.01	0.000235
67	L815386 XLR	0.00232	0.00419	0.15	2.1	0.00	7.93	0.000012	4.8	0.17	0.00	0.00028	0.03	0.00213
68	app b tables B1 to B3	0.00	0.01	0.15		0.00		0.00		0.04			0.03	0.00
69	L1195890 XLR	0.00	0.00	0.15	2.22	0.00	13.30	0.00	2.82	0.09	0.00	0.00	0.15	0.00
70	L1125898 XLR	0.00	0.00	0.15	5.54	0.00	8.34	0.00	6.43	0.66	0.00	0.00	0.04	0.00
71	L1144418 XLR	0.00	0.00	0.15	2.32	0.00	5.49	0.00	4.27	0.35	0.00	0.00	0.02	0.01
72	L946390 XLR	0.00	0.00		2.30	0.00		0.00	3.90		0.00	0.00	0.01	0.01
73	L1380836 XLR	0.00	0.00	0.15	2.38	0.00	8.05	0.00	3.09	0.15	0.00	0.00	0.03	0.00
74	app b tables B1 to B3	0.02	0.00	0.15		0.00		0.00		1.77	0.01			0.02
75	L1535070 XLR	0.00	0.00	0.15	4.73	0.00	6.59	0.00	5.38	0.58	0.00	0.00	0.02	0.00
76	L798225 XLR	0.000281	0.0117	0.15	4.5	0.00	7.46	0.000077	21.4	0.65	0.00	0.00505	0.014	0.00306
77	L923152 XLR	0.00	0.00	0.15	5.50	0.00	6.80	0.00	6.20	0.51	0.00	0.00	0.02	0.00
78	L1274727 XLR	0.00	0.01	0.15	1.99	0.00	9.15	0.00	2.83	0.07	0.00	0.00	0.01	0.00
79	L798225 XLR	0.00408	0.00	0.15	1.00	0.00	5.77	0.00	2.2	0.257	0.00	0.00029	0.01	0.00704
80	L829307 XLR	0.00	0.01	0.15	3.70	0.00	4.34	0.00	4.80	0.60	0.00	0.00	0.03	0.01
81	L815386 XLR	0.000618	0.00175	0.15	2.2	0.00	5.31	0.000015	3.4	0.303	0.00	0.00064	0.022	0.00677
82	L1125898 XLR	0.00	0.00	0.15	2.33	0.00	6.21	0.00	3.94	0.33	0.00	0.00	0.03	0.01
83	L812430 XLR	0.000498	0.00218	0.15	1.00	0.00	9.53	0.00	2.5	0.0471	0.00	0.00095	0.037	0.000423
84	L1274727 XLR	0.00	0.00	0.15	2.71	0.00	10.50	0.00	3.43	0.17	0.00	0.00	0.07	0.00
85	L1341520 XLR	0.01	0.00	0.15	2.56	0.00	9.43	0.00	8.12	0.54	0.00	0.00	0.05	0.03
86	L1380836 XLR	0.00	0.00	0.15	2.38	0.00	4.99	0.00	3.20	0.29	0.00	0.01	0.04	0.01
87	L1535070 XLR	0.00	0.00	0.15	2.22	0.00	6.99	0.00	2.92	0.15	0.00	0.00	0.02	0.00
88	L1339478 XLR	0.00	0.00	0.15	2.37	0.00	6.61	0.00	3.27	0.33	0.00	0.00	0.02	0.00
89	L1535070 XLR	0.00	0.00	0.15	2.63	0.00	7.34	0.00	8.06	0.56	0.00	0.00	0.03	0.03
90	L1274727 XLR	0.01	0.00	0.15	2.70	0.00	11.10	0.00	8.35	0.53	0.00	0.00	0.06	0.03
91	L1108531 XLR	0.00	0.00	0.15	5.63	0.00	6.82	0.00	6.13	0.64	0.00	0.00	0.01	0.00

	A	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
1	File	Vanadium (V)Total mg/L	Zinc (Zn)Total mg/L	Aluminum (Al)Dissolved mg/L	Antimony (Sb)Dissolved mg/L	Arsenic (As)Dissolved mg/L	Barium (Ba)Dissolved mg/L	Beryllium (Be)Dissolved mg/L	Bismuth (Bi)Dissolved mg/L	Boron (B)Dissolved mg/L	Cadmium (Cd)Dissolved mg/L	Calcium (Ca)Dissolved mg/L	Chromium (Cr)Dissolved mg/L	Cobalt (Co)Dissolved mg/L
47	app b tables B1 to B3	0.02	0.02	0.00	0.00	0.58	0.01	0.00	0.05	0.05	0.00	69.50	0.00	0.00
48	L1048234 XLR	0.00	0.01	0.01	0.00	8.08	0.01	0.00	0.00	0.01	0.00	114.00	0.00	0.00
49	L1144418 XLR	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	9.40	0.00	0.00
50	L1073407 XLR													
51	L923152 XLR	0.00	0.01	0.00	0.00	0.00	0.11	0.00	0.00	0.01	0.00	73.60	0.00	0.00
52	L1799287 XLR	0.01	0.03	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.00	5.02	0.00	0.00
53	app b tables B1 to B3	0.02	0.04	0.02	0.00	0.01	0.13	0.00	0.05	0.05	0.00	27.90	0.00	0.00
54	L1048234 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	41.80	0.00	0.00
55	L1108531 XLR	0.00	0.01	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	81.70	0.00	0.00
56	L1274727 XLR	0.00	0.13	0.00	0.00	0.13	0.06	0.00	0.00	0.01	0.00	34.30	0.00	0.00
57	L1016937 XLR	0.00	0.01	0.00	0.00	8.84	0.01	0.00	0.00	0.01	0.00	116.00	0.00	0.00
58	L1380836 XLR	0.00	0.01	0.00	0.00	0.00	0.13	0.00	0.00	0.01	0.00	83.90	0.00	0.00
59	L1086893 XLR	0.00	0.01	0.00	0.00	8.33	0.01	0.00	0.00	0.01	0.00	110.00	0.00	0.00
60	L1094446 XLR	0.00	0.01	0.00	0.00	9.62	0.01	0.00	0.00	0.01	0.00	115.00	0.00	0.00
61	L1086893 XLR	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	19.70	0.00	0.00
62	L1125898 XLR	0.00	0.00	0.00	0.00	8.60	0.01	0.00	0.00	0.01	0.00	108.00	0.00	0.00
63	L1341520 XLR	0.00	0.01	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	80.60	0.00	0.00
64	L1144418 XLR	0.00	0.01	0.00	0.00	8.30	0.01	0.00	0.00	0.01	0.00	116.00	0.00	0.00
65	app b tables B1 to B3	0.02	0.00	0.19	0.00	0.17	0.01	0.00	0.05	0.05	0.00	19.80	0.00	0.00
66	L798225 XLR	0.00	0.00	0.00	0.00046	0.0708	0.0266	0.00	0.00	0.01	0.00	7.86	0.00	0.00
67	L815386 XLR	0.001	0.0275	0.0079	0.0023	0.0113	0.0639	0.00	0.00	0.01	0.000088	43.9	0.00	0.00041
68	app b tables B1 to B3	0.02	0.01	0.01	0.00	0.07	0.01	0.00	0.05	0.05	0.00	6.01	0.00	0.00
69	L1195890 XLR	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.00	0.01	0.00	16.60	0.00	0.00
70	L1125898 XLR	0.00	0.06	0.00	0.00	2.10	0.01	0.00	0.00	0.01	0.00	145.00	0.00	0.00
71	L1144418 XLR	0.00	0.01	0.00	0.00	0.00	0.13	0.00	0.00	0.01	0.00	83.00	0.00	0.00
72	L946390 XLR	0.00	0.01	0.00	0.00	0.00	0.12	0.00		0.05	0.00	79.10	0.00	0.00
73	L1380836 XLR	0.00	0.02	0.01	0.00	0.01	0.01	0.00	0.00	0.01	0.00	38.80	0.00	0.00
74	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.03	0.02	0.00	0.05	0.05	0.00	46.40	0.00	0.00
75	L1535070 XLR	0.00	0.03	0.00	0.00	3.26	0.01	0.00	0.00	0.01	0.00	140.00	0.00	0.00
76	L798225 XLR	0.00	0.0241	0.0012	0.00048	0.644	0.0219	0.00	0.00	0.01	0.00	67.6	0.00	0.00017
77	L923152 XLR	0.00	0.03	0.01	0.00	1.88	0.01	0.00	0.00	0.01	0.00	112.00	0.00	0.00
78	L1274727 XLR	0.00	0.10	0.05	0.05	0.74	0.00	0.00	0.00	0.01	0.00	13.10	0.00	0.00
79	L798225 XLR	0.00	0.0141	0.00	0.00	0.132	0.052	0.00	0.00	0.01	0.000037	34.8	0.00	0.00
80	L829307 XLR	0.00	0.02	0.00	0.01	0.03	0.02	0.00	0.00	0.01	0.00	92.10	0.00	0.00
81	L815386 XLR	0.00	0.0054	0.0014	0.00037	0.00047	0.113	0.00	0.00	0.01	0.000019	79.8	0.00	0.00021
82	L1125898 XLR	0.00	0.01	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	77.90	0.00	0.00
83	L812430 XLR	0.0018	0.0676	0.0045	0.00072	0.0477	0.0215	0.00	0.00	0.01	0.000032	7.35	0.00	0.00
84	L1274727 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	38.80	0.00	0.00
85	L1341520 XLR	0.00	0.01	0.00	0.00	8.39	0.01	0.00	0.00	0.01	0.00	105.00	0.00	0.00
86	L1380836 XLR	0.00	0.04	0.01	0.00	0.16	0.06	0.00	0.00	0.01	0.00	47.70	0.00	0.00
87	L1535070 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	41.40	0.00	0.00
88	L1339478 XLR	0.00	0.02	0.00	0.00	0.04	0.08	0.00	0.00	0.01	0.00	39.90	0.00	0.00
89	L1535070 XLR	0.00	0.04	0.00	0.00	7.73	0.01	0.00	0.00	0.01	0.00	113.00	0.00	0.00
90	L1274727 XLR	0.00	0.02	0.00	0.00	8.77	0.01	0.00	0.00	0.01	0.00	106.00	0.00	0.00
91	L1108531 XLR	0.00	0.01	0.00	0.00	3.02	0.01	0.00	0.00	0.01	0.00	157.00	0.00	0.00

	A	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU
1	File	Copper (Cu)Dissolved mg/L	Iron (Fe)Dissolved mg/L	Lead (Pb)Dissolved mg/L	Lithium (Li)Dissolved mg/L	Magnesium (Mg)Dissolved mg/L	Manganese (Mn)Dissolved mg/L	Mercury (Hg)Dissolved mg/L	Molybdenum (Mo)Dissolved mg/L	Nickel (Ni)Dissolved mg/L	Phosphorus (P)Dissolved mg/L	Potassium (K)Dissolved mg/L	Selenium (Se)Dissolved mg/L
47	app b tables B1 to B3	0.00	0.02	0.00		16.40	0.20		0.00	0.00	0.15	1.52	0.00
48	L1048234 XLR	0.00	0.09	0.00	0.01	10.60	0.17	0.00	0.00	0.00	0.15	2.60	0.00
49	L1144418 XLR	0.00	0.02	0.00	0.03	5.27	0.00	0.00	0.00	0.00	0.15	1.48	0.00
50	L1073407 XLR												
51	L923152 XLR	0.00	0.02	0.00	0.01	27.60	0.00	0.00	0.00	0.00	0.15	2.40	0.00
52	L1799287 XLR	0.00	0.01	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.15	0.59	0.00
53	app b tables B1 to B3	0.00	0.18	0.00		4.59	0.08		0.00	0.01	0.15	2.25	0.00
54	L1048234 XLR	0.00	0.67	0.00	0.03	8.62	0.11	0.00	0.00	0.00	0.15	2.40	0.00
55	L1108531 XLR	0.00	0.02	0.00	0.01	28.10	0.00	0.00	0.00	0.00	0.15	2.24	0.00
56	L1274727 XLR	0.00	0.01	0.00	0.02	46.00	0.02	0.00	0.01	0.00	0.15	2.15	0.00
57	L1016937 XLR	0.00	0.10	0.00	0.01	10.80	0.17	0.00	0.00	0.00	0.15	2.70	0.00
58	L1380836 XLR	0.00	0.01	0.00	0.01	32.30	0.00	0.00	0.00	0.00	0.15	2.26	0.00
59	L1086893 XLR	0.00	0.10	0.00	0.01	10.60	0.17	0.00	0.00	0.00	0.15	2.40	0.00
60	L1094446 XLR	0.00	0.08	0.00	0.01	10.50	0.17	0.00	0.01	0.00	0.15	2.28	0.00
61	L1086893 XLR	0.00	0.02	0.00	0.04	11.10	0.00	0.00	0.00	0.00	0.15	1.00	0.00
62	L1125898 XLR	0.00	0.04	0.00	0.01	10.20	0.16	0.00	0.01	0.00	0.15	2.12	0.00
63	L1341520 XLR	0.00	0.01	0.00	0.01	31.80	0.00		0.00	0.00	0.15	2.19	0.00
64	L1144418 XLR	0.00	0.10	0.00	0.01	11.00	0.19	0.00	0.01	0.00	0.15	2.46	0.00
65	app b tables B1 to B3	0.00	0.26	0.00		3.09	0.03		0.01	0.00	0.15	0.92	0.00
66	L798225 XLR	0.00096	0.02	0.00	0.00	1.07	0.00109		0.000673	0.00	0.15	1.00	0.00
67	L815386 XLR	0.00366	0.02	0.000146	0.0063	14.4	0.078	0.00	0.00278	0.00267	0.15	1.00	0.00
68	app b tables B1 to B3	0.00	0.02	0.00		1.21	0.01		0.00	0.00	0.15	0.52	0.00
69	L1195890 XLR	0.00	0.01	0.00	0.04	9.63	0.00	0.00	0.00	0.00	0.15	1.43	0.00
70	L1125898 XLR	0.00	6.98	0.00	0.20	35.80	0.85	0.00	0.00	0.00	0.15	5.34	0.00
71	L1144418 XLR	0.00	0.02	0.00	0.01	28.90	0.00	0.00	0.00	0.00	0.15	2.21	0.00
72	L946390 XLR	0.00	0.02	0.00	0.01	29.20	0.00	0.00	0.00	0.00		2.30	0.00
73	L1380836 XLR	0.00	0.62	0.00	0.03	8.30	0.10	0.00	0.00	0.00	0.15	2.20	0.00
74	app b tables B1 to B3	0.00	0.02	0.00		4.40	0.05		0.02	0.00	0.15	0.47	0.00
75	L1535070 XLR	0.00	8.67	0.00	0.21	34.00	0.79		0.00	0.00	0.15	5.07	0.00
76	L798225 XLR	0.00027	0.293	0.00	0.0896	58.4	0.0712		0.000228	0.00964	0.15	4.5	0.00
77	L923152 XLR	0.00	5.90	0.00	0.16	28.10	0.63	0.00	0.00	0.00	0.15	5.50	0.00
78	L1274727 XLR	0.00	10.90	0.00	0.07	11.40	0.38	0.00	0.00	0.01	0.15	1.97	0.00
79	L798225 XLR	0.0003	0.055	0.00	0.0188	42.1	0.0826		0.00433	0.00	0.15	1.00	0.00
80	L829307 XLR	0.00	0.02	0.00	0.00	20.30	0.30	0.00	0.00	0.01	0.15	3.20	0.00
81	L815386 XLR	0.00278	0.02	0.00	0.0111	26.8	0.0432	0.00	0.000942	0.00075	0.15	2.2	0.00
82	L1125898 XLR	0.00	0.02	0.00	0.01	28.10	0.00	0.00	0.00	0.00	0.15	2.16	0.00
83	L812430 XLR	0.00082	0.02	0.000125	0.00	1.18	0.00768	0.00	0.000478	0.00073	0.15	1.00	0.00
84	L1274727 XLR	0.00	0.24	0.00	0.04	8.40	0.12	0.00	0.00	0.00	0.15	2.38	0.00
85	L1341520 XLR	0.00	0.05	0.00	0.01	10.20	0.17		0.00	0.00	0.15	2.37	0.00
86	L1380836 XLR	0.00	1.00	0.00	0.01	25.80	0.07	0.00	0.00	0.00	0.15	2.33	0.00
87	L1535070 XLR	0.00	0.42	0.00	0.03	8.69	0.12		0.00	0.00	0.15	2.20	0.00
88	L1339478 XLR	0.00	0.01	0.00	0.01	24.70	0.00		0.00	0.00	0.15	2.37	0.00
89	L1535070 XLR	0.00	0.10	0.00	0.01	10.90	0.17		0.00	0.00	0.15	2.37	0.00
90	L1274727 XLR	0.00	0.08	0.00	0.01	10.40	0.17	0.00	0.01	0.00	0.15	2.45	0.00
91	L1108531 XLR	0.00	8.82	0.00	0.22	38.30	0.94	0.00	0.00	0.00	0.15	6.04	0.00

	A	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE
1	File	Silicon (Si)Dissolved mg/L	Silver (Ag)Dissolved mg/L	Sodium (Na)Dissolved mg/L	Strontium (Sr)Dissolved mg/L	Thallium (Tl)Dissolved mg/L	Tin (Sn)Dissolved mg/L	Titanium (Ti)Dissolved mg/L	Uranium (U)Dissolved mg/L	Vanadium (V)Dissolved mg/L	Zinc (Zn)Dissolved mg/L
47	app b tables B1 to B3		0.00	5.03	0.57			0.005	0.01	0.02	0.00
48	L1048234 XLR	6.61	0.00	8.50	0.51	0.00	0.00	0.01	0.03	0.00	0.01
49	L1144418 XLR	8.20	0.00	2.77	0.05	0.00	0.00	0.01	0.00	0.00	0.00
50	L1073407 XLR										
51	L923152 XLR	4.96	0.00	3.90	0.30	0.00	0.00	0.01	0.01	0.00	0.00
52	L1799287 XLR	6.49	0.00	2.09	0.03	0.00	0.00	0.01	0.00	0.00	0.01
53	app b tables B1 to B3		0.00	3.98	0.20			0.01	0.00	0.02	0.01
54	L1048234 XLR	6.80	0.00	3.20	0.15	0.00	0.00	0.01	0.00	0.00	0.00
55	L1108531 XLR	4.92	0.00	3.90	0.32	0.00	0.00	0.01	0.01	0.00	0.00
56	L1274727 XLR	6.49	0.00	2.39	0.32	0.00	0.00	0.01	0.01	0.00	0.07
57	L1016937 XLR	6.47	0.00	8.40	0.50	0.00	0.00	0.01	0.03	0.00	0.00
58	L1380836 XLR	5.08	0.00	4.07	0.35	0.00	0.00	0.01	0.01	0.00	0.01
59	L1086893 XLR	6.62	0.00	8.20	0.51	0.00	0.00	0.01	0.03	0.00	0.00
60	L1094446 XLR	6.55	0.00	8.46	0.57	0.00	0.00	0.01	0.03	0.00	0.00
61	L1086893 XLR	6.46	0.00	2.60	0.11	0.00	0.00	0.01	0.00	0.00	0.01
62	L1125898 XLR	6.47	0.00	7.04	0.52	0.00	0.00	0.01	0.03	0.00	0.00
63	L1341520 XLR	4.69	0.00	4.31	0.36	0.00	0.00	0.01	0.01	0.00	0.00
64	L1144418 XLR	6.57	0.00	7.75	0.55	0.00	0.00	0.01	0.03	0.00	0.00
65	app b tables B1 to B3		0.00	4.43	0.13			0.005	0.01	0.02	0.00
66	L798225 XLR	6.61	0.00	2.1	0.0484	0.00	0.00	0.01	0.000177	0.00	0.0125
67	L815386 XLR	6.91	0.00	4.9	0.162	0.00	0.00015	0.01	0.00179	0.00	0.0253
68	app b tables B1 to B3		0.00	1.95	0.03			0.01	0.00	0.02	0.00
69	L1195890 XLR	6.54	0.00	2.55	0.09	0.00	0.00	0.01	0.00	0.00	0.00
70	L1125898 XLR	6.73	0.00	6.46	0.65	0.00	0.00	0.01	0.00	0.00	0.05
71	L1144418 XLR	4.97	0.00	4.11	0.33	0.00	0.00	0.01	0.01	0.00	0.00
72	L946390 XLR		0.00	4.00		0.00	0.00	0.01	0.01	0.00	0.00
73	L1380836 XLR	6.32	0.00	3.09	0.15	0.00	0.00	0.01	0.00	0.00	0.00
74	app b tables B1 to B3		0.00	5.19	1.71			0.005	0.02	0.02	0.00
75	L1535070 XLR	6.60	0.00	5.83	0.63	0.00	0.00	0.02	0.00	0.00	0.02
76	L798225 XLR	7.37	0.00	21.4	0.672	0.00	0.00142	0.01	0.00313	0.00	0.0077
77	L923152 XLR	5.96	0.00	6.60	0.47	0.00	0.00	0.01	0.00	0.00	0.04
78	L1274727 XLR	8.95	0.00	2.90	0.07	0.00	0.00	0.01	0.00	0.00	0.10
79	L798225 XLR	5.86	0.00	2.2	0.267	0.00	0.00012	0.01	0.00735	0.00	0.0025
80	L829307 XLR	3.64	0.00	4.20	0.54	0.00	0.00	0.01	0.01	0.00	0.01
81	L815386 XLR	4.92	0.00	3.5	0.308	0.00	0.00	0.01	0.00685	0.00	0.0122
82	L1125898 XLR	4.89	0.00	4.00	0.32	0.00	0.00	0.01	0.01	0.00	0.01
83	L812430 XLR	8.69	0.00	2.3	0.0429	0.00	0.00026	0.01	0.000061	0.00	0.0168
84	L1274727 XLR	6.89	0.00	3.31	0.16	0.00	0.00	0.01	0.00	0.00	0.00
85	L1341520 XLR	6.09	0.00	8.03	0.52	0.00	0.00	0.01	0.03	0.00	0.00
86	L1380836 XLR	3.87	0.00	3.19	0.29	0.00	0.00	0.01	0.01	0.00	0.01
87	L1535070 XLR	6.63	0.00	2.97	0.15	0.00	0.00	0.01	0.00	0.00	0.01
88	L1339478 XLR	5.65	0.00	3.33	0.33	0.00	0.00	0.01	0.00	0.00	0.02
89	L1535070 XLR	6.21	0.00	7.89	0.55	0.00	0.00	0.01	0.03	0.00	0.01
90	L1274727 XLR	6.53	0.00	8.05	0.51	0.00	0.00	0.01	0.03	0.00	0.00
91	L1108531 XLR	7.25	0.00	6.67	0.70	0.00	0.00	0.01	0.00	0.00	0.01

	A	B	C	D	E	F
1	File	Project	Report To	ALS File No.	Date Received	Date
92	L1380836 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1380836	21/10/2013	05/02/2015
93	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	29/08/2012
94	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012
95	L815386 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L815386	08/09/2009	18/09/2009
96	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
97	L798225 XLR	1053550.02/C2404	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L798225	28/07/2009	12/08/2009
98	L1274727 XLR	GROUND WATER	Christiane Buie, STRATAGOLD CORPORATION	L1274727	04/03/2013	15/03/2013
99	L1339478 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1339478	29/07/2013	05/02/2015
100	L1453356 XLR	GROUNDWATER	Mark Ayranto, STRATAGOLD CORPORATION	L1453356	09/05/2014	28/05/2014
101	app b tables B1 to B3					
102	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
103	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
104	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
105	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
106	L1535070 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1535070	20/10/2014	30/10/2014
107	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
108	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012
109	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
110	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
111	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
112	L798225 XLR	1053550.02/C2404	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L798225	28/07/2009	12/08/2009
113	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012
114	app b tables B1 to B3					
115	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
116	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
117	L1380836 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1380836	21/10/2013	05/02/2015
118	app b tables B1 to B3					
119	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
120	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
121	L1127086 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1127086	23/03/2012	27/03/2012
122	app b tables B1 to B3					
123	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
124	L1108531 XLR	123110377 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1108531	28/01/2012	13/02/2012
125	L1453356 XLR	GROUNDWATER	Mark Ayranto, STRATAGOLD CORPORATION	L1453356	09/05/2014	28/05/2014
126	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
127	L1453356 XLR	GROUNDWATER	Mark Ayranto, STRATAGOLD CORPORATION	L1453356	09/05/2014	28/05/2014
128	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
129	L1016937 XLR	123110377 GROUNDWATER	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L1016937	13/06/2011	24/06/2011
130	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	29/08/2016
131	L1048234 XLR	123110377 501.200 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1048234	22/08/2011	08/09/2011
132	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
133	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
134	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012
135	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
136	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012

	A	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	File	Well ID	Location	Date Sampled	Quarter 1-Jan-Mar, 2-Apr-Jun, 3 Jly-Sep, 4 Oct-Dec	Time Sampled	ALS Sample ID	Matrix	Conductivity uS/cm	Hardness (as CaCO3) mg/L	pH	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity NTU	Acidity (as CaCO3) mg/L
92	L1380836 XLR	MW96-13A	Eagle Pup	19/10/2013	Q4	15:30	L13808364	Water	404.00	272.00	8.27	34.70	260.00	24.80	0.50
93	L1195890 XLR	MW10-DG6	Dublin Gulch	15/08/2012	Q3	09:10	L11958902	Water	708.00	408.00	7.35	34.40	578.00	18.90	
94	L1226369 XLR	MW96-13A	Eagle Pup	16/10/2012	Q4	17:00	L12263694	Water	440.00	266.00	8.11	34.00	236.00	34.80	
95	L815386 XLR	MW09-OG3	Olive Gulch	04/09/2009	Q3	00:00	L8153861	Water	62	20.2	6.56	33.8	40	10	
96	L1048234 XLR	MW96-13A	Eagle Pup				L104823413	Water	466.00	272.00	8.25	33.20	251.00	16.20	
97	L798225 XLR	MW96-9B	Bawn Boy Gulch	27/07/2009	Q3	10:30	L7982253	Water	50	18.6	7.04	32.5	42	25.9	
98	L1274727 XLR	MW09-DG4	Dublin Gulch	01/03/2013	Q1	17:40	L12747271	Water	556.00	319.00	7.82	32.00	351.00	24.70	
99	L1339478 XLR	MW96-13A	Eagle Pup	26/07/2013	Q3	12:35	L13394784	Water	445.00	268.00	7.75	32.00	267.00	29.30	
100	L1453356 XLR	MW09-DG4	Dublin Gulch	08/05/2014	Q2	09:00	L14533561	Water	564.00	328.00	8.06	31.70	356.00	10.40	
101	app b tables B1 to B3	DH95-141	Bawn Boy Gulch	22/07/1996	Q3				144.00	56.00	7.80	31.00	86.00	7.70	
102	L1073407 XLR	MW10-PG1	Platinum Gulch	16/10/2011	Q4	20:00	L10734072	Water	597.00	333.00	7.88	30.70	426.00	13.80	
103	L1008190 XLR	MW09-DG4	Dublin Gulch	19/05/2011	Q2	14:00	L10081907	Water	539.00	312.00	7.79	30.50	352.00	13.70	
104	L812430 XLR	MW96-23	Platinum Gulch	27/08/2009	Q3	00:00	L8124307	Water	287	140	7.83	29.8	170		
105	L1016937 XLR	MW10-AG5	Ann Gulch	09/06/2011	Q2	16:30	L10169372	Water	224.00	83.10	6.80	29.30	151.00	16.90	
106	L1535070 XLR	MW09-DG4	Dublin Gulch	19/10/2014	Q4	09:00	L15350701	Water	592.00	326.00	7.77	29.30	354.00	15.10	240.00
107	L812430 XLR	MW09-STU2	Suttles Gulch	27/08/2009	Q3	00:00	L81243013	Water	659	452	7.62	28.8	397	23	
108	L1226369 XLR	MW10-AG6	Ann Gulch	17/10/2012	Q4	12:20	L12263697	Water	189.00	102.00	7.88	28.70	117.00	16.30	
109	L1048234 XLR	MW10-AG5	Ann Gulch	18/08/2011	Q3	13:40	L10482345	Water	246.00	90.20	6.80	28.50	189.00	19.20	
110	L812430 XLR	MW09-DG1	Dublin Gulch	27/08/2009	Q3	00:00	L81243011	Water	377	189	7.74	27.8	217		
111	L1094446 XLR	MW09-DG6	Dublin Gulch	07/12/2011	Q4	18:00	L10944462	Water	877.00	501.00	7.89	27.80	655.00	87.80	
112	L798225 XLR	MW96-26	Bawn Boy Gulch	27/07/2009	Q3	09:30	L7982251	Water	186	89	7.72	27.5	126	28.9	
113	L1226369 XLR	MW09-DG6	Dublin Gulch	17/10/2012	Q4	12:00	L12263692	Water	836.00	486.00	7.62	27.30	640.00	46.30	
114	app b tables B1 to B3	DH95-106	Suttles Gulch	22/07/1996	Q3				277.00	99.00	8.02	27.00	161.00	7.70	
115	L1094446 XLR	MW09-DG4	Dublin Gulch	07/12/2011	Q4	08:30	L10944461	Water	552.00	304.00	8.11	26.50	354.00	10.50	
116	L923152 XLR	MW10-AG3A	Ann Gulch	19/08/2010	Q3	11:00	L9231521	Water	279.00	142.00	8.02	25.60	196.00	13.50	
117	L1380836 XLR	MW10-PG1	Platinum Gulch	19/10/2013	Q4	09:46	L13808363	Water	489.00	315.00	8.09	25.30	383.00	10.60	2.10
118	app b tables B1 to B3	DH95-139	Bawn Boy Gulch	21/09/1996	Q3				60.60	24.10	7.44	24.00	37.00	9.30	
119	L812430 XLR	MW96-8	Bawn Boy Gulch	27/08/2009	Q3	00:00	L8124302	Water	62.9	25	7.14	23.3	47		
120	L1016937 XLR	MW10-AG3A	Ann Gulch	09/06/2011	Q2	11:30	L10169378	Water	278.00	149.00	8.11	23.30	169.00	11.50	
121	L1127086 XLR	MW96-23	Platinum Gulch	21/03/2012	Q1	09:00	L11270861	Water	955.00	564.00	7.94	23.30	739.00	23.50	
122	app b tables B1 to B3	DH95-152	Dublin Gulch	22/05/1996	Q2				939.00	486.00	7.35	22.00	687.00	22.30	
123	L829307 XLR	MW09-OG3	Olive Gulch	05/10/2009	Q4	12:00	L8293071	Water	336.00	183.00	7.11	21.80	221.00	12.00	
124	L1108531 XLR	MW96-13A	Eagle Pup	25/01/2012	Q1	15:30	L11085314	Water	467.00	279.00	8.21	21.60	240.00	11.40	
125	L1453356 XLR	MW10-AG3A	Ann Gulch	08/05/2014	Q2	10:00	L14533562	Water	19.80	8.72	7.00	21.50	22.10	23.20	
126	L1016937 XLR	MW96-13A	Eagle Pup	09/06/2011	Q2	14:40	L10169374	Water	448.00	262.00	8.17	21.30	235.00	11.30	
127	L1453356 XLR	MW10-PG1	Platinum Gulch	07/05/2014	Q2	14:00	L14533563	Water	592.00	315.00	8.16	21.30	378.00	8.10	
128	L829307 XLR	MW09-DG4	Dublin Gulch	05/10/2009	Q4	19:30	L8293078	Water	540.00	293.00	7.67	20.80	358.00	6.70	
129	L1016937 XLR	MW09-STU2	Suttles Gulch	09/06/2011	Q2	13:30	L10169377	Water	693.00	407.00	7.82	20.70	394.00	21.50	
130	L1195890 XLR	MW10-AG3A	Ann Gulch	15/08/2012	Q3	00:00	L119589010	Water	269.00	141.00	8.16	19.10	180.00	13.30	
131	L1048234 XLR	MW09-STU2	Suttles Gulch	18/08/2011	Q3	15:50	L10482347	Water	760.00	410.00	7.91	18.50	492.00	19.70	
132	L1073407 XLR	MW10-DG6	Dublin Gulch	16/10/2011	Q4	11:30	L10734074	Water	876.00	496.00	7.44	18.00	663.00	61.10	
133	L923152 XLR	MW96-13A	Eagle Pup	19/08/2010	Q3	17:00	L9231529	Water	455.00	260.00	8.00	17.60	246.00	6.38	
134	L1226369 XLR	MW09-DG4	Dublin Gulch	17/10/2012	Q4	10:45	L12263691	Water	523.00	320.00	7.98	17.30	361.00	11.40	
135	L1086893 XLR	MW09-DG6	Dublin Gulch	16/11/2011	Q4	19:10	L10868932	Water	869.00	491.00	8.00	16.80	644.00	60.70	
136	L1226369 XLR	MW10-AG5	Ann Gulch	17/10/2012	Q4	13:30	L12263698	Water	61.50	24.90	7.03	16.70	67.00	56.60	

	A	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	File	Alkalinity, Bicarbonate (as CaCO3) mg/L	Alkalinity, Carbonate (as CaCO3) mg/L	Alkalinity, Hydroxide (as CaCO3) mg/L	Alkalinity, Total (as CaCO3) mg/L	Ammonia as N mg/L	Bromide (Br) mg/L	Chloride (Cl) mg/L	Fluoride (F) mg/L	Nitrate (as N) mg/L	Nitrite (as N) mg/L	Total Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Ortho Phosphate as P mg/L	Total Dissolved Phosphate As P mg/L
92	L1380836 XLR				252.00	0.02		0.66	0.40	0.11	0.00	0.55	0.66	0.00	0.00
93	L1195890 XLR				91.70	0.15		0.25	0.16	0.01	0.00	0.32	0.33	0.00	0.00
94	L1226369 XLR				243.00	0.02		0.72	0.51	0.03	0.00	0.51	0.54	0.00	0.00
95	L815386 XLR	26	1.00	1.00	26	0.01	0.03	0.25	0.025	0.125	0.0011	2.3		0.00	
96	L1048234 XLR				248.00	0.03	0.03	0.25	0.44	0.00	0.00	0.78	0.52	0.00	0.00
97	L798225 XLR	19.8	1.00	1.00	19.8	0.00	0.03	0.25	0.028	0.399	0.0049	0.592		0.0337	
98	L1274727 XLR				221.00	0.00		0.25	0.12	0.09	0.00	0.20	0.28	0.00	0.00
99	L1339478 XLR				266.00	0.02		0.54	0.51	0.02	0.00	0.66	0.75	0.00	0.00
100	L1453356 XLR				224.00	0.00		0.25	0.12	0.05	0.00			0.00	
101	app b tables B1 to B3				53.90	0.01		0.25	0.26	0.06	0.01			0.03	
102	L1073407 XLR				181.00	0.02	0.03	0.25	0.48	0.01	0.01	0.12	0.14	0.08	0.08
103	L1008190 XLR	215.00				0.01	0.03	0.25	0.10	0.05	0.00	0.17		0.00	
104	L812430 XLR	130	1.00	1.00	130	0.00	0.03	0.25	0.056	0.479	0.00	0.119		0.0331	
105	L1016937 XLR	27.40				0.01	0.03	0.25	0.22	0.00	0.00	0.22	0.22	0.00	0.01
106	L1535070 XLR					0.00		0.25	0.10	0.17	0.00			0.00	
107	L812430 XLR	285	1.00	1.00	285	0.152	0.03	0.25	0.11	0.0065	0.00	0.488		0.0011	
108	L1226369 XLR				79.10	0.00		0.25	0.43	0.19	0.00	0.05	0.24	0.02	0.02
109	L1048234 XLR				31.80	0.03	0.03	0.25	0.27	0.01	0.00	0.25	0.57	0.00	0.01
110	L812430 XLR	147	1.00	1.00	147	0.0554	0.03	0.25	0.138	0.00	0.00	0.191		0.0012	
111	L1094446 XLR	183.00	1.00	1.00	183.00	0.21	0.25	2.50	0.30	0.03	0.01	0.32	0.32	0.00	0.02
112	L798225 XLR	81.9	1.00	1.00	81.9	0.00	0.03	0.25	0.247	0.00	0.00	0.092		0.0053	
113	L1226369 XLR				149.00	0.20		1.25	0.38	0.01	0.01	0.36	0.37	0.00	0.01
114	app b tables B1 to B3				92.10	0.00		0.25	0.09	0.00	0.00			0.00	
115	L1094446 XLR	213.00	1.00	1.00	213.00	0.00	0.03	0.25	0.12	0.09	0.00	0.08	0.17	0.00	0.00
116	L923152 XLR	95.30	1.00	1.00	95.30	0.02	0.03	0.25	0.29	0.00	0.00	0.03	0.00	0.00	0.00
117	L1380836 XLR				176.00	0.03		0.25	0.47	0.07	0.00	0.08	0.15	0.16	0.10
118	app b tables B1 to B3				21.80	0.00		0.25	0.06	0.14	0.00			0.02	
119	L812430 XLR	19	1.00	1.00	19	0.00	0.03	0.25	0.038	0.0939	0.00	0.056		0.005	
120	L1016937 XLR	95.60				0.03	0.03	0.25	0.29	0.00	0.00	0.17	0.17	0.00	0.00
121	L1127086 XLR				157.00	0.24	0.25	2.50	0.10	0.03	0.01	0.48	0.48	0.02	0.07
122	app b tables B1 to B3				378.00	0.34		1.00	0.18	0.00	0.00			0.00	
123	L829307 XLR				108.00	0.03	0.03	0.25	0.41	0.01	0.00	0.21		0.00	0.00
124	L1108531 XLR				247.00	0.01	0.03	0.25	0.42	0.00	0.00	0.05	0.05	0.00	0.00
125	L1453356 XLR				7.00	0.01		0.25	0.01	0.04	0.00			0.00	
126	L1016937 XLR	243.00				0.01	0.03	0.25	0.41	0.00	0.00	0.27	0.27	0.01	0.00
127	L1453356 XLR				175.00	0.00		0.25	0.42	0.06	0.00			0.11	
128	L829307 XLR				209.00	0.00	0.03	0.25	0.08	0.08	0.01	0.14		0.00	0.00
129	L1016937 XLR	328.00				0.14	0.03	0.25	0.22	0.00	0.00	0.34	0.34	0.01	0.01
130	L1195890 XLR				95.90	0.02		0.25	0.26	0.00	0.00	0.16	0.16	0.00	0.00
131	L1048234 XLR				344.00	0.14	0.13	1.25	0.23	0.01	0.00	0.51	0.68	0.00	0.01
132	L1073407 XLR				188.00	0.22	0.25	2.50	0.30	0.03	0.01	0.27	0.27	0.00	0.03
133	L923152 XLR	244.00	1.00	1.00	244.00	0.01	0.03	0.25	0.40	0.01	0.00	0.17	0.18	0.00	0.00
134	L1226369 XLR				213.00	0.00		0.25	0.13	0.12	0.00	0.03	0.12	0.00	0.00
135	L1086893 XLR				186.00	0.23	0.25	2.50	0.32	0.03	0.01	0.38	0.38	0.00	0.02
136	L1226369 XLR				10.50	0.00		0.25	0.14	0.07	0.00	0.26	0.33	0.00	0.01

	A	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1	File	Total Phosphate as P mg/L	Sulfate (SO4) mg/L	Anion Sum mg/L	Cation Sum mg/L	Cation Anion Balance mg/L	Cyanide, Weak Acid Diss mg/L	Cyanide, Total mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L	Aluminum (Al)Total mg/L	Antimony (Sb)Total mg/L	Arsenic (As)Total mg/L	Barium (Ba)Total mg/L	Beryllium (Be)Total mg/L
92	L1380836 XLR	0.04	18.90	5.48	5.61	1.10			3.91		0.27	0.00	0.39	0.07	0.00
93	L1195890 XLR	0.05	310.00				0.00	0.00	2.61		0.39	0.00	2.09	0.01	0.00
94	L1226369 XLR	0.07	19.20				0.00	0.00	5.50		0.38	0.00	0.48	0.09	0.00
95	L815386 XLR	0.0185	3.12						1.82		0.736	0.0006	0.00242	0.0152	0.00
96	L1048234 XLR	0.02	18.10						3.36		0.42	0.00	0.20	0.06	0.00
97	L798225 XLR	0.086	2.41						5.74		0.394	0.00143	0.0751	0.0283	0.00
98	L1274727 XLR	0.02	99.00				0.00	0.00	3.28		3.26	0.00	0.03	0.17	0.00
99	L1339478 XLR	0.04	18.00	5.74	5.54	1.80			4.85		0.25	0.00	0.55	0.07	0.00
100	L1453356 XLR	0.01	102.00	6.62	6.79	1.30			1.15	1.20	0.15	0.00	0.00	0.12	0.00
101	app b tables B1 to B3	0.08	13.10					0.00			0.21	0.00	0.18	0.01	0.00
102	L1073407 XLR	0.13	152.00					0.00	1.22		1.74	0.00	8.26	0.04	0.00
103	L1008190 XLR	0.02	99.40						1.50		0.18	0.00	0.00	0.11	0.00
104	L812430 XLR	0.0585	22.8						2.18		0.54	0.00182	0.25	0.0201	0.00
105	L1016937 XLR	0.03	78.70						1.02		0.27	0.05	0.66	0.01	0.00
106	L1535070 XLR	0.00	89.50	6.69	6.72	0.30			2.58		0.21	0.00	0.00	0.12	0.00
107	L812430 XLR	0.024	90.1						2.32		0.028	0.00029	1.32	0.0224	0.00
108	L1226369 XLR	0.03	23.40				0.00	0.00	1.29		0.68	0.00	0.05	0.01	0.00
109	L1048234 XLR	0.03	84.30						3.00		0.15	0.04	0.77	0.01	0.00
110	L812430 XLR	0.01	52.6						2.35		0.499	0.00412	0.0712	0.0489	0.00
111	L1094446 XLR	0.07	325.00						2.10		0.06	0.00	2.85	0.01	0.00
112	L798225 XLR	0.053	9.76						1.79		0.209	0.0208	0.589	0.0406	0.00
113	L1226369 XLR	0.08	341.00				0.00	0.00	2.44		0.13	0.00	2.78	0.01	0.00
114	app b tables B1 to B3	0.05	45.70					0.01			0.18	0.00	0.03	0.02	0.00
115	L1094446 XLR	0.01	95.10						4.27		0.47	0.00	0.01	0.12	0.00
116	L923152 XLR	0.01	49.00						1.23		0.16	0.00	0.02	0.01	0.00
117	L1380836 XLR	0.10	146.00	6.59	6.70	0.90			1.23		0.48	0.00	7.97	0.01	0.00
118	app b tables B1 to B3	0.06	6.60					0.00			0.22	0.00	0.07	0.01	0.00
119	L812430 XLR	0.0202	9.16						0.85		0.274	0.00138	0.0653	0.0331	0.00
120	L1016937 XLR	0.01	49.70						1.38		0.28	0.00	0.01	0.01	0.00
121	L1127086 XLR	0.11	391.00				0.00	0.00	2.82		0.43	0.00	2.13	0.03	0.00
122	app b tables B1 to B3	0.00	160.00					0.00			0.04	0.00	1.15	0.01	0.00
123	L829307 XLR	0.03	66.80						2.81		0.25	0.00	0.03	0.08	0.00
124	L1108531 XLR	0.02	18.30						0.96		0.29	0.00	0.25	0.06	0.00
125	L1453356 XLR	0.05	1.24	0.17	0.26	21.20			10.90	9.96	0.79	0.00	0.02	0.02	0.00
126	L1016937 XLR	0.02	18.40						0.90		0.32	0.00	0.22	0.06	0.00
127	L1453356 XLR	0.28	141.00	6.47	6.69	1.70			1.93	1.28	0.63	0.00	7.15	0.01	0.00
128	L829307 XLR	0.01	92.80						1.64		0.27	0.00	0.00	0.11	0.00
129	L1016937 XLR	0.03	87.40						2.42		0.20	0.00	0.93	0.02	0.00
130	L1195890 XLR	0.01	50.10				0.00	0.00	2.44		0.38	0.00	0.02	0.01	0.00
131	L1048234 XLR	0.04	92.40						5.17		0.12	0.00	1.05	0.02	0.00
132	L1073407 XLR	0.07	309.00					0.00	1.12		0.03	0.00	3.51	0.01	0.00
133	L923152 XLR	0.02	18.50						1.28		0.15	0.00	0.18	0.06	0.00
134	L1226369 XLR	0.01	98.50				0.00	0.00	1.91		0.23	0.00	0.00	0.13	0.00
135	L1086893 XLR	0.10	320.00						1.72		0.12	0.00	2.87	0.01	0.00
136	L1226369 XLR	0.08	16.70				0.00	0.00	8.78		1.12	0.05	0.43	0.01	0.00

	A	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI
1	File	Bismuth (Bi)Total mg/L	Boron (B)Total mg/L	Cadmium (Cd)Total mg/L	Calcium (Ca)Total mg/L	Chromium (Cr)Total mg/L	Cobalt (Co)Total mg/L	Copper (Cu)Total mg/L	Iron (Fe)Total mg/L	Lead (Pb)Total mg/L	Lithium (Li)Total mg/L	Magnesium (Mg)Total mg/L	Manganese (Mn)Total mg/L	Mercury (Hg)Total mg/L
92	L1380836 XLR	0.00	0.01	0.00	34.40	0.00	0.00	0.01	1.66	0.00	0.02	45.00	0.21	0.00
93	L1195890 XLR	0.00	0.01	0.00	109.00	0.00	0.00	0.00	12.30	0.00	0.19	30.90	0.38	0.00
94	L1226369 XLR	0.00	0.01	0.00	36.60	0.00	0.00	0.01	2.38	0.01	0.02	44.20	0.37	0.00
95	L815386 XLR	0.00	0.01	0.000035	6.95	0.00055	0.00048	0.00384	0.555	0.000907	0.0056	1.13	0.0496	0.00
96	L1048234 XLR	0.00	0.01	0.00	35.20	0.00	0.00	0.00	1.25	0.00	0.02	43.00	0.10	0.00
97	L798225 XLR	0.00	0.01	0.000047	5.98	0.00097	0.00057	0.00228	0.736	0.00219	0.00	0.88	0.0668	
98	L1274727 XLR	0.00	0.01	0.00	80.20	0.01	0.00	0.02	10.00	0.01	0.02	32.00	0.15	0.00
99	L1339478 XLR	0.00	0.01	0.00	32.20	0.00	0.00	0.00	2.29	0.00	0.02	43.60	0.09	
100	L1453356 XLR	0.00	0.01	0.00	79.20	0.00	0.00	0.00	0.38	0.00	0.01	29.80	0.01	0.00
101	app b tables B1 to B3	0.05	0.05	0.00	19.50	0.00	0.00	0.00	0.05	0.00		3.12	0.01	0.00
102	L1073407 XLR	0.00	0.01	0.00	115.00	0.00	0.00	0.01	2.56	0.00	0.01	11.10	0.19	0.00
103	L1008190 XLR	0.00	0.01	0.00	77.50	0.00	0.00	0.00	0.49	0.00	0.01	27.80	0.03	0.00
104	L812430 XLR	0.00062	0.011	0.000099	43.4	0.00112	0.00087	0.00449	0.72	0.00167	0.0112	5.79	0.0191	0.00
105	L1016937 XLR	0.00	0.01	0.00	13.00	0.00	0.00	0.00	10.80	0.00	0.07	11.90	0.37	0.00
106	L1535070 XLR	0.00	0.01	0.00	75.30	0.00	0.00	0.00	0.48	0.00	0.01	28.20	0.01	
107	L812430 XLR	0.00	0.01	0.00	81.8	0.00	0.00	0.00019	1.57	0.000317	0.0578	59.7	0.0645	0.00
108	L1226369 XLR	0.00	0.01	0.00	20.40	0.00	0.00	0.00	1.37	0.00	0.04	12.10	0.01	0.00
109	L1048234 XLR	0.00	0.01	0.00	15.80	0.00	0.00	0.00	12.60	0.00	0.07	13.90	0.46	0.00
110	L812430 XLR	0.00	0.013	0.000062	37.1	0.0022	0.00144	0.00403	2.23	0.0017	0.0211	23.8	0.292	0.00
111	L1094446 XLR	0.00	0.01	0.00	139.00	0.00	0.00	0.00	8.61	0.00	0.21	33.30	0.85	0.00
112	L798225 XLR	0.00	0.01	0.000063	25.8	0.00	0.00211	0.00198	3.6	0.000824	0.0064	5.73	0.324	
113	L1226369 XLR	0.00	0.01	0.00	137.00	0.00	0.00	0.00	9.71	0.00	0.22	34.40	0.72	0.00
114	app b tables B1 to B3	0.05	0.05	0.00	43.90	0.00	0.00	0.00	0.18	0.00		4.35	0.06	0.00
115	L1094446 XLR	0.00	0.01	0.00	76.90	0.00	0.00	0.00	1.43	0.00	0.01	26.60	0.03	0.00
116	L923152 XLR	0.00	0.01	0.00	42.70	0.00	0.00	0.01	1.13	0.00	0.04	9.58	0.12	0.00
117	L1380836 XLR	0.00	0.01	0.00	109.00	0.00	0.00	0.00	0.31	0.00	0.01	10.60	0.18	0.00
118	app b tables B1 to B3	0.05	0.05	0.00	7.54	0.00	0.00	0.00	0.18	0.00		1.07	0.01	0.00
119	L812430 XLR	0.00	0.01	0.000045	8.01	0.00087	0.00019	0.00092	0.381	0.000672	0.00	1.18	0.00876	0.00
120	L1016937 XLR	0.00	0.01	0.00	44.20	0.00	0.00	0.01	1.40	0.00	0.04	9.13	0.13	0.00
121	L1127086 XLR	0.00	0.01	0.00	168.00	0.00	0.00	0.00	2.33	0.00	0.02	26.60	0.71	0.00
122	app b tables B1 to B3	0.05	0.05	0.00	76.80	0.00	0.00	0.00	1.23	0.00		69.60	0.02	0.00
123	L829307 XLR	0.00	0.01	0.00	45.00	0.00	0.00	0.00	0.48	0.00	0.01	17.20	0.09	0.00
124	L1108531 XLR	0.00	0.01	0.00	35.60	0.00	0.00	0.00	1.08	0.00	0.02	44.40	0.08	0.00
125	L1453356 XLR	0.00	0.01	0.00	2.46	0.00	0.00	0.07	2.39	0.00	0.00	0.56	0.08	0.00
126	L1016937 XLR	0.00	0.01	0.00	35.80	0.00	0.00	0.00	1.08	0.00	0.02	40.80	0.11	0.00
127	L1453356 XLR	0.00	0.01	0.00	106.00	0.00	0.00	0.00	0.33	0.00	0.01	10.50	0.17	0.00
128	L829307 XLR	0.00	0.03	0.00	74.80	0.00	0.00	0.00	0.86	0.00	0.01	28.00	0.03	0.00
129	L1016937 XLR	0.00	0.01	0.00	75.10	0.00	0.00	0.00	1.90	0.00	0.05	49.10	0.07	0.00
130	L1195890 XLR	0.00	0.01	0.00	40.70	0.00	0.00	0.00	1.46	0.00	0.03	8.95	0.12	0.00
131	L1048234 XLR	0.00	0.01	0.00	79.70	0.00	0.00	0.00	2.04	0.00	0.05	53.40	0.11	0.00
132	L1073407 XLR	0.00	0.01	0.00	141.00	0.00	0.00	0.00	9.79	0.00	0.21	34.50	0.80	0.00
133	L923152 XLR	0.00	0.01	0.00	34.10	0.00	0.00	0.00	0.54	0.00	0.02	42.40	0.10	0.00
134	L1226369 XLR	0.00	0.01	0.00	82.20	0.00	0.00	0.00	0.69	0.00	0.01	29.40	0.01	0.00
135	L1086893 XLR	0.00	0.01	0.00	137.00	0.00	0.00	0.00	8.60	0.00	0.23	34.60	0.85	0.00
136	L1226369 XLR	0.00	0.01	0.00	5.08	0.00	0.00	0.01	4.96	0.00	0.02	3.01	0.07	0.00

	A	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV
1	File	Molybdenum (Mo)Total mg/L	Nickel (Ni)Total mg/L	Phosphorus (P)Total mg/L	Potassium (K)Total mg/L	Selenium (Se)Total mg/L	Silicon (Si)Total mg/L	Silver (Ag)Total mg/L	Sodium (Na)Total mg/L	Strontium (Sr)Total mg/L	Thallium (Tl)Total mg/L	Tin (Sn)Total mg/L	Titanium (Ti)Total mg/L	Uranium (U)Total mg/L
92	L1380836 XLR	0.01	0.00	0.15	2.48	0.00	6.95	0.00	2.56	0.33	0.00	0.00	0.01	0.01
93	L1195890 XLR	0.00	0.00	0.15	4.96	0.00	7.20	0.00	6.28	0.49	0.00	0.00	0.03	0.00
94	L1226369 XLR	0.01	0.00	0.15	2.39	0.00	7.67	0.00	2.71	0.34	0.00	0.00	0.04	0.01
95	L815386 XLR	0.00235	0.00376	0.15	1.00	0.00	7.75	0.000015	3.8	0.0318	0.00	0.00034	0.026	0.000175
96	L1048234 XLR	0.01	0.00	0.15	2.30	0.00	7.17	0.00	2.40	0.32	0.00	0.00	0.02	0.01
97	L798225 XLR	0.000533	0.00143	0.15	1.00	0.00	6.5	0.00	1.00	0.0319	0.00	0.00199	0.027	0.00102
98	L1274727 XLR	0.00	0.01	0.15	2.85	0.00	10.50	0.00	4.04	0.34	0.00	0.00	0.11	0.01
99	L1339478 XLR	0.01	0.00	0.15	2.39	0.00	6.80	0.00	2.58	0.33	0.00	0.00	0.02	0.01
100	L1453356 XLR	0.00	0.00	0.15	2.11	0.00	5.02	0.00	4.02	0.35	0.00	0.00	0.02	0.01
101	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		0.13	0.01			0.01
102	L1073407 XLR	0.01	0.00	0.15	2.90	0.00	10.20	0.00	8.60	0.57	0.00	0.00	0.10	0.03
103	L1008190 XLR	0.00	0.00	0.15	2.40	0.00	5.25	0.00	3.80	0.29	0.00	0.00	0.01	0.01
104	L812430 XLR	0.00725	0.00221	0.15	1.00	0.0023	5.23	0.00	12.3	0.208	0.00	0.00263	0.023	0.00465
105	L1016937 XLR	0.00	0.01	0.15	2.10	0.00	8.70	0.00	3.00	0.07	0.00	0.00	0.01	0.00
106	L1535070 XLR	0.00	0.00	0.15	2.08	0.00	5.19	0.00	3.35	0.32	0.00	0.00	0.02	0.01
107	L812430 XLR	0.000208	0.00	0.15	4.9	0.00	7.53	0.00	5.8	0.642	0.00	0.00017	0.01	0.00175
108	L1226369 XLR	0.00	0.00	0.15	1.89	0.00	8.34	0.00	2.78	0.12	0.00	0.00	0.05	0.00
109	L1048234 XLR	0.00	0.01	0.15	2.50	0.00	9.59	0.00	3.60	0.08	0.00	0.00	0.01	0.00
110	L812430 XLR	0.0121	0.00433	0.15	3.3	0.00	5.37	0.000158	11	0.274	0.00	0.00081	0.026	0.00161
111	L1094446 XLR	0.00	0.00	0.15	5.22	0.00	6.41	0.00	6.47	0.67	0.00	0.00	0.01	0.00
112	L798225 XLR	0.00802	0.0052	0.15	1.00	0.00	14.5	0.00	2.3	0.171	0.00	0.00097	0.012	0.000899
113	L1226369 XLR	0.00	0.00	0.15	5.47	0.00	7.12	0.00	6.39	0.62	0.00	0.00	0.02	0.00
114	app b tables B1 to B3	0.02	0.00	0.15		0.00		0.00		1.67	0.01			0.02
115	L1094446 XLR	0.00	0.00	0.15	2.18	0.00	5.45	0.00	3.80	0.30	0.00	0.00	0.03	0.01
116	L923152 XLR	0.00	0.00	0.15	2.90	0.00	6.96	0.00	3.70	0.18	0.00	0.00	0.01	0.00
117	L1380836 XLR	0.01	0.00	0.15	2.40	0.00	8.70	0.00	8.13	0.54	0.00	0.00	0.02	0.03
118	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.03	0.01			0.00
119	L812430 XLR	0.000669	0.00074	0.15	1.00	0.00	6.8	0.000014	2.3	0.0473	0.00	0.00029	0.013	0.000267
120	L1016937 XLR	0.00	0.00	0.15	2.60	0.00	7.21	0.00	3.30	0.16	0.00	0.00	0.01	0.00
121	L1127086 XLR	0.03	0.01	0.15	2.71	0.00	4.83	0.00	10.40	0.93	0.00	0.00	0.02	0.03
122	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		1.08	0.01			0.00
123	L829307 XLR	0.00	0.00	0.15	2.60	0.00	8.03	0.00	3.90	0.20	0.00	0.00	0.02	0.00
124	L1108531 XLR	0.01	0.00	0.15	2.18	0.00	7.34	0.00	2.28	0.34	0.00	0.00	0.01	0.01
125	L1453356 XLR	0.00	0.01	0.15	1.45	0.00	1.92	0.00	0.48	0.01	0.00	0.00	0.03	0.00
126	L1016937 XLR	0.01	0.00	0.15	2.10	0.00	6.61	0.00	2.30	0.32	0.00	0.00	0.02	0.01
127	L1453356 XLR	0.00	0.00	0.15	2.38	0.00	7.21	0.00	7.70	0.52	0.00	0.00	0.02	0.03
128	L829307 XLR	0.00	0.00	0.75	5.00	0.00	5.59	0.00	5.00	0.39	0.00	0.00	0.03	0.01
129	L1016937 XLR	0.00	0.00	0.15	4.50	0.00	7.31	0.00	5.10	0.54	0.00	0.00	0.02	0.00
130	L1195890 XLR	0.00	0.00	0.15	2.42	0.00	7.98	0.00	3.26	0.16	0.00	0.00	0.03	0.00
131	L1048234 XLR	0.00	0.00	0.15	5.30	0.00	7.93	0.00	5.50	0.58	0.00	0.00	0.01	0.00
132	L1073407 XLR	0.00	0.00	0.15	5.50	0.00	6.71	0.00	6.70	0.63	0.00	0.00	0.01	0.00
133	L923152 XLR	0.01	0.00	0.15	2.30	0.00	6.54	0.00	2.40	0.34	0.00	0.00	0.01	0.01
134	L1226369 XLR	0.00	0.00	0.15	2.33	0.00	5.67	0.00	4.22	0.34	0.00	0.00	0.02	0.01
135	L1086893 XLR	0.00	0.00	0.15	5.70	0.00	7.05	0.00	6.50	0.64	0.00	0.00	0.02	0.00
136	L1226369 XLR	0.00	0.02	0.15	1.40	0.00	7.92	0.00	1.14	0.02	0.00	0.00	0.05	0.00

	A	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
1	File	Vanadium (V)Total mg/L	Zinc (Zn)Total mg/L	Aluminum (Al)Dissolved mg/L	Antimony (Sb)Dissolved mg/L	Arsenic (As)Dissolved mg/L	Barium (Ba)Dissolved mg/L	Beryllium (Be)Dissolved mg/L	Bismuth (Bi)Dissolved mg/L	Boron (B)Dissolved mg/L	Cadmium (Cd)Dissolved mg/L	Calcium (Ca)Dissolved mg/L	Chromium (Cr)Dissolved mg/L	Cobalt (Co)Dissolved mg/L
92	L1380836 XLR	0.00	0.04	0.00	0.00	0.13	0.06	0.00	0.00	0.01	0.00	34.30	0.00	0.00
93	L1195890 XLR	0.00	0.02	0.01	0.00	1.65	0.00	0.00	0.00	0.01	0.00	112.00	0.00	0.00
94	L1226369 XLR	0.00	0.14	0.00	0.00	0.13	0.06	0.00	0.00	0.01	0.00	35.20	0.00	0.00
95	L815386 XLR	0.00	0.0226	0.0248	0.0002	0.00038	0.00605	0.00	0.00	0.01	0.000019	6.49	0.00	0.00026
96	L1048234 XLR	0.00	0.01	0.01	0.00	0.16	0.06	0.00	0.00	0.01	0.00	36.10	0.00	0.00
97	L798225 XLR	0.00	0.0186	0.0203	0.00075	0.058	0.0199	0.00	0.00	0.01	0.000024	6.12	0.00	0.00021
98	L1274727 XLR	0.01	0.03	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	77.20	0.00	0.00
99	L1339478 XLR	0.00	0.03	0.00	0.00	0.14	0.06	0.00	0.00	0.01	0.00	32.60	0.00	0.00
100	L1453356 XLR	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	81.20	0.00	0.00
101	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.18	0.01	0.00	0.05	0.05	0.00	17.70	0.00	0.00
102	L1073407 XLR	0.00	0.01	0.00	0.00	8.67	0.01	0.00	0.00	0.01	0.00	116.00	0.00	0.00
103	L1008190 XLR	0.00	0.02	0.01	0.00	0.00	0.10	0.00	0.00	0.01	0.00	78.90	0.00	0.00
104	L812430 XLR	0.00	0.011	0.0034	0.00113	0.222	0.0123	0.00	0.00	0.01	0.000044	46.6	0.00	0.00
105	L1016937 XLR	0.00	0.09	0.03	0.05	0.62	0.00	0.00	0.00	0.01	0.00	13.30	0.00	0.00
106	L1535070 XLR	0.00	0.02	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	81.40	0.00	0.00
107	L812430 XLR	0.00	0.0041	0.001	0.00023	1.33	0.0214	0.00	0.00	0.01	0.00	81.6	0.00	0.00
108	L1226369 XLR	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	21.10	0.00	0.00
109	L1048234 XLR	0.00	0.10	0.14	0.04	0.75	0.01	0.00	0.00	0.01	0.00	14.80	0.00	0.00
110	L812430 XLR	0.00	0.0712	0.004	0.00365	0.0309	0.0394	0.00	0.00	0.012	0.000018	37.2	0.00	0.00106
111	L1094446 XLR	0.00	0.01	0.00	0.00	2.02	0.01	0.00	0.00	0.01	0.00	143.00	0.00	0.00
112	L798225 XLR	0.00	0.069	0.0012	0.0137	0.605	0.0369	0.00	0.00	0.01	0.000026	26.2	0.00	0.00197
113	L1226369 XLR	0.00	0.03	0.00	0.00	2.28	0.01	0.00	0.00	0.01	0.00	138.00	0.00	0.00
114	app b tables B1 to B3	0.02	0.00	0.00	0.00	0.03	0.01	0.00	0.05	0.05	0.00	34.00	0.00	0.00
115	L1094446 XLR	0.00	0.01	0.00	0.00	0.00	0.11	0.00	0.00	0.01	0.00	77.40	0.00	0.00
116	L923152 XLR	0.00	0.02	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	41.00	0.00	0.00
117	L1380836 XLR	0.00	0.03	0.00	0.00	7.75	0.01	0.00	0.00	0.01	0.00	109.00	0.00	0.00
118	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.07	0.01	0.00	0.05	0.05	0.00	7.88	0.00	0.00
119	L812430 XLR	0.00	0.0098	0.0019	0.00044	0.0649	0.0133	0.00	0.00	0.01	0.00	8.16	0.00	0.00
120	L1016937 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	44.40	0.00	0.00
121	L1127086 XLR	0.00	0.02	0.00	0.00	1.51	0.02	0.00	0.00	0.01	0.00	178.00	0.00	0.00
122	app b tables B1 to B3	0.02	0.00	0.01	0.00	1.18	0.01	0.00	0.05	0.05	0.00	78.80	0.00	0.00
123	L829307 XLR	0.00	0.01	0.00	0.00	0.02	0.07	0.00	0.00	0.01	0.00	45.90	0.00	0.00
124	L1108531 XLR	0.00	0.00	0.00	0.00	0.18	0.06	0.00	0.00	0.01	0.00	36.80	0.00	0.00
125	L1453356 XLR	0.00	0.02	0.12	0.00	0.00	0.01	0.00	0.00	0.01	0.00	2.76	0.00	0.00
126	L1016937 XLR	0.00	0.01	0.00	0.00	0.17	0.05	0.00	0.00	0.01	0.00	36.40	0.00	0.00
127	L1453356 XLR	0.00	0.01	0.01	0.00	6.98	0.01	0.00	0.00	0.01	0.00	108.00	0.00	0.00
128	L829307 XLR	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.03	0.00	72.80	0.00	0.00
129	L1016937 XLR	0.00	0.01	0.01	0.00	0.93	0.02	0.00	0.00	0.01	0.00	78.80	0.00	0.00
130	L1195890 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	41.80	0.00	0.00
131	L1048234 XLR	0.00	0.01	0.01	0.00	0.98	0.02	0.00	0.00	0.01	0.00	78.30	0.00	0.00
132	L1073407 XLR	0.00	0.00	0.00	0.00	3.64	0.01	0.00	0.00	0.01	0.00	142.00	0.00	0.00
133	L923152 XLR	0.00	0.02	0.00	0.00	0.12	0.06	0.00	0.00	0.01	0.00	33.90	0.00	0.00
134	L1226369 XLR	0.00	0.01	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	80.70	0.00	0.00
135	L1086893 XLR	0.00	0.02	0.00	0.00	1.90	0.01	0.00	0.00	0.01	0.00	138.00	0.00	0.00
136	L1226369 XLR	0.00	0.04	0.04	0.02	0.05	0.00	0.00	0.00	0.01	0.00	5.10	0.00	0.00

	A	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU
1	File	Copper (Cu)Dissolved mg/L	Iron (Fe)Dissolved mg/L	Lead (Pb)Dissolved mg/L	Lithium (Li)Dissolved mg/L	Magnesium (Mg)Dissolved mg/L	Manganese (Mn)Dissolved mg/L	Mercury (Hg)Dissolved mg/L	Molybdenum (Mo)Dissolved mg/L	Nickel (Ni)Dissolved mg/L	Phosphorus (P)Dissolved mg/L	Potassium (K)Dissolved mg/L	Selenium (Se)Dissolved mg/L
92	L1380836 XLR	0.00	0.02	0.00	0.02	45.30	0.02	0.00	0.01	0.00	0.15	2.37	0.00
93	L1195890 XLR	0.00	10.60	0.00	0.18	31.10	0.37	0.00	0.00	0.00	0.15	5.00	0.00
94	L1226369 XLR	0.00	0.01	0.00	0.02	43.20	0.04	0.00	0.01	0.00	0.15	2.33	0.00
95	L815386 XLR	0.00336	0.02	0.00	0.0052	0.96	0.0379	0.00	0.0025	0.00273	0.15	1.00	0.00
96	L1048234 XLR	0.00	0.14	0.00	0.02	44.20	0.06	0.00	0.01	0.00	0.15	2.10	0.00
97	L798225 XLR	0.00125	0.02	0.000114	0.00	0.81	0.0423		0.000499	0.00077	0.15	1.00	0.00
98	L1274727 XLR	0.00	0.01	0.00	0.01	30.70	0.00	0.00	0.00	0.00	0.15	2.18	0.00
99	L1339478 XLR	0.00	0.02	0.00	0.02	45.40	0.06		0.01	0.00	0.15	2.36	0.00
100	L1453356 XLR	0.00	0.01	0.00	0.01	30.50	0.00	0.00	0.00	0.00	0.15	2.13	0.00
101	app b tables B1 to B3	0.00	0.02	0.00		2.84	0.01		0.01	0.00	0.15	0.86	0.00
102	L1073407 XLR	0.00	0.07	0.00	0.01	10.70	0.17	0.00	0.01	0.00	0.15	2.50	0.00
103	L1008190 XLR	0.00	0.02	0.00	0.01	27.90	0.00	0.00	0.00	0.00	0.15	2.20	0.00
104	L812430 XLR	0.00115	0.02	0.00	0.0102	5.85	0.000096	0.00	0.00688	0.0007	0.15	1.00	0.0021
105	L1016937 XLR	0.00	9.39	0.00	0.07	12.10	0.33	0.00	0.00	0.01	0.15	2.10	0.00
106	L1535070 XLR	0.00	0.01	0.00	0.01	29.80	0.00		0.00	0.00	0.15	2.18	0.00
107	L812430 XLR	0.00018	1.46	0.000052	0.057	60.1	0.0623	0.00	0.00019	0.00	0.15	5.1	0.00
108	L1226369 XLR	0.00	0.01	0.00	0.04	12.00	0.00	0.00	0.00	0.00	0.15	1.56	0.00
109	L1048234 XLR	0.00	11.20	0.00	0.07	12.90	0.46	0.00	0.00	0.01	0.15	2.10	0.00
110	L812430 XLR	0.00084	0.02	0.00	0.0197	23.3	0.276	0.00	0.0136	0.00316	0.15	3.2	0.00
111	L1094446 XLR	0.00	6.01	0.00	0.21	34.70	0.84	0.00	0.00	0.00	0.15	5.23	0.00
112	L798225 XLR	0.00023	2.59	0.000107	0.0053	5.75	0.321		0.00875	0.0042	0.15	1.00	0.00
113	L1226369 XLR	0.00	7.80	0.00	0.22	34.40	0.71	0.00	0.00	0.00	0.15	5.63	0.00
114	app b tables B1 to B3	0.00	0.02	0.00		3.42	0.02		0.02	0.00	0.15	0.63	0.00
115	L1094446 XLR	0.00	0.02	0.00	0.01	26.80	0.00	0.00	0.00	0.00	0.15	2.14	0.00
116	L923152 XLR	0.00	0.33	0.00	0.04	9.73	0.11	0.00	0.00	0.00	0.15	2.90	0.00
117	L1380836 XLR	0.00	0.07	0.00	0.01	10.50	0.17	0.00	0.00	0.00	0.15	2.30	0.00
118	app b tables B1 to B3	0.00	0.02	0.00		1.07	0.00		0.00	0.00	0.15	0.44	0.00
119	L812430 XLR	0.00089	0.02	0.00	0.00	1.12	0.0014	0.00	0.000619	0.00	0.15	1.00	0.00
120	L1016937 XLR	0.00	0.65	0.00	0.03	9.22	0.10	0.00	0.00	0.00	0.15	2.50	0.00
121	L1127086 XLR	0.00	0.07	0.00	0.02	28.80	0.69	0.00	0.03	0.00	0.15	2.69	0.00
122	app b tables B1 to B3	0.00	1.13	0.00		70.20	0.02		0.00	0.00	0.15	3.94	0.00
123	L829307 XLR	0.00	0.02	0.00	0.01	16.60	0.08	0.00	0.00	0.00	0.15	2.20	0.00
124	L1108531 XLR	0.00	0.14	0.00	0.02	45.30	0.07	0.00	0.01	0.00	0.15	2.14	0.00
125	L1453356 XLR	0.06	0.11	0.00	0.00	0.45	0.06	0.00	0.00	0.00	0.15	1.46	0.00
126	L1016937 XLR	0.00	0.16	0.00	0.02	41.50	0.07	0.00	0.01	0.00	0.15	2.00	0.00
127	L1453356 XLR	0.00	0.01	0.00	0.01	10.70	0.16	0.00	0.00	0.00	0.15	2.35	0.00
128	L829307 XLR	0.00	0.08	0.00	0.01	27.00	0.02	0.00	0.00	0.00	0.75	5.00	0.00
129	L1016937 XLR	0.00	1.26	0.00	0.04	51.10	0.06	0.00	0.00	0.00	0.15	4.70	0.00
130	L1195890 XLR	0.00	0.56	0.00	0.03	8.98	0.10	0.00	0.00	0.00	0.15	2.29	0.00
131	L1048234 XLR	0.00	1.52	0.00	0.05	52.20	0.10	0.00	0.00	0.00	0.15	5.10	0.00
132	L1073407 XLR	0.00	9.73	0.00	0.20	34.50	0.79	0.00	0.00	0.00	0.15	5.40	0.00
133	L923152 XLR	0.00	0.02	0.00	0.02	42.60	0.06	0.00	0.01	0.00	0.15	2.70	0.00
134	L1226369 XLR	0.00	0.01	0.00	0.01	28.70	0.00	0.00	0.00	0.00	0.15	2.19	0.00
135	L1086893 XLR	0.00	5.80	0.00	0.22	35.20	0.81	0.00	0.00	0.00	0.15	5.50	0.00
136	L1226369 XLR	0.01	0.60	0.00	0.02	2.95	0.06	0.00	0.00	0.01	0.15	1.11	0.00

	A	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE
1	File	Silicon (Si)Dissolved mg/L	Silver (Ag)Dissolved mg/L	Sodium (Na)Dissolved mg/L	Strontium (Sr)Dissolved mg/L	Thallium (Tl)Dissolved mg/L	Tin (Sn)Dissolved mg/L	Titanium (Ti)Dissolved mg/L	Uranium (U)Dissolved mg/L	Vanadium (V)Dissolved mg/L	Zinc (Zn)Dissolved mg/L
92	L1380836 XLR	6.46	0.00	2.58	0.32	0.00	0.00	0.01	0.01	0.00	0.03
93	L1195890 XLR	6.42	0.00	6.09	0.48	0.00	0.00	0.01	0.00	0.00	0.02
94	L1226369 XLR	6.55	0.00	2.65	0.33	0.00	0.00	0.01	0.01	0.00	0.07
95	L815386 XLR	6.04	0.00	3.8	0.0305	0.00	0.00	0.01	0.00009	0.00	0.0138
96	L1048234 XLR	6.55	0.00	2.30	0.32	0.00	0.00	0.01	0.01	0.00	0.00
97	L798225 XLR	6.25	0.00	2	0.032	0.00	0.00055	0.01	0.000223	0.00	0.0233
98	L1274727 XLR	4.91	0.00	3.85	0.32	0.00	0.00	0.01	0.01	0.00	0.00
99	L1339478 XLR	6.46	0.00	2.62	0.33	0.00	0.00	0.01	0.01	0.00	0.02
100	L1453356 XLR	4.85	0.00	4.07	0.34	0.00	0.00	0.01	0.01	0.00	0.00
101	app b tables B1 to B3		0.00	3.58	0.11			0.005	0.01	0.02	0.00
102	L1073407 XLR	6.60	0.00	8.50	0.55	0.00	0.00	0.01	0.03	0.00	0.00
103	L1008190 XLR	4.94	0.00	3.80	0.29	0.00	0.00	0.01	0.01	0.00	0.00
104	L812430 XLR	4.59	0.00	11.8	0.198	0.00	0.00129	0.01	0.00438	0.00	0.0024
105	L1016937 XLR	8.72	0.00	3.20	0.06	0.00	0.00	0.01	0.00	0.00	0.10
106	L1535070 XLR	5.24	0.00	3.50	0.34	0.00	0.00	0.01	0.01	0.00	0.01
107	L812430 XLR	7.49	0.00	6	0.632	0.00	0.00	0.01	0.00174	0.00	0.005
108	L1226369 XLR	6.30	0.00	2.62	0.12	0.00	0.00	0.01	0.00	0.00	0.00
109	L1048234 XLR	8.93	0.00	3.20	0.08	0.00	0.00	0.01	0.00	0.00	0.10
110	L812430 XLR	4.53	0.00	11.7	0.267	0.00	0.00	0.01	0.00149	0.00	0.0374
111	L1094446 XLR	6.46	0.00	6.57	0.67	0.00	0.00	0.01	0.00	0.00	0.01
112	L798225 XLR	14.3	0.00	2.4	0.176	0.00	0.00011	0.01	0.000806	0.00	0.0297
113	L1226369 XLR	6.67	0.00	6.35	0.60	0.00	0.00	0.01	0.00	0.00	0.02
114	app b tables B1 to B3		0.00	4.78	1.30			0.005	0.02	0.02	0.00
115	L1094446 XLR	4.81	0.00	3.94	0.31	0.00	0.00	0.01	0.01	0.00	0.00
116	L923152 XLR	6.63	0.00	3.60	0.16	0.00	0.00	0.01	0.00	0.00	0.01
117	L1380836 XLR	6.20	0.00	7.90	0.52	0.00	0.00	0.01	0.03	0.00	0.01
118	app b tables B1 to B3		0.00	1.44	0.03			0.005	0.00	0.02	0.00
119	L812430 XLR	6.64	0.00	2.2	0.0454	0.00	0.00	0.01	0.000175	0.00	0.0051
120	L1016937 XLR	6.81	0.00	3.30	0.15	0.00	0.00	0.01	0.00	0.00	0.00
121	L1127086 XLR	4.40	0.00	10.60	0.98	0.00	0.00	0.01	0.04	0.00	0.00
122	app b tables B1 to B3		0.00	29.30	1.10			0.005	0.00	0.02	0.00
123	L829307 XLR	7.71	0.00	3.50	0.18	0.00	0.00	0.01	0.00	0.00	0.01
124	L1108531 XLR	6.79	0.00	2.37	0.34	0.00	0.00	0.01	0.01	0.00	0.00
125	L1453356 XLR	0.80	0.00	0.55	0.01	0.00	0.00	0.01	0.00	0.00	0.01
126	L1016937 XLR	6.25	0.00	2.30	0.30	0.00	0.00	0.01	0.01	0.00	0.00
127	L1453356 XLR	6.23	0.00	7.64	0.51	0.00	0.00	0.01	0.03	0.00	0.01
128	L829307 XLR	5.13	0.00	5.00	0.39	0.00	0.00	0.03	0.01	0.00	0.00
129	L1016937 XLR	7.28	0.00	5.30	0.53	0.00	0.00	0.01	0.00	0.00	0.00
130	L1195890 XLR	6.93	0.00	3.23	0.16	0.00	0.00	0.01	0.00	0.00	0.01
131	L1048234 XLR	7.62	0.00	5.30	0.57	0.00	0.00	0.01	0.00	0.00	0.01
132	L1073407 XLR	6.68	0.00	6.50	0.66	0.00	0.00	0.01	0.00	0.00	0.00
133	L923152 XLR	6.44	0.00	2.40	0.32	0.00	0.00	0.01	0.01	0.00	0.01
134	L1226369 XLR	5.01	0.00	3.92	0.32	0.00	0.00	0.01	0.01	0.00	0.00
135	L1086893 XLR	6.92	0.00	6.40	0.63	0.00	0.00	0.01	0.00	0.00	0.01
136	L1226369 XLR	5.46	0.00	1.13	0.02	0.00	0.00	0.01	0.00	0.00	0.03

	A	B	C	D	E	F
1	File	Project	Report To	ALS File No.	Date Received	Date
137	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
138	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	02/09/2012
139	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
140	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
141	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
142	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	29/08/2013
143	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
144	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
145	app b tables B1 to B3					
146	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
147	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
148	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
149	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	29/08/2015
150	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
151	L1144418 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1144418	08/05/2012	23/05/2012
152	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
153	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
154	app b tables B1 to B3					
155	app b tables B1 to B3					
156	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
157	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
158	L1339478 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1339478	29/07/2013	05/02/2015
159	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
160	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
161	app b tables B1 to B3					
162	app b tables B1 to B3					
163	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012
164	L1339478 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1339478	29/07/2013	05/02/2015
165	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
166	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
167	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
168	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
169	app b tables B1 to B3					
170	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
171	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
172	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
173	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
174	L1799287 XLR	GROUNDWATER	Steve Wilbur, STRATAGOLD CORPORATION	L1799287	15/07/2016	29/07/2016
175	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
176	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
177	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
178	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
179	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
180	L1274727 XLR	GROUND WATER	Christiane Buie, STRATAGOLD CORPORATION	L1274727	04/03/2013	15/03/2013
181	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011

	A	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	File	Well ID	Location	Date Sampled	Quarter 1-Jan-Mar, 2-Apr-Jun, 3 Jly-Sep, 4 Oct-Dec	Time Sampled	ALS Sample ID	Matrix	Conductivity uS/cm	Hardness (as CaCO3) mg/L	pH	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity NTU	Acidity (as CaCO3) mg/L
137	L946390 XLR	MW10-AG3A	Ann Gulch	19/10/2010	Q4	17:20	L9463902	Water	275.00	146.00	8.02	16.30	169.00	15.60	
138	L1195890 XLR	MW10-PG1	Platinum Gulch	15/08/2012	Q3	16:00	L11958909	Water	585.00	319.00	8.03	16.30	424.00	4.86	
139	L1008190 XLR	MW96-23	Platinum Gulch	19/05/2011	Q2	20:30	L10081906	Water	415.00	189.00	7.97	16.00	265.00	1.96	
140	L1125898 XLR	MW96-13A	Eagle Pup	18/03/2012	Q1	15:00	L11258984	Water	451.00	260.00	8.40	16.00	241.00	7.74	
141	L829307 XLR	MW09-DG1	Dublin Gulch	05/10/2009	Q4	14:00	L8293076	Water	418.00	221.00	7.61	15.80	254.00	34.00	
142	L1195890 XLR	MW96-13A	Eagle Pup	15/08/2012	Q3	10:10	L11958904	Water	445.00	272.00	8.19	15.20	251.00	12.30	
143	L1073407 XLR	MW09-DG2	Dublin Gulch	16/10/2011	Q4	13:00	L10734079	Water	597.00	349.00	7.50	14.70	380.00	3.46	
144	L946390 XLR	MW10-DG6	Dublin Gulch	20/10/2010	Q4	08:30	L9463905	Water	888.00	525.00	7.30	14.30	673.00	40.90	
145	app b tables B1 to B3	DH95-139	Bawn Boy Gulch	24/05/1996	Q2				60.40	24.80	7.01	14.00	38.00	9.30	
146	L923152 XLR	MW10-DG7	Dublin Gulch	20/08/2010	Q3	10:00	L9231525	Water	178.00	91.10	7.69	13.60	122.00	1.43	
147	L923152 XLR	MW09-STU2	Suttles Gulch	19/08/2010	Q3	18:00	L92315210	Water	755.00	427.00	7.58	13.10	471.00	23.10	
148	L923152 XLR	MW10-AG5	Ann Gulch	19/08/2010	Q3	11:30	L9231522	Water	190.00	82.50	6.82	13.10	148.00	21.40	
149	L1195890 XLR	MW10-AG5	Ann Gulch	15/08/2012	Q3	13:10	L11958908	Water	49.40	20.30	7.07	12.10	68.00	38.30	
150	L1125898 XLR	MW09-DG2	Dublin Gulch	18/03/2012	Q1	13:30	L11258983	Water	552.00	302.00	8.18	12.00	331.00	5.30	
151	L1144418 XLR	MW10-AG3A	Ann Gulch	06/05/2012	Q2	09:30	L11444189	Water	267.00	143.00	7.95	11.80	171.00	10.10	
152	L923152 XLR	MW96-23	Platinum Gulch	19/08/2010	Q3	16:00	L9231528	Water	360.00	169.00	8.08	11.60	228.00	2.75	
153	L1086893 XLR	MW09-DG2	Dublin Gulch	18/11/2011	Q4	11:45	L10868937	Water	583.00	318.00	8.32	11.50	361.00	6.45	
154	app b tables B1 to B3	DH95-152	Dublin Gulch	27/09/1995	Q3				912.00	492.00	7.35	11.00	715.00	10.60	
155	app b tables B1 to B3	DH95-152	Dublin Gulch	21/09/1996	Q3				812.00	420.00	7.39	11.00	599.00	9.80	
156	L1008190 XLR	MW96-13A	Eagle Pup	19/05/2011	Q2	17:45	L10081908	Water	447.00	262.00	8.03	11.00	239.00	6.10	
157	L946390 XLR	MW96-23	Platinum Gulch	20/10/2010	Q4	10:00	L9463907	Water	363.00	186.00	8.13	10.80	226.00	3.41	
158	L1339478 XLR	MW10-AG3A	Ann Gulch	26/07/2013	Q3	09:40	L13394781	Water	245.00	130.00	7.86	10.70	167.00	8.77	
159	L1008190 XLR	MW09-DG2	Dublin Gulch	19/05/2011	Q2	14:50	L10081901	Water	621.00	328.00	7.78	10.50	389.00	3.62	
160	L923152 XLR	MW10-PG1	Platinum Gulch	19/08/2010	Q3	14:00	L9231526	Water	564.00	288.00	7.86	10.10	391.00	2.26	
161	app b tables B1 to B3	DH95-151	Suttles Gulch	22/07/1996	Q3				628.00	347.00	7.58	10.00	456.00	9.70	
162	app b tables B1 to B3	DH95-106	Suttles Gulch	21/09/1996	Q3				284.00	133.00	7.99	10.00	198.00	4.50	
163	L1226369 XLR	MW09-DG2	Dublin Gulch	17/10/2012	Q4	10:30	L12263693	Water	499.00	296.00	8.01	10.00	324.00	9.54	
164	L1339478 XLR	MW96-15A	Eagle Pup	26/07/2013	Q3	11:40	L13394783	Water	654.00	410.00	7.42	10.00	433.00	17.10	
165	L1094446 XLR	MW96-23	Platinum Gulch	08/12/2011	Q4	11:30	L10944468	Water	940.00	634.00	8.05	9.80	720.00	10.90	
166	L829307 XLR	MW96-8	Bawn Boy Gulch	05/10/2009	Q4	12:30	L8293072	Water	64.20	25.80	7.08	9.30	49.00	3.39	
167	L946390 XLR	MW10-PG1	Platinum Gulch				L94639011	Water	567.00	316.00	8.00	9.30	395.00	1.43	
168	L1094446 XLR	MW96-13A	Eagle Pup	07/12/2011	Q4	16:00	L10944469	Water	450.00	275.00	8.30	9.20	241.00	7.23	
169	app b tables B1 to B3	DH95-150	Stewart Gulch	24/05/1996	Q2				808.00	447.00	7.40	9.00	570.00	11.30	
170	L946390 XLR	MW10-AG5	Ann Gulch	19/10/2010	Q4	18:00	L9463903	Water	187.00	79.50	6.59	8.80	124.00	9.02	
171	L1086893 XLR	MW96-13A	Eagle Pup	18/11/2011	Q4	11:00	L10868938	Water	467.00	269.00	8.51	8.80	239.00	8.04	
172	L1125898 XLR	MW10-AG3A	Ann Gulch	18/03/2012	Q1	12:20	L112589810	Water	275.00	138.00	8.25	8.70	160.00	9.82	
173	L1008190 XLR	MW09-DG6	Dublin Gulch	19/05/2011	Q2	13:30	L10081905	Water	379.00	246.00	7.24	8.00	268.00	23.50	
174	L1799287 XLR	MW09-OG3	Olive Gulch	13/07/2016	Q3	0.33	L17992872	Water	418.00	236.00	7.96	8.00	255.00	5.21	
175	L812430 XLR	DH95-152	Dublin Gulch	27/08/2009	Q3	00:00	L8124309	Water	787	443	7.74	7.8	494		
176	L829307 XLR	MW96-23	Platinum Gulch	05/10/2009	Q4	18:00	L8293077	Water	313.00	153.00	7.78	7.80	192.00	6.45	
177	L1008190 XLR	MW09-STU2	Suttles Gulch	19/05/2011	Q2	15:15	L100819012	Water	35.60	21.20	7.07	7.50	79.00	9.87	
178	L812430 XLR	MW96-15B	Eagle Pup	27/08/2009	Q3	00:00	L8124305	Water	446	274	7.9	7.3	236		
179	L946390 XLR	MW09-DG2	Dublin Gulch	19/10/2010	Q4	16:15	L9463901	Water	465.00	305.00	7.73	7.30	297.00	2.37	
180	L1274727 XLR	MW09-DG2	Dublin Gulch	01/03/2013	Q1	12:30	L12747272	Water	522.00	296.00	7.78	7.30	305.00	4.71	
181	L1094446 XLR	MW09-DG2	Dublin Gulch	08/12/2011	Q4	08:30	L10944467	Water	599.00	339.00	7.99	7.20	382.00	1.76	

	A	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	File	Alkalinity, Bicarbonate (as CaCO3) mg/L	Alkalinity, Carbonate (as CaCO3) mg/L	Alkalinity, Hydroxide (as CaCO3) mg/L	Alkalinity, Total (as CaCO3) mg/L	Ammonia as N mg/L	Bromide (Br) mg/L	Chloride (Cl) mg/L	Fluoride (F) mg/L	Nitrate (as N) mg/L	Nitrite (as N) mg/L	Total Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Ortho Phosphate as P mg/L	Total Dissolved Phosphate As P mg/L
137	L946390 XLR					0.02	0.03	0.25	0.25	0.00	0.00	0.03		0.00	0.00
138	L1195890 XLR				176.00	0.03		0.25	0.45	0.01	0.00	0.12	0.13	0.29	0.20
139	L1008190 XLR	155.00				0.00	0.03	0.25	0.07	0.42	0.00	0.11		0.02	
140	L1125898 XLR				258.00	0.01	0.03	0.25	0.41	0.00	0.00	0.03	0.00	0.00	0.00
141	L829307 XLR				166.00	0.03	0.03	0.25	0.23	0.00	0.00	0.19		0.00	0.00
142	L1195890 XLR				253.00	0.01		0.25	0.31	0.03	0.00	0.27	0.31	0.00	0.00
143	L1073407 XLR				242.00	0.00	0.03	0.25	0.17	0.12	0.00	0.10	0.22	0.00	0.00
144	L946390 XLR					0.20	0.25	2.50	0.10	0.03	0.01	0.22		0.00	0.03
145	app b tables B1 to B3				21.50	0.00		0.25	0.05	0.12	0.00			0.01	
146	L923152 XLR	65.80	1.00	1.00	65.80	0.00	0.03	0.25	0.11	0.01	0.01	0.03	0.02	0.00	0.00
147	L923152 XLR	348.00	1.00	1.00	348.00	0.14	0.25	2.50	0.10	0.08	0.01	0.17	0.25	0.00	0.01
148	L923152 XLR	18.00	1.00	1.00	18.00	0.01	0.03	0.25	0.24	0.00	0.00	0.16	0.16	0.00	0.00
149	L1195890 XLR				10.10	0.00		0.25	0.08	0.07	0.00	0.21	0.28	0.00	0.01
150	L1125898 XLR				228.00	0.00	0.03	0.25	0.18	0.17	0.00	0.14	0.31	0.00	0.00
151	L1144418 XLR				97.30	0.02	0.03	0.25	0.29	0.00	0.00	0.06	0.06	0.00	0.00
152	L923152 XLR	138.00	1.00	1.00	138.00	0.00	0.03	0.25	0.07	0.22	0.00	0.03	0.22	0.00	0.01
153	L1086893 XLR				233.00	0.01	0.03	0.25	0.18	0.00	0.00	0.18	0.18	0.00	0.01
154	app b tables B1 to B3				419.00	0.36		1.70	0.15	0.01	0.00			0.00	
155	app b tables B1 to B3				335.00	0.27		0.60	0.15	0.00	0.00			0.03	
156	L1008190 XLR	251.00				0.01	0.03	0.25	0.39	0.01	0.00	0.05		0.01	
157	L946390 XLR					0.01	0.03	0.25	0.06	0.31	0.00	0.09		0.01	0.01
158	L1339478 XLR				106.00	0.03		0.25	0.30	0.00	0.00	0.18	0.15	0.00	0.00
159	L1008190 XLR	240.00				0.01	0.03	0.76	0.15	0.04	0.00	0.10		0.00	
160	L923152 XLR	156.00	1.00	1.00	156.00	0.00	0.03	3.13	0.39	0.03	0.00	0.11	0.14	0.04	0.03
161	app b tables B1 to B3				248.00	0.02		0.25	0.29	0.14	0.00			0.01	
162	app b tables B1 to B3				105.00	0.00		0.25	0.08	0.01	0.00			0.00	
163	L1226369 XLR				199.00	0.01		0.53	0.19	0.13	0.00	0.34	0.47	0.00	0.00
164	L1339478 XLR				303.00	0.04		0.25	0.28	0.00	0.00	0.14	0.10	0.00	0.00
165	L1094446 XLR	163.00	1.00	1.00	163.00	0.17	0.25	2.50	0.10	0.08	0.01	0.63	0.72	0.01	0.07
166	L829307 XLR				20.10	0.02	0.03	0.25	0.03	0.09	0.00	0.19		0.01	0.01
167	L946390 XLR					0.15	0.03	1.93	0.38	0.06	0.00	0.61		0.13	0.11
168	L1094446 XLR	239.00	6.30	0.50	245.00	0.01	0.03	0.25	0.41	0.00	0.00	0.03	0.00	0.00	0.00
169	app b tables B1 to B3				394.00	0.02		0.25	0.30	0.00	0.00			0.00	
170	L946390 XLR					0.01	0.03	0.25	0.22	0.00	0.00	0.18		0.00	0.00
171	L1086893 XLR				250.00	0.01	0.03	0.25	0.42	0.00	0.00	0.05	0.05	0.00	0.00
172	L1125898 XLR				103.00	0.04	0.03	0.25	0.28	0.00	0.00	0.06	0.06	0.00	0.00
173	L1008190 XLR	50.70				0.05	0.03	0.25	0.19	0.01	0.00	0.03		0.00	
174	L1799287 XLR				144.00	0.01		0.25	0.60	0.00	0.00	0.03	0.03	0.00	0.00
175	L812430 XLR	320	1.00	1.00	320	0.412	0.25	2.50	0.10	0.03	0.01	1.2		0.0082	
176	L829307 XLR				136.00	0.00	0.03	0.25	0.06	0.43	0.00	0.19		0.03	0.03
177	L1008190 XLR	13.40				0.02	0.13	1.25	0.05	0.01	0.00	0.06		0.00	
178	L812430 XLR	243	1.00	1.00	243	0.0245	0.03	0.25	0.318	0.00	0.00	0.094		0.0026	
179	L946390 XLR					0.00	0.03	0.25	0.15	0.02	0.00	0.08		0.00	0.00
180	L1274727 XLR				209.00	0.01		0.25	0.18	0.20	0.00	0.31	0.51	0.00	0.00
181	L1094446 XLR	230.00	1.00	1.00	230.00	0.00	0.03	0.25	0.18	0.17	0.00	0.10	0.27	0.00	0.00

	A	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1	File	Total Phosphate as P mg/L	Sulfate (SO4) mg/L	Anion Sum mg/L	Cation Sum mg/L	Cation Anion Balance mg/L	Cyanide, Weak Acid Diss mg/L	Cyanide, Total mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L	Aluminum (Al)Total mg/L	Antimony (Sb)Total mg/L	Arsenic (As)Total mg/L	Barium (Ba)Total mg/L	Beryllium (Be)Total mg/L
137	L946390 XLR	0.01	46.60						1.21		0.29	0.00	0.02	0.01	0.00
138	L1195890 XLR	0.20	155.00				0.00	0.00	1.97		0.96	0.00	8.32	0.02	0.00
139	L1008190 XLR	0.02	76.30						2.08		0.24	0.00	0.17	0.02	0.00
140	L1125898 XLR	0.01	18.10				0.00	0.00	0.80		0.42	0.00	0.21	0.06	0.00
141	L829307 XLR	0.03	67.70						1.09		0.06	0.00	0.46	0.03	0.00
142	L1195890 XLR	0.02	20.50				0.00	0.00	1.24		0.11	0.00	0.26	0.07	0.00
143	L1073407 XLR	0.02	108.00					0.00	2.57		0.11	0.01	0.05	0.09	0.00
144	L946390 XLR	0.07	328.00						1.68		0.08	0.00	3.89	0.01	0.00
145	app b tables B1 to B3	0.05	6.80					0.00			0.10	0.00	0.06	0.01	0.00
146	L923152 XLR	0.00	25.20						1.87		0.14	0.00	0.00	0.04	0.00
147	L923152 XLR	0.03	95.00						2.51		0.05	0.00	1.12	0.02	0.00
148	L923152 XLR	0.01	68.40						1.86		0.12	0.03	0.17	0.00	0.00
149	L1195890 XLR	0.04	11.40				0.00	0.00	9.17		1.48	0.03	0.22	0.01	0.00
150	L1125898 XLR	0.01	93.10				0.00	0.00	2.55		0.26	0.01	0.05	0.08	0.00
151	L1144418 XLR	0.01	47.70				0.00	0.00	0.63		0.36	0.00	0.02	0.01	0.00
152	L923152 XLR	0.01	53.70						2.16		0.20	0.00	0.19	0.01	0.00
153	L1086893 XLR	0.02	95.80						3.04		0.08	0.01	0.05	0.07	0.00
154	app b tables B1 to B3	0.05	164.00					0.00			0.06	0.00	1.83	0.02	0.00
155	app b tables B1 to B3	0.08	139.00					0.00			0.01	0.00	1.11	0.02	0.00
156	L1008190 XLR	0.01	18.20						0.53		0.09	0.00	0.18	0.06	0.00
157	L946390 XLR	0.03	54.40						1.95		0.08	0.00	0.19	0.01	0.00
158	L1339478 XLR	0.01	48.40	3.13	2.83	5.10			1.90		0.24	0.00	0.01	0.01	0.00
159	L1008190 XLR	0.01	117.00						1.95		0.03	0.00	0.03	0.06	0.00
160	L923152 XLR	0.05	139.00						2.34		0.06	0.00	5.29	0.02	0.00
161	app b tables B1 to B3	0.05	116.00					0.00			0.13	0.00	0.24	0.06	0.00
162	app b tables B1 to B3	0.03	45.30					0.00			0.05	0.00	0.03	0.02	0.00
163	L1226369 XLR	0.01	92.70				0.00	0.00	4.96		0.21	0.01	0.05	0.08	0.00
164	L1339478 XLR	0.03	121.00	8.58	8.43	0.90			1.34		0.08	0.01	1.14	0.05	0.00
165	L1094446 XLR	0.09	382.00						4.57		0.39	0.00	2.07	0.03	0.00
166	L829307 XLR	0.02	8.98						1.72		0.17	0.00	0.07	0.03	0.00
167	L946390 XLR	0.11	138.00						2.97		0.05	0.00	6.38	0.01	0.00
168	L1094446 XLR	0.01	18.10						0.64		0.10	0.00	0.29	0.06	0.00
169	app b tables B1 to B3	0.00	90.80					0.00			0.02	0.00	1.14	0.03	0.00
170	L946390 XLR	0.01	66.00						1.11		0.04	0.02	0.02	0.01	0.00
171	L1086893 XLR	0.01	18.50						0.69		0.12	0.00	0.19	0.06	0.00
172	L1125898 XLR	0.00	47.50				0.00	0.00	1.06		0.31	0.00	0.01	0.01	0.00
173	L1008190 XLR	0.02	139.00						1.12		0.02	0.00	1.84	0.00	0.00
174	L1799287 XLR	0.01	81.40	4.60	4.92	3.30			1.41		0.07	0.00	0.11	0.11	0.00
175	L812430 XLR	0.0297	129						3.9		0.106	0.00075	0.554	0.0259	0.00
176	L829307 XLR	0.04	29.10						1.85		0.39	0.00	0.24	0.02	0.00
177	L1008190 XLR	0.03	1.25						23.00		0.13	0.00	0.04	0.03	0.00
178	L812430 XLR	0.0045	17.3						0.25		0.0665	0.00021	0.118	0.0578	0.00
179	L946390 XLR	0.01	75.30						4.06		0.04	0.00	0.07	0.07	0.00
180	L1274727 XLR	0.01	91.30				0.00	0.00	2.76		0.11	0.01	0.05	0.08	0.00
181	L1094446 XLR	0.01	108.00						2.47		0.06	0.01	0.05	0.08	0.00

	A	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI
1	File	Bismuth (Bi)Total mg/L	Boron (B)Total mg/L	Cadmium (Cd)Total mg/L	Calcium (Ca)Total mg/L	Chromium (Cr)Total mg/L	Cobalt (Co)Total mg/L	Copper (Cu)Total mg/L	Iron (Fe)Total mg/L	Lead (Pb)Total mg/L	Lithium (Li)Total mg/L	Magnesium (Mg)Total mg/L	Manganese (Mn)Total mg/L	Mercury (Hg)Total mg/L
137	L946390 XLR		0.05	0.00	43.60	0.01	0.00	0.01	2.03	0.00	0.03	9.06	0.11	0.00
138	L1195890 XLR	0.00	0.01	0.00	109.00	0.00	0.00	0.00	1.05	0.00	0.01	10.80	0.18	0.00
139	L1008190 XLR	0.00	0.01	0.00	61.90	0.00	0.00	0.00	0.26	0.00	0.02	10.20	0.01	0.00
140	L1125898 XLR	0.00	0.01	0.00	35.50	0.00	0.00	0.00	1.04	0.00	0.02	43.50	0.08	0.00
141	L829307 XLR	0.00	0.01	0.00	40.10	0.00	0.00	0.00	3.73	0.00	0.03	30.10	0.20	0.00
142	L1195890 XLR	0.00	0.01	0.00	34.60	0.01	0.00	0.00	0.91	0.00	0.02	44.50	0.17	0.00
143	L1073407 XLR	0.00	0.01	0.00	70.40	0.00	0.00	0.00	0.15	0.00	0.02	41.90	0.02	0.00
144	L946390 XLR		0.05	0.00	150.00	0.00	0.00	0.00	10.70	0.00	0.21	37.70	1.04	0.00
145	app b tables B1 to B3	0.05	0.05	0.00	8.54	0.00	0.00	0.00	0.15	0.00		1.15	0.01	0.00
146	L923152 XLR	0.00	0.01	0.00	22.10	0.00	0.00	0.00	0.24	0.00	0.01	7.53	0.03	0.00
147	L923152 XLR	0.00	0.01	0.00	78.30	0.00	0.00	0.00	2.80	0.00	0.06	55.80	0.07	0.00
148	L923152 XLR	0.00	0.01	0.00	13.60	0.00	0.00	0.00	2.31	0.00	0.06	11.70	0.37	0.00
149	L1195890 XLR	0.00	0.01	0.00	4.50	0.00	0.00	0.01	3.61	0.00	0.01	2.41	0.05	0.00
150	L1125898 XLR	0.00	0.01	0.00	61.60	0.00	0.00	0.00	0.47	0.00	0.02	37.10	0.01	0.00
151	L1144418 XLR	0.00	0.01	0.00	43.40	0.00	0.00	0.00	1.49	0.00	0.04	9.02	0.12	0.00
152	L923152 XLR	0.00	0.01	0.00	52.90	0.00	0.00	0.00	0.20	0.00	0.02	9.26	0.01	0.00
153	L1086893 XLR	0.00	0.01	0.00	61.10	0.00	0.00	0.00	0.27	0.00	0.02	39.20	0.04	0.00
154	app b tables B1 to B3	0.05	0.05	0.00	76.20	0.00	0.00	0.00	1.08	0.00		73.80	0.03	0.00
155	app b tables B1 to B3	0.05	0.05	0.00	65.90	0.00	0.00	0.00	1.01	0.00		60.00	0.02	0.00
156	L1008190 XLR	0.00	0.01	0.00	36.70	0.00	0.00	0.00	0.59	0.00	0.02	42.90	0.12	0.00
157	L946390 XLR		0.05	0.00	57.40	0.00	0.00	0.00	0.15	0.00	0.02	9.59	0.00	0.00
158	L1339478 XLR	0.00	0.01	0.00	38.50	0.00	0.00	0.00	1.07	0.00	0.04	8.34	0.11	
159	L1008190 XLR	0.00	0.01	0.00	64.90	0.00	0.00	0.00	0.02	0.00	0.02	38.80	0.05	0.00
160	L923152 XLR	0.00	0.01	0.00	98.10	0.00	0.00	0.00	0.06	0.00	0.01	10.20	0.11	0.00
161	app b tables B1 to B3	0.05	0.05	0.00	53.60	0.00	0.00	0.00	0.87	0.00		50.20	0.10	0.00
162	app b tables B1 to B3	0.05	0.05	0.00	48.10	0.00	0.00	0.00	0.08	0.00		4.55	0.06	0.00
163	L1226369 XLR	0.00	0.01	0.00	58.40	0.00	0.00	0.01	0.39	0.00	0.02	34.60	0.01	0.00
164	L1339478 XLR	0.00	0.01	0.00	58.70	0.00	0.00	0.00	3.75	0.00	0.03	62.00	0.18	
165	L1094446 XLR	0.00	0.01	0.00	210.00	0.00	0.00	0.01	2.10	0.00	0.02	33.60	0.51	0.00
166	L829307 XLR	0.00	0.01	0.00	8.23	0.00	0.00	0.00	0.25	0.00	0.00	1.21	0.01	0.00
167	L946390 XLR		0.05	0.00	109.00	0.00	0.00	0.00	0.10	0.00	0.01	10.60	0.13	0.00
168	L1094446 XLR	0.00	0.01	0.00	34.70	0.00	0.00	0.00	1.10	0.00	0.02	41.50	0.10	0.00
169	app b tables B1 to B3	0.05	0.05	0.00	78.30	0.00	0.00	0.00	0.86	0.00		62.20	0.07	0.00
170	L946390 XLR		0.05	0.00	13.20	0.00	0.00	0.00	0.32	0.00	0.07	11.60	0.43	0.00
171	L1086893 XLR	0.00	0.01	0.00	33.20	0.00	0.00	0.00	0.61	0.00	0.02	42.40	0.09	0.00
172	L1125898 XLR	0.00	0.01	0.00	42.10	0.00	0.00	0.00	1.25	0.00	0.04	8.79	0.12	0.00
173	L1008190 XLR	0.00	0.01	0.00	109.00	0.00	0.00	0.00	12.10	0.00	0.16	28.20	0.33	0.00
174	L1799287 XLR	0.00	0.01	0.00	57.50	0.00	0.00	0.00	1.32	0.00	0.01	22.90	0.05	0.00
175	L812430 XLR	0.00	0.01	0.00	71.5	0.00	0.0003	0.0026	0.344	0.00109	0.111	63.8	0.0747	0.00
176	L829307 XLR	0.00	0.02	0.00	47.90	0.00	0.00	0.00	0.55	0.00	0.01	6.75	0.02	0.00
177	L1008190 XLR	0.00	0.01	0.00	5.07	0.00	0.00	0.01	0.35	0.00	0.00	1.83	0.03	0.00
178	L812430 XLR	0.00	0.01	0.000037	33.8	0.00	0.00	0.00062	0.239	0.000371	0.018	43	0.0376	0.00
179	L946390 XLR		0.05	0.00	56.90	0.00	0.00	0.00	0.50	0.00	0.02	34.90	0.05	0.00
180	L1274727 XLR	0.00	0.01	0.00	59.20	0.00	0.00	0.00	0.18	0.00	0.02	37.50	0.01	0.00
181	L1094446 XLR	0.00	0.01	0.00	67.90	0.00	0.00	0.00	0.10	0.00	0.02	40.50	0.01	0.00

	A	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV
1	File	Molybdenum (Mo)Total mg/L	Nickel (Ni)Total mg/L	Phosphorus (P)Total mg/L	Potassium (K)Total mg/L	Selenium (Se)Total mg/L	Silicon (Si)Total mg/L	Silver (Ag)Total mg/L	Sodium (Na)Total mg/L	Strontium (Sr)Total mg/L	Thallium (Tl)Total mg/L	Tin (Sn)Total mg/L	Titanium (Ti)Total mg/L	Uranium (U)Total mg/L
137	L946390 XLR	0.00	0.00		2.70	0.00		0.00	3.50		0.00	0.00	0.02	0.00
138	L1195890 XLR	0.01	0.00	0.15	2.62	0.00	9.37	0.00	8.24	0.54	0.00	0.00	0.06	0.03
139	L1008190 XLR	0.01	0.00	0.15	2.30	0.01	5.14	0.00	18.80	0.30	0.00	0.00	0.01	0.01
140	L1125898 XLR	0.01	0.00	0.15	2.22	0.00	7.71	0.00	2.42	0.34	0.00	0.00	0.01	0.01
141	L829307 XLR	0.00	0.00	0.15	3.10	0.00	5.99	0.00	8.20	0.34	0.00	0.00	0.01	0.00
142	L1195890 XLR	0.01	0.00	0.15	2.18	0.00	6.72	0.00	2.49	0.34	0.00	0.00	0.01	0.01
143	L1073407 XLR	0.00	0.00	0.15	3.20	0.00	6.62	0.00	4.70	0.50	0.00	0.00	0.01	0.01
144	L946390 XLR	0.00	0.00		6.00	0.00		0.00	7.00		0.00	0.00	0.01	0.00
145	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.03	0.01			0.00
146	L923152 XLR	0.00	0.00	0.15	1.00	0.00	4.44	0.00	1.00	0.12	0.00	0.00	0.01	0.00
147	L923152 XLR	0.00	0.00	0.15	5.10	0.00	7.56	0.00	5.50	0.62	0.00	0.00	0.01	0.00
148	L923152 XLR	0.00	0.01	0.15	2.40	0.00	8.20	0.00	3.60	0.06	0.00	0.00	0.01	0.00
149	L1195890 XLR	0.00	0.02	0.15	1.32	0.00	7.68	0.00	0.97	0.02	0.00	0.00	0.04	0.00
150	L1125898 XLR	0.00	0.00	0.15	2.90	0.00	6.43	0.00	4.59	0.43	0.00	0.00	0.01	0.01
151	L1144418 XLR	0.00	0.00	0.15	2.44	0.00	7.83	0.00	3.25	0.17	0.00	0.00	0.02	0.00
152	L923152 XLR	0.01	0.00	0.15	1.00	0.01	4.52	0.00	11.40	0.29	0.00	0.00	0.01	0.01
153	L1086893 XLR	0.00	0.00	0.15	3.10	0.00	6.31	0.00	5.50	0.44	0.00	0.00	0.01	0.01
154	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		1.01			0.01	0.01
155	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.91	0.01			0.00
156	L1008190 XLR	0.01	0.00	0.15	2.10	0.00	6.44	0.00	2.20	0.32	0.00	0.00	0.01	0.01
157	L946390 XLR	0.01	0.00		2.10	0.01		0.00	13.10		0.00	0.00	0.01	0.01
158	L1339478 XLR	0.00	0.00	0.15	2.29	0.00	6.90	0.00	3.08	0.19	0.00	0.00	0.01	0.00
159	L1008190 XLR	0.00	0.00	0.15	2.90	0.00	5.93	0.00	16.90	0.43	0.00	0.00	0.01	0.01
160	L923152 XLR	0.01	0.00	0.15	2.80	0.00	5.80	0.00	10.90	0.50	0.00	0.00	0.01	0.03
161	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.49	0.01			0.01
162	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		1.69	0.01			0.03
163	L1226369 XLR	0.00	0.00	0.15	2.85	0.00	6.43	0.00	4.76	0.40	0.00	0.00	0.02	0.00
164	L1339478 XLR	0.00	0.00	0.15	2.22	0.00	5.93	0.00	3.05	0.54	0.00	0.00	0.01	0.01
165	L1094446 XLR	0.04	0.01	0.15	3.03	0.00	5.32	0.00	13.50	1.22	0.00	0.00	0.02	0.04
166	L829307 XLR	0.00	0.00	0.15	1.00	0.00	6.73	0.00	2.40	0.05	0.00	0.00	0.01	0.00
167	L946390 XLR	0.01	0.00		2.80	0.00		0.00	10.80		0.00	0.00	0.01	0.03
168	L1094446 XLR	0.01	0.00	0.15	1.91	0.00	6.29	0.00	2.22	0.31	0.00	0.00	0.01	0.01
169	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		0.55	0.01			0.01
170	L946390 XLR	0.00	0.01		2.30	0.00		0.00	3.80		0.00	0.00	0.01	0.00
171	L1086893 XLR	0.01	0.00	0.15	2.10	0.00	6.55	0.00	2.40	0.32	0.00	0.00	0.01	0.01
172	L1125898 XLR	0.00	0.00	0.15	2.37	0.00	7.70	0.00	3.17	0.16	0.00	0.00	0.02	0.00
173	L1008190 XLR	0.00	0.00	0.15	5.40	0.00	6.89	0.00	6.00	0.42	0.00	0.00	0.01	0.00
174	L1799287 XLR	0.00	0.00	0.15	2.32	0.00	9.43	0.00	2.11	0.28	0.00	0.00	0.01	0.00
175	L812430 XLR	0.0003	0.0104	0.15	4.9	0.00	7.79	0.00	22	0.966	0.00	0.00216	0.011	0.0036
176	L829307 XLR	0.01	0.00	0.15	2.10	0.00	5.23	0.00	12.80	0.22	0.00	0.01	0.02	0.01
177	L1008190 XLR	0.00	0.01	0.15	1.00	0.00	0.95	0.00	1.00	0.03	0.00	0.00	0.01	0.00
178	L812430 XLR	0.00455	0.00	0.15	2.3	0.00	5.85	0.00	2.5	0.341	0.00	0.00012	0.01	0.00747
179	L946390 XLR	0.00	0.00		2.90	0.00		0.00	6.10		0.00	0.00	0.01	0.00
180	L1274727 XLR	0.00	0.00	0.15	2.86	0.00	6.15	0.00	4.63	0.43	0.00	0.00	0.01	0.01
181	L1094446 XLR	0.00	0.00	0.15	2.97	0.00	5.93	0.00	5.68	0.44	0.00	0.00	0.01	0.01

	A	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
1	File	Vanadium (V)Total mg/L	Zinc (Zn)Total mg/L	Aluminum (Al)Dissolved mg/L	Antimony (Sb)Dissolved mg/L	Arsenic (As)Dissolved mg/L	Barium (Ba)Dissolved mg/L	Beryllium (Be)Dissolved mg/L	Bismuth (Bi)Dissolved mg/L	Boron (B)Dissolved mg/L	Cadmium (Cd)Dissolved mg/L	Calcium (Ca)Dissolved mg/L	Chromium (Cr)Dissolved mg/L	Cobalt (Co)Dissolved mg/L
137	L946390 XLR	0.00	0.03	0.00	0.00	0.00	0.01	0.00		0.05	0.00	43.40	0.00	0.00
138	L1195890 XLR	0.00	0.00	0.00	0.00	8.08	0.01	0.00	0.00	0.01	0.00	110.00	0.00	0.00
139	L1008190 XLR	0.00	0.01	0.00	0.00	0.18	0.02	0.00	0.00	0.01	0.00	59.70	0.00	0.00
140	L1125898 XLR	0.00	0.00	0.00	0.00	0.16	0.06	0.00	0.00	0.01	0.00	34.60	0.00	0.00
141	L829307 XLR	0.00	0.02	0.00	0.00	0.20	0.03	0.00	0.00	0.01	0.00	40.50	0.00	0.00
142	L1195890 XLR	0.00	0.01	0.01	0.00	0.12	0.05	0.00	0.00	0.01	0.00	35.60	0.00	0.00
143	L1073407 XLR	0.00	0.02	0.00	0.01	0.05	0.09	0.00	0.00	0.01	0.00	70.30	0.00	0.00
144	L946390 XLR	0.00	0.04	0.01	0.00	3.75	0.01	0.00		0.05	0.00	149.00	0.00	0.00
145	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.06	0.01	0.00	0.05	0.05	0.00	8.16	0.00	0.00
146	L923152 XLR	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.01	0.00	23.30	0.00	0.00
147	L923152 XLR	0.00	0.00	0.00	0.00	1.12	0.02	0.00	0.00	0.01	0.00	78.10	0.00	0.00
148	L923152 XLR	0.00	0.11	0.01	0.02	0.13	0.00	0.00	0.00	0.01	0.00	13.60	0.00	0.00
149	L1195890 XLR	0.00	0.03	0.07	0.02	0.09	0.00	0.00	0.00	0.01	0.00	4.46	0.00	0.00
150	L1125898 XLR	0.00	0.04	0.00	0.01	0.04	0.08	0.00	0.00	0.01	0.00	60.70	0.00	0.00
151	L1144418 XLR	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	42.80	0.00	0.00
152	L923152 XLR	0.00	0.01	0.00	0.00	0.18	0.01	0.00	0.00	0.01	0.00	52.30	0.00	0.00
153	L1086893 XLR	0.00	0.03	0.01	0.01	0.04	0.07	0.00	0.00	0.01	0.00	63.30	0.00	0.00
154	app b tables B1 to B3	0.02	0.00	0.02	0.00	1.78	0.02	0.00	0.05	0.05	0.00	76.10	0.00	0.00
155	app b tables B1 to B3	0.02	0.00	0.00	0.00	1.11	0.02	0.00	0.10	0.05	0.00	67.20	0.00	0.00
156	L1008190 XLR	0.00	0.02	0.00	0.00	0.13	0.05	0.00	0.00	0.01	0.00	35.80	0.00	0.00
157	L946390 XLR	0.00	0.01	0.00	0.00	0.20	0.01	0.00		0.05	0.00	58.60	0.00	0.00
158	L1339478 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	38.50	0.00	0.00
159	L1008190 XLR	0.00	0.01	0.00	0.00	0.04	0.06	0.00	0.00	0.01	0.00	66.90	0.00	0.00
160	L923152 XLR	0.00	0.04	0.00	0.00	5.59	0.02	0.00	0.00	0.01	0.00	98.00	0.00	0.00
161	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.19	0.06	0.00	0.05	0.05	0.00	54.70	0.00	0.00
162	app b tables B1 to B3	0.02	0.00	0.00	0.00	0.02	0.02	0.00	0.05	0.05	0.00	46.10	0.00	0.00
163	L1226369 XLR	0.00	0.05	0.00	0.01	0.05	0.07	0.00	0.00	0.01	0.00	59.80	0.00	0.00
164	L1339478 XLR	0.00	0.01	0.00	0.00	0.31	0.04	0.00	0.00	0.01	0.00	58.00	0.00	0.00
165	L1094446 XLR	0.00	0.03	0.00	0.00	1.98	0.03	0.00	0.00	0.01	0.00	200.00	0.00	0.00
166	L829307 XLR	0.00	0.01	0.00	0.00	0.06	0.03	0.00	0.00	0.01	0.00	8.46	0.00	0.00
167	L946390 XLR	0.00	0.03	0.01	0.00	6.44	0.01	0.00		0.05	0.00	109.00	0.00	0.00
168	L1094446 XLR	0.00	0.00	0.00	0.00	0.16	0.06	0.00	0.00	0.01	0.00	36.70	0.00	0.00
169	app b tables B1 to B3	0.02	0.00	0.00	0.00	1.14	0.03	0.00	0.05	0.05	0.00	77.40	0.00	0.00
170	L946390 XLR	0.00	0.11	0.01	0.02	0.00	0.01	0.00		0.05	0.00	13.10	0.00	0.00
171	L1086893 XLR	0.00	0.01	0.00	0.00	0.15	0.06	0.00	0.00	0.01	0.00	34.60	0.00	0.00
172	L1125898 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	41.30	0.00	0.00
173	L1008190 XLR	0.00	0.00	0.01	0.00	0.94	0.00	0.00	0.00	0.01	0.00	68.90	0.00	0.00
174	L1799287 XLR	0.00	0.00	0.00	0.00	0.08	0.10	0.00	0.00	0.01	0.00	57.30	0.00	0.00
175	L812430 XLR	0.00	0.0134	0.0035	0.00053	0.557	0.0226	0.00	0.00	0.01	0.00	73.8	0.00	0.00
176	L829307 XLR	0.00	0.01	0.00	0.00	0.23	0.01	0.00	0.00	0.01	0.00	50.40	0.00	0.00
177	L1008190 XLR	0.00	0.00	0.38	0.00	0.09	0.03	0.00	0.00	0.01	0.00	5.28	0.00	0.00
178	L812430 XLR	0.00	0.0034	0.0016	0.00	0.104	0.0551	0.00	0.00	0.01	0.000022	36.7	0.00	0.00
179	L946390 XLR	0.00	0.04	0.00	0.00	0.09	0.07	0.00		0.05	0.00	61.10	0.00	0.00
180	L1274727 XLR	0.00	0.03	0.00	0.01	0.04	0.07	0.00	0.00	0.01	0.00	56.90	0.00	0.00
181	L1094446 XLR	0.00	0.03	0.00	0.01	0.04	0.08	0.00	0.00	0.01	0.00	68.30	0.00	0.00

	A	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU
1	File	Copper (Cu)Dissolved mg/L	Iron (Fe)Dissolved mg/L	Lead (Pb)Dissolved mg/L	Lithium (Li)Dissolved mg/L	Magnesium (Mg)Dissolved mg/L	Manganese (Mn)Dissolved mg/L	Mercury (Hg)Dissolved mg/L	Molybdenum (Mo)Dissolved mg/L	Nickel (Ni)Dissolved mg/L	Phosphorus (P)Dissolved mg/L	Potassium (K)Dissolved mg/L	Selenium (Se)Dissolved mg/L
137	L946390 XLR	0.00	0.19	0.00	0.03	9.04	0.10	0.00	0.00	0.00		2.60	0.00
138	L1195890 XLR	0.00	0.06	0.00	0.01	10.60	0.17	0.00	0.00	0.00	0.15	2.36	0.00
139	L1008190 XLR	0.00	0.02	0.00	0.01	9.71	0.00	0.00	0.01	0.00	0.15	2.10	0.01
140	L1125898 XLR	0.00	0.02	0.00	0.02	42.20	0.06	0.00	0.01	0.00	0.15	1.99	0.00
141	L829307 XLR	0.00	1.68	0.00	0.03	29.00	0.17	0.00	0.00	0.00	0.15	2.70	0.00
142	L1195890 XLR	0.00	0.03	0.00	0.02	44.40	0.03	0.00	0.01	0.00	0.15	1.99	0.00
143	L1073407 XLR	0.00	0.02	0.00	0.02	42.00	0.01	0.00	0.00	0.00	0.15	3.20	0.00
144	L946390 XLR	0.00	9.82	0.00	0.20	37.10	0.99	0.00	0.00	0.00		5.80	0.00
145	app b tables B1 to B3	0.00	0.02	0.00		1.08	0.00		0.00	0.00	0.15	0.54	0.00
146	L923152 XLR	0.00	0.02	0.00	0.01	7.97	0.02	0.00	0.00	0.00	0.15	2.70	0.00
147	L923152 XLR	0.00	2.69	0.00	0.05	56.20	0.07	0.00	0.00	0.00	0.15	5.30	0.00
148	L923152 XLR	0.00	1.60	0.00	0.06	11.80	0.33	0.00	0.00	0.01	0.15	2.40	0.00
149	L1195890 XLR	0.01	0.96	0.00	0.01	2.24	0.04	0.00	0.00	0.01	0.15	1.04	0.00
150	L1125898 XLR	0.00	0.02	0.00	0.02	36.60	0.00	0.00	0.00	0.00	0.15	2.74	0.00
151	L1144418 XLR	0.00	0.68	0.00	0.04	8.78	0.11	0.00	0.00	0.00	0.15	2.31	0.00
152	L923152 XLR	0.00	0.02	0.00	0.01	9.40	0.00	0.00	0.01	0.00	0.15	2.10	0.01
153	L1086893 XLR	0.00	0.02	0.00	0.02	39.00	0.03	0.00	0.00	0.00	0.15	3.00	0.00
154	app b tables B1 to B3	0.00	1.02	0.00		73.30	0.03		0.00	0.00	0.15	4.63	0.00
155	app b tables B1 to B3	0.00	1.02	0.00		61.20	0.02		0.00	0.00	0.15	5.19	0.00
156	L1008190 XLR	0.00	0.02	0.00	0.02	42.00	0.01	0.00	0.00	0.00	0.15	2.00	0.00
157	L946390 XLR	0.00	0.02	0.00	0.02	9.69	0.00	0.00	0.01	0.00		2.00	0.01
158	L1339478 XLR	0.00	0.61	0.00	0.03	8.17	0.10		0.00	0.00	0.15	2.29	0.00
159	L1008190 XLR	0.00	0.02	0.00	0.02	39.20	0.05	0.00	0.00	0.00	0.15	2.90	0.00
160	L923152 XLR	0.00	0.02	0.00	0.01	10.50	0.11	0.00	0.01	0.00	0.15	3.00	0.00
161	app b tables B1 to B3	0.00	0.89	0.00		51.00	0.10		0.00	0.00	0.15	4.03	0.00
162	app b tables B1 to B3	0.00	0.02	0.00		4.30	0.05		0.02	0.00	0.15	0.42	0.00
163	L1226369 XLR	0.00	0.01	0.00	0.02	35.60	0.01	0.00	0.00	0.00	0.15	3.15	0.00
164	L1339478 XLR	0.00	0.65	0.00	0.03	64.40	0.14		0.00	0.00	0.15	2.24	0.00
165	L1094446 XLR	0.00	1.15	0.00	0.02	32.60	0.47	0.00	0.04	0.00	0.15	2.91	0.00
166	L829307 XLR	0.00	0.02	0.00	0.00	1.14	0.00	0.00	0.00	0.00	0.15	1.00	0.00
167	L946390 XLR	0.00	0.02	0.00	0.01	10.60	0.12	0.00	0.01	0.00		2.80	0.00
168	L1094446 XLR	0.00	0.15	0.00	0.02	44.40	0.07	0.00	0.01	0.00	0.15	1.97	0.00
169	app b tables B1 to B3	0.00	0.82	0.00		61.50	0.07		0.01	0.00	0.15	3.54	0.00
170	L946390 XLR	0.00	0.12	0.00	0.06	11.40	0.40	0.00	0.00	0.01		2.20	0.00
171	L1086893 XLR	0.00	0.11	0.00	0.02	44.40	0.07	0.00	0.01	0.00	0.15	2.10	0.00
172	L1125898 XLR	0.00	0.11	0.00	0.04	8.58	0.11	0.00	0.00	0.00	0.15	2.32	0.00
173	L1008190 XLR	0.00	5.20	0.00	0.13	17.90	0.18	0.00	0.00	0.00	0.15	4.30	0.00
174	L1799287 XLR	0.00	0.92	0.00	0.01	22.60	0.05	0.00	0.00	0.00	0.15	2.26	0.00
175	L812430 XLR	0.00028	0.176	0.00012	0.099	63	0.0656	0.00	0.00024	0.0085	0.15	4.8	0.00
176	L829307 XLR	0.00	0.02	0.00	0.01	6.59	0.03	0.00	0.01	0.00	0.15	1.00	0.00
177	L1008190 XLR	0.01	0.92	0.00	0.00	1.93	0.03	0.00	0.00	0.01	0.15	1.00	0.00
178	L812430 XLR	0.00	0.02	0.00	0.0182	44.1	0.0192	0.00	0.00454	0.00	0.15	2.1	0.00
179	L946390 XLR	0.00	0.53	0.00	0.02	37.00	0.06	0.00	0.00	0.00		2.90	0.00
180	L1274727 XLR	0.00	0.01	0.00	0.02	37.50	0.00	0.00	0.00	0.00	0.15	2.75	0.00
181	L1094446 XLR	0.00	0.02	0.00	0.02	40.80	0.01	0.00	0.00	0.00	0.15	3.01	0.00

	A	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE
1	File	Silicon (Si)Dissolved mg/L	Silver (Ag)Dissolved mg/L	Sodium (Na)Dissolved mg/L	Strontium (Sr)Dissolved mg/L	Thallium (Tl)Dissolved mg/L	Tin (Sn)Dissolved mg/L	Titanium (Ti)Dissolved mg/L	Uranium (U)Dissolved mg/L	Vanadium (V)Dissolved mg/L	Zinc (Zn)Dissolved mg/L
137	L946390 XLR		0.00	3.40		0.00	0.00	0.01	0.00	0.00	0.01
138	L1195890 XLR	6.45	0.00	7.91	0.51	0.00	0.00	0.01	0.03	0.00	0.00
139	L1008190 XLR	4.33	0.00	17.80	0.27	0.00	0.00	0.01	0.01	0.00	0.00
140	L1125898 XLR	6.39	0.00	2.28	0.32	0.00	0.00	0.01	0.01	0.00	0.00
141	L829307 XLR	5.78	0.00	7.40	0.30	0.00	0.00	0.01	0.00	0.00	0.01
142	L1195890 XLR	6.53	0.00	2.31	0.33	0.00	0.00	0.01	0.01	0.00	0.01
143	L1073407 XLR	6.37	0.00	4.60	0.50	0.00	0.00	0.01	0.01	0.00	0.01
144	L946390 XLR		0.00	6.80		0.00	0.00	0.01	0.00	0.00	0.01
145	app b tables B1 to B3		0.00	1.74	0.03			0.005	0.00	0.02	0.00
146	L923152 XLR	4.65	0.00	1.00	0.11	0.00	0.00	0.01	0.00	0.00	0.01
147	L923152 XLR	7.68	0.00	5.70	0.59	0.00	0.00	0.01	0.00	0.00	0.01
148	L923152 XLR	8.06	0.00	3.70	0.06	0.00	0.00	0.01	0.00	0.00	0.11
149	L1195890 XLR	5.28	0.00	0.93	0.02	0.00	0.00	0.01	0.00	0.00	0.02
150	L1125898 XLR	5.54	0.00	4.37	0.42	0.00	0.00	0.01	0.01	0.00	0.04
151	L1144418 XLR	6.94	0.00	3.18	0.16	0.00	0.00	0.01	0.00	0.00	0.00
152	L923152 XLR	4.31	0.00	12.10	0.26	0.00	0.00	0.01	0.01	0.00	0.02
153	L1086893 XLR	6.24	0.00	5.50	0.43	0.00	0.00	0.01	0.01	0.00	0.02
154	app b tables B1 to B3		0.00	21.90	1.01			0.01	0.01	0.02	0.01
155	app b tables B1 to B3		0.00	23.60	0.92			0.005	0.00	0.02	0.00
156	L1008190 XLR	6.19	0.00	2.10	0.30	0.00	0.00	0.01	0.01	0.00	0.00
157	L946390 XLR		0.00	12.90		0.00	0.00	0.01	0.01	0.00	0.01
158	L1339478 XLR	6.36	0.00	3.11	0.16	0.00	0.00	0.01	0.00	0.00	0.01
159	L1008190 XLR	5.98	0.00	16.40	0.42	0.00	0.00	0.01	0.01	0.00	0.01
160	L923152 XLR	5.86	0.00	11.20	0.49	0.00	0.00	0.01	0.03	0.00	0.04
161	app b tables B1 to B3		0.00	3.46	0.50			0.01	0.01	0.02	0.00
162	app b tables B1 to B3		0.00	5.09	1.60			0.005	0.02	0.02	0.00
163	L1226369 XLR	5.89	0.00	5.07	0.39	0.00	0.00	0.01	0.00	0.00	0.06
164	L1339478 XLR	5.69	0.00	3.14	0.53	0.00	0.00	0.01	0.01	0.00	0.00
165	L1094446 XLR	4.55	0.00	13.20	1.16	0.00	0.00	0.01	0.04	0.00	0.01
166	L829307 XLR	6.62	0.00	2.10	0.04	0.00	0.00	0.01	0.00	0.00	0.01
167	L946390 XLR		0.00	10.70		0.00	0.00	0.01	0.03	0.00	0.03
168	L1094446 XLR	6.44	0.00	2.29	0.31	0.00	0.00	0.01	0.01	0.00	0.00
169	app b tables B1 to B3		0.00	3.98	0.55			0.005	0.01	0.02	0.00
170	L946390 XLR		0.00	3.70		0.00	0.00	0.01	0.00	0.00	0.11
171	L1086893 XLR	6.58	0.00	2.30	0.32	0.00	0.00	0.01	0.01	0.00	0.00
172	L1125898 XLR	6.96	0.00	3.20	0.16	0.00	0.00	0.01	0.00	0.00	0.00
173	L1008190 XLR	6.17	0.00	4.50	0.25	0.00	0.00	0.01	0.00	0.00	0.01
174	L1799287 XLR	9.03	0.00	2.07	0.27	0.00	0.00	0.01	0.00	0.00	0.00
175	L812430 XLR	7.68	0.00	20	0.86	0.00	0.00143	0.01	0.00334	0.00	0.0085
176	L829307 XLR	4.61	0.00	11.70	0.20	0.00	0.00	0.01	0.01	0.00	0.01
177	L1008190 XLR	1.81	0.00	1.00	0.03	0.00	0.00	0.02	0.00	0.00	0.01
178	L812430 XLR	6.02	0.00	2.2	0.336	0.00	0.00	0.01	0.00763	0.00	0.001
179	L946390 XLR		0.00	5.90		0.00	0.00	0.01	0.01	0.00	0.02
180	L1274727 XLR	5.52	0.00	4.43	0.40	0.00	0.00	0.01	0.01	0.00	0.03
181	L1094446 XLR	5.84	0.00	5.53	0.45	0.00	0.00	0.01	0.01	0.00	0.02

	A	B	C	D	E	F
1	File	Project	Report To	ALS File No.	Date Received	Date
182	L1144418 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1144418	08/05/2012	23/05/2012
183	L1195890 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1195890	17/08/2012	30/08/2012
184	app b tables B1 to B3					
185	L1226369 XLR	GROUNDWATER	Todd Goodsell, STRATAGOLD CORPORATION	L1226369	19/10/2012	01/11/2012
186	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
187	L1094446 XLR	123110377 501.2DO	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1094446	10/12/2011	28/12/2011
188	L812430 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L812430	31/08/2009	24/09/2009
189	app b tables B1 to B3					
190	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
191	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
192	L1144418 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1144418	08/05/2012	23/05/2012
193	L923152 XLR	123110244 101.005	JENNIFER TODD, STANTEC CONSULTING LTD.~BURNABY	L923152	20/08/2010	02/09/2010
194	app b tables B1 to B3					
195	app b tables B1 to B3					
196	app b tables B1 to B3					
197	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
198	L829307 XLR	1053550.08 C3112 810.030	NEIL MACLEOD, JACQUES WHITFORD~BURNABY	L829307	13/10/2009	26/10/2009
199	L1086893 XLR	123110377 501.990 GROUNDWATER	Karen Munro, STANTEC CONSULTING LTD.~BURNABY	L1086893	21/11/2011	06/12/2011
200	L1108531 XLR	123110377 GROUNDWATER	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1108531	28/01/2012	13/02/2012
201	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
202	L946390 XLR	123110244	TOBI GARDNER, STANTEC CONSULTING LTD.~BURNABY	L946390	22/10/2010	03/11/2010
203	app b tables B1 to B3					
204	app b tables B1 to B3					
205	app b tables B-1 to B-3					
206	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
207	L1125898 XLR	EAGLE GOLD VAN 2012039	Todd Goodsell, STRATAGOLD CORPORATION	L1125898	20/03/2012	23/03/2012
208	L1144418 XLR	EAGLE GOLD	Todd Goodsell, STRATAGOLD CORPORATION	L1144418	08/05/2012	23/05/2012
209	app b tables B1 to B3					
210	L1008190 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1008190	24/05/2011	03/06/2011
211	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
212	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
213	L1073407 XLR	EAGLE GOLD 123110377 501.200	Tobi Gardner, STANTEC CONSULTING LTD.~BURNABY	L1073407	18/10/2011	01/11/2011
214	L815386 XLR	1053550.08	JENNIFER TODD, JACQUES WHITFORD~BURNABY	L815386	08/09/2009	18/09/2009

	A	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	File	Well ID	Location	Date Sampled	Quarter 1-Jan-Mar, 2-Apr-Jun, 3 Jly-Sep, 4 Oct-Dec	Time Sampled	ALS Sample ID	Matrix	Conductivity uS/cm	Hardness (as CaCO3) mg/L	pH	Total Suspended Solids mg/L	Total Dissolved Solids mg/L	Turbidity NTU	Acidity (as CaCO3) mg/L
182	L1144418 XLR	MW09-DG2	Dublin Gulch	06/05/2012	Q2	12:20	L11444182	Water	523.00	297.00	7.57	7.20	325.00	3.08	
183	L1195890 XLR	MW09-DG2	Dublin Gulch	15/08/2012	Q3	09:25	L11958903	Water	484.00	273.00	7.90	7.10	327.00	1.88	
184	app b tables B1 to B3	DH95-151	Suttles Gulch	27/09/1995	Q3				435.00	234.00	7.37	7.00	310.00	3.20	
185	L1226369 XLR	MW10-PG1	Platinum Gulch	17/10/2012	Q4	09:00	L12263699	Water	563.00	318.00	8.05	6.70	397.00	6.04	
186	L1008190 XLR	MW10-AG5	Ann Gulch	19/05/2011	Q2	12:45	L10081903	Water	189.00	79.00	6.88	6.50	132.00	17.10	
187	L1094446 XLR	MW10-AG5	Ann Gulch	07/12/2011	Q4	12:05	L10944465	Water	234.00	91.10	7.01	6.50	164.00	12.70	
188	L812430 XLR	MW09-DG2	Dublin Gulch	27/08/2009	Q3	00:00	L81243012	Water	557	293	7.5	6.3	350		
189	app b tables B1 to B3	DH95-150	Stewart Gulch	27/09/1995	Q3				686.00	511.00	7.35	6.00	653.00	5.00	
190	L829307 XLR	MW09-OG2	Olive Gulch	05/10/2009	Q4	15:30	L8293073	Water	42.70	15.70	6.99	5.80	41.00	4.20	
191	L1086893 XLR	MW10-AG3A	Ann Gulch	17/11/2011	Q4	13:45	L10868934	Water	286.00	134.00	8.30	5.50	174.00	7.13	
192	L1144418 XLR	MW96-13A	Eagle Pup	06/05/2012	Q2	09:30	L11444183	Water	445.00	269.00	8.17	5.20	234.00	4.35	
193	L923152 XLR	MW09-DG2	Dublin Gulch	19/08/2010	Q3	14:30	L9231527	Water	409.00	218.00	7.63	5.10	258.00	1.19	
194	app b tables B1 to B3	DH95-139	Bawn Boy Gulch	22/07/1996	Q3				61.50	25.10	7.61	5.00	39.00	2.00	
195	app b tables B1 to B3	DH95-150	Stewart Gulch	22/07/1996	Q3				793.00	450.00	7.86	5.00	568.00	7.40	
196	app b tables B1 to B3	DH95-152	Dublin Gulch	22/07/1996	Q3				838.00	421.00	7.54	5.00	613.00	4.20	
197	L1008190 XLR	MW10-PG1	Platinum Gulch	19/05/2011	Q2	20:50	L10081909	Water	581.00	323.00	7.87	5.00	413.00	1.96	
198	L829307 XLR	MW96-15B	Eagle Pup	05/10/2009	Q4	13:30	L8293075	Water	445.00	262.00	7.90	4.80	233.00	4.05	
199	L1086893 XLR	MW10-AG5	Ann Gulch	17/11/2011	Q4	15:00	L10868935	Water	238.00	93.60	6.96	4.80	173.00	9.14	
200	L1108531 XLR	MW09-DG2	Dublin Gulch	26/01/2012	Q1	10:00	L11085313	Water	597.00	343.00	7.75	4.70	358.00	1.77	
201	L1008190 XLR	MW10-AG6	Ann Gulch	19/05/2011	Q2	12:55	L10081904	Water	107.00	63.90	7.45	4.50	84.00	6.95	
202	L946390 XLR	MW10-DG7	Dublin Gulch	20/10/2010	Q4	09:00	L9463906	Water	173.00	86.30	7.91	4.30	94.00	0.71	
203	app b tables B1 to B3	DH95-141	Bawn Boy Gulch	21/09/1996	Q3				140.00	61.40	8.80	4.00	91.00	12.70	
204	app b tables B1 to B3	DH95-151	Suttles Gulch	21/09/1996	Q3				675.00	398.00	7.50	4.00	496.00	7.80	
205	app b tables B-1 to B-3	MW96-1	Bawn Boy Gulch	21/09/1996	Q3				633.00	281.00	7.68	4.00	478.00	4.50	
206	L1073407 XLR	MW10-AG3A	Ann Gulch	16/10/2011	Q4	14:30	L10734076	Water	267.00	136.00	8.03	3.30	172.00	5.31	
207	L1125898 XLR	MW10-AG5	Ann Gulch	18/03/2012	Q1	11:00	L11258988	Water	217.00	83.70	6.92	3.30	154.00	16.30	
208	L1144418 XLR	MW10-AG5	Ann Gulch	06/05/2012	Q2	10:15	L11444187	Water	221.00	84.00	6.68	3.20	152.00	7.48	
209	app b tables B1 to B3	DH95-150	Stewart Gulch	21/09/1996	Q3				825.00	454.00	7.25	2.00	578.00	9.40	
210	L1008190 XLR	MW10-AG3A	Ann Gulch	19/05/2011	Q2	12:00	L10081902	Water	273.00	146.00	7.97	1.50	181.00	3.70	
211	L1073407 XLR	MW09-DG4	Dublin Gulch	16/10/2011	Q4	08:30	L10734073	Water	558.00	321.00	7.65	1.50	353.00	0.63	
212	L1073407 XLR	MW10-AG5	Ann Gulch	16/10/2011	Q4	14:00	L10734077	Water	259.00	97.60	6.86	1.50	183.00	2.18	
213	L1073407 XLR	MW96-13A	Eagle Pup	16/10/2011	Q4	18:00	L10734078	Water	449.00	267.00	8.11	1.50	239.00	1.77	
214	L815386 XLR	MW09-DG5	Dublin Gulch	03/09/2009	Q3	00:00	L8153864	Water		452					

	A	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH
1	File	Alkalinity, Bicarbonate (as CaCO3) mg/L	Alkalinity, Carbonate (as CaCO3) mg/L	Alkalinity, Hydroxide (as CaCO3) mg/L	Alkalinity, Total (as CaCO3) mg/L	Ammonia as N mg/L	Bromide (Br) mg/L	Chloride (Cl) mg/L	Fluoride (F) mg/L	Nitrate (as N) mg/L	Nitrite (as N) mg/L	Total Kjeldahl Nitrogen mg/L	Total Nitrogen mg/L	Ortho Phosphate as P mg/L	Total Dissolved Phosphate As P mg/L
182	L1144418 XLR				208.00	0.00	0.03	0.71	0.18	0.16	0.00	0.16	0.31	0.00	0.00
183	L1195890 XLR				195.00	0.01		0.25	0.12	0.10	0.00	0.16	0.26	0.00	0.00
184	app b tables B1 to B3				210.00	0.00		0.70	0.21	0.37	0.00			0.00	
185	L1226369 XLR				171.00	0.03		0.25	0.49	0.02	0.00	0.12	0.14	0.07	0.09
186	L1008190 XLR	18.10				0.00	0.03	0.25	0.22	0.01	0.00	0.07		0.00	
187	L1094446 XLR	28.50	1.00	1.00	28.50	0.01	0.03	0.25	0.28	0.00	0.00	0.03	0.00	0.00	0.02
188	L812430 XLR	210	1.00	1.00	210	0.0315	0.03	0.25	0.104	0.00	0.0104	0.339		0.00	
189	app b tables B1 to B3				464.00	0.00		1.10	0.28	0.00	0.00			0.01	
190	L829307 XLR				20.50	0.00	0.03	0.25	0.01	0.09	0.00	0.08		0.00	0.00
191	L1086893 XLR				97.00	0.02	0.03	0.25	0.30	0.00	0.00	0.08	0.08	0.00	0.00
192	L1144418 XLR				250.00	0.01	0.03	0.25	0.41	0.00	0.00	0.07	0.07	0.00	0.00
193	L923152 XLR	157.00	1.00	1.00	157.00	0.01	0.03	0.25	0.17	0.00	0.01	0.08	0.09	0.00	0.00
194	app b tables B1 to B3				20.70	0.00		0.25	0.08	0.13	0.00			0.03	
195	app b tables B1 to B3				390.00	0.02		0.25	0.28	0.00	0.00			0.03	
196	app b tables B1 to B3				343.00	0.33		0.70	0.20	0.00	0.00			0.08	
197	L1008190 XLR	178.00				0.02	0.03	0.25	0.44	0.02	0.00	0.06		0.35	
198	L829307 XLR				239.00	0.00	0.03	0.25	0.34	0.01	0.00	0.14		0.00	0.00
199	L1086893 XLR				34.90	0.01	0.03	0.25	0.29	0.00	0.00	0.03	0.00	0.00	0.01
200	L1108531 XLR				233.00	0.00	0.03	0.25	0.17	0.16	0.00	0.08	0.24	0.00	0.00
201	L1008190 XLR	44.70				0.00	0.03	0.25	0.28	0.22	0.00	0.10		0.01	
202	L946390 XLR					0.00	0.03	0.25	0.10	0.00	0.00	0.03		0.00	0.00
203	app b tables B1 to B3				55.90	0.00		0.25	0.25	0.07	0.01			0.03	
204	app b tables B1 to B3				262.00	0.02		0.25	0.32	0.12	0.00			0.01	
205	app b tables B-1 to B-3				65.10	0.07		3.30	0.23	0.01	0.01			0.00	
206	L1073407 XLR				104.00	0.02	0.03	0.25	0.29	0.00	0.00	0.05	0.05	0.00	0.00
207	L1125898 XLR				24.10	0.01	0.21	0.25	0.28	0.00	0.00	0.03	0.00	0.01	0.01
208	L1144418 XLR				30.50	0.01	0.03	0.25	0.28	0.00	0.00	0.06	0.06	0.00	0.01
209	app b tables B1 to B3				407.00	0.04		0.25	0.15	0.00	0.00			0.01	
210	L1008190 XLR	92.20				0.01	0.03	0.25	0.25	0.00	0.00	0.05		0.00	
211	L1073407 XLR				225.00	0.00	0.03	0.25	0.12	0.12	0.00	0.06	0.18	0.00	0.00
212	L1073407 XLR				33.30	0.01	0.03	0.25	0.27	0.00	0.00	0.14	0.14	0.00	0.01
213	L1073407 XLR				256.00	0.01	0.03	0.25	0.41	0.00	0.00	0.03	0.00	0.00	0.00
214	L815386 XLR														

	A	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1	File	Total Phosphate as P mg/L	Sulfate (SO4) mg/L	Anion Sum mg/L	Cation Sum mg/L	Cation Anion Balance mg/L	Cyanide, Weak Acid Diss mg/L	Cyanide, Total mg/L	Total Organic Carbon mg/L	Dissolved Organic Carbon mg/L	Aluminum (Al)Total mg/L	Antimony (Sb)Total mg/L	Arsenic (As)Total mg/L	Barium (Ba)Total mg/L	Beryllium (Be)Total mg/L
182	L1144418 XLR	0.01	88.50				0.00	0.00	2.01		0.14	0.01	0.05	0.08	0.00
183	L1195890 XLR	0.01	87.70				0.00	0.00	3.08		0.12	0.01	0.05	0.07	0.00
184	app b tables B1 to B3	0.01	50.30					0.00			0.07	0.00	0.12	0.07	0.00
185	L1226369 XLR	0.10	146.00				0.00	0.00	1.75		0.15	0.00	8.33	0.01	0.00
186	L1008190 XLR	0.00	71.50						0.77		0.01	0.02	0.01	0.00	0.00
187	L1094446 XLR	0.02	83.40						0.81		0.06	0.04	0.72	0.00	0.00
188	L812430 XLR	0.00	98.9						4.74		0.595	0.008	0.0548	0.0797	0.00
189	app b tables B1 to B3	0.03	97.80					0.01			0.10	0.00	1.91	0.03	0.00
190	L829307 XLR	0.00	1.04						1.62		0.24	0.00	0.00	0.01	0.00
191	L1086893 XLR	0.00	48.50						0.93		0.10	0.00	0.01	0.01	0.00
192	L1144418 XLR	0.01	18.40				0.00	0.00	0.25		0.11	0.00	0.19	0.06	0.00
193	L923152 XLR	0.01	64.00						4.15		0.08	0.01	0.04	0.05	0.00
194	app b tables B1 to B3	0.04	6.20					0.00			0.13	0.00	0.07	0.01	0.00
195	app b tables B1 to B3	0.30	90.40					0.00			0.03	0.00	1.14	0.03	0.00
196	app b tables B1 to B3	0.22	142.00					0.00			0.02	0.00	1.09	0.01	0.00
197	L1008190 XLR	0.33	149.00						0.92		0.03	0.00	7.74	0.01	0.00
198	L829307 XLR	0.01	17.30						0.52		0.10	0.00	0.13	0.06	0.00
199	L1086893 XLR	0.02	86.10						0.68		0.06	0.04	0.84	0.01	0.00
200	L1108531 XLR	0.00	100.00						1.96		0.42	0.01	0.05	0.08	0.00
201	L1008190 XLR	0.02	9.79						4.10		0.21	0.00	0.03	0.00	0.00
202	L946390 XLR	0.00	23.80						1.86		0.02	0.00	0.00	0.04	0.00
203	app b tables B1 to B3	0.13	13.40					0.00			0.11	0.00	0.18	0.02	0.00
204	app b tables B1 to B3	0.04	128.00					0.00			0.04	0.00	0.25	0.06	0.00
205	app b tables B-1 to B-3	0.02	256.00					0.00			0.08	0.00	0.01	0.03	0.00
206	L1073407 XLR	0.00	47.90					0.00	0.74		0.02	0.00	0.01	0.01	0.00
207	L1125898 XLR	0.02	78.30				0.00	0.00	0.78		0.10	0.04	0.77	0.01	0.00
208	L1144418 XLR	0.03	76.70				0.00	0.00	0.56		0.10	0.05	0.76	0.00	0.00
209	app b tables B1 to B3	0.26	89.80					0.00			0.01	0.00	1.18	0.03	0.00
210	L1008190 XLR	0.00	49.70						0.70		0.02	0.00	0.01	0.01	0.00
211	L1073407 XLR	0.00	97.30					0.00	1.23		0.01	0.00	0.00	0.13	0.00
212	L1073407 XLR	0.02	92.40					0.00	1.27		0.03	0.04	0.73	0.01	0.00
213	L1073407 XLR	0.01	18.30					0.00	1.10		0.02	0.00	0.15	0.06	0.00
214	L815386 XLR														

	A	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI
1	File	Bismuth (Bi)Total mg/L	Boron (B)Total mg/L	Cadmium (Cd)Total mg/L	Calcium (Ca)Total mg/L	Chromium (Cr)Total mg/L	Cobalt (Co)Total mg/L	Copper (Cu)Total mg/L	Iron (Fe)Total mg/L	Lead (Pb)Total mg/L	Lithium (Li)Total mg/L	Magnesium (Mg)Total mg/L	Manganese (Mn)Total mg/L	Mercury (Hg)Total mg/L
182	L1144418 XLR	0.00	0.01	0.00	62.00	0.00	0.00	0.00	0.25	0.00	0.02	36.90	0.01	0.00
183	L1195890 XLR	0.00	0.01	0.00	54.60	0.00	0.00	0.01	0.24	0.00	0.02	34.90	0.01	0.00
184	app b tables B1 to B3	0.05	0.05	0.00	40.20	0.00	0.00	0.00	0.23	0.00		32.60	0.03	0.00
185	L1226369 XLR	0.00	0.01	0.00	110.00	0.00	0.00	0.00	0.23	0.00	0.01	10.60	0.18	0.00
186	L1008190 XLR	0.00	0.01	0.00	12.80	0.00	0.00	0.00	0.22	0.00	0.06	11.00	0.32	0.00
187	L1094446 XLR	0.00	0.01	0.00	14.60	0.00	0.00	0.00	12.50	0.00	0.07	12.40	0.39	0.00
188	L812430 XLR	0.00	0.01	0.000085	57.3	0.00191	0.00161	0.00415	1.89	0.0025	0.0257	33.7	0.411	0.00
189	app b tables B1 to B3	0.05	0.05	0.00	85.90	0.00	0.00	0.00	0.63	0.00		73.60	0.86	0.00
190	L829307 XLR	0.00	0.01	0.00	4.91	0.00	0.00	0.00	0.35	0.00	0.00	0.83	0.02	0.00
191	L1086893 XLR	0.00	0.01	0.00	41.20	0.00	0.00	0.00	0.84	0.00	0.03	8.64	0.11	0.00
192	L1144418 XLR	0.00	0.01	0.00	37.60	0.00	0.00	0.00	0.58	0.00	0.02	44.70	0.08	0.00
193	L923152 XLR	0.00	0.01	0.00	43.50	0.00	0.00	0.00	0.30	0.00	0.02	26.50	0.02	0.00
194	app b tables B1 to B3	0.05	0.05	0.00	8.20	0.00	0.00	0.00	0.14	0.00		1.17	0.00	0.00
195	app b tables B1 to B3	0.05	0.05	0.00	76.40	0.00	0.00	0.00	0.83	0.00		62.50	0.07	0.00
196	app b tables B1 to B3	0.05	0.05	0.00	64.30	0.00	0.00	0.00	0.98	0.00		60.20	0.02	0.00
197	L1008190 XLR	0.00	0.01	0.00	112.00	0.00	0.00	0.00	0.10	0.00	0.01	10.60	0.16	0.00
198	L829307 XLR	0.00	0.01	0.00	35.90	0.00	0.00	0.00	0.32	0.00	0.02	42.90	0.03	0.00
199	L1086893 XLR	0.00	0.01	0.00	15.30	0.00	0.00	0.00	13.80	0.00	0.08	13.20	0.43	0.00
200	L1108531 XLR	0.00	0.01	0.00	66.40	0.00	0.00	0.00	0.38	0.00	0.02	40.40	0.04	0.00
201	L1008190 XLR	0.00	0.01	0.00	11.00	0.00	0.00	0.00	0.24	0.00	0.03	6.10	0.00	0.00
202	L946390 XLR		0.05	0.00	22.50	0.00	0.00	0.00	0.12	0.00	0.01	7.97	0.01	0.00
203	app b tables B1 to B3	0.05	0.05	0.00	21.30	0.00	0.00	0.00	0.07	0.00		2.87	0.00	0.00
204	app b tables B1 to B3	0.05	0.05	0.00	58.60	0.00	0.00	0.00	0.77	0.00		55.10	0.12	0.00
205	app b tables B-1 to B-3	0.05	0.05	0.00	110.00	0.00	0.00	0.00	0.08	0.00		4.53	0.11	0.00
206	L1073407 XLR	0.00	0.01	0.00	40.20	0.00	0.00	0.00	0.68	0.00	0.04	8.62	0.11	0.00
207	L1125898 XLR	0.00	0.01	0.00	14.40	0.00	0.00	0.00	13.30	0.00	0.08	12.00	0.43	0.00
208	L1144418 XLR	0.00	0.01	0.00	14.20	0.00	0.00	0.00	12.00	0.00	0.08	12.20	0.39	0.00
209	app b tables B1 to B3	0.05	0.05	0.00	78.60	0.00	0.00	0.00	0.85	0.00		63.70	0.07	0.00
210	L1008190 XLR	0.00	0.01	0.00	43.60	0.00	0.00	0.00	0.77	0.00	0.03	8.95	0.11	0.00
211	L1073407 XLR	0.00	0.01	0.00	82.50	0.00	0.00	0.00	0.02	0.00	0.01	29.40	0.00	0.00
212	L1073407 XLR	0.00	0.01	0.00	16.50	0.00	0.00	0.00	13.90	0.00	0.08	14.00	0.45	0.00
213	L1073407 XLR	0.00	0.01	0.00	37.00	0.00	0.00	0.00	0.22	0.00	0.02	43.90	0.07	0.00
214	L815386 XLR													

APPENDIX F:
Compiled Groundwater Monitoring Data – 1995-2016

	A	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV
1	File	Molybdenum (Mo)Total mg/L	Nickel (Ni)Total mg/L	Phosphorus (P)Total mg/L	Potassium (K)Total mg/L	Selenium (Se)Total mg/L	Silicon (Si)Total mg/L	Silver (Ag)Total mg/L	Sodium (Na)Total mg/L	Strontium (Sr)Total mg/L	Thallium (Tl)Total mg/L	Tin (Sn)Total mg/L	Titanium (Ti)Total mg/L	Uranium (U)Total mg/L
182	L1144418 XLR	0.00	0.00	0.15	2.93	0.00	6.07	0.00	5.25	0.44	0.00	0.00	0.01	0.01
183	L1195890 XLR	0.00	0.00	0.15	2.69	0.00	6.02	0.00	4.41	0.40	0.00	0.00	0.01	0.00
184	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.34			0.01	0.01
185	L1226369 XLR	0.01	0.00	0.15	2.49	0.00	6.88	0.00	8.34	0.53	0.00	0.00	0.02	0.03
186	L1008190 XLR	0.00	0.01	0.15	2.10	0.00	7.73	0.00	3.50	0.06	0.00	0.00	0.01	0.00
187	L1094446 XLR	0.00	0.01	0.15	2.08	0.00	9.06	0.00	2.98	0.07	0.00	0.00	0.01	0.00
188	L812430 XLR	0.00729	0.006	0.15	3.6	0.00	6.79	0.00	20.3	0.445	0.00	0.00106	0.031	0.00469
189	app b tables B1 to B3	0.01	0.00	0.15		0.00		1.00		0.61			0.01	0.01
190	L829307 XLR	0.00	0.00	0.15	1.00	0.00	6.50	0.00	2.60	0.03	0.00	0.00	0.01	0.00
191	L1086893 XLR	0.00	0.00	0.15	2.50	0.00	7.10	0.00	3.30	0.16	0.00	0.00	0.01	0.00
192	L1144418 XLR	0.01	0.00	0.15	2.18	0.00	6.86	0.00	2.43	0.35	0.00	0.00	0.01	0.01
193	L923152 XLR	0.00	0.00	0.15	2.60	0.00	5.45	0.00	5.00	0.32	0.00	0.00	0.01	0.00
194	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.04	0.01			0.00
195	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		0.55	0.01			0.01
196	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.91	0.01			0.00
197	L1008190 XLR	0.01	0.00	0.15	2.60	0.00	6.42	0.00	8.60	0.51	0.00	0.00	0.01	0.03
198	L829307 XLR	0.00	0.00	0.15	2.40	0.00	6.15	0.00	2.50	0.34	0.00	0.00	0.01	0.01
199	L1086893 XLR	0.00	0.01	0.15	2.30	0.00	9.41	0.00	3.20	0.08	0.00	0.00	0.01	0.00
200	L1108531 XLR	0.00	0.01	0.15	3.10	0.00	7.12	0.00	4.76	0.46	0.00	0.00	0.02	0.01
201	L1008190 XLR	0.00	0.00	0.15	1.00	0.00	7.43	0.00	2.30	0.07	0.00	0.00	0.01	0.00
202	L946390 XLR	0.00	0.00		1.00	0.00		0.00	1.00		0.00	0.00	0.01	0.00
203	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		0.22	0.01			0.01
204	app b tables B1 to B3	0.00	0.00	0.15		0.00		0.00		0.54	0.01			0.01
205	app b tables B-1 to B-3	0.04	0.00	0.15		0.00		0.00		0.37	0.01			0.00
206	L1073407 XLR	0.00	0.00	0.15	2.40	0.00	6.72	0.00	3.30	0.16	0.00	0.00	0.01	0.00
207	L1125898 XLR	0.00	0.01	0.15	2.09	0.00	9.28	0.00	3.02	0.07	0.00	0.00	0.01	0.00
208	L1144418 XLR	0.00	0.01	0.15	2.12	0.00	9.39	0.00	3.03	0.07	0.00	0.00	0.01	0.00
209	app b tables B1 to B3	0.01	0.00	0.15		0.00		0.00		0.56	0.01			0.01
210	L1008190 XLR	0.00	0.00	0.15	2.50	0.00	6.86	0.00	3.10	0.15	0.00	0.00	0.01	0.00
211	L1073407 XLR	0.00	0.00	0.15	2.30	0.00	5.23	0.00	4.20	0.35	0.00	0.00	0.01	0.01
212	L1073407 XLR	0.00	0.01	0.15	2.20	0.00	9.09	0.00	3.20	0.09	0.00	0.00	0.01	0.00
213	L1073407 XLR	0.01	0.00	0.15	2.10	0.00	6.54	0.00	2.30	0.35	0.00	0.00	0.01	0.01
214	L815386 XLR													

	A	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI
1	File	Vanadium (V)Total mg/L	Zinc (Zn)Total mg/L	Aluminum (Al)Dissolved mg/L	Antimony (Sb)Dissolved mg/L	Arsenic (As)Dissolved mg/L	Barium (Ba)Dissolved mg/L	Beryllium (Be)Dissolved mg/L	Bismuth (Bi)Dissolved mg/L	Boron (B)Dissolved mg/L	Cadmium (Cd)Dissolved mg/L	Calcium (Ca)Dissolved mg/L	Chromium (Cr)Dissolved mg/L	Cobalt (Co)Dissolved mg/L
182	L1144418 XLR	0.00	0.04	0.00	0.01	0.05	0.07	0.00	0.00	0.01	0.00	60.10	0.00	0.00
183	L1195890 XLR	0.00	0.03	0.00	0.01	0.04	0.07	0.00	0.00	0.01	0.00	53.60	0.00	0.00
184	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.13	0.06	0.00	0.05	0.05	0.00	40.20	0.00	0.00
185	L1226369 XLR	0.00	0.01	0.00	0.00	7.74	0.01	0.00	0.00	0.01	0.00	110.00	0.00	0.00
186	L1008190 XLR	0.00	0.09	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	13.10	0.00	0.00
187	L1094446 XLR	0.00	0.11	0.05	0.04	0.66	0.00	0.00	0.00	0.01	0.00	15.20	0.00	0.00
188	L812430 XLR	0.0012	0.0466	0.143	0.0069	0.0492	0.0661	0.00	0.00	0.01	0.000064	61.2	0.00537	0.00124
189	app b tables B1 to B3	0.02	0.00	0.01	0.00	1.99	0.03	0.00	0.05	0.05	0.00	85.00	0.00	0.00
190	L829307 XLR	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	5.03	0.00	0.00
191	L1086893 XLR	0.00	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	39.90	0.00	0.00
192	L1144418 XLR	0.00	0.00	0.00	0.00	0.16	0.06	0.00	0.00	0.01	0.00	36.70	0.00	0.00
193	L923152 XLR	0.00	0.04	0.00	0.01	0.03	0.05	0.00	0.00	0.01	0.00	43.20	0.00	0.00
194	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.07	0.01	0.00	0.05	0.05	0.00	8.20	0.00	0.00
195	app b tables B1 to B3	0.02	0.00	0.01	0.00	1.15	0.03	0.00	0.05	0.05	0.00	76.70	0.00	0.00
196	app b tables B1 to B3	0.02	0.01	0.01	0.00	1.10	0.02	0.00	0.05	0.05	0.00	66.30	0.00	0.00
197	L1008190 XLR	0.00	0.06	0.00	0.00	8.28	0.01	0.00	0.00	0.01	0.00	112.00	0.00	0.00
198	L829307 XLR	0.00	0.01	0.00	0.00	0.10	0.05	0.00	0.00	0.01	0.00	36.40	0.00	0.00
199	L1086893 XLR	0.00	0.10	0.03	0.04	0.81	0.01	0.00	0.00	0.01	0.00	15.70	0.00	0.00
200	L1108531 XLR	0.00	0.02	0.00	0.01	0.05	0.08	0.00	0.00	0.01	0.00	68.90	0.00	0.00
201	L1008190 XLR	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.01	0.00	13.30	0.00	0.00
202	L946390 XLR	0.00	0.01	0.00	0.00	0.00	0.04	0.00		0.05	0.00	22.10	0.00	0.00
203	app b tables B1 to B3	0.02	0.00	0.01	0.00	0.16	0.02	0.00	0.05	0.05	0.00	20.70	0.00	0.00
204	app b tables B1 to B3	0.02	0.00	0.00	0.00	0.24	0.06	0.00	0.05	0.05	0.00	62.00	0.00	0.00
205	app b tables B-1 to B-3	0.02	0.01	0.02	0.00	0.00	0.03	0.00	0.05	0.05	0.00	105.00	0.00	0.00
206	L1073407 XLR	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	40.40	0.00	0.00
207	L1125898 XLR	0.00	0.11	0.05	0.04	0.75	0.00	0.00	0.00	0.01	0.00	14.10	0.00	0.00
208	L1144418 XLR	0.00	0.11	0.06	0.04	0.74	0.00	0.00	0.00	0.01	0.00	13.90	0.00	0.00
209	app b tables B1 to B3	0.02	0.00	0.00	0.00	1.14	0.03	0.00	0.10	0.05	0.00	77.90	0.00	0.00
210	L1008190 XLR	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	43.60	0.00	0.00
211	L1073407 XLR	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.01	0.00	80.90	0.00	0.00
212	L1073407 XLR	0.00	0.10	0.02	0.04	0.80	0.01	0.00	0.00	0.01	0.00	16.30	0.00	0.00
213	L1073407 XLR	0.00	0.00	0.00	0.00	0.16	0.06	0.00	0.00	0.01	0.00	36.10	0.00	0.00
214	L815386 XLR			0.0045	0.00238	0.00208	0.0431	0.00	0.00	0.019	0.000108	100	0.00	0.00339

	A	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU
1	File	Copper (Cu)Dissolved mg/L	Iron (Fe)Dissolved mg/L	Lead (Pb)Dissolved mg/L	Lithium (Li)Dissolved mg/L	Magnesium (Mg)Dissolved mg/L	Manganese (Mn)Dissolved mg/L	Mercury (Hg)Dissolved mg/L	Molybdenum (Mo)Dissolved mg/L	Nickel (Ni)Dissolved mg/L	Phosphorus (P)Dissolved mg/L	Potassium (K)Dissolved mg/L	Selenium (Se)Dissolved mg/L
182	L1144418 XLR	0.00	0.02	0.00	0.02	35.70	0.00	0.00	0.00	0.00	0.15	2.76	0.00
183	L1195890 XLR	0.00	0.01	0.00	0.02	33.80	0.00	0.00	0.00	0.00	0.15	2.51	0.00
184	app b tables B1 to B3	0.00	0.11	0.00		32.60	0.03		0.00	0.00	0.15	1.37	0.00
185	L1226369 XLR	0.00	0.05	0.00	0.01	10.40	0.16	0.00	0.00	0.00	0.15	2.35	0.00
186	L1008190 XLR	0.00	0.02	0.00	0.05	11.20	0.29	0.00	0.00	0.01	0.15	2.20	0.00
187	L1094446 XLR	0.00	11.60	0.00	0.08	12.90	0.40	0.00	0.00	0.01	0.15	2.17	0.00
188	L812430 XLR	0.00367	0.948	0.00187	0.0243	34.1	0.411	0.00	0.00633	0.00472	0.15	3.2	0.00
189	app b tables B1 to B3	0.00	0.59	0.00		72.60	0.08		0.01	0.00	0.15	3.88	0.00
190	L829307 XLR	0.00	0.03	0.00	0.00	0.76	0.01	0.00	0.00	0.00	0.15	1.00	0.00
191	L1086893 XLR	0.00	0.02	0.00	0.03	8.29	0.11	0.00	0.00	0.00	0.15	2.30	0.00
192	L1144418 XLR	0.00	0.17	0.00	0.02	43.10	0.07	0.00	0.01	0.00	0.15	2.06	0.00
193	L923152 XLR	0.00	0.02	0.00	0.02	26.80	0.02	0.00	0.00	0.00	0.15	2.90	0.00
194	app b tables B1 to B3	0.00	0.02	0.00		1.12	0.00		0.00	0.00	0.15	0.68	0.00
195	app b tables B1 to B3	0.00	0.80	0.00		62.70	0.07		0.01	0.00	0.15	3.77	0.00
196	app b tables B1 to B3	0.00	0.99	0.00		62.10	0.02		0.00	0.00	0.15	7.16	0.00
197	L1008190 XLR	0.00	0.06	0.00	0.01	10.30	0.15	0.00	0.00	0.00	0.15	2.50	0.00
198	L829307 XLR	0.00	0.02	0.00	0.02	41.70	0.01	0.00	0.00	0.00	0.15	2.00	0.00
199	L1086893 XLR	0.00	13.20	0.00	0.08	13.20	0.43	0.00	0.00	0.01	0.15	2.20	0.00
200	L1108531 XLR	0.00	0.02	0.00	0.02	41.40	0.03	0.00	0.00	0.00	0.15	3.06	0.00
201	L1008190 XLR	0.00	0.02	0.00	0.03	7.42	0.00	0.00	0.00	0.00	0.15	1.00	0.00
202	L946390 XLR	0.00	0.02	0.00	0.01	7.55	0.01	0.00	0.00	0.00		1.00	0.00
203	app b tables B1 to B3	0.00	0.02	0.00		2.38	0.00		0.01	0.00	0.15	1.18	0.00
204	app b tables B1 to B3	0.00	0.54	0.00		59.00	0.13		0.00	0.00	0.15	1.85	0.00
205	app b tables B-1 to B-3	0.00	0.02	0.00		4.38	0.10		0.04	0.00	0.15	7.27	0.00
206	L1073407 XLR	0.00	0.63	0.00	0.03	8.50	0.10	0.00	0.00	0.00	0.15	2.30	0.00
207	L1125898 XLR	0.00	12.70	0.00	0.07	11.80	0.40	0.00	0.00	0.01	0.15	1.99	0.00
208	L1144418 XLR	0.00	11.80	0.00	0.07	12.00	0.41	0.00	0.00	0.01	0.15	2.03	0.00
209	app b tables B1 to B3	0.00	0.83	0.00		63.00	0.07		0.01	0.00	0.15	2.61	0.00
210	L1008190 XLR	0.00	0.33	0.00	0.03	8.95	0.10	0.00	0.00	0.00	0.15	2.50	0.00
211	L1073407 XLR	0.00	0.02	0.00	0.01	29.00	0.00	0.00	0.00	0.00	0.15	2.40	0.00
212	L1073407 XLR	0.00	13.70	0.00	0.07	13.80	0.44	0.00	0.00	0.01	0.15	2.20	0.00
213	L1073407 XLR	0.00	0.16	0.00	0.02	43.00	0.07	0.00	0.01	0.00	0.15	2.00	0.00
214	L815386 XLR	0.0105	0.068	0.000347	0.0943	49	0.411	0.00	0.0056	0.00664	0.15	22.1	0.00

	A	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE
1	File	Silicon (Si)Dissolved mg/L	Silver (Ag)Dissolved mg/L	Sodium (Na)Dissolved mg/L	Strontium (Sr)Dissolved mg/L	Thallium (Tl)Dissolved mg/L	Tin (Sn)Dissolved mg/L	Titanium (Ti)Dissolved mg/L	Uranium (U)Dissolved mg/L	Vanadium (V)Dissolved mg/L	Zinc (Zn)Dissolved mg/L
182	L1144418 XLR	5.47	0.00	4.96	0.46	0.00	0.00	0.01	0.01	0.00	0.03
183	L1195890 XLR	5.52	0.00	4.16	0.36	0.00	0.00	0.01	0.00	0.00	0.02
184	app b tables B1 to B3		0.00	2.98	0.34			0.01	0.01	0.02	0.00
185	L1226369 XLR	6.37	0.00	7.88	0.51	0.00	0.00	0.01	0.03	0.00	0.01
186	L1008190 XLR	7.80	0.00	3.50	0.05	0.00	0.00	0.01	0.00	0.00	0.11
187	L1094446 XLR	9.59	0.00	3.17	0.07	0.00	0.00	0.01	0.00	0.00	0.12
188	L812430 XLR	6.4	0.00	18.2	0.426	0.00	0.00109	0.013	0.00446	0.00	0.0346
189	app b tables B1 to B3		0.00	3.91	0.60			0.005	0.01	0.02	0.00
190	L829307 XLR	6.12	0.00	2.40	0.03	0.00	0.00	0.01	0.00	0.00	0.01
191	L1086893 XLR	6.37	0.00	3.10	0.17	0.00	0.00	0.01	0.00	0.00	0.00
192	L1144418 XLR	6.49	0.00	2.32	0.33	0.00	0.00	0.01	0.01	0.00	0.00
193	L923152 XLR	5.41	0.00	5.10	0.29	0.00	0.00	0.01	0.00	0.00	0.03
194	app b tables B1 to B3		0.00	1.90	0.04			0.005	0.00	0.02	0.01
195	app b tables B1 to B3		0.00	4.02	0.55			0.005	0.01	0.02	0.00
196	app b tables B1 to B3		0.00	25.20	0.94			0.005	0.00	0.02	0.00
197	L1008190 XLR	6.40	0.00	8.20	0.47	0.00	0.00	0.01	0.03	0.00	0.02
198	L829307 XLR	5.94	0.00	2.10	0.30	0.00	0.00	0.01	0.01	0.00	0.00
199	L1086893 XLR	9.51	0.00	3.10	0.08	0.00	0.00	0.01	0.00	0.00	0.12
200	L1108531 XLR	5.97	0.00	4.87	0.47	0.00	0.00	0.01	0.01	0.00	0.02
201	L1008190 XLR	6.70	0.00	2.30	0.07	0.00	0.00	0.01	0.00	0.00	0.01
202	L946390 XLR		0.00	1.00		0.00	0.00	0.01	0.00	0.00	0.00
203	app b tables B1 to B3		0.00	3.81	0.28			0.005	0.01	0.02	0.00
204	app b tables B1 to B3		0.00	3.21	0.57			0.005	0.01	0.02	0.00
205	app b tables B-1 to B-3		0.00	13.40	0.36			0.005	0.00	0.02	0.01
206	L1073407 XLR	6.62	0.00	3.30	0.16	0.00	0.00	0.01	0.00	0.00	0.00
207	L1125898 XLR	9.15	0.00	2.88	0.07	0.00	0.00	0.01	0.00	0.00	0.11
208	L1144418 XLR	9.01	0.00	2.97	0.07	0.00	0.00	0.01	0.00	0.00	0.10
209	app b tables B1 to B3		0.00	3.54	0.55			0.01	0.01	0.02	0.00
210	L1008190 XLR	6.68	0.00	3.00	0.14	0.00	0.00	0.01	0.00	0.00	0.00
211	L1073407 XLR	5.10	0.00	4.00	0.34	0.00	0.00	0.01	0.01	0.00	0.00
212	L1073407 XLR	9.01	0.00	3.10	0.09	0.00	0.00	0.01	0.00	0.00	0.11
213	L1073407 XLR	6.36	0.00	2.30	0.33	0.00	0.00	0.01	0.01	0.00	0.00
214	L815386 XLR	3.39	0.00	23.9	0.407	0.00	0.00243	0.01	0.000768	0.00	0.0354

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APPENDIX I

Eagle Gold Project Spill Response Plan
Version 2017-01

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EAGLE GOLD PROJECT

SPILL RESPONSE PLAN

Version 2017-01

MARCH 2017

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1 INTRODUCTION

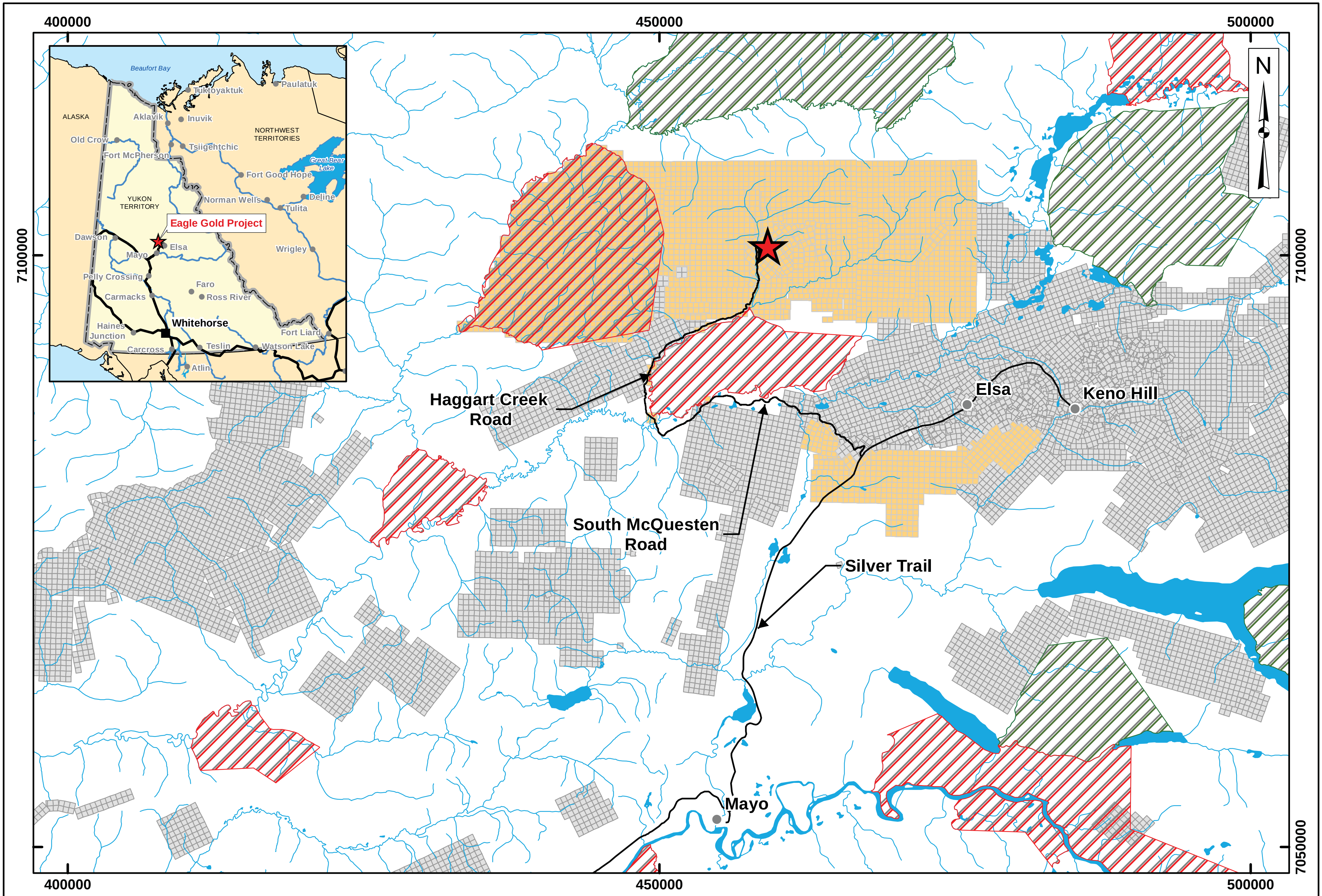
StrataGold Corporation (SGC), a directly held-wholly owned subsidiary of Victoria Gold Corp., has proposed to construct, operate, close and reclaim a gold mine in central Yukon. The Eagle Gold Project (‘the Project’) is located 85 km from Mayo Yukon using existing highway and access roads (Figure 1.1-1). The Project will involve open pit mining and gold extraction using a three stage crushing process, heap leaching, and a carbon adsorption, desorption, and recovery system over the mine life.

SGC is committed to exploring for, building, operating and closing mines in an environmentally, socially and financially responsible manner. SGC will endeavor to protect the environment in which it operates by providing a safe, responsible and efficient operating atmosphere through the development, and implementation of corporate policies as well as development and operational plans.

The purpose of this Spill Contingency Plan (the Plan) is to enable timely and effective responses to any spill throughout the life of the Project. The Plan provides measures to prevent spills from occurring, and response measures to be implemented in the event of a spill.

This plan was informed by the guidelines provided by Government of Yukon’s Department of Energy, Mines and Resources and the Yukon Water Board in the Plan Requirement Guidance for Quartz Mining Projects (August 2013), the Terms and Conditions of Recommendation, Proponent Commitments and Proponent Mitigations specified in the Final Screening Report and Recommendation (Yukon Environmental and Socio-economic Assessment Board Project Assessment 2010-0267), and the regulatory approvals issued for the Project

Appendix A summarizes the requirements pertaining to spill prevention and response outlined in the Final Screening Report and Recommendation and other licenses and permits issued to date.



Legend:

Eagle Gold Project	Town / Village	Category A Settlement Land
StrataGold Claims	Road	Category B Settlement Land
Other Claims	Watercourse	

StrataGold Corporation

0 3 6 12
Kilometres

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD 83 Zone 8N	HC	
Date: 2017/03/15	Figure: 1.1-1	Project Location

2 SPILL DEFINITION AND CATEGORIES

2.1 SPILL DEFINITION

A spill is defined under Section 132 of the *Yukon Environment Act* ("the Act") as a "release of a substance into the natural environment; from or out of a structure, vehicle or other container; and that is abnormal in quantity or quality in light of all the circumstances of the release; or in excess of an amount specified in the regulations". For the purposes of the *Act*, a "substance" means a hazardous substance, pesticide, contaminant or special waste.

2.2 REPORTABLE SPILLS

Schedule A of the *Yukon Spills Regulations* defines reportable spill quantities in reference to hazardous material classes defined under the *Transportation of Dangerous Goods Regulations*. The release into the environment of a hazardous material above the reportable quantities or any release into a watercourse is a reportable spill under the *Yukon Spills Regulations* and SGC is required immediately notify the 24-hour Yukon Spill Report line at:

867-667-7244

Any staff member who is unsure of the volume of material or type of material release and/or is unable to follow the reporting structure described in Section 4 of this Plan, is advised to report the spill to the 24-hour Yukon Spill Report line.

Spill Reporting Forms will be completed for all spills (Appendix B).

Reporting thresholds for all substances including hazardous materials, pesticide, contaminant or special waste used or stored at the Project are provided in Table 2.2-1, Table 2.2-2 and Appendix C.

A list of emergency contact numbers is provided in Appendix D.

Material Safety Data Sheets (MSDS) for all hazardous substances used for the Project at risk of spills are provided by the Solid Waste and Hazardous Materials Management Plan.

Table 2.2-1: Reportable Spill Thresholds

Substance Name	Type	TDGA Class	Reportable Threshold
Propane	Petroleum product	2	Any amount of gas from a container larger than 100 L, or where the spill results from equipment failure, error, or deliberate action or inaction
Acetylene	Petroleum product	2	Any amount of gas from a container larger than 100 L, or where the spill results from equipment failure, error, or deliberate action or inaction
Oxygen	Gas	2	Any amount of gas from a container larger than 100 L, or where the spill results from equipment failure, error, or

Substance Name	Type	TDGA Class	Reportable Threshold
			deliberate action or inaction
Gasoline	Petroleum product	3	200 L (any amount if spilled into a watercourse)
Diesel	Petroleum product	3	200 L (any amount if spilled into a watercourse)
Jet A & B Aviation Fuel	Petroleum Product	3	200 L (any amount if spilled into a watercourse)
Antifreeze	Solvent	9	5 L
Lubricating and Hydraulic Oils	Lubricating oil	n/a	200 L (any amount if spilled into a watercourse)

Table 2.2-2: Reportable Spill Thresholds for Special Waste

Substance Type	Time period	Reportable Threshold
Special Waste that may cause an adverse effect	N/A	Any amount
Solid Special Waste	24 hours	500 g
	30 days	5 kg
Liquid Special Waste	24 hours	500 ml
	30 days	5 L
Mixture of Solid and Liquid Waste	24 hours	500 g or 500 ml whichever is less
	30 days	5 kg or 5 L whichever is less

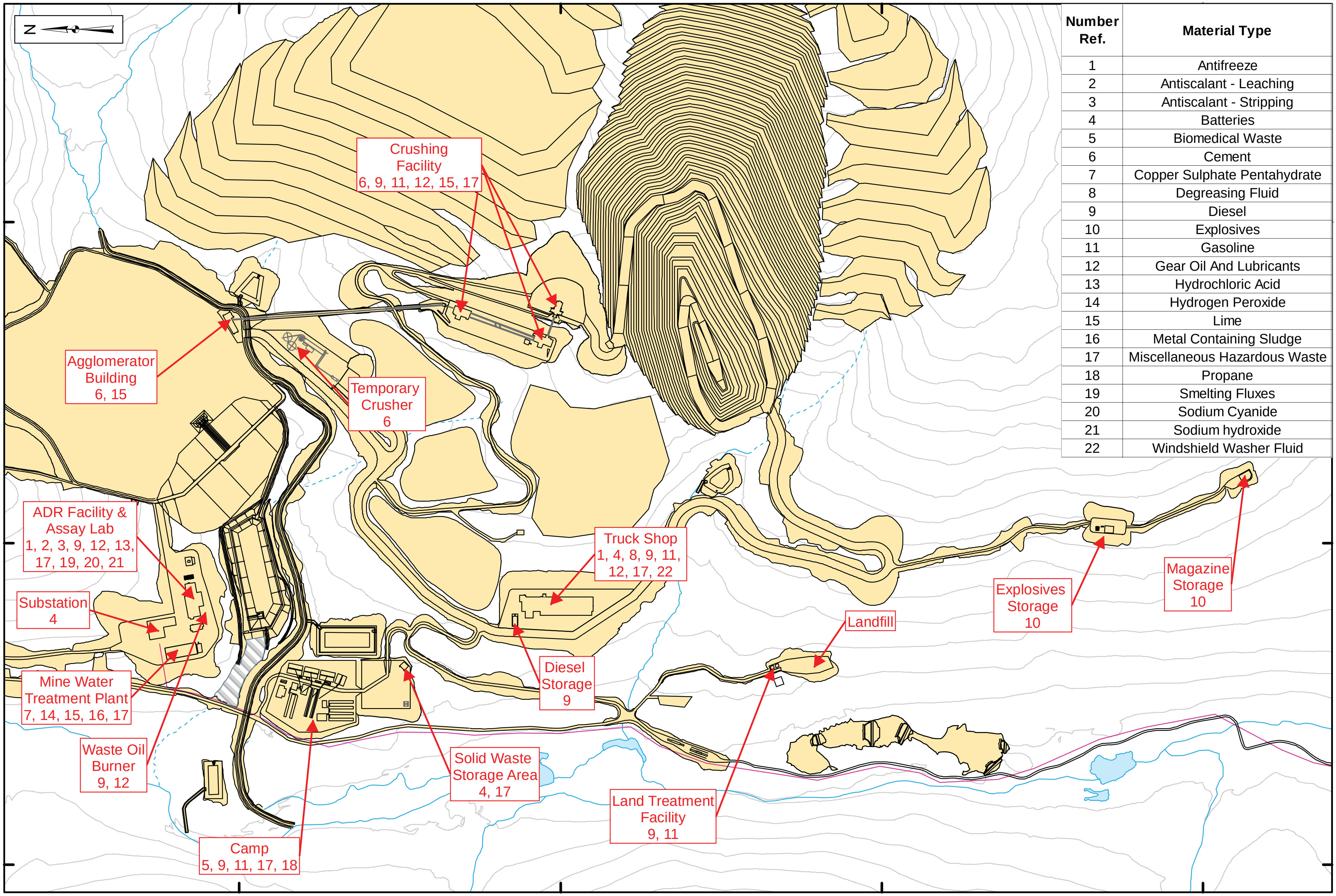
2.3 NON-REPORTABLE SPILLS

Spilled materials which are below the reporting thresholds are not required to be reported externally; however, all spills (whether reportable externally or not) must be reported internally to the SGC Environmental Department, and the SGC Environmental Department will maintain a record of all spills. Non-reportable spills will be handled according to the Spill Response Procedure described in Section 3 of this Plan. After any non-reportable spill is controlled and cleaned up, the Environmental Department will complete the Spill Response Form, and replenish spill cleanup supplies used for the response.

2.4 STORAGE LOCATIONS AND USE OF HAZARDOUS MATERIALS

Hazardous materials used on site and storage locations are described in the Solid Waste and Hazardous Materials Management Plan and shown on Figure 2.4-1.

SGC will ensure that spill kits compatible with the type and volume of material stored and used are available at sites where hazardous materials are stored and used.



Number Ref.	Material Type
1	Antifreeze
2	Antiscalant - Leaching
3	Antiscalant - Stripping
4	Batteries
5	Biomedical Waste
6	Cement
7	Copper Sulphate Pentahydrate
8	Degreasing Fluid
9	Diesel
10	Explosives
11	Gasoline
12	Gear Oil And Lubricants
13	Hydrochloric Acid
14	Hydrogen Peroxide
15	Lime
16	Metal Containing Sludge
17	Miscellaneous Hazardous Waste
18	Propane
19	Smelting Fluxes
20	Sodium Cyanide
21	Sodium hydroxide
22	Windshield Washer Fluid

Legend:

Facility
Watercourse
Reserved Area
Transmission Line
Contours (25m)

StrataGold Corporation

0 125 250 500
Meters

Projection: NAD 83 Zone 8N

Drawn By: HC

Date: 2017/03/15

Figure: 2.4-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Storage Areas for Hazardous Materials

3 SPILL RESPONSE PROCEDURE

The immediate priority in the event of a spill is to ensure the safety of any personnel in the immediate vicinity and to minimize the potential impact to the environment due to a sustained release of hazardous material. The implementation of spill containment measures and site cleanup and remediation will only be undertaken when safety is assured and the source of the release has been controlled.

Before responding to any spill, it is important to first STOP and THINK:

- Identify hazards
- Assess Risks
- Control Risks

The priority sequence for spill response is as follows:

1. **ENSURE SAFETY**
   - Identify the spilled material (if not possible, assume dangerous)
   - Use Personal Protective Equipment (PPE)
   - Ensure the safety of nearby personnel
   - Remove all ignition sources – no smoking
2. **FIRST AID**
   - Call for assistance if necessary
   - Attend to the injured
   - Begin first aid immediately as required by following the guidelines from MSDS for the substance released
3. **STOP THE FLOW (IF POSSIBLE)**
   - Close valves, shut off pumps and plug holes or leaks (if safe to do so)
4. **NOTIFY YOUR SUPERVISOR AND/OR SPILL RESPONSE TEAM**
   - Provide basic information of spill – What, Who, Where, When and How
   - Activate Spill Response Team
5. **SECURE THE AREA**
   - Limit access to the spill area and prevent unauthorized entry

6. **CONTAIN THE RELEASE**
   - Block off and protect drains, culverts, and other drainage structures which are not designated for spill management
   - Use dykes, berms, trenches, ditches or sorbent material from spill kits to control the spilled substances
7. **CLEAN-UP**
   - Under the direction of the Spill Response Team, begin clean-up activities
8. **REPORT THE SPILL**
   - The Environmental Manager, or designate, will report the spill to the appropriate agencies.
9. **CONDUCT INCIDENT INVESTIGATION**
   - Undertake appropriate corrective and preventative action and document all activities on the Spill Report Form

3.1 SPILL RESPONSE EQUIPMENT

Spill kits will be available at all hazardous materials storage sites and transfer areas shown in Figure 2.4-1. Spill kits will also be available in hazardous material transporters, heavy equipment and light trucks. Spill kits will contain booms, sorbent materials, shovels and PPE, and fire extinguishers will be located in close proximity to assist in responding to a possible spill incident involving flammable materials. Spill kits will also contain a kit inventory sheet to assist with monthly inspections and the replenishment of spent supplies and equipment. The SGC Environmental Department will be responsible for monthly spill kit inspections, the replenishment of spent supplies and equipment, and ensuring that the site is equipped with a spare fully stocked 50 Gallon Spill response kit. The spare 50 Gallon Spill response kit will be deployed to other locations in the event of a spill requiring additional equipment or as a replacement until spent, location specific, kits can be replenished.

If there is a risk of spills on open water, surface booms will be available for deployment.

All spill kits will include the 2016 Emergency Response Guidebook which has been developed jointly by Transport Canada (TC), the U.S. Department of Transportation (DOT), the Secretariat of Transport and Communications of Mexico (SCT) and with the collaboration of CIQUIME (Centro de Informaciòn Quìmica para Emergencias) of Argentina, for use by fire fighters, police, and other emergency services personnel who may be the first to arrive at the scene of a transportation incident involving dangerous goods.

The Emergency Response Guidebook is a guide to aid first responders in quickly identifying the specific or generic hazards of the material(s) involved in the incident, and protecting themselves and the general public during the initial response phase of the incident.

Figures 3.1-1 and 3.1-2 provide the location of Spill Response Equipment and Table 3.1-1 provides an inventory of anticipated Spill Response Equipment located around the Project Site:

Table 3.1-1: Inventory of Spill Response Equipment Planned for the Project

Location	Type of Equipment
ADR Facility and Assay Lab – Reagent Storage area	2X100 Gallon Spill response carts containing: ▪ Booms, sorbent pads, socks, dikes, pillows ▪ Hazmat Chemical Absorbent Pulp ▪ Disposal bags and Ties ▪ Neoprene Drain Cover ▪ Spill Response Plan ▪ Emergency Response Guidebook ▪ Chemical-resistant gloves ▪ Goggles This location will also be equipped with the following: ▪ Self-contained breathing apparatus ▪ Totally-Encapsulating Chemical Protective (TECP) suits ▪ Escape air packs (10 minute)
ADR Facility and Assay Lab– At each reagent handling area	2X50 Gallon Spill kits containing: ▪ Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Hazmat Chemical Absorbent Pulp ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Self-contained breathing apparatus ▪ Totally-Encapsulating Chemical Protective (TECP) suits ▪ Escape air packs (10 minute)
Mine water treatment plant	1X100 Gallon Spill response carts containing: ▪ Booms, sorbent pads, socks, dikes, pillows ▪ Hazmat Chemical Absorbent Pulp ▪ Disposal bags and Ties ▪ Chemical-resistant Gloves ▪ Goggles ▪ Neoprene Drain Cover ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Self-contained breathing apparatus ▪ Totally-Encapsulating Chemical Protective (TECP) suits ▪ Escape air packs (10 minute)

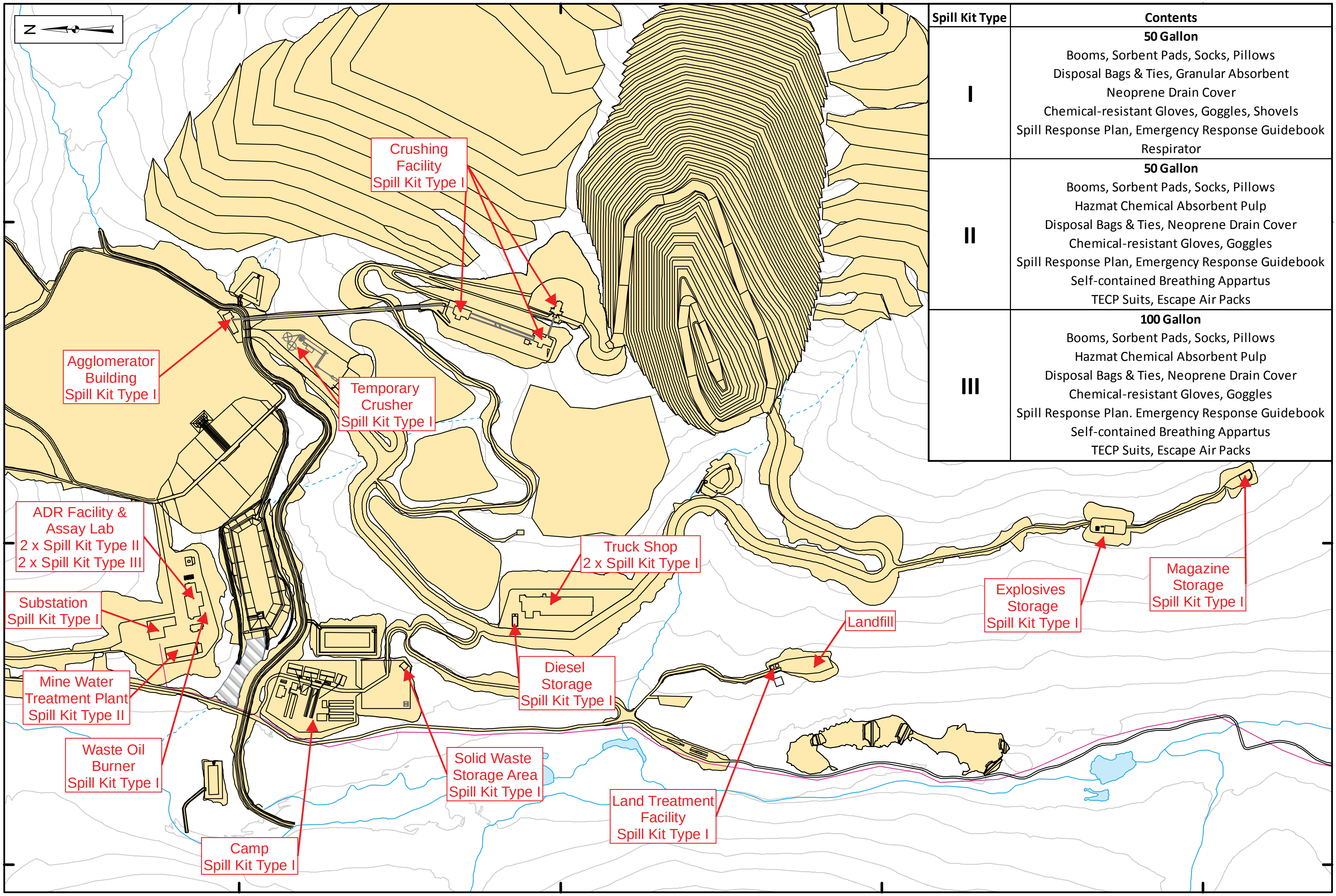
Location	Type of Equipment
Truck shop	2 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators
Crushing and screening plants	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators
Agglomerator Building	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: Respirators
Fuel storage areas	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves

Location	Type of Equipment
	▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators
Explosives storage facility	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators
Explosives magazine	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators
Camp	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators

Location	Type of Equipment
Solid Waste Storage Area	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators
Substation	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook This location will also be equipped with the following: ▪ Respirators
Inside mine vehicles: Fuel carts Utility vehicles Explosive transport vehicles Emergency response vehicles	Vehicle spill kits containing: ▪ Sorbent Pads, Socks and Pillows ▪ Disposable Bags and Ties ▪ Granular Absorbent ▪ Neoprene Drain Cover ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan ▪ Emergency Response Guidebook
Strategic locations along access road	1 X 50 Gallon Spill kits containing: ▪ Booms, Sorbent Pads, Socks, Pillows ▪ Disposal Bags and Ties ▪ Granular Absorbent ▪ Chemical-resistant Gloves ▪ Goggles ▪ Shovels ▪ Spill Response Plan

Location	Type of Equipment
	▪ Emergency Response Guidebook

An inventory of spill kits will be maintained and monthly inspections will be carried out to ensure that they are suitably stocked. All spill kits will have MSDS for the substances used in the area serviced by the kit.



Spill Kit Type	Contents
I	**50 Gallon** Booms, Sorbent Pads, Socks, Pillows Disposal Bags & Ties, Granular Absorbent Neoprene Drain Cover Chemical-resistant Gloves, Goggles, Shovels Spill Response Plan, Emergency Response Guidebook Respirator
II	**50 Gallon** Booms, Sorbent Pads, Socks, Pillows Hazmat Chemical Absorbent Pulp Disposal Bags & Ties, Neoprene Drain Cover Chemical-resistant Gloves, Goggles Spill Response Plan, Emergency Response Guidebook Self-contained Breathing Appartus TECP Suits, Escape Air Packs
III	**100 Gallon** Booms, Sorbent Pads, Socks, Pillows Hazmat Chemical Absorbent Pulp Disposal Bags & Ties, Neoprene Drain Cover Chemical-resistant Gloves, Goggles Spill Response Plan. Emergency Response Guidebook Self-contained Breathing Appartus TECP Suits, Escape Air Packs

Legend:

Facility
Transmission Line
Watercourse
Contours (25m)
Reserved Area

StrataGold Corporation

0 125 250 500
Meters

Projection: NAD 83 Zone 8N

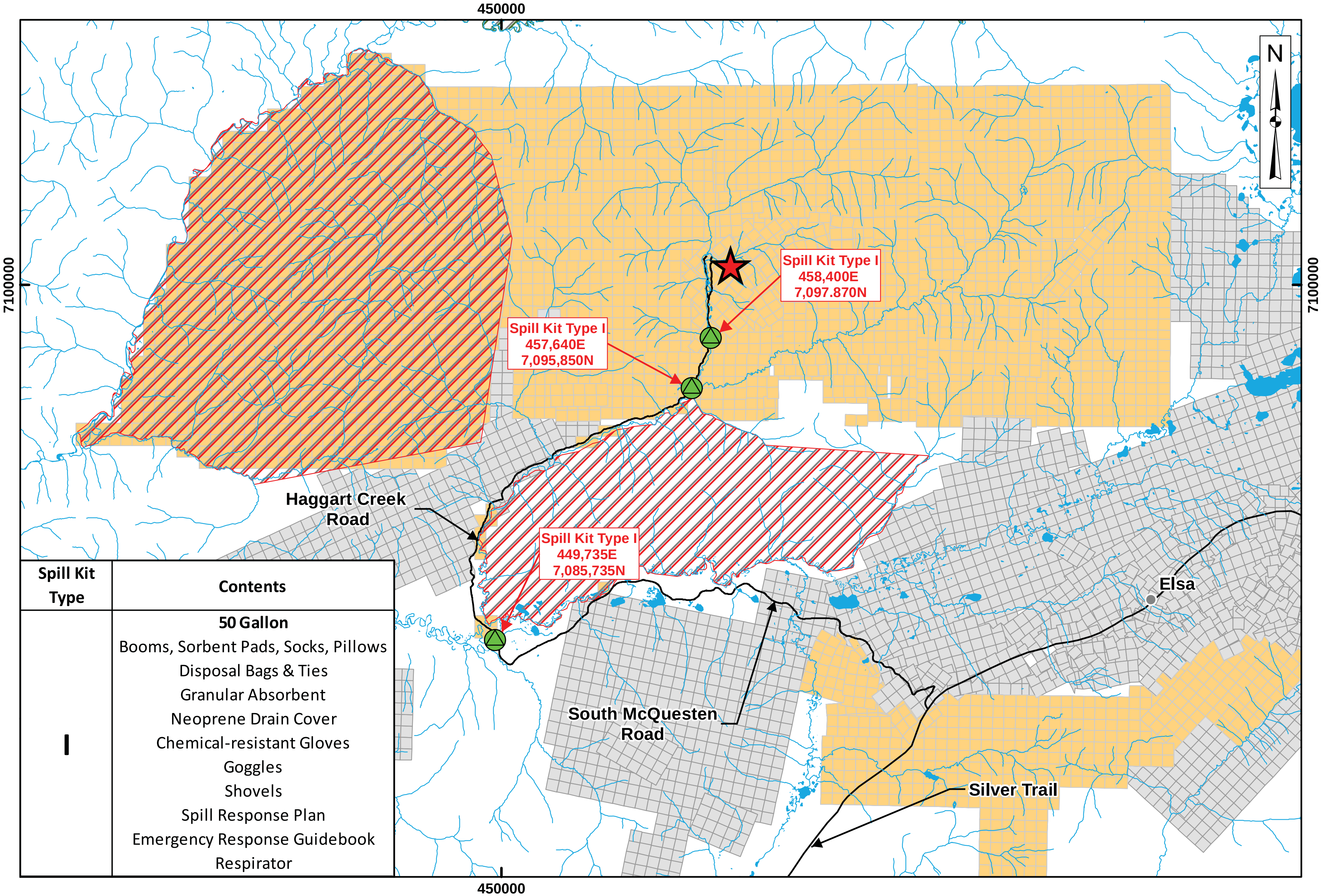
Drawn By: HC

Date: 2017/03/15

Figure: 3.1-1

EAGLE GOLD PROJECT
YUKON TERRITORY

Planned Location of Spill Response Equipment



Spill Kit Type	Contents
I	**50 Gallon** Booms, Sorbent Pads, Socks, Pillows Disposal Bags & Ties Granular Absorbent Neoprene Drain Cover Chemical-resistant Gloves Goggles Shovels Spill Response Plan Emergency Response Guidebook Respirator

Legend:

- Eagle Gold Project
- Spill Kit Location
- Town / Village
- StrataGold Claims
- Other Claims
- Watercourse
- Road
- Category A Settlement Land
- Category B Settlement Land

0 1.25 2.5 5
Kilometres

StrataGold Corporation

Projection:	Drawn By:	
NAD 83 Zone 8N	HC	**EAGLE GOLD PROJECT YUKON TERRITORY**
Date: 2017/03/15	Figure: 3.1-2	**Additional Spill Response Resource Locations**

3.2 DUTIES AND RESPONSIBILITIES

To ensure human safety and limit potential environmental effects resulting from a spill, all site personnel will have specific responsibilities when responding to a spill. The responsibilities for spill response are summarized in Table 3.2-1 and depicted in Figure 3.2-1.

Table 3.2-1: Position and Responsibilities of Personnel Involved in Spill Response

Position	Responsibilities
All Personnel (Discoverer)	▪ Assess the initial severity of the spill and safety concerns ▪ Identify the source of the spill ▪ Ensure the safety of nearby personnel ▪ Begin first aid immediately as required ▪ Report all spills to Supervisor and Environmental Coordinator as soon as possible ▪ Determine the size of the spill and, if safe to do so, stop or contain it ▪ Remove all ignition sources if safe to do so ▪ Participate in spill response as a member of cleanup crew under the direction of the Spill Response Team
Supervisors	▪ Contact the Mine Manager ▪ Report to the site of the spill ▪ Gather information on the spill (substance, location, approximate area/quantity, in water, etc.) ▪ Participate in spill response as a member of cleanup crew under the direction of the Spill Response Team
Emergency Response/Spill Response Team	▪ Report to the site of the spill ▪ Assume primary role for first aid (Emergency Response Team) ▪ Stop or contain the spill ▪ Remove all ignition sources ▪ Take appropriate response measures – deploy booms, absorbents, and other equipment and materials as required ▪ Continue cleanup as directed by Mine Manager or Environmental Coordinator
Mine Manager	▪ Report to the site of the spill or Incident Command Centre (if Emergency Response Team has been deployed) ▪ Coordinate initial and ongoing response efforts ▪ Ensure source of spill has stopped and contain spill ▪ Record spill information ▪ Ensure a log book of all spill or unauthorized discharge occurrences is maintained ▪ Ensure coordination of equipment and personnel as needed ▪ Oversee the cleanup operation until it is satisfactorily completed ▪ Decide with the Environmental Coordinator if mobilization of additional equipment, resources or personnel is warranted
Environmental Manager /Coordinator	▪ Report to the site of the spill ▪ Report the spill to the Yukon 24-Hour Spill Report Line and Energy Mines and Resources - Client Services and Inspections

Position	Responsibilities
	▪ Ensure timely response and cleanup of spill site and impacted areas ▪ With the Mine Manager, decide if additional equipment, resources or personnel is required for containment and remedial activities ▪ Notify senior management ▪ Oversee completion and distribution of Spill Report ▪ Ensure investigation identifies measures to prevent similar spills
Executive Vice President	▪ Communicate with the media for large spills when required. ▪ Ensure that all press releases are accurate and in accordance with policy ▪ Make financial decisions on major expenses during large spill response ▪ Oversee preventative measures to ensure risk of a similar incident is mitigated

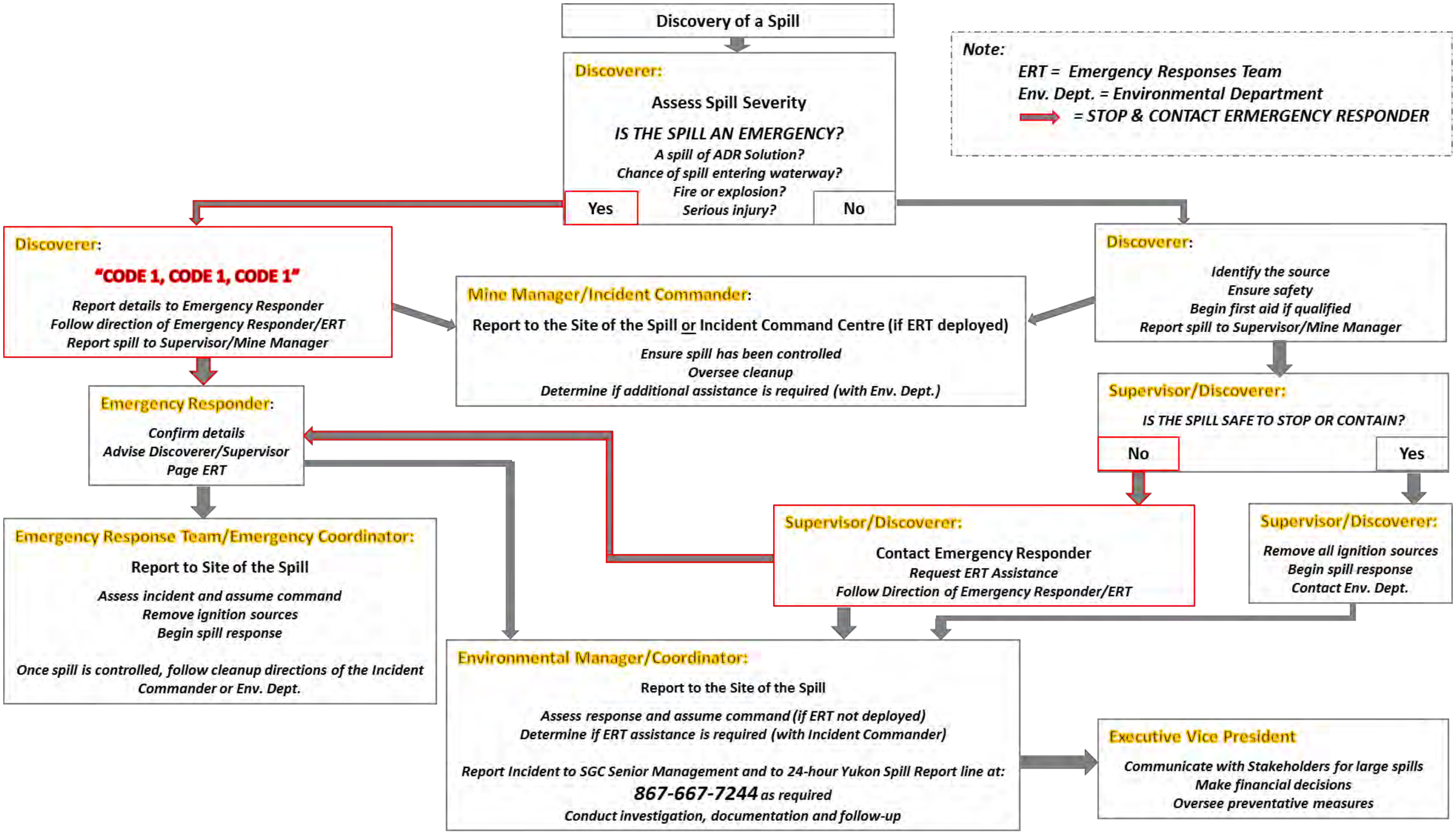


Figure 3.2-1: Spill Response Procedure

3.3 CONTAINMENT AND CLEANUP PROCEDURES

Containment methods for spills vary depending on the substance, size of the spill, location (inside buildings or outside), terrain and soil type, proximity to watercourses, climatic conditions and the availability of equipment and personnel.

Spill containment and response steps for each substance that could be spilled are summarized in Table 3.3-1 and Appendix C.

Table 3.3-1: Spill Containment Procedures by Substance

Substance Name	Type	TDG A Class	PPE required for Spill Response	Cleanup or disposal method
Propane	Petroleum product	2	Insulated gloves, safety glasses, respirator if there is a possible of oxygen reduction (confined spaces with poor ventilation)	Shut off flow and remove ignition sources if safe to do so and evacuate area. Consult supplier if container needs disposal.
Acetylene	Petroleum product	2	Insulated gloves, safety glasses, respirator	Shut off flow and remove ignition sources if safe to do so and evacuate area. Consult supplier if container needs disposal.
Oxygen	Gas	2	Insulated gloves, safety glasses	Allow gas to dissipate. Consult supplier if container needs disposal.
Gasoline	Petroleum product	3	Chemical-resistant impervious gloves, safety glasses, respirator if ventilation is inadequate	Approach from upwind, contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.
Diesel	Petroleum product	3	Chemical-resistant impervious gloves, safety glasses	Approach from upwind and contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.
Jet A & B Aviation Fuel	Petroleum Product	3	Chemical resistant gloves, safety glasses	Use sorbents, pump free liquid into containment. Arrange for transport of material to an approved facility.
Antifreeze	Solvent	9	Chemical-resistant impervious gloves, safety glasses	Approach from upwind, contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.
Lubricating and Hydraulic Oils	Lubricatin g oil	n/a	Chemical-resistant gloves, safety glasses.	Approach from upwind, contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.

Various practical methods of containment and recovery have been proven and effective for use in northern climates on land, snow ice or in open water. These methods are summarized in Table 3.3-2.

Table 3.3-2: Spill Containment Procedures by Location

Spill location	Response Actions	Containment Methods	Limitations	Required resources
Snow and Ice	▪ Stop spill source ▪ Eliminate ignition sources ▪ Block entry to waterways with snow dyke or other barrier ▪ Trench or ditch to intercept or contain spill ▪ Compact snow around spill to increase retention ▪ Contain or collect contaminated snow	Snow or Ice dykes	▪ Best suited for flat areas in winter ▪ Requires sufficient snow or ice	▪ Shovels ▪ Heavy equipment
		Snow or Ice trench	▪ Requires sufficient snow or ice ▪ Only applicable when ice is >1m thick ▪ Generally requires mechanical equipment for construction on ice	▪ Shovels ▪ Heavy equipment ▪ Ice chain saws
		Sorbent berm	▪ Requires sufficient, readily available sorbent material ▪ Impractical for larger spills	▪ Sorbents
Land	▪ Stop spill source ▪ Eliminate ignition sources ▪ Block entry to waterways with sand or gravel dyke ▪ Trench or ditch to intercept or contain spill ▪ Deploy sorbents ▪ Recover liquids with pumps or vacuum equipment	Sand or gravel dykes	▪ Best suited for flat areas ▪ Requires sufficient, easily excavated material if hand tools are being used	▪ Shovels ▪ Heavy equipment ▪ Sandbags or liner material if available ▪ Pump out equipment
		Land trench	▪ Can be difficult to excavated if soil is frozen ▪ Not conducive to areas with shallow bedrock	▪ Shovels ▪ Heavy equipment ▪ Pump out equipment
		Sorbent berm	▪ Requires sufficient, readily available sorbent material ▪ Impractical for larger spills	▪ Sorbents
Open Water	▪ Stop spill source ▪ Eliminate ignition sources ▪ Deploy sorbent booms or containment booms to control spread of substance	Sorbent boom	▪ Requires sufficient, readily available sorbent material ▪ No suitable for fast moving watercourses	▪ Sorbents
		Containment boom	▪ Requires sufficient, readily available sorbent material	▪ Sorbents

An effective way of controlling spills on land is through the construction of trenches or berms using sand and gravel. Small spills may be contained manually using shovels. More substantial spills may require the use of heavy equipment to dig trenches or place berm material.

Since snow has absorbent and containment properties, snow can be very effective for containing spills. Liquid spills typically become immobile within the snow pack and can be easily removed for transport and disposal. Snow will be used to its advantage in the construction of snow dykes, and whenever possible, the snow pack will be left in place to avoid contaminating the underlying substrate. For spills on ice, the methods of containment are similar to those used on land.

Spills occurring on open water (e.g. water retention ponds) will spread very rapidly, and therefore, initial preventative measures such as those described in Table 3.3-1 will be taken to minimize the potential for spills to enter open water. In the event of a petroleum product spills on open water, booms will be deployed immediately to limit the spread of the product and to facilitate recovery, by absorbents or by pumping.

3.4 OFF-SITE RESOURCES

With the exception of medical aid incidents, external resources will be authorized only by the Mine Manager or designate, or those with a higher level of responsibility. Key municipal, territorial and federal services and contact numbers are provided in Table 3.4-1.

Table 3.4-1: Municipal, Territorial and Federal Services and Contact Numbers

Name	Office	Location
Canutec – Emergency Response for TDG spill	**613-996-6666** or ***666 on a cellular phone**	Ottawa
Mayo Nursing Station	867-996-4444	Mayo
Mayo Fire & Rescue	867-996-2222	Mayo (Volunteer Responders)
Mayo RCMP	Emergency: 867-996-5555 Admin: 867-996-2677	Mayo
Whitehorse Regional Hospital - Emergency and Admissions	867-393-8700	Whitehorse
Environment Yukon Conservation Officer – Debra Morris	867-996-2202	Mayo
Environment Yukon Conservation Officer Services Branch	867-667-8005	Whitehorse
First Nation of Nacho Nyäk Dun	867-996-2265	Mayo
Environment Yukon Fish and Wildlife Branch	867-667-5715	Whitehorse
Fisheries and Oceans Canada	867-393-6722	Whitehorse
Yukon Energy Corporation	867-996-2387	Mayo

Name	Office	Location
Yukon Energy Corporation	1-800-676-2843	After hours Whitehorse
Yukon Workers' Compensation Health and Safety Board, Chief Mines Safety Officer, Occupational Health & Safety Branch - Michael Henney	867-667-8739	Whitehorse
Yukon Workers' Compensation Health and Safety Board 24-Hour Emergency Line for Reporting Serious Workplace Incidents and Injuries	867-667-5450	Whitehorse

3.5 FIRE SUPPRESSION

The Fire Response Procedure in the Emergency Response Plan must be implemented in the event of a fire.

Fire suppression equipment will be located at all hazardous materials storage, transfer and dispensing areas. If a spill of a flammable substance occurs and is ignited, firefighting efforts may be required prior to spill containment and cleanup. Personnel will be made aware of substance specific dangers prior to conducting fire suppression activities.

Any individual discovering a fire is responsible for attempting to control it and notifying his or her supervisor (Note: Any attempt to control the fire should be made without exposing oneself to risk or injury).

An individual should never enter a smoke-filled environment without self-contained breathing apparatus, appropriate protective clothing and proper training. If a fire is not immediately extinguished and poses an active threat to human health or the environment, then a 'Code 1' call that describes the size and location of the fire must be activated. Immediately notify the Mine Manager in such an event.

In the event that the Mine Manager deems that site wide evacuation is necessary, all personnel must gather at the appropriate muster station so that transport from the site can be arranged, and all mine personnel can be accounted for.

The Mine Manager or designate must:

- Take and remain in charge of firefighting activities until the fire is extinguished
- Ensure all personnel not involved are evacuated to a safe zone and instructed to be on standby for deployment on firefighting duties
- Identify all fire extinguishers used in the firefighting effort and ensure they are serviced, tested, re-charged, and returned for re-use.

3.6 CONTAMINATED SOIL

If cleanup material contains hazardous materials, it will be prepared for transport and taken to an approved offsite facility. Caution will be taken with reactive chemicals to make sure disposal of the material does not create additional danger through potential reaction with other materials.

Hazardous materials that cannot be re-used or recycled will be handled in accordance with SGC's Solid Waste and Hazardous Materials Management Plan.

A land treatment facility will be constructed for the progressive treatment and remediation of hydrocarbon contaminated soils as and when required. The land treatment facility will be located adjacent to the landfill area and will consist of two cells that are 10 m by 10 m each. If soil permeability in the facility is greater than 10^{-5} cm/s, a geo-membrane liner will be installed and covered with fine grained gravel or soil to temporarily store and land farm contaminated soil. The area will be leveled and sloped such that run-off from the area can be contained and treated prior to release to the receiving environment.

Hydrocarbon contaminated soils will be stored within the land treatment facility and remediated by regular tilling (aeration) and standard northern bioremediation practices. Runoff from the facility will be collected in a sump and treated via an oil water separator in the sump prior to discharge to ground. The construction of dual cells will allow the treatment of contaminants in cell 1 while soils are added to cell 2, remediation treatment will occur in summer months only. Contaminated soils will be tested for hydrocarbons prior to treatment and will be tested for F1/F2/F3/F4 (one test per 50 cubic meters).

4 INTERNAL AND EXTERNAL REPORTING

Any spill for which external reporting is required, as described in Section 2.2, will be reported to the 24-hour Yukon Spill Report Line. The reporting sequence below will be followed to allow for an efficient and effective response, completion of an accurate spill report, and timely notification of SGC management, government agencies, and First Nations.

- The First Observer (the person who discovers the spill) will identify the source and report to his/her direct supervisor.
- The supervisor will gather spill information and provide to the Mine Manager and Environmental Manager or designate.
- The Environmental Manager or designate will record the information regarding the spill and forward it to the Mine Manager.
- The Environmental Manager or Environmental Coordinator will report the spill to SGC senior management and the 24-hour Spill Report Line and the Department of Energy, Mines and Resources - Client Services and Inspections, as well as overseeing the completion and distribution of spill-related information.

5 TRAINING REQUIREMENTS

All personnel on site involved with the handling, use, storage and transportation of hazardous substances will be trained in the procedures for responding to and reporting of spills. Training topics will include:

- Workplace Hazardous Materials Information System (WHMIS) – renewed every 3 years and mandatory for all new hires
- Transportation of Dangerous Goods
- Hazmat training will be delivered to Emergency Response Team members

The following spill related topics will be covered during site orientation for all relevant personnel:

- Responsibilities of personnel
- Causes of spills and preventative measures
- Control, containment and cleanup methods for various spill locations
- Emergency contact information and location
- Storage and disposal of materials used on site
- Reporting requirement and procedure
- Overview of Spill Response Plan
- PPE requirements for handling potential spill materials

6 BEST MANAGEMENT PRACTICES

SGC will incorporate best management practices (BMPs) into all work procedures and plans. BMPs relating to spills are outlined below.

6.1 HEALTH AND SAFETY

SGC will implement a system of workplace inspections to ensure that procedures put in place to prevent incidents and accidents relating to hazardous materials are followed. This system will identify levels of hazard, which will trigger immediate work stoppages, and levels of hazards, which will trigger notification of management. This system will ensure that work does not continue with inadequate provisions for health and safety and those personnel are empowered to address unsafe or potentially unsafe scenarios.

Specifically in relation to hazardous materials, the following will be provided:

- Engineering controls and engineered hazardous material handling mechanisms to ensure that manual handling and ergonomic issues do not exacerbate the risk associated with working with hazardous materials.
- Monitoring systems for detection of hazardous solution and gaseous leaks.
- PPE designed for use in handling the various types of hazardous materials.
- Communication systems with emergency response capabilities.
- MSDS for all hazardous materials will be readily available anywhere these products are stored or used.
- A copy of the MSDSs will be accessible in the site offices.
- Emergency contact information will be posted and kept current.

6.2 SPILL PREVENTION

All relevant personnel that will use or handle hazardous materials will receive WHMIS training and will be trained in proper handling, spill response, and PPE use specific to their job tasks.

No lubrication, refueling or maintenance of equipment is permitted to occur within 30 m of watercourses or wetlands. All fuelling and lubrication of equipment will be conducted in a manner that minimizes the possibility of spills with containers, hoses and nozzles kept free of leaks and all fuel nozzles equipped with functional automatic shutoffs.

Sodium cyanide will be mixed with water in a well-ventilated area and maintained at a high pH to prevent the evolution of hydrogen cyanide gas.

The following mitigation measures will be implemented to minimize the potential for transportation incidents that could result in a hazardous substance spill:

- SGC will work with the Department of Highways and Public Works to ensure the access road is properly maintained.
- Speed limits will be strictly enforced for all Project vehicles.
- SGC will ensure trucking and hauling contractors have appropriate driver training, radio contact capabilities, properly maintained vehicles, and spill response capabilities.
- SGC will ensure all hazardous materials are transported and handled in accordance with the *Transportation of Dangerous Goods Act.*
- Signage will be posted along the access road to the Project to ensure non-Project traffic is aware of radio protocols.
- Wildlife migration corridors and crossings along the access road will be identified and signage provided in high risk areas.
- Wildlife crossing and escape points will be plowed in the access road snow banks.
- SGC will have on-site personnel with emergency first aid training to provide primary care in the event of an accident, and will implement the appropriate components of the Emergency Response Plan for the Project.

6.3 SPILL RESPONSE

All site personnel will be familiar with SGC's Spill Response Plan, and their duties and responsibilities. Storage sites will be well labeled, and MSDS are accessible in storage areas. This Spill Response Plan will be kept current, and made available to all personnel. SGC will ensure that suitable spill kits are used for spill response and that personnel are trained in using the spill response equipment.

6.4 STORAGE OF HAZARDOUS MATERIALS

The Solid Waste and Hazardous Materials Management Plan, describes the method of storage of hazardous materials for the Project. SGC will ensure that all hazardous materials are stored with secondary containment structures, either in the form of concrete foundations with curbed sides or double walling of the primary container. Hazardous material storage areas will be well labeled and access to the storage areas will be restricted.

Spill response equipment will be available at hazardous materials storage locations and will be inventoried, maintained and inspected monthly. Signage will be clearly visible in storage, dispensing and transfer areas. Fire extinguishers and/or fire suppression systems will be located at all hazardous material storage locations. Fuel and lubrication materials will be stored a minimum of 30 m from natural watercourses.

6.5 FUEL TRANSFER PROCEDURES

All personnel responsible for transfer, storage, transportation or handling of fuel will be trained in safe work practices for fuel and lubricants.

Caches of spill response materials will be placed along the South McQuesten Road and the Haggart Creek Road, including at the Haggart Creek crossing. Project personnel will have appropriate emergency response and spill contingency training and knowledge; equipment, materials and procedures will be maintained to limit consequences of releases of fuel or oil to the terrestrial or aquatic environment through prompt containment and clean-up.

6.5.1 Spill Protection and Prevention

Spill prevention will be undertaken through ensuring that accepted standard operating procedures are employed for the safe and secure transfer of hazardous materials from product transporters and within the Project site. Hazardous materials will be stored in areas that have containment structures such as concrete foundations with curbed sides. Hazardous material handling will be undertaken within the concrete foundations. Equipment handling hazardous materials will be inspected regularly and any inadequacies will be reported to maintenance personnel and repaired prior to continuation with work.

Spills will be responded to using the methods described in this Plan, according to what type of substance and what surface they occur on, as described in Section 3.3 and Appendix C. Routine inspections and maintenance will be conducted at hazardous material storage and transfer areas. Storage areas will be kept clean through good housekeeping practices.

6.5.2 Dispensing

Storage containers will be stored properly, and will not be over filled. Operating procedures will be established to minimize the potential for fuel spills during dispensing. All personnel handling fuel will be trained on these procedures.

6.6 ROUTINE MONITORING

Monitoring and maintenance is essential in the prevention of spills, and the effective handling of potential spills.

6.6.1 Maintenance

Maintenance procedures will be posted in applicable service areas. Maintenance personnel will be trained and familiar with the procedures. Regular checks will be performed on storage and dispensing equipment to identify any potential problems. If the regular checks identify issues, repairs are to be made prior to continued use of the piece of equipment. Spill response equipment will be kept stocked and maintained, and maintenance logs will be kept.

6.6.2 Perimeter Assessment

The following outlines items that will be identified during inspection:

- Signs of leakage from storage containers, loss of material, cracks, holes etc.
- Signs of inadequacy of secondary containment structures
- Unexpected solution or gaseous emissions will be thoroughly investigated to determine the source and nature of the emissions.
- Discoloration, oily discharges or any unusual odours.

6.6.3 Hazardous Material Storage and Transfer Areas

The following outlines items that will be identified during inspection:

- Spills or stains on the ground.
- Losses of material from storage containers.
- Cracks or damage to storage containers.
- Emergency shut off systems in place, functioning and clearly marked.
- Spill kits are available, adequate and accessible.
- Procedures posted for reference, MSDS are available

APPENDIX A

Assessment, Licence and Permit Requirements for Spill Prevention and Response

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Assessment, Licence and Permit Requirements for Spill Prevention and Response

Document, License or Permit	Section Number	Requirement
Final Screening Report and Recommendation: Terms and Condition of Recommendation	11	As proposed, the Proponent shall ensure a certified cyanide transporter is used and appropriate driver training, radio contact capabilities, vehicle maintenance, and emergency clean-up kits will be on trucks carrying NaCN. Furthermore, the Proponent shall ensure that emergency clean-up kits include equipment to contain NaCN as well and material to protect from, and respond to, cyanide toxicity in spill responders.
Final Screening Report and Recommendation: Terms and Condition of Recommendation	23	The proponent shall ensure that the following communication elements are in the ERP: a) Notification to management, regulatory agencies, outside response providers and medical facilities of the cyanide emergency. b) Notification to potentially affected communities of the cyanide related incident and any necessary response measures. c) Communication protocols with the media.
Final Screening Report and Recommendation: Proponent Commitments	97	SGC will implement the following to maximize road and transport safety: a) Ensure trucking/hauling contractors have appropriate driver training, radio contact capabilities, vehicle maintenance requirements, and spill response capabilities b) Ensure all hazardous materials are transported and handled in accordance with the Transport of Dangerous Goods Act and Regulations
Final Screening Report and Recommendation: Proponent Commitments	98	SGC commits to the following spill prevention and response measures: a) If there is any doubt regarding the size of a spill, material involved, and whether it is reportable, SGC will err on the side of caution and report the spill. b) Caches of spill response materials will be placed along the access road as required by the Spill Contingency Plan, including the Haggart Creek Crossing. c) Project staff will have appropriate emergency response and spill contingency training and knowledge. Equipment, materials, and procedures will be maintained to limit the consequences of releases to the environment through prompt containment and clean-up. d) Fuels, hydrogen peroxide, and other hazardous liquids will be transferred from tanker trucks to storage tanks by enclosed lines, hoses, and pumps equipped with pressure transducers and volume counters to ensure tanks cannot be overfilled. e) No lubrication, refuelling or maintenance of equipment will occur within 30 m of wetlands or watercourses. f) All fuelling and lubrication of construction equipment will be carried out in a manner that minimizes the possibility of spills. All containers, hoses, and nozzles will be free of leaks and all fuel nozzles equipped with functional automatic shut-offs. g) Where stationary equipment cannot be relocated more than 30 m from a watercourse, it will be situated in a designated area that has been bermed and lined with an impermeable barrier with a holding capacity equal to 125% of the largest tank within the berm. h) Equipment operators will be appropriately trained in spill response procedures and carry spill kits capable of handling spills on land and water.

Assessment, Licence and Permit Requirements for Spill Prevention and Response

Document, License or Permit	Section Number	Requirement
Final Screening Report and Recommendation: Proponent Commitments	110	SGC is committed to developing and implementing Environmental Management Plans with the following components: a) Spill Contingency Plan
Final Screening Report and Recommendation: Proponent Commitments	112	The ERP will include the following commitments: a) Resource inventories of personnel, equipment, first aid kits, spill kits, and clean-up materials will be maintained on-site and updated regularly. These inventories will also contain information on external resources available off-site (e.g., RCMP, fire department, other mining establishments in the vicinity). b) All staff on site will receive basic training, including environmental awareness, general emergency response, spill contingency measures, and communication procedures. Truck drivers transporting hazardous materials will also receive additional training on spill response, hazardous material handling, and emergency driving techniques. All security personnel will be trained in first aid.
Final Screening Report and Recommendation: Proponent Mitigations	26	Prevent and respond to all potential spills.
Final Screening Report and Recommendation: Proponent Mitigations	59	Fuel, hazardous material and explosives will be managed according to industry standards including; storage in appropriate containers; containment areas sized to hold the larger of 110% of the largest tank or 10% of the total maximum volume of all tanks in the facility; and storage of explosives in separate buildings away from the rest of the mine activities.
Quartz Mining License QML-0011	10.3	The Licensee must immediately implement the environmental management system if a spill or release of dangerous or hazardous substance or material occurs at the mine.
Class 4 Mining Lands Approval LQ00303	6	All spills must be reported immediately to the 24-Hour Yukon Spill Reporting Ling (867) 667-7244 and to the Mining Inspections Division (867) 456-3882.
Class 4 Mining Lands Approval LQ00303	37	A spill contingency plan for petroleum products and other hazardous waste must be prepared and posted in the camp and at all fuel handling locations used in carrying out the exploration program. The spill plan shall include reporting to EMR-CSI Mining Inspections and the Chief to ensure compliance with spill reporting requirements.
Class 4 Mining Lands Approval LQ00303	38	All spill clean-up equipment and material must be maintained in a state of readiness sufficient at all times to contain and clean-up any hazardous material spills.
Class 4 Mining Lands Approval LQ00303	39	If a spill occurs, the spill contingency plan must be immediately implemented and notice given to the 24-hour Yukon Spill Report Line. As soon as practicable, an inspector must be contacted. Whatever remedial action is required to clean-up the spill and reclaim the affected land and water must be taken.
Class 4 Mining Lands Approval LQ00303	40	Routine maintenance areas where heavy equipment is serviced or repaired should be inspected regularly for minor spills and stored waste hydrocarbons.
Class 4 Mining Lands Approval LQ00303	41	Any contaminated soils should be excavated and contained for eventual land farm treatment at an approved facility.
Type B Water Use Licence QZ16-	19	Where a spill or an unauthorized discharge occurs, that is of a reportable quantity under the Yukon Spills

Assessment, Licence and Permit Requirements for Spill Prevention and Response

Document, License or Permit	Section Number	Requirement
006		Regulations, the Licensee shall immediately contact the 24-hour Yukon Spill Report number, (867) 667-7244 and implement the Spill Contingency Plan. A detailed written report on any such event including, but not limited to, dates, quantities, parameters, causes and other relevant details and explanations, shall be submitted to the Board not later than 10 days after the occurrence.
Type B Water Use Licence QZ16-006	20	The Licensee shall apply the relevant procedures in the Spill Contingency Plan. The Licensee shall review the Spill Contingency Plan annually and shall provide a summary of that review, including any revisions to the plan, as a component of the annual report.
Type B Water Use Licence QZ16-006	21	The Licensee shall maintain a log book of all spill or unauthorized discharge occurrences, including spills that are less than the reportable quantities under the Yukon Spills Regulations. The log book shall be made available at the request of an Inspector. The log book shall include, but not necessarily be limited to the: a) date and time of the spill or unauthorized discharge occurrence; b) substance spilt or discharged; c) approximate amount spilt or discharged; d) location of the spill; e) distance between the spill or discharge and the nearest Watercourse; and f) remedial measures taken to contain and clean-up the spill area or to cease the unauthorized discharge.
Type B Water Use Licence QZ16-006	22	The Licensee shall include a summary of all spills or unauthorized discharges that occurred during the year reported, as part of the annual report.
Type B Water Use Licence QZ16-006	23	All personnel shall be trained in procedures to be followed and the equipment to be used in the containment of a spill.
Type B Water Use Licence QZ16-006	24	Prior to the commencement of construction. the Licensee shall update the Spill Contingency Plan and provide the updated plan to the Board.
Type B Water Use Licence QZ16-006	25	The Spill Contingency Plan shall be posted on site for the duration of the works.
Type B Water Use Licence QZ16-006	26	Ten days prior to construction, the Licensee shall submit material safety data sheets to the Board for all petroleum products and/or hazardous materials that are to be present during this undertaking.
Type B Water Use Licence QZ16-006	13	Fuel, lubricants, hydraulic fluids, coolants and similar substances shall be stored and/or transferred a minimum of 30 metres from the Natural Boundary of any Watercourse, in such a way that said substances are not deposited in or allowed to be deposited in waters.
Type A Water Use Licence QZ14-041	8	The Licensee shall apply the relevant procedures in the Spill Contingency Plan. The Licensee shall review the Spill Contingency Plan annually and shall provide a summary of that review, including any revisions to the plan, as a component of the annual report.
Type A Water Use Licence QZ14-041	9	The Licensee shall maintain a log book of all spill or unauthorized discharge occurrences, including spills that are less than the reportable quantities under the Yukon Spills Regulations. The log book shall be made available

Document, License or Permit	Section Number	Requirement
		at the request of an Inspector. The log book shall include, but not necessarily be limited to the: g) Date and time of the spill; h) Substance spilt or discharged; i) Approximate amount spilt or discharged; j) Location of the spill; k) Distance between the spill or discharge and the nearest Watercourse; and l) Remedial measures taken to contain and clean-up the spill area or to cease the unauthorized discharge.
Type A Water Use Licence QZ14-041	10	The Licensee shall include a summary of all spills or unauthorized discharges that occurred during the year reported, as part of the annual report.
Type A Water Use Licence QZ14-041	11	All relevant personnel shall be trained in procedures to be followed and the equipment to be used in the containment of a spill.
Type A Water Use Licence QZ14-041	12	Prior to the commencement of Development, the Licensee shall update the Spill Contingency Plan and provide the updated plan to the Board.
Type A Water Use Licence QZ14-041	13	The Spill Contingency Plan shall be posted on site for the duration of the works.
Type A Water Use Licence QZ14-041	14	Ten days prior to Development, the Licensee shall submit material safety data sheets to the Board for all petroleum products and/or hazardous materials that are to be present during the Project.
Type A Water Use Licence QZ14-041	15	Fuel, lubricants, hydraulic fluids, coolants and similar substances shall be stored and/or transferred a minimum of 30 meters from the Natural Boundary of any Watercourse, in such a way that said substances are not deposited in waters.

APPENDIX B

Eagle Gold Spill Report Form

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EAGLE GOLD PROJECT
SPILL RESPONSE FORM

StrataGold Corporation

Name (first observer):		**Department:**	
Date of spill:		**Time of spill:**	
Location of spill:		**Site conditions (temperature, wind, precipitations, etc.):**	
Photos: please list & append			
Safety hazards identified (Fire, explosive substance, etc.):			
Substance spilled:			
Estimated volume of spill (Liters or kilograms):			
Cause of spill (Equipment malfunction, vehicle accident, etc.)			
Environmental areas affected (watercourse, soil, wetland, etc.)			
Containment actions taken:			
Disposal method and location:			
Samples taken:			
Further actions required:			
Supervisor reported to:			
Is the Spill Reportable		**Who was it reported to?**	

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APPENDIX C

Reportable Spill Thresholds

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Reportable Spill Thresholds, Personal Protective Equipment and Clean-up Method by Substance FOR UNUSED PRODUCTS

Substance Name	Type	TDGA Class	Reportable Threshold	PPE required for Spill Response	Cleanup or disposal method
Propane	Petroleum product	2	Any amount of gas from a container larger than 100 L, or where the spill results from equipment failure, error, or deliberate action or inaction	Insulated gloves, safety glasses, respirator if there is a possible of oxygen reduction (confined spaces with poor ventilation)	Shut off flow and remove ignition sources if safe to do so and evacuate area. Consult supplier if container needs disposal.
Acetylene	Petroleum product	2	Any amount of gas from a container larger than 100 L, or where the spill results from equipment failure, error, or deliberate action or inaction	Insulated gloves, safety glasses, respirator	Shut off flow and remove ignition sources if safe to do so and evacuate area. Consult supplier if container needs disposal.
Oxygen	Gas	2	Any amount of gas from a container larger than 100 L, or where the spill results from equipment failure, error, or deliberate action or inaction	Insulated gloves, safety glasses	Allow gas to dissipate. Consult supplier if container needs disposal.
Gasoline	Petroleum product	3	200 L (any amount if spilled into a watercourse	Chemical-resistant impervious gloves, safety glasses, respirator if ventilation is inadequate	Approach from upwind, contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.
Diesel	Petroleum product	3	200 L (any amount if spilled into a watercourse)	Chemical-resistant impervious gloves, safety glasses	Approach from upwind and contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.
Jet A & B Aviation Fuel	Petroleum Product	3	200 L (any amount if spilled into a watercourse)	Chemical resistant gloves, safety glasses	Use sorbents, pump free liquid into containment. Arrange for transport of material to an approved facility.
Antifreeze	Solvent	9	5 L	Chemical-resistant impervious gloves, safety glasses	Approach from upwind, contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.
Lubricating and Hydraulic Oils	Lubricating oil	n/a	200 L (any amount if spilled into a watercourse)	Chemical-resistant gloves, safety glasses.	Approach from upwind, contain and collect spillage with sorbents from spill kits and/or sand and gravel. Pump free liquid into containment. Arrange for transport of material to an approved facility.

Reportable Spill Thresholds, Personal Protective Equipment and Clean-up Method by Substance
FOR USED/WASTE PRODUCTS

Substance Type	Time period	Reportable Threshold
Special Waste that may cause an adverse effect	N/A	Any amount
Solid Special Waste	24 hours	500 g
	30 days	5 kg
Liquid Special Waste	24 hours	500 ml
	30 days	5 L
Mixture of Solid and Liquid Waste	24 hours	500 g or 500 ml whichever is less
	30 days	5 kg or 5 L whichever is less

APPENDIX D

Spill Response Emergency Contact Numbers

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EAGLE GOLD PROJECT
SPILL RESPONSE
EMERGENCY CONTACT NUMBERS

Resource	Position/Division	Contact Number
Yukon Government - Environment	Spill Report Centre	**867-667-7244**
Eagle Gold Project Site	Site Manager	**Office 604-484-5665 or 778-785-0482** **Cell 867-335-4928**
StrataGold Corporation	Executive VP	**Office 604-696-6614** **Cell 778-888-4010**
StrataGold Corporation	Lands & Permitting Manager	**Office 604-696-6600** **Cell 604-349-6469**
Transport Canada	CANUTEC 24-hour service	**613-996-6666** or ***666 on a cellular phone**
Yukon Government – Energy, Mines and Resources	Client Services and Inspections – Mayo	**867-996-2568**
Yukon Government – Energy, Mines and Resources	Client Services and Inspections – Whitehorse	**867-456-3882**
Mayo Nursing Station		**867-996-4444**
Mayo Fire & Rescue		**867-996-2222**
Mayo RCMP		**Emergency: 867-996-5555** **Admin: 867-996-2677**
Yukon Government - Environment	Conservation	**867-996-2202**
Fisheries and Oceans Canada		**867-393-6722**

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APPENDIX J

Eagle Gold Project Solid Waste and Hazardous Materials Management Plan Version 2017-01

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EAGLE GOLD PROJECT
SOLID WASTE AND HAZARDOUS MATERIALS MANAGEMENT PLAN

Version 2017-01

MARCH 2017

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1 INTRODUCTION

1.1 PROJECT SUMMARY

StrataGold Corporation (SGC), a directly held wholly owned subsidiary of Victoria Gold Corp. has proposed to construct, operate, close and reclaim a gold mine in central Yukon. The Eagle Gold Project ('the' Project) is located 85 km from Mayo, Yukon using existing highway and access roads. The Project will involve open pit mining and gold extraction using a three stage crushing process, heap leaching, and a carbon adsorption, desorption, and recovery system over the mine life.

1.2 SCOPE AND OBJECTIVES

This Solid Waste and Hazardous Materials Management Plan describes the management of solid waste and special waste produced by and hazardous materials used by the proposed Eagle Gold Project. All solid wastes and hazardous materials will be handled, stored and disposed of according to the appropriate regulations and permits issued under the Yukon *Environment Act, Explosives Act, and Transportation of Dangerous Goods Act*, including the existing Waste Management Permit 81-064 and a future Land Treatment Facility Permit as required.

SGC will manage solid wastes, special wastes, and hazardous materials using the following objectives:

- Effective management that enables the safe transport, handling, storage and use of hazardous materials;
- Reduction of waste generated through efficient procurement, recovery, re-use, and recycling;
- Disposal of solid waste in permitted on and off site facilities; and
- On-site treatment/remediation of hazardous waste spills (e.g. hydrocarbon-contaminated soils).

1.3 WASTE MINIMIZATION

SGC will minimize waste by reduction (source control), reusing, recycling, and energy recovery to the greatest extent possible. Waste minimization will include the following measures:

- Reduction of materials before they enter the waste stream via effective procurement so that orders of perishable consumables do not exceed usage rates and generate unnecessary waste. This may also include using effective ways to package materials before or when they are shipped to site, thereby reducing the amount of packaging that goes to the landfill.
- Reuse of materials and products in their original form. This may include refurbishment of a product prior to its reuse provided the product can perform the same function for which it was

originally intended. Recycling involves recovering materials that can be processed into new products. With secondary recovery, a further distinction must be made on whether the recovered product can be used to reproduce the original item or whether it must be "downcycled" into a lower grade product. Downcycling can prolong the useful life of a material. In limited cases, site waste can be downcycled and used for alternative purposes. An example is using waste tires as traffic control/safety structures as discussed in Section 2.5.

- Energy recovery – used materials are combusted to generate energy, which can be used to heat buildings or processes as well as to generate electricity. Energy recovery is a better option than simply incinerating the material because a useful product (heat) is being generated. Energy recovery will be employed by incineration of waste oil to heat facilities as opposed to transportation for off-site disposal.

Waste disposal will be used after consideration of these waste minimization efforts.

1.4 PERMITS

SGC (via Victoria Gold Corp.) currently holds Waste Management Permit No: 81-064 (Appendix A) that authorizes:

- Temporarily store solid waste generated by camp activities;
- Generate, store, or otherwise handle waste oil, waste antifreeze, and waste fuels; and
- Operate equipment for the incineration of special waste (waste oil).

Waste management permits required for the Project are listed in Table 1-1.

Table 1-1: Solid Waste Management Permits Required for the Project

Permit	Required for	Government agency and permit reference
Amended Waste Management Permit	Generating, handling and transporting of special wastes and solid wastes	Environment Yukon
Air Emissions Permit	For open burning of solid waste	Environment Yukon
Burning Permit	For burning of cleared timber and vegetation between April 1 and September 30	Department of Community Services Wildland Fire Management or the Department of Energy, Mines & Resources Client Services & Inspections
Permit/certificate for Transport of Dangerous Goods	Required for transport of hazardous materials including special wastes	Transport Canada
Land Treatment Facility Permit	Establishing a facility for treatment of potential hydrocarbon and hazardous material contaminated soil or snow	Environment Yukon

1.5 DEFINITIONS

- ***Bear-proof container*:** a container sealed to prevent the escape of attractant odours and strong enough to exclude a bear from the contents.
- ***Modified transfer station:*** a waste disposal facility where most types of garbage are transferred to another facility for final disposal (usually by burial or incineration); the only exception is that construction and demolition wastes may be buried on-site.
- ***MSDS:*** Material Safety Data Sheet
- ***Non-putrescible Waste:*** any waste that contains no more than trivial amounts of putrescible materials. Putrescible waste contains organic matter that is capable of being decomposed and may be capable of attracting or providing food for wildlife.
- ***Open Burning:*** combustion of material without control of emitted products of combustion to the atmosphere.
- ***Putrescible Waste:*** waste that contains organic matter and is capable of decomposition. Putrescible waste may attract or provide food for wildlife (e.g., kitchen waste).
- ***Solid Waste:*** waste that originates from residential, commercial, industrial or institutional sources, from the demolition or construction of buildings or other structures or is specified in a solid waste management plan to be solid waste.
- ***Special or Hazardous Waste:*** any waste requiring special handling, storage, or destruction and prescribed as special waste by *Yukon Special Waste Regulations*, whether or not the waste has any commercial value or is capable of being used for a useful purpose (e.g., waste oil). For the purposes of this plan, special wastes and hazardous wastes are used interchangeably.
- ***Waste:*** includes solid and special waste.
- ***WHMIS***: Workplace Hazardous Materials Information System.

2 NON-HAZARDOUS SOLID WASTE

The non-hazardous solid waste storage and transfer facility will be located in the south east of the construction laydown area adjacent to the road from camp to the truck shop. Non-hazardous solid wastes will be stored in dedicated, commercially available skips or bins in this area. Putrescible waste and any other waste that will attract wildlife (e.g. food containers, recyclables, etc.) will be stored in commercial bear-proof containers and surrounded by an electric fence which will be operational from May 1 to October 31 to prevent wildlife from entering the area. If there are tracks or other signs of dangerous wildlife attempting to access the waste storage area, the fence will be activated between November 1 and April 30. Figure 2-1 provides the location of the solid waste storage area and other waste storage or disposal areas including the incinerator, landfill, and land treatment facility.

The solid waste storage and transfer facility will be constructed on a concrete pad, or similar containment, that is sloped with berms to contain potentially contaminated run-off within the storage facility in accordance with the *Yukon Solid Waste Regulations*. Run-off from the solid waste storage facility will be pumped from the drains and used as process solution or, if testing shows it is below discharge criteria set in the Water Use License, it may be either directed through the camp septic system or discharged to the environment. This facility will be designed to safely contain:

- Non-hazardous wastes from the camp accommodations, offices and operational areas,
- Putrescible waste in bear-proof containers, and
- Non-hazardous recyclable materials in dedicated recycling bins.

SGC personnel and contractors handling wastes will be trained on the segregation of wastes for temporary storage within the solid waste storage facility prior to disposal.

Table 2-1 provides a solid waste management matrix that outlines the handling, storage and disposal methods for each waste type. Subsequent sections describe the location and methods of solid waste storage and disposal. Putrescible waste will not be stored for a period greater than seven days prior to incineration whereas the duration of storage for solid wastes that require off site disposal and that are not animal attractants will be dependent upon holding container capacity. These wastes that require off site disposal will be transported off site to approved facilities on a regular basis as needed by storage container capacity.

Table 2-1: Handling, Storage, and Disposal of Solid Waste

Waste Type	Description	Storage prior to disposal	Disposal
Kitchen waste	Putrescible food waste	Solid waste storage facility / Bear-proof containers	Incinerate
Office and dormitory	Non-putrescible waste, plastic food containers, waxed paper	Solid waste storage facility / Garbage bins	Incinerate

Waste Type	Description	Storage prior to disposal	Disposal
waste	containers, tetra packs, textiles and garbage	and Bear-proof containers (for food packaging etc.)	
Treated wood	Construction materials	Solid waste storage facility	Landfill or transported offsite to a permitted facility
Light plastics and styrofoam	Wrapping films, light packaging, etc.	Solid waste storage facility	Incinerate
Medical waste	Bandages, used first aid products, etc.	Solid waste storage facility	Incinerate
Medical Waste	Sharps	Special Waste Storage Area at truck shop	Off-site disposal Sent to approved facility
Ash	Ash produced by incineration and open burn area	Solid waste storage facility	Landfill
Heavy plastics	Plastic containing chlorine, PVC piping, HDPE liner scraps, construction material packaging, etc.	Solid waste storage facility	Landfill
Aerosol containers	Used aerosol containers from kitchen, dormitory, process facility, truck shop etc.	Solid waste storage facility	Landfill
Alkaline batteries	Used batteries from appliances etc.	Solid waste storage facility	Landfill
Lead acid batteries	Used batteries from vehicles and heavy equipment	Special Waste Storage Area at truck shop	Off-site disposal Sent to approved facility
Recyclable containers	Aluminum, glass, and plastic beverage containers	Solid waste storage facility / Recycling bins	Off-site disposal Mayo recycling center
Waste oil	Waste oil from vehicles, heavy equipment and generators	Special Waste Storage Area at truck shop	Waste oil burner
Lubricants, filters and packaging	Grease, hydraulic fluids, antifreeze, oil drums, oil filters, absorbent pads, etc.	Special Waste Storage Area at truck shop	Incinerate filters and packaging Landfill for absorbent pads Waste burner for lubricants
Special/Hazardous waste	Filters, hazardous material packaging, reagent packaging, spill cleanup, paint tins, miscellaneous hazardous waste	ADR Special Waste Storage Area / Stored in dedicated labeled bins	Off-site disposal Sent to approved facility or returned to supplier as needed
Reagent drums (empty and rinsed)	Process and mine water treatment related reagent containers.	Special Waste Storage Area at ADR facility	Landfill for non-hazardous waste containers or off-site disposal for hazardous waste containers

Waste Type	Description	Storage prior to disposal	Disposal
Steel	Scrap, used or discarded engine parts, steel frames, construction offcuts, crusher linings, etc.	Solid waste storage facility or adjacent to truck shop	Off-site disposal Sent to scrap dealer prior to closure and reclamation
Tires (under 24.5" diameter)	Worn tires or damaged tires from light vehicles	Solid waste storage facility or adjacent to truck shop	Off-site disposal Small tires will be sent to Yukon tire disposal depots
Tires (over 24.5" diameter)	Worn tires or damaged tires from heavy equipment	Solid waste storage facility or adjacent to truck shop	Barrier use or landfill/co-disposal within Waste Rock Storage Facilities
Untreated wood and paper products	Construction materials, paper / cardboard office waste, used reagent (rinsed) and cement bags, etc.	Open burn area	Open burn

2.1 RECYCLABLE MATERIAL

Recyclables will be sorted and stored in dedicated and segregated recycling bins prior to transfer off site for donation to local charity for refund and/or recycling depot. The community of Mayo maintains a depot for certain recyclable materials. Recyclable materials not accepted by a local charity or by the Mayo depot will be shipped to Whitehorse . Recyclables will be washed to minimize wildlife attractants prior to storage. Recyclable materials include:

- Aluminum and/or tin cans
- Plastic bottles and/or containers
- Glass bottles

2.2 INCINERATION

The solid waste storage area will include a dual chambered industrial incinerator to incinerate solid waste including putrescible waste, domestic waste (office and dormitory), certain bio-medical wastes (e.g. dressings, bandages, etc.) and various packaging. Recyclable materials, specific bio-medical wastes (e.g. sharps) and other special wastes will be removed from the incinerator waste stream and be disposed of via methods described by the special waste management plan or recycled off site. Office and dormitory garbage bins will be transferred to bear-proof containers located in the solid waste storage area. Putrescible waste from the camp kitchen facilities will be placed into the bear-proof containers by kitchen staff. Putrescible waste will not be stored for a period of greater than seven days prior to incineration. Bottom ash from the incinerator will be disposed of in the on-site landfill area.

The incinerator will be inspected and maintained by Site Operations personnel, and all maintenance activities will be logged. The incinerator operator will be a trained employee or contractor familiar with the incinerator operating manual, and will use the following standard operating procedures when using the incinerator:

- Complete the incinerator pre-operational inspection and checklist.
- Ensure that the integral components of the incinerator including the burners, gauges, valves, lines, walls, doors and exhaust components, are maintained in accordance with the manufacturer's specifications and in such a manner as to provide optimum control of contaminant emissions during all operating periods.
- Ensure all waste is completely reduced to ash during incineration before completion.
- Complete the Incinerator Log for all incineration activities.
- Incinerator Log sheets will be provided to the Environmental Coordinator or designate weekly.

An example Incinerator Log sheet is attached to this plan as Appendix B. The pre-operational inspection will be conducted to ensure the incinerator is ready and safe prior to use. The inspection must be performed by a qualified operator designated to use the equipment prior to operation. Operators are to inform the maintenance department if equipment deficiencies are discovered prior to use. The maintenance department will arrange for maintenance as required. The inspection checklist will include verification of the following items:

- The appropriate Personal Protective Equipment (PPE) is used.
- Ash bin is empty.
- Burner chamber is clean without presence of hot ambers or flames.
- The door to burner chamber is in working order and the seal around the door frame is without rips, tears or absent sections.
- The blower safety relay switch is not stuck and the retract spring is in good working order.
- The fire extinguisher is present and operational.
- The fuel shut off is free moving.
- All fuel lines are inspected for leaks or abrasions.
- No flammable material is in the immediate area outside of the incinerator.

2.3 OPEN BURNING

SGC will designate a suitable site for the open burning of brush generated from site and associated infrastructure development areas, particularly during the initial construction phase. The designated area will be cleared of vegetation with a setback of 30 m from watercourses or dwellings or as may be required by a burning permit. SGC will obtain a burning permit from Yukon Government

Community Services Wildland Fire Management or the Client Services District Office prior to open burning.

The burning permit application will include best management practices — to safely burn the brush waste and to ensure compliance with Yukon Government Community Services burning permit requirements. The burning permit application will include the following information:

- Location of the site where burning will take place,
- The estimated volume and type of material to be burnt,
- The timeframe in which the burn will take place,
- The weather criteria for the burn i.e. the weather conditions that will dictate cancellation of the planned burn such as high winds,
- The equipment and trained personnel who will be onsite for the burn.

Non-hazardous solid waste suitable for open burning will be burned via the following standard procedures:

- Ensure a natural or artificially induced draft is present when solid waste is burned, that all material is completely reduced to ash and that no combustibles are allowed to smolder (burn and smoke without flame).
- Divert surface water run-off from the open burning area.
- Do not use waste petroleum products to assist with open burning of solid waste.
- Other than waste plywood and particle board, do not open burn treated wood products including but not limited to wood products that have been treated with creosote, chromium copper arsenate [CCA], pentachlorophenol, or any type of paint.

2.4 LANDFILL

Non-putrescible, non-hazardous waste not incinerated will be transported to an on-site landfill area. The landfill will be used throughout the life of the Project and will be operated in a manner that will facilitate landfill closure at the cessation of operations.

The landfill will accommodate non-putrescible waste generated during all stages of the Project and be operated in a manner that will facilitate landfill closure at the cessation of mine operation. The landfill area is a flat cleared area with cells for the burial of material. The landfill will contain a sea-can container to temporarily house waste generated by contractors and/or operations personnel until it is segregated for either incineration or off-site disposal or recycling.

The landfill area has been located according to the siting requirements for Commercial Dumps provided by Environment Yukon (January 2016). The landfill area is not located on permafrost, and meets setback requirements outlined by Environment Yukon.

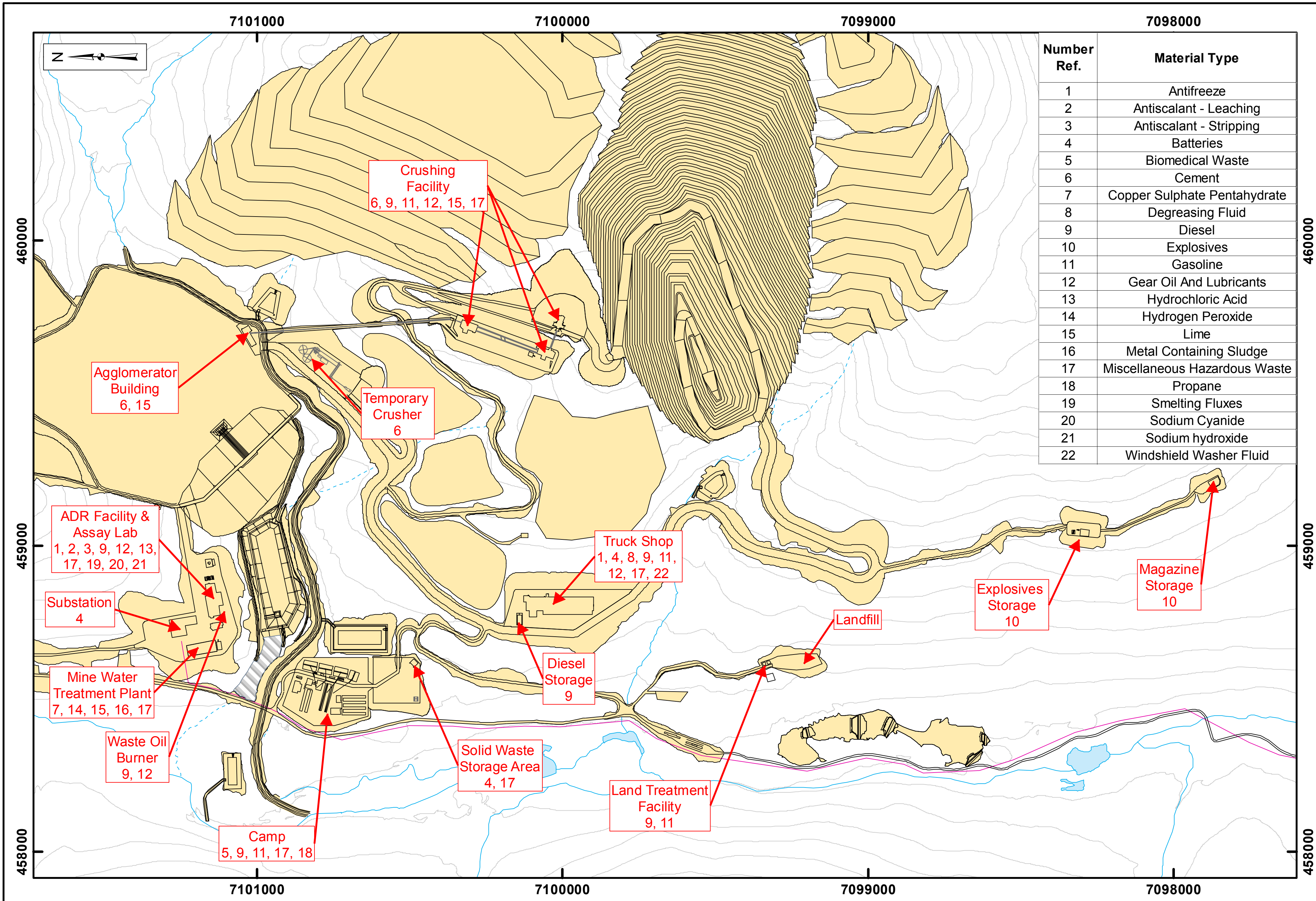
A sign at the entrance to the landfill will list conditions for use, emergency contacts and procedures, and items that may not be disposed of within the facility such as: batteries, special (hazardous) wastes, acids, corrosives, solvents, oily wastes, explosives, or unsterilized medical waste. As per *Environment Act* Permit 81-064, a gated electric exclusion fence will surround the landfill and will be operational from May 1 to October 31 to prevent wildlife from entering the encompassed areas of the site. If there are tracks or other signs of dangerous wildlife attempting to access the landfill, the fence will be activated between November 1 and April 30.

Non-hazardous solid waste suitable for landfill will be buried via the following standard procedures:

- Burial (or deposition) of special wastes or materials containing contaminated material containing contaminants in excess of the industrial land use standards in the *Contaminated Sites Regulation* into the landfill is prohibited.
- Solid waste will be loaded into an active landfill cell and covered with overburden material to a depth of 0.1 metres to prevent windblown solid waste and attraction of birds after every 0.5 metres of solid waste is deposited. Cover material may not reasonably be obtained due to snow. During winter months solid waste will be stored in active land fill cells between November 1 and April 15 until cover material is available for use.
- Dispose of ash from incinerator or open burning by:
    - Placing it in a cell and immediately covering it with overburden material to a depth of 0.1 meter to prevent dispersal by wind; or
    - Placing it in a covered metal container suitable for transporting it to a permitted solid waste disposal facility.
- Divert surface water run-off away from the landfill cell.

2.5 USED TIRES

Worn or damaged tires will be collected and stored at the truck shop prior to disposal. Tires not used as protection barriers at various locations on-site will be disposed of in accordance with the Yukon Used Tire Program. Tires with a rim size of 24.5 inches diameter or less will be transported off-site to a depot that accepts tires in accordance with the Yukon Used Tire Management Program. Yukon Government does not currently have a facility to dispose of tires with a rim size of greater than 24.5 inches. Large tires that cannot be used for protection barriers will be disposed of in the on-site landfill or via encapsulation in the Waste Rock Storage Areas during operations.



Number Ref.	Material Type
1	Antifreeze
2	Antiscalant - Leaching
3	Antiscalant - Stripping
4	Batteries
5	Biomedical Waste
6	Cement
7	Copper Sulphate Pentahydrate
8	Degreasing Fluid
9	Diesel
10	Explosives
11	Gasoline
12	Gear Oil And Lubricants
13	Hydrochloric Acid
14	Hydrogen Peroxide
15	Lime
16	Metal Containing Sludge
17	Miscellaneous Hazardous Waste
18	Propane
19	Smelting Fluxes
20	Sodium Cyanide
21	Sodium hydroxide
22	Windshield Washer Fluid

Legend:

- Facility
- Transmission Line
- Watercourse
- Contours (25m)
- Reserved Area

StrataGold Corporation

Projection: NAD 83 Zone 8N

Drawn By: HC

0 125 250 500 Meters

Date: 2017/03/23

Figure: 2-1

EAGLE GOLD PROJECT YUKON TERRITORY

Locations of Solid Waste Handling & Special Waste Storage Areas

3 SPECIAL WASTE

Special wastes are defined as any waste requiring special handling, storage, or destruction and prescribed as special waste by *Yukon Special Waste Regulations*, regardless of whether the waste has any commercial value or is capable of useful purpose (e.g., waste oil burning for heat). For the purposes of this plan, special wastes and hazardous wastes are used interchangeably.

The following guidelines from Environment Yukon were used in the preparation of this plan:

- Environmental Programs – Storage and Handling of Special Waste, 2015
- Environmental Programs - Oil Water Separators, June 2013
- Environmental Programs – Special Waste Transportation, May 2013
- Environmental Programs – General Information on Waste Oil, November 2015
- Environmental Programs – Guidelines for the Management of Biomedical Waste In Yukon, March 2011
- Environmental Programs - Requirements for Commercial Dumps, January 2016

Hazardous materials will be recycled, re-used, recovered, or consumed to the extent economically and logically feasible. Hazardous wastes are defined as residual hazardous materials, whether in their original form or different material state/mixture. Hazardous wastes will be contained in purpose built containers prior to disposal.

Special wastes will be collected and stored in specially marked, dedicated containers until shipment to an appropriate treatment or disposal facility. Areas where special wastes will be generated and stored include the following:

- Process Facility – Adsorption, Desorption, Recovery (ADR) plant
- Truck Shop
- Mine Water Treatment Plant (MWTP)
- First Aid Room
- Assay Laboratory

The ADR, the truck shop and the MWTP will be constructed on concrete slabs with curbed sides. These facilities will include sumps to collect spills, and process waste. Liquids captured by the sumps will be treated as special wastes and disposed of according to the specific waste type. All locations used for the storage of special wastes will be covered or otherwise protected to ensure that receptacles containing special waste are not unduly exposed to inclement weather. Special wastes generated by the Eagle Gold Project will include:

- Hydrocarbon Contaminated Soils (from spills)

- Waste Oil and Diesel Fuel
- Used Filters
- Waste Antifreeze
- Waste Solvents and Lubricants
- Used Lead Acid Batteries
- Aerosol Containers
- Waste Processing Reagents and Containers
- Laboratory Contaminated Crucibles, Cupels, Glassware, and associated Solutions,
- Biomedical Wastes

Brief descriptions of the special (hazardous) waste management practices are provided as follows and further details on the best management practices for each of these materials are provided in Appendix C. Estimated quantities of special wastes produced by the Project are provided in Table 3-1.

Table 3-1: Estimated Special Waste Quantities Generated by Project Phase [1]

Waste Type	Construction	Operations	Closure and Reclamation	Total
▪ Oil and lubricants (liters)	20,000	170,000	10,000	**200,000**
▪ Antifreeze (liters)	1,000	8,500	500	**10,000**
▪ Hydraulic fluid (liters)	1,500	12,750	750	**15,000**
▪ Used oil filters	4,000	34,000	2,000	**40,000**
▪ Batteries	100	850	50	**1,000**
▪ Aerosol cans	1,000	8,500	500	**10,000**
▪ Miscellaneous spent laboratory materials – cupels, crucibles, glassware, etc. (tonnes)	-	Less than 1 tonne	Less than 1 tonne	**Less than 2 tonnes**
▪ Miscellaneous reagent and chemical containers	150	1,275	75	**1,500**
▪ Biomedical waste	Minor quantities	Minor quantities	Minor quantities	Minor quantities

3.1 LAND TREATMENT FACILITY

A land treatment facility will be constructed for the progressive treatment and remediation of hydrocarbon contaminated soils as and when required. The land treatment facility will be located

[1] Estimates are approximate and will require update once the project is commissioned

adjacent to the landfill area and will consist of two cells that are 10 m by 10 m each. If soil permeability in the facility is greater than 10^{-5} cm/s, a geo-membrane liner will be installed and covered with fine grained gravel or soil to temporarily store and land farm contaminated soil. The area will be leveled and sloped such that run-off from the area can be contained and treated prior to release to the receiving environment.

Hydrocarbon contaminated soils will be stored within the land treatment facility and remediated by regular tilling (aeration) and standard northern bioremediation practices. Snow will be removed prior to spring freshet to prevent excess runoff from the facility. Runoff from the facility will be collected in a sump and treated via an oil water separator in the sump prior to discharge to ground. The construction of dual cells will allow active treatment of contaminants in cell 1 while remediated soils can be stored in cell 2 prior to reuse. No new contaminated soil will be applied when the soil is frozen, covered in snow or saturated with water. Contaminated soils undergoing remediation treatment will be tested for hydrocarbons prior to treatment and will be tested for F1/F2/F3/F4 (one test per 50 cubic meters). Application of fertilizer and water will consist of approximately 1 kg fertilizer per ton and 100 liters of water per ton however water content may vary depending on moisture content of the contaminated soils. Aeration of hydrocarbon soils mix and introduce oxygen to reaction - aeration will occur every two weeks - testing of contaminated soils every 4 weeks. Once the material has been remediated to meet *Yukon Contaminated Sites Regulations Numerical Soil Standards for Industrial Land Use*), SGC will obtain approval from Environment Yukon to remove the material from the treatment facility for re-application as required around the Project site such as cover for the landfill area.

3.2 WASTE OIL AND DIESEL FUEL

The major sources of waste oil are from mobile equipment and generators. The most common types of used oil for the Project include crank case oil, gear oil, transmission fluid, and hydraulic oil. Waste oil will be stored in a 10,000-litre storage tank. During construction all waste oil will be stored until the commissioning of the process solution heating boiler during operations. If waste oil in excess of site storage is generated during construction, the storage tank will be pumped out and disposed of at an approved facility.

During operations, waste oil will be burned along with diesel fuel in the process solution-heating boiler. The waste oil storage tank will be stored in a secondary containment facility located adjacent to the ADR building. The design of the solution-heating boiler will be approved by the Canadian Standards Association, the Underwriter Laboratory, the Underwriters Laboratory Canada, or by the Yukon Government Protective Services Branch. Oil stored for use in the solution heating boiler will comply with Environment Yukon guidelines pertaining to contaminant concentrations in the used oil. Waste oil blending will not be done without written authorization from an environmental protection officer to ensure that the procedure has been followed correctly so that the blended waste oil will be suitable for use in a waste oil burner. This procedure will also apply to small quantities of diesel from used fuel filters, diesel spills or diesel collected in spill trays during maintenance.

Used hydrocarbon contaminated absorbent pads will be wrung out to ensure they are drained of liquid oil waste and disposed of in the land fill. Waste oil filters and hydraulic hoses will be drained of oil and incinerated. Prior to incineration, hoses will be drained and drip dried, filters will be punctured and set in a tray to allow oil to drain for approximately 24 hours. Empty oil drums will be drained prior to being shipped offsite to a designated recycling facility.

An oil and water separator will be used in the truck shop to capture residual hydrocarbons for disposal. Separated water will be dealt with in accordance with the Environmental Programs - Oil Water Separators guidelines prior to any discharge.

3.3 WASTE ANTI-FREEZE

Used anti-freeze will be stored in designated leak free containers prior to disposal or recycling at permitted facilities. All hazardous wastes will be transported offsite in accordance with the *Transportation of Dangerous Goods Act* and the *Yukon Special Waste Regulations.*

3.4 WASTE SOLVENTS AND LUBRICANTS

Small quantities of waste solvents and lubricants will be generated through routine maintenance and repair of equipment.

Solvents and lubricants will be collected and stored in dedicated drums for regular shipment to a permitted recycle or disposal facility. Containers will be appropriately secured and segregated from other waste products during storage and transportation. All hazardous wastes will be transported offsite in accordance with the *Transportation of Dangerous Goods Act* and the *Yukon Special Waste Regulations.*

3.5 USED-LEAD-ACID BATTERIES

Commercially available high-density polyethylene (HDPE) storage bins will be located within the truck shop for the secure storage of spent lead-acid batteries. Once the bins are full, the batteries will be transported to a battery supplier or other institution capable of safely disposing of the batteries.

The following steps will be followed to help prevent acid leaks and spills and to avoid contamination of the storage site:

- Batteries will be placed on wooden pallets in secondary containment (e.g. on a liner or berm) to prevent the escape of acid. Pallets will not be stacked more than two high.
- Batteries will not be stacked more than three layers thick and each layer will be separated with a sheet of plywood or other suitable material.

3.6 BIOMEDICAL WASTES

A small amount of biomedical waste will be generated at the first aid room. Biomedical wastes will be collected and stored in designated purpose-built containers and disposed of primarily via incineration or at an approved off-site facility (e.g., for waste sharps). Biomedical waste containers will be leak resistant, tightly sealed, puncture resistant, color coded and will be stored in a locked facility within the first aid room only accessible by trained medical personnel. Biomedical waste containers will be color coded as follows:

- Human Anatomical — Red
- Animal — Orange
- Microbiology and lab — Yellow
- Human blood and bodily fluid — Yellow
- Waste sharps — Yellow

3.7 USED AEROSOL CONTAINERS

Used aerosol containers will be stored in dedicated bins in the solid waste storage facility. Aerosol containers will be punctured to release remaining contents and pressure prior to disposal in the landfill.

3.8 WASTE PROCESSING REAGENTS AND CONTAINERS

Minimal amounts of reagents will be wasted during operations through the implementation of diligent reagent management practices. This is particularly applicable to reagents such as cyanide, hydrochloric acid and sodium hydroxide. A full list of hazardous materials used as reagents is listed in Section 4 of this plan. In the event of a reagent spill, the material would be contained, recovered and if possible returned and used in the process or mine water treatment circuit. Where this is not possible, the recovered reagent material and associated spill cleanup materials will be contained in special waste containers such as HDPE bins prior to transportation offsite to a licensed disposal facility. Reagents not used will never be mixed and will be segregated prior to disposal.

Reagent bags will be rinsed and incinerated. Rinse water will be collected and used for process solution or if testing shows it is below discharge criteria set in the Water Use Licence, it may be discharged to the camp septic system. Reagent containers will be returned to reagent suppliers for re-use or rinsed, crushed and disposed of on site in the landfill as appropriate. Contaminated reagent containers or packaging that cannot be effectively rinsed or returned to the supplier will be stored in suitable bins at the special waste storage facility prior to transportation offsite to a licensed disposal facility.

3.9 LABORATORY WASTES

As a precautionary measure all laboratory waste will be treated as hazardous and stored in the special waste storage facility. Prior to storage, where possible hazardous materials/wastes are destroyed or the hazardous nature of the waste is reduced in a safe manner. For example, hydrochloric acid laboratory ware will be washed to dilute and buffer the concentration of any residual acid remaining on the glassware to a safe level prior to storage and disposal.

Laboratory personnel will receive Workplace Hazardous Materials Information System (WHMIS) training to ensure they are capable of identifying and managing hazardous wastes. The procedures for managing various types of hazardous materials and wastes resulting from the laboratory will be in accordance with the MSDS for the various materials/chemicals used.

4 HAZARDOUS MATERIALS MANAGEMENT

The Project will include the use of materials associated that are classified as hazardous. This section of the Plan includes a description of hazardous materials management with the following objectives:

- Effective management of hazardous materials;
- Identify the planned hazardous materials that will be transported, stored or utilized on site and provide the relevant Material Safety Data Sheets (MSDS); and
- Describe storage, transportation and handling procedures to minimize the potential for spills.

Table 4-1 lists the hazardous materials used or produced by the Project as well as the storage locations for each. Figure 2-1 depicts storage areas for hazardous materials. Consumables used by the Project classified as hazardous materials will be procured from suppliers that follow best practices in transport, handling, and storage of hazardous materials.

Table 4-1: Hazardous Materials Required for or Generated by the Project

Type	Name	Use	Storage location
Solvent	Antifreeze	Machinery coolant	Truck shop storeroom, in supplier container
Solvent	Antiscalant – leaching circuit	Prevents scale in cyanide distribution system	ADR facility reagent storage, in supplier container
Solvent	Antiscalant – stripping circuit	Prevents build-up of scale in gold stripping system	ADR facility reagent storage, in supplier container
Battery	Lead acid batteries	Mining machinery	Truck shop storeroom, in a cool dry area Old batteries in bin/ on a pallet
Reagent	Cement	Infrastructure foundation construction	Silos at the temporary crushing and screening facility
Reagent	Cement	Agglomeration of ore stacked in HLF	Silos at the crushing facility, ore preparation complex
Reagent	Copper sulphate pentahydrate	Cyanide detoxification	Mine Water Treatment Plant in supplier containers
Solvent	Degreasing fluid	Washing of engines and parts in workshop	Truck shop storeroom, in supplier container
Petroleum product	Diesel	Mining fleet, vehicle and machinery fuel	Fuel storage facility and ADR facility
Blasting compound	Explosives	Blasting	Explosives magazine and storage facility
Petroleum product	Gasoline	Various non-diesel equipment on site	Fuel storage facility / tank farm
Lubricating oil	Gear oil and lubricants	Machinery lubrication	Truck shop storeroom, in supplier containers or drums

Type	Name	Use	Storage location
Reagent	Hydrochloric acid	Washing of activated carbon prior to re-use in stripping process	ADR facility stripping circuit reagent storage area, in supplier container/ drum
Reagent	Hydrogen peroxide	Cyanide detoxification	Mine Water Treatment Plant in supplier containers
Petroleum product	Jet A and B Fuel	Helicopter	Fuel storage facility
Reagent	Lime (calcium hydroxide)	Improves stability of ore in the heap leach process	In silos at the heap leach facility, ore preparation complex
Waste	Metal containing sludge	Water treatment residue	Mine Water Treatment Plant
Waste	Miscellaneous Hazardous waste	Hazardous material waste not classified such as fluorescent tubes or paint	Special waste storage area
Gas	Oxygen	First aid for cyanide exposure	Camp medical facility/clinic
Petroleum product	Propane	Heating fuel	Propane farm adjacent to camp
Reagent	Smelting fluxes	Used during smelting (10% Borax) (80% Flourspar) (5% NaCO3)(5% Sodium Nitrate)	ADR facility/ refinery area
Reagent	Sodium cyanide	Gold extraction from ore	ADR facility leaching circuit reagent storage area
Reagent	Sodium hydroxide	Used for the desorption of gold from the activated carbon	ADR facility leaching circuit reagent storage area, in supplier packaging
Solvent	Windshield washer fluid	Windshield washing	Truck shop storeroom, in supplier container

4.1 HAZARDOUS MATERIAL MANAGEMENT PRACTICES

Detailed best management practices that will be followed for the transportation, storage, use and disposal of hazardous materials are provided in Appendix C of this Plan. Special (hazardous) waste management practices for the Eagle Gold Project are provided in Section 3 above.

SGC will establish and maintain inventories of hazardous materials stored and used for the Project. The nature of the inventories will depend on the type of material. For example, the volume of diesel and other fuels stored and distributed to vehicles or equipment on site will be inventoried. Strict control of materials such as sodium cyanide will be implemented and records of delivery (manifests), inventory and usage will be kept.

Personnel will follow established procedures designed to protect themselves and the environment. Personnel will be equipped with the proper PPE required to safely handle the hazardous materials that they will be exposed to as part of their job. Prior to working with hazardous materials, personnel will be familiar with the standard operating procedures and the associated MSDS for each item. Newly hired personnel will be trained and mentored by experienced personnel prior to being permitted to work with hazardous materials. Personnel will be required to demonstrate competence with hazardous materials to the supervisors prior to completion of training and/or mentoring program. Safety meetings will be attended by all personnel. Any incidents or near misses will be discussed during these meetings in an effort to raise awareness of any potential and existing hazards. All changes in procedures, equipment, or hazardous material use will be communicated to personnel.

Hazardous materials will be recycled, re-used, recovered, or consumed to the extent economically and logically feasible. Hazardous wastes are defined as residual hazardous materials, whether in their original form or different material state/mixture. Hazardous wastes will be contained in purpose built containers prior to disposal.

Delivery points will be demarcated and secured to prevent unintentional entry by untrained personnel. Where required, gantries fitted with hoists or forklifts will be available at delivery points to minimize manual handling of hazardous materials. Where hazardous materials are delivered in a liquid or gaseous state from a bulk container, facilities will utilize leak proof couplings.

4.2 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

Workplace Hazardous Materials Information System (WHMIS) training will be mandatory for SGC personnel that transport, use or dispose of hazardous materials. Personnel will undertake WHMIS training upon commencing employment as part of an induction program. Personnel will be re-certified every 3 years.

WHMIS will be implemented on site by the SGC Health & Safety department by requiring:

- Communication between hazardous material suppliers prior to dispatching of materials;
- Adequate storage infrastructure in line with industry standards;
- The prominent display of valid MSDS and WHMIS signage on hazardous material storage areas;
- Regular inspection of containers and storage areas;
- Availability and use of appropriate personal protective equipment;
- Provision of emergency preparedness equipment such as fire extinguishers, eye flushing points, and first aid supplies;
- Availability of appropriate spill kits for all hazardous materials;
- Training of personnel handling hazardous materials;
- Ensuring that safe and secure storage of hazardous materials is implemented to avoid potentially dangerous chemical interactions;
- The implementation of monitoring systems for hazardous material storage and handling areas, such as monitoring of HCN gas in Cyanide storage areas.

4.3 MATERIAL SAFETY DATA SHEETS

Current Material Safety Data Sheets (MSDS) provided by the manufacturer will be available to all personnel. The MSDS documentation will be available at every location where hazardous materials are stored; in addition MSDS documentation will be available from the SGC Health & Safety department. Hazardous materials storage areas will include signage using standard WHMIS symbols and descriptions of materials stored in each area. Appendix D provides the current MSDS sheets for each of the hazardous materials to be used at the Project site. MSDS sheets will be replaced if necessary once final selection and procurement of hazardous materials has been completed.

4.4 TRANSPORTATION OF DANGEROUS GOODS

Personnel involved in the transportation of dangerous goods will be given certified training in WHMIS and Transportation of Dangerous Goods (TDG). Training will be per Transport Canada training requirements including:

- The nine classifications of hazardous materials
- Documentation requirements for transportation of hazardous materials
- Understanding safety marks, labels and placards required for transportation of hazardous materials
- Safety requirements for Transportation of Dangerous Goods
- Spill response procedures for transportation of hazardous materials

SGC will ensure that personnel required to oversee and be involved with the transportation of dangerous goods will hold valid certificates of competency and appropriate regulatory approvals under the *Yukon Special Waste Regulations* during any time in which they transport dangerous goods.

In addition to the above provisions it is noted that hazardous materials will be delivered to the Eagle Gold site throughout the mine's operational life by suppliers and personnel not employed directly by SGC. Therefore, SGC will require transport companies to be in compliance with the *Transportation of Dangerous Goods Act* and Regulations and the Yukon Special Waste Regulations. SGC will also maintain emergency response capabilities for spills that may occur at the mine site. To the extent possible, the transportation of hazardous materials will only take place when road conditions are suitable. During winter months transport may be curtailed during periods when the roads are not safe for trucks due to ice or snow related hazards.

When road conditions are uncertain for the transportation of hazardous materials, the vehicle or truck will be accompanied by an escort vehicle between the mine site and the Silver Trail.

The project site is accessible by government maintained roads with the exception of the Haggart Creek Road (HCR). SGC will maintain the HCR to provide a safe and effective transportation route for all hazardous materials required on site. The HCR is currently wider than a single lane and requires minor upgrades to support Project traffic volumes and loads. It has been proposed that the

HCR be upgraded to a two-way, one-lane, radio controlled access road. Road upgrades will be in accordance with design standards for Low Volume Roads (LVR 50) as specified by the Transportation Association of Canada (TAC).

The following measures will be implemented to minimize the potential for transportation accidents.

- SGC will work with the Department of Highways and Public Works to ensure both public and private portions of the access road are properly maintained and upgraded as required.
- SGC will ensure all hazardous materials are transported and handled in accordance with the *Transportation of Dangerous Goods Act* and Regulations, and the *Yukon Special Waste Regulations.*
- The HCR will be a one-lane radio controlled access road with regular vehicle pull-outs to allow passing; signage will be posted to ensure non-Project traffic is aware of radio protocols. Speed limits will be posted and enforced.
- Wildlife crossings along the road will be identified and signage provided in high risk areas. Crossing areas will be plowed during winter to maintain escape points.
- SGC will have on-site personnel with emergency first-aid training to provide primary care in the event of an accident per the Emergency Response Plan for the Project.

4.5 EMERGENCY RESPONSE TO HAZARDOUS MATERIALS / WASTE RELEASES

A site specific spill response plan and emergency response plan has been developed for the Project. A hazardous material spill will trigger incident response procedures contained in the Emergency Response Plan in terms of directing of external assistance and notifications, personnel responsibilities and Mine Rescue Teams preparations. The Spill Response Plan outlines the equipment to be used and the procedures applicable to specific types of spills.

5 INSPECTIONS AND RECORD KEEPING

Regular inspections and record keeping for solid waste, special waste, and hazardous material management will be conducted in accordance with the *Yukon Environment Act* and Regulations.

5.1 INSPECTION REQUIREMENTS

Table 5-1 presents the inspection requirements for all hazardous material storage, waste storage, and disposal areas.

Table 5-1: Inspection Requirements

Area	Requirement	Frequency
Waste storage areas	• Verify segregation and proper storage of waste • Electric fence inspection to ensure it is functioning properly to deter wildlife (check charge level and potential grounding) • Inspect surface water runoff interception (non-contact water diversion cut offs and contact water into sumps or treatment) • Ensure sign outside facility includes required information including wastes allowed in facility, spill response reporting phone numbers, etc. • Post copy of *Environment Act* permit and Solid Waste Management Plan	Weekly
Land fill area	• Electric fence inspection to ensure it is functioning properly to deter wildlife (check charge level and potential grounding) • Inspect surface water runoff interception (non-contact water diversion cut offs and contact water into sumps or treatment) • Ensure no wildlife attractants are in landfill area including kitchen waste • Ensure no hazardous wastes are present; if so transfer to appropriate storage prior to off-site disposal • Inspect cover material on deactivated cells to ensure proper placement • Ensure sign outside facility includes required information including wastes allowed in facility, spill response reporting phone numbers, etc. • Post copy of *Environment Act* permit and Solid Waste Management Plan	Weekly
Incinerator	• Inspection and maintenance of incinerator and all components including fuel tanks and supply. • Ensure sign outside facility includes required information including wastes allowed in facility, spill response reporting phone numbers, etc. • Post copy of *Environment Act* permit and Solid Waste Management Plan	Monthly or as required
Waste oil burner	• Inspection and maintenance of all components and storage of waste oil and diesel.	Monthly or as required

Area	Requirement	Frequency
Land treatment facility	• Inspection of cells 1 and 2 for usage and fertilizer application • Testing of remediated soils • Inspection of the surface water drainage sump • Ensure sign outside facility includes required information including wastes allowed in facility, spill response reporting phone numbers, etc. • Post copy of *Environment Act* permit and Solid Waste Management Plan	Quarterly or as required
Used tire storage area (truck shop)	• Inspect tires are stored properly and sorted via size (under 24.5 inch diameter versus over 24.5 inch diameter)	Quarterly or as required
Hazardous Material & Special waste storage areas	• Display of Material Safety Data Sheets • Inspection of proper segregation, storage and containment of all hazardous materials and special wastes • Ensure sign outside facility includes required information including wastes allowed in facility, spill response reporting phone numbers, etc. • Post copy of *Environment Act* permit and Solid Waste & Hazardous Materials Management Plan	Weekly or as required

5.2 RECORDS

Table 5-2 provides a list of records that will be kept as part of the solid waste management plan. Records will be kept on site for a minimum of three years and will be made available upon request.

Table 5-2: Record Keeping

Area	Requirement	Frequency
All inspections	• Include name, date, observations, actions taken, date of action	Each inspection
Land fill area	• Log of materials disposed of at landfill including: ○ Date ○ Individual transferring waste to landfill ○ Waste type ○ Quantity/volume ○ Cell • Locations of all active and closed cells	As required when wastes are disposed of and when cells are activated or closed
Incinerator	• Pre-operation checklist • Daily log • Stack tests	As required per use As required per use Quarterly
Open burning area	• Open burning log including date, personnel completing burn, type and volume of material burned	As required per use
Waste oil burner	• Waste oil burner inspection log • Waste oil feedstock sampling and analysis (as requested by Client Services and Inspections)	Monthly or each inspection

Area	Requirement	Frequency
Spills and leaks	• Spill report: ○ Date of spill or observation ○ Location and distance to nearest watercourse ○ Substance ○ Estimated quantity ○ Clean up procedures ○ Notifications	As required
Land treatment facility	• Land treatment facility inspection log • Land treatment soil testing results	Quarterly or each inspection
Used tire storage area (truck shop)	• Total number of used tires disposed of on-site and locations • Total number of used tires disposed of off-site	Quarterly or as required
Special waste management areas	• Inventory of special wastes received, stored, used and disposed of • Details of disposal of all special wastes • Records of collection from hazardous waste collection services	Monthly or as required
Hazardous Materials	• Up to date MSDS for all hazardous materials • Delivery manifests for all hazardous materials including date, type, quantity, transporter, etc. • Inventory of hazardous materials • Training certification for all personnel involved with transportation, handling, storage and use of hazardous materials	Monthly or as required

APPENDIX A

Waste Management Permit

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Permit No: 81-064

Yukon
Environment

WASTE MANAGEMENT PERMIT

Issued Pursuant to the *Environment Act*,
the *Air Emissions Regulations*, the *Solid Waste Regulations*,
and the *Special Waste Regulations*

Permittee: **StrataGold Corporation**

Mailing Address: **910-1050 West Pender Street, Vancouver, BC V6E 3S7**

Site Location: **Haggart Creek Road, Mayo**
64°2'13.409"N 135°44'32.616"W

Authorized Representative: **Hugh Coyle, Lands & Permitting Manager**
Phone/Fax: **(604) 696-6600 / (604) 682-5232**
Email: **hcoyle@vitgoldcorp.com**

Effective Date: **January 1, 2017**
Expiry Date: **December 31, 2021**

This permit replaces permit #81-064 issued on December 19th, 2013.

Scope of Authorization: In accordance with your application, **Victoria Gold Corporation**, represented by yourself, is authorized to:

a. operate a dump for the disposal of solid waste generated by the commercial activities of the permittee;
b. generate or store: **waste oil, waste antifreeze, waste solvents and waste fuels**; and
c. operate equipment for the incineration of: **waste oil**

at the above site location ("the site") as set out in the terms and conditions of this permit.

Dated this 29th day of December, 2016

John Ryder

A/ Director, Environmental Programs Branch
Environment Yukon

DEPARTMENT OF ENVIRONMENT
ENVIRONMENTAL PROGRAMS
Whitehorse, Yukon
Certified true copy of original
Date: 29 Dec 16 Initials: JCVM

1. DEFINITIONS

1. In this permit,

"Act" means the *Environment Act*, R.S.Y. 2002, c. 76;

"approved plan" means a plan that is submitted by the permittee and approved by an environmental protection analyst under this permit and includes any terms and conditions specified by the environmental protection analyst in the approval;

"associated personnel" means all employees, contractors and volunteers involved in the permitted activities;

"Branch" means the Environmental Programs Branch, Environment Yukon;

"contaminated material" means any soil, snow, sediment, or water that has one or more parameters in excess of applicable standards in the *Contaminated Sites Regulation*, O.I.C. 2002/171;

"dangerous wildlife" means wildlife so defined in the *Wildlife Act,* R.S.Y. 2002, c. 229;

"environmental protection analyst" means an employee of the Branch so designated by the Minister of Environment under the Act;

"environmental protection officer" means an employee of the Government of Yukon so designated by the Minister of Environment under the Act;

"putrescible waste" means food or plant-based waste which can decompose or rot;

"Regulations" means any or all of the *Air Emissions Regulations*, O.I.C. 1998/207, the *Solid Waste Regulations*, O.I.C. 2000/11, the *Contaminated Sites Regulation*, O.I.C. 2002/171, the *Designated Materials Regulation*, O.I.C. 2003/184, the *Storage Tank Regulations,* O.I.C. 1996/194, the *Spills Regulations*, O.I.C. 1996/193, and the *Special Waste Regulations*, O.I.C. 1995/047, as applicable;

"solid waste" includes waste which originates from residential, commercial, industrial or institutional sources, or from the demolition or construction of buildings or other structures or which is specified in a solid waste management plan to be solid waste and for greater certainty includes litter, as defined in the *Act*, but does not include untreated brush or wood products that are not mixed with other materials;

"special waste management facility" means an operation which handles or disposes special wastes generated by other persons or operations, and includes without limitation a community collection system which is intended to collect or transport special waste to a special waste management facility in the Yukon;

"spill" means a release of a substance in excess of the amounts specified in Schedule A of the *Spills Regulations*, O.I.C. 1996/193, or that is abnormal in quantity or quality in light of all the circumstances of the release;

"storage tank" means a closed container with a capacity of more than 230 litres that is designed to be installed in a fixed location, and includes either an aboveground storage tank or an underground storage tank;

"substance" means a hazardous substance, pesticide, contaminant, or special waste.

"vehicle" has the same meaning as in the *Motor Vehicles Act*, R.S.Y. 2002, c. 153; and

"waste manifest" means the shipping document required to be completed by the permittee as set out in this permit in the form approved by an environmental protection officer.

2. Any term not defined in this permit that is defined in the Act or the Regulations has the same meaning as in the Act or the Regulations.

2. General

1. No condition of this permit limits the applicability of any other law or bylaw.

2. The permittee shall ensure that all activities authorized by this permit occur on property that the permittee has the right to enter upon and use for that purpose.

3. The permittee shall ensure that all associated personnel:
   a) have access to a copy of this permit;
   b) are knowledgeable of the terms and conditions of this permit; and
   c) receive the appropriate training for the purposes of carrying out the requirements of this permit.

4. The permittee shall provide notice in writing to an environmental protection analyst prior to any significant change of circumstances at the site, including without limitation:
   a) closure of the operation or site;
   b) change of ownership of the site;
   c) discontinuation of any regulated activity at the site;
   d) generating, storing or transporting special wastes other than those authorized by this permit; or
   e) change to the mailing address or phone number of the permittee.

5. Where conflicts exist between this permit, the permit application or elements of any plan pertaining to any activity regulated under the Act, this permit shall prevail.

6. If an inspection reveals that the site or equipment is in any way not in compliance with this permit or approved plans developed in accordance with this permit, the permittee shall repair the damage or take other actions as required to bring the site or equipment into compliance.

7. For clarity, all obligations of the permittee under this permit survive the expiry date.

3. Plans and Reports

1. When the permittee is required to submit a plan under this permit, the permittee shall:
   a) ensure the plan meets the requirements for that type of plan as established by the Branch in writing, where applicable;
   b) submit the plan in writing to an environmental protection analyst; and

c) implement the plan as of the date it is submitted, unless otherwise provided for in this permit.

2. If the permittee wants to amend a submitted plan, the permittee shall submit the proposed amendment to an environmental protection analyst as if the amendment were a plan under section 3.1 of this permit.

3. If an environmental protection analyst directs in writing that a submitted plan be amended, the permittee must prepare the required amendment by the date specified and submit it as if it were a plan referred to in section 3.1 of this permit.

4. FENCING AND SECURITY

1. The permittee shall install and maintain, in accordance with the manufacturer's operating and maintenance instructions and recommendations, an electric exclusion fence(s) and gates that encompass all putrescible waste storage and disposal areas at the dump and any other areas of the site that become or may become an attractant to animals. The fence and gates shall be adequate to prevent dangerous wildlife from entering the encompassed areas of the site.

2. The fences and gates referenced in paragraph 4.1 above must be:
   a) activated continuously from May 1 to October 31 of each year;
   b) activated between November 1 and April 30 of each year if there are tracks or other signs of dangerous wildlife attempting to access the dump; and
   c) activated upon the written request of an environmental protection officer.

3. If the permittee wishes to deactivate the electric fence for any length of time during the period of operation referenced in paragraph 4.2 (other than for regular maintenance of the fence), the permittee shall obtain prior approval from an environmental protection officer.

4. The permittee shall conduct weekly inspections of all electric fences and shall maintain them as necessary during periods of activation as specified in paragraph 4.2 to ensure that:
   a) the fence is sufficiently charged to deter wildlife; and
   b) there is no vegetation or windblown litter or other items along the perimeter of the fence, or contacting the fence, that may act as a ground.

5. The permittee shall ensure that all gates are closed and secured every time personnel leave the area bounded by the electric fence.

6. The permittee shall install and maintain fencing or other comparable measures to prevent the release of solid waste from the dump.

5. STORAGE AND OFF-SITE TRANSFER OF SOLID WASTE

1. The permittee shall ensure that putrescible waste is stored in bear-proof containers and that it is not stored for a period of greater than seven days prior to being transferred offsite in accordance with this permit.

2. The permittee shall ensure that all ash from incinerating or open burning is placed in a covered metal container and transported to a permitted solid waste disposal facility.

3. The permittee shall ensure that all materials listed in Schedule A of the *Designated Materials Regulation*, O.I.C. 2003/184, are not buried or burned and that they are taken periodically to a municipal or community dump or other depot for those materials.

4. The permittee shall ensure that they receive written authorization from the operator of any municipal or Yukon government solid waste disposal facility prior to transferring any waste to that facility.

5. The permittee shall report any incidents involving dangerous wildlife to the Government of Yukon, Conservation Officer Services Branch (**867-390-2685**) or the TIPP line (**1-800-661-0525**).

6. STORAGE AND HANDLING OF SPECIAL WASTE

1. The permittee shall not handle special wastes other than those authorized by this permit.

2. The permittee shall not discard, destroy, treat, process, incinerate, or recycle special wastes unless specifically authorized by this permit, except for mixing or dilution authorized by an environmental protection officer as an acceptable treatment or disposal option for the special waste.

3. The permittee shall ensure that each container containing special waste is clearly labelled to indicate the type of special waste stored. The permittee shall not mix different types of special waste.

4. The permittee shall ensure that special wastes are stored and handled in such a manner as to prevent their release into the environment.

5. The permittee shall ensure that:
    a. all drums and other portable containers containing special wastes are covered or stored out of inclement weather;
    b. all drums and other portable containers containing special wastes are stored off the ground;
    c. all containers used to store special waste are closed at all times during storage;
    d. special wastes are stored in a manner that will prevent incompatible substances from reacting adversely with each other;

e. containers used for the storage of special waste are made of materials that will not adversely react with the special waste;
f. special wastes stored in leaking containers are immediately transferred to intact containers; and
g. all containers used for the storage of special waste are clearly marked to identify what special waste is stored in the container.

6. The permittee shall inspect special waste storage containers:
   a) weekly in terms of visual inspections for leaks;
   b) monthly in terms of the volume of special wastes stored on site;
   c) annually in terms of tank/container quality, piping, and auxiliary equipment; and
   d) upon request from an environmental protection officer.

7. The permittee shall not allow any residue at the bottom of a container used for the storage of special waste to be released to the environment. Such residue shall be collected by the permittee and considered to be special waste until proven by testing to not be special waste.

8. The permittee shall not store special wastes that are petroleum products in a storage tank with a capacity greater than 4000L unless specifically authorized by a permit issued pursuant to the *Storage Tank Regulations*, O.I.C. 1996/194.

9. The permittee shall not store special wastes that are not petroleum products in a storage tank with a capacity of 2000L or greater unless specifically authorized by a permit issued pursuant to the *Storage Tank Regulations*, O.I.C. 1996/194.

10. If an inspection reveals that the amount of special waste stored at the site may pose a risk to human health or the environment, the permittee shall develop and implement a final disposal plan for the special waste, as directed in writing by an environmental protection officer.

7. WASTE OIL

1. Waste oil in which one or more contaminants exceeds the standards specified in Table 1 below shall be considered contaminated waste oil.

TABLE 1: ACCEPTABLE ANALYSIS METHODS AND CONTAMINANT LEVELS IN WASTE OIL

Contaminant	Maximum Concentration (mg/kg)	Test Method
Arsenic	5.0	EPA 3050B/3051 & 7060
Cadmium	2.0	EPA 3050B/3052 & 7000/7131
Chromium	10	EPA 3050B/3051 & 7000/7191
Lead	50	EPA 3050B/3051 & 7000/7421
Total organic halogens	1000	EPA 9020B or EPA 9022
PCBs	2.0	EPA 3540C/3541 & 8082

2. Determination as to whether waste oil is contaminated shall be made in accordance with the "General Information on Waste Oil" guidelines established by the Branch, as amended from time to time.

3. Prior to blending contaminated waste oil with uncontaminated waste oil, the permittee shall obtain analytical results for both the contaminated and uncontaminated oil and blend the oil in accordance with the "General Information on Waste Oil" guidelines established by the Branch, as amended from time to time.

4. When submitting a sample of waste oil feedstock for laboratory analysis the permittee shall ensure that the laboratory uses the methods specified in Table 1, or equivalent, as amended from time to time, for each listed substance. The permittee shall ensure that the detection limit of the method used is lower than the standards set forth in Table 1.

5. The permittee shall not incinerate contaminated waste oil.

6. Waste oil shall only be incinerated in an appliance which is approved or certified to burn waste oil by the Canadian Standards Association (CSA), the Underwriters' Laboratories (UL), or the Underwriters' Laboratories of Canada (ULC).

7. The waste oil incinerator must be installed, operated and maintained in accordance with the manufacturer's written instructions and specifications.

8. The permittee shall have a sample of their waste oil feedstock analyzed as directed by an environmental protection officer, and shall allow an environmental protection officer to obtain samples of their waste oil feedstock for the purpose of submitting them for analysis.

9. No special wastes other than waste oil may be incinerated under this permit without undertaking an environmental assessment pursuant to the *Yukon Environmental and Socio-economic Assessment Act*.

8. TRANSPORT AND TRANSFER OF SPECIAL WASTE

1. The permittee shall not transport or transfer special wastes other than within the site.

2. The permittee shall ensure that all special wastes are transported and transferred in such a manner as to prevent their release into the environment.

3. The permittee shall complete a waste manifest documenting each shipment of special wastes from the site. The permittee shall distribute copies of the waste manifest in the manner described thereon.

4. The permit number **YG81-064** shall be used as the Provincial Identification Number on waste manifests used for the transport of the listed special wastes.

5. The permittee shall ensure that all vehicles operated by the permittee and carrying any special wastes are secured to prevent access by unauthorized persons.

6. The permittee shall ensure that special wastes are transported to a special waste management facility in the Yukon or another jurisdiction that is permitted to receive those listed special wastes.

7. The permittee shall ensure that special wastes are transported by a carrier permitted in the Yukon to transport the listed special wastes.

9. SPILLS

1. The permittee shall contact either an environmental protection officer, or the 24-hour Yukon Spill Report Centre (**867-667–7244**) as soon as possible under the circumstances in the event of a release, spill, unauthorized emission, discharge, or escape of any substance listed in the *Spills Regulations*, O.I.C. 1996/193, or any special wastes.

2. The permittee shall ensure that clean-up equipment appropriate for the amount and type of special waste generated or stored on site (such as sorbent, shovel, broom, bucket, gloves, boots, etc.) is readily accessible at all locations where the special wastes are handled or stored.

3. The permittee shall ensure that spill procedures are developed, maintained, and posted at all locations where special wastes are handled or stored, and that all personnel (employees, contractors or volunteers) are familiar with those procedures. The spill procedures must meet the requirements for that type of plan as established by the Branch in writing.

4. The permittee shall ensure that contaminated material resulting from a release, spill, unauthorized emission, discharge, or escape or any special wastes is properly handled in accordance with the *Contaminated Sites Regulation*, O.I.C. 2002/171.

10. INSPECTIONS AND RECORD KEEPING

1. The permittee shall keep the following general records at the site:
   a) a current site plan showing the location of the solid and special waste storage and handling locations;
   b) a copy of each plan developed under this permit, and any amendments to and approvals of each plan;
   c) inspections conducted by the permittee in accordance with this permit (including the name of the person conducting the inspection, the date of each inspection, any observations recorded during the inspection, actions taken as a result of those observations, and the date each action was taken); and
   d) any and all deficiencies remedied in accordance with paragraph 2.6, and how and when they were remedied.

2. The permittee shall keep the following records at the site related to the offsite transfer of solid waste:
   a) written authorization from the operator of any municipal or Yukon government solid waste disposal facility authorizing the transfer of waste to that facility.

3. The permittee shall keep the following records at the site related to the storage and handling of special waste:
   a) the types of special wastes generated or stored at the site, their estimated volumes, and their storage location(s);
   b) a copy of any waste manifests used to transport special wastes to or from the site; and
   c) notes concerning any release, spill, unauthorized emission, discharge, or escape that occurred at the site, including the substance involved and estimated quantity, the date of observation, any spill reports made, and clean-up procedures implemented.

4. The permittee shall keep all records required under this permit in a format acceptable to an environmental protection officer for a minimum of three years and make them available for inspection by an environmental protection officer upon request.

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APPENDIX B

Incinerator and Open Burning Log

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Incinerator and Open Burning Log

Date	Operator	Incinerator / Open Burn Start Time	Incinerator / Open Burn End Time	Kitchen Waste	Office and Dorm Waste	Treated Wood	Light Plastics	Medical Waste	Oil Filters and Packaging	Paper and untreated wood	Volume of waste incinerated (Kg)	Volume of Ash produced (kg)	Average Temp in Secondary Chamber (°C)	Open Burning – Volume of Solid Waste burned (kg)	Open Burning – Volume of untreated wood burned (kg)	Description of Maintenance and Inspections
03-Mar-13	*T. Goodsell*	*08:30*	*11:00*	*X*	*X*			*X*			*25*	*10*	*800*	*NA*	*NA*	*Pre-op inspection - passed.* *Fueled incinerator.* *Cleaned ash bin transferred to landfill.*
03-Mar-13	*T. Goodsell*	*11:30*	*18:00*							*X*			*NA*	*100*	*20*	*Wind direction northeast approx. 10 knots. Removed ash and transferred to landfill.*

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APPENDIX C

Hazardous Materials Management Practices

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1 BEST MANAGEMENT PRACTICE - ANTIFREEZE

Chemical name/class:	Ethylene Glycol	CAS #:	67-56-1
Designated Work Area:		Truck shop / ADR facility for heat recovery	

Antifreeze is generally made of either ethylene glycol or propylene glycol and used to lower the freezing point of mining machinery coolant and can be used in heat recovery from diesel generators, as a closed loop circuit, which can be used to heat mine shops, and buildings.

- Handle, store and dispose of antifreeze in accordance with the supplier MSDS.
- Store unused antifreeze in the supplier's containers within secondary containment structures. Antifreeze will be stored in the truck shop store, and at the ADR facility in a holding tank, as part of the heat recovery circuit.
- Antifreeze purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any spills or leaks if such events occur.
- The disposal of used/spilled antifreeze will be undertaken by placing it in bulk tanks / drums, and transporting it to Yukon depots accepting used antifreeze. The transportation will be conducted either by SGC or by a third-party service provider in conformance with TDGA requirements.
- Antifreeze packaging or containers will not be used for any other purpose; the containers will either be returned to the supplier or disposed of as hazardous / special waste in a permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as indicated in the supplier MSDS.
- Spilled material will be regarded as hazardous / special waste and will be disposed of in a permitted third party hazardous waste landfill or disposal facility.

2 BEST MANAGEMENT PRACTICE - LEACHING CIRCUIT ANTISCALANT

Chemical name/class:	**Millsperse**	**CAS #:**	**26099-09-2**
Designated Work Area:		Heap leach facility / solution management	

This product is used in the leaching circuit to prevent the heap leach cyanide distribution system from clogging which would reduce the efficiency of the heap leach process.

- Handle, store and dispose of the leaching circuit antiscalant in accordance with the supplier MSDS.
- This product is used in the leaching circuit to prevent the heap leach cyanide distribution system from clogging which would reduce the efficiency of the heap leach process.
- Store unused antiscalant in the supplier's containers within secondary containment structures. The antiscalant will be stored in the ADR facility within areas with secondary containment foundations.
- Antiscalant purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any spills or leaks if such events occur.
- SGC does not anticipate the production of waste leaching circuit antiscalant. Should a circumstance arise whereby unused leaching circuit is required to be transported offsite for disposal then the disposal will be carried out through procedures described in the MSDS and supplier advice. The transportation offsite will be carried out either by SGC or by service provider in conformance with TDGA requirements.
- Antiscalant packaging or containers will not be used for any other purpose, the containers will either be returned to the supplier or disposed of as hazardous / special waste in a permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as indicated in the supplier MSDS.
- Spilled leaching circuit antiscalant will be placed in the heap leach so that spilled material will be consumed within the heap leach solution.

3 BEST MANAGEMENT PRACTICE - STRIPPING CIRCUIT ANTISCALANT

Chemical name/class:	Ethylenediaminetetraacetic Acid Tetrasodium Salt	CAS #:	10378-23-1
Designated Work Area:		Stripping circuit solution management	

This antiscalant used in the stripping circuit is a chemical called Ethylenediaminetetraacetic Acid Tetrasodium Salt (EDTA). EDTA is a persistent organic pollutant because it degrades to ethylenediaminetriacetic acid, which then cyclizes to the diketopiperizide, a cumulative, persistent, organic environmental pollutant.

- Handle, store and dispose of the stripping circuit antiscalant in accordance with the supplier MSDS.
- Store unused antiscalant in the supplier’s containers within secondary containment structures. The antiscalant will be stored in the ADR facility within areas with secondary containment structures/ foundations.
- Antiscalant purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any spills or leaks if such events occur.
- SGC does not anticipate the production of waste stripping circuit antiscalant. Should a circumstance arise whereby unused stripping circuit is required to be transported offsite for disposal then the disposal will be carried out using procedures described in the MSDS and supplier advice. The transportation offsite will be conducted either by SGC or by service provider in conformance with TDGA requirements.
- Antiscalant packaging or containers will not be used for any other purpose, the containers will either be returned to the supplier or disposed of as hazardous / special waste in a permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as indicated in the supplier MSDS.
- Spilled stripping circuit antiscalant will be disposed of by mixing into the ADR facility solution if possible so that spilled material will be used up within the ADR facility solution. If this is not possible then the spilled material and contaminated soil, water or snow will be stored in suitable containers prior to transport offsite to a permitted third party hazardous / special waste disposal facility or landfill.

4 BEST MANAGEMENT PRACTICE - LEAD ACID BATTERIES

Chemical name/class:	Liquid sulphuric acid and heavy metals	CAS #:	N/A
Designated Work Area:		Truck shop	

SGC will ensure that personnel handle, store, dispose of batteries with care, and are handled upright such that the contents of the battery cells do not leak. SGC will store unused batteries in a clean dry area in the truck shop store.

Waste vehicle batteries will be collected for regular shipment to a permitted recycle or disposal facility. Used-lead acid batteries will be temporarily stored within the truck shop in a designated dry, secure area prior to shipment off site to a battery s-upplier or other institution capable of safely disposing of the batteries.

Battery purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any stock losses or missing stock. SGC will generate and maintain a register of batteries inserted into each mine vehicle.

Batteries will be purchased specifically for the type of vehicle and properly installed. This will enhance the battery life.

The steps outlined below for storing batteries will be followed to help prevent acid leaks and spills and to avoid contamination of the storage site:

- Batteries will be placed on wooden pallets in secondary containment (i.e., on a liner or berm) to prevent the escape of acid,
- Before putting waste batteries on the pallet, plastic sheeting will be placed on it to completely enclose all of the batteries in a continuous sheet of plastic. All sides will be wrapped to protect the batteries from the weather and to prevent any acid from being discharged into the environment,
- Batteries will not be stacked more than three layers thick and each layer will be separated with a sheet of plywood or other suitable material.

The transportation offsite of old batteries will be carried out either by SGC or by service provider in conformance with TDGA requirements.

All spills will be reported to the SGC Environmental Coordinator.

The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.

Spill cleanup will be undertaken as per the MSDS for sulphuric acid. Spill material collected will be stored in hazardous waste containers or bins for disposal for transportation offsite to a permitted third party hazardous / special waste disposal facility or landfill.

5 BEST MANAGEMENT PRACTICE - BIOMEDICAL WASTE

Chemical name/class:	**Sharps, needles, swabs, human blood / body fluid / tissue, empty medicine bottles, used bandages, gloves**	**CAS #:**	**N/A**
Designated Work Area:		Site medical facility	

SGC will equip the camp medical facility with necessary containers/bins for storage and disposal of biomedical waste. These containers are commercially available and are designed to prevent use for storage of other wastes or for accidental leakage or the contents. These containers will be color coded and stored in a locked facility only accessible by trained medical personnel. Potential color-coding of the containers will be as follows:

- Human anatomical waste – Red
- Animal waste– Orange
- Microbiology and lab waste– Yellow
- Human blood and body fluid– Yellow
- Waste sharps– Yellow

Waste sharps will be transported offsite for disposal by an approved third party facility accepting or handling medical waste. Such facilities include hospitals and government clinics. The transportation of these wastes will be provided either by SGC or by service provider in conformance with TDGA requirements. Other biomedical wastes will be incinerated.

6 BEST MANAGEMENT PRACTICE - CEMENT

Chemical name/class:	Cement	CAS #:	65997-15-1
Designated Work Area:		Heap leach facility	

Cement will be used during construction, for concrete manufacturing and during operations for heap leach stabilization.

- Handle, store and dispose of the cement in accordance with the supplier MSDS.
- Cement purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any unexpected losses.
- Cement will be supplied in bulk road transportation trucks, with mechanical off- loading equipment. The Cement will be stored in purpose built silos to keep the cement dry and facilitate distribution during the process via automated systems.
- All spills of uncured concrete into watercourses will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for cement.

7 BEST MANAGEMENT PRACTICE - DEGREASING FLUID

Chemical name/class:	Ethoxylated C12-15 alcohol Potassium Hydroxide Alcohol C9-11, ethoxylated Alkyl dimethyl benzyl ammonium chloride Ethyl alcohol Sodium metasilicate, pentahydrate	CAS #:	68131-39-5 1310-58-3 68439-46-3 68424-85-1 64-17-5 10213-79-3
Designated Work Area:		Truck shop	

Degreasing fluid will be used in the truck shop for washing of mechanical parts during maintenance and repairs. Degreasing fluid will be stored in supplier containers in the truck shop store, behind locked doors. The degreaser will be handled through use of a degreasing table or degreasing tank, with an inbuilt tray for recycling and collection of degreasing fluid.

- Handle, store and dispose of the degreasing fluid in accordance with the supplier MSDS.
- Degreasing fluid packaging or containers will not be used for any other purpose. The containers will either be returned to the supplier or disposed of as hazardous / special waste in a permitted third party hazardous / special waste disposal facility or landfill.
- Degreaser purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any stock losses or missing stock.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for degreasing fluid.

8 BEST MANAGEMENT PRACTICE - DIESEL

Chemical name/class:	Diesel	CAS #:	64742-81-0
Designated Work Area:		Camp and ADR facility	

Diesel will be used as fuel for mining machinery and various diesel engine powered equipment, such as generators, mobile welding, diesel powered boilers and diesel powered pumps.

- SGC will ensure that personnel handle, store and dispose of waste diesel in accordance with the supplier MSDS.
- SGC will construct a fuel storage facility, which will include diesel storage tanks and a secondary containment foundation with curbed sides to contain 110% of the volume of the largest tank within the facility. Diesel will be stored in certified tanks, which will be subject to weekly inspections. The diesel storage facility will be equipped with firefighting and spill cleanup equipment.
- Diesel will be pumped into vehicles and equipment directly where possible and via a dedicated diesel transport vehicle for machinery that is too large, too slow, semi-stationary or stationary for direct filling at the diesel storage facility. The purpose built diesel transport vehicle will be equipped with spill kits and firefighting equipment. The vehicle will be subject to inspection at shift change by the operators and weekly inspection by environmental, health and safety personnel. Records of diesel storage and use will be maintained, and every transaction will be recorded.
- With the implementation of diligent fuel management practices, SGC anticipates that minimal quantities of waste diesel will be generated. Minor diesel spills that may occur during machinery maintenance will be collected in drip trays, temporarily stored at the truck shop in a suitable HDPE container and periodically transferred into the used oil storage tank for use as fuel for the solution-heating boiler.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for diesel. Contaminated soil, water or snow will be stored and remediated in the land treatment facility.

9 BEST MANAGEMENT PRACTICE - EXPLOSIVES

Explosives will be handled, stored and used in accordance with the Explosives Management Plan.

- Procure explosives from a certified explosives supplier / contractor.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup and disposal of spilled material will be undertaken as per the Explosives Management Plan.

10 BEST MANAGEMENT PRACTICE - GASOLINE

Chemical name/class:	Gasoline/ petrol	CAS #:	86290-81-5
Designated Work Area:		Fuel storage and site wide	

- Handle, store and dispose of the diesel in accordance with the supplier MSDS.
- Fuel storage facility to include:
  - secondary containment foundations with curbed sides to contain 110% of the volume of the largest tank within the facility.
  - certified tanks, which will be subject to regular inspections.
  - firefighting and spill cleanup equipment.
- Gasoline will be pumped into vehicles and equipment directly where possible. Records of gasoline storage and use will be maintained, and every transaction will be recorded.
- With the implementation of diligent fuel management practices, SGC anticipates that minimal quantities of waste gasoline will be generated. Minor gasoline spills that may occur during machinery maintenance will be collected in drip trays, temporarily stored at the truck shop in a suitable HDPE container and periodically transferred into the used oil storage tank for use as fuel for the solution-heating boiler.
- If large quantities of gasoline require disposal, this will be executed by containment within tanks/drums and transportation offsite to a permitted third party facility accepting hazardous/ special waste.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for gasoline. Contaminated soil, water or snow will be stored in the land treatment facility.

11 BEST MANAGEMENT PRACTICE - GEAR OIL AND LUBRICANTS (OIL)

Chemical name/class:	Engine oil (15W40) Grease Hydraulic oil Differential oil Automatic transmission fluid Brake fluid 2 stroke oil	CAS #:	490-243
Designated Work Area:		Truck shop	

SGC will use gear oil and lubricants for various applications as required by mining machinery lubrication or power transmission requirements. The oils and lubricants will be stored in drums/ containers in the truck shop store. Drums being used will be placed on support frames over a spill tray/pallet. Oil in containers will be decanted using a funnel to prevent spillage.

- Handle, store and dispose of gear oil and lubricants in accordance with the supplier MSDS.
- During oil changes or machinery maintenance, oil will be collected in purposefully designed trays/ oil collection tanks, for decanting into an old oil storage tank or bowser. Old oil will be transferred into the used oil storage tank for use as fuel for the solution-heating boiler.
- Waste oil from the mining equipment will be stored at the ADR facility in a 10,000-litre tank for use as fuel for the solution-heating boiler. SGC will ensure compliance with the Environment Yukon guideline titled Guide for Used Oil Burner Operators and will obtain appropriate Environment Yukon permits for the storage of waste oils in the oil storage tank and the incineration of oil in the solution-heating boiler.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for oil. Oil contaminated soil, water or snow will be stored and remediated in the land treatment facility.

12 BEST MANAGEMENT PRACTICE - HYDROCHLORIC ACID

Chemical name/class:	HCl	CAS #:	7647-01-0
Designated Work Area:		ADR Facility	

Hydrochloric acid is used in the stripping circuit in the ADR facility. Approximately 450 litres will be used per day. HCL will be stored in supplier drums/ containers within a secondary containment foundation of concrete with curbed sides with epoxy lining. Spill kits and personal protective equipment will be provided at the areas where HCl is stored and handled. Storage of HCl will be undertaken to prevent accidental interactions with Sodium Cyanide and Sodium Hydroxide in the leaching circuit. This will be carried out by constructing separate storage facilities and separate drainage for these facilities.

- Handle, store and dispose of the HCl in accordance with the supplier MSDS.
- All installations and equipment will be designed and approved by a professional engineer with experience in handling of hydrochloric acid.
- The handling of HCl will be carried out mechanically to minimize manual handling through lifting and transportation equipment and decanting facilities. Only authorized personnel who have completed training and certification will be allowed to handle HCl.
- Hydrochloric acid purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any unexpected losses.
- No waste HCl is expected, in the case of a spill, spill cleanup sorbent materials resulting will be handled as per the Spill Response Plan, and disposed of as hazardous/ special waste offsite.
- HCl packaging or containers will not be used for any other purpose, the containers will either be returned to the supplier or disposed of as hazardous / special waste in a permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for HCl. Spill kit sorbent materials, soil or snow used to contain a hydrochloric acid spill will be placed in hazardous / special waste bins for transportation offsite to a permitted third party facility or landfill accepting hazardous / special waste.

13 BEST MANAGEMENT PRACTICE - HYDROGEN PEROXIDE

Chemical name/class:	Hydrogen peroxide (H_2O_2)	CAS #:	7722-84-1
Designated Work Area:		Cyanide detoxification (Water treatment plant)	

Hydrogen Peroxide solution will be used for Cyanide detoxification. Hydrogen peroxide will be stored in supplier drums/ containers within a secondary containment foundation of concrete with curbed sides. Spill kits and personal protective equipment will be provided at the areas where Hydrogen Peroxide is stored and handled.

- Handle, store and dispose of the Hydrogen Peroxide in accordance with the supplier MSDS.
- All installations and equipment will be designed and approved by a professional engineer with experience in handling of hydrogen peroxide.
- The handling of Hydrogen Peroxide will be carried out mechanically to minimize manual handling through lifting and transportation equipment and decanting facilities. Only authorized personnel who have completed training and certification will be allowed to handle Hydrogen Peroxide.
- Hydrogen Peroxide purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any unexpected losses.
- No waste Hydrogen Peroxide is expected, in the case of a spill, spill cleanup sorbent materials used for product recovery will be handled as per the Spill Response Plan, and disposed of as hazardous/ special waste offsite.
- Hydrogen Peroxide packaging or containers will not be used for any other purpose, the containers will either be returned to the supplier or disposed of as hazardous / special waste in a permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for Hydrogen Peroxide. Spill kit sorbent materials, soil or snow used to contain a Hydrogen Peroxide spill will be placed in hazardous / special waste bins for transportation offsite to a permitted third party facility or landfill accepting hazardous / special waste.

14 BEST MANAGEMENT PRACTICE - LIME

Chemical name/class:	Calcium Hydroxide (lime)	CAS #:	1305-62-0
Designated Work Area:		Heap leach facility	

Lime will be used during operations for heap leach stabilization and pH regulation. Approximately 24 tonnes of lime will be used per day during operations.

- Handle, store and dispose of lime safely and in accordance with manufacturer's specifications and the MSDS.
- Lime purchase, storage and use will be recorded for database and cost control purposes. This information will also be used for reconciling any unexpected losses.
- Lime will be supplied to SGC Eagle Gold project site in bulk trucks, with mechanical off-loading equipment. The lime will be stored in purpose built silos to keep the lime dry and facilitate distribution during the process via automated systems.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for lime.
- Lime contaminated soil, snow or water will be placed on the heap leach facility during operations, to avoid offsite disposal.

15 BEST MANAGEMENT PRACTICE - METAL CONTAINING SLUDGE

Preliminary estimates indicate that the Mine Waste Water Treatment Plant (MWTP) will produce approximately 117 tonnes of dry solids per year (2333 total dry tonnes) of low pH (ferric and barium) sludge which will require encapsulation. Sulphate will be managed by gypsum solubility and water management practices. Based on these preliminary assumptions, the quantity of caustic sludge produced during MWTP operations is estimated to average 237 tonnes per year (4744 total dry tonnes).

The sludge produced by the MWTP during the Operations Phase will be temporarily placed and stored on freeze consolidation pad(s) adjacent to the MWTP for the purpose of managing solids during operation. During the closure phase of the Project, the caustic sludge will be transferred to the heap and incorporated into the closure cap for final disposal.

Low pH sludge will be encapsulated in an engineered synthetic liner and covered with earth fill and growth media. This pad will have sufficient capacity to contain all the ferric sludge produced over the life of mining and closure. Further details pertaining to sludge management are provided in SGC's Sludge Management Plan (Appendix 9.4 of the WUL application and Appendix K section 5.4 of Part 1 of the QML application).

All spills will be reported to the SGC Environmental Coordinator. The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.

Spill cleanup will be undertaken as per spill cleanup procedures for hazardous materials or waste. Spilled materials will be contained and placed within the engineered synthetic liner as described above.

16 BEST MANAGEMENT PRACTICE - MISCELLANEOUS HAZARDOUS / SPECIAL WASTE

SGC will ensure that minimal miscellaneous hazardous / special waste is produced by the Project. Items that will fall into this category include aerosol cans, used paint tins, radioactive materials, used oil and fuel filters, and typical domestic hazardous / special wastes.

Miscellaneous hazardous/special waste will be stored in a dedicated bin within the special waste storage area. Used oil and fuel filters will be incinerated. Other miscellaneous hazardous/special waste will be transported offsite for disposal in a permitted third party hazardous / special waste disposal facility or landfill.

- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.

Spill cleanup will be undertaken as per spill cleanup procedures for hazardous materials or waste. Spilled materials will be contained and placed within the bin at the special waste storage area.

17 BEST MANAGEMENT PRACTICE - PROPANE

Chemical name/class:	Propane Class 1 – Flammable gas	CAS #:	74-98-6
Designated Work Area:		Camp and ADR facility	

Propane will be used as fuel for heating and some aspects of the process in the ADR facility. Propane will be supplied by tank and stored in 19,000 litres propane tanks at the mine site.

- Handle, store and dispose of storage and use of propane is conducted in accordance with the supplier MSDS.
- Procure approved commercial propane tanks.
- Propane tanks storage sites will be cleared of vegetation, and will be away from roads and areas where mining machinery operate.
- No smoking signs and no open flame will be placed at propane storage areas.
- Should propane leaks occur, SGC will ensure that the source of the leaks is detected as early as possible and that the leakages are stopped. No spill contingency procedure is applicable to propane, due to the gaseous nature of this product.

18 BEST MANAGEMENT PRACTICE - SMELTING FLUXES

Chemical name/class:	Sodium tetra borate	CAS #:	1330-43-4
Designated Work Area:		Refinery	

The smelting fluxes are used in the refinery for slag formation. SGC will ensure that personnel handle, store and dispose of smelting fluxes in accordance with the supplier MSDS.

- Smelting fluxes will be supplied in bags and will be stored in the supplier bags/ packaging. The smelting fluxes will be stored in the refinery in a locked storeroom.
- Waste smelting fluxes are not expected, however smelting flux packaging and any unexpected/spilled smelting flux waste, will be stored in bins in the special waste storage facility and transported offsite to a permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for smelting fluxes.

19 BEST MANAGEMENT PRACTICE - SODIUM CYANIDE

Sodium Cyanide is used in the heap leaching circuit for gold extraction. SGC will ensure that personnel handle, store and dispose of sodium cyanide in accordance with the supplier MSDS.

Particular care will be taken with the management of cyanide, to ensure that no cyanide is released to the natural environment without prior safe destruction. Please refer to the Cyanide Management Plan for additional information on the transportation, handling, storage and use of cyanide.

In the unlikely event that Sodium Cyanide or cyanide in solution requires disposal, SGC will safely gather, handle and transport the material for disposal with the heap leach facility and ADR facility, such that no external disposal is required. Prior to mine closure a program will be implemented to destroy cyanide and remove residual cyanide in all forms from the Project site.

20 BEST MANAGEMENT PRACTICE - SODIUM HYDROXIDE

Chemical name/class:	**Sodium Hydroxide (NaOH)**	**CAS #:**	**1310-73-2**
Designated Work Area:		ADR Facility	

Sodium Hydroxide is used in desorption of gold from the activated carbon in the ADR. It is supplied as solid pellets, which must not be exposed to moisture during storage. Roughly 90 kg will be used per day and a 2-week supply will be stored on site. NaOH is commonly known as lye or caustic soda. NaOH is a strong corrosive base and storage facilities must be appropriately constructed to avoid corrosion of structures.

- Handle, store and dispose of store and dispose of sodium hydroxide in accordance with the supplier MSDS.
- NaOH will be stored in the ADR facility within secondary containment foundation, in the supplier packaging. The storage facility will be in an area where no solution or water is handled or stored to ensure that the packaged NaOH remains dry.
- Spill kits and personal protective equipment will be provided at the areas where NaOH is stored and handled. Storage of NaOH will be undertaken to prevent accidental interactions with Hydrochloric acid in the stripping circuit. This will be carried out by having separate storage facilities and separate drainage for these facilities.
- No waste NaOH is expected, however in the case of a spill, contaminated spill cleanup sorbent materials, will be handled as per the Spill Response Plan, and disposed of as hazardous/ special waste offsite.
- NaOH packaging or containers will not be used for any other purpose, the containers will either be returned to the supplier or disposed of as hazardous / special waste in permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per a MSDS for NaOH. Spill kit sorbent materials, soil or snow used to contain a NaOH spill will be placed in hazardous / special waste bins for transportation offsite to permitted third party facility or landfill accepting hazardous / special waste.

21 BEST MANAGEMENT PRACTICE - WINDOW WASHING FLUID

Chemical name/class:	Window washing Fluid	CAS #:	67-56-1
Designated Work Area:		Truck shop	

Window washing fluid will be used during cold conditions to prevent washing water from freezing.

- Handle, store and dispose of store and dispose of window washing fluid in accordance with the supplier MSDS.
- Window washing fluid will be stored in the supplier containers in a locked storeroom in the truck shop.
- No waste window washing fluid is expected, except for contaminated spill cleanup sorbent materials, which will be handled as per the Spill Response Plan, and disposed of as hazardous/ special waste offsite.
- Window washing fluid packaging or containers will not be used for any other purpose; the containers will be disposed of as hazardous / special waste in permitted third party hazardous / special waste disposal facility or landfill.
- All spills will be reported to the SGC Environmental Coordinator.
- The Yukon Spill Report Centre must be contacted at **(867) 667-7244** if the spill exceeds the reporting thresholds presented in the Spill Response Plan.
- Spill cleanup will be undertaken as per the MSDS for window washing fluid. Spill kit sorbent materials, soil or snow used to contain a window washing fluid spill will be placed in hazardous / special waste bins for transportation offsite to a permitted third party facility or landfill accepting hazardous / special waste.

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APPENDIX D

Material Safety Data Sheets

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Material Safety Data Sheet

PETRO-CANADA ANTIFREEZE

1 . Product and company identification

Product name : PETRO-CANADA ANTIFREEZE

Synonym : Universal Antifreeze, Radiator Antifreeze, Diesel Antifreeze, Petro-Canada Antifreeze-Coolant, Petro-Canada Heavy Duty Antifreeze-Coolant, Pre-Mix Antifreeze, Petro-Canada Premium Radiator Antifreeze, Diesel Engine Coolant, Pre-Mixed Radiator Antifreeze/Coolant Petro-Canada.

Code : W269

Material uses : Used as an engine antifreeze coolant.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Clear viscous liquid.

Odour : Odourless.

WHMIS (Canada) :

Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : CAUTION!

MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. POSSIBLE BIRTH DEFECT HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS, BASED ON ANIMAL DATA. POSSIBLE DEVELOPMENTAL HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE ADVERSE DEVELOPMENTAL EFFECTS, BASED ON ANIMAL DATA.

May be harmful if swallowed. Slightly irritating to the eyes and skin. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Contains material that may cause target organ damage, based on animal data. Contains material which may cause birth defects, based on animal data. Contains material which may cause developmental abnormalities, based on animal data. Avoid exposure during pregnancy. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation.

Ingestion : Harmful if swallowed. Ingestion of this product may cause gastro-intestinal irritation, nausea, vomiting, abdominal pain, and diarrhea. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Skin : Slightly irritating to the skin.

Eyes : Slightly irritating to the eyes.

Potential chronic health effects

2 . Hazards identification

Chronic effects : Contains material that may cause target organ damage, based on animal data.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : Contains material which may cause birth defects, based on animal data.

Developmental effects : Contains material which may cause developmental abnormalities, based on animal data.

Fertility effects : No known significant effects or critical hazards.

Target organs : The substance may be toxic to kidneys and liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Ethylene glycol	107-21-1	45 - 50

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Non-flammable.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

5 . Fire-fighting measures

Products of combustion : Carbon oxides (CO, CO2), smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Avoid exposure during pregnancy. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Ethylene glycol	**ACGIH TLV (United States).** CEIL: 100 mg/m³, (aerosol)

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

8 . Exposure controls/personal protection

Engineering measures : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: neoprene, nitrile, polyvinyl chloride (PVC). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Clear viscous liquid.
Flash point : Not available.
Auto-ignition temperature : Not available.
Flammable limits : Not available.
Colour : Yellow.
Odour : Odourless.
Odour threshold : Not available.
pH : Not available.
Boiling/condensation point : 129°C (264.2°F)
Melting/freezing point : -37°C (-34.6°F)
Relative density : 1.06 to 1.09
Vapour pressure : 0.008 kPa (0.06 mm Hg)
Vapour density : 2.1 [Air = 1]
Volatility : Not available.
Evaporation rate : Not available.
Viscosity : Not available.
Pour point : Not available.

9 . Physical and chemical properties

Solubility : Soluble in water, methanol and diethyl ether.

10 . Stability and reactivity

Chemical stability : The product is stable.

Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.

Materials to avoid : Reactive with oxidising agents, acids and alkalis.

Hazardous decomposition products : May release COx, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Ethylene glycol	LD50 Dermal	Rabbit	9530 mg/kg	-
	LD50 Oral	Rat	4700 mg/kg	-
	LC50 Inhalation Dusts and mists	Rat	2725 mg/m³	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Ethylene glycol	A4	-	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

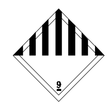
13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	UN3082	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Ethylene glycol based coolant)	9	III		**Special provisions** In single containers of 5000 lbs capacity or less this product is exempt from DOT regulations (not regulated).

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Target organ effects

Canada

WHMIS (Canada) : Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : Not determined.

16 . Other information

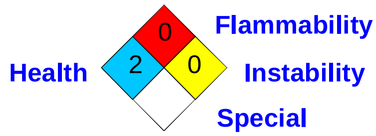
Label requirements : MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. POSSIBLE BIRTH DEFECT HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS, BASED ON ANIMAL DATA. POSSIBLE DEVELOPMENTAL HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE ADVERSE DEVELOPMENTAL EFFECTS, BASED ON ANIMAL DATA.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		0
Physical hazards		0
Personal protection		H

16 . Other information

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **3/11/2010.**

Date of issue : 11 March 2010

Date of previous issue : No previous validation.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

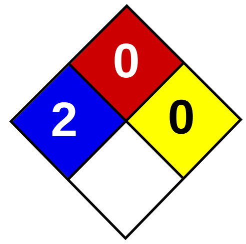
For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper sulfate pentahydrate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper sulfate pentahydrate

Catalog Codes: SLC3778, SLC4567, SLC1774, SLC3565, SLC5353

CAS#: 7758-99-8

RTECS: GL8900000

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not applicable.

Synonym: Blue vitriol; Copper (II) Sulfate Pentahydrate

Chemical Name: Cupric sulfate pentrahydrate

Chemical Formula: CuSO4.5H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper sulfate pentahydrate	7758-99-8	100

Toxicological Data on Ingredients: Copper sulfate pentahydrate: ORAL (LD50): Acute: 300 mg/kg [Rat.]. DERMAL (LD50): Acute: >2000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When heated to decomposition it emits toxic fumes. Solutions are acidic and can react with magnesium to evolve flammable hydrogen gas

Special Remarks on Explosion Hazards: Nitromethanes and copper salts spontaneously form explosive materials

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation TWA: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 (mg/m3) from NIOSH InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline granules solid. Powdered solid.)

Odor: Odorless.

Taste: Nauseous metallic.

Molecular Weight: 249.69 g/mole

Color: Blue. (Light.)

pH (1% soln/water): Not available.

Boiling Point: 150°C (302°F)

Melting Point: 110°C (230°F)

Critical Temperature: Not available.

Specific Gravity: 2.28 @ 15.6 deg. C(Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol.

Solubility:
Easily soluble in hot water. Soluble in cold water, methanol. Solubility in water: 31.6 g/100 ml @ 0 deg. C.; 203.3 g/100 ml @ 100 deg. C Solubility in methanol: 15.6 g/100 ml @ 18 deg. C. Insoluble in ethanol. It readily forms alkaline complexes at sufficiently high concentrations of amines or alkali cyanides. Practically insoluble in most organic solvents.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat (high temperatures), incompatible materials, exposure to air

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Highly corrosive in presence of steel.

Special Remarks on Reactivity:
Air Sensitive. Slowly efflorescent in air. Solutions of hyprobromite are decomposed by powerful catalytic action of cupric ions, even as impurities. Incompatible with finely powdered metals.

Special Remarks on Corrosivity:
Corrosive to finely powdered metals. Very corrosive to plain steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 300 mg/kg [Rat.]. Acute dermal toxicity (LD50): >2000 mg/kg [Rat].

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: kidneys, liver.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 1088 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material based on animal data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. May cause skin burns. It may cause and itching allergic eczema. Eyes: Causes eye irritation. May cause eye burns. It may cause conjunctivitis, corneal discoloration, ulceration and turbidity of the cornea. Inhalation: Causes respiratory tract (nose, throat, lung) irritation with coughing and wheezing. May cause ulceration and perforation of the nasal septum if inhaled in excessive quantities. Burning copper sulfate may result in irritating and poisonous gases which may irritate the respiratory tract and lungs, and may cause fume metal fever which is characterized by flu-like symptoms such as fever, chills, muscle aches. Ingestion: Harmful if swallowed. May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea, metallic taste, burning sensation in the stomach or epigastrum, abdominal pain, and possible gastrointestinal tract bleeding. May affect metabolism(metabolic acidosis), liver (liver damage, jaundice), blood (Methemoglobin, hemalytic anemia), urinary system (kidney damage, hematuria, hemoglobinuria, albuminuria), behavior/nervous systems (somnolence, tremor, psychosis, muscle weakness, coma), cardiovascular system (lowering of blood pressure, dysthrythmia). Oral mucosa, vomitus, stools, and saliva may be stained blue or green following ingestion. Aspiration pneumonia may develop following emesis and CNS depression. Chronic Potential Health Effects: Skin: Repeated or prolonged skin contact may cause thickening of the skin.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 0.1 ppm 48 hours [Goldfish]. 0.1 mg/l 96 hours [Rainbow Trout]. 2.5 mg/l 96 hours [Rainbow Trout].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation:
If released to soil, copper sulfate may leach to groundwater, be partly oxidized, or bind to humic materials, clay, or hydrous of iron and manganese. In water, it will bind to carbonates as well as humic materials, clay and hydrous oxides of iron and manganese. Copper is accumulated by plants and animals, but it does not appear to biomagnify from plants to animals. This lack of biomagnification appears common with heavy metals. In air, copper aerosols (in general) have a residence time of 2 to 10 days in an unpolluted atmosphere and 0.1 to >4 in a polluted, urban areas.

Section 13: Disposal Considerations

Waste Disposal:
Copper dusts or mist or copper compounds may be disposed of in Group III sealed containers in a secure sanitary landfill. Copper containing soluble wastes can be concentrated through the use of ion exchange, reverse osmosis, or evaporators to the point where copper can be electrolytically removed and sent to a reclaiming firm. If recovery is not feasible, the copper can be precipitated through the use of caustics and the sludge depositied in a chemical waste landfill. Be sure to consult with authorities (waste regulators). Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 9: Miscellaneous hazardous material.

Identification: : Environmentally hazardous substance, n.o.s. (Cupric Sulfate) UNNA: 3077 PG: III

Special Provisions for Transport:
additional markings "Marine Pollutant" - required for bulk shipments. The words "Marine Pollutant" must be entered on the shipping paper in association iwth the basic DOT description for bulk shipments.

Section 15: Other Regulatory Information

Federal and State Regulations:
SARA 313 toxic chemical notification and release reporting: Copper compounds CERCLA: Hazardous substances.: Copper sulfate pentahydrate: 10 lbs. (4.536 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R36/38- Irritating to eyes and skin. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S22- Do not breathe dust. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

Created: 10/09/2005 05:01 PM

Last Updated: 11/01/2010 12:00 PM

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Material Safety Data Sheet

Section I. Product Identification and Uses

HMIS (HFRP)	
Health Hazard	2
Fire Hazard	0
Reactivity	0
Personal Protection	s

Common / Trade name	SYSCO-RELIANCE DEGREASER SUPC 0097915	**TDG**	Class 8
WHMIS	D2B, E	**PIN**	UN3267 CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S., (Potassium Hydroxide)
Code	2005	**PG**	III
Material uses	Cleaner, degreaser.		

Section II. Hazardous Ingredients

Name	CAS #	% by weight	TLV/PEL	LC50/LD50
Ethoxylated C12-15 alcohol	68131-39-5	1-5	Not available.	ORAL (LD50): Acute: 4150 mg/kg [Rat.].
Potassium Hydroxide	1310-58-3	1-5	Not available.	ORAL (LD50): Acute: 273 mg/kg [Rat]. 365 mg/kg [Rat]. 388 mg/kg [Rat].
Alcohol C9-11, ethoxylated	68439-46-3	0.5-1.5	Not available.	ORAL (LD50): Acute: 1400 mg/kg [Rat].
Alkyl dimethyl benzyl ammonium chloride (C12-16)	68424-85-1	0.5-1.5	Not available.	ORAL (LD50): Acute: 426 mg/kg [Rat]. 919 mg/kg [Mouse].
Ethyl alcohol	64-17-5	0-1	Not available.	ORAL (LD50): Acute: 8300 mg/kg [Mouse]. 13700 mg/kg [Rat]. 17750 mg/kg [Rat].
Sodium metasilicate, pentahydrate	10213-79-3	1-5	Not available.	ORAL (LD50): Acute: 600 mg/kg [Rat.].

Section III. First Aid Measures

Eye contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. If irritation persists, get medical attention.
Skin contact	In case of contact, immediately flush skin with plenty of water while removing contaminated clothing and shoes.Get medical attention if irritation develops.
Inhalation	Allow the victim to rest in a well ventilated area. Seek medical attention if discomfort persists.
Ingestion	DO NOT induce vomiting. Have conscious person drink several glasses of water. NEVER give an unconscious person anything to ingest. Seek immediate medical attention.

Section IV. Physical Data

Physical state and apperance	Liquid.	**Colour**	Orange - Pink.
pH (1% soln/water)	12.0 - 13.0	**Odour**	Faint odor of Quaternary Ammonium coumpond.
pH (concentrate)	13.0 - 14.0	**Volatility**	Not available.
Boiling point	The lowest known value is 100°C (212°F) (Water). Weighted average: 106.85°C (224.3°F)	**Vapour density**	Weighted average: 1 (Air = 1)
Specific gravity	1.028 - 1.046 (Water = 1)	**Vapour pressure**	The highest known value is 2.3 kPa (17.2 mm Hg) (at 20°C) (Water). Weighted average: 2.27 kPa (17.03 mm Hg) (at 20°C)
Solubility	Miscible in water.		

Section V. Fire and Explosion Data

The product is	Non-flammable.
Auto-ignition temperature	Not applicable.
Flash points	Not applicable.
Degradation products	Not applicable.
Extinguising media	Use DRY chemicals, CO2, water spray or foam.

Section VI. Reactivity data

Stability	The product is stable.
Decomp. products	Not available.
Reactivity	Incompatible with oxidizing agents, acids, reducing agents, organic materials, metals.

Section VII. Toxicological properties

Route of entry	Eye contact. Ingestion. Inhalation. Skin contact.
Toxicity for animals	See section II
Acute effects	Dangerous in case of skin and eye contact (corrosive), of ingestion (corrosive to digestive system). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract.
Chronic effects	Not classified or listed by IARC, NTP, OSHA, EU and ACGIH.

Section VIII. Preventive measure

Waste disposal	Dispose of material according to régional, provincial and federal regulations. Consult your local or regional authorities.
Storage	Store in a dry, cool and well ventilated area. Keep away from incompatibles.
Precautions	Avoid breathing vapors or spray mists.Avoid contact with skin and eyes.In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.In case of contact, immediately flush skin with plenty of water while removing contaminated clothing and shoes.Wear suitable protective clothing, gloves and eye/face protection.
Spill and leak	Absorb with an inert DRY material and place in an appropriate waste disposal container. Dispose of in accordance with federal, provincial, or local regulations.

Section IX. Personal protective equipment

Gloves	Gloves (impervious)
Respiratory	In case of insufficient ventilation, wear suitable respiratory equipment.
Eyes	Splash goggles.
Other	Full suit, boots, face shield: are recommended under exceptional circumstances such as fire, spill or for prolonged contact with bulk quantities.
Eng. controls	Ensure that eyewash stations and safety showers are proximal to the work-station location.

Section X. Preparation and other Information

Validated by the Regulatory Affairs Department on July 15th 2011

Printed 18 July 2011

EMERGENCY: EMERGENCY:CANUTEC 613-996-6666

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy of completeness of the information contained herein. Final determination of suitability of any material is the sole responsability of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Annex A. Legend

HMIS	Hazardous Materials Identification System
WHMIS	WHMIS Workplace Hazardous Materials Information System
TDG	Transport Dangerous Goods
PIN	Product Identification Number
PG	Packaging Group

Fiche signalétique

Section I. Identification et utilisation du produit

HMIS (HFRP)

Dangers pour la santé	2
Risques d'incendie	0
Réactivité	0
Protection personnelle	s

Nom commun / commercial	SYSCO-AVANTAGE DEGRAISSANT SUPC 0097915	**TMD**	Classe 8
SIMDUT	D2B, E	**NIP**	UN3267 LIQUIDE ORGANIQUE CORROSIF, BASIQUE, N.S.A., (Hydroxyde de potassium)
Code	2005	**GE**	III
Utilisation	Nettoyant, dégraissant.		

Section II. Ingrédients dangereux

Nom	**# Cas**	**% en poids**	**LMP/LEP**	**CL50/DL50**
Alcool C12-15 éthoxylé	68131-39-5	1-5	Non disponible.	ORALE (DL50): Aiguë: 4150 mg/kg [Rat.].
Hydroxyde de Potassium	1310-58-3	1-5	Non disponible.	ORALE (DL50): Aiguë: 273 mg/kg [Rat]. 365 mg/kg [Rat]. 388 mg/kg [Rat].
Alcool C9-11 éthoxylé	68439-46-3	0.5-1.5	Non disponible.	ORALE (DL50): Aiguë: 1400 mg/kg [Rat].
Alkyl dimethyl benzyl ammonium chloride (C12-16)	68424-85-1	0.5-1.5	Non disponible.	ORALE (DL50): Aiguë: 426 mg/kg [Rat]. 919 mg/kg [Souris].
Alcool ethylique	64-17-5	0-1	Non disponible.	ORALE (DL50): Aiguë: 8300 mg/kg [Souris]. 13700 mg/kg [Rat]. 17750 mg/kg [Rat].
Metasilicate de sodium, pentahydrate	10213-79-3	1-5	Non disponible.	ORALE (DL50): Aiguë: 600 mg/kg [Rat.].

Section III. Premiers soins

Contact oculaire	Rincer les yeux IMMÉDIATEMENT à l'eau courante pendant au moins 15 minutes en gardant les paupières ouvertes. Si l'irritation persiste, appeler un médecin.
Contact cutané	En cas de contact, rincer immédiatement la peau à grande eau et retirer les vêtements et les chaussures contaminés.En cas d'irritation, consulter un médecin.
Inhalation	Permettre à la victime de se reposer dans un endroit bien ventilé. Obtenir de l'aide médicale si le malaise persiste.
Ingestion	NE PAS faire vomir. Si la personne est consciente, lui faire boire quelques verres d'eau. NE RIEN faire ingérer à une personne inconsciente. Obtenir immédiatement de l'aide médicale.

Section IV. Données physiques

État physique et apparence	Liquide.	**Couleur**	Orange - Rose.
pH (sol.1%/eau)	12.0 - 13.0	**Odeur**	Légère odeur de composés d'ammonium quaternaire.
pH (concentré)	13.0 - 14.0	**Volatilité**	Non applicable.
Point d'ébullition	La plus basse valeur connue est 100°C (212°F) (Eau). Moyenne pondérée: 106.85°C (224.3°F)	**Densité de vapeur**	Moyenne pondérée: 1 (Air = 1)
Gravité spécifique	1.028-1.046 (Eau = 1)	**Pression de vapeur**	La plus haute valeur connue est 2.3 kPa (17.2 mm Hg) (à 20°C) (Eau). Moyenne pondérée: 2.27 kPa (17.03 mm Hg) (à 20°C)
Solubilité	Miscible dans l'eau.		

Section V. Risques d'incendie et d'explosion

Le produit est	Ininflammable.
Température d'auto-ignition	Sans objet.
Point d'éclair	Sans objet.
Produits de dégradation	Non applicable.
Mode d'extinction	Utiliser des poudres chimiques SÈCHES, du CO2, de l'eau pulvérisée ou une mousse.

Section VI. Données sur la réactivité

Stabilité	Le produit est stable.
Produits de décomp.	Non disponible.
Réactivité	Incompatible avec les agents comburants, les acides, les agents réducteurs, les substances organiques, les métaux.

Section VII. Propriétés toxicologiques

Voies d'absorption	Contact oculaire. Ingestion. Inhalation. Contact cutané.
Toxicité pour les animaux	Voir section II
Effets aigus	Dangereux en cas de contact avec les yeux, la peau (corrosif), d'ingestion (corrosif pour le système digestif). Le liquide ou les gouttelettes de liquide en suspension peuvent endommager les tissus, particulièrement les muqueuses des yeux, de la bouche ou des voies respiratoires.
Effets chroniques	Non classé par le CIRC, le NTP, l'OSHA, l'UE et l'ACGIH.

Section VIII. Mesures préventives

Élimination des résidus	Eliminer selon les lois régionales, provinciales et fédérales.Consulter les autorités locales ou régionales.
Entreposage	Conserver dans un endroit sec, frais et bien ventilé. Conserver à l'écart des matières incompatibles.
Précautions	Éviter d'inhaler les vapeurs ou le brouillard.Éviter le contact avec la peau et les yeux.En cas de contact avec les yeux, laver immédiatement et abondamment avec de l'eau et consulter un spécialiste.En cas de contact, rincer immédiatement la peau à grande eau et retirer les vêtements et les chaussures contaminés.Porter un vêtement de protection approprié, des gants et un appareil de protection des yeux/du visage.
Déversement ou fuite	Absorber avec une substance inerte SÈCHE et mettre dans un contenant de récupération approprié.Éliminer selon les lois fédérales, provinciales ou locales.

Section IX. Équipement de protection personel

Gants	Gants (résistants aux produits chimiques).
Respiratoire	En cas de ventilation insuffisante, porter un appareil respiratoire approprié.
Yeux	Lunettes anti-éclaboussures.
Autres	Vêtement de protection complet, bottes, masque facial: sont recommandés en des circonstances exceptionelles telles que feu, déversement ou lors d'un contact prolongé avec des quantités en vrac.
Contrôles d'ingénérie	S'assurer de la proximité d'une douche oculaire et d'une douche de sécurité au poste de travail.

Section X. Préparation et autres renseignements

Validé par le service des affaires reglementaires le 15 juillet 2011

Imprimé le 18 juil. 2011

URGENCE: URGENCE :CANUTEC 613-996-6666

Au meilleur de nos connaissances, l'information contenue dans ce document est exacte. Toutefois, ni le fournisseur ci-haut mentionné ni aucune de ses succursales ne peut assumer quelque responsabilité que ce soit en ce qui a trait à l'exactitude ou à l'état complet de l'information contenue dans ce document. La détermination finale de la convenance de tout matériel ou produit est la responsabilité exclusive de l'utilisateur. Tous les matériaux ou produits peuvent présenter certains risques et devraient être utilisés avec prudence. Bien que certains risques soient décrits dans ce document, nous ne pouvons garantir que ce sont les seuls risques qui existent.

Annexe A. Legende

HMIS	Système d'Identification sur les matières dangereuses
SIMDUT	Système d'Information sur les Matières Dangereuses Utilisées au Travail
TMD	Transport des Matières Dangereuses
NIP	Numéro d'Identification du Produit
GE	Groupe d'Emballage

Material Safety Data Sheet

DIESEL FUEL

PETRO-CANADA

1 . Product and company identification

Product name : DIESEL FUEL

Synonym : Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, D60, P40, P50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC).

Code : W104, W293; SAP: 120, 121, 122, 125, 126, 129, 130, 135, 287, 288

Material uses : Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

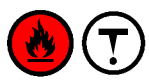
In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Bright oily liquid.

Odour : Mild petroleum oil like.

WHMIS (Canada) :



Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Combustible liquid. Severely irritating to the skin. Irritating to eyes. Keep away from heat, sparks and flame. Do not get in eyes. Avoid breathing vapour or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.

Skin : Severely irritating to the skin.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

2 . Hazards identification

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Kerosine (petroleum), hydrodesulfurized / Fuels, diesel / Fuel Oil No. 2	64742-81-0 / 68334-30-5 / 68476-30-2	95 - 100
Fatty acids methyl esters	61788-61-2 / 67784-80-9 / 73891-99-3	0 - 5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

5 . Fire-fighting measures

Special remarks on fire hazards : Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Runoff to sewer may create fire or explosion hazard.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Kerosine (petroleum), hydrodesulfurized	**ACGIH TLV (United States). Absorbed through skin.** TWA: 200 mg/m³ 8 hour(s).
Fuels, diesel	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).
Fuel oil No. 2	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: nitrile, neoprene, polyvinyl alcohol (PVA), Viton. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	: Bright oily liquid.
Flash point	: Diesel fuel: Closed cup: ≥40°C (≥104°F) Marine Diesel Fuel: Closed Cup: ≥60°C (≥140°F) Mining Diesel: Closed Cup: ≥52°C (≥126°F)
Auto-ignition temperature	: 225°C (437°F)
Flammable limits	: Lower: 0.7% Upper: 6%
Colour	: Clear to yellow (This product may be dyed red for taxation purposes).
Odour	: Mild petroleum oil like.
Odour threshold	: Not available.
pH	: Not available.
Boiling/condensation point	: 150 to 371°C (302 to 699.8°F)
Melting/freezing point	: Not available.
Relative density	: 0.80 to 0.88 kg/L @ 15°C (59°F)
Vapour pressure	: 1 kPa (7.5 mm Hg) @ 20°C (68ºF).
Vapour density	: 4.5 [Air = 1]
Volatility	: Semivolatile to volatile.
Evaporation rate	: Not available.
Viscosity	: Diesel fuel: 1.3 - 4.1 cSt @ 40°C (104°F) Marine Diesel Fuel: 1.3 - 4.4 cSt @ 40°C (104°F)
Pour point	: Not available.
Solubility	: Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

10 . Stability and reactivity

Chemical stability	: The product is stable.
Hazardous polymerisation	: Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	: Reactive with oxidising agents and acids.
Hazardous decomposition products	: May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Kerosine (petroleum), hydrodesulfurized	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5000 mg/m³	4 hours
Fuels, diesel	LD50 Dermal	Mouse	24500 mg/kg	-
	LD50 Oral	Rat	7500 mg/kg	-
Fuel oil No. 2	LD50 Oral	Rat	12000 mg/kg	-

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

11 . Toxicological information

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Kerosine (petroleum), hydrodesulfurized	A3	-	-	-	-	-
Fuels, diesel	A3	3	-	-	-	-
Fuel oil No. 2	A3	3	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1202	DIESEL FUEL	3	III		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Combustible liquid
Irritating material

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

15 . Regulatory information

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

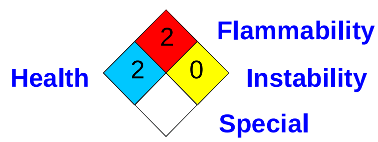
16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.) :

Health	2
Flammability	2
Physical hazards	0
Personal protection	H

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **7/6/2010.**

Date of issue : 6 July 2010

Date of previous issue : 7/3/2009.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

GASOLINE, UNLEADED

1 . Product and company identification

Product name : GASOLINE, UNLEADED

Synonym : Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending

Code : W102E, SAP: 102 to 117

Material uses : Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Clear liquid.

Odour : Gasoline

WHMIS (Canada) :

Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH CAN CAUSE HERITABLE GENETIC EFFECTS.

Flammable liquid. Irritating to eyes, respiratory system and skin. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Avoid contact with eyes, skin and clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Contains material which can cause heritable genetic effects. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

2 . Hazards identification

Skin	:	Irritating to skin.
Eyes	:	Irritating to eyes.

Potential chronic health effects

Chronic effects	:	This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Repeated or prolonged exposure to the substance can produce blood disorders.
Carcinogenicity	:	Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenicity	:	Contains material which can cause heritable genetic effects.
Teratogenicity	:	No known significant effects or critical hazards.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	:	Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Gasoline	86290-81-5	85-100
Ethanol	64-17-5	0.1-1
Benzene	71-43-2	0.5-1.5
Toluene	108-88-3	15-40*

**Montreal: may vary from 3-40%*
**Edmonton: may vary from 1-5%*

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact	:	Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	:	Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	:	Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
Notes to physician	:	No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Flammable liquid (NFPA) .

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), polynuclear aromatic hydrocarbons, phenols, aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Extremely flammable in presence of open flames, sparks, shocks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical

7 . Handling and storage

(ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Gasoline	**ACGIH TLV (United States).** TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s).
Ethanol	**ACGIH TLV (United States).** STEL: 1000 ppm 15 minute(s).
Benzene	**ACGIH TLV (United States). Absorbed through skin.** TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s).
Toluene	**ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

8 . Exposure controls/personal protection

Hands	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: polyvinyl alcohol (PVA), Viton. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Eyes	:	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
Skin	:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Environmental exposure controls	:	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	:	Clear liquid.
Flash point	:	Closed cup: -50 to -38°C (-58 to -36.4°F) [Tagliabue.]
Auto-ignition temperature	:	257°C (494.6°F) (NFPA)
Flammable limits	:	Lower: 1.3% (NFPA) Upper: 7.6% (NFPA)
Colour	:	Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.
Odour	:	Gasoline
Odour threshold	:	Not available.
pH	:	Not available.
Boiling/condensation point	:	25 to 220°C (77 to 428°F) (ASTM D86)
Melting/freezing point	:	Not available.
Relative density	:	0.685 to 0.8 kg/L @ 15°C (59°F)
Vapour pressure	:	<107 kPa (<802.5 mm Hg) @ 37.8°C (100°F)
Vapour density	:	3 to 4 [Air = 1] (NFPA)
Volatility	:	Not available.
Evaporation rate	:	Not available.
Viscosity	:	Not available.
Pour point	:	Not available.
Solubility	:	Hydrocarbon components virtually insoluble in water. Soluble in alcohol, ether, chloroform and benzene. Dissolves fats, oils and natural resins.

10 . Stability and reactivity

Chemical stability	:	The product is stable.
Hazardous polymerisation	:	Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	:	Reactive with oxidising agents, acids and interhalogens.
Hazardous decomposition products	:	May release COx, NOx, phenols, polycyclic aromatic hydrocarbons, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Gasoline	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	13600 mg/kg	-
Ethanol	LD50 Dermal	Rabbit	>15800 mg/kg	-
	LD50 Oral	Mouse	3450 mg/kg	-
	LC50 Inhalation Vapour	Rat	8850 mg/m³	4 hours
Benzene	LD50 Dermal	Rabbit	>8240 mg/kg	-
	LD50 Oral	Rat	930 mg/kg	-
	LC50 Inhalation Vapour	Rat	13228 ppm	4 hours
Toluene	LD50 Dermal	Rabbit	12125 mg/kg	-
	LD50 Oral	Rat	636 mg/kg	-
	LC50 Inhalation Vapour	Rat	7585 ppm	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Gasoline	A3	2B	-	-	-	-
Ethanol	A3	-	-	-	-	-
Benzene	A1	1	A	+	Proven.	+
Toluene	A4	3	D	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : There is a wealth of information about the teratogenic hazards of Toluene in the literature; however, based upon professional judgement regarding the body of evidence, WHMIS classification as a teratogen is not warranted.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1203	GASOLINE	3	II		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Flammable liquid
Irritating material
Carcinogen

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

16 . Other information

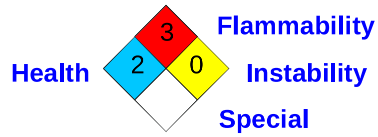
Label requirements : FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH CAN CAUSE HERITABLE GENETIC EFFECTS.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		3
Physical hazards		0
Personal protection		H

16 . Other information

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **4/21/2010.**

Date of issue : 9 April 2010

Date of previous issue : No previous validation.

Responsible name : **Product Safety - RS**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET

602698-00 MOBIL DTE 13M

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL DTE 13M
SUPPLIER: EXXONMOBIL OIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037
24 - Hour Health and Safety Emergency (call collect): 609-737-4411
24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296
Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: http://emmsds.ihssolutions.com/

2. COMPOSITION/INFORMATION ON INGREDIENTS
CHEMICAL NAMES AND SYNONYMS: PET. HYDROCARBONS AND ADDITIVES
GLOBALLY REPORTABLE MSDS INGREDIENTS:
None.
OTHER INGREDIENTS:
Substance Name Approx. Wt%

HYDROTREATED LIGHT NAPHTHENIC 25-35
DISTILLATE (PETROLEUM)
(64742-53-6)
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION
Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).
EMERGENCY OVERVIEW: Amber Liquid. Note: Pressurized mists may form a flammable mixture. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation.
For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES
EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area.
INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.
INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.
INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES
EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Note: Pressurized mists may form a flammable mixture.
COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.
Flash Point C(F): 210(410) (ASTM D-92).
Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES
NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify
CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.
WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE
HANDLING: High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention. No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.
SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.
EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION
OCCUPATIONAL EXPOSURE LIMITS:
When mists/aerosols can occur, the following are recommended: 5 mg/m3 (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m3 (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m3 (as oil mist) - OSHA Permissible Exposure Limit (PEL)
VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.
RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.
EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.
SKIN PROTECTION: Not normally required. When splashing or liquid contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES
Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): 210(410) (ASTM D-92)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.874
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 32.0
VISCOSITY AT 100 C, cSt: 6.1
POUR POINT C(F): -45(-49)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY
STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA
—-ACUTE TOXICOLOGY—-
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). —-Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). —-Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). —-Based on testing of similar products and/or the components.

EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). —-Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). —-Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.
—-SUBCHRONIC TOXICOLOGY (SUMMARY)—-
No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).
—-REPRODUCTIVE TOXICOLOGY (SUMMARY)—-
No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.
—-CHRONIC TOXICOLOGY (SUMMARY)—-
Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified
Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.
—-SENSITIZATION (SUMMARY)—-
Not expected to be sensitizing based on tests of this product, components, or similar products.

12. ECOLOGICAL INFORMATION
ENVIRONMENTAL FATE AND EFFECTS:
In the absence of specific environmental data for this product, this assessment is based on information for representative products.
ECOTOXICITY: Available ectoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product.
MOBILITY: When released into the environment, adsorption to sediment and soil will be the predominant behavior.
PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable.
BIOACCUMULATIVE POTENTIAL: Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal.

13. DISPOSAL CONSIDERATIONS
WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION
USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.
STATIC ACCUMULATOR (50 picosiemens or less): YES

15. REGULATORY INFORMATION
US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.
EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling not required.
Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, DSL, and KECI.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no “EXTREMELY HAZARDOUS SUBSTANCES”.
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.
THIS PRODUCT HAS BEEN AUTHORIZED BY USDA FOR USE UNDER THE FOLLOWING CATEGORY: This product is acceptable as a lubricant where there is no possibility of food contact (complies with earlier USDA guidelines for H-2 lubricant use).
The following product ingredients are cited on the lists below:
CHEMICAL NAME CAS NUMBER LIST CITATIONS *

ZINC (ELEMENTAL ANALYSIS) (0.08%) 7440-66-6 22
ZINC ALKYL DITHIOPHOSPHATE 68649-42-3 22
(0.67%)

—- REGULATORY LISTS SEARCHED —-
1=ACGIH ALL 6=IARC 1 11=TSCA 4 16=CA P65 CARC 21=LA RTK
2=ACGIH A1 7=IARC 2A 12=TSCA 5a2 17=CA P65 REPRO 22=MI 293
3=ACGIH A2 8=IARC 2B 13=TSCA 5e 18=CA RTK 23=MN RTK
4=NTP CARC 9=OSHA CARC 14=TSCA 6 19=FL RTK 24=NJ RTK
5=NTP SUS 10=OSHA Z 15=TSCA 12b 20=IL RTK 25=PA RTK
26=RI RTK
* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.
Code key:CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: HYDRAULIC OIL
NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES
ARE NOT FORMULATED TO CONTAIN PCBS.
Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:
INDUSTRIAL LABEL
Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. First Aid: Wash skin with soap and water. Flush eyes with water. If overcome by fumes or vapor, remove to fresh air. If ingested do not induce vomiting. If symptoms persist seek medical assistance. Read and understand the MSDS before using this product.

For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN: 602698-00, CMCS97: 970705, REQ: US - MARKETING, SAFE USE: L EHS Approval Date: 25APR2003

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Prepared by: ExxonMobil Oil Corporation
Environmental Health and Safety Department, Clinton, USA

Effective Date of Issue: JANUARY 5th 2009

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1. Identification of the substance/preparation and company undertaking

Material Name : SAE 50
Uses : Engine Oil
Product Code : SAE50
Manufacturer/Supplier : Aztec Oils Ltd
29-33 Intake Rd
Bolsover
Chesterfield
S44 6BB
United Kingdom
Telephone : + 44(0)1246 823007
Fax : + 44(0) 1246 823014
Email : enq@aztecoils.co.uk
Emergency Telephone Number : +44(0)1246 823007

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2. Hazard Identification

EC Classification : Not classified as dangerous under EC criteria

Health Hazards : Not expected to be a health hazard when used under normal conditions. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/ folliculitis. Used oil may contain harmful impurities.

Signs & Symptoms : Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the kin of exposed areas.
Ingestion may result in nausea, vomiting and/or diarrhoea.

Safety Hazards : Not classified as flammable but will burn.

Environmental Hazards : Not classified as dangerous for the environment.

---

3. **Composition/Information on Ingredients.**

Preparation Description : Highly refined mineral oils & additives.
Hazardous Components

Chemical Identity	CAS	EINECS	Symbol(s)	R-phrase(s)	Conc.

Additional Information: the highly refined mineral oil contains <3% (w/w) DMSO-extract, according to IP346. Refer to chapter 16 for full text of EC R-phrases.

---

4. First Aid Measures

General Information : Not expected to be a health hazard when used under normal conditions.

Inhalation : No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.

Skin contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical advice.

Eye Contact : Flush eyes with copious quantities of water. If persistent Irritation occurs, obtain medical attention.

Ingestion : In general no treatment is necessary unless large quantities are Swallowed, however, get medical advice.

Advice to Physician : treat symptomatically.

---

5. Fire Fighting Measures

Clear fire area of all non-emergency personnel.

Specific Hazards : Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and Inorganic compounds.

Suitable Extinguishing Media: Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

Unsuitable Extinguishing Media: Do not use water in a jet.

Protective Equipment for Fire-fighters: Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

---

6. Accidental Release Measures

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material safety Data Sheet. See Chapter 13 for information on disposal. Observe all relevant local and international regulations.

Protective measures : Avoid contact with skin and eyes. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth or other appropriate barriers.

Clean up Methods : Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as a clay, sand or other suitable material and dispose of properly.

Additional Advice : Local authorities should be advised if significant spillages Cannot be contained.

---

7. **Handling and Storage**:

General Precautions : Use local exhaust ventilation if there is a risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.

Handling : Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment used.

Storage : Keep container tightly closed and in a cool, well ventilated place. Use properly labelled and closable containers.
Storage Temperature: 0-50oC / 32-122oF
The storage of this product may be subject to the Control of Pollution (Oil Storage) (England) Regulations. Further guidance maybe obtained from the local environmental agency office.

Recommended Materials : For containers or container linings, use mild steel or high Density polyethylene.

Unsuitable Materials : PVC.

Additional Information : Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.
Exposure to this product should be reduced as low as reasonably practicable. Reference should be made to The Health & Safety Executive's publication "COSHH Essentials"

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8. Exposure Control / Personal Protection:

Occupational Exposure Limits

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE supplier.

Respiratory Protection : No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not

	maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours (boiling point >65oC(149oF) meeting EN141.
Hand Protection	: Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended
Eye Protection	: Wear safety glasses or full face shield if splashes are likely to occur. Approved to EU Standard EN166.
Protective Clothing	: Skin protection not ordinarily required beyond standard issue work clothes.
Monitoring Methods	: Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	: Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

9. Physical and Chemical Properties

Appearance	: Amber. Liquid
Odour	: Slight Hydrocarbon
pH	:Data not available
Initial Boiling Point and Boiling Range	: >280oC/536oF estimated values.
Pour Point	: Typical -18oC/0oF
Flash Point	: Typical 242oC/468oF (COC)
Upper/lower Flammability or explosion limits	: Typical 1-10% (V) based on mineral oil)
Auto-ignition temperature	: > 320oC/608oF
Vapour pressure	: <0.5 Pa at 20oC/68oF (estimated values)
Density	: Typical 890 kg/m3 at 15oC/59oF
Water solubility	: Negligible

n-octanol/water partition coefficient (log Pow)	: >6 (based on information on similar products)
Kinematic viscosity	: Typical 220.00 mm2/s at 40oC/104oF
Vapour density (air=1)	: >1 (estimated value(s))
Evaporation rate (nBuAc=1)	: Data not available

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10. Stability and Reactivity

Stability	: Stable
Conditions to avoid	: Extremes of temperature and direct sunlight
Materials to avoid	: Strong oxidising agents.
Hazardous Decomposition Products	: Hazardous decomposition products are not expected to form during normal storage.

---

11 Toxicological Information

Basis for Assessment	: Information given is based on data on the components and the toxicology of similar products.
Acute Oral Toxicity	: Expected to be of low toxicity: LD50>5000 mg/kg, Rat
Acute Dermal Toxicity	: Expected to be of low toxicity: LD50>5000 mg/kg, Rabbit
Acute Inhalation Toxicity	: Not considered to be an inhalation hazard under normal conditions of use.
Skin Irritation	: Expected to be slightly irritating. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.
Eye Irritation	: Expected to be slightly irritating
Respiratory	: Inhalation of vapours or mists may cause irritation.
Sensitisation	: Not expected to be a skin sensitiser.
Repeated Dose Toxicity	: Not expected to be a hazard
Mutagenicity	: Not considered a mutagenic hazard
Carcinogenicity	: Product contains mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer(IARC). Other components are not known to be associated with carcinogenic effects.
Reproductive and Development Toxicity	: Not expected to be a hazard.
Additional Information	: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible. Continuous contact with used engine oils has caused skin cancer in animal tests.

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12. Ecological Information

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

Acute Toxicity : Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50> 100mg/l (to aaquatic organisms) (LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract). Mineral oil is not expected to cause any chronic effects to aquatic organisms at concentration less than 1mg/l.

Mobility : Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.

Persistence/degradability : Expected to be not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.

Bioaccumulation : Contains components with the potential to bio accumulate.

Other Adverse Effects : Product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photo-chemical ozone creation potential or global warming potential.

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13. Disposal Conditions:

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.

Container Disposal : Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations.
EU Waste Disposal Code (EWC): 13 02 05 mineral-based non-chlorinated engine, gear and lubricating oils.
classification of waste is always the responsibility of the end user.

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14. Transport Information

ADR
This material is not classified as dangerous under ADR regulations.

RID
This material is not classified as dangerous under RID regulations.

ADNR
This material is not classified as dangerous under ADNR regulations.

IMDG
This material is not classified as dangerous under IMDG regulations

IATA(Country variations may apply)
This material is not classified as dangerous under IATA regulations.

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15. Regulatory Information

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

EC Classification	: Not classified as dangerous under EC criteria.
EC Symbols	: No Hazard Symbol required
EC Risk Phrases	: Not classified
EC Safety Phrases	: Not classified
EINECS	: All components listed or polymer exempt.
TSCA	: All components listed

Other Information

Environmental Protection Act 1990 (as amended). Health & Safety at Work Act 1974. Consumer Protection Act 1987. Control of Pollution Act 1974. Environmental Act 1995. Factories Act 1961. Carriage of Dangerous Goods by Road and Rail (Classification, Packaging and Labelling) Regulations. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Control of Substances Hazardous to Health Regulations 1994 (as amended). Road Traffic (Carriage of Dangerous Substances in Packages) Regulations. Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations. Road Traffic (Carriage of Dangerous Substances in Road Tankers in Tank Containers) Regulations. Road Traffic (Training of Drivers of Vehicles Carrying Dangerous Goods) Regulations. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations. Health and safety (First Aid) Regulations 1981. Personal Protective Equipment (EC directive) Regulations 1992. Personal Protective Equipment at Work Regulations 1992.

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16. Other Information

R-phrase(s)
Not classified

MSDS Version No	2.0
MSDS Effective Date	05/01/2009
MSDS Regulation	Regulation 1907/2006/EC
MSDS Distribution	The information in this document should be made available to all who may handle the product.
Disclaimer	This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

NULON 85W-140 LIMITED SLIP DIFFERENTIAL OIL

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
NULON 85W-140 LIMITED SLIP DIFFERENTIAL OIL

SYNONYMS
"Product Code: LSD85W140"

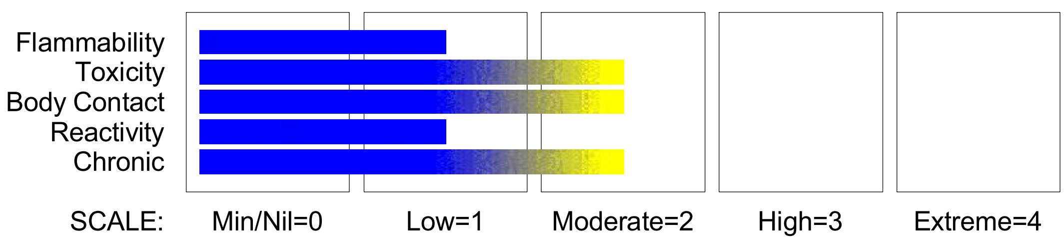
PRODUCT USE
• Used according to manufacturer's directions.
Limited slip differential oil.

SUPPLIER
Company: Nulon Products Pty Ltd
Address:
17 Yulong Close
Moorebank
NSW, 2170
Australia
Telephone: +61 2 9608 7800
Fax: +61 2 9601 4700
Email: msds@nulon.com.au

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to NOHSC Criteria, and ADG Code.

CHEMWATCH HAZARD RATINGS



POISONS SCHEDULE
None

RISK
•None under normal operating conditions.

SAFETY

Safety Codes	Safety Phrases
S23	• Do not breathe gas/fumes/vapour/spray.
S24	• Avoid contact with skin.
S39	• Wear eye/face protection.
S26	• In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
residual oils, petroleum, solvent- refined (severe)	64742-01-4.	80-85
paraffinic distillate, heavy, hydrotreated (severe)	64742-54-7.	5-10
mineral oil	Not avail.	5-15
ingredients at levels determined not to be hazardous		balance

continued...

Section 4 - FIRST AID MEASURES

SWALLOWED
• - Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

EYE
• If this product comes in contact with the eyes:
- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN
• If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED
• - If fumes or combustion products are inhaled remove from contaminated area.
- Other measures are usually unnecessary.

NOTES TO PHYSICIAN
• Treat symptomatically.
- Heavy and persistent skin contamination over many years may lead to dysplastic changes. Pre-existing skin disorders may be aggravated by exposure to this product.
- In general, emesis induction is unnecessary with high viscosity, low volatility products, i.e. most oils and greases.
- High pressure accidental injection through the skin should be assessed for possible incision, irrigation and/or debridement.
NOTE: Injuries may not seem serious at first, but within a few hours tissue may become swollen, discoloured and extremely painful with extensive subcutaneous necrosis.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
• - Water spray or fog.
- Alcohol stable foam.
- Dry chemical powder.
- Carbon dioxide.

FIRE FIGHTING
• - Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use water delivered as a fine spray to control fire and cool adjacent area.

FIRE/EXPLOSION HAZARD
• - Combustible.
- Slight fire hazard when exposed to heat or flame.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).
Combustion products include: carbon dioxide (CO_2), phosphorus oxides (POx), sulfur oxides (SOx), other pyrolysis products typical of burning organic material.
May emit poisonous fumes.
CARE: Water in contact with hot liquid may cause foaming and a steam explosion with wide scattering of hot oil and possible severe burns. Foaming may cause overflow of containers and may result in possible fire.

FIRE INCOMPATIBILITY
• - Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

HAZCHEM
None

PERSONAL PROTECTION

Glasses:	Gloves:	Respirator:
Chemical goggles.	PVC chemical resistant type.	Type A- P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
• Slippery when spilt.
- Remove all ignition sources.
- Clean up all spills immediately.

continued...

- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.

MAJOR SPILLS
• Slippery when spilt.
Moderate hazard.
- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING
• - DO NOT allow clothing wet with material to stay in contact with skin.
- Electrostatic discharge may be generated during pumping - this may result in fire.
- Ensure electrical continuity by bonding and grounding (earthing) all equipment.
- Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<=1 m/sec until fill pipe submerged to twice its diameter, then <= 7 m/sec).
- Avoid splash filling.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

SUITABLE CONTAINER
• - Metal can or drum
- Packaging as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY
• CARE: Water in contact with heated material may cause foaming or a steam explosion with possible severe burns from wide scattering of hot material. Resultant overflow of containers may result in fire.
- Avoid reaction with oxidising agents.

STORAGE REQUIREMENTS
• - Store in original containers.
- Keep containers securely sealed.
- No smoking, naked lights or ignition sources.
- Store in a cool, dry, well-ventilated area.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA mg/m³
Australia Exposure Standards	residual oils, petroleum, solvent-refined (severe) (Oil mist, refined mineral)	5
Australia Exposure Standards	paraffinic distillate, heavy, hydrotreated (severe) (Oil mist, refined mineral)	5
Australia Exposure Standards	mineral oil (Oil mist, refined mineral)	5

PERSONAL PROTECTION

RESPIRATOR
Type A-P Filter of sufficient capacity

EYE
• - Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

continued...

HANDS/FEET
• - Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber.
NOTE:
- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity.

OTHER
• - Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.

ENGINEERING CONTROLS
• General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE
Clear bright amber liquid; not miscible with water.

PHYSICAL PROPERTIES
Liquid.
Does not mix with water.
Floats on water.

State	Liquid	Molecular Weight	Not Available
Melting Range (℃)	Not Available	Viscosity	384 cSt@40℃
Boiling Range (℃)	Not Available	Solubility in water (g/L)	I mmiscible
Flash Point (℃)	180 (PMCC)	pH (1% solution)	Not Applicable
Decomposition Temp (℃)	Not Available	pH (as supplied)	Not A pplicable
Autoignition Temp (℃)	Not Available	Vapour Pressure (kPa)	Not Available
Upper Explosive Limit (%)	Not Available	Specific Gravity (water=1)	0.88- 0.93
Lower Explosive Limit (%)	Not Available	Relative Vapour Density (air=1)	Not Available
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY
• - Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.
For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS
ACUTE HEALTH EFFECTS
• Not applicable.

CHRONIC HEALTH EFFECTS
• Not applicable.

TOXICITY AND IRRITATION
PARAFFINIC DISTILLATE, HEAVY, HYDROTREATED (SEVERE):
MINERAL OIL:
RESIDUAL OILS, PETROLEUM, SOLVENT-REFINED (SEVERE):
• unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

• unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

• Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.
No significant acute toxicological data identified in literature search.

RESIDUAL OILS, PETROLEUM, SOLVENT-REFINED (SEVERE):

continued...

• No significant acute toxicological data identified in literature search.
The substance is classified by IARC as Group 3:
NOT classifiable as to its carcinogenicity to humans.
Evidence of carcinogenicity may be inadequate or limited in animal testing.

PARAFFINIC DISTILLATE, HEAVY, HYDROTREATED (SEVERE):

TOXICITY	IRRITATION
Oral (rat) LD50: >15000 mg/kg	Nil Reported
Dermal (None) rabbit: None >5000 mg/kg	

• No data of toxicological significance identified in literature search.

MINERAL OIL:

• Toxicity and Irritation data for petroleum-based mineral oils are related to chemical components and vary as does the composition and source of the original crude.
A small but definite risk of occupational skin cancer occurs in workers exposed to persistent skin contamination by oils over a period of years.
Petroleum oils which are solvent refined/extracted or severely hydrotreated, contain very low concentrations of both.

Section 12 - ECOLOGICAL INFORMATION

No data

Section 13 - DISPOSAL CONSIDERATIONS

• - Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.
Otherwise:
- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area.
A Hierarchy of Controls seems to be common - the user should investigate:
- Reduction.
- DO NOT allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM:
None (ADG7)

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: ADG7, UN, IATA, IMDG

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE
None

REGULATIONS
Regulations for ingredients

residual oils, petroleum, solvent-refined (severe) (CAS: 64742-01-4) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia Inventory of Chemical Substances (AICS)","OECD Representative List of High Production Volume (HPV) Chemicals"

continued...

paraffinic distillate, heavy, hydrotreated (severe) (CAS: 64742-54-7) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia High Volume Industrial Chemical List (HVICL)","Australia Inventory of Chemical Substances (AICS)","OECD Representative List of High Production Volume (HPV) Chemicals"

No data for Nulon 85W-140 Limited Slip Differential Oil (CW: 4731-28)
No data for mineral oil (CAS: , Not avail)

Section 16 - OTHER INFORMATION

• Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

• The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings.

Issue Date: 24-Aug-2010
Print Date: 25-Aug-2010

This is the end of the MSDS.

Cover Sheet

micromeritics®

INSTRUMENT CORPORATION
ONE MICROMERITICS DR.
NORCROSS, GA 30093-1877 U.S.A.

						DWN BY	J. Pittman
						ENGR	J. Mocny
C	Revision	JAP	6/25/04		040265	ENGR SIG	P. Hendrix
B	Revision	MD	04/02/03	JM	030200	HR SIG	J. Mocny
A	New format and numbering system	C. Bills	5/24/00	—	990544	QA SIG	A. Dovin
-	Formal Release	C. Bills	6-26-07	—	970446	ES SIG	K. Massengill
REV	REVISION DESCRIPTION	BY	DATE	CHK	REL. NO.		

MSDS
HYDRAULIC FLUID OD-15-10
(1-L)

SIZE	NUMBER	PAGE
A	920/16002/00MSDS	X of 3

Micromeritics Material Safety Data Sheet

Title : HYDRAULIC FLUID OD-15-10(1-L) | MSDS No. : 920/16002/00MSDS
Date of Preparation : 06/25/04 | Revision : C

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: HYDRAULIC FLUID OD-15-10
Chemical Formula: Blend
CAS Number: n/a
Other Designations:
General Use:
Supplier: Micromeritics Instrument Corp.
1 Micromeritics Dr.
Norcross, GA 30093-1877 USA
Contact: Human Resources
Phone: (770) 662-3620
Fax: (770) 662-3696
Manufacturer: Sun Company, Inc. Ten Penn Center 1801 Market St. Philadelphia, PA 19103-1699
(770) 662-3678

Section 2 - Composition / Information on Ingredients

Ingredient Name	CAS Number	% vol
Severely solvent refined heavy paraffinic petroleum oil	64741-88-4	90-100
Zinc dialkyl Dithiophosphats	68649-42-3	0-1
Butylated Phenol	n/a	0-1
Calcium Sulfonate	61789-86-4	0-1
Acrylic Copolymer	68171-46-0	0-1
2-Ethylhexanol	104-76-7	0-1

Trace Impurities:

	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH
Ingredient	TWA	STEL	TWA	STEL	TWA	STEL	IDLH
Severely solvent refined heavy paraffinic petroleum oil	5mg/m^3	-	5mg/m^3	-	n/a	n/a	n/a
Zinc dialkyl Dithiophosphats	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Butylated Phenol	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Calcium Sulfonate	n.a	n/a	n/a	n/a	n/a	n/a	n/a
Acrylic Copolymer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Ethylhexanol	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional exposure limits: Oil Mist	5mg/m^3		5mg/m^3				

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

HMIS	
H	1
F	1
R	0
PPE†	
†Sec. 8	

Potential Health Effects

Primary Entry Routes: Skin
Effects of Overexposure:

Inhalation: No effects expected
Eye: Contact with the eye may cause minimal irritation.
Skin: Practically non-toxic if absorbed (LD50 greater than 2000 mg/kg). May cause mild irritation with prolonged or repeated contact.
Ingestion: Practically non-toxic (LD50 > 15g/Kg).

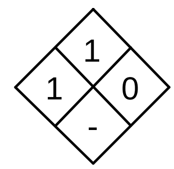
Section 4 - First Aid Measures

Inhalation: Move person to fresh air.
Eye: Flush with water.
Skin: Wash with soap and water until no odor remains. Wash clothing before reuse.
Swallowing: Practically non-toxic. Induction of vomiting not required. Obtain emergency medical attention. Small amounts which accidentally enter mouth should be rinsed out until taste of it is gone.

Other Information: Warning!! *High pressure injection of oil through the skin is a medial emergency. There may be no sign of injury and no initial pain. This oil must be removed completely by a physician. Failure to obtain immediate treatment has resulted in loss of a finger, hand or arm.*
WHMIS Classification: Not controlled.

Section 5 - Fire-Fighting Measures

NFPA



Flash Point: 380°F (192°C)
Flash Point Method: COC
Extinguishing Media: Water spray, regular foam, dry chemical, carbon dioxide.
Unusual Fire or Explosion Hazards: n/a
Fire-Fighting Procedures: Wear self-contained breathing apparatus. Wear structural firefighters protective clothing.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: n/a

Section 7 - Handling and Storage

Handling/ Storage Requirements: n/a

Section 8 - Exposure Controls / Personal Protection

N/A

Section 9 - Physical and Chemical Properties

Appearance and Odor: clear fluid, little odor
Odor Threshold: n/a
Vapor Pressure: <0.0001 (mm Hg at 20 °C)
Vapor Density (Air=1): 10 +
Formula Weight: n/a
Density: n/a
Specific Gravity (H_2O=1, at 4 °C): 0.87

Water Solubility: nil
Other Solubilities: n/a
Boiling Point: n/a
Melting Point: n/a
Viscosity: 165 sus @ 100°F. 32.0 CST @ 40 °C.
% Volatile: n/a
Evaporation Rate: 1000X slower (ehtyl ether = 1)

Section 10 - Stability and Reactivity

Stability: HYDRAULIC FLUID OD-15-10 is stable.
Polymerization: Hazardous polymerization will not occur.
Chemical Incompatibilities: Strong oxidizers.
Conditions to Avoid: n/a
Hazardous Decomposition Products: Combustion will produce carbon monoxide, oxides of sulfur and asphyxiants.

Section 11- Toxicological Information

n/a

Section 12 - Ecological Information

Ecotoxicity: n/a

Section 13 - Disposal Considerations

Disposal: n/a

Section 14 - Transport Information

n/a

Section 15 - Regulatory Information

n/a

Section 16 - Other Information

Prepared By: C. Bills
Revision Notes:

Disclaimer:

Material Safety Data Sheet

ENDURATEX ™ EP 1000

1 . Product and company identification

Product name : ENDURATEX ™ EP 1000

Code : ENT1000, 490-243

Material uses : Enduratex EP 1000 extreme pressure gear oil is suitable for enclosed helical, worm, spur and bevel gear assemblies which require an EP type ISO 1000 viscosity grade lubricant. It is specifically intended for use in heavy duty gears in the mining and resource industries.

Manufacturer : Petro-Canada Lubricants Inc.
2310 Lakeshore Road West
Mississauga, Ontario
Canada L5J 1K2

In case of emergency : Suncor Energy: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Viscous liquid.

Odour : Mild sulphur/phosphorus odour.

WHMIS (Canada) : Not controlled under WHMIS (Canada).

OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Emergency overview : No specific hazard.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Skin : Slightly irritating to the skin.

Eyes : Slightly irritating to the eyes.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : Not listed as carcinogenic by OSHA, NTP or IARC.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (Section 11)

3 . Composition/information on ingredients

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact	Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin contact	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
Notes to physician	No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product	May be combustible at high temperature.
Extinguishing media	
Suitable	Use an extinguishing agent suitable for the surrounding fire.
Not suitable	None known.
Special exposure hazards	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Products of combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), phosphorus oxides (POx), sulphur oxides (SOx), hydrogen sulfide (H2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Special protective equipment for fire-fighters	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Special remarks on fire hazards	Low fire hazard. This material must be heated before ignition will occur.
Special remarks on explosion hazards	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions	No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
Environmental precautions	Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
Methods for cleaning up	
Small spill	Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Mineral oil	**ACGIH TLV (United States). Notes: (Mineral oil)** TWA: 5 mg/m³, (Inhalable fraction)

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: neoprene, nitrile, polyvinyl alcohol (PVA), Viton®.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

8 . Exposure controls/personal protection

Skin	:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Environmental exposure controls	:	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	:	Viscous liquid.
Flash point	:	Open cup: 237°C (458.6°F) [Cleveland.]
Auto-ignition temperature	:	Not available.
Flammable limits	:	Not available.
Colour	:	Clear brown
Odour	:	Mild sulphur/phosphorus odour.
Odour threshold	:	Not available.
pH	:	Not available.
Boiling/condensation point	:	Not available.
Melting/freezing point	:	Not available.
Relative density	:	0.902 kg/L @ 15°C (59°F)
Vapour pressure	:	Not available.
Vapour density	:	Not available.
Volatility	:	Not available.
Evaporation rate	:	Not available.
Viscosity	:	1077 cSt @ 40°C (104°F), 55 cSt @ 100°C (212°F), VI=100
Pour point	:	-15°C (5°F)
Solubility	:	Not available.

10 . Stability and reactivity

Chemical stability	:	The product is stable.
Hazardous polymerisation	:	Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Mutagenicity

Conclusion/Summary : Not available.

11 . Toxicological information

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	Not regulated.	-	-	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Not regulated.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

15 . Regulatory information

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

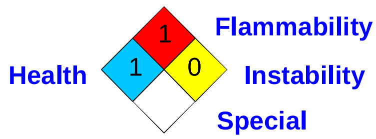
International lists : **China inventory (IECSC)**: All components are listed or exempted.

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	1
Flammability	1
Physical hazards	0
Personal protection	B

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **4/18/2011.**

Date of issue : 18 April 2011

Date of previous issue : 3/11/2009.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

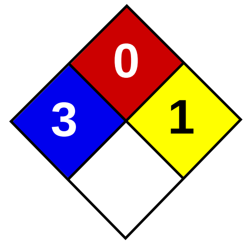
Internet: lubricants.petro-canada.ca/msds

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: 1-800-378-4518
Ontario & Central Canada, telephone: 1-800-268-5850; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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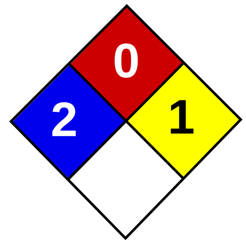
Last Updated: 11/01/2010 12:00 PM



Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet
Hydrogen Peroxide 30% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrogen Peroxide 30%

Catalog Codes: SLH1552

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Hydrogen Peroxide

CI#: Not applicable.

Synonym: Hydrogen Peroxide 30%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	70
Hydrogen Peroxide	7722-84-1	30

Toxicological Data on Ingredients: Hydrogen Peroxide: ORAL (LD50): Acute: 2000 mg/kg [Mouse]. DERMAL (LD50): Acute: 4060 mg/kg [Rat]. 2000 mg/kg [pig]. VAPOR (LC50): Acute: 2000 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: combustible materials

Explosion Hazards in Presence of Various Substances: Slightly explosive in presence of open flames and sparks, of heat, of organic materials, of metals, of acids.

Fire Fighting Media and Instructions:
Fire: Small fires: Use water. Do not use dry chemicals or foams. CO2, or Halon may provide limited control. Large fires: Flood fire area with water from a distance. Move containers from fire area if you can do it without risk. Do not move cargo or vehicle if cargo has been exposed to heat. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. / Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide, aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-140]

Special Remarks on Fire Hazards:
Most cellulose (wood, cotton) materials contain enough catalyst to cause spontaneous ignition with 90% Hydrogen Peroxide. Hydrogen Peroxide is a strong oxider. It is not flammable itself, but it can cause spontaneous combustion of flammable materials and continued support of the combustion because it liberates oxygen as it decomposes. Hydrogen peroxide mixed with magnesium and a trace of magnesium dioxide will ignite immediately.

Special Remarks on Explosion Hazards:

Soluble fuels (acetone, ethanol, glycerol) will detonate on a mixture with peroxide over 30% concentration, the violence increasing with concentration. Explosive with acetic acid, acetic anhydride, acetone, alcohols, carboxylic acids, nitrogen containing bases, As_2S_3, Cl_2 + KOH, FeS, $FeSO_4$ + 2 methylpryidine + H_2SO_4, nitric acid, potassium permanganate, P_2O_5, H_2Se, Alcohols + H_2SO_4, Alcohols + tin chloride, Antimoy trisulfide, chlorosulfonic acid, Aromatic hydrocarbons + trifluoroacetic acid, Azeliac acid + sulfuric acid (above 45 C), Benzenesulfonic anhydride, tert-butanol + sulfuric acid, Hydrazine, Sulfuric acid, Sodium iodate, Tetrahydrothiophene, Thiodiglycol, Mercurous oxide, mercuric oxide, Lead dioxide, Lead oxide, Manganese dioxide, Lead sulfide, Gallium + HCl, Ketenes + nitric acid, Iron (II) sulfate + 2-methylpyridine + sulfuric acid, Iron (II) sulfate + nitric acid, + sodium carboxymethylcellulose (when evaporated), Vinyl acetate, trioxane, water + oxygenated compounds (eg: acetaldehyde, acetic acid, acetone, ethanol, formaldehyde, formic acid, methanol, 2-propanol, propionaldehyde), organic compounds. Beware: Many mixitures of hydrogen peroxide and organic materials may not explode upon contact. However, the resulting combination is detonatable either upon catching fire or by impact. EXPLOSION HAZARD: SEVERE, WHEN HIGHLY CONCENTRATED OR PURE H_2O_2 IS EXPOSED TO HEAT, MECHANICAL IMPACT, OR CAUSED TO DECOMPOSE CATALYTICALLY BY METALS & THEIR SALTS, DUSTS & ALKALIES. ANOTHER SOURCE OF HYDROGEN PEROXIDE EXPLOSIONS IS FROM SEALING THE MATERIAL IN STRONG CONTAINERS. UNDER SUCH CONDITIONS EVEN GRADUAL DECOMPOSITION OF HYDROGEN PEROXIDE TO WATER + 1/2 OXYGEN CAN CAUSE LARGE PRESSURES TO BUILD UP IN THE CONTAINERS WHICH MAY BURST EXPLOSIVELY. Fire or explosion: May explode from friction, heat or contamination. These substances will accelerate burning when involved in a fire. May ignite combustibles (wood, paper, oil, clothing, etc.). Some will react explosively with hydrocarbons (fuels). Containers may explode when heated. Runoff may create fire or explosion hazard. /Hydrogen peroxide, aqueous solution, stabilized, with more than 60% Hydrogen peroxide; Hydrogen peroxide, stabilized/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-143] . Fire or explosion: These substances will accelerate burning when involved in a fire. Some may decompose explosively when heated or involved in a fire. May explode from heat or contamination. Some will react explosively with hydrocarbons (fuels). May ignite combustibles (wood, paper, oil, clothing, etc.). Containers may explode when heated. Runoff may create fire or explosion hazard. /Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide, aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-140] (Hydrogen Peroxide)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Corrosive liquid. Oxidizing material. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 8°C (46.4°F). Refrigerate Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Hydrogen Peroxide TWA: 1 (ppm) from ACGIH (TLV) [United States] TWA: 1 (ppm) from OSHA (PEL) [United States] TWA: 1 STEL: 2 [Canada] TWA: 1.4 (mg/m3) from NIOSH TWA: 1.4 (mg/m3) from OSHA (PEL) [United States] TWA: 1 (ppm) [United Kingdom (UK)] TWA: 1.4 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Odorless.

Taste: Slightly acid. Bitter

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Not available

Boiling Point: 108°C (226.4°F)

Melting Point: -33°C (-27.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.1 (Water = 1)

Vapor Pressure: 3.1 kPa (@ 20°C)

Vapor Density: 1.1 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in cold water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable. It contains a stabilizer.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with reducing agents, combustible materials, organic materials, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Light sensitive. Incompatible with reducing materials, ethers (dioxane, furfuran, tetrahydrofuran), oxidizing materials, Metals(eg. potassium, sodium lithium, iron, copper, brass, bronze, chromium, zinc, lead, silver, nickel), metal oxides (eg. cobalt oxide, iron oxide, lead oxide, lead hydroxide, manganese oxide), metal salts (eg. calcium permanganate, salts of iron), manganese, asbestos, vanadium, platinium, tungsten, molybdeum, triethylamine, palladium, sodium pyrophosphate, carboxylic acids, cyclopentadiene, formic acid, rust, ketones, sodium carbonate, alcohols, sodium borate, aniline, mercurous chloride, rust, nitric acid, sodium pyrophosphate, hexavalent chromium compounds, tetrahydrofuran, sodium fluoride organic matter, potassium permanganate, urea, chlorosulfonic acid, manganese dioxide, hydrogen selenide, charcoal, coal, sodium borate, alkalies, cyclopentadiene, glycerine, cyanides (potassium, cyanide, sodium cyanide), nitrogen compounds.. Caused to decompose catalytically by metals (in order of decreasing effectiveness): Osmium, Palladium, Platinum, Iridium, Gold, Silver, Manganese, Cobalt, Copper, Lead. Concentrated hydrogen peroxide may decompose violently or explosively in contact with iron, copper, chromium, and most other metals and their salts, and dust. (Hydrogen Peroxide)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact.

Toxicity to Animals:
Acute oral toxicity (LD50): 6667 mg/kg (Mouse) (Calculated value for the mixture). Acute dermal toxicity (LD50): 6667 mg/kg (pig) (Calculated value for the mixture).

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH [Hydrogen Peroxide]. Classified 3 (Not classifiable for human.) by IARC [Hydrogen Peroxide]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Hydrogen Peroxide]. Mutagenic for bacteria and/or yeast. [Hydrogen Peroxide]. Contains material which may cause damage to the following organs: blood, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of ingestion, of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer and may affect genetic material based on animal data. May be tumorigenic. (Hydrogen Peroxide)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes severe skin irritation and possible burns. Absorption into skin may affect behavior/central nervous system (tremor, ataxia, convulsions), respiration (dyspnea, pulmonary emboli), brain. Eyes: Causes severe eye irritation, superficial clouding, corneal edema, and may cause burns. Inhalation: Causes respiratory tract irritation with coughing, lacrimation. May cause chemical burns to the respiratory tract. May affect behavior/Central nervous system (insomnia, headache, ataxia, nervous tremors with numb extremities) and may cause ulceration of nasal tissue, and , chemical pneumonia, unconciousness, and possible death. At high concentrations, respiratory effects may include acute lung damage, and delayed pulmonary edema. May affect blood. Ingestion: Causes gastrointestional tract irritation with nausea, vomiting, hypermotility, and diarrhea. Causes gastrointestional tract burns. May affect cardiovascular system and cause vascular collapse and damage. May affect blood (change in leukocyte count, pigmented or nucleated red blood cells). May cause difficulty in swallowing, stomach distension and possible cerebal swelling. May affect behavior/central nervous system (tetany, excitement). Chronic Potential Health Effects: Prolonged or repeated skin contact may cause dermatitis. Repeated contact may also cause corneal damage. Prolonged or repeated ingestion may affect metabolism (weight loss). Prolonged or repeated inhalation may affect respiration, blood. (Hydrogen Peroxide)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short/long term degradation products are to be expected.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Hydrogen peroxide, aqueous solution UNNA: 2014 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York acutely hazardous substances: Hydrogen Peroxide Rhode Island RTK hazardous substances: Hydrogen Peroxide Pennsylvania RTK: Hydrogen Peroxide Florida: Hydrogen Peroxide Minnesota: Hydrogen Peroxide Massachusetts RTK: Hydrogen Peroxide New Jersey: Hydrogen Peroxide TSCA 8(b) inventory: Hydrogen Peroxide SARA 302/304/311/312 extremely hazardous substances: Hydrogen Peroxide CERCLA: Hazardous substances.: Hydrogen Peroxide: 1 lbs. (0.4536 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive liquid. CLASS F: Dangerously reactive material.

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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MATERIAL SAFETY DATA SHEET

Ashland

Date Prepared: 08/18/04
Date Printed: 01/06/07
MSDS No: 306.0186241-003.004

MILLSPERSE 802 ANTISCALANT

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity

Product Name: MILLSPERSE 802 ANTISCALANT
Product Code:
General or Generic ID: ANTISCALANT

Company

Ashland
Ashland Distribution Co. &
Ashland Specialty Chemical Co.
P. O. Box 2219
Columbus, OH 43216
614-790-3333

Emergency Telephone Number:

1-800-ASHLAND (1-800-274-5263)
24 hours everyday

Regulatory Information Number:
1-800-325-3751

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
POLY(MALEIC ACID)	26099-09-2	5.0- 15.0
ORGANIC ACID		1.0- 10.0

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye

Can cause permanent eye injury. Symptoms include stinging, tearing, redness, and swelling of eyes. Can injure the cornea and cause blindness.

Skin

Can cause permanent skin damage. Symptoms may include redness, burning, and swelling of skin, burns, and other skin damage.

Swallowing

Swallowing this material may be harmful or fatal. Symptoms may include severe stomach and intestinal irritation (nausea, vomiting, diarrhea), abdominal pain, and vomiting of blood. Swallowing this material may cause burns and destroy tissue in the mouth, throat, and digestive tract. Low blood pressure and shock may occur as a result of severe tissue injury.

Inhalation

Breathing this material may be harmful or fatal. Symptoms may include severe irritation and burns to the nose, throat, and respiratory tract.

Symptoms of Exposure

Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), lung edema (fluid buildup in the lung tissue).

Continued on next page

Target Organ Effects
No data

Developmental Information
Based on the available information, risk to the fetus from maternal exposure to this material cannot be assessed.

Cancer Information
This material is not expected to cause cancer in humans since it did not cause cancer in laboratory animals. This material is not listed as a carcinogen by the International Agency for Research on Cancer, the National Toxicology Program, or the Occupational Safety and Health Administration.

Other Health Effects
No data

Primary Route(s) of Entry
Inhalation, Skin contact, Eye contact, Ingestion - Industrial products are not meant to be swallowed.

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4. FIRST AID MEASURES

Eyes
If material gets into the eyes, immediately flush eyes gently with water for at least 15 minutes while holding eyelids apart. If symptoms develop as a result of vapor exposure, immediately move individual away from exposure and into fresh air before flushing as recommended above. Seek immediate medical attention.

Skin
Immediately flush skin with water for at least 15 minutes while removing contaminated clothing and shoes. Seek immediate medical attention. Wash clothing before reuse and discard contaminated shoes.

Swallowing
Seek immediate medical attention. Do not induce vomiting. Vomiting will cause further damage to the mouth and throat. If individual is conscious and alert, immediately rinse mouth with water and give milk or water to drink. If possible, do not leave individual unattended.

Inhalation
If symptoms develop, immediately move individual away from exposure and into fresh air. Seek immediate medical attention; keep person warm and quiet. If person is not breathing, begin artificial respiration. If breathing is difficult, administer oxygen.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin, lung (for example, asthma-like conditions), eye.

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5. FIRE FIGHTING MEASURES

Flash Point
Not applicable

Continued on next page

Explosive Limit
Not applicable

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: carbon dioxide and carbon monoxide.

Fire and Explosion Hazards
No special fire hazards are known to be associated with this product.

Extinguishing Media
Use an extinguishing media appropriate for surrounding fire.

Fire Fighting Instructions
Use water spray to cool fire exposed containers and structures until fire is out if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes. Wear full firefighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

NFPA Rating
Health - 3, Flammability - 0, Reactivity - 1

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6. ACCIDENTAL RELEASE MEASURES

Small Spill
Absorb liquid on vermiculite, floor absorbent or other absorbent material. Scoop or scrape up. Put in container for recovery or disposal. May be neutralized with soda ash, TSP, or bicarbonate of soda.

Large Spill
Persons not wearing protective equipment should be excluded from area of spill. Stop spill at source. Dike to prevent spreading. Carefully add lime or sodium carbonate to neutralize acid. Place residue in a container for disposal.

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7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed.

Storage
Product solutions are corrosive to many commonly used materials of construction such as steel, galvanized iron, aluminum, tin and zinc. These solutions can be stored and handled in baked phenolic-lined steel, polyethylene, stainless steel, or reinforced epoxy-plastic equipment. Store in closed containers in a dry, well-ventilated area.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Chemical splash goggles and face shield (8" min.) in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. (Consult your industrial hygienist.)

Continued on next page

Skin Protection
Wear resistant gloves such as: nitrile rubber, polyvinyl chloride, To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear acid-resistant apron, or in emergency conditions, acid-resistant clothing and boots.

Respiratory Protections
If overexposure has been determined or documented, a NIOSH/MSHA jointly approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators under specified conditions. (See your safety equipment supplier.) Engineering or administrative controls should be implemented to reduce exposure.

Engineering Controls
Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below level of overexposure (from known, suspected or apparent adverse effects).

Exposure Guidelines
Component

POLY(MALEIC ACID) (26099-09-2)
No exposure limits established

ORGANIC ACID
No exposure limits established

9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point
(for component) 212.0 F (100.0 C)

Vapor Pressure
(for component) 17.500 mmHg

Specific Vapor Density
< 1.000 @ AIR=1

Specific Gravity
1.040 @ 77.00 F

Liquid Density
8.654 lbs/gal @ 77.00 F
1.040 kg/l @ 25.00 C

Percent Volatiles
85.0 - 100.0 %

Evaporation Rate
SLOWER THAN ETHYL ETHER

Continued on next page

Appearance
CLEAR, STRAW YELLOW LIQUID

State
LIQUID

Physical Form
HOMOGENEOUS SOLUTION

Color
CLEAR, STRAW YELLOW

Odor
No data

pH
1.4 - 2.2

10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: carbon dioxide and carbon monoxide.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: nitrites, strong alkalis, strong oxidizing agents, sulphites.

11. TOXICOLOGICAL INFORMATION

This mixture has not been specifically tested.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information
This mixture has not been specifically tested.

13. DISPOSAL CONSIDERATION

Waste Management Information
Dispose of in accordance with all applicable local, state and federal regulations. For assistance with your waste management needs - including disposal, recycling and waste stream reduction, contact Ashland Distribution Company, IC&S Environmental Services Group at 800-531-7106.

Continued on next page

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14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101

DOT Description:
NON-REGULATED BY D.O.T.

Container/Mode:
55 GAL DRUM/TRUCK PACKAGE

NOS Component:
None

RQ (Reportable Quantity) - 49 CFR 172.101
Not applicable

Other Transportation Information
The Transport Information may vary with the container and mode of shipment.

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15. REGULATORY INFORMATION

US Federal Regulations

TSCA (Toxic Substances Control Act) Status
TSCA (UNITED STATES) The intentional ingredients of this product are listed

CERCLA RQ - 40 CFR 302.4(a)
None

CERCLA RQ - 40 CFR 302.4(b)
This material has a RQ of 100 lbs as a D002 Corrosive unlisted hazardous substance.

SARA 302 Components - 40 CFR 355 Appendix A
None

Section 311/312 Hazard Class - 40 CFR 370.2
Immediate(X) Delayed( ) Fire( ) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65
None

OSHA Process Safety Management 29 CFR 1910
None listed

EPA Accidental Release Prevention 40 CFR 68
None listed

International Regulations

Inventory Status
DSL (CANADA) The intentional ingredients of this product are listed.

State and Local Regulations

California Proposition 65
None

Continued on next page

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

Material Safety Data Sheet

Section 1: PRODUCT AND COMPANY INFORMATION

Product Name(s): Lafarge Hydrated Lime

Product Identifiers: Hydrated Lime, Slaked Lime, Dolomitic Hydrated Lime, Lime, Caustic Lime, Lime Hydrate, Calcium Hydroxide, Calcium Dihydroxide, Calcium Magnesium Hydroxide, Type N Lime, Type S Lime

Manufacturer:
Lafarge North America Inc.
12018 Sunrise Valley Drive, Suite 500
Reston, VA 20191

Information Telephone Number:
703-480-3600 (9am to 5pm EST)

Emergency Telephone Number:
1-800-451-8346 (3E Hotline)

Product Use: Hydrated lime is used as an additive for mortar, cement, concrete and concrete products. It is also used in soil stabilization, as an anti-stripping agent in asphalt, for pH adjustment, and in other products that are widely used in construction.

Note: This MSDS covers many types of hydrated lime. Individual composition of hazardous constituents will vary between types of hydrated lime.

Section 2: COMPOSITION/INFORMATION ON INGREDIENTS

Component	Percent (By Weight)	CAS Number	OSHA PEL -TWA (mg/m^3)	ACGIH TLV-TWA (mg/m^3)	LD_{50} (mouse)	LC_{50}
Calcium Hydroxide	50-95	1305-62-0	15 (T); 5 (R)	5 (T)	7300mg/kg, oral	NA
Magnesium Hydroxide	0-50	1309-42-8	NA	NA	8500mg/kg, oral	NA
Calcium Oxide	0-5	1305-78-8	5 (T)	2 (T)	3059 mg/kg, intraperitoneal	NA
Magnesium Oxide	0-5	1309-48-4	15 (T)	10 (T)	NA	NA
Calcium Carbonate*	0-3	1317-65-3	15 (T), 5 (R)	3 (R); 10 (T)	NA	NA
Crystalline Silica	0-1	14808-60-7	[(10) / (%SiO_2+2)] (R); [(30) / (%SiO_2+2)] (T)	0.025 (R)	NA	NA

Note: Exposure limits for components noted with an * contain no asbestos and <1% crystalline silica

Hydrated lime is produced from the slow addition of water to crushed or ground quicklime (calcium oxide) which is produced by burning various forms of limestone. Trace amounts of chemicals may be detected during chemical analysis. For example, hydrated lime may contain trace amounts of iron oxide, aluminum oxide, fluoride compounds, and other trace compounds.

Section 3: HAZARD IDENTIFICATION

WARNING

Corrosive - Causes severe burns.
Toxic - Harmful by inhalation.
(Contains crystalline silica)

Use proper engineering controls, work practices, and personal protective equipment to prevent exposure to wet or dry product.

Read MSDS for details.

Revised: 03/01/11

Section 3: HAZARD IDENTIFICATION (continued)

Emergency Overview:	Hydrated lime is a granular, white or grey, odorless powder. It is not combustible or explosive. A single, short-term exposure to the dry powder presents little or no hazard. Exposure of sufficient duration to hydrated lime can cause serious, potentially irreversible tissue (skin, eye, respiratory tract) damage due to chemical (caustic) burns, including third degree burns.
Potential Health Effects:	
Eye Contact:	Airborne dust may cause immediate or delayed irritation or inflammation. Eye contact with large amounts of dry powder or with wet hydrated lime can cause moderate eye irritation, chemical burns and blindness. Eye exposures require immediate first aid and medical attention to prevent significant damage to the eye.
Skin Contact:	Hydrated lime may cause dry skin, discomfort, irritation, and severe burns.
Burns:	Exposure of sufficient duration to wet hydrated lime, or to dry hydrated lime on moist areas of the body, can cause serious, potentially irreversible damage to skin, eye, respiratory and digestive tracts due to chemical (caustic) burns, including third degree burns. A skin exposure may be hazardous even if there is no pain or discomfort.
Inhalation (acute):	Breathing dust may cause nose, throat or lung irritation, including choking, depending on the degree of exposure. Inhalation of high levels of dust can cause chemical burns to the nose, throat and lungs.
Inhalation (chronic):	Risk of injury depends on duration and level of exposure.
Silicosis:	This product contains crystalline silica. Prolonged or repeated inhalation of respirable crystalline silica from this product can cause silicosis, a seriously disabling and fatal lung disease. See Note to Physicians in Section 4 for further information.
Carcinogenicity:	Hydrated lime is not listed as a carcinogen by IARC or NTP; however, hydrated lime contains trace amounts of crystalline silica which is classified by IARC and NTP as known human carcinogen.
Autoimmune Disease:	Some studies show that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis may be associated with the increased incidence of several autoimmune disorders such as scleroderma (thickening of the skin), systemic lupus erythematosus, rheumatoid arthritis and diseases affecting the kidneys.
Tuberculosis:	Silicosis increases the risk of tuberculosis.
Renal Disease:	Some studies show an increased incidence of chronic kidney disease and end-stage renal disease in workers exposed to respirable crystalline silica.
Ingestion:	Do not ingest hydrated lime. Although ingestion of small quantities of hydrated lime is not known to be harmful, large quantities can cause chemical burns in the mouth, throat, stomach, and digestive tract.
Medical Conditions Aggravated by Exposure:	Individuals with lung disease (e.g. bronchitis, emphysema, COPD, pulmonary disease) can be aggravated by exposure.

Section 4: FIRST AID MEASURES

Eye Contact: Rinse eyes thoroughly with water for at least 15 minutes, including under lids, to remove all particles. Seek medical attention for abrasions and burns.

Skin Contact: Wash with cool water and a pH neutral soap or a mild skin detergent. Seek medical attention for rash, burns, irritation, and prolonged unprotected exposures to wet hydrated lime, cement, cement mixtures or liquids from wet cement.

Inhalation: Move person to fresh air. Seek medical attention for discomfort or if coughing or other symptoms do not subside.

Ingestion: Do not induce vomiting. If conscious, have person drink plenty of water. Seek medical attention or contact poison control center immediately.

Note to Physician: The three types of silicosis include:

- Simple chronic silicosis – which results from long-term exposure (more than 20 years) to low amounts of respirable crystalline silica. Nodules of chronic inflammation and scarring provoked by the respirable crystalline silica form in the lungs and chest lymph nodes. This disease may feature breathlessness and may resemble chronic obstructive pulmonary disease (COPD).
- Accelerated silicosis – occurs after exposure to larger amounts of respirable crystalline silica over a shorter period of time (5-15 years). Inflammation, scarring, and symptoms progress faster in accelerated silicosis than in simple silicosis.
- Acute silicosis – results from short-term exposure to very large amounts of respirable crystalline silica. The lungs become very inflamed and may fill with fluid, causing severe shortness of breath and low blood oxygen levels.

Progressive massive fibrosis may occur in simple or accelerated silicosis, but is more common in the accelerated form. Progressive massive fibrosis results from severe scarring and leads to the destruction of normal lung structures.

Section 5: FIREFIGHTING MEASURES

Flashpoint & Method: Non-combustible

General Hazard: Avoid breathing dust. Hydrated lime is caustic.

Extinguishing Media: Use extinguishing media appropriate for surrounding fire.

Firefighting Equipment: Hydrated lime poses no fire-related hazard. A SCBA is recommended to limit exposures to combustion products when fighting any fire.

Combustion Products: None.

Section 6: ACCIDENTAL RELEASE MEASURES

General: Place spilled material into a container. Avoid actions that cause the hydrated lime to become airborne. Avoid inhalation of hydrated lime and contact with skin. Wear appropriate protective equipment as described in Section 8. Scrape wet hydrated lime and place in container. Allow material to dry or solidify before disposal. Do not wash hydrated lime down sewage and drainage systems or into bodies of water (e.g. streams).

Waste Disposal Method: Dispose of hydrated lime according to Federal, State, Provincial and Local regulations.

Section 7: HANDLING AND STORAGE

General: Keep bulk and bagged hydrated lime dry until used. Stack bagged material in a secure manner to prevent falling. Bagged material is heavy and poses risks such as sprains and strains to the back, arms, shoulders and legs during lifting and mixing. Handle with care and use appropriate control measures.

Engulfment hazard. To prevent burial or suffocation, do not enter a confined space, such as a silo, bin, bulk truck, or other storage container or vessel that stores or contains hydrated lime. Hydrated lime can buildup or adhere to the walls of a confined space. The hydrated lime can release, collapse or fall unexpectedly.

Usage: Cutting, crushing or grinding hardened cement, concrete or other crystalline silica-bearing materials will release respirable crystalline silica. Use all appropriate measures of dust control or suppression, and Personal Protective Equipment (PPE) described in Section 8 below.

Housekeeping: Avoid actions that cause the hydrated lime to become airborne during clean-up such as dry sweeping or using compressed air. Use HEPA vacuum to clean-up dust. Use PPE described in Section 8 below.

Storage Temperature: Unlimited. **Storage Pressure:** Unlimited.

Storage: Sore in a cool, dry and well ventilated location. Do not store near incompatible materials. Keep away from moisture. Do not store or ship in aluminum containers.

Clothing: Promptly remove and launder clothing that is dusty or wet with hydrated lime. Thoroughly wash skin after exposure to dust or wet hydrated lime.

Section 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls: Use local exhaust or general dilution ventilation or other suppression methods to maintain dust levels below exposure limits.

Personal Protective Equipment (PPE):

Respiratory Protection: Under ordinary conditions no respiratory protection is required. Wear a NIOSH approved respirator that is properly fitted and is in good condition when exposed to dust above exposure limits.

Eye Protection: Wear ANSI approved glasses or safety goggles when handling dust or wet hydrated lime to prevent contact with eyes. Wearing contact lenses when using hydrated lime, under dusty conditions, is not recommended.

Skin Protection: Wear gloves, boot covers and protective clothing impervious to water to prevent skin contact. Do not rely on barrier creams, in place of impervious gloves. Remove clothing and protective equipment that becomes saturated with wet hydrated lime and immediately wash exposed areas.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid (powder).	**Evaporation Rate:**	NA.
Appearance:	White or grey powder.	**pH (in water):**	12-13
Odor:	None.	**Boiling Point:**	>1000° C
Vapor Pressure:	NA.	**Freezing Point:**	None, solid.
Vapor Density:	NA.	**Viscosity:**	None, solid.
Specific Gravity:	2-3	**Solubility in Water:**	Negligible

Section 10: STABILITY AND REACTIVITY

Stability: Stable, but reacts slowly with carbon dioxide to form calcium and magnesium carbonate. Keep dry until use. Hydrated lime may react with water, resulting in a slight release of heat, depending on the amount of lime (Calcium oxide) present. Avoid contact with incompatible materials.

Incompatibility: Wet hydrated lime and cement is alkaline and is incompatible with acids, ammonium salts and aluminum metal. Hydrated lime and cement dissolves in hydrofluoric acid, producing corrosive silicon tetrafluoride gas. Hydrated lime and cement reacts with water to form silicates and calcium hydroxide. Silicates react with powerful oxidizers such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride.

Hazardous Polymerization: None.

Hazardous Decomposition: Hydrated lime will decompose at 540°C to produce calcium oxide (quicklime), magnesium oxide, and water.

Section 11 and 12: TOXICOLOGICAL AND ECOLOGICAL INFORMATION

For questions regarding toxicological and ecological information refer to contact information in Section 1.

Section 13: DISPOSAL CONSIDERATIONS

Dispose of waste and containers in compliance with applicable Federal, State, Provincial and Local regulations.

Section 14: TRANSPORT INFORMATION

This product is not classified as a Hazardous Material under U.S. DOT or Canadian TDG regulations.

Section 15: REGULATORY INFORMATION

OSHA/MSHA Hazard Communication: This product is considered by OSHA/MSHA to be a hazardous chemical and should be included in the employer's hazard communication program.

CERCLA/SUPERFUND: This product is not listed as a CERCLA hazardous substance.

EPCRA SARA Title III: This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 and is considered a hazardous chemical and a delayed health hazard.

EPRCA SARA Section 313: This product contains none of the substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

RCRA: If discarded in its purchased form, this product would not be a hazardous waste either by listing or characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.

TSCA: Hydrated lime and crystalline silica are exempt from reporting under the inventory update rule.

California Proposition 65: Crystalline silica (airborne particulates of respirable size) is known by the State of California to cause cancer.

Section 15: REGULATORY INFORMATION (continued)

WHMIS/DSL: Products containing crystalline silica and calcium carbonate are classified as D2A, E and are subject to WHMIS requirements.

Section 16: OTHER INFORMATION

Abbreviations:

>	Greater than	NA	Not Applicable
ACGIH	American Conference of Governmental Industrial Hygienists	NFPA	National Fire Protection Association
CAS No	Chemical Abstract Service number	NIOSH	National Institute for Occupational Safety and Health
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act	NTP	National Toxicology Program
		OSHA	Occupational Safety and Health Administration
CFR	Code for Federal Regulations	PEL	Permissible Exposure Limit
CL	Ceiling Limit	pH	Negative log of hydrogen ion
DOT	U.S. Department of Transportation	PPE	Personal Protective Equipment
EST	Eastern Standard Time	R	Respirable Particulate
HEPA	High-Efficiency Particulate Air	RCRA	Resource Conservation and Recovery Act
HMIS	Hazardous Materials Identification System	SARA	Superfund Amendments and Reauthorization Act
IARC	International Agency for Research on Cancer	T	Total Particulate
		TDG	Transportation of Dangerous Goods
LC_{50}	Lethal Concentration	TLV	Threshold Limit Value
LD_{50}	Lethal Dose	TWA	Time Weighted Average (8 hour)
mg/m^3	Milligrams per cubic meter	WHMIS	Workplace Hazardous Materials Information System
MSHA	Mine Safety and Health Administration		

This MSDS (Sections 1-16) was revised on March 1, 2011.

An electronic version of this MSDS is available at: www.lafarge-na.com under the Sustainability section.

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NO WARRANTY IS MADE, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE.

MATERIAL SAFETY DATA SHEET

SECTION I – PRODUCT INFORMATION

Product Name: Propane
Trade Name: LPG (Liquefied Petroleum Gas)
Chemical Formula: C3H8
WHMIS Classification: Class A – Compressed Gas
Class B, Division I – Flammable Gas

Supplier:

Business:

Non Medical Emergency:

Uses and Occurrence: Propane is commonly used as fuel for heating, cooking, automobiles, forklift trucks, crop drying and welding and cutting operations. Propane is used in industry as a refrigerant, solvent and as a chemical feedstock.

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT

All components of this product are either on the Domestic Substances List (DSL) or are exempt.

SECTION II – HAZARDOUS INGREDIENTS

Components	CAS Registry No.	Proportion of Product	LC50	LD50
Propane	74-98-6	95% - 98%	N/A	N/A
Ethane	74-84-0	3% - 5%	N/A	N/A
Butane	106-97-8	1% - 3%	N/A	N/A
Iso-Butane	75-28-5	0.1% - 0.3%	N/A	N/A
Methane	74-82-8	0.1% - 0.2%	N/A	N/A

Note: Composition given is typical for Grade 1 Propane; exact composition will vary from shipment to shipment.

- Explanation for change – HD5 refers to American specification, Grade 1 is Canadian equivalent in CGSB 3.14 Standard

SECTION III – CHEMICAL AND PHYSICAL DATA

Form: While stored under pressure – liquid and/or vapour
Boiling Point: -42 ^{o}C atm
Freezing Point: -188 ^{o}C
Evapouration Rate: Rapid (Gas at Normal Ambient Conditions)
Vapour Pressure: 1,013 (kPa) @ 26.0 ^{o}C
Vapour Density: 1.52 (Air = 1)
Coefficient of Water/Oil Distribution: Not available
PH: Not available
Soluble in Water: 6.1% by Volume @ 17.8 ^{o}C and 753 mmHg
Specific Gravity: 0.51 (Water = 1)
Appearance: Colourless liquid and vapour while stored under pressure.
Colourless and odourless gas in natural state at any concentration.
Commercial propane has an odourant added which is commonly ethyl mercaptan which has an odour similar to boiling cabbage or rotten eggs.
Odour Threshold: 4800 PPM
See Note 1 - Odourants

SECTION IV – FIRE OR EXPLOSION HAZARD DATA

Flash Point: -103.4 ^{o}C **Method**: Closed Cup
Flammable Limits: Lower 2.4%, Upper 9.5%
Auto Ignition Temperature: 432 ^{o}C
Products Evolved Due to Heat or Combustion: Carbon monoxide can be produced when primary and secondary airs are deficient while combustion is taking place.
Fire and Explosive Hazards: Explosive air-vapour mixtures may form if allowed to leak to atmosphere.
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes
Fire Extinguishing Precautions: Use water spray to cool exposed cylinders or tanks. Do not extinguish fire unless the source of the escaping gas that is fuelling the fire can be turned off. Fire can be extinguished with carbon dioxide and/or dry chemical (BC). Container metal shells require cooling with water to prevent flame impingement and the weakening of metal. If weakening, the area must be evacuated. If gas has not ignited, liquid and vapour may be dispersed by water spray or flooding.
Special Fire Fighting Equipment: Protective clothing, hose monitors, fog nozzles, self contained breathing apparatus.

SECTION V – REACTIVITY DATA

Stability: Stable
Conditions to Avoid: Keep separate from oxidizing agents. Gas explodes spontaneously when mixed with chlorine dioxide.
Incompatibility: Remove sources of ignition and observe distance requirements for storage tanks from combustible material, drains, and openings to buildings.
Hazardous Decomposition Products: Deficient primary and secondary air can produce carbon monoxide.
Hazardous Polymerization: Will not occur.

SECTION VI – TOXICOLOGICAL PROPERTIES OF MATERIAL

ACUTE EXPOSURE:

Eyes: As a gas, none, Liquid causes "cold burns'.
Respiratory System: Little physiological effect at concentrations below 10.000 PPM. Higher concentrations may cause dizziness and unconsciousness due to asphyxiation. ***SEE NOTE 2 – ASPHYXIANT.***
Chronic Exposure: There are no reported effects from long-term low-level exposure.
Other: Liquid can cause burns and frostbite if in direct contact with skin.
Sensitization Properties: Skin – unknown, **Respiratory** – unknown.
Carcinogenicity: Not determined. ***SEE NOTE 3 (NORM).***

MEDIAN LETHAL DOSE:
Oral: Not applicable for gas.
Inhalation: Not determined.
Dermal: Not applicable for gas.
Other: Not determined.
IRRITATION INDEX:
Skin: No appreciable effect (gas).
Eyes: No appreciable effect (gas).
Symptoms of Exposure: Above 10,000 PPM – dizziness, stupor, unconsciousness. ***SEE NOTE 2 attached.*** American Conference of Governmental Industrial Hygienists (ACGIH) classifies propane as an asphyxiate; there is no recommended "Threshold Limit Value" (TLV).
Teratogenicity: Not determined.
Mutagenicity: Not determined.

SECTION VII – OCCUPATION CONTROL PROCEDURES

Eyes: Safety glasses, goggles, or face shield required when transferring product.
Skin: Insulated gloves if contact with liquid or liquid cooled equipment is expected. Wear gloves and long sleeves when transferring product.
Inhalation: In atmosphere, where the concentration of propane would reduce oxygen level below 18% in inhaled air, self contained breathing apparatus required. ***SEE NOTE 3 – (NORM).***
Ventilation: Explosion proof ventilation equipment required in confined spaces.

SECTION VIII – EMERGENCY AND FIRST AID PROCEDURES

FIRST AID:
Eyes: Should eye contact with liquid occur, flush eyes with lukewarm water for 15 minutes. Obtain immediate medical care.
Skin: In case of "Cold Burn" from contact with liquid, immediately place affected area in lukewarm water and keep at this temperature until circulation returns. If fingers or hands are frostbitten, have the victim hold his hand next to his body such as under the armpit. Obtain immediate medical care.

SPILL OR LEAK:
Eliminate leak if possible.
Eliminate source of ignition.
Ensure cylinder is upright.
Disperse vapours with hose streams using fog nozzles, watch for low area, as propane is heavier than air and can settle in low areas. Remain upwind of leak, keep people away.
Prevent vapour and/or liquid from entering into sewers, basements or confined areas.

SECTION 1X – TRANSPORTATION, HANDLING AND STORAGE

- Transport and store cylinders and tanks secured in an upright position in a ventilated space, away from ignition sources (so relief valve is in contact with vapour space of cylinder or tank).
- Cylinders that are not in use must have the valves in the closed position and be equipped with a protective cap or guard.
- Do not store with oxidizing agents, oxygen or chlorine cylinders.
- Transport, handle and store according to applicable federal and provincial regulations (CGA B149.2). ***SEE NOTE 4 – MAGNETIC RESIDUES.***

TDG Classification: 2.1 (gas)
TDG Shipping Name: Liquid Petroleum Gas (Propane)
TDG Special Provisions: 56, 90, and 102
PIN UN: 1075

SECTION X – PREPARATION INFORMATION

Prepared by: Propane Gas Association of Canada
(403) 543-6500

Date prepared: November 2010

The information contained herein is believed to be accurate. It is provided independently of any sale of the product. It is not intended to constitute performance information concerning the product. No express warranty or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product information contained herein.

This information is in addition to the information supplied on the MSDS and forms a part of the MSDS by reference to note numbers indicated:

NOTE 1 ODOURANTS:

Odourants are not completely effective warning agents in all cases.
Certain odourants are polar and/or chemically reactive and may be depleted by reaction or absorption.
Sensitivity to odourants differs from person to person and may decrease with age or impaired physical conditions such as colds or respiratory allergies.
Prolonged exposure to odourants can create desensitization to the odour.

NOTE 2 ASPHYXIANT AND NARCOTIC EFFECTS OF PROPANE:

LPG's can displace air and can act as an asphyxiant. Lack of oxygen may cause dizziness, headaches, diminished awareness, faulty judgment, increase in fatigue and impaired muscular co-ordination. If these symptoms are identified while working in close proximity to propane that is released, go immediately into a fresh air environment.

LPG's are anaesthetic gases within the upper explosive limits and higher concentrations. A person working around propane in an enclosed space or in close proximity to a propane source such as filling cylinders, purging lines, investigating leaks, etc. who feels light-headed, dizzy, drunken, sleepy, or intoxicated should go immediately into fresh air. This narcotic effect may impair a person's judgment temporarily but will rapidly disappear in fresh air.

NOTE 3 NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM):

Sludges and tank scale from propane storage tanks, bulk delivery truck tanks, railway tank cars, and fuel filters and strainers screens may contain Naturally Occurring Radioactive Material (NORM) in the form of lead 210.

Equipment used for the transfer of propane such as propane piping and hoses, pumps and compressors may have detectable levels of radioactive lead 210 on inner surfaces.

Workers involved in cleaning, repair or maintenance on inner surfaces of such equipment should avoid breathing dust generated from such activities. Suitable codes of practice should be developed for the activities, detailing appropriate occupational hygiene and disposal practices.

NOTE 4 MAGNETIC RESIDUES IN PROPANE:

Magnetic residues generated in automotive fuel tanks from "mill scale" or corrosion processes may impair the operation of magnetic gauges and electronic solenoid valves.

Collection of gross amounts of solid residues can affect the proper operation of lock offs, mixers, pressure release valves, etc.

Solid residues could contain NORM (see note 3).

Anachemia

255 Norman.
Lachine (Montreal), Que
H8R 1A3

Material Safety Data Sheet

EMERGENCY NUMBERS:

(USA) CHEMTREC : 1(800) 424-9300 (24hrs)
(CAN) CANUTEC : 1(613) 996-6666 (24hrs)
(USA) Anachemia : 1(518) 297-4444
(CAN) Anachemia : 1(514) 489-5711

WHMIS	Protective Clothing	TDG Road/Rail
WHMIS CLASS: D-2A		Not controlled under TDG (Canada). PIN: Not applicable. PG: Not applicable.
		

Section I. Product Identification and Uses

Product name	**SODIUM BORATE, ANHYDROUS**
Chemical formula	Na2B4O7
Synonyms	Sodium tetraborate, Sodium borate anhydrous, Sodium pyroborate, Borax glass, AC-8266T, MR-103, 80950, 029-940-01, 029-940-02, 029-940-03
Supplier	Anachemia Canada. 255 Norman. Lachine (Montreal), Que H8R 1A3

CI#	Not available.
CAS#	1330-43-4
Code	AC-8266T
Formula weight	201.27
Supersedes	

Material uses	For laboratory use only.

Section II. Ingredients

Name	CAS #	%	TLV
1) SODIUM BORATE	1330-43-4	98-100	Exposure limit: ACGIH TWA 2 mg/m3; STEL 6 mg/m3

Toxicity values of the hazardous ingredients	SODIUM BORATE DECAHYDRATE: ORAL (LD50): Acute: 2660 mg/kg (Rat). 2000 mg/kg (Mouse). 5330 mg/kg (Guinea pig). ORAL (LDLo): Acute: 709 mg/kg (Man).

Section III. Physical Data

Physical state and appearance / Odor	Solid. (White crystalline solid. Odorless.)
pH (1% soln/water)	9.3
Odor threshold	Not available.
Percent volatile	0% at 21°C
Freezing point	742°C
Boiling point	Not applicable.
Specific gravity	2.367 (Water = 1)
Vapor density	Not applicable.
Vapor pressure	Not applicable.
Water/oil dist. coeff.	Not applicable.
Evaporation rate	Not applicable.
Solubility	3.1 to 5.8% @ 25°C (in H_2O)

Section IV. Fire and Explosion Data

Flash point	Not applicable.
Flammable limits	Not applicable.
Auto-ignition temperature	Not applicable.
Fire degradation products	Oxides of sodium.
Fire extinguishing procedures	Use extinguishing media suitable for surrounding materials. Wear adequate personal protection to prevent contact with material or its combustion products. Self contained breathing apparatus with a full facepiece operated in a pressure demand or other positive pressure mode.
Fire and Explosion Hazards	The product is not sensitive to impact. The product is not sensitive to static discharge. Emits toxic fumes under fire conditions.

Section V. Toxicological Properties

Routes of entry	Inhalation and ingestion. Eye contact. Skin contact. Skin absorption.
Effects of Acute Exposure	Harmful by ingestion, inhalation or skin absorption. Irritant. Target organs: respiratory system, eyes, skin.
Eye	Causes irritation. May cause slight burning sensation due to heat of hydration.
Skin	Causes skin irritation. May cause desquamation. Can be absorbed through damaged skin causing symptoms similar to ingestion.
Inhalation	Material is irritating to mucous membranes and upper respiratory tract. See ingestion.
Ingestion	Causes gastrointestinal irritation. May cause central nervous system depression (headache, nausea, vomiting, dizziness, abdominal pain, etc...), diarrhea, oliguria, anuria, erythema, macular rash, kidney damage, cardiovascular collapse, shock and death if ingested in large amounts. Toxic effects may be delayed.

Section V. Toxicological Properties

Effects of Chronic Overexposure	May cause nose irritation, dyspnea, abdominal pain, reversible erythema and/or rash, central nervous system effects, dizziness, macular rash and lung damage. Animal studies show that ingestion of large amounts of borates over prolonged periods of time cause a decrease in sperm production and testicle size in male laboratory animals and developmental effects if fetuses of pregnant female laboratory animals. Carcinogenic effects: Not available. Mutagenic effects: Not available. To the best of our knowledge, the chemical, physical, and toxicity of this substance has not been fully investigated.

Section VI. First Aid Measures

Eye contact	Immediately flush eyes with copious quantities of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Call a physician.
Skin contact	Immediately flush skin with plenty of water and soap for at least 15 minutes while removing contaminated clothing and shoes. If irritation occurs or persists seek medical attention. Wash contaminated clothing before reusing.
Inhalation	Remove patient to fresh air. Administer approved oxygen supply if breathing is difficult. Administer artificial respiration or CPR if breathing has ceased. Call a physician.
Ingestion	If conscious, wash out mouth with water. Have conscious person drink several glasses of water or milk. Seek immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Section VII. Reactivity Data

Stability	Stable. Conditions to avoid: High temperatures, sparks, open flames and all other sources of ignition, contamination.
Hazardous decomp. products	Not available.
Incompatibility	Strong oxidizing agents, acids, metallic salts, alkaloids, zirconium, reducing agents (alkali metals, metals hydrides, etc...).
Reaction Products	Product dissolves slowly in water with evolution of heat. Hazardous polymerization will not occur.

Section VIII. Preventive Measures

Protective Clothing in case of spill and leak	Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Spill and leak	Evacuate the area. Sweep up and place in container for disposal. Avoid raising dust. Ventilate area and wash spill site after material pick up is complete. DO NOT empty into drains. DO NOT touch spilled material.
Waste disposal	According to all applicable regulations. Harmful to aquatic life at low concentrations. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.
Storage and Handling	Store in a cool place away from heated areas, sparks, and flame. Store in a well ventilated area. Store away from incompatible materials. Do not add any other material to the container. Do not wash down the drain. Do not breathe dust. Keep container tightly closed and dry. Manipulate under an adequate fume hood. Avoid raising dust. Empty containers may contain a hazardous residue. Handle and open container with care. Minimize dust generation and exposure - use dust mask or appropriate protection. This product must be manipulated by qualified personnel. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking and food consumption while handling. Product is highly hygroscopic.

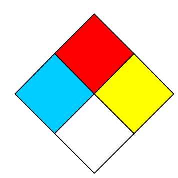
Section IX. Protective Measures

Protective clothing	Splash goggles. Impervious gloves, apron, coveralls, and/or other resistant protective clothing. Sufficient to protect skin. A OSHA/MSHA jointly approved respirator is advised in the absence of proper environmental controls. If more than TLV, do not breathe vapor. Wear self-contained breathing apparatus. Do not wear contact lenses. Make eye bath and emergency shower available. Ensure that eyewash station and safety shower is proximal to the work-station location.
Engineering controls	Use in a chemical fume hood to keep airborne levels below recommended exposure limits. Do not use in unventilated spaces.

Section X. Other Information

Special Precautions or comments

Teratogen! Reproductive toxin! Irritant! Do not breathe dust. Avoid all contact with the product. Avoid prolonged or repeated exposure. Manipulate in a well ventilated area or under an adequate fume hood. Handle and open container with care. Container should be opened only by a technically qualified person.
NOTES TO PHYSICIAN: Gastric lavage with 5% sodium bicarbonate is suggested. This should be followed by saline catharsis. Assure adequate hydration. Borax is not considered an acute poison. After ingestion or absorption into the bloodstream of large amounts (15 grams or more), symptoms may appear after 24-72 hours. Borates are readily dissipated through the urine (70% in the first 24 hours).
RTECS NO: ED4588000 (Sodium borate).



NFPA

Prepared by MSDS Department/Département de F.S..

Validated 23-Sep-2009

Telephone# (514) 489-5711

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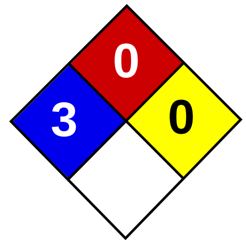

Health	3
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Sodium Cyanide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium Cyanide

Catalog Codes: SLS2314, SLS3736

CAS#: 143-33-9

RTECS: VZ7525000

TSCA: TSCA 8(b) inventory: Sodium Cyanide

CI#: Not available.

Synonym:

Chemical Name: Sodium Cyanide

Chemical Formula: NaCN

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium Cyanide	143-33-9	100

Toxicological Data on Ingredients: Sodium Cyanide: ORAL (LD50): Acute: 6.44 mg/kg [Rat]. DERMAL (LD50): Acute: 10.4 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of acids, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Dangerous on contact with acids, acid fumes, water or stream. It will produce toxic and flammable vapors of CN-H and sodium oxide. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas. When heated to decomposition it emits toxic fumes hydgrogen cyanide and oxides of nitrogen

Special Remarks on Explosion Hazards: Fusion mixtures of metal cyanides with metal chlorates, perchlorated or nitrates causes a violent explosion

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Poisonous solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
STEL: 5 (mg/m3) from ACGIH (TLV) [United States] SKIN CEIL: 4.7 from NIOSH CEIL: 5 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Granular solid. Flakes solid.)

Odor:
Faint almond-like odor. Odorless when perfectly dry. Emits odor of hydrogen cyanide when damp.

Taste: Not available.

Molecular Weight: 49.01 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 1496°C (2724.8°F)

Melting Point: 563°C (1045.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.595 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Vapor Density of Hydrogen Cyanide gas: 0.941

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Soluble in cold water. Slightly soluble in Ethanol

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, moisture, incompatibles.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity:
Corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent reaction with fluorine gas, magnesium, nitrates, nitric acid. Dangerous on contact with acids, acid fumes, water or stream. It wil produce toxic and flammable vapors of CN-H and sodium oxide. Cyanide may react with CO2 in ordinary air to form toxic hydrogen cyanide gas. Strong oxidizers such as acids, acid salts, chlorates, and nitrates. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas.

Special Remarks on Corrosivity: Corrosive to aluminum

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 6.44 mg/kg [Rat]. Acute dermal toxicity (LD50): 10.4 mg/kg [Rabbit].

Chronic Effects on Humans: May cause damage to the following organs: skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects (maternal and paternal fertility) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health effects: Skin: May cause itching and irritation. May be fatal if absorbed through injured skin with symtpoms similar to those noted for inhalation and ingestion. Eyes: May cause eye irritation and eye damage. Inhalation: May cause respiratory tract irritation. May be fatal if inhaled. The substance inhibits cellular respiration causing metabolic asphyxiation. May cause headache, weakness, dizziness, labored breathing, nausea, vomiting. May be followed by cardiovascular effects, unconciousness, convulsions, coma, and death Ingestion: May be fatal if swallowed. May cause

gastrointestinal tract irritation with nausea, vomiting. May affect behavior and nervous systems(seizures, convulsions, change in motor activity, headache, dizziness, confusion, weakness stupor, aniexity, agitation, tremors), cardiovascular system, respiration (hyperventilation, pulmonary edema, breathing difficulty, respiratory failure), cardiovascular system (palpitations, rapid heart beat, hypertension, hypotension). Massive doses by produce sudden loss of conciousness and prompt death from respiratory arrest. Smaller but still lethal doses on the breath or vomitus. Chronic Potential Health Effects: Central Nervous system effects (headaches, vertigo, insomnia, memory loss, tremors, fatigue), fatigue, metabolic effects (poor appetite), cardiovascular effects (chest discomfort, palpitations), nerve damage to the eyes, or dermatitis, respiratory tract irritation, eye irritation, or death can occur. may prolong the illness for 1 or more hours. A bitter almond odor may be noted

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Sodium cyanide UNNA: 1689 PG: I

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Sodium Cyanide Illinois chemical safety act: Sodium Cyanide New York release reporting list: Sodium Cyanide Rhode Island RTK hazardous substances: Sodium Cyanide Pennsylvania RTK: Sodium Cyanide Minnesota: Sodium Cyanide Massachusetts RTK: Sodium Cyanide Massachusetts spill list: Sodium Cyanide New Jersey: Sodium Cyanide New Jersey spill list: Sodium Cyanide Louisiana RTK reporting list: Sodium Cyanide Louisiana spill reporting: Sodium Cyanide California Director's List of Hazardous Substances: Sodium Cyanide TSCA 8(b) inventory: Sodium Cyanide TSCA 4(a) final test rules: Sodium Cyanide TSCA 8(a) PAIR: Sodium Cyanide TSCA 8(d) H and S data reporting: Sodium Cyanide TSCA 12(b) one time export: Sodium Cyanide SARA 302/304/311/312 extremely hazardous substances: Sodium Cyanide CERCLA: Hazardous substances.: Sodium Cyanide: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material. CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive solid.

DSCL (EEC):
R27/28- Very toxic in contact with skin and if swallowed. R41- Risk of serious damage to eyes. S1/2- Keep locked up and out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water S36/37- Wear suitable protective clothing and gloves. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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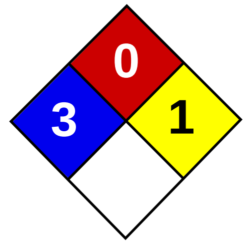
Last Updated: 06/09/2012 12:00 PM



Health	3
Fire	0
Reactivity	2
Personal Protection	J

Material Safety Data Sheet
Sodium hydroxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium hydroxide

Catalog Codes: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705

CAS#: 1310-73-2

RTECS: WB4900000

TSCA: TSCA 8(b) inventory: Sodium hydroxide

CI#: Not available.

Synonym: Caustic Soda

Chemical Name: Sodium Hydroxide

Chemical Formula: NaOH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: metals

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not available

Special Remarks on Fire Hazards:
sodium hydroxide + zinc metal dust causes ignition of the latter. Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, ally alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichlorethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontanously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

Special Remarks on Explosion Hazards:
Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aquesous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxde + impure tetrahydrofuran, which can contain peroxides, can

cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:
Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m3) from OSHA (PEL) [United States] CEIL: 2 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Deliquescent solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.]

Boiling Point: 1388°C (2530.4°F)

Melting Point: 323°C (613.4°F)

Critical Temperature: Not available.

Specific Gravity: 2.13 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, moist air

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

Special Remarks on Reactivity:
Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahyrofuran is very exothermic, a mild explosion being noted on one occassion. Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, foraldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. berylium, lead acetate, nickel carbonyl, tetraethyl lead), mitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acylonitrile, phorosous pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: **II**

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hydroxide Minnesota: Sodium hydroxide Massachusetts RTK: Sodium hydroxide New Jersey: Sodium hydroxide Louisiana spill reporting: Sodium hydroxide California Director's List of Hazardous Substances: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R35- Causes severe burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 11/01/2010 12:00 PM

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MATERIAL SAFETY DATA SHEET

Sodium Hypochlorite 5-20%

Section 01 - Chemical And Product And Company Information

Product Identifier ……………………….. Sodium Hypochlorite (5-20%)

Product Use …………………………….... Disinfectant, bleaching agent, source of available chlorine, deodorizer.

Supplier Name…………………………… ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By.................………………..…. ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date...........……………….. December 22, 2010

24-Hour Emergency Phone………….. 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....……………...	Sodium Hypochlorite	4.90-16.80%
CAS Number...................……………....	Sodium Hypochlorite	7681-52-9

Synonym (s)...................……………….Industrial bleach, hypo, bleach, Javel water, household bleach

Section 03 - Hazard Identification

Inhalation.....................……………….... Irritant of the nose and throat, causing coughing, difficulty breathing, and pulmonary edema.

Skin Contact / Absorption………... Causes severe skin irritation with blistering and ulceration.

Eye Contact................…………... Causes severe irritation of the mucous membranes of the eyes. May cause severe eye damage.

Ingestion...................…………… Burning of the mouth and throat, abdominal cramps, nausea, vomiting, diarrhea, shock. May lead to convulsions, coma, and even death.

Exposure Limits…………………….. ACGIH/TLV-TWA: 0.5ppm (chlorine)

Section 04 - First Aid Measures

Inhalation...................…………….. Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption………….. Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact................……………... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion...................……………… Do not induce vomiting. If vomiting occurs, lean victim forward to prevent breathing in vomitus. Give large amounts of water. Do not give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention.

Additional Information...……………... Not available

Section 05 - Fire Fighting

Conditions of Flammability………... Non-flammable

Means of Extinction......…………….. Product does not burn. Use appropriate extinguishing media for material that is supplying the fuel to the fire.

Flash Point...…………………………. Not applicable

Auto-ignition Temperature…………. Not applicable

Upper Flammable Limit …………….. Not applicable

Lower Flammable Limit.................. Not applicable

Hazardous Combustible Products... Decomposition may produce chlorine gas and/or hydrogen chloride gas.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards........................ Pressure buildup in containers could result in an explosion when heated or in contact with acidic fumes. Vigorous reaction with oxidizable organic materials may result in a fire.

Section 06 - Accidental Release Measures

Leak / Spill...................................... Wear appropriate personal protective equipment. Ventilate area. Stop or reduce leak if safe to do so. Restrict access to spill area until clean up is complete. Prevent material from entering sewers, waterways or confined spaces. Soak up smaller spills with absorbent material that does not react with spilled material. Flush with water to remove any residue.

Deactivating Materials................... Spills can be carefully neutralized first with sodium sulphite, sodium metabisulphite or other dechlorination agent for no chlorine residual, then a pH adjustment may be required with hydrochloric acid until the pH is 7. Note neutralization reactions may produce heat so necessary precautions must be taken. Local regulatory agencies should also be contacted for proper disposal.

Section 07 - Handling and Storage

Handling Procedures...................... Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements..................... Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials. Venting of containers is advisable.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes.. Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory.................................. A NIOSH-approved respirator suitable for chlorine is recommended. Where a higher level of protection is required, use a self-contained breathing apparatus.

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Gloves.. Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Clothing...................................... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Footwear..................................... Impervious boots of chemically resistant material should be worn at all times.

Engineering Controls

Ventilation Requirements.............. Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State................................ Liquid

Odor and Appearance.................... Strong chlorine odour. Clear, greenish-yellow solution.

Odor Threshold.............................. Not available

Specific Gravity (Water=1).............. 1.17 at 20°C (12% trade)

Vapor Pressure (mm Hg, 20C)......... 12.1mm Hg at 20°C (12.5 wt %)

Vapor Density (Air=1)..................... Not available

Evaporation Rate........................... Not available

Boiling Point.................................. Slowly decomposes above 40°C.

Freeze/Melting Point...................... ~ -15°C (12% trade)

pH.. < 12

Water/Oil Distribution Coefficient.... Not available

Bulk Density.................................. Not available

% Volatiles by Volume.................... Not available

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Solubility in Water......................... Complete

Molecular Formula......................... $NaOCl$

Molecular Weight......................... 74.44

Section 10 - Stability and Reactivity

Stability... Unstable at temperatures above 40°C, in sunlight, and in contact with acid.

Incompatibility................................. Incompatible with strong acids, ammonia, oxidizable materials, nickel, copper, tin, manganese, and iron.

Hazardous Products of Decomposition.. Chlorine (by reaction with acids), oxygen (by reaction with nickel, copper, tin, manganese, iron), sodium chloride, sodium chlorate, with increased temperature.

Polymerization................................. Will not occur

Section 11 - Toxicological Information

Irritancy... Strong irritant

Sensitization................................. Not available

Chronic/Acute Effects..................... If over-exposed to the solution, there will be constant irritation of the eyes, nose, and throat.

Synergistic Materials..................... Not available

Animal Toxicity Data....................... LD_{50}(oral,rat): 8910mg/kg (undiluted sodium hypochlorite)

Carcinogenicity............................. Not considered to be carcinogenic (IARC and ACGIH).

Reproductive Toxicity..................... Not available

Teratogenicity................................. Not available

Mutagenicity................................. Not available

Section 12 - Ecological Information

Fish Toxicity................................. Not available

Biodegradability........................... Not available

Environmental Effects.................. Not available

Section 13 - Disposal Consideration

Waste Disposal............................ Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class... 8 (not regulated at solutions below 7%)

Group.. III (not regulated at solutions below 7%)

PIN Number................................ UN 1791(not regulated at solutions below 7%)

Other.. Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....................E

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

NSF Certification................................Product is certified under NSF/ANSI Standard 60 for disinfection and oxidation at a maximum dosage for the following:

sodium hypochlorite 5%: 200mg/L
sodium hypochlorite 6%: 175mg/L
sodium hypochlorite 7%: 161mg/L
sodium hypochlorite 8%: 146mg/L
sodium hypochlorite 9%: 131mg/L
sodium hypochlorite 10%: 116mg/L
sodium hypochlorite 11%: 101mg/L
sodium hypochlorite 12%: 87mg/L
sodium hypochlorite 13%: 82mg/L
sodium hypochlorite 14%: 76mg/L
sodium hypochlorite 15%: 70mg/L
sodium hypochlorite 16%: 66mg/L
sodium hypochlorite 17%: 62mg/L
sodium hypochlorite 18%: 58mg/L
sodium hypochlorite 19%: 54mg/L
sodium hypochlorite 20%: 50mg/L

Sanitizer Use: to obtain 10 liters of a 200 mg/L solution as available chlorine, use 16.7 mL of Hypochlor-12 for each 10 liters of clean, potable water.

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / MSDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Material Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service or technical service department.

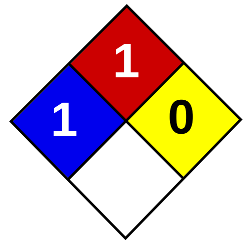
ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522



Health	1
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Ethylenediaminetetraacetic Acid Tetrasodium Salt MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylenediaminetetraacetic Acid Tetrasodium Salt

Catalog Codes: SLE2284

CAS#: 10378-23-1

RTECS: AH5075000 (For CAS no. 64-02-8 known as EDTA Tetrasodium salt , anhydrous)

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not available.

Synonym: Versene, Kalex, Hampene, Dissolvine; EDTA tetrasodium salt dihydrate; Tetrasodium EDTA dihydrate; Tetrasodium salt EDTA dihydrate; Tetrasodium salt of EDTA, dihydrate; Tetrasodium salt of ethylenediaminetetraacetic acid, dihydrate; Sodium salt of ethylenediaminetetraacetic acid, dihydrate; Sodium ethylenediaminetetraacetate, dihydrate; Sodium ethylenediaminetetraacetic acid, dihydrate; Sodium EDTA, dihydrate; Edetate sodium dihydrate; Edetic acid tetrasodium salt, dihydrate; Endrate tetrasodium; Ethylenebis(iminodiacetic acid) tetrasodium salt, dihydrate; Ethylenediaminetetraacetic acid, tetrasodium salt, dihydrate ; Edathaniltetrasodium , dihydrate ; N , N'-Ethylenediaminediacetic acid tetrasodium salt.

Chemical Name: Acetic acid, (etrhylenedinitrilo)tetra-, tetrasodium salt, dihydrate

Chemical Formula: $C10H12N2Na4O8.2H2O$

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylenediaminetetraacetic acid tetrasodium salt	10378-23-1	100

Toxicological Data on Ingredients: Ethylenediaminetetraacetic acid tetrasodium salt: ORAL (LD50): Acute: >2000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: CLOSED CUP: Higher than 93.3°C (200°F).

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO2), nitrogen oxides (NO, NO2...). Some metallic oxides.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances: Slightly explosive in presence of open flames and sparks. Non-explosive in presence of shocks.

Fire Fighting Media and Instructions: SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: As with most organic solids, fire is possible at elevated temperatures

Special Remarks on Explosion Hazards: Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill: Use a shovel to put the material into a convenient waste disposal container. Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions: Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 416.23 g/mole

Color: White.

pH (1% soln/water): 11.3 [Basic.]

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Bulk Density: 0.77 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Avoid contact with aluminum, copper, copper alloys, zinc, and nickel, and strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): >2000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health effects: Skin: May cause skin irritation. Eyes: May cause eye irritation. Inhalation: May cause irritation of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation. The toxicological properties of this substance have not been fully investigated.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 760 mg/l 96 hours [Bull gill sunfish]. 59.8 mg/l 96 hours [Fathead Minnow].

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: No products were found.

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): This product is not classified according to the EU regulations. Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:29 PM

Last Updated: 11/01/2010 12:00 PM

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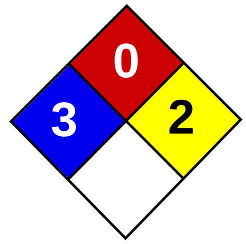

Health	3
Fire	0
Reactivity	2
Personal Protection	

Material Safety Data Sheet
Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid

Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid

Chemical Name: Hydrogen sulfate

Chemical Formula: H2-SO4

Contact Information:

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Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulfuric acid	7664-93-9	95 - 98

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:
Products of combustion are not available since material is non-flammable. However, products of decompostion include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phorphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:
M i x t u r e s o f s u l f u r i c a c i d a n d a n y o f t h e f o l l o w i n g c a n e x p l o d e : p - n i t r o t o l u e n e , p e n t a s i l v e r trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decompositon.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:
270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dillute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS) Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestial tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the repiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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Material Safety Data Sheet

LUMINOL ™ TR (Type I Trace-Inhibited)

1 . Product and company identification

Product name : LUMINOL ™ TR (Type I Trace-Inhibited)

Code : LUMTR

Material uses : Premium trace-inhibited (Type I) insulating oil for use in electrical transformers, circuit breakers and switches.

Manufacturer : Petro-Canada Lubricants Inc.
2310 Lakeshore Road West
Mississauga, Ontario
Canada L5J 1K2

In case of emergency : Suncor Energy: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Viscous liquid.

Odour : Slight naphthalene like odour.

WHMIS (Canada) : Not controlled under WHMIS (Canada).

OSHA/HCS status : While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Emergency overview : No specific hazard.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : No known significant effects or critical hazards.

Ingestion : No known significant effects or critical hazards.

Skin : Slightly irritating to the skin.

Eyes : Slightly irritating to the eyes.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : Not listed as carcinogenic by OSHA, NTP or IARC.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	Mixture	-

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

The base oil may be a mixture of the following CAS#s: 8042-47-5, 64742-46-7, 64742-47-8, 64742-53-6, 64742-54-7, 64742-55-8, 72623-84-8, 72623-85-9, 72623-86-0, 72623-87-1, 178603-64-0, 178603-65-1, 178603-66-2, 445411-73-4

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : May be combustible at high temperature.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Low fire hazard. This material must be heated before ignition will occur.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	**ACGIH TLV (United States). Notes: (Mineral oil)** TWA: 5 mg/m³, (Inhalable fraction) 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: nitrile, neoprene, polyvinyl alcohol (PVA), Viton®.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

8 . Exposure controls/personal protection

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	: Viscous liquid.
Flash point	: Open cup: 170°C (338°F) [Cleveland.]
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Colour	: Clear and bright
Odour	: Slight naphthalene like odour.
Odour threshold	: Not available.
pH	: Not available.
Boiling/condensation point	: Not available.
Melting/freezing point	: Not available.
Relative density	: 0.84 kg/L @ 15°C (59°F)
Vapour pressure	: Not available.
Vapour density	: Not available.
Volatility	: Not available.
Evaporation rate	: Not available.
Viscosity	: 9.4 cSt @ 40°C (104°F), 2.6 cSt @ 100°C (212°F)
Pour point	: -60°C (-76°F)
Solubility	: Insoluble in water.

10 . Stability and reactivity

Chemical stability	: The product is stable.
Hazardous polymerisation	: Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	: Reactive with oxidising agents and acids.
Hazardous decomposition products	: May release COx, NOx, SOx, hydrocarbons, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Dusts and mists	Rat	>5.2 mg/l	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

11 . Toxicological information

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	A4	-	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : This product is inherently biodegradable.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Not regulated.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

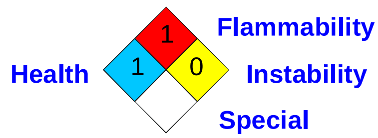
Europe inventory : All components are listed or exempted.

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	1
Flammability	1
Physical hazards	0
Personal protection	B

National Fire Protection Association (U.S.A.) :



References : Available upon request.
™ Trademark of Suncor Energy Inc. Used under licence.

Date of printing : **2/8/2012.**

Date of issue : 8 February 2012

Date of previous issue : No previous validation.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

Internet: lubricants.petro-canada.ca/msds

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: 1-800-378-4518
Ontario & Central Canada, telephone: 1-800-268-5850; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752

Notice to reader

16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

PETRO-CANADA ANTIFREEZE

1 . Product and company identification

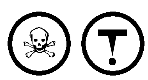
Product name	:	PETRO-CANADA ANTIFREEZE
Synonym	:	Universal Antifreeze, Radiator Antifreeze, Diesel Antifreeze, Petro-Canada Antifreeze-Coolant, Petro-Canada Heavy Duty Antifreeze-Coolant, Pre-Mix Antifreeze, Petro-Canada Premium Radiator Antifreeze, Diesel Engine Coolant, Pre-Mixed Radiator Antifreeze/Coolant Petro-Canada.
Code	:	W269
Material uses	:	Used as an engine antifreeze coolant.
Manufacturer	:	PETRO-CANADA P.O. Box 2844 150 – 6th Avenue South-West Calgary, Alberta T2P 3E3
In case of emergency	:	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Clear viscous liquid.

Odour : Odourless.

WHMIS (Canada) :



Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : CAUTION!

MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. POSSIBLE BIRTH DEFECT HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS, BASED ON ANIMAL DATA. POSSIBLE DEVELOPMENTAL HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE ADVERSE DEVELOPMENTAL EFFECTS, BASED ON ANIMAL DATA.

May be harmful if swallowed. Slightly irritating to the eyes and skin. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Contains material that may cause target organ damage, based on animal data. Contains material which may cause birth defects, based on animal data. Contains material which may cause developmental abnormalities, based on animal data. Avoid exposure during pregnancy. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation.

Ingestion : Harmful if swallowed. Ingestion of this product may cause gastro-intestinal irritation, nausea, vomiting, abdominal pain, and diarrhea. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Skin : Slightly irritating to the skin.

Eyes : Slightly irritating to the eyes.

Potential chronic health effects

2 . Hazards identification

Chronic effects	: Contains material that may cause target organ damage, based on animal data.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: Contains material which may cause birth defects, based on animal data.
Developmental effects	: Contains material which may cause developmental abnormalities, based on animal data.
Fertility effects	: No known significant effects or critical hazards.
Target organs	: The substance may be toxic to kidneys and liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Ethylene glycol	107-21-1	45 - 50

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Non-flammable.

Extinguishing media

- **Suitable** : Use an extinguishing agent suitable for the surrounding fire.
- **Not suitable** : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

5 . Fire-fighting measures

Products of combustion : Carbon oxides (CO, CO2), smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Avoid exposure during pregnancy. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. If during normal use the material presents a respiratory hazard, use only with adequate ventilation or wear appropriate respirator. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Ethylene glycol	**ACGIH TLV (United States).** CEIL: 100 mg/m³, (aerosol)

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

8 . Exposure controls/personal protection

Engineering measures : If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: neoprene, nitrile, polyvinyl chloride (PVC). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Clear viscous liquid.
Flash point : Not available.
Auto-ignition temperature : Not available.
Flammable limits : Not available.
Colour : Yellow.
Odour : Odourless.
Odour threshold : Not available.
pH : Not available.
Boiling/condensation point : 129°C (264.2°F)
Melting/freezing point : -37°C (-34.6°F)
Relative density : 1.06 to 1.09
Vapour pressure : 0.008 kPa (0.06 mm Hg)
Vapour density : 2.1 [Air = 1]
Volatility : Not available.
Evaporation rate : Not available.
Viscosity : Not available.
Pour point : Not available.

9 . Physical and chemical properties

Solubility : Soluble in water, methanol and diethyl ether.

10 . Stability and reactivity

Chemical stability : The product is stable.

Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.

Materials to avoid : Reactive with oxidising agents, acids and alkalis.

Hazardous decomposition products : May release COx, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Ethylene glycol	LD50 Dermal	Rabbit	9530 mg/kg	-
	LD50 Oral	Rat	4700 mg/kg	-
	LC50 Inhalation Dusts and mists	Rat	2725 mg/m³	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Ethylene glycol	A4	-	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

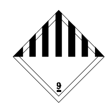
13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	UN3082	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Ethylene glycol based coolant)	9	III		**Special provisions** In single containers of 5000 lbs capacity or less this product is exempt from DOT regulations (not regulated).

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Target organ effects

Canada

WHMIS (Canada) : Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : Not determined.

16 . Other information

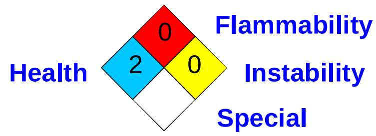
Label requirements : MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. POSSIBLE BIRTH DEFECT HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE BIRTH DEFECTS, BASED ON ANIMAL DATA. POSSIBLE DEVELOPMENTAL HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE ADVERSE DEVELOPMENTAL EFFECTS, BASED ON ANIMAL DATA.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		0
Physical hazards		0
Personal protection		H

16 . Other information

National Fire Protection Association (U.S.A.) :



References : Available upon request.
™ Trademark of Suncor Energy Inc. Used under licence.

Date of printing : **3/11/2010.**

Date of issue : 11 March 2010

Date of previous issue : No previous validation.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

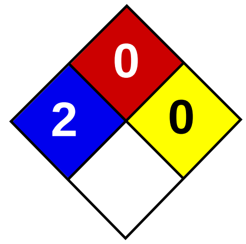
For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Health	2
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Copper sulfate pentahydrate MSDS

Section 1: Chemical Product and Company Identification

Product Name: Copper sulfate pentahydrate

Catalog Codes: SLC3778, SLC4567, SLC1774, SLC3565, SLC5353

CAS#: 7758-99-8

RTECS: GL8900000

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not applicable.

Synonym: Blue vitriol; Copper (II) Sulfate Pentahydrate

Chemical Name: Cupric sulfate pentrahydrate

Chemical Formula: CuSO4.5H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Copper sulfate pentahydrate	7758-99-8	100

Toxicological Data on Ingredients: Copper sulfate pentahydrate: ORAL (LD50): Acute: 300 mg/kg [Rat.]. DERMAL (LD50): Acute: >2000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
When heated to decomposition it emits toxic fumes. Solutions are acidic and can react with magnesium to evolve flammable hydrogen gas

Special Remarks on Explosion Hazards: Nitromethanes and copper salts spontaneously form explosive materials

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Do not ingest. Do not breathe dust. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 (mg/m3) from ACGIH (TLV) [United States] Inhalation TWA: 0.1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 (mg/m3) from NIOSH InhalationConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline granules solid. Powdered solid.)

Odor: Odorless.

Taste: Nauseous metallic.

Molecular Weight: 249.69 g/mole

Color: Blue. (Light.)

pH (1% soln/water): Not available.

Boiling Point: 150°C (302°F)

Melting Point: 110°C (230°F)

Critical Temperature: Not available.

Specific Gravity: 2.28 @ 15.6 deg. C(Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol.

Solubility:
Easily soluble in hot water. Soluble in cold water, methanol. Solubility in water: 31.6 g/100 ml @ 0 deg. C.; 203.3 g/100 ml @ 100 deg. C Solubility in methanol: 15.6 g/100 ml @ 18 deg. C. Insoluble in ethanol. It readily forms alkaline complexes at sufficiently high concentrations of amines or alkali cyanides. Practically insoluble in most organic solvents.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat (high temperatures), incompatible materials, exposure to air

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Highly corrosive in presence of steel.

Special Remarks on Reactivity:
Air Sensitive. Slowly efforescent in air. Solutions of hyprobromite are decomposed by powerful catalytic action of cupric ions, even as impurities. Incompatible with finely powdered metals.

Special Remarks on Corrosivity:
Corrosive to finely powdered metals. Very corrosive to plain steel

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 300 mg/kg [Rat.]. Acute dermal toxicity (LD50): >2000 mg/kg [Rat].

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: kidneys, liver.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 1088 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material based on animal data

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. May cause skin burns. It may cause and itching allergic eczema. Eyes: Causes eye irritation. May cause eye burns. It may cause conjunctivitis, corneal discoloration, ulceration and turbidity of the cornea. Inhalation: Causes respiratory tract (nose, throat, lung) irritation with coughing and wheezing. May cause ulceration and perforation of the nasal septum if inhaled in excessive quantities. Burning copper sulfate may result in irritating and poisonous gases which may irritate the respiratory tract and lungs, and may cause fume metal fever which is characterized by flu-like symptoms such as fever, chills, muscle aches. Ingestion: Harmful if swallowed. May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea, metallic taste, burning sensation in the stomach or epigastrum, abdominal pain, and possible gastrointestinal tract bleeding. May affect metabolism(metabolic acidosis), liver (liver damage, jaundice), blood (Methemoglobin, hemalytic anemia), urinary system (kidney damage, hematuria, hemoglobinuria, albuminuria), behavior/nervous systems (somnolence, tremor, psychosis, muscle weakness, coma), cardiovascular system (lowering of blood pressure, dysthrythmia). Oral mucosa, vomitus, stools, and saliva may be stained blue or green following ingestion. Aspiration pneumonia may develop following emesis and CNS depression. Chronic Potential Health Effects: Skin: Repeated or prolonged skin contact may cause thickening of the skin.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 0.1 ppm 48 hours [Goldfish]. 0.1 mg/l 96 hours [Rainbow Trout]. 2.5 mg/l 96 hours [Rainbow Trout].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation:
If released to soil, copper sulfate may leach to groundwater, be partly oxidized, or bind to humic materials, clay, or hydrous of iron and manganese. In water, it will bind to carbonates as well as humic materials, clay and hydrous oxides of iron and manganese. Copper is accumulated by plants and animals, but it does not appear to biomagnify from plants to animals. This lack of biomagnification appears common with heavy metals. In air, copper aerosols (in general) have a residence time of 2 to 10 days in an unpolluted atmosphere and 0.1 to >4 in a polluted, urban areas.

Section 13: Disposal Considerations

Waste Disposal:
Copper dusts or mist or copper compounds may be disposed of in Group III sealed containers in a secure sanitary landfill. Copper containing soluble wastes can be concentrated through the use of ion exchange, reverse osmosis, or evaporators to the point where copper can be electrolytically removed and sent to a reclaiming firm. If recovery is not feasible, the copper can be precipitated through the use of caustics and the sludge depositied in a chemical waste landfill. Be sure to consult with authorities (waste regulators). Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 9: Miscellaneous hazardous material.

Identification: : Environmentally hazardous substance, n.o.s. (Cupric Sulfate) UNNA: 3077 PG: III

Special Provisions for Transport:
additional markings "Marine Pollutant" - required for bulk shipments. The words "Marine Pollutant" must be entered on the shipping paper in association iwth the basic DOT description for bulk shipments.

Section 15: Other Regulatory Information

Federal and State Regulations:
SARA 313 toxic chemical notification and release reporting: Copper compounds CERCLA: Hazardous substances.: Copper sulfate pentahydrate: 10 lbs. (4.536 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R22- Harmful if swallowed. R36/38- Irritating to eyes and skin. R50/53- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. S22- Do not breathe dust. S60- This material and its container must be disposed of as hazardous waste. S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

Section 16: Other Information

References:
-The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

Created: 10/09/2005 05:01 PM

Last Updated: 11/01/2010 12:00 PM

Good things come from SYSCO

Material Safety Data Sheet

Section I. Product Identification and Uses

HMIS (HFRP)	
Health Hazard	2
Fire Hazard	0
Reactivity	0
Personal Protection	s

Common / Trade name	SYSCO-RELIANCE DEGREASER SUPC 0097915	**TDG**	Class 8
WHMIS	D2B, E	**PIN**	UN3267 CORROSIVE LIQUID, BASIC, ORGANIC, N.O.S., (Potassium Hydroxide)
Code	2005	**PG**	III
Material uses	Cleaner, degreaser.		

Section II. Hazardous Ingredients

Name	CAS #	% by weight	TLV/PEL	LC50/LD50
Ethoxylated C12-15 alcohol	68131-39-5	1-5	Not available.	ORAL (LD50): Acute: 4150 mg/kg [Rat.].
Potassium Hydroxide	1310-58-3	1-5	Not available.	ORAL (LD50): Acute: 273 mg/kg [Rat]. 365 mg/kg [Rat]. 388 mg/kg [Rat].
Alcohol C9-11, ethoxylated	68439-46-3	0.5-1.5	Not available.	ORAL (LD50): Acute: 1400 mg/kg [Rat].
Alkyl dimethyl benzyl ammonium chloride (C12-16)	68424-85-1	0.5-1.5	Not available.	ORAL (LD50): Acute: 426 mg/kg [Rat]. 919 mg/kg [Mouse].
Ethyl alcohol	64-17-5	0-1	Not available.	ORAL (LD50): Acute: 8300 mg/kg [Mouse]. 13700 mg/kg [Rat]. 17750 mg/kg [Rat].
Sodium metasilicate, pentahydrate	10213-79-3	1-5	Not available.	ORAL (LD50): Acute: 600 mg/kg [Rat.].

Section III. First Aid Measures

Eye contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. If irritation persists, get medical attention.
Skin contact	In case of contact, immediately flush skin with plenty of water while removing contaminated clothing and shoes.Get medical attention if irritation develops.
Inhalation	Allow the victim to rest in a well ventilated area. Seek medical attention if discomfort persists.
Ingestion	DO NOT induce vomiting. Have conscious person drink several glasses of water. NEVER give an unconscious person anything to ingest. Seek immediate medical attention.

Section IV. Physical Data

Physical state and apperance	Liquid.	**Colour**	Orange - Pink.
pH (1% soln/water)	12.0 - 13.0	**Odour**	Faint odor of Quaternary Ammonium coumpond.
pH (concentrate)	13.0 - 14.0	**Volatility**	Not available.
Boiling point	The lowest known value is 100°C (212°F) (Water). Weighted average: 106.85°C (224.3°F)	**Vapour density**	Weighted average: 1 (Air = 1)
Specific gravity	1.028 - 1.046 (Water = 1)	**Vapour pressure**	The highest known value is 2.3 kPa (17.2 mm Hg) (at 20°C) (Water). Weighted average: 2.27 kPa (17.03 mm Hg) (at 20°C)
Solubility	Miscible in water.		

Section V. Fire and Explosion Data

The product is	Non-flammable.
Auto-ignition temperature	Not applicable.
Flash points	Not applicable.
Degradation products	Not applicable.
Extinguising media	Use DRY chemicals, CO2, water spray or foam.

Section VI. Reactivity data

Stability	The product is stable.
Decomp. products	Not available.
Reactivity	Incompatible with oxidizing agents, acids, reducing agents, organic materials, metals.

Section VII. Toxicological properties

Route of entry	Eye contact. Ingestion. Inhalation. Skin contact.
Toxicity for animals	See section II
Acute effects	Dangerous in case of skin and eye contact (corrosive), of ingestion (corrosive to digestive system). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract.
Chronic effects	Not classified or listed by IARC, NTP, OSHA, EU and ACGIH.

Section VIII. Preventive measure

Waste disposal	Dispose of material according to régional, provincial and federal regulations. Consult your local or regional authorities.
Storage	Store in a dry, cool and well ventilated area. Keep away from incompatibles.
Precautions	Avoid breathing vapors or spray mists.Avoid contact with skin and eyes.In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.In case of contact, immediately flush skin with plenty of water while removing contaminated clothing and shoes.Wear suitable protective clothing, gloves and eye/face protection.
Spill and leak	Absorb with an inert DRY material and place in an appropriate waste disposal container. Dispose of in accordance with federal, provincial, or local regulations.

Section IX. Personal protective equipment

Gloves	Gloves (impervious)
Respiratory	In case of insufficient ventilation, wear suitable respiratory equipment.
Eyes	Splash goggles.
Other	Full suit, boots, face shield: are recommended under exceptional circumstances such as fire, spill or for prolonged contact with bulk quantities.
Eng. controls	Ensure that eyewash stations and safety showers are proximal to the work-station location.

Section X. Preparation and other Information

Validated by the Regulatory Affairs Department on July 15th 2011

Printed 18 July 2011

EMERGENCY: EMERGENCY:CANUTEC 613-996-6666

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy of completeness of the information contained herein. Final determination of suitability of any material is the sole responsability of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Annex A. Legend

HMIS	Hazardous Materials Identification System
WHMIS	WHMIS Workplace Hazardous Materials Information System
TDG	Transport Dangerous Goods
PIN	Product Identification Number
PG	Packaging Group

Fiche signalétique

Section I. Identification et utilisation du produit

HMIS (HFRP)	
Dangers pour la santé	2
Risques d'incendie	0
Réactivité	0
Protection personnelle	s

Nom commun / commercial	SYSCO-AVANTAGE DEGRAISSANT SUPC 0097915	**TMD**	Classe 8
SIMDUT	D2B, E	**NIP**	UN3267 LIQUIDE ORGANIQUE CORROSIF, BASIQUE, N.S.A., (Hydroxyde de potassium)
Code	2005	**GE**	III
Utilisation	Nettoyant, dégraissant.		

Section II. Ingrédients dangereux

Nom	# Cas	% en poids	LMP/LEP	CL50/DL50
Alcool C12-15 éthoxylé	68131-39-5	1-5	Non disponible.	ORALE (DL50): Aiguë: 4150 mg/kg [Rat.].
Hydroxyde de Potassium	1310-58-3	1-5	Non disponible.	ORALE (DL50): Aiguë: 273 mg/kg [Rat]. 365 mg/kg [Rat]. 388 mg/kg [Rat].
Alcool C9-11 éthoxylé	68439-46-3	0.5-1.5	Non disponible.	ORALE (DL50): Aiguë: 1400 mg/kg [Rat].
Alkyl dimethyl benzyl ammonium chloride (C12-16)	68424-85-1	0.5-1.5	Non disponible.	ORALE (DL50): Aiguë: 426 mg/kg [Rat]. 919 mg/kg [Souris].
Alcool ethylique	64-17-5	0-1	Non disponible.	ORALE (DL50): Aiguë: 8300 mg/kg [Souris]. 13700 mg/kg [Rat]. 17750 mg/kg [Rat].
Metasilicate de sodium, pentahydrate	10213-79-3	1-5	Non disponible.	ORALE (DL50): Aiguë: 600 mg/kg [Rat.].

Section III. Premiers soins

Contact oculaire	Rincer les yeux IMMÉDIATEMENT à l'eau courante pendant au moins 15 minutes en gardant les paupières ouvertes. Si l'irritation persiste, appeler un médecin.
Contact cutané	En cas de contact, rincer immédiatement la peau à grande eau et retirer les vêtements et les chaussures contaminés.En cas d'irritation, consulter un médecin.
Inhalation	Permettre à la victime de se reposer dans un endroit bien ventilé. Obtenir de l'aide médicale si le malaise persiste.
Ingestion	NE PAS faire vomir. Si la personne est consciente, lui faire boire quelques verres d'eau. NE RIEN faire ingérer à une personne inconsciente. Obtenir immédiatement de l'aide médicale.

Section IV. Données physiques

État physique et apparence	Liquide.	**Couleur**	Orange - Rose.
pH (sol.1%/eau)	12.0 - 13.0	**Odeur**	Légère odeur de composés d'ammonium quaternaire.
pH (concentré)	13.0 - 14.0	**Volatilité**	Non applicable.
Point d'ébullition	La plus basse valeur connue est 100°C (212°F) (Eau). Moyenne pondérée: 106.85°C (224.3°F)	**Densité de vapeur**	Moyenne pondérée: 1 (Air = 1)
Gravité spécifique	1.028-1.046 (Eau = 1)	**Pression de vapeur**	La plus haute valeur connue est 2.3 kPa (17.2 mm Hg) (à 20°C) (Eau). Moyenne pondérée: 2.27 kPa (17.03 mm Hg) (à 20°C)
Solubilité	Miscible dans l'eau.		

Section V. Risques d'incendie et d'explosion

Le produit est	Ininflammable.
Température d'auto-ignition	Sans objet.
Point d'éclair	Sans objet.
Produits de dégradation	Non applicable.
Mode d'extinction	Utiliser des poudres chimiques SÈCHES, du CO2, de l'eau pulvérisée ou une mousse.

Section VI. Données sur la réactivité

Stabilité	Le produit est stable.
Produits de décomp.	Non disponible.
Réactivité	Incompatible avec les agents comburants, les acides, les agents réducteurs, les substances organiques, les métaux.

Section VII. Propriétés toxicologiques

Voies d'absorption	Contact oculaire. Ingestion. Inhalation. Contact cutané.
Toxicité pour les animaux	Voir section II
Effets aigus	Dangereux en cas de contact avec les yeux, la peau (corrosif), d'ingestion (corrosif pour le système digestif). Le liquide ou les gouttelettes de liquide en suspension peuvent endommager les tissus, particulièrement les muqueuses des yeux, de la bouche ou des voies respiratoires.
Effets chroniques	Non classé par le CIRC, le NTP, l'OSHA, l'UE et l'ACGIH.

Section VIII. Mesures préventives

Élimination des résidus	Eliminer selon les lois régionales, provinciales et fédérales.Consulter les autorités locales ou régionales.
Entreposage	Conserver dans un endroit sec, frais et bien ventilé. Conserver à l'écart des matières incompatibles.
Précautions	Éviter d'inhaler les vapeurs ou le brouillard.Éviter le contact avec la peau et les yeux.En cas de contact avec les yeux, laver immédiatement et abondamment avec de l'eau et consulter un spécialiste.En cas de contact, rincer immédiatement la peau à grande eau et retirer les vêtements et les chaussures contaminés.Porter un vêtement de protection approprié, des gants et un appareil de protection des yeux/du visage.
Déversement ou fuite	Absorber avec une substance inerte SÈCHE et mettre dans un contenant de récupération approprié.Éliminer selon les lois fédérales, provinciales ou locales.

Section IX. Équipement de protection personel

Gants	Gants (résistants aux produits chimiques).
Respiratoire	En cas de ventilation insuffisante, porter un appareil respiratoire approprié.
Yeux	Lunettes anti-éclaboussures.
Autres	Vêtement de protection complet, bottes, masque facial: sont recommandés en des circonstances exceptionelles telles que feu, déversement ou lors d'un contact prolongé avec des quantités en vrac.
Contrôles d'ingénérie	S'assurer de la proximité d'une douche oculaire et d'une douche de sécurité au poste de travail.

Section X. Préparation et autres renseignements

Validé par le service des affaires reglementaires le 15 juillet 2011

Imprimé le 18 juil. 2011

URGENCE: URGENCE :CANUTEC 613-996-6666

Au meilleur de nos connaissances, l'information contenue dans ce document est exacte. Toutefois, ni le fournisseur ci-haut mentionné ni aucune de ses succursales ne peut assumer quelque responsabilité que ce soit en ce qui a trait à l'exactitude ou à l'état complet de l'information contenue dans ce document. La détermination finale de la convenance de tout matériel ou produit est la responsabilité exclusive de l'utilisateur. Tous les matériaux ou produits peuvent présenter certains risques et devraient être utilisés avec prudence. Bien que certains risques soient décrits dans ce document, nous ne pouvons garantir que ce sont les seuls risques qui existent.

Annexe A. Legende

HMIS	Système d'Identification sur les matières dangereuses
SIMDUT	Système d'Information sur les Matières Dangereuses Utilisées au Travail
TMD	Transport des Matières Dangereuses
NIP	Numéro d'Identification du Produit
GE	Groupe d'Emballage

Material Safety Data Sheet

DIESEL FUEL

1 . Product and company identification

Product name : DIESEL FUEL

Synonym : Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, D60, P40, P50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC).

Code : W104, W293; SAP: 120, 121, 122, 125, 126, 129, 130, 135, 287, 288

Material uses : Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining Diesel has a higher flash point requirement, for safe use in underground mines.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

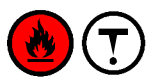
In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Bright oily liquid.

Odour : Mild petroleum oil like.

WHMIS (Canada) :



Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Combustible liquid. Severely irritating to the skin. Irritating to eyes. Keep away from heat, sparks and flame. Do not get in eyes. Avoid breathing vapour or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.

Skin : Severely irritating to the skin.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : No known significant effects or critical hazards.

Carcinogenicity : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

2 . Hazards identification

Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	:	Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Kerosine (petroleum), hydrodesulfurized / Fuels, diesel / Fuel Oil No. 2	64742-81-0 / 68334-30-5 / 68476-30-2	95 - 100
Fatty acids methyl esters	61788-61-2 / 67784-80-9 / 73891-99-3	0 - 5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact	:	Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	:	Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	:	Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
Notes to physician	:	No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product	:	Combustible liquid
Extinguishing media		
Suitable	:	Use dry chemical, CO_2, water spray (fog) or foam.
Not suitable	:	Do not use water jet.
Special exposure hazards	:	Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
Products of combustion	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), smoke and irritating vapours as products of incomplete combustion.
Special protective equipment for fire-fighters	:	Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

5 . Fire-fighting measures

Special remarks on fire hazards : Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Runoff to sewer may create fire or explosion hazard.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Kerosine (petroleum), hydrodesulfurized	**ACGIH TLV (United States). Absorbed through skin.** TWA: 200 mg/m³ 8 hour(s).
Fuels, diesel	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).
Fuel oil No. 2	**ACGIH TLV (United States). Absorbed through skin.** TWA: 100 mg/m³, (Inhalable fraction and vapour) 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: nitrile, neoprene, polyvinyl alcohol (PVA), Viton. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	:	Bright oily liquid.
Flash point	:	Diesel fuel: Closed cup: ≥40°C (≥104°F) Marine Diesel Fuel: Closed Cup: ≥60°C (≥140°F) Mining Diesel: Closed Cup: ≥52°C (≥126°F)
Auto-ignition temperature	:	225°C (437°F)
Flammable limits	:	Lower: 0.7% Upper: 6%
Colour	:	Clear to yellow (This product may be dyed red for taxation purposes).
Odour	:	Mild petroleum oil like.
Odour threshold	:	Not available.
pH	:	Not available.
Boiling/condensation point	:	150 to 371°C (302 to 699.8°F)
Melting/freezing point	:	Not available.
Relative density	:	0.80 to 0.88 kg/L @ 15°C (59°F)
Vapour pressure	:	1 kPa (7.5 mm Hg) @ 20°C (68ºF).
Vapour density	:	4.5 [Air = 1]
Volatility	:	Semivolatile to volatile.
Evaporation rate	:	Not available.
Viscosity	:	Diesel fuel: 1.3 - 4.1 cSt @ 40°C (104°F) Marine Diesel Fuel: 1.3 - 4.4 cSt @ 40°C (104°F)
Pour point	:	Not available.
Solubility	:	Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

10 . Stability and reactivity

Chemical stability	:	The product is stable.
Hazardous polymerisation	:	Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	:	Reactive with oxidising agents and acids.
Hazardous decomposition products	:	May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Kerosine (petroleum), hydrodesulfurized	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5000 mg/m³	4 hours
Fuels, diesel	LD50 Dermal	Mouse	24500 mg/kg	-
	LD50 Oral	Rat	7500 mg/kg	-
Fuel oil No. 2	LD50 Oral	Rat	12000 mg/kg	-

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

11 . Toxicological information

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Kerosine (petroleum), hydrodesulfurized	A3	-	-	-	-	-
Fuels, diesel	A3	3	-	-	-	-
Fuel oil No. 2	A3	3	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1202	DIESEL FUEL	3	III		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Combustible liquid
Irritating material

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

15 . Regulatory information

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

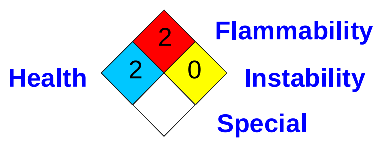
16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.) :

Health	2
Flammability	2
Physical hazards	0
Personal protection	H

National Fire Protection Association (U.S.A.) :



References : Available upon request.
™ Trademark of Suncor Energy Inc. Used under licence.

Date of printing : **7/6/2010.**

Date of issue : 6 July 2010

Date of previous issue : 7/3/2009.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

GASOLINE, UNLEADED

PETRO-CANADA

1 . Product and company identification

Product name : GASOLINE, UNLEADED

Synonym : Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending

Code : W102E, SAP: 102 to 117

Material uses : Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

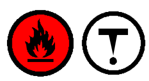
In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Clear liquid.

Odour : Gasoline

WHMIS (Canada) :



Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH CAN CAUSE HERITABLE GENETIC EFFECTS.

Flammable liquid. Irritating to eyes, respiratory system and skin. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Avoid contact with eyes, skin and clothing. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Contains material which can cause heritable genetic effects. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. Ingestion of this product may cause Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

2 . Hazards identification

Skin : Irritating to skin.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Repeated or prolonged exposure to the substance can produce blood disorders.

Carcinogenicity : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Contains material which can cause heritable genetic effects.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Medical conditions aggravated by over-exposure : Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Gasoline	86290-81-5	85-100
Ethanol	64-17-5	0.1-1
Benzene	71-43-2	0.5-1.5
Toluene	108-88-3	15-40*

**Montreal: may vary from 3-40%*
**Edmonton: may vary from 1-5%*

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : Flammable liquid (NFPA) .

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), polynuclear aromatic hydrocarbons, phenols, aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Extremely flammable in presence of open flames, sparks, shocks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical

7 . Handling and storage

(ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Gasoline	**ACGIH TLV (United States).** TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s).
Ethanol	**ACGIH TLV (United States).** STEL: 1000 ppm 15 minute(s).
Benzene	**ACGIH TLV (United States). Absorbed through skin.** TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s).
Toluene	**ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

8 . Exposure controls/personal protection

Hands	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: polyvinyl alcohol (PVA), Viton. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Eyes	:	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
Skin	:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Environmental exposure controls	:	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	:	Clear liquid.
Flash point	:	Closed cup: -50 to -38°C (-58 to -36.4°F) [Tagliabue.]
Auto-ignition temperature	:	257°C (494.6°F) (NFPA)
Flammable limits	:	Lower: 1.3% (NFPA) Upper: 7.6% (NFPA)
Colour	:	Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.
Odour	:	Gasoline
Odour threshold	:	Not available.
pH	:	Not available.
Boiling/condensation point	:	25 to 220°C (77 to 428°F) (ASTM D86)
Melting/freezing point	:	Not available.
Relative density	:	0.685 to 0.8 kg/L @ 15°C (59°F)
Vapour pressure	:	<107 kPa (<802.5 mm Hg) @ 37.8°C (100°F)
Vapour density	:	3 to 4 [Air = 1] (NFPA)
Volatility	:	Not available.
Evaporation rate	:	Not available.
Viscosity	:	Not available.
Pour point	:	Not available.
Solubility	:	Hydrocarbon components virtually insoluble in water. Soluble in alcohol, ether, chloroform and benzene. Dissolves fats, oils and natural resins.

10 . Stability and reactivity

Chemical stability	:	The product is stable.
Hazardous polymerisation	:	Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	:	Reactive with oxidising agents, acids and interhalogens.
Hazardous decomposition products	:	May release COx, NOx, phenols, polycyclic aromatic hydrocarbons, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Gasoline	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Oral	Rat	13600 mg/kg	-
Ethanol	LD50 Dermal	Rabbit	>15800 mg/kg	-
	LD50 Oral	Mouse	3450 mg/kg	-
	LC50 Inhalation Vapour	Rat	8850 mg/m³	4 hours
Benzene	LD50 Dermal	Rabbit	>8240 mg/kg	-
	LD50 Oral	Rat	930 mg/kg	-
	LC50 Inhalation Vapour	Rat	13228 ppm	4 hours
Toluene	LD50 Dermal	Rabbit	12125 mg/kg	-
	LD50 Oral	Rat	636 mg/kg	-
	LC50 Inhalation Vapour	Rat	7585 ppm	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Gasoline	A3	2B	-	-	-	-
Ethanol	A3	-	-	-	-	-
Benzene	A1	1	A	+	Proven.	+
Toluene	A4	3	D	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : There is a wealth of information about the teratogenic hazards of Toluene in the literature; however, based upon professional judgement regarding the body of evidence, WHMIS classification as a teratogen is not warranted.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1203	GASOLINE	3	II		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Flammable liquid
Irritating material
Carcinogen

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

16 . Other information

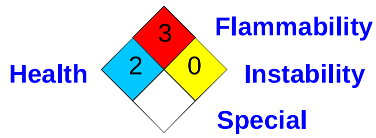
Label requirements : FLAMMABLE LIQUID AND VAPOUR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER. CONTAINS MATERIAL WHICH CAN CAUSE HERITABLE GENETIC EFFECTS.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		3
Physical hazards		0
Personal protection		H

16 . Other information

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **4/21/2010.**

Date of issue : 9 April 2010

Date of previous issue : No previous validation.

Responsible name : **Product Safety - RS**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET

602698-00 MOBIL DTE 13M

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: MOBIL DTE 13M
SUPPLIER: EXXONMOBIL OIL CORPORATION
3225 GALLOWS RD.
FAIRFAX, VA 22037
24 - Hour Health and Safety Emergency (call collect): 609-737-4411
24 - Hour Transportation Emergency:
CHEMTREC: 800-424-9300 202-483-7616
LUBES AND FUELS: 281-834-3296
Product and Technical Information:
Lubricants and Specialties: 800-662-4525 800-443-9966
Fuels Products: 800-947-9147
MSDS Fax on Demand: 613-228-1467
MSDS Internet Website: http://emmsds.ihssolutions.com/

2. COMPOSITION/INFORMATION ON INGREDIENTS
CHEMICAL NAMES AND SYNONYMS: PET. HYDROCARBONS AND ADDITIVES
GLOBALLY REPORTABLE MSDS INGREDIENTS:
None.
OTHER INGREDIENTS:
Substance Name Approx. Wt%

HYDROTREATED LIGHT NAPHTHENIC 25-35
DISTILLATE (PETROLEUM)
(64742-53-6)
See Section 8 for exposure limits (if applicable).

3. HAZARDS IDENTIFICATION
Under normal conditions of use, this product is not considered hazardous according to regulatory guidelines (See section 15).
EMERGENCY OVERVIEW: Amber Liquid. Note: Pressurized mists may form a flammable mixture. DOT ERG No. : NA
POTENTIAL HEALTH EFFECTS: Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation.
For further health effects/toxicological data, see Section 11.

4. FIRST AID MEASURES
EYE CONTACT: Flush thoroughly with water. If irritation occurs, call a physician.
SKIN CONTACT: Wash contact areas with soap and water. Remove and clean oil soaked clothing daily and wash affected area.
INJECTION INJURY WARNING: If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.
INHALATION: Not expected to be a problem. However, if respiratory irritation, dizziness, nausea, or unconsciousness occurs due to excessive vapor or mist exposure, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or mouth-to-mouth resuscitation.
INGESTION: Not expected to be a problem. Seek medical attention if discomfort occurs. Do not induce vomiting.

5. FIRE-FIGHTING MEASURES
EXTINGUISHING MEDIA: Carbon dioxide, foam, dry chemical and water fog.
SPECIAL FIRE FIGHTING PROCEDURES: Water or foam may cause frothing. Use water to keep fire exposed containers cool. Water spray may be used to flush spills away from exposure. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
SPECIAL PROTECTIVE EQUIPMENT: For fires in enclosed areas, fire fighters must use self-contained breathing apparatus.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Note: Pressurized mists may form a flammable mixture.
COMBUSTION PRODUCTS: Fumes, smoke, carbon monoxide, sulfur oxides, aldehydes and other decomposition products, in the case of incomplete combustion.
Flash Point C(F): 210(410) (ASTM D-92).
Flammable Limits (approx.% vol.in air) - LEL: 0.9%, UEL: 7.0%
NFPA HAZARD ID: Health: 0, Flammability: 1, Reactivity: 0

6. ACCIDENTAL RELEASE MEASURES
NOTIFICATION PROCEDURES: Report spills/releases as required to appropriate authorities. U.S. Coast Guard and EPA regulations require immediate reporting of spills/releases that could reach any waterway including intermittent dry creeks. Report spill/release to Coast Guard National Response Center toll free number (800)424-8802. In case of accident or road spill notify
CHEMTREC (800) 424-9300.
PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
LAND SPILL: Shut off source taking normal safety precautions. Take measures to minimize the effects on ground water. Recover by pumping or contain spilled material with sand or other suitable absorbent and remove mechanically into containers. If necessary, dispose of adsorbed residues as directed in Section 13.
WATER SPILL: Confine the spill immediately with booms. Warn other ships in the vicinity. Notify port and other relevant authorities. Remove from the surface by skimming or with suitable absorbents. If permitted by regulatory authorities the use of suitable dispersants should be considered where recommended in local oil spill procedures.

ENVIRONMENTAL PRECAUTIONS: Prevent material from entering sewers, water sources or low lying areas; advise the relevant authorities if it has, or if it contaminates soil/vegetation.
PERSONAL PRECAUTIONS: See Section 8

7. HANDLING AND STORAGE
HANDLING: High pressure injection under the skin may occur due to the rupture of pressurized lines. Always seek medical attention. No special precautions are necessary beyond normal good hygiene practices. See Section 8 for additional personal protection advice when handling this product.
STORAGE: Keep containers closed when not in use. Do not store in open or unlabelled containers. Store away from strong oxidizing agents and combustible materials. Do not store near heat, sparks, flame or strong oxidants.
SPECIAL PRECAUTIONS: Prevent small spills and leakages to avoid slip hazard.
EMPTY CONTAINER WARNING: Empty containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION
OCCUPATIONAL EXPOSURE LIMITS:
When mists/aerosols can occur, the following are recommended: 5 mg/m3 (as oil mist)- ACGIH Threshold Limit Value (TLV), 10 mg/m3 (as oil mist) - ACGIH Short Term Exposure Limit (STEL), 5 mg/m3 (as oil mist) - OSHA Permissible Exposure Limit (PEL)
VENTILATION: If mists are generated, use adequate ventilation, local exhaust or enclosures to control below exposure limits.
RESPIRATORY PROTECTION: If mists are generated, and/or when ventilation is not adequate, wear approved respirator.
EYE PROTECTION: If eye contact is likely, safety glasses with side shields or chemical type goggles should be worn.
SKIN PROTECTION: Not normally required. When splashing or liquid contact can occur frequently, wear oil resistant gloves and/or other protective clothing. Good personal hygiene practices should always be followed.

9. PHYSICAL AND CHEMICAL PROPERTIES
Typical physical properties are given below. Consult Product Data Sheet for specific details.
APPEARANCE: Liquid
COLOR: Amber
ODOR: Mild
ODOR THRESHOLD-ppm: NE
pH: NA
BOILING POINT C(F): > 316(600)
MELTING POINT C(F): NA
FLASH POINT C(F): 210(410) (ASTM D-92)
FLAMMABILITY (solids): NE
AUTO FLAMMABILITY C(F): NA
EXPLOSIVE PROPERTIES: NA
OXIDIZING PROPERTIES: NA
VAPOR PRESSURE-mmHg 20 C: < 0.1
VAPOR DENSITY: > 2.0
EVAPORATION RATE: NE
RELATIVE DENSITY, 15/4 C: 0.874
SOLUBILITY IN WATER: Negligible
PARTITION COEFFICIENT: > 3.5
VISCOSITY AT 40 C, cSt: 32.0
VISCOSITY AT 100 C, cSt: 6.1
POUR POINT C(F): -45(-49)
FREEZING POINT C(F): NE
VOLATILE ORGANIC COMPOUND: NE
DMSO EXTRACT, IP-346 (WT.%): <3, for mineral oil only
NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES
FOR FURTHER TECHNICAL INFORMATION, CONTACT YOUR MARKETING REPRESENTATIVE

10. STABILITY AND REACTIVITY
STABILITY (THERMAL, LIGHT, ETC.): Stable.
CONDITIONS TO AVOID: Extreme heat and high energy sources of ignition.
INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidizers.
HAZARDOUS DECOMPOSITION PRODUCTS: Product does not decompose at ambient temperatures.
HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL DATA
—-ACUTE TOXICOLOGY—-
ORAL TOXICITY (RATS): Practically non-toxic (LD50: greater than 2000 mg/kg). —-Based on testing of similar products and/or the components.
DERMAL TOXICITY (RABBITS): Practically non-toxic (LD50: greater than 2000 mg/kg). —-Based on testing of similar products and/or the components.
INHALATION TOXICITY (RATS): Practically non-toxic (LC50: greater than 5 mg/l). —-Based on testing of similar products and/or the components.

EYE IRRITATION (RABBITS): Practically non-irritating. (Draize score: greater than 6 but 15 or less). —-Based on testing of similar products and/or the components.
SKIN IRRITATION (RABBITS): Practically non-irritating. (Primary Irritation Index: greater than 0.5 but less than 3). —-Based on testing of similar products and/or the components.
OTHER ACUTE TOXICITY DATA: Although an acute inhalation study was not performed with this product, a variety of mineral and synthetic oils, such as those in this product, have been tested. These samples had virtually no effect other than a nonspecific inflammatory response in the lung to the aerosolized mineral oil. The presence of additives in other tested formulations (in approximately the same amounts as in the present formulation) did not alter the observed effects.
—-SUBCHRONIC TOXICOLOGY (SUMMARY)—-
No significant adverse effects were found in studies using repeated dermal applications of similar formulations to the skin of laboratory animals for 13 weeks at doses significantly higher than those expected during normal industrial exposure. The animals were evaluated extensively for effects of exposure (hematology, serum chemistry, urinalysis, organ weights, microscopic examination of tissues etc.).
—-REPRODUCTIVE TOXICOLOGY (SUMMARY)—-
No teratogenic effects would be expected from dermal exposure, based on laboratory developmental toxicity studies of major components in this formulation and/or materials of similar composition.
—-CHRONIC TOXICOLOGY (SUMMARY)—-
Repeated and/or prolonged exposure may cause irritation to the skin, eyes or respiratory tract. Overexposure to oil mist may result in oil droplet deposition and/or granuloma formation. For mineral base oils: Base oils in this product are severely solvent refined and/or severely hydrotreated. Chronic mouse skin painting studies of severely treated oils showed no evidence of carcinogenic effects. These results are confirmed on a continuing basis using various screening methods such as Modified
Ames Test, IP-346, and/or other analytical methods. For synthetic base oils: The base oils in this product have been tested in the Ames assay and other tests of mutagenicity with negative results. These base oils are not expected to be carcinogenic with chronic dermal exposures.
—-SENSITIZATION (SUMMARY)—-
Not expected to be sensitizing based on tests of this product, components, or similar products.

12. ECOLOGICAL INFORMATION
ENVIRONMENTAL FATE AND EFFECTS:
In the absence of specific environmental data for this product, this assessment is based on information for representative products.
ECOTOXICITY: Available ectoxicity data (LL50 >1000 mg/L) indicates that adverse effects to aquatic organisms are not expected from this product.
MOBILITY: When released into the environment, adsorption to sediment and soil will be the predominant behavior.
PERSISTENCE AND DEGRADABILITY: This product is expected to be inherently biodegradable.
BIOACCUMULATIVE POTENTIAL: Bioaccumulation is unlikely due to the very low water solubility of this product, therefore bioavailability to aquatic organisms is minimal.

13. DISPOSAL CONSIDERATIONS
WASTE DISPOSAL: Product is suitable for burning in an enclosed, controlled burner for fuel value. Such burning may be limited pursuant to the Resource Conservation and Recovery Act. In addition, the product is suitable for processing by an approved recycling facility or can be disposed of at an appropriate government waste disposal facility. Use of these methods is subject to user compliance with applicable laws and regulations and consideration of product characteristics at time of disposal.
RCRA INFORMATION: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrosivity, or reactivity. The unused product is not formulated with substances covered by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

14. TRANSPORT INFORMATION
USA DOT: NOT REGULATED BY USA DOT.
RID/ADR: NOT REGULATED BY RID/ADR.
IMO: NOT REGULATED BY IMO.
IATA: NOT REGULATED BY IATA.
STATIC ACCUMULATOR (50 picosiemens or less): YES

15. REGULATORY INFORMATION
US OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this product is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.
EU Labeling: Product is not dangerous as defined by the European Union Dangerous Substances/Preparations Directives. EU labeling not required.
Governmental Inventory Status: All components comply with TSCA, EINECS/ELINCS, AICS, DSL, and KECI.
U.S. Superfund Amendments and Reauthorization Act (SARA) Title III:
This product contains no “EXTREMELY HAZARDOUS SUBSTANCES”.
SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.
This product contains no chemicals subject to the supplier notification requirements of SARA (313) toxic release program.
THIS PRODUCT HAS BEEN AUTHORIZED BY USDA FOR USE UNDER THE FOLLOWING CATEGORY: This product is acceptable as a lubricant where there is no possibility of food contact (complies with earlier USDA guidelines for H-2 lubricant use).
The following product ingredients are cited on the lists below:
CHEMICAL NAME CAS NUMBER LIST CITATIONS *

ZINC (ELEMENTAL ANALYSIS) (0.08%) 7440-66-6 22
ZINC ALKYL DITHIOPHOSPHATE 68649-42-3 22
(0.67%)

—- REGULATORY LISTS SEARCHED —-
1=ACGIH ALL 6=IARC 1 11=TSCA 4 16=CA P65 CARC 21=LA RTK
2=ACGIH A1 7=IARC 2A 12=TSCA 5a2 17=CA P65 REPRO 22=MI 293
3=ACGIH A2 8=IARC 2B 13=TSCA 5e 18=CA RTK 23=MN RTK
4=NTP CARC 9=OSHA CARC 14=TSCA 6 19=FL RTK 24=NJ RTK
5=NTP SUS 10=OSHA Z 15=TSCA 12b 20=IL RTK 25=PA RTK
26=RI RTK
* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.
Code key:CARC=Carcinogen; SUS=Suspected Carcinogen; REPRO=Reproductive

16. OTHER INFORMATION

USE: HYDRAULIC OIL
NOTE: PRODUCTS OF EXXON MOBIL CORPORATION AND ITS AFFILIATED COMPANIES
ARE NOT FORMULATED TO CONTAIN PCBS.
Health studies have shown that many hydrocarbons pose potential human health risks which may vary from person to person. Information provided on this MSDS reflects intended use. This product should not be used for other applications. In any case, the following advice should be considered:
INDUSTRIAL LABEL
Under normal conditions of intended use, this product does not pose a risk to health. Excessive exposure may result in eye, skin or respiratory irritation. Always observe good hygiene measures. First Aid: Wash skin with soap and water. Flush eyes with water. If overcome by fumes or vapor, remove to fresh air. If ingested do not induce vomiting. If symptoms persist seek medical assistance. Read and understand the MSDS before using this product.

For Internal Use Only: MHC: 1* 1* 1* 1* 1*, MPPEC: A, TRN: 602698-00, CMCS97: 970705, REQ: US - MARKETING, SAFE USE: L EHS Approval Date: 25APR2003

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Prepared by: ExxonMobil Oil Corporation
Environmental Health and Safety Department, Clinton, USA

Effective Date of Issue: JANUARY 5th 2009

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1. Identification of the substance/preparation and company undertaking

Material Name : SAE 50
Uses : Engine Oil
Product Code : SAE50
Manufacturer/Supplier : Aztec Oils Ltd
29-33 Intake Rd
Bolsover
Chesterfield
S44 6BB
United Kingdom
Telephone : + 44(0)1246 823007
Fax : + 44(0) 1246 823014
Email : enq@aztecoils.co.uk
Emergency Telephone Number : +44(0)1246 823007

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2. Hazard Identification

EC Classification : Not classified as dangerous under EC criteria

Health Hazards : Not expected to be a health hazard when used under normal conditions. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/ folliculitis. Used oil may contain harmful impurities.

Signs & Symptoms : Oil acne/folliculitis signs and symptoms may include formation of black pustules and spots on the kin of exposed areas.
Ingestion may result in nausea, vomiting and/or diarrhoea.

Safety Hazards : Not classified as flammable but will burn.

Environmental Hazards : Not classified as dangerous for the environment.

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3. Composition/Information on Ingredients.

Preparation Description : Highly refined mineral oils & additives.
Hazardous Components

Chemical Identity	CAS	EINECS	Symbol(s)	R-phrase(s)	Conc.

Additional Information: the highly refined mineral oil contains <3% (w/w) DMSO-extract, according to IP346. Refer to chapter 16 for full text of EC R-phrases.

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4. First Aid Measures

General Information : Not expected to be a health hazard when used under normal conditions.

Inhalation : No treatment necessary under normal conditions of use. If symptoms persist, obtain medical advice.

Skin contact : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available. If persistent irritation occurs, obtain medical advice.

Eye Contact : Flush eyes with copious quantities of water. If persistent Irritation occurs, obtain medical attention.

Ingestion : In general no treatment is necessary unless large quantities are Swallowed, however, get medical advice.

Advice to Physician : treat symptomatically.

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5. Fire Fighting Measures

Clear fire area of all non-emergency personnel.

Specific Hazards : Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Unidentified organic and Inorganic compounds.

Suitable Extinguishing Media: Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.

Unsuitable Extinguishing Media: Do not use water in a jet.

Protective Equipment for Fire-fighters: Proper protective equipment including breathing apparatus must be worn when approaching a fire in a confined space.

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6. Accidental Release Measures

Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material safety Data Sheet. See Chapter 13 for information on disposal. Observe all relevant local and international regulations.

Protective measures : Avoid contact with skin and eyes. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth or other appropriate barriers.

Clean up Methods : Slippery when spilt. Avoid accidents, clean up immediately. Prevent from spreading by making a barrier with sand, earth or other containment material. Reclaim liquid directly or in an absorbent. Soak up residue with an absorbent such as a clay, sand or other suitable material and dispose of properly.

Additional Advice : Local authorities should be advised if significant spillages Cannot be contained.

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7. **Handling and Storage**:

General Precautions : Use local exhaust ventilation if there is a risk of inhalation of vapours, mists or aerosols. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.

Handling : Avoid prolonged or repeated contact with skin. Avoid inhaling vapour and/or mists. When handling product in drums, safety footwear should be worn and proper handling equipment used.

Storage : Keep container tightly closed and in a cool, well ventilated place. Use properly labelled and closable containers.
Storage Temperature: 0-50oC / 32-122oF
The storage of this product may be subject to the Control of Pollution (Oil Storage) (England) Regulations. Further guidance maybe obtained from the local environmental agency office.

Recommended Materials : For containers or container linings, use mild steel or high Density polyethylene.

Unsuitable Materials : PVC.

Additional Information : Polyethylene containers should not be exposed to high temperatures because of possible risk of distortion.
Exposure to this product should be reduced as low as reasonably practicable. Reference should be made to The Health & Safety Executive's publication "COSHH Essentials"

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8. Exposure Control / Personal Protection:

Occupational Exposure Limits

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate ventilation to control airborne concentrations. Where material is heated, sprayed or mist formed, there is greater potential for airborne concentrations to be generated.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE supplier.

Respiratory Protection : No respiratory protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid breathing of material. If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for combined particulate/organic gases and vapours (boiling point >65oC(149oF) meeting EN141.

Hand Protection	: Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC, neoprene or nitrile rubber gloves. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended
Eye Protection	: Wear safety glasses or full face shield if splashes are likely to occur. Approved to EU Standard EN166.
Protective Clothing	: Skin protection not ordinarily required beyond standard issue work clothes.
Monitoring Methods	: Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	: Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

9. Physical and Chemical Properties

Appearance	: Amber. Liquid
Odour	: Slight Hydrocarbon
pH	:Data not available
Initial Boiling Point and Boiling Range	: >280oC/536oF estimated values.
Pour Point	: Typical -18oC/0oF
Flash Point	: Typical 242oC/468oF (COC)
Upper/lower Flammability or explosion limits	: Typical 1-10% (V) based on mineral oil)
Auto-ignition temperature	: > 320oC/608oF
Vapour pressure	: <0.5 Pa at 20oC/68oF (estimated values)
Density	: Typical 890 kg/m3 at 15oC/59oF
Water solubility	: Negligible

n-octanol/water partition coefficient (log Pow)	: >6 (based on information on similar products)
Kinematic viscosity	: Typical 220.00 mm2/s at 40oC/104oF
Vapour density (air=1)	: >1 (estimated value(s))
Evaporation rate (nBuAc=1)	: Data not available

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10. Stability and Reactivity

Stability	: Stable
Conditions to avoid	: Extremes of temperature and direct sunlight
Materials to avoid	: Strong oxidising agents.
Hazardous Decomposition Products	: Hazardous decomposition products are not expected to form during normal storage.

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11 Toxicological Information

Basis for Assessment	: Information given is based on data on the components and the toxicology of similar products.
Acute Oral Toxicity	: Expected to be of low toxicity: LD50>5000 mg/kg, Rat
Acute Dermal Toxicity	: Expected to be of low toxicity: LD50>5000 mg/kg, Rabbit
Acute Inhalation Toxicity	: Not considered to be an inhalation hazard under normal conditions of use.
Skin Irritation	: Expected to be slightly irritating. Prolonged or repeated skin contact without proper cleaning can clog the pores of the skin resulting in disorders such as oil acne/folliculitis.
Eye Irritation	: Expected to be slightly irritating
Respiratory	: Inhalation of vapours or mists may cause irritation.
Sensitisation	: Not expected to be a skin sensitiser.
Repeated Dose Toxicity	: Not expected to be a hazard
Mutagenicity	: Not considered a mutagenic hazard
Carcinogenicity	: Product contains mineral oils of types shown to be non-carcinogenic in animal skin-painting studies. Highly refined mineral oils are not classified as carcinogenic by the International Agency for Research on Cancer(IARC). Other components are not known to be associated with carcinogenic effects.
Reproductive and Development Toxicity	: Not expected to be a hazard.
Additional Information	: Used oils may contain harmful impurities that have accumulated during use. The concentration of such impurities will depend on use and they may present risks to health and the environment on disposal. ALL used oil should be handled with caution and skin contact avoided as far as possible. Continuous contact with used engine oils has caused skin cancer in animal tests.

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12. Ecological Information

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products.

Acute Toxicity : Poorly soluble mixture. May cause physical fouling of aquatic organisms. Expected to be practically non toxic: LL/EL/IL50> 100mg/l (to aaquatic organisms) (LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract). Mineral oil is not expected to cause any chronic effects to aquatic organisms at concentration less than 1mg/l.

Mobility : Liquid under most environmental conditions. Floats on water. If it enters soil, it will adsorb to soil particles and will not be mobile.

Persistence/degradability : Expected to be not readily biodegradable. Major constituents are expected to be inherently biodegradable, but the product contains components that may persist in the environment.

Bioaccumulation : Contains components with the potential to bio accumulate.

Other Adverse Effects : Product is a mixture of non-volatile components, which are not expected to be released to air in any significant quantities. Not expected to have ozone depletion potential, photo-chemical ozone creation potential or global warming potential.

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13. Disposal Conditions:

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses.

Container Disposal : Dispose in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Local Legislation : Disposal should be in accordance with applicable regional, national, and local laws and regulations.
EU Waste Disposal Code (EWC): 13 02 05 mineral-based non-chlorinated engine, gear and lubricating oils.
classification of waste is always the responsibility of the end user.

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14. Transport Information

ADR
This material is not classified as dangerous under ADR regulations.

RID
This material is not classified as dangerous under RID regulations.

ADNR
This material is not classified as dangerous under ADNR regulations.

IMDG
This material is not classified as dangerous under IMDG regulations

IATA(Country variations may apply)
This material is not classified as dangerous under IATA regulations.

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15. Regulatory Information

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

EC Classification	: Not classified as dangerous under EC criteria.
EC Symbols	: No Hazard Symbol required
EC Risk Phrases	: Not classified
EC Safety Phrases	: Not classified
EINECS	: All components listed or polymer exempt.
TSCA	: All components listed

Other Information

Environmental Protection Act 1990 (as amended). Health & Safety at Work Act 1974. Consumer Protection Act 1987. Control of Pollution Act 1974. Environmental Act 1995. Factories Act 1961. Carriage of Dangerous Goods by Road and Rail (Classification, Packaging and Labelling) Regulations. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Control of Substances Hazardous to Health Regulations 1994 (as amended). Road Traffic (Carriage of Dangerous Substances in Packages) Regulations. Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations. Road Traffic (Carriage of Dangerous Substances in Road Tankers in Tank Containers) Regulations. Road Traffic (Training of Drivers of Vehicles Carrying Dangerous Goods) Regulations. Reporting of Injuries, Diseases and Dangerous Occurrences Regulations. Health and safety (First Aid) Regulations 1981. Personal Protective Equipment (EC directive) Regulations 1992. Personal Protective Equipment at Work Regulations 1992.

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16. Other Information

R-phrase(s)
Not classified

MSDS Version No	2.0
MSDS Effective Date	05/01/2009
MSDS Regulation	Regulation 1907/2006/EC
MSDS Distribution	The information in this document should be made available to all who may handle the product.
Disclaimer	This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
NULON 85W-140 LIMITED SLIP DIFFERENTIAL OIL

SYNONYMS
"Product Code: LSD85W140"

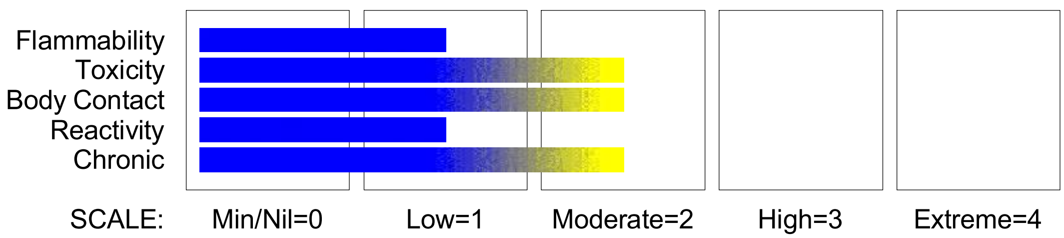
PRODUCT USE
• Used according to manufacturer's directions.
Limited slip differential oil.

SUPPLIER
Company: Nulon Products Pty Ltd
Address:
17 Yulong Close
Moorebank
NSW, 2170
Australia
Telephone: +61 2 9608 7800
Fax: +61 2 9601 4700
Email: msds@nulon.com.au

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to NOHSC Criteria, and ADG Code.

CHEMWATCH HAZARD RATINGS



POISONS SCHEDULE
None

RISK
•None under normal operating conditions.

SAFETY

Safety Codes	Safety Phrases
S23	• Do not breathe gas/fumes/vapour/spray.
S24	• Avoid contact with skin.
S39	• Wear eye/face protection.
S26	• In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
residual oils, petroleum, solvent- refined (severe)	64742-01-4.	80-85
paraffinic distillate, heavy, hydrotreated (severe)	64742-54-7.	5-10
mineral oil	Not avail.	5-15
ingredients at levels determined not to be hazardous		balance

continued...

Section 4 - FIRST AID MEASURES

SWALLOWED
• - Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

EYE
• If this product comes in contact with the eyes:
- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN
• If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED
• - If fumes or combustion products are inhaled remove from contaminated area.
- Other measures are usually unnecessary.

NOTES TO PHYSICIAN
• Treat symptomatically.
- Heavy and persistent skin contamination over many years may lead to dysplastic changes. Pre-existing skin disorders may be aggravated by exposure to this product.
- In general, emesis induction is unnecessary with high viscosity, low volatility products, i.e. most oils and greases.
- High pressure accidental injection through the skin should be assessed for possible incision, irrigation and/or debridement.
NOTE: Injuries may not seem serious at first, but within a few hours tissue may become swollen, discoloured and extremely painful with extensive subcutaneous necrosis.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
• - Water spray or fog.
- Alcohol stable foam.
- Dry chemical powder.
- Carbon dioxide.

FIRE FIGHTING
• - Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use water delivered as a fine spray to control fire and cool adjacent area.

FIRE/EXPLOSION HAZARD
• - Combustible.
- Slight fire hazard when exposed to heat or flame.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).
Combustion products include: carbon dioxide (CO_2), phosphorus oxides (POx), sulfur oxides (SOx), other pyrolysis products typical of burning organic material.
May emit poisonous fumes.
CARE: Water in contact with hot liquid may cause foaming and a steam explosion with wide scattering of hot oil and possible severe burns. Foaming may cause overflow of containers and may result in possible fire.

FIRE INCOMPATIBILITY
• - Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.

HAZCHEM
None

PERSONAL PROTECTION

Glasses:	Gloves:	Respirator:
Chemical goggles.	PVC chemical resistant type.	Type A- P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
• Slippery when spilt.
- Remove all ignition sources.
- Clean up all spills immediately.

continued...

- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.

MAJOR SPILLS
• Slippery when spilt.
Moderate hazard.
- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING
• - DO NOT allow clothing wet with material to stay in contact with skin.
- Electrostatic discharge may be generated during pumping - this may result in fire.
- Ensure electrical continuity by bonding and grounding (earthing) all equipment.
- Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<=1 m/sec until fill pipe submerged to twice its diameter, then <= 7 m/sec).
- Avoid splash filling.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

SUITABLE CONTAINER
• - Metal can or drum
- Packaging as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY
• CARE: Water in contact with heated material may cause foaming or a steam explosion with possible severe burns from wide scattering of hot material. Resultant overflow of containers may result in fire.
- Avoid reaction with oxidising agents.

STORAGE REQUIREMENTS
• - Store in original containers.
- Keep containers securely sealed.
- No smoking, naked lights or ignition sources.
- Store in a cool, dry, well-ventilated area.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA mg/m³
Australia Exposure Standards	residual oils, petroleum, solvent-refined (severe) (Oil mist, refined mineral)	5
Australia Exposure Standards	paraffinic distillate, heavy, hydrotreated (severe) (Oil mist, refined mineral)	5
Australia Exposure Standards	mineral oil (Oil mist, refined mineral)	5

PERSONAL PROTECTION

RESPIRATOR
Type A-P Filter of sufficient capacity

EYE
• - Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

continued...

HANDS/FEET
• - Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber.
NOTE:
- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity.

OTHER
• - Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.

ENGINEERING CONTROLS
• General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE
Clear bright amber liquid; not miscible with water.

PHYSICAL PROPERTIES
Liquid.
Does not mix with water.
Floats on water.

State	Liquid	Molecular Weight	Not Available
Melting Range (℃)	Not Available	Viscosity	384 cSt@40℃
Boiling Range (℃)	Not Available	Solubility in water (g/L)	I mmiscible
Flash Point (℃)	180 (PMCC)	pH (1% solution)	Not Applicable
Decomposition Temp (℃)	Not Available	pH (as supplied)	Not A pplicable
Autoignition Temp (℃)	Not Available	Vapour Pressure (kPa)	Not Available
Upper Explosive Limit (%)	Not Available	Specific Gravity (water=1)	0.88- 0.93
Lower Explosive Limit (%)	Not Available	Relative Vapour Density (air=1)	Not Available
Volatile Component (%vol)	Not Available	Evaporation Rate	Not Available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY
• - Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.
For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS
ACUTE HEALTH EFFECTS
• Not applicable.

CHRONIC HEALTH EFFECTS
• Not applicable.

TOXICITY AND IRRITATION
PARAFFINIC DISTILLATE, HEAVY, HYDROTREATED (SEVERE):
MINERAL OIL:
RESIDUAL OILS, PETROLEUM, SOLVENT-REFINED (SEVERE):
• unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

• unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

• Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.
No significant acute toxicological data identified in literature search.

RESIDUAL OILS, PETROLEUM, SOLVENT-REFINED (SEVERE):

continued...

• No significant acute toxicological data identified in literature search.
The substance is classified by IARC as Group 3:
NOT classifiable as to its carcinogenicity to humans.
Evidence of carcinogenicity may be inadequate or limited in animal testing.

PARAFFINIC DISTILLATE, HEAVY, HYDROTREATED (SEVERE):

TOXICITY	IRRITATION
Oral (rat) LD50: >15000 mg/kg	Nil Reported
Dermal (None) rabbit: None >5000 mg/kg	

• No data of toxicological significance identified in literature search.

MINERAL OIL:

• Toxicity and Irritation data for petroleum-based mineral oils are related to chemical components and vary as does the composition and source of the original crude.
A small but definite risk of occupational skin cancer occurs in workers exposed to persistent skin contamination by oils over a period of years.
Petroleum oils which are solvent refined/extracted or severely hydrotreated, contain very low concentrations of both.

Section 12 - ECOLOGICAL INFORMATION

No data

Section 13 - DISPOSAL CONSIDERATIONS

• - Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.
Otherwise:
- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area.
A Hierarchy of Controls seems to be common - the user should investigate:
- Reduction.
- DO NOT allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM:
None (ADG7)

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: ADG7, UN, IATA, IMDG

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE
None

REGULATIONS
Regulations for ingredients

residual oils, petroleum, solvent-refined (severe) (CAS: 64742-01-4) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia Inventory of Chemical Substances (AICS)","OECD Representative List of High Production Volume (HPV) Chemicals"

continued...

paraffinic distillate, heavy, hydrotreated (severe) (CAS: 64742-54-7) is found on the following regulatory lists;
"Australia Hazardous Substances","Australia High Volume Industrial Chemical List (HVICL)","Australia Inventory of Chemical Substances (AICS)","OECD Representative List of High Production Volume (HPV) Chemicals"

No data for Nulon 85W-140 Limited Slip Differential Oil (CW: 4731-28)
No data for mineral oil (CAS: , Not avail)

Section 16 - OTHER INFORMATION

• Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

• The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings.

Issue Date: 24-Aug-2010
Print Date: 25-Aug-2010

This is the end of the MSDS.

Cover Sheet

micromeritics®
INSTRUMENT CORPORATION
ONE MICROMERITICS DR.
NORCROSS, GA 30093-1877 U.S.A.

REV	REVISION DESCRIPTION	BY	DATE	CHK	REL. NO.		
						DWN BY	J. Pittman
						ENGR	J. Mocny
C	Revision	JAP	6/25/04		040265	ENGR SIG	P. Hendrix
B	Revision	MD	04/02/03	JM	030200	HR SIG	J. Mocny
A	New format and numbering system	C. Bills	5/24/00	—	990544	QA SIG	A. Dovin
-	Formal Release	C. Bills	6-26-07	—	970446	ES SIG	K. Massengill

MSDS
HYDRAULIC FLUID OD-15-10
(1-L)

SIZE	NUMBER	PAGE
A	920/16002/00MSDS	X of 3

Micromeritics Material Safety Data Sheet

Title : HYDRAULIC FLUID OD-15-10(1-L) MSDS No. : 920/16002/00MSDS
Date of Preparation : 06/25/04 Revision : C

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: HYDRAULIC FLUID OD-15-10
Chemical Formula: Blend
CAS Number: n/a
Other Designations:
General Use:
Supplier: Micromeritics Instrument Corp.
1 Micromeritics Dr.
Norcross, GA 30093-1877 USA

Contact: Human Resources
Phone: (770) 662-3620
Fax: (770) 662-3696

Manufacturer: Sun Company, Inc. Ten Penn Center 1801 Market St. Philadelphia, PA 19103-1699
(770) 662-3678

Section 2 - Composition / Information on Ingredients

Ingredient Name	CAS Number	% vol
Severely solvent refined heavy paraffinic petroleum oil	64741-88-4	90-100
Zinc dialkyl Dithiophosphats	68649-42-3	0-1
Butylated Phenol	n/a	0-1
Calcium Sulfonate	61789-86-4	0-1
Acrylic Copolymer	68171-46-0	0-1
2-Ethylhexanol	104-76-7	0-1

Trace Impurities:

	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH
Ingredient	**TWA**	**STEL**	**TWA**	**STEL**	**TWA**	**STEL**	**IDLH**
Severely solvent refined heavy paraffinic petroleum oil	5mg/m^3	-	5mg/m^3	-	n/a	n/a	n/a
Zinc dialkyl Dithiophosphats	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Butylated Phenol	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Calcium Sulfonate	n.a	n/a	n/a	n/a	n/a	n/a	n/a
Acrylic Copolymer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Ethylhexanol	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional exposure limits: Oil Mist	5mg/m^3		5mg/m^3				

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

HMIS
H 1
F 1
R 0
PPE†
†Sec. 8

Potential Health Effects

Primary Entry Routes: Skin
Effects of Overexposure:

Inhalation: No effects expected
Eye: Contact with the eye may cause minimal irritation.
Skin: Practically non-toxic if absorbed (LD50 greater than 2000 mg/kg). May cause mild irritation with prolonged or repeated contact.
Ingestion: Practically non-toxic (LD50 > 15g/Kg).

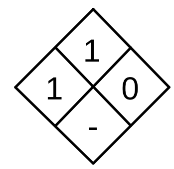
Section 4 - First Aid Measures

Inhalation: Move person to fresh air.
Eye: Flush with water.
Skin: Wash with soap and water until no odor remains. Wash clothing before reuse.
Swallowing: Practically non-toxic. Induction of vomiting not required. Obtain emergency medical attention. Small amounts which accidentally enter mouth should be rinsed out until taste of it is gone.

Other Information: Warning!! *High pressure injection of oil through the skin is a medial emergency. There may be no sign of injury and no initial pain. This oil must be removed completely by a physician. Failure to obtain immediate treatment has resulted in loss of a finger, hand or arm.*
WHMIS Classification: Not controlled.

Section 5 - Fire-Fighting Measures

NFPA



Flash Point: 380°F (192°C)
Flash Point Method: COC
Extinguishing Media: Water spray, regular foam, dry chemical, carbon dioxide.
Unusual Fire or Explosion Hazards: n/a
Fire-Fighting Procedures: Wear self-contained breathing apparatus. Wear structural firefighters protective clothing.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: n/a

Section 7 - Handling and Storage

Handling/ Storage Requirements: n/a

Section 8 - Exposure Controls / Personal Protection

N/A

Section 9 - Physical and Chemical Properties

Appearance and Odor: clear fluid, little odor
Odor Threshold: n/a
Vapor Pressure: <0.0001 (mm Hg at 20 °C)
Vapor Density (Air=1): 10 +
Formula Weight: n/a
Density: n/a
Specific Gravity (H_2O=1, at 4 °C): 0.87

Water Solubility: nil
Other Solubilities: n/a
Boiling Point: n/a
Melting Point: n/a
Viscosity: 165 sus @ 100°F. 32.0 CST @ 40 °C.
% Volatile: n/a
Evaporation Rate: 1000X slower (ehtyl ether = 1)

Section 10 - Stability and Reactivity

Stability: HYDRAULIC FLUID OD-15-10 is stable.
Polymerization: Hazardous polymerization will not occur.
Chemical Incompatibilities: Strong oxidizers.
Conditions to Avoid: n/a
Hazardous Decomposition Products: Combustion will produce carbon monoxide, oxides of sulfur and asphyxiants.

Section 11- Toxicological Information

n/a

Section 12 - Ecological Information

Ecotoxicity: n/a

Section 13 - Disposal Considerations

Disposal: n/a

Section 14 - Transport Information

n/a

Section 15 - Regulatory Information

n/a

Section 16 - Other Information

Prepared By: C. Bills
Revision Notes:

Disclaimer:

Material Safety Data Sheet

ENDURATEX ™ EP 1000

1 . Product and company identification

Product name	:	ENDURATEX ™ EP 1000
Code	:	ENT1000, 490-243
Material uses	:	Enduratex EP 1000 extreme pressure gear oil is suitable for enclosed helical, worm, spur and bevel gear assemblies which require an EP type ISO 1000 viscosity grade lubricant. It is specifically intended for use in heavy duty gears in the mining and resource industries.
Manufacturer	:	Petro-Canada Lubricants Inc. 2310 Lakeshore Road West Mississauga, Ontario Canada L5J 1K2
In case of emergency	:	Suncor Energy: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state	:	Viscous liquid.
Odour	:	Mild sulphur/phosphorus odour.
WHMIS (Canada)	:	Not controlled under WHMIS (Canada).
OSHA/HCS status	:	While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.
Emergency overview	:	No specific hazard.
Routes of entry	:	Dermal contact. Eye contact. Inhalation. Ingestion.
Potential acute health effects		
Inhalation	:	No known significant effects or critical hazards.
Ingestion	:	No known significant effects or critical hazards.
Skin	:	Slightly irritating to the skin.
Eyes	:	Slightly irritating to the eyes.
Potential chronic health effects		
Chronic effects	:	No known significant effects or critical hazards.
Carcinogenicity	:	Not listed as carcinogenic by OSHA, NTP or IARC.
Mutagenicity	:	No known significant effects or critical hazards.
Teratogenicity	:	No known significant effects or critical hazards.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	:	Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (Section 11)

3 . Composition/information on ingredients

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact	: Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
Skin contact	: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Protection of first-aiders	: No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
Notes to physician	: No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product	: May be combustible at high temperature.
Extinguishing media	
Suitable	: Use an extinguishing agent suitable for the surrounding fire.
Not suitable	: None known.
Special exposure hazards	: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Products of combustion	: Carbon oxides (CO, CO_2), nitrogen oxides (NO_x), phosphorus oxides (PO_x), sulphur oxides (SO_x), hydrogen sulfide (H_2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
Special remarks on fire hazards	: Low fire hazard. This material must be heated before ignition will occur.
Special remarks on explosion hazards	: Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions	: No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
Environmental precautions	: Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
Methods for cleaning up	
Small spill	: Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Mineral oil	**ACGIH TLV (United States). Notes: (Mineral oil)** TWA: 5 mg/m³, (Inhalable fraction)

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: neoprene, nitrile, polyvinyl alcohol (PVA), Viton®.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

8 . Exposure controls/personal protection

Skin	:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Environmental exposure controls	:	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	:	Viscous liquid.
Flash point	:	Open cup: 237°C (458.6°F) [Cleveland.]
Auto-ignition temperature	:	Not available.
Flammable limits	:	Not available.
Colour	:	Clear brown
Odour	:	Mild sulphur/phosphorus odour.
Odour threshold	:	Not available.
pH	:	Not available.
Boiling/condensation point	:	Not available.
Melting/freezing point	:	Not available.
Relative density	:	0.902 kg/L @ 15°C (59°F)
Vapour pressure	:	Not available.
Vapour density	:	Not available.
Volatility	:	Not available.
Evaporation rate	:	Not available.
Viscosity	:	1077 cSt @ 40°C (104°F), 55 cSt @ 100°C (212°F), VI=100
Pour point	:	-15°C (5°F)
Solubility	:	Not available.

10 . Stability and reactivity

Chemical stability	:	The product is stable.
Hazardous polymerisation	:	Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Conclusion/Summary	:	Not available.

Chronic toxicity

Conclusion/Summary	:	Not available.

Irritation/Corrosion

Conclusion/Summary	:	Not available.

Sensitiser

Conclusion/Summary	:	Not available.

Carcinogenicity

Conclusion/Summary	:	Not available.

Mutagenicity

Conclusion/Summary	:	Not available.

11 . Toxicological information

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	Not regulated.	-	-	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Not regulated.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

15 . Regulatory information

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : All components are listed or exempted.

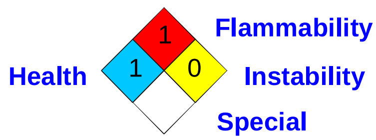
International lists : **China inventory (IECSC)**: All components are listed or exempted.

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	1
Flammability	1
Physical hazards	0
Personal protection	B

National Fire Protection Association (U.S.A.) :



References : Available upon request.
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Date of printing : **4/18/2011.**

Date of issue : 18 April 2011

Date of previous issue : 3/11/2009.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

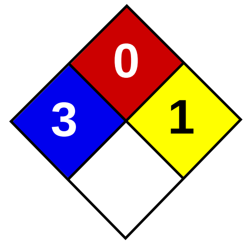
Internet: lubricants.petro-canada.ca/msds

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: 1-800-378-4518
Ontario & Central Canada, telephone: 1-800-268-5850; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrochloric acid

Catalog Codes: SLH1462, SLH3154

CAS#: Mixture.

RTECS: MW4025000

TSCA: TSCA 8(b) inventory: Hydrochloric acid

CI#: Not applicable.

Synonym: Hydrochloric Acid; Muriatic Acid

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: of metals

Explosion Hazards in Presence of Various Substances: Non-explosive in presence of open flames and sparks, of shocks.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammble gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

Special Remarks on Explosion Hazards:

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pungent. Irritating (Strong.)

Taste: Not available.

Molecular Weight: Not applicable.

Color: Colorless to light yellow.

pH (1% soln/water): Acidic.

Boiling Point:
108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

Melting Point:
-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

Critical Temperature: Not available.

Specific Gravity:
1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

Vapor Pressure: 16 kPa (@ 20°C) average

Vapor Density: 1.267 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.25 to 10 ppm

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility: Soluble in cold water, hot water, diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, water

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothmeric reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the folloiwng can cause explosion or ignition on contact or

Special Remarks on Corrosivity:

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (fetoxicity). May affect genetic material.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjuntivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and larryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well has headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomitting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophogeal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Hydrochloric acid, solution UNNA: 1789 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangeureuses au canada. Centre de conformité internatinal Ltée. 1986.

Other Special Considerations: Not available.

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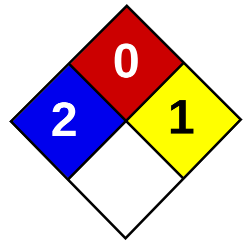
Last Updated: 11/01/2010 12:00 PM



Health	3
Fire	0
Reactivity	1
Personal Protection	

Material Safety Data Sheet
Hydrogen Peroxide 30% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrogen Peroxide 30%

Catalog Codes: SLH1552

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Hydrogen Peroxide

CI#: Not applicable.

Synonym: Hydrogen Peroxide 30%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Water	7732-18-5	70
Hydrogen Peroxide	7722-84-1	30

Toxicological Data on Ingredients: Hydrogen Peroxide: ORAL (LD50): Acute: 2000 mg/kg [Mouse]. DERMAL (LD50): Acute: 4060 mg/kg [Rat]. 2000 mg/kg [pig]. VAPOR (LC50): Acute: 2000 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: combustible materials

Explosion Hazards in Presence of Various Substances: Slightly explosive in presence of open flames and sparks, of heat, of organic materials, of metals, of acids.

Fire Fighting Media and Instructions:
Fire: Small fires: Use water. Do not use dry chemicals or foams. CO2, or Halon may provide limited control. Large fires: Flood fire area with water from a distance. Move containers from fire area if you can do it without risk. Do not move cargo or vehicle if cargo has been exposed to heat. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
Cool containers with flooding quantities of water until well after fire is out. ALWAYS stay away from tanks engulfed in fire.
For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. / Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide, aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-140]

Special Remarks on Fire Hazards:
Most cellulose (wood, cotton) materials contain enough catalyst to cause spontaneous ignition with 90% Hydrogen Peroxide. Hydrogen Peroxide is a strong oxider. It is not flammable itself, but it can cause spontaneous combustion of flammable materials and continued support of the combustion because it liberates oxygen as it decomposes. Hydrogen peroxide mixed with magnesium and a trace of magnesium dioxide will ignite immediately.

Special Remarks on Explosion Hazards:

Soluble fuels (acetone, ethanol, glycerol) will detonate on a mixture with peroxide over 30% concentration, the violence increasing with concentration. Explosive with acetic acid, acetic anhydride, acetone, alcohols, carboxylic acids, nitrogen containing bases, As_2S_3, Cl_2 + KOH, FeS, $FeSO_4$ + 2 methylpryidine + H_2SO_4, nitric acid, potassium permanganate, P_2O_5, H_2Se, Alcohols + H_2SO_4, Alcohols + tin chloride, Antimoy trisulfide, chlorosulfonic acid, Aromatic hydrocarbons + trifluoroacetic acid, Azeliac acid + sulfuric acid (above 45 C), Benzenesulfonic anhydride, tert-butanol + sulfuric acid, Hydrazine, Sulfuric acid, Sodium iodate, Tetrahydrothiophene, Thiodiglycol, Mercurous oxide, mercuric oxide, Lead dioxide, Lead oxide, Manganese dioxide, Lead sulfide, Gallium + HCl, Ketenes + nitric acid, Iron (II) sulfate + 2-methylpyridine + sulfuric acid, Iron (II) sulfate + nitric acid, + sodium carboxymethylcellulose (when evaporated), Vinyl acetate, trioxane, water + oxygenated compounds (eg: acetaldehyde, acetic acid, acetone, ethanol, formaldehyde, formic acid, methanol, 2-propanol, propionaldehyde), organic compounds. Beware: Many mixitures of hydrogen peroxide and organic materials may not explode upon contact. However, the resulting combination is detonatable either upon catching fire or by impact. EXPLOSION HAZARD: SEVERE, WHEN HIGHLY CONCENTRATED OR PURE H_2O_2 IS EXPOSED TO HEAT, MECHANICAL IMPACT, OR CAUSED TO DECOMPOSE CATALYTICALLY BY METALS & THEIR SALTS, DUSTS & ALKALIES. ANOTHER SOURCE OF HYDROGEN PEROXIDE EXPLOSIONS IS FROM SEALING THE MATERIAL IN STRONG CONTAINERS. UNDER SUCH CONDITIONS EVEN GRADUAL DECOMPOSITION OF HYDROGEN PEROXIDE TO WATER + 1/2 OXYGEN CAN CAUSE LARGE PRESSURES TO BUILD UP IN THE CONTAINERS WHICH MAY BURST EXPLOSIVELY. Fire or explosion: May explode from friction, heat or contamination. These substances will accelerate burning when involved in a fire. May ignite combustibles (wood, paper, oil, clothing, etc.). Some will react explosively with hydrocarbons (fuels). Containers may explode when heated. Runoff may create fire or explosion hazard. /Hydrogen peroxide, aqueous solution, stabilized, with more than 60% Hydrogen peroxide; Hydrogen peroxide, stabilized/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-143] . Fire or explosion: These substances will accelerate burning when involved in a fire. Some may decompose explosively when heated or involved in a fire. May explode from heat or contamination. Some will react explosively with hydrocarbons (fuels). May ignite combustibles (wood, paper, oil, clothing, etc.). Containers may explode when heated. Runoff may create fire or explosion hazard. /Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide, aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-140] (Hydrogen Peroxide)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Corrosive liquid. Oxidizing material. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis.

Storage:
Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalies, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Do not store above 8°C (46.4°F). Refrigerate Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Hydrogen Peroxide TWA: 1 (ppm) from ACGIH (TLV) [United States] TWA: 1 (ppm) from OSHA (PEL) [United States] TWA: 1 STEL: 2 [Canada] TWA: 1.4 (mg/m3) from NIOSH TWA: 1.4 (mg/m3) from OSHA (PEL) [United States] TWA: 1 (ppm) [United Kingdom (UK)] TWA: 1.4 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Odorless.

Taste: Slightly acid. Bitter

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Not available

Boiling Point: 108°C (226.4°F)

Melting Point: -33°C (-27.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.1 (Water = 1)

Vapor Pressure: 3.1 kPa (@ 20°C)

Vapor Density: 1.1 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in cold water. Soluble in diethyl ether.

Section 10: Stability and Reactivity Data

Stability: The product is stable. It contains a stabilizer.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, incompatible materials

Incompatibility with various substances: Reactive with reducing agents, combustible materials, organic materials, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Light sensitive. Incompatible with reducing materials, ethers (dioxane, furfuran, tetrahydrofuran), oxidizing materials, Metals(eg. potassium, sodium lithium, iron, copper, brass, bronze, chromium, zinc, lead, silver, nickel), metal oxides (eg. cobalt oxide, iron oxide, lead oxide, lead hydroxide, manganese oxide), metal salts (eg. calcium permanganate, salts of iron), manganese, asbestos, vanadium, platinium, tungsten, molybdeum, triethylamine, palladium, sodium pyrophosphate, carboxylic acids, cyclopentadiene, formic acid, rust, ketones, sodium carbonate, alcohols, sodium borate, aniline, mercurous chloride, rust, nitric acid, sodium pyrophosphate, hexavalent chromium compounds, tetrahydrofuran, sodium fluoride organic matter, potassium permanganate, urea, chlorosulfonic acid, manganese dioxide, hydrogen selenide, charcoal, coal, sodium borate, alkalies, cyclopentadiene, glycerine, cyanides (potassium, cyanide, sodium cyanide), nitrogen compounds.. Caused to decompose catalytically by metals (in order of decreasing effectiveness): Osmium, Palladium, Platinum, Iridium, Gold, Silver, Manganese, Cobalt, Copper, Lead. Concentrated hydrogen peroxide may decompose violently or explosively in contact with iron, copper, chromium, and most other metals and their salts, and dust. (Hydrogen Peroxide)

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact.

Toxicity to Animals:
Acute oral toxicity (LD50): 6667 mg/kg (Mouse) (Calculated value for the mixture). Acute dermal toxicity (LD50): 6667 mg/kg (pig) (Calculated value for the mixture).

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH [Hydrogen Peroxide]. Classified 3 (Not classifiable for human.) by IARC [Hydrogen Peroxide]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Hydrogen Peroxide]. Mutagenic for bacteria and/or yeast. [Hydrogen Peroxide]. Contains material which may cause damage to the following organs: blood, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of ingestion, of inhalation (lung corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause cancer and may affect genetic material based on animal data. May be tumorigenic. (Hydrogen Peroxide)

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes severe skin irritation and possible burns. Absorption into skin may affect behavior/central nervous system (tremor, ataxia, convulsions), respiration (dyspnea, pulmonary emboli), brain. Eyes: Causes severe eye irritation, superficial clouding, corneal edema, and may cause burns. Inhalation: Causes respiratory tract irritation with coughing, lacrimation. May cause chemical burns to the respiratory tract. May affect behavior/Central nervous system (insomnia, headache, ataxia, nervous tremors with numb extremities) and may cause ulceration of nasal tissue, and , chemical pneumonia, unconciousness, and possible death. At high concentrations, respiratory effects may include acute lung damage, and delayed pulmonary edema. May affect blood. Ingestion: Causes gastrointestional tract irritation with nausea, vomiting, hypermotility, and diarrhea. Causes gastrointestional tract burns. May affect cardiovascular system and cause vascular collapse and damage. May affect blood (change in leukocyte count, pigmented or nucleated red blood cells). May cause difficulty in swallowing, stomach distension and possible cerebal swelling. May affect behavior/central nervous system (tetany, excitement). Chronic Potential Health Effects: Prolonged or repeated skin contact may cause dermatitis. Repeated contact may also cause corneal damage. Prolonged or repeated ingestion may affect metabolism (weight loss). Prolonged or repeated inhalation may affect respiration, blood. (Hydrogen Peroxide)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short/long term degradation products are to be expected.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Hydrogen peroxide, aqueous solution UNNA: 2014 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
New York acutely hazardous substances: Hydrogen Peroxide Rhode Island RTK hazardous substances: Hydrogen Peroxide Pennsylvania RTK: Hydrogen Peroxide Florida: Hydrogen Peroxide Minnesota: Hydrogen Peroxide Massachusetts RTK: Hydrogen Peroxide New Jersey: Hydrogen Peroxide TSCA 8(b) inventory: Hydrogen Peroxide SARA 302/304/311/312 extremely hazardous substances: Hydrogen Peroxide CERCLA: Hazardous substances.: Hydrogen Peroxide: 1 lbs. (0.4536 kg);

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive liquid. CLASS F: Dangerously reactive material.

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:46 PM

Last Updated: 11/01/2010 12:00 PM

Ashland

MILLSPERSE 802 ANTISCALANT

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Material Identity

Product Name: MILLSPERSE 802 ANTISCALANT
Product Code:
General or Generic ID: ANTISCALANT

Company

Ashland
Ashland Distribution Co. &
Ashland Specialty Chemical Co.
P. O. Box 2219
Columbus, OH 43216
614-790-3333

Emergency Telephone Number:

1-800-ASHLAND (1-800-274-5263)
24 hours everyday

Regulatory Information Number:
1-800-325-3751

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient(s)	CAS Number	% (by weight)
POLY(MALEIC ACID)	26099-09-2	5.0- 15.0
ORGANIC ACID		1.0- 10.0

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eye

Can cause permanent eye injury. Symptoms include stinging, tearing, redness, and swelling of eyes. Can injure the cornea and cause blindness.

Skin

Can cause permanent skin damage. Symptoms may include redness, burning, and swelling of skin, burns, and other skin damage.

Swallowing

Swallowing this material may be harmful or fatal. Symptoms may include severe stomach and intestinal irritation (nausea, vomiting, diarrhea), abdominal pain, and vomiting of blood. Swallowing this material may cause burns and destroy tissue in the mouth, throat, and digestive tract. Low blood pressure and shock may occur as a result of severe tissue injury.

Inhalation

Breathing this material may be harmful or fatal. Symptoms may include severe irritation and burns to the nose, throat, and respiratory tract.

Symptoms of Exposure

Signs and symptoms of exposure to this material through breathing, swallowing, and/or passage of the material through the skin may include: stomach or intestinal upset (nausea, vomiting, diarrhea), irritation (nose, throat, airways), lung edema (fluid buildup in the lung tissue).

Continued on next page

Target Organ Effects
No data

Developmental Information
Based on the available information, risk to the fetus from maternal exposure to this material cannot be assessed.

Cancer Information
This material is not expected to cause cancer in humans since it did not cause cancer in laboratory animals. This material is not listed as a carcinogen by the International Agency for Research on Cancer, the National Toxicology Program, or the Occupational Safety and Health Administration.

Other Health Effects
No data

Primary Route(s) of Entry
Inhalation, Skin contact, Eye contact, Ingestion - Industrial products are not meant to be swallowed.

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4. FIRST AID MEASURES

Eyes
If material gets into the eyes, immediately flush eyes gently with water for at least 15 minutes while holding eyelids apart. If symptoms develop as a result of vapor exposure, immediately move individual away from exposure and into fresh air before flushing as recommended above. Seek immediate medical attention.

Skin
Immediately flush skin with water for at least 15 minutes while removing contaminated clothing and shoes. Seek immediate medical attention. Wash clothing before reuse and discard contaminated shoes.

Swallowing
Seek immediate medical attention. Do not induce vomiting. Vomiting will cause further damage to the mouth and throat. If individual is conscious and alert, immediately rinse mouth with water and give milk or water to drink. If possible, do not leave individual unattended.

Inhalation
If symptoms develop, immediately move individual away from exposure and into fresh air. Seek immediate medical attention; keep person warm and quiet. If person is not breathing, begin artificial respiration. If breathing is difficult, administer oxygen.

Note to Physicians
Preexisting disorders of the following organs (or organ systems) may be aggravated by exposure to this material: skin, lung (for example, asthma-like conditions), eye.

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5. FIRE FIGHTING MEASURES

Flash Point
Not applicable

Continued on next page

Explosive Limit
Not applicable

Autoignition Temperature
No data

Hazardous Products of Combustion
May form: carbon dioxide and carbon monoxide.

Fire and Explosion Hazards
No special fire hazards are known to be associated with this product.

Extinguishing Media
Use an extinguishing media appropriate for surrounding fire.

Fire Fighting Instructions
Use water spray to cool fire exposed containers and structures until fire is out if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes. Wear full firefighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

NFPA Rating
Health - 3, Flammability - 0, Reactivity - 1

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6. ACCIDENTAL RELEASE MEASURES

Small Spill
Absorb liquid on vermiculite, floor absorbent or other absorbent material. Scoop or scrape up. Put in container for recovery or disposal. May be neutralized with soda ash, TSP, or bicarbonate of soda.

Large Spill
Persons not wearing protective equipment should be excluded from area of spill. Stop spill at source. Dike to prevent spreading. Carefully add lime or sodium carbonate to neutralize acid. Place residue in a container for disposal.

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7. HANDLING AND STORAGE

Handling
Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid, and/or solid), all hazard precautions given in the data sheet must be observed.

Storage
Product solutions are corrosive to many commonly used materials of construction such as steel, galvanized iron, aluminum, tin and zinc. These solutions can be stored and handled in baked phenolic-lined steel, polyethylene, stainless steel, or reinforced epoxy-plastic equipment. Store in closed containers in a dry, well-ventilated area.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Eye Protection
Chemical splash goggles and face shield (8" min.) in compliance with OSHA regulations are advised; however, OSHA regulations also permit other type safety glasses. (Consult your industrial hygienist.)

Continued on next page

Skin Protection

Wear resistant gloves such as: nitrile rubber, polyvinyl chloride, To prevent repeated or prolonged skin contact, wear impervious clothing and boots. Wear acid-resistant apron, or in emergency conditions, acid-resistant clothing and boots.

Respiratory Protections

If overexposure has been determined or documented, a NIOSH/MSHA jointly approved air supplied respirator is advised in absence of proper environmental control. OSHA regulations also permit other NIOSH/MSHA respirators under specified conditions. (See your safety equipment supplier.) Engineering or administrative controls should be implemented to reduce exposure.

Engineering Controls

Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below level of overexposure (from known, suspected or apparent adverse effects).

Exposure Guidelines

Component

POLY(MALEIC ACID) (26099-09-2)
No exposure limits established

ORGANIC ACID
No exposure limits established

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9. PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point

(for component) 212.0 F (100.0 C)

Vapor Pressure

(for component) 17.500 mmHg

Specific Vapor Density

< 1.000 @ AIR=1

Specific Gravity

1.040 @ 77.00 F

Liquid Density

8.654 lbs/gal @ 77.00 F
1.040 kg/l @ 25.00 C

Percent Volatiles

85.0 - 100.0 %

Evaporation Rate

SLOWER THAN ETHYL ETHER

Continued on next page

Appearance
CLEAR, STRAW YELLOW LIQUID

State
LIQUID

Physical Form
HOMOGENEOUS SOLUTION

Color
CLEAR, STRAW YELLOW

Odor
No data

pH
1.4 - 2.2

10. STABILITY AND REACTIVITY

Hazardous Polymerization
Product will not undergo hazardous polymerization.

Hazardous Decomposition
May form: carbon dioxide and carbon monoxide.

Chemical Stability
Stable.

Incompatibility
Avoid contact with: nitrites, strong alkalis, strong oxidizing agents, sulphites.

11. TOXICOLOGICAL INFORMATION

This mixture has not been specifically tested.

12. ECOLOGICAL INFORMATION

Ecotoxicological Information
This mixture has not been specifically tested.

13. DISPOSAL CONSIDERATION

Waste Management Information
Dispose of in accordance with all applicable local, state and federal regulations. For assistance with your waste management needs - including disposal, recycling and waste stream reduction, contact Ashland Distribution Company, IC&S Environmental Services Group at 800-531-7106.

Continued on next page

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14. TRANSPORT INFORMATION

DOT Information - 49 CFR 172.101

DOT Description:
NON-REGULATED BY D.O.T.

Container/Mode:
55 GAL DRUM/TRUCK PACKAGE

NOS Component:
None

RQ (Reportable Quantity) - 49 CFR 172.101
Not applicable

Other Transportation Information
The Transport Information may vary with the container and mode of shipment.

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15. REGULATORY INFORMATION

US Federal Regulations

TSCA (Toxic Substances Control Act) Status
TSCA (UNITED STATES) The intentional ingredients of this product are listed

CERCLA RQ - 40 CFR 302.4(a)
None

CERCLA RQ - 40 CFR 302.4(b)
This material has a RQ of 100 lbs as a D002 Corrosive unlisted hazardous substance.

SARA 302 Components - 40 CFR 355 Appendix A
None

Section 311/312 Hazard Class - 40 CFR 370.2
Immediate(X) Delayed( ) Fire( ) Reactive( ) Sudden Release of Pressure( )

SARA 313 Components - 40 CFR 372.65
None

OSHA Process Safety Management 29 CFR 1910
None listed

EPA Accidental Release Prevention 40 CFR 68
None listed

International Regulations

Inventory Status
DSL (CANADA) The intentional ingredients of this product are listed.

State and Local Regulations

California Proposition 65
None

Continued on next page

16. OTHER INFORMATION

The information accumulated herein is believed to be accurate but is not warranted to be whether originating with the company or not. Recipients are advised to confirm in advance of need that the information is current, applicable, and suitable to their circumstances.

MATERIAL SAFETY DATA SHEET

SECTION I – PRODUCT INFORMATION

Product Name: Propane
Trade Name: LPG (Liquefied Petroleum Gas)
Chemical Formula: C3H8
WHMIS Classification: Class A – Compressed Gas
Class B, Division I – Flammable Gas

Supplier:

Business:

Non Medical Emergency:

Uses and Occurrence: Propane is commonly used as fuel for heating, cooking, automobiles, forklift trucks, crop drying and welding and cutting operations. Propane is used in industry as a refrigerant, solvent and as a chemical feedstock.

CEPA: CANADIAN ENVIRONMENTAL PROTECTION ACT

All components of this product are either on the Domestic Substances List (DSL) or are exempt.

SECTION II – HAZARDOUS INGREDIENTS

Components	CAS Registry No.	Proportion of Product	LC50	LD50
Propane	74-98-6	95% - 98%	N/A	N/A
Ethane	74-84-0	3% - 5%	N/A	N/A
Butane	106-97-8	1% - 3%	N/A	N/A
Iso-Butane	75-28-5	0.1% - 0.3%	N/A	N/A
Methane	74-82-8	0.1% - 0.2%	N/A	N/A

Note: Composition given is typical for Grade 1 Propane; exact composition will vary from shipment to shipment.

- Explanation for change – HD5 refers to American specification, Grade 1 is Canadian equivalent in CGSB 3.14 Standard

SECTION III – CHEMICAL AND PHYSICAL DATA

Form: While stored under pressure – liquid and/or vapour
Boiling Point: -42 ^{o}C atm
Freezing Point: -188 ^{o}C
Evapouration Rate: Rapid (Gas at Normal Ambient Conditions)
Vapour Pressure: 1,013 (kPa) @ 26.0 ^{o}C
Vapour Density: 1.52 (Air = 1)
Coefficient of Water/Oil Distribution: Not available
PH: Not available
Soluble in Water: 6.1% by Volume @ 17.8 ^{o}C and 753 mmHg
Specific Gravity: 0.51 (Water = 1)
Appearance: Colourless liquid and vapour while stored under pressure.
Colourless and odourless gas in natural state at any concentration.
Commercial propane has an odourant added which is commonly ethyl mercaptan which has an odour similar to boiling cabbage or rotten eggs.
Odour Threshold: 4800 PPM
See Note 1 - Odourants

SECTION IV – FIRE OR EXPLOSION HAZARD DATA

Flash Point: -103.4 ^{o}C **Method**: Closed Cup
Flammable Limits: Lower 2.4%, Upper 9.5%
Auto Ignition Temperature: 432 ^{o}C
Products Evolved Due to Heat or Combustion: Carbon monoxide can be produced when primary and secondary airs are deficient while combustion is taking place.
Fire and Explosive Hazards: Explosive air-vapour mixtures may form if allowed to leak to atmosphere.
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes
Fire Extinguishing Precautions: Use water spray to cool exposed cylinders or tanks. Do not extinguish fire unless the source of the escaping gas that is fuelling the fire can be turned off. Fire can be extinguished with carbon dioxide and/or dry chemical (BC). Container metal shells require cooling with water to prevent flame impingement and the weakening of metal. If weakening, the area must be evacuated. If gas has not ignited, liquid and vapour may be dispersed by water spray or flooding.
Special Fire Fighting Equipment: Protective clothing, hose monitors, fog nozzles, self contained breathing apparatus.

SECTION V – REACTIVITY DATA

Stability: Stable
Conditions to Avoid: Keep separate from oxidizing agents. Gas explodes spontaneously when mixed with chlorine dioxide.
Incompatibility: Remove sources of ignition and observe distance requirements for storage tanks from combustible material, drains, and openings to buildings.
Hazardous Decomposition Products: Deficient primary and secondary air can produce carbon monoxide.
Hazardous Polymerization: Will not occur.

SECTION VI – TOXICOLOGICAL PROPERTIES OF MATERIAL

ACUTE EXPOSURE:

Eyes: As a gas, none, Liquid causes "cold burns'.
Respiratory System: Little physiological effect at concentrations below 10.000 PPM. Higher concentrations may cause dizziness and unconsciousness due to asphyxiation. ***SEE NOTE 2 – ASPHYXIANT.***
Chronic Exposure: There are no reported effects from long-term low-level exposure.
Other: Liquid can cause burns and frostbite if in direct contact with skin.
Sensitization Properties: Skin – unknown, **Respiratory** – unknown.
Carcinogenicity: Not determined. ***SEE NOTE 3 (NORM).***

MEDIAN LETHAL DOSE:
Oral: Not applicable for gas.
Inhalation: Not determined.
Dermal: Not applicable for gas.
Other: Not determined.
IRRITATION INDEX:
Skin: No appreciable effect (gas).
Eyes: No appreciable effect (gas).
Symptoms of Exposure: Above 10,000 PPM – dizziness, stupor, unconsciousness. ***SEE NOTE 2 attached.*** American Conference of Governmental Industrial Hygienists (ACGIH) classifies propane as an asphyxiate; there is no recommended "Threshold Limit Value" (TLV).
Teratogenicity: Not determined.
Mutagenicity: Not determined.

SECTION VII – OCCUPATION CONTROL PROCEDURES

Eyes: Safety glasses, goggles, or face shield required when transferring product.
Skin: Insulated gloves if contact with liquid or liquid cooled equipment is expected. Wear gloves and long sleeves when transferring product.
Inhalation: In atmosphere, where the concentration of propane would reduce oxygen level below 18% in inhaled air, self contained breathing apparatus required. ***SEE NOTE 3 – (NORM).***
Ventilation: Explosion proof ventilation equipment required in confined spaces.

SECTION VIII – EMERGENCY AND FIRST AID PROCEDURES

FIRST AID:
Eyes: Should eye contact with liquid occur, flush eyes with lukewarm water for 15 minutes. Obtain immediate medical care.
Skin: In case of "Cold Burn" from contact with liquid, immediately place affected area in lukewarm water and keep at this temperature until circulation returns. If fingers or hands are frostbitten, have the victim hold his hand next to his body such as under the armpit. Obtain immediate medical care.

SPILL OR LEAK:
Eliminate leak if possible.
Eliminate source of ignition.
Ensure cylinder is upright.
Disperse vapours with hose streams using fog nozzles, watch for low area, as propane is heavier than air and can settle in low areas. Remain upwind of leak, keep people away.
Prevent vapour and/or liquid from entering into sewers, basements or confined areas.

SECTION 1X – TRANSPORTATION, HANDLING AND STORAGE

- Transport and store cylinders and tanks secured in an upright position in a ventilated space, away from ignition sources (so relief valve is in contact with vapour space of cylinder or tank).
- Cylinders that are not in use must have the valves in the closed position and be equipped with a protective cap or guard.
- Do not store with oxidizing agents, oxygen or chlorine cylinders.
- Transport, handle and store according to applicable federal and provincial regulations (CGA B149.2). ***SEE NOTE 4 – MAGNETIC RESIDUES.***

TDG Classification: 2.1 (gas)
TDG Shipping Name: Liquid Petroleum Gas (Propane)
TDG Special Provisions: 56, 90, and 102
PIN UN: 1075

SECTION X – PREPARATION INFORMATION

Prepared by: Propane Gas Association of Canada
(403) 543-6500

Date prepared: November 2010

The information contained herein is believed to be accurate. It is provided independently of any sale of the product. It is not intended to constitute performance information concerning the product. No express warranty or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product information contained herein.

This information is in addition to the information supplied on the MSDS and forms a part of the MSDS by reference to note numbers indicated:

NOTE 1 ODOURANTS:

Odourants are not completely effective warning agents in all cases.
Certain odourants are polar and/or chemically reactive and may be depleted by reaction or absorption.
Sensitivity to odourants differs from person to person and may decrease with age or impaired physical conditions such as colds or respiratory allergies.
Prolonged exposure to odourants can create desensitization to the odour.

NOTE 2 ASPHYXIANT AND NARCOTIC EFFECTS OF PROPANE:

LPG's can displace air and can act as an asphyxiant. Lack of oxygen may cause dizziness, headaches, diminished awareness, faulty judgment, increase in fatigue and impaired muscular co-ordination. If these symptoms are identified while working in close proximity to propane that is released, go immediately into a fresh air environment.

LPG's are anaesthetic gases within the upper explosive limits and higher concentrations. A person working around propane in an enclosed space or in close proximity to a propane source such as filling cylinders, purging lines, investigating leaks, etc. who feels light-headed, dizzy, drunken, sleepy, or intoxicated should go immediately into fresh air. This narcotic effect may impair a person's judgment temporarily but will rapidly disappear in fresh air.

NOTE 3 NATURALLY OCCURRING RADIOACTIVE MATERIAL (NORM):

Sludges and tank scale from propane storage tanks, bulk delivery truck tanks, railway tank cars, and fuel filters and strainers screens may contain Naturally Occurring Radioactive Material (NORM) in the form of lead 210.

Equipment used for the transfer of propane such as propane piping and hoses, pumps and compressors may have detectable levels of radioactive lead 210 on inner surfaces.

Workers involved in cleaning, repair or maintenance on inner surfaces of such equipment should avoid breathing dust generated from such activities. Suitable codes of practice should be developed for the activities, detailing appropriate occupational hygiene and disposal practices.

NOTE 4 MAGNETIC RESIDUES IN PROPANE:

Magnetic residues generated in automotive fuel tanks from "mill scale" or corrosion processes may impair the operation of magnetic gauges and electronic solenoid valves.

Collection of gross amounts of solid residues can affect the proper operation of lock offs, mixers, pressure release valves, etc.

Solid residues could contain NORM (see note 3).

Anachemia
255 Norman.
Lachine (Montreal), Que
H8R 1A3

Material Safety Data Sheet

EMERGENCY NUMBERS:

(USA) CHEMTREC : 1(800) 424-9300 (24hrs)
(CAN) CANUTEC : 1(613) 996-6666 (24hrs)
(USA) Anachemia : 1(518) 297-4444
(CAN) Anachemia : 1(514) 489-5711

WHMIS	Protective Clothing	TDG Road/Rail
WHMIS CLASS: D-2A		Not controlled under TDG (Canada). PIN: Not applicable. PG: Not applicable.
		

Section I. Product Identification and Uses

Product name	**SODIUM BORATE, ANHYDROUS**
Chemical formula	$Na_2B_4O_7$
Synonyms	Sodium tetraborate, Sodium borate anhydrous, Sodium pyroborate, Borax glass, AC-8266T, MR-103, 80950, 029-940-01, 029-940-02, 029-940-03
Supplier	Anachemia Canada. 255 Norman. Lachine (Montreal), Que H8R 1A3

CI#	Not available.
CAS#	1330-43-4
Code	AC-8266T
Formula weight	201.27
Supersedes	

Material uses	For laboratory use only.

Section II. Ingredients

Name	CAS #	%	TLV
1) SODIUM BORATE	1330-43-4	98-100	Exposure limit: ACGIH TWA 2 mg/m3; STEL 6 mg/m3

Toxicity values of the hazardous ingredients	SODIUM BORATE DECAHYDRATE: ORAL (LD50): Acute: 2660 mg/kg (Rat). 2000 mg/kg (Mouse). 5330 mg/kg (Guinea pig). ORAL (LDLo): Acute: 709 mg/kg (Man).

Section III. Physical Data

Physical state and appearance / Odor	Solid. (White crystalline solid. Odorless.)
pH (1% soln/water)	9.3
Odor threshold	Not available.
Percent volatile	0% at 21°C
Freezing point	742°C
Boiling point	Not applicable.
Specific gravity	2.367 (Water = 1)
Vapor density	Not applicable.
Vapor pressure	Not applicable.
Water/oil dist. coeff.	Not applicable.
Evaporation rate	Not applicable.
Solubility	3.1 to 5.8% @ 25°C (in H_2O)

Section IV. Fire and Explosion Data

Flash point	Not applicable.
Flammable limits	Not applicable.
Auto-ignition temperature	Not applicable.
Fire degradation products	Oxides of sodium.
Fire extinguishing procedures	Use extinguishing media suitable for surrounding materials. Wear adequate personal protection to prevent contact with material or its combustion products. Self contained breathing apparatus with a full facepiece operated in a pressure demand or other positive pressure mode.
Fire and Explosion Hazards	The product is not sensitive to impact. The product is not sensitive to static discharge. Emits toxic fumes under fire conditions.

Section V. Toxicological Properties

Routes of entry	Inhalation and ingestion. Eye contact. Skin contact. Skin absorption.
Effects of Acute Exposure	Harmful by ingestion, inhalation or skin absorption. Irritant. Target organs: respiratory system, eyes, skin.
Eye	Causes irritation. May cause slight burning sensation due to heat of hydration.
Skin	Causes skin irritation. May cause desquamation. Can be absorbed through damaged skin causing symptoms similar to ingestion.
Inhalation	Material is irritating to mucous membranes and upper respiratory tract. See ingestion.
Ingestion	Causes gastrointestinal irritation. May cause central nervous system depression (headache, nausea, vomiting, dizziness, abdominal pain, etc...), diarrhea, oliguria, anuria, erythema, macular rash, kidney damage, cardiovascular collapse, shock and death if ingested in large amounts. Toxic effects may be delayed.

Section V. Toxicological Properties

Effects of Chronic Overexposure	May cause nose irritation, dyspnea, abdominal pain, reversible erythema and/or rash, central nervous system effects, dizziness, macular rash and lung damage. Animal studies show that ingestion of large amounts of borates over prolonged periods of time cause a decrease in sperm production and testicle size in male laboratory animals and developmental effects if fetuses of pregnant female laboratory animals. Carcinogenic effects: Not available. Mutagenic effects: Not available. To the best of our knowledge, the chemical, physical, and toxicity of this substance has not been fully investigated.

Section VI. First Aid Measures

Eye contact	Immediately flush eyes with copious quantities of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Call a physician.
Skin contact	Immediately flush skin with plenty of water and soap for at least 15 minutes while removing contaminated clothing and shoes. If irritation occurs or persists seek medical attention. Wash contaminated clothing before reusing.
Inhalation	Remove patient to fresh air. Administer approved oxygen supply if breathing is difficult. Administer artificial respiration or CPR if breathing has ceased. Call a physician.
Ingestion	If conscious, wash out mouth with water. Have conscious person drink several glasses of water or milk. Seek immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Section VII. Reactivity Data

Stability	Stable. Conditions to avoid: High temperatures, sparks, open flames and all other sources of ignition, contamination.
Hazardous decomp. products	Not available.
Incompatibility	Strong oxidizing agents, acids, metallic salts, alkaloids, zirconium, reducing agents (alkali metals, metals hydrides, etc...).
Reaction Products	Product dissolves slowly in water with evolution of heat. Hazardous polymerization will not occur.

Section VIII. Preventive Measures

Protective Clothing in case of spill and leak
Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.

Spill and leak
Evacuate the area. Sweep up and place in container for disposal. Avoid raising dust. Ventilate area and wash spill site after material pick up is complete. DO NOT empty into drains. DO NOT touch spilled material.

Waste disposal
According to all applicable regulations. Harmful to aquatic life at low concentrations. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Storage and Handling
Store in a cool place away from heated areas, sparks, and flame. Store in a well ventilated area. Store away from incompatible materials. Do not add any other material to the container. Do not wash down the drain. Do not breathe dust. Keep container tightly closed and dry. Manipulate under an adequate fume hood. Avoid raising dust. Empty containers may contain a hazardous residue. Handle and open container with care. Minimize dust generation and exposure - use dust mask or appropriate protection. This product must be manipulated by qualified personnel. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking and food consumption while handling. Product is highly hygroscopic.

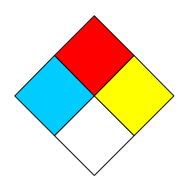
Section IX. Protective Measures

Protective clothing
Splash goggles. Impervious gloves, apron, coveralls, and/or other resistant protective clothing. Sufficient to protect skin. A OSHA/MSHA jointly approved respirator is advised in the absence of proper environmental controls. If more than TLV, do not breathe vapor. Wear self-contained breathing apparatus. Do not wear contact lenses. Make eye bath and emergency shower available. Ensure that eyewash station and safety shower is proximal to the work-station location.

Engineering controls
Use in a chemical fume hood to keep airborne levels below recommended exposure limits. Do not use in unventilated spaces.

Section X. Other Information

Special Precautions or comments
Teratogen! Reproductive toxin! Irritant! Do not breathe dust. Avoid all contact with the product. Avoid prolonged or repeated exposure. Manipulate in a well ventilated area or under an adequate fume hood. Handle and open container with care. Container should be opened only by a technically qualified person.
NOTES TO PHYSICIAN: Gastric lavage with 5% sodium bicarbonate is suggested. This should be followed by saline catharsis. Assure adequate hydration. Borax is not considered an acute poison. After ingestion or absorption into the bloodstream of large amounts (15 grams or more), symptoms may appear after 24-72 hours. Borates are readily dissipated through the urine (70% in the first 24 hours).
RTECS NO: ED4588000 (Sodium borate).

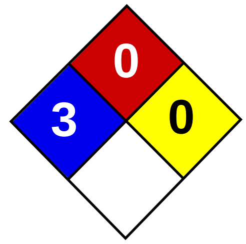


NFPA

Prepared by MSDS Department/Département de F.S..

Validated 23-Sep-2009

Telephone# (514) 489-5711



Health	3
Fire	1
Reactivity	0
Personal Protection	J

Material Safety Data Sheet
Sodium Cyanide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium Cyanide

Catalog Codes: SLS2314, SLS3736

CAS#: 143-33-9

RTECS: VZ7525000

TSCA: TSCA 8(b) inventory: Sodium Cyanide

CI#: Not available.

Synonym:

Chemical Name: Sodium Cyanide

Chemical Formula: NaCN

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium Cyanide	143-33-9	100

Toxicological Data on Ingredients: Sodium Cyanide: ORAL (LD50): Acute: 6.44 mg/kg [Rat]. DERMAL (LD50): Acute: 10.4 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of acids, of moisture.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:
Dangerous on contact with acids, acid fumes, water or stream. It will produce toxic and flammable vapors of CN-H and sodium oxide. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas. When heated to decomposition it emits toxic fumes hydgrogen cyanide and oxides of nitrogen

Special Remarks on Explosion Hazards: Fusion mixtures of metal cyanides with metal chlorates, perchlorated or nitrates causes a violent explosion

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Corrosive solid. Poisonous solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
STEL: 5 (mg/m3) from ACGIH (TLV) [United States] SKIN CEIL: 4.7 from NIOSH CEIL: 5 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Granular solid. Flakes solid.)

Odor:
Faint almond-like odor. Odorless when perfectly dry. Emits odor of hydrogen cyanide when damp.

Taste: Not available.

Molecular Weight: 49.01 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 1496°C (2724.8°F)

Melting Point: 563°C (1045.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.595 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Vapor Density of Hydrogen Cyanide gas: 0.941

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Soluble in cold water. Slightly soluble in Ethanol

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, moisture, incompatibles.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity:
Corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Violent reaction with fluorine gas, magnesium, nitrates, nitric acid. Dangerous on contact with acids, acid fumes, water or stream. It wil produce toxic and flammable vapors of CN-H and sodium oxide. Cyanide may react with CO_2 in ordinary air to form toxic hydrogen cyanide gas. Strong oxidizers such as acids, acid salts, chlorates, and nitrates. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas.

Special Remarks on Corrosivity: Corrosive to aluminum

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 6.44 mg/kg [Rat]. Acute dermal toxicity (LD50): 10.4 mg/kg [Rabbit].

Chronic Effects on Humans: May cause damage to the following organs: skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May cause adverse reproductive effects (maternal and paternal fertility) based on animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health effects: Skin: May cause itching and irritation. May be fatal if absorbed through injured skin with symtpoms similar to those noted for inhalation and ingestion. Eyes: May cause eye irritation and eye damage. Inhalation: May cause respiratory tract irritation. May be fatal if inhaled. The substance inhibits cellular respiration causing metabolic asphyxiation. May cause headache, weakness, dizziness, labored breathing, nausea, vomiting. May be followed by cardiovascular effects, unconciousness, convulsions, coma, and death Ingestion: May be fatal if swallowed. May cause

gastrointestinal tract irritation with nausea, vomiting. May affect behavior and nervous systems(seizures, convulsions, change in motor activity, headache, dizziness, confusion, weakness stupor, aniexity, agitation, tremors), cardiovascular system, respiration (hyperventilation, pulmonary edema, breathing difficulty, respiratory failure), cardiovascular system (palpitations, rapid heart beat, hypertension, hypotension). Massive doses by produce sudden loss of conciousness and prompt death from respiratory arrest. Smaller but still lethal doses on the breath or vomitus. Chronic Potential Health Effects: Central Nervous system effects (headaches, vertigo, insomnia, memory loss, tremors, fatigue), fatigue, metabolic effects (poor appetite), cardiovascular effects (chest discomfort, palpitations), nerve damage to the eyes, or dermatitis, respiratory tract irritation, eye irritation, or death can occur. may prolong the illness for 1 or more hours. A bitter almond odor may be noted

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Sodium cyanide UNNA: 1689 PG: I

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut carcinogen reporting list.: Sodium Cyanide Illinois chemical safety act: Sodium Cyanide New York release reporting list: Sodium Cyanide Rhode Island RTK hazardous substances: Sodium Cyanide Pennsylvania RTK: Sodium Cyanide Minnesota: Sodium Cyanide Massachusetts RTK: Sodium Cyanide Massachusetts spill list: Sodium Cyanide New Jersey: Sodium Cyanide New Jersey spill list: Sodium Cyanide Louisiana RTK reporting list: Sodium Cyanide Louisiana spill reporting: Sodium Cyanide California Director's List of Hazardous Substances: Sodium Cyanide TSCA 8(b) inventory: Sodium Cyanide TSCA 4(a) final test rules: Sodium Cyanide TSCA 8(a) PAIR: Sodium Cyanide TSCA 8(d) H and S data reporting: Sodium Cyanide TSCA 12(b) one time export: Sodium Cyanide SARA 302/304/311/312 extremely hazardous substances: Sodium Cyanide CERCLA: Hazardous substances.: Sodium Cyanide: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-6: Reactive and very flammable material. CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive solid.

DSCL (EEC):
R27/28- Very toxic in contact with skin and if swallowed. R41- Risk of serious damage to eyes. S1/2- Keep locked up and out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water S36/37- Wear suitable protective clothing and gloves. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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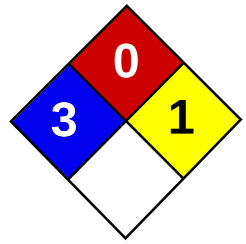
Last Updated: 06/09/2012 12:00 PM



Health	3
Fire	0
Reactivity	2
Personal Protection	J

Material Safety Data Sheet
Sodium hydroxide MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sodium hydroxide

Catalog Codes: SLS3298, SLS1081, SLS2503, SLS3925, SLS1705

CAS#: 1310-73-2

RTECS: WB4900000

TSCA: TSCA 8(b) inventory: Sodium hydroxide

CI#: Not available.

Synonym: Caustic Soda

Chemical Name: Sodium Hydroxide

Chemical Formula: NaOH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

Toxicological Data on Ingredients: Sodium hydroxide LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: metals

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions: Not available

Special Remarks on Fire Hazards:
sodium hydroxide + zinc metal dust causes ignition of the latter. Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, ally alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichlorethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontanously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

Special Remarks on Explosion Hazards:
Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aquesous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxde + impure tetrahydrofuran, which can contain peroxides, can

cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

Section 6: Accidental Release Measures

Small Spill:
Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

Large Spill:
Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
STEL: 2 (mg/m3) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m3) from OSHA (PEL) [United States] CEIL: 2 (mg/m3) from NIOSHConsult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Deliquescent solid.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 40 g/mole

Color: White.

pH (1% soln/water): 13.5 [Basic.]

Boiling Point: 1388°C (2530.4°F)

Melting Point: 323°C (613.4°F)

Critical Temperature: Not available.

Specific Gravity: 2.13 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, moisture, moist air

Incompatibility with various substances:
Highly reactive with metals. Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

Corrosivity: Not available.

Special Remarks on Reactivity:
Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahyrofuran is very exothermic, a mild explosion being noted on one occassion. Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, foraldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. berylium, lead acetate, nickel carbonyl, tetraethyl lead), mitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acylonitrile, phorosous pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

Special Remarks on Corrosivity: Very caustic to aluminum and other metals in presence of moisture.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
LD50: Not available. LC50: Not available.

Chronic Effects on Humans:
MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

Special Remarks on Chronic Effects on Humans: May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

Special Remarks on other Toxic Effects on Humans:

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sodium hydroxide, solid UNNA: 1823 PG: **II**

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hydroxide Minnesota: Sodium hydroxide Massachusetts RTK: Sodium hydroxide New Jersey: Sodium hydroxide Louisiana spill reporting: Sodium hydroxide California Director's List of Hazardous Substances: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS E: Corrosive solid.

DSCL (EEC):
R35- Causes severe burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:32 PM

Last Updated: 11/01/2010 12:00 PM

MATERIAL SAFETY DATA SHEET

Sodium Hypochlorite 5-20%

Section 01 - Chemical And Product And Company Information

Product Identifier ………………………. Sodium Hypochlorite (5-20%)

Product Use …………………………….Disinfectant, bleaching agent, source of available chlorine, deodorizer.

Supplier Name…………………………. ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By.................………….……. ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date.........………………. December 22, 2010

24-Hour Emergency Phone…………. 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients....……….…...	Sodium Hypochlorite	4.90-16.80%
CAS Number..................……………...	Sodium Hypochlorite	7681-52-9

Synonym (s)..................………………..Industrial bleach, hypo, bleach, Javel water, household bleach

Section 03 - Hazard Identification

Inhalation...................………………... Irritant of the nose and throat, causing coughing, difficulty breathing, and pulmonary edema.

Skin Contact / Absorption………... Causes severe skin irritation with blistering and ulceration.

Eye Contact..............…………... Causes severe irritation of the mucous membranes of the eyes. May cause severe eye damage.

Ingestion.................…………….. Burning of the mouth and throat, abdominal cramps, nausea, vomiting, diarrhea, shock. May lead to convulsions, coma, and even death.

Exposure Limits…………………….. ACGIH/TLV-TWA: 0.5ppm (chlorine)

Section 04 - First Aid Measures

Inhalation................…………….. Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption………….. Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact..............…………….... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion.................……………… Do not induce vomiting. If vomiting occurs, lean victim forward to prevent breathing in vomitus. Give large amounts of water. Do not give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention.

Additional Information...……………... Not available

Section 05 - Fire Fighting

Conditions of Flammability………... Non-flammable

Means of Extinction.......…………... Product does not burn. Use appropriate extinguishing media for material that is supplying the fuel to the fire.

Flash Point...…………………………. Not applicable

Auto-ignition Temperature………… Not applicable

Upper Flammable Limit …………….. Not applicable

Lower Flammable Limit.................. Not applicable

Hazardous Combustible Products... Decomposition may produce chlorine gas and/or hydrogen chloride gas.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards........................ Pressure buildup in containers could result in an explosion when heated or in contact with acidic fumes. Vigorous reaction with oxidizable organic materials may result in a fire.

Section 06 - Accidental Release Measures

Leak / Spill....................................... Wear appropriate personal protective equipment. Ventilate area. Stop or reduce leak if safe to do so. Restrict access to spill area until clean up is complete. Prevent material from entering sewers, waterways or confined spaces. Soak up smaller spills with absorbent material that does not react with spilled material. Flush with water to remove any residue.

Deactivating Materials................... Spills can be carefully neutralized first with sodium sulphite, sodium metabisulphite or other dechlorination agent for no chlorine residual, then a pH adjustment may be required with hydrochloric acid until the pH is 7. Note neutralization reactions may produce heat so necessary precautions must be taken. Local regulatory agencies should also be contacted for proper disposal.

Section 07 - Handling and Storage

Handling Procedures...................... Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements..................... Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials. Venting of containers is advisable.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes.. Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory.................................. A NIOSH-approved respirator suitable for chlorine is recommended. Where a higher level of protection is required, use a self-contained breathing apparatus.

CLEARTECH

Gloves…………………………………..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Clothing……………………….……..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Footwear……………………………..... Impervious boots of chemically resistant material should be worn at all times.

Engineering Controls

Ventilation Requirements………...... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other……………………………………... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State.......……....…………... Liquid

Odor and Appearance…..…………... Strong chlorine odour. Clear, greenish-yellow solution.

Odor Threshold....………………......... Not available

Specific Gravity (Water=1)………….. 1.17 at 20°C (12% trade)

Vapor Pressure (mm Hg, 20C)……... 12.1mm Hg at 20°C (12.5 wt %)

Vapor Density (Air=1)...……………... Not available

Evaporation Rate...........……...……... Not available

Boiling Point.................……………..... Slowly decomposes above 40°C.

Freeze/Melting Point.....…………….... ~ -15°C (12% trade)

pH..........................……………………. < 12

Water/Oil Distribution Coefficient.... Not available

Bulk Density.................……………… Not available

% Volatiles by Volume………..……... Not available

Solubility in Water........................ Complete

Molecular Formula........................ NaOCl

Molecular Weight.......................... 74.44

Section 10 - Stability and Reactivity

Stability.. Unstable at temperatures above 40°C, in sunlight, and in contact with acid.

Incompatibility.................................... Incompatible with strong acids, ammonia, oxidizable materials, nickel, copper, tin, manganese, and iron.

Hazardous Products of Decomposition.. Chlorine (by reaction with acids), oxygen (by reaction with nickel, copper, tin, manganese, iron), sodium chloride, sodium chlorate, with increased temperature.

Polymerization.................................... Will not occur

Section 11 - Toxicological Information

Irritancy.. Strong irritant

Sensitization.................................. Not available

Chronic/Acute Effects.................. If over-exposed to the solution, there will be constant irritation of the eyes, nose, and throat.

Synergistic Materials...................... Not available

Animal Toxicity Data...................... LD_{50}(oral,rat): 8910mg/kg (undiluted sodium hypochlorite)

Carcinogenicity.............................. Not considered to be carcinogenic (IARC and ACGIH).

Reproductive Toxicity.................... Not available

Teratogenicity................................ Not available

Mutagenicity.................................. Not available

Section 12 - Ecological Information

Fish Toxicity.................................. Not available

Biodegradability..............…………..... Not available

Environmental Effects………………. Not available

Section 13 - Disposal Consideration

Waste Disposal.............…..………….. Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class……………..……………….…... 8 (not regulated at solutions below 7%)

Group..............…………….....……... III (not regulated at solutions below 7%)

PIN Number...................…...……….. UN 1791(not regulated at solutions below 7%)

Other…………………………………..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification........…………....E

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

NSF Certification................................Product is certified under NSF/ANSI Standard 60 for disinfection and oxidation at a maximum dosage for the following:

sodium hypochlorite 5%: 200mg/L
sodium hypochlorite 6%: 175mg/L
sodium hypochlorite 7%: 161mg/L
sodium hypochlorite 8%: 146mg/L
sodium hypochlorite 9%: 131mg/L
sodium hypochlorite 10%: 116mg/L
sodium hypochlorite 11%: 101mg/L
sodium hypochlorite 12%: 87mg/L
sodium hypochlorite 13%: 82mg/L
sodium hypochlorite 14%: 76mg/L
sodium hypochlorite 15%: 70mg/L
sodium hypochlorite 16%: 66mg/L
sodium hypochlorite 17%: 62mg/L
sodium hypochlorite 18%: 58mg/L
sodium hypochlorite 19%: 54mg/L
sodium hypochlorite 20%: 50mg/L

Sanitizer Use: to obtain 10 liters of a 200 mg/L solution as available chlorine, use 16.7 mL of Hypochlor-12 for each 10 liters of clean, potable water.

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / MSDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Material Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service or technical service department.

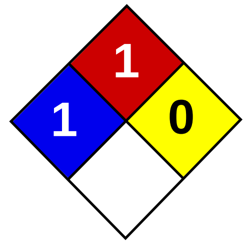
ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522



Health	1
Fire	1
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Ethylenediaminetetraacetic Acid Tetrasodium Salt MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylenediaminetetraacetic Acid Tetrasodium Salt

Catalog Codes: SLE2284

CAS#: 10378-23-1

RTECS: AH5075000 (For CAS no. 64-02-8 known as EDTA Tetrasodium salt , anhydrous)

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not available.

Synonym: Versene, Kalex, Hampene, Dissolvine; EDTA tetrasodium salt dihydrate; Tetrasodium EDTA dihydrate; Tetrasodium salt EDTA dihydrate; Tetrasodium salt of EDTA, dihydrate; Tetrasodium salt of ethylenediaminetetraacetic acid, dihydrate; Sodium salt of ethylenediaminetetraacetic acid, dihydrate; Sodium ethylenediaminetetraacetate, dihydrate; Sodium ethylenediaminetetraacetic acid, dihydrate; Sodium EDTA, dihydrate; Edetate sodium dihydrate; Edetic acid tetrasodium salt, dihydrate; Endrate tetrasodium; Ethylenebis(iminodiacetic acid) tetrasodium salt, dihydrate; Ethylenediaminetetraacetic acid, tetrasodium salt, dihydrate ; Edathaniltetrasodium , dihydrate ; N , N'-Ethylenediaminediacetic acid tetrasodium salt.

Chemical Name: Acetic acid, (etrhylenedinitrilo)tetra-, tetrasodium salt, dihydrate

Chemical Formula: C10H12N2Na4O8.2H2O

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylenediaminetetraacetic acid tetrasodium salt	10378-23-1	100

Toxicological Data on Ingredients: Ethylenediaminetetraacetic acid tetrasodium salt: ORAL (LD50): Acute: >2000 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: CLOSED CUP: Higher than 93.3°C (200°F).

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO_2), nitrogen oxides (NO, NO_2...). Some metallic oxides.

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances: Slightly explosive in presence of open flames and sparks. Non-explosive in presence of shocks.

Fire Fighting Media and Instructions: SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: As with most organic solids, fire is possible at elevated temperatures

Special Remarks on Explosion Hazards: Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill: Use a shovel to put the material into a convenient waste disposal container. Neutralize the residue with a dilute solution of acetic acid. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage

Precautions: Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Crystalline solid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 416.23 g/mole

Color: White.

pH (1% soln/water): 11.3 [Basic.]

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Bulk Density: 0.77 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents, metals.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Avoid contact with aluminum, copper, copper alloys, zinc, and nickel, and strong oxidizers.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): >2000 mg/kg [Rat].

Chronic Effects on Humans: May cause damage to the following organs: upper respiratory tract, skin, eyes.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health effects: Skin: May cause skin irritation. Eyes: May cause eye irritation. Inhalation: May cause irritation of the respiratory tract. Ingestion: May cause gastrointestinal tract irritation. The toxicological properties of this substance have not been fully investigated.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 760 mg/l 96 hours [Bull gill sunfish]. 59.8 mg/l 96 hours [Fathead Minnow].

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: No products were found.

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC): This product is not classified according to the EU regulations. Not applicable.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/01/2010 12:00 PM

Health 3
Fire 0
Reactivity 2
Personal Protection

Material Safety Data Sheet
Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid

Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

CAS#: 7664-93-9

RTECS: WS5600000

TSCA: TSCA 8(b) inventory: Sulfuric acid

CI#: Not applicable.

Synonym: Oil of Vitriol; Sulfuric Acid

Chemical Name: Hydrogen sulfate

Chemical Formula: H2-SO4

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Sulfuric acid	7664-93-9	95 - 98

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion:
Products of combustion are not available since material is non-flammable. However, products of decompostion include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

Fire Hazards in Presence of Various Substances: Combustible materials

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards:
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phorphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

Special Remarks on Explosion Hazards:
M i x t u r e s o f s u l f u r i c a c i d a n d a n y o f t h e f o l l o w i n g c a n e x p l o d e : p - n i t r o t o l u e n e , p e n t a s i l v e r trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picratres, fulminats, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decompositon.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Hygroscopic. Reacts. violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:
270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dillute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs.(RTECS) Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestial tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the repiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisons), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 2

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 2

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

Section 16: Other Information

References:
-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

Other Special Considerations: Not available.

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Last Updated: 06/09/2012 12:00 PM

Material Safety Data Sheet

LUMINOL ™ TR (Type I Trace-Inhibited)

PETRO-CANADA

1 . Product and company identification

Product name	:	LUMINOL ™ TR (Type I Trace-Inhibited)
Code	:	LUMTR
Material uses	:	Premium trace-inhibited (Type I) insulating oil for use in electrical transformers, circuit breakers and switches.
Manufacturer	:	Petro-Canada Lubricants Inc. 2310 Lakeshore Road West Mississauga, Ontario Canada L5J 1K2
In case of emergency	:	Suncor Energy: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state	:	Viscous liquid.
Odour	:	Slight naphthalene like odour.
WHMIS (Canada)	:	Not controlled under WHMIS (Canada).
OSHA/HCS status	:	While this material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200), this MSDS contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.
Emergency overview	:	No specific hazard.
Routes of entry	:	Dermal contact. Eye contact. Inhalation. Ingestion.
Potential acute health effects		
Inhalation	:	No known significant effects or critical hazards.
Ingestion	:	No known significant effects or critical hazards.
Skin	:	Slightly irritating to the skin.
Eyes	:	Slightly irritating to the eyes.
Potential chronic health effects		
Chronic effects	:	No known significant effects or critical hazards.
Carcinogenicity	:	Not listed as carcinogenic by OSHA, NTP or IARC.
Mutagenicity	:	No known significant effects or critical hazards.
Teratogenicity	:	No known significant effects or critical hazards.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	:	Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated skin exposure can produce local skin destruction or dermatitis.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	Mixture	-

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

The base oil may be a mixture of the following CAS#s: 8042-47-5, 64742-46-7, 64742-47-8, 64742-53-6, 64742-54-7, 64742-55-8, 72623-84-8, 72623-85-9, 72623-86-0, 72623-87-1, 178603-64-0, 178603-65-1, 178603-66-2, 445411-73-4

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : May be combustible at high temperature.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Low fire hazard. This material must be heated before ignition will occur.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	**ACGIH TLV (United States). Notes: (Mineral oil)** TWA: 5 mg/m³, (Inhalable fraction) 8 hour(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour filter

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: nitrile, neoprene, polyvinyl alcohol (PVA), Viton®.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

8 . Exposure controls/personal protection

Skin	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Environmental exposure controls	: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	: Viscous liquid.
Flash point	: Open cup: 170°C (338°F) [Cleveland.]
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Colour	: Clear and bright
Odour	: Slight naphthalene like odour.
Odour threshold	: Not available.
pH	: Not available.
Boiling/condensation point	: Not available.
Melting/freezing point	: Not available.
Relative density	: 0.84 kg/L @ 15°C (59°F)
Vapour pressure	: Not available.
Vapour density	: Not available.
Volatility	: Not available.
Evaporation rate	: Not available.
Viscosity	: 9.4 cSt @ 40°C (104°F), 2.6 cSt @ 100°C (212°F)
Pour point	: -60°C (-76°F)
Solubility	: Insoluble in water.

10 . Stability and reactivity

Chemical stability	: The product is stable.
Hazardous polymerisation	: Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid	: Reactive with oxidising agents and acids.
Hazardous decomposition products	: May release COx, NOx, SOx, hydrocarbons, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Dusts and mists	Rat	>5.2 mg/l	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

11 . Toxicological information

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Mixture of severely hydrotreated and hydrocracked base oil (petroleum).	A4	-	-	-	-	-

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : This product is inherently biodegradable.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	Not regulated.	-	-	-		-
DOT Classification	Not available.	Not available.	Not available.	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Not regulated.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

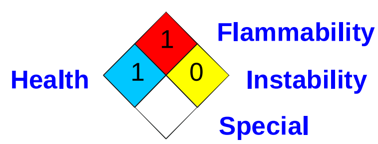
Europe inventory : All components are listed or exempted.

16 . Other information

Hazardous Material Information System (U.S.A.) :

Health	1
Flammability	1
Physical hazards	0
Personal protection	B

National Fire Protection Association (U.S.A.) :



References : Available upon request.
™ Trademark of Suncor Energy Inc. Used under licence.

Date of printing : **2/8/2012.**

Date of issue : 8 February 2012

Date of previous issue : No previous validation.

Responsible name : **Product Safety - JDW**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : The Canadian Controlled Products Regulations (CPR) (Under the Hazardous Products Act, part of the WHMIS legislation) only apply to WHMIS Controlled (i.e., hazardous) products. Therefore, the CPR and the 3-year update rule specified therein do not apply to WHMIS Non-Controlled products. Although this is true, customarily Petro-Canada reviews and updates Non-Controlled product MSDS if a customer requests such an update. These Non-Controlled product updates are given a lower priority than Controlled products but are handled as soon as practicable. If you would like to verify if the MSDS you have is the most current, or you require any further information, please contact:

Internet: lubricants.petro-canada.ca/msds

Lubricants:
Western Canada, telephone: 1-800-661-1199; fax: 1-800-378-4518
Ontario & Central Canada, telephone: 1-800-268-5850; fax: 1-800-201-6285
Quebec & Eastern Canada, telephone: 1-800-576-1686; fax: 1-800-201-6285

For Product Safety Information: (905) 804-4752

Notice to reader

16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Material Safety Data Sheet

Preparation Date: 31-Jul-2006 **Revision Date:** 24-Aug-2009 **Revision Number:** 1

SECTION 1 – PRODUCT AND COMPANY IDENTIFICATION

Supplier(s):

Orica Canada Inc.
Maple Street
Brownsburg, QC
For MSDS Requests: 1-450-533-4201

Orica USA Inc.
33101 E. Quincy Avenue
Watkins, CO 80137-9406
For MSDS Requests: 1-303-268-5000

Product Name:	**Fortan™ Advantage, Fortis™ Advantage & Fortis™ Advantage ANE (USA)**
Product Code:	2310
Alternate Name(s):	Apex™ Clear
UN-No:	UN3139
Recommended Use:	Can be sensitized to become a booster sensitive emulsion explosive.

Emergency Telephone Number: FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855.** FORM ATF F 5400.0 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

SECTION 2 – HAZARD IDENTIFICATION

Emergency Overview:
May cause skin irritation and/or dermatitis. Irritating to eyes. Harmful if swallowed. Oxidizing agent. May cause methemoglobinemia. May cause liver damage. May cause kidney damage.

Appearance:	**Physical State:**	**Odor:**
Opaque, viscous liquid	Viscous, liquid	Vinegar

SECTION 3 – COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	**CAS-No**	**Weight %**
Ammonium Nitrate	6484-52-2	60-75
Mineral Oil	64742-53-6	1-6
Diesel Fuel Oil	68476-34-6	1-6

SECTION 4 – FIRST AID MEASURES

General Advice:	In case of accident or if you feel unwell, seek medical advice IMMEDIATELY (show the product label where possible).
Eye Contact:	Immediately flush with plenty of water. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Immediate medical attention is required.
Skin Contact:	Wash off immediately with soap and plenty of water, removing all contaminated clothes and shoes. If skin irritation persists, call a physician.
Inhalation:	Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.
Ingestion:	Immediate medical attention is required. Do no induce vomiting. Clean mouth with water and afterwards drink plenty of water. If spontaneous vomiting occurs, have victim lean forward with head positioned to avoid breathing in of vomitus, rinse mouth and administer more water. Never give anything by mouth to and unconscious person.
Notes to physician:	Symptomatic. Administer oxygen if there are signs of cyanosis. If clinical condition deteriorates, administer 10cc Methylene Blue intravenously. It is unlikely for this to be required with methemoglobin level of less than 40%.

SECTION 5 – FIRE-FIGHTING MEASURES

Flammable properties: Not itself combustible but assists fire in burning materials. The product does not flash. Rate of burning: attempts to smother a fire involving this product will be ineffective as it is its own oxygen source.

Suitable extinguishing media: Use Water only, in as much volume as possible to cool the burning mass quickly. Chemical extinguishers will not work. Fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

Unsuitable extinguishing media: Chemical extinguishers will not work. Attempts to smother a fire involving this product will be ineffective as it is its own oxygen source. Smother this product could lead to decomposition and explosion. This product is more sensitive to detonation if contaminated with organic or oxidisable material or if heated while confined. Unless the mass of product on fire is flooded with water, re-ignition is possible.

Specific hazards arising from the chemical: Toxic gases and vapours will be released by the thermal decomposition of this material. At higher temperatures, decomposition may be explosive, especially if confined. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry.

Protective equipment and precautions for firefighters: As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH approved (or equivalent) and full protective gear.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Methods for containment: Contain or absorb leaking liquid with sand or earth or other suitable substance.

Methods for cleaning up: Avoid the use of metal tools containing iron and/or copper. Be careful to avoid shock, friction, and contact with grit. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment.

Other information: Deactivating chemicals: Detergents will break up emulsions if mixed in.

SECTION 7 – HANDLING AND STORAGE

Handling: Avoid contact with eyes or skin. Wash thoroughly with soap and water after handling. Wash clothing before re-use. Locate safety shower and eyewash station closest to chemical handling area. The use of coveralls is recommended. Use good industrial hygiene and housekeeping practices. Keep away from open flames, hot surfaces and sources of ignition

Storage: Store in a cool, well-ventilated area. Keep away from heat, sparks, and flames. Keep storage containers closed. Store at 10-27℃ (50-80℉). Do not expose closed containers to temperatures above 40℃ (104℉). Product is mildly corrosive to concrete and steel. Stainless steel and aluminium are adequate. Avoid materials made of copper, iron, or bronze.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Mineral oil	5 mg/m³	5 mg/ m³	
Diesel Fuel	TWA: 100 mg/m³ Skin		

Other exposure guidelines: Ammonium Nitrate: ORICA Guideline 5 mg/m^3 (internal TWA)

Engineering Measures: No information available.

Personal Protective Equipment

Eye/Face Protection: Tightly fitting safety goggles.

Skin Protection: User should verify impermeability under normal conditions of use prior to general use. Impervious butyl rubber gloves.

Respiratory Protection: In case of insufficient ventilation wear suitable respiratory equipment. A NIOSH-approved respirator, if required.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety practice. Recommendations listed in this section indicate the type of equipment, which will provide protection against over exposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Opaque, viscous liquid	**Odor:**	Vinegar
Physical State:	Viscous, liquid	**Viscosity:**	No information available
pH:	3 - 6	**Flash Point:**	Not applicable
Autoignition Temperature:	230-265°C/ 446-509°F	**Boiling Point/Range:**	None
Melting Point/Range:	Not available	**Flammable Limits (Upper):**	Not applicable
Flammable Limits (Lower):	Not applicable	**Explosion Power:**	No data available
Specific Gravity:	1.20 – 1.35 g/cc	**Water Solubility:**	Slightly soluble
Other Solubility:	Slightly soluble in standard organic solvents.	**Vapor Pressure:**	0 mmHg @ 20°C
Oxidizing Properties:	Oxidizer	**Partition Coefficient (n-octanol/water):**	No data available

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable under normal conditions. Decomposition Temperature: Ammonium Nitrate will spontaneously decompose at 210°C (410°F).

Conditions to avoid: Keep away from open flames, hot surfaces and sources of ignition. Not expected to be sensitive to static discharge. Not expected to be sensitive to mechanical impact.

Incompatible materials: Avoid oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

Hazardous decomposition products: The following toxic decomposition products may be released. At temperatures above 210°C (410°F), decomposition may be explosive, especially if confined. Nitrogen oxides (NOx). Carbon oxide. Hydrocarbons.

Hazardous Polymerization: None under normal processing. Hazardous polymerization does not occur. Explosive material under shock conditions.

SECTION 11 – TOXICOLOGICAL INFORMATION

<u>**Acute Toxicity**</u>

Product Information: Irritating to eyes. May cause skin irritation. Harmful if swallowed.

Chemical name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ammonium Nitrate	2217 mg/kg Rat	3000 mg/kg Rabbit	88.8 mg/L Rat 4 h
Mineral Oil	4300 mg/kg Rat		
Diesel Fuel	>5000 mg/kg (rabbit)		

Subchronic Toxicity (28 Days): Ammonium Nitrate: Ingestion may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. If ingested, nitrates may be reduced to nitrites by bacteria in the digestive tract. Signs and symptoms of nitrite poisoning include methemoglobinemia, nausea, dizziness, increased heart rate, hypotension, fainting and, possibly shock.

Chronic Toxicity: May cause methemoglobinemia.

Carcinogenicity: The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical name	ACGIH	IARC	NTP	OSHA
Diesel Fuel	A3			

Legend: A3: Confirmed as an animal carcinogen.

Mutagenic effects: There is no evidence of mutagenic potential.

Irritation: Irritating to eyes. May cause irritation of respiratory tract. May cause skin irritation in susceptible persons.

Reproductive effects: No information is available and no adverse reproductive effects are anticipated.

Developmental effects: No information is available and no adverse developmental effects are anticipated.

Target Organ: Eyes, skin, respiratory system, blood, liver, urinary tract, gastrointestinal tract (GI), endocrine system, & immune system.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotoxicity effects: Dissolves slowly in water. Harmful to aquatic life at low concentrations.
Environmental Effects: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Persistence/Degradability: Some water resistance but soluble with extended time periods.

Mobility in Environmental media: Dissolves slowly in water.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Method: Burn under supervision of an expert at an explosive burning ground or destroy by detonation in boreholes, in accordance with applicable local, provincial and federal regulations. Call upon the services of an Orica Technical Representative.

SECTION 14 – TRANSPORT INFORMATION

DOT Proper Shipping Name: Oxidizing substance, liquid, N.O.S. (Ammonium Nitrate)
Hazard Class: 5.1
UN-No: UN3139
Packing group: II

Transportation Emergency Telephone Number: 1-877-561-3636 or CHEMTREC: 1-800-424-9300

SECTION 15 – REGULATORY INFORMATION

USA CLASSIFICATION:

SARA Regulations Sections 313 and 40 CFR 372: This product contains the following toxic chemical(s) subject to reporting requirements, Ammonium Nitrate (6484-52-2).

SARA 311/312 Hazardous Categorization
Acute Heath Hazard: Yes
Chronic Health Hazard: Yes
Fire Hazard: Yes
Reactive Hazard: No
Sudden Release of Pressure Hazard: Yes

Ozone Protection and 40 CFR 42: No reportable quantities of ozone depleting agents

Other Regulations/Legislations which apply to this product: New Jersey Right-to-Know, Pennsylvania Right-to-Know, Massachusetts Right-to-Know, Rhode Island Right-to-Know, Florida, New Jersey Special Health Hazard Substance List, Minnesota Hazardous Substance List, California Director's List of Hazardous Substances, California Proposition 65.

TSCA: Complies **DSL:** Complies **NDSL:** Complies

The components in the product are on the following international inventory lists:

Chemical Name	TSCA	DSL	NDSL	ENCS	EINECS	ELINCS	CHINA	KECL	PICCS	AICS
Ammonium Nitrate	X	X	-	X	X	-	X	X	X	X
Mineral Oil	X	X	-	-	X	-	X	X	X	X
Diesel Fuel	X	X	-	-	X	-	X	X	X	X

Legend: X – Listed

SECTION 16 – OTHER INFORMATION

Prepared by: **Safety Health & Environment**
303-268-5000

Preparation Date: 31-Jul-2006
Revision Date: 24-Aug-2009

The information contained herein is offered only as guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Orica will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein.

End of MSDS

APPENDIX K

Eagle Gold Project Dust Control Plan Version 2017-01

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EAGLE GOLD PROJECT

DUST CONTROL PLAN

Version 2017-01

MARCH 2017

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1 INTRODUCTION

1.1 PROJECT SUMMARY

StrataGold Corporation (SGC), a directly held wholly owned subsidiary of Victoria Gold Corp. has proposed to construct, operate, close and reclaim a gold mine in central Yukon. The Eagle Gold Project ('the' Project) is located 85 km from Mayo, Yukon using existing highway and access roads. The Project will involve open pit mining and gold extraction using a three stage crushing process, heap leaching, and a carbon adsorption, desorption, and recovery system over the mine life.

1.2 SCOPE AND OBJECTIVES

The objective of this Dust Control Plan is to describe the best management practices and mitigation measures that will be employed to minimize dust emissions from the Project. The scope of the plan includes dust control methods, ambient air quality monitoring procedures, and a description of existing meteorological conditions that may influence dust emissions and deposition.

This Dust Control Plan was informed by the guidelines provided by Government of Yukon's Department of Energy, Mines and Resources and the Yukon Water Board in the Plan Requirement Guidance for Quartz Mining Projects (August 2013), the Yukon Government Dust Management Plan Guidelines, the Terms and Conditions of Recommendation, Proponent Commitments and Proponent Mitigations specified in the Final Screening Report and Recommendation (Yukon Environmental and Socio-economic Assessment Board Project Assessment 2010-0267), and the regulatory approvals issued for the Project.

2 DUST CONTROL METHODS

The following sections provide a description of best management practices used throughout all Project phases and methods to control dust during construction and operations.

2.1 BEST MANAGEMENT PRACTICES

The following are Best Management Practices that will be implemented during all phases of the Project:

- Minimization of land clearing activities to the extent possible (e.g. do not disturb land beyond facility or road boundaries or areas required for construction).
- Construction of haul roads with low silt content material.
- Low speed limits for all mobile mine equipment.
- Trucks to maintain more than 15 seconds separation when possible to reduce respirable dust exposure to following truck.
- Site roads to be watered within 12 hours of previous wettings (e.g. rain or via water truck) on hot dry days and within 48 hours on cool humid days or as necessary.
- Orientation of material stockpiles so that the length is parallel with prevailing winds where possible.
- Establishment of waste rock storage area final surfaces early to enable re-vegetation.
- Delay blasting if conditions are unfavourable.
- Visual inspections to identify and address potential dust emissions.
- Timely response to dust complaints by adjacent land users.
- Record of dust suppression activities.

2.2 CONSTRUCTION PHASE

The primary sources of dust generated during the construction phase will be:

- Clearing and grubbing.
- Salvaging and stockpiling of overburden.
- Development of quarry and borrow areas.
- Traffic on existing and newly constructed site roads.

Project design includes the reduction of overall site road length to shorten haul distances to decrease maintenance and operations cost for the mine fleet. In turn, optimized road length will result in reduced dust emissions compared to roads of greater length. Similarly, cleared land will be minimized to the extent possible to reduce cost of material handling which will result in decreased vegetation and soil disturbance. Dust control options during mining, loading and dumping of topsoil and overburden are generally limited to dust suppression watering however; the construction plan includes the start of land clearing activities to occur as early in the spring as possible when soil moisture is optimal after break up.

Water will be used as a dust suppressant using a tank truck with spray bars for cleared surfaces, overburden stockpiles, borrow sites, and site roads as required during dry conditions. The water truck will be used as required to suppress visible dust emissions. The water truck capacity will be approximately 5,000 gallons (18,927 liters). The total estimated water use for dust suppression for site roads and cleared areas will be up to approximately 40 truckloads of water (200,000 gallons) per day during dry conditions. It is assumed that dust suppression will be required for up to approximately 20 days/month from June to September. During construction, the source of water for dust suppression will be an existing groundwater well located on the Dublin Gulch alluvial fan adjacent to Haggart Creek. This well was installed by previous land users to provide potable and drilling water for a mineral exploration camp at Dublin Gulch.

Chemical dust suppressants such as polymers or surfactants may be considered if raw water alone is not effective for dust control. Surfactant additives increase the ability of water to wet and suppress dust by reducing surface tension of water, which causes water to spread in smaller droplets. Water is better absorbed into the cleared area of roadbed rather than runoff or evaporation from road surfaces. Polymer additives function to seal surfaces so that fine particulate matter is not readily mobilized. SGC will notify Yukon Government if any chemical dust suppressant additives are considered prior to use.

Overburden stockpiles, borrow areas, and large cleared areas will be wetted as necessary to control dust by a water truck with spray bar. In the event the water truck application rate is not sufficient to control dust, additional measures such as construction of additional wind breaks or stationary misters will be considered.

2.3 OPERATIONS PHASE

The primary sources of dust generated during the operations phase of the Project will be:

- Open-pit mining including blasting, excavation, and ore/waste hauling and handling.
- Mining equipment, haul truck and other vehicle traffic.
- Ore processing including crushing, hauling, and conveying.

2.3.1 Blasting

Blasting is usually a relatively minor contributor to total dust emissions. The options for controlling dust from blasting are somewhat limited however Project planning includes delaying blasting under unfavourable wind and atmospheric conditions when possible to reduce dust.

Dust generated when processing mined materials, primarily occurs as a result of the mechanical handling of ore. At the ore processing plant the mineral is extracted through a variety of processes that usually involve particle size reduction.

2.3.2 Traffic

Water will be used as a dust suppressant using a tank truck with spray bars for cleared surfaces, stockpiles and site roads as required during dry conditions. The water truck capacity will be approximately 5,000 gallons (18,927 liters). The total estimated water use for dust suppression for site roads and cleared areas will be approximately 40 truckloads of water (200,000 gallons) per day during dry conditions. It is assumed that water will only be applied for dust suppression for approximately 20 days/month from June to September. During operations, the primary sources of water for dust suppression will be the Lower Dublin South Pond and an existing well adjacent to Haggart Creek.

Active site roads will be watered unless meteorological conditions (e.g., rain, frozen surfaces, etc.) are adequate to suppress dust to a degree that is equivalent to 3-hour periodic watering. Inactive roads will be watered if there is evidence of wind driven dust.

2.3.3 Ore Handling and Processing

The following is a description of the ore processing method and systems that includes a summary of dust control methods. Dust control design criteria is appended as Appendix A.

After blasting, ore from the open pit will be delivered by haul truck to the primary crusher, located north of the open pit. During regular operations, ore will be transported overland by covered conveyor from the primary crusher to the crushing and screening plants. During winter months the primary crushed ore will be conveyed to the 100 d ore storage pad. Once climatic conditions return to operational criteria for heap leach pad stacking the ore stockpiled on the 100 d storage pad will be fed back into the crushing system at the secondary crushing plant. The crushing system will produce an average particle size P80 6.4 mm for delivery to the heap leach pad.

Crushed ore will be transported by covered conveyor to the heap leach pad for stacking. Belt agglomeration will occur using lime and cement before it is stacked on the heap leach pad. Agglomeration will be achieved with cement and lime additions to the ore following tertiary crushing while the ore is traveling down the overland conveyor system. Ore will be stacked on a composite liner system in 10 m lifts using a stacking conveyor system.

Primary Crushing and Conveying

During regular operations, run-of-mine (ROM) ore will be delivered by haul trucks from the open pit to the primary gyratory crusher, located to the north of the open pit. ROM ore will be direct-dumped into the primary crusher dump pocket, or a small temporary ROM stockpile, if the primary crusher is not available for direct dumping. The ore will be direct-dumped into the dump hopper situated above the gyratory crusher, and will be discharged to the crusher with a discharge setting of 150 mm. The dump hopper will be enclosed on two sides. As dust is most easily entrained in the wind when material is falling through the air, the truck unloading will be sheltered from the wind. The primary crushed ore will be collected in the discharge pocket below the primary crusher. An apron feeder will regulate the discharge rate of the primary crushed ore. This crushed product will report to a 250 t bin by a system of conveyors. The conveyors will be fitted with covers along their entire length to prevent additional moisture addition to the ore, block wind entrainment of dust and reduce overall dust emissions. The discharge of the primary crusher as well as the apron feeder discharge will be located inside the crusher building and as such will be shielded from the prevailing winds. All transfer points within the primary crusher building will incorporate dust collection extraction points and the dust will be conveyed to one or more dust collectors.

Secondary Crushing and Conveying

The primary crushing discharge conveyor will deliver the primary crushed ore to a surge bin. Two belt feeders will regulate the ore feed rate from the surge bins to double deck vibrating screens (secondary screens) with apertures of 89 and 38 mm, respectively. The two separation decks produce a coarse and a fine product. The coarse product material will discharge to two Metso MP1000 (or equivalent) standard head cone crushers (secondary crushers), each with a closed side setting of 19 mm. The undersize material from the secondary screens will be combined with crushed material and conveyed to the tertiary crusher surge bin and will be ready for further processing. The secondary and tertiary crushing and screening devices will be enclosed within industrial buildings to control dust emissions.

Within each crushing section (secondary or tertiary) as ore is transferred from one conveyor to another the ore transfer point will be enclosed by a fabricated steel chute. Likewise at points of ore loading onto conveyors from screens or crushers there are fabricated carbon steel chutes. These material transfer points (chutes) serve to enclose the ore stream thus confining the fine particulate. By use of an exhaust fan and duct work these hoods are linked to an emissions control device (bag house). The control device will have particulate removal of 95 – 99% efficiency for 10 micron particulate to meet National and Territorial ambient air quality guidelines. The secondary and tertiary crushing buildings will each have a dedicated baghouse for dust control.

Tertiary Crushing and Conveying

Ore from the secondary crushing circuit will be conveyed to a feed bin prior to the last crushing stage. Material from the feed bin will be fed, in parallel, to four 4,300 x 8,500 mm inclined vibrating screens. The screen oversize material from the four screens will be fed to four Metso MP1000 (or equivalent) tertiary crushers operating in a closed circuit. Screen undersize material will be conveyed directly to a series of conveyors and then to the heap leach pad. The tertiary crusher discharge will be fed back to the vibratory screens thereby completing the closed circuit. Various ancillary equipment will include a dust collection system, overhead cranes, weightometers, samplers, maintenance hoists, and lubrication units for the crushers. All crushing and screening will be carried out inside the process building and shielded from the prevailing winds.

The majority of dust will be generated by the truck unloading, material transfer points and screens.

Mitigation for dust emissions from the crushing facility will be as follows:

- Truck Unloading Station
  - Shelter the dumping of ore from the wind by enclosing the truck dump to the maximum extent possible
  - By the use of fine spray or fog suppression
  - Dust extraction with conveyance to and processing in dust collectors
- Material Transfer Points
  - Drop heights will be reduced wherever practical to minimize air entrainment.
  - The use of sleeves and proper chute design will prevent air entrainment of the dust.
  - Dust extraction with conveyance to and processing in dust collectors
  - Conveyors will be covered or enclosed in buildings or conveyor galleries.
- Vibrating screens
  - Screens will be equipped with dust covers
  - Screen feed and screen discharge transfer points will be handled similarly as all material transfer points as described above.

Cement - lime addition and heap stacking

The Heap Leach Facility (HLF) conveyor system will be operated using a conveyor stacking system that will include:

- overland conveyors
- grasshopper-type portable transfer conveyors
- horizontal mobile bridge conveyor mounted on a dozer crawler carriage
- radial stacking conveyor, capable of powered luffing, slewing and stacking to a height of 10 m and fitted with a stinger

The HLF feed conveyors will be installed adjacent to the heap leach pad, and then extended as needed around the western circumference pad, from the crusher area. The grasshopper conveyors will transport the ore from the overland conveyors to the bridge conveyor. The ore will be placed in 10 m lifts using the radial stacker. The leach lifts will be constructed from east to west, retreating up the slope of the pad. As the stacker retreats, the grasshopper conveyors will be removed from the transfer train and relocated in an adjacent area so that the heap will be constructed from the toe upwards in a series of 60 m wide by 500 m long lifts.

As the crushed ore (final product material) is conveyed from the tertiary crushing area, lime and Portland cement will be added to the material on the conveyor at a controlled rate by screw conveyor or rotary valve, together with water to facilitate agglomeration (moisture control) of the heap leach feed material. As the crushed ore leach feed material passes from one conveyor to another en route to the HLF, the particles will be mixed with the these reagents for agglomeration. The agglomeration process will aid in binding small particles to larger particles and thereby assist in reducing dust emissions of small particles.

Dust is most easily entrained in the wind when the material is falling through the air at points of transfer. Therefore, it is important to reduce the drop heights of material transfer points wherever practical. The use of sleeves and proper chute design incorporating wind barriers will be used to minimize dust entrainment. Fixed transfer points will be sheltered from the wind by the use of enclosures. All conveyor belts will be covered and incorporate belt cleaners in order to reduce material carry back on the return strand of the conveyor.

Refinery

Smelting will take place in a diesel-fired tilting crucible furnace. The furnace will be equipped with hydraulic control of the tilt mechanism for the pouring of the molten gold melt product. The filtered precipitate will be mixed with fluxes, typically a combination of borax, niter and possibly silica sand. A cascading mould system will be included. Off gases from the melting furnace will be extracted with a fan and then discharged into a bag house to remove particulate matter. A dry aspirated dust collection system will control fumes and dust emissions from the smelting furnace. A canopy hood will be located over the furnace and collected fines will be dropped via a rotary air lock into a drum for manual removal as required.

Assay Laboratory

The assay lab will be a will be a prefabricated modular structure located inside the ADR facility. This facility will house all necessary laboratory equipment for metallurgical grade testing and control. The lab will be equipped with all appropriate HVAC and chemical disposal equipment as needed. A dry aspirated dust collection system equipped with a single dust collector and exhaust fan with pick up hoods will be located at crushers, pulverizers, and workstations. Collected fines will be discharged via a rotary air lock into a drum that will be manually emptied as required.

2.4 INSPECTIONS AND RECORDS

Dust emissions and mitigation measures will be monitored by regular inspections and corrective actions taken when appropriate. Potential dust sources that will be inspected will include but are not necessarily limited to the following:

- Active land clearing, excavation and site preparation areas
- Borrow material quarries and stockpiles
- Overburden stockpile and construction material screening area(s)
- Open pit
- Eagle pup waste rock storage area
- Platinum gulch waste rock storage area
- Primary crusher
- Crushing and screening plant (including all dump pockets, transfer points, feed bins, etc.)
- Overland conveyor system from Crushing and Screening Plant to HLF
- Heap leach pad (including grasshopper and radial conveyor transfer and drop points)
- Inactive site roads
- Active site roads including haul and secondary site access roads

2.5 CONTINGENCY MEASURES

Contingency measures may be implemented, as the result of a site or area inspection, in a timely manner and will be subject to additional inspection to confirm satisfactory performance. The following contingency measures will be used in the event inspections, monitoring and/or complaints require:

1) Additional dust suppression via more frequent watering of roads and exposed soils
2) Traffic and work reduction in areas where dust is generated
3) Rescheduling of revegetation activities for disturbed areas so that they may be seeded as early as possible
4) Wind barrier (windrow) construction such as crushed rock, soil berms or fences upwind of roads and exposed areas. The following methods will be considered when placing barriers to prevent dust emissions:
    a. Wind barriers are most effective when placed perpendicular to the direction of the prevailing wind, but will have little or no effect when the wind direction is parallel to the barrier.

   b. When choosing wind barriers it has been observed that solid barriers provide significant reductions in wind velocity for relatively short leeward distances, whereas porous barriers provide smaller reductions in velocity for more extended distances.
   c. Wind barriers should be at least 2 metres high.
   d. Screening material with a porosity of 50% is optimum for controlling dust.

5) Reconfiguration or covering of stockpiles. Limit work to the downwind side of stockpiles. Uncovered stockpiles may need re-orientation to offer minimal cross sectional area to prevailing winds.
6) Reduce drop heights from conveyors
7) Limit material transfer points
8) Installation of additional sprinklers along conveyor or increase enclosure of conveyors
9) Pre-watering of areas prior to earthworks
10) Stoppage of work that generates dust
11) Immediate review of dust control equipment, control measures and overall management plan

Ongoing dust control concerns and corrective actions will be periodically reviewed by the Environmental Manager to determine if additional contingency measures and/or Project design, or operational changes are required.

2.6 RESPONSIBILITIES

The Mine Manager is responsible for the effective implementation of the Dust Control Plan, providing the resources needed for the implementation and continual improvement of the Plan and for participating in annual management review meetings.

Designated construction and operations personnel will conduct daily inspections for their assigned area(s) and will report any significant dust emission events/concerns to their Supervisor and the Environmental Manager.

Production Supervisors and Maintenance Supervisors (or designates) are responsible for addressing high priority corrective/maintenance actions within 24 hours; and for scheduling and following up on lower priority corrective/maintenance actions within one week.

3 AIR QUALITY OBJECTIVES AND MONITORING

The following sections provide a summary of the air quality monitoring objectives and methods that will be used to monitor dust emissions during construction and operations.

It is anticipated that atmospheric Criteria Air Contaminants (CAC) will be emitted during the construction and operations phases of the Project. The primary CACs will result from dust emissions from overburden excavation and handling, most notably clearing, grading, drilling, blasting, loading/unloading, unpaved road traffic and emissions from diesel combustion from heavy vehicles and machinery.

3.1 YUKON AMBIENT AIR QUALITY STANDARDS

Yukon Ambient Air Quality Standards define maximum allowable limits for particulate matter, nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2) and ground level ozone (O_3). These standards are presented in Table 3.1-1.

Table 3.1-1: Yukon Ambient Air Quality Standards[ab]

Parameter	Standard (µg/m3)[c]	Standard (ppm)[d]	Standard (ppbv)[e]
Total Suspended Particulate (TSP)			
24–hour average	120		
Annual geometric mean	60		
Fine Particulate Matter ($PM_{2.5}$)			
24–hour average	28		
Annual mean (calendar year)	10		
Coarse Particulate Matter (PM_{10})			
24-hour average	50		
Nitrogen Dioxide (NO_2)			
1-hour average			213
24–hour average			106
Annual arithmetic mean			32
Carbon Monoxide (CO)			
1-hour average		13	
8-hour average		5	
Sulphur Dioxide (SO_2)			
1-hour average			172
24–hour average			57
Annual arithmetic mean			11

Ground Level Ozone (O_3)			
8-hour running average			63

NOTES:
[a] The following standards are the maximum concentrations of pollutants acceptable in ambient air throughout the Yukon Territory. These standards will be used to determine the acceptability of emissions from proposed and existing developments.
[B] All ambient air quality measurements will be referenced to standard conditions of 25 degrees Celsius and 101.3 kiloPascals.
[C] ug/m^3 = micrograms per cubic meter
[D] ppm = parts per million
[E] ppbv = parts per billion by volume

3.2 AMBIENT AIR QUALITY MONITORING AND THRESHOLDS FOR ADDITIONAL MITIGATION MEASURES

The air quality baseline data collection program is planned to record baseline data prior to construction and operations. A Thermo Scientific Partisol 2025i Sequential Ambient Air Sampler has been installed near the Camp climate station, in an area away from active exploration activities. The unit is capable of sampling TSP over a continuous 24-hour period according to protocols established for the National Air Pollution Surveillance (NAPS) program.

SGC has established ambient air TSP thresholds for monitoring. If the TSP concentrations exceed 100 µg/m^3 24 hour average or 50 µg/m^3 as an annual geometric mean, additional dust control mitigation measures will be implemented and chemical analyses of TSP will be carried out to determine the chemical composition of dust deposition for potential effects to human and ecological health.

3.2.1 Methods

As the Project moves into the construction phase, air quality monitoring will consist of TSP monitoring using the existing Partisol Air Sampling unit near the lower camp climate station. The air quality sampler will sample on a 6-day cycle.

The 2025i Partisol holds a filter supply magazine containing 16 filter cassettes. Filters used include a Pallflex TX40 HI20-WW 47 mm filter specified for TSP and $PM_{2.5}$ and a 37 mm MCE (mixed cellulose ester) filter specified for metals. Each filter will be pre-weighed in triplicate according to procedures in U.S. EPA 2.12 Quality Assurance Handbook, Section 7. The filter weight will be recorded along with the filter cassette number and placed into the cassette. Sixteen cassettes are placed into a magazine and shipped to site to be installed in the Partisol.

During a programmed sampling date, the 2025i maintains a temperature- and pressure-compensated flow of 16.67 L/min (1 m^3/hr) through the filter. Following completion of the programmed sampling event (24 hours) the sample filter is automatically transferred into the storage magazine. After 16 sampling events have been completed the storage magazine will be shipped to an accredited laboratory for re-weighing.

The sampled concentration is determined as the net weight of the filter divided by the total flow volume over the sampling event. Chemical analysis of particulate samples will be performed on two samples every second magazine. Data management and record keeping will be an integral part of the monitoring program. Sampling, analysis and reporting will be performed in accordance with the industry standards (ASTM 2010).

In addition to air quality sampling, dust control inspections will be conducted for site roads and facilities to determine the need for additional mitigation measures. If threshold levels for TSP are exceeded, SGC will take the following actions:

1. Review all applicable air quality, meteorological data and metadata (e.g., records of Project activities during the exceedance period, inspection reports, field notes etc. and any other information that may be relevant) to determine reason for high TSP concentrations.
2. Apply contingency measures, and modify or add mitigation measures to reduce dust emissions.
3. Notify Government of Yukon of the exceedance and any changes to mitigation measures.

Annual reports will be produced which contain the recorded TSP concentrations with comparison to Yukon Ambient Air Quality Standards. The reports will also contain the sampling QA/QC data recorded in the Partisol Sampler interval file and the results of any chemical lab analyses (after mining begins during operations).

4 EXISTING ENVIRONMENT

The following sections have been excerpted from climate baseline data reports to provide a summary of existing conditions that may influence dust emissions and deposition.

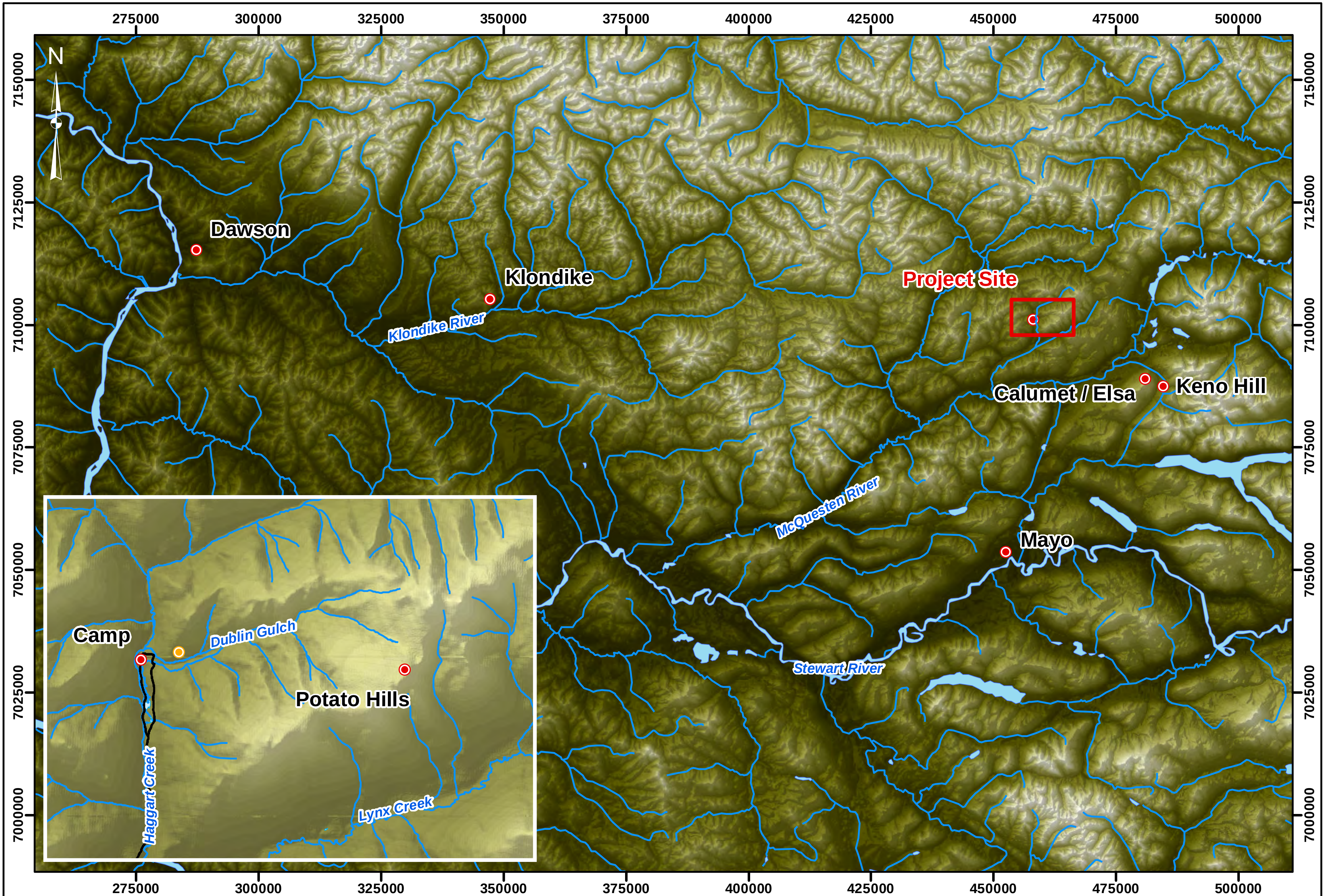
4.1 SITE METEOROLOGY

The Project area is characterized by a continental-type climate with moderate annual precipitation and a large temperature range. Summers are short and can be hot, while winters are long and cold with moderate snowfall. Rainstorm events can occur frequently during the summer and may contribute between 30 to 40% of the annual precipitation. Higher elevations are typically snow-free by mid-June. Frost may occur at any time during the summer or fall.

Climatic parameters are measured at the Project site by two weather stations as shown in Figure 4.1-1. The Potato Hills station is situated at the highest elevation of the site (1420 m), and was installed in August 2007. The second station was originally installed near the camp at 823 m in August 2009, and subsequently moved to its current location in September 2010 at 782 m due to construction of new camp facilities.

The mean measured temperature at site is approximately -3.6°C at the Camp station (782 m) and -3.8°C at the Potato Hills station (1420 m) over the respective periods of record. Maximum temperatures range from -43.8°C to 22.0°C and from -36.6°C to 22.8°C at the Camp and Potato Hills stations respectively (Lorax 2016).

The measured annual rainfall at the site during the monitoring period has ranged from 187.2 mm to 248.8 mm and from 162.6 mm to 462.2 mm for the Camp and Potato Hills stations respectively. Snowpack surveys indicated that annual maximum snow water equivalent (SWE) values during the respective periods of record ranged from 93 mm to 160 mm at the Camp snow course, 98 mm to 117 (shorter record) at the Ann Gulch snow course, and vary from 190 mm to 410 mm at the Potato Hills snow course (Lorax 2016).



Legend:

- Climate Station
- Snow Course Only
- Watercourse
- Road

StrataGold Corporation

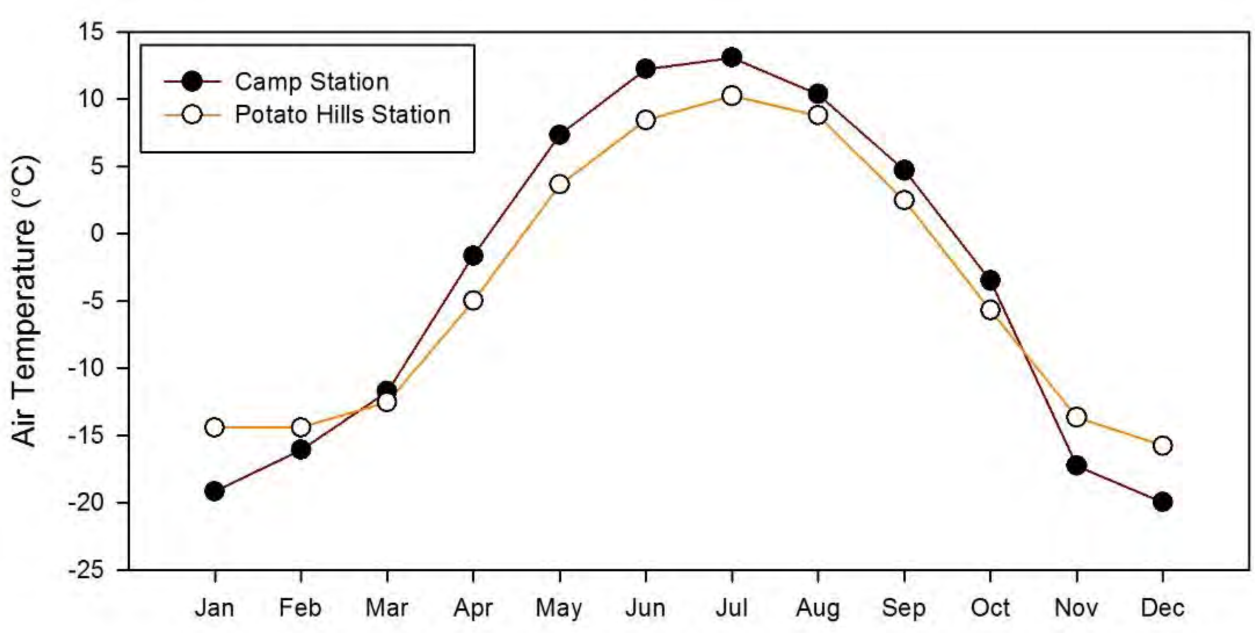
0 5 10 20 30
Kilometers

Projection:	Drawn By:	EAGLE GOLD PROJECT YUKON TERRITORY
NAD83 UTM Zone 8N	HC	
Date: 2017/03/28	Figure: 4.1-1	Climate Station Locations and Snow Courses

4.1.1 Temperature

Annually, spring thaw begins in April when daily maximum temperatures exceed 0°C, although daily mean temperatures may not rise above freezing until May. Annual maximums occur in July and daily mean temperatures begin to recede during late August and September. However, daily minimums may drop below freezing at night during August. Daily freezing conditions begin in October and annual minimums occur in January.

Mean, maximum and minimum monthly (based on the daily average) temperatures are presented in Table 4.1-1. At the camp station, monthly average temperature ranges from -20.2°C in January to 13.1°C in July and -16.1°C to 10.1°C at the Potato Hills station for the same months. The minimum (maximum) recorded daily average temperatures were -43.8°C (22.0°C) and -36.6°C (22.8°C) at the Camp and Potato Hills stations respectively. The minimum (maximum) recorded 15-minute temperatures were -46.4°C (31.6°C) and -37.6°C (28.5°C) at the Camp and Potato Hills stations, respectively. The monthly mean temperature signatures for both climate stations are shown in Figure 4.1-2 (Lorax 2016).



Source: Lorax 2016

Figure 4.1-2 Project Area Monthly Mean Temperatures

Table 4.1-1: Project Site Monthly Air Temperature Record

Climate Station	Elevation (m asl)	Temperature (°C)														
		Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009	Mean	-	-	-	-	-	-	-	-	6.2	-2.6	-13.6	-17.3	-
			Maximum	-	-	-	-	-	-	-	-	11.2	2.3	-2.2	-2.8	-
			Minimum	-	-	-	-	-	-	-	-	-4.8	-9.7	-22.6	-31.3	-
		2010	Mean	-17.1	-10.8	-6.9	1.1	8.3	12.1	13.6	12.1	4.4	-3.4	-13.5	-24.1	-2.0
			Maximum	-6.7	1.0	1.4	9.4	16.9	15.7	18.0	20.5	11.8	7.1	4.0	-11.2	20.5
			Minimum	-33.4	-25.0	-17.7	-6.8	1.8	7.2	10.3	6.2	-6.1	-10.5	-28.4	-37.7	-37.7
		2011	Mean	-22.9	-21.3	-15.9	-3.2	7.7	11.5	12.8	9.2	5.1	-2.8	-20.7	M	-
			Maximum	-1.3	-1.4	2.1	2.7	16.1	16.1	18.2	14.3	9.7	0.3	-6.4	M	-
			Minimum	-38.5	-37.8	-30.3	-11.6	-2.2	7.0	9.5	5.7	0.9	-6.8	-39.1	M	-
		2012	Mean	-25.2	-12.2	-13.4	0.4	5.9	13.3	12.6	10.5	5.0	M	-24.1	-25.9	-4.8
			Maximum	-7.2	0.7	-1.4	4.4	12.6	19.4	16.7	15.6	13.6	M	-10.3	-8.5	19.4
			Minimum	-40.4	-24.2	-24.4	-7.6	-0.4	8.7	8.7	4.5	-0.6	M	-37.1	-41.0	-41.0
		2013	Mean	-21.6	-13.3	-15.5	-8.6	5.0	14.2	14.0	11.9	5.5	-2.5	-18.7	-26.7	-4.7
			Maximum	-9.3	-4.4	0.3	2.9	14.1	22.0	18.5	18.0	14.5	4.9	-4.0	-11.6	22.0
			Minimum	-43.8	-20.9	-26.8	-16.6	-2.6	6.0	9.5	4.9	0.9	-9.9	-39.5	-40.7	-43.8
		2014	Mean	-14.9	-23.4	-13.8	-1.8	7.0	11.0	13.4	10.6	3.7	-3.5	-15.8	-15.2	-3.6
			Maximum	-1.8	-6.4	-3.8	4.5	12.9	16.5	18.6	15.1	9.4	3.4	-3.3	-4.6	18.6
			Minimum	-34.1	-36.8	-24.4	-12.4	2.5	5.4	8.7	4.5	-3.8	-11.9	-33.8	-26.4	-36.8
		2015	Mean	-19.4	-18.1	-11.5	-0.1	10.1	11.2	12.2	9.0	2.9	-1.5	-15.1	-15.2	-3.0
			Maximum	-2.9	-1.7	-1.0	4.4	17.5	15.5	16.8	15.4	7.3	3.4	-4.4	-6.0	17.5
			Minimum	-39.1	-38.3	-26.8	-4.8	-0.9	5.6	7.9	1.6	-4.3	-9.3	-33.1	-34.3	-39.1
		All Years	Mean	-20.2	-16.5	-12.9	-2.0	7.3	12.2	13.1	10.6	4.7	-2.7	-17.4	-20.8	-3.6
			Maximum	-1.3	1.0	2.1	9.4	17.5	22.0	18.6	20.5	14.5	7.1	4.0	-2.8	22.0
			Minimum	-43.8	-38.3	-30.3	-16.6	-2.6	5.4	7.9	1.6	-6.1	-11.9	-39.5	-41.0	-43.8
Potato Hills Station	1420	2007	Mean	-	-	-	-	-	-	-	-	1.0	-6.9	-12.0	-15.2	-
			Maximum	-	-	-	-	-	-	-	-	8.0	-1.5	-5.5	-9.4	-
			Minimum	-	-	-	-	-	-	-	-	-6.2	-13.8	-27.7	-24.2	-
		2008	Mean	-17.7	-17.2	-11.3	-4.8	3.3	8.7	8.1	5.3	1.9	-7.7	-10.8	-18.6	-5.1
			Maximum	-9.2	-3.4	-2.8	2.7	12.5	14.3	13.4	9.2	6.7	2.4	-5.4	-8.4	14.3
			Minimum	-33.1	-31.9	-29.6	-16.8	-0.6	4.6	2.8	1.7	-7.7	-21.3	-19.6	-27.2	-33.1
		2009	Mean	-19.3	-17.2	-16.7	-4.4	M	M	12.6	7.4	3.3	-5.3	-12.8	-11.9	-
			Maximum	-0.5	-10.4	-7.0	9.4	M	M	22.8	16.2	10.4	-1.9	-4.9	-3.8	-

Climate Station	Elevation (m asl)	Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
			Minimum	-34.8	-30.3	-25.2	-13.0	M	M	6.6	3.1	-6.3	-14.2	-19.1	-21.2	-
		2010	Mean	-14.5	-9.7	-9.4	-1.8	5.2	8.8	10.5	9.7	2.3	-5.3	-11.7	-18.2	-2.9
			Maximum	-5.1	-1.8	-2.9	6.3	15.1	13.4	15.2	19.5	8.8	3.1	-1.4	-8.8	19.5
			Minimum	-30.9	-26.4	-16.5	-8.3	-4.0	2.7	6.2	3.4	-9.3	-10.4	-23.1	-25.6	-30.9
		2011	Mean	-15.5	-18.3	-13.9	-5.6	4.8	8.8	10.3	7.0	4.1	-5.7	-18.0	-13.0	-4.6
			Maximum	-5.6	-3.6	-1.4	1.3	15.3	13.9	15.7	11.4	20.4	-1.2	-9.1	-8.8	20.4
			Minimum	-28.0	-30.2	-23.2	-13.0	-7.2	2.2	5.9	5.3	-5.5	-12.1	-29.0	-20.0	-30.2
		2012	Mean	-19.8	-11.1	-13.4	-1.9	3.1	11.3	10.9	M	M	-8.4	-18.8	-19.4	-
			Maximum	-6.8	-5.1	-1.7	1.8	9.5	18.5	17.9	M	M	3.3	-8.0	-6.5	-
			Minimum	-30.3	-19.5	-22.6	-8.0	-2.5	5.5	5.5	M	M	-16.8	-24.0	-29.2	-
		2013	Mean	*-17.6*	*-11.3*	-14.2	*-10.4*	*2.8*	12.1	11.6	11.0	3.0	-2.9	-16.0	-19.5	-4.3
			Maximum	-5.5	-4.9	-5.1	*-2.5*	*13.5*	22.2	17.4	19.9	10.2	1.3	-4.7	-3.4	22.2
			Minimum	-36.6	-15.5	-24.8	*-18.4*	*-6.2*	2.0	5.3	1.7	-1.8	-8.5	-28.9	-29.1	-36.6
		2014	Mean	-10.0	-15.9	-11.5	-3.4	*5.6*	8.7	11.8	8.7	2.1	-5.6	-11.6	-11.4	-2.7
			Maximum	0.6	-7.8	-5.1	3.2	*11.5*	17.6	15.6	13.9	8.5	0.9	-5.0	-5.4	17.6
			Minimum	-27.3	-26.3	-19.9	-13.5	*0.4*	1.7	7.4	1.7	-5.2	-12.1	-22.5	-19.2	-27.3
		2015	Mean	-14.4	-13.8	-9.6	*-2.3*	*8.6*	*8.6*	*9.5*	7.1	0.1	-3.7	-13.5	-13.6	-3.1
			Maximum	-3.9	-2.3	-0.5	*1.4*	*16.5*	*13.6*	*14.9*	17.0	4.9	2.0	-4.3	-5.6	17.0
			Minimum	-31.7	-32.7	-24.3	*-6.5*	*-3.2*	*1.9*	*4.4*	-2.0	-6.1	-10.7	-28.3	-25.3	-32.7
		All Years	Mean	-16.1	-14.3	-12.5	-4.4	4.8	9.6	10.7	8.0	2.2	-5.7	-13.9	-15.6	-3.8
			Maximum	0.6	-1.8	-0.5	9.4	16.5	22.2	22.8	19.9	20.4	3.3	-1.4	-3.4	22.8
			Minimum	-36.6	-32.7	-29.6	-18.4	-7.2	1.7	2.8	-2.0	-9.3	-21.3	-29.0	-29.2	-36.6

Source: Lorax 2016

NOTES:

1. Values are calculated from average daily temperatures.
2. Data is considered missing for a month if less than 25 days of data are available for that month.
3. Monthly values in italics for the Potato Hills station, for the period of 2013 through 2015 have been infilled using monthly regression relationships with temperature data from the Camp station.
4. Monthly values in gray for the period of June 2014 to March 2015 were recorded by a standalone HOBO temperature sensor.
5. ‘M’ denotes data missing due to a sensor malfunction.
6. Monthly temperature lapse rates presented in Section 3.1 are based on a comparison of monthly average temperature data from the Camp and Potato Hills stations.

During the months of March to October inclusive, the standard lapse rate applies, with temperatures decreasing with rising elevation, and are approximately 3°C cooler at the upper station, on average. However, during the winter months of November to February, temperature inversions are common at the Project site, with temperatures roughly 2.5°C cooler on average in the valley bottom than at the height of land (Lorax 2016).

The spring/summer lapse rate of -4°C/1000 is consistent with the saturated adiabatic lapse rate of -5.0°C/1000 m. This is likely due to increased frequency of precipitation during the summer months, when the majority of annual precipitation falls, resulting in warmer and wetter air masses at the Project site. The winter lapse rate of +4°C/1000 m is consistent with that reported by Wahl *et al*. (1987), which states that during a temperature inversion, lapse rates can range from 3-5°C/1000 m of elevation gain (Lorax 2016).

Long-term temperature data from Mayo demonstrate there has not been any long-term warming or cooling trend in the region over the last 80 years. Over the period of record, the mean annual temperature at Mayo has fluctuated approximately 4°C. Over this period, there has been a larger variability in annual minimum temperatures, while annual maximum temperatures have stayed relatively constant.

4.1.2 Precipitation

Long-term estimates of precipitation for the area have been based on analyses of regional climate data from stations in Mayo, Dawson, Klondike, Elsa, and Keno Hill. Comparison of Project site data to Mayo data demonstrated that the Potato Hills station received approximately 1.3 times more monthly precipitation. This reflects the orographic effect common to mountainous regions and is evident in the Project site precipitation estimates. Rainfall, snowfall, and surface lying moisture and snow are natural dust suppressants. As such, the area is not prone to prolonged dusty periods. Based on the regional and local data, monthly precipitation totals are highest in July and lowest in February.

4.1.2.1 Rainfall

The precipitation data is collected at the Project site using tipping bucket rain gauges, which have not been adapted to measure snowfall. Therefore, the precipitation data presented in Table 4.1-2 is for rainfall only, collected between the months of March and October, inclusive. Generally precipitation falls as snow from November through March, with precipitation falling as a mix of rain and snow in April and October. Rainfall data for March is included in the table below, where the temperature record indicates that precipitation would have fallen as rain (i.e., daily average air temperature was above zero).

Maximum annual monthly rainfall is realized in the month of July (53.2 mm and 65.6 mm at the Camp and Potato Hills stations, respectively). On an annual basis, rainfall at the Camp station averages 222.6 mm, and 254.7 mm at the Potato Hills station (Lorax 2016).

Table 4.1-2: Project Site Monthly Rainfall Data

Climate Station	Elevation (m asl)	Precipitation (mm)													
		Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009		-	-	-	-	-	-	-	-	35.0	*8.0*	S	S	-
		2010		-	-	5.0	9.0	20.0	62.0	34.0	28.0	25.0	*12.0*	S	S	195.0
		2011		-	-	11.0	10.0	16.0	31.0	75.0	44.0	40.0	*9.0*	S	S	236.0
		2012		-	-	13.0	1.0	22.0	18.0	74.6	29.8	24.0	*4.8*	S	S	187.2
		2013		-	-	8.6	10.4	34.6	25.6	28.4	35.2	58.6	*25.2*	S	S	226.6
		2014		-	-	5.4	8.8	9.2	52.8	43.2	70.4	28.8	*23.2*	S	S	241.8
		2015		-	-	20.8	13.0	8.2	28.8	64.0	62.0	38.6	*13.4*	S	S	248.8
		All Years	Mean	-	-	10.6	8.7	18.3	36.4	53.2	44.9	35.7	*13.7*	S	S	222.6
			Maximum	-	-	20.8	13.0	34.6	62.0	75.0	70.4	58.6	*25.2*	S	S	248.8
			Minimum	-	-	5.0	1.0	8.2	18.0	28.4	28.0	24.0	*4.8*	S	S	187.2
Potato Hills Station	1420	2007		-	-	-	-	-	-	-	24.0	100.8	*2.0*	S	S	-
		2008		S	S	3.4	4.8	58.4	52.0	201.2	130.0	11.2	*1.2*	S	S	462.2
		2009		S	S	S	3.0	-	50.8	12.6	75.4	44.4	*1.2*	S	S	-
		2010		S	S	1.0	6.2	16.4	77.2	45.8	39.4	4.2	*5.4*	S	S	195.6
		2011		S	S	0.2	7.2	21.2	38.0	92.8	83.8	34.4	*0.4*	S	S	278.0
		2012		S	S	S	0.6	9.6	24.2	64.8	37.8	21.0	*4.6*	S	S	162.6
		2013		S	S	2.2	0.2	29.6	33.2	18.0	18.2	63.8	*10.0*	S	S	175.2
		2014		S	S	S	M	M	M	M	M	M	*M*	S	S	-
		2015		S	S	M	M	M	M	M	48.5	27.1	*10.0*	S	S	-
		All Years	Mean	S	S	S	3.7	27.0	45.9	72.5	57.1	38.4	*4.4*	S	S	254.7
			Maximum	S	S	S	7.2	58.4	77.2	201.2	130.0	100.8	*10.0*	S	S	462.2
			Minimum	S	S	S	0.2	9.6	24.2	12.6	18.2	4.2	*0.4*	S	S	162.6

Source: Lorax 2016

NOTES:

1. Winter precipitation data (October through April in many years) are unreliable due to the majority falling as snow. The months where no rainfall was recorded due to freezing conditions are denoted by an 'S'.
2. Data for the month of October are in italics, as rainfall is not measured for the entire month.
3. 'M' denotes data missing due to a sensor malfunction.

4.1.2.2 Snow Data

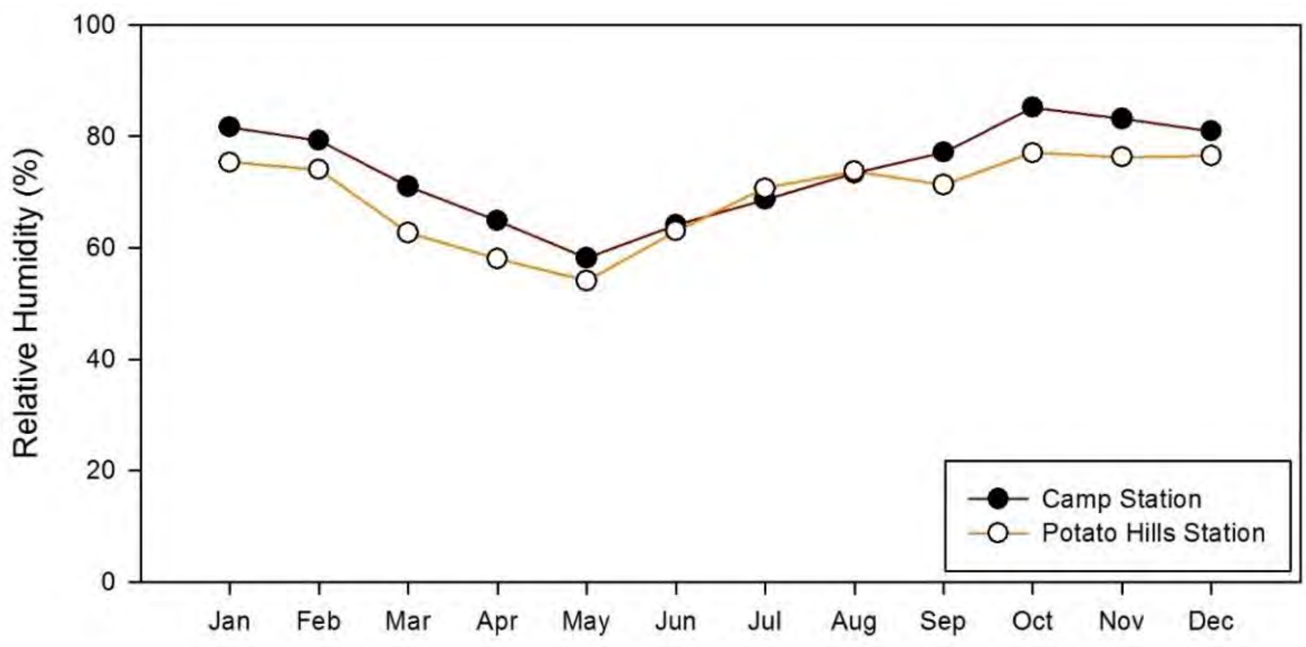
Snow data is being collected at three snow courses at the Project site. The annual maximum snow water equivalent (SWE) value generally occurs in late-March or early-April. Field measurements from site show that snow density is generally lower earlier in the season, corresponding to colder temperatures, but increases through winter as the snow pack deepens, weathers and as snow melt progresses (Lorax 2016).

Overall, these data shown that annual maximum SWE values at the Camp snow course range from 93 mm to 160 mm, range from 117 mm to 237 mm (shorter record) at the Ann Gulch snow course, and vary from 190 mm to 410 mm at the Potato Hills snow course (Lorax 2016).

4.1.3 Relative Humidity

Relative humidity is a measure of the water vapour content of an air parcel, expressed as a percentage of the total water vapour required for the air to be fully saturated at a given temperature. Therefore, at colder temperatures, less water vapour is required to achieve a high relative humidity, and conversely at higher temperatures, more water vapour is required to obtain the same relative humidity value (Lorax 2016).

Given that air temperatures are well below zero during the winter, relative humidity values are elevated throughout the winter, and lower during the summer. With respect to monthly patterns for relative humidity, the annual minima is expected to occur in the month of May. All monthly average relative humidity values from both climate stations are provided in Figure 4.1-3 (Lorax 2016).



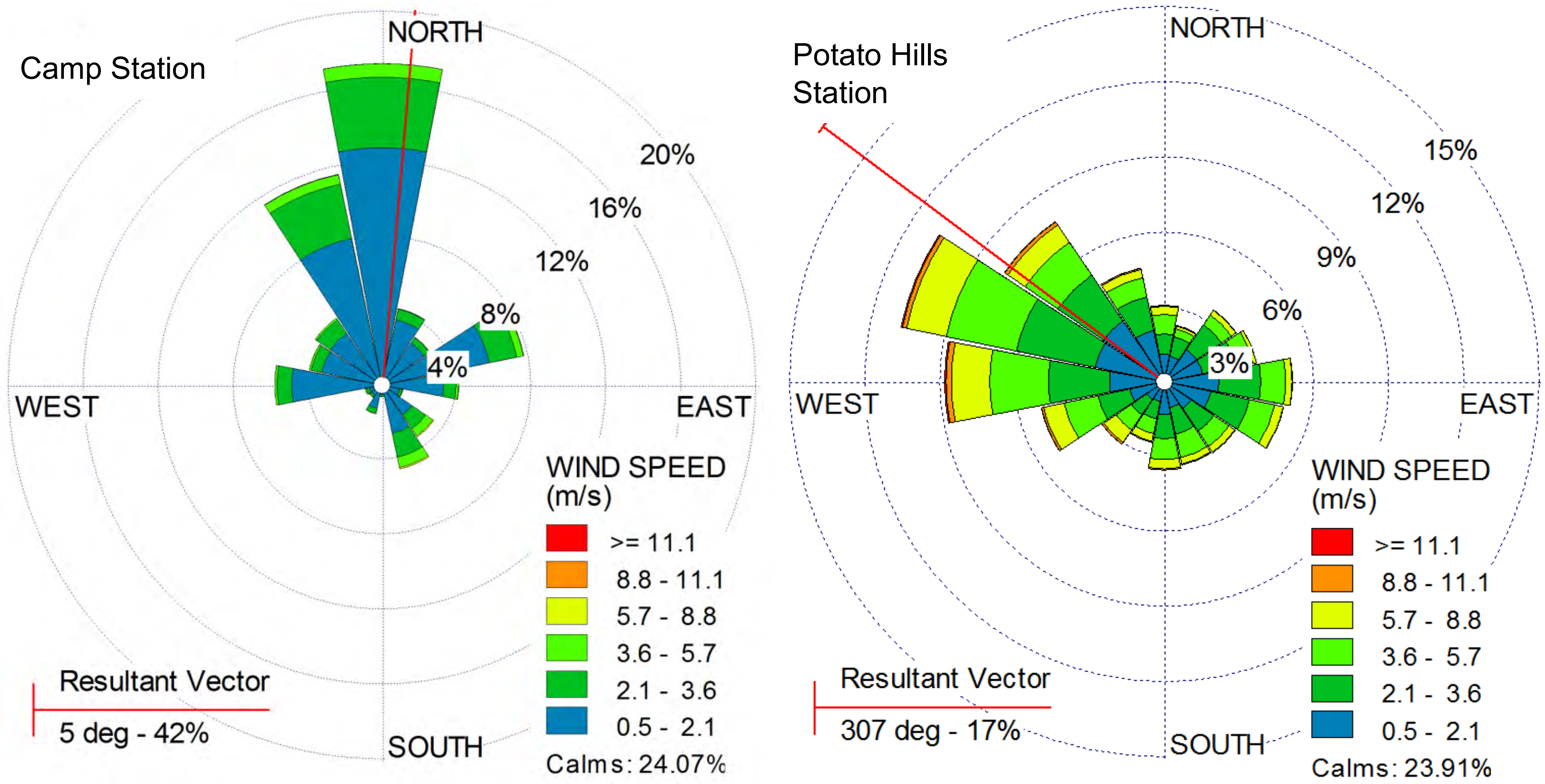
Source: Lorax 2016

Figure 4.1-3 Project Site Average Monthly Relative Humidity

4.1.4 Wind Speed and Direction

Wind roses have been produced to illustrate wind vector trends at each station (Figure 4.1-4).

The predominant wind direction at the site climate stations is from the north, and west-northwest, for the Camp and Potato Hills stations, respectively. Wind speeds average 1.2 m/s at the Camp station, and 2.3 m/s at the Potato Hills station, on an annual basis (Table 4.1-6; Figure 4.1-4). The maximum recorded gust speed at the Camp station was 15.1 m/s, and 23.9 m/s at the Potato Hills station. As shown in Table 4.1-6, the mean monthly wind speeds for both stations are higher in the spring, summer, and autumn months, and lower in the winter, with annual minima occurring in December, and annual maxima in May (Lorax 2016).



Source: Lorax 2016

NOTES:
Wind roses are based on hourly averages of 15-minute readings of wind speed and direction

Figure 4.1-4 Project Site Wind Roses

Table 4.1-3: Project Site Monthly Average Wind Speeds

Climate Station	Elevation (m asl)	Wind Speed (m/s)												
		Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Camp Station	782	2009	-	-	-	-	-	-	-	1.4	1.2	1.2	1.1	0.7	-
		2010	1.2	1.1	2.2	2.0	1.9	1.5	1.4	1.3	1.5	1.2	0.7	1.0	1.4
		2011	0.6	1.2	1.3	1.8	1.7	1.5	1.3	1.2	1.4	0.9	0.9	0.2	1.2
		2012	0.9	1.2	1.6	1.4	1.9	1.3	1.4	1.3	1.5	1.1	1.3	0.7	1.3
		2013	0.8	0.9	1.2	2.2	1.5	1.7	1.5	1.3	1.6	0.8	0.7	0.7	1.2
		2014	0.1	0.8	1.3	1.5	1.8	1.6	1.5	1.2	1.2	1.3	0.9	0.5	1.2
		2015	0.2	0.3	1.1	1.4	1.6	1.6	1.2	1.2	1.3	1.1	0.7	0.0	1.0
		2016	0.7	0.7	1.4	1.2	-	-	-	-	-	-	-	-	1.0
		Average	0.7	0.9	1.5	1.6	1.7	1.5	1.4	1.3	1.4	1.1	0.9	0.5	1.2
Potato Hills Station	1420	2007	-	-	-	-	-	-	-	2.3	2.3	3.0	3.0	0.8	-
		2008	2.8	3.7	3.6	3.6	3.6	3.1	3.1	2.8	1.7	1.3	2.6	3.1	2.9
		2009	3.2	2.5	3.2	3.0	3.1	2.7	2.9	2.0	2.0	3.4	2.3	2.1	2.7
		2010	2.1	2.1	3.9	3.6	2.7	2.0	2.6	2.7	3.0	2.8	1.5	1.0	2.5
		2011	2.0	3.2	3.4	3.2	3.4	2.0	1.8	2.3	1.2	0.4	2.0	1.4	2.2
		2012	0.0	0.2	1.4	2.0	2.9	1.8	1.9	2.0	2.9	2.5	2.6	0.7	-
		2013	1.7	0.7	2.9	4.8	2.6	2.3	2.5	1.8	2.9	2.2	2.1	2.2	2.4
		2014	1.6	2.6	2.5	3.0	2.7	-	-	-	-	-	-	-	-
		2015	-	-	-	-	-	-	0.9	1.8	2.5	1.4	0.0	0.0	-
		2016	1.3	2.7	2.8	2.9	-	-	-	-	-	-	-	-	-
		Average	1.8	2.2	3.0	3.3	3.0	2.3	2.2	2.2	2.3	2.1	2.0	1.4	2.3

Source: Lorax 2016

4.1.5 Solar Radiation

Solar radiation (or solar irradiance) is a measure of the power per unit area provided by the Sun, in watts per square meter (W/m^2). Given the high-latitude location of the Project site, day length, and therefore solar radiation, fluctuate greatly on a seasonal basis. Average annual minima of 1 W/m^2 (Camp station) and 3 W/m^2 (Potato Hills station) occur in the month of December, while the average annual maxima of 221 W/m^2 and 230 W/m^2 occur in May at the Camp and Potato Hills stations, respectively. The Camp stations location in the valley bottom results in slightly lower incident solar radiation, presumably due to the shading effect of the surrounding terrain.

4.1.6 Potential Evaporation

15-minute potential evaporation rates were computed for the Camp station using available climate and the Ref-ET calculator - a compiled, stand-alone computer program that calculates reference evapotranspiration (ASCE, 2005). For the period of available record (Jan 2013 to Apr 2016), a 15-minute climate input file was prepared for the Eagle Gold site. The input variables required by Ref-ET are: maximum air temperature, minimum air temperature, relative humidity, incoming solar radiation, atmospheric pressure and wind speed (Lorax 2016).

From the assembled climate inputs, Ref-ET returned potential evaporation (PE) computations at daily time-step based on an array of evaporation models (e.g., Penman-Monteith model, Priestley-Taylor formulation). May to end-September PE for the Camp station is estimated to be 380 mm, with highest monthly rates of PE expected in May, June, July and August of each year.

5 REFERENCES

ASCE, 2005. ASCE Standardized Reference Evapotranspiration Equation. American Society of Civil Engineers. 216 p.

Lorax (Lorax Environmental) 2016. Eagle Gold Climate Baseline Report, Final Report. Report prepared by Lorax for Victoria Gold Corporation. 26 October 2016.

Wahl, H.E., Fraser, D.B., Harvey, R.C. and Maxwell, J.B. 1987. *Climate of Yukon*. Atmospheric Environment Service, Environment Canada, Ottawa, Ontario.

Yukon Environment. 2014. Dust Management Plan Guidelines. June 2014.

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APPENDIX A

Dust control design criteria

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APPENDIX A

Dust control design criteria

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SPECIFICATION REVISION INDEX

Rev.	Issue Date	Issued for	Signatures				
			Prepared By	Reviewed By	Project Engineer	Project Manager	Client
A	23 May 2011	Internal Review	BD	RY	RY	MR	
B	10 Jun 2011	Client Review	BC	RY	RY	MR	

TABLE OF CONTENTS

1.0 GENERAL

1.1 SCOPE

.1 This design criteria shall form the basis of all dust control systems for the project site, and shall be read in conjunction with the referenced Codes and Standards.

.2 The scope of project areas that are governed by this design criteria will be:

- Primary Crushing
- Secondary Crushing
- Tertiary Crushing
- Refinery
- Laboratory.

.3 This design criteria will govern the production and contents of the following documents:

- Design Calculations
- Equipment performance specifications
- General arrangement drawings
- Detailed drawings
- Standard detail drawings.

1.2 CODES AND STANDARDS

.1 All design material, equipment manufacturing, fabrication, testing, installation and construction shall be in accordance with the latest edition of the applicable codes and standards of the following organizations. The organizations include, but are not limited to, the following:

Institution	Description
ABMA	American Bearing Manufacturers' Association
ACI	American Concrete Institute
AGMA	American Gear Manufacturers' Association
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers

Institution	Description
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CEC	Canadian Electrical Code
CEMA	Conveyor Equipment Manufacturers' Association
CISC	Canadian Institute of Steel Construction
CSA	Canadian Standards Association
CWB	Canadian Welding Bureau
EEMAC	Electrical Equipment Manufacturers Association
FM	Factory Mutual
HI	Hydraulic Institute
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
IFE	Industrial Fasteners Institute
ISA	Instrument Society of America
ISMA	Industrial Silencer Manufacturers' Association
ISO	International Organization for Standardization
JIC	Joint Industrial Council
MHIA	Material Handling Industry of America
MHEA	Material Handling Engineers Association
MPTA	Mechanical Power Transmission Association
YWCHSB	Yukon Worker's Compensation Health and Safety Board
MSS	Manufacturers' Standardization Society
NACE	National Association of Corrosion Engineers
NBC	National Building Code of Canada
NEC	National Electrical Code (US)
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFC	National Fire Code
NFPA	National Fire Protection Association
NFPI	National Fluid Power Institute
OSHA	Occupational Safety and Health Act
PFI	Pipe Fabrication Institute
PPI	Plastics Pipe Institute
RMA	Rubber Manufacturers' Association
SNT	Society of Non-Destructive Testing
SAE	Society of Automotive Engineers
SSPC	Steel Structure Painting Council
TEMA	Tubular Exchanger Manufacturers' Association
UL	Underwriters Laboratories
CUL	Underwriters Laboratories of Canada

Institution	Description
WHMIS	Workplace Hazardous Materials Information System
WCB	Worker's Compensation Board, British Columbia

.2 The codes and laws of Yukon, municipality or jurisdiction may take precedence over the aforementioned codes.

1.3 REFERENCE SPECIFICATIONS

.1 For equipment general specification, weather and all site data refer "02 10 00 TS – Site Conditions" unless otherwise noted in the equipment Criteria.

.2 For all piping data and information (pipe velocity, pipe material, and buried pipe) see "40 00 00 DC Piping Design Criteria".

.3 For all structural data and information see "05 00 00 DC Structural Design Criteria".

.4 For all electrical data and information see "26 00 00 DC Electrical Design Criteria".

.5 For all instrumentation data and control information see "40 90 00 DC Instrumentation Design Criteria".

.6 For all building services data and information see "24 00 00 DC HVAC Design Criteria".

1.4 DESIGN PARAMETERS

.1 The basic requirements of dust control systems shall be to:

- Minimize emissions to atmosphere
- Minimize loss of product from the process
- Maintain stack emissions below established criteria
- Maintain air quality standards.

.2 The dust control systems shall be designed based on the premise that the material handling equipment, such as screens, conveyors, chutes, and skirting, are designed and maintained to prevent spillage and loss of material, and that the skirting lengths and heights are suitable for the intended dust control systems.

.3 Aspirated systems shall be dedicated to individual process circuits, in order to provide flexibility with operations.

.4 Fogging systems shall be capable of reducing the fugitive dust emissions from transfer points, to 97.5% of those levels documented in USEPA –AP42 emission factors.

.5 The velocity of air entering exhaust hoods shall be such that it does not remove excess material from the process flow.

.6 Hoods shall be provided at the rear of transfer chutes, wherever the fall of material exceeds 3 metres, or if the receiving conveyor is inclined.

.7 All dust conveying ducting shall be round.

.8 All ducting shall be flanged in lengths that will enable ease of installation and future removal.

.9 Duct diameters shall be sized to ensure complete conveyance of all collected dust, from the point of collection, to the dust collection equipment.

.10 In no case shall the duct velocity, in dust conveying ducting, be less than 20 m/s.

.11 The duct velocity in “clean” air ducting, on the downstream side of dust collection equipment, shall not be less than 15.3 m/s.

.12 Duct cleanouts shall be provided such that the internals of all sections of dust conveying ducting can be inspected and cleaned out. Cleanouts shall be located on the top, or side of the duct, not on the bottom.

.13 Air flow measuring ports shall be provided in all branch ducts and all main ducts, to enable each section of the system to be tested and balanced.

.14 Air flow test ports shall not be located within six duct diameters upstream of any turbulence and not less than two duct diameters downstream of any turbulence.

.15 Dampers shall be provided in all branch ducts for air flow balancing. The dampers shall only be low leakage blast gate type, with means to lock the gates in the final balanced position.

.16 Branch entries into a main duct shall preferably enter at an angle of 30 degrees, but in no case shall the angle exceed 45 degrees.

.17 Branch entries shall enter a main such that the duct velocities are maintained throughout the fitting.

.18 The included angle for duct contractions and expansions shall not exceed 15 degrees.

.19 No two branch entries shall enter the main duct opposite each other in the same plane.

.20 90 degree bends shall be constructed of seven segments of straight ducting, and have a centreline radius of two and a half times the duct diameter.

.21 Bends of less than 90 degrees shall be constructed of a pro-rated number of segments of straight duct, and have a centreline radius of two and a half times the duct diameter.

.22 Exhaust stacks shall not have any impediment to straight through flow. The only allowable arrangement of weather protection is the stack head configuration, where the head is at least four times the duct diameter and the head diameter is 25 mm larger than the stack diameter.

.23 Exhaust stack discharge velocities shall be at least 15.3 m/s.

.24 Fan inlet ducts shall be configured to prevent uneven loading of the fan wheel.

.25 Fan discharge ducts shall remain straight for at least one fan inlet diameter before any bend, and that bend shall only be turned in the direction of fan rotation.

.26 All exterior surfaces of ducts shall be prepared to SSPC-3 prior to application of paint.

.27 Paint shall be applied to all exterior duct surfaces.

.28 Ducts shall be supported at the following intervals: 3 m spacing for 200 mm diameter and smaller: 4.5 m for 210 mm diameter through 480 mm and 6 m spacing for ducts larger than 480 mm diameter.

.29 Duct supports shall be designed for the weight of the ducting and fittings, plus the following allowance for material:

1.0	Mains Dust Load	% Full:	33 Vertical & 33 Horizontal
2.0	Sub mains Dust Load	% Full:	50 Vertical & 50 Horizontal
3.0	Branches Dust Load	% Full:	100 Vertical & 100 Horizontal

.30 Vertical ducts shall be supported at the base of the riser.

.31 Emissions to atmosphere, through dust collector exhaust stacks are limited to 32 mg/dsm^3 and an opacity of less than 7%.

1.5 SPECIFIC DUST CONTROL SYSTEMS

Dust control shall be provided in the following areas of the project:

.1 Primary Crusher Dump Pocket

Dump Pocket: No fixed system for dust control.

.2 Primary Crusher - Below the crusher

A dry aspirated dust collection system handled by a single dust collector and exhaust fan, with pick up hoods located at the following points:

- Primary crusher Apron Feeder
- Secondary crusher feed conveyor
- Winter ore storage feed conveyor
- The collected fines will be discharged back to the process via a rotary air lock onto the primary crusher discharge conveyor.

.3 Secondary Crusher Feed Bin

A dry aspirated dust collection system handled by a single bin vent located on the top of the secondary crusher feed bin will negate dust that is produced by the feed from the primary crusher discharge conveyor into the bin.

The collected fines will be discharged back to the secondary crusher feed bin.

.4 Secondary Crushing

A dry aspirated dust collection system handled by a single dust collector and exhaust fan, with pick up hoods located at the following points:

- Head chute of secondary crusher belt feeders
- Secondary crusher screens
- Secondary crusher discharges onto conveyor
- Head chute of secondary crusher discharge conveyor
- Discharge onto Tertiary crusher feed conveyor
- Head chute of tertiary crushing transfer conveyor
- The collected fines will be discharged back to the process via a rotary air lock onto the tertiary crushing feed bin conveyor.

.5 Tertiary Crushing Feed Bin

Multiple dry aspirated bin vents, located on the top of the tertiary crushing feed bin will negate dust that is produced by the feed from the tertiary crushing feed conveyor into the bin.

The collected fines will be discharged back to the tertiary crushing feed bin.

.6 Tertiary Crushing

A dry aspirated dust collection system handled by a single dust collector and exhaust fan, with pick up hoods located at the following points:

- Head chute of tertiary crusher belt feeders
- Tertiary crusher screens
- Tertiary crusher discharges onto conveyor
- Head chute of tertiary crushing discharge conveyor No 1
- Discharge onto Tertiary crushing discharge conveyor No 2.

The collected fines will be discharged back to the process via a rotary air lock onto the Tertiary crushing discharge conveyor No 2.

.7 Cement and Lime Addition

- Dry aspirated bin vents will be located on top of each of the cement and lime silos to negate dust emissions when the silos are being filled.
- Barren solution will be sprayed onto the tertiary crushing discharge conveyor No 2 at the discharge points of each cement and lime silo onto the conveyor, to control dust emissions at these locations.

.8 Refinery

- A dry aspirated dust collection system will control fumes and dust emissions from the smelting furnace.
- A canopy hood will be located over the furnace, and the temperature of the air enterning the dust collector will b e maintained below 200 degrees Celsius.
- The collected fines will be dropped, via a rotary air lock, into a drum for manual removal when needed.

.9 Laboratory - Sample Prep

- Dry aspirated dust collection system handled by a single dust collector and exhaust fan, with pick up hoods located at the following points:

  .a Crushers

  .b Pulverizers

.c Dust hood workstations

.d The collected fines will be discharged via a rotary air lock into a drum, that will be manually emptied on an as needed basis.

.10 Laboratory - Fire Assay

- Dry aspirated dust collection system handled by a single dust collector and exhaust fan, with pick up hoods located at the following points:

.a Flux mixing

.b Pulverizers

.c Parting hood

.d Furnace hoods

.e The collected fines will be discharged via a rotary air lock into a drum, that will be manually emptied on an as needed basis.

2.0 EQUIPMENT

2.1 DUST COLLECTORS

.1 Materials and equipment shall be standard products of established manufacturers who have continuously produced the type of equipment suitable for the conditions specified.

.2 All like-equipment shall be manufactured by a single source, to minimize spare parts.

.3 Dust collectors shall be of the reverse pulse type, utilising dry compressed air for purging the filters, whilst remaining on-line during the purge.

.4 Dust collectors shall be designed and manufactured for heavy duty mining applications.

.5 Filter materials shall be selected by the dust collector supplier to suit the properties of the anticipated materials including the moisture content, temperature and size.

.6 Cartridge filters shall not be used.

.7 Filter bags shall not exceed 3m in length.

2.2 DUST COLLECTOR EXHAUST FANS

.1 Fans shall be located on the clean side of the dust collector.

.2 Fans shall be heavy duty single inlet single width centrifugal fans, utilising radial impellers.

.3 Fans shall be belt driven and be mounted on a sub frame for mounting directly onto concrete or steel structures.

.4 Fans shall be complete with guards designed to fit around all rotating machinery including drive shafts and V-belts. All such guards shall be designed for easy removal and accessibility to equipment.

2.3 ROTARY VALVES

.1 Rotary valves shall be gear driven, cast iron, flanged units.

.2 Rotary valves shall be directly connected to the discharge flange of the dust collector hopper.

.3 The vanes of the rotary valve shall be adjustable and shall be fabricated of abrasion resistant steel.

END OF DESIGN CRITERIA

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APPENDIX L

Technical Memo - Update on Peso Vegetation Plots

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Laberge
ENVIRONMENTAL SERVICES
P.O. Box 21072
Whitehorse, Y.T.
Y1A 6P7

email: laberge@northwestel.net
Office Phone: 867-668-6838
Fax: 867-667-6956

TECHNICAL MEMO

To: Steve Wilbur
Victoria Gold

Date: November 30th, 2016

From: Bonnie Burns
Laberge Environmental Services

Re: **Update on Peso Vegetation Plots**

The fourth annual assessment of the vegetation plots at the Peso mine site was conducted on July 14th, 2016. The details of the assessment have been summarized in Table 1 (Waste Rock sites) and Table 2 (Trench sites) which also includes the assessments recorded in 2013, 2014 and 2015. The current assessment also included observations on the "buffer" unplanted and non treated plots within each block. Species identified on these plots are presented in Table 3. These plants represent natural colonization from the surrounding plots and from the neighbouring environment since September 2012, when the Peso site was seeded.

Figures 1 and 2 demonstrate the estimated vegetative cover for each Plot at the Waste Rock and Trench sites respectively.

Photographs of selected plots are also included with this memo.

Note that details on the methodology and observed results from 2012 to 2014 are included in a previously submitted report (Laberge, 2015).

Below are summarized observations and comments on the 2016 assessment:

Waste Rock Site

- The plots that received no treatment but were seeded at the same rate and with the same species as the others continue to support no growth.
- The vegetative cover decreased in all plots in Blocks 1 and 3 since last assessed.
- There is continued healthy growth on Plot 2-4 in Block #2 (see Photo #6), where the cover increased to 80%.
- Non planted species that were observed growing on some of the waste rock plots include willows, spruce, subalpine fir and paper birch.
- The limited plant growth in Block 3 appears very stressed (see Photo #8).
- The plots containing the healthiest plants with the greatest diversity of growth were generally observed on the plots that had been treated with biochar, compost and dolomite (Photo #9).
- There were few volunteer plants growing in the buffer plots at the Waste Rock Site. The majority were documented at Block 2. None were apparent at Block 3.

Trench Site

- The seeded plots that received no treatment continued to support minor growth.
- Ticklegrass was not planted at this site but is a common volunteer plant on most of the plots on all of the Blocks. Ticklegrass is a native species throughout the Peso site.
- Non planted species that were observed growing on some of the trench plots include willows, spruce, Labrador Tea, subalpine fir and paper birch.

- There was an increase in plant cover at several of plots.
- There is diverse growth in all of the plots in Block 3.
- Alsike clover, an introduced species to the Yukon, was documented at two of the plots in Bock 3 (see Photo #14). Although it is a nitrogen fixer (as is alder), if it appears to be spreading, they will be removed during the next assessment. It is suspected that it came in with the compost during the initial seeding.
- Generally the plots treated with compost and biochar exhibited the best growth.

Summary

The 2016 assessment was conducted 2½ weeks earlier than the 2015 and 2014 surveys. This could partially account for the reduced plant cover at some of the plots as the grasses had not reached full maturity and growth for the season. However, overall the vegetation at most of the plots appeared healthy, especially at the Trench site.

The majority of the colonization of the buffer plots were shrubs, with some grasses at the Trench Site. Dwarf birch appears to be a good natural colonizer at the Peso site as it was commonly found growing in the buffer plots.

The Blocks that supported the healthiest and most robust plants were those located closer to the forest margin; Blocks 1 and 3 at the Trench Site and Block 2 at the Waste Rock site. These locations probably provide some protection from the elements and possibly retain greater moisture than the more open sites.

It appears evident at Block 3 on the Waste Rock dump that acid rock drainage is seeping in this area (staining on the rock surfaces) and inhibiting growth (Photo #10). The effects of biochar and dolomite used at the plots have been pretty much exhausted and now are insufficient to combat this, resulting in no growth or very stressed growth of the seeded species. Interestingly, the small willows and dwarf birch observed in Plot 3-4 appeared relatively healthy.

Laberge Environmental Services. 2015. Revegetation and Bioremediation Trials on the Dublin Gulch Property, 2012 to 2014. Prepared for Victoria Gold Corp.

TABLE 3 SPECIES OBSERVED IN THE BUFFER PLOTS, JULY 14, 2016

Species	Trench			Waste Rock		
	Block 1	Block 2	Block 3	Block 1	Block 2	Block 3
Unidentified grass		√	√		√	
Alpine Bluegrass (*Poa alpina*)	√					
Tufted Hairgrass (*Deschampsia caespitosa*)	√					
Ticklegrass (*Agrostis scabra*)	√		√			
Sheep Fescue (*Festuca ovina*)			√			
Dwarf Birch (*Betula glandulosa*)	√	√	√	√	√	
Willows (*Salix spp*)	√	√	√		√	
Blueberry (*Vaccinium uliginosum*)		√	√			
Labrador Tea (*Ledum groenlandicum*)		√	√			
Mossberry (*Empetrum nigrum*)		√				
Cranberry (*Vaccinium vitis-idaea*)		√				
Alder (*Alnus viridis*)	√		√	√	√	
Spruce (*Picea glauca*)	√	√	√		√	
Paper Birch (*Betula papyrifera*)		√	√		√	
Aspen (*Populus tremuloides*)			√			
Moss			√			

TABLE 1 ASSESSMENTS OF THE PLOTS AT THE WASTE ROCK SITE, 2013, 2014, 2015 AND 2016

BLOCK #1

Plot #	Date	% Cover	Species, height cm and/or # of individuals	Overall Health	Comments
1-1	Jul-13	0			bare plot
	Sep-13	<1	1 blade of unidentifiable grass	stressed	bare plot
	Aug-14	0			bare plot, moist soil
	Aug-15	0			bare plot
	Jul-16	0			bare plot
1-2	Jul-13	40 - 50	2 species of grass - unidentified alder, 8 plants hedysarum, 2 plants	good	tallest and most robust growth of all plots in block
	Sep-13	60 - 65	tickle grass, some in seed, max 30 cm glaucous bluegrass up to 12 cm sheep fescue (?), 8 cm alder < 1cm hedysarum, < 2cm	good	green healthy growth, signs of grazing
	Aug-14	70	tufted hairgrass, 2 plants up to 40 cm ticklegrass, many plants, avg 35 cm sheep fescue, 3 mature plants, max 35 to 40 cm alder, 7 plants	good	even coverage of plot, 1 willow in plot
	Aug-15	55	tufted hairgrass glaucous bluegrass tickle grass sheep fescue alder	good	willow in plot
	Jul-16	50	unidentified grasses tickle grass sheep fescue tufted hairgrass glaucous bluegrass 5 alders up to 34.5 cm 10 Salix spp	good	some moss lady bug in plot
1-3	Jul-13	15 - 20	small tufts of unidentified grass alder, 2 plants - very small	good	
	Sep-13	30 - 35	glaucous bluegrass up to 8 cm unidentified grass up to 10 cm alder, <1 cm	good	sporadic cover
	Aug-14	40	ticklegrass, max 35 cm alder, 1 plant	fairly good	uneven distribution, bare sections
	Aug-15	15	tickle grass tufted hairgrass unidentified grasses alder	some grasses are stressed	
	Jul-16	5	ticklegrass unidentified tufts of stressed grasses 2 alders up to 11.5 cm	sttressed	
1-4	Jul-13	10 - 15	small tufts of unidentified grass, at least 2 species	fairly good	
	Sep-13	30 - 35	glaucous bluegrass up to 8 cm unidentified grass up to 4 cm alder, <1 cm	partially stressed	
	Aug-14	50	ticklegrass, many mature plants, up to 30 cm sheep fescue, a few plants, up to 15 cm alder, 5 plants	good	uneven distribution
	Aug-15	20	tickle grass glaucous bluegrass alder	good	willow in plot
	Jul-16	15 to 20	unidentified grasses glaucous bluegrass ticklegrass 13 alder 22 Salix spp 3 spruce	grasses appear somewhat stressed, others appear healthy	herbivory on the alders and on some grasses
1-5	Jul-13	5	sparse short growth of grasses	stressed	
	Sep-13	50	glaucous bluegrass, 4 cm tickle grass up to 3 cm unidentified grass up to 4 cm alder, < 2cm hedysarum	good	Signs of grazing. even coverage of growth
	Aug-14	60	tickle grass, mature, max 25 cm immature glaucous bluegrass immature grass - may be sheep fescue alder, 2 plants	good	Several tufts of unidentifiable grass.
	Aug-15	45	sheep fescue tickle grass glaucous bluegrass alpine bluegrass alders	good	willows
	Jul-16	30	unidentified grasses ticklegrass sheep fescue glaucous bluegrass 5 alders up to 61.5 cm 16 Salix spp	grasses appear somewhat stressed, shrubs appear healthy	

TABLE 1 ASSESSMENTS OF THE PLOTS AT THE WASTE ROCK SITE, 2013, 2014, 2015 AND 2016

BLOCK #2

Plot #	Date	% Cover	Species, height cm and/or # of individuals	Overall Health	Comments
2-1	Jul-13	0	no sign of any growth		bare plot
	Sep-13	0	no sign of any growth		bare plot
	Aug-14	0	no sign of any growth		bare plot
	Aug-15	0	no sign of any growth		bare plot
	Jul-16	0	no sign of any growth		bare plot
2-2	Jul-13	35	unidentified tufts of grass - healthy alder, 1 plant, very small hedysarum, 2 plants	good	coverage mostly on east half
	Sep-13	50	ticklegrass up to 16 cm sheep fescue up to 12 cm glaucous bluegrass up to 8 cm alder hedysarum,	good	growth covers most of the eastern half of plot
	Aug-14	60	ticklegrass, mature, max 30 cm alder, 7 plants volunteer willow, 6 plants volunteer spruce, 2 plants	good	growth covers most of the eastern half of plot
	Aug-15	60	tickle grass glaucous bluegrass unidentified grasses alders	good	healthy alder growth, many juvenile willow plants, 2 spruce seedlings, leaf litter
	Jul-16	40	ticklegrass unidentified grasses 51 alder up to 34 cm, many small 16 Salix spp 2 spruce 1 subalpine fir	good	moose had walked thru Block leaf litter blue bug on alder leaf
2-3	Jul-13	45	unidentified tufts of grass - healthy alder, 9 plants	good	more even coverage
	Sep-13	60	ticklegrass up to 11 cm glaucous bluegrass up to 11 cm alder, several small seedlings	good	even cover of plot
	Aug-14	60	ticklegrass, max 38 cm immature sheep fescue alder, >20 plants	good	even distribution
	Aug-15	60	tickle grass unidentified grasses many alder	good	healthy alder growth willow in plot
	Jul-16	40	ticklegrass unidentified grasses many alder, more than in 2-2, up to 36 cm 6 Salix spp 3 paper birch		
2-4	Jul-13	50	unidentified tufts of 2 to 3 species of grass - healthy glaucous bluegrass alder, 1 plant	good	even growth on plot
	Sep-13	60	glaucous bluegrass up to 8 cm sheep fescue up to 4 cm ticklegrass up to 3 cm alder, <1 cm	good	even cover of plot
	Aug-14	60	sheep fescue, several mature immature glaucous bluegrass, up to 15 cm alder, 15 plants	good	even distribution 1 volunteer willow plant
	Aug-15	70	tufted hairgrass tickle grass sheep fescue glaucous bluegrass many alder	good	healthy alder growth willow in plot
	Jul-16	80	glaucous bluegrass ticklegrass lots of alder 2 Salix spp 2 spruce 1 paper birch	good	lush growth
2-5	Jul-13	30	unidentified tufts of grass - healthy hedysarum, 2 plants	good	
	Sep-13	40 - 50	tickle grass up to 30 cm glaucous bluegrass up to 13 cm alder, < 1cm	good	even cover of plot, less robust growth than plot 2-4
	Aug-14	50	tickle grass, many mature, up to 30 cm sheep fescue, several, up to 25 cm alder, 8 plants	good	
	Aug-15	50	ticklegrass glaucous bluegrass unidentified grasses	good	willows in plot
	Jul-16	30	unidentified grasses glaucous bluegrass - couple of plants 16 alder 3 Salix spp 1 paper birch	grasses appear stressed, others look healthy	

TABLE 1 ASSESSMENTS OF THE PLOTS AT THE WASTE ROCK SITE, 2013, 2014, 2015 AND 2016

BLOCK #3

Plot #	Date	% Cover	Species, height cm and/or # of individuals	Overall Health	Comments
3-1	Jul-13	0	no growth		bare plot
	Sep-13	0	no growth		bare, moist plot
	Aug-14	0	no growth		moose track in plot
	Aug-15	0	no growth		
	Jul-16	0	no growth		bare plot
3-2	Jul-13	30	unidentified tufts of grass alder, 5 plants	partially stressed	growth localized, plants appear stressed on right side
	Sep-13	30	ticklegrass, lots in seed, up to 35 cm glaucous bluegrass up to 8 cm	partially stressed	
	Aug-14	20	ticklegrass, mature, max 33 cm sheep fescue, several mature, max 15 cm	partially stressed	half of plot is bare
	Aug-15	10	tickle grass glaucous bluegrass	stressed	
	Jul-16	<5	ticklegrass glaucous bluegrass	stressed	
3-3	Jul-13	5	sparse stressed grass growth	stressed	
	Sep-13	5 - 10	unidentified grass up to 5 cm	stressed	
	Aug-14	0	dead grasses from last year's growth	stressed	
	Aug-15	0	no growth		
	Jul-16	0	no growth		
3-4	Jul-13	40 - 50	many tufts of healthy unidentified grasses	good	good growth in lower half
	Sep-13	50	tickle grass, some in seed, up to 4 cm sheep fescue (?), 7 cm glaucous bluegrass, up to 2 cm	good	
	Aug-14	35	ticklegrass, up to 35 cm tufted hairgrass, 1 mature plant, up to 40 cm sheep fescue, 1 mature plant, up to 34 cm	good	healthiest plot in Block #3
	Aug-15	25	tufted hairgrass tickle grass sheep fescue glaucous bluegrass	good	willow in plot
	Jul-16	15	unidentified grasses glaucous bluegrass ticklegrass tufted hairgass 4 Salix spp 2 dwarf birch	grasses stressed	
3-5	Jul-13	<10	unidentified grasses	partially stressed	some tufts quite healthy
	Sep-13	10 - 15	glaucous bluegrass, < 2 cm unidentified grass up to 3 cm	stressed	most plants are brown
	Aug-14	<10	tickle grass, a few mature and immature, up to 25 cm glaucous bluegrass, 1 mature, 25 cm stressed stunted grasses dead grass from last year	stressed	good soil moisture
	Aug-15	10	tickle grass	good	
	Jul-16	<5	glaucous bluegrass unidentified grasses	stressed	

NOTE: stressed = brown or withered plants
good = green plants showing vigor

TABLE 2 ASSESSMENTS OF THE PLOTS AT THE TRENCH SITE, 2013, 2014, 2015 AND 2016

BLOCK #1

Plot #	Date	% Cover	Species, avg height cm and/or # of individuals	Overall Health	Comments
1-1A	Jul-13	<1	sparse scraggly grass growth 1 hedysarum	stressed	a few shoots deep in gravel
	Sep-13	<1	unidentifiable grass, mostly brown, 2-3 cm	stressed	some green growth
	Aug-14	0			no growth
	Aug-15	<1	4 alder	good	small, seem healthy
	Jul-16	<1	2 alder 3 dwarf birch, up to 4.5 cm	good	plants are small but appear healthy, no grass
1-2A	Jul-13	45 - 50	alpine bluegrass unidentifiable grass hedysarum, 7 plants	good	even grass cover
	Sep-13	50	alpine bluegrass < 2cm 2 other grass species up to 4cm alder < 1cm hedysarum, < 2cm	good	Signs of grazing.
	Aug-14	60	alpine bluegrass ticklegrass, max 30 cm sheep fescue, max 30 cm alder, 13 plants	good	lots of tufts of unidentifiable grass 5 - 7 cm tall
	Aug-15	40	alpine bluegrass tickle grass unidentified grasses 12 alder	good	grass shows signs of grazing
	Jul-16	60	unidentified grasses, some possible immature hairgrass alpine bluegrass tickle grass spike trisetum, some in seed sheep fescue 12 alder, robust growth up to 21 cm	good	some accumulated leaf litter, a few small mushrooms present.
1-3	Jul-13	40	alpine bluegrass unidentified grasses hedysarum, 8 plants alder, 3 plants	good	most robust growth in Block #1
	Sep-13	50 - 60	alpine bluegrass, dominant species, < 3cm 3 other grass species up to 5 cm alder, <2 cm hedysarum, < 2cm	good	Signs of grazing.
	Aug-14	70	ticklegrass, max 30 cm, more mature plants than 1-2A alpine bluegrass, avg 4 cm alder, 8 plants sheep fescue, max 22 cm, 1 mature plant	good	Lots of tufts of unidentifiable grass 5 - 6 cm tall. Signs of grazing.
	Aug-15	50	alpine bluegrass tickle grass unidentified grasses 20 alder	good	alders growing significantly Signs of grazing. alder leaf litter
	Jul-16	70	unidentified grasses alpine bluegrass tickle grass spike trisetum sheep fescue tufted hairgrass, 1 in seed, 50.5 cm 1 willow 24 alder, some heights: 30 cm, 21.5 cm, 18.5 cm	good	lots of leaf litter plants look healthy
1-1B	Jul-13	<5	unidentified grass hedysarum, 4 plants alder, 1 plant	stressed	but some green growth
	Sep-13	<5	brown grasses, 2 - 4 cm hedysarum	stressed	
	Aug-14	<1	hedysarum, 1 plant	stressed	dead grass from last year
	Aug-15	<1	alder unidentified grasses	stressed	alder stunted
	Jul-16	<1	8 alder, all ≤ 1 cm		1 dwarf birch just ouside plot
1-2B	Jul-13	35	alpine bluegrass unidentified grasses hedysarum alder	good	even coverage of plot
	Sep-13	45	alpine bluegrass, 2 - 3 cm 3 other grass species, 2 - 4 cm alder, < 1cm	good	Signs of grazing. scat in plot
	Aug-14	60	tickle grass, many mature, max 38 cm alpine bluegrass, 3-4 cm, not as many as 1-3 alder, 4 plants some small hedysarum	good	Several tufts of unidentifiable grass. Alder leaf litter from near by.
	Aug-15	45	alpine bluegrass tickle grass unidentified grasses 20 alder	good	Signs of grazing. rabbit scat leaf litter 1 juvenile willow
	Jul-16	55	unidentified grasses tickle grass alpine bluegrass sheep fescue 51 alder, up to 8 cm 7 Salix spp		small black bugs on some plants

TABLE 2 ASSESSMENTS OF THE PLOTS AT THE TRENCH SITE, 2013, 2014, 2015 AND 2016

BLOCK #2

Plot #	Date	% Cover	Species, height cm and/or # of individuals	Overall Health	Comments
2-3A	Jul-13	25 - 30	unidentified grasses alder, 2 plants hedysarum, 1 plant	good	Buffer plot above 2-3A and beside 2-1A has 14 alder and 1 labrador tea.
	Sep-13	35	alpine bluegrass, <2cm 3 other species of grass alder	good	Signs of grazing. Rabbit pellet spruce seedling
	Aug-14	45	spiked trisetum, 2 mature, up to 27 cms sheep fescue, 5 mature, up to 27 cm alpine bluegrass, <2cm lots of tufts of unidentified grasses alder, 6 plants	good	1 possible volunteer blueberry plant in plot
	Aug-15	40	alpine bluegrass spiked trisetum sheep fescue 6 alder	good	blueberry plant on edge of plot, 2 willow spp, 1 labrador tea in plot
	Jul-16	30	alpine bluegrass sheep fescue 2 alder, one large 53 cm, robust growth 11 dwarf birch 20 Salix spp	somewhat stressed	1 small spruce in plot 3 probable paper birch blueberry on plot edge
2-1A	Jul-13	<5	sparse straggly grass shoots alder, 3 plants	stressed	
	Sep-13	<5	2 grasses, 2 - 3 cm hedysarum, 1 plant alder	stressed	Most grasses were brown
	Aug-14	<1	small grasses alder, 3 plants	stressed	1 labrador tea in plot
	Aug-15	<1	alder unidentified grass species	stressed	1 labrador tea in plot 1 spruce and willow
	Jul-16	<1	a few unidentified blades of grass 9 dwarf birch subalpine fir Salix spruce	stressed	all plants very small
2-2	Jul-13	40	alpine bluegrass unidentified grasses	good	even distribution
	Sep-13	45	alpine bluegrass, 2 cm unidentified grass species up to 5 cm	good	
	Aug-14	50	sheep fescue, several mature, up to 25 cm lots of immature alpine bluegrass, <3 cm spiked trisetum, 3 mature, up to 15 cms tickle grass, 1 mature, up to 23 cm alder, 2 plants	good	good healthy coverage
	Aug-15	45	alpine bluegrass spiked trisetum sheep fescue alder	good	4 willow spp 1 labrador tea in plot
	Jul-16	45	sheep fescue, up to 46 cm alpine bluegrass spike trisetum 2 alder, one large 73 cm 12 Salix spp dwarf birch spruce	good	1 blueberry plant in plot 1 labrador tea below plot
2-3B	Jul-13	20	unidentified tufts of grasses hedysarum, 1 plant	good	
	Sep-13	30	alpine bluegrass, 2 cm 2 species of grass, <4 cm hedysarum	good	Tiny capped mushrooms in plot.
	Aug-14	40	tickle grass, 2 plants up to 20 cm alpine bluegrass, 1 mature, up to 10 cm several tufts of unknown grasses alder, 1 plant	good	2 alders growing just outside of plot
	Aug-15	35	alpine bluegrass spiked trisetum sheep fescue alder	good	1 spruce seedling in plot labrador tea and willow spp
	Jul-16	25	sheep fescue, up to 23.5 cm alpine bluegrass spike trisetum, up to 19 cm unidentified grasses dwarf birch, 19.5 cm 9 Salix spp 4 labrador tea	good	many small shrubs growing in the neighbouring buffer plot (dwarf birch, salix, labrador tea) and 3 paper birch and 3 spruce
2-1B	Jul-13	<5	a few blades of unidentified grass hedysarum, 1 plant	stressed	1 spruce seedling in plot
	Sep-13	5	unidentified grass, 3 - 4 cm alder, <1 cm, 4 plants	stressed	most grasses are brown
	Aug-14	<1	quite a bit of dead grass - didn't survive alder, 3 plants	stressed	possible 3 willows in plot
	Aug-15	<1	alder	stressed	willow spp
	Jul-16	1 to 5	unidentified grasses 4 Salix spp 8 dwarf birch 1 paper birch	stressed shrubs fairly healthy	

TABLE 2 ASSESSMENTS OF THE PLOTS AT THE TRENCH SITE, 2013, 2014, 2015 AND 2016

BLOCK #3

Plot #	Month / Year	% Cover	Species, avg height cm and/or # of individuals	Overall Health	Comments
3-2A	Jul-13	40	unidentified tufts of grass - lots alpine bluegrass, alder, 1 plant hedysarum, 2 plants	good	robust healthy plot
	Sep-13	40	alpine bluegrass, 2 cm 2 other grass species, <4 cm hedysarum, <1 cm alder, <1 cm	good	Sign of grazing. Some moss in plot
	Aug-14	60	tufted hairgrass, 4 mature plants, up to 70 cm ticklegrass, mature up to 35 cm sheep fescue, mature up to 35 cm spiked trisetum, mature up to 33 cm alpine bluegrass, lots of immature, < 3cm alder, 1 plant	good	4 volunteer willow in plot, very diverse plot, has the most mature plants
	Aug-15	50	tufted hairgrass sheep fescue alpine bluegrass spiked trisetum tickle grass alder	good	lots of moss, clover willow
	Jul-16	70*	unidentified grasses tickle grass tufted hairgrass alpine bluegrass (only a few plants) 5 alder, tallest 71 cm 11 Salix spp 5 dwarf birch	grasses are stressed other plants appear healthy	lots of moss, large tuft of alsike clover
3-3A	Jul-13	35	unidentified tufts of grass - lots tufted hairgrass, 1 mature plant	good	
	Sep-13	40	tufted hairgrass, mature, up to 30 cm alpine bluegrass, 2 cm other grasses, 3 cm alder	good	Sign of grazing.
	Aug-14	50	tufted hairgrass, mature, up to 42 cm ticklegrass, mature up to 36 cm sheep fescue, mature up to 30 cm spiked trisetum, mature up to 20 cm alpine bluegrass, lots of immature, 2 - 4 cm alder, 4	good	1 willow in plot
	Aug-15	40	tufted hairgrass alpine bluegrass spiked trisetum sheep fescue tickle grass alder	good	willow lots of moss, 1 mushroom
	Jul-16	65	unidentified grasses tickle grass sheep fescue alpine bluegrass 7 alder up to 37 cm 8 Salix spp 1 possible Hedysarum plant	good	Some moss in plot
3-1	Jul-13	5	sparse unhealthy unidentified grass	stressed	in upper right corner only
	Sep-13	5 - 10	unidentified grass, <3 cm alder, <1 cm	stressed	grass is brown
	Aug-14	<5	sheep fescue, immature - small but healthy ticklegrass, 1 mature, 10 cm alder, 10 plants, very small	good	1 labrador tea and 1 tiny spruce seedling in plot, one fairly large aspen growing downhill of plot
	Aug-15	5	tickle grass unidentified grass species alder	good	1 labrador tea 1 willow
	Jul-16	5	unidentified grasses tickle grass alder 8 dwarf birch 2 small spruce		small amount of moss 1 very small blueberry labrador tea
3-2B	Jul-13	20	unidentified small tufts of grasses alpine bluegrass alder, 3 plants hedysarum, 5 plants	good	
	Sep-13	30	alder, <2cm, 12 plants alpine bluegrass, < 2cm unidentified grass, < 4cm hedysarum, < 2cm	partially stressed	But lots of green healthy plants.
	Aug-14	40	tickle grass up to 15 cm alpine bluegrass unidentified immature grasses alder, approx 20	good	1 willow growing in plot
	Aug-15	35	sheep fescue spiked trisetum alpine bluegrass tickle grass unidentified grasses alder	good	willow, clover in flower
	Jul-16	45	unidentified grasses (may be some sheep fescue) alpine bluegrass tickle grass tufted hairgrass, 40.5 cm 11 alder 13 dwarf birch 7 Salix spp	overall good but some grasses appear slightly stressed	some moss signs of grazing on upper leaves of alder alsike clover in plot 2 paper birch
3-3B	Jul-13	10 - 15	small tufts of unidentified grasses alpine bluegrass alder, 5 plants hedysarum, 1 plant	fairly good	possible willow in plot
	Sep-13	15 - 20	alpine bluegrass, < 1cm unidentified grass, < 3cm alder, < 1cm hedysarum, < 2cm	good	plants appear healthy although small
	Aug-14	30	unidentified tufts of grass - several alpine bluegrass, immature alder, 9 plants	good	no mature grasses 1 spruce in plot 1 willow in plot
	Aug-15	25	spiked trisetum alpine bluegrass unidentified grasses alder	good	1 spruce seedling willow lots of moss,
	Jul-16	5 to 10	unidentified grasses alpine bluegrass, a few plants 5 alder 8 dwarf birch 5 Salix spp 1 spruce	grasses are stressed other plants appear healthy	lots of moss, not included in cover estimate.

* = includes moss cover, without moss, approximately 35 % cover

FIGURE 1 Waste Rock Site as Assessed on July 14th, 2016

Treatment Number	Treatment
1	Seed only
2	Seed, biochar, compost
3	Seed, biochar, compost, leonardite
4	Seed, biochar, compost, dolomite lime
5	Seed, biochar, compost, leonardite, dolomite lime

Waste Rock Block #1

1 Plot # 1-1 C = 0% C = 0% (2015) C = 0% (2014)		**3** Plot # 1-3 C = 5% C = 15% (2015) C = 40% (2014)		**5** Plot # 1-5 C = 30% C = 45% (2015) C = 60% (2014)
	2 Plot # 1-2 C = 50% C = 55% (2015) C = 70% (2014)		**4** Plot # 1-4 C = 15 – 20% C = 20% (2015) C = 50% (2014)	

Waste Rock Block #2

	2 Plot # 2-2 C = 40% C = 60% (2015) C = 60% (2014)		**4** Plot # 2-4 C = 80% C = 70% (2015) C = 60% (2014)	
1 Plot # 2-1 C = 0% C = 0% (2015) C = 0% (2014)		**3** Plot # 2-3 C = 40% C = 60% (2015) C = 60% (2014)		**5** Plot # 2-5 C = 30% C = 50% (2015) C = 50% (2014)

Waste Rock Block #3

1 Plot # 3-1 C = 0% C = 0% (2015) C = 0% (2014)		**3** Plot # 3-3 C = 0% C = 0% (2015) C = 0% (2014)		**5** Plot # 3-5 C = <5% C = 10% (2015) C = <10% (2014)
	2 Plot # 3-2 C = <5% C = 10% (2015) C = 20% (2014)		**4** Plot # 3-4 C = 15 % C = 25% (2015) C = 35% (2014)	

C = Cover

→ Buffer plots – not seeded or treated.

FIGURE 2 Trench Site as Assessed on July 14th, 2016

Treatment Number	Treatment
1	Seed only
2	Seed, biochar, compost
3	Seed, biochar, compost, leonardite

Trench Block #1

1 Plot #1-1A C = <1% C = <1% (2015) C = 0% (2014)		**3** Plot #1-3 C = 70% C = 50% (2015) C = 70% (2014)		**2** Plot #1-2B C = 55% C = 45% (2015) C = 60% (2014)
	2 Plot #1-2A C = 60% C = 40% (2015) C = 60% (2014)		**1** Plot #1-1B C = <1% C = <1% C = <1% (2014)	

Trench Block #2

	1 Plot # 2-1A C = <1% C = <1% (2015) C = <1% (2014)		**3** Plot # 2-3B C = 25% C = 35% (2015) C = 40% (2014)	
3 Plot # 2-3A C = 30% C = 40% (2015) C = 45% (2014)		**2** Plot # 2-2 C = 45% C = 45% (2015) C = 50% (2014)		**1** Plot # 2-1B C = 1 – 5% C = <1% (2015) C = <1% (2014)

Trench Block #3

2 Plot #3-2A C = 70% C = 50% (2015) C = 60% (2014)		**1** Plot #3-1 C = 5% C = 5% (2015) C = <5% (2014)		**3** Plot #3-3B C = 5 – 10% C = 25% (2015) C = 30% (2014)
	3 Plot #3-3A C = 65% C = 40% (2015) C = 50% (2014)		**2** Plot #3-2B C = 45% C = 35% (2015) C = 40% (2014)	

C = Cover

Buffer plots – not seeded or treated.

WASTE ROCK PLOTS, JULY 14TH, 2016

Photo #1: Plot 1-2 at Block 1 at the Waste Rock Site.

Photo #2: Plot 1-4 in the foreground, Plot 1-5 in the background and part of Plot 1-3 at far left.

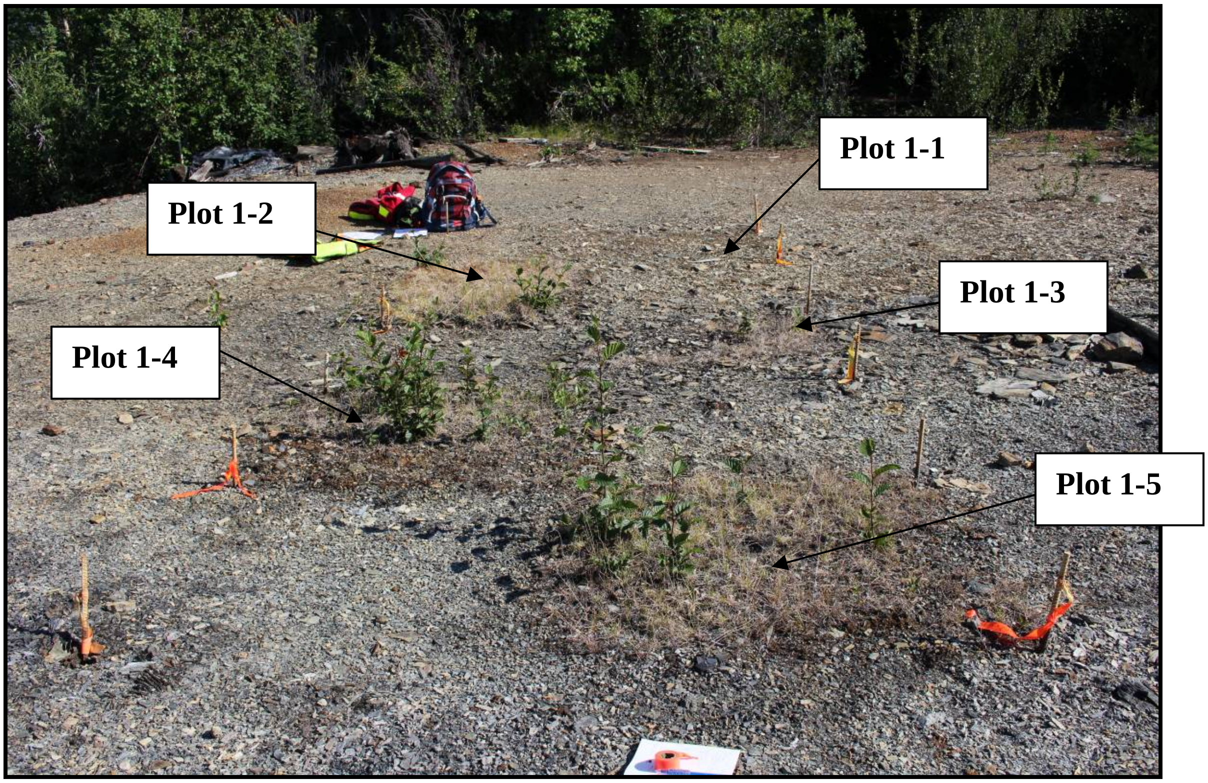

Photo #3: Overview of Block 1 at the Waste Rock Site.

Photo #4: Plot 2-2 in Block 2 at the Waste Rock Site.

Photo #5: A larval lady beetle (*Coccinella sp*) on an alder leaf in Plot 2-2.

Photo #6: Lush growth at Plot 2-4 on Waste Rock Site.

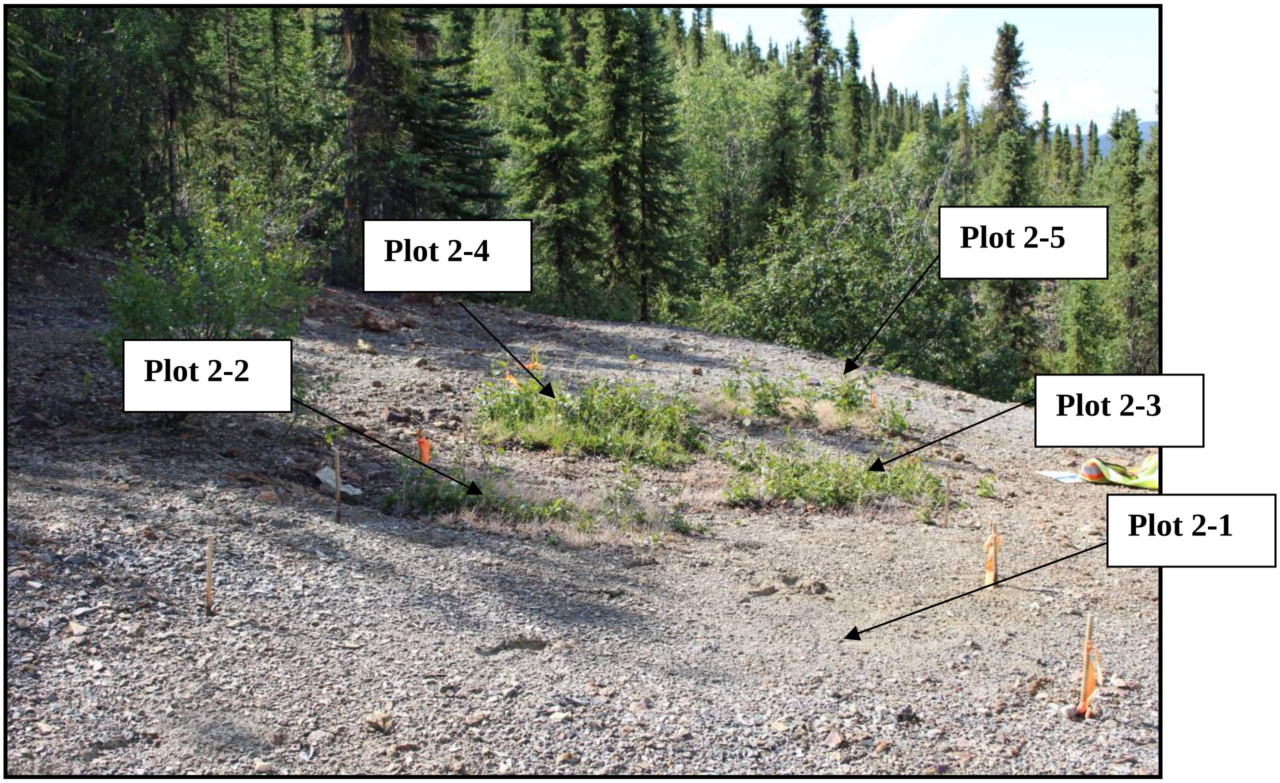

Photo #7: Overview of Block 2 at the Waste Rock Site.

Photo #8: Stressed and meagre growth at Plot 3-2 on Waste Rock Site.

Photo #9: Plot 3-4 had the greatest growth and diversity in Block 3 at the Waste Rock Site.

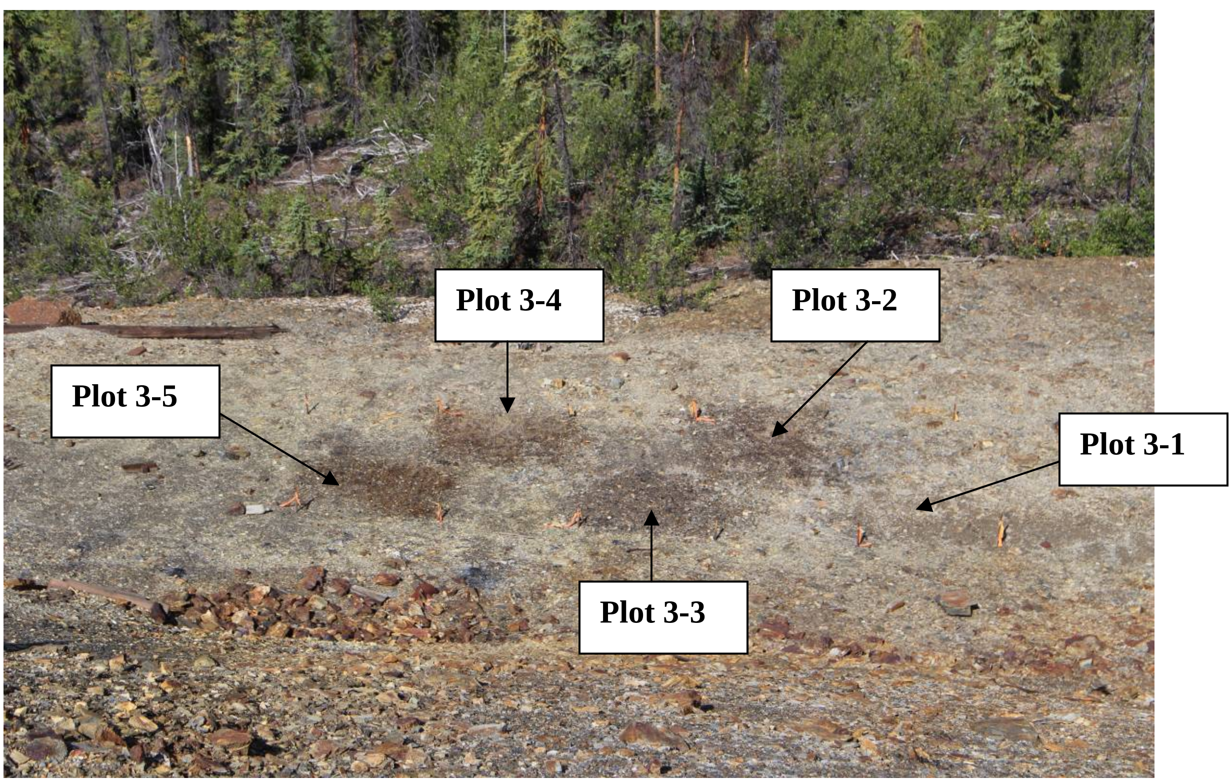

Photo #10: Overview of Block 3 at the Waste Rock Site. Note stained rocks on slope and base of tier.

TRENCH SITE PLOTS, JULY 14TH, 2016

Photo #1: Healthy plant growth at Plot 1-2B at the Trench Site.

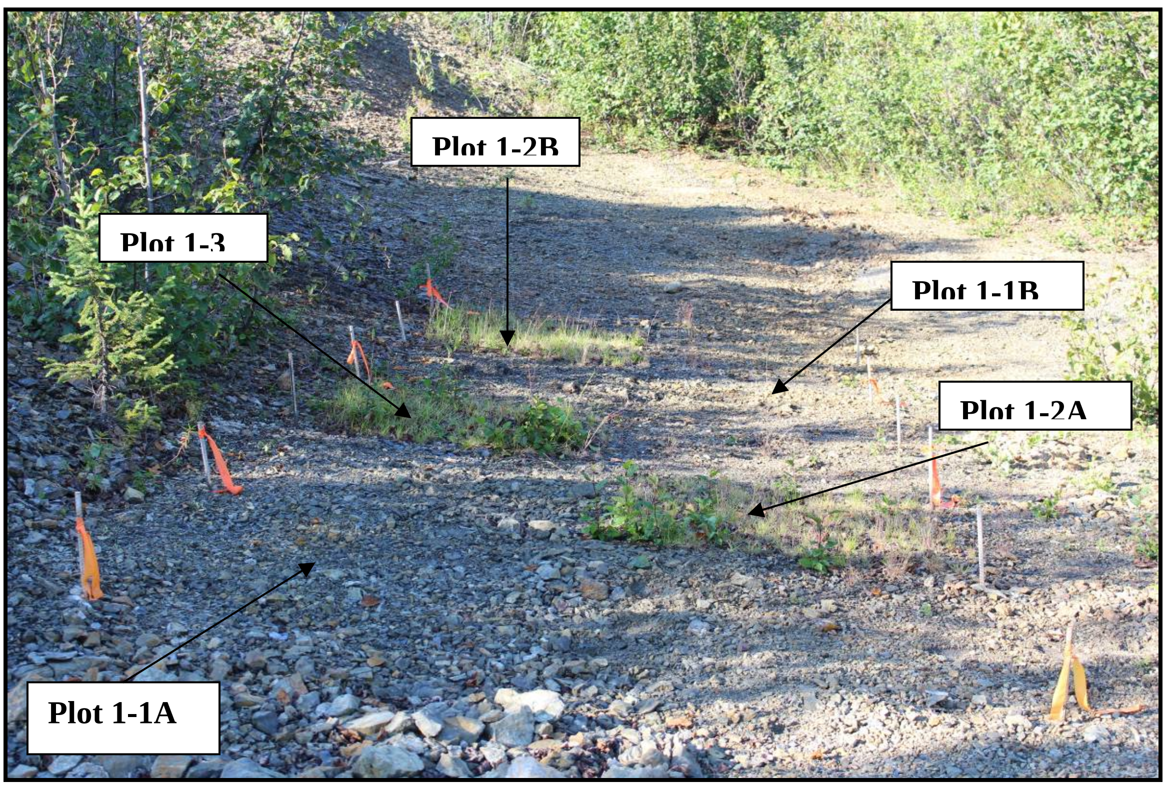

Photo #12: The plots at Block 1 at the Trench Site.

Photo #: Healthy alder at Plot 2-3A

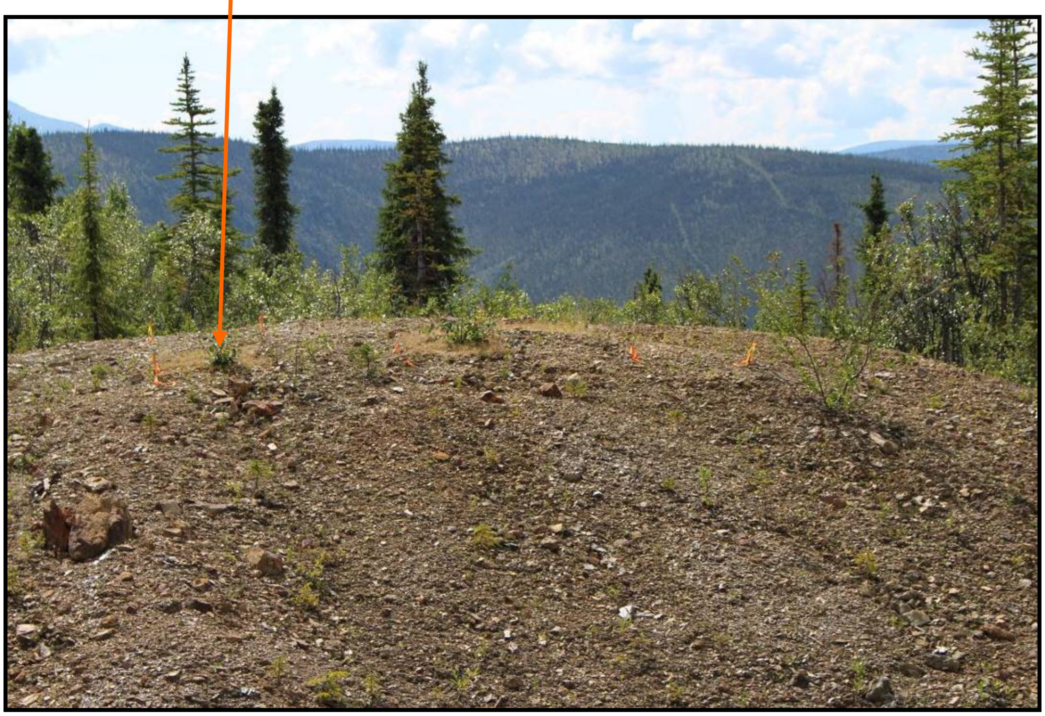

Photo #13: Overview of Block 2 at the Trench Site.

Photo #14: Plot 3-2A at the Trench Site, large clump of alsike clover in the foreground.

Photo #15: Plot 3-3A at the Trench Site.

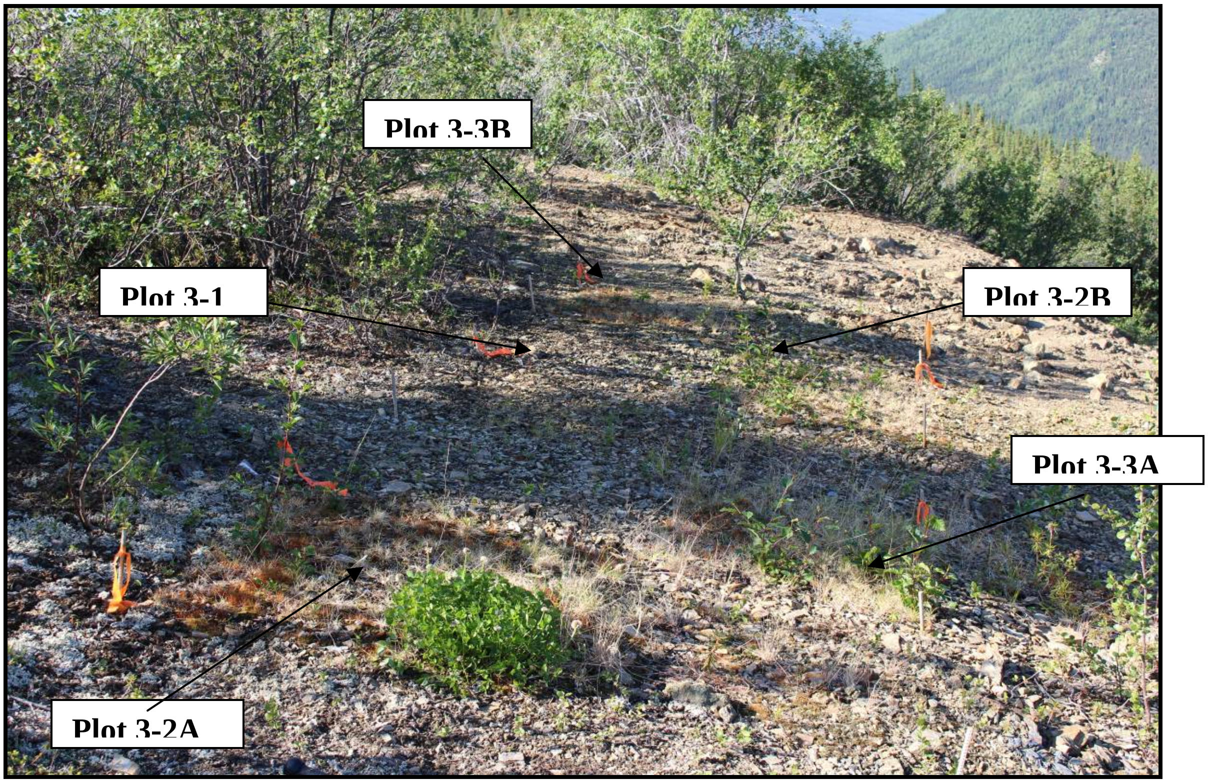

Photo #16: Overview of Block 3 at the Trench Site.