FINAL

2023 Annual Facility Performance Review - SDH Tailings Management Area

Sä Dena Hes Mine, Yukon Territory, Canada

Teck Resources Limited

SRK Consulting (Canada) Inc. ■ CAPR002559 ■ August 2023

srk consulting

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Useful Definitions

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

AEP	Annual Exceedance Probability
AFPR	Annual Facility Performance Report
ALARP	As Low As Reasonably Practicable
AMECFW	AMEC Foster Wheeler
CDA	Canadian Dam Association
DDRP	Detailed Decommissioning Reclamation Plan
DSR	Dam Safety Review
ECWFM	European Centre for Medium-Range Weather Forecasts
EOR	Engineer of Record
FOS	Factor of Safety
GISTM	Global Industry Standard on Tailings Management
HSRC	Health, Safety and Reclamation Code
ICMM	International Council on Mining and Metals
IDF	Inflow Design Flood
MAC	Mining Association of Canada
MAP	Mean Annual Precipitation
MERP	Mine Emergency Response Plan
NBC SHC	National Building Code Seismic Hazard Calculator
OMS	Operation, Maintenance and Surveillance
PGA	Peak Ground Acceleration
PMF	Probable Maximum Flood
RTFE	Responsible Tailings Facility Engineer
SDHOC	Sä Dena Hes Operating Corporation
SRS	Sediment Retaining Structure
TARP	Trigger Action Response Plan
TMA	Tailings Management Area
YG	Yukon Government

Executive Summary

This report presents the results of the 2023 Annual Facility Performance Review (AFPR) of the Sä Dena Hes Tailings Management Area (TMA). The TMA forms part of the closed Sä Dena Hes mine located near Watson Lake, Yukon. The only remaining tailings retaining embankment at the closed site is the North Embankment (formerly the North Dam). A small embankment, referred to as the Sediment Retaining Structure (SRS), was also retained after closure of the site to collect any sediment that would be generated from the till cap that was placed over the exposed tailings.

The inspection was completed by Peter Mikes, P.Eng. and Ignacio Cueto, of SRK Consulting (Canada) Inc. on June 6 and 7, 2023. SRK staff were accompanied by several Teck staff throughout the visit including Morgan Lypka, P.Eng. (Responsible Tailings Facility Engineer (RTFE)) and Jeff Basarich (Site Caretaker) of Teck.

The work was completed in accordance with Teck's Tailings and Water Retaining Structures Guideline and Policy (2019) and in observation of the Global Industry Standard on Tailings Management (GISTM 2020), inclusive of its expectation to be a public domain document indicative of the EOR's summary commentary of the annual performance of the TMA.

Summary of Facility Description

The original TMA consisted of three earth structures, which were referred to as the North Embankment, the South Dam, and the Reclaim Dam. The North Embankment and South Dam, which impounded the tailings, were constructed between July 1990 and October 1991. Both structures were built to a height of about 13 meters. The Reclaim Dam was built to retain supernatant water decanted from the tailings pond. The mine operation involved recycling of the retained water to the mill, with a controlled discharge when required into the adjacent Camp Creek from April to October each year.

Operations at Sä Dena Hes Mine commenced in July 1991 and were suspended in December 1992. Decommissioning of the site began in 2014 and was completed in 2015 by the Sä Dena Hes Operating Corp.

Tailings and water retaining structures that currently remain on the site are the North Embankment and the Sediment Retaining Structure (SRS). The SRS is a 7 m high embankment which impounds a small pond.

Summary of Key Observations and Significant Changes

North Embankment

The North Embankment is currently stable and functioning in accordance with design parameters. The structure does not retain water except during snow melt when the tailings cover drainage channels may be restricted due to ice or snow blockages. During the June 2022 snow melt, ponded water overtopped the embankment resulting in an erosion gully that eroded approximately 415 m^3 of embankment fill with no tailings displaced. Once the pond had drained, the erosion discontinued. The

gully was repaired in June 2022 and no signs of any instability were observed during the 2023 site inspection. Long-term improvements to the facility are currently being designed to eliminate future risk of overtopping.

The piezometers are in good condition and continue to function as designed. The seasonal fluctuations in the piezometers were consistent with those in previous years.

Sediment Retaining Structure

The SRS is functioning in accordance with design parameters. However, water appears to be flowing beneath the spillway riprap and geotextile and internally eroding the embankment material resulting in sediment accumulation downstream of the SRS and deformation of the spillway and crest. In addition, a small slough was identified on the downstream slope near the east embankment that was subsequently repaired in August 2023. A timeline for decommissioning of the SRS is recommended to be established to determine if repair of the spillway should be completed.

North Drainage Channel

The North Drainage Channel is functioning in accordance with design parameters. A slippage of the riprap occurred in the outlet to the SRS pond, exposing the geotextile, and an erosion gully developed immediately to the west of the area of riprap movement. These features were subsequently repaired in August 2023..

Summary of Hazards and Potential Consequences

A required component of the AFPR is to review hazards and the consequences of different potential failure modes of the North Embankment and the SRS. There are three potential failure modes for tailings facilities – instability, internal erosion, and overtopping. Any number of potential failure mechanisms can be present to create one of those modes for a given facility – when a potential mechanism is shown to be credible then the facility has a credible failure mode.

The main potential failure mechanisms of the SRS are:

- Overtopping from one of:
  - runoff from extreme precipitation events that exceeds the flow capacity of the SRS spillway
  - ice build up and debris in the SRS spillway
- Internal Erosion (Piping)
- Slope instability

The main potential failure mechanisms for the North Embankment are:

- Overtopping due to a blockage of tailings cover drainage channels and subsequent build-up of a pond due to extreme precipitation and/or snowmelt
- Internal Erosion (Piping)
- Slope instability

At the Sä Dena Hes TMA, there exists no credible catastrophic failure modes for the North Embankment and SRS and, as a result, no life safety concerns from these facilities. This performance review concluded that the North Embankment and the SRS are in adequate condition and fall within acceptable values according to the Canadian Dam Association (CDA) guidelines for stability (CDA 2019).

Teck is committed to the safe and environmentally responsible management of tailings facilities throughout the mining life cycle to minimize harm to the environment and protect the health and safety of our people and surrounding Communities of Interest. This commitment includes the implementation of the Global Industry Standard on Tailings Management (GISTM) and industry-leading guidelines established by the International Council on Mining and Metals (ICMM), the Mining Association of Canada (MAC) and CDA.

For the purpose of assigning a dam classification, the consequences of potential failure modes are assessed as per the CDA guidelines and the requirements of the jurisdictions in which we operate. The GISTM bases consequence classification on credible failure modes only, which may result in a lower stated classification.

As part of Teck's commitment to the safety of tailings facilities, Teck has adopted using extreme loading criteria for any new facilities with a credible catastrophic flow failure mode, regardless of consequence classification. Risk assessments are performed for all tailings facilities, with the objective of reducing risks to As Low As Reasonably Practicable (ALARP). In some cases, this results in further risk reduction beyond applicable regulatory requirements and is consistent with the GISTM and industry-leading best practice.

Summary of OMS Manual and MERP

The Operation, Maintenance and Surveillance (OMS) Manual was last updated on December 21, 2021 and is reviewed annually. An updated draft revision has been prepared to incorporate the North Embankment erosion gully repairs and additional monitoring and maintenance requirements to prevent a similar incident in the future but has not yet been finalized.

Teck developed a Mine Emergency Response Plan (MERP) for the site that was finalized on July 27, 2021 and replaces the Emergency Preparedness and Response Plan. The MERP is also reviewed annually. SRK has reviewed the TMA applicable sections of the MERP and found the plan to be adequate for the site.

Recommendations

A list of deficiencies or non-conformances noted from the performance review are summarized in Tables E1 and E2. The list also includes all outstanding deficiencies and non-conformances from previous reviews.

Table E1: Table of Recommendations for the 2023 TMA Inspection

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
			2021 Recommendations			
North Embank-ment	2021-3	A long-term goal for the TMA is to reduce all potential catastrophic failure modes to non-credible.	-	Undertake a credible failure modes assessment for the TMA.	4	**Complete** Failure mode review determined that there are no catastrophic failure modes.
North Embank-ment	2021-4	Water levels in Piezometer 2A triggered alerts and event-driven inspections during the last two freshets that are attributable to higher snowpacks and rainfall. The event driven inspection resulted in no dam safety concerns.	OMS Section 6.2.2	Undertake a review of the trigger action alert levels and consider additional levels for seasonal freshet conditions. Establish snowpack monitoring stations to investigate the impact between snowmelt and the North Embankment foundation pressures.	4	**Complete** Trigger review completed in May 2023.
			2022 Recommendations			
Tailings Cover	2022-2	An erosion gully is present in the reclamation cover north of the SRS pond that has eroded through the cover and has exposed geotextile.	OMS Section 5.2.1	Shape the erosion gully to form a channel with a nominal amount of fill overtop of the base of the gully. Provide appropriate erosion protection material to the channel.	4	**Completed** Repairs completed in August 2023.
North Embank-ment	2022-3	Drainage channel blockages on the tailings cover during snowmelt results in the formation of a pond adjacent to the North Embankment. In 2022, the pond overtopped the North Embankment and formed an erosion gully that required repairs.	OMS Section 5.2.1	Modify the dam to eliminate the risk of overtopping. Due to limitations in the tailings cover thickness, increasing the grade of the cover drainage channels is not possible without exposing tailings. As a result, raising the dam to increase the freeboard is recommended.	2	**In Progress** Before end of 2024.

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
North Embank-ment and Tailings Cover	2022-4	As above (2022-3)	OMS Sections 5 and 6	Modify the TMA maintenance and surveillance programs in the OMS Manual to include monitoring for the development of a pond against the North Embankment and maintenance to clear drainage pathways on the tailings cover during the snowmelt period. The modifications should include use of satellite monitoring to track pond development, an additional site inspection in early-May to establish site access and clear a drainage path to the south. As a contingency, a plan should be developed for the mobilization of a pump and associated equipment to pump the ponded water downstream of the North Embankment. The OMS Manual should also be updated to include the as-built information from the North Embankment erosion gully repairs as outlined in Section 6.4.	2	**Completed** Interim OMS Manual updated, and the additional measures were followed this past freshet.
				2023 Recommendations		
North Embank-ment	2023-1	The amount of embankment seepage is unable to be determined as the monitoring station MH-02 is located approximately 35 m downstream of the embankment and captures mostly seepage from the valley sidewall.	-	Install a new seepage monitoring station near the embankment toe as part of North Embankment Upgrades.	4	**New** Before end of 2024.
North Embank-ment	2023-2	Seepage is present along an approximate 80 m long zone at the downstream toe and the ground at the lower portion of the embankment is moist and soft due to seepage and recent snowmelt. The relative contribution from snowmelt, seepage through the dam, and upward seepage from groundwater is unable to be determined.	-	To improve the understanding of the contributions of seepage through the embankment and from groundwater recharge, consider installing additional piezometers in the tailings upstream of the embankment and in the embankment fill and foundation in the downstream slope of the embankment.	4	**New** Before end of 2024.
Tailings Cover	2023-3	Several areas of ponding were present along with several areas of erosion.	OMS Section 5.2.1	As part of the upcoming North Embankment Upgrades, a review of the cover drainage network is recommended to reduce the amount of ponding and provide engineered erosion protection where required along drainage pathways.	4	**New** Before end of 2023.

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
SRS	2023-4	Water is suspected to be flowing beneath the riprap and geotextile in the spillway and eroding the underlying SRS embankment and leading to embankment deformation.	OMS Section 5.2.1	Evaluate the long-term plan and intention of the SRS and, if the planned life exceeds the next five years (2028), the spillway should be reconstructed.	4	**New** Decommission the SRS or repair the spillway before 2028.
SRS	2023-5	A slough is present on the downstream slope near the east abutment.	OMS Section 5.2.1	Repair slough by removing soft material and backfilling with coarse soils.	3	**Completed** Repairs completed in August 2023.
North Drainage Channel	2023-6	Riprap movement has occurred immediately upstream of the channel outlet to the SRS Pond.	OMS Section 5.2.1	Replace the riprap. Undertake a hydraulic analysis to confirm the riprap sizing requirements. The riprap gradation may be augmented as needed using riprap sourced from the Rock cofferdam immediately north of the SRS Pond to meet project requirements.	3	**Completed** Repairs completed in August 2023.
North Drainage Channel	2023-7	An erosion gulley is present on the berm on the west bank of the channel immediately adjacent to the area of riprap movement.	OMS Section 5.2.1	Backfill the gully using riprap sourced from the Rock Cofferdam immediately north of the SRS Pond.	3	**Completed** Repairs completed in August 2023.

Table E2: General Description of Priority Rankings

Priority	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant regulatory concern.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact or significant regulatory action; or a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks. This typically includes ongoing construction items within the appropriate construction cycle.

Notes: Based on Teck (2019) and the Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia.

1 Introduction

1.1 Purpose, Scope of Work, and Methodology

SRK Consulting (Canada) Inc. was retained by Teck Resources Limited (Teck) on behalf of the Sä Dena Hes Operating Corp to complete the Annual Facility Performance Report (AFPR) of the closed Sä Dena Hes mine located near Watson Lake, Yukon.

The site inspection was completed on June 6 and 7, 2023 by Peter Mikes, P.Eng., and Ignacio Cueto of SRK. SRK staff were accompanied by several Teck staff throughout the visit including Morgan Lypka, P.Eng. (Responsible Tailings Facility Engineer (RTFE)) and Jeff Basarich (Site Caretaker) of Teck, who were the primary contacts for information about the site conditions and performance during the past year.

This report presents the results of the 2023 performance for the period of September 2022 to June 2023 (reporting period) and includes the following structures and features:

- The Tailings Management Area (TMA) that includes:
  - The North Embankment (formerly the North Dam)
  - Tailings Cover
  - North Drainage Channel
  - Sediment Retaining Structure (SRS)

The scope of the work consisted of:

- A visual inspection of the physical condition of the structures and features to identify any deficiencies and non-conformances:
- A review of the Operation, Maintenance and Surveillance Manual (OMS) and the Emergency Response Plan for the TMA as documented in Mine Emergency Response Plan (MERP)
- A review of the potential consequences of failure
- A review of the routine site inspection forms provided by Teck.
- A review of the monitoring records, and data of the North Embankment provided by Teck

1.2 Teck Corporate Policy

Teck is committed to the safe and environmentally responsible management of tailings facilities throughout the mining life cycle to minimize harm to the environment and protect the health and safety of our people and surrounding Communities of Interest. This commitment includes the implementation of the Global Industry Standard on Tailings Management (GISTM) and industry-leading guidelines established by the International Council on Mining and Metals (ICMM), the Mining Association of Canada (MAC) and Canadian Dam Association (CDA).

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1.3 Regulatory Requirements and Guidelines

The site is regulated under Quartz Mining Licence QML-0004 and management of water is regulated by Water Use Licence QZ16-051. Both licenses approved the "Detailed Decommissioning and Reclamation Plan (DDRP) prepared by Teck (2015) that was implemented in 2014 and 2015.

- Clause 11.1 of Quartz Mining License QML-004 requires an inspection of all engineered structures, works and installations located at the site to be conducted by an independent engineer by September 30 of each year.
- Clause 45 of the Water Licence QZ16-051 also requires all earthworks and water retaining structures including, but not limited to, open pits, waste dumps, ditches, dikes, weirs and appurtenance be inspected by a Professional Engineer as per the Post-Closure Geotechnical Monitoring Plan (SRK 2014). The water licence requires annual inspections through 2026 and every five years thereafter until the expiry of the water licence at the end of 2040.

This report focuses on the TMA and associated water management infrastructure, inspection results for all other engineered structures are documented in a separate report.

This report reviews the performance of the TMA relative to the following:

- Guideline for Tailings and Water Retaining Structures (Teck 2019)
- Global Industry Standard on Tailings Management (GISTM 2020)
- ICMM Tailings Management: Good Practice Guide (ICMM 2021)
- Canadian Dam Association (CDA) Dam Safety Guidelines (CDA 2013) and the associated Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams (CDA 2019)
- Developing an Operation, Maintenance, and Surveillance Manual for Tailings and Water Management Facilities (MAC 2021)

2 Background

2.1 Facility Description

2.1.1 Overview

This section provides a description of the TMA components remaining at the site after decommissioning in 2014 and 2015. A map showing the overall mine site is provided on Figure 1 with a general arrangement map of the TMA provided in Figure 2.

2.1.2 Tailings Management Area

The original TMA which extended from the North Embankment to the South Dam covered an area of approximately 0.2 km^2. During the operating life of the mine, approximately 700,000 tonnes of tailings (400,000 m^3 based on tailings density of 1.8 tonnes/m^3) were deposited into the impoundment, primarily at the northern end.

The tailings at the northern end of the TMA are retained by the North Embankment. The North Embankment is approximately 15 m high with a crest elevation of 1,100 m, a crest length of about 260 m, and a crest width of 10 m. A site plan and section through the embankment are shown in Figure 3. The embankment is an earthen, zoned embankment structure constructed between July 1990 and October 1991 in a single stage. In June 2022, an erosion gully developed in the embankment that required repairs that were also completed in June. The erosion was caused by ponded snow melt water overtopping the embankment due to ineffective drainage to the south. A cross section of the repaired embankment is presented in Figure 4. Plans for raising the embankment to provide additional freeboard are currently in progress.

Most of the tailings are within the northern half of the TMA, north of the original cofferdam that was removed in 2014. The tailings behind the North Embankment were capped with a till cover in 2014 to provide a means of controlling wind erosion of tailings to provide a growth medium of the tailings for revegetation. The cover thickness varies between approximately 0.4 m and 2.2 m and was constructed of excavated dam fill material. The cover was sloped away from the crest of the North Embankment in a southerly direction towards the SRS. Water is no longer regularly impounded in the TMA. A shallow swale was constructed down the middle of the cover to direct surface runoff on the cover to the SRS.

The SRS was constructed in 2014 by leaving in place a low-profile embankment composed of the former South Dam. The SRS is considered temporary, and Teck plans to remove the structure in the future. The primary function of the SRS is to retain any sediment that may be transported from the till cover over time. The SRS is approximately 7 m high, with a crest length of about 80 m and crest width of 4 m. The depth of water behind the structure is a maximum of about 1.7 m. An emergency spillway was constructed through the SRS to convey flows from the upstream catchment to the South Drainage Channel. The as-built location, plan and profile of the SRS are presented in Figure 5.

2.1.3 Tailings

The mineralization at Sä Dena Hes is characterized by zinc and lead sulphides with low concentrations of iron sulphides in association with abundant carbonates. Therefore, acid generation will not occur. Zinc, cadmium and lead leaching are controlled by the oxidation of sphalerite (Zn, Cd) and galena under pH-neutral atmospheric conditions. Breakdown of sphalerite is apparent throughout the site. Acceleration of sphalerite oxidation is not expected in the absence of a mechanism to lower pH. Zinc and cadmium leaching is expected to continue but is not to accelerate (Teck 2015).

2.1.4 North Drainage Channel

Three drainage channels were built as part of the 2014 TMA decommissioning (Figure 2). The longest of the three was constructed through the former Reclaim Dam and the pond area to route Camp Creek flows along its historical alignment. The other two drainages (the North Channel and the South Channel) were constructed to direct runoff from the covered tailings areas to the new Camp Creek Drainage Channel. There is also a drainage channel located down the middle of the cover that directs runoff from the tailings cover at the northern end of the TMA.

The North Drainage Channel is considered to be part of the TMA as it directs surface runoff around covered tailings to the SRS. The South Drainage Channel and Camp Creek Drainage Channel are downstream of the TMA and inspection results are reported separately.

The North Diversion Channel was constructed along the east side of the former South Pond to divert as much runoff as possible away from the tailings and soil cover during the first few years after the cover placement. Conveyed water is retained in the SRS to allow for sediments to deposit before the water is discharged into Camp Creek. The channel length is about 300 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile. A plan, profile, and typical section of the channel is presented in Figure 6. The channel is designed for the 1 in 1000-year, 24-hour IDF. Upstream and downstream side slopes are 2H:1V. Average grade of the channel is 3%.

2.2 TMA Design Basis

Table 2-1 provides the relevant design criteria adopted for the TMA decommissioning in 2014 and 2015 (SRK 2013). Section 1.2 provides Teck's corporate policy regarding tailings management and design criteria for any future modifications.

Table 2-1: TMA Design Criteria

Parameter	North Embankment	SRS
Consequence Classification[1]	Significant	Low
Inflow design Flood (IDF)		
Minimum AEP[2]	1/3 between 1 in 1,000-year event and the PMF[3]	1 in 1,000-year event
IDF Peak Flow (m^3/s)	Not Applicable (no spillway)	5.4
Freeboard		
Minimum Operating Freeboard	Not Applicable (no water impounded)	1.0
Freeboard during passage of IDF		0.5
Seismic Event		
Minimum AEP[2]	1 in 2,475-year event	1 in 1,000-year event
PGA[4] (g)	0.20	0.073
Slope Stability FOS		
Static	1.5	1.5
Pseudo-static	1.0	1.0
Post-earthquake	1.2	1.2

Notes:

[1] As per CDA classification
[2] AEP = Annual exceedance probability
[3] PMF = Probable maximum flood
[4] PGA = peak ground acceleration

2.3 Summary of History

The Sä Dena Hes mine was constructed in 1991 and operated for a 16-month period between August 1991 and December 1992. The Sä Dena Hes Operating Corporation (SDHOC) purchased the property from Curragh Resources Inc. in March 1994. The Sä Dena Hes Mining Corporation (the Company) is a joint venture between Teck Resources Limited (“Teck” - 50% ownership) and Pan Pacific Metal Mining Corp (50% ownership, a wholly owned subsidiary of Korea Zinc.) Teck is the operator and manages the property under the joint venture agreement.

In 2014 and 2015 the mine site was closed and decommissioned in accordance with the DDRP (Teck 2015). The decommissioning and reclamation activities consisted of:

- Removal of the South and Reclaim Dams
- Relocation of the existing Camp Creek Diversion to its original creek alignment
- Construction of the SRS at the toe of the removed South Dam
- Construction of ancillary riprap lined drainage channels

- Placement of the till cover over the tailings that would remain stored on site behind the North Embankment
- Dismantling, decommissioning, and disposal of all site infrastructure including the mill
- Regrading and capping of the waste rock dump areas
- Landforming and capping of the mill area and other site disturbances
- Decommissioning of site access roads
- Revegetation (scarification, tree planting and seeding)

3 Surveillance and Maintenance during Reporting Period

The TMA is a closed facility. Teck conducts on-going maintenance and surveillance of the TMA and the water management infrastructure at the site including the access road from the Robert Campbell Highway as per the Sä Dena Hes OMS Manual (Teck 2021).

3.1 Surveillance

Surveillance of the TMA consists of routine visual inspections, satellite monitoring during the snowmelt period to track ponding near the North Embankment, water quality sampling, and instrumentation monitoring (piezometers and seepage flow). In addition to the routine surveillance program, a site-wide review of InSAR satellite data from 2018 to 2022 was undertaken in the fall of 2022 to identify any areas or potential deformation that have not been identified through the existing surveillance program. A summary of the InSAR data and review of the instrumentation data is provided in Section 5.2.

Routine visual inspections are completed by the Site Caretaker in the spring and the fall, with an additional summer inspection (this report) completed by an engineer (EOR for the TMA). The Fall 2022 inspection was completed on October 14, 2022 and the Spring 2023 inspection was completed on May 27 and 28, 2023. The routine inspection forms are provided in Appendix D.

Satellite images were monitored and reviewed during late May and early June to track the snowpack melting process. Considering the erosion event at the North Embankment in 2022, the monitoring is completed to identify the development of any ponding near the North Embankment, which triggers an additional site inspection to determine if any active management is needed to ensure that pond drains away from the embankment. This process triggered a visual inspection on May 15, 2023, to confirm the extent of ponding and to determine if any actions were required to prevent overtopping of the embankment. The visit determined that no actions were required and that drainage to the south (away from the embankment crest) was not impeded.

Water quality sampling is completed bimonthly, which includes monitoring of seepage at the toe of the North Embankment. During the site visits by the sampling team, inspections of the North Embankment and the SRS spillway are made to check for any blockages or subsidence.

3.2 Maintenance

In October 2022, the short-term recommendations listed in the North Embankment Repair As-built Report (SRK 2022) were implemented and included installation of erosion control blankets, decommissioning of the borrow area that was used in the repair located southwest of the North Embankment, and seeding of the repairs area. Photographs of the completed maintenance are included in the Fall 2022 routine inspection form provided in Appendix D.

4 Climate Data and Water Balance

4.1 Review and Summary of Climate Data

This section presents the current climate data for the site. As there is no weather station at the site, data from select local meteorological stations were used to determine temperatures, mean annual precipitation, and evaporation for the site. Regional and regression analyses were carried out by SRK to develop correlations from the available data to the site in absence of any site-specific data. Details of the correlation development are provided in SRK (2023b).

Table 4-1 and Figure 7 presents a comparison of the estimated climate conditions from July 2022 through June 2023 compared to average values. Mean site temperatures are estimated to be 2 °C cooler than temperatures at the Watson Lake Airport. The evaporation potential was estimated in the Hydrometeorological Characterization Report (SRK 2023b). ERA5-Land climatic gridded model produced by European Centre for Medium-Range Weather Forecasts (ECWFM) was used to predict a Mean Annual Precipitation (MAP) for the site of 675 mm.

Table 4-1: Site Climate Data (July 2022 to June 2023) Compared to Climate averages (1980-2021)

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
Normals													
Daily Max. Temp [°C]	18.6	16.4	10.1	1.4	-10.0	-15.3	-15.7	-10.7	-3.9	3.8	11.1	16.9	1.9
Daily Min. Temp [°C]	5.5	3.6	-0.5	-6.7	-19.6	-25.3	-26.0	-24.0	-19.6	-9.8	-1.7	3.4	-10.1
Daily Mean Temp [°C]	12.1	10.0	4.8	-2.6	-14.8	-20.3	-20.9	-17.3	-11.7	-3.0	4.7	10.2	-4.1
Precip. (Site) [mm]	98	77	72	61	41	37	38	25	29	37	63	96	675
Reporting Period (July 2022 through June 2023)													
Mean Temp [°C]	14.1	13.2	7.6	1.0	-15.8	-23.3	-14.2	-17.8	-12.6	-1.5	8.7	10.0	-2.6
Precipitation [mm]	38	33	31	33	8	26	62	47	11	19	13	78	398

Sources: SRK (2023b), https://srk.sharepoint.com/sites/FS261/Internal/Monitoring%20Data/Climate/WatsonLake_Precip_rev01.xlsx?web=1

The Watson Lake A station was used as the reference station for 2022 and 2023 data as it is the most representative station close to the site that is currently active. Total precipitation recorded at Watson Lake Airport (Climate ID: 2101204) from July 2022 through June 2023 was reported as 275 mm. Using the undercatch correction factor of 1.13 (SRK 2018), total corrected annual precipitation at Watson Lake for the same period was 311 mm. A 1.28 ratio was applied to convert the corrected Watson Lake Airport precipitation to a representative site precipitation based on the ERA5-Land regression analysis (SRK 2018) to result in a total precipitation of 398 mm for the site during the reporting period.

The climate data indicates that precipitation during the reporting period was 41% lower than the average.

The Yukon Government Department of Environment's Water Resources Branch issues the Yukon Snow Survey Bulletin and Water Supply Forecast three times annually in early March, April, and May

(YG 2023). Data from May 1, 2023, for the Liard River Basin (Hyland Meteorological Station) shows that due to a delayed melt, the Liard River basin-average snow water equivalent (SWE) was estimated to be 140% of the historical median with a SWE of 189 mm. A graph of the SWE over the winter of 2022-23 at the Hyland Station is provided in Figure 7. While the snowpack was higher than average, it was significantly less than the May 2022 snowpack that was a contributing factor in the North Embankment erosion gully event in June 2022. The May 2022 snowpack of 324 mm at the Hyland Station was the historical maximum SWE recorded for May with records extending back to 1980.

4.2 Review of Water Balance and Freeboard

SRS

The SRS Pond has a maximum surface area of about 1,600 m^2 during the freshet high flow period. The catchment area for the SRS spillway is 1.33 km^2 as shown on Figure 8.

A simplified mean annual average water balance calculation for the catchment above the SRS is summarized in Table 4-2 based on data compiled for the recent SRK hydrological study (SRK 2023b), the estimate of the site MAP during the reporting period (July through June), and the following assumptions:

- Inflow from the surrounding hillside catchment (1.17 km^2) based on a runoff coefficient of 0.60
- Inflow from the tailings till cover (0.16 km^2) based on a runoff coefficient of 0.50
- Direct precipitation input to the SRS pond (0.0016 km^2)

Outflow from the SRS pond is calculated as the difference between pond inputs and outputs based on the following assumptions:

- Mean annual lake evaporation of 345 mm (SRK 2023b). Use of the mean annual lake evaporation is considered more reasonable compared to developing a yearly correlation from Watson Lake data to due to the high variability in weather conditions between the two sites over smaller time-scales.
- Seepage losses estimated at 0.5 L/s

Table 4-2: TMA Water Balance

Item	Units	Mean Annual	2022-2023
Precipitation	mm	675	398
Mean annual lake evaporation	mm	345	345
Mean annual run-on from the hillside catchment above the SRS	m^3	473,850	279,396
Direct Precipitation on the SRS pond surface	m^3	1,080	637
Mean annual runoff from tailings cover material	m^3	52,650	31,044
Total Annual Inflow	m^3	527,580	311, 077
Annual pond evaporation losses	m^3	552	552

Item	Units	Mean Annual	2022-2023
Seepage losses	m^3	16,320	16,320
Net Annual Discharge Volume over spillway	m^3	511,260	294,757

Sources: https://srk.sharepoint.com/sites/FS261/Internal/Site%20Water%20balance/2019-2020%20Water%20Balance%20SDH.xlsx?web=1
Note: The time period for 2022-2023 is July through June.

The SRS was designed to convey the 1 in 1,000-year flood event while maintaining 1 m of freeboard to the crest of the embankment. The climate data review found no indication of an extreme precipitation event that would have compromised the design freeboard during the past year.

North Embankment

The tailings behind the North Embankment were capped with a till cover in 2014 with the cover tied into the upstream crest of the embankment. The cover was sloped to drain water away from the crest and towards the SRS to the south. A shallow swale (Main Drainage Channel) was constructed down the middle of the cover to direct the surface runoff on the cover to the SRS. A pond develops annually during the snowmelt period adjacent to the dam that is believed to be primarily caused by restricted drainage to the south, likely due to snow and/or ice blockages.

The 2022 AFPR recommended remedial actions to increase the North Embankment freeboard. The design is currently under development with the goal for implementation in 2024. The concept is to construct a berm on the North Embankment crest, following the dam slope, and to add a graded beach with a 3% slope (covering approximately 50 m) towards the south to improve the surficial flow.

4.3 Water Discharge Quality

The surface water quality discharging from the TMA is currently monitored bi-monthly under the Yukon Water License QZ16-051. The groundwater quality is currently monitored under the same license. Water quality results are submitted to the Yukon Water Board as part of the Annual Water Licence. The report is due in March the year following the operational period covered.

5 Site Observations

5.1 Visual Inspections

Weather during the June 6 and 7, 2023 site inspection was mostly sunny with temperatures ranging between approximately 5°C to 18°C. 14 mm of precipitation was recorded at the Watson Lake Airport between June 4 and 6. The ground surface was free of snow and moist/wet from previous precipitation.

Site observations are provided in the following subsections. Select photographs taken during the inspection are provided in Appendix A. The start of Appendix A also includes figures that provide the photograph locations and a tracklog of the inspection route.

5.1.1 North Embankment

A site plan and a section of the North Embankment are presented on Figure 3. Table 5-1 provides the inspection observations along with references to corresponding photographs and applicable recommendations.

Table 5-1: North Embankment Observations

Observation	Figure (App. A)	Photo	Associated Recommendation
■ The crest of the North Embankment is in good condition and shows no signs of deformation or abnormal settling.	A-6	NE-01, NE-02	n/a
■ The piezometers and settlement gauges on the North Embankment are in good condition and continue to function as designed. The PVC pipe at NDW-4A has been shortened and now fits within the protective casing as recommended in the 2022 Annual Facility Performance Report.	A-7	NE-03, NE-04	n/a
■ The downstream slope shows no signs of mass deformation nor is there any sign of bulging at the downstream toe. While there are a few shrubs and small trees on the slope, no excessive vegetation growth beyond the guidelines in OMS Manual was noted.	A-8	NE-05, NE-06	n/a
■ The downstream slope in the erosion gully repair area (2022) has been covered with an erosion control blanket with a small amount of grass present, mostly in the lower portion of the embankment (estimated less than 1% coverage) where the ground was moist. The ground was wet at the outlet of the French Drain constructed as part of the gully repair.	A-9	NE-07, NE-08	n/a
■ Historical areas of exposed wind-blown tailings are present in the downstream dam face where no vegetation is present. The tailings were present prior to remediation of the site in 2015 and with the human health and ecological risk assessment (part of the DDRP (Teck 2015)) determining that risk management of the area was considered acceptable as opposed to remediation.	n/a	n/a	n/a
■ Seepage downstream of the embankment is measured at monitoring station MH-02 and is a combination of groundwater discharge from the surrounding hillsides to the east and west, as well as from seepage flow from the impoundment. Seepage at MH-02 was clear at the time of the	A-10	NE-09	2023-1

Observation	Figure (App. A)	Photo	Associated Recommend ation
inspection and estimated to be <0.5 L/s. The embankment seepage quantity is unable to be determined as seepage monitoring station MH-02 is ~35 m downstream and captures mostly seepage from the valley sidewalls.			
■ Along the downstream toe of the North Embankment is an approximate 80 m long seepage zone (consistent with 2022 observations). The seepage pathway has established overtop of the erosion debris. Seepage at the embankment toe was clear with an estimated flow < 0.1L/s.	A-11	NE-10, NE-11	2023-2

5.1.2 Sediment Retaining Structure

Figures 4 and 5 provide a site plan and sections of the SRS. Table 5-2 provides the inspection observations along with references to corresponding photographs and applicable recommendations.

Table 5-2: SRS Observations

Observation	Figure (App. A)	Photo	Associated Recommend -ation
■ The rock cofferdam and the sedimentation pond are functional. The sedimentation pond was clear at the time of our inspection with no evidence of any sediment buildup.	A-12	SRS-01	n/a
■ A transverse crack is present across the dam crest approximately 1 m east of the spillway. The crack was first observed in 2021 and is believed to be caused by frost heave. The depth of the crack is unknown but is not likely to extend deep enough to act as a preferential seepage pathway through the structure.	A-12	SRS-02	n/a
■ Water is suspected to be flowing beneath the riprap and geotextile in the spillway and internally eroding the underlying SRS embankment and leading to embankment deformation. This mechanism is supported by the following observations:			2023-04
– Sediment accumulation immediately downstream of the spillway over a length of approximately 30 m in the South Drainage Channel and is accumulating in the riprap void space. A review of 2020-2021 photographs indicates that the rate of sediment accumulation is increasing. Water downstream of the sediment was observed to be clear.	A-13	SRS-03	
– The crest east of the spillway is lower in elevation compared to the west crest of the spillway with visible deformation observable on the upstream slope as indicated by folding of the jute-netting. A review of the 2022 LiDAR surface indicates that the east crest is 0.25 m lower than the west crest.	A-13	SRS-04	
– A transverse crack is present across the dam crest approximately 1 m east of the spillway. The crack was first observed in 2021 and is likely related to the crest deformation, with frost heave as another potential contribution factor.	A-12	SRS-02	

Observation	Figure (App. A)	Photo	Associated Recommend -ation
■ Continued erosion beneath the spillway is expected, however, no immediate actions are recommended to repair the spillway at this time as the structure is considered temporary, with Teck planning to remove the structure in the future.			n/a
■ A slough is present on the downstream slope approximately 8 meters from the east abutment that has a 1 m high scarp, approximately 2.5 m wide. – Portions of the slump appear to be fresh with saturated soils present. – A review of photographs from the August 2022 site inspection indicates that the smaller sized slough was present at that time, which isalso evident in the September 2022 LiDAR survey with a depth of 0.3 m in the 2022 surface. – The slough is in an area well away from the SRS pond and does not pose an immediate risk to the structure.	A-14	SRS-05, SRS-06	2023-5

5.1.3 Tailings Cover

Table 5-3 provides the inspection observations related to the TMA cover along with references to corresponding photographs and applicable recommendations.

Table 5-3: Tailings Cover Observations

Observation	Figure (App. A)	Photo	Associated Recommend -ation
■ The till tailings cover generally slopes down away from the North Embankment. Areas of minor ponding and soft ground conditions were observed throughout most of the cover due to recent precipitation and snowmelt.	A-15	TC-01, TC-02	n/a
■ The Main Drainage Channel constructed within the cover to assist in directing runoff away from North Embankment was clear of any debris or vegetation and functional. Small areas of ponding water were observed where there is no positive gradient along the channel.	A-16	TC-03, TC-04	n/a
■ The scarification of the cover surface as part of the reclamation activities is oriented parallel to the Main Drainage Channel and the grooving of the surface impedes drainage to the channel. Occasional hand-dug swales are present in some areas to direct the ponded water to the channel.	A-17	TC-05	2023-3
■ Vegetation is slowly developing over the entire area of the cover and is more developed along the east, west and south edges of the cover.	A-17	TC-06	n/a
■ An erosion gulley is present in the reclamation cover immediately to the north of the SRS Pond that is approximately 20 m long, 0.5 m wide and up to 1 m deep. The erosion gulley appears to be unchanged compared to the 2022 inspection.	A-18	TC-07, TC-08	2022-2
■ On-going cover erosion was observed near the south end of the main tailings area (north of the former coffer dam) where water flows west from the east edge of the cover to the main drainage channel.			2023-3

Observation	Figure (App. A)	Photo	Associated Recommend -ation
– The erosion feature is about 40 m long and includes two main drainage pathways that are up to 1 m wide and 0.3 m deep. – No tailings were observed at the base of the erosion, which consists of cobbles and appear to be self-armouring.			

5.1.4 North Drainage Channel

A site plan of the North Drainage Channel is presented on Figure 6. Table 5-4 provides the inspection observations along with references to corresponding photographs and applicable recommendations.

Table 5-4: North Drainage Channel Observations

Observation	Figure (App. A)	Photo	Associated Recommend -ation
■ No sediment deposition was observed within the channel.	n/a	b/a	n/a
■ Slippage of the riprap has occurred immediately upstream of the channel outlet to the SRS pond exposing the geotextile. The displaced riprap is deposited at the channel outlet to the pond.	A-19	NDC-01	2023-06
■ An erosion gulley is present immediately to the west of the area of riprap movement that is approximately 0.6 m deep, and 0.5 m wide.	A-20	NDC-02	2023-07
■ The 2020 repairs completed to the slough in the North Drainage Channel berm located 40 m upstream of the SRS Pond remains functional with no change in condition compared to the 2022 inspection.	n/a	n/a	n/a

5.2 Instrumentation Review

There are seven standpipe piezometers and three settlement gauges at the North Embankment. The instrumentation locations are shown in Figure 3. All elevations are based on a datum that was established during a LiDAR survey carried out in 2012. The original site datum used to design and build the structures in the early 1990's was about 2 m lower than the 2012 datum. All previous inspection reports, prior to 2014, used the 1990 datum.

The current instrumentation monitoring system is mainly located on the North Embankment crest. An internal erosion assessment completed in 2023 determined that piping through the embankment foundation is credible either through backwards erosion or through an existing defect (Section 6.1.2). To improve the understanding of the piezometric pressures and seepage gradients through the embankment and the foundation, additional piezometers are recommended as described in Section 6.1.2).

5.2.1 Water Levels

The water levels in the North Embankment standpipe piezometers are manually recorded bi-monthly and the results are reviewed by the EOR after each monitoring session. Figures C-1 to C-4 in Appendix C provides a plot of seasonal water levels since 2012.

The piezometers are in good condition and continue to function as designed. The seasonal fluctuations recorded during the reporting period are consistent with those in previous years.

A review of the piezometer triggers in the Trigger Action Response Plan (TARP) was completed in May 2023 (SRK 2023c). The review was initiated as the 'minor risk alert level criteria' exceeded the foundation piezometers (A-Series) in each of the past three freshets, which was attributed to higher-than-average snowpacks in those years. The previous thresholds were based on a stability analysis factor of safety (FOS) value of 1.6. Table 5-5 presents the updated FOS threshold criteria.

Table 5-5: Updated Piezometer Trigger Criteria

Condition	FOS Threshold Criteria
Acceptable Situation (green)	FOS > 1.5
Minor Risk Situation (yellow)	1.5 ≤ FOS < 1.3
Moderate Risk Situation (amber)	1.3 ≤ FOS < 1.1
High Risk Situation (red)	FOS ≤ 1.1

There were no piezometer trigger exceedances based on the updated FOS threshold criteria.

5.2.2 Discharge Flows

There is no discharge from the tailings surface behind the North Embankment. Runoff from the tailings cover is directed away from the North Embankment towards the SRS sedimentation pond. Outflows from the SRS are not measured.

There is seepage from the hillside to the west of the North Embankment and minor seepage from the TMA which reports to MH-02. The MH-02 is about 35 m downstream and captures mostly seepage from the valley sidewalls. An additional seepage monitoring station near the embankment toe is recommended to be installed as the embankment seepage flow rate is unable to be determined accurately, and as noted in Section 6.1.2, internal erosion through the foundation is considered to be possible.

During the site inspection, seepage from the toe was estimated to be <0.1L/s and seepage at MH-02 was estimated to be <0.5 L/s (<30 L/min). Figure C-7 presents historical flow data from MH-02 since 1992 and shows that the flow rate was within the historical expected range.

5.2.3 Deformation/Settlement

North Embankment settlement gauge readings were collected between 1993 and 2020. Annual readings were discontinued after 2020 as displacements were negligible. The gauges remain in operational condition and are to be read following any major seismic event as per the OMS Manual. Figure C-5 in Appendix C provides the settlement gauge readings between 2015 and 2020 that show no significant elevation changes.

In 2022, Teck undertook a historical InSAR satellite survey study to analyze site-wide surface displacements at SDH using satellite imagery during snow-free periods between 2018 and 2021 (3V Geomatics 2022). SRK was provided access to 3vGeomatics' web-based platform to review the results of the InSAR analysis. Figure C-6 in Appendix C provides a high-level overview of the displacements in the TMA area during this period. The results show no significant displacements occurring in the TMA area. Figure C-6 plots two representative areas within the TMA:

- Point A on the North Embankment: Data indicates small (~6 mm) seasonal fluctuation, likely due to freeze-thaw effects, with no apparent movement detected.
- Point B on the Tailings Cover: Point B was selected in an area of the cover that showed the largest displacement. A review of the time series graph of displacement shows there was approximately 10 mm of settlement between 2018 and 2019, with no apparent movement since 2019 except for a seasonal fluctuation likely due to freeze-thaw effects.

Other areas of the cover show similar displacement between the 2018 and 2019 imagery, with no significant displacement between 2019 and 2021. Based on the data, there is no clear displacement trend that can be identified in the TMA area and no further analysis is required.

5.2.4 Freshet Satellite Monitoring

Following the 2022 North Embankment erosion event, the TMA surveillance program was revised to include monitoring of satellite imagery between April and June (or until the site is snow free) to identify any pond development adjacent to the North Embankment. Publicly available Setinall-2 satellite imagery was used, which generally provided an image of the site four times per week. A summary of select images from May 2023 is provided in Appendix B. The imagery indicates that a pond started to form sometime May 5 and 10, 2023. Based on the imagery, a site inspection was completed on May 15 that found that the snowmelt on the cover was mostly complete and no additional actions were required to manage water.

5.3 Site Inspection Forms

Routine inspections of the TMA are made by the Teck Site Caretaker twice a year in the spring and the fall. No safety concerns related to the North Embankment and the SRS were identified during review of the routine inspection forms. The Fall 2022 and Spring 2023 routine inspection form are provided in Appendix D.

6 Facility Safety Assessment

6.1 Hazards and Failure Modes Review

As a permanently closed site, structures that have the potential to endanger human life or create environmental damage were either removed or upgraded to enhance long-term physical stability.

Hazards that could manifest themselves were identified for the North Embankment and SRS include runoff from extreme precipitation events, seismic events, ice-buildup and debris in the SRS spillway and Tailings Cover Drainage Channels, potential for liquefaction of the tailings, and flow capacity of the SRS spillway. This section reviews the hazards that have been identified for the North Embankment and the SRS and provides an assessment of the safety of these structures relative to the potential failure modes listed in the CDA (2014) Technical Bulletin.

6.1.1 Dam Overtopping

North Embankment

While the tailings cover is graded to allow water to drain to the south and away from the North Embankment Crest, a review of publicly available satellite imagery between 2018 and 2022 indicates that water pools against the North Embankment during snow melt. The pooling is suspected to be caused by ineffective drainage to the south, likely due to the blockage of drainage channels due to snow and/or ice. Due to the limited freeboard, there is a risk that ponded water can overtop the dam in response to a rainfall event or snowmelt like that occurred in June 2022.

This overtopping mechanism was raised as a credible failure mechanism in the 2015 Dam Safety Review (DSR) (AMECFW 2016). In response to this concern, a hydrological study was completed (SRK 2018) to assess the likelihood of overtopping of the North Embankment in the event of an extreme design flood event that conserved a blockage of the central main drainage channel. The results indicated that during the Probable Maximum Flood (PMF), the North Embankment crest was not overtopped with ponded water reaching within a few centimeters of the embankment crest and with water diverted around the blockage through a secondary drainage channel to the east. The study did not consider blockages within the secondary channel. Considering the 2022 overtopping event, an engineering design is currently under development to raise the embankment to provide additional freeboard to prevent a similar future event.

As part of the 2022 embankment repairs, the crest within the vicinity of the repair area was raised by approximately 0.5 m and the minimum crest elevation is now approximately 20 cm higher than it was prior to the gully; however, the embankment remains vulnerable to future erosion events during future snow melt periods. As noted above, the design of an embankment raise is currently under development and satellite monitoring of the site during freshet is now conducted to track the development of a pond that triggers a site inspection and any preventative action.

SRS

The spillway in the SRS is a riprap lined channel designed to convey the 1 in 1,000-year IDF with 1.0 m of freeboard. As noted in the site inspection observations (Section 5.1.2), deformation of the crest in the vicinity of the spillway has been observed with an estimated settlement of 0.25 m. Even with the settlement, there is adequate freeboard remaining and the spillway is still expected to function in accordance with the design parameters.

6.1.2 Internal Erosion

North Embankment

The North Embankment was built as a tailings retaining structure designed to allow seepage through the dam. The dam has three zones: an upstream low permeability compacted zone of silty till, a semi pervious compacted central zone of sandy till and a compacted outer downstream shell of pervious sand and gravel. Underlying the dam is a native sandy, gravelly silt (till). There are no current indicators of fines being washed through to embankment, although there is some seepage evident at the downstream toe. This seepage is mixed in with historical spring activity that was noted during the embankment construction and the annual inspections. The tailings placed up against the upstream face of the embankment have significantly reduced the seepage loss since initial construction.

An internal erosion assessment (SRK 2023a) carried out in early 2023 determined that both the till and tailings materials are internally unstable and susceptible to suffusion, and that piping through the embankment foundation is credible based on the seepage analyses results and an evaluation of critical hydraulic gradients. The potential for piping through the foundation is supported by historical evidence of sand boils at the embankment toe when the impoundment was temporarily filled with water to an elevation of approximately 1,098.5 m in preparation of the mill start-up in 1991 (SRK 1992). Following this event during the mill start-up, the water level was lowered and subsequently the impoundment was filled with tailings which reduced the seepage and hydraulic gradient through the embankment. No evidence of internal erosion has been identified since this event.

The failure mode is considered non-catastrophic with no large-scale impacts due to the limited amount of water retained by the North Embankment. Any slope instability or sloughing caused by internal erosion would not likely result in a release of tailings due to the wide crest width, and the volume of tailings that would be released through a sinkhole would be minor due to the limited volume of free water.

Due to uncertainties in the seepage gradients through the structure, additional piezometers are recommended to be installed in the tailings, embankment, and foundation to improve the understanding of piezometric pressures, as well as material permeabilities. The data would be used to improve the accuracy of the seepage model and hydraulic gradients to better assess the likelihood of internal erosion.

SRS

The SRS is an earthfill dam constructed of silty till that is classified as SM and ML as per to the Unified Soil Classification System. This material type is considered to have a low resistance to piping (Rivard 1981). A coarse rock seepage control layer is present east of the spillway while no seepage control is present west of the spillway. While seepage through the embankment is barely measurable, there is one small boil that has been noted at the downstream toe of the SRS, but no loss of fines detected. The pond behind the SRS has a maximum depth of about 1.5 m and the average hydraulic gradient through the structure is 0.15. Based on the hydraulic gradient, material type, and guidance provided by Rivard (1981), internal erosion is plausible and should be monitored.

As noted in Section 5.1.2, water is suspected to be flowing beneath the SRS spillway riprap and geotextile leading to erosion of the underlying embankment fill and resulting in settlement of the crest and riprap deformation. Sediments accumulation was observed in the South Drainage Channel immediately downstream of the spillway. Continued erosion of sediment is expected, however, no immediate actions are recommended at this time since the structure is considered temporary and planned to be decommissioned within the next five years. Should the SRS be required for a longer period of time, spillway repairs will be required.

6.1.3 Slope Stability

North Embankment

The most recent stability analysis for the North Dam was completed in 2017 and 2018 (SRK 2017, 2018) with the results shown in Table 6-1. The pseudo-static stability analysis completed for this study was based on the 2015 National Building Code Seismic Hazard Calculator (NBC SHC) that lists the 1 in 2,475-year peak ground acceleration (PGA) as 0.14 g (Site Class C). The PGA in the most recent 2020 NBC Seismic Hazard Calculator lists the 1 in 2,475-year PGA to be 0.164 g (Site Class C). The stability analysis results show that the North Dam is stable under both static and seismic assessments with the structure exceeding minimum target FOS requirements. Whether this non-catastrophic failure mode is credible or non-credible will be evaluated over 2022 and 2023 and that work will verify or refine the conservative assumptions. A site-specific seismic hazard assessment is currently in development that will be used to assess the credibility.

Table 6-1: North Embankment Stability Analysis Results

Loading Condition	Target FOS	Calculated FOS	Reference
Long Term Static	1.5	1.6	SRK (2017)
Pseudo-Static	1.0	1.2	SRK (2017)
Post-earthquake	1.2	1.6	SRK (2018)

SRS

The most recent stability analysis of the current configuration of the SRS (SRK 2015) indicates that the structure meets minimum target FOS requirements under both static and pseudo-static conditions. The stability analysis results are provided in Table 6-2. The seismic calculation was completed using the full PGA value of 0.15 g (2010 NBC SHC), which was based on the target level for earthquake hazards suggested by CDA (2019) guidelines for a low consequence class dam in the passive care phase. It is also noted that the PGA based on the 2020 NBC SHC is now 0.10 g.

Table 6-2: SRS Stability Analysis Results

Loading Condition	Target FOS	Calculated FOS
Long Term Static	1.5	1.7
Pseudo-Static	1.0	1.2
Post-earthquake	1.2	1.6

6.1.4 Surface Erosion

North Embankment

The erosion gully observed in June 2022 was caused by a release of ponded water from the TMA and is considered an overtopping failure mode and not a surface erosion failure mode. No other signs of surface erosion were observed at the North Embankment.

Teck personnel conduct routine and event-driven inspections of the TMA and monitor the downstream dam slope for surface erosion caused by snow melt and rainfall runoff. The inspection frequency is considered appropriate to effectively monitor, track, and repair any erosion prior to any failure.

SRK completed a study (SRK 2018) to assess the erosion potential of the material on the downstream face that could occur due to extreme precipitation. The study concluded that existing sand and gravel material exposed on the downstream face is adequate to withstand the runoff from the 200-year, 24-hour rainfall event without any significant erosion. The need to provide additional erosion protection for passive closure is currently under investigation.

SRS

GeoJute fabric protection on the downstream face of the SRS is in good condition and provides adequate protection against surface erosion. No signs of surface erosion were observed in areas protected by the GeoJute. The surficial slump observed in the downstream slope near the east abutment is located outside of the GeoJute placement limit but is located in area that is 30 m away from the SRS Pond. A recommendation to repair the slough is provided in Section 7.5.

6.2 Review of Upstream and Downstream Conditions

The TMA is located on a catchment divide so all conditions are predominantly downstream. There are no identifiable hazards to the east and west sides of the valley adjacent to the TMA. There is no change in the downstream condition of the TMA to the north and to the south that affects the potential consequences of failure.

6.3 Consequences of Failure Review

North Embankment

Downstream of the North Embankment, the valley grade falls at approximately 7 to 9% towards False Canyon Creek, which conveys flows into the Frances River, a tributary of the Liard River. The area downstream is undeveloped with no identifiable population at risk, public roads, or any other infrastructure. The probability of a failure mode leading to large scale loss of tailings from the TMA is very low as there is no water impounded except for a limited volume during snow melt, no identifiable brittle failure mode as the dam is founded on dense till with a post-seismic FOS that indicates that the dam would still have a FOS above 1 in the event of an earthquake. As a result, no significant loss or deterioration of fish or wildlife habitat is expected with restoration highly possible.

The embankment is classified as ‘Significant’ consequence based on CDA (2019) criteria after the last DSR (AMECFW 2016).

SRS

Like the North Embankment, the area downstream of the SRS is undeveloped with no identifiable population at risk, public roads, or any other infrastructure. In addition, the reservoir capacity is small (800 m^3 of water) and as a result, no long-term environmental losses are expected.

The structure is classified as a ‘Low’ consequence based on CDA (2019) criteria.

6.4 OMS Manual Review

The latest revision of the OMS Manual was update on December 21, 2021. The OMS Manual is reviewed annually and generally follows the Mining Association of Canada’s guidelines for OMS Manuals (MAC 2021) and is adequate for the TMA. The OMS manual was reviewed as part of 2022 AFPR and included a number of changes to incorporate the North Embankment erosion gully repairs and additional monitoring requirements. The updates have been implemented but the OMS Manual remains in draft form. In addition to the North Embankment revisions, the TARP has been updated based on the North Embankment piezometer trigger review (SRK 2023d) as described in Section 5.2.1.

SRK reviewed the most recent draft of the OMS Manual and have provided a marked-up version of recommended edits. Most are minor changes; the most significant ones are revision to note the recent slumping and erosion at the SRS and modifications of the SRS potential failure modes and

performance indicator, as well as to update discussion related to potential failure modes to include the potential for internal erosion and specify the inspection for sand boils along the embankment toe as a potential visual indicator based on the internal erosion assessment (SRK 2023a).

6.5 Mine Emergency Response Plan Review

Teck developed a Mine Emergency Response Plan (MERP) for Sä Dena Hes that was finalized on July 27, 2021, and replaces the sites' Emergency Preparedness and Response Plan.

A tabletop test exercise of the MERP was completed during the 2020 annual inspection of the TMA, which involved a simulated tailings emergency scenario and included the EOR and Teck personnel, with the test findings incorporated into the MERP on December 14, 2021. SRK reviewed the TMA applicable sections of the MERP in 2022 and found the plan to be adequate for the site.

The adequacy of the MERP was demonstrated during the response to the discovery of the North Embankment erosion gully on June 17, 2022, with risk mitigations and repairs implemented in a timely manner to minimize environmental impacts.

7 Summary and Recommendations

7.1 Summary of Construction and Operation Activities

The site is currently closed and there are no operational activities. Maintenance was completed in October 2022 to provide erosion protection for the June 2022 North Embankment erosion gully repair area, and to decommission the borrow area used for the embankment repairs.

7.2 Summary of Performance

The North Embankment is currently stable. The structure does not retain water except during snow melt when the tailings cover drainage may be restricted due to ice or snow blockages in the drainage channels. During the June 2022 snow melt, ponded water overtopped the embankment resulting in the development of an erosion gully that eroded approximately 415 m^3 of embankment fill with no tailings displaced. Once the pond had drained, the erosion discontinued. No signs of any instability were observed during the 2023 site inspection. An embankment raise is currently being designed for the North Embankment to increase the freeboard to eliminate the risk of overtopping like that occurred in 2022.

The SRS is functioning in accordance with design parameters. However, water appears to be flowing beneath the spillway riprap and geotextile that is internally eroding the embankment material resulting in sediment accumulation downstream of the SRS and deformation of the spillway and dam crest. In addition, a small slough was identified on the downstream slope near the east embankment that was subsequently repaired in August 2023. A timeline for decommissioning of the SRS is recommended to be established to determine if repair of the spillway should be completed.

The North Drainage Channel is functioning in accordance with design parameters. A slippage of the riprap occurred in the outlet to the SRS pond, exposing the geotextile, and an erosion gully has developed immediately to the west of the area of riprap movement. These features were subsequently repaired in August 2023.

7.3 Summary of Climate and Water Balance

Based on observations at the Watson Lake Airport climate station, the climate during the reporting period of July 2022 through June 2023 was dryer than average with a total precipitation of 398 mm at the Site compared to the mean annual precipitation of 675 mm.

The TMA is designed to be a flow-through facility with no active water management required. The tailings cover is graded to drain to the south, away from the North Embankment, and towards the SRS. The SRS spillway can pass the design flow associated with a 1 in 1,000-year precipitation event. During the 2022 snowmelt, a blockage of the drainage channels to the south due to snow and/or ice, resulted in the formation of a pond and the overtopping of the North Embankment leading to an erosion gulley. Remedial actions to prevent future overtopping events are being designed.

7.4 Summary of Changes to Facility or Upstream or Downstream Conditions

There were no significant changes in upstream or downstream conditions of the TMA that would affect the potential consequences of failure.

7.5 Table of Deficiencies and Non-Conformances

SRK has completed the 2023 facility performance review of Sä Dena Hes Mine, TMA and water management infrastructure and concluded that the North Embankment, the SRS and the North Drainage Channel are in adequate condition.

Table 7-1 shows the priority ranking description developed by Teck, and Table 7-2 provides a summary of deficiencies and non-conformances noted during the 2023 performance review and outstanding deficiencies or non-conformances from previous reviews.

Table 7-1: General Description of Priority Rankings

Priority	Description
1	A high probability or actual dam safety issue considered immediately dangerous to life, health or the environment, or a significant regulatory concern.
2	If not corrected, could likely result in dam safety issues leading to injury, environmental impact or significant regulatory action; or, a repetitive deficiency that demonstrates a systematic breakdown of procedures.
3	Single occurrences of deficiencies or non-conformances that alone would not be expected to result in dam safety issues.
4	Best Management Practice as a suggestion for continuous improvement towards industry best practices that could further reduce potential risks. This typically includes ongoing construction items within the appropriate construction cycle.

Notes: Priority ratings developed by Teck (2019) and are consistent with the BC Health, Safety and Reclamation Code (HSRC) for Mines in British Columbia.

Table 7-2: Table of Recommendations for the 2023 TMA Inspection

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
			2021 Recommendations			
North Embank-ment	2021-3	A long-term goal for the TMA is to reduce all potential catastrophic failure modes to non-credible.	-	Undertake a credible failure modes assessment for the TMA.	4	**Complete** Failure mode review determined that there are no catastrophic failure modes.
North Embank-ment	2021-4	Water levels in Piezometer 2A triggered alerts and event-driven inspections during the last two freshets that are attributable to higher snowpacks and rainfall. The event driven inspection resulted in no dam safety concerns.	OMS Section 6.2.2	Undertake a review of the trigger action alert levels and consider additional levels for seasonal freshet conditions. Establish snowpack monitoring stations to investigate the impact between snowmelt and the North Embankment foundation pressures.	4	**Complete** Trigger review completed in May 2023.
			2022 Recommendations			
Tailings Cover	2022-2	An erosion gully is present in the reclamation cover north of the SRS pond that has eroded through the cover and has exposed geotextile.	OMS Section 5.2.1	Shape the erosion gully to form a channel with a nominal amount of fill overtop of the base of the gully. Provide appropriate erosion protection material to the channel.	4	**Completed** Repairs completed in August 2023.
North Embank-ment	2022-3	Drainage channel blockages on the tailings cover during snowmelt results in the formation of a pond adjacent to the North Embankment. In 2022, the pond overtopped the North Embankment and formed an erosion gully that required repairs.	OMS Section 5.2.1	Modify the dam to eliminate the risk of overtopping. Due to limitations in the tailings cover thickness, increasing the grade of the cover drainage channels is not possible without exposing tailings. As a result, raising the dam to increase the freeboard is recommended.	2	**In Progress** Before end of 2024.

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
North Embank-ment and Tailings Cover	2022-4	As above (2022-3)	OMS Sections 5 and 6	Modify the TMA maintenance and surveillance programs in the OMS Manual to include monitoring for the development of a pond against the North Embankment and maintenance to clear drainage pathways on the tailings cover during the snowmelt period. The modifications should include use of satellite monitoring to track pond development, an additional site inspection in early-May to establish site access and clear a drainage path to the south. As a contingency, a plan should be developed for the mobilization of a pump and associated equipment to pump the ponded water downstream of the North Embankment. The OMS Manual should also be updated to include the as-built information from the North Embankment erosion gully repairs as outlined in Section 6.4.	2	**Completed** Interim OMS Manual updated, and the additional measures were followed this past freshet.
				2023 Recommendations		
North Embank-ment	2023-1	The amount of embankment seepage is unable to be determined as the monitoring station MH-02 is located approximately 35 m downstream of the embankment and captures mostly seepage from the valley sidewall.	-	Install a new seepage monitoring station near the embankment toe as part of North Embankment Upgrades.	4	**New** Before end of 2024.
North Embank-ment	2023-2	Seepage is present along an approximate 80 m long zone at the downstream toe and the ground at the lower portion of the embankment is moist and soft due to seepage and recent snowmelt. The relative contribution from snowmelt, seepage through the dam, and upward seepage from groundwater is unable to be determined.	-	To improve the understanding of the contributions of seepage through the embankment and from groundwater recharge, consider installing additional piezometers in the tailings upstream of the embankment and in the embankment fill and foundation in the downstream slope of the embankment.	4	**New** Before end of 2024.
Tailings Cover	2023-3	Several areas of ponding were present along with several areas of erosion.	OMS Section 5.2.1	As part of the upcoming North Embankment Upgrades, a review of the cover drainage network is recommended to reduce the amount of ponding and provide engineered erosion protection where required along drainage pathways.	4	**New** Before end of 2023.

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
SRS	2023-4	Water is suspected to be flowing beneath the riprap and geotextile in the spillway and eroding the underlying SRS embankment and leading to embankment deformation.	OMS Section 5.2.1	Evaluate the long-term plan and intention of the SRS and, if the planned life exceeds the next five years (2028), the spillway should be reconstructed.	4	**New** Decommission the SRS or repair the spillway before 2028.
SRS	2023-5	A slough is present on the downstream slope near the east abutment.	OMS Section 5.2.1	Repair slough by removing soft material and backfilling with coarse soils.	3	**Completed** Repairs completed in August 2023.
North Drainage Channel	2023-6	Riprap movement has occurred immediately upstream of the channel outlet to the SRS Pond.	OMS Section 5.2.1	Replace the riprap. Undertake a hydraulic analysis to confirm the riprap sizing requirements. The riprap gradation may be augmented as needed using riprap sourced from the Rock cofferdam immediately north of the SRS Pond to meet project requirements.	3	**Completed** Repairs completed in August 2023.
North Drainage Channel	2023-7	An erosion gulley is present on the berm on the west bank of the channel immediately adjacent to the area of riprap movement.	OMS Section 5.2.1	Backfill the gully using riprap sourced from the Rock Cofferdam immediately north of the SRS Pond.	3	**Completed** Repairs completed in August 2023.

Closure

This report, 2023 Annual Facility Performance Review, was prepared by

Ignacio Cueto
Senior Consultant

and reviewed by

PROFESSIONAL ENGINEER YUKON TERRITORY PETER H. MIKES 2023-08-29

Peter Mikes, P. Eng
Principal Consultant,
Engineer of Record

PERMIT TO PRACTICE
Signature
Date 2023-08-29
PERMIT NUMBER: PP019
Association of Professional Engineers of Yukon

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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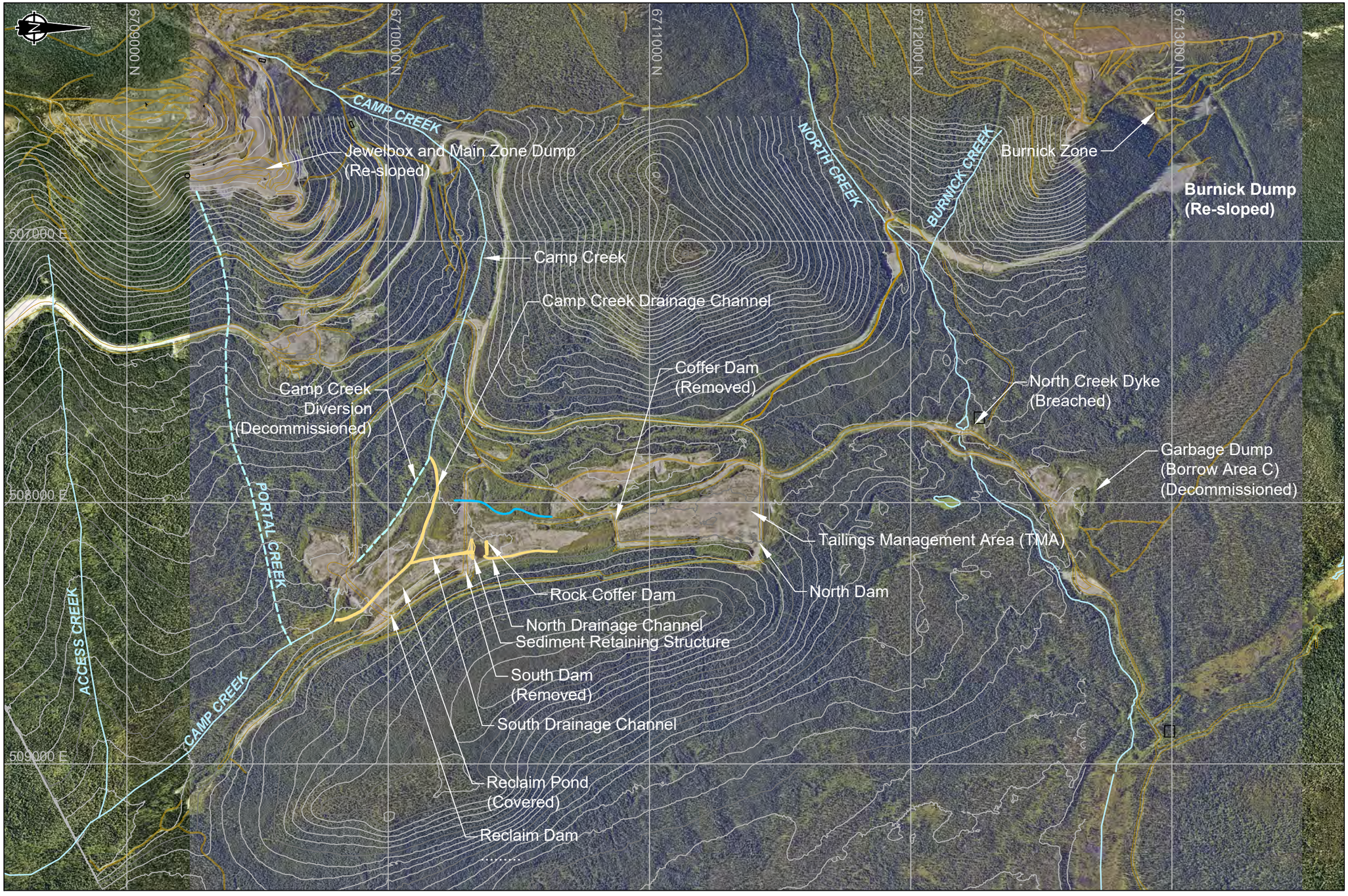
Appendix A Figures



LEGEND

Creeks

NOTES

1. Contours are shown at 10.0m intervals.
2. All units are in meters unless otherwise specified.

REFERENCES

1. Coordinate system is UTM NAD 83CSRS zone 9V.
2. 2022 topographic contour data and aerial photos provided by Teck.

0m 10 20 30 40 50 60

srk consulting

SRK JOB NO.: CAPR002559 | REG. NO.:

FILE NAME: CAPR002559 - GA.dwg

Teck

Sä Dena Hes

2023 Annual Facility Performance Review

DRAWING TITLE: Vicinity Map

DATE: July 2023 | APPROVED: PM | FIGURE: 01

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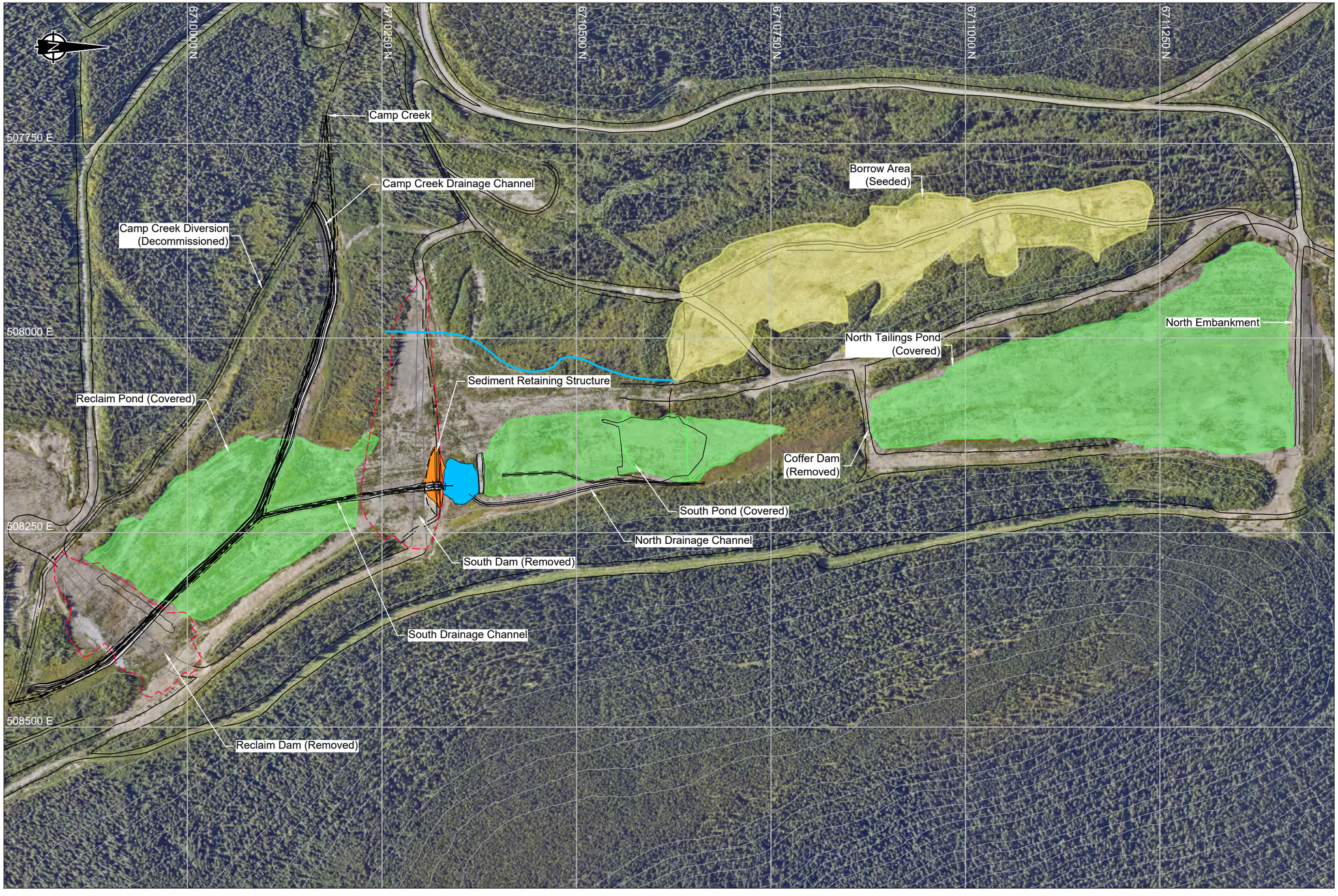

LEGEND

- Major Contour (5m interval)
- Minor Contour (1m interval)
- Edge of Road
- Design Edge of Road
- Camp Creek Drainage Channel
- Dam Excavation Extent
- Sedimentation Pond
- Capped Areas
- Seeded Area

NOTES

1. Contours are shown at 5.0m intervals.
2. All units are in meters unless otherwise specified.

REFERENCES

1. Coordinate system is UTM NAD 83CSRS zone 9V.
2. 2022 topographic contour data and aerial photos provided by Teck.
3. As-built survey data was collected by Yukon Engineering Services and Amec Foster Wheeler.
4. Tailings characterization work conducted by Golder Associates determined the location of capping at the South Pond and Reclaim Pond areas.

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FILE NAME: CAPR002559 - Site GA.dwg

Teck

Sä Dena Hes

2023 Annual Facility Performance Review

DRAWING TITLE:

TMA General Arrangement Map

DATE: July 2023 | APPROVED: PM | FIGURE: 02

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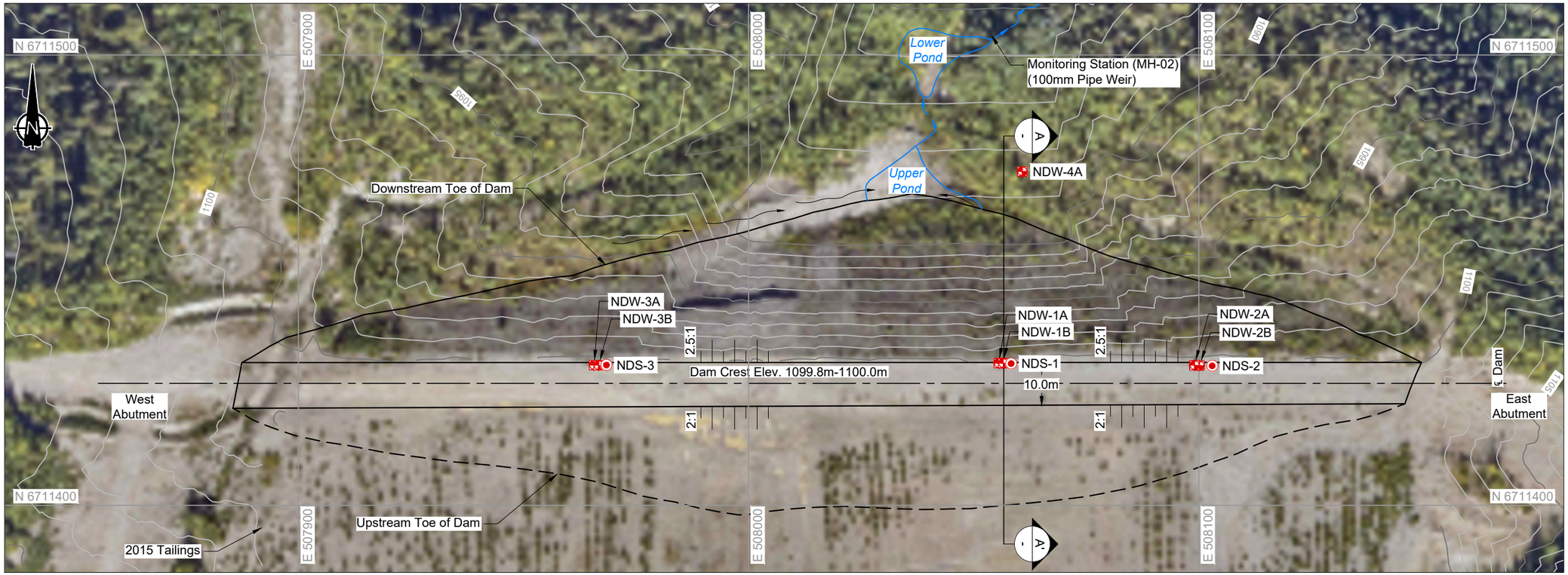
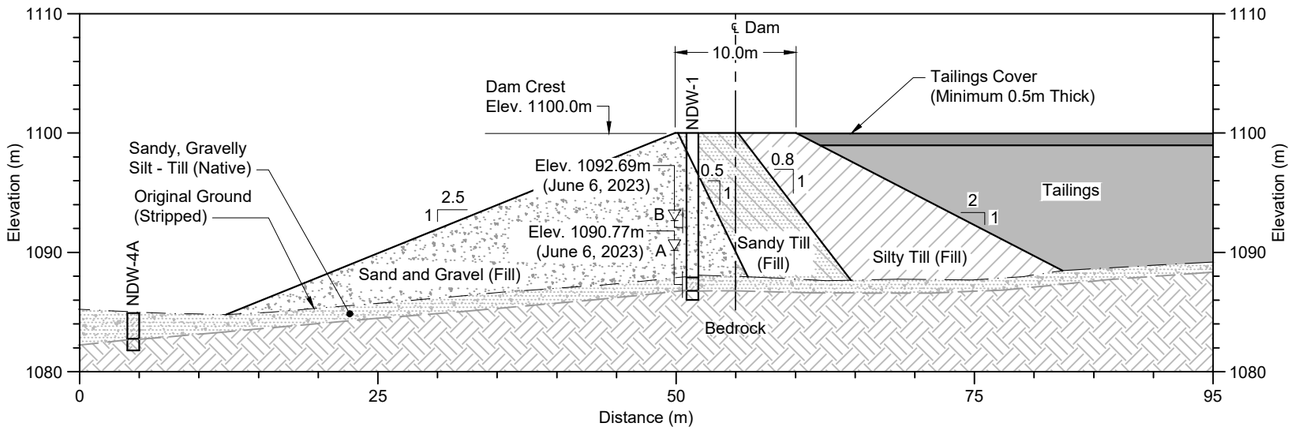


North Dam Site Plan

0m 10 20 30 40



Typical Section

0m 5 10 15 20

LEGEND

- Piezometer head for Filter Zone Indicated
- Piezometers Installed (Nov. 1991)
- Settlement Gauge Installed (Nov. 1991)
- Bedrock
- Contours Major (Ground at 5.0m Intervals)
- Contours Minor (Ground at 1.0m Intervals)
- Contours Major (Tailings Cover at 0.5m Intervals)
- Contours Minor (Tailings Cover at 0.1m Intervals)
- Existing Ground (Stripped)
- Seepage
- Tailings Cover Limits
- Sandy Till (Fill)
- Sitly Till (Fill)
- Sand & Gravel (Fill)
- Silty Sand (Till)
- Gravelly Silty Sand (Till)
- Sand & Gravel (Native)
- Bedrock
- Tailings
- Tailings Cap

NOTES

1. Ground Contours are shown at 1.0m intervals. Tailings cover contours are shown at 0.1m intervals.
2. All units are in meters unless otherwise specified.

REFERENCES

1. Coordinate system is UTM NAD 83CSRS zone 9V.
2. Topographic contour data was obtained from McElhanney and are based on August 15, 2012 LiDAR survey and October 2013 YES Survey. Aerial photo provided by Teck.
3. 2015 tailings cover contours obtained from Yukon Engineering Surfaces.

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SRK JOB NO.: CAPR002559 | REG. NO.:

FILE NAME: CAPR002559 - North Dam.dwg

Teck

Sä Dena Hes

2023 Annual Facility Performance Review

DRAWING TITLE: North Dam Site Plan and Typical Section

DATE: July 2023 | APPROVED: PM | FIGURE: 03

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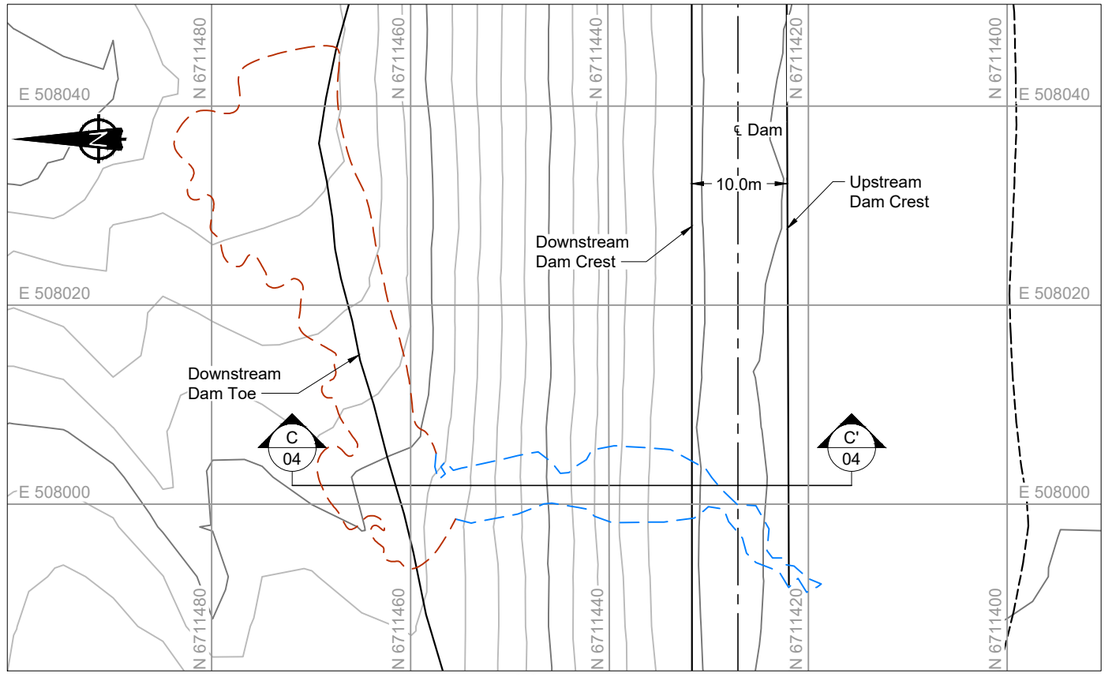
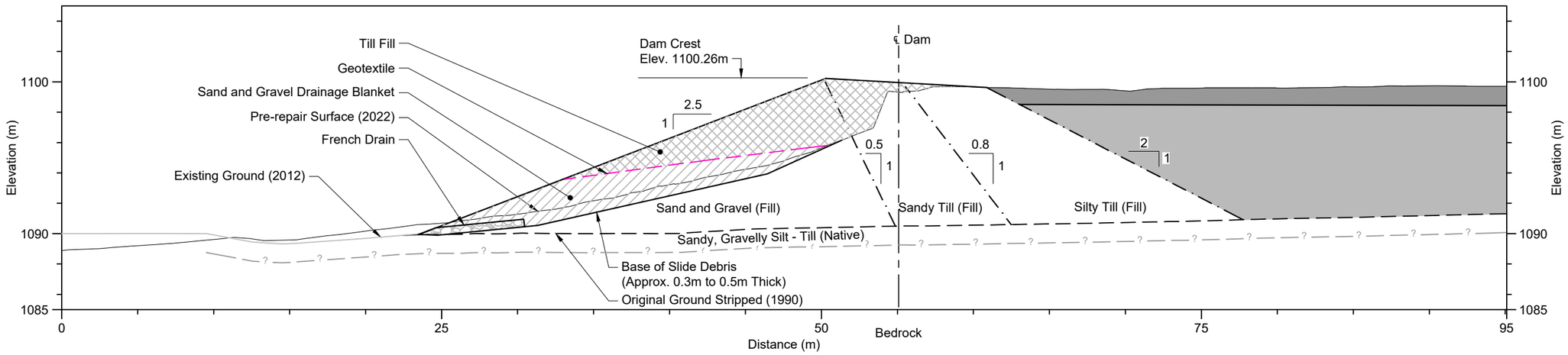


Plan View of Completed Repairs

0m 6 12 18 24



C 04 **Erosion Gulley Cross Section**

0m 3 6 9 12

LEGEND

- Bedrock
- Erosion Debris Extent
- Erosion Gulley Extent
- Existing Ground 2012
- Geotextile
- Pre-repair Surface 2022
- Original Dam
- Original Ground Stripped (Pre-Construction) 1990
- French Drain
- Sand and Gravel Drainage Blacket
- Till Fill
- Tailings
- Tailings Cover

NOTES

1. Contours are shown at 1.0m intervals.
2. Contours in the plan view are interpolated and are approximate.
3. All units are in meters unless otherwise specified.
4. The repaired downstream slope surface is estimated based on field observations.

REFERENCES

1. Coordinates are UTM Zone 9, NAD83 (CSRS) and are derived holding values of point UGL100 fixed in 3D.
2. Cooridnates of point UGL100 were established using Natural Resources Canada CSRS-PPP Service (precise point positioning).
3. Elevations are orthometric and in meters. Elevations reference to the CGVD28 datum using the HTv2.0 Geoid Model.
4. The digital file of this plan is UTM Grid scale, not ground scale. Combined scale factor at point UGL100 is CSF 0.9941220
5. Coordinates of UGL100 are:
   UGL100
   UTM N: 6709661.884m
   UTM E: 507376.593m
   Ortho Elev: 1206.100m
6. UAV DEM and Imagery:
   Date: 2022-06-20
   UAV: M300 with P1 Camera
   UAV capture Altitude: 120m AGL
   GSD: 1.4cm/pix
   Orthophoto Resolution: 10cm/pix
7. Topographic contour data was obtained from McElhanney and is based on August 15, 2012 LiDAR survey and October 2013 YES Survey.

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SRK JOB NO.: CAPR002559 | REG. NO.:

FILE NAME: CAPR002559 - North Dam Repair.dwg

Teck

Sä Dena Hes

2023 Annual Facility Performance Review

DRAWING TITLE: North Dam Repaired Cross Section

DATE: July 2023 | APPROVED: PM | FIGURE: 04

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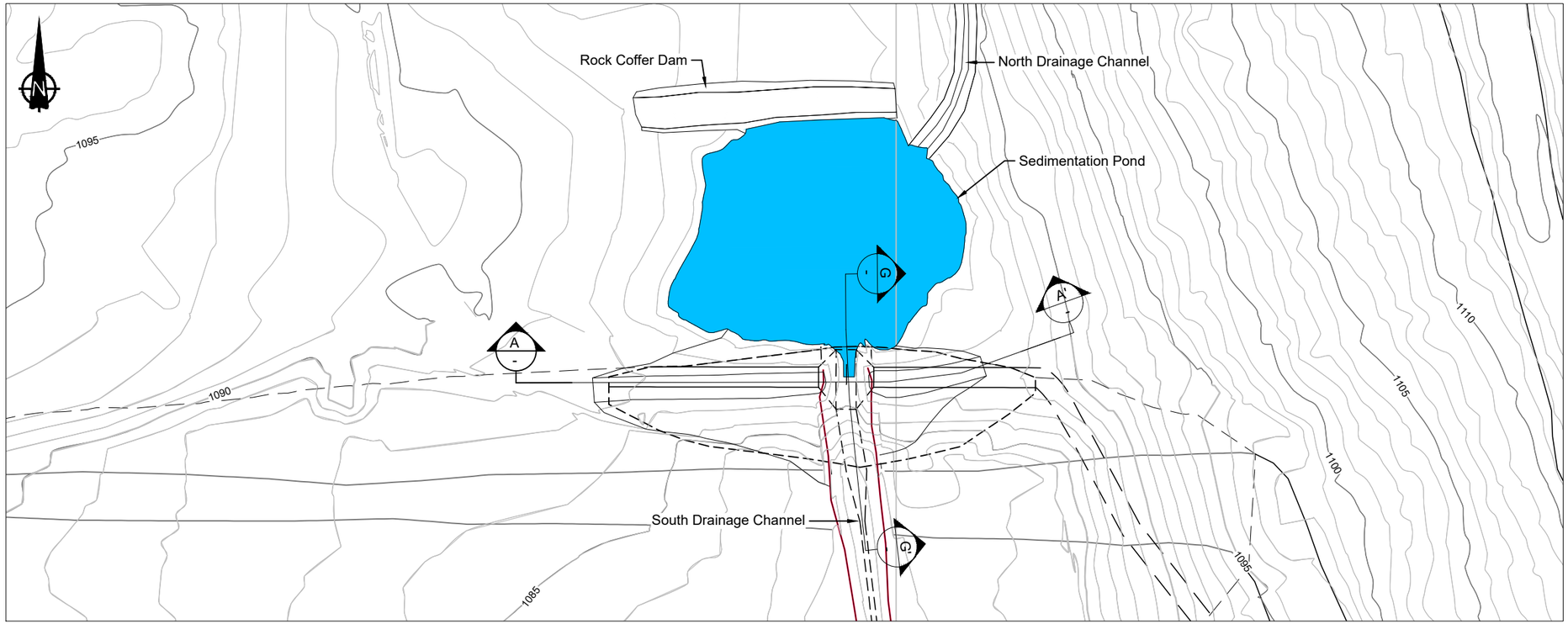


Plan

0m 10 20 30 40

LEGEND

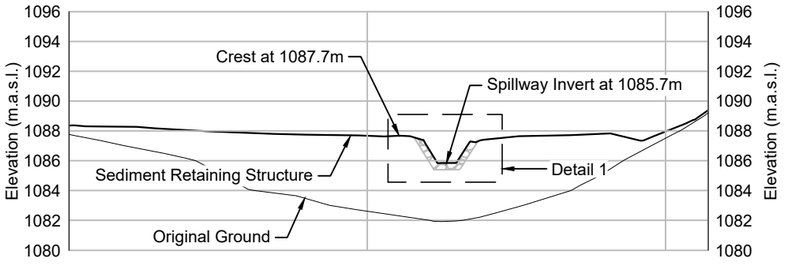
- Major Contour (5m)
- Minor Contour (1m)
- Dam Crest
- Dam Toe
- Edge of Road
- Original Ground
- Non-woven Geotextile
- Riprap
- Sediment Pond

NOTES

1. Contours are shown at 1.0m intervals.
2. All units are in meters unless otherwise specified.
3. Excavated dam fill material was used to cap tailings. The final excavated surface was graded to promote drainage and blended topography into adjacent natural topography.
4. Rip rap from downstream toe buttress was salvaged and reused during channel construction.
5. The decant tower was demolished down to the foundation. Steel reinforced concrete was deposited in the onsite landfill located in Borrow Area C. The remaining concrete foundation was covered with dam fill material and graded to blend into topography.
6. Design extents of rip rap and geotextile, as no as-built survey.

REFERENCES

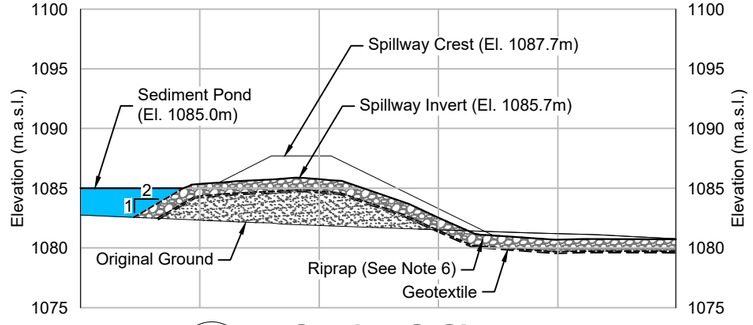
1. Coordinate system is UTM NAD 83CSRS zone 9V.
2. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey.



A / - **Profile A-A'**

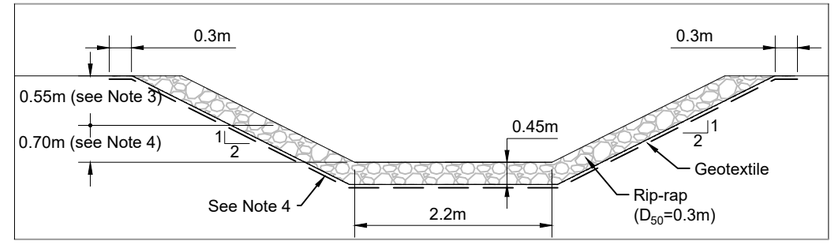
0m 10 20 30 40 Horizontal

0m 4 8 12 16 Vertical



G / - **Section G-G'**

0m 5 10 15 20



1 / - **Detail 1 - Design Spillway Typical Section**

N.T.S.

0m 10 20 30 40

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SRK JOB NO.: CAPR002559	REG. NO.:
FILE NAME: CAPR002559 - Sediment Retaining Structure.dwg	

Teck

Sä Dena Hes

2023 Annual Facility Performance Review

DRAWING TITLE: Sediment Retaining Structure Plan and Profile

DATE:	APPROVED:	FIGURE:
July 2023	PM	05

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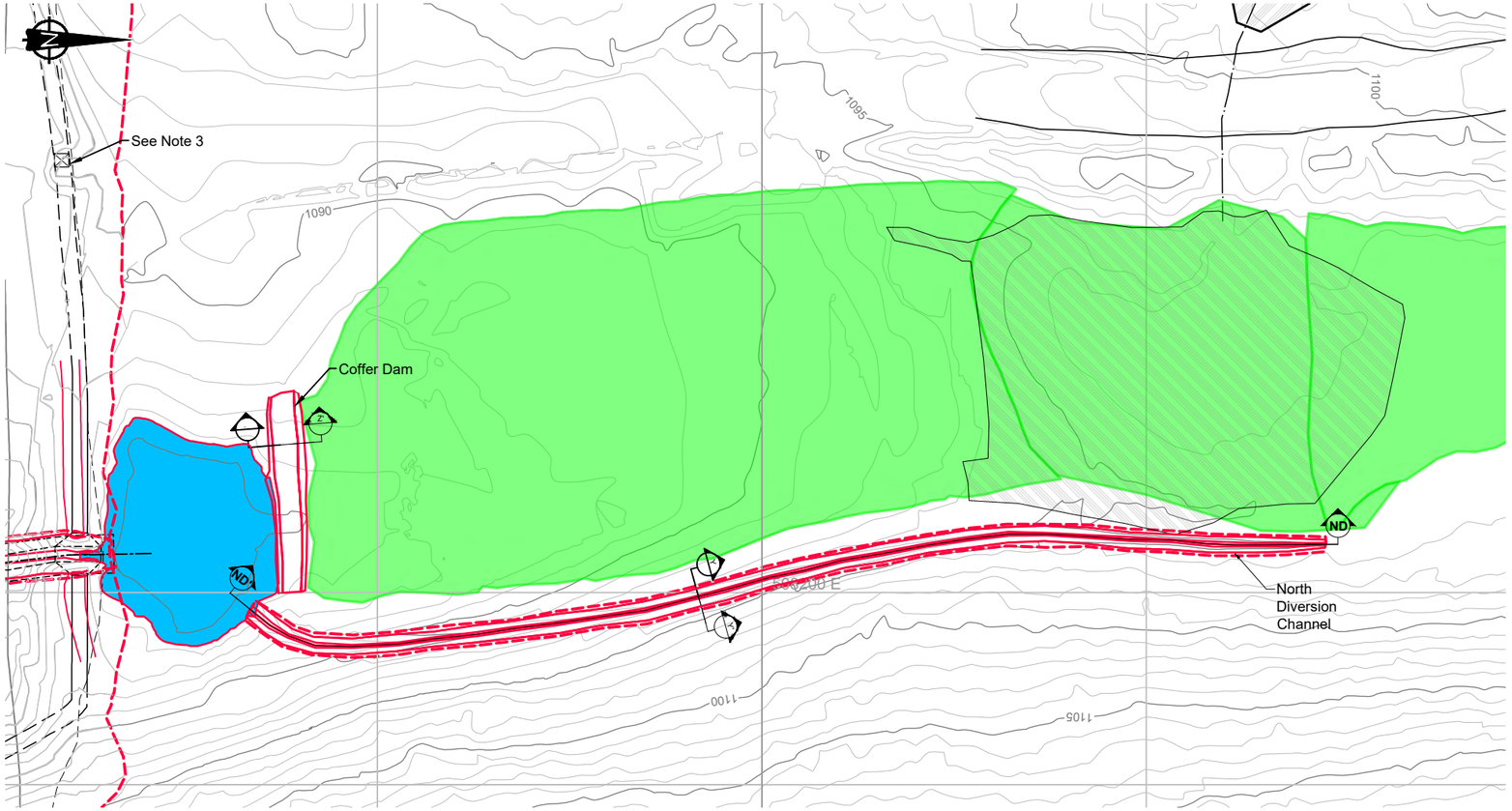
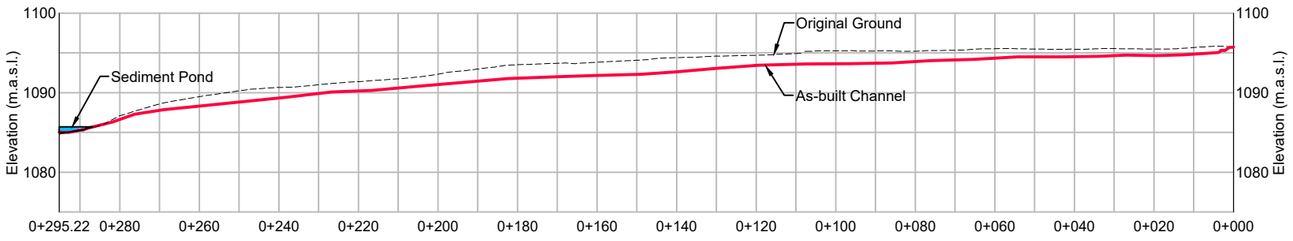


PLAN

0 5 10 15 20 25
Scale in Metres



ND
-
Profile ND - ND'
2x Vertical Exaggeration

Horizontal: 0 5 10 15 20 25 Scale in Metres

Vertical: 0 2.5 5 7.5 10 12.5 Scale in Metres

LEGEND

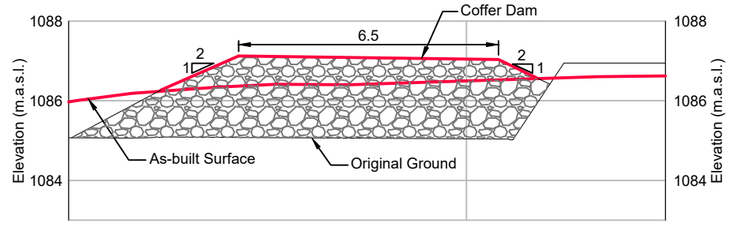
- Major Contours (5m)
- Minor Contours (1m)
- Edge of Road
- Tailings Pipeline
- Existing Ground (Profile)
- Non-woven Geotextile
- Covered Tailings (Proposed in Design)
- Rip Rap
- Sediment Pond (As-built)
- As-built Toe
- As-built Crest
- As-built Extent of Excavation / Fill

NOTES

1. Contours are shown at 1.0m intervals.
2. All units are in meters unless otherwise specified.
3. Based on field conditions the North Drainage Channel was realigned to avoid constructing the channel through deposited tailings.
4. Based on field conditions a Rock Cofferdam was constructed to retain soft tailings from sliding into the sediment retention pond during cover construction.
5. The decant tower was demolished down to the foundation. Steel reinforced concrete was deposited in the onsite landfill located in Borrow Area C. The remaining concrete foundation was covered with dam fill material and graded to blend into topography.
6. Design extents of rip rap and geotextile, as no as-built survey.

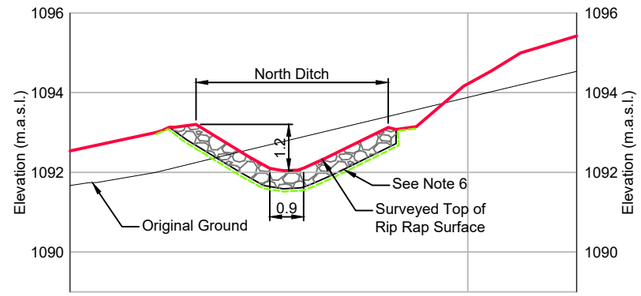
Design North Tailings Drainage Channel Riprap Volume Summary Table:

Location	D_{50} (m)	Armoring Depth (m)	Volume (m^3)
Y	0.3	0.45	638
Discharge Area	0.3	0.45	25



Z
-
Section Z - Z'

0 1 2 3 4 5
Scale in Metres



Y
-
Section Y - Y'

0 1 2 3 4 5
Scale in Metres

REFERENCES

1. Coordinate system is UTM NAD 83CSRS zone 9V.
2. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey.

srk consulting

SRK JOB NO.: CAPR002559 | REG. NO.:

FILE NAME: CAPR002559 - North Drainage Channel.dwg

Teck

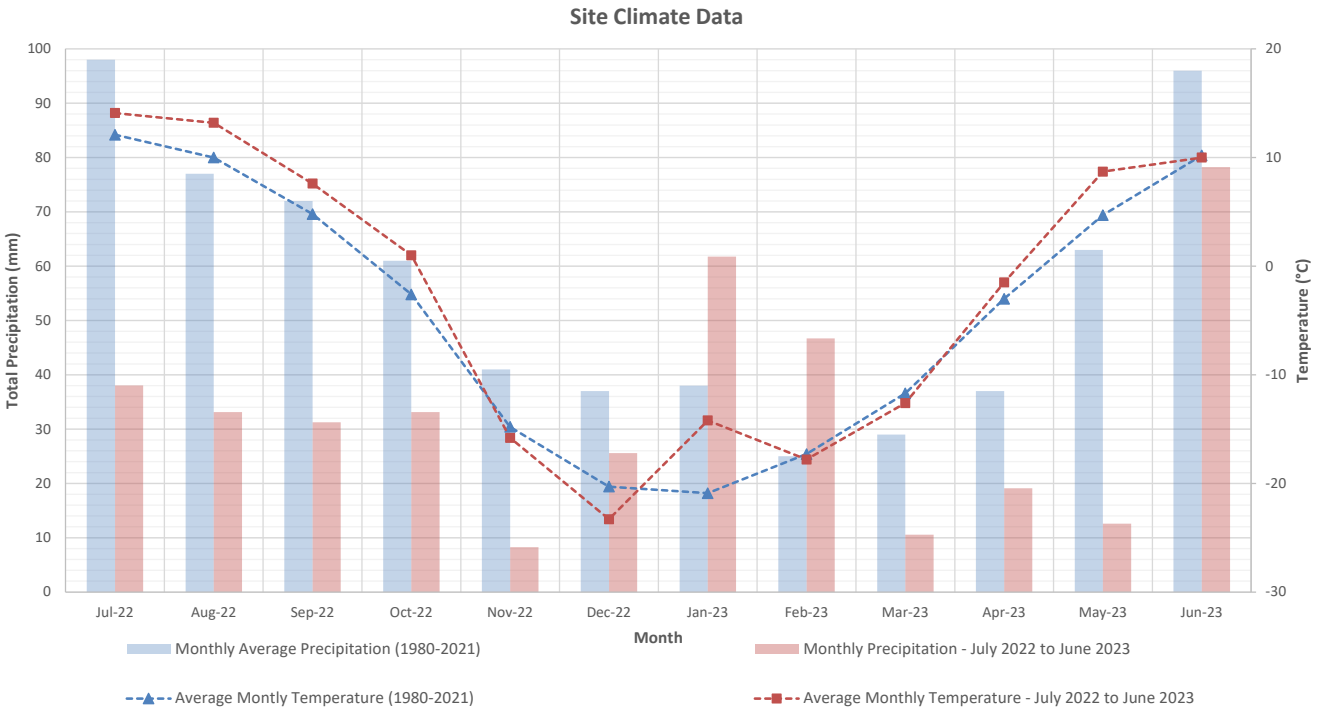
Sä Dena Hes

2023 Annual Facility Performance Review

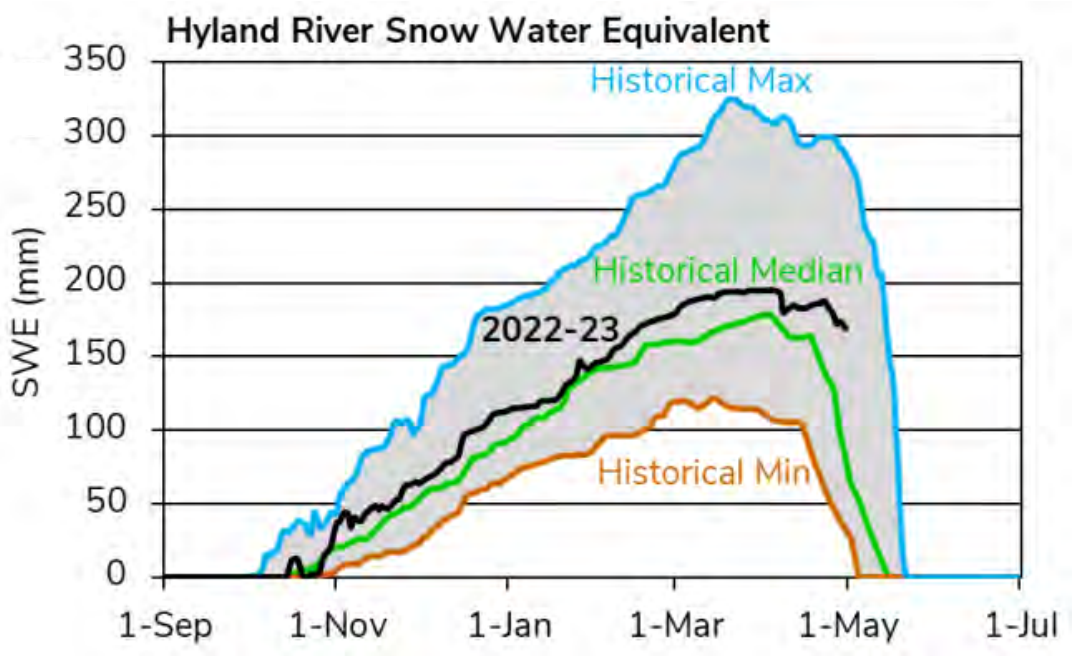
DRAWING TITLE:
North Drainage Channel Plan, Profile and Sections

DATE: July 2023 | APPROVED: PM | FIGURE: 06

C:\Users\thayal\SRK Consulting\FS291 Sä Dena Hes - 1040_CAD_GIS\ACAD_C3D\CAPR002522_EOR Services\2023 Annual Review\CAPR002559 - North Drainage Channel.dwg

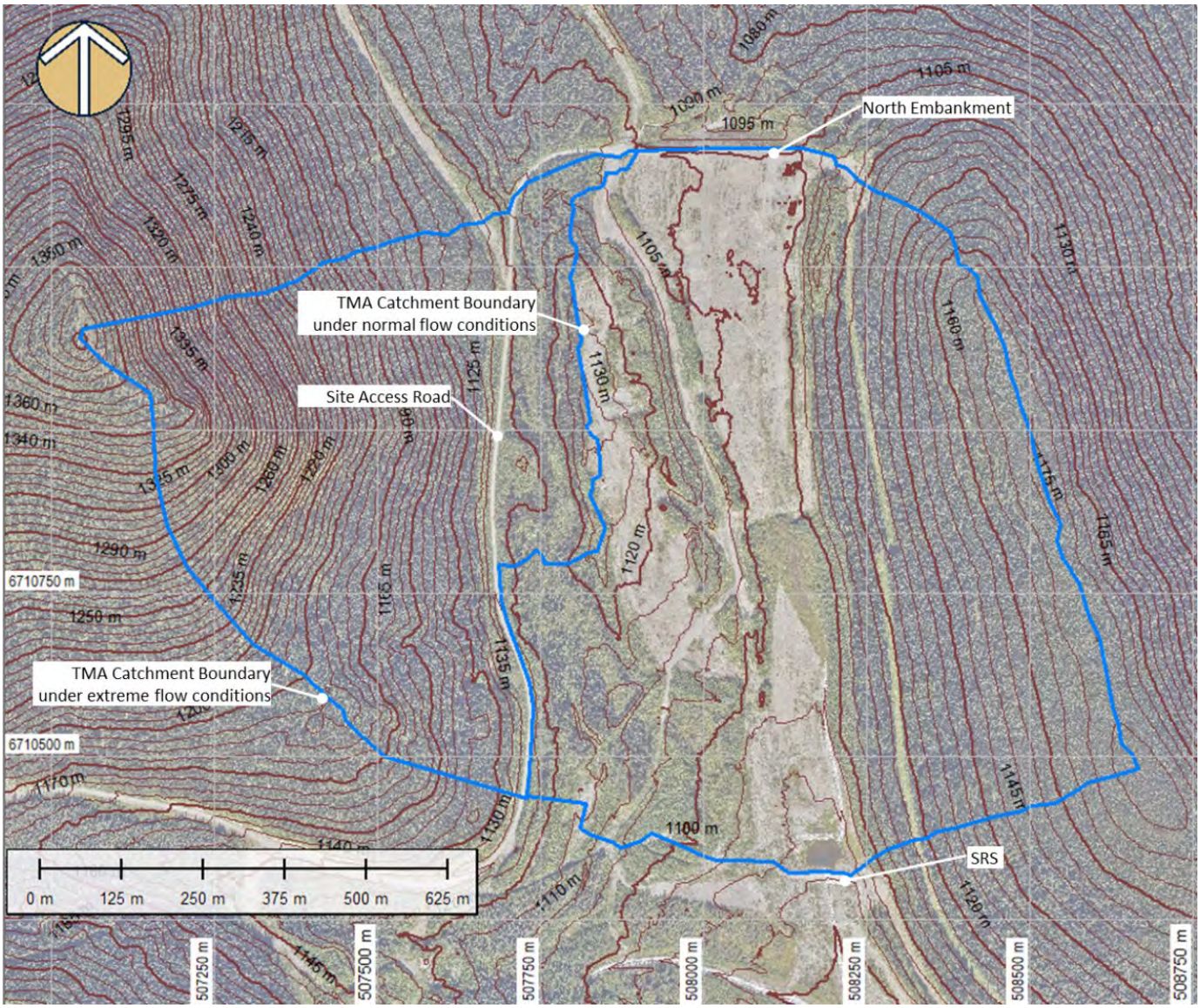


a) Monthly Precipitation and Temperature Data



b) Winter 2022-23 Liard River Basin Snow Water Equivalent Data

https://yukon.ca/sites/yukon.ca/files/env/env-snow-bulletin-may-2023-en.pdf



Sources : https://srk.sharepoint.com/sites/NA1CT008.075/Deliverables/Climate_Report/03_Figures/Fig2-3_TMA%20Catchment.pptx ?web=1

Notes: The normal flow boundary assumes the upstream diversions on the west side of the catchment are functional, while the extreme flow boundary assumes that the diversions fail.

srk consulting	Teck	2023 Annual Facility Performance Review		
		TMA Catchment Area		
Job No: CAPR002559 Filename: SDH_2023AFPR_Figures_Portrait.pptx	Sa Dena Hes	Date: July 2023	Approved: PHM	Figure: **8**

Appendix B Site Photographs

Notes:
1. Orthographic photo depicts the 2022 surface.
2. Coordinate system is UTM NAD83 Zone 9.

✕ Photo Location

srk consulting

Teck

2023 Annual Facility Performance Review

Inspection Areas and Photo Logs

Job No: CAPR002559
Filename: SDH_2023_AFPR_PhotoLocs.pptx

Sa Dena Hes

Date:	Approved:	Figure:
July 2023	PHM	**A-1**

Notes:
1. Orthographic photo depicts the 2022 surface.
2. Coordinate system is UTM NAD83 Zone 9.

✕ Photo Location

srk consulting

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2023 Annual Facility Performance Review

North Embankment Photo Locations

Job No: CAPR002559

Filename: SDH_2023_AFPR_PhotoLocs.pptx

Sa Dena Hes

Date: July 2023

Approved: PHM

Figure: **A-2**

Notes:
1. Orthographic photo depicts the 2022 surface.
2. Coordinate system is UTM NAD83 Zone 9.

✕ Photo Location

srk consulting

Teck

2023 Annual Facility Performance Review

Sediment Retaining Structure Photo Locations

Job No: CAPR002559
Filename: SDH_2023_AFPR_PhotoLocs.pptx

Sa Dena Hes

Date:	Approved:	Figure:
July 2023	PHM	**A-3**

Notes:
1. Orthographic photo depicts the 2022 surface.
2. Coordinate system is UTM NAD83 Zone 9.

✕ Photo Location

srk consulting

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2023 Annual Facility Performance Review

Tailings Cover Area
Photo Locations

Job No: CAPR002559
Filename: SDH_2023_AFPR_PhotoLocs.pptx

Sa Dena Hes

Date:	Approved:	Figure:
July 2023	PHM	**A-4**

Notes:
1. Orthographic photo depicts the 2022 surface.
2. Coordinate system is UTM NAD83 Zone 9.

✕ Photo Location

srk consulting

Teck

2023 Annual Facility Performance Review

North Drainage Channel Photo Locations

Job No: CAPR002559
Filename: SDH_2023_AFPR_PhotoLocs.pptx

Sa Dena Hes

Date:	Approved:	Figure:
July 2023	PHM	**A-5**

Photo NE-01: North Embankment alignment seen from the west abutment; it shows no abnormal deformation.

Photo NE-02: A closer look to the North embankment crest.

srk consulting	Teck	2023 Annual Facility Performance Review		
		North Embankment		
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023	Approved: PHM	Figure: **A-6**

Photo NE-03: North embankment crest piezometers casings.

Photo NE-04: NDW-A4 Piezometer fitting in the casing after being trimmed following the 2022 recommendations.

Photo NE-05: North embankment downstream slope vegetation seen from the east abutment.

Photo NE-06: North embankment downstream slope vegetation seen from the toe.

srk consulting	Teck	2023 Annual Facility Performance Review		
		North Embankment		
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023	Approved: PHM	Figure: **A-8**

Photo NE-07: North embankment gully repair erosion protection mat at the toe of the repair.

Photo NE-08: North embankment gully repair erosion protection mat.

srk consulting	Teck	2023 Annual Facility Performance Review		
		North Embankment		
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023	Approved: PHM	Figure: **A-9**

Photo NE-09: North embankment seen from the seepage monitoring station location. The flow appears to be clear.

srk consulting	Teck	2023 Annual Facility Performance Review
		North Embankment
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023 | Approved: PHM | Figure: **A-10**

Photo NE-10: Seepage observed at the dam toe during the inspection.

Photo NE-11: North embankment gully repair erosion protection mat at the toe was wet and the material underneath was soft.

srk consulting	Teck	2023 Annual Facility Performance Review **North Embankment**
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023 | Approved: PHM | Figure: **A-11**

Photo SRS-01: Rock cofferdam seen from the west. The water appears to be clear.

Photo SRS-02:Transverse crack across the dam crest approximately 1m east of the spillway seen from downstream.

srk consulting	Teck	2023 Annual Facility Performance Review		
		Sediment Retaining Structure		
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023	Approved: PHM	Figure: **A-12**

Photo SRS-03: Sediment accumulation in the spillway outlet seen from the east margin of the spillway.

Photo SRS-04:The crest east of the spillway is lower in elevation compared to the west crest of the spillway with visible deformation observable on the upstream slope

srk consulting	Teck	2023 Annual Facility Performance Review **Sediment Retaining Structure**		
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023	Approved: PHM	Figure: **A-13**

Photo SRS-05: Slough present on the downstream slope.

Photo SRS-06:Slough seen from downstream position. The slough is away from the spillway and the ponded water area, and approximately 8 meters from the east abutment.

srk consulting	Teck	2023 Annual Facility Performance Review **Sediment Retaining Structure**
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023 | Approved: PHM | Figure: **A-14**

Photo TC-01: Ponded water 1/2.

Photo TC-02:Ponded water 2/2.

srk consulting	Teck	2023 Annual Facility Performance Review **Tailings Cover Area**
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023 | Approved: PHM | Figure: **A-15**

Photo TC-03: Main drainage channel flowing normally.

Photo TC-04:Main drainage channel area with ponded water (no positive gradient)

srk consulting	Teck	2023 Annual Facility Performance Review **Tailings Cover Area**
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023 | Approved: PHM | Figure: **A-16**

Photo TC-05: Scarification oriented parallel to the main drainage channel impeding drainage

Photo TC-06: Vegetation is developing over the area, being less dense in the center. Photo taken from the North Embankment.

Photo TC-07: Erosion gully observed near the south end of the main tailings area. Unchanged since 2022

Photo TC-08: Vegetation is developing over the area, being less dense in the center. Photo taken from the North Embankment.

srk consulting	Teck	2023 Annual Facility Performance Review **Tailings Cover Area**
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023 | Approved: PHM | Figure: **A-18**

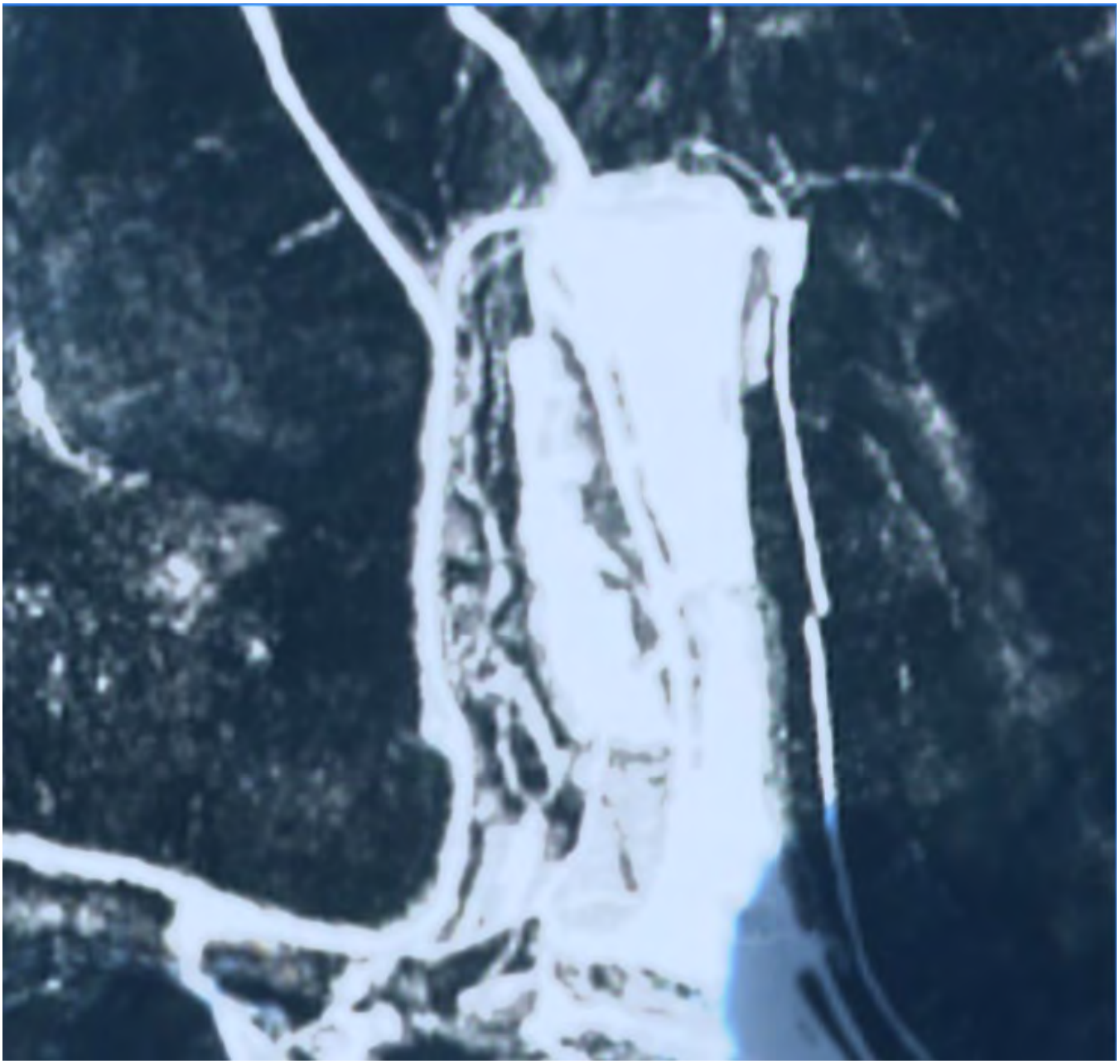
Photo NDC-01: Slippage of the riprap immediately upstream the channel outlet.

srk consulting	Teck	2023 Annual Facility Performance Review
		North Drainage Channel
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023 / Approved: PHM / Figure: **A-19**

Photo NDC-02: Erosion gully immediately to the west of the riprap movement area.

srk consulting	Teck	2023 Annual Facility Performance Review		
		North Drainage Channel		
Job No: CAPR002559 Filename: SDH_2023_AFPR_Photolog.pptx	Sa Dena Hes	Date: July 2023	Approved: PHM	Figure: **A-20**

Appendix C Satellite Imagery

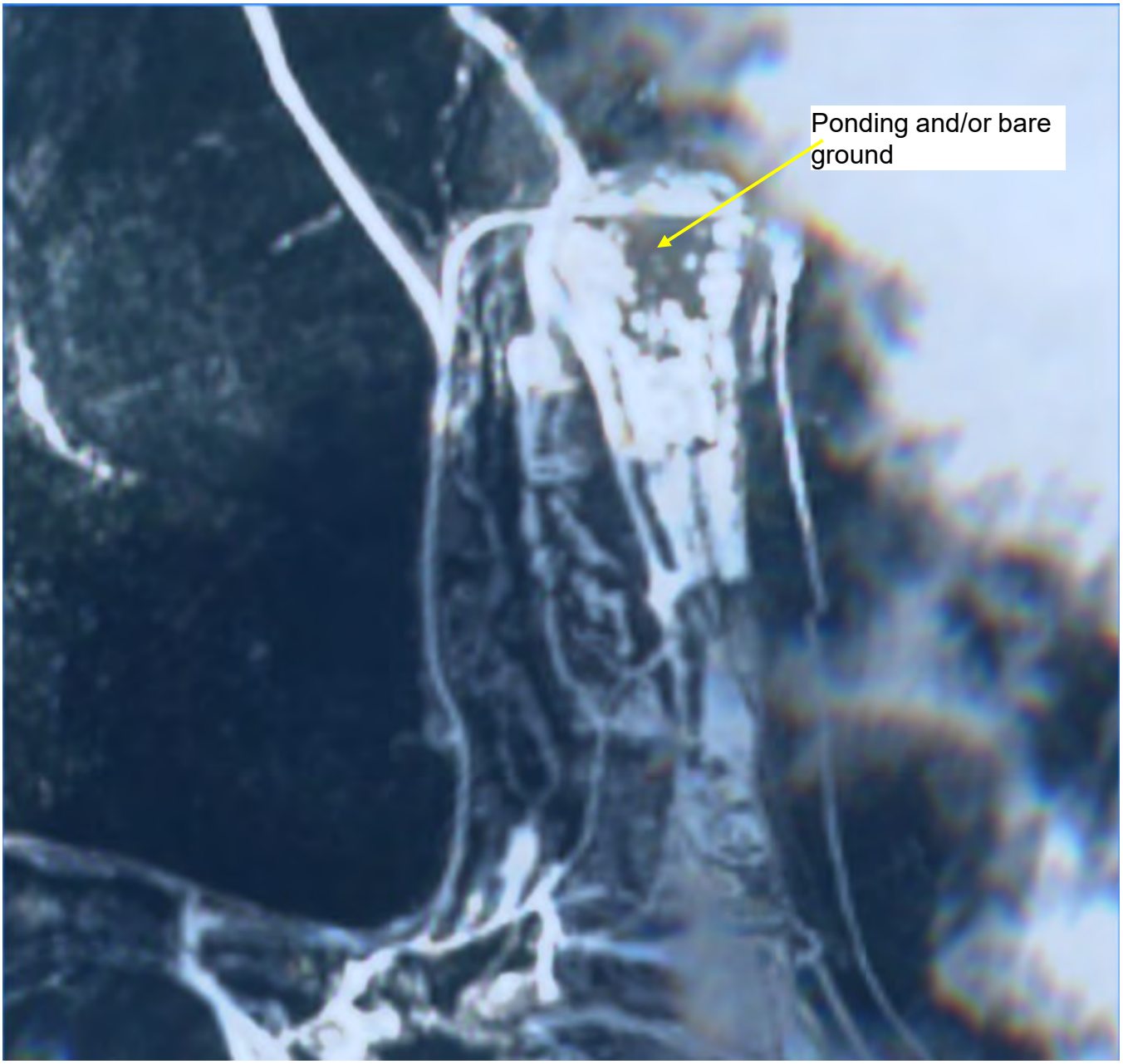


Notes:
1. Sentinal-2 L2A, true colour.
2. Imagery obtained from Copernicus Open Access Hub.

srk consulting	Teck	Satellite Imagery		
		May 5, 2023		
Job No: CAPR002559 Filename: Figures_SDH-NorthDam_Satellite.pptx	Sa Dena Hes	Date: July 2023	Approved: P. Mikes	Figure: B-1

Notes:
1. Sentinal-2 L2A, true colour.
2. Imagery obtained from Copernicus Open Access Hub.

srk consulting	Teck	Satellite Imagery
		May 10, 2023
Job No: CAPR002559 Filename: Figures_SDH-NorthDam_Satellite.pptx	Sa Dena Hes	Date: July 2023 / Approved: P. Mikes / Figure: **B-2**



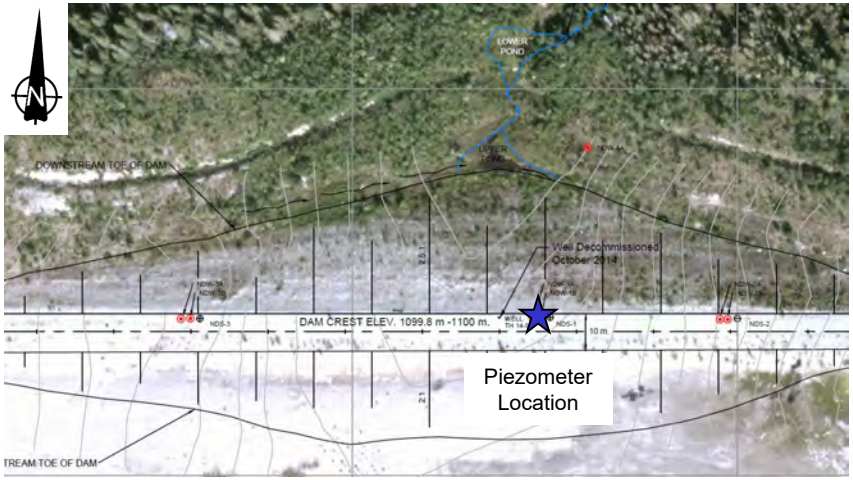
Notes:
1. Sentinal-2 L2A, true colour.
2. Imagery obtained from Copernicus Open Access Hub.

srk consulting	Teck	Satellite Imagery
		May 13, 2023
Job No: CAPR002559 Filename: Figures_SDH-NorthDam_Satellite.pptx	Sa Dena Hes	Date: July 2023 / Approved: P. Mikes / Figure: **B-3**

Notes:
1. Sentinal-2 L2A, true colour.
2. Imagery obtained from Copernicus Open Access Hub.

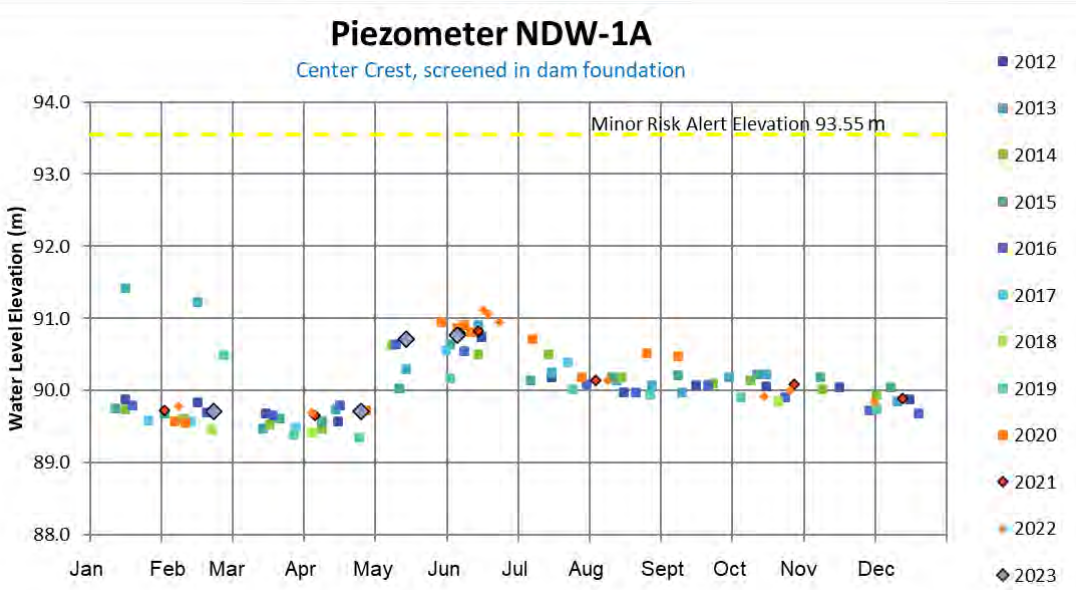
srk consulting	Teck	Satellite Imagery
		May 15, 2023
Job No: CAPR002559 Filename: Figures_SDH-NorthDam_Satellite.pptx	Sa Dena Hes	Date: July 2023 / Approved: P. Mikes / Figure: **B-4**

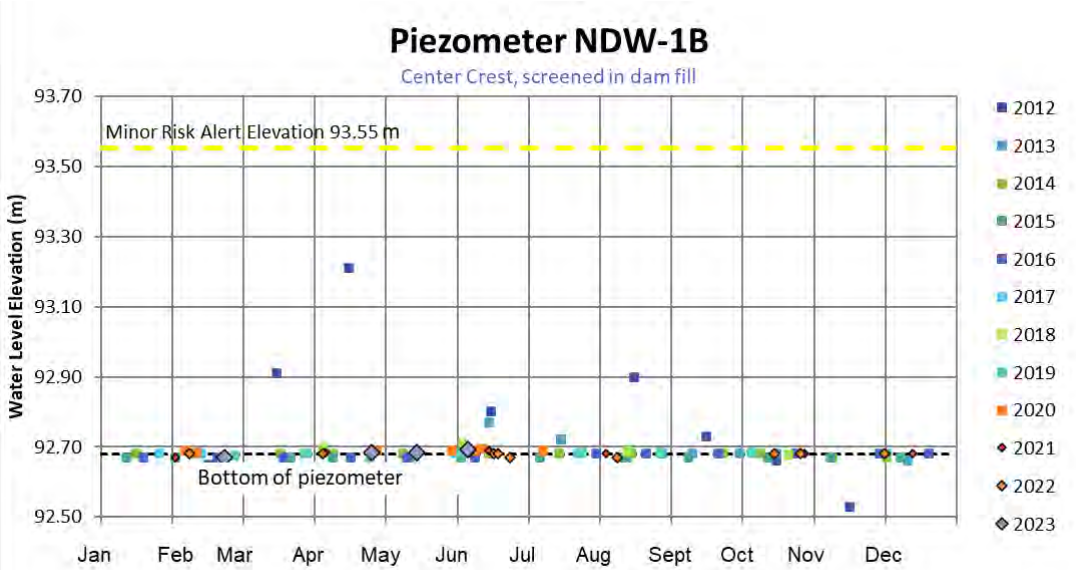
Appendix D Instrumentation Data



Notes:

1. Orthographic Photo depicts the pre-decommissioned surface on August 12, 2012
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.





Source File:
https://srk.sharepoint.com/:x:/r/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2023Edition.xlsx

srk consulting

Teck

North Dam Instrumentation

North Dam Piezometers NDW-1A and NDW-1B

Job No: CAPR002559

Filename: Figures_ND_Piezometers_CAPR002559.pptx

Sa Dena Hes

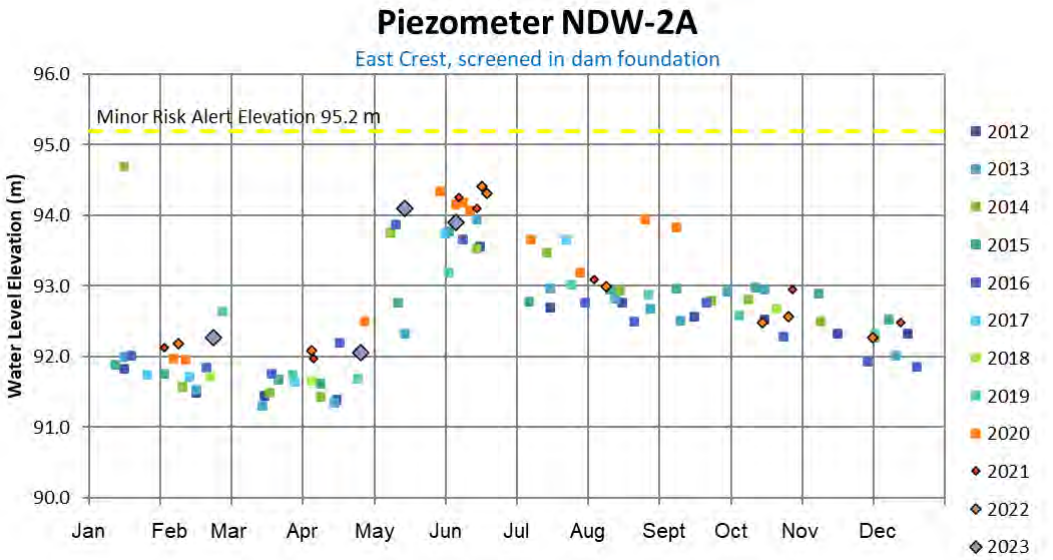
Date: July 2023

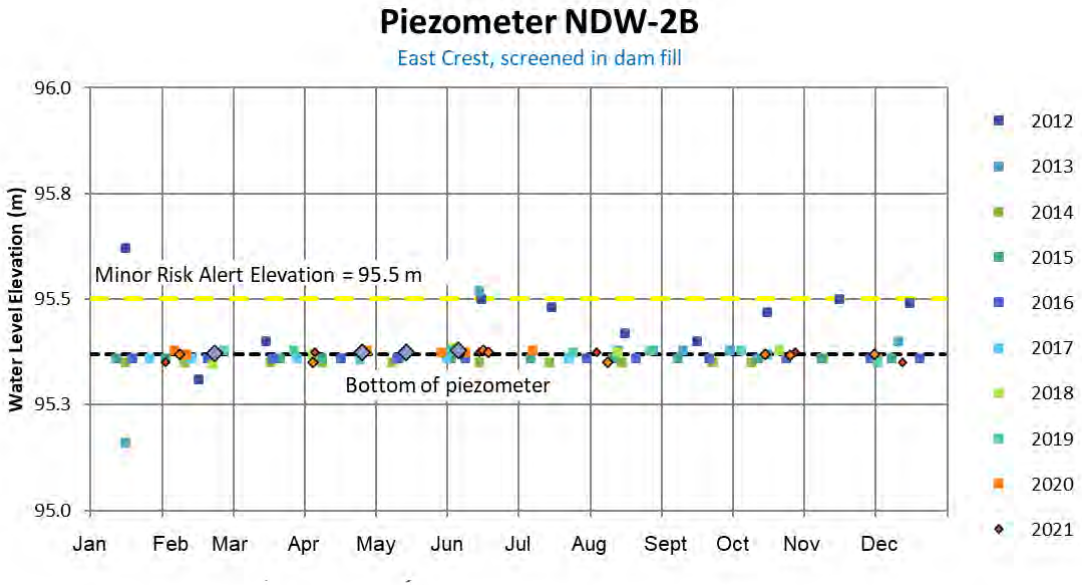
Approved: P. Mikes

Figure: **C-1**

Notes:

1. Orthographic Photo depicts the pre-decommissioned surface on August 12, 2012
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.





Source File:
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srk consulting

Teck

North Dam Instrumentation

North Dam Piezometers NDW-2A and NDW-2B

Job No: CAPR002559

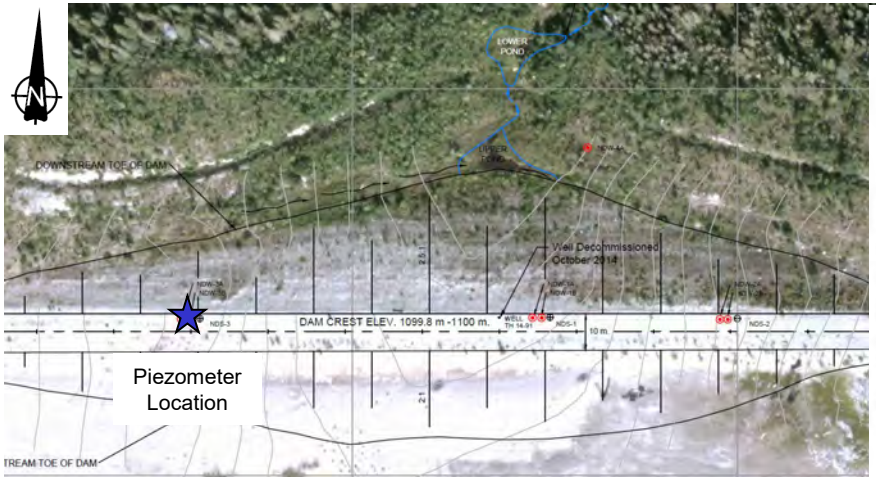
Filename: Figures_ND_Piezometers_CAPR002559.pptx

Sa Dena Hes

Date: July 2023

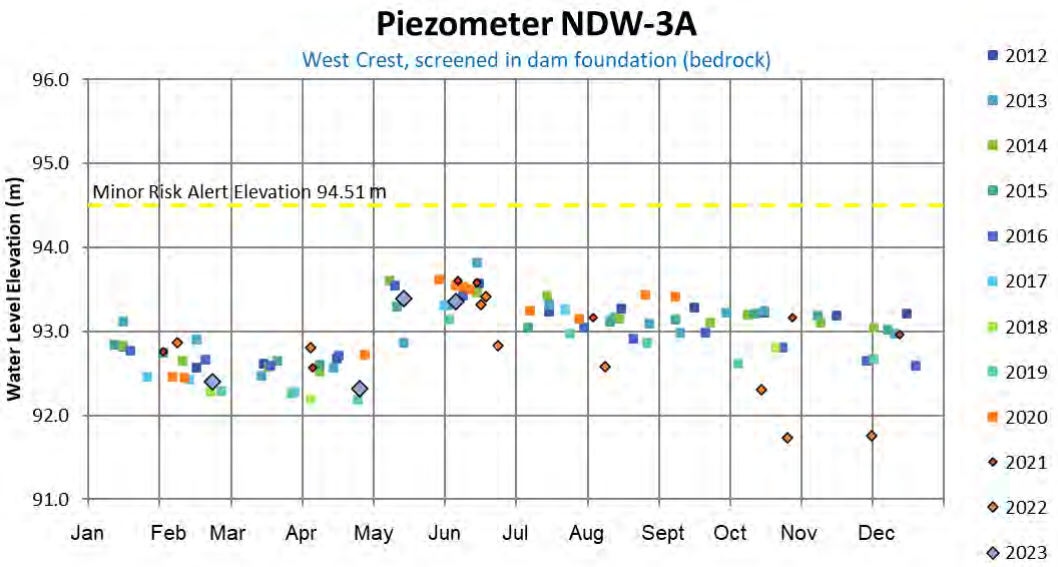
Approved: P. Mikes

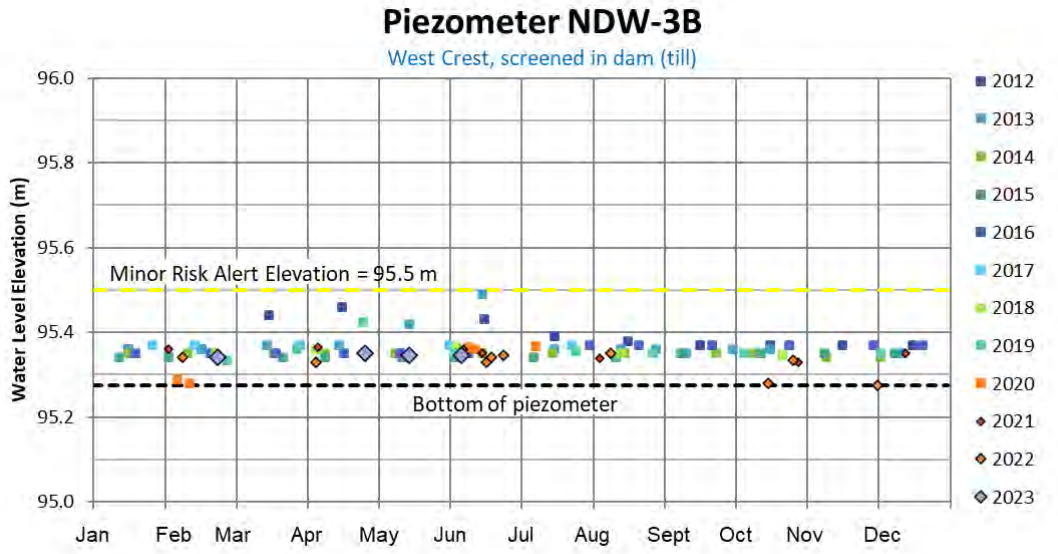
Figure: **C-2**



Notes:

1. Orthographic Photo depicts the pre-decommissioned surface on August 12, 2012
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.





Source File:
https://srk.sharepoint.com/:x:/r/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2023Edition.xlsx

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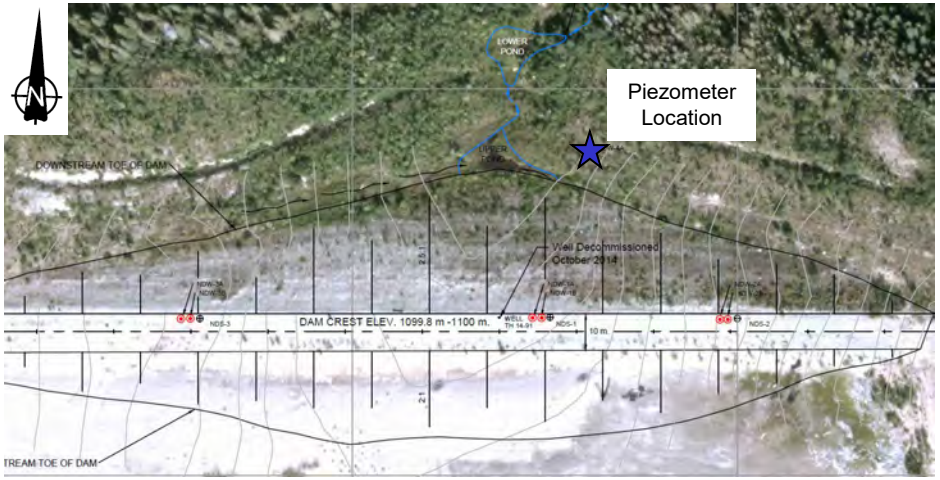
North Dam Instrumentation

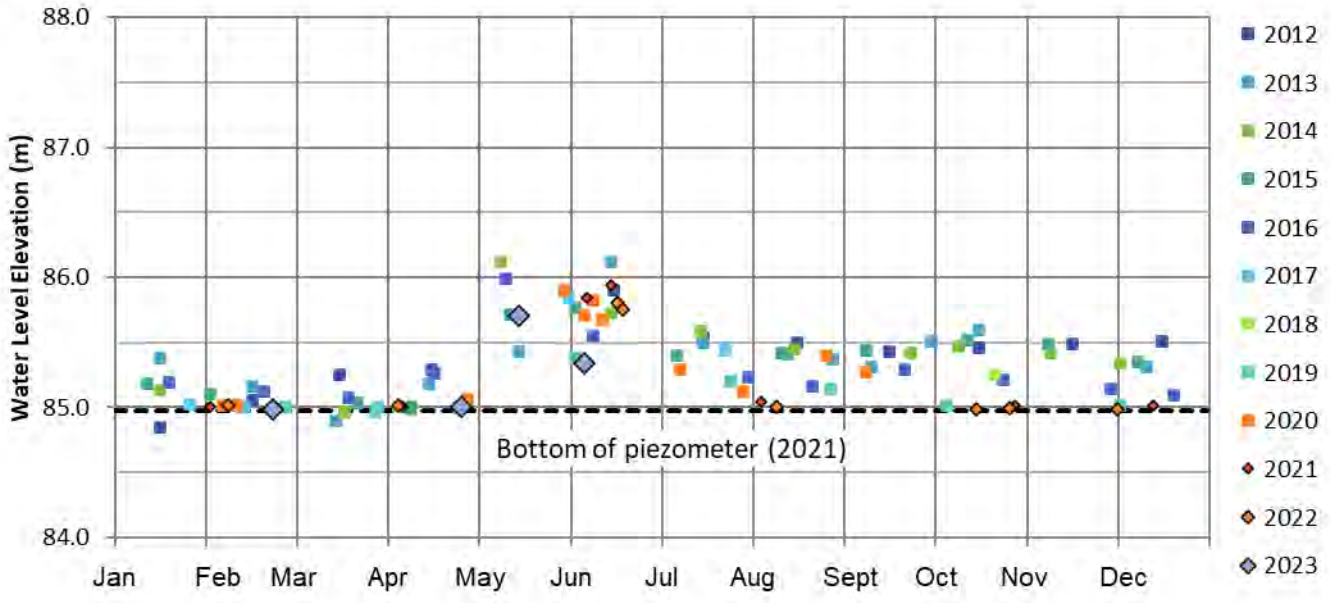
North Dam Piezometers NDW-3A and NDW-3B

Job No: CAPR002559	Sa Dena Hes	Date: July 2023	Approved: P. Mikes	Figure: **C-3**
Filename: Figures_ND_Piezometers_CAPR002559.pptx				



Notes:

1. Orthographic Photo depicts the pre-decommissioned surface on August 12, 2012
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.



Source File:
https://srk.sharepoint.com/:x:/r/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2023Edition.xlsx

srk consulting

Teck

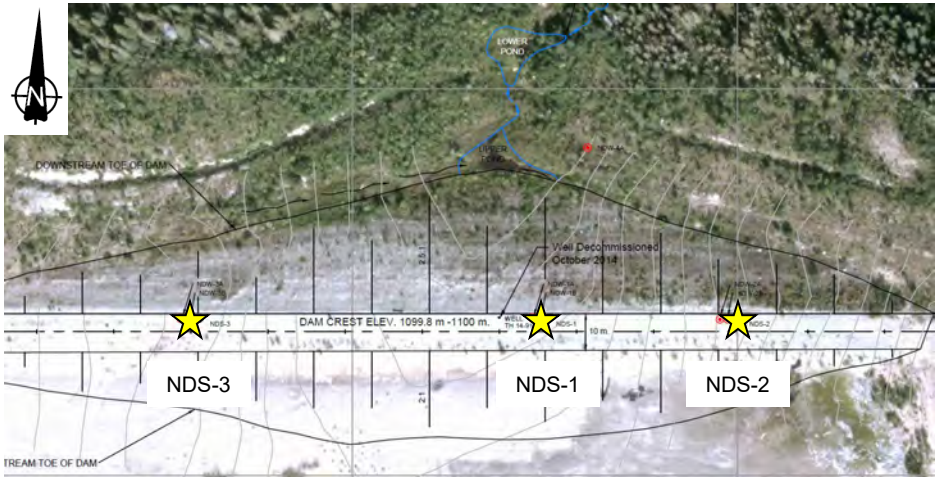
North Dam Instrumentation

North Dam Piezometers
NDW-4A

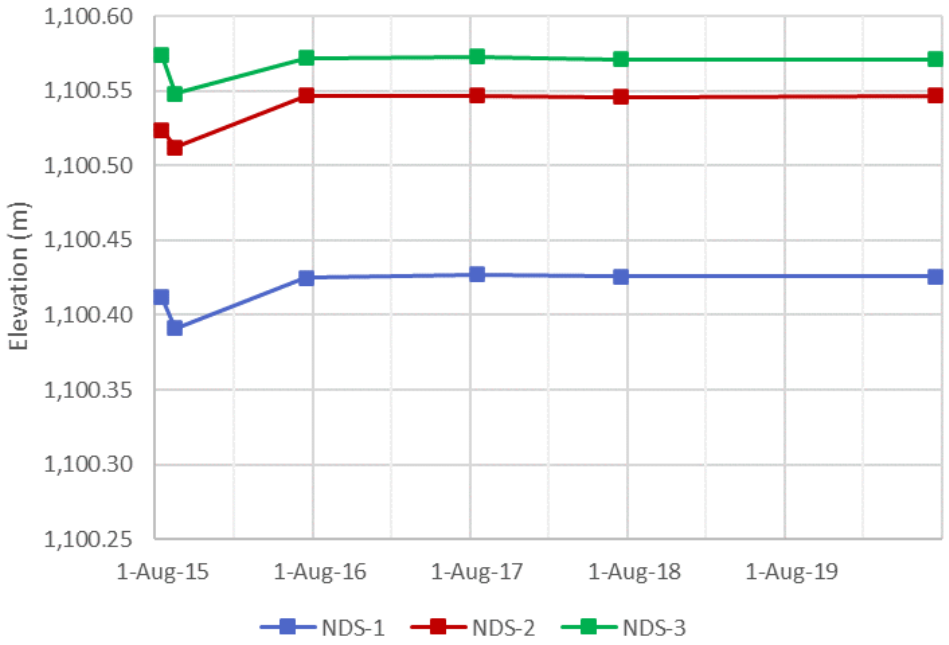
Job No: CAPR002559
Filename: Figures_ND_Piezometers_CAPR002559.pptx

Sa Dena Hes

Date: July 2023
Approved: P. Mikes
Figure: **C-4**



Notes:
1. Orthographic Photo depicts the pre-decommissioned surface on August 12, 2012
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.



Threshold Criteria (masl)

	Acceptable	Warning	Alarm
NDS-1	1,100.425	1,100.375	1,100.325
NDS-2	1,100.545	1,100.495	1,100.445
NDS-3	1,100.570	1,100.520	1,100.470

Elevation Readings

	Settlement Pins			
Date	NDS-1	NDS-2	NDS-3	Notes
6-Aug-15	1,100.412	1,100.524	1,100.574	
10-Sep-15	1,100.391	1,100.512	1,100.548	
1-Jul-16	1,100.425	1,100.547	1,100.572	2016 and onward readings are relative to BM 103
1-Aug-17	1,100.427	1,100.547	1,100.573	
25-Jul-18	1,100.426	1,100.546	1,100.571	
24-Jul-20	1,100.426	1,100.547	1,100.571	

Source File:
https://srk.sharepoint.com/:x:/r/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2023Edition.xlsx

srk consulting

Job No: CAPR002559
Filename: Figures_ND_Piezometers_CAPR002559.pptx

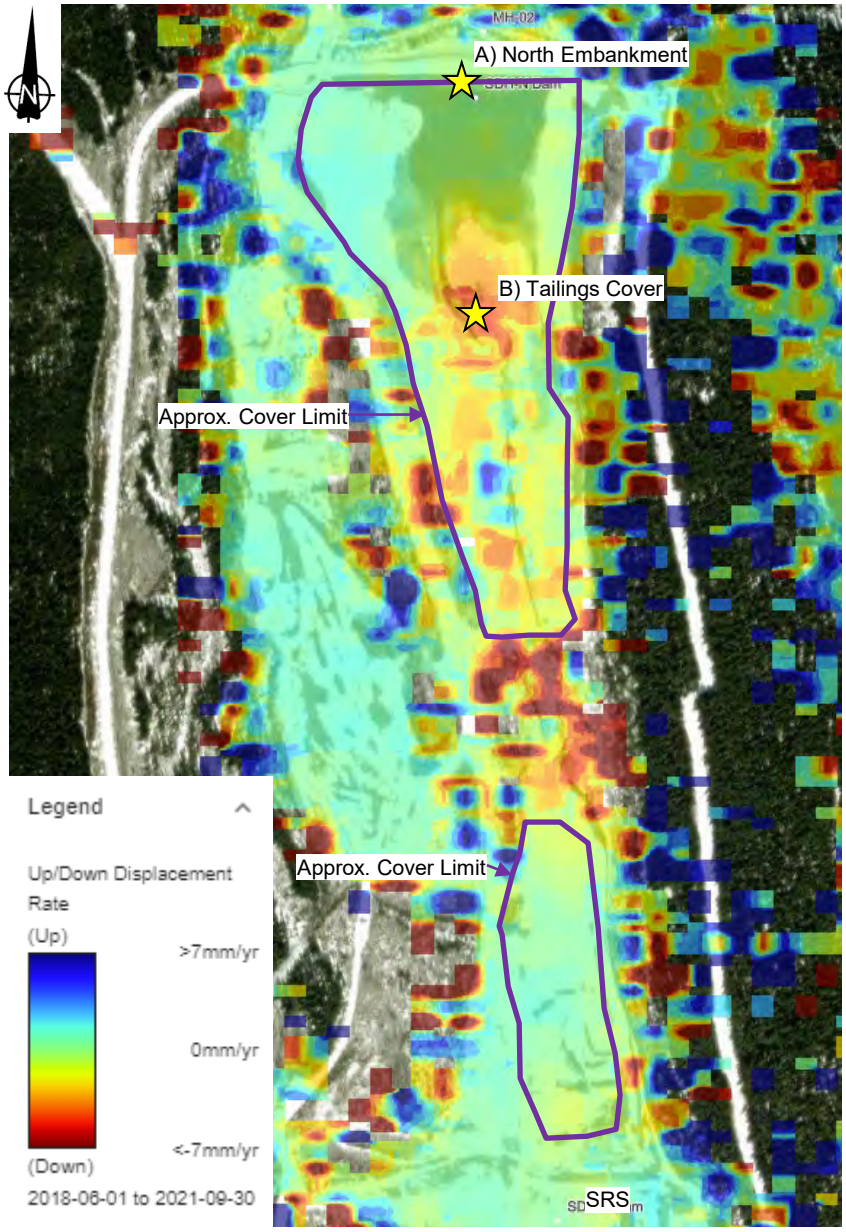
Teck

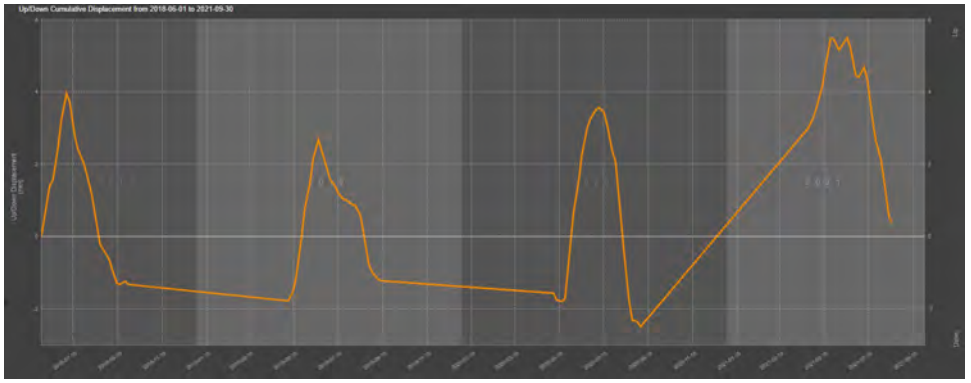
Sa Dena Hes

North Dam Instrumentation

North Dam Settlement Pins

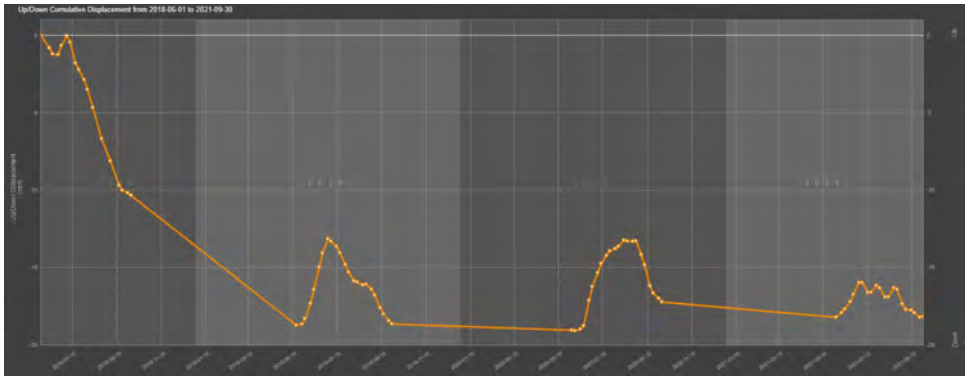
Date: July 2023
Approved: P. Mikes
Figure: **C-5**





A) North Embankment:

1. Graph shows cumulative displacement on the crest during snow-free months between June 2018 and September 2021.
2. Data indicates a ~ 6 mm seasonal fluctuation due to freeze/thaw effects with no apparent movement detected.

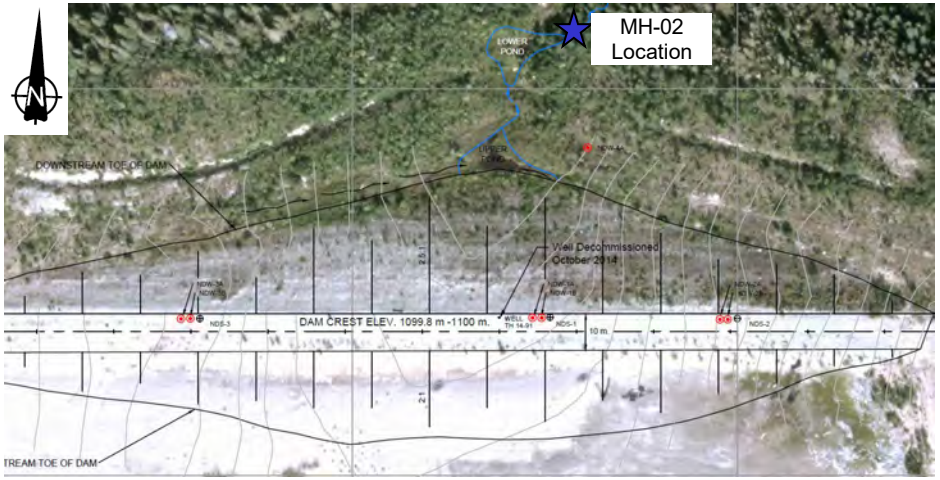


B) Tailings Cover

1. Graph shows cumulative displacement on the crest during snow-free months between June 2018 and September 2021.
2. Data shows an approximate 10 mm displacement between 2018 and 2019, with no apparent movement since other than a seasonal fluctuation due to freeze/thaw effects.

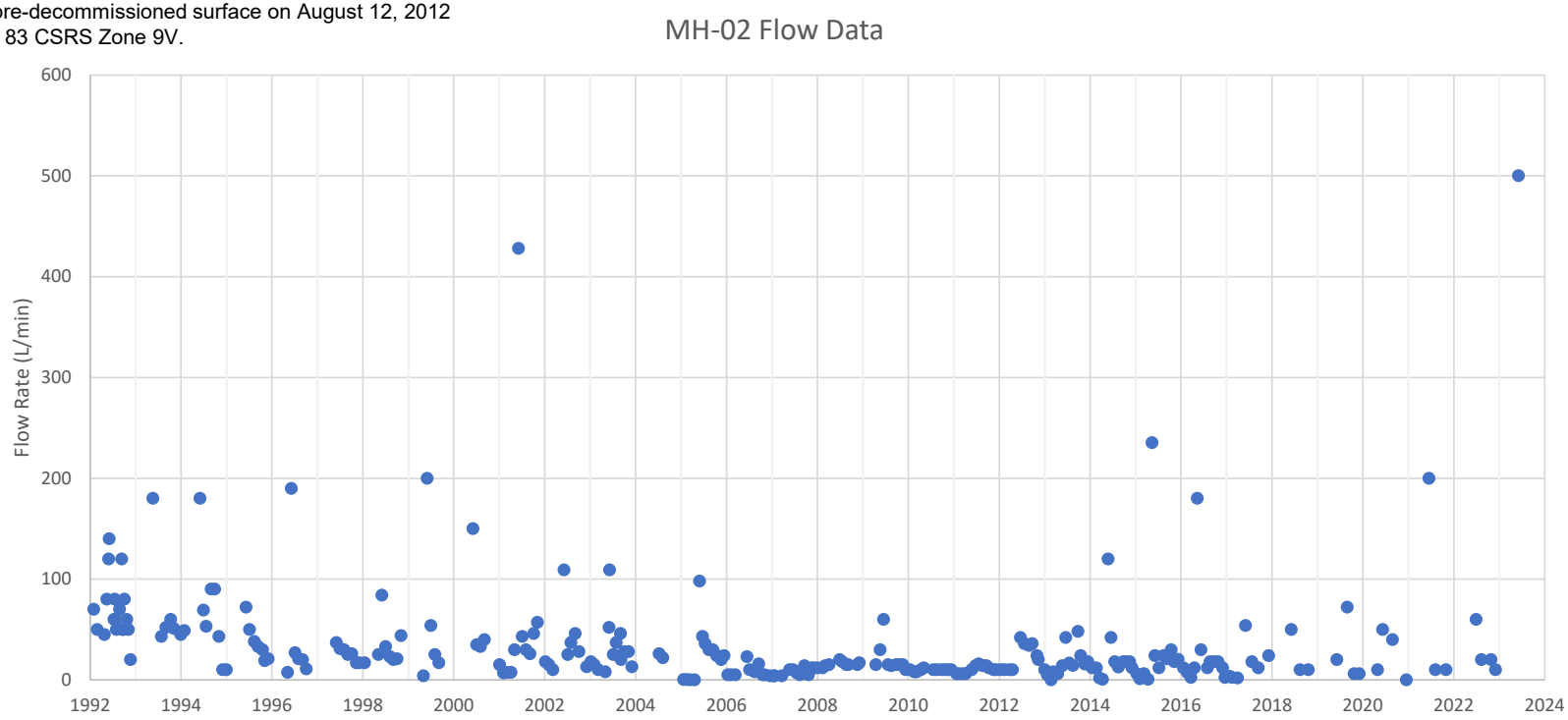
Source:
https://motionary.3vgeomatics.com

srk consulting	Teck	North Dam Instrumentation
Job No: CAPR002559 Filename: Figures_ND_Piezometers_CAPR002559.pptx	Sa Dena Hes	**InSAR Displacement Data – June 2018 to Sept. 2021**
		Date: July 2023 / Approved: P. Mikes / Figure: **C-6**



Notes:

1. Orthographic Photo depicts the pre-decommissioned surface on August 12, 2012
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.



Source File:
https://srk.sharepoint.com/sites/FS261/Internal/Monitoring%20Data/MH-02_Seepage_Flow.xlsx?web=1

srk consulting	Teck	North Dam Instrumentation
		MH-02 Flow Data
Job No: CAPR002559 Filename: Figures_ND_Piezometers_CAPR002559.pptx	Sa Dena Hes	Date: July 2023 / Approved: P. Mikes / Figure: **C-7**

Appendix E Routine Inspection Forms

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00007

General Information

Inspected By:
Jeff Basarich

Jewel Box

Jewelbox Soil Caps

Date:
13/10/2022

General Appearance
Few deepening rills and slumping on hillside below old capped portal

Erosion
Deepening of erosion at top end of road onto cap.

Settlement/Depressions
Slumping below portal area

Standing Water
No Issues

Vegetation
Slowly developing greenish hue over entire area, indicating grass & plant growth.

Waste Rock Dumps

Cracks/Scarps
No Issues

Susidence
No Issues

Erosion
None out of the ordinary

Seeps
No Issues

Jewel Box Photo's

No.
00007

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
North Dam erosion		
Repairs in progress		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Repairs completed		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Seeding and placement of jute erosion controls		

Sa Dena Hes Mine Site Geotechnical Inspection

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Photo Discription	Photo	Photo Location
Jute placement		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Dam repairs tidied up		

Sa Dena Hes Mine Site Geotechnical Inspection

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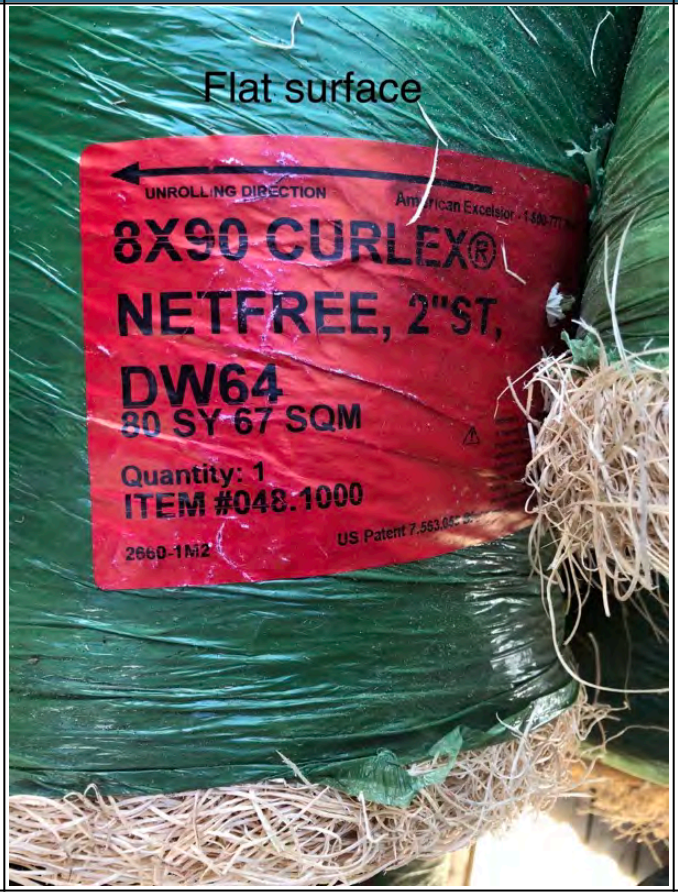
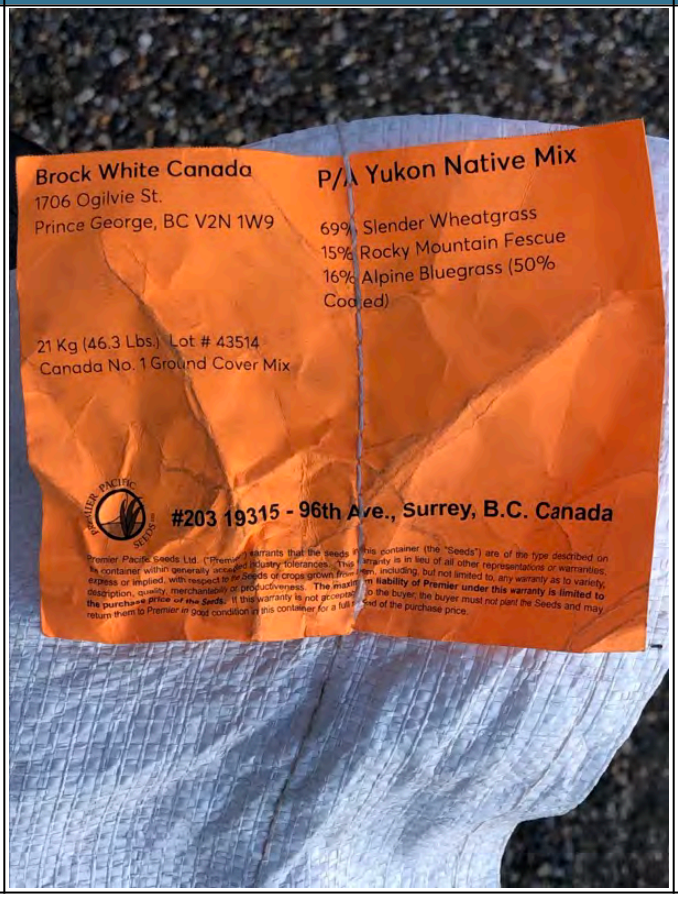
Photo Discription	Photo	Photo Location
Curlex fiber used for flat area of dam crest		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Seed mix used- ordered from Brock White Construction Materials (Prince George)		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Staples/pegs for holding jute in place ineffective and very difficult to pound into rocky soils. Used 6-8”spikes with large fender washers. Worked very well and cut installation time by 3/4 at least.(ie.- 5 mins to push, straighten, adjust factory staples v/s 30 seconds to hammer in a spike). Spikes feel much more secure.		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Curlex fiber placed		
Curlex fiber October 15, 2022-secured by snow		

Sa Dena Hes Mine Site Geotechnical Inspection

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Photo Discription	Photo	Photo Location
Jute used- manufacturers tag, designed for steeper slopes 1.5/1		

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Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Piezometer NDW-4A - plastic casing cut off inside outer steel casing to allow for casing lid to close. Holes drilled in steel casing to allow water to drain. New casing measurement to well bottom is 3.11m		

Sa Dena Hes Mine Site Geotechnical Inspection

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Photo Discription	Photo	Photo Location
Draining NDW-4A		

Sa Dena Hes Mine Site Geotechnical Inspection

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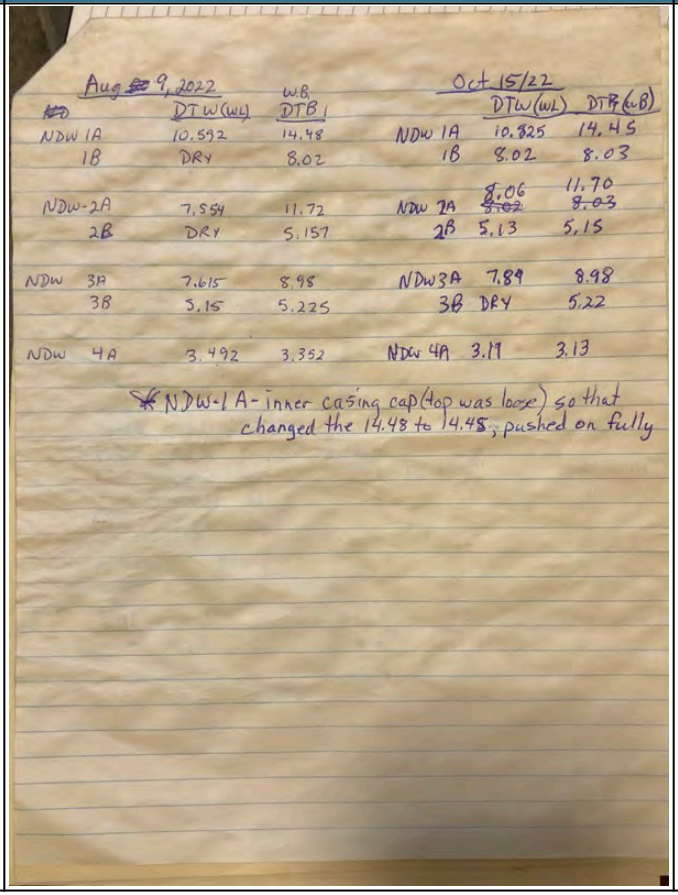
Photo Discription	Photo	Photo Location
Piezometer readings-Aug 9 & Oct 15		

Aug 9, 2022

	DTW (WL)	W.B. DTB
NDW 1A	10.592	14.48
1B	DRY	8.02
NDW-2A	7.554	11.72
2B	DRY	5.157
NDW 3A	7.615	8.98
3B	5.15	5.225
NDW 4A	3.492	3.352

Oct 15/22

	DTW (WL)	DTB (W.B)
NDW 1A	10.825	14.45
1B	8.02	8.03
NDW 2A	~~8.02~~ 8.06	~~8.03~~ 11.70
2B	5.13	5.15
NDW3A	7.89	8.98
3B	DRY	5.22
NDW 4A	3.19	3.13

* NDW-1A - inner casing cap (top was loose) so that changed the 14.48 to 14.45, pushed on fully

North Pond Cap

Date:
13/10/2022

Settlement/Depressions
No Issues

Vegetation
No Issues

General Appearance
Willow growth doing great. A few areas are sparse

Standing Water
Minimal ponding of shallow water. Clean leaves

Drainage Swale

Sa Dena Hes Mine Site Geotechnical Inspection

where seedling plugs were not put in correctly or frost jacked up.

Erosion

No Issues

and silty deposits by hand to enhance the flow.

Evaporite Salts

No Issues

Very slight slope but draining as well as possible. Clean silted in areas by hand. Will need to fill a few puddling areas along edge of tailings cap and upstream crest of dam.

North Pond Photo's

Photo Discription	Photo	Photo Location
North pond cap		
After repairs completed		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Center drainage swale		

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Mid way of drainage swale		

Sa Dena Hes Mine Site Geotechnical Inspection

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Photo Discription	Photo	Photo Location
Looking towards North dam from Old Coffer dam, North pond soil cap		

South Pond Cap

Date:
13/10/2022

General Appearance
No Issues

Erosion
No Issues

Settlement/Depressions
No Issues

Standing Water
Shallow ponding caused by springs along the lower North East side of South pond soil cap, 100m above SRS. No change.

Evaporite Salts
No Issues

Vegetation
No Issues

Drainage Swale
No Issues

South Pond Photo's

Sa Dena Hes Mine Site Geotechnical Inspection

No.
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Photo Discription	Photo	Photo Location
South pond soil cap		
Ponded area on soil cap		

North Diversion Channel

Date:

Riprap

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00007

14/10/2022

No Issues

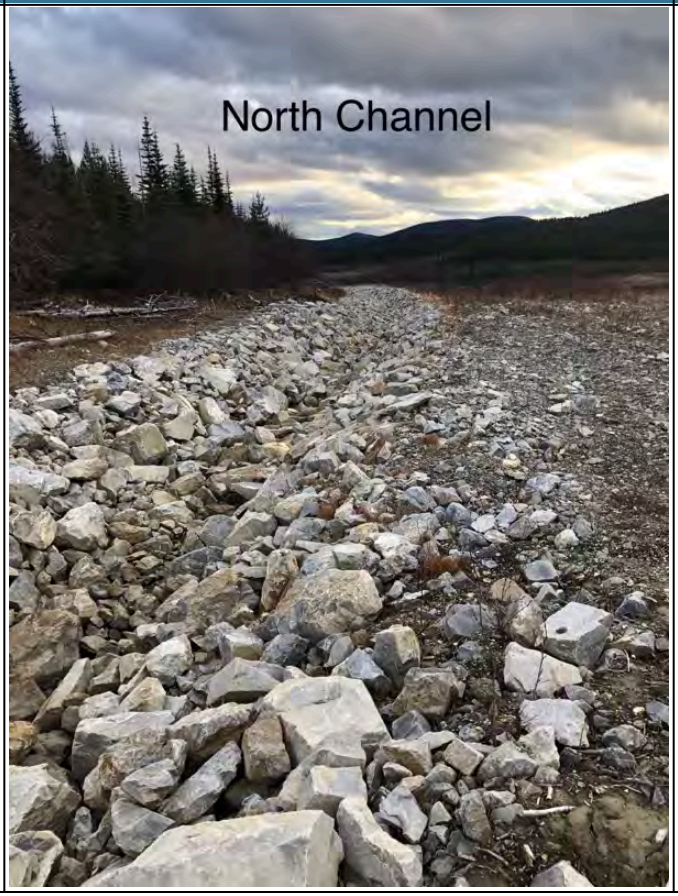
Slideslopes

No Issues

Debris

No Issues

North Diversion Photo's

Photo Discription	Photo	Photo Location
North channel		

Sediment Retaining Structure (SRS)

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00007

Date:
14/10/2022

Depth of water at spillway
Level with bottom of rip rap

Sloughing of spillway slopes
No Issues

Spillway riprap
No Issues

Debris at spillway inlet
No Issues

Erosion
No Issues

Settlement/Depressions
Settlement at lower West edge of SRS riprap

Sinkholes
No Issues

Cracks/Movement
Vertical cracking on downstream face about 30cm from edge of riprap

Debris
No Issues

Vegetation
No Issues

Downstream Toe Seepage
Historic spring at toe seems less than normal

East Hillside Seepage
Seasonally less seepage present

SRS Photo's

No.
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Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
SRS pond		

Sa Dena Hes Mine Site Geotechnical Inspection

No.
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Photo Discription	Photo	Photo Location
Slump at bottom west side of riprap, vertical cracking along downstream riprap, under jute matting.		

South Drainage Channel

Date:
13/10/2022

Slideslopes
No Issues

Riprap
No Issues

Debris
No Issues

South Drainage Photo's

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00007

Photo Discription	Photo	Photo Location
South channel		

Camp Creek Drainage Channel

Date:
14/10/2022

Slideslopes
No Issues

Riprap
No Issues

Debris
No Issues

Camp Creek Photo's

Sa Dena Hes Mine Site Geotechnical Inspection

No.
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Photo Discription	Photo	Photo Location
Reclaim area from Osprey nest.		

Sign:

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

General Information

Inspected By:
Jeff Basarich

Jewel Box

Jewelbox Soil Caps

Date:
27/05/2023

General Appearance
Erosion channels slightly deeper in some areas, generally standing up well.

Erosion
Several new shallow(30cm)erosion channels throughout face/slope of waste rock dump.

Settlement/Depressions
Several new slumps up to 1.2m deep, downstream slope.

Standing Water
No Issues

Vegetation
No Issues

Waste Rock Dumps

Cracks/Scarps
No Issues

Susidence
Slumps

Erosion
Several shallow erosion channels, up to 40cm on down stream slope, much more pronounced at base of slope.

Seeps
No flow from portal drains

Jewel Box Photo's

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

27/05/2023

No Issues

No Issues

Ponded Water

Shallow pond 35m from crest along west hillside.

Cracks/Movement

No Issues

Erosion

No Issues

Vegetation

No Issues

North Dam Photo's

Photo Discription	Photo	Photo Location
Snow remaining on Dam face		Latitude: 60.538708 Longitude: -128.854263

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

Photo Discription	Photo	Photo Location
Toe seepage clear		

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

Photo Discription	Photo	Photo Location
Dam crest		Latitude: 60.538776 Longitude: -128.856277
Dam downstream face		Latitude: 60.538902 Longitude: -128.855942

North Pond Cap

Date:

Settlement/Depressions

Vegetation

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

27/05/2023

General Appearance
No Issues

Erosion
New erosion rills from east hillside to swale. Approx. mid way downstream along swale.

Minor settlement mid way beside Drainage swale.

Standing Water
No Issues

Evaporite Salts
No Issues

No Issues

Drainage Swale
Minor pooling approximately 250m downstream of crest.

North Pond Photo's

Photo Discription	Photo	Photo Location
Soil cap		Latitude: 60.538754 Longitude: -128.856277

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Drainage swale#1		Latitude: 60.538795 Longitude: -128.854019
Settlement-approx20cm deep, along drainage swale.		Latitude: 60.536350 Longitude: -128.852524

Teck

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

Photo Discription	Photo	Photo Location
Ponding NE corner along hillside		
Looking South mid way down drainage swale		Latitude: 60.536198 Longitude: -128.852844

No.
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Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Erosion from east hillside area		Latitude: 60.535511 Longitude: -128.852676

No.
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Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Depth of erosion approximately 40cm		Latitude: 60.535515 Longitude: -128.851822

Teck

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

Photo Discription	Photo	Photo Location
Hillside seepage from East hillside. Appears to be a very small boil.		Latitude: 60.535442 Longitude: -128.851990

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
East hillside seepage, slight organic residue.		Latitude: 60.535351 Longitude: -128.852036

No.
00009

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Flow path from North pond past old coffer dam, into wetland.		Latitude: 60.533981 Longitude: -128.852539

Sa Dena Hes Mine Site Geotechnical Inspection

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Photo Discription	Photo	Photo Location
Ponding along West hillside,		Latitude: 60.537048 Longitude: -128.855911

South Pond Cap

Date:
28/05/2023

General Appearance
No issues

Erosion
No Issues

Settlement/Depressions
No Issues

Standing Water
No Issues

Evaporite Salts
No Issues

Vegetation
Regrowth significantly slower on Northern 1/2 of soil cap

Drainage Swale
No Issues

South Pond Photo's

No.
00009

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Vegetation Regrowth near photo hub #2 , south cap, significantly slower than the rest of the S. pond		Latitude: 60.531151 Longitude: -128.852432
South pond cap		Latitude: 60.531105 Longitude: -128.852417

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Seep from Under North channel, area that was previously repaired.		Latitude: 60.530457 Longitude: -128.850510
Looking South west across South pond cap		Latitude: 60.530281 Longitude: -128.850525

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Looking West across S. pond . Erosion channel in center of pond cap slightly larger.. Hillside seeps from East hillside , travel under North Channel.		Latitude: 60.529957 Longitude: -128.850128
Erosion channel, center of south pond cap, to SRS.		Latitude: 60.529793 Longitude: -128.851578

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
West hillside seepage onto S pond cap and into the SRS.		Latitude: 60.529854 Longitude: -128.852615
West hillside seepage flow towards SRS		Latitude: 60.529869 Longitude: -128.852692

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

Photo Discription	Photo	Photo Location
Erosion of South pond cap, from west hillside seepage. Minor ponding 15cm deep		Latitude: 60.529606 Longitude: -128.852280

North Diversion Channel

Date:
28/05/2023

Slideslopes
No Issues

Riprap
No Issues

Debris
No Issues

North Diversion Photo's

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

Photo Discription	Photo	Photo Location
Looking upstream of N Channel.		Latitude: 60.530170 Longitude: -128.850143

Sa Dena Hes Mine Site Geotechnical Inspection

No.
00009

Photo Discription	Photo	Photo Location
Looking South, downstream, North Channel into SRS		Latitude: 60.529945 Longitude: -128.850464

Sediment Retaining Structure (SRS)

Date:
28/05/2023

Depth of water at spillway
Bottom of riprap, flowing under riprap.

Sloughing of spillway slopes
No Issues

Spillway riprap
No Issues

Debris at spillway inlet
Few boards, removed.

Erosion
No Issues

Settlement/Depressions
1m x1m settlement West side , lower downstream slope of SRS.

Sinkholes
No Issues

Cracks/Movement
Vertical cracks that have been present along sides of downstream riprap appear to be silting in.

Debris
No Issues

Vegetation
Significant mossy/weed growth covering bottom of SRS pond.

Downstream Toe Seepage
Does not appear to be from toe. Appears to be from East hillside running parallel to toe.

East Hillside Seepage
Yes

SRS Photo's

No.
00009

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Looking East across SRS		Latitude: 60.528877 Longitude: -128.851196
Looking North across SRS		Latitude: 60.528679 Longitude: -128.850418

No.
00009

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Debris removed from SRS drainage channel		Latitude: 60.528576 Longitude: -128.850891

No.
00009

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Historic small spring near toe of SRS has stopped. Seepages from East hillside along downstream toe of SRS.		Latitude: 60.528706 Longitude: -128.849976
Looking N/W across SRS		Latitude: 60.528793 Longitude: -128.849594

Sa Dena Hes Mine Site Geotechnical Inspection

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Photo Discription	Photo	Photo Location
Settlement lower, west side , downstream SRS face		Latitude: 60.528580 Longitude: -128.850906

South Drainage Channel

Date:
28/05/2023

Slideslopes
No Issues

Riprap
No Issues

Debris
No Issues

No.
00009

Sa Dena Hes Mine Site Geotechnical Inspection

South Drainage Photo's

Photo Discription	Photo	Photo Location
Downstream flow		Latitude: 60.528767 Longitude: -128.850372

No.
00009

Sa Dena Hes Mine Site Geotechnical Inspection

Photo Discription	Photo	Photo Location
Hillside seepage- West side of Lower Camp Cr.		Latitude: 60.525085 Longitude: -128.847153

Sign: