

Final

2022 Annual Facility Performance Review

Sä Dena Hes Mine, Yukon Territory
Teck Resources Limited



SRK Consulting (Canada) Inc. ■ CAPR001928 ■ November 2022



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Prepared for:

Teck Resources Limited
601 Knighton Road
Kimberley, BC, V1A 3E1
Canada

+1 250 427 8413
www.teck.com

Prepared by:

SRK Consulting (Canada) Inc.
1066 West Hastings Street, Suite 2200
Vancouver, BC V6E 3X2
Canada

+1 604 681 4196
www.srk.com

Lead Author: Peter Mikes, P.Eng. **Initials:** PHM
Reviewer: John Kurylo, P.Eng **Initials:** JBK

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The Teck logo, consisting of the word "Teck" in a bold, black, sans-serif font.

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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 Review
ALARP	As Low As Reasonably Practical
AMECFW	AMEC Foster Wheeler
CDA	Canadian Dam Association
DDRP	Detailed Decommissioning Reclamation Plan
DSR	Dam Safety Review
EOR	Engineer of Record
FOS	Factor of Safety
GISTM	Global Industry Standard on Tailings Management
HSRC	Health, Safety and Reclamation Code
IDF	Inflow Design Flood
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
SRS	Sediment Retaining Structure
TARP	Trigger Action Response Plan
TMA	Tailings Management Area
WRD	Waste Rock Dumps
YG	Yukon Government

Executive Summary

This report presents the results of the 2022 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 Dam. A small dike, 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. Other facilities are included in the AFPR scope to fulfill annual inspection and reporting requirements of the site Water Licence QZ16-051 (issued April 2017) and the Quartz Mining License QML-0004 (issued December 2015). These other facilities consist of a series of ripped lined diversion channels and the reclaimed waste rock dumps at the location of the closed portals adjacent to the Main, Jewelbox and Burnick ore zones

The inspection was completed by Mr. Peter Mikes, P.Eng. and Kisa Elmer, P.Eng., of SRK Consulting (Canada) Inc. on August 16 and 17, 2022 while accompanied by Jeff Basarich (Teck). Peter Mikes is Engineer of Record (EOR) for the TMA.

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) (ICMM 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 Dam, the South Dam, and the Reclaim Dam. The North and South Dams, which impounded the tailings, were constructed between July 1990 and October 1991. The dams for both structures were built to a height of about 13 meters. The reclaim dam was built to detain supernatant water decanted from the tailings pond. The mine operation involved recycling of the detained 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 Dam and the Sediment Retaining Structure (SRS). The SRS is a 7 m high dike which impounds a small pond.

Summary of Key Observations and Significant Changes

North Dam

The North Dam is currently stable. The dam 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, the ponded water overtopped the dam sometime between June 1

and June 7 resulting in the development of an erosion gully in the North Dam that eroded approximately 415 m³ of dam fill with no tailings displaced. Once the pond drained, the erosion discontinued. Repairs to the North Dam were completed in June, with additional erosion protection measures implemented in October 2022. During the August site inspection, no signs of any instability on the crest or the downstream slope were observed.

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. Like the 2021 freshet, water levels in Piezometer 2A triggered an alert indicating an exceedance just above the 'minor risk alert level' trigger criteria during the 2021 freshet. Following a review of the data and the local precipitation records for the same period, it is SRK's opinion that these unexpected rises in the water levels in Piezometer 2A were attributed to an unseasonably high snowpack and rainfall. Subsequent readings are more consistent with trends seen in previous years. No further action is required outside of continued monitoring.

Sediment Retaining Structure

The SRS is in good physical condition and the spillway is functioning in accordance with design parameters. A transverse crack that was first observed in 2021 remains across the dam crest approximately 1 m east of the spillway that is believed to be caused by frost heave. No further action is required as the crack does not extend deep enough to act as a preferential seepage pathway through the structure, and the structure is considered to be temporary, with Teck planning to remove the structure in the future as part of an overall "safe closure" landscape.

North Creek

The North Creek crosses three access roads that were decommissioned in 2014 with the creek conveyed across the roads in riprap lined channels. Riprap movement and bank erosion or deformation has occurred at all three crossings. The North Creek will continue to erode these channel sections but will eventually sustain itself without maintenance. No remedial action is required.

Summary of Hazards and Potential Consequences

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

The main hypothetical 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 hypothetical failure mechanisms for the North Dam 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 Stability

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

SRK understands that Teck's long-term goal for all tailings facilities is to reach a condition of "Safe Closure" which is taken to be landform status with all failure modes being reduced to non-credible. Erosion caused by snow melt water at North Dam in a similar manner that occurred in 2022 is a concern that will require to be addressed as noted in the AFPR recommendations. The likelihood of the other non-catastrophic mechanisms is judged to be extremely rare based on extreme consequence loading conditions and conservative assumptions. Whether those non-catastrophic failure modes are credible or non credible will be evaluated over 2022 and 2023 and that work will verify or refine the conservative assumptions.

Summary of OMS Manual and MERP

The Operation, Maintenance and Surveillance (OMS) Manual was last updated on December 21, 2021 and is reviewed annually. The next revision of the manual should be revised to incorporate the North Dam erosion gully repairs and additional monitoring and maintenance requirements to prevent a similar incident in the future.

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 2021 performance review are summarized in Tables E1 and E2. All recommendations from previous inspections have been implemented.

Table E1: Table of Recommendations

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
2021 Recommendations						
TMA	2021-1	Since 2015, all revisions to the OMS Manual have remained in 'draft' status.	OMS Section 1.3	Finalize the next revision of the OMS Manual.	3	Complete OMS updated in December 2021
North Dam	2021-2	The soup can used as a cap on NDW-4A was displaced at time of the inspection.	OMS Section 5.2.1	Install a proper 2-inch PVC pipe plug and trim the PVC pipe such that it fits in steel protective casing. Water pooled within the casing should be removed (either siphoned or by drilling a small hole within the steel casing).	4	Complete
North Dam	2021-3	A long-term goal for the TMA is to reduce all potential failure modes to non-credible.	-	Undertake a credible failure modes assessment for the TMA.	4	In Progress Before end of 2022
North Dam	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 Dam foundation pressures.	4	In Progress Before end of 2022.
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. Armour the gully with a layer of geotextile and riprap.	4	New Before end of 2024.
North Dam	2022-3	Drainage channel blockages on the tailings cover during snowmelt results in the formation of a pond adjacent to the North Dam. In 2022, the pond overtopped the North Dam and formed an erosion gully that required repairs.	OMS Section 5.2.1	Modify the dam to eliminate the risk of future erosion events. 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	New 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 Dam and Tailings Cover	2022-4	As above	OMS Sections 5 and 6	<p>Modify the TMA maintenance and surveillance programs in the OMS Manual to include monitoring for the development of a pond against the North Dam 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 Dam.</p> <p>The OMS Manual should also be updated to include the as-built information from the North Dam erosion gully repairs as outlined in Section 6.4.</p>	2	New Before end of Q1 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 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 August 16 and 17, 2022 by Peter Mikes, P.Eng., and Kisa Elmer, P.Eng., of SRK while accompanied by Jeff Basarich (Teck). Peter Mikes has filled the role of Engineer of Record (EOR) for the TMA since 2021. The Responsible Tailings Facility Engineer (RTFE) is Morgan Lykpa, P.Eng. (Teck) who has filled this roll since 2019. Ms. Lypka was unavailable for the site inspection in 2022 but was consulted in follow-up discussions from the visit.

This report presents the results of the 2022 AFPR for the period of September 2021 through August 2022 (reporting period) and includes the following structures and features:

- The Tailings Management Area (TMA) that includes:
 - The North Tailings Dam
 - Till Tailings Cover
 - North and South drainage channels
 - Sediment Retaining Structure (SRS)
- The North Creek Channel that was reclaimed following decommissioning of the North Creek Dike and Second Crossing of North Creek
- The relocated Camp Creek drainage channel
- The Burnick, Main Zone and Jewelbox Waste Rock Dump areas

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 piezometer and settlement records of the North Dam provided by Teck

1.2 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. While this report focuses on the TMA and associated water management infrastructure, the waste rock dump areas are also included in the inspection in accordance with Clause 45 of the water license.

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

- Guideline for Tailings and Water Retaining Structures (Teck 2019)
- Dam Safety Guidelines (CDA 2013)
- 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)

The site is also working towards a “landform” status and eventual “safe closure” per the GISTM with all failure modes being reduced to non-credible as per the Executive Summary.

2 Background

2.1 Facility Description

2.1.1 Overview

This section provides a description of the components remaining at the mine 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 Dam to the South Dam covered an area of approximately 0.2 km². During the operating life of the mine, approximately 700,000 tonnes of tailings (400,000m³ based on tailings density of 1.8 tonnes/m³) were deposited into the impoundment, primarily at the northern end.

The tailings at the northern end of the TMA are retained by the North Dam. The North Dam 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 dam are shown in Figures 3 and 4. The dam is an earthen, zoned embankment structure constructed between July 1990 and October 1991 in a single stage.

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 Dam 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 Dam in a southerly direction towards the SRS. Water is no longer regularly impounded behind the dam. 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 dike 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 spillway and drainage channel geometries are presented in Figures 5 and 6.

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 will continue but is not expected to accelerate. Most sources will continue to leach zinc and cadmium at the current rates (Teck 2015).

2.1.4 Water Management Infrastructure

Overview

Three drainage channels were built as part of the 2014 TMA decommissioning (Figure 9). 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.

South Drainage Channel

The South Drainage Channel was constructed from the SRS spillway through the former South Dam and connects with the Camp Creek Drainage Channel. The channel length is about 230 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile (Figure 10). The channel is designed for the 1 in 1000-year, 24-hour Inflow Design Flood (IDF). Upstream and downstream side slopes are 2H:1V. Average grade of the channel is 4%.

Camp Creek Drainage Channel

The Camp Creek Drainage Channel was constructed through the former Reclaim Dam and pond area to route Camp Creek flows along its historical alignment (Figure 9). The channel length is about 940 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile (see Figure 8). 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 5%.

North Diversion Channel

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 detained in the SRS to allow for sediments to deposit before the water is discharged into Camp Creek (Figure 11). The channel length is about 300 m and it was installed with riprap erosion protection placed on top of a non-woven geotextile. 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%.

North Creek

During operation of the mine, a dike was built over the North Creek as a water storage facility for the mill. The dike (see Figure 1 for location) was decommissioned in 2015 and a riprapped channel was built through the old dike to convey the flow along North Creek to False Canyon Creek. A similar channel was also built downstream to convey the North Creek flow through a decommissioned access road.

2.1.5 Waste Rock Dumps

During operation of the mine, waste rock dumps were developed at each of the main portals, associated with the Main Zone, the Jewelbox Zone and the Burnick Zone ore bodies (Figure 1). At closure, the portals were closed off with waste rock, and the dumps were resloped to direct runoff away from the openings and to provide more stable conditions.

2.2 TMA Design Basis

Table 2.1 on the following page provides the relevant design criteria adopted for the TMA decommissioning in 2014 and 2015 (SRK 2013).

Teck has since advised that they are aligned with the most conservative interpretation of the Global Industrial Standard on Tailings Management (GISTM) (ICMM 2020), which in turn, is consistent with their safety culture. Commensurately, Teck has advised that consequence classification is not a part of their management governance going forward and has asked that it not be reported in this AFPR. Instead, they intend to adopt the extreme consequence case design loading for any facility with credible flow failure modes. For facilities without a credible failure mode in terms of a life safety issue, Teck indicates they will reduce credible risks to As Low As Reasonably Practical (ALARP). This consequence case applies for both earthquake and flood scenarios for all tailings facilities, consistent with the GISTM.

2.4 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 Dam
- 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)

Table 2.1: TMA Design Criteria

Parameter	North Dam	SRS
Inflow Design Flood (IDF)		
Minimum AEP	1/3 between the 1,000-year event and the PMF	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	1 in 2,475-year event	1 in 1,000-year event
PGA (g)	0.20 g	0.073 g
Slope Stability Factors of Safety (FOS)		
Static		1.5
Pseudo-static		1.0
Post-earthquake		1.2

Notes:

- ¹ AEP = Annual exceedance probability
- ² PMF = Probable maximum flood
- ³ PGA = peak ground acceleration

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). Considering the erosion event at the North Dam in 2022 (Section 3.2), active management is needed during the snow melt period to manage melt water near the North Dam as described in Section 7 Recommendations.

3.1 Surveillance

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 2021 inspection was completed concurrently with the 2021 EOR inspection on September 22, 2021 and the spring inspection was completed on June 29, 2022. The spring 2022 routine inspection form is provided in Appendix E. The 2022 fall inspection was completed on October 13, 2022 (after the reporting period of this report) with the results to be included in the 2023 AFPR.

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

3.2 North Dam Erosion Maintenance Event

On June 17, 2022, during a site visit by the site caretaker, an erosion gully was observed on the North Dam that required repairs. The North Dam repairs occurred between June 23 and 28, 2022. The initial site visit was completed to assess site access prior to the June water quality sampling campaign. The observation of the gully prompted the initiation of the emergency response procedures as per the Mine Emergency Response Plan (MERP), that included the EOR's site presence and guidance throughout the repairs.

Based on SRK's current understanding of the dam construction, foundation, seepage, site topography and weather observations, the following describes the erosion mechanism that SRK judges to be most likely:

Surface water from melting snow was confined within the northern tailings management area due to ice/snow blockages in drainage channels to the south and a snow cornice that developed along the dam crest. As snow continued to melt, the pond reached a critical level with water migrating through the snow and ice to eventually erode a channel through the dam within a rapid timeframe (sometime between June 1 and June 7 based on satellite imagery). Once the pond had drained, the erosion discontinued.

The potential contributing factors to the erosion event and supporting evidence are provided in as follows:

- **Extreme snowpack:** At the start of May 2022, the average snow water equivalent (SWE) in the Liard River basin was the highest snowpack on record for this time of the year with records dating back to 1980 (YG 2022).
- **Rapid Snowmelt:** Snowmelt at site typically occurs in May and early June. May temperatures were slightly higher than normal, with significantly higher temperatures between May 31 and June 8. Watson Lake Airport daily maximum temperatures ranged between 19°C and 25°C during this period. Satellite imagery at this time shows extensive snow coverage in the TMA on May 22 and general snow-free conditions on June 7, 2022.
- **Ponding water within the TMA adjacent to the North Dam:** Satellite Imagery (Appendix B) shows a pond developing against the North Dam in late May. A review of historical satellite imagery shows a pond also developed in 2020 and 2021, indicating that the pond formation may be an annual occurrence during snowmelt.
- **Drainage blockages to the south:** A survey of the tailings cover on June 20, 2022 (Figure 4) shows drainage channels on the cover surface that are intended to direct snowmelt and precipitation to the south and away from the dam. Within 250 m of the dam, the channel has minimal positive drainage with ponded water present in the channel bottom throughout most of the year. Due to the shallow grade and slow flow velocity, the channels may be prone to blockages from ice and/or snow.
- **Limited Freeboard:** The tailings cover ties-into the downstream dam crest resulting in an approximate 0.3 m freeboard across the dam crest in the area of the gully.
- **Snowdrift and development of a cornice at the North Dam:** There is a prevalent northerly wind at the TMA that results in the drifting of snow to the north and the development of a cornice at the North Dam as evidenced by site observations and satellite imagery (Appendix B).

Extreme rainfall and internal erosion are not believed to be factors in the initiation of the erosion gully. The highest 24-hour rainfall measured at the Watson Lake Airport between June 1 and 9, was 9.3 mm on June 8 (after the overtopping event). The second highest event was 0.6 mm on June 6. Internal erosion is not believed to be a factor in the gully formation as the embankment pore pressures were typical and the gully did not appear to extend into the foundation during the embankment repairs.

The erosion gully was located approximately 155 m from the west abutment of the dam, or 30 m east of Settlement Gauge NDS-3. A plan showing the erosion gully location and cross section is provided in Figures 4 and 5. The gully was U-shaped with near vertical side-walls. The size of the gully was more pronounced within the “Sand and Gravel” embankment fill downstream of the dam crest, with the appearance of a plunge pool that suggests waterfall erosion and the release of pooled water from the TMA. The typical gully width within the “Sand and Gravel” fill ranged between 3 m and 7.5 m, with a depth of up to 4 m immediately below the downstream crest. The erosion was less through the till zones across the dam crest with a typical width of 3 m and depths ranging from 1 m at the upstream crest to 3 m at the downstream crest. A minor amount of cover material also eroded with no tailings were visible within the eroded area. The total volume of displaced material was approximately 415 m³.

The eroded material flowed to the valley bottom, with most of the displaced mass retained above the MH-02 seepage monitoring station (located approximately 35 m downstream of the dam toe), with minor amounts of sediment deposition visible at the outlet of the former eastern diversion channel.

Photos of the erosion gully and its repair are provided in Appendix C, with as-built repair drawings provided in Figure 6. Sand and Gravel material from the vertical gully side-slopes were excavated and placed at the base of the gully to create a drainage layer. The remainder of the gully was filled with a well graded sandy till sourced from a decommissioned access road located immediately to the west of the TMA. The layer of geotextile was installed as a separated layer between the two fill types. In addition, a 0.5 m thick and 2 m wide French Drain was installed at the base of the gully near the dam toe after a small seep was encountered during excavation of the erosion debris.

An as-built report of the gully repairs has been prepared (SRK 2022) that documents the site observations, contributing factors to the event, construction procedures, QA/QC activities, as well as short-term and long-term recommendations. Following the August 17, site inspection, a number of the short-term recommendations have been implemented, with the installation of jute netting, erosion control blankets, and seeding of the repair areas completed in early October 2022. The remaining short-term recommendations are included within Section 7.5 of this report.

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 (2018).

Table 4.1 presents a comparison of the estimated climate conditions from September 2020 through August 2021 compared to average values. Mean site temperatures are estimated to be 3.5 °C cooler than temperatures at the Watson Lake Airport. The regression analysis predicted a Mean Annual Precipitation (MAP) for the site of 646 mm based on an elevation of 1080 m.

Table 4.1: Site Climate Data (September 2021 through August 2022) compared to Climate Averages

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Annual
Normals													
Daily Max. Temp [°C]	8.4	-0.4	-13.1	-18.0	-20.2	-12.3	-5.3	1.3	8.1	14.2	17.1	14.5	-0.5
Daily Min. Temp [°C]	-2.3	-10.1	-24.4	-27.9	-31.3	-28.2	-22.6	-13.2	-3.2	1.7	5.3	3.7	-12.7
Daily Mean Temp [°C]	3.0	-5.3	-18.7	-22.9	-25.7	-20.3	-14.0	-6.0	2.5	7.9	11.2	9.1	-6.6
MAP (Site) [mm]	71.7	75.6	58.8	64.6	58.1	49.1	39.4	23.9	33.6	47.8	60.7	63.3	646
Lake Evap. (Site) [mm]	10.4	8.4	18.2	41.4	75.5	96.9	99.5	71.6	33.4	11.0	7.2	9.7	483.2
Reporting Period (September 2021 through August 2022)													
Mean Temp [°C]	3.8	-3.0	-16.6	-32.7	-24.1	-19.6	-12.9	-7.4	2.4	11.0	13.0	11.8	-6.2
Precipitation [mm]	34	14	147	94	160	110	74	10	28	90	42	37	830

Source: file: 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 2021 and 2022 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 September 2021 through August 2022 was reported as 517 mm. Using the undercatch correction factor of 1.13 (SRK 2018), total corrected annual precipitation at Watson Lake for the same period was 584 mm. A 1.42 ratio was applied to convert the corrected Watson Lake Airport precipitation to a representative site precipitation based on the regression analysis (SRK 2018) to result in a total precipitation of 830 mm for the site during the reporting period.

The climate data indicates that precipitation was higher than the average (28% higher) with over two times the normal precipitation during the winter (November 2021 through March 2022) when 585 mm of precipitation occurred compared to a normal precipitation of 270 mm. The high winter precipitation resulted in an extreme snowpack, which as noted in Section 3, at the start of the 2022 freshet (May

2022), the average SWE in the Liard River basin was the highest snowpack on record with records dating back to 1980 (YG 2022).

4.2 Review of Water Balance and Freeboard

SRS

The SRS Pond has a maximum surface area of about 1,600 m² during the freshet high flow period. The catchment area for the SRS spillway is 1.33 km² as shown on Figure 12.

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 2018), the estimate of the site MAP during the reporting period (September through August), and the following assumptions:

- Inflow from the surrounding hillside catchment (1.17 km²) based on a runoff coefficient of 0.60
- Inflow from the tailings till cover (0.16 km²) based on a runoff coefficient of 0.50
- Direct precipitation input to the SRS pond (0.0016 km²)

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

- Historical mean annual pond evaporation of 483 mm
- Seepage losses estimated at 0.5 L/s

Table 4.2: TMA Water Balance

Item	Units	Mean Annual	2019-2020	2020-2021	2021-2022
Precipitation	mm	646	491	519	830
Mean annual lake evaporation	mm	483	483	483	483
Mean annual run-on from the hillside catchment above the SRS	m ³	453,492	344,687	364,057	582,660
Direct Precipitation on the SRS pond surface	m ³	1,034	786	830	1,328
Mean annual runoff from tailings cover material	m ³	50,388	38,299	40,451	64,740
Total Annual Inflow	m ³	504,914	383,772	405,338	64,740
Annual pond evaporation losses	m ³	773	773	773	773
Seepage losses	m ³	15,768	15,768	15,768	15,768
Net Annual Discharge Volume over spillway	m ³	488,373	367,231	388,797	632,187

Sources: <https://srk.sharepoint.com/sites/FS261/Internal/Site%20Water%20balance/2019-2020%20Water%20Balance%20SDH.xlsx?web=1>

Note: The time period for each column is September through August.

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 dike. The climate data review found no indication of an extreme precipitation event that would have compromised the design freeboard during the past year.

North Dam

The tailings behind the North Dam were capped with a till cover in 2014 with the cover tied into the upstream crest of the dam. 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. As shown in Appendix B, satellite imagery shows that 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. As described in Section 3, an overtopping event occurred sometime between June 1 and June 7, 2022 that resulted in the formation of an erosion gully through the dam.

Prior to the erosion event, the as-built survey of the tailings cover showed that there was a 0.3 m freeboard across the North Dam crest in the gully area. During the gully repairs, the crest in the area was graded with the 3-5% grade to drain to the south away from the dam with the downstream crest raised by approximately 0.5 m (SRK 2022). The new low point in the downstream crest is located immediately east of the repair area and is 0.2 m higher than the low point in the downstream crest prior to the repair. While the dam freeboard has slightly increased, it remains vulnerable to a similar overtopping event in the future. Remedial actions to increase the North Dam freeboard have been recommended (refer to Section 7.5).

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 Report in March the year following the operational period covered.

5 Site Observations

5.1 Visual Inspection

Weather during the August 16 and 17, 2022 site inspection was mostly sunny with temperatures ranging between approximately 8°C and 23°C. Minor precipitation occurred overnight between the 16th and 17th. The ground surface was free of snow and dry, with some damp areas on the tailings cover on the August 17.

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 TMA Drainage Channels

The three riprapped drainage channels (North Diversion Channel, South Drainage Channel, and the Camp Creek Channel) were constructed during the TMA decommissioning in 2014. Table 5.1 provides the inspection observations along with references to corresponding photographs and applicable recommendations. Figure 9 provides a plan view of the channels.

Table 5.1: TMA Drainage Channel Observations

Channel	Observation	Figure (App. A)	Photo	Associated Recommendation
North Diversion Channel	<ul style="list-style-type: none"> The condition of the channel is unchanged compared to the 2021 inspection. The channel is in good condition with no signs of major subsidence or movement of the riprap erosion protection. 	A-8	DC-04	n/a
South Diversion Channel	<ul style="list-style-type: none"> The condition of the channel is unchanged compared to the 2021 inspection. The channel is in good condition with no signs of major subsidence or movement of the riprap erosion protection. As noted in the 2021, minor cracking is present parallel to the channel that was typically offset from the crest by 1 to 2 meters. The cracking is suspected to have resulted from frost heave and does not impact channel performance. 	A-7, A-8	DC-01, DC-03	n/a n/a
Camp Creek Channel	<ul style="list-style-type: none"> The Camp Creek Channel is in good condition with no signs of major subsidence or movement of the riprap erosion protection. 	A-7,	DC-01, DC-02	n/a

5.1.2 North Creek

The 2015 site reclamation works included decommissioning of culvert crossings of North Creek at three locations: the access road to the Burnick Zone, the North Creek Dike, and the access road to the landfill area. Table 5.2 provides the inspection observations along with references to corresponding photographs and applicable recommendations.

Table 5.2: North Creek Observations

Observation	Figure (App. A)	Photo	Associated Recommendation
<ul style="list-style-type: none"> ■ New channel erosion observed across the decommissioned access road to the Burnick Zone. In the 2021 inspection, subsidence of the south slope of the road crossing was observed with the erosion protection material in good condition (jute netting and riprap). In the 2022 inspection, the south slope was in similar condition, but new erosion observed on the north bank, along with some displacement of the erosion protection riprap and exposing of the underlying geotextile. Seepage was observed entering the channel on the north bank with rusty reddish coloured staining. The creek will continue to erode this section of the channel area but will eventually sustain itself with no intervening maintenance required. 	A-9	NC-01, NC-02	n/a
<ul style="list-style-type: none"> ■ A beaver dam is present at the upstream end of the decommissioned North Creek Dike structure. A beaver dam was previously removed in 2020, with no dam observed in 2021. 	A-10	NC-03	2022-1
<ul style="list-style-type: none"> ■ No change in condition was observed of the channel erosion at the downstream end of the decommissioned North Creek Dike Structure. The creek will continue to erode this section of the channel area but will eventually sustain itself with no intervening maintenance required. 	A-10	NC-04	n/a
<ul style="list-style-type: none"> ■ At the landfill area road crossing, erosion of the road fill on the north side of the channel is ongoing. Additional sloughing of the bank has occurred since the 2021 site inspection. Like the other North Creek crossing locations, the creek will continue to erode this section of the channel area but will eventually sustain itself without maintenance. No remedial action is required. 	A-11	NC-05, NC-06	n/a

5.1.3 North Dam

A site plan and a section of the North Dam are presented on Figures 3 and 4. Table 5.3 provides the inspection observations along with references to corresponding photographs and applicable recommendations.

Table 5.3: North Dam Observations

Observation	Figure (App. A)	Photo	Associated Recommendation
<ul style="list-style-type: none"> ▪ The crest of the North Dam is in good condition and shows no signs of deformation or abnormal settling. 	A-12, A-13	ND-01, ND-04	n/a
<ul style="list-style-type: none"> ▪ 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-12, A-15	ND-01, ND-07	n/a
<ul style="list-style-type: none"> ▪ The downstream slope in the erosion gully repair area consisted of bare soil and was prone to erosion. Since the inspection, jute netting (like that at the SRS) was installed on the downstream dam slope with additional erosion control blankets along the dam crest in the affected area, with the entire area newly seeded. These additional remedial actions were completed in early October. 	A-12, A-13	ND-01, ND-03	n/a
<ul style="list-style-type: none"> ▪ 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. 	A-13	ND-03	n/a
<ul style="list-style-type: none"> ▪ The piezometers and settlement gauges on the North Dam are in good condition and continue to function as designed. The PVC pipe at NDW-4A extends above the protective casing and is prone to damage and weathering. A remedial action is included in the Section 7 recommendations. 	A-12, A-14	ND-01, ND-05	2021-2
<ul style="list-style-type: none"> ▪ Seepage downstream of the dam is collected at a monitoring station referred to as MH-02 and is a combination of groundwater discharge from the surrounding hillsides to the west and minimal seepage flow from the impoundment. The small pond upstream of the monitoring pipe has filled in with debris from the North Dam erosion event but remains functional. Seepage was clear at the time of the inspection. No change in the flow rate or consistency of the flow was noted during the site visit or during the routine site inspections and water quality sampling. 	A-14	ND-06	n/a
<ul style="list-style-type: none"> ▪ Along the downstream toe of the North Dam there is an 80 m long seepage zone. The seepage pathway has established overtop of the erosion debris. Seepage at the toe of dam was observed to be clear. 	A-15	ND-08	n/a
<ul style="list-style-type: none"> ▪ The till borrow area used for the erosion gully repairs is located approximately 80 m south of the west abutment of the dam on a decommissioned access road. At the time of the inspection, decommissioning of the borrow was partially completed with half of the slopes graded and landformed. Since the inspection, the remaining slopes have been regraded, and all disturbed areas have been seeded. 	A-12	ND-02	n/a

5.1.4 Sediment Retaining Structure

Figures 5 and 6 provide a site plan and sections of the SRS. Table 5.4 provides the inspection observations along with references to corresponding photographs and applicable recommendations.

Table 5.4: SRS Observations

Observation	Figure (App. A)	Photo	Associated Recommendation
<ul style="list-style-type: none"> The condition of the SRS is unchanged compared to the 2021 inspection. A minor amount of seepage was observed at the SRS toe east of the spillway that is consistent with previous years observations. 	A-18	SRS-05, SRS-06	n/a
<ul style="list-style-type: none"> 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-16	SRS-01, SRS-02	n/a
<ul style="list-style-type: none"> The SRS spillway is stable with no apparent riprap displacement. 	A-17	SRS-03, SRS-10	n/a
<ul style="list-style-type: none"> 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. 			n/a
<ul style="list-style-type: none"> The east crest of the spillway also appears to be lower in elevation compared to the west crest of the spillway; however, a comparison of previous inspection photos shows no visible change in ground conditions. No actions are recommended as the structure is considered temporary, with Teck planning to remove the structure in the future. 	A-16	SRS-02	n/a

5.1.5 Tailings Cover

Table 5.5 provides the inspection observations related to the TMA cover along with references to corresponding photographs and applicable recommendations.

Table 5.5: Tailings Cover Observations

Observation	Figure (App. A)	Photo	Associated Recommendation
<ul style="list-style-type: none"> The till tailings cover has overall downward gradient away from the North Dam. Near the North Dam, three small puddles were observed due to recent precipitation. These puddles were created because of truck trafficking during the North Dam repairs in June 2022. No remedial action is required. 	A-19	TC-01	n/a
<ul style="list-style-type: none"> The swale constructed within the cover to assist in directing runoff away from North Dam 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-20	TC-03	n/a
<ul style="list-style-type: none"> 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-19, A-20, A-21	TC-01 to TC-04	n/a
<ul style="list-style-type: none"> An erosion gully 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 gully was observed during the 2021 inspection but appears to have increased in size in the past year. Several areas of 	A-21, A-22	TC-06, TC-07, TP-08	2022-2

Observation	Figure (App. A)	Photo	Associated Recommendation
exposed geotextile were observed with no signs of tailings. This area of the cover was placed due to elevated metal concentrations within the pond, but based on historical aerial photographs, it is not located in an area where tailings deposition occurred. A remedial action is included in the Section 7.5 recommendations.			

5.1.6 Burnick, Jewelbox and Main Zone Waste Rock Dumps

The Burnick, Jewelbox and Main Zone Waste Rock Dump (WRD) areas were reclaimed in 2015 with the mine openings sealed and the dumps resloped and covered to provide more stable conditions. The conditions of the WRDs were mostly the same largely the same as those observed during the 2021 inspection. Table 5.6 provides the inspection observations along with references to corresponding photographs and applicable recommendations. Figures 13 and 14 provides a plan view of the Burnick Zone, and Main Zone/Jewelbox Zones, respectively.

Table 5.6: Waste Rock Dump Area Observations

Area	Observation	Figure (App. A)	Photo	Associated Recommendation
Burnick	<ul style="list-style-type: none"> ■ The regraded fill over the 1200 Portal is in good conditions and the portal drainpipe is functional. Minor settlement of the fill that was placed over the 1200 portal has resulted in a settlement crack in the fill. This crack was noted in previous inspections. No action is required. 	A-31	WR-17, WR-18	n/a
	<ul style="list-style-type: none"> ■ The regraded waste rock in the 1300 Portal area is also in good condition with no signs of deformation. The 1300 Portal drainpipe is functional with no flow observed. 	A-32	WR-19, WR-20	n/a
Jewelbox / Main Zone	<ul style="list-style-type: none"> ■ At the low point of the Jewelbox waste rock dump, the 2 to 3 m deep erosion gully that has been monitored over the last few years showed some additional deterioration since last year. The base of the gully is primarily situated in bedrock. The sidewalls of the gully are near vertical and prone to further erosion. There is no impact on the stability of the dump and no action is required. 	A-24 A-25	WR-03, WR-04, WR-05	n/a
	<ul style="list-style-type: none"> ■ Water that flows down the gully mentioned above, crosses the decommissioned access road to the waste rock area at four locations. Erosion gullies were noted at the upper three crossings that are up to 0.3 m deep. These gullies appear to be self-armouring and no action is needed at this time. 	A-23	WR-01, WR-02	n/a
	<ul style="list-style-type: none"> ■ Surficial sloughing of the soil cover is located downslope of the 1408 Portal. The circular sloughs are typically 0.3 m deep and resulted in bulges at the slough toe. There is no impact on the overall dump stability and no action is required. 	A-26	WR-08	n/a
	<ul style="list-style-type: none"> ■ The 1408 Portal drainpipes and the vent pipe in the 1408 Portal area are in good condition. 	A-27	WR-09, WR-10	n/a

Area	Observation	Figure (App. A)	Photo	Associated Recommendation
	<ul style="list-style-type: none"> ■ Rill erosion in the soil cover is present at the south end of the 1408 Portal WRD where the slope is approximately 2H:1V. The condition of the rill erosion appears unchanged compared to the 2021 inspection and no action is required. 	A-28	WR-12	n/a
	<ul style="list-style-type: none"> ■ Two to three shallow openings were observed in the pit wall at the Main Zone area. These openings may have been caused by internal subsidence but currently do not pose a safety concern. No action is required. 	A-29	WR-13, WR-14	n/a
	<ul style="list-style-type: none"> ■ A new erosion gully was observed in the Main Zone Pit backfill above the 1380 Portal. The gully is situated in waste rock and appears to be self-armouring with no significant catchment that reports to the gully at the upstream end. No remedial action is required. 	A-30	WR-15, WR-16	n/a

5.2 Instrumentation Review

There are seven standpipe piezometers and three settlement gauges at the North Dam. 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 adequate for the facility. The need for any additional instrumentation will be reviewed following credible failure modes assessment and TARP review that are currently in progress.

5.2.1 Water Levels

The water levels in the North Dam standpipe piezometers are manually recorded bi-monthly and the results are reviewed by the EOR after each monitoring session. Figures B-1 to B-4 in Appendix D 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.

Piezometers NDW-1A and NDW-2A exceeded the 'minor risk alert level criteria' in the Trigger and Action Response Plan (TARP) during readings collected on June 17, 2021 (during the identification of the North Dam erosion (Section 3.2)). The same exceedances occurred during the 2020 and 2021 freshets and the exceedances are attributed to a deeper snowpacks than usual based on a review of YG snow surveys from these years. Subsequent readings collected during the North Dam erosion repairs indicated the freshet groundwater level peaked and was receding.

The minor risk alert level criteria for the piezometers were established based on a stability analysis sensitivity study (SRK 2019) to correspond to a condition when the stability factor of safety is equal to

1.5. Given that this criterion has been triggered at NDW-2A the last three years with no issues related to instability, a review of the trigger levels is recommended in Section 7.5.

5.2.2 Deformation/Settlement

Settlement gauge readings for the North Dam were collected between 1993 and 2020. The annual readings were discontinued after the 2020 readings as no unexpected settlement of the embankment has been observed over the 27-year monitoring period. The gauges remain in operational condition and are to be read following any major seismic event as per the OMS Manual. Figure B-5 in Appendix D provides the settlement gauge readings between 2015 and 2020 that show no significant elevation changes.

5.2.3 Discharge Flows

There is no discharge from the tailings surface behind the North Dam. There is seepage from the hillside to the west of the North Dam and minor seepage from the TMA which reports to MH-02. Runoff from the tailings cover is directed away from the North Dam towards the sedimentation pond located behind the SRS.

Outflows from the SRS are not measured.

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 Dam and the SRS were identified during review of the routine inspection forms. The Spring 2022 routine inspection form is provided in Appendix E.

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 Dam 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 Dam 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.

SRK understands that Teck's long-term goal for this tailings facility is to a state of safe closure that includes reaching landform status with all potential failure modes being reduced to non-credible. The likelihood of the any credible failure mode at the site is extremely rare based on extreme consequence loading conditions and conservative assumptions. Further, there are no credible catastrophic failure modes present at the site. A catastrophic failure is a failure that results in a material disruption to social, environmental, and local economic systems (ICMM 2020). Whether the non-catastrophic failure modes are credible or non credible will be evaluated in 2022 and 2023 to verify or refine the conservative assumptions.

6.1.1 Dam Overtopping

North Dam

While the tailings cover is graded to allow water to drain to the south and away from the North Dam Crest, a review of publicly available satellite imagery between 2018 and 2022 indicates that water pools against the north dam 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. Details of the erosion gully, including the initiation mechanism, potential contributing factors and subsequent repairs are provided in Section 3.

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 Dam 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 Dam crest was not overtopped with ponded water reaching within a few centimetres of the dam 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, the hydrological study is currently being revised to determine if additional freeboard is needed to prevent a similar future event.

As part of the dam repairs (Section 2), the dam 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 dam remains vulnerable to future erosion events during future snow melt periods. Remedial actions to mitigate this risk are recommended in Section 7.5.

SRS

The spillway in the SRS is a riprap lined channel designed to convey the 1 in 1,000-year IDF with 0.5 m of freeboard. The spillway shows no sign of movement of the riprap and is functioning in accordance with the design parameters. The spillway and freeboard are effective controls to manage overtopping risks.

6.1.2 Internal Erosion

North Dam

The North Dam 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 indicators of fines being washed through to dam, although there is some seepage evident at the downstream toe. This seepage is mixed in with historical spring activity that was noted during the construction of the dam and the annual dam inspections. The tailings placed up against the upstream face of the dam have significantly reduced the seepage loss since initial construction.

The hydraulic gradient across the North Dam is in the range of 0.1 to 0.2. The dam material consists of a mixture of silty till to sandy till which is estimated to have a critical hydraulic gradient ranging from 1 to 1.3. The likelihood of internal erosion as a failure mode is considered to be extremely rare based on extreme consequence loading conditions and conservative assumptions. 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.

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 dike is barely measurable, there is one small boil that has been noted at the downstream toe of the SRS dike, 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.

6.1.3 Slope Stability

North Dam

The most recent stability analysis for the North Dam was completed in 2017 and 2018 (SRK 2017, 2018) with the results shown in Table 6.2. 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 Dam 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 6.3. 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 Dam

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 (Section 5.2.1) and not a surface erosion failure mode. No other signs of surface erosion were observed at the North Dam.

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.

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 at the SRS.

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.

The North Dam erosion event eroded approximately 415 m³ of dam fill based on a survey of the gully completed by Underhill Geomatics on June 20, 2022. The majority of the eroded debris was deposited at the dam toe and valley bottom upstream of seepage monitoring station MH-02 as shown in Figure 4.

6.3 Consequence of Failure Review

North Dam

Downstream of the North Dam, 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.

SRS

Like the North Dam, 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 m³ of water) and as a result, no long-term environmental losses are expected.

6.4 OMS Manual Review

The latest revision of the OMS Manual was updated 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 considered adequate for the TMA. The next revision of the manual should include changes to incorporate the North Dam erosion gully repairs specifically:

1. Section 3.1.1 (Site History): Update section to mention the gully and reference the as-built documentation.
2. Section 3.3.2 (North Dam Description): Update section to describe the gully repair cross-section and reference the as-built drawings.
3. Section 5.2 (Routine and Preventative Maintenance Schedule and Triggers): Update section to include a site visit during the snowmelt period and snow clearing TMA cover to minimize pond formation near the North Dam.
4. Section 6.1.1 (Monitoring Frequency, Schedule, and Procedures): Revise the monitoring frequency to include a site inspection of the North Dam during the snow melt period (typically early-May) and to include Satellite Monitoring for track the pond formation on the TMA cover.
5. Section 6.1.2 (Identified Performance Objectives and Indicators for Potential Failure Modes): Update Table 19 to include the overtopping/erosion gully potential failure mode at the North Dam.
6. Figures: Update to include the North Dam repair as-built drawings.
7. Trigger Action Response Plan: Update the visual inspection section to include triggers/responses related to observations of a water pooling adjacent to the North Dam.

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 Dam 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 operation activities. Earthworks were completed in June 2022 to repair an erosion gully in the North Dam.

7.2 Summary of Performance

The North Dam is currently stable. The dam 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, the ponded water overtopped the dam sometime between June 1 and 7 resulting in the development of an erosion gully in the North Dam that eroded approximately 415 m³ of dam fill with no tailings were displaced. Once the pond had drained, the erosion discontinued. Repairs to the North Dam were completed in June, with additional erosion protection measures implemented in October 2022. During the August site inspection, no signs of any instability on the crest or the downstream slope were observed.

The SRS is in good physical condition and the spillway is functioning in accordance with design parameters. A transverse crack that was first observed in 2021 remains across the dam crest approximately 1 m east of the spillway that is believed to be caused by frost heave. No further action is required as the crack does not extend deep enough to act as a preferential seepage pathway through the structure, and the structure is considered to be temporary, with Teck planning to remove the structure in the future as part of an overall “safe closure” landscape.

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 September 2021 through August 2022 was wetter than average with a total precipitation of 830 mm at the Site compared to the mean annual precipitation of 646 mm. Winter precipitation was particularly higher than normal that resulted in the highest recorded snowpack on record within the Liard River basin in May 2022 (YG 2022). The high snowpack and rapid snowmelt are believed to be the main contributing factors in the development of the erosion gully at the North Dam.

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 Dam, 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 Dam leading to an erosion gully. Remedial actions to prevent future overtopping events are provided in the Section 7.5 recommendations.

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 2021 facility performance review of Sä Dena Hes Mine, TMA and water management infrastructure and concluded that the North Dam, the SRS, the diversion channels and the waste rock dumps are in good condition.

Table 7.1 and Table 7.2 provide a summary of deficiencies and non-conformances noted during the 2022 performance review and outstanding deficiencies or non-conformances from the 2021 performance review.

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.

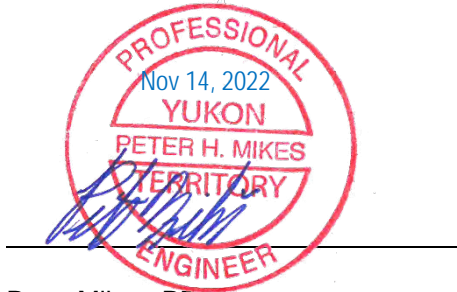
Table 7.2: Table of Recommendations from the 2022 Mine Waste Facilities Inspections

Structure	ID No.	Deficiency or Non-Conformance	Applicable Regulation or OMS Reference	Recommended Actions	Priority (Table 7.1)	Recommended Deadline / Status
2021 Recommendations						
TMA	2021-1	Since 2015, all revisions to the OMS Manual have remained in 'draft' status.	OMS Section 1.3	Finalize the next revision of the OMS Manual.	3	Complete OMS updated in December 2021
North Dam	2021-2	The soup can used as a cap on NDW-4A was displaced at time of the inspection.	OMS Section 5.2.1	Install a proper 2-inch PVC pipe plug and trim the PVC pipe such that it fits in steel protective casing. Water pooled within the casing should be removed (either siphoned or by drilling a small hole within the steel casing).	4	Complete
North Dam	2021-3	A long-term goal for the TMA is to reduce all potential failure modes to non-credible.	-	Undertake a credible failure modes assessment for the TMA.	4	In Progress Before end of 2022
North Dam	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 Dam foundation pressures.	4	In Progress Before end of 2022.
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. Armour the gully with a layer of geotextile and riprap.	4	New Before end of 2024.
North Dam	2022-3	Drainage channel blockages on the tailings cover during snowmelt results in the formation of a pond adjacent to the North Dam. In 2022, the pond overtopped the North Dam 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	New 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 Dam and Tailings Cover	2022-4	As above	OMS Sections 5 and 6	<p>Modify the TMA maintenance and surveillance programs in the OMS Manual to include monitoring for the development of a pond against the North Dam 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 Dam.</p> <p>The OMS Manual should also be updated to include the as-built information from the North Dam erosion gully repairs as outlined in Section 6.4.</p>	2	New Before end of Q1 2023.

Closure

This report, 2022 Annual Facility Performance Report, was prepared by

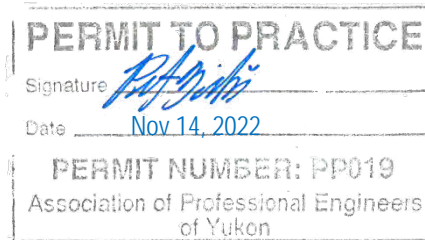


Peter Mikes, PEng
Principal Consultant

and reviewed by



John Kurylo, PEng
Principal Consultant

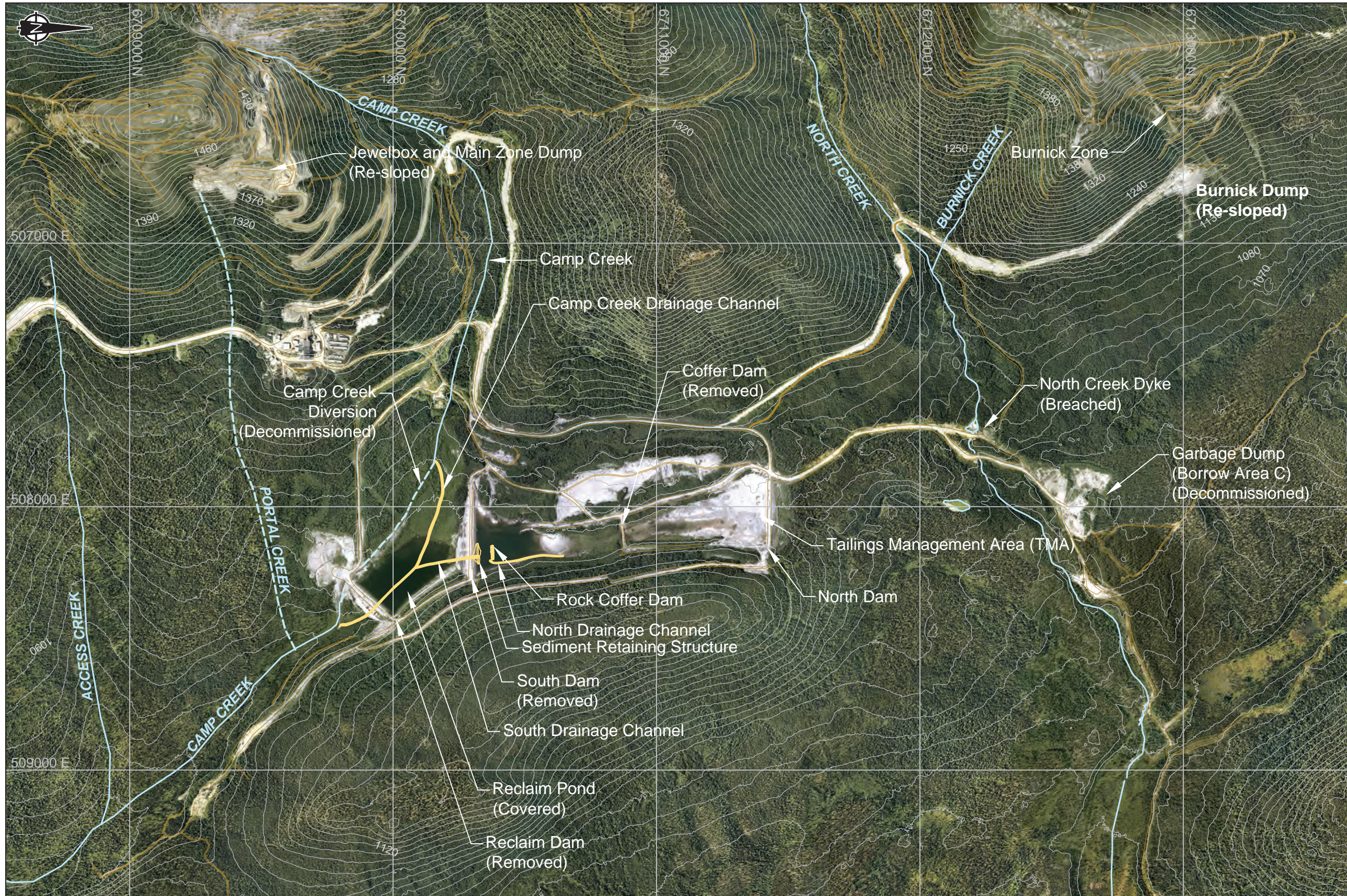


All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

References

- [AMECFW] Amec Foster Wheeler Environment & Infrastructure, 2016. Sä Dena Hes Mine, Tailings Management Facility 2015 Dam Safety Review. Report prepared for Teck Resources Limited. TE133102.5000. February.
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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. Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey.
3. Orthographic photo depicts pre-decommissioned surface.

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SRK JOB NO.: CAPR001928 REG. NO.:

FILE NAME: Sheet 1-12-13 and 14.dwg

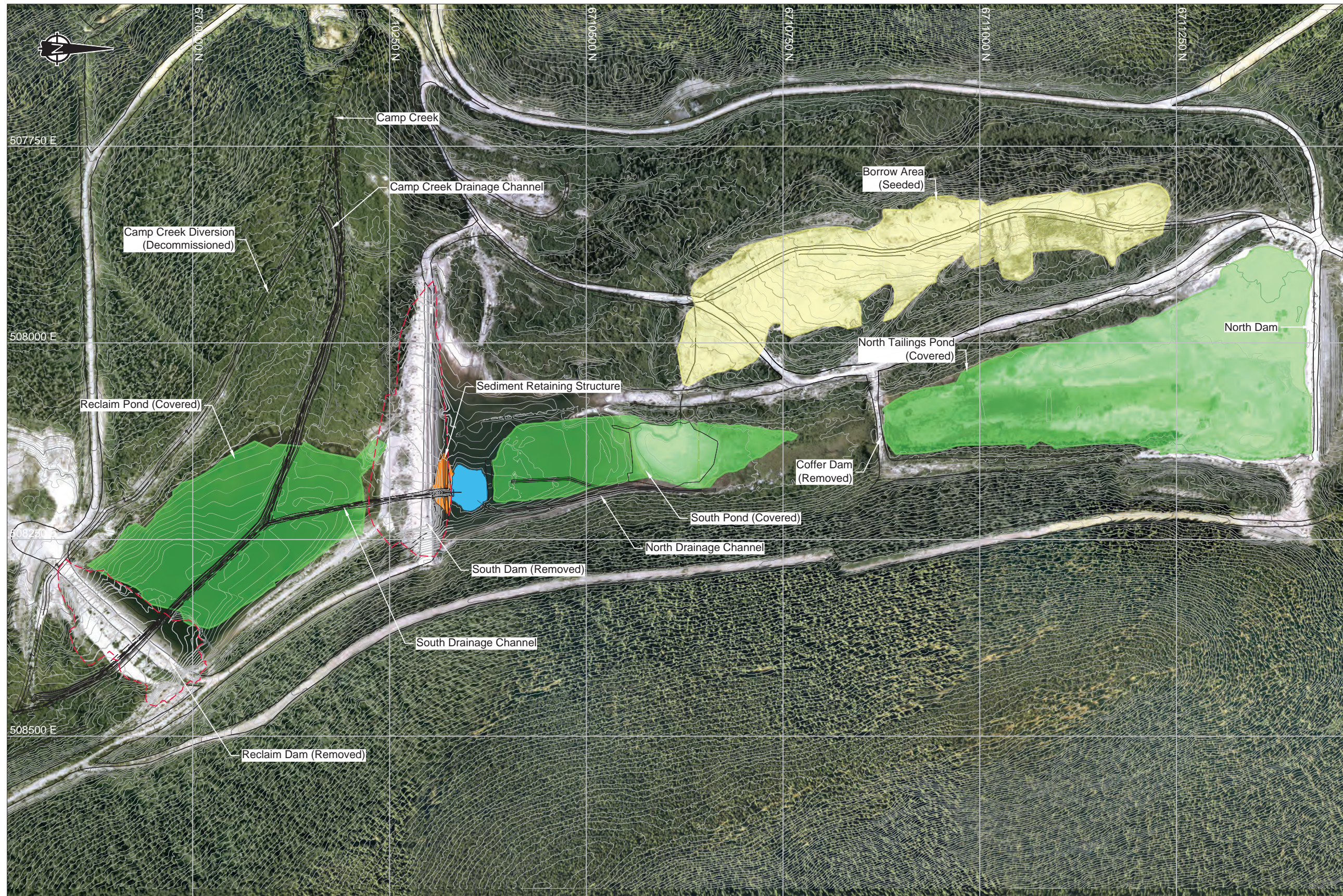
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Sä Dena Hes

2022 Annual Facility Performance Review

DRAWING TITLE: Vicinity Map

DATE: October 2022 APPROVED: PM FIGURE: 01

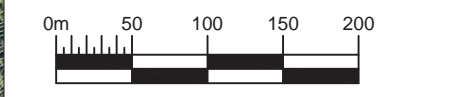


LEGEND

	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

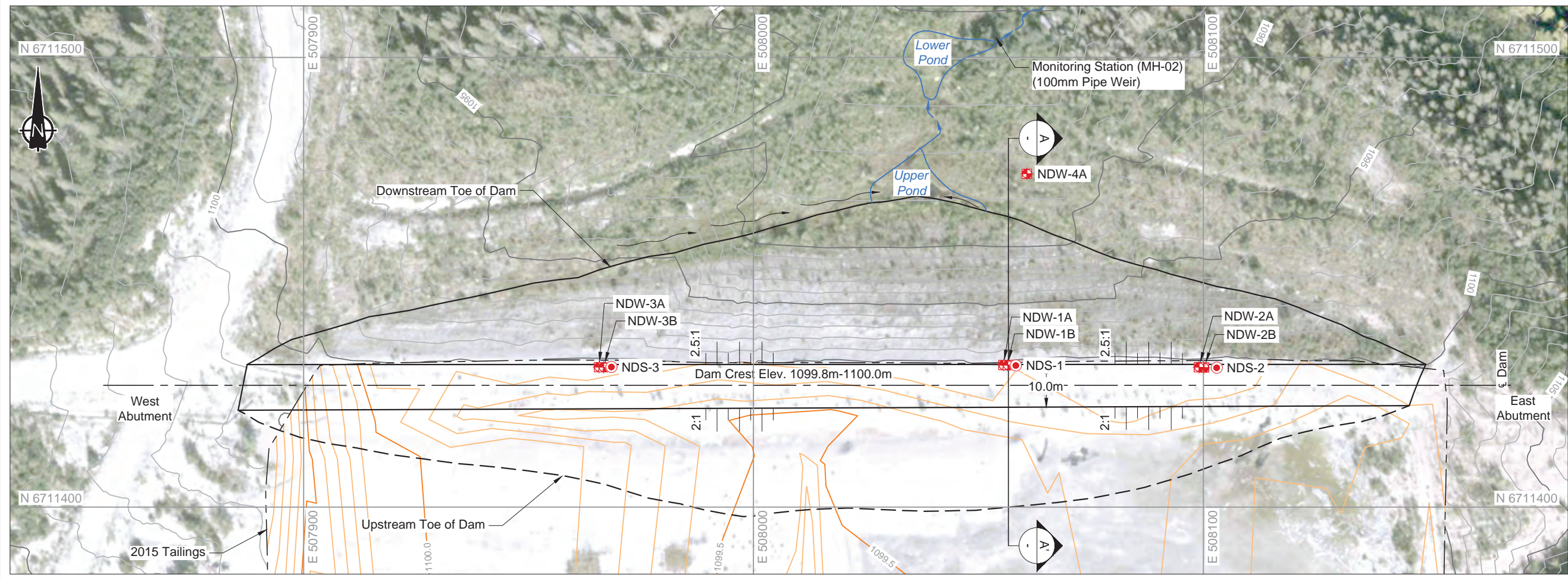
- NOTES**
- Contours are shown at 5.0m intervals.
 - All units are in meters unless otherwise specified.

- REFERENCES**
- Coordinate system is UTM NAD 83CSRS zone 9V.
 - Preconstruction topographical contour data was obtained from McElhaney and is based on August 15, 2012 LiDAR Survey.
 - As-built survey data was collected by Yukon Engineering Services and Amec Foster Wheeler.
 - Tailings characterization work conducted by Golder and Associates determined the location of capping at the South Pond and Reclaim Pond areas.
3. Orthographic photo depicts pre-decommissioned surface.



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		2022 Annual Facility Performance Review			
		DRAWING TITLE: TMA General Arrangement Map			
SRK JOB NO.: CAPR001928 FILE NAME: Sheet 2.dwg	REG. NO.:	Sä Dena Hes	DATE: October 2022	APPROVED: PM	FIGURE: 02



LEGEND

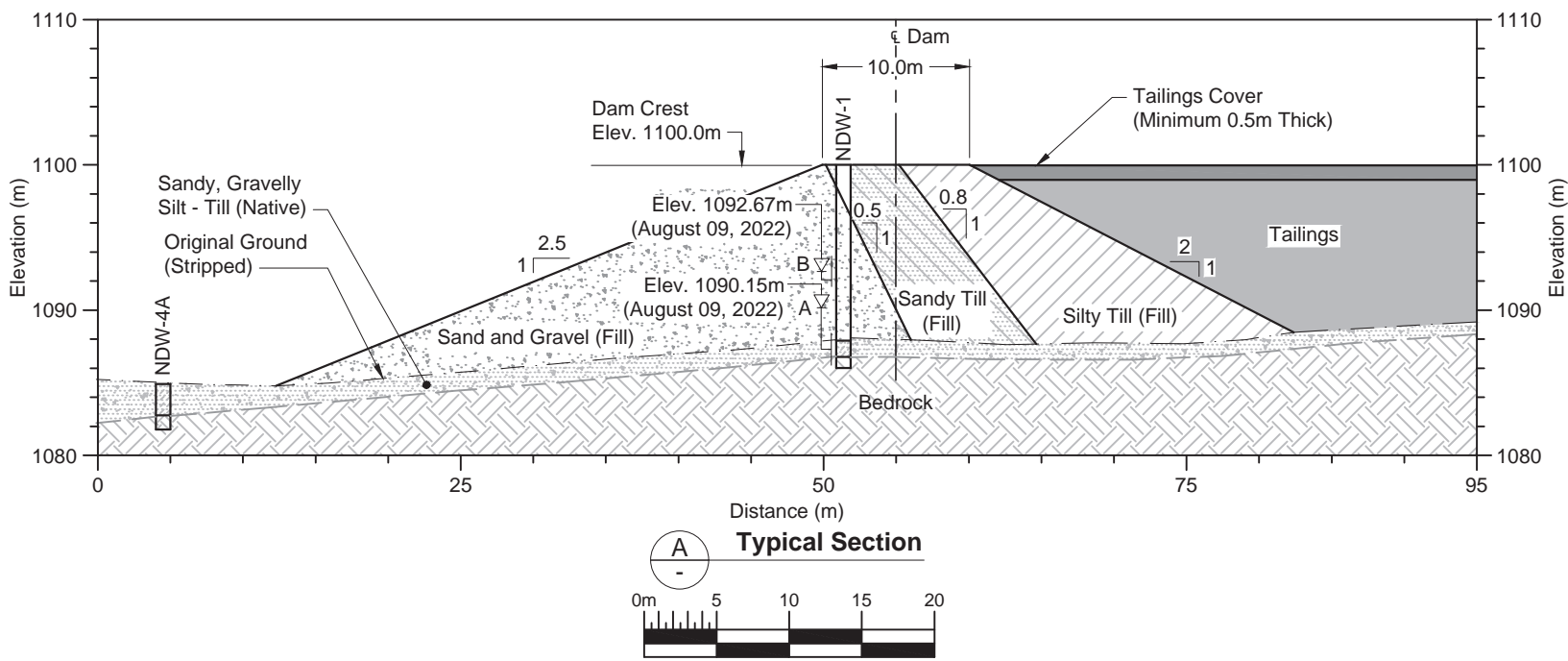
- Piezometer head for Filter Zone Indicated
- Piezometers Installed (Nov. 1991)
- Settlement Gauge Installed (Nov. 1991)
- Bedrock
- Contours Major (Ground at 5.0m Intervals)
- Contours Minor (Ground at 1.0m Intervals)
- Contours Major (Tailings Cover at 0.5m Intervals)
- Contours Minor (Tailings Cover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

NOTES

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

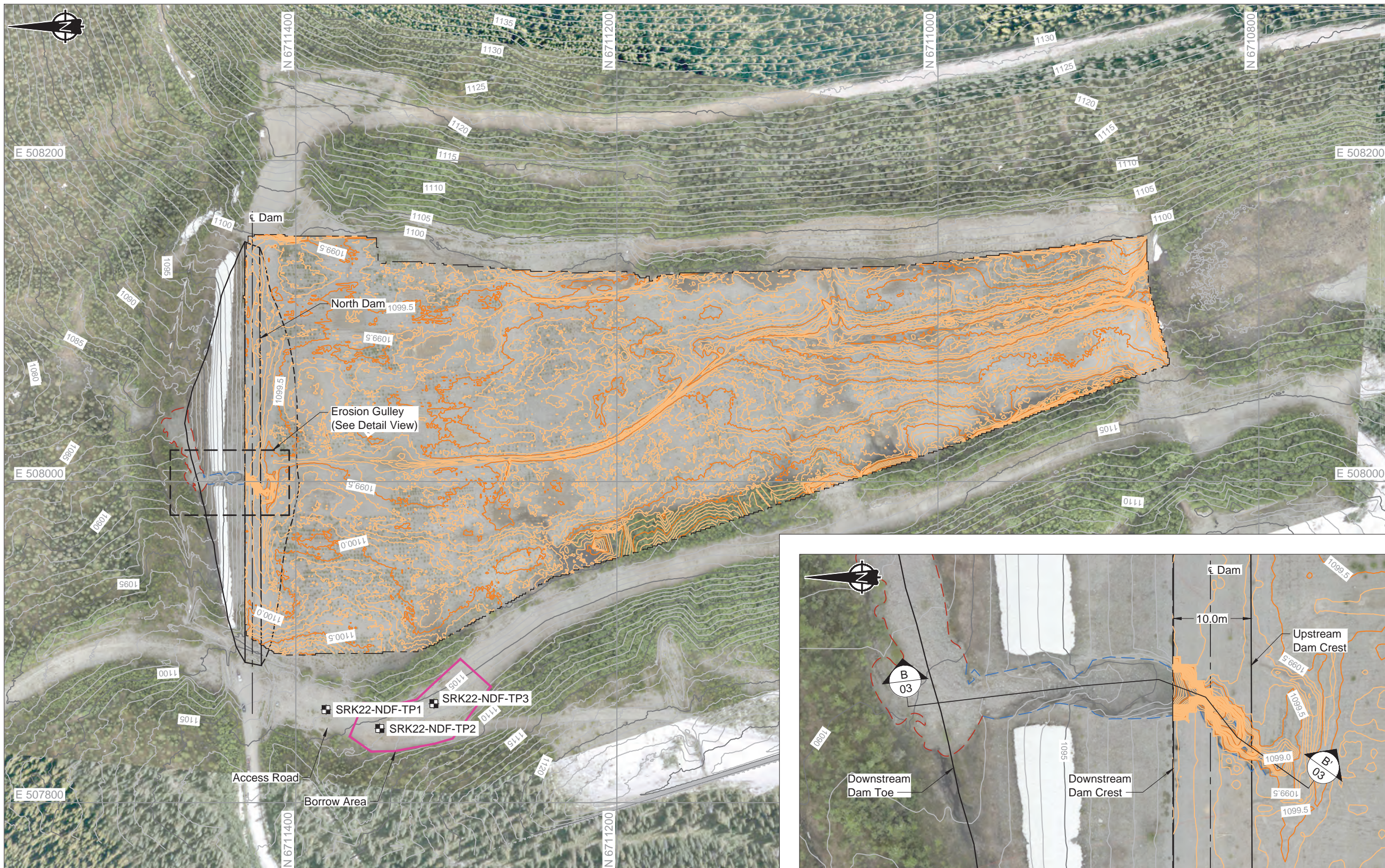
REFERENCES

- Coordinate system is UTM NAD 83CSRS zone 9V.
- Topographic contour data and aerial photos were obtained from McElhanney and are based on August 15, 2012 LiDAR survey and October 2013 YES Survey.
- 2015 tailings cover contours obtained from Yukon Engineering Surfaces.



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		2022 Annual Facility Performance Review		
		DRAWING TITLE: North Dam Site Plan and Typical Section		
SRK JOB NO.: CAPR001928 FILE NAME: CAPR001928 - Fig 3.dwg	REG. NO.:	DATE: October 2022	APPROVED: PM	FIGURE: 03
Sä Dena Hes				

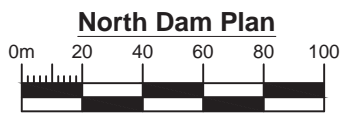


- LEGEND**
- Test Pits
 - Borrow Area Extents
 - Contours Major (Ground at 5.0m Intervals)
 - Contours Minor (Ground at 1.0m Intervals)
 - Contours Major (Tailings Cover at 0.5m Intervals)
 - Contours Minor (Tailings Cover at 0.1m Intervals)
 - Erosion Debris Extent
 - Erosion Gulley Extent
 - Tailings Cover Limits

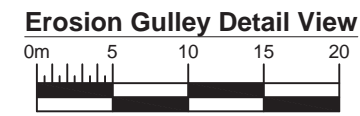
- NOTES**
1. Ground contours are shown at 1.0m intervals. Tailings cover contours are shown at 0.1m intervals.
 2. All units are in meters unless otherwise specified.

- REFERENCES**
1. Coordinates are UTM Zone 9, NAD83 (CSRS) and are derived holding values of point UGL100 fixed in 3D.
 2. Coordinates 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
 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

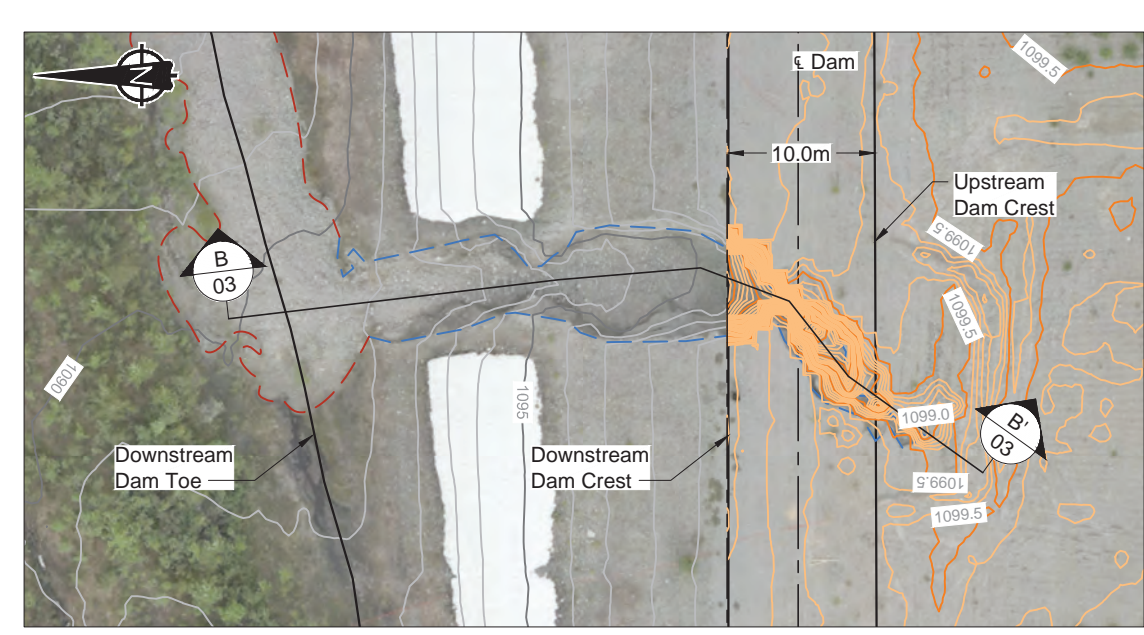
Test Pit Points		
Northing	Easting	Description
6711381.20	507857.93	SRK22-NDF-TP1
6711347.74	507846.18	SRK22-NDF-TP2
6711314.00	507861.62	SRK22-NDF-TP3



North Dam Plan



Erosion Gulley Detail View



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Sä Dena Hes

2022 Annual Facility Performance Review

DRAWING TITLE:
 North Dam Erosion Gulley and Tailings Cover Site Plan - June 20, 2022

DATE: October 2022 APPROVED: PM FIGURE: 04

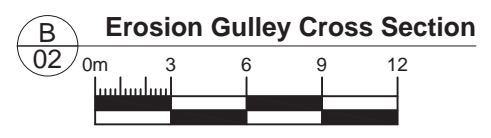
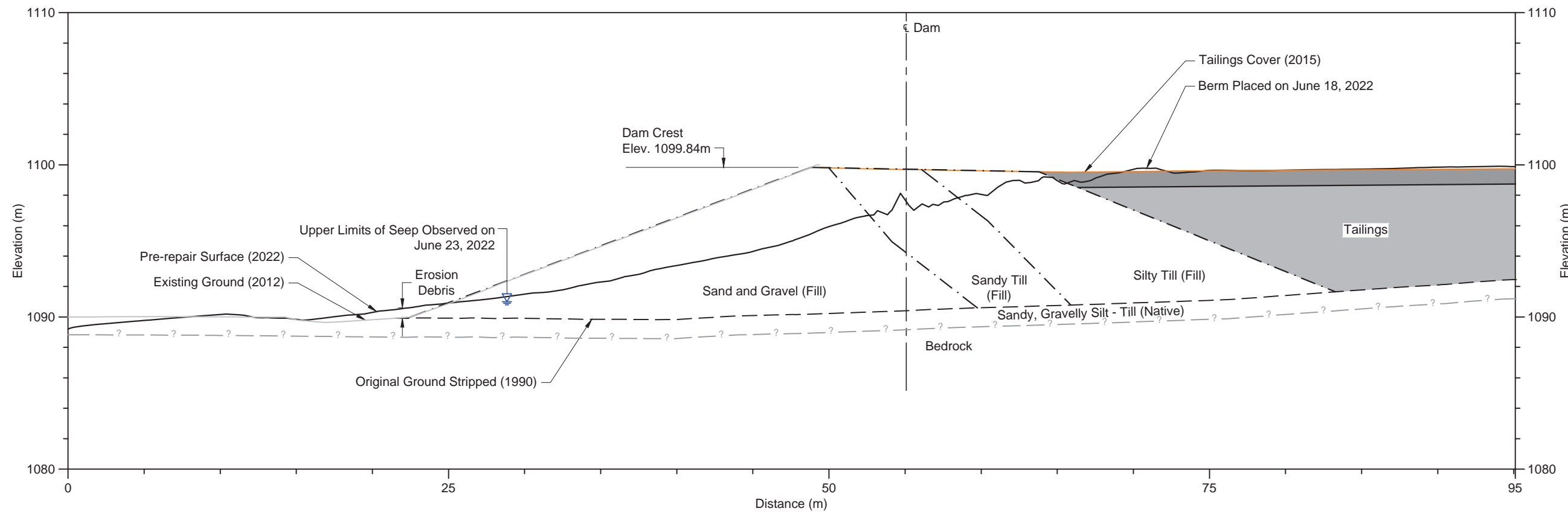
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- LEGEND**
-  Upper Limit Of Seepage Observed on June 23, 2022. Bedrock
 -  Bedrock Surface (2012)
 -  Pre-repair Surface (2022)
 -  Original Dam
 -  Original Ground Stripped (1990)
 -  Tailings Cover (2015)
 -  Tailings Cover
 -  Tailings

- NOTES**
1. All units are in meters unless otherwise specified.

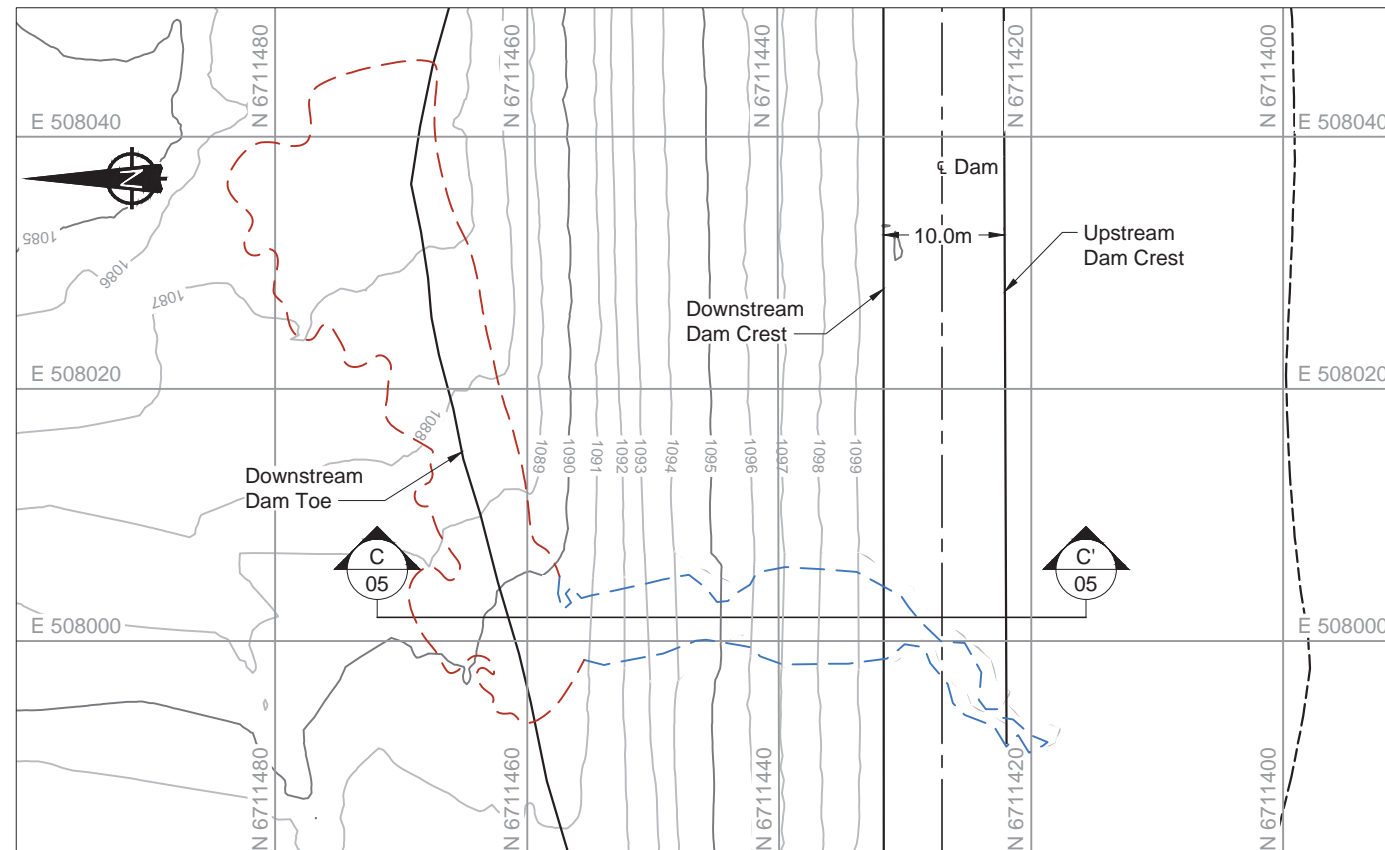
REFERENCES

1. Coordinates are UTM Zone 9, NAD83 (CSRS) and are derived holding values of point UGL100 fixed in 3D.
2. Coordinates 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.
8. 2015 tailings cover contours obtained from Yukon Engineering Surfaces.

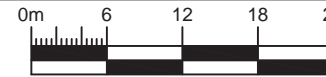


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		2022 Annual Facility Performance Review		
		DRAWING TITLE: North Dam Erosion Gully Cross Section		
SRK JOB NO.: CAPR001928	REG. NO.:	Sä Dena Hes		
FILE NAME: Sheet 4 and 5.dwg	DATE: October 2022	APPROVED: PM	FIGURE: 05	



Plan View of Completed Repairs



LEGEND

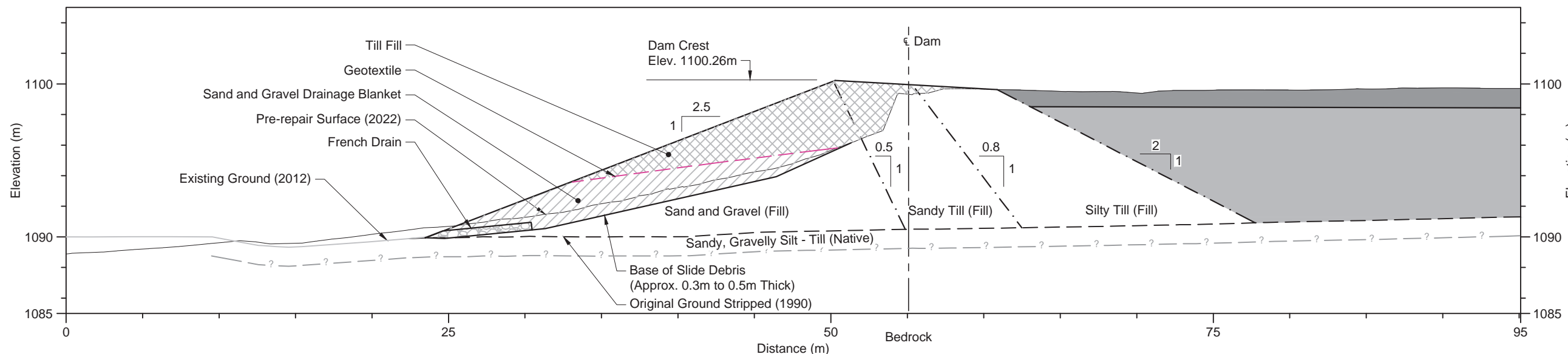
- Bedrock
- - - Erosion Debris Extent
- - - Erosion Gulley Extent
- Existing Ground 2012
- - - Geotextile
- Pre-repair Surface 2022
- - - Original Dam
- - - Original Ground Stripped (Pre-Construction) 1990
- [Pattern] French Drain
- [Pattern] Sand and Gravel Drainage Blanket
- [Pattern] Till Fill
- [Pattern]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

NOTES

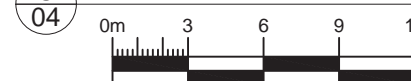
1. Contours are shown at 1.0m intervals.
2. Contours in the plan view are interpolated and are approximate.
3. All units are in meters unless otherwise specified.
4. The repaired downstream slope surface is estimated based on field observations.

REFERENCES

1. Coordinates are UTM Zone 9, NAD83 (CSRS) and are derived holding values of point UGL100 fixed in 3D.
2. Coordinates 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
 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.

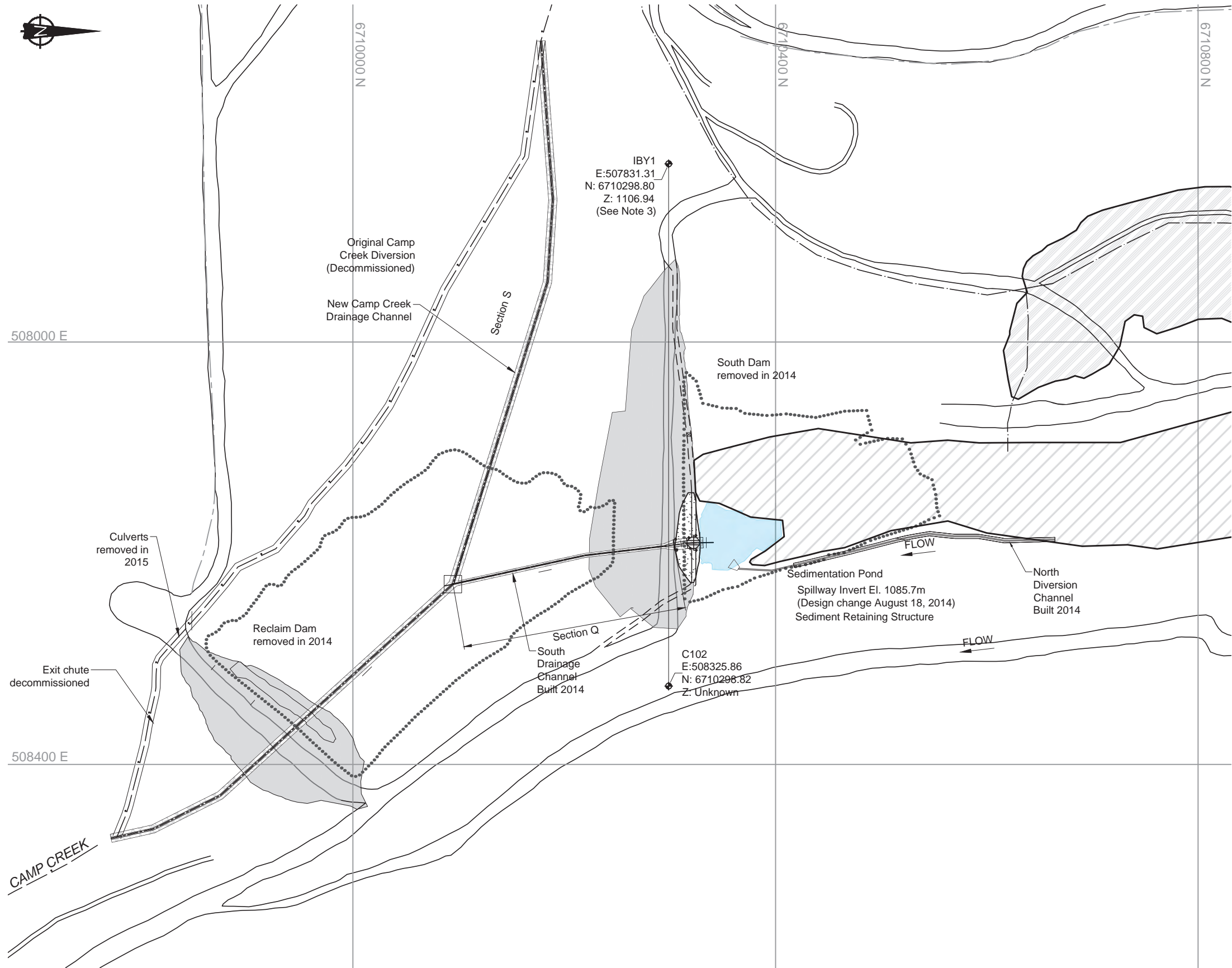


Erosion Gully Cross Section



C:\Users\mradon\SRK Consulting\F22\ Sä Dena Hes - 1040_CAD_GIS\CAD_C3D\F1022 Annual Facility Performance Review\Sheet 6.dwg

		2022 Annual Facility Performance Review		
		DRAWING TITLE: North Dam Repaired Cross Section		
SRK JOB NO.: CAPR001928	REG. NO.:	Sä Dena Hes		DATE: October 2022
FILE NAME: Sheet 6.dwg		APPROVED: PM	FIGURE:	06



LEGEND

	Covered Tailings
	Removed Dams
	Sedimentation Pond
	Minor Contours (1m interval)
	Major Contours (5m interval)
	Camp Creek
	Drainage Channel

- NOTES**
- Contours are shown at 10.0m intervals.
 - All units are in meters unless otherwise specified.
 - This Benchmark datum is currently used to monitor settlement gauges on the dam and was used as the benchmark in construction of the dam. The elevation has been adjusted from 1103.54m to the current LiDAR Survey elevation.

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

C:\Users\madon\SRK Consulting\F5261 Sä Dena Hes - 1040_CAD_GIS\CAD_C3D\F1022 Annual Facility Performance Review\Sheet 7.dwg

		2022 Annual Facility Performance Review		
		DRAWING TITLE: Sediment Retaining Structure Location Map		
SRK JOB NO.: CAPR001928	REG. NO.:	Sä Dena Hes		DATE: October 2022
FILE NAME: Sheet 7.dwg		APPROVED: PM	FIGURE:	07



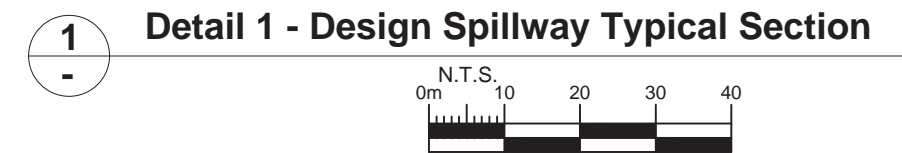
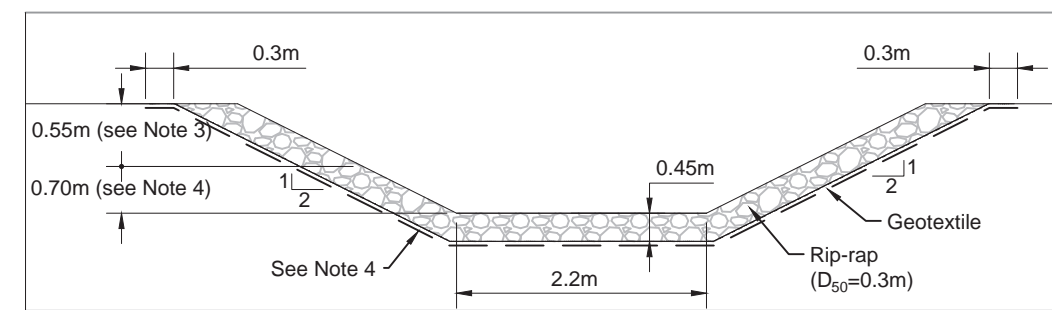
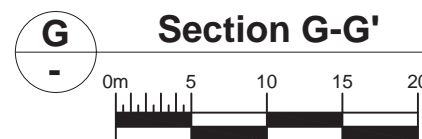
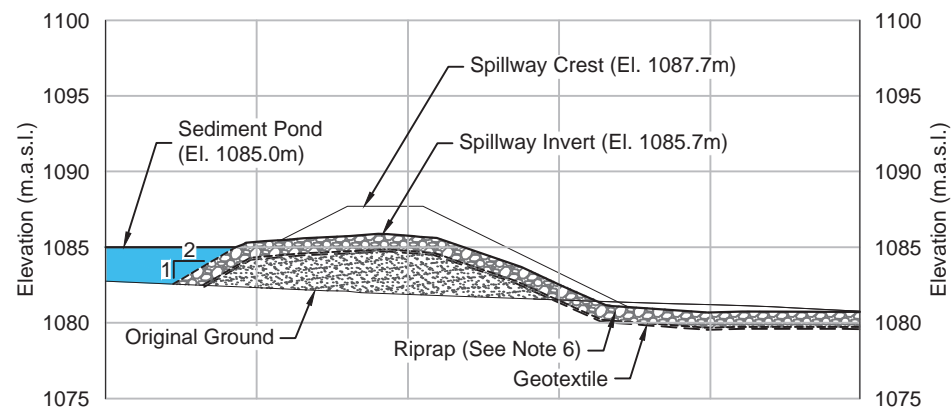
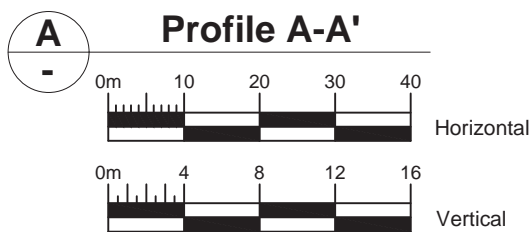
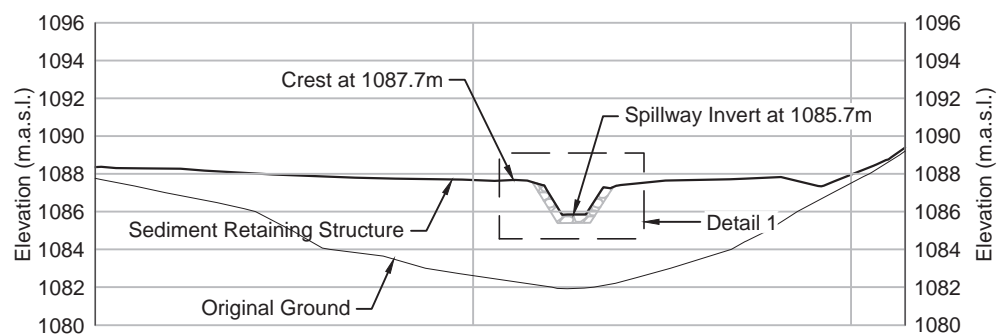
LEGEND

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

- NOTES**
- Contours are shown at 1.0m intervals.
 - All units are in meters unless otherwise specified.
 - 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.
 - Rip rap from downstream toe buttress was salvaged and reused during channel construction.
 - 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.
 - Design extents of rip rap and geotextile, as no as-built survey.

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

Plan



C:\Users\mradon\SRK Consulting\F5248 Sä Dena Hes - 1040_CAD_GIS\CAD_C3D\F10222 Annual Facility Performance Review\Sheet 8.dwg

srk consulting

SRK JOB NO.: CAPR001928 REG. NO.:
FILE NAME: Sheet 8.dwg

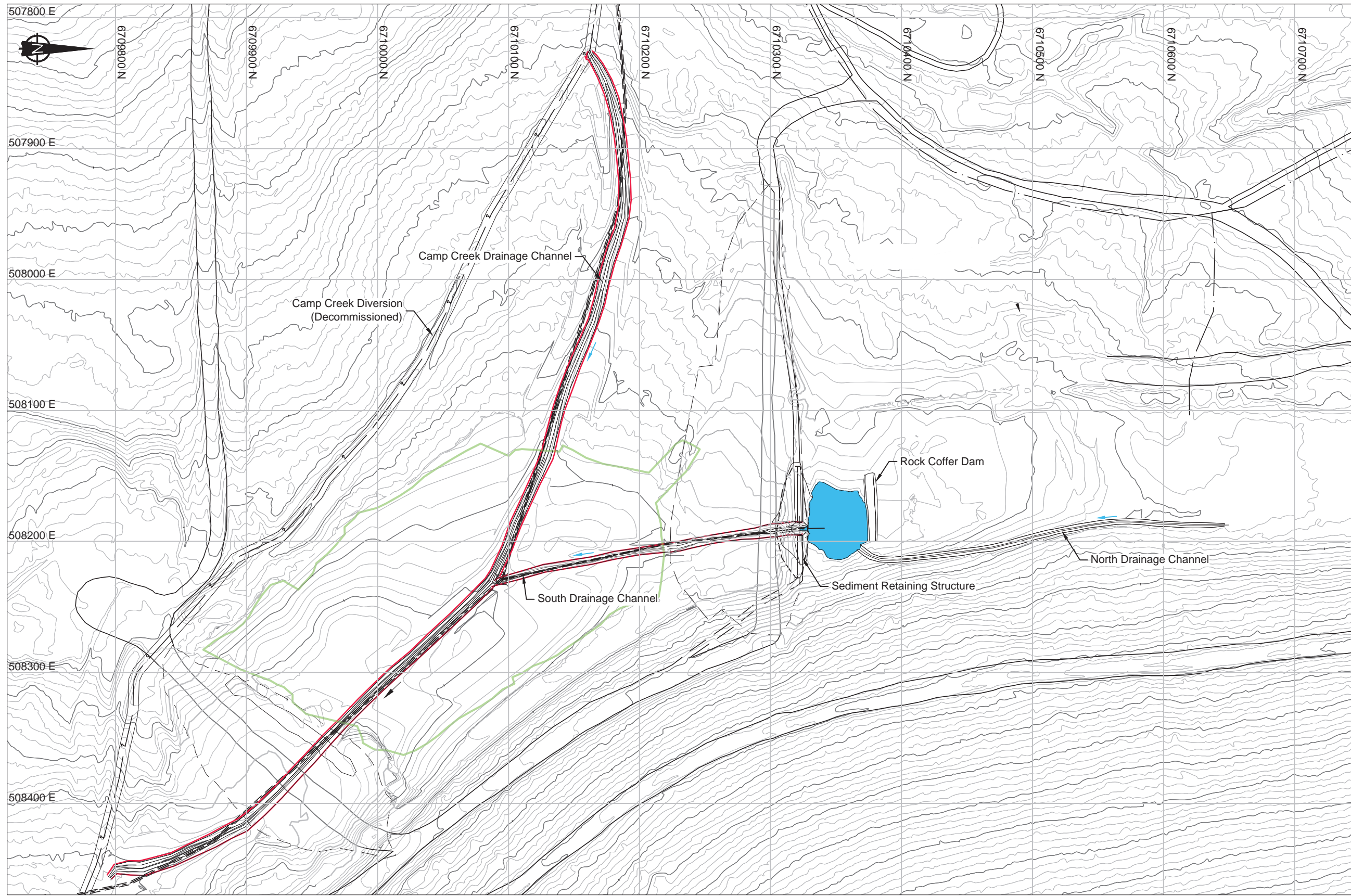
Teck

Sä Dena Hes

2022 Annual Facility Performance Review

DRAWING TITLE:
**Sediment Retaining Structure
Plan and Profile**

DATE: October 2022 APPROVED: PM FIGURE: 08

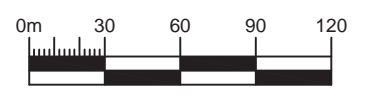


LEGEND

	Major Contour (5m)
	Minor Contour (1m)
	Dam Crest
	Dam Toe
	Edge of Road
	Direction of Flow
	Sediment Pond

- NOTES**
1. Contours are shown at 1.0m intervals.
 2. All units are in meters unless otherwise specified.
 3. As-built Camp Creek Drainage Channel upstream and downstream tie-in locations and North Drainage Channel alignments were modified from the design by Amec foster wheeler, with consultation from SRK and Teck, based on field conditions.

- 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.



C:\Users\mradon\SRK Consulting\F5248 Sä Dena Hes - 1040_CAD_GIS\CAD_C3D\F1022 Annual Facility Performance Review\Sheet 9.dwg

srk consulting

SRK JOB NO.: CAPR001928	REG. NO.:
FILE NAME: Sheet 9.dwg	

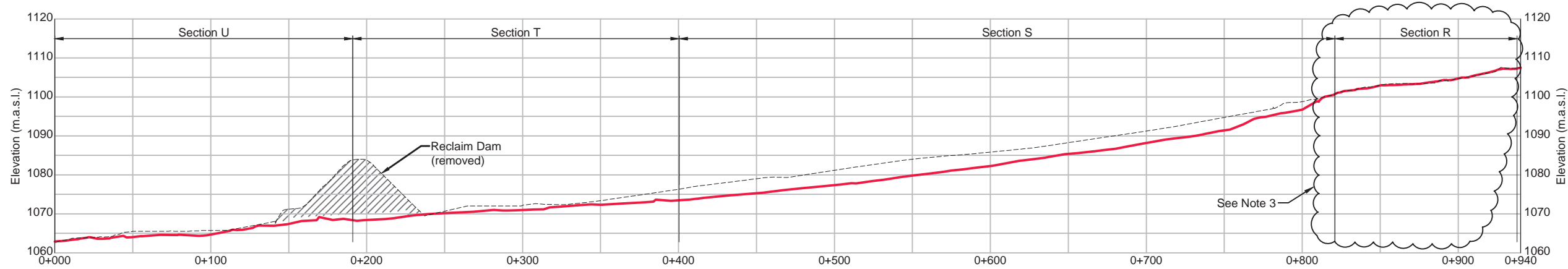
Teck

Sä Dena Hes

2022 Annual Facility Performance Review

DRAWING TITLE:
Drainage Channel Plan

DATE: October 2022	APPROVED: PM	FIGURE: 09
-----------------------	-----------------	---------------



- LEGEND**
- Top of Drainage Channel Profile
 - Pre-existing Ground
 - Pre-Construction Ground
 - Sediment Retaining Structure
 - Non-woven Geotextile
 - Material to be removed
 - Rip Rap
 - Till (left in place from Original Dam)
 - As-built Surface (2015)

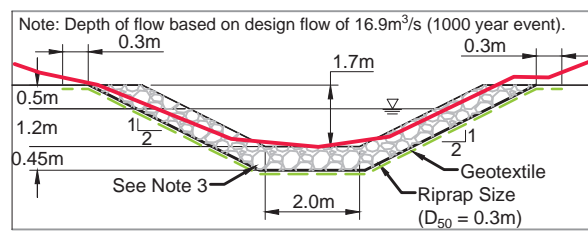
- NOTES**
- All units are in meters unless otherwise specified.
 - Based on field conditions Section R was removed from the design and the upstream tie-in location was modified.
 - Design extents of rip rap and geotextile, as no as-built survey.

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

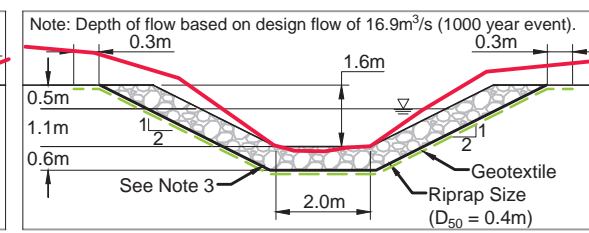
W
09 Profile W - W'
Camp Creek Channel

Horizontal: 0 10 20 30 40 50
Scale in Metres

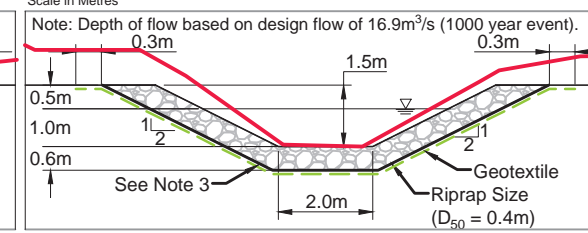
Vertical: 0 5 10 15 20 25
Scale in Metres



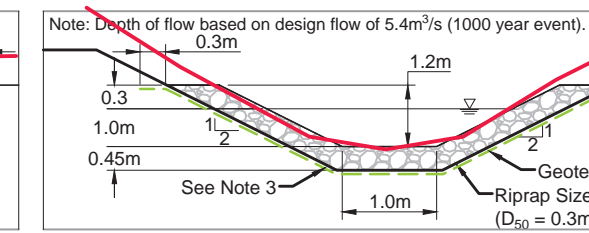
U
09 DESIGN SECTION U - U'
Camp Creek Drainage Channel
N.T.S.



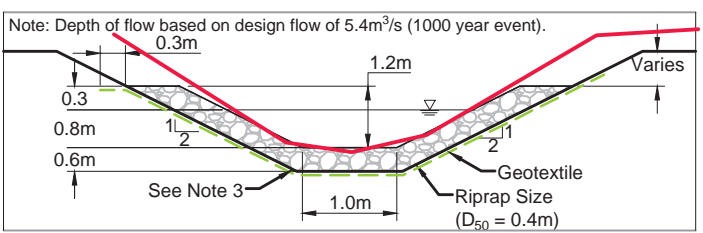
T
09 DESIGN SECTION T - T'
Camp Creek Drainage Channel
N.T.S.



S
09 DESIGN SECTION S - S'
Camp Creek Drainage Channel
N.T.S.

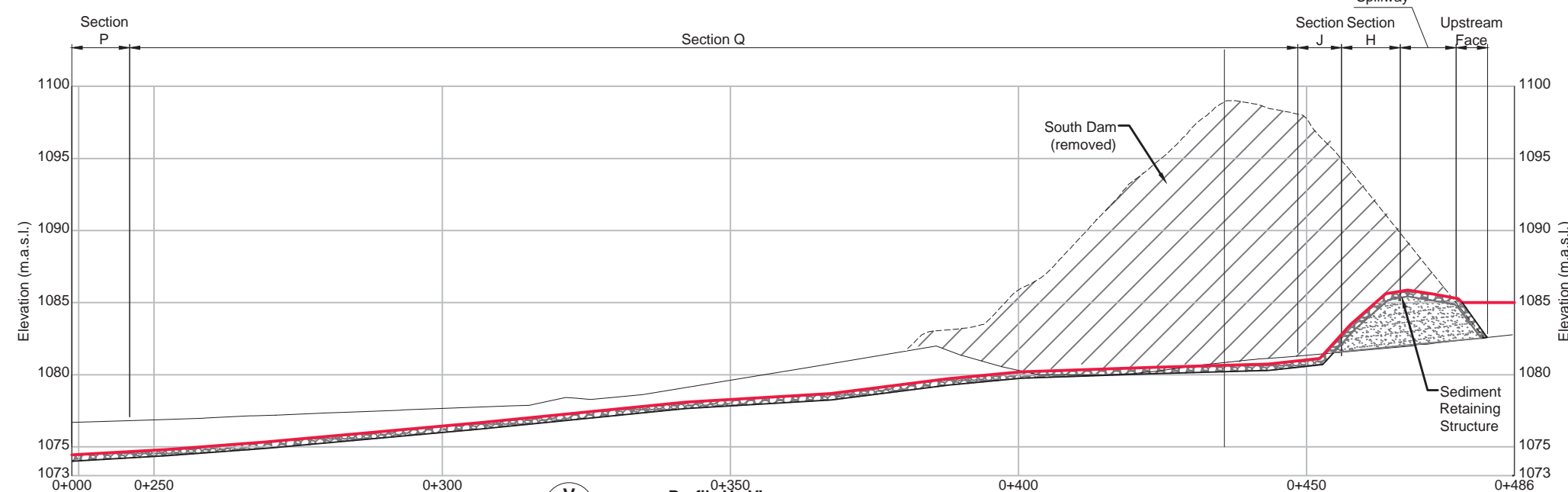


Q
09 DESIGN SECTION Q - Q'
South Drainage Channel
N.T.S.



P
09 DESIGN SECTION P - P'
South Dam Drainage Channel
N.T.S.

Design Drainage Channel			
Riprap Volume Summary Table			
Location	D ₅₀ (m)	Armoring Depth (m)	Volume (m ³)
Section U	0.3	0.45	993
Section T	0.4	0.6	1409
Section S	0.4	0.6	2875
Section P	0.4	0.6	52



V
09 Profile V - V'
South Drainage Channel

Horizontal: 0 5 10 15 20 25
Scale in Metres

Vertical: 0 2 4 6 8 10
Scale in Metres

AS-BUILT EXCAVATED RIPRAP QUANTITIES USED FOR CHANNEL CONSTRUCTION			
Material	Units	Quantity	Notes
Riprap developed from the Quarry	m ³	5,492	Volume tracked by Amec Foster Wheeler
Riprap salvaged from Toe Buttresses	m ³	3,592	Volume tracked by Amec Foster Wheeler

srk consulting

SRK JOB NO.: CAPR001928 REG. NO.:
FILE NAME: Sheet 10 and 11.dwg

Teck

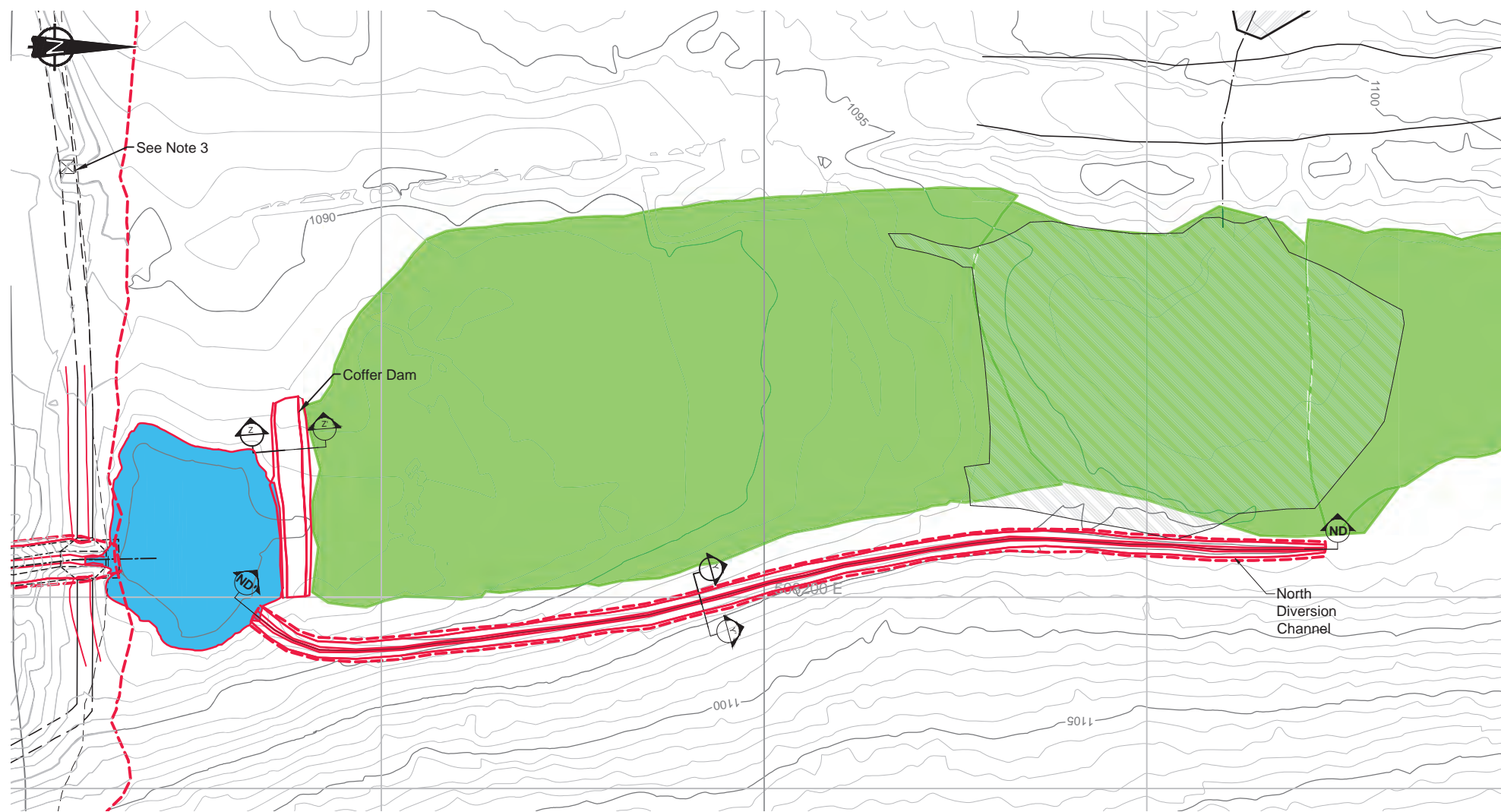
Sä Dena Hes

2022 Annual Facility Performance Review

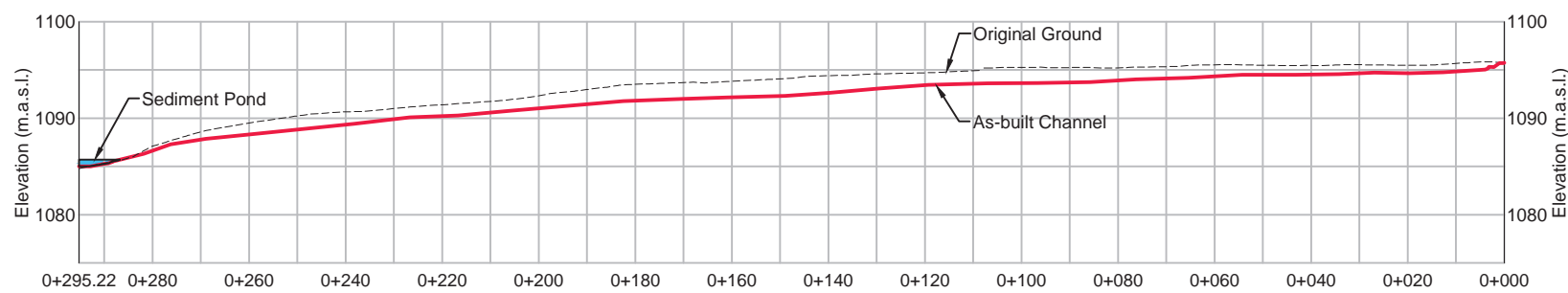
DRAWING TITLE:
Drainage Channel Sections

DATE: October 2022 APPROVED: PM FIGURE: 10

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PLAN



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

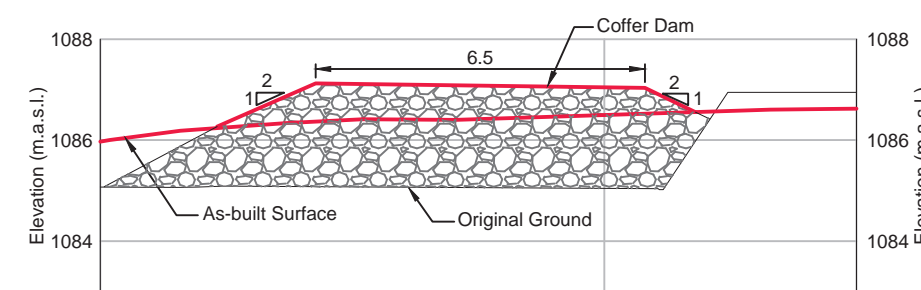
- Major Contours (5m)
- Minor Contours (1m)
- Edge of Road
- Tailings Pipeline
- Existing Ground (Profile)
- Non-woven Geotextile
- Covered Tailings (Proposed in Design)
- Rip Rap
- Sediment Pond (As-built)
- As-built Toe (2015)
- As-built Crest (2015)
- As-built Extent of Excavation / Fill (2015)

NOTES

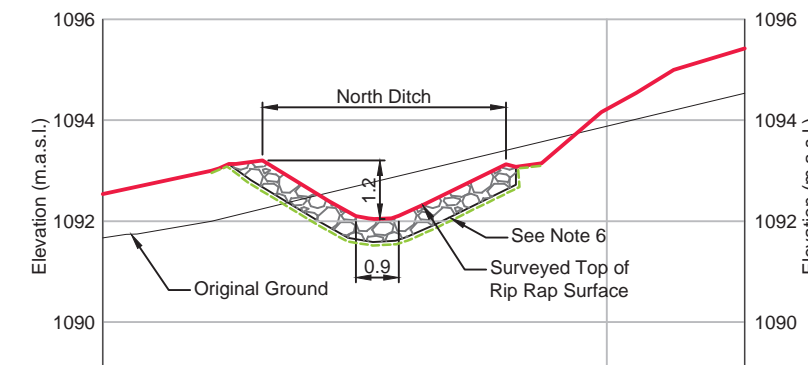
1. Contours are shown at 1.0m intervals.
2. All units are in meters unless otherwise specified.
3. Based on field conditions the North Drainage Channel was realigned to avoid constructing the channel through deposited tailings.
4. Based on field conditions a Rock Cofferdam was constructed to retain soft 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



Section Z - Z'
Scale in Metres



Section Y - Y'
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.



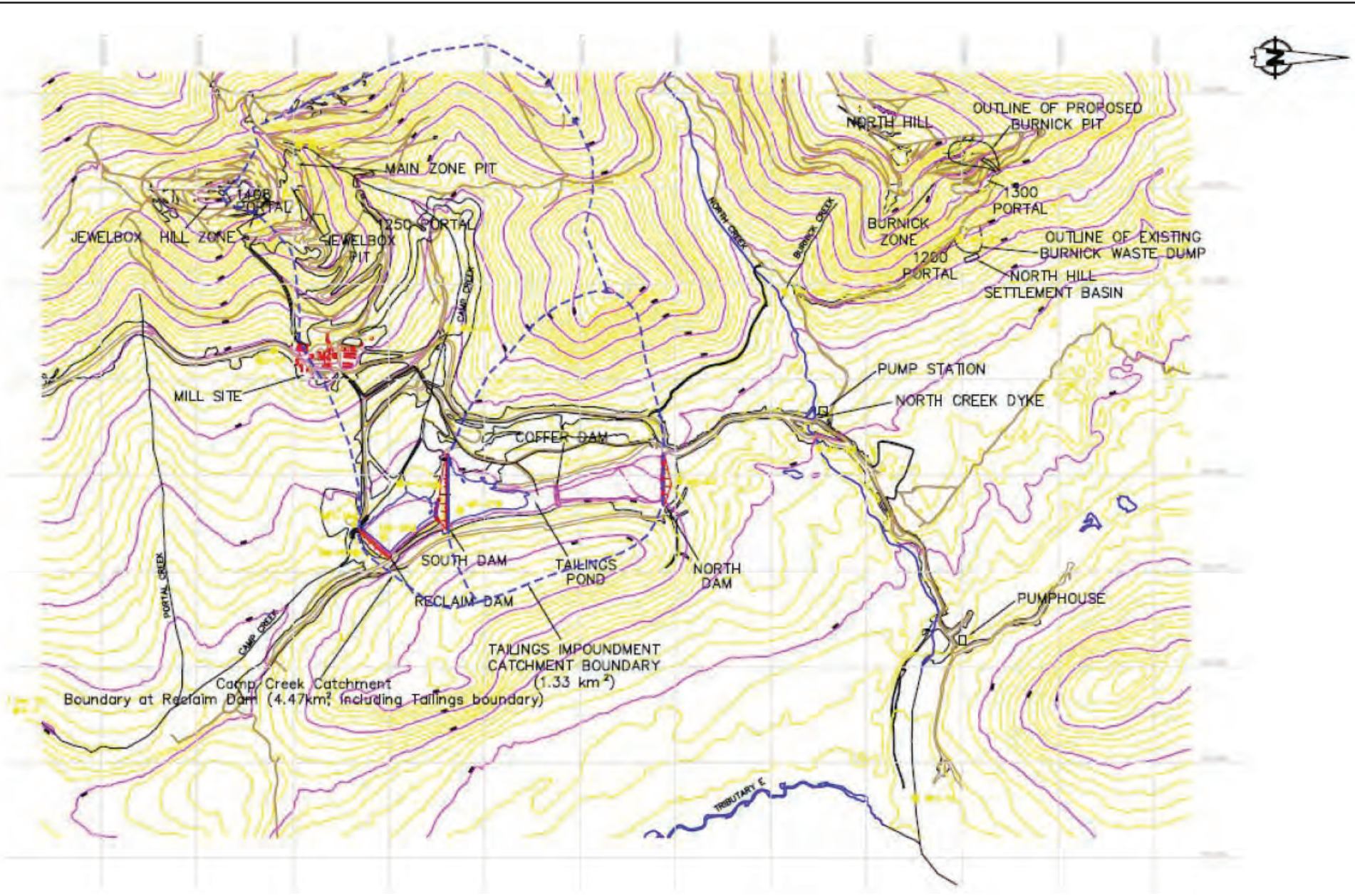
2022 Annual Facility Performance Review

DRAWING TITLE:
North Drainage Channel Plan,
Profile and Sections

SRK JOB NO.: CAPR001928
REG. NO.:
FILE NAME: Sheet 10 and 11.dwg

Sä Dena Hes

DATE: October 2022
APPROVED: PM
FIGURE:



		2022 Annual Facility Performance Review		
		Catchment Areas		
Job No: CAPR001928 Filename: SDH_AFPR_Figures-Catchment_WRDumps.pptx	Sa Dena Hes	Date: Sept. 2022	Approved: PHM	Figure: 12



		2022 Annual Facility Performance Review		
		Burnick Zone Plan View		
Job No: CAPR001928	Sa Dena Hes	Date: Sept. 2022	Approved: PHM	Figure: 13
Filename: SDH_AFPR_Figures-Catchment_WRDumps.pptx				

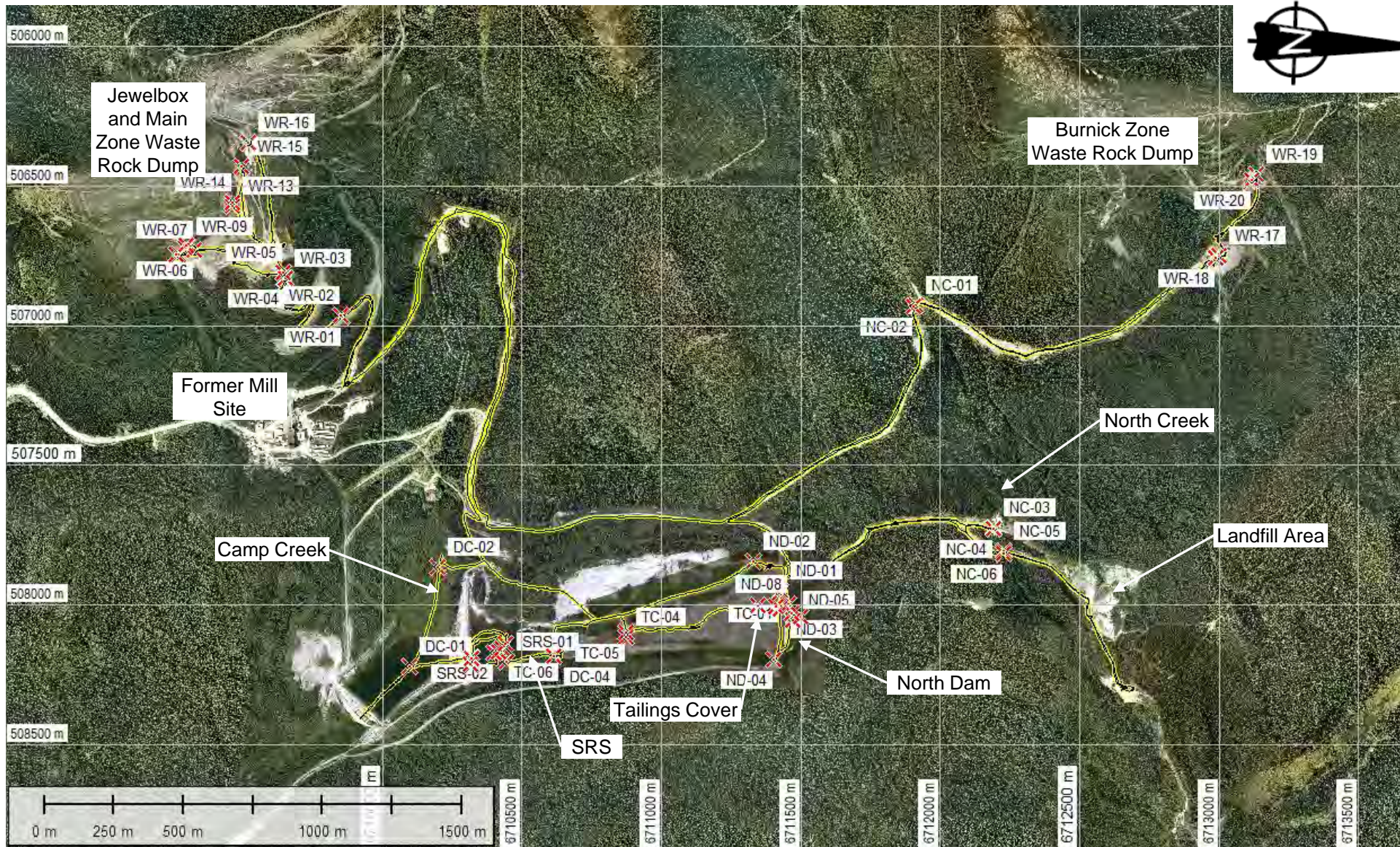



Job No: CAPR001928
Filename: SDH_AFPR_Figures-Catchment_WRDumps.pptx


Sa Dena Hes

2022 Annual Facility Performance Review		
Main Zone and Jewelbox Zone Plan View		
Date: Sept. 2022	Approved: PHM	Figure: 14

Appendix A. Site Photographs



Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Coordinate system is UTM NAD83 Zone 9.

 2022 Inspection GPS track log

 Photo location and direction



Job No: CAPR001928
 Filename: SDH_2022-SiteInspection-PhotoLocations.pptx



Sa Dena Hes

2022 Annual Facility Performance Report

Inspection Areas and Photo Logs

Date:
Sept. 28, 2022

Approved:
PHM

Figure:
A-1



Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Coordinate system is UTM NAD83 Zone 9.



Job No: CAPR001928
 Filename: SDH_2022-SiteInspection-PhotoLocations.pptx

Sa Dena Hes

2022 Annual Facility Performance Report

Main and Jewelbox Zone Waste Rock Dump Photo Locations

Date:
 Sept. 28, 2022

Approved:
 PHM

Figure:
A-1



Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Coordinate system is UTM NAD83 Zone 9.



2022 Annual Facility Performance Report

**Burnick Zone Waste Rock Dump
Photo Locations**

Job No: CAPR001928
 Filename: SDH_2022-SiteInspection-PhotoLocations.pptx

Sa Dena Hes

Date:
Sept. 28, 2022

Approved:
PHM

Figure:
A-3



Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Coordinate system is UTM NAD83 Zone 9.



North Creek Photo Locations

Job No: CAPR001928
 Filename: SDH_2022-SiteInspection-PhotoLocations.pptx

Sa Dena Hes

Date:
 Sept. 28, 2022

Approved:
 PHM

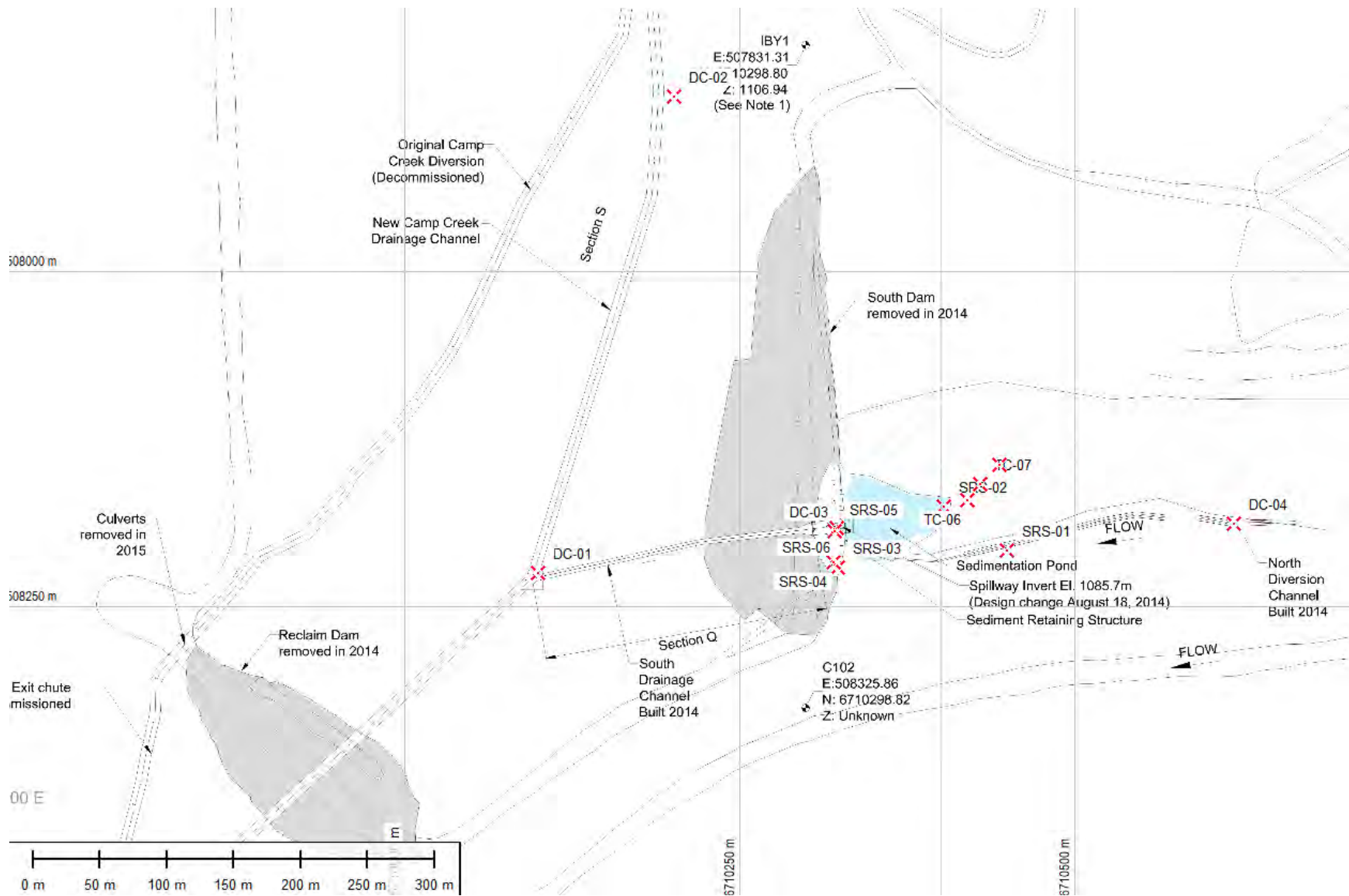
Figure:
A-4



Notes:

1. Orthographic photo of the North Dam and Tailings Cover taken on June 20, 2022. The photo is overlain on top of the August 12 orthophoto shown on the previous figures.
2. Coordinate system is UTM NAD83 Zone 9.

		2022 Annual Facility Performance Report		
		North Dam and Tailings Cover Photo Locations		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection-PhotoLocations.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-5



- Notes:
1. See Figure 5 in this report for further details on the base plan shown.

		2022 Annual Facility Performance Report		
		SRS, South Tailings Cover and Drainage Channel Photo Locations		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection-PhotoLocations.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-6



Photo DC-01: Camp Creek looking downstream at the confluence with the South Drainage Channel..



Photo DC-02: Camp Creek looking upstream.

		2022 Annual Facility Performance Review		
		South Diversion Channel and Camp Creek		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-7



Photo DC-03: Upper end of the South Drainage Channel taken from the SRS Spillway.



Photo DC-04: North Diversion Channel looking upstream.

		2022 Annual Facility Performance Review		
		South Diversion Channel and Camp Creek		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-8



Photo NC-01: Channel Erosion at North Creek across the decommissioned access road to Burnick Zone.



Photo NC-02: Channel Erosion at North Creek across the decommissioned access road to Burnick Zone. Seepage observed entering channel leaving a rusty-reddish coloured stain on the soils.

		2022 Annual Facility Performance Review		
		North Creek		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-9



Photo NC-03: Beaver dam at the upstream end of the decommissioned North Creek Dike structure.



Photo NC-04: Channel erosion at the downstream end of the decommissioned North Creek Dike structure with exposed geotextile. The condition appears unchanged compared to 2021 inspection photos.

		2022 Annual Facility Performance Review		
		North Creek		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-10



Photo NC-05: On-going channel and bank erosion at the downstream end of the lower decommissioned access road crossing of North Creek to the landfill area.



Photo NC-06: On-going channel and bank erosion at the upstream end of the lower decommissioned access road crossing of North Creek to the landfill area.

		2022 Annual Facility Performance Review		
		North Creek		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-11



Photo ND-01: North Dam looking east towards the erosion gully repair area.



Photo ND-02: Till borrow area used for the North Dam repairs. The borrow slopes have been partially regraded and landformed.

		2022 Annual Facility Performance Review		
		North Dam		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-12



Photo ND-03: Erosion debris downstream of the dam. The silt fence is placed across the erosion gully repair area approximately midway down the slope. Historical wind-blown tailings visible to the right of the silt fence, further upslope.



Photo ND-04: North Dam looking west.

		2022 Annual Facility Performance Review		
		North Dam		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-13



Photo ND-05: Piezometer NDW-4A downstream of the dam toe. The PVC pipe extends above the protective casing.



Photo ND-06: MH-02 flow monitoring pipe.

		2022 Annual Facility Performance Review		
		North Dam		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Pholog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-14



Photo ND-07: Downstream slope of the North Dam looking southeast from the base of the erosion gully repair area.



Photo ND-08: Downstream toe of the North Dam looking west at the base of the erosion gully repair area.

		2022 Annual Facility Performance Review		
		North Dam		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-15



Photo SRS-01: SRS and pond looking south. The North Drainage Channel is located at the left side of the photo.



Photo SRS-02: SRS in distance, with the coffer dam in the foreground of the photo.

		2022 Annual Facility Performance Review		
		Sediment Retaining Structure (SRS) Area		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-16



Photo SRS-03: Crest and downstream slope of the SRS looking west from the spillway.



Photo SRS-04: SRS crest looking west from the east abutment.

		2022 Annual Facility Performance Review		
		Sediment Retaining Structure (SRS) Area		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-17



Photo SRS-05: Downstream face of the SRS on the east side of the spillway looking southwest.



Photo SRS-06: Downstream face of the SRS on the east side of the spillway looking southeast.

		2022 Annual Facility Performance Review		
		Sediment Retaining Structure (SRS) Area		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-18



Photo TC-01: North Dam crest and tailings cover south of the erosion gully repair area.



Photo TC-02: Upstream end of the Main drainage swale taken from the North Dam looking south.

		2022 Annual Facility Performance Review		
		Tailings Cover		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Pholog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-19



Photo TC-03: Main drainage swale that flows south through the middle of the tailings cover.



Photo TC-04: Sediment accumulation at the south end of the Northern Tailings Area at the location of the former Coffey Dam (removed).

		2022 Annual Facility Performance Review		
		Tailings Cover		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-20



Photo TC-05: Tailings cover looking north.



Photo TC-06: Erosion gully in tailings cover immediately to the south of the SRS Pond. Areas of exposed geotextile observed. No visible tailings observed.

		2022 Annual Facility Performance Review		
		Tailings Cover		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photos.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-21



Photo TC-07: Upstream end of the erosion gully in the tailings cover south of the SRS Pond.



Photo TC-08: Reclamation cover looking south towards the SRS and the start of the erosion gully.

		2022 Annual Facility Performance Review		
		Tailings Cover		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-22



Photo WR-01: Rill and gully erosion across the decommissioned access road to the Jewelbox Waste Rock Dump.



Photo WR-02: Erosion gully across the decommissioned access road to the Jewelbox Waste Rock Dump.

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photos.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-23



Photo WR-03: Jewelbox Waste Rock Dump looking upstream from the erosion gully (Photo WR-04).



Photo WR-04: Erosion gully at the base of the Jewelbox Waste Rock Dump looking downslope. The gully has eroded down to bedrock.

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-24



Photo WR-05: Erosion gully at the base of the Jewelbox Waste Dump looking upstream.



Photo WR-06: Overview of the TMA taken from the 1408 Portal Waste Rock Dump.

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-25



Photo WR-07: 1408 Portal Waste Rock Dump looking north.



Photo WR-08: Surficial slumping near the south end of the 1408 Portal Waste Rock Dump

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-26



Photo WR-09: Vent pipe from the 1408 portal.



Photo WR-10: Drainpipes from the 1408 Portal.

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Pholog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-27



Photo WR-11: Fill placement above the 1408 Portal looking north.



Photo WR-12: Rill erosion at the south end of the 1408 Portal Waste Rock Dump looking southeast.

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-28



Photo WR-13: Openings in the Jewelbox Pit wall above the Main Zone Waste Rock Dump



Photo WR-14: Jewelbox Pit wall looking west.

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-29



Photo WR-15: Erosion gully down the Main Zone Waste Rock Dump above the 1380 Portal.



Photo WR-16: Backfill at the 1380 Portal below Main Zone Waste Rock Dump.

		2022 Annual Facility Performance Review		
		Main Zone and Jewelbox Zone Waste Rock Dump Areas		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-30



Photo WR-17: Regraded Burnick Waste Rock Dump at the 1200 Portal.



Photo WR-18: 1200 Portal drainpipe.

		2022 Annual Facility Performance Review		
		Burnick Waste Rock Dump Area		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_PhotoLog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-31



Photo WR-19: Regraded 1300 Portal Waste Rock Dump and 1300 Portal area



Photo WR-20: 1300 Portal drainpipe.

		2022 Annual Facility Performance Review		
		Burnick Waste Rock Dump Area		
Job No: CAPR001928 Filename: SDH_2022-SiteInspection_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: A-32

Appendix B. Satellite Imagery



Notes:

- 1. Sentinel-2 L2A, true colour.
- 2. Imagery obtained from Copernicus Open Access Hub.



Satellite Imagery

May 22, 2022

Job No: CAPR001928

Filename: Figures_SDH-NorthDam_Satellite.pptx

Sa Dena Hes

Date:
August 2022

Approved:
P. Mikes

Figure: **B-1**



Water started to pond

Notes:

- 1. Sentinel-2 L2A, true colour.
- 2. Imagery obtained from Copernicus Open Access Hub.



Satellite Imagery

May 27, 2022

Job No: CAPR001928

Filename: Figures_SDH-NorthDam_Satellite.pptx

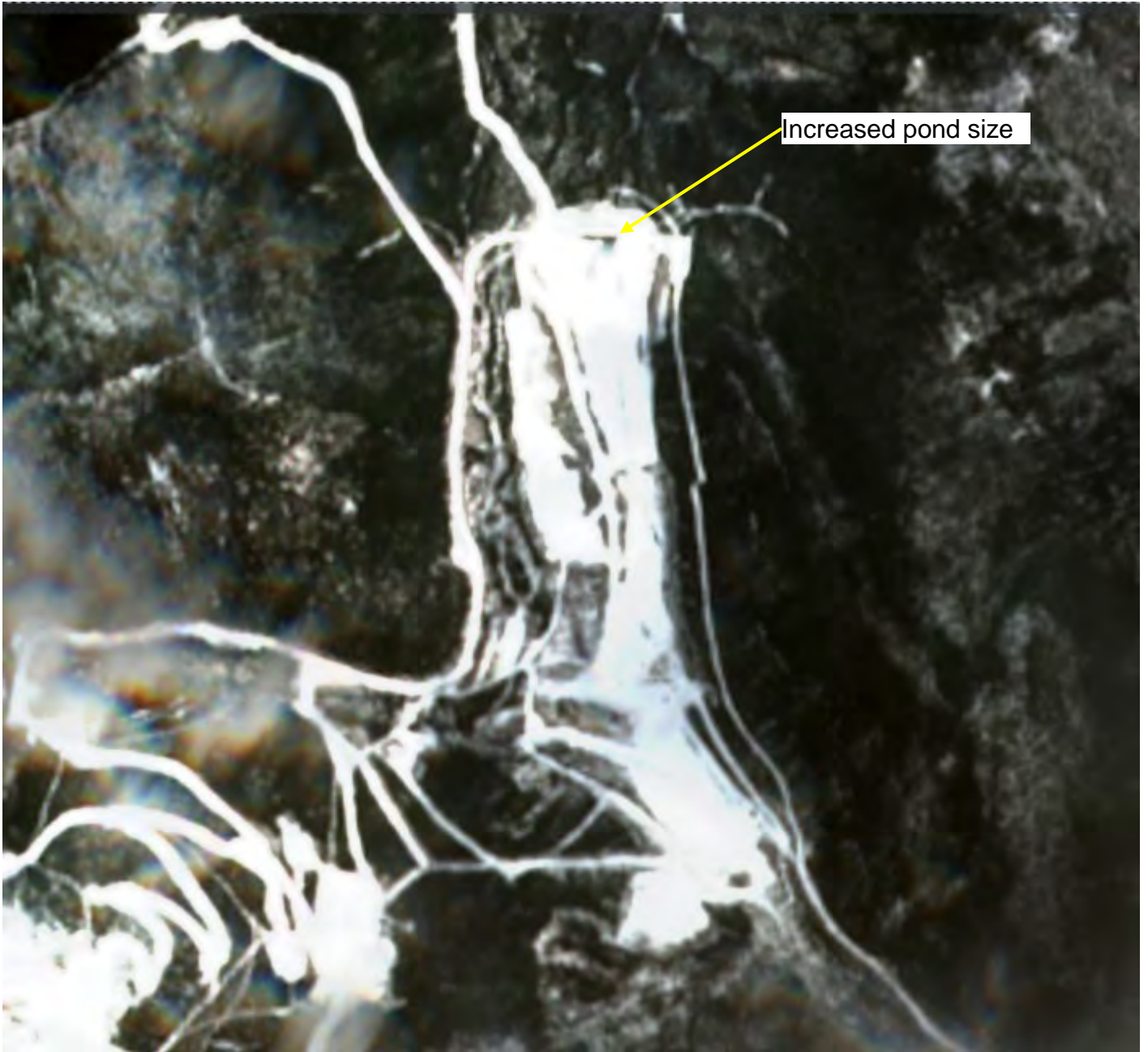
Sa Dena Hes

Date:
August 2022

Approved:
P. Mikes

Figure: **B-2**

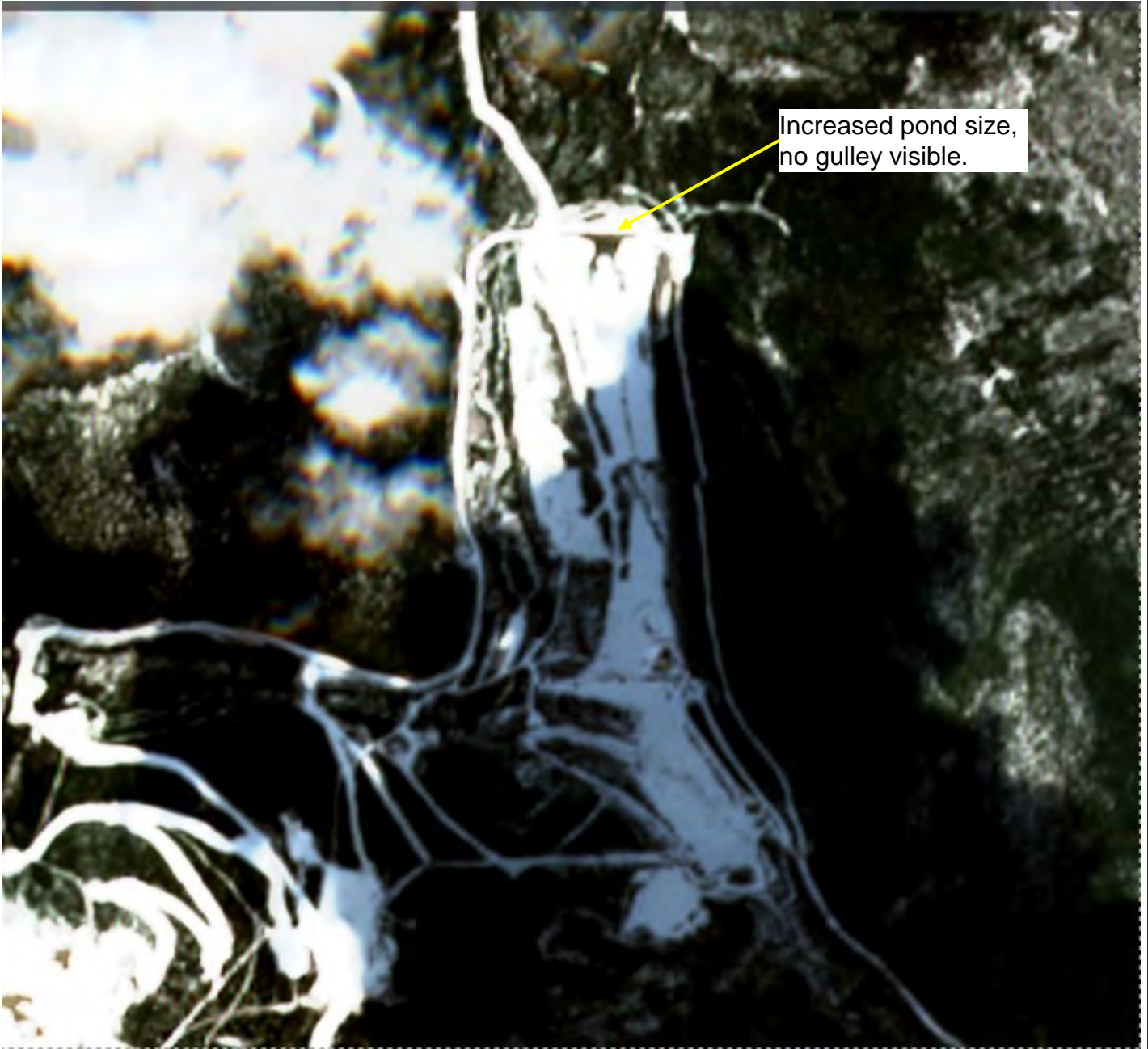
https://srk.sharepoint.com/sites/NA-CAPR001928/Deliverables/2022_APR/030_Appendices/Appendix%20B%20-%20Satellite%20Imagery/Figures_SDH-NorthDam_Satellite.pptx?web=1



Notes:

- 1. Sentinel-2 L2A, true colour.
- 2. Imagery obtained from Copernicus Open Access Hub.

		Satellite Imagery		
		May 28, 2022		
Job No: CAPR001928	Sa Dena Hes	Date: August 2022	Approved: P. Mikes	Figure: B-3
Filename: Figures_SDH-NorthDam_Satellite.pptx				



Notes:

- 1. Sentinel-2 L2A, true colour.
- 2. Imagery obtained from Copernicus Open Access Hub.

		Satellite Imagery		
		June 1, 2022		
Job No: CAPR001928	Sa Dena Hes	Date: August 2022	Approved: P. Mikes	Figure: B-4
Filename: Figures_SDH-NorthDam_Satellite.pptx				



Image not to clear, but appears that the pond is gone and the snow has mostly melted from TMA; gap in snow on the downstream slope of dam evident (erosion gully)

Notes:

- 1. Sentinel-2 L2A, true colour.
- 2. Imagery obtained from Copernicus Open Access Hub.



Satellite Imagery

June 7, 2022

Job No: CAPR001928

Sa Dena Hes

Date: August 2022

Approved: P. Mikes

Figure: B-5

Filename: Figures_SDH-NorthDam_Satellite.pptx



No snow/pond on tailings cover. Small gap evident in the snow on the downstream slope that is the gulley location

Notes:

1. Sentinel-2 L2A, true colour.
2. Imagery obtained from Copernicus Open Access Hub.



Satellite Imagery

June 11, 2022

Job No: CAPR001928

Filename: Figures_SDH-NorthDam_Satellite.pptx

Sa Dena Hes

Date:
August 2022

Approved:
P. Mikes

Figure: **B-6**

https://srk.sharepoint.com/sites/NA-CAPR001928/Deliverables/2022_APR/030_Appendices/Appendix%20B%20-%20Satellite%20Imagery/Figures_SDH-NorthDam_Satellite.pptx?web=1



May 10, 2020, satellite imagery showing a large pond on the cover surface..

		Satellite Imagery		
		May 10, 2022		
Job No: CAPR001928 Filename: Figures_SDH-NorthDam_Satellite.pptx	Sa Dena Hes	Date: August 2022	Approved: P. Mikes	Figure: B-7

Appendix C. North Dam Erosion Gully Repair Photographs



Photo 1: Drone Orthophoto - June 20, 2022



Photo 2: Erosion Gully looking upslope (June 21, 2022).

		2022 AFPR		
		North Dam Gully Repair Photographs		
Job No: CAPR001928 Filename: SDH_NorthDamGullyRepair_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: C-1



Photo 3: Erosion of the dam crest and tailings cover at the upstream end of the erosion gully (June 21, 2022).



Photo 4a/b: West and east sides of the erosion gully (June 21, 2022).

		2022 AFPR		
		North Dam Gully Repair Photographs		
Job No: CAPR001928 Filename: SDH_NorthDamGullyRepair_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: C-2



Photo 5: Excavator constructing working platforms down the west side of the gully (June 23, 2022).



Photo 6: French Drain installation at the base of the gully (June 24, 2022).

		2022 AFPR		
		North Dam Gully Repair Photographs		
Job No: CAPR001928 Filename: SDH_NorthDamGullyRepair_Pholog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: C-3



Photo 7: Sand and Gravel gully side slopes were scaled back and placed at the base of the gully (June 24, 2022).



Photo 8: Compaction of Sand and Gravel in 0.3 m lifts (June 24, 2022).

		2022 AFPR		
		North Dam Gully Repair Photographs		
Job No: CAPR001928 Filename: SDH_NorthDamGullyRepair_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: C-4



Photo 9: Placement of sand and gravel and trimming of the dam slope (June 25, 2022).



Photo 10: Geotextile installation to delineate between the Sand and Gravel and Repair Till embankment zones (June 25, 2022).

		2022 AFPR		
		North Dam Gully Repair Photographs		
Job No: CAPR001928 Filename: SDH_NorthDamGullyRepair_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: C-5



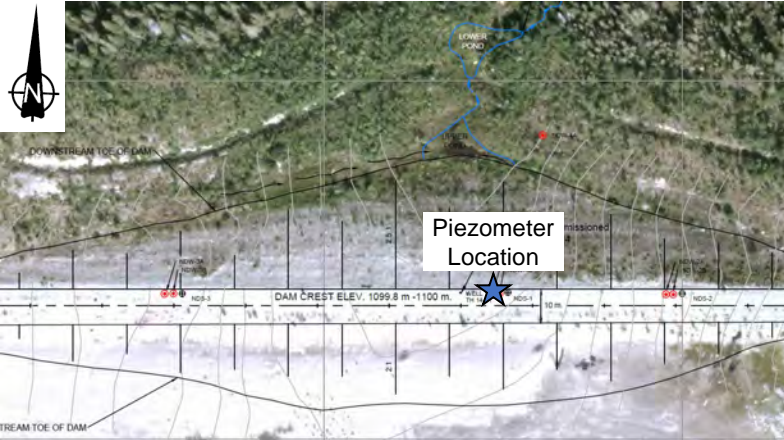
Photo 9: Till placement (June 26, 2022).



Photo 10: Completed repairs looking west (June 28, 2022).

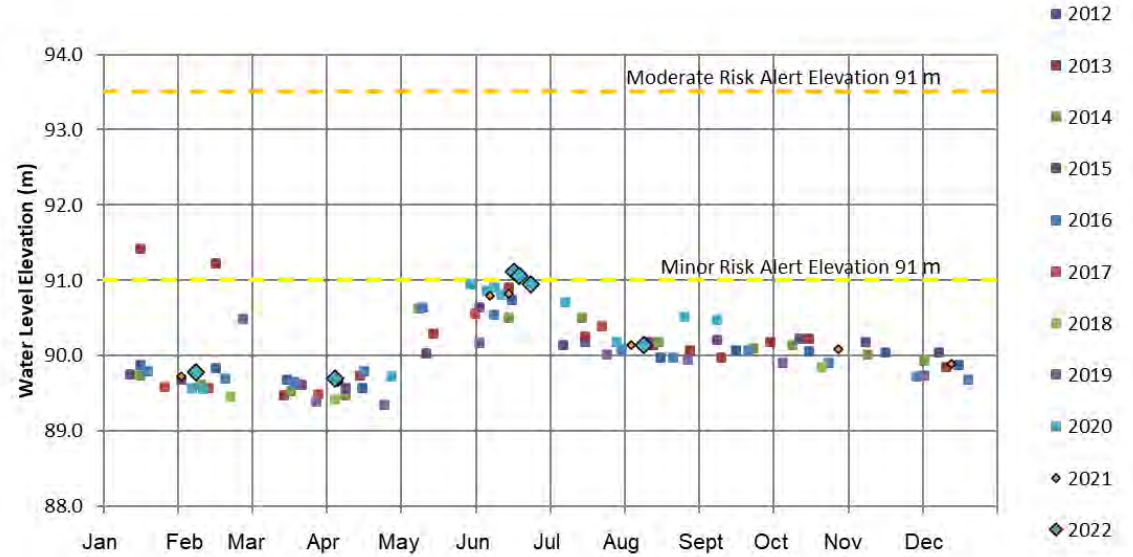
		2022 AFPR		
		North Dam Gully Repair Photographs		
Job No: CAPR001928 Filename: SDH_NorthDamGullyRepair_Photolog.pptx	Sa Dena Hes	Date: Sept. 28, 2022	Approved: PHM	Figure: C-6

Appendix D. Instrumentation Data

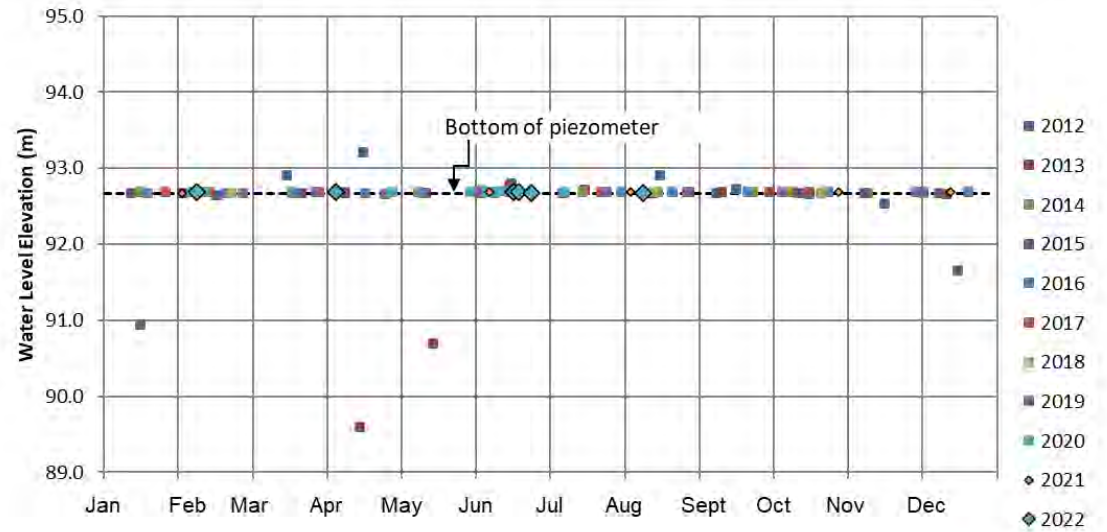


Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.



NDW-1A – Screened in dam foundation (bedrock)



NDW-1B – Screened in dam fill (Sandy Till)



North Dam Instrumentation

North Dam Piezometers
NDW-1A and 1B

Source file:
https://srk.sharepoint.com/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2022Edition.xlsx?web=1

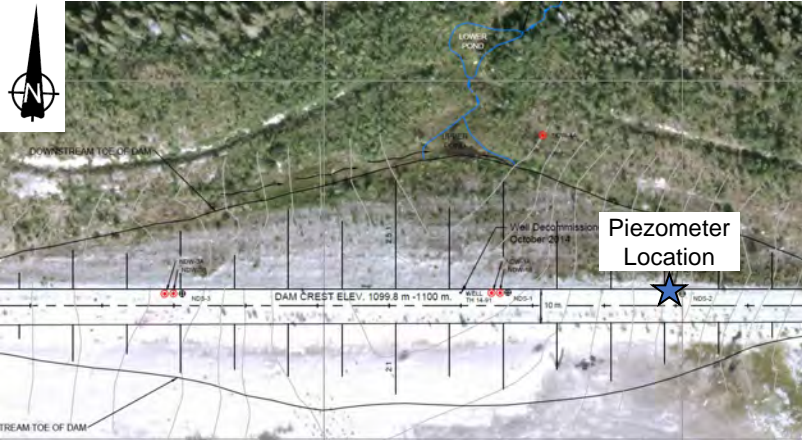
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Sa Dena Hes

Date:
August 2022

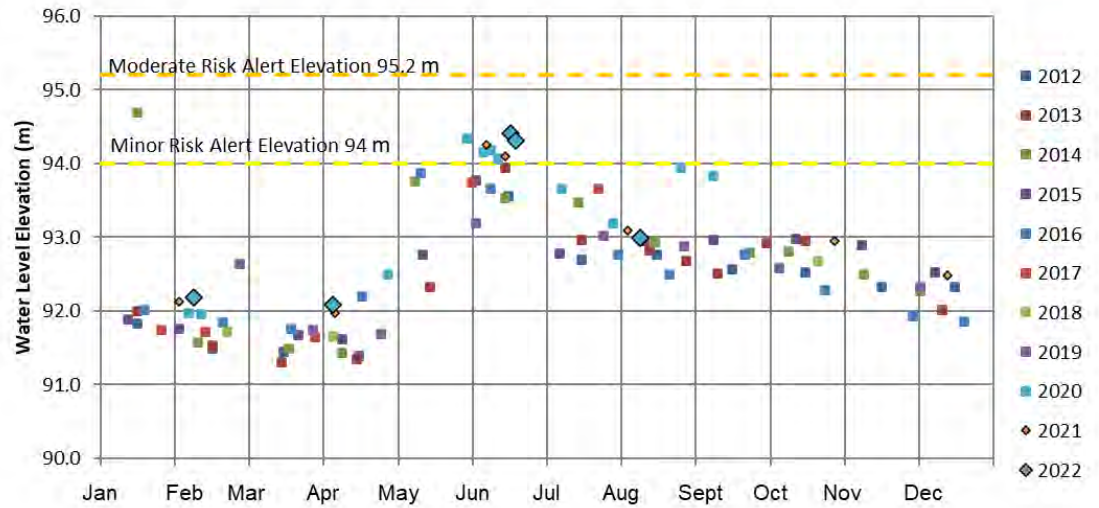
Approved:
P. Mikes

Figure: **D-1**

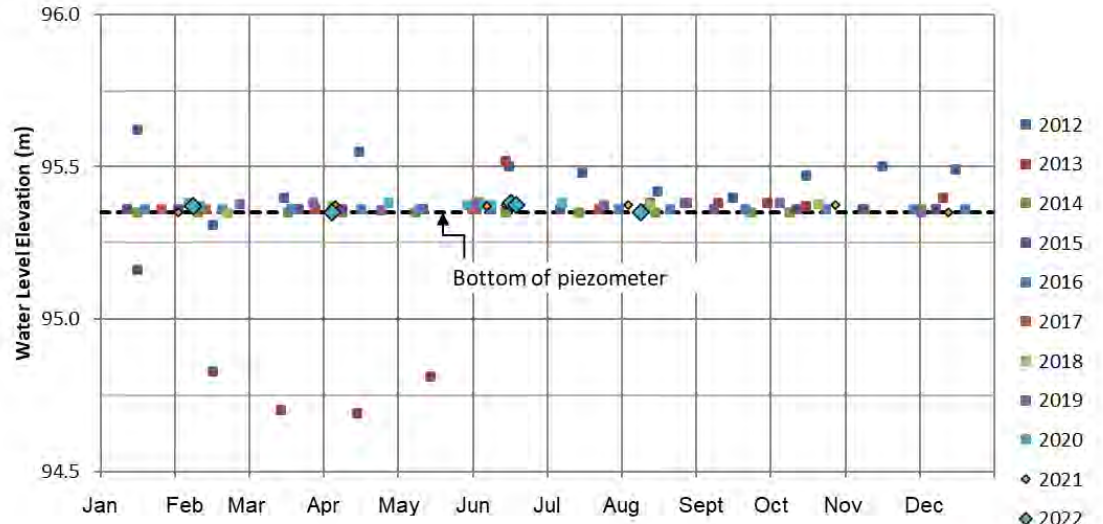


Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.



NDW-2A – Screened in dam foundation (bedrock)



NDW-2B – Screened in dam fill (Sandy Till)



North Dam Instrumentation

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

Source file:
https://srk.sharepoint.com/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2022Edition.xlsx?web=1

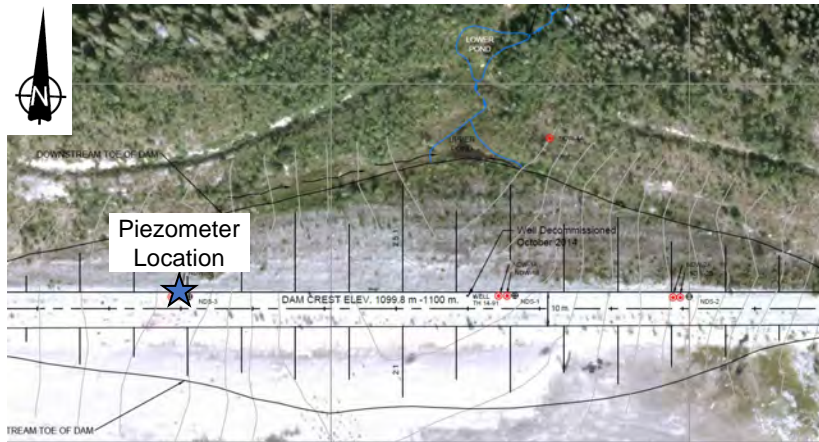
Job No: CAPR001928
 Filename: Figures_ND_Piezometers_CAPR001928.pptx

Sa Dena Hes

Date:
August 2022

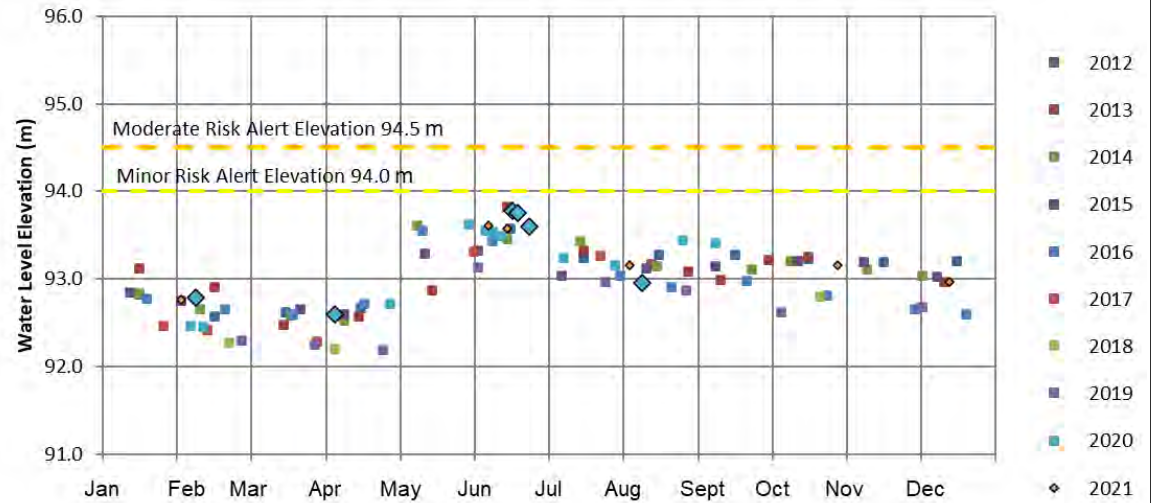
Approved:
P. Mikes

Figure:
D-2

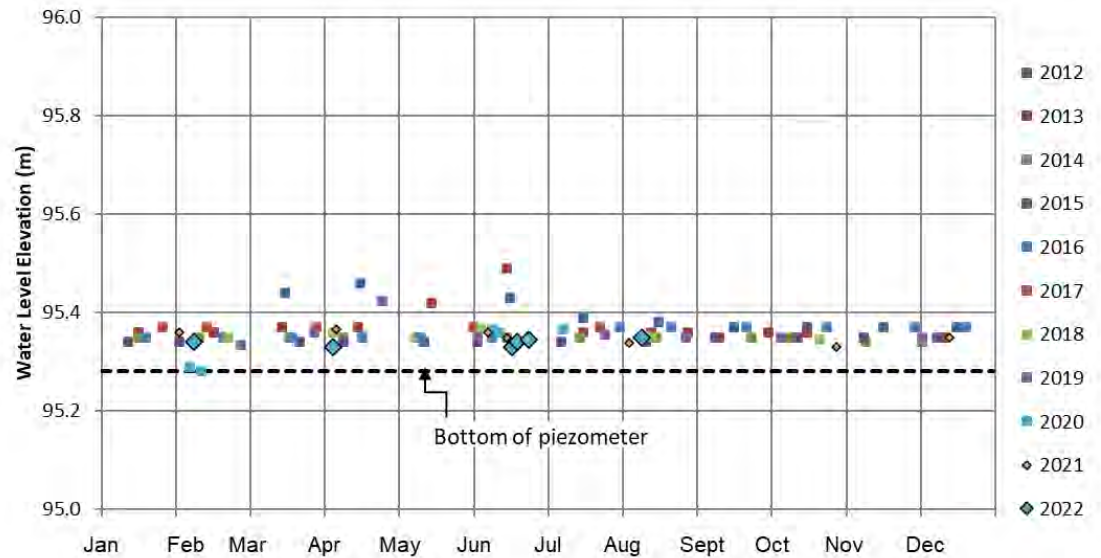


Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.



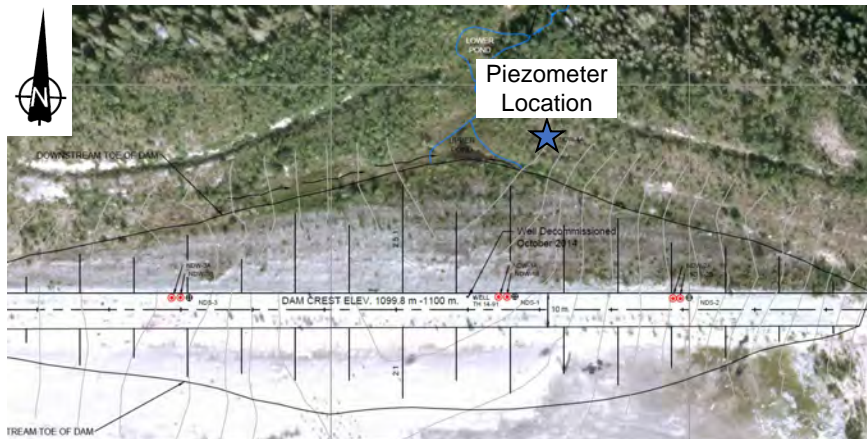
NDW-3A – Screened in dam foundation (bedrock)



NDW-3B – Screened in dam fill (Sandy Till)

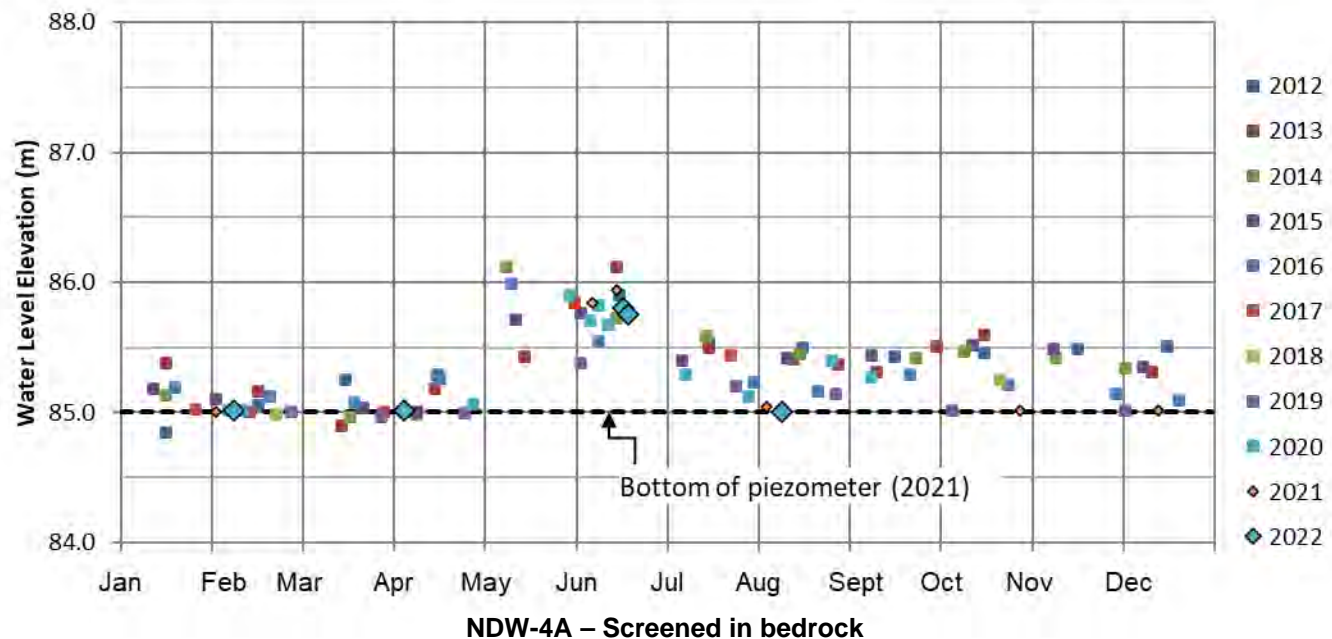
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https://srk.sharepoint.com/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2022Edition.xlsx?web=1

		North Dam Instrumentation		
		North Dam Piezometers NDW-3A and 3B		
Job No: CAPR001928 Filename: Figures_ND_Piezometers_CAPR001928.pptx	Sa Dena Hes	Date: August 2022	Approved: P. Mikes	Figure: D-3



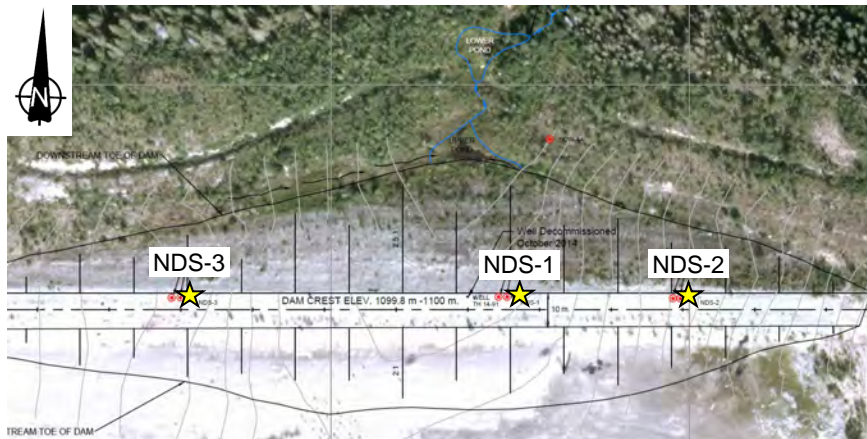
Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 2012.
2. Co-ordinate system is UTM NAD 83 CSRS Zone 9V.



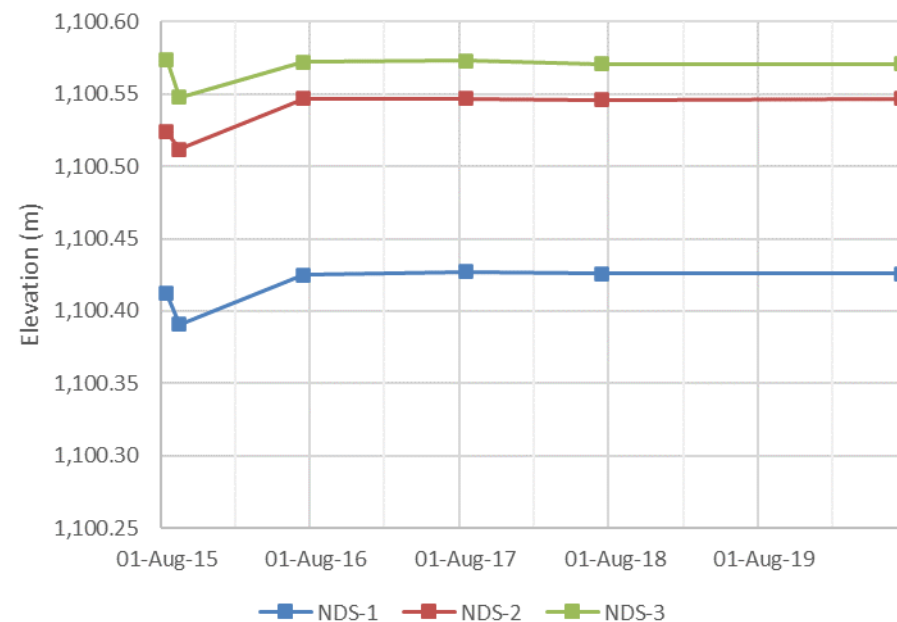
		North Dam Instrumentation		
		North Dam Piezometers NDW-4A		
Job No: CAPR001928 Filename: Figures_ND_Piezometers_CAPR001928.pptx	Sa Dena Hes	Date: August 2022	Approved: P. Mikes	Figure: D-4

Source file:
https://srk.sharepoint.com/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2022Edition.xlsx?web=1



Notes:

1. Orthographic photo depicts the pre-decommissioned surface on August 15, 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

Date	Settlement Pins			Notes
	NDS-1	NDS-2	NDS-3	
06-Aug-15	1,100.412	1,100.524	1,100.574	
10-Sep-15	1,100.391	1,100.512	1,100.548	
01-Jul-16	1,100.425	1,100.547	1,100.572	2016 and onward readings are relative to BM 103
01-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/sites/FS261/Internal/Monitoring%20Data/NDMPiezolevels_2022Edition.xlsx?web=1

		North Dam Instrumentation	
		North Dam Settlement Pins	
Job No: CAPR001928 Filename: Figures_ND_Piezometers_CAPR001928.pptx	Sa Dena Hes	Date: August 2022	Approved: P. Mikes

Appendix E. Routine Inspection Forms



Sa Dena Hes Mine Site Geotechnical Inspection

No.
00006

General Information

Inspected By:
Jeff Basarich

Jewel Box

Jewelbox Soil Caps

Date:

29/06/2022

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

No Issues

Waste Rock Dumps

Cracks/Scarps

No Issues

Susidence

No Issues


Erosion

None out of the ordinary

Seeps

No Issues

Jewel Box Photo's

Photo Discription	Photo	Photo Location
<p>Hole in the wall still snow covered</p>		

Burnick

Inspection Date:

29/06/2022

Weather:

15 sunny

Burnick 1200 Waste Rock Dump

Cracks/Scarps

No Issues

Subsidence

No Issues

Erosion

No Issues

Seeps

Appears to have had heavy runoff but no excessive erosion or rills.

Water coming from middle portal drain.

Burnick 1300 Waste Rock Dump

Cracks

No Issues

Subsidence

No Issues

Erosion

No Issues

Seeps

No Issues

Burnick Photo's

Photo Discription	Photo	Photo Location
Water from portal drain		

North Creek Dike Breach

Date

25/06/2022

Sideslopes

No Issues Found

Settlement/Depressions

No Issues Found

Debris at Inlet

Some beaver debris , clean out with mini excavator

Vegetation

No Issues Found



Sa Dena Hes Mine Site Geotechnical Inspection

No.
00006

Riprap
Further erosion of rip rap

Discharge
Discharge end eroding further as rip rap washes away

North Creek Second Crossing

Date:
25/06/2022
Sideslopes
Substantial erosion unable to safely cross, pull back some rip rap with mini excavator to re-establish a passable road across
Riprap
No Issues Found

Settlement/Depressions
No Issues Found
Debris at Inlet
No Issues Found
Discharge
Discharge erosion is substantially more than last fall, large round crater.

Vegetation
No Issues Found


North Dam

Date:
17/06/2022
Ponded Water
No Issues
Erosion
Major erosion issue , west of center of N. Dam. Large erosion gully washed from tailings cap to almost the toe of downstream face. Contacted appropriate supervisor and repairs were performed.

Settlement/Depressions
No Issues
Cracks/Movement
No Issues
Vegetation
No Issues

Downstream Toe Seepage
No Issues

North Dam Photo's

Photo Discription	Photo	Photo Location
North Dam erosion		

North Pond Cap

Date:
26/06/2022

General Appearance
Willow growth doing ok, a bit patchy.

Erosion
No Issues

Settlement/Depressions
No Issues

Standing Water
Minimal ponding of shallow water.

Evaporite Salts
No Issues

Vegetation
No Issues

Drainage Swale
Very slight slope but draining as good as possible

North Pond Photo's

Photo Discription	Photo	Photo Location
North pond cap		

Photo Discription	Photo	Photo Location
After repairs completed		

South Pond Cap

Date:
27/06/2022
General Appearance
No Issues


Settlement/Depressions
No Issues
Standing Water
No Issues

Vegetation
No Issues
Drainage Swale
No Issues

Erosion
No Issues

Evaporite Salts
No Issues

South Pond Photo's


Photo Discription	Photo	Photo Location
South pond soil cap		

North Diversion Channel

Date:
28/06/2022
Slideslopes
No Issues

Riprap
No Issues
Debris
No Issues

North Diversion Photo's

Photo Discription	Photo	Photo Location
North channel		

Sediment Retaining Structure (SRS)

Date:
29/06/2022
Depth of water at spillway
Level with bottom of rip rap

Erosion
No Issues
Settlement/Depressions
No Issues

Vegetation
No Issues
Downstream Toe Seepage
Historic spring at toe seems less than normal

Sloughing of spillway slopes

No Issues

Spillway riprap

No Issues

Debris at spillway inlet

No Issues

Sinkholes

No Issues

Cracks/Movement

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


Debris

No Issues

East Hillside Seepage

No Issues

SRS Photo's

Photo Discription	Photo	Photo Location
SRS pond		

South Drainage Channel

Date:

29/06/2022

Slideslopes

No Issues

Riprap

No Issues

Debris

No Issues

South Drainage Photo's

Photo Discription	Photo	Photo Location
South channel		

Camp Creek Drainage Channel

Date: 30/06/2022	Riprap No Issues
Slideslopes No Issues	Debris No Issues

Reclaim Pond Soil Cap

Date: 30/06/2022	Settlement/Depressions No Issues	Drainage Swale No Issues
General Appearance Osprey's appear to be nesting again on power pole	Standing Water No Issues	
Erosion No Issues	Vegetation No Issues	

Reclaim Pond Photo's

Photo Discription	Photo	Photo Location
Reclaim area		

Sign:

