Operation, Maintenance, and Surveillance (OMS) Manual

Giant Mine Remediation Project

Submitted to:

Public Services and Procurement Canada

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Operation, Maintenance and Surveillance Manual (Version F)

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November 6, 2023

Document History

The Operation, Maintenance, and Surveillance (OMS) Manual should be reviewed on an annual basis and following any significant changes at the site to assess if the document is representative of the current condition and operation of the dams at the time of the review. Revisions to the manual should be undertaken within a reasonable timeframe (not to exceed six months) of changes should updates to the content be required.
The version history of the OMS Manual is shown below. The most current revision of the OMS Manual supersedes all previous versions.

Revision No.	Revision Date	Revised by	Revision Notes
F	2023-11-06	WSP Canada Inc.	Updated seismic data for Site. Updated flood runoff volumes for the Northwest Pond, North Pond, Settling and Polishing Ponds based on inflow design flood. Updated pond storage volume versus water elevations for Settling and Polishing Ponds. Updated pond water level and corresponding warning levels in the Polishing Pond based on Dam 1 raise. Added instrumentation and displacement warning levels of for Splitter Dyke. Added Mill Pond Structure to surveillance. Updated environment protection and reporting and documentation for operations. Include instrumentation installed in April 2023. Updated water licence sampling and testing. Added an appendix on Responsibility of Updating OMS (Appendix A).
E	2022-07-22	Parsons Inc.	Updated dam classifications based on the 2020 Dam Break Analysis. Updated dam dimensions. Updated warning levels for B2 Dam piezometers. Updated pond level differential between the Polishing Pond and the Settling Pond associated with the Splitter Dyke.
D	2021-06-09	Golder Associates Ltd.	Include instrumentation installed in 2019 and 2020. Incorporated applicable recommendations from 2019 Dam Safety Review and 2020 Annual Geotechnical Inspection.
C	2019-09-04	Golder Associates Ltd.	Minor corrections to text.
B	2019-02-15	Golder Associates Ltd.	Incorporate client comments, organizational changes, 2018 inspection and drilling results.
A	2018-03-27	Golder Associates Ltd.	Reviewed and rewritten to comply with up-to-date standards, best practices, and regulations.
2006 Version 2	2006-10-12	Original by Golder Associates Ltd.	

Signature Page

The update of this OMS is a shared responsibility between Parsons (i.e., Main Construction Manager) and WSP (i.e., Geotechnical Consultant). The specific updating responsibility of each individual section is presented in APPENDIX A.

The review protocol for the OMS Manual is shown below.

Revised by:	Hung Vu, Geotechnical Engineer WSP Canada Inc.	Signature	Nov. 6, 2023 Date
Reviewed by:	Doug Hayes, Mine Manager Parsons Inc.	Signature	Date
	Reuben Makohoniuk, Environmental Manager Parsons Inc.	Signature	Date
	Bradley Mueller, Project Manager Public Services and Procurement Canada	Signature	Date
	Carlos Philipovsky, Project Manager Public Services and Procurement Canada	Signature	Date
Approved by:	Miguel Larivière, Departmental Representative Crown-Indigenous Relations and Northern Affairs Canada	Signature	Date
	Natalie Plato, Deputy Director Crown-Indigenous Relations and Northern Affairs Canada	Signature	Date

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List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AEMP	Aquatic Effects Monitoring Program
AGI	Annual Geotechnical Inspection
AHCCD	Adjusted Historical Canadian Climate Data
CDA	Canadian Dam Association
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CRP	Closure and Reclamation Plan
CWEEDS	Canadian Weather Energy and Engineering Datasets
DBA	Dam Breach Analysis
DSR	Dam Safety Review
EEM	Environmental Effects Monitoring
EPRP	Emergency Preparedness and Response Plan
ERP	Emergency Response Plan
ETP	Effluent Treatment Plant
GMOB	Giant Mine Oversight Board
GMRP	Giant Mine Remediation Project
GNWT	Government of Northwest Territories
HDPE	High-density polyethylene
MAC	Mining Association of Canada
MCM	Main Construction Manager
MDMER	Metal and Diamond Mining Effluent Regulations
MVLWB	Mackenzie Valley Land and Water Board
NHC	Northwest Hydraulic Consultants
NHWL	Non Hazard Waste Landfill
OMS	Operation, Maintenance, and Surveillance
PGA	Peak ground acceleration
PMF	Peak maximum flood
PMP	Probable maximum precipitation
PSPC	Public Services and Procurement Canada
RCMP	Royal Canadian Mounted Police
RFID	Radio Frequency ID
SOP	Standard Operating Procedure
SRK	SRK Consulting Ltd.
SWE	Snow Water Equivalent
TCA	Tailings Containment Area
UBC	Under Baker Creek
USSD	United States Society on Dams
UTM	Universal Transverse Mercator
VWP	Vibrating wire piezometer
WSCC	Workers' Safety and Compensation Commission

List of Units and Symbols

Unit	Definition
cm	centimetre
m^3	cubic metres
m^3/day	cubic meters per day
m^3/s	cubic meters per second
°C	degrees Celsius
ha	hectare
Hz	Hertz
in	inch
km	kilometer
kΩ	kilo-Ohm
kPa	kilo-Pascal
masl	meters above sea level
mbgs	meters below ground surface
m	metre
m/s	meters per second
m/s^2	meters per second squared
mbar	millibar (used for pressure)
mm	millimetres
Ω	Ohm
km^2	square kilometers
m^2	square meters
Symbol	**Definition**
≥	equal or greater than
≤	equal or less than
>	greater than
H:V	horizontal to vertical (used for slope angle)
<	less than
%	percent

1.0 OBJECTIVE

The objective of this Operations, Maintenance and Surveillance (OMS) Manual is to provide procedures for the operation, maintenance and surveillance of all dams associated with Tailings Containment Areas and the existing water treatment system at the Giant Mine, Yellowknife, Northwest Territories. Surface water dams, which are not associated with the Tailings Containment Areas, are also included in this document.

This document is not intended to provide design parameters or calculations. Reference should be made to the technical documents listed in this OMS Manual for details of design parameters and calculations.

2.0 DOCUMENT USER GUIDE

This document is organized as follows:

1. Section 3.0 – Roles and Responsibilities
   Provides the organization structure for the management of Giant Mine along with named individuals, their responsibilities, and training requirements.
2. Section 4.0 – Site and Facilities Description
   Provides an overview of the facilities at the Giant Mine including dam consequence classifications. Additional details, including dam history and construction details, are presented in APPENDIX B.
3. Section 5.0 – Site Reference Data
   Provides reference data used at Giant Mine including regulatory requirements, relevant operating manuals, grid system, and compliance points.
4. Section 6.0 – Site Conditions
   Provides a brief description of site conditions. Detailed climate data is presented in APPENDIX D. Water balance information and typical water flow at the site facilities are presented in APPENDIX E.
5. Section 7.0 – Operations
   Provides details on how the facilities should be operated including the following:
   - Water management and treatment requirements.
   - Storage capacity of facility ponds.
   - Maximum pond water levels, and warning levels.
6. Section 8.0 – Surveillance
   Provides surveillance requirements for the facilities including the following:
   - Procedures for visual inspection, how often these should be conducted, and by whom. Standard inspection forms are provided in APPENDIX G.
   - Procedures for reading geotechnical instrumentation, how often these should be read, and the establishment of warning levels.
   - Requirements for sampling and testing as per water licence requirements.
   - Requirements for conducting topographic and bathymetric surveys.
   - Requirements for conducting annual dam inspections and required frequency for dam safety reviews (DSR).

7. Section 9.0 – Maintenance
   Provides requirements for routine and preventive maintenance activities.
8. Section 10.0 – Emergency Preparedness and Response Plan (EPRP)
   Provides procedures for identifying, preparing for, and responding to an on-site dam emergency, including the following:
   - Identification of determined warning levels, and specific actions to be implemented should these levels be reached.
   - Emergency contacts and call-out procedures.
   - Preventative and remedial responses to incidents.
   - Identification of possible resources to assist with incidents.

The update of this OMS is a shared responsibility between Parsons (i.e., Main Construction Manager) and WSP (i.e., Geotechnical Consultant). The specific updating responsibility of each individual section is presented in APPENDIX A.

3.0 ROLES AND RESPONSIBILITIES

3.1 Organization Chart

An organization chart identifying the organizations and individuals involved with the management of Giant Mine Tailings Containment Areas (TCAs) and surface water dams, and the chain of command is presented in Figure 1. Key staff for the owner, remediation contractor, subcontractors and external advisors are included.

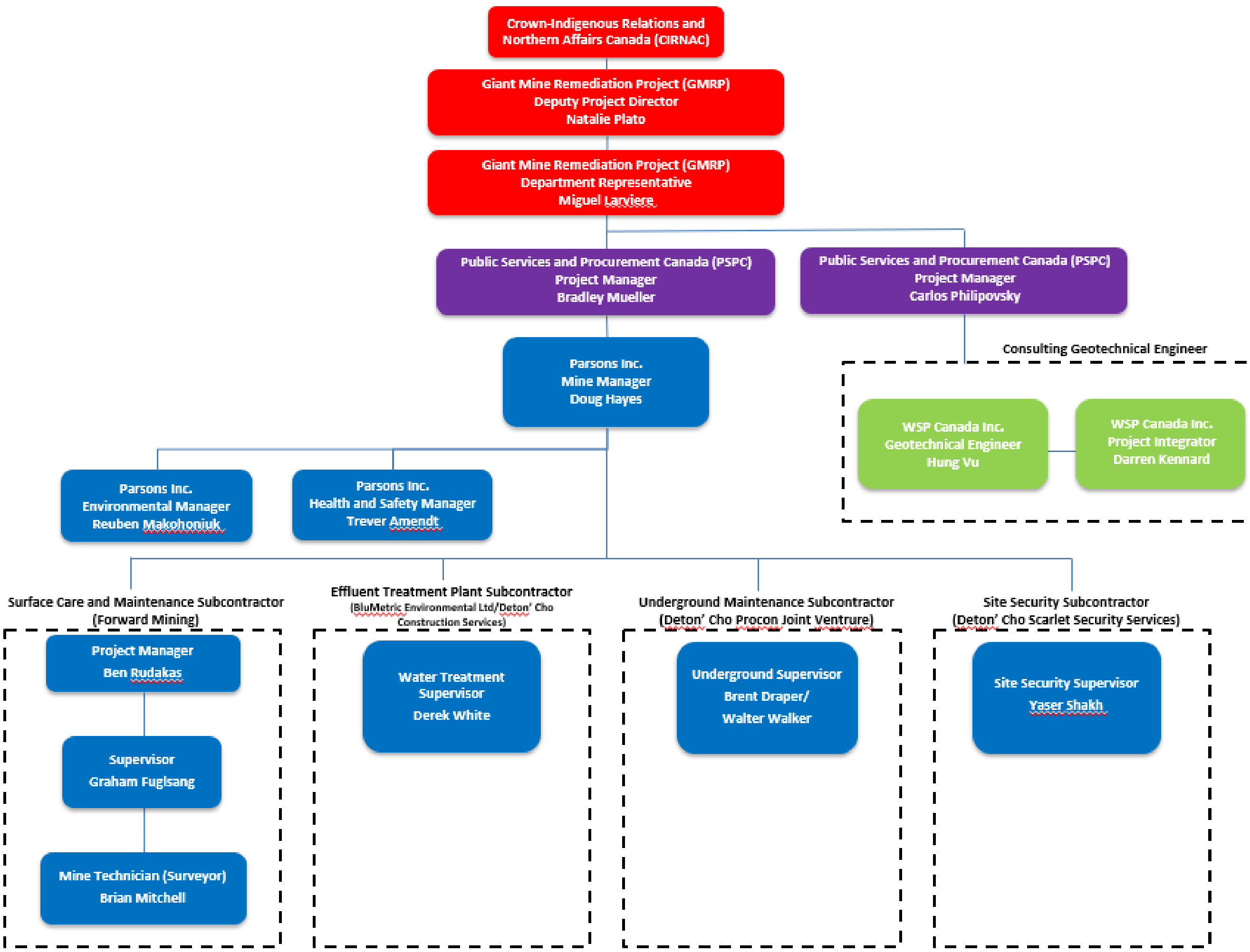

Figure 1: Giant Mine Chain of Command

3.2 Responsibilities and Contact Information of Formally Assigned Individuals

The responsibilities and contact information of individuals with formally assigned roles in the operation, maintenance, and surveillance of the Giant Mine TCAs and Surface Water Dams are defined in Table 1.

Table 1: Individual's Responsibilities

Role		Name	Company/ Department	Responsibilities	Contact Numbers
Site Owner	Deputy Director	Natalie Plato	CIRNAC	Be available for consultation. Public relations communication. Awareness of their role in OMS Manual and EPRP.	Office: 867.669.2838 Mobile: 867.445.6499
	Departmental Representative	Miguel Larivière	CIRNAC	Be available for consultation. Public relations communication. Awareness of their role in OMS Manual and EPRP.	Office: 867.669.2435 Mobile: 867.444.9400
	Project Managers	Bradley Mueller	PSPC	Administration and management of contracts on behalf of CIRNAC, as it relates to Parsons. Awareness of their role in OMS Manual and EPRP.	Office: 867.766.8361 Mobile: 867.444.9282
		Carlos Philipovsky	PSPC	Administration and management of contracts on behalf of CIRNAC, as it relates to Parsons. Awareness of their role in OMS Manual and EPRP.	Office: 867.766.8304 Mobile: 867.445.3570
Main Construction Manager (MCM)	Mine Manager (TCA Responsible Person)	Doug Hayes	Parsons	Assist with routine and event-driven/special maintenance and inspections as outlined by this OMS Manual. TCA Responsible person. Awareness of their central role in OMS Manual and EPRP.	Office: 867.669.3715 Mobile: 867.688.1036 780.207.5259
	Environmental Manager	Reuben Makohoniuk	Parsons	Be available for consultation. Complete inspections, as assigned by the Mine Manager.	Office: 867.669.3725 Mobile: 603.818.8184
	Safety and Security Manager	Trever Amendt	Parsons	Be available for consultation. Awareness of their role in OMS Manual and EPRP.	Office: 867.669.3719
Surface Care and Maintenance Subcontractor	Project Manager	Ben Rudakas	Forward	Be available for consultation.	Office: 867.669.3702 Mobile: 613.415.4067
	Superintendent	Graham Fuglsang	Forward	General observations weekly and scheduling. Complete weekly inspections, as assigned by the Mine Manager.	Office: 867.669.3705 Mobile: 867.876.0255
	Civil Technician (Surveyor)	Brian Mitchell	Forward	Complete routine surveying of dams and pond levels. Complete weekly inspections, as assigned by the Mine Manager.	Office: 867.669.3728 Mobile: 867.445.3376
Effluent Treatment Plant Subcontractor	Supervisor	Derek White	BluMetric	Operation of the Effluent Treatment Plant on a seasonal basis	Mobile: 877.487.8436x330

Table 1: Individual's Responsibilities

Role		Name	Company/ Department	Responsibilities	Contact Numbers
Underground Care and Maintenance Subcontractor	Supervisor	Brent Draper	Procon	Awareness of OMS Manual and their role in EPRP.	Office: 867.669.3717 Mobile: 778.220.6682
	Supervisor	Walter Walker	Procon	Awareness of OMS Manual and their role in EPRP.	Office: 867.669.3717 Mobile: 867.445.3302
Site Security Subcontractor	Supervisor	Yaser Shakh	Scarlet Security	Be available for consultation. Complete routine security inspections of the dams, as assigned by the Mine Manager. Awareness of their role in EPRP.	Office: 867.873.3202 (ext. 401) Mobile: 867.222.3814
Engineer of Record (EOR) – No EOR at this time		TBC	TBC	TBC	TBC
Consulting Geotechnical Engineer	Geotechnical Engineer	Hung Vu	WSP	Be available for consultation, complete Annual Geotechnical Inspection (AGI) of Dams, participate in dam safety reviews, and risk assessments. Awareness of their role in the OMS Manual and EPRP.	Mobile: 306.260.4018

Note: TBC = to be confirmed.

3.3 Requirements for Competency and Training

Table 2 summarizes the minimum knowledge, competency, and training requirements for personnel involved in the operation, maintenance, and surveillance of the Giant Mine TCAs and Surface Water Dams.

The role of the TCA Responsible Person has been delegated to the Mine Manager by the Site Owner. Within the OMS Manual and EPRP, the title of Mine Manager is used as it is the common terminology used at Giant Mine. Due to the Mine Manager's workload, many of the routine tasks (e.g., weekly inspections, dam operations) have been delegated to Site Technical Staff (Parsons and Forward Mining staff).

At this time, the Site Owner does not have an officially designated Engineer of Record. Currently, the Consulting Geotechnical Engineer performs many of these functions as a temporary measure. Once the Site Owner designates an Engineer of Record, the OMS Manual and EPRP should be updated identifying who is the Engineer of Record. Responsibilities currently assigned to the Consulting Geotechnical Engineer will typically be assigned to the Engineer of Record.

Table 2: Required Proficiencies and Training

Roles	Minimum Knowledge and Competency Requirements	Training
Mine Manager (TCA Responsible Person)	▪ Detailed understanding of the responsibilities related to the dams, their safety, and applicable regulations ▪ An understanding of the significance of hazard and risk ▪ Detailed understanding of Giant Mine TCAs and B2 Dam operations, maintenance, and surveillance procedures in relation to OMS Manual ▪ Detailed understanding of EPRP in relation to the Giant Mine TCAs and B2 Dam ▪ Detailed understanding of regulatory requirements for various regulatory bodies in relation to AGIs and DSRs ▪ Understanding of dam design principles and construction techniques ▪ Understanding of abnormal and noncompliance conditions and protocol	▪ OMS Manual ▪ EPRP ▪ Existing AGI reports ▪ Existing DSR reports
Site Technical Staff (e.g., Parsons and Forward staff)	▪ Detailed understanding of Giant Mine TCAs and B2 Dam operations, maintenance, and surveillance procedures in relation to OMS Manual ▪ Detailed understanding of EPRP in relation to the Giant Mine TCAs and B2 Dam ▪ Understanding of dam design principles and construction techniques ▪ Understanding of abnormal and noncompliance conditions and protocol	▪ OMS Manual ▪ EPRP
Engineer of Record	▪ Experience commensurate with the consequence classification and complexity of the facility ▪ Registration as Professional Engineer in the Northwest Territories ▪ Has or is employed by a firm that holds a permit to practice engineering in the Northwest Territories ▪ Detailed understanding of dam safety regulatory responsibilities ▪ Detailed understanding of design, construction history, as well as applicable standards, criteria, and guidelines	▪ OMS Manual ▪ EPRP ▪ Dam engineering ▪ Applicable guidelines and regulations

Table 2: Required Proficiencies and Training

Roles	Minimum Knowledge and Competency Requirements	Training
PSPC and Forward Employees	■ Understanding of contents of the OMS Manual ■ Knowledge of specific risks as they apply to work areas in and around the pond	■ OMS Manual
CIRNAC (Site Owner)	■ Accountable for decisions related to management of TCAs and dams ■ Needs to be aware of key outcomes of how risks are being managed ■ Accountable and responsible for putting in place an appropriate management structure ■ Assigns responsibility and appropriate budgetary authority for management of TCAs and dams	■ OMS Manual ■ EPRP ■ Applicable guidelines and regulations
Subcontractors	■ Knowledge of specific risks as they apply to work areas in and around the pond	
External Consultants	■ Experience with specific role relevant to the Giant TCAs and Surface Water Dams	■ OMS Manual ■ EPRP

Note: OMS = Operation, Maintenance, and Surveillance; EPRP = emergency preparedness and response plan; AGI = Annual Geotechnical Inspection of Dams; DSR = dam safety review; TCA = tailings containment area.

3.4 Site Personnel

Typically, a total of 50 to 200 employees may be on site at any time. Roughly 40 people are full-time employees based on site year-round of which up to 12 are Parsons' staff. The remaining 150 employees are made up of employees that would work for one of the several subcontractors or consultants, and the exact number varies over time.

Employees and visitors to site must report to the site office located at the C-Dry building for check-in. There is a sign-in sheet and a tag-in board at C-Dry. The tag-in board uses photographic identification cards to monitor personnel present on site.

3.5 Responsibilities for Managing Change

The annual inspection of the facilities may identify needs for updates to the operation, maintenance, or surveillance of the facilities on site. The Mine Manager and Site Owner's MCM may also identify needs during the year.

The OMS Manual and all associated documents will be kept current with appropriate practices and procedures. It will be reviewed annually, at a minimum, by the required personnel (see the review protocol of the Signature Page). The Mine Manager will be responsible for ensuring that changes to the facility or within the management structure are reflected in the OMS Manual, approved, and distributed accordingly.

4.0 SITE AND FACILITIES DESCRIPTION

4.1 Site Overview

Giant Mine is an abandoned open pit and underground gold mine located within the City of Yellowknife boundary, approximately 1.5 kilometres (km) from the community of Ndilǫ and 9 km from the community of Dettah in the Northwest Territories. The mine has had several owners and operators since the first mining stakes were claimed in 1935 (Silke 2009).

The first tailings-retaining facility constructed at the site was the Original Tailings Containment Area (Original TCA), located to the northeast of the mill. Tailings were deposited within the Original TCA up until the late 1980s. Figure 2 shows the approximate footprints of the Original and Northwest TCAs.

Additional tailings storage was required and in 1988 construction of the Northwest Tailings Containment Area (Northwest TCA) was completed. Since 1988, the majority of the tailings were deposited in the Northwest TCA. Tailings production at the site ceased in 1999.

The main surface water features of the site are Yellowknife Bay and Baker Creek. Baker Creek, shown in Figure 2, generally runs from north to south, and is located to the west of the Original and Northwest TCAs.

Yellowknife Bay is located to the east of the site. In order to mine the B2 Pit (also known as Under Baker Creek Pit or UBC Pit), Baker Creek was diverted to its current location by the construction of the B2 Dam. Figure 2 shows the location of B2 Dam.

According to the Canadian Dam Association (CDA) (2013) definition, Giant Mine is in the Closure-Active Care phase of the mine life. In the context of the site's Closure and Reclamation Plan (CRP), the site is currently in care and maintenance and active remediation started July 2021 (CIRNAC and GNWT 2021). The only operations at the facility are related to the management of surface water and water treatment on an annual basis which includes the use of the Northwest TCA, Original TCA, and B2 Dam and ongoing site remediation activities.

Additional minor dams on site are used on a temporary or seasonal basis and, as such, are not part of the overall management of the Giant Mine TCAs or year-round surface water management. These minor dams, shown in Figure 2, include the following:

- M&M Dam
- DWC Dam
- C1 Clay Borrow Dam
- Mill Pond Structure

Additional details on the background, history, and construction of the individual dams are provided in APPENDIX B.

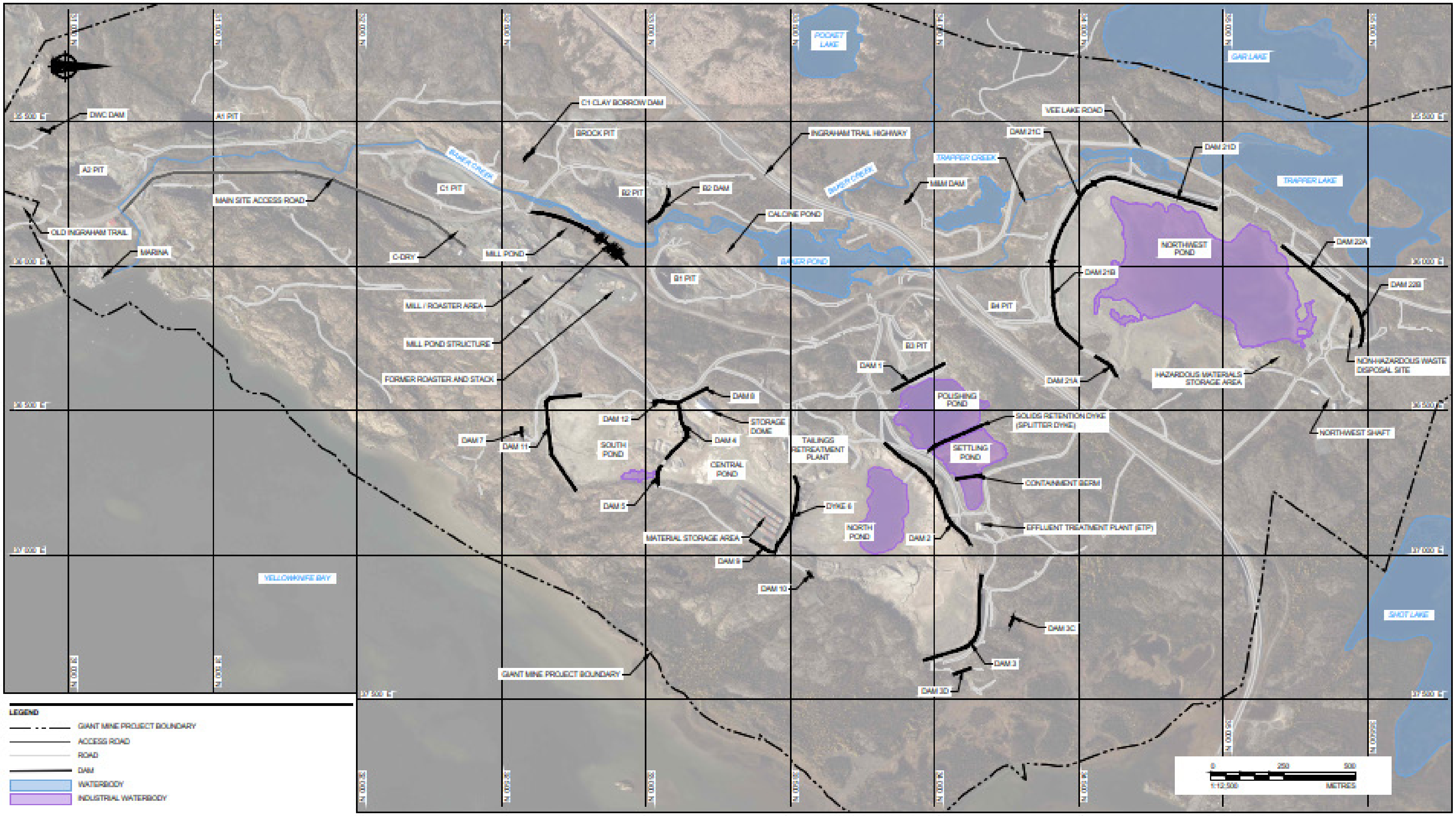

Figure 2: Overview of Giant Mine

4.2 Tailings Transportation and Deposition

During milling, the Giant Mine tailings were transported via pipeline as a slurry (mixture of crushed rock and water) and discharged from spigots located at the perimeter dams. Up until the mid-1970s deposition of tailings was considered to be inefficient during the winter months, as the cold climate and shallow depth of water in the TCAs resulted in ineffective sedimentation of solids and the formation of ice lenses (Geocon 1975). From about 1980, the depositional strategy relied upon having deeper water within the TCAs during the winter such that tailings could settle below ice, reducing the occurrence of ice lenses (Geocon 1975).

4.3 Access Roads and Security

Current access to the site from Yellowknife city centre is via a 5 km paved road, which is on GNWT Commissioner's Land. The access is along the former Northwest Territories' Highway 4 (aka Old Ingraham Trail). The old highway and haul roads remain serviceable and are accessible using light vehicles.

Site access is currently restricted to site personnel and approved individuals/companies with site clearance. The site has 24-hour security located at the entrance gate to Giant Mine. No parking will be available on-site for private vehicles effective April 1, 2023. Parsons is progressing to having an RFID system available for site-access.

4.4 Dam Consequence Classification

All dams have been assigned consequence classifications based on CDA (2013) guidelines. Dam classifications are a key factor in the assessment of dam monitoring needs. There are a total of 23 dams at the site that have a dam consequence classification between low and very high (Golder 2022a). There are no dams with the extreme classification.

Figure 3 shows the location of the Original TCA dams and Figure 4 shows the location of the Northwest TCA dams. For the locations of B2 Dam and other surface water management dams, refer to Figure 2.

Table 3 provides a summary of the dam consequence classification for the dams at Giant Mine according to CDA (2013) guidelines. There are nine dams with a classification of very high to high and 14 dams with a classification of significant to low. Refer to APPENDIX C for a summary of the rationale supporting the current dam classifications.

Table 3: Summary of Dam Consequence Classifications

CDA (2013) Consequence Classification	Original TCA Dams	Northwest TCA Dams	Surface Water Dams	Total Number
Very High	-	■ Dam 21A ■ Dam 21B ■ Dam 21C	■ B2 Dam	4
High	■ Dam 1 ■ Dam 2	■ Dam 21D ■ Dam 22A ■ Dam 22B	-	5
Significant	■ Dam 3 ■ Dam 11	-	■ Mill Pond Structure	3

Table 3: Summary of Dam Consequence Classifications

CDA (2013) Consequence Classification	Original TCA Dams	Northwest TCA Dams	Surface Water Dams	Total Number
Low	▪ Dam 3C & 3D ▪ Dam 4 ▪ Dam 5 ▪ Dam 6 ▪ Dam 7 ▪ Dam 8 ▪ Dam 9 ▪ Dam 12 ▪ Splitter Dyke	-	▪ DWC Dam ▪ C1 Clay Borrow Dam	12
Not Applicable	▪ Dam 10 ▪ Containment Berm	-	▪ M&M Dam	3

Source: Golder (2022a).

Note: - = no data (implies that no dams are currently classified).

Dam 10 and M&M Dam are no longer classified as dams following the 2019 Dam Safety Review (DSR) and 2020 Annual Geotechnical Inspection (AGI) (SRK 2020; Golder 2021a). The M&M Dam is monitored as a flood dyke.

Consequence classifications of four Original TCA dams (Dam 1, Dam 2, Dam 3, and Dam 11) and six Northwest TCA dams (Dams 21A through 21D, Dam 22A, and Dam 22B) are based on the results of Dam Breach Analysis (DBA). All other dam consequence classifications are based on high-level desktop reviews.

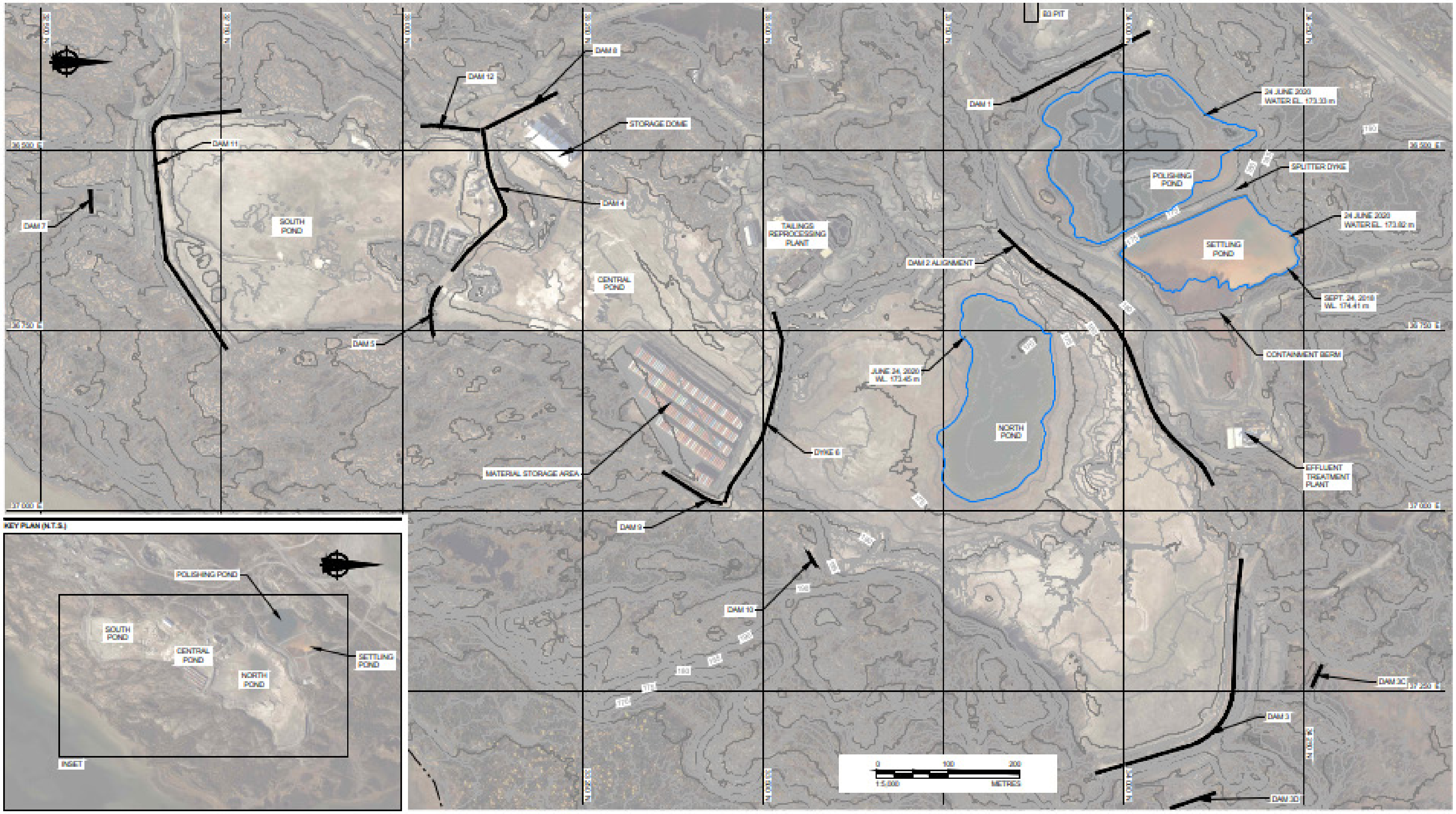

Figure 3: Overview of Original TCA Dams at Giant Mine

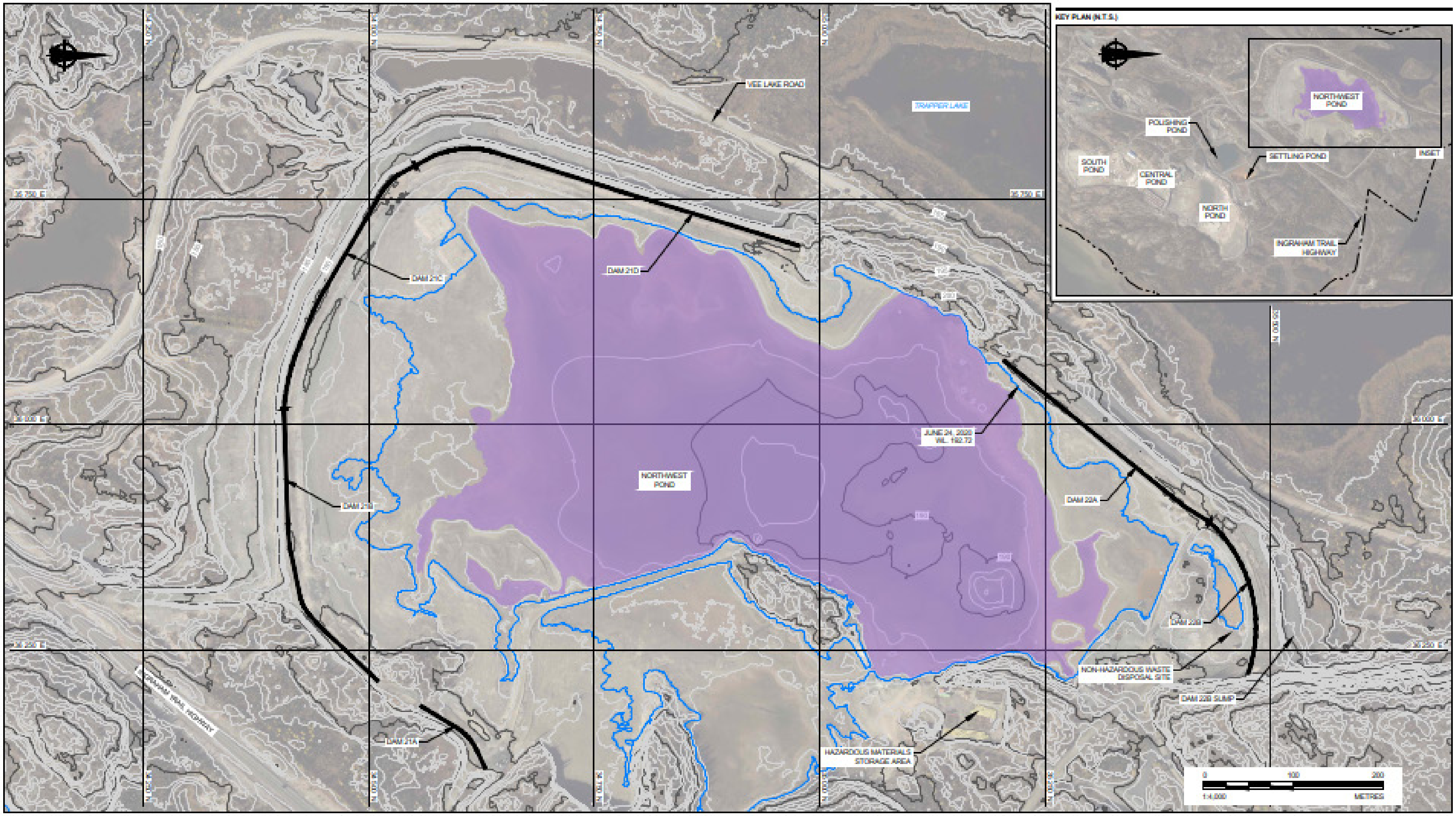

Figure 4: Overview of Northwest TCA Dams at Giant Mine

5.0 SITE REFERENCE DATA

5.1 Applicable Guidance and Regulatory Requirements

Applicable codes, guidelines, and regulations governing the Giant Mine TCAs and Surface Water Dams are listed below.

- Canadian Dam Association (CDA) Dam Safety Guidelines (2013 Edition) (CDA 2013)
- CDA Bulletin Application of Dam Safety Guidelines to Mining Dams (2019 Edition) (CDA 2019)
- CDA Technical Bulletin: Dam Safety Reviews (CDA 2016)
- Mining Association of Canada Guidelines (MAC 2021a, b)
- Mackenzie Valley Land and Water Board (MVLWB): Type A Water Licence (MV2007L8-0031) issued to Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) – Giant Mine Remediation Project (MVLWB 2021).

5.2 Mine Operating Manuals

Applicable Standard Operating Procedure (SOP) and operating manual in use at the Giant Mine:

- SOP# - ETP – 01: Giant Mine ETP Operating Manual – 2008 (Deton'Cho / Nuna 2008)
- SOP Ice Buildup and Freshet Management (Parsons 2022)

5.3 Coordinate System and Maps

The coordinate system at site is called the Giant Mine Remediation Project (GMRP) grid. This coordinate system is a truncated version of the UTM Zone 11, NAD83. In the GMRP coordinate system, elevations are referenced to mean sea level.

Details of the coordinate system used are provided in Ollerhead Ltd (2006). For reference, the following conversions are applicable when using the GMRP grid.

- To convert from UTM Zone 11, NAD83 (meters) to GMRP (metres)
  - Northings: NGMRP = (NUTM ÷ 0.9998013) – 6901377.963
  - Eastings: EGMRP = (NUTM ÷ 0.9998013) – 600126.430
- To convert from GMPR (meters) to UTM Zone 11, NAD83 (meters)
  - Northings: NUTM = (NGMRP x 0.9998013) + 6900006.660
  - Eastings: EUTM = (EGMRP x 0.9998013) + 600007.182

5.4 Regulatory Framework for Dam Safety

The Giant Mine is permitted under Type A Water Licence MV2007L8-0031. Overall, the Water Licence requires that:

> *…all structures intended to contain, withhold, divert, or retain Water or Wastes and which meet the definition of a Dam under the [CDA] Dam Safety Guidelines, are designed, constructed, maintained, and monitored to meet or exceed the [CDA] Dam Safety Guidelines.*

Other specific requirements of Water Licence MV2007L8-0031 relevant to the OMS Manual include the following:

- The completion of an AGI during the summer months by a Professional Engineer. An AGI report must also be submitted to the MVLWB within 120 days of the completion of the AGI site visit.
- That DSRs be conducted of all structures that contain water or wastes, in accordance with the CDA (2013) Dam Safety Guidelines.

The CDA (2013) Dam Safety Guidelines recommend that a DSR be conducted every five to 10 years depending on the consequence of dam failure, as shown in Table 4. A DSR was completed in 2019 (SRK 2020), so the next DSR would be initiated sometime between 2024 and 2029, depending on the dam consequence classification.

Table 4: Frequency for Dam Safety Reviews

Dam Consequence Classification	Frequency	Dam ID
Extreme	Every five years	None
Very High	Every five years	B2 Dam, Dam 21A, 21B, 21C
High	Every seven years	Dam 1, 2, 21D, 22A, 22B
Significant	Every 10 years	Dam 3, Dam 11, Mill Pond Structure
Low	See note[1]	Dam 3C, 3D, 4, 5, 6, 7, 8, 9, 12, Splitter Dyke, DWC Dam, C1 Clay Borrow Dam

Notes: Dam 10, Containment Bern, and M&M Dam do not have a consequence classification.

[1]A Dam Safety Review is not required for low-consequence dams. However, the consequences of failure should be reviewed periodically since they may change with downstream development. If the classification increases, a Dam Safety Review is required at that time.

6.0 SITE CONDITIONS

6.1 Topography

The Giant Mine site consists of undulating topography, with a central valley containing Baker Creek and Trapper Creek. Extensive areas of exposed bedrock are present on the higher ground, as well as minor surficial deposits in low-lying areas. The ridges on either side of Baker Creek are 10 to 20 m high and the slope angles are bedrock controlled. There is a thin layer of soil on most of the ridge slopes. Mining activity in the Baker Creek Valley has significantly altered the local topography and portions of the Baker Creek channel have been relocated several times throughout the history of operations.

6.2 Geology

The area around Giant Mine is composed mainly of mafic volcanic rocks (basalt and andesite) and intrusive equivalents (gabbro and diorite), known collectively as the Kam Group (John 1991).

The area was glaciated during the Pleistocene period resulting in outwash sand and gravel plains, eskers, and glacial lacustrine clays in the valleys. Bedrock is of Precambrian origin and consists predominantly of greywacke, slate, quartzite, arkose, argillite, and phyllite.

In general terms, sub-ground conditions are characterized by (after Geocon 1975):

- stratum of organics in the form of either muskeg, peat, or organic silt; over
- silty clay and, in some areas, followed by a stratum of silt with sand sometimes with trace clay; over
- a veneer of silty or sandy till; over
- bedrock.

6.3 Vegetation and Wildlife

The vegetation in the region is typical of the Taiga Shield Ecozone with its plains and hills of the Canadian Shield. The site contains stunted coniferous and deciduous stands, including black spruce, alders, willows, and tamarack in the fens and bogs and open, mixed woods of white spruce, balsam fir, and trembling aspen (after McGill 2017).

Wildlife of the Taiga Shield Ecozone includes barren-ground and some woodland caribou, moose, wolf, snowshoe hare, artic fox as well as black and grizzly bear.

Representative bird species include arctic and red-throated loons, northern phalarope, tree sparrow, and grey-cheeked thrush.

6.4 Climate

Summary of climate information for the Giant Mine is presented here. For additional details see APPENDIX D.

- Climate data relevant to the Giant Mine area are available from the Environment Canada climate station at Yellowknife Airport (Station ID 2204101)
- The mean annual temperature is -4.9 degrees Celsius
  - The coldest month is typically January, with a mean temperature of -27.3 degrees Celsius.
  - The warmest month is typically July, with a mean temperature of 16.5 degrees Celsius.

- The annual total precipitation is 333 mm, including approximately 172 mm of rainfall and 161 mm of water equivalent snowfall.
  - The wettest month is August with approximately 44 mm of total precipitation.
  - The driest month is March with approximately 19 mm of total precipitation.
- The probable maximum precipitation for a 24-hour event (point PMP) is 328 mm.
  - Snowmelt typically occurs in April and May. The snowmelt in an average year (two-year-return event) is 7.8 mm/day, including 34 percent sublimation.
  - The annual total evaporation is 524 mm, with the majority of evaporation occurring in June and July (50 percent).
- Prevailing winds during the open water season occur predominantly from the east to the south. The average wind speed ranges between 3 m/s and 6 m/s.

6.5 Water Balance

Water balance models for the North Pond (which also collects surface water from the former South and Central Ponds) and Northwest Pond are presented in APPENDIX E.

These water balances provide average expected conditions for the North and Northwest Ponds.

The water balance for the Polishing and Settling Ponds is predominantly controlled by surface water treatment (inflows and outflows). A separate water balance has not been calculated for these ponds. Flows are tracked to the Effluent Treatment Plant (ETP) (from the Northwest Pond) and from the Polishing Pond to Baker Creek.

6.6 Permafrost

Recent and historic site investigations confirmed the presence of frozen ground beneath multiple dams on site. This frozen ground may be defined as permafrost depending on the ground temperature and the duration of sustained temperatures. Within this section, relevant permafrost definitions and an overview of known permafrost conditions at Giant Mine dams is provided.

Permafrost definitions relevant to the OMS include the following:

- **Permafrost**: where the ground temperature is at or below zero degrees Celsius during at least two consecutive winters and the intervening summer (Andersland and Ladanvi 2004).
- **Discontinuous permafrost**: which occurs when permafrost is present only in certain areas and covers less than 90 percent but more than 50 percent of the ground area.
- **Warm permafrost**: where ground temperatures are in the range of zero to -1 degrees Celsius (Geological Survey of Canada 1998).
- **Low salinity permafrost**: where the pore fluid contains salt (i.e., solids that are soluble in water) with a concentration of less than five parts per thousand (Hivon and Sego 1993).

Giant Mine is located within the discontinuous permafrost zone (Geological Survey of Canada 1998). Where encountered, in and around Yellowknife, it is typically warm and found in peat bogs where organic material contributed to and preserved the permafrost.

Geotechnical investigations completed between 2018 and 2020 encountered frozen ground beneath multiple dams on site. Subsequent ground temperature monitoring confirmed permafrost conditions. Dam specific summaries are provided below.

- **Dam 1**: Permafrost is located in the dam's foundation and ranges from zones of near total ice with very little soil, to frozen soil with minimal to no visible ice (Golder 2019). The permafrost was encountered mostly in a layer of silty clay. Measured ground temperatures in the permafrost zone have ranged between -0.1 to -0.3 degrees Celsius (Golder 2021b), which has been classified as warm permafrost. The salinity of the permafrost was found to be low, so although the permafrost is warm, much of the water is likely in a frozen state. In 2020, 38 passive thermosyphons were installed to reduce the temperature of the permafrost in key foundation locations (Golder 2021b).
- **Northwest TCA Dams** (Golder 2020b): Frozen soil was encountered at all dam foundations during a geotechnical investigation of the perimeter dams conducted in 2019. Measured ground temperatures typically ranged between -1 to -4 degrees Celsius in the frozen soil zones.

Site-specific data on the presence and extent of frozen soil in the foundations of dams and within the TCA boundaries, where encountered during geotechnical investigations, are provided in APPENDIX B.

6.7 Seismicity

According to the 2020 National Building Code of Canada seismic hazard calculator (NRC 2020), the values of peak ground acceleration (PGA) that is expressed as a ratio of gravitational acceleration (i.e., g) for the Giant Mine site are as follows:

1) 0.034 g for the 1-in-1,000-year event (five percent probability of exceedance 50 years).
2) 0.067 g for the 1-in-2,475-year event (two percent probability of exceedance in 50 years).

These PGA values were based on Site Class E conditions which were considered conservative due to the presence of near surface bedrock and rockfill material.

7.0 OPERATIONS

The Giant Mine is in the Closure-Active Care phase of the mine life. The only operations at the facility are related to the management of surface water and water treatment on an annual basis and ongoing closure and reclamation activities.

Water management and treatment structures at the site, as shown in Figure 5, include the following:

- Northwest TCA, in which Dam 22B has the lowest minimum crest elevation of the low permeability element and therefore controls water levels in the Northwest Pond.
- Original TCA, in which only the following dams retain water:
  - Splitter Dyke retains water in the Settling Pond.
  - Dam 1 retains water in the Polishing Pond.
  - Dam 2 retains water in the North Pond.
- B2 Dam diverts water in Baker Creek away from B2 Pit.
- Mill Pond Structure retains water in the Mill Pond.

Approximate total areas for combined tailings and water surface within the TCA ponds (excluding dams) are as follows (SRK 2005):

- Northwest Pond: 44 ha
- North Pond: 29 ha
- Central Pond: 13 ha
- South Pond: 9 ha
- Settling Pond: 4 ha
- Polishing Pond: 5 ha

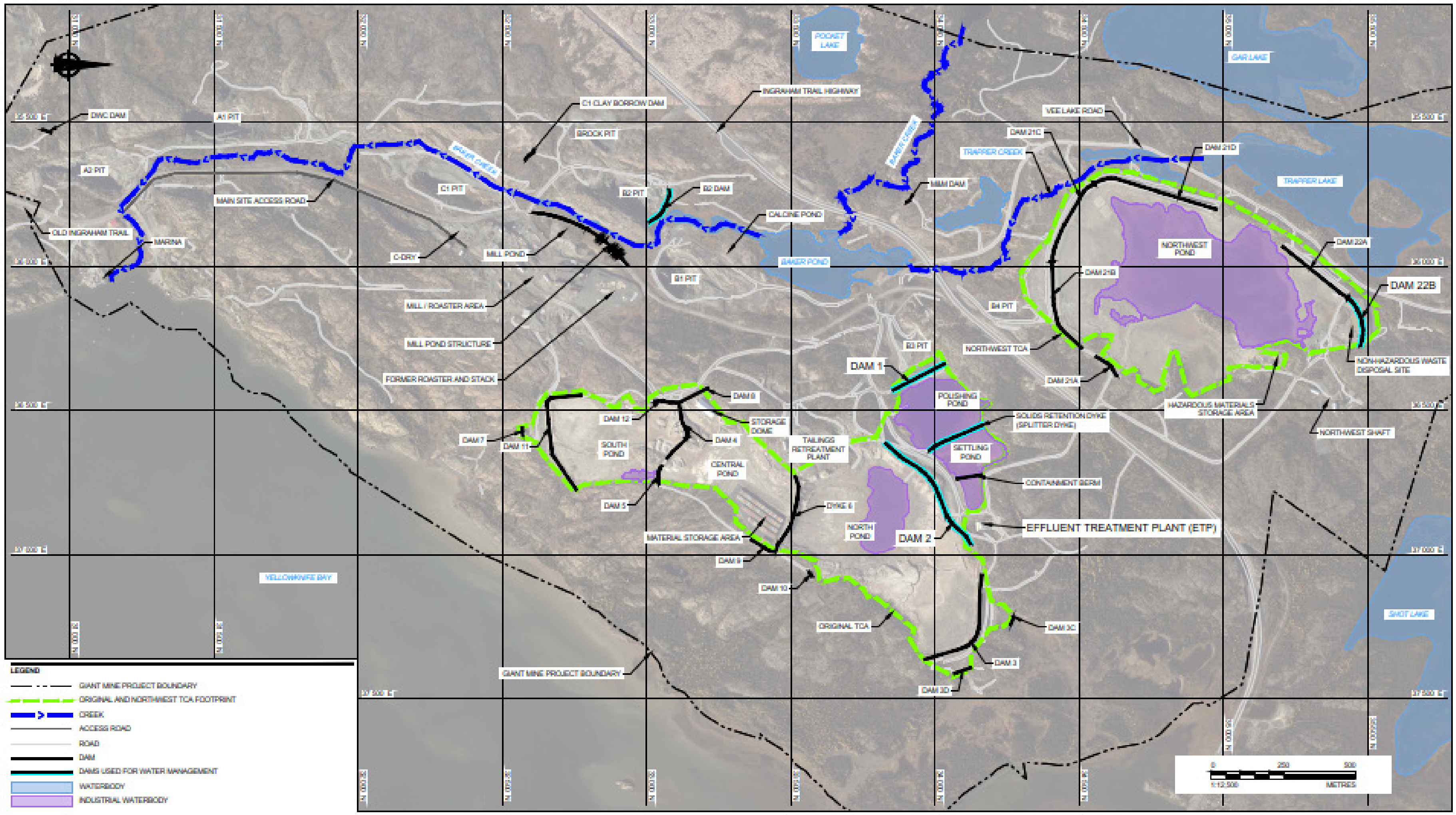

Figure 5: Overview of Water Management Facilities at Giant Mine

7.1 Water Management

The following elements make up water management of the Giant Mine site:

- Water from the underground mine is pumped to the Northwest Pond for storage.
- Surface water runoff and direct precipitation are collected in the Northwest Pond.
- Surface water runoff and direct precipitation from the South and Central Ponds (which no longer retain a significant quantity of ponded surface water) flow by gravity to the North Pond where it is collected along with runoff and direct precipitation in the North Pond.
- Surface water runoff (contact water) is collected in the main building area around C-Shaft and conveyed to the Mill Pond. Water from the clay borrow area is also collected and conveyed to the Mill Pond. Mill Pond water is conveyed to the North Pond.
- If required (i.e., storage volume reached) water from the North Pond is pumped to the Northwest Pond or treated directly at ETP.
- By mid to late June the Northwest Pond is normally near its storage capacity and water is pumped from the pond to the ETP for treatment.
- Following treatment, water is discharged into the Settling Pond, and then pumped to the Polishing Pond. Retention time within these ponds is controlled based on maintaining surface water levels within the Settling and Polishing Ponds (as presented in Section 7.6).
- Once discharge criteria are met, water is discharged via a siphon from the Polishing Pond to Baker Creek.
- Water flow in Baker Creek is diverted by B2 Dam, which prevents Baker Creek flow from entering into the B2 Pit.
- By the end of September, and termination of water treatment, the water elevation in the ponds is generally at their lowest.

An illustration of surface water management is presented in Figure 6. Emergency pumping requirements are as follows:

- High water volume in the Northwest Pond will be managed by pumping water from the NWTP into the Northwest Shaft and into the mine pool below 750 Level.
- Pond water level differential between the Polishing Pond and Settling Pond will be eliminated to mitigate the risk of Splitter Dyke failure. If this is not achievable (because current sludge elevation along the toe of the Splitter Dyke is higher than the current water level in the Polishing Pond), Settling Pond water level adjacent to the Splitter Dyke will be maintained as low as practicably possible.
- Water levels in the Settling Pond and Polishing Pond should be monitored daily during ETP operation. The Splitter Dyke should be visually inspected daily if zero pond level differential cannot be maintained.
- Parsons will increase the frequency of visual inspection of the Splitter Dyke to twice daily if the ETP is operated at increased pond level differential, higher than 0.2 m (Parsons RFI No.: RFI-0052-0001 Rev0).

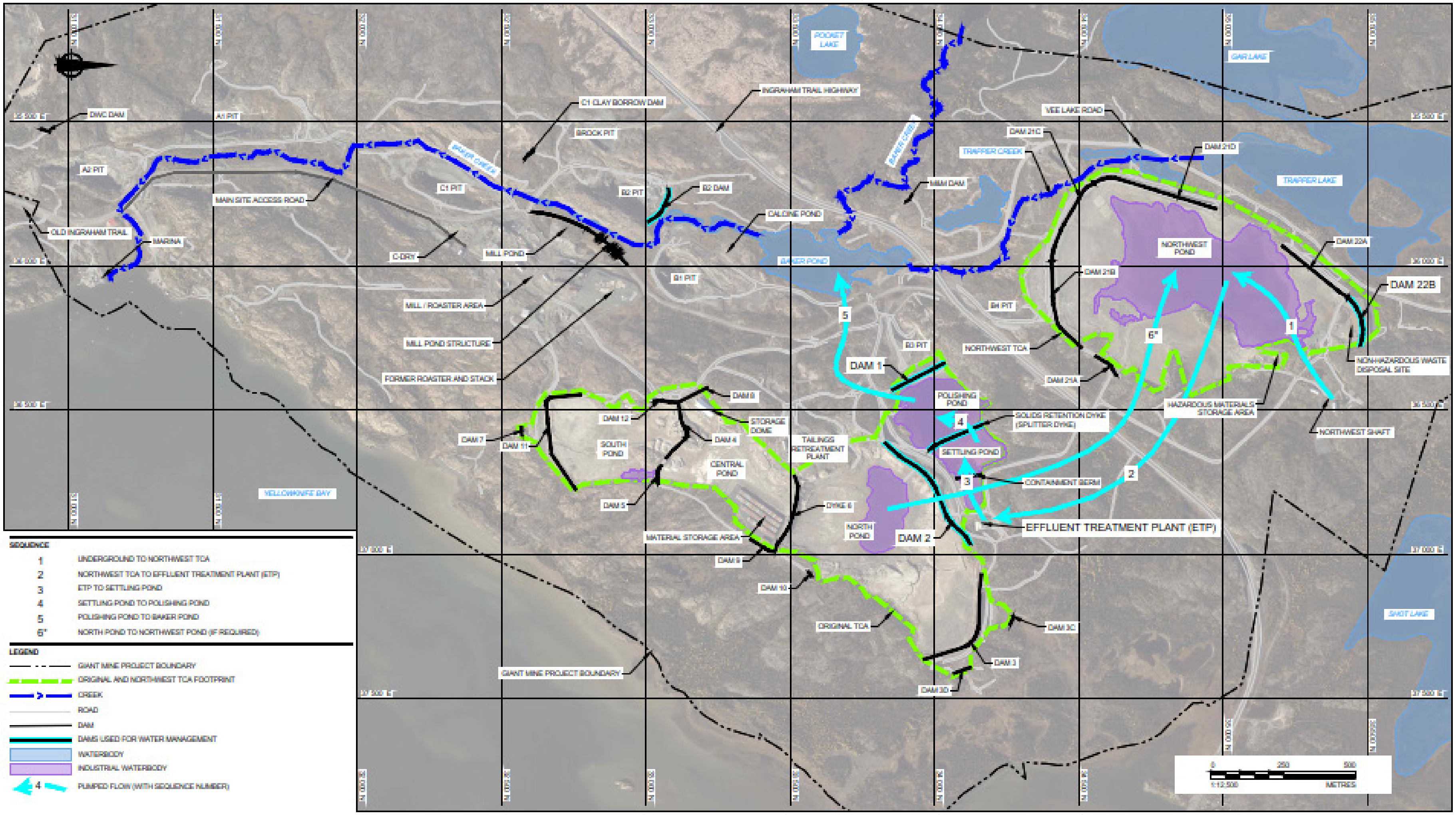

Figure 6: Overview of Water Treatment at Giant Mine

7.2 Water Treatment

The Giant Mine ETP Operating Manual (i.e., SOP# - ETP – 01) must be consulted for details of operational practices for water treatment.

7.3 Pond Storage Capacity

Only the Northwest, North, Settling, and Polishing Ponds retain ponded water. Estimates of storage capacity with respect to elevation are presented here and are based on available topographic data. Comments in the tables denote the estimated total pond volume at the maximum permissible pond elevation and the point of overtopping (i.e., minimum elevation of the top of the low permeability element). Storage volumes should be verified as per the frequency presented in Section 8.7.

- The storage volume versus water elevation of Northwest Pond is shown in Table 5 and Figure 7.
- The storage volume versus water elevation of North Pond is shown in Table 6 and Figure 8.
- The storage volume versus water elevation of Polishing Pond and Settling Pond is shown in Table 7 and Figure 9.
- The storage volume versus water elevation of Mill Pond Structure is currently being determined.

The water level differential between the Polishing Pond and Settling Pond has been updated to maintain as low as practically possible. The storage volume was re-evaluated for the combined Polishing Pond and Settling Pond.

Discussion of the freeboard levels in each facility are provided in Section 7.5.

Table 5: Storage Volume with Water Elevation Data - Northwest Pond

Water Elevation (masl)	Approximate Pond Volume[1] (m^3)
186.9	0
187.5	84
188.0	335
188.5	851
189.0	3,377
189.5	11,764
190.0	27,918
190.5	55,805
191.0	106,032
191.5	180,896
192.0	292,370
192.5	436,416
193.0	607,989
193.35[2]	740,671
193.5	800,837
194.0	1,012,532
194.25[3]	1,120,000

[1]Bathymetry survey conducted in 2019 (Golder 2020a).

[2]Maximum permissible pond elevation (minimum freeboard). Pond volume based on linear interpolation of 2019 bathymetry data.

[3]Minimum crest elevation of low permeability element at Dam 22 (Golder 2013). Pond volume estimated based on linear extrapolation of staged storage curve in Golder (2020a).

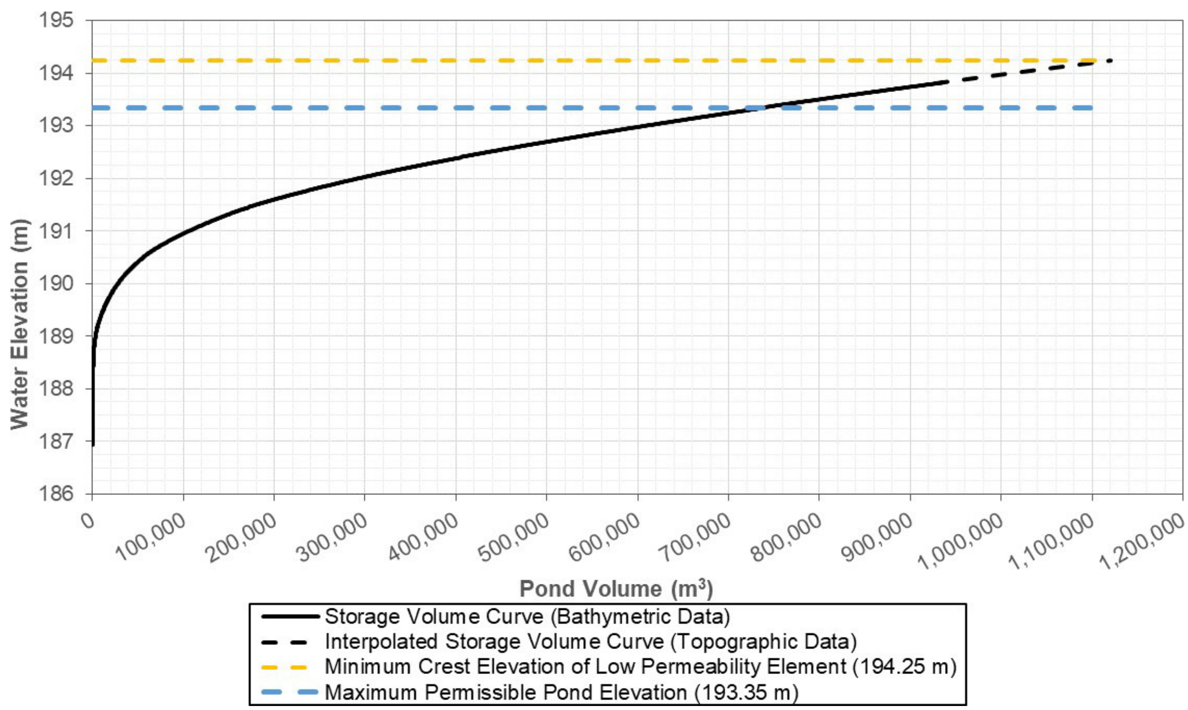

Figure 7: Water Elevation Versus Storage Volume - Northwest Pond

Table 6: Storage Volume with Water Elevation Data - North Pond

Water Elevation (masl)	Approximate Pond Volume[1,2] (m3)
169.4	0
170.0	86
171.0	920
172.0	8,696
173.0	30,568
174.0	63,264
175.0	112,760
176.0	202,260
176.5	264,747[3]
177.0	327,234
178.0	465,298
179.0	611,228
180.0	764,975
180.03[4]	769,695
181.0	926,043
181.23[5]	959,910

[1]Bathymetry survey conducted in 2019 (Golder 2020a).

[2]Volumes shown were linearly interpolated from 2019 bathymetry survey (Golder 2020a).

[3]Maximum effective volume if Polishing Pond is at maximum permissible pond elevation.

[4]Minimum freeboard of Dam 2.

[5]Minimum crest elevation of low permeability element (e.g., spill point).

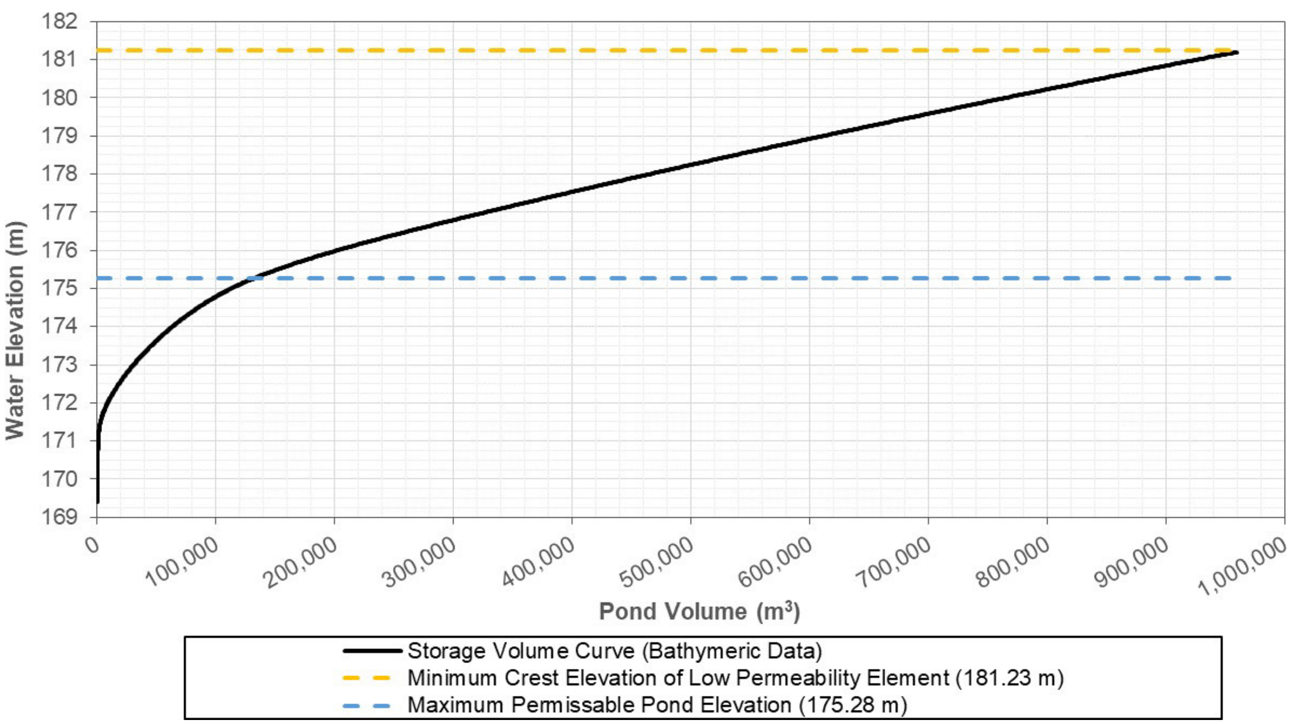

Figure 8: Water Elevation Versus Storage Volume - North Pond

Table 7: Storage Volume with Water Elevation Data - Polishing Pond and Settling Pond

Water Elevation (masl)	Approximate Pond Volume (m^3)
163.5	0
163.9	17
164.3	98
164.7	406
165.1	1,378
165.5	2,971
165.9	5,000
166.3	7,383
166.7	10,084
167.1	13,056
167.5	16,273
167.9	19,742
168.3	23,467
168.7	27,549
169.1	32,050
169.5	37,347
169.9	43,807
170.3	51,074
170.7	58,930
171.1	67,337
171.5	76,356
171.9	86,195
172.3	96,924
172.7	108,761
173.1	122,997
173.5	139,855
173.9	158,071
174.2	172,719
174.4	182,754
174.6	196,723
174.8[1]	211,776
175	227,400
175.2	243,609
175.4	260,284
175.6	277,387
175.8	294,954
176	313,158
176.2[2]	332,076

Source: WSP (2023)

[1]Maximum permissible pond elevation (corresponding to minimum freeboard).

[2]Minimum crest elevation of low permeability element (e.g., spill point).

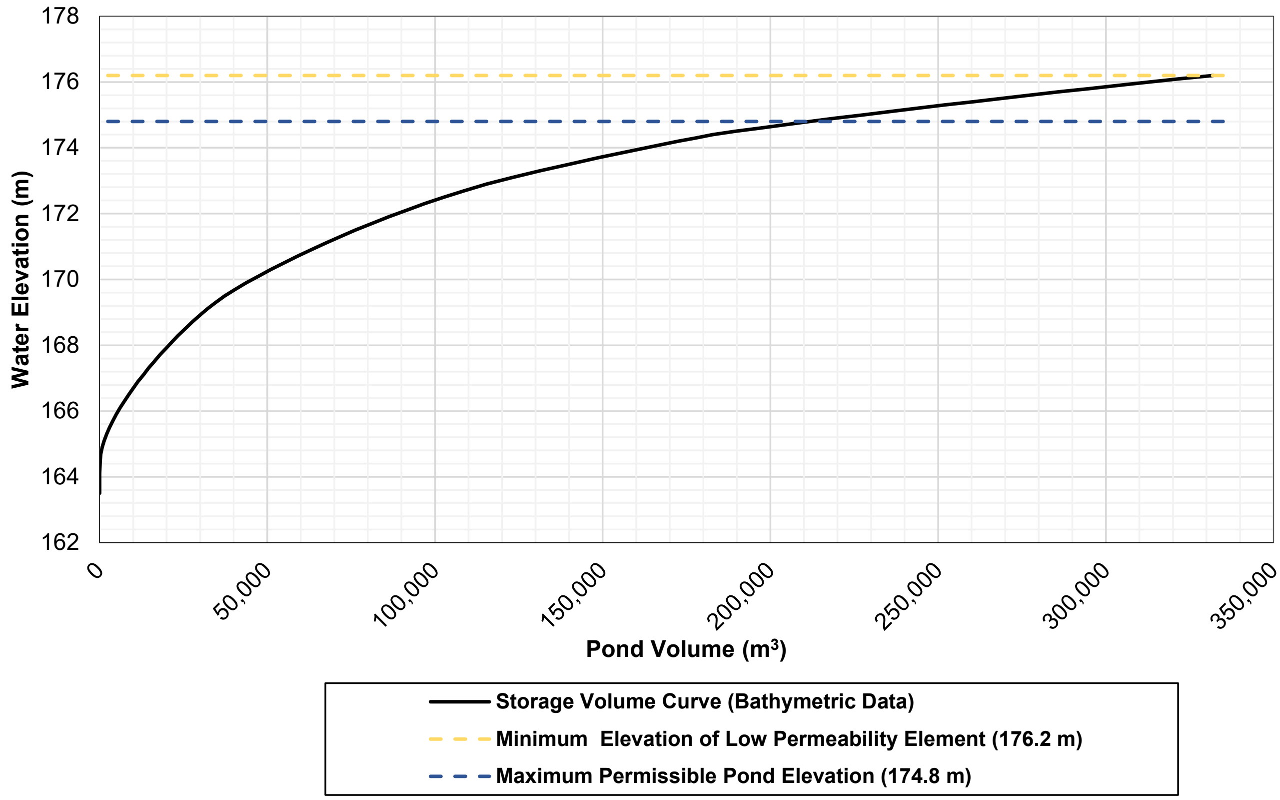

Figure 9: Water Elevation Versus Storage Volume - Polishing and Settling Ponds

7.4 Flood Runoff Volume

Design hydrographs were analyzed by routing the design intensity-duration-frequency data using the sub-watershed and terrain characteristics for each pond area. It was determined that the spring storm events govern for storage capacity requirements, assuming no active water management operations such as pumping during the events (WSP 2023). Based on the CDA Guidelines (CDA 2013):

- The inflow design flood (IDF) event for Dam 1 (retains Polishing Pond and Settling Pond) and Dam 2 (retains North Pond) are 33% between the 1000-year and the probable maximum flood (PMF) events.
  - The Central and South Ponds discharge into the North Pond and were assessed under the same IDF event to provide total expected runoff volumes for the North Pond.
- The IDF event for Dam 21 (Northwest Pond) is 67% between the 1000-year and the PMF events.

The resulting flood runoff volumes are presented in Table 8.

Table 8: Design Runoff Volume

Location	Governing Storm	Runoff Volume (m^3)
Northwest Pond	Spring (2/3 between the 1000-year and PMF)	165,500
North Pond[1]	Spring (1/3 between the 1000-year and PMF)	129, 500
Combined Settling and Polishing Pond		72,000

Source: WSP (2023).

[1]Includes surface water runoff from the South Pond and Central Pond of the Original TCA.

PMF = probably maximum flood.

When B2 Dam was rehabilitated in 2007, it was designed to retain a 1-in-500-year flood event (SRK 2008), which predicted a flow of 25 m^3 per second in Baker Creek (NHC 2007). Based on updated flood estimates and a 2018 dam crest survey, the B2 Dam appeared to be able to retain at least a 1-in-1,000-year flood event (Golder 2017a, 2018). B2 Dam was not rehabilitated to retain a PMF flow as the B1 Pit would be flooded before the B2 Dam would be overtopped (SRK 2008).

7.5 Minimum Freeboards

This section details the minimum freeboards established for the water retaining dams. Freeboard is defined here as the vertical distance between the still water level and the top of the impervious core of a dam or dyke. Minimum water freeboards for ponds were calculated based on the PMF inflows presented in Table 8 and the estimated wave runup caused by a 1-in-2-year return event wind acting perpendicular to the dam crest. Freeboard values are calculated using the approach set out in CDA (2013) guidelines.

Pond levels typically fluctuate throughout the year with the minimum pond level typically observed immediately following annual water treatment and the maximum water level observed during the spring freshet.

Minimum freeboards and corresponding water level for the Northwest, North, Settling, and Polishing Ponds are shown in Table 9.

Table 9: Minimum Freeboard and Corresponding Water Levels

Parameter	Northwest Pond	North Pond	Settling Pond and Polishing Pond	Notes
Minimum freeboard (m)	0.90	1.2	1.4	Calculated as inflow design flood plus wave runup.
Lowest dam crest elevation (masl)	194.25	181.14	176.40	Lowest dam crest elevation from available survey.
Lowest elevation of low permeability core (masl)	194.25	181.14	176.20	Elevation at which water is retained by low permeability core.
Maximum permissible water level (masl)	193.35	179.94	174.80	Water elevation corresponding to minimum freeboard.

Notes: Dam crest elevation and low permeability core elevation were based on 2022 survey for Northwest Pond and North Pond, and Dam 1 raise construction records for Settling and Polishing Ponds.

The following dams have a minimum freeboard of 1.0 m: Dam 3 to Dam 9, Dam 11, Dam 12, Dyke 6. Hydrology analysis for the Mill Pond Structure is underway to determine the storage capacity and minimum freeboard for the Mill Pond Structure. The minimum freeboard for B2 Dam was estimated to be 0.9 m at the B2 Dam (Golder 2021a). This is based on the minimum estimated top of liner (165.6 m) and the design flood elevation of 164.7 m (1-in-500-year, NHC 2007). Unlike the ponds, the freeboard at B2 Dam does not consider wave height due to its relatively short fetch length.

7.6 Pond Water Levels and Warning Levels

Pond water levels at Giant Mine have restrictions based on one or more of the following:

- Minimum freeboard requirements, as outlined in Section 7.5
- Differential water level, with the maximum and minimum permissible water levels in one pond dependent on the water level in another pond
- Rate of water elevation change

In Section 7.6.1, context for differential water level restrictions is described and the warning levels for both minimum freeboard and differential water elevations is provided. In Section 7.6.2, actions corresponding to warning levels being exceeded are provided. In Section 7.6.3, restrictions for the rate of water elevation change, which is only for the Polishing Pond, is described.

7.6.1 Minimum Freeboard and Differential Water Level

In addition to the freeboard requirements outlined in Section 7.5, maximum and minimum water levels for the North Pond and Settling Pond are also dependent on the water level in the Polishing Pond at any given time. This results in maximum operating levels in these facilities that are necessary to provide the minimum freeboards determined in Section 7.5. These restrictions are based on measures that have been established to control seepage through Dam 2 and minimize the risk of the Splitter Dyke failure.

Three levels of warning have been established for the Giant Mine for management of pond water levels related to minimum freeboard and differential water elevations. The warning levels and their descriptions are provided in Table 10.

Table 10: Warning Level Descriptions - Minimum Freeboard and Pond Differential

Warning Level	Colour Code	Description
Normal	Green	Water reached an elevation or differential that is typical and within historical precedent. No additional monitoring or actions required.
Notification	Yellow	Water reached an elevation or differential that is greater than is typical, but within historical precedent. Additional monitoring and/or action may be required.
Caution	Orange	Water reached an elevation or differential that is greater than the historical precedent. Additional monitoring and/or actions are required.

The selected warning levels for minimum freeboard (i.e., maximum pond elevation) for the Northwest Pond, Polishing Pond, and Baker Creek at B2 Dam are presented in Table 11 and visually in Figure 10 to Figure 12. These ponds are controlled by the minimum freeboard requirements and have no differential water level restrictions. For action to respond to the warning levels, refer to Table 13 in Section 7.6.2. If the caution level is exceeded, refer to Table 31, which will require immediate action and may include the implementation of the Emergency Response Plan (ERP).

Table 11: Warning Levels - Pond Water Elevation and Freeboard Criteria

Water Source	Criteria			
	Type (elevation or freeboard)	Normal	Notification	Caution
Polishing Pond	Elevation (masl)	≥172.9 to ≤174.4	>174.4 to ≤174.7	≥174.7 to <174.8
	Freeboard (m)	≤3.3 to ≥1.8	<1.8 to ≥1.5	≤1.5 to >1.4
Northwest Pond	Elevation (masl)	>189.6 to ≤192.4	>192.4 to ≤192.9	>192.9 to ≤193.35
	Freeboard (m)	≤4.65 to ≥1.85	<1.85 to ≥1.35	<1.35 to ≥0.9
Baker Creek at B2 Dam	Elevation (masl)	≥163.4 to ≤163.8	>163.8 to ≤164.0	>164.0 to ≤164.7
	Freeboard (m)	≤2.2 to ≥1.8	<1.8 to ≥1.6	<1.6 to ≥0.9

The selected warning levels for the North Pond (Dam 2) and the Settling Pond (Splitter Dyke) water level differential, with respect to the water level in the Polishing Pond, are presented in Table 12 and visually illustrated in Figure 13 and Figure 14. For actions to respond to the warning levels, refer to Table 13. If the caution level is exceeded, refer to Table 31, which will require immediate action and may include the implementation of the ERP.

Table 12: Warning Levels - Water Differential Criteria

Water Source	Water Differential Criteria (m)			
	Dam/Dyke	Normal	Notification	Caution
North Pond[1]	Dam 2	<1.0	≥1.0 to <1.7	≥1.7
Settling Pond[2]	Splitter Dyke	0	Not available	Not available

[1]Differential implies that North Pond water elevation is greater than that of the Polishing Pond.

[2]Water level differential between Settling Pond and Polishing Pond shall be maintained as low as practically possible (Golder 2022b).

The maximum and minimum differential between water levels in the Settling and North Ponds (shown in Figure 12 and Figure 13) are also presented in tabular format in APPENDIX F.

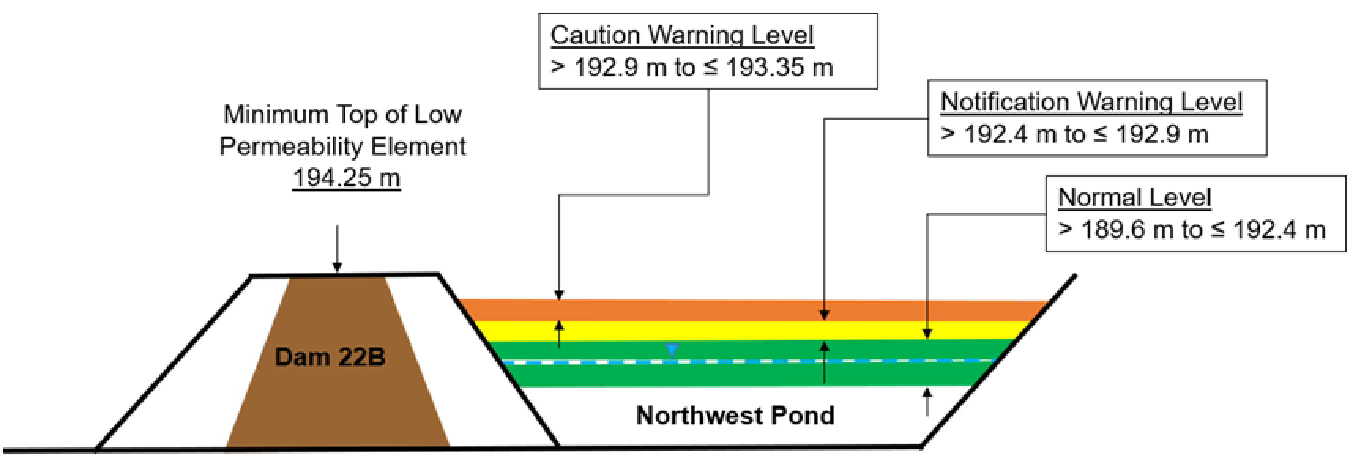

Figure 10: Water and Infrastructure Elevations for Northwest Pond (not to scale)

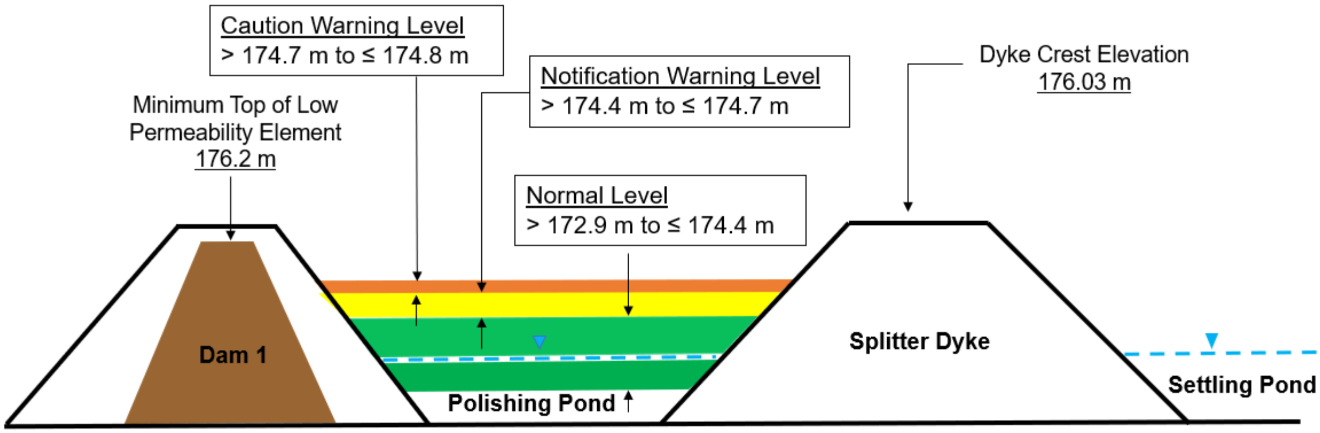

Figure 11: Water and Infrastructure Elevations for Polishing Pond (not to scale)

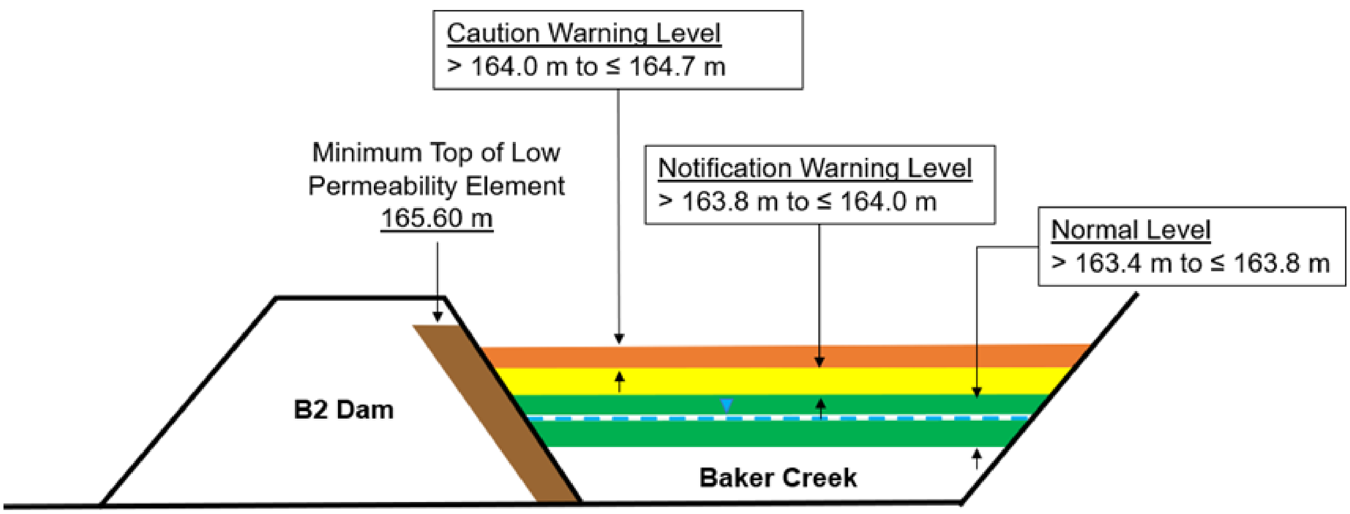

Figure 12: Water and Infrastructure Elevations for Baker Creek (not to scale)

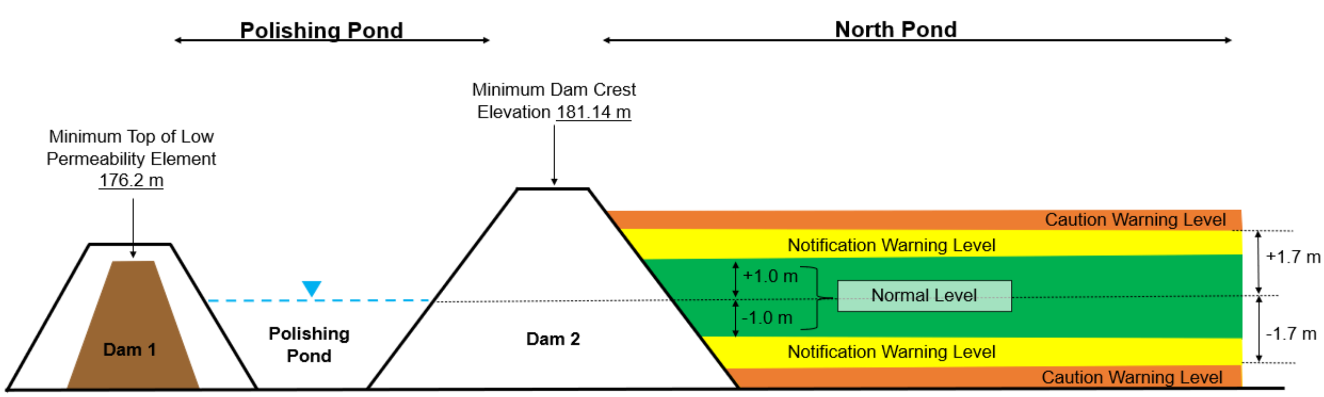

Figure 13: Water and Infrastructure Elevations Dam 2 / North Pond (not to scale)

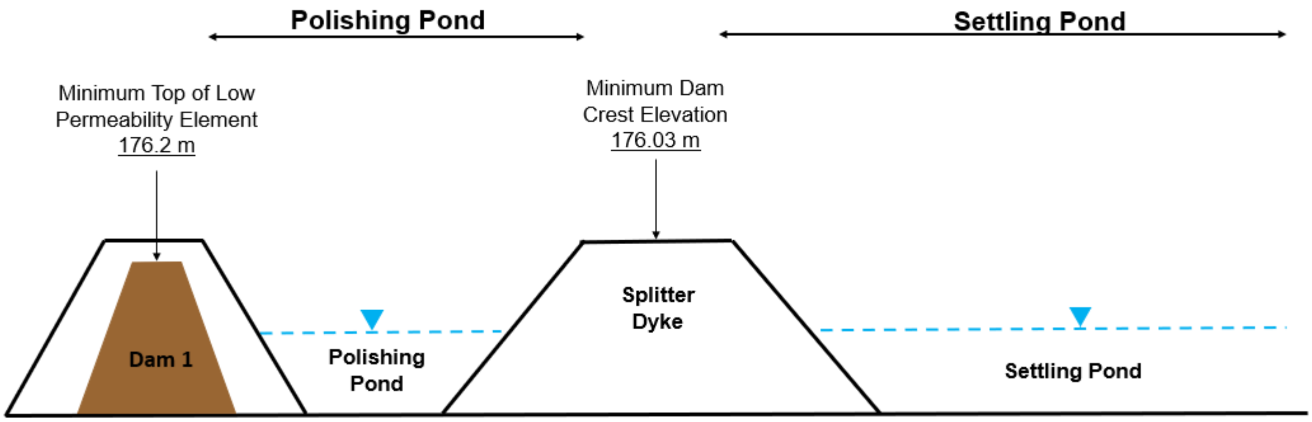

Figure 14: Water and Infrastructure Elevations for Settling Pond / Splitter Dyke (not to scale)

7.6.2 Actions Corresponding to Warning Levels

In Section 7.6.1, warning levels have been established for pond water elevations and differentials. In Table 13, actions that correspond to the exceedance of either the notification or caution warning levels are provided. If the caution warning level is exceeded, refer to Table 30 in Section 10.8. This is a more serious scenario as the ERP may potentially need to be initiated.

Table 13: Actions for Corresponding to Pond Warning Levels

Warning Level	Event Criteria	Actions by Site Technical Staff	Actions by Mine Manager (TCA Responsible Person)	Actions by Site Owner (CIRNAC and PSPC)	Actions by Consulting Geotechnical Engineer

Notification	**Water Elevations**
	■ Water level in Northwest Pond:
	  ■ Less than or equal to 192.9 m
	  ■ Greater than 192.4
	■ Water level in Polishing Pond:
	  ■ Less than or equal to 174.7 m
	  ■ Greater than 174.4 m
	■ Water level in Baker Creek at B2 Dam:
	  ■ Less than or equal to 164.0 m
	  ■ Greater than 163.8 m
	Pond Differentials
	■ Dam 2:
	  ■ Water level in North Pond ≥ Polishing Pond: +1.0 to +1.7 m
	  ■ Water level in North Pond ≤ Polishing Pond: -1.0 m to -1.7 m
	■ Splitter Dyke
	  ■ Water level differential between Settling Pond and Polishing Pond shall be maintained as low as practically possible
		■ Perform and record daily visual inspection.
		■ Measure water levels in North, Polishing, Settling and Northwest Ponds and determine capacity to receive water
		■ Set up pumps and pipelines to enable transfer of water from ponds or if not available to underground
			■ Notify Consulting Geotechnical Engineer for guidance
			■ Notify Site Owner
			■ Perform visual inspection
			■ Be available for consultation
			Be prepared to notify stakeholders and neighboring communities
				■ Be available for consultation	■ Be available for consultation

Caution	**Water Elevations**
	■ Water level in Northwest Pond:
	  ■ Less than or equal to 193.35 m
	  ■ Greater than 192.9
	■ Water level in Polishing Pond
	  ■ Less than or equal to 174.8 m
	  ■ Greater than 174.7
	■ Water level in Baker Creek at B2 Dam:
	  ■ Less than or equal to 164.7 m
	  ■ Greater than 164.0 m
		■ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections.
		■ Measure water levels in North, Polishing, Settling and Northwest Ponds and determine capacity to receive water
		■ Set up pumps and pipelines to enable transfer of water from ponds or if not available to underground
			■ Notify Consulting Geotechnical Engineer for guidance
			■ Notify Site Owner
			■ Perform visual inspection
			■ Be available for consultation
			■ Be prepared to notify stakeholders and neighboring communities
			■ Be prepared to evacuate underground
				■ Be available for consultation	■ Be available for consultation

	Pond Differentials
	■ Dam 2:
	  ■ Water level in North Pond ≥ Polishing Pond: >+1.7 m
	  ■ Water level in North Pond ≤ Polishing Pond: <-1.7 m
	■ Splitter Dyke
	  ■ Water level differential between Settling Pond and Polishing Pond shall be maintained as low as practically possible
		■ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections.
		■ Measure water levels in North, Polishing, Settling and Northwest Ponds and determine capacity to receive water
		■ Reduce differential using pumps.
			■ Notify Consulting Geotechnical Engineer for guidance
			■ Notify Site Owner
			■ Perform visual inspection
			■ Be available for consultation
				■ Be available for consultation	■ Be available for consultation

7.6.3 Rate of Water Elevation Change

No restriction is currently applied for changes in water elevation within the Polishing Pond, North Pond and Northwest Pond.

7.7 Environmental Protection

A monitoring program exists to conduct surface water, groundwater, mine water, and effluent monitoring at the Site. Effluent and water monitoring at the Site, including quality assurance and quality control (QA/QC) measures, is conducted to meet the requirements of the Type A Water Licence MV2007L8-0031 issued by the Mackenzie Valley Land and Water Board (MVLWB 2021), as well as the federal Metal and Diamond Mining Effluent Regulations (MDMER) and the Environmental Effects Monitoring (EEM) program. Additional effluent and water monitoring is completed through the Operational Monitoring Program (OMP). Refer to the Standard Operating Procedures and QA/QC Plan for Effluent and Water Sampling Rev 3.0 (CIRNAC and GNWT 2022).

Operational samples are collected by the ETP operator and submitted to a local lab on a four-hour turn-around-time. These are collected daily and the results compared to the allowable discharge limits. Monitoring of critical dams is undertaken daily. Visual monitoring for potential dam seepage is undertaken as part of the visual dam inspection. Water bodies adjacent to the dams are visually monitored for turbidity during the visual dam inspection. Any turbidity observed is follow-up with water quality sampling.

7.8 Change Management

The Mine Manager will be responsible for ensuring that any changes in operations or within management are reflected in the OMS Manual and subsequently reviewed, approved, and distributed accordingly. The Parsons' Surface Superintendent will be fully conversant in all requirements of the OMS Manual. Any change in Parsons project personnel will trigger a review of the potential impact on this OMS manual. Any significant change in Parsons personnel or changes in site conditions shall result in an update to the OMS Manual. As the GMRP work progresses all project work that will potentially impact dam conditions shall be informed to the Consulting Geotechnical Engineer.

7.9 Documentation

The OMS Manual and all associated documents will be kept current with appropriate practices and procedures and, at a minimum, reviewed annually by the required personnel. Electronic copies of the OMS Manual and all inspection reports will be kept on the Parsons SharePoint site.

7.10 Reporting and Documentation

Records of yearly water inputs are to be provided by the water treatment subcontractor to the Mine Manager. Records include the following:

- Water volume discharged to the aquatic environment
- Volumes of seepage pumped from sumps or other structures
- Water elevations in the North, Settling, Polishing, and Northwest Ponds
- Water volumes pumped from the underground workings
- Water volumes transferred from the North Pond to the Northwest Pond
- Water volumes transferred from Dam 3 Sumps A and B, Dam 1 Sump, and Dam 22B Sump

- Water treated at the ETP
- Water volumes transferred from the Northwest Pond to ETP
- Water volumes transferred from the North Pond to ETP
- Water volumes from the ETP to the Settling and Polishing Ponds
- Water quality sampling results
- Water volumes collected and transferred from NHWL
- Water volumes transferred from the Mill Pond to the Central Pond

Records are to be provided to the Mine Manager for storage at the Giant Mine offices and electronically on a secure server. A summary of data should be provided to the Consulting Geotechnical Engineer monthly during the ETP operation, until an Engineer of Record is designated.

8.0 SURVEILLANCE

8.1 Objectives

A surveillance program is implemented to assess the current performance of the facilities relative to their intended purpose.

The objective of the surveillance program is to confirm adequate performance of the facility, including containment, stability, and operational function, by observing, measuring, and recording data relative to potential failure modes and specific operational controls.

8.2 Training Requirements

No specific training for OMS Manual and EPRP awareness has been completed. The training requirements for the personnel involved in tailings management are listed in Section 3.3. When awareness training is completed, the Mine Manager should document attendees and keep the training records. It will be the responsibility of the Mine Manager to ensure workers new to dam safety management have undergone OMS Manual and EPRP awareness training. Desk top drills related to the EPRP will be conducted on an annual basis.

8.3 Surveillance Procedures

A program of regular periodic surveillance is required to ensure that the facilities are performing adequately and that any problems are detected so that necessary corrective actions can be implemented in a timely manner. The following surveillance procedures will be conducted.

- Visual monitoring by site staff (Section 8.4)
- Reading of geotechnical instruments (Section 8.5)
- Sampling and testing in accordance with the water licence (Section 8.6)
- Survey and bathymetry (Section 8.7)
- Collection of climate data from weather station (Section 8.8)
- Annual Geotechnical Inspections (Section 8.9)
- Dam Safety Reviews to be conducted in accordance with CDA (2013), based on dam classification (Section 8.10)
- Event-driven geotechnical inspections are to be arranged following any extreme weather or seismic events, including extreme wind, rainfall, or earthquakes (Section 8.11)
- Incident-driven inspections are to be arranged to investigate underlying causes of spills, equipment failures or unavailability, or similar incidents that affect the performance of the water management system (Section 8.12)

The Mine Manager is responsible for the implementation of all visits conducted on site.

8.4 Visual Inspection

Routine visual inspections are a key part of the surveillance of the dams. In Section 8.4.1, an overview of the general inspection requirements is provided, such as minimum monitoring frequency and documentation, as well as general guidance on potential key observations for inspectors to be aware of. In Section 8.4.2, specific inspection requirements for monitoring of cracks and the Dam 1 thermosyphon are described.

In Section 8.4.3, warning levels that could be triggered based on observations from the visual inspections are listed, along with corresponding actions are provided.

8.4.1 General Inspection Requirements

Table 14 outlines the different failure modes applicable to the facilities at Giant Mine and visual observations which may indicate potential failure.

Table 14: Failure Modes and Identification

Failure Mode	Conditions Related to Possible Increased Risk of Potential Failure Mode
Overtopping	▪ high water elevation ▪ blockage of water management structures (culverts, ditches, pumps, pipelines, channels, spillways and diversions) ▪ extreme meteorological event (precipitation, wind, and wave action) ▪ dam settlement, sinkholes ▪ excessive accumulation of solids (e.g., sludge build-up in Settling Pond)
Instability	▪ cracking ▪ dam settlement ▪ slope movement (as detected by settlement plates and survey monuments) ▪ dam bulging ▪ increase in water levels in the dam (piezometers) ▪ increased seepage ▪ erosion ▪ seismic event
Piping	▪ sediment laden seepage (e.g., cloudy visual appearance) ▪ wet spots at downstream dam toe or on downstream slope ▪ sinkholes, onset of sudden and new depressions in tailings impoundment

Documented visual monitoring of the dams and facilities will be carried out. Table 15 summarizes the minimum frequency for visual inspection of the dams, organized by their current CDA classification. The minimum inspection frequencies shown are also organized by frequency when the ETP is operating, and when it is not.

Daily inspections may be completed by Site Security or other staff as delegated by the Mine Manager. Weekly inspections are completed by Site Technical Staff (e.g., Environmental Manager, Mine Technician). Monthly inspections are performed by the Mine Manager. Daily, weekly and monthly inspection forms are found in APPENDIX G.

Table 15: Minimum Visual Inspection Frequencies

CDA Classification	TCA or Surface Water Dam	Dam Name	Minimum Inspection Frequency					
			During Operation			Outside Operation		
			Daily	Weekly	Monthly	Daily	Weekly	Monthly
Very High	Surface Water	B2 Dam	X	X	X	X	X	X
	Northwest	Dam 21A	X	X	X	X	X	X
		Dam 21B	X	X	X	X	X	X
		Dam 21C	X	X	X	X	X	X
High	Original	Dam 1	X	X	X	X	X	X
		Dam 2	X	X	X	X	X	X
	Northwest	Dam 21D	X	X	X	X	X	X
		Dam 22A	X	X	X	X	X	X
		Dam 22B	X	X	X	X	X	X
Significant	Original	Dam 3 (A&B)		X	X		X	X
		Dam 11		X	X		X	X
	Mill Area	Mill Pond Structure		X	X		X	X
Low	Original	Dam 3C		X	X		X	X
		Dam 3D		X	X		X	X
		Dam 4		X	X		X	X
		Dam 5		X	X		X	X
		Dyke 6		X	X		X	X
		Dam 7		X	X		X	X
		Dam 8		X	X		X	X
		Dam 9		X	X		X	X
		Dam 12		X	X		X	X
		Splitter Dyke	X	X	X	X[1]	X	X
	Surface Water	DWC Dam			X			X
		C1 Clay Borrow Dam			X			X
Not Applicable	Original	Dam 10						
	Surface Water	M&M Dam[2]						

[1]Daily inspection not required if zero differential water elevation is maintained.

[2]Inspection before and after spring freshet (e.g., in April and late May) and around winter free-up (e.g., October).

Documentation required from the inspections includes the completed inspection form and a photographic record. The level of detail required for the inspection of each dam is dependent on the consequence classification and size of the dam (i.e., inspection of very high consequence, large dams should take longer and provide more detail than significant consequence, small dams). The Mine Manager is responsible for ensuring visual inspections are completed and that completed inspections are reviewed.

Should any conditions be identified which indicate a possible increased risk of a potential failure (Table 14) or if a warning level is reached, the Mine Manager and Consulting Geotechnical Engineer should be informed immediately. Reporting procedures should be updated once an Engineer of Record is designated.

The results of the following inspections should be forwarded to the Consulting Geotechnical Engineer within one month of the date they were completed:

- Monthly inspections by Mine Manager
- Weekly inspections at the following times:
  - Last two inspections prior to the onset of freshet.
  - First two inspections following the end of the freshet.
  - Last two inspections prior to the commencement of annual water treatment.
  - All inspections while water treatment is in process.
  - last two inspections prior to freeze-up.

The Mine Manager and Consulting Geotechnical Engineer will review the information and may be required to take further action or implement the EPRP (Section 10.0) based on the information provided in the inspections.

All general inspections involve a brief assessment of facilities, dams, and all water management structures. All inspections should cover the tasks noted below. Additional requirements for weekly and monthly inspections are detailed in the forms in APPENDIX G.

- Observation of water levels, with immediate reporting when warning levels are exceeded.
- Observation of dam crests for any evidence of significant slope instability, cracking, sloughing, or slides.
- Observation of seepage at the downstream toe or on the downstream slope of the dams along with a visual description of the appearance of the seepage (e.g., sediment laden or clear). If seepage appears sediment laden (e.g., cloudy), the Mine Manager and Consulting Geotechnical Engineer are to be notified immediately.
- Observation of erosion on the dam profile (crest, downstream, and upstream slopes and toes).
- Observation and recording of any deterioration of the access roads; deterioration would include:
  - Any indications of instability (e.g., potholes, slumping, or cracks) in the road or the supporting fills below the road.
  - Any accumulations of debris or other materials on the road or paths.
- Observation of any blocked or eroded water courses.

If seepage is observed through the dams or there are any indications of dam movement, the Consulting Geotechnical Engineer should be informed immediately, and a site visit arranged.

Inspections should provide an assessment of both the upstream and downstream faces of the dams. Upstream slope inspections entail observations of:

- any water ponding against the face
- any water seeping from the face, wet spots
- any indication of cracking on the face
- any distortion or displacement of the face.

Downstream slope inspection includes observing the following:

- Indication of cracking in the dam fill
- Areas of local subsidence in the dam fill
- Areas of water ponding
- Areas of accumulation of fines or other unsuitable materials
- Areas of vegetation growth

8.4.2 Specific Monitoring Requirements

Within this subsection, specific instructions for the monitoring of cracks and the Dam 1 thermosyphons are described.

8.4.2.1 Monitoring of Cracks

Any identified cracks should be monitored to assess their ongoing condition. Inspection records should document the following:

- Number of cracks present on a dam
- Crack lengths
- Crack orientations
- Crack widths
- Crack depth
- Method of identifying specific cracks

Any observations of new cracks should be recorded in inspection forms and these cracks demarcated by use of stakes, spray paint, or other means of identification. The new crack location(s) are to be surveyed for documentation.

8.4.2.2 Dam 1 Thermosyphons

Thirty-eight inclined passive thermosyphons were installed in a row at Dam 1 during remediation works completed in 2020 (Golder 2021b). The location of the thermosyphon row is shown in Figure 15. The thermosyphons were installed to extract heat from the foundation of Dam 1 to induce freeze-back of the permafrost to limit the settlement of the dam.

The thermosyphons are to be visually inspected as part of the routine inspections of Dam 1. Inspections are to identify if thermosyphons appear damaged or require maintenance. If damage is observed, report it to the Mine Manager (Section 9.4.5 provides further maintenance instructions). Also, inspections should note if ponded water or accumulation of snow are observed near the thermosyphons as this may affect thermal performance.

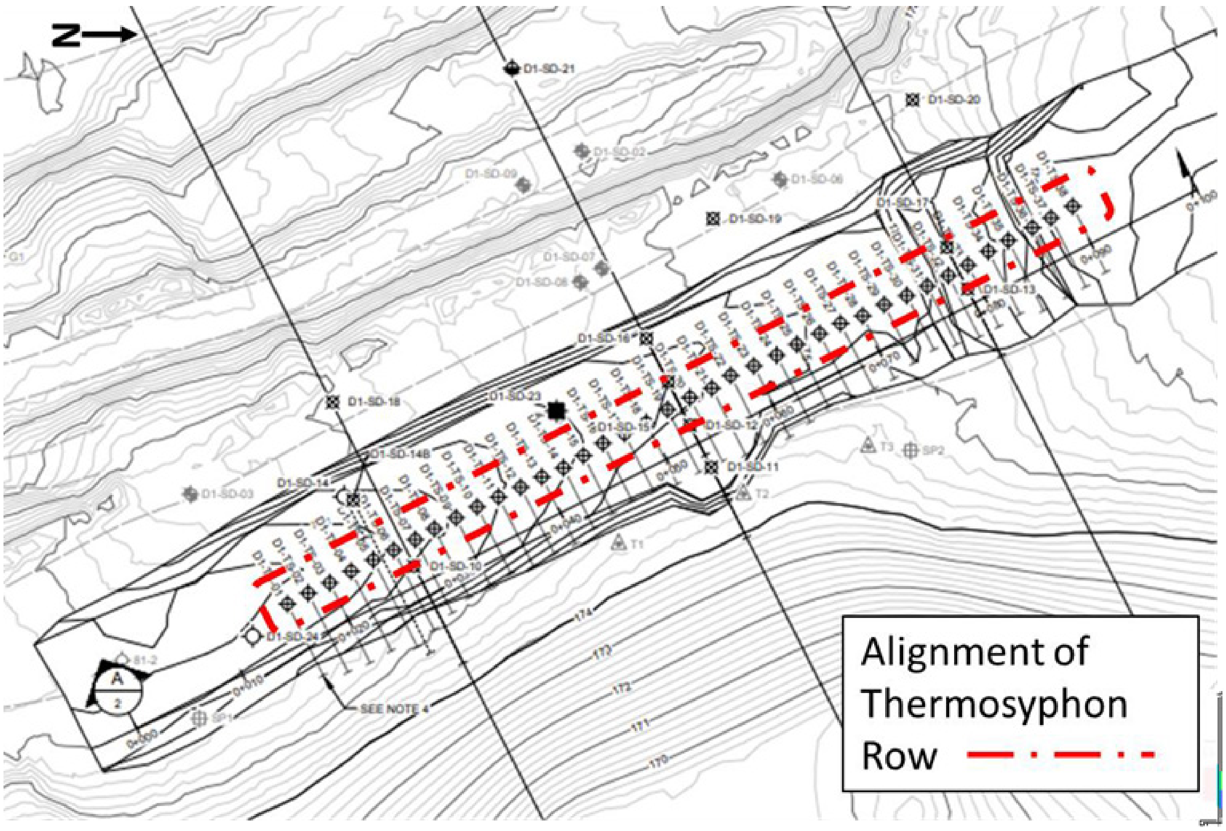

Figure 15: Dam 1 Thermosyphons Alignment

8.4.3 Warning Levels and Corresponding Actions

Three levels of warning have been established for visual inspection observations. In Table 16 the warning levels and their descriptions are provided.

Warning level events are provided in Table 17, along with corresponding actions. The quantities and descriptions provided are approximate. If any abnormal observations are made or conditions appear to be changing rapidly with time, the Mine Manager should be notified, even if some of the thresholds do not appear to be exceeded.

If observations are noted that exceed those of the caution levels, or that water is overtopping a dam, refer to Table 31 in Section 10.8 for actions, some of which may trigger the implementation of the ERP.

Table 16: Warning Level Descriptions: Visual Inspections

Warning Level	Colour Code	Description
Normal		No visual observation of any new deformation features (e.g., cracks, sloughs), erosion, water elevation, or seepage. If any observations, they were within values previously documented.
Notification		An observation of a new deformation feature, erosion, water elevation, or seepage. The observed scale and/or location is such that it is unlikely to be an early indicator of a potential failure mode.
Caution		Observation of a new deformation feature, erosion, water elevation, or seepage, or an existing observation that is increasing in size or severity. The observed scale and/or location is such that it may be an early indicator of a potential failure mode.

Table 17: Visual Inspection Warning Levels and Actions

Warning Level	Event Criteria	Actions by Site Technical Staff	Actions by Mine Manager (TCA Responsible Person)	Actions by Site Owner (CIRNAC and PSPC)	Actions by Consulting Geotechnical Engineer
Notification	■ cracks (<50 mm wide) ■ settlement (<0.3 m) ■ bulging ■ erosion but localized and/or not in a location that is critical to dam containment (e.g., downstream toe) ■ clear water observed seeping through or at toe of dams or dykes ■ vandalism	■ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections. ■ Survey deformation or settlement feature(s) ■ Determine extent of potential failure mode ■ Inform Mine Manager of findings	■ Notify Consulting Geotechnical Engineer for guidance ■ Notify Site Owner ■ Perform visual inspection ■ Be available for consultation	■ Be available for consultation.	■ Be available for consultation.
Caution	■ cracks (>50 mm wide) ■ settlement (>0.3 m) ■ bulging ■ erosion that is widespread and/or in a location that is critical to water containment (e.g., low permeability material) ■ cloudy water observed seeping through or at toe of dams or dykes ■ vandalism	■ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections. ■ Determine extent of potential failure mode ■ Inform Mine Manager of the findings	■ Notify Consulting Geotechnical Engineer for guidance ■ Notify Site Owner ■ Perform visual inspection ■ Be available for consultation ■ Be prepared to evacuate underground	■ Be available for consultation. ■ Be prepared to notify stakeholders.	■ Be available for consultation.

8.5 Instrumentation

Several types of geotechnical instrumentation are installed at the dams. The types of instruments, and their intended use for monitoring the dam and/or its foundation, are described below:

- Vibrating Wire Piezometers (VWP): used to measure pore-water pressures and groundwater elevations.
- Standpipe Piezometers (SPZ): used to measure pore-water pressures and groundwater elevations. At some locations, the SPZs were blocked, likely with ice.
- Thermistor Strings (TH): used to measure ground temperatures
- Inclinometer Casings (INC): used to measure horizontal subsurface displacements
- Displacement monitoring locations: to measure displacement of the dams using conventional surveying techniques. Monitoring locations consist of one of the three types, as listed in the following bullets.
  - Survey Monuments (SM): measure horizontal and vertical displacement. Consist of metal rod hammered into the ground surface.
  - Settlement Plates (SP): measure vertical displacement. Consists of a metal rod affixed to a metal plate. Metal plate was installed below ground surface, either during construction (e.g., B2 Dam) or during drilling of a borehole (e.g., Dam 1).
  - Settlement Anchors (SA): measure vertical displacement at depths. Consists of a metal rod affixed to metal spikes. Metal spikes were installed into the borehole several metres below ground surface.

Table 18 provides a list of the number of operational geotechnical instruments at each dam. For as-built information, refer to APPENDIX H (e.g., installed coordinates and elevations, calibration certificates).

Within Subsection 8.5.1, the minimum instrumentation reading frequency for the instruments is provided. In Subsection 8.5.2, warning levels for the instruments are provided.

Table 18: Summary of Number of Operational Geotechnical Instrumentation

TCA or Surface Water Dam	Dam Identification	Number of Instruments					
		Vibrating Wire (VWP)	Standpipe Piezometer (SPZ)		Thermistor (TH)	Inclinometer (INC)	Displacement Monitoring
			Thawed	Frozen			
Original TCA	Dam 1	6	-	-	13	1	8
	Dam 2	-	5	-	-	-	-
	Dam 3	-	3	-	1	-	-
	Dam 4	-	4	-	-	-	-
	Dam 5	-	1	-	-	-	-
	Dam 11	-	2	-	1	-	-
	Splitter Dyke	-	-	-	-	-	6

Table 18: Summary of Number of Operational Geotechnical Instrumentation

TCA or Surface Water Dam	Dam Identification	Number of Instruments					
		Vibrating Wire (VWP)	Standpipe Piezometer (SPZ)		Thermistor (TH)	Inclinometer (INC)	Displacement Monitoring
			Thawed	Frozen			
Northwest TCA[1]	Dam 21A	1	1	1	1	-	-
	Dam 21B	-	2	1	1	-	-
	Dam 21C	-	-	2	2	-	-
	Dam 21D	-	-	2	1	-	-
	Dam 22A	-	-	2	2	-	-
	Dam 22B	-	-	2	2	-	-
Surface Water Dams	B2 Dam	7	-	-	-	-	30

Note: - = no data (implies that specific instruments are not currently installed).

[1]New instrumentation installation and retrofitting completed before July 2023 (i.e., Phase 1) for the Northwest TCA dams have been added to the table. Instrumentation installation in Phase 2 is planned to be completed in Summer 2023.

8.5.1 Minimum Monitoring Frequency

Table 19 provides the minimum reading frequency for each type of instrument, organized by the dam in which it was installed. Instrument readings are to be physically or digitally recorded, followed by digital entry into a spreadsheet or database. The Mine Manager is responsible of arranging and ensuring for the completion of instrument monitoring and recording of information.

Readings should be forwarded to the Consulting Geotechnical Engineer as part of ongoing monitoring and for inclusion in the AGI of Dams report.

Table 19: Minimum Instrumentation Readings Frequency

TCA or Surface Water Dam	Dam Identification	Minimum Reading Frequency					
		Vibrating Wire (VWP)	Standpipe Piezometer (SPZ)		Thermistor (TH)	Inclinometer (INC)	Displacement Monitoring
			Thawed	Frozen			
Original TCA	Dam 1	Daily	-	-	Daily[1]	Monthly	Weekly
	Dam 2	-	Monthly	-	Monthly	-	-
	Dam 3	-	Monthly	-	-	-	-
	Dam 11	-	Monthly	-	Monthly	-	-
	Splitter Dyke	-	-	-	-	-	Weekly/Monthly[2]
Northwest TCA	Dam 21A	-	Weekly	-	Monthly	-	-
	Dam 21B	-	Weekly	-	Monthly	-	-
	Dam 21C	-	-	n/a	Monthly	-	-
	Dam 21D	-	-	n/a	Monthly	-	-
	Dam 22A	-	-	n/a	Monthly	-	-
	Dam 22B	-	-	n/a	Monthly	-	-

Table 19: Minimum Instrumentation Readings Frequency

TCA or Surface Water Dam	Dam Identification	Minimum Reading Frequency					
		Vibrating Wire (VWP)	Standpipe Piezometer (SPZ)		Thermistor (TH)	Inclinometer (INC)	Displacement Monitoring
			Thawed	Frozen			
Surface Water Dams	B2 Dam	Weekly	-	-	-	-	Monthly

Notes: n/a = not applicable (standpipe piezometer is frozen. Readings cannot be recorded until locations are retrofitted), - = no data (implies that specific instruments are not installed).

[1]Daily for thermistor D1-SD-09, weekly for other thermistors.

[2]Monthly during EPT non-operation, weekly during EPT operation.

8.5.2 Warning Level

Three levels of warning have been established for the Giant Mine for instrument readings. In Table 20 the warning levels and their descriptions are provided.

Table 20: Warning Level Descriptions: Visual Inspections

Warning Level	Colour Code	Description
Normal		Readings are within a range and/or demonstrated trend that is typical and within historical precedent.
Notification		Readings have a level and/or demonstrated a trend that differs from that previously established by available monitoring results.
Caution		Readings have exceeded a level and/or demonstrated a trend that is beyond that previously established by available monitoring results.

In the following subsections, the instrument warning levels and corresponding actions are provided and organized by the instrument type. Generally, the warning levels for the instrumentation were selected with judgement and based on the precedent and trends set with available monitoring data, unless noted otherwise.

8.5.2.1 Vibrating Wire Piezometers

VWPs are located at Dam 1 and B2 Dam. Warning levels are provided in Table 21 for Dam 1 and Table 22 for B2 Dam.

Dam 1

For Dam 1, warning levels are based on the precedent set by readings and are expressed as an overall hydraulic head elevation. For actions corresponding to notification and caution warning levels, refer to Table 29. If caution warning levels are exceeded, refer to Table 31 in Section 10.8.

Table 21: Dam 1 Vibrating Wire Piezometer Warning Level Criteria

Piezometer Identification	Total Head Readings Warning Levels (masl)		
	Normal	Notification	Caution
D1-SD-01	≥154.1 to ≤157.0	>157.0 to ≤161.5	>161.5 to ≤164.1
D1-SD-02	≥164.1 to ≤166.4	>166.4 to ≤167.1	>167.1 to ≤168.5
D1-SD-03	≥154.3 to ≤154.6	>154.6 to ≤156.6	>156.6 to ≤165.7
D1-SD-05	≥162.3 to ≤163.1	>163.1 to ≤164.1	>164.1 to ≤166.9
D1-SD-06S	≥164.3 to ≤167.1	>167.1 to ≤168.1	>168.1 to ≤171.7
D1-SD-06D	≥153.3 to ≤153.7	>153.7 to ≤155.2	>155.2 to ≤171.7
D1-SD-21	≥166.9 to ≤168.1	>168.1 to ≤168.5	>168.5 to ≤169.4
D1-SD-22	≥166.3 to ≤168.7	>168.7 to ≤169.1	>169.1 to ≤169.8

B2 Dam

Warning levels presented in Table 22 are based on the measured water pressures at the piezometers.

The caution level is slightly greater than the maximum recorded total head at the piezometer location. The notification level is set to be 0.5 m lower than the caution level, except for piezometer PZ-7. The notification level for PZ-7 is set to be 0.2 m lower than its caution level (Golder 2022c).

For actions corresponding to notification and caution warning levels, refer to Table 29. If caution warning levels are exceeded, refer to Table 31 in Section 10.8.

Table 22: B2 Dam Vibrating Wire Piezometer Warning Level Criteria

Vibrating Wire Piezometer	Total Head Reading Warning Levels (masl)		
	Normal	Notification	Caution
PZ-1	≤165.5	>165.5 to ≤166.0	>166.0 to ≤166.5
PZ-2	≤164.3	>164.3 to ≤164.8	>164.8 to ≤160.0
PZ-3	≤164.0	>164.0 to ≤164.5	>164.5 to ≤165.5
PZ-4	≤163.5	>163.5 to ≤164.0	>164.0 to ≤165.5
PZ-5	≤163.0	>163.0 to ≤163.5	>163.5 to ≤165.5
PZ-6	≤162.2	>162.2 to ≤162.7	>162.7 to ≤165.5
PZ-7	≤164.0	>164.0 to ≤164.2	>164.2 to ≤164.7

8.5.2.2 Standpipe Piezometer Warning Levels

Although standpipe piezometers (SPZ) were installed at several dams in 2019, some locations were frozen when they were last measured. There is a plan to complete the retrofitting program in summer 2023. The warning levels will be determined after the completion of the retrofitting program.

8.5.2.3 Thermistor String Warning Levels

Several thermistor strings (TH) have been installed at the dams to monitor subsurface temperatures, typically in locations where frozen soil was encountered during drilling.

Table 23 and Table 24 list the warning levels for select thermistors and their nodes that are installed at the Original TCA and the Northwest TCA. The following warning levels have only been selected for thermistors and nodes that were installed within permafrost. Levels were set based on available monitoring data and to identify tends of warming ground temperatures in the permafrost. Warming of the permafrost, which could indicate changing seepage conditions and/or the potential for deformation, thus requiring additional monitoring and/or actions. Warning levels have not been assigned for thermistors and/or nodes that are in material that does not currently meet the definition of permafrost.

Table 23: Original Tailings Containment Area: Thermistor Warning Levels

Dam Identification	Borehole Identification	Range of Thermistor Nodes Installed in Permafrost		Warning Level for Maximum Temperature Reading (°C)		
		Node No.	Depth (mbgs)	Normal	Notification	Caution
Dam 1	D1-SD-09	9, 10, 11	10.5, 12.5, 13.5	≤-0.1	n/d	>-0.1 to<0
		12 and 13	14.5 and 15.5	≤-0.2	>-0.2 to ≤-0.1	>-0.1 to <0
Dam 11	D11-SD19-20	13[1] and 14[1]	7.1 and 8.6	n/d	n/d	n/d

Notes: mbgs = metres below ground surface, n/d = not designated.

[1]Located in rockfill.

For Dam 1, warning levels have not been designated for 12 of the 13 thermistors, including those for the thermosyphon row (D1-SD-10 to D1-SD-17, inclusive) and for downstream benches (D1-SD-18 to D1-SD-21, inclusive). Thermistors are to monitor performance of the thermosyphon row, which was commissioned in December 2020.

No warning levels have been designated for the thermistor at Dam 2 (D2-SD19-25B), as temperatures measured since its installation do not indicate the presence of permafrost.

Table 24: Northwest Tailings Containment Area: Thermistor Warning Levels

Dam Identification	Borehole Identification	Range of Thermistor Nodes Installed in Permafrost		Warning Level for Maximum Temperature Reading (°C)		
		Node No.	Depth (mbgs)	Normal	Notification	Caution
Dam 21A	D21A-SD19-32	13[1]	6.5	n/d	n/d	n/d
		14, 15, 16	8.0, 9.5, 11.0	≤-1.0	>-1.0 to ≤-0.8	>-0.8 to ≤0
Dam 21D	D21D-SD19-13	11[1]	4.7	n/d	n/d	n/d
		12, 13, 14, 15	6.2, 7.7, 9.2, 10.7	≤-1.8	>-1.8 to ≤ -0.8	>-0.8 to ≤0
		16[2]	12.2	n/d	n/d	n/d
Dam 22B	D22B-SD19-08	9[1], 10[1] & 11[1]	6.5, 8.0, 9.5	n/d	n/d	n/d
		12, 13, 14, 15	11.0, 12.5, 14.0, 15.5	≤-0.7	>-0.7 to ≤-0.5	>-0.5 to ≤0
		16[2]	17.0	n/d	n/d	n/d

Note: m^{bgs} = metres below ground surface; n/d = not designated.

[1]Located in rockfill.

[2]Located in bedrock.

For the Northwest TCA thermistors, the warning levels have generally been set according to the material in which the nodes were installed and fluctuations in temperatures observed in the monitoring data. For nodes installed in soil (e.g., organics, clay), the warning levels have been set to be conservative and to provide an early trigger of any measured warming trend. For nodes installed in rock-fill or bedrock, warning levels are not designated.

8.5.2.4 Inclinometer Warning Levels

Inclinometer casing warning levels are included in Table 25. Warning levels are based on the maximum cumulative horizontal displacement at regular depth intervals. For actions corresponding to notification and caution warning levels, refer to Table 29. If caution warning levels are exceeded, refer to Table 31 in Section 10.8.

Table 25: Inclinometer Warning Level Criteria

Inclinometer Identification	Overall Measurement of Horizontal Displacement (mm)		
	Normal	Notification	Caution
D1-SD-05	≤30	>30 to ≤100	>100 to ≤200
D1-SD-06	≤30	>30 to ≤100	>100 to ≤200
D1-SD-07	≤30	>30 to ≤100	>100 to ≤200

8.5.2.5 Displacement Monitoring Warning Levels

The displacement monitoring warning levels are presented in Table 26 for Dam 1, Table 27 for B2 Dam, and Table 28 for Splitter Dyke. For actions corresponding to notification and caution warning levels, refer to Table 29. If caution warning levels are exceeded, refer to Table 31 in Section 10.8.

Table 26: Dam 1 Displacement Monitoring Warning Level Criteria

Location on Dam	Instrument		Criteria for Vertical Movement in One-year Period (mm)		
	Identification	Type	Normal	Notification	Caution
Downstream Toe	SP3	SP	≤30	>30 to ≤150	>150 to ≤250
Downstream Bench	D1-SD-08	SA	≤30	>30 to ≤100	>100 to ≤150
Crest	D1-SD-23	SA	≤30	>30 to ≤100	>100 to ≤150
Upstream Slope	SP1 and SP2	SP	≤30	>30 to ≤150	>150 to ≤250
	T01	SM	≤30	>30 to ≤40	>40 to ≤200
	T02	SM	≤30	>30 to ≤80	>80 to ≤200
	T03	SM	≤30	>30 to ≤70	>70 to ≤200

SA = settlement anchor, SM = survey monument, SP = settlement plate.

Table 27: B2 Dam Displacement Monitoring Warning Level Criteria

Location on Dam	Instrument		Criteria for Vertical Movement in One-year Period (mm)		
	Identification	Type	Normal	Notification	Caution
Downstream Toe	S01 to S06	SP	≤30	>30 to ≤75	>75 to ≤150
	S27 to S34	SM	≤30	>30 to ≤100	>100 to ≤200
Upstream Crest	S07 to S12	SM	≤30	>30 to ≤100	>100 to ≤200
	S13 to S20	SP	≤30	>30 to ≤75	>75 to ≤150
Upstream Toe	S21 to S23	SP	≤30	>30 to ≤50	>50 to ≤150

SM = survey monument, SP = settlement plate.

Table 28: Splitter Dyke Displacement Monitoring Warning Level Criteria

Location on Dyke	Instrument		Criteria for Vertical Movement in One-year Period (mm)		
	Identification	Type	Normal	Notification	Caution
Downstream Slope	T1, T3, T5	SM	≤200	>200 to ≤250	>250 to ≤350
Upstream Slope	T2, T4, T6	SM	≤200	>200 to ≤250	>250 to ≤350

SM = survey monument.

8.5.3 Actions Corresponding to Warning Levels

In Section 8.5.2, warning levels have been established for instrument readings. In Table 29, actions that correspond to the exceedance of either the notification or caution warning levels are provided.

If caution warning levels are exceeded, refer to Table 31 in Section 10.8. This is a more serious scenario, as the ERP may potentially need to be initiated.

Table 29: Actions for Corresponding to Instrumentation Warning Levels

Warning Level	Event Criteria	Actions by Site Technical Staff	Actions by Mine Manager (TCA Responsible Person)	Actions by Site Owner (CIRNAC and PSPC)	Actions by Consulting Geotechnical Engineer
Notification	Refer to the following tables: ▪ Table 21 and Table 22 for Dam 1 and B2 Dam vibrating wire piezometers ▪ Table 23 and Table 24 for Original and Northwest TCA thermistors ▪ Table 25 for Dam 1 inclinometers ▪ Table 26, Table 27, and Table 28 for Dam 1, B2 Dam, and Splitter Dyke displacement monitoring locations	▪ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections. ▪ Record an additional reading within 12 hours ▪ Inform Mine Manager of findings	▪ Perform visual inspection if requested by the Consulting Geotechnical Engineer ▪ Be available for consultation	▪ Be available for consultation.	▪ Notify Site technical staff and Mine Manager of reading ▪ Request additional reading and visual inspections ▪ Be available for consultation.
Caution	Refer to the following tables: ▪ Table 21 and Table 22 for Dam 1 and B2 Dam vibrating wire piezometers ▪ Table 23 and Table 24 for Original and Northwest TCA thermistors ▪ Table 25 for Dam 1 inclinometers ▪ Table 26, Table 27, and Table 28 for Dam 1, B2 Dam, and Splitter Dyke displacement monitoring locations	▪ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections. ▪ Increase monitoring to every six hours ▪ Inform Mine Manager of the findings	▪ Perform visual inspection ▪ Be available for consultation ▪ Be prepared to evacuate underground and affected areas	▪ Be available for consultation. ▪ Be prepared to notify stakeholders and neighboring communities	▪ Notify Site technical staff, Mine Manager, and Site Owner of the reading. ▪ Request additional reading and visual inspections. ▪ Be available for consultation.

8.6 Water Sampling and Testing

The details of the water sampling and testing program are provided in the Standard Operating Procedures and QA/QC Plan for Effluent and Water Sampling Rev 3.0 (CIRNAC and GNWT 2022). It outlines the routine monitoring of surface water, mine water, and groundwater that is completed at the Site daily, weekly, monthly, quarterly, or seasonally depending on the regulatory and operational requirements. The monitoring schedule is developed each year once the start date for treated effluent discharge from the ETP is known.

The Standard Operating Procedures and QA/QC Plan for Effluent and Water Sampling Rev 3.0 (CIRNAC and GNWT 2022) describes the sampling requirements for surface water, mine water, and groundwater monitoring under the SNP, MDMER/EEM, and OMP programs, as well as the AEMP if relevant. Where sample locations fall under more than one program (e.g., a station is both an SNP and an AEMP station), the relevant programs are indicated.

Stations associated with the ETP that are sampled for compliance with the Water Licence and/or MDMER/EEM during discharge are SNP 43-1 (treated effluent; SNP and MDMER/EEM), SNP 43-11 (reference area; SNP and MDMER/EEM), and Baker Creek Exposure Point (exposure area; MDMER/EEM).

Treated effluent from the effluent treatment plant (ETP) is discharged into Baker Creek during open-water conditions, usually over a two- to three-month period between July and September unless higher water conditions at the Site necessitate an earlier/extended discharge period. Effluent discharge typically begins after 1 July each year to avoid the spring spawning period for Arctic Grayling except for during high-water conditions that necessitate early discharge (e.g., June). Treated effluent is tested for compliance with the Effluent Quality Criteria (EQC) defined in the Water Licence (MV2007L8-0031) as well as MDMER discharge limits before it is released into Baker Creek, which then flows into Yellowknife Bay in Great Slave Lake.

Further ETP operational samples, submitted for arsenic analysis on a 4-hour turn-around-time, are taken by the ETP Operator on a daily basis. These results are compared to the allowable discharge requirements and adjustments to the treatment process can be made if concentrations approach the caution level.

Water sampling and testing is also required by the Type A Water Licence (MVLWB 2021).

8.7 Survey and Bathymetry

A topographic survey of the dam crests of Dam 1, Splitter Dyke, Dam 2, B2 Dam, and the Northwest TCA dams is carried out annually to check the dam crest elevations and determine potential changes in water levels for the next operating year. Additional surveys may be required should conditions be observed to change significantly or higher than normal operating elevations of water within the dams.

Bathymetric surveys will be carried out as required by ongoing observations and recommendations from the Consulting Geotechnical Engineer or if conditions change. These surveys will be used to recalibrate the water storage capacity estimates of the ponds. The most recent bathymetric survey was completed in 2019 in support of closure design studies (Golder 2020a)

8.8 Weather Stations

Climate data should be downloaded regularly by the Environmental Manager or their designate to monitor conditions in comparison with the long-term average data (APPENDIX D). This information should be forwarded to the Consulting Geotechnical Engineer to assist in determining trends that may influence oversight of the water management systems.

Observations of air temperature, rainfall, and snowfall are available publicly for Yellowknife Airport. These observations can be obtained from Environment Canada (https://www.canada.ca/en/services/environment/weather.html). Further details on weather stations are presented in APPENDIX D.

To improve the credibility of the Yellowknife Airport data for the precipitation at Giant Mine, climate data should be corrected by the Consulting Geotechnical Engineer or designate by applying the rainfall and snowfall weighting and under-catch factors that are identified in APPENDIX D.

For early alerts of possible extreme events, the Environmental Manager should subscribe to the Weather Network weather alert service, (https://www.theweathernetwork.com/us) or similar and check the Environment Canada website for public weather alerts (https://weather.gc.ca/warnings/index_e.html) on a regular basis. Should an extreme event alert be received, the Environmental Manager will inform the Mine Manager and Consulting Geotechnical Engineer and carry out an inspection prior to and following the event to assess any potential effect to the dams/facilities.

Rainfall data at Yellowknife Airport should be collected from Environment Canada following any heavy rainfall warning issued between April and September. Environment Canada defines heavy rainfall as 7 mm per hour or more.

If total rainfall during any 24-hour period exceeds 50 mm, which is approximately equivalent to a 1-in-10-year daily rainfall event (Table D-5, APPENDIX D), an inspection should be scheduled as soon as practical.

8.9 Annual Geotechnical Inspections of Dams

As part of requirements for annual water licence reporting to MVLWB, the dams at Giant Mine are to be inspected annually, during the summer months by a Professional Engineer (MVLWB 2021). Although not explicitly stated in the Water Licence, an implied requirement is that the Professional have geotechnical experience in dams and engineered structures that are located in areas of permafrost. This has been termed AGI of Dams (but is known as Dam Safety Inspection in other jurisdictions).

The AGI of Dams includes comprehensive review of the facilities and their management systems. This inspection has been completed by the Consulting Geotechnical Engineer but would be completed by the Engineer of Record once one is designated.

8.10 Frequency of Dam Safety Reviews

The CDA (2013) Dam Safety Guidelines recommends that a DSR be conducted every five to 10 years depending on the dam consequence. The frequency for the dams at Giant Mine is included in Table 4.

As the last DSR was conducted in 2019 (SRK 2020), the next DSR would be initiated sometime between 2024 and 2029, depending on the dam consequence classification.

8.11 Event-Driven Procedures

In addition to the routine and periodic inspections, special inspections may be required after unusual or significant seismic or climatic events (and during if possible). Significant climatic events include heavy rainfall and spring freshet floods.

Giant Mine staff should carry out the special inspections after significant events and the Consulting Geotechnical Engineer should be notified of the findings. If there are any concerns with areas, facilities, or dams, then the Mine Manager will arrange to bring in the Consulting Geotechnical Engineer for further inspections and review.

Unusual events are defined in the ERP (Table 32 in Section 10.8) along with required actions.

8.12 Trigger for Change of Operations

The Giant Mine is in the Closure-Active Care phase of the mine life. The only operations at the facility are related to the management and treatment of surface water and ongoing closure and reclamation works.

Ongoing surveillance is intended to detect any unusual conditions that could signify potential issues with the site, as described in Section 8.4. If any unusual conditions are observed, the Mine Manger must be informed immediately. Depending on the nature and severity of the condition observed, the Consulting Geotechnical Engineer may be contacted and/or the EPRP may be initiated. The decision to execute the EPRP will only be made once an incident exists (e.g., possible failure or failure of a dam) and there is a serious risk to facilities and/or downstream stakeholders (e.g., release of water and/or tailings).

8.13 Documentation and Reporting

Surveillance reporting must be documented, and records maintained. If an important issue arises from an inspection, the Mine Manager should be notified immediately. The Mine Manager will contact the Consulting Geotechnical Engineer if necessary. Required surveillance reports are presented in Table 30.

Table 30: Surveillance Reporting Requirements

Surveillance Report	Report Provided To	Frequency of Reporting
Daily visual inspection sheets (photographs should be filed, if taken)	Mine Manager Environmental Manager Consulting Geotechnical Engineer	Immediately following inspection Within one week of inspection
Weekly visual inspection sheets	Mine Manager Environmental Manager Consulting Geotechnical Engineer	Immediately following inspection Within one week of inspection
Monthly inspection sheets and photographic records	Consulting Geotechnical Engineer	Within one month of inspection
Records of instrument readings	Mine Manager Environmental Manager Consulting Geotechnical Engineer	Within one week of inspection
Annual Geotechnical Inspection Report	Mackenzie Valley Land and Water Board (MVLWB)	Within 120 days following the completion of the site visit
Annual Water Licence Report	MVLWB	Annually by March 31 for the previous operating period
Dam Safety Reviews	Mine Manager Consulting Geotechnical Engineer	Copy of final report provided to Consulting Geotechnical Engineer within one month of completion
Special inspection due to extreme weather or seismic events	Mine Manager Consulting Geotechnical Engineer	Immediately following inspection Within 24 hours of inspection
Memorandum for each geotechnical inspection completed by the Consulting Geotechnical Engineer	Mine Manager	Within one month of inspection

[1]Dams with very high to high classification – photographic records should be taken.

Hard copies of all documents produced in the reporting process are to be stored at the project offices with electronic copy on a secure server.

Inspection reports are to be maintained by Forward Mining at its site office at the Giant Mine site and electronically on a secure server.

Observations made during inspections must be catalogued in field books. Photocopies/electronic copies of the used pages of the field books should be made for safekeeping. Copies of field notes or field books should be stored at the site offices of the person making the inspection when not in use.

The inspection records must include specific reference to seepage (or lack thereof) at each of the dams inspected. Quantitative estimates of the seepage should be made with reference to the location of the seepage (if any).

As a requirement of the water licence (MVLWB 2021), an annual report must be submitted by March 31 of every year. The report must include all the data and information required by the Surveillance Network Program described in the water licence. It is the responsibility of the Mine Manager to prepare these annual reports, which would include the summary tables prepared by the Environmental Manager. The Mine Manager is responsible for submitting copies to Public Services and Procurement Canada (PSPC), who then provide reports to CIRNAC. Submittal of reports to the MVLWB is the responsibility of CIRNAC.

9.0 MAINTENANCE

9.1 Objectives

Maintenance is important to keep the facilities in a safe condition and for the effective management of ponded water. It is the responsibility of the Mine Manager to ensure that the facilities are properly maintained.

The objectives of the maintenance program are to:

- identify and describe critical parts of the facility.
- address routine, predictive/preventative, and event-driven maintenance.
- address operating and surveillance observations for all components of the facility.

9.2 Inventory of Components Requiring Maintenance

The following components of the Giant Mine TCAs and surface water dams may require maintenance over the facility's lifetime.

- access roads
- dams
- dykes
- Mill Pond Structure
- water management systems and channels
- water management and treatment equipment
- water treatment ponds
- spillways
- pumps and pipe systems

9.3 Maintenance Schedule and Triggers

The facilities should be subject to a regular maintenance program.

The Mine Manager for Giant Mine should have sufficient personnel or access to a contractor in close proximity to the Site to perform necessary repairs to infrastructure. These repairs would be planned tasks to address issues identified during the regular inspections (Section 8.4) or inspections due to extreme weather or reported sudden change in conditions (Section 8.11).

Contractors in Yellowknife who have experience with earthworks and who could be contacted are as follows:

- ACE Enterprise Ltd, 151 Enterprise Drive, 867.920.2082
- RTL Construction, 350 Old Airport Road, 867.873.6271
- Nahanni Construction Ltd, 100 Nahanni Drive, 867.873.2975
- Weatherby Trucking Ltd, Highway 3, km 331.5, 867.873.9801
- Forward Mining LP, 5204 Franklin Avenue, 867.874.3243

9.4 Routine and Preventative Maintenance

Maintenance requirements for the facilities and dams are provided here. In addition to the requirements established in this section additional requirements will be established on an annual basis as part of AGI reporting.

9.4.1 Access

Site access roads, including roads from offices and workshops to dams and facilities, should be maintained. In addition, the condition of the access road to the site should also be monitored. Any observed road deterioration or damage during site visits should be recorded and arrangements made for repairs to be carried out.

The maintenance program may normally include regrading of the gravel site access roads and dust control as needed. It is not anticipated that extensive work would be required. If work should be required on the main site access road, it may be necessary to coordinate with MVLWB prior to initiating work.

Some locations on site have specific vehicle access restrictions, which are:

- Dyke 6 – All vehicle activity should stay at least 15 m away from the slope crest in the area of failure of Dyke 6. Maintain a barricade with appropriate signage to communicate the restriction.
- Dam 12 – Prevent vehicle activity on Dam 12 and maintain a barricade to the dam with appropriate signage to communicate the restriction.

9.4.2 Dams and Dykes

Maintenance work required on the dam and dyke structures to control seepage, settlement, and erosion should be carried out as needed and comprise the following activities.

General

- Regrade dam crests and replace granular road surfacing material to maintain crest design profiles.
- Replace and regrade fill materials lost on the downstream face and road surface (such as may be eroded by rainfall runoff).
- Place dam fill to maintain dam crest elevations. The placement of additional fill is intended to preserve dam crest elevations but does not mitigate the need to investigate and determine causes of historic observed settlement. Fill should not be placed without consultation with the Consulting Geotechnical Engineer.
- Replace and regrade fill materials lost on the pond side slope and regrade the adjacent road.
- Direct seepage away from dam toes, where a sump or other infrastructure is not already in use.
- Consult the Consulting Geotechnical Engineer prior to any excavation or earthworks in and around the dams (e.g., excavation of tailings upstream of Dam 12 for use in underground stabilization work).

Dam 1

- Prior to snowmelt, remove all snow from the Dam 1 crest, downstream slope, and abutments to minimize the quantity of snow melt that could potentially infiltrate.
- During the spring freshet, divert surface water runoff away from the dam to minimize infiltration of water.
- Pumping infrastructure should be available to remove any ponded water observed on the dam crest. Typically occurs during the spring freshet but could be required at any other time.

Ongoing removal of vegetation is required, to prevent the growth of larger trees and the damage to the dams that could occur in the event of treefall.

9.4.3 Spillways and Water Management Channels

To maintain the efficiency of spillways and water management channels, the following activities should be undertaken.

General

The conveying capacity of spillways and channels must be maintained. The spillways should be kept clean of any blockages (such as from soil material or vegetation).

A reserve of clay (e.g., C1 Clay Borrow Area) should be on site to form a clay plug at spillways, if needed. This material should be placed in spillways or elsewhere only under the direction of the Consulting Geotechnical Engineer.

Dyke 6

- The spillway across the crest of dyke is to be inspected after each intense rainfall event and spring freshet.
- Inspect the drainage pipe located upstream (Central Pond) during routine inspections. Remove any debris or tailings from the intake to avoid impeding the flow of water into the North Pond.
- Inspect the surface water sumps located upstream (Central Pond) during routine inspections. Minimize the quantity of ponded water as the dyke was not constructed to retain water.

DWC Dam

Inspect plastic screen, paving stones, and steel mesh as part of routine inspections. Remove debris from screens frequently to prevent the screens or inlet pipe from blockages.

9.4.4 Water Management and Treatment Equipment

To maintain the efficiency of water management and treatment operations, water management equipment should be kept in a well-maintained condition. Examples of such equipment include, but are not limited to, the following:

- pumps
- valves
- pipe and/or hose
- water treatment plant instruments
- holding tanks
- mixers, etc.

A supply of critical spares for operation of the ETP should be maintained on site. Further details on water treatment are contained in the Giant Mine ETP Operating Manual (i.e., SOP# - ETP – 01).

9.4.5 Dam 1 Thermosyphon Maintenance

In the sections below, routine and emergency maintenance tasks for the thermosyphons are summarized. These are required to maintain the thermosyphons in good working condition. Refer to the thermosyphon suppliers recommended maintenance for further details (Arctic Foundations of Canada 2020).

Routine Maintenance

- Any snow accumulation surrounding the radiator fin(s) should be removed, but in a manner that does not damage the unit.
- Maintain the ground surface surrounding the thermosyphon row so that all runoff water drains away from the thermosyphons. Depressions should be filled such that water does not pond or pool near the thermosyphons.
- Measure radiator temperature at the start of each winter season. Temperatures can be measured using a contact thermometer or thermal imaging camera. Functioning thermosyphons will display radiator temperatures a few degrees warmer than ambient air.

Emergency Maintenance

If damage to the thermosyphons or leaks from casing are observed during routine inspections, the following steps are to be implemented:

- Determine the cause of the damage if possible and make provisions to preclude additional damage.
- Determine by inspection if the pressure integrity of the damaged unit has been compromised. If so, this is to be recorded and the Mine Manager is to be notified immediately.
- If release of gas is observed, keep out of the area and control access to the location until the release has stopped. Once the gas has stopped, plug the hole or (if the hole is not identifiable) cover the area to prevent moisture ingress.
- If damage occurs to the thermosyphons, the manufacturer is to be contacted to arrange for repair/replacement.

9.4.6 Event-Driven Maintenance

After a special inspection triggered by an event, event-driven maintenance may be required. These requirements will be determined by the Mine Manager and/or Consulting Geotechnical Engineer following the inspection. The maintenance should be completed as soon as required, as indicated by the Engineer.

9.4.7 Documentation and Reporting

Maintenance reports/records are to be produced and should be maintained by Forward Mining. Copies of these documents should be provided to the Consulting Geotechnical Engineer within one month of completion.

Construction or installation of any new features (for example instrumentation) should also be documented in a construction record report by the contractor completing the works. Copies of these reports should be provided to the Mine Manager and Consulting Geotechnical Engineer following completion.

All records will be maintained by Forward Mining at their offices and electronically on a secure server.

10.0 EMERGENCY PREPAREDNESS AND RESPONSE PLAN

The Emergency Preparedness and Response Plan (EPRP) is the overall framework for those involved with the TCAs and dams at Giant Mine to be ready to respond to an emergency. Preparedness covers pro-active measures that can be implemented and practiced such that in the event of an emergency, the procedures can be executed promptly.

If an emergency appears to be imminent, Section 10.5 provides the EERP. This provides procedures in direct response to dam failure where water and/or tailings may be released.

Giant Mine is a closed facility under active care and maintenance, with no current or scheduled mining activities planned. There are currently no automated warning systems in place at the site specifically related to dam safety. Site personnel are present on site on a full-time basis. Inspection of the facilities occurs as described in Section 8.4. Personnel are trained to respond to specific changes in site conditions.

10.1 Requirements of Legislation, Codes of Practice, Commitments, etc.

The requirements related to this EPRP and applicable Codes of practice are listed below:

- CDA Dam Safety Guidelines (CDA 2013): Section 4.0 Emergency Preparedness
- Application of Dam Safety Guidelines to Mining Dams (CDA 2019)
- MAC Guidelines (MAC 2021a, b)

10.2 Identification of all Jurisdictions, Agencies, and Individuals Involved in Preparedness and Response

Depending on the emergency related to the Giant Mine TCAs, an emergency response could involve the following jurisdictions, agencies, and individuals.

- Emergency responders:
  - Off-site (fire/ambulance/RCMP)
  - On-site Site Security subcontractor
- Main Construction Manager (Parsons) and their various subcontractors with responsibilities for:
  - Mine Manager (Parsons)
  - TCA Responsible Person (Parsons)
  - Site Personnel (various subcontractors)
- Site Owner
  - CIRNAC
  - PSPC officials
- Consulting Geotechnical Engineer (or another geotechnical consultant)
- Regulatory, Project oversight, and stakeholder parties
  - MVLWB
  - Government of Northwest Territories (GNWT)

- City of Yellowknife
- Giant Mine Oversight Board (GMOB)
- Workers' Safety and Compensation Commission (WSCC)
- First Nations community leaders

10.3 Training Requirements

Personnel are to read and comply with the following documents:

1) Operation, Maintenance, and Surveillance Manual for Giant Mine Tailings Containment Areas and B2 Dam (this document)
2) Other operational manuals, as required and presented in Section 5.2

If personnel complete any specific training that relates to the OMS Manual, EPRP, or dam safety management, this should be documented within the OMS Manual.

10.4 Public Relations Plan

All public relations are the responsibility of CIRNAC.

Parsons' Emergency Management and Response Plan (EMRP) (Parsons 2021) states that all media inquiries are to be directed to CIRNAC. If any unexpected media report to the Site, they are to be referred to the Mine Manager, who will direct them to CIRNAC.

10.5 Emergency Response Plans

If it appears that a dam safety emergency is imminent, where the release of water and/or tailings is possible, go immediately to Section 10.5.1. For all other ERPs, refer to Section 10.5.2.

10.5.1 Emergency Response Plan – Dam Failure

If the release of water and/or tailings appears possible, the Mine Manager, in consultation with the Consulting Geotechnical Engineer, will initiate the ERP for Dam Failure. The Mine Manager will become the Incident Commander. Refer to Section 10.5.2 for Parsons (2021) framework for generic Emergency Response.

Figure 16 presents the emergency response plan for the ERP for Dam Failure. Initially, it is paramount that workers and the public located at low topographic elevations downstream of the potential failure, be evacuated immediately. The list of parties to be contacted by the Mine Manager and their responsibilities are found in Figure 16.

In Figure 17 areas that would be at risk of inundation and may have workers or public present are shown. High risk areas are underground workings (via B2 and B3 Pits), along Baker Creek and Trapper Creek, and along public mine access roads.

Once evacuation orders have been raised for underground and along Baker Creek, the next critical step is blocking further access to public roads. The Mine Manager would contact the RCMP and rely upon them setting up blockades. Suggested blockade points are shown in Figure 18, but adjustments to blockages could be required depending on specific circumstances.

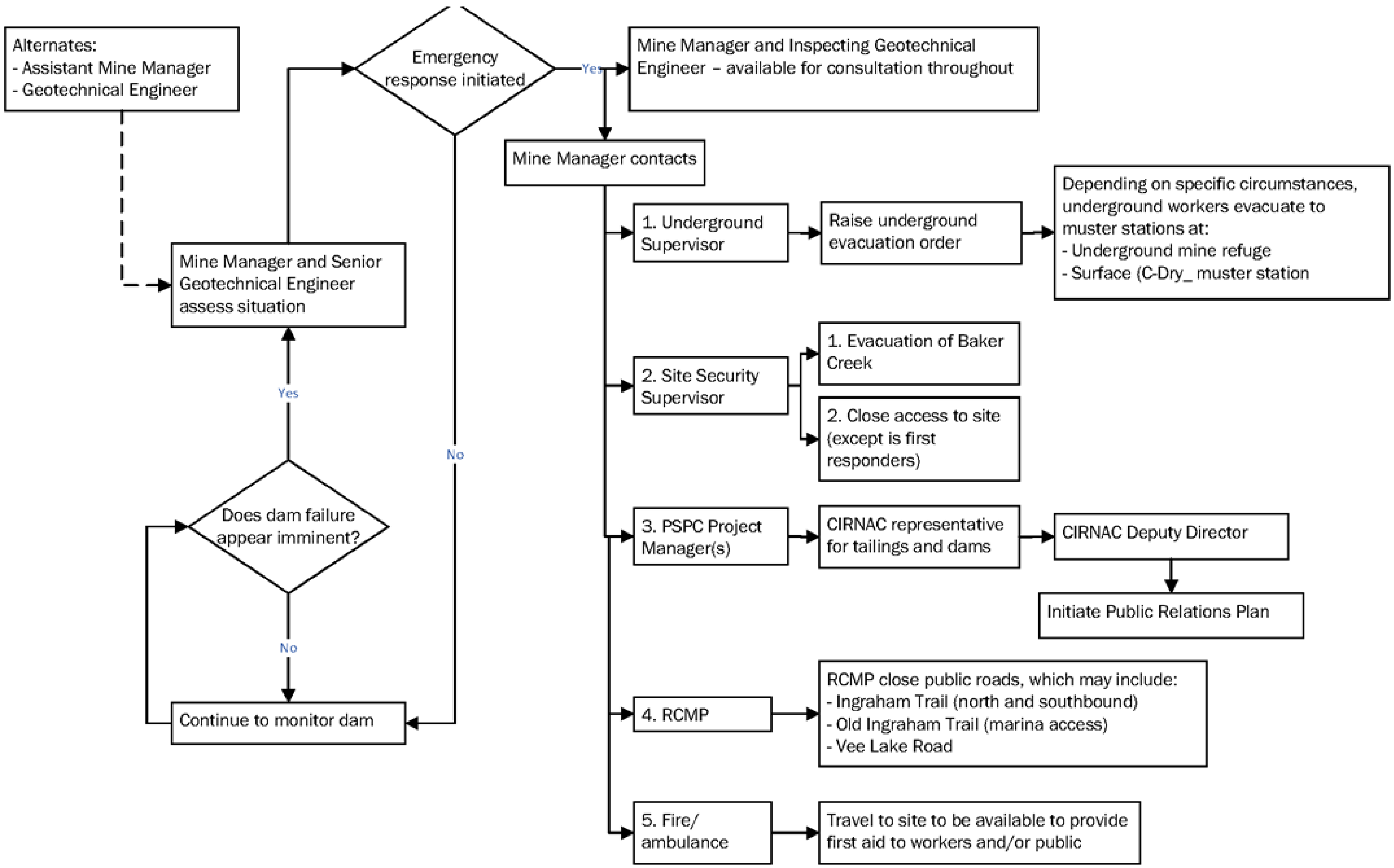

Figure 16: Emergency Response Plan - Dam Failure

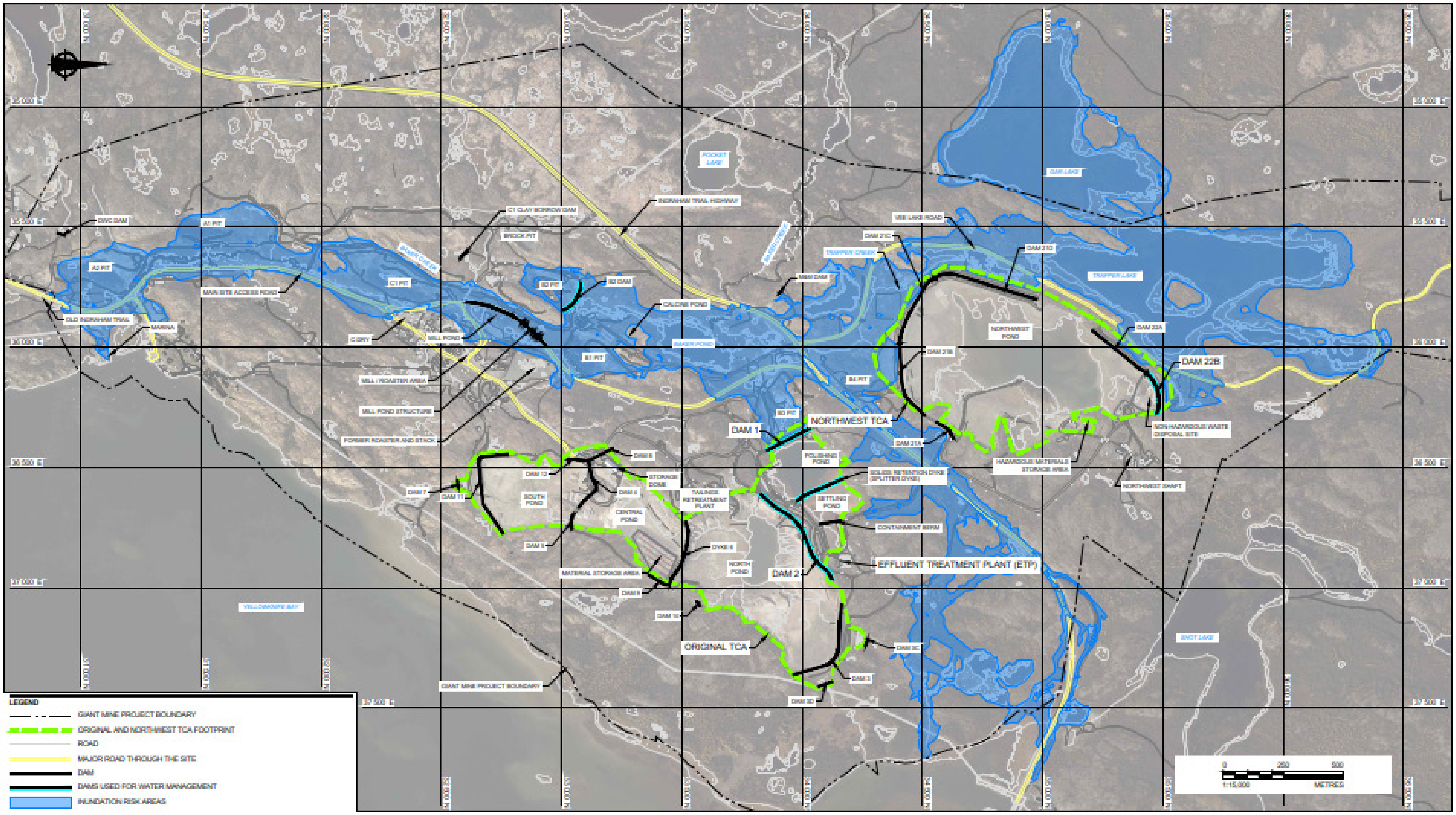

Figure 17: Emergency Response Plan – Inundation Risk Areas

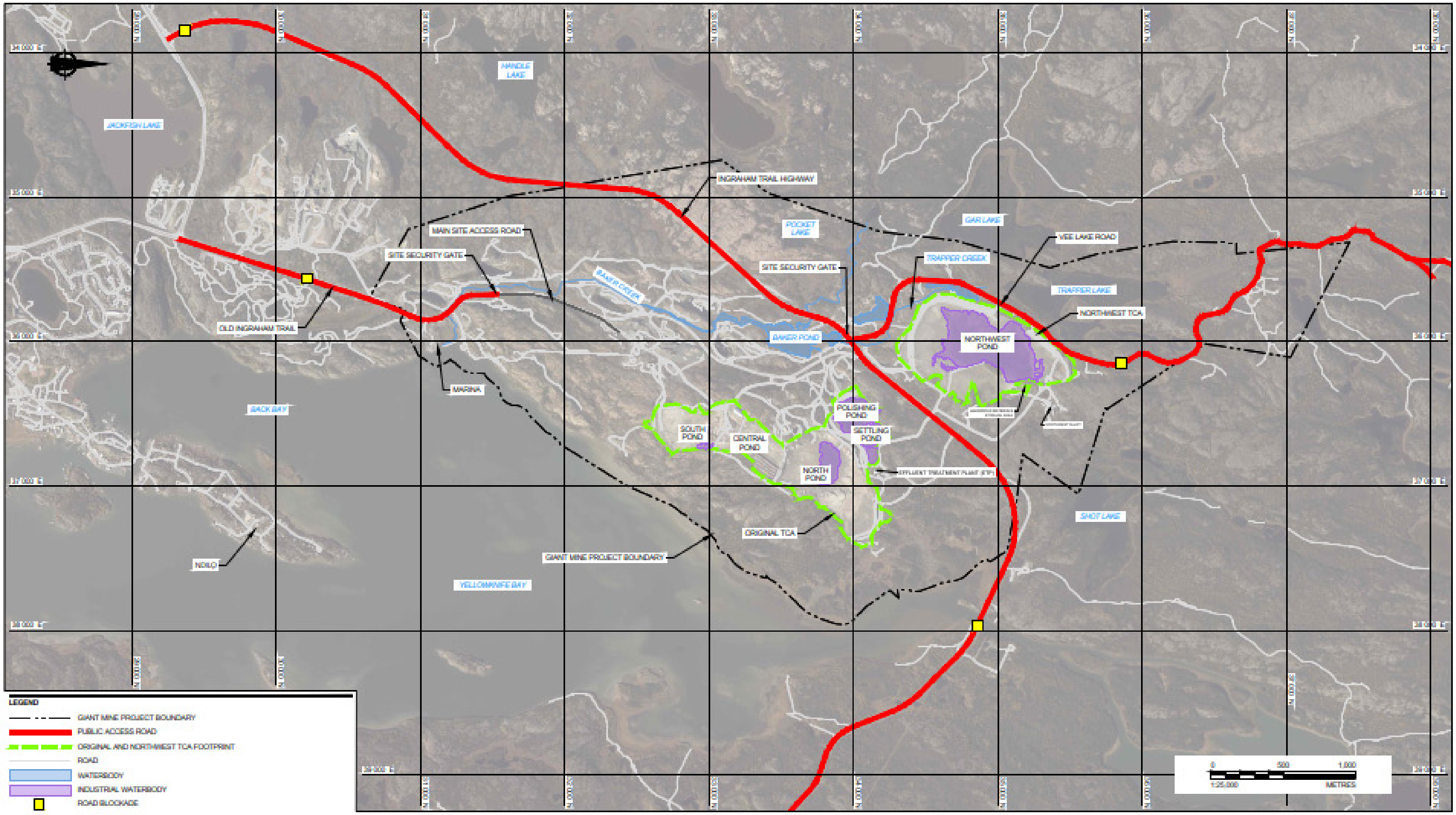

Figure 18: Emergency Response Plan – Road Blockade Points

10.5.2 Other Emergency Response Plans

Figure 19 shows Parsons’ generic Incident Response Plan. The Parsons (2021) Emergency Management and Response Plan contains twelve specific incident action plans in response to:

- earthquake
- environmental release (spill)
- emergency enclosure entry and exit procedures
- fire or explosion hazards
- flood
- medical emergency
- power failure
- vehicle accident
- severe weather
- structural failure or building collapse
- rescue from height
- mine emergency and rescue

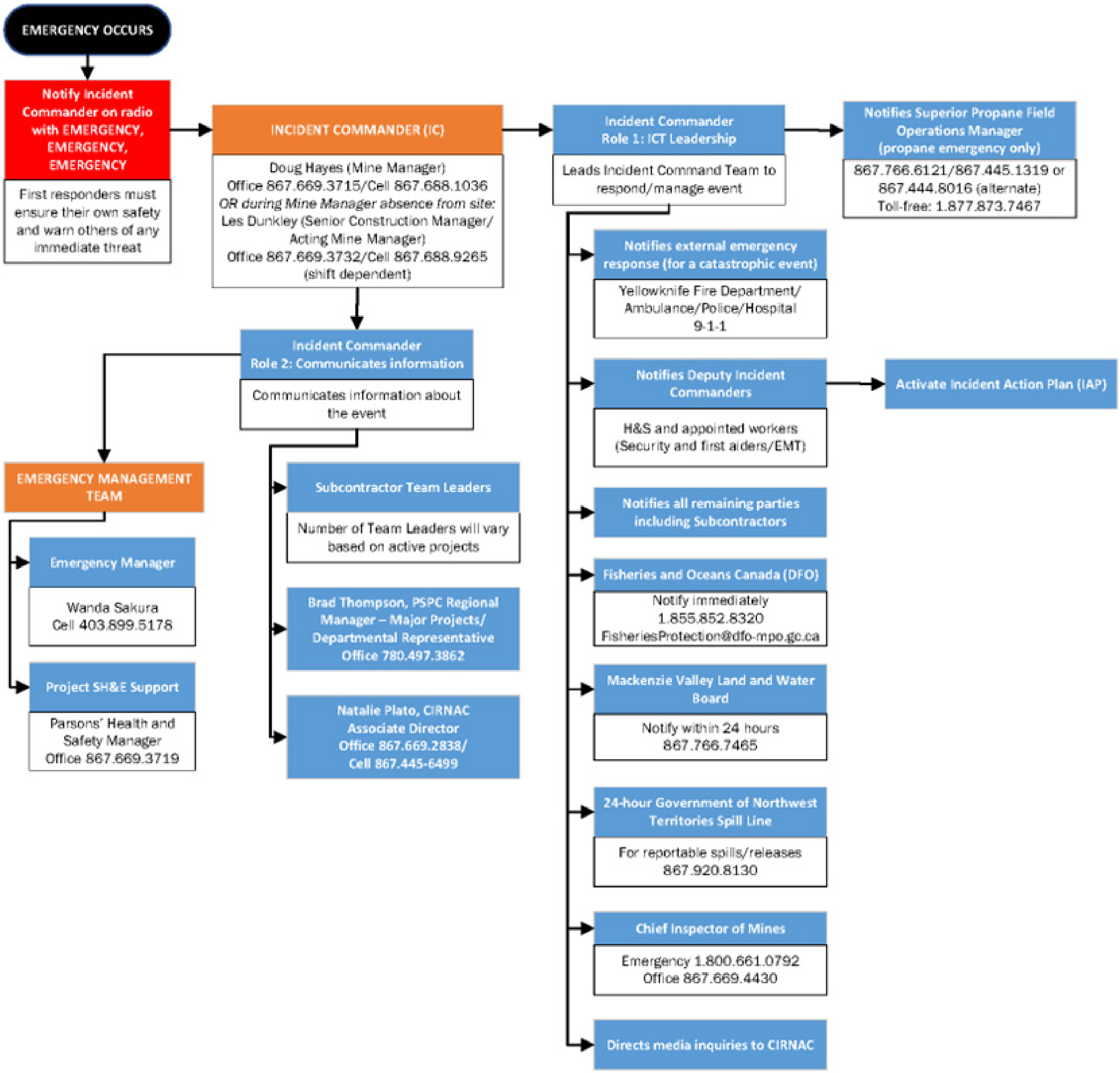

Figure 19: Parsons Generic Incident Response Plan for Giant Mine Remediation Project

10.6 Incident Investigation Procedure

All dam safety incidents at Giant Mine must be reported to the Mine Manager or the Environmental Manager, who will then contact the Consulting Geotechnical Engineer. The Consulting Geotechnical Engineer may request that an incident investigation be initiated. The Mine Manager will be responsible for obtaining incident reports from their subcontractors, as aligned with the incident investigation sections of Parsons' EMRP (Parsons 2021).

10.7 Call-out Procedure for Emergency Response

If a condition related to a potential failure mode is observed (Table 14) by the personnel conducting an inspection, the Mine Manager must be informed immediately. Members of the public may also report incidents either directly to Giant Mine or via other governmental services or Department for Environmental and Natural Resources.

This EPRP can be activated based on specific caution levels (Sections 7.6.2, 8.4.3, and 8.5.3) or exceedance thereof (Section 10.8) and at three levels of response following the identification of an incident on site. The response level of an incident may be raised or lowered following ongoing monitoring and management. The three levels of response are:

- Level 1. On-site incident with no potential for effect to neighboring communities.
- Level 2. External incident following the warning of a potentially critical situation.
- Level 3. External incident when failure is active or imminent.

Once the Mine Manager has determined whether the reported conditions meet the criteria for either the caution level or exceedance thereof, the Mine Manager may need to call emergency contacts and/or stakeholders and neighboring communities depending on emergency conditions. A list of contacts, including emergency contacts, are listed in Table 35.

10.8 Exceedance of Caution Warning Levels and Corresponding Actions

Broadly, notification and caution warning levels have been established for water elevations (Section 7.6), visual observations (Section 8.4.3), and instrumentation (Section 8.5.2) When caution warning levels are exceeded, responding actions are provided in Table 31. Unusual events and actions are presented in Table 32.

Table 31: Actions for Exceedance of Caution Warning Levels

Surveillance Criteria	Event Criteria	Actions by Site Technical Staff	Actions by Mine Manager	Actions by Site Owner (CIRNAC and PSPC)	Actions by Consulting Geotechnical Engineer
Pond Levels (Section 7.6)	Combination of two criteria being met. 1. Water level or differential exceeds one of the following: ▪ Water level in Northwest Pond ≥ 193.35 m ▪ Water level in Polishing Pond ≥ 174.8 m ▪ Water level in North Pond ≥ Polishing Pond +1.7 m ▪ Water level in North Pond ≤ Polishing Pond -1.7 m ▪ Water level at B2 Dam ≥ 164.7 m 2. Flow into pond or Baker Creek is anticipated to stop or be reduced to a rate whereby water level can be reasonably expected to remain static or reduce with time.	▪ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections. ▪ Determine extent of potential failure mode ▪ Measure water levels in ponds and determine capacity to receive water (if not actioned at Notification Level) ▪ Set up and start pumps and pipelines (if not already at Caution Level) ▪ Start pumping system ▪ Inform Mine Manager of findings	▪ Notify Consulting Geotechnical Engineer for guidance ▪ Notify Site Owner ▪ Perform visual inspection ▪ Be available for consultation ▪ Be prepared to evacuate underground and affected areas	▪ Be available for consultation ▪ Be prepared to notify stakeholders and neighboring communities.	▪ Be available for consultation
	Combination of three criteria being met. 1. Water level or differential exceeds one of the following: a. Water level in Northwest Pond ≥ 193.35 m b. Water level in Polishing Pond ≥ 174.8 m c. Water level in North Pond ≥ Polishing Pond +1.7 m d. Water level in North Pond ≤ Polishing Pond -1.7 m e. Water level at B2 Dam ≥ 164.7 m 2. Flow into pond or Baker Creek is anticipated to continue whereby an overtopping failure could potentially occur.	▪ Perform and record visual inspection. Inspection to be filed as special inspection and separate to routine inspections. ▪ Determine extent of potential failure mode ▪ Measure water levels in ponds and determine capacity to receive water (if not actioned at Notification Level) ▪ Set up and start pumps and pipelines (if not already at Caution Level) ▪ Start pumping system ▪ Follow Mine Manager's instructions	▪ Notify Consulting Geotechnical Engineer for guidance ▪ Notify Site Owner ▪ Perform visual inspection ▪ Be available for consultation ▪ Initiate Emergency Response ▪ Evacuate underground and affected areas	▪ Be available for consultation ▪ Notify stakeholders and neighboring communities	▪ Be available for consultation
Visual (Section 8.4)	▪ water overtopping the dams or dykes ▪ major cracks (>50 mm wide) ▪ Large sink holes (>0.5 m) that are also associated with seepage and/or turbid water	▪ Perform and record visual inspection, if safe to do so. Inspection to be filed as special inspection and separate to routine inspections. ▪ Determine extent of potential failure mode ▪ Inform Mine Manager of findings	▪ Notify Consulting Geotechnical Engineer for guidance ▪ Notify Site Owner ▪ Perform visual inspection ▪ Be prepared to evacuate underground and affected areas ▪ Be available for consultation	▪ Be prepared to notify stakeholders and neighboring communities ▪ Be available for consultation	▪ Review monitoring data, considering visual observations ▪ Be available for consultation
Instrumentation (Section 8.5)	▪ Mine Manager and Consulting Geotechnical Engineer agree that potential for the occurrence of a failure mode exists (e.g., piping, foundation failure, overtopping) based on the observations and monitoring data available at the time.	▪ Follow Mine Manager's instructions	▪ Be prepared to evacuate underground and affected areas	▪ Be prepared to notify stakeholders and neighboring communities	▪ Notify Mine Manager and Site Owner of the interpreted potential failure mode. ▪ Be available for consultation.

Table 32: Actions for Unusual Events

Unusual Event	Unusual Event Criteria	Actions by Site Technical Staff	Actions by Mine Manager	Actions by Site Owner (CIRNAC and PSPC)	Actions by Consulting Geotechnical Engineer
Unusual Event – Earthquake[1]	▪ M>4.0 within 40 km ▪ 6.0>M≥5.0 within 80 km ▪ 7.0>M≥6.0 within 120 km ▪ 8.0>M≥7.0 within 200 km ▪ M≥8.0 within 320 km	▪ Perform visual inspection within 24 hours ▪ For unusual events, determine effect of unusual event on the facility ▪ Inform Mine Manager of the findings	▪ Notify Consulting Geotechnical Engineer for guidance ▪ Notify Site Owner ▪ Perform visual inspection ▪ Be available for consultation ▪ Be prepared to notify stakeholders and neighboring communities	▪ Be available for consultation	▪ Be available for consultation
Unusual Event – Storm	▪ Rainfall >50 mm in 24 hours (1-in-10-year storm event)				

[1]USSD (2003).

M = earthquake magnitude.

10.9 Communication System and Procedures

If a condition related to a potential failure mode is observed on site (Table 14), the Mine Manager must be notified immediately, ideally via the fastest method available (e.g., emergency radio channel).

Once the Mine Manager has determined the potential risk to the facility and the associated possibility for a failure, the following emergency contacts may need to be notified as determined by the emergency response leader or designate. Table 33 provides contact numbers for emergency situations. As public relations are the responsibility of CIRNAC, contact details for various levels of government and First Nations, public broadcast institutions and media have been deliberately omitted from Table 33.

Table 33: Official Contacts

Contact	Phone Number	Comments
Giant Mine Emergency Radio Channel	Repeater radio channel	Program the radio to the following: RX (receiver): 163.890 TD (transmitter): 163.170
	Underground Radio Channel	Program the radio to the following: RX (receiver): 147.325000 TD (transmitter): 173.750000
Northwest Territories Emergency Measures Office	1.867.920.2303	24-hour emergency call line
Northwest Territories 24-hour Spill Line	1.867.920.8103	
Northwest Territories Environmental Health	1.867.873.2183 or 1.837.767.9066	
Northwest Territories Fire Marshal	1.867.920.2303	
Fire Department	9-1-1	Yellowknife
Police Office	9-1-1	Yellowknife
Health and Social Services Authority	1.867.873.7224	Yellowknife

Note: Any of the three-digit exchange codes for Yellowknife (873, 669, 920, etc.) will work for police, fire, and ambulance.

10.10 Preventive and Remedial Responses for Different Failure Modes

Preventive and remedial responses for different failure modes are described in Table 34.

Table 34: Preventive and Remedial Responses for Failure Modes

Failure Mode	Events/Conditions that may precede Failure	Preventative Maintenance	Detection Measures	Remedial Responses (after failure)
Over-topping	▪ Heavy rainfall/snowmelt ▪ Heavy winds ▪ Pond levels above maximum level(s) ▪ Slope failure	▪ Record instrumentation readings and check against warning levels ▪ Water treatment and discharge to lower pond level(s) ▪ Pumps to reduce water levels within ponds	▪ Regular inspections to check water levels	▪ Earthworks to re-establish dam and low permeability element ▪ Environment cleanup ▪ Pumps to reduce water levels within ponds
Instability/ Collapse	▪ Seismic event ▪ Cracking ▪ Settlement ▪ Bulging ▪ Seepage ▪ Erosion (internal and external)	▪ Remedial earthwork in case of excessive erosion or detection of conditions that suggest incipient instability ▪ Instrumentation readings below warning levels	▪ Regular inspections to assess embankment stability; checking for cracks, settlement, bulging, rutting, etc.	▪ Earthworks to re-establish dyke ▪ Environment cleanup ▪ Pumps to reduce water levels within ponds
Contaminated Seepage	▪ Increased contaminants identified through water quality testing	▪ Water level reduction/cover placement to reduce seepage rates ▪ Intercept/collect seepage and recycle or treat prior to environmental discharge	▪ Water quality checks as per the water sampling program (i.e., surveillance network program) detailed in the Type A Water Licence	▪ Water treatment ▪ Earthworks to contain seepage ▪ Seepage interception and pump back systems for treatment prior to release ▪ Environment cleanup
Piping	▪ Seepage ▪ Wet spots downstream of dam toes, with or without turbid water ▪ Sinkholes and/or depressions ▪ Animal burrows	▪ Water treatment and discharge to lower pond level(s) ▪ Use only filter compatible materials for dam repairs	▪ Regular inspections checking for seepage and pooled water at the toe of the dams ▪ Check for signs of turbid water	▪ Earthworks ▪ Environment cleanup ▪ Pumps to reduce water levels within ponds

10.11 Available Resources

In response to an emergency, additional resources may be required, such as equipment, material, and other personnel. Types of equipment and materials likely to be required in response to an emergency, are listed below.

Materials

- Clay
- Granular crush materials of various sizes, with some example sizes of (listed below according to their maximum particle size):
  - 19 to 25 mm minus (¾ to 1-inch minus)
  - 150 mm minus (6-inch minus)
  - 300 mm minus (12-inch minus)
- Rock-fill (run-of-quarry)
- Pipe (e.g., HDPE or steel) or lay-flat hoses
- Geosynthetics (e.g., geotextile or geomembrane)

Equipment

- Bulldozer
- Excavator
- Haul trucks
- Loader
- Water pumps

Depending on the time of year and the work that is ongoing, Parsons and their subcontractors may have some of the listed equipment and materials located on site. However, procurement of equipment and materials from off site may be required. Table 35 lists the contact details for several Yellowknife based contractors who could provide equipment and materials.

Several sources or borrow material have been identified on site (Golder 2017b) that could be used. Figure 20 shows the locations of several fine grained borrow sources, where materials like clay/silt, sand, and gravel, and other fill mixtures can be obtained. At this time, only the C1 Clay Borrow area has been developed. To access other areas, development work such as access roads and topsoil stripping would be required. Coarse grained borrow sources shown in Figure 20 would require blasting and processing and therefore are not practical sources f or use in an emergency.

Resources available to Giant are included in Table 35.

Table 35: Available Resources

Company	Contact	Comments
Ace Enterprises Ltd.	1.867.920.2082	Yellowknife-based contractor – specialized in earthworks
RTL Construction	1.867.873.6271	Yellowknife-based contractor – specialized in equipment rentals
Great Slave Helicopters	1.867.873.2081	Yellowknife
Matrix Helicopters	1.867.766.4953	Yellowknife
Nahanni Construction Ltd.	1.867.873.2975	Yellowknife-based contractor
Weatherby Trucking Ltd.	1.867.873.9801	Yellowknife-based contractor – specialized in earth moving

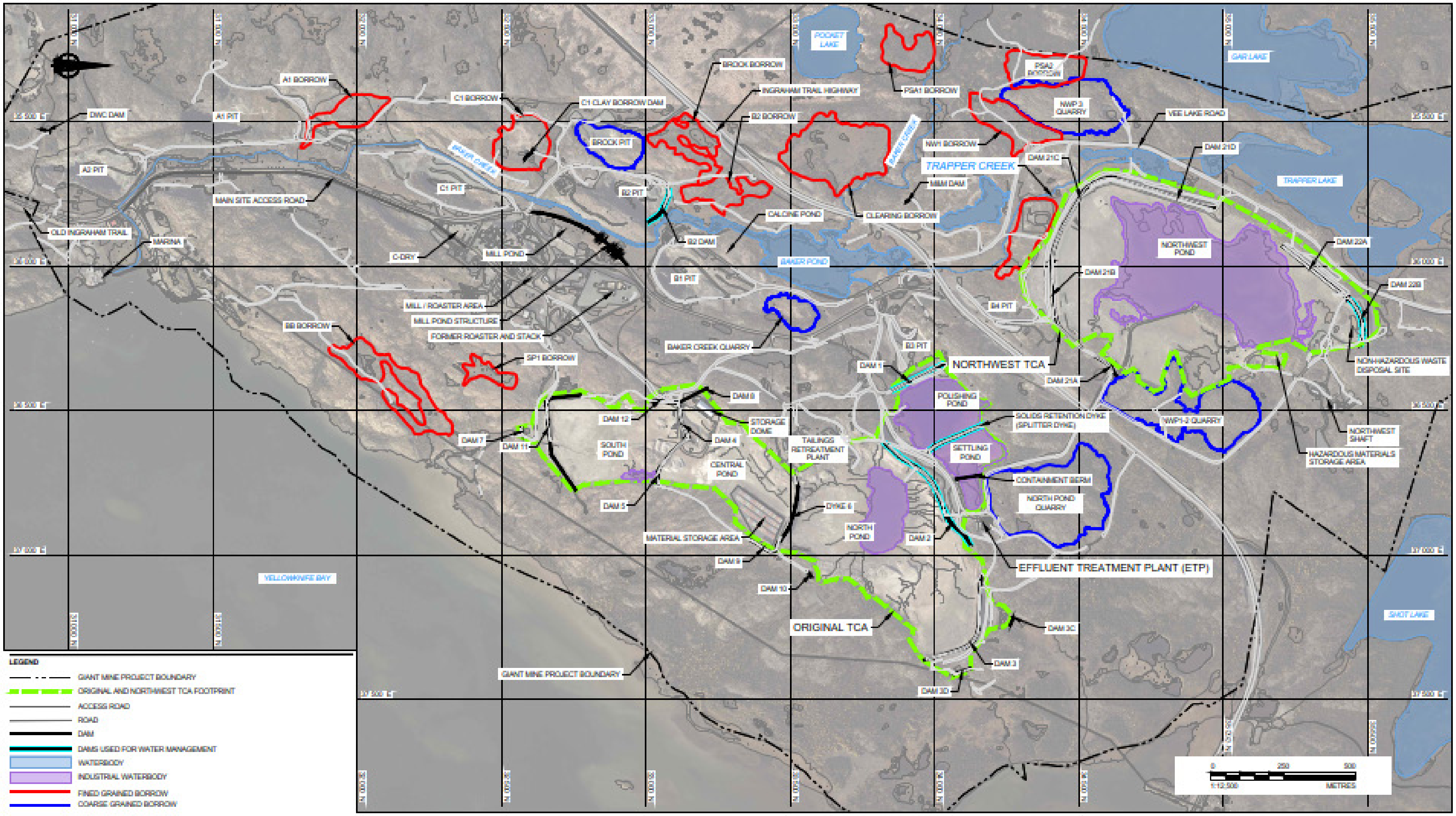

Figure 20: Potential Borrow Site

10.12 Assessment for On-site and Off-site Effects

DSR was completed in 2019 (SRK 2020). The potential effect of a dam failure is provided in APPENDIX C.

10.13 Emergency Preparedness and Response Plan Testing

Testing of the EPRP is completed annually. Testing includes:

- desktop drills
- site staff and drills
- wider community response drills.

The outcomes of drills are to be documented and kept on file. Any identified gaps such as missing resources, equipment, or procedures are to be rectified immediately and the EPRP updated.

Periodic testing of the emergency procedures with neighboring agencies and stakeholders is an integral part of emergency preparedness.

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APPENDIX A

Responsibility of Updating OMS

APPENDIX A – Responsibility of Updating OMS Manual

GMRP – OMS Manual (Version F)

OMS Manual – Table of Contents			Section Author		
Section No.		Section Title	Parsons	WSP	Overlap
1.0		**Objective**	-	◆	-
2.0		**Document User Guide**	◆	-	-
3.0		**Roles and Responsibilities**	-	-	◆
	3.1	Organization Chart	-	-	◆
	3.2	Responsibilities and Contact Information of Formally Assigned Individuals	-	-	◆
	3.3	Requirements for Competency and Training	-	◆	-
	3.4	Site Personnel	◆	-	-
	3.5	Responsibilities for Managing Change	◆	-	-
4.0		**Site Facilities Description**	*n/a*	*n/a*	*n/a*
	4.1	Site Overview	-	◆	-
	4.2	Tailings Transportation and Deposition	-	◆	-
	4.3	Access Roads and Security	◆	-	-
	4.4	Dam Consequence Classification	-	◆	-
5.0		**Site Reference Data**	*n/a*	*n/a*	*n/a*
	5.1	Applicable Guidance and Regulatory Requirements	-	-	◆
	5.2	Mine Operating Manuals	◆	-	-
	5.3	Horizontal Coordinate System and Maps	◆	-	-
	5.4	Regulatory Framework for Dam Safety	-	◆	-
6.0		**Site Conditions**	*n/a*	*n/a*	*n/a*
	6.1	Topography	-	◆	-
	6.2	Geology	-	◆	-
	6.3	Vegetation and Wildlife	-	◆	-
	6.4	Climate	-	◆	-
	6.5	Water Balance	-	◆	-
	6.6	Permafrost	-	◆	-
	6.7	Seismicity	-	◆	-
7.0		**Operations**	-	◆	-
	7.1	Water Management	◆	-	-
	7.2	Water Treatment	◆	-	-
	7.3	Pond Storage Capacity	-	◆	-
	7.4	Flood Storage Capacity	-	◆	-
	7.5	Minimum Freeboards	-	◆	-
	7.6	Pond Water Levels and Warning Levels	-	◆	-
	7.7	Environmental Protection	◆	-	-
	7.8	Change Management	◆	-	-
	7.9	Documentation	◆	-	-
	7.10	Reporting and Documentation	◆	-	-

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OMS Manual – Table of Contents			Section Author		
Section No.		Section Title	Parsons	WSP	Overlap
8.0		**Surveillance**	*n/a*	*n/a*	*n/a*
	8.1	Objectives	-	◆	-
	8.2	Training Requirements	◆	-	-
	8.3	Surveillance Procedures	-	◆	-
	8.4	Visual Inspection	-	◆	-
	8.5	Instrumentation	-	◆	-
	8.6	Water License Sampling and Testing	◆	-	-
	8.7	Survey and Bathymetry	-	◆	-
	8.8	Weather Stations	-	◆	-
	8.9	Annual Geotechnical Inspections of Dams	-	◆	-
	8.10	Frequency of Dam Safety Reviews	-	◆	-
	8.11	Event Driven Procedures	-	◆	-
	8.12	Triggers for Change of Operations	-	◆	-
	8.13	Documentation and Reporting	-	-	◆
9.0		**Maintenance**	*n/a*	*n/a*	*n/a*
	9.1	Objectives	-	◆	-
	9.2	Inventory of Components Requiring Maintenance	◆	-	-
	9.3	Maintenance Schedule and Triggers	◆	-	-
	9.4	Routing and Preventative Maintenance	◆	-	-
10.0		**Emergency Preparedness and Response Plan**	◆	-	-
	10.1	Requirements of Legislation, Codes of Practice, Commitments, Etc.	-	◆	-
	10.2	Identification of all Jurisdictions, Agencies and Individuals Involved in Preparedness Response	-	-	◆
	10.3	Training Requirements	◆	-	-
	10.4	Public Relations Plan	-	-	◆
	10.5	Emergency Response Plans	-	-	◆
	10.6	Incident Investigation Procedure	◆	-	-
	10.7	Call-out Procedure for Emergency Response	◆	-	-
	10.8	Exceedance of Caution Warning Levels and Corresponding Actions	-	◆	-
	10.9	Communication System & Procedures	◆	-	-
	10.10	Preventive and Remedial Responses to Failure Modes	-	◆	-
	10.11	Available Resources	◆	-	-
	10.12	Assessment for On-site and Off-site Effects	-	◆	-
	10.13	EPRP Testing	◆	-	-

Note: ◆ = major responsibility contributing to the section. If it is an overlap, it means both Parsons and WSP contribute to the section.
- = minor or no responsibility contributing to the section. n/a = not applicable (implies only a section title).

APPENDIX A – Responsibility of Updating OMS Manual

GMRP – OMS Manual (Version F)

OMS Manual – Appendices		Appendix Author		
Appendix No.	**Appendix Title**	**Parsons**	**WSP**	**Overlap**
A	Responsibility of Updating OMS Manual	-	-	◆
B	Dam Geometry & Foundation	-	◆	-
C	Dam Consequence Classifications	-	◆	-
D	Climate Data	-	◆	-
E	Water Balance	-	◆	-
F	Water Pond Elevations	-	◆	-
G	Inspection Forms	◆	-	-
H[1]	Instrumentation Installation Details and Instrument Calibration Certificates		◆	-

Note: ◆ = major responsibility contributing to the appendix. If it is an overlap, it means both Parsons and WSP contribute to the appendix. - = minor or no responsibility contributing to the appendix.

[1]Contents are generally produced from third party.

APPENDIX B

Dam Geometry and Foundation

B-1 Original Tailings Containment Area

Between the early 1950's and the late 1980's, tailings were deposited to the north of the mill within an area referred to as the Original TCA. Prior to tailings deposition, the approximate area of the Original TCA comprised of two lakes (Bow Lake and Oran Lake) as well as several smaller ponds and bogs (SRK 2005). The Original TCA currently comprises of five separate ponds: Polishing Pond, Settling Pond, North Pond, Central Pond and South Pond.

Dams

Tailings and water within the Original TCA are retained by thirteen earthfill dams. Dams 1, 3, 8, 9, 11, and 12 are external tailings and/or water retention structures. Downstream of these areas are either the naturally occurring environment, land disturbed by mining, or seepage collection dams.

Dams 3C, 3D, and 7, although external, were constructed to collect and manage seepage from the Original TCA. Dams 2, 4 and 5 are internal dams that are contained within the original TCA. Dyke 6 is an internal dyke or causeway that was constructed over tailings.

A rockfill causeway, called Splitter Dyke, was constructed in the 1980's to form the present day Polishing and Settling Ponds. The dyke was constructed of mine muck (i.e., blasted run of mine waste, typically consisting of sand and gravel sized particles). The dyke was constructed to increase the retention time of treated water in the Settling Pond to improve water quality. In previous operations treated water was allowed to seep through the dyke and into the Polishing Pond. However current operations use pumps to transfer water from the Settling Pond to the Polishing Pond. The dyke is underlain by water treatment sludge and tailings, as such, fill materials placed on the upstream and downstream slopes were typically placed without compaction.

In November 2015, a small dyke, referred to as the Containment Berm was constructed to contain sludge and tailings excavated from the Settling Pond with the aim of increasing the storage capacity of the Settling Pond. The berm was constructed to the east of the Settling Pond and was constructed of a granular fill core placed to a height of approximately 1 m, with upstream filter zones and non-woven geotextile. Sludge in Settling Pond and part of the Containment Berm was partially excavated in 2022 to increase storage capacity of the Settling Pond.

Construction History

Mine construction started in 1937 and mining operations in 1948. Between the early 1950's and the late 1980's, tailings were deposited in the Original TCA.

- **1973:** Until at least 1973, tailings were deposited within two pre-existing lakes and were retained by Dams 1, 2, 3, and a portion of Dam 4 (Dam 4A), within the area of the present day Polishing, Settling, North, and Central Ponds (Golder 2005).
- **1965 to1975:** Dams 3C and 3D were constructed between 1965 and 1975 to intercept seepage from Dam 3.

- **1974**: Dams 1, 2, 3, and a portion of Dam 4 (Dam 4A) were raised to provide additional storage. At this time these dams were also lined with clay and a granular filter installed on the upstream slope. (Golder 2005).
- **1980 to 1984**: Dams 4 (Dams 4B and 4C) through 10 were constructed and Dams 2 and 3 raised to provide further tailings storage (Geocon 1983). Dam 11 was constructed to create the South Pond.
- **1988 to 1990**: Tailings deposition in the Original TCA generally ceased following the construction of the Northwest TCA. Between 1988 and 1990, a Tailings Retreatment Plant was used to reprocess tailings from the North and Central Ponds for residual gold (SRK 2007). Effluent from the Tailings Retreatment Plant was discharged in the Northwest TCA.
- **1999:** Since the cessation of milling on site in 1999, Dam 1 has been raised in order to account for ongoing settlement of the dam crest and to maintain water storage capacity and freeboard.
- **2002:** Dam 1 was raised by approximately 1.5 m.
- 2020: Thermosyphons were installed along the Dam 1 crest (2021a)
- 2022: Dam 1 was raised by approximately 1.7 m along the dam upstream crest (Golder 2022a).

Dam Geometry and Foundations

A technical memo was issued by Golder (Golder 2021b) highlighting the dam dimensions mainly obtained from dam drawings based on 2018 LiDAR survey, and 2019 on-ground survey as part of site investigations for dams. These dam dimensions are to be used as reference moving forward. Details of dam geometry and foundation conditions are presented in Table B-1.

Site-specific data on the presence or extent of permafrost in the foundations of dams or the TCA boundaries, where encountered during geotechnical investigations, is provided in Figure B-1 and Figure B-2.

Table B-1*:* Original Tailings Containment Area: Overview of Dams

Dam/Dyke	Length[a] (m)	Height[a] (m)	Crest Width[a] (m)	Foundation / Construction[b], [c]
Splitter Dyke	230	5	4	■ Rockfill dyke over tailings
Dam 1	200	10	7 to 20	■ Foundation included, depending on location (Golder 2018): ▪ tailings, ▪ Organics, ▪ Frozen soil and visible ice (up to 9.6 m thick) ▪ Fluvial sand and gravel, ▪ Plastic and low plasticity clay ■ Rockfill dam constructed with an upstream clay blanket ■ Raised sections include filter zone of sand and gravel

Table B-1: Original Tailings Containment Area: Overview of Dams

Dam/Dyke	Length[(a)] (m)	Height[(a)] (m)	Crest Width[(a)] (m)	Foundation / Construction[(b), (c)]
Dam 2	470	14	15 to 30	■ Foundation included 3 m of tailings over 1 m of peat over 4 to 6 m of silty clay at the centre of longitudinal section ■ Permafrost encountered between 14 and 15.2 m deep ■ Rockfill dam constructed with an upstream clay blanket and core ■ Raised sections include filter zone of sand and gravel ■ Upstream toe berm included for stability
Dam 3	460	15	7to 12	■ Founded on variable depths of peat over silty clay over silt at different cross-sections. ■ Upstream clay seal constructed ■ West side includes a toe berm ■ Last raises constructed of silty clay using upstream method ■ Raised sections include filter zone of sand and gravel
Dam 3C	60	1.5	5 to 6	■ Foundation included 10 m of silty clay with visible ice over bedrock ■ Permafrost encountered at depth of 7 m ■ Rockfill structure with clay and tailings slimes on upstream
Dam 3D	60	4	5 to 6	■ Foundation included silty sand or sandy till ■ Organics removed prior to construction ■ Rockfill dam with clay zone and granular filter on upstream slope
Dam 4	215	14 [(d)]	14	■ Foundation included 1 to 5 m of silty clay over some silt with no visible ice over bedrock ■ No frozen soil was encountered in foundation during 2019 drillings ■ Rockfill dam constructed in 3 m lifts using downstream technique ■ Clay placed on upstream side in 1979
Dam 5	75	13 [(d)]	7.5	■ Founded on variable depths of peat, silty clay, silt and sand ■ Upstream clay barrier and downstream clay cut-off constructed in 1981
Dyke 6	280	9	6 to 20	■ Foundation included tailings over peat and soft clay over bedrock ■ Frozen tailings were known to exist in the foundation of the dyke (Geocon 1975). ■ Dam does not include a zone of low hydraulic conductivity

Table B-1: Original Tailings Containment Area: Overview of Dams

Dam/Dyke	Length[a] (m)	Height[a] (m)	Crest Width[a] (m)	Foundation / Construction[b], [c]
Dam 7	25	3	3	■ Foundation included silty clay over bedrock ■ No permafrost encountered ■ Silty clay core constructed ■ No toe drain constructed
Dam 8	110	3	4 to 5	■ Foundation was clay and bedrock (Geocon 1983). ■ Upstream clay zone placed in 1980. Clay blanket overlain by riprap was added to upstream side in 1981. ■ Modifications to flatten slopes completed in 1981.
Dam 9	95	11	4 to 7	■ Foundation was bedrock ■ Downstream shell of rockfill with upstream zone of silt or clay
Dam 10	50	3	5	■ Constructed on rockfill
Dam 11	465	18.5	15	■ Foundation included 3 to 4 m of silty clay over bedrock ■ Constructed with clay core ■ Mid and lower level berms on west and central sections
Dam 12	80	5	4	■ Foundation may include bedrock, clay or mine waste, depending on the location ■ Dam may have been constructed with mine rockfill with no seepage barrier

(a) Source: Golder 2021b.

(b) Source: Golder 2021c.

(c) Source: SRK 2020.

(d) It is the dam height after south pond tailings are removed.

B-2 Northwest Tailings Containment Area Construction History and Dam Geometry

Following the undertaking of a major tailings storage expansion project, the construction of Dams 21 (A through D) and Dam 22A and B, was initiated in 1986 to form the Northwest TCA (Golder 2005). Between 1986 and 1999 tailings were deposited in the Northwest TCA.

Dams

The six dams of the Northwest Containment Area are constructed of rockfill and include low permeability elements in the form of a clay core along with a granular filter, placed along the upstream slope. According to available design drawings, the clay core was designed to be keyed into bedrock (Geocon 1987). The downstream slopes of these dams are as steep as 1H:1V, but are typically buttressed by rockfill placed at the downstream toe. From 1986 to 1999, most tailings produced by the Mill and Tailings Retreatment Plant at Giant mine were deposited in the Northwest TCA.

Construction History

- **1986**: Construction of Dams 21 (A through D) and Dam 22A and B, was initiated to form the Northwest TCA (Golder 2005).
- **1986 to 1999**: Most tailings were deposited in the Northwest TCA, from both the mill and from the Tailings Retreatment Plant.

Dam Geometry and Foundations

Details of dam geometry and foundation conditions are presented in Table B-2.

Site-specific data on the presence or extent of permafrost in the foundations of dams or the TCA boundaries, where encountered during geotechnical investigations, is provided in Figure B-1.

Table B-2: Northwest Tailings Containment Area: Overview of Dams

Dam/Dyke	Length[(a)] (m)	Height[(a)] (m)	Crest Width[(a)] (m	Foundation/Construction[(b)]
21A	100	8	15	■ Foundation included a layer of 0.5 m peat, 1.5 m silty clay and 0.3 m silt over bedrock. ■ Foundations were frozen during 2019 geotechnical investigation.
21B	350	20	15	■ Foundation included varying depths of peat followed by silty clay and clayey silt, followed by sand over bedrock. ■ Foundations were found frozen during 2019 geotechnical investigation, except for one borehole. ■ Some ice was observed within the rockfill as well. ■ No records of construction available
21C	300	14	15	■ Foundation included varying depths of silty clay, followed by silt and sand over bedrock. ■ Foundation was frozen and ice particles were observed in rockfill as well during 2019 geotechnical investigation. ■ Downstream slope has a single bench at mid height

Table B-2: Northwest Tailings Containment Area: Overview of Dams

Dam/Dyke	Length[(a)] (m)	Height[(a)] (m)	Crest Width[(a)] (m	Foundation/Construction[(b)]
21D	460	13	15	■ Foundation included varying depths of peat, silty clay, followed by silt over bedrock. ■ Organic silt removed prior to construction ■ Downstream slope has a single bench at mid height ■ Dam raise was constructed in 2003. It increased clay core by 0.6 m, with rockfill shell on upstream slope extended. ■ Foundation was frozen and ice particles were observed in rockfill as well during 2019 geotechnical investigation.
22A	275	8	15	■ Foundation included varying depths of peat, silty clay, followed by silt and sand over bedrock. ■ Frozen soils were encountered in dam's foundation soils as well as rockfill, excluding in organic layer at downstream bench.
22B	175	11	15	■ Foundation included a discontinuous organic layer, topsoil underlain by varying depth of silty clay and silt over bedrock. A small deposit of encountered sand was interpreted to be discontinuous. Frozen soil was encountered in rockfill and dam's foundation, however not up to the top of bedrock.

(a) Source: Golder 2021b.
(b) Source: Golder 2021c.

B-3 B2 Dam Construction History and Dam Geometry

In order to divert Baker Creek and to eventually develop the B2 Pit, the B2 Dam was constructed in the 1980's. The dam was not constructed as an engineered structure and has had a history of poor performance, which includes dam breach and overtopping events (SRK 2008). In 2006, a significant seep of muddy water was observed to be emanating from the toe of the dam and was observed to flow onto the B2 Pit wall.

In response to the 2006 seepage event, the B2 Dam was reconstructed during the winter of 2008 using fill materials, non-woven geotextile, and bituminous liner. With Baker Creek frozen, a key trench was excavated at the upstream toe and creek bed and the liner was placed along the downstream slope, across the key trench, and in some locations, up the opposite slope of the creek bed (SRK 2008).

In 2022, a rockfill buttress was constructed at B2 Dam downstream side (Golder 2022b). This is to improve the slope stability of the downstream slope of the dam to meet CDA Guidelines (2013) under static loading condition.

Dam Geometry and Foundations

Details of dam geometry and foundation conditions are presented in Table B-3.

Site-specific data on the presence or extent of permafrost in the foundations of dams or the TCA boundaries, where encountered during geotechnical investigations, is provided in Figure B-1.

Table B-3: Overview of Dam B2

Dam/Dyke	Length[(a)] (m)	Height[(a)] (m)	Crest Width[(a)] (m)	Foundation/Construction[(c)]
B2	120	13	10 to 15	■ Foundation includes bedrock mainly overlain by 10 m thick silty clay. A 5 m thick silt and a discontinuous 0.1 m thick layer organics was encountered at some locations. ■ Frozen conditions were observed locally at some boreholes. ■ Records of construction available in SRK (2008)

(a) Source: Golder 2021b.

(b) Source: Golder 2021d.

B-4 Other Dams

A description of the other, minor, dams at the Giant mine site are included below for reference. Management of these dams is not included as part of this OMS manual.

M&M Dam

During the winter of 2011, Baker Creek froze to the creek bed. During the subsequent freshet (Spring 2011), the presence of anchored ice resulted in the upper Baker Creek diverting away from the original creek alignment. The M&M Dam was constructed to retain the flow of upper Baker Creek if a similar condition were to occur in the future. M&M Dam has an approximate maximum height of 1 m, crest length of 20 m and crest width of 3 m.

DWC Dam

Anecdotal evidence indicates that the DWC Dam was constructed sometime in the 1970’s or 1980’s to prevent surface water run-off from flowing into the A2 Pit. The dam retains water within a small bog. A high-density polyethylene pipe penetrates the dam with an intake located on the upstream slope. The pipe drains water from the pond for discharge east of the A2 Pit in the general vicinity of the outlet from Baker Creek into Yellowknife Bay. DWC Dam has an approximate maximum height of 2 m, crest length of 30 m, and width of 2 m.

C1 Clay Borrow Dam

The C1 Clay Borrow area is located due west of the mine offices (known as C-Dry). Soil was excavated from the area for use in on-going rehabilitation projects over several years. However, disturbance of this area has resulted in turbid surface water runoff, particularly during the spring freshet and high rainfall events. To manage the turbid water, prior to entering Baker Creek, two ponds were excavated in the borrow area to retain surface water runoff until suspended solids had settled. As an additional measure, a small dam, approximately 1 m high, was constructed downstream of one of the ponds as a freeboard structure. C1 Clay Borrow Dam has an approximate crest length of 50 m and crest width of 3 m.

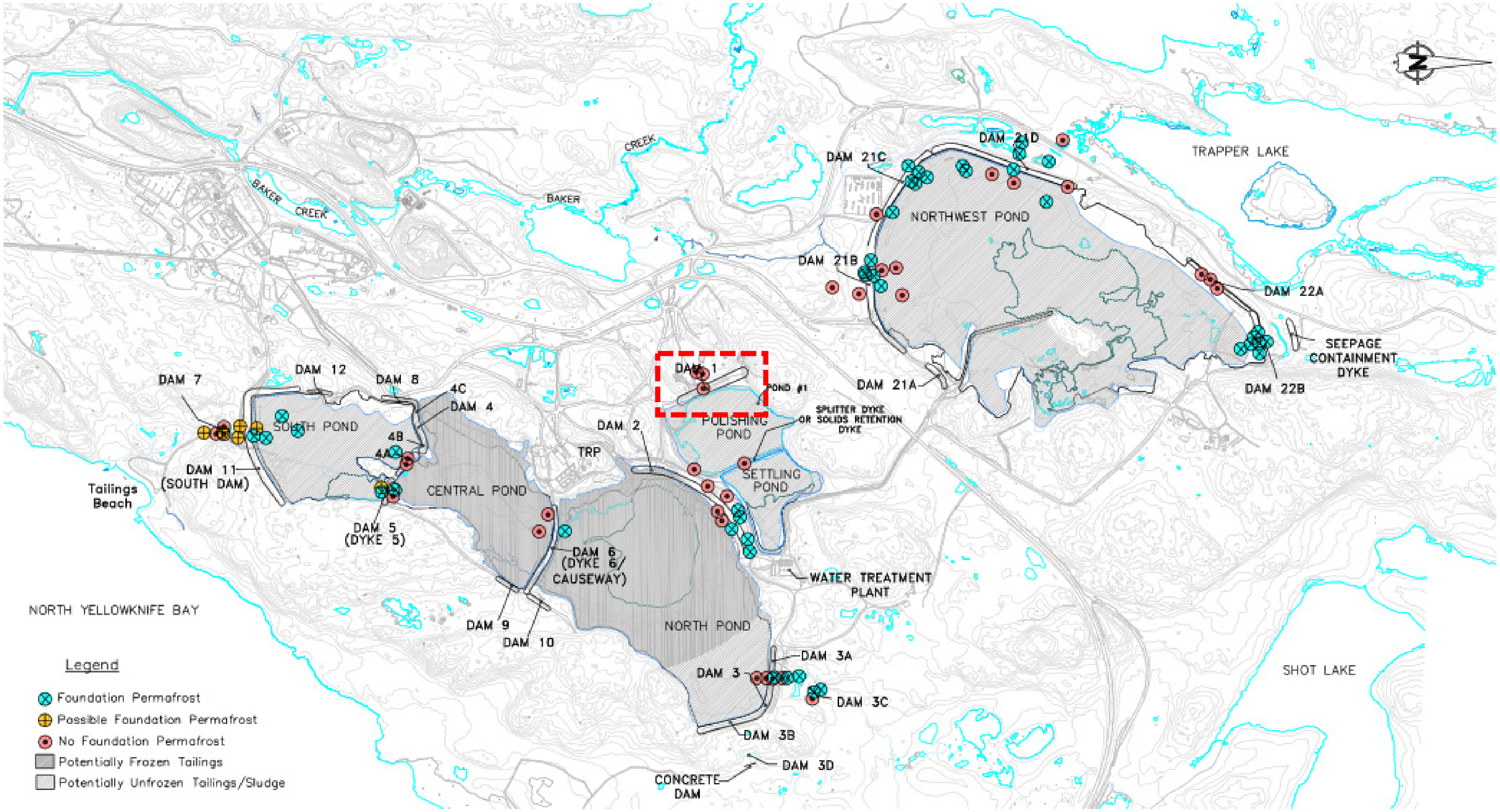

Figure B-1: Overview of Permafrost (from SRK 2007)

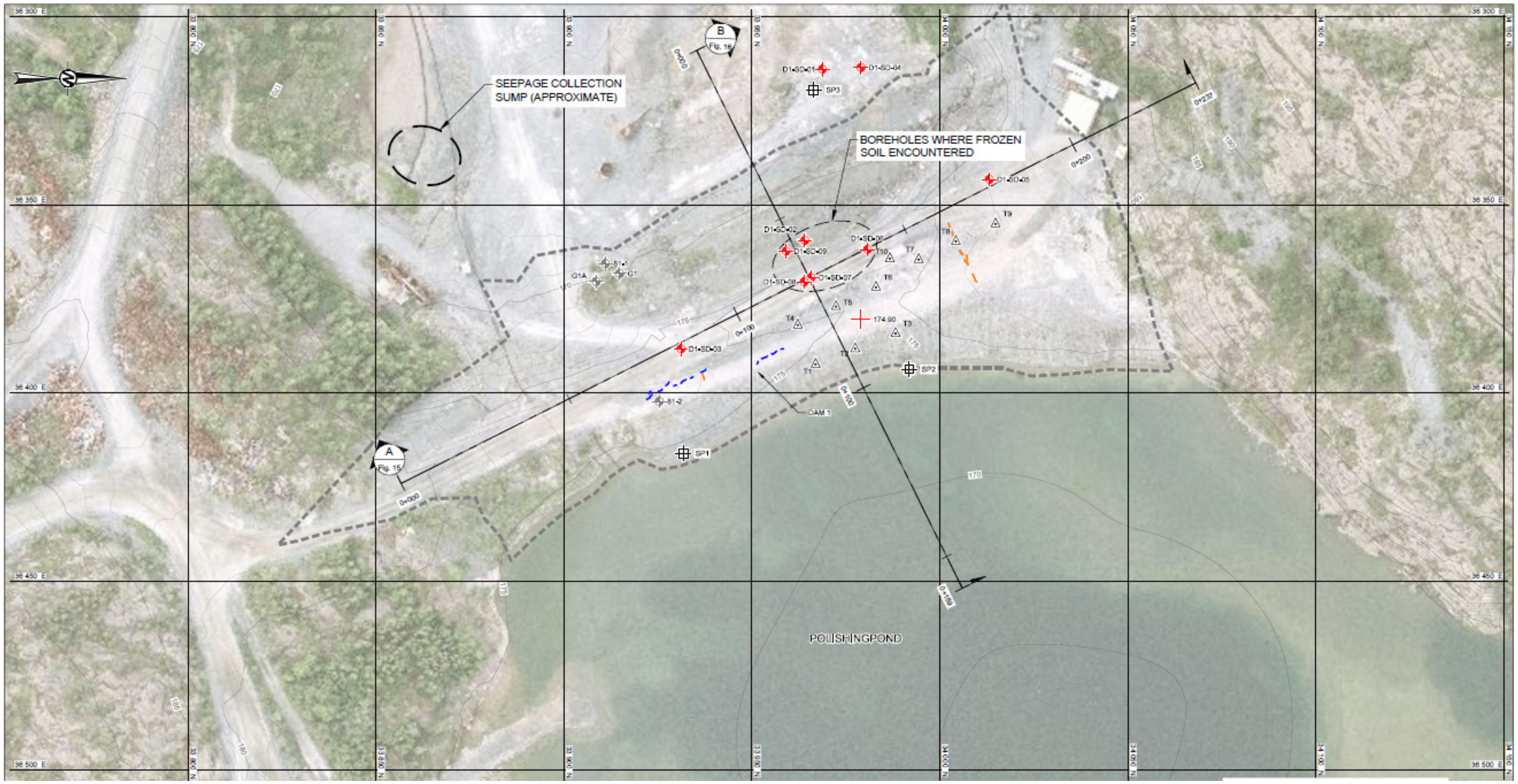

Figure B-2: Dam 1 Overview – Frozen Soil Locations (from Golder 2018)

B-5 References

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APPENDIX C

Dam Consequence Classifications

C-1 Introduction

There are a total of 23 dams at Giant Mine that have a dam consequence classification. The primary basis for the dam classifications is from a 2015 desktop review (Golder 2015). A Dam Break Analysis (DBA) was completed in 2020 for 10 dams, located in the Original and Northwest Tailings Containment Areas (TCAs) at Giant Mine (Golder 2021). An update to the consequence classification of 10 dams (Dam 1, Dam 2, Dam 3, Dam 11, Dam 21A, Dam 21B, Dam 21C, Dam 21D, Dam 22A and Dam 22B) was made following the results obtained in the 2020 DBA and 2021 AGI site visit.

C-2 Dam Consequence Classifications

Dam classifications were previously governed by Guidelines of CDA 2013, as per requirements of the water license. However, more recently, Global Tailings Review (GTR 2020), published the Global Industry Standard on Tailings Management (GISTM) which also provided dam consequence classification. While GISTM is closely aligned with CDA (2013), it does provide more detailed, and in some cases quantitative guidelines for the assessment of dam consequence guidelines. In cases where the GISTM provided useful additional guidance to that provided in CDA (2013), the GISTM guidance was used to inform Golder's assessment of consequence classifications (Golder 2021). For dams with multiple consequences, the consequence classification considered to drive the dam's current classification is shown in **bold text**.

Table C-1 summarizes the updated dam consequence classification and the supporting rational.

Table C-1: Rational for Dam Consequence Classifications as per CDA (2013)

Dam	Potential Dam Failure Consequence/s	Classification	Classification Rationale
B2	May flood B2 Pit and underground workings via Pit B2 Portal which may: ■ **Expose underground staff to risk of injury or fatality.** ■ Damage the underground dewatering pumps which are important in preventing flooding of the Arsenic chambers.	Very High	Infrastructure and economics: Very high economic losses affecting important infrastructure or services (e.g., highway, industrial facility, storage facilities for dangerous substances), or employment
21A	Tailings may flow over the Ingraham Trail Highway which may: ■ **Expose commuters on the highway to risk of injury or fatality.** Debris could flow north along Ingraham Trail as well. ■ Adversely impact water treatment. ■ Flooding of B3 pits would result in debris flowing into the underground mine via the portals. ■ Flooding of C1 and A2 pit. Some flow into B1 pit. ■ Debris could flow into Settling and Polishing Ponds, triggering Dam 1 failure.	Very High	Potential loss of life: 10-100. Infrastructure and economics: Very high economic losses affecting important infrastructure and services (e.g., highway, industrial facility, storage facilities for dangerous substances), or employment.
21B	Tailings may flow over the Ingraham Trail Highway and into Baker Creek which may: ■ **Expose commuters on the highway to risk of injury or fatality.** ■ Further contaminate Baker Creek ■ Adversely impact water treatment ■ Flooding of B2 and B3 pits would result in debris flowing into the underground mine via the UBC and 1-38 portals. ■ Flooding of B1, C1 and A2 pits.		
21C			
1	May flood B3 Pit and underground workings via 1-38 Portal which may: ■ **Expose underground staff to risk of injury or fatality.** ■ Adversely impact water treatment. ■ Flow into C1 pit is a possibility.	High	Loss of life: 10 or fewer.
2	Tailings may flow into the Polishing Pond which may: ■ Compromise the stability of Dam 1. This may lead to flooding of B3 Pit and underground workings via 1-38 Portal, and in turn **expose the underground staff to risk of injury or fatality.** ■ Adversely impact water treatment. ■ Some flow into B1 pit is a possibility. ■ Flow into C1 pit and consequently A2 pit is a possibility.		Loss of life: 10 or fewer if Dam 1 stability is compromised.
21D	Tailings may flow across the Vee Lake road, primarily into Trapper Lake, but also reaches Gar Lake. Debris flow from Trapper Creek into Baker Creek: ■ **Expose travelers on the road to Vee Lake to risk of injury or fatality.** ■ Further contaminate Trapper Lake and Trapper Creek. ■ Adversely impact water treatment. ■ Debris flow reaches all the way to Yellowknife Bay.	High	Loss of life: 10 or fewer
22A	Tailings may flow across the Vee Lake road, primarily into Trapper Lake, but also reaches Gar Lake. Debris flow from Trapper Creek into Baker Creek: ■ **Expose travelers on the road to Vee Lake to risk of injury or fatality.** ■ Further contaminate Trapper Lake and Trapper Creek. ■ Adversely impact water treatment. ■ Some plume of debris likely to reach Yellowknife Bay		
22B			
3	Hypothetical breach appears unlikely to result in flow failure because: ■ Ponding water at least 250 m away. ■ In case of breach, material would flow downstream but majority of debris unlikely to reach Yellowknife Bay.	Significant	Environmental and cultural values: No significant loss or deterioration of habitat. Potential contamination of livestock/ fauna water supply with no health effects.
11	Hypothetical breach appears unlikely to result in flow failure because: ■ Ponding water more than 300 m away. ■ Debris from the failure could reach the shore of Yellowknife Bay.		
Mill Pond Structure	Substantial water storage potential could potentially result in incremental loss of environmental and cultural values in the event of a breach.		Environmental and cultural values: Loss of marginal habitat only. Restoration or compensation in kind highly possible.
3C	Dams retaining tailings with no water on surface. Liquefaction potential considered low (SRK 2007). Limited impact expected downstream.	Low	Environmental and cultural values: Minimal short-term loss. No long term loss.
3D			
4			
5			
6			
7			
8			
9			
12	Dam retaining tailings with minor water on surface.	Low	Environmental and cultural values: minimal short-term loss. No long term loss. Infrastructure: low economic loss to operation.
Splitter Dyke	Breach would result in flow of water and sludge into Polishing Pond. The Polishing Pond has a larger surface area than the Settling Pond and should therefore be of sufficient size to contain failure if the Settling Pond is operated at or below its maximum operating level.	Low	Infrastructure and economics: Low economic losses; area contains limited infrastructure or service.
DWC Dam	Water (surface water runoff) would be contained within A2 Pit.	Low	Environmental: No short or long-term loss.
C1 Clay Borrow Dam	Water (surface water runoff) flows into Baker Creek, but remediation in kind feasible.	Low	Environmental: Minimal short-term loss. No long-term loss.
10	Not applicable	Not applicable	In its current state the dam has no implication on the operation of the North Pond. To be reviewed in the event of any operational changes.
M&M Dam	Not applicable	Not applicable	Dam was implemented as emergency response. No currently relied upon.
Containment Berm	Not applicable	Not applicable	Does not directly retain solids or water. Structure was not designed to retain water and is permeable.

To assist the Mine Manager in determining the areas to evacuate and restrict access to, Table C-2 provides a high level summary of the significant areas that would be affected in the event of a dam failure.

Table C-2: Significant Areas Impacted by Dam Failure

TCA	Dam	Water Bodies				Public Roads		Mine Access Roads		Mine Infrastructure			
		Baker Creek	Yellowknife Bay	Gar & Trapper Lakes	Trapper Creek	Ingraham Trail (Hwy 4)	Vee Lake Road	UBC Bridge	Gatehouse Bridge	Open Pits		Portal to Underground	Water Treatment
										Flooded	Some Flow		
Original	1	X	X	-	-	X	-	X	X	B3	-	1-38	X
	2	X	X	-	-	X	-	X	X	B3 & C1	B1 & A2	1-38	X
	3	-	-	-	-	-	-	-	-	-	-	-	-
	11	-	X	-	-	-	-	-	-	-	-	-	-
Northwest	21A	X	X	-	-	X	X	X	X	B3, C1, & A2	B1	1-38	X
	21B	X	X	-	X	X	X	X	X	B3, B2, B1, C1, A2	-	1-38 & UBC	-
	21C	X	X	-	X	X	X	X	X	B3, B2, B1, C1, A2	-	1-38 & UBC	-
	21D	X	X	X	X	X	X	-	-	-	-	-	-
	22A	X	X	X	X	X	X	-	-	-	-	-	-
	22B	X	X	X	X	X	X	-	-	-	-	-	-

Source: Golder (2021)

C-3 References

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APPENDIX D

Climate Data

D-1 Climate Station Reference

Climate data relevant to Giant Mine area are available from the Environment Canada climate station at Yellowknife Airport (Station ID 2204101). Where historical data are not available from Yellowknife airport, data from alternative stations, as shown in Table D-1, can be used.

Table D-1: Regional Climate Stations

Name	Environment Canada Station Number	Latitude	Longitude	Elevation[a] (masl)
Yellowknife A	2204100	62°27'47" N	114°26'25" W	205.7
Yellowknife CS[b]	2204155	62°28'00" N	114°27'00" W	210.0
Yellowknife Hydro[b]	2204200	62°40'00" N	114°15'00" W	159.4
Yellowknife Henderson[b]	2204110	62°27'00" N	114°23'00" W	200.0

(a) Approximate general elevation of the site is 190.0 masl.

(b) Climate data has gaps and their use in this document was limited.

Evaporation data, estimated for shallow lakes, should be determined based on Morton's evaporation method (Alberta Environment 2011) using geographic and climate factors available from Yellowknife Airport and solar radiation data available from Environment Canada's Canadian Weather Energy and Engineering Datasets (CWEEDS) database.

D-2 Correction of Climate Data

Daily rainfall and snowfall data, as recorded at the Yellowknife airport climate station, should be corrected for "under-catch" factors, based on the Adjusted Historical Canadian Climate Data (AHCCD) database (EC 2017a). Adjustments should be applied to rain and snow separately.

Under-catch factors used for Yellowknife airport for use at Giant Mine are:

- Rainfall: 1.15
- Snowfall: 1.20

Corrections should also be applied to rainfall quantities to account for wind under-catch, evaporation, and gauge-specific wetting losses.

Density corrections should be applied to snowfall quantities based upon coincident ruler and Nipher gauge measurements.

Adjustments for the correction of precipitation amounts are proposed by Mekis and Hogg (1999) and apply to northern weather stations.

Evaporation data, estimated for shallow lakes, should be determined based on Morton's evaporation method (Alberta Environment 2011) using geographic and climate factors available from Yellowknife Airport and solar radiation data available from CWEEDS database.

D-3 Temperature

Yellowknife is located in a region with arid and subarctic continental climate characterized by long and cold winters and short and cool summers (Golder 2011). Air masses in the winter and spring originate in the Arctic and westerly air flows from the Pacific Ocean sweep over the site during the summer and fall months (Gibson and Reid 2010). Available air temperature data from Yellowknife Airport climate station were used to characterize the long-term temperature variations at the mine site.

The monthly mean, minimum, maximum temperatures and corresponding annual values are shown in Table D-2.

Table D-2: Annual and Monthly Mean, Minimum and Maximum Temperature

Month	Monthly Temperature (ºC)		
	Mean	Minimum	Maximum
January	-27.3	-37.0	-15.2
February	-24.3	-35.6	-15.9
March	-17.9	-27.6	-9.9
April	-6.3	-16.4	1.2
May	4.7	-1.5	11.0
June	12.9	9.4	16.3
July	16.5	13.3	19.3
August	14.1	10.3	17.2
September	7.1	2.8	10.4
October	-1.4	-6.2	2.9
November	-13.8	-24.4	-6.0
December	-23.2	-31.3	-13.2
Annual	**-4.9**	**-37.0**	**-19.3**

Source: Golder (2011).

The mean annual temperature is -4.9ºC. The coldest month is typically January, with a mean temperature of -27.3ºC and the warmest month is typically July, with a mean temperature of 16.5ºC.

The following assumptions can be made for surface water related activities, based on the available temperature data:

- During the winter months, November to March, mean temperatures remain below 0ºC. Precipitation occurring during this period will predominately occur as snowfall and will accumulate on the ground as snow or ice.
- During the summer months, June to August, mean temperatures remain above 0ºC. No snow accumulation on the ground will occur during this period and precipitation will contribute to surface runoff.
- During the fall freeze-up, September to October, or during the spring melt, April to May, precipitation may occur as rainfall or snow, depending on air temperature. Precipitation may accumulate on the ground as snow and rain-on-snow events may occur.

D-4 Precipitation

Annual and Monthly Precipitation

Total annual precipitation is estimated to be 333 mm for a mean year, with the mean annual rainfall estimated to be 172.3 mm and the mean annual snowfall estimated to be 160.6 mm of snow, presented as snow water equivalent (SWE) (Golder 2011). In a mean year, approximately 52% of precipitation occurs as rain and 48% occurs as snow. Precipitation occurs primarily in the summer and fall months, with approximately 60% of the total annual precipitation occurring between July and November.

The majority of rain occurs between the months of June and October. The majority of snow occurs between October and April, with no snowfall recorded in the month of July.

Table D-3 presents the estimated mean monthly and annual rainfall, snowfall and total precipitation values, adjusted for under-catch.

Table D-3: Monthly Precipitation (Rainfall and Snowfall) Averages

Month	Rainfall (mm)	Snowfall (SWE, mm)	Total Precipitation (mm)
January	0.3	21.2	21.5
February	0.3	19.3	19.5
March	0.2	18.8	19.0
April	2.8	11.6	14.5
May	15.7	4.8	20.5
June	25.0	0.2	25.2
July	40.1	0.0	40.1
August	44.1	0.1	44.1
September	32.1	3.9	36.0
October	15.2	23.6	38.7
November	1.6	32.5	37.1
December	0.4	26.6	27.1
Annual	**172.3**	**160.6**	**333.0**

Source: Golder (2011).

Note:

Precipitation data recorded at Yellowknife Airport (1943 to 2006) from AHCCD database (EC 2010).

Data presented does not include losses due to snow sublimation, snow redistribution.

The annual values may not total exactly due to rounding.

Annual extreme precipitation (rainfall and snowfall) quantities at site, for different return periods, are shown in Table D-4 for wet and dry year conditions.

Table D-4: Annual Rainfall and Snowfall Extreme Quantities

	Return Period (years)	Rainfall (mm)	Snowfall (cm)
Dry	25	99.0	94.7
	5	136.2	131.1
Median	2	174.5	165.7
Wet	5	217.6	202.6
	10	241.6	222.5
	25	268.0	243.0
	50	285.2	255.5
	100	300.9	266.0
	200	315.2	274.8
	500	332.6	284.4

Source: Golder (2011).

Note:

Rainfall and snowfall estimates were adjusted for undercatch. Because extreme rainfall and snowfall conditions may not occur in the same year, these values may not be added to estimate total annual precipitation values for corresponding return periods.

Extreme Precipitation Events

24-hour rainfall events for various return periods, estimated using the Intensity-Duration-Frequency curves published by Environment Canada for Yellowknife Airport Station, Station ID 2204100, are presented in Table D-5.

Table D-5: 24-Hour Rainfall Depths at Yellowknife Airport Climate Station (1963-1996)

Return Period (years)	Rainfall (mm)
2	26.4
5	40.5
10	49.8
25	61.6
50	70.3
100	79.0
500	101.1

Source: Golder (2011).

Probable Maximum Precipitation

Values for a local Probable Maximum Precipitation event (point PMP) at Giant mine are provided in Table D-6. The point PMP values can be used for most of the areas of the site which are characterized by small to medium size watersheds.

Table D-6: Estimated Total Point Peak Maximum Precipitation Rainfall Depths for Various Durations at Yellowknife Airport

Duration (hours)	Point PMP Rainfall Depth (mm)
0.5	83
1	96
2	121
6	191
12	244
24	328
48	343
72	354

Source: Golder (2017).

D-5 Spring Snowmelt

Spring snowmelt typically occurs in April and May. The spring freshet is defined as the period of peak snowmelt, which has a significant impact on runoff and stream discharge. Table D-7 presents the estimated snowpack depth and associated water content for various return periods, and with and without sublimation and/or blowing snow losses.

Table D-7: Snowmelt Rates for 14-day Events

Return Period (years)		14-day Snowmelt with 0% Sublimation (mm/day)	14-day Snowmelt with 34% Sublimation (mm/day)
Dry	5	9.4	6.2
Median	2	11.9	7.8
Wet	5	14.5	9.6
	10	15.9	10.5
	25	17.4	11.5
	50	18.2	12.0
	100	19.0	12.5
	200	19.6	13.0
	500	20.3	13.4

Source: Golder (2011).

D-6 Wind

Wind analysis is presented using the hourly wind speed and direction recorded at the Yellowknife Airport Climate station between 1953 and 2017. Wind characteristics (wind classes frequency distribution) are summarized in Table D-8.

Table D-8: Yellowknife Climate Station Wind Speed and Directions Frequencies (1953-2017)

Direction		Wind Classes (m/s)					
Cardinal or Intermediate	Sector Midpoint (degrees)	0.5 to 3.0	3.0 to 6.0	6.0 to 10.0	10.0 to 15.0	>= 15.0	Total (%)
N	0.0	2.08	3.12	2.00	0.18	0.00	7.38
NNE	22.5	1.60	2.29	1.18	0.08	0.00	5.15
NE	45.0	1.89	3.08	1.26	0.08	0.00	6.31
ENE	67.5	1.97	3.23	1.17	0.04	0.00	6.41
E	90.0	3.04	5.81	2.02	0.05	0.00	10.92
ESE	112.5	1.82	3.12	1.14	0.02	0.00	6.10
SE	135.0	1.89	3.15	1.22	0.04	0.00	6.30
SSE	157.5	2.11	4.48	2.34	0.10	0.00	9.04
S	180.0	2.40	4.71	1.97	0.09	0.00	9.16
SSW	202.5	1.15	1.45	0.30	0.00	0.00	2.89
SW	225.0	1.04	1.04	0.22	0.01	0.00	2.31
WSW	247.5	1.01	0.96	0.22	0.01	0.00	2.20
W	270.0	1.79	1.91	0.62	0.05	0.00	4.38
WNW	292.5	1.38	2.15	1.01	0.11	0.00	4.64
NW	315.0	1.50	2.78	1.75	0.19	0.01	6.23
NNW	337.5	1.29	2.36	1.64	0.19	0.01	5.49
	Sub-Total	*27.96*	*45.65*	*20.05*	*1.23*	*0.02*	*94.91*
						Calms	**5.09**
						Total	**100.00**

N = north; NNE = north-northeast; NE = northeast; ENE = east – northeast; E = east; ESE = east-southeast; SE = southeast; SSE = south-southeast; S = south; SSW = south-southwest; SW = southwest; WSW = west-southwest; W = west; WNW = west-northwest; NW = northwest; NNW = north-northwest; m/s= metres per second; > greater than; % = percent.

Wind analysis is presented using the hourly wind speed and direction recorded at the Yellowknife Airport Climate station between 1953 and 2017, for the open water season, June to October. During the open water season (June to October), the most frequent winds are from the east (approximately 11%), followed by south (approximately 9%) and south-southeast (approximately 9%). The calm frequency, time at which wind speeds are less than 0.5 m/s, is approximately 5.1% of the time. The wind rose for the open water season is presented in Figure D-1.

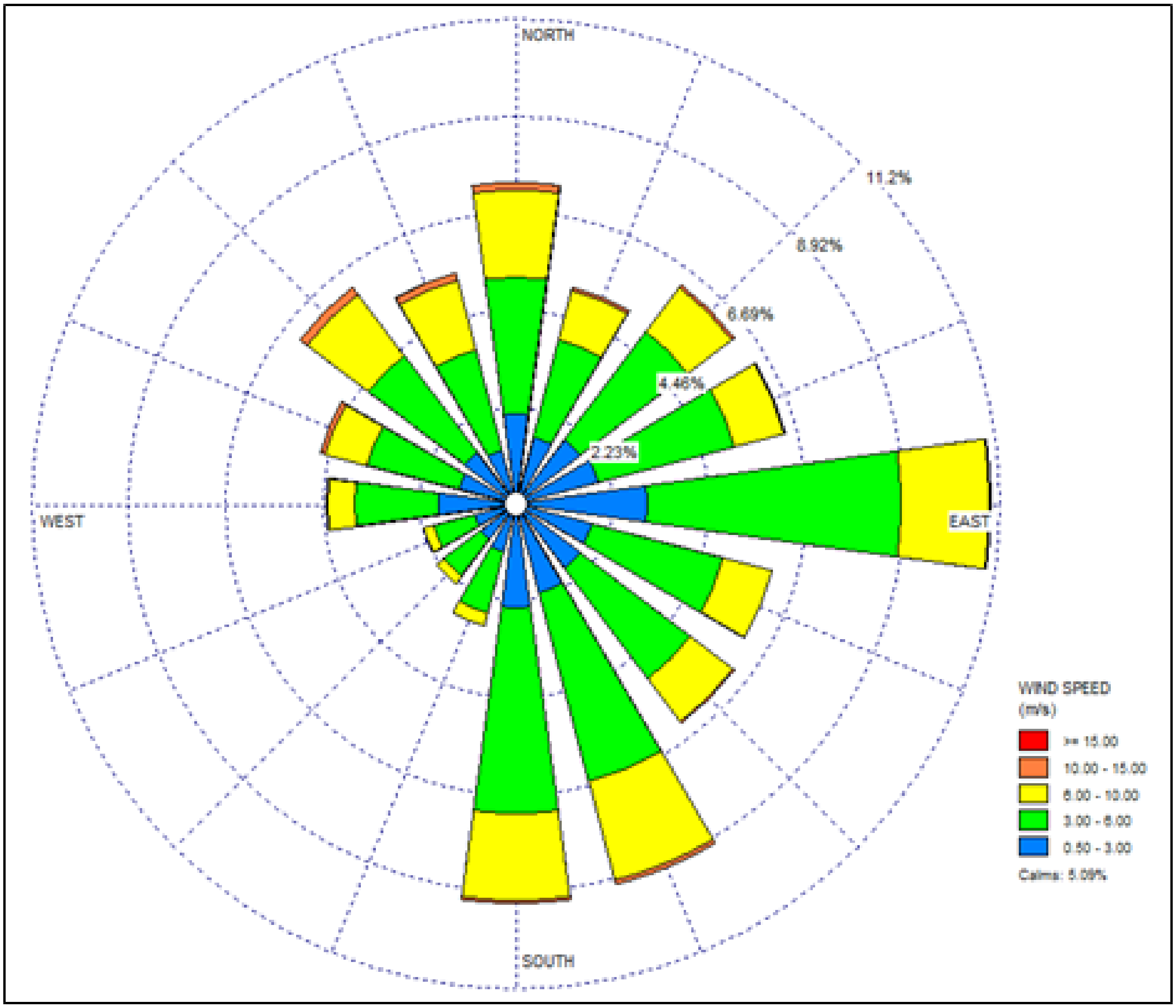


Figure D-1: Yellowknife Airport Wind-Rose (1953 to 2017)

D-7 Evaporation

Monthly lake evaporation rates are estimated using the Morton shallow lake evaporation method (Alberta Environment 2011) for the data range for which all climate factors are available (1972 to 2015). Data used includes:

- geographic factors
  - location
  - lake characteristics
- climatic factors, including data range available from EC (2017b).
  - air temperature (1942 to date)
  - solar radiation (1972 to 2005)
  - dew point temperature (1972 to 2012)
  - wind speed (1972 to 2012)

Evaporation occurs from March to October, and the estimated average lake evaporation for these months is presented in Table D-9.

Table D-9: Estimated Average Monthly Lake Evaporation

Month	Monthly Evaporation (mm)	Percentage of Total Evaporation (%)
March	2	0
April	52	10
May	95	18
June	129	25
July	129	25
August	83	16
September	31	6
October	3	1
Total	**524**	**100**

Note: Values derived from Morton model applied to small lakes using climate inputs measured at the Yellowknife Airport and The Canadian Weather Energy and Engineering Datasets (EC 2017b). The annual values may not total exactly due to rounding values.

D-8 References

Alberta Environment. 2011. Evaporation and Evapotranspiration Methods, Prepared by Golder for Alberta Environment Central Region, Red Deer. July 2011.

EC (Environment Canada). 2010. Adjusted Historical Canadian Climate Data (AHCCD). Retrieved October 2010 from: http://ec.gc.ca/dccha-ahccd/.

EC. 2017a. Adjusted and Homogenized Canadian Climate Data (AHCCD). https://open.canada.ca/en.

EC. 2017b. Historical Climate Data. Available online at https://climate.weather.gc.ca/.

Gibson, J.J. and Reid, R. 2010. Stable isotope fingerprint of open-water evaporation losses and effective drainage area fluctuation in a subarctic shield watershed. Journal of Hydrology 381, p. 142 – 150.

Golder (Golder Associates Ltd.). 2011. Design Basis Memo for Surface Water Drainage Infrastructure. Technical Memorandum. Project 09-1427-0006/5100/5110. 2011.

Golder. 2017. Giant Mine – Baker Creek Flood Hazard Assessment. Prepared for GMRP by Golder. November 2017.

Mekis, E. and Hogg, W.D. 1999. Rehabilitation and analysis of Canadian daily precipitation time series. Atmosphere-Ocean 37:53-85.

APPENDIX E

Water Balance

E-1 North Pond Water Balance

A water balance model for the North Pond was completed using GoldSim software based on the available concurrent set of complete climate and hydrological data 1972 to 2016 as shown in Figure E-1 and Figure E-2. The water balance does not include inputs to the tailings containment area (TCA) from mine operations e.g., tailings deposition or pumping from underground.

The North Pond water balance provides details on average expected conditions for the North Pond based on the available concurrent set of complete climate and hydrological data 1972 to 2016 as shown in Figure E-1 and Figure E-2. The water balance does not include inputs to the TCA from mine operations e.g., tailings deposition or pumping from underground.

During fall and winter, when temperatures are below freezing, snowfall was modeled as accumulated snowpack which reports as snowmelt during the spring freshet. Based on the assumption that the ground is typically frozen and infiltration is minimal when snowmelt occurs, the snowmelt runoff coefficient was estimated to be 1.0, for all area types. Runoff coefficients were applied as follows:

- Natural Ground = 0.4
- Rock = 0.74
- Ponds = 1.0

Lake evaporation, infiltration to groundwater, and lateral infiltration to Yellowknife Bay were combined into a single term representing the water losses in the water balance. The following assumptions were made:

- Evaporation only occurs within the pond area which constitutes a relatively small percentage of the total watershed area of the North Pond.
- Infiltration to ground water was correlated with the amount of water lost to the underground mine, which is unsupported by direct field observations.
- Water losses to deep groundwater are not significant due to the local permafrost regime and are not included in the model. Lateral infiltration to Yellowknife Bay was assumed at 5% of the total runoff generated within the North and Central ponds watershed, and 25% of runoff generated within the South Pond watershed (Golder 2016).
- Discharge from the North Pond represents the excess water stored within the pond after accounting for losses.

The results of the water balance indicate that, during the model simulation period, water had been released from the North Pond every year, occurring predominantly during the open water season (Figure E-1). Seasonal variability of water volumes within the North Pond was observed, with the highest volumes observed during spring freshet (April and May). Water inputs to the pond occurred throughout the summer months (July through October) and were highly responsive to rainfall events. During winter months (November through March) water inputs to the pond were generally absent (Figure E-2).

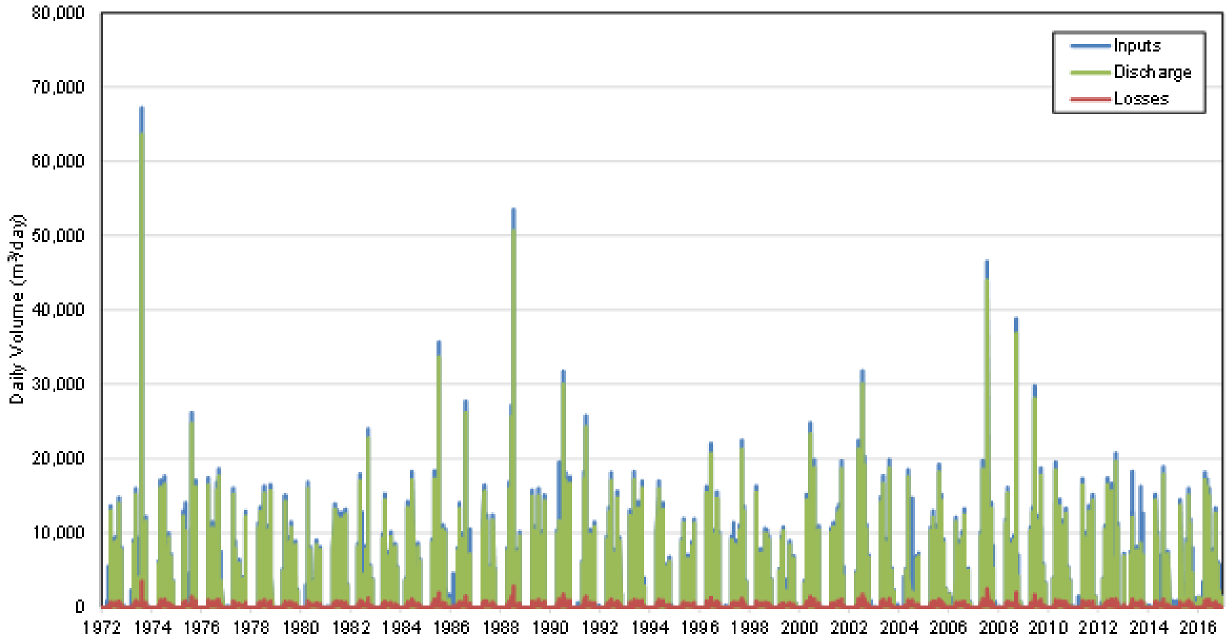


Figure E-1: Daily Water Volumes at North Pond between 1972 and 2016

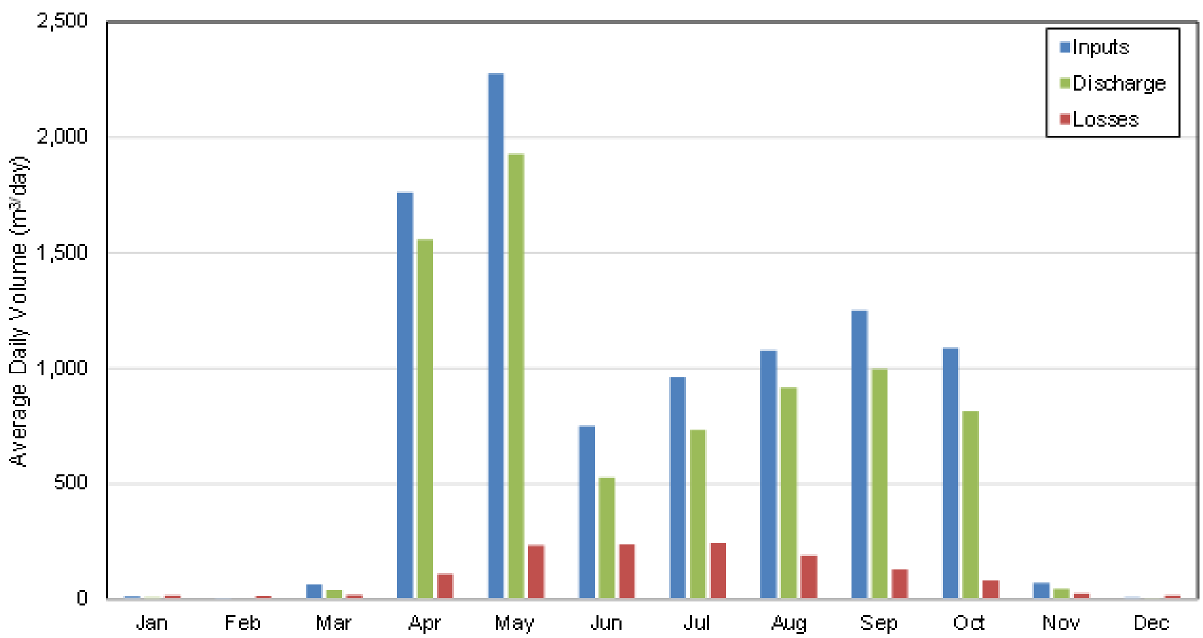


Figure E-2: Average Daily Water Volumes at North Pond for each Month (1972 to 2016)

E-2 Northwest Pond Water Balance

A water balance model for the Northwest Pond was completed using GoldSim software based on the available concurrent set of complete climate and hydrological data 1972 to 2016 as shown in Figures Figure E-3 and Figure E-4. The water balance does not include inputs to the TCA from mine operations e.g., tailings deposition or pumping from underground. This water balance provides details on average expected conditions for the Northwest Pond.

Water levels at the pond are highly influenced by water pumping activities from the underground into the pond and from the pond to the Effluent Treatment Plant. The model adopted the underground pumping rates to the Northwest Pond for the period between 2011 to 2016 (data prior to 2011 was not available).

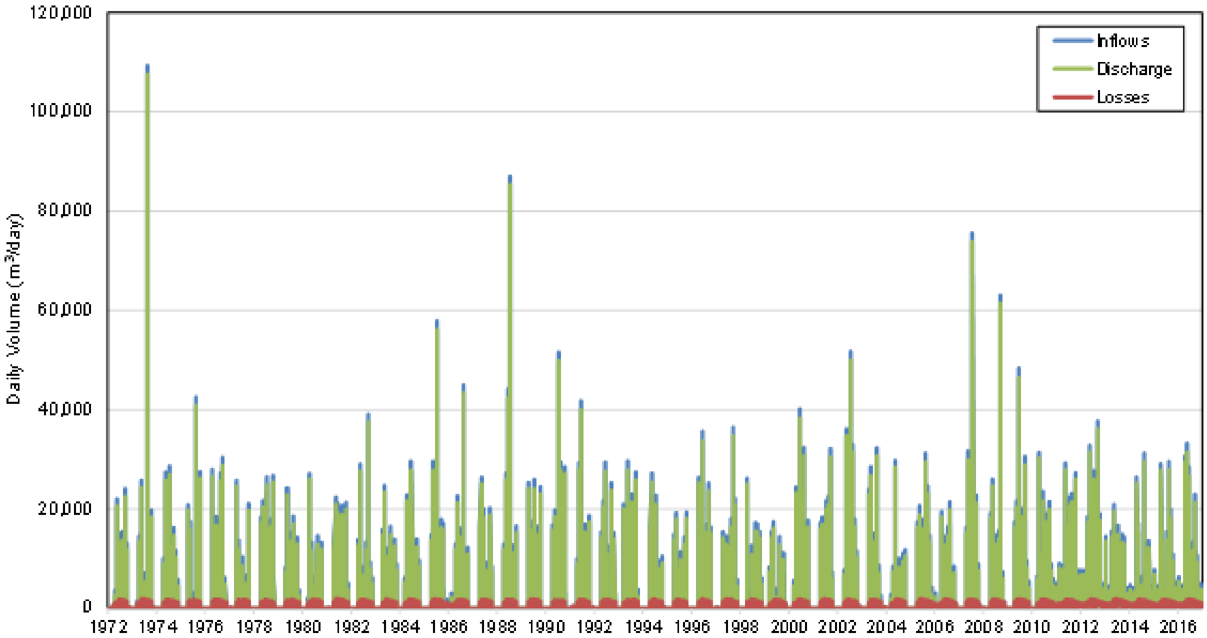
During fall and winter, when temperatures are below freezing, snowfall was modeled as accumulated snowpack which reports as snowmelt during the spring freshet. Based on the assumption that the ground is typically frozen and infiltration is minimal when snowmelt occurs, the snowmelt runoff coefficient was estimated to be 1.0, for all area types. Runoff coefficients were applied as follows:

- Natural Ground = 0.4
- Rock = 0.74
- Ponds = 1.0

Lake evaporation, infiltration to groundwater, and lateral infiltration to Trapper Creek were combined into a single term representing the water losses in the water balance. The following assumptions were made:

- Evaporation only occurs within the pond area which constitutes a relatively small percentage of the total watershed area of the Northwest Pond.
- Infiltration to ground water was correlated with the amount of water lost to the underground mine, which is unsupported by direct field observations.
- Water losses to deep groundwater are not significant due to the local permafrost regime and are not included in the model.
- Lateral infiltration to Trapper Creek was determined using Darcy’s Equation.

The results of the water balance indicate that, during the model simulation period, water had been released from the Northwest Pond every year and occurred predominantly during the open water season (Figure E-3). Seasonal variability of water volumes within the Northwest Pond was evident, with the highest volumes observed during spring freshet (April and May). Water inputs to the pond occurred throughout the summer months (July through October) and were highly dependent on rainfall events. During winter months (November through March) water inputs to the pond were generally absent (Figure E-4).



Note: 2011 to 2016 period includes pumping rates to the Northwest Pond from the underground mine.

Figure E-3: Modeled Daily Volumes at Northwest Pond between 1972 and 2016

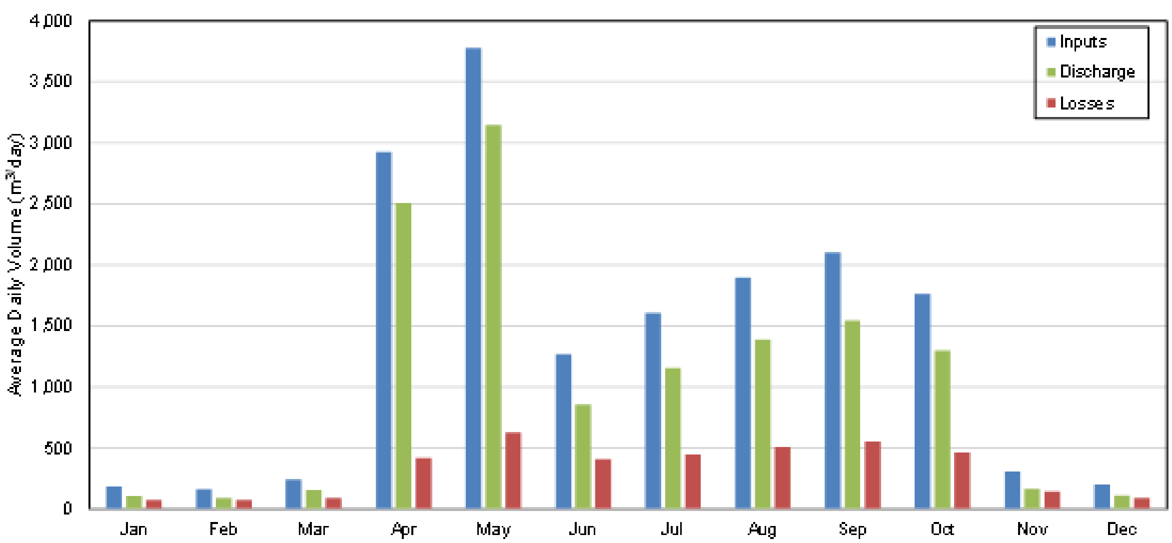


Figure E-4: Derived Daily Average Volumes at Northwest Pond each Month (1972 to 2016)

E-3 References

Golder (Golder Associates Ltd.). 2016. Present-day Arsenic Loading to Baker Creek and Yellowknife Bay. Prepared for Public Works and Government Services Canada, Yellowknife, NT, Canada. 30 November 2016.

APPENDIX F

Water Pond Elevations

Appendix G:
Water Pond Elevations

Polishing Pond Water Level (m)	Settling Pond Levels			
	Caution Warning Level		Notification Warning Level	
	Settling Pond > Polishing Pond (m)	Settling Pond < Polishing Pond (m)	Settling Pond > Polishing Pond (m)	Settling Pond < Polishing Pond (m)
174.8	175.00	174.60	174.85	174.75
174.7	174.90	174.50	174.75	174.65
174.6	174.80	174.40	174.65	174.55
174.5	174.70	174.30	174.55	174.45
174.4	174.60	174.20	174.45	174.35
174.3	174.50	174.10	174.35	174.25
174.2	174.40	174.00	174.25	174.15
174.1	174.30	173.90	174.15	174.05
173.9	174.10	173.70	173.95	173.85
173.7	173.90	173.50	173.75	173.65
173.5	173.70	173.30	173.55	173.45
173.3	173.50	173.10	173.35	173.25
173.1	173.30	172.90	173.15	173.05
172.9	173.10	172.70	172.95	172.85

Note:

Caution Warning Level Range

Notification Warning Level Range

Normal Water Range

Polishing Pond Water Level (m)	North Pond Levels			
	Caution Warning Level		Notification Warning Level	
	North Pond > Polishing Pond (m)	North Pond < Polishing Pond (m)	North Pond > Polishing Pond (m)	North Pond < Polishing Pond (m)
174.8	176.50	173.10	175.80	173.80
174.7	176.40	173.00	175.70	173.70
174.6	176.30	172.90	175.60	173.60
174.5	176.20	172.80	175.50	173.50
174.4	176.10	172.70	175.40	173.40
174.3	176.00	172.60	175.30	173.30
174.2	175.90	172.50	175.20	173.20
174.1	175.80	172.40	175.10	173.10
173.9	175.60	172.20	174.90	172.90
173.7	175.40	172.00	174.70	172.70
173.5	175.20	171.80	174.50	172.50
173.3	175.00	171.60	174.30	172.30
173.1	174.80	171.40	174.10	172.10
172.9	174.60	171.20	173.90	171.90

Note:

Caution Warning Level Range

Notification Warning Level Range

Normal Water Range

APPENDIX G

Inspection Forms

DAILY TCA INSPECTION	
Inspector:	Weather Conditions:
Date:	Wildlife Sightings:

	B2 Dam	**Dam 1**	**Dam 2**	**Splitter Dyke**	**Dam 21A**	**Dam 21B**	**Dam 21C**	**Dam 21D**	**Dam 22A**	**Dam 22B**
Classification Category	**Very High**	**High**	**High**	**Low**	**High**	**High**	**High**	**High**	**High**	**High**
Time										
Y= Yes, N=No										
Sinkholes										
Cracks										
Seeps										
Erosion										
Slope Failure										
Settlement										
Seepage at toe (cloudy/clear appearance)										
New Observation										

***IF ANY CONDITIONS ARE NEW OBSERVATIONS, MINE MANAGER SHOULD BE CONTACTED IMMEDIATELY

Additional Comments:

Inspector's Signature ______________________ Supervisor's Signature ______________________

Original Tailings Containment Area
Weekly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Carry out visual inspection of Original Tailings Containment Area starting at Dam 1 and proceeding clockwise
2) Note occurrence of features and provide description of any issues found (see visual reference guide)
3) Take photographic record
4) If at any point you observe unsafe conditions inform the Mine Manager immediately
5) On Completion this completed form should be returned to the Mine Manager's office for review and action (if required)
6) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Overall Comments:

Dam 1

Historic/Previous Issues:	Tension cracks and ongoing settlement of crest. Provide comparison of current and previous conditions. i.e. similar or increasing							
Estimated Freeboard:			**Polishing Pond Elevation:**					
Minimum Freeboard:	**1.4 m (Max Elevation of Polishing Pond: 174.8 m)**							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 2

Historic/Previous Issues:								
DIFFERENTIAL (max 1.7m):						**North Pond Elevation:**		
Minimum Freeboard:	North Pond - 1.7m							
Maximum Freeboard:	North Pond + 1.7m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Original Tailings Containment Area
Weekly Inspection Record Form

Dam 3								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.2 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 11								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Original Tailings Containment Area
Weekly Inspection Record Form

Dam 3C and Dam 3D

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.2 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 4

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Original Tailings Containment Area
Weekly Inspection Record Form

Dam 5								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dyke 6								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Original Tailings Containment Area
Weekly Inspection Record Form

Dam 7								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		Crest		Downstream Slope		Downstream Toe	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 8								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		Crest		Downstream Slope		Downstream Toe	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Original Tailings Containment Area
Weekly Inspection Record Form

Dam 9

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 12

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Original Tailings Containment Area
Weekly Inspection Record Form

Splitter Dyke								
Historic/Previous Issues:								
DIFFERENTIAL:				**Settling Pond Elevation:**				
Maximum Water Level: 174.8m								
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Completed Form Received by Mine Manager's Office			
Name:		**Date and Time:**	
Completed Form Reviewed by Mine Manager			
Name:		**Date and Time:**	
Follow Up Actions Required:			

Northwest Pond Tailings Containment Area
Weekly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Daily Inspections Completed Prior to Inspection:			

1) Carry out visual inspection of Northwest Pond Tailings Containment Area starting at Dam 21D and proceeding clockwise
2) Note occurrence or not of features and provide description of any issues found (see visual reference guide)
3) Take photographic record
4) If at any point you observe unsafe conditions inform the Mine Manager immediately
5) On Completion this completed form should be returned to the Mine Manager's office for review and action (if required)
6) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Overall Comments:

Dam 21A

Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 21B

Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Northwest Pond Tailings Containment Area
Weekly Inspection Record Form

Dam 21C

Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 21D

Historic/Previous Issues:	Cracking at downstream toe bench. Provide comparison of current and previous conditions. i.e. similar or increasing							
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Northwest Pond Tailings Containment Area
Weekly Inspection Record Form

Dam 22A

Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 22B

Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Completed Form Received by Mine Manager's Office			
Name:		**Date and Time:**	
Completed Form Reviewed by Mine Manager			
Name:		**Date and Time:**	
Follow Up Actions Required:			

B2 Dam (Baker Pond)
Weekly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Carry out visual inspection of B2 Dam
2) Note occurrence or not of features and provide description of any issues found (see visual reference guide)
3) Take photographic record
4) Read Piezometers and Barometer weekly between April and August
5) If at any point you observe unsafe conditions inform the Mine Manager immediately
6) On Completion this completed form should be returned to the Mine Manager's office for review and action (if required)
7) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Overall Comments:

B2 Dam

Historic/Previous Issues:	Seepage at downstream toe. Note if present, estimated flow rates and if clear or with sediment.		
Baker Creek Elevation:			
Estimated Freeboard:		**Maximum Water Level: 164.7m**	
Minimum Freeboard:	0.9m		

	Upstream Slope		Crest		Downstream Slope		Downstream Toe	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear of Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								

Comments:

Completed Form Received by Mine Manager's Office			
Name:		**Date and Time**	
Completed Form Reviewed by Mine Manager			
Name:		**Date and Time**	
Follow Up Actions Required:			

Mill Pond Stucture
Weekly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Carry out visual inspection of Mill Pond Structure
2) Note occurrence or not of features and provide description of any issues found (see visual reference guide)
3) Take photographic record
5) If at any point you observe unsafe conditions inform the Mine Manager immediately
6) On Completion this completed form should be returned to the Mine Manager's office for review and action (if required)
7) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

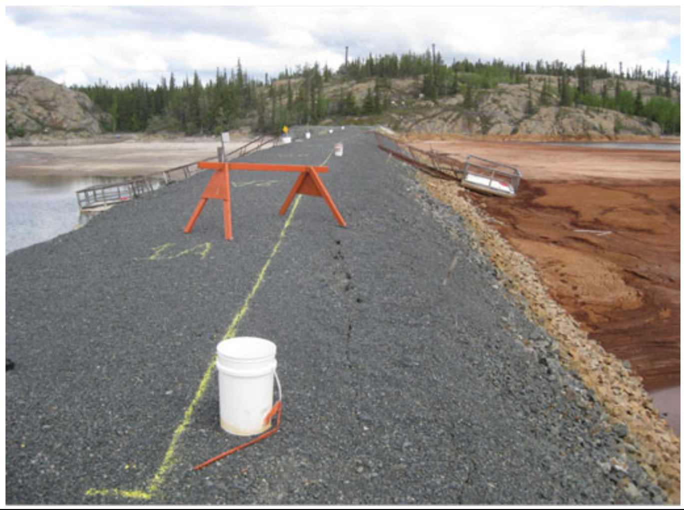
Overall Comments:

Mill Pond Structure

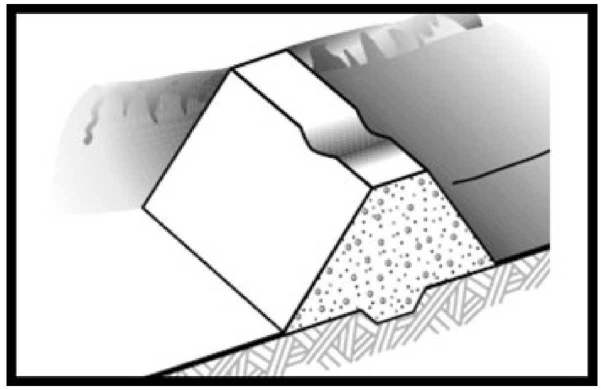
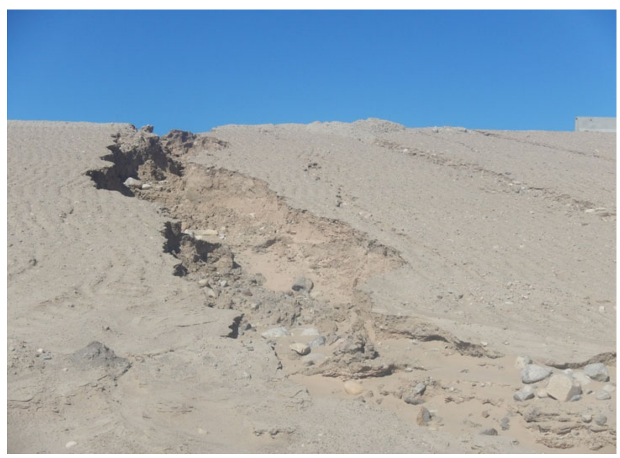
	Upstream Slope		Crest		Downstream Slope		Downstream Toe	
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:								
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear of Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Completed Form Received by Mine Manager's Office			
Name:		**Date and Time**	
Completed Form Reviewed by Mine Manager			
Name:		**Date and Time**	
Follow Up Actions Required:			

VISUAL REFERENCE GUIDE

INSPECTION ITEM	EXAMPLE IMAGE
Freeboard	
Longitudinal Cracks (Record Length, Width, and Depth)	
Transverse Cracks (Record Length, Width, and Depth)	

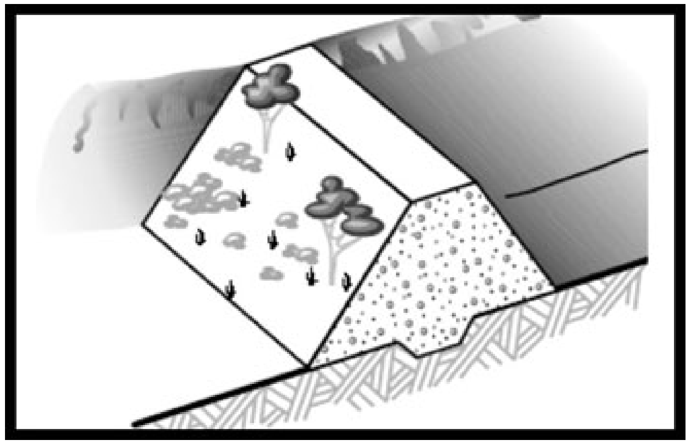
VISUAL REFERENCE GUIDE

INSPECTION ITEM	EXAMPLE IMAGE
Settlement (Record Length, Width, and Depth)	
Sinkhole (Record Size and Depth)	
Sloughing/Erosion (Record Size and Depth)	

VISUAL REFERENCE GUIDE

INSPECTION ITEM	EXAMPLE IMAGE
Sliding (Record length of slip as well as vertical and lateral movement)	
Seepage / Wet Areas on Slopes (Estimate flow and note whether clear or dirty')	
Seepage / Wet Areas at Toe (Estimate flow and note whether clear or dirty')	

VISUAL REFERENCE GUIDE

INSPECTION ITEM	EXAMPLE IMAGE
Vegetation Growth on Dam (Record species and size)	
Animal Burrows (Record depth and size)	

Original Tailings Containment Area
Monthly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Weekly and Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Review Follow-up actions from previous inspections
2) Carry out visual inspection of Original Tailings Containment Area starting at Dam 1 and proceeding clockwise
3) Note occurrence or not of features and provide description of any issues found
4) Take photographic record
5) Review requirements for quarterly surveys of instruments
6) Review OMS Manual and EPRP
7) File completed inspection form and send copy to Consulting Geotechnical Engineer
8) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Review of Previous Actions:

Overall Comments:

Dam 1

Historic/Previous Issues:	Tension cracks and ongoing settlement of crest. Provide comparison of current and previous conditions. i.e. similar or increasing							
Estimated Freeboard:			**Polishing Pond Elevation:**					
Minimum Freeboard:	**1.0m (Max Elevation of Polishing Pond: 175.0m)**							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								

Comments:

Settlement Plates (Measured Quarterly)			
Date of Last Survey:		**Date of Next Survey:**	
Survey Required:		**Survey Scheduled Date:**	
Survey Scheduled by:			

Survey Monuments (Measured Quarterly)			
Date of Last Survey:		**Date of Next Survey:**	
Survey Required:		**Survey Scheduled Date:**	

Original Tailings Containment Area
Monthly Inspection Record Form

Survey Scheduled by:								
Dam 2								
Historic/Previous Issues:								
DIFFERENTIAL (max 1.7m):					**North Pond Elevation:**			
Minimum Freeboard:	North Pond - 1.7m							
Maximum Freeboard:	North Pond + 1.7m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								
Dam 3								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								
Dam 11								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No

Original Tailings Containment Area
Monthly Inspection Record Form

Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 3C and Dam 3D

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		Crest		Downstream Slope		Downstream Toe	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 4

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		Crest		Downstream Slope		Downstream Toe	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 5

Historic/Previous Issues:	

Original Tailings Containment Area
Monthly Inspection Record Form

Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dyke 6

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 7

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Original Tailings Containment Area
Monthly Inspection Record Form

Dam 8								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 9								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 12								
Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:	1.0 m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	

Original Tailings Containment Area
Monthly Inspection Record Form

Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Splitter Dyke

Historic/Previous Issues:								
DIFFERENTIAL:					**Settling Pond Elevation:**			
Maximum Water Level: 175m								
Maximum Freeboard:	1.0m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Clear or Cloudy Seepage	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Review of Operational Maintenance and Surveillance Manual

Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Review of Emergency Preparedness and Response Plan

Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Original Tailings Containment Area Monthly Inspection Record Form			
Completed Form Filed			
Name:		**Date and Time:**	
Follow Up Actions Required:			

Northwest Pond Tailings Containment Area
Monthly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Weekly and Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Review Follow-up actions from previous inspections
2) Carry out visual inspection of Northwest Pond starting at Dam 21D and proceeding clockwise
3) Note occurrence or not of features and provide description of any issues found
4) Take photographic record
5) Review requirments for quarterly surveys of instruments
6) Review OMS Manual and EPRP
7) File completed inspection form and send copy to Consulting Geotechnical Engineer
8) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Review of Previous Actions:

Overall Comments:

Dam 21A

Historic/Previous Issues:

Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								

Comments:

Dam 21B

Historic/Previous Issues:

Northwest Pond Tailings Containment Area
Monthly Inspection Record Form

Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 21C

Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 21D

Historic/Previous Issues:	Cracking at downstream toe bench. Provide comparison of current and previous conditions. i.e. similar or increasing							
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								

Northwest Pond Tailings Containment Area Monthly Inspection Record Form	
Comments:	

Northwest Pond Tailings Containment Area
Monthly Inspection Record Form

Dam 22A								
Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Dam 22B								
Historic/Previous Issues:								
Estimated Freeboard:			**Maximum Water Level: 193.35m**					
Minimum Freeboard:	0.9m							
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Review of Operational Maintenance and Surveillance Manual			
Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Northwest Pond Tailings Containment Area
Monthly Inspection Record Form

Review of Emergency Preparedness and Response Plan			
Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Completed Form Filed			
Name:		**Date and Time:**	
Follow Up Actions Required:			

B2 Dam (Baker Pond)
Monthly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Weekly and Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Review Follow-up actions from previous inspections
2) Carry out visual inspection of B2 Dam
3) Carry out visual inspection of Baker Creek downstream of B2 Dam
4) Note occurrence oof features and provide description of any issues found
5) Take photographic record
6) Review requirments for quarterly surveys of instruments
7) Review OMS Manual and EPRP
8) File completed inspection form and send copy to Consulting Geotechnical Engineer
6) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Review of Previous Actions:

Overall Comments:

B2 Dam

Historic/Previous Issues:	Seepage at downstream toe. Note if present, estimated flow rates and if clear or with sediment							
Estimated Freeboard:								
Minimum Freeboard:								
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								

Comments:

B2 Dam (Baker Pond)
Monthly Inspection Record Form

Settlement Plates (Measured Quarerly)

Date of Last Survey:		**Date of Next Survey:**	
Survey Required:		**Survey Scheduled Date:**	
Survey Scheduled by:			

(Measured Monthly September to May)

	Readings		
	Piezometer (Lc) (B Units)	**Thermistor (Tc) (°C)**	**Barometer (Bc) (kPa)**
PZ-1			
PZ-2			
PZ-3			
PZ-4			
PZ-5			
PZ-6			
PZ-7			

Downstream Baker Creek

Historic/Previous Issues:			
	Creek Channel		**Comments**
Sloughing, Slide, Bulging	O Yes	O No	
Obstructions	O Yes	O No	
Vegetation Growth	O Yes	O No	
Animals/ Burrows	O Yes	O No	
Erosion	O Yes	O No	
Silt in base	O Yes	O No	
Photographs:			

Review of Operational Maintenance and Surveillance Manual

Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Review of Emergency Preparedness and Response Plan

Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Completed Form Filed

Name:		**Date and Time**	
Follow Up Actions Required:			

Mill Pond Structure
Monthly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Weekly and Daily Inspections Completed Prior to Inspection:			

Instructions:
1) Review Follow-up actions from previous inspections
2) Carry out visual inspection of Mill Pond Structure
3) Note occurrence oof features and provide description of any issues found
4) Take photographic record
5) Review requirments for quarterly surveys of instruments
6) Review OMS Manual and EPRP
7) File completed inspection form and send copy to Consulting Geotechnical Engineer
8) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Review of Previous Actions:

Overall Comments:

C1 Clay Borrow Dam

Historic/Previous Issues:

Estimated Freeboard:

Minimum Freeboard:

	Upstream Slope		Crest		Downstream Slope		Downstream Toe	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								

Comments:

Review of Emergency Preparedness and Response Plan

Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Completed Form Filed

Name:		**Date and Time**	
Follow Up Actions Required:			

C1 Clay Borrow Dam
Monthly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Weekly and Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Review Follow-up actions from previous inspections
2) Carry out visual inspection of C1 Clay Borrow Dam
3) Note occurrence oof features and provide description of any issues found
4) Take photographic record
5) Review requirments for quarterly surveys of instruments
6) Review OMS Manual and EPRP
7) File completed inspection form and send copy to Consulting Geotechnical Engineer
8) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Review of Previous Actions:

Overall Comments:

C1 Clay Borrow Dam

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:								
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								
Comments:								

Review of Emergency Preparedness and Response Plan

Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Completed Form Filed

Name:		**Date and Time**	
Follow Up Actions Required:			

DWC Dam
Monthly Inspection Record Form

Date:		**Inspected By:**	
Weather:			
Review of Weekly and Daily Inspections Completed Prior to Inspection:			

Instructions:

1) Review Follow-up actions from previous inspections
2) Carry out visual inspection of DWC Dam
3) Note occurrence oof features and provide description of any issues found
4) Take photographic record
5) Review requirments for quarterly surveys of instruments
6) Review OMS Manual and EPRP
7) File completed inspection form and send copy to Consulting Geotechnical Engineer
8) Very High and High Consequence Dams in RED. Significant Consequence Dams in ORANGE. Low Consequence Dams in BLUE

Review of Previous Actions:

Overall Comments:

DWC Dam

Historic/Previous Issues:								
Estimated Freeboard:								
Minimum Freeboard:								
	Upstream Slope		**Crest**		**Downstream Slope**		**Downstream Toe**	
Cracks	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Settlement	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sinkholes	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Erosion	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Sloughing, Slide, Bulging	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Wet or Seepage Areas	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Vegetation Growth	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Animal Burrows	O Yes	O No	O Yes	O No	O Yes	O No	O Yes	O No
Photographs:								

Comments:

Review of Emergency Preparedness and Response Plan

Date of Last Revision:		**Reflects Current Conditions:**	
Comments/Amendments Required			

Completed Form Filed

Name:		**Date and Time**	
Follow Up Actions Required:			

APPENDIX H

Instrumentation Installation Details and Instrument Calibration Certificates

Table H-1: Instrumentation Installation Details

Dam	Instrument type	Instrument ID	Instrument Location	Installation						Note
				Instrument Depth (mbgs)*	Ground Surface Elevation (masl)	Instrument Elevation (masl)	Material Instrument Installed In	Installation Year		
Dam 1	Vibrating Wire Piezometer	D1-SD-01	Downstream toe	12.2	166.14	153.95	Clay	2018		Not returning signals since March 2022
		D1-SD-02	Central Downstream bench	7.9	172.02	164.10	Clay	2018		Functioning properly.
		D1-SD-03	North abutment	21.0	175.32	154.29	Sandy Silt	2018		Functioning properly
		D1-SD-05	South abutment	13.7	176.06	162.34	Sandy Silt	2018		Recording negative pressure
		D1-SD-06S	Max crest settlement area	14.3	173.77	159.44	Clay	2018		Functioning properly
		D1-SD-06D	Max crest settlement area	20.4	173.77	153.35	Silty Gravel and Sand	2018		Functioning properly
		D1-SD-21	Third downstream bench	4.6	171.40	166.87	Fill-Sand	2020		Functioning properly
		D1-SD-22	Northern downstream bench	4.6	170.90	166.33	Fill-Silty Sand	2020		Recording negative pressure
	Thermistor	D1-SD-09	Central Downstream bench	-0.3 to 18.5	172.19	Node 16 at 153.7	16 nodes in various soils	2018		Functioning properly except for Bead 1 and 15
		D1-SD-10	In inclined casing along the crest	4.8 to 30.7	175.80	Node 16 at 145.15	16 nodes in various soils	2020		Functioning properly
		D1-SD-11	In inclined casing along the crest	-0.9 to 25	175.00	Node 16 at 149.97	16 nodes in various soils	2020		Functioning properly
		D1-SD-12	In inclined casing along the crest	-0.2 to 25.8	175.10	Node 16 at 149.28	16 nodes in various soils	2020		Functioning properly
		D1-SD-13	In inclined casing along the crest	-1.8 to 24.1	175.40	Node 16 at 151.29	16 nodes in various soils	2020		Functioning properly
		D1-SD-14B	In inclined casing along the crest	10.4 to 36.3	175.80	Node 16 at 139.46	16 nodes in various soils	2020		Functioning properly except for Bead 1 and 15
		D1-SD-15	In inclined casing along the crest	-0.2 to 25.7	175.10	Node 16 at 149.38	16 nodes in various soils	2020		Functioning properly
		D1-SD-16	In inclined casing along the crest	0.6 to 26.5	175.10	Node 16 at 148.62	16 nodes in various soils	2020		Functioning properly
		D1-SD-17	In inclined casing along the crest	-1.8 to 24.1	175.20	Node 16 at 150.80	16 nodes in various soils	2020		Functioning properly
		D1-SD-18	First southern downstream bench	-1 to 20.9	175.00	Node 16 at 154.14	16 nodes in various soils	2020		Functioning properly
		D1-SD-19	First central downstream bench	-0.7 to 21.2	174.70	Node 16 at 153.48	16 nodes in various soils	2020		Functioning properly
		D1-SD-20	First northern downstream bench	2 to 23.9	174.70	Node 16 at 150.82	16 nodes in various soils	2020		Functioning properly
		D1-SD-21	Third downstream bench	-0.8 to 17.1	171.40	Node 16 at 154.35	16 nodes in various soils	2020		Functioning properly
	Settlement Plate	SP1	Upstream slope	0.0	177.48	177.48	Ground Surface	2002		Decommissioned in July 2022
		SP2	Upstream slope	0.0	177.32	177.32	Ground Surface	2002		Decommissioned in July 2022
		SP3	Downstream toe	0.0	167.70	167.70	Ground Surface	2002		Functioning properly
	Survey Monument	T01	Upstream slope	0.0		175.98	Ground Surface	2016		Decommissioned in July 2022
		T02	Upstream slope	0.0		175.86	Ground Surface	2016		Decommissioned in July 2022
		T03	Upstream slope	0.0		175.96	Ground Surface	2016		Decommissioned in July 2022
		T04	Upstream slope near crest	0.0		176.59	Ground Surface	2016		Decommissioned in October 2020
		T05	On crest	0.0		176.48	Ground Surface	2016		Decommissioned in October 2020
		T06	On crest	0.0		176.37	Ground Surface	2016		Decommissioned in October 2020
		T07	On crest	0.0		176.69	Ground Surface	2016		Decommissioned in October 2020
		T08	On crest	0.0		176.97	Ground Surface	2016		Decommissioned in October 2020
		T22-01	On crest	0.0		177.76	Ground Surface	2022		Functioning properly
		T22-02	On crest	0.0		177.60	Ground Surface	2022		Functioning properly
		T22-03	On crest	0.0		177.61	Ground Surface	2022		Functioning properly
		T22-04	On crest	0.0		177.61	Ground Surface	2022		Functioning properly
		T22-05	On crest	0.0		177.59	Ground Surface	2022		Functioning properly
	Survey Anchor	D1-SD-08	Bench downstream of Dam's crest	14.0	174.23	160.23	Silty Clay	2018		Functioning properly
		D1-SD-23	On protection berm downstream of Thermosyphon alignment	17.4	175.45	158.05	Clay	2020		Functioning properly
	Inclinometer	D1-SD-05	South abutment		176.06		31 nodes in various soils	2018		Functioning properly.
		D1-SD-06	Max crest settlement area		173.77		47 nodes in various soils	2018		Damaged. Not monitored since March 2022
		D1-SD-07	Max crest settlement area		174.19		47 nodes in various soils	2018		Damaged. Not monitored since March 2022
Splitter Dyke	Survey Monument	T1	Downstream crest	0.0		177.0	Ground surface	2022		Functioning properly
		T2	Upstream crest	0.0		176.9	Ground surface	2022		Functioning properly
		T3	Downstream crest	0.0		177.0	Ground surface	2022		Functioning properly
		T4	Upstream crest	0.0		177.3	Ground surface	2022		Functioning properly
		T5	Downstream crest	0.0		177.4	Ground surface	2022		Functioning properly
		T6	Upstream crest	0.0		177.2	Ground surface	2022		Functioning properly

Table H-1: Instrumentation Installation Details

Dam	Instrument type	Instrument ID	Instrument Location	Installation					Note
				Instrument Depth (mbgs)*	Ground Surface Elevation (masl)	Instrument Elevation (masl)	Material Instrument Installed In	Installation Year	
Dam 2	Standpipe Piezometer	D2-SD19-23	Upstream	4 to 7.0	186.72	182.7 to 179.7	Silty Clay / Clay	2019	Not monitored in 2020, 2021 and 2022
		D2-SD19-24	Crest	7.0 to 10.1	183.39	176.4 to 173.3	Sandy Silt / Gravel and Rockfill	2019	
		D2-SD19-25	Upstream	10.7 to 13.7	181.26	170.6 to 167.6	Tailings	2019	
		D2-SD19-26	Downstream	6.1 to 9.1	177.50	171.4 to 168.4	Tailings	2019	
		D2-SD19-27	Downstream	5.3 to 8.4	178.50	173.2 to 170.1	Fill Material / Tailings	2019	
	Thermistor	D2-SD19-25B	Upstream	5.0 to 20.4	181.10	Node 16 at 160.7	16 nodes in various soils	2019	Coupler damaged during snow removal on 10 Feb 2023. Repairs deemed unnecessary.
Dam 3	Standpipe Piezometer	D3-SD19-28	Upstream crest	22.6 to 25.6	187.83	165.2 to 162.2	Clayey Silt / Silty Clay	2019	Not monitored in 2020, 2021 and 2022
		D3-SD19-29	Upstream crest	14 to 17.1	188.10	174.1 to 117	Silty Clay / Gravel	2019	
		D3-SD19-31	Downstream	12.2 to 15.2	173.45	161.25 to 158.25	Silt / Silty Clay	2019	
Dam 4	Standpipe Piezometer	D4-SD19-01	South of the dam in South Pond	6.1 to 9.1	190.77	184.7 to 181.7	Gravel / Clayey Silt	2019	Not monitored in 2020, 2021 and 2022
		D4-SD19-02	Crest	6.1 to 9.1	190.52	184.4 to 181.4	Fill Material / Bedrock	2019	
		D4-SD19-03B	Crest	6.1 to 9.1	190.11	184 to 181	Fill Material / Bedrock	2019	Not monitored in 2020, 2021 and 2022
		D4-SD19-04	South of the dam in South Pond	8.4 to 11.5	188.62	180.2 to 177.1	Rockfill	2019	Not monitored in 2020, 2021 and 2022
		D4-SD19-21	South of the dam in South Pond	10.7 to 13.7	190.20	179.5 to 176.5	Fill Material	2019	Destroyed
Dam 5	Standpipe Piezometer	D5-SD19-05B	South of the dam in South Pond	6.1 to 9.1	191.10	185.0 to 182.0	Tailings / Silty Clay	2019	Not monitored in 2020, 2021 and 2022
Dam 11	Standpipe Piezometer	D11-SD19-19	Crest	7.0 to 10.1	190.62	183.6 to 180.5	Fill Material	2019	Not monitored in 2020, 2021 and 2022
		D11-SD19-20	Downstream of crest	8.5 to 11.6	184.66	176.2 to 173.1	Rockfill / Silty Clay	2019	
	Thermistor	D11-SD19-20	Downstream of crest	Above ground to 11.6	184.66	Node 16 at 173.06	Node 9 to 16 in various Soils	2019	Functioning properly
Dam 21A	Vibrating Wire Piezometer	D21A-SD19-32	Dam Crest	10.9	195.57	184.67	Bedrock	2023	Installed in March 2023. Data yet to be downloaded.
	Standpipe Piezometer	D21A-SD19-32	Dam crest	6.1 to 9.1	195.57	189.47 to 186.47	Organic Silt / Silty Clay	2019	Not monitored in 2020, 2021 and 2022
		D21A-SD19-33	Downstream toe	2.7 to 5.8	191.42	188.72 to 185.62	Rockfill / Bedrock	2019	No reading in 2019. Not monitored in 2020, 2021 and 2022.
	Thermistor	D21A-SD19-32	Dam crest	Above ground to 11	195.57	Node 16 at 184.57	Node 9 to 16 in various Soils	2019	Functioning properly
Dam 21B	Thermistor	D21B-SD19-17	Dam Crest	-0.4 to 26.0	194.78	Node 16 at 168.8	Node 2 to 16 in various Soils	2023	Functioning properly
	Standpipe Piezometer	D21B-SD19-15	Downstream bench	15.2 to 18.3	184.15	168.95 to 165.85	Silt / Silt and Sand	2019	Not monitored in 2020, 2021 and 2022
		D21B-SD19-16	Dam crest	12.2 to 15.2	195.04	182.84 to 179.84	Rockfill	2019	
		D21B-SD19-17	Dam crest	24.4 to 27.4	194.78	170.38 to 167.38	Silt / Sand and Silt	2019	
Dam 21C	Thermistor	D21C-SD19-14	Bench	-0.9 to 10.4	188.10	Node 16 at 177.7	Node 3 to 16 in various soils	2023	Functioning properly
		D21C-SD19-18	Downstream crest	-0.2 to 15.1	194.94	Node 16 at 179.8	Node 2 to 16 in various Soils	2023	Functioning properly
	Standpipe Piezometer	D21C-SD19-14	Bench	9.1 to 12.2	188.10	179.00 to 175.90	Clay / Silt and Sand	2019	Not monitored in 2020, 2021 and 2022
		D21C-SD19-18	Downstream crest	13.7 to 16.8	194.94	181.24 to 178.14	Peat / Bedrock	2019	
Dam 21D	Standpipe Piezometer	D21D-SD19-11	Dam crest	12.2 to 15.2	194.32	182.12 to 179.12	Fill Material / Silt	2019	Not monitored in 2020, 2021 and 2022
		D21D-SD19-12	Dam crest	12.2 to 15.2	194.39	182.19 to 179.2	Fill Material / Silty Clay	2019	
	Thermistor	D21D-SD19-13	Bench	Above ground to 12.2	187.46	Node 16 at 175.26	Node 8 to 16 in various Soils	2019	Functioning properly
Dam 22A	Thermistor	D22A-SD19-09	Dam Crest	-0.8 to 10.5	194.79	Node 16 at 184.3	Node 3 to 16 in various soils	2023	Functioning properly
		D22A-SD19-10	Downstream bench	-0.9 to 4.9	188.16	Node 16 at 183.2	Node 4 to 16 in various soils	2023	Functioning properly
	Standpipe Piezometer	D22A-SD19-09	Dam Crest	9.1 to 12.2	194.79	185.69 to 182.59	Silty Clay / Silty Sand	2019	Not monitored in 2020, 2021 and 2022
		D22A-SD19-10	Downstream bench	3.8 to 6.9	188.16	184.36 to 181.26	Silty Clay / Bedrock	2019	

Table H-1: Instrumentation Installation Details

Dam	Instrument type	Instrument ID	Instrument Location	Installation					Note
				Instrument Depth (mbgs)*	Ground Surface Elevation (masl)	Instrument Elevation (masl)	Material Instrument Installed In	Installation Year	
Dam 22B	Standpipe Piezometer	D22B-SD19-07	Downstream bench	10.7 to 13.7	188.22	177.52 to 174.52	Sandy Silt / Bedrock	2019	Not monitored in 2020, 2021 and 2022
		D22B-SD19-08	Dam Crest	13.7 to 16.8	194.27	180.57 to 177.47	Silt / Bedrock	2019	
	Thermistor	D22B-SD19-07	Downstream bench	-0.7 to 11.6	188.22	Node 16 at 176.6	Node 3 to 16 in various soils	2023	Functioning properly except node 15
		D22B-SD19-08	Dam Crest	1.7 to 17.0	194.27	Node 16 at 177.27	16 nodes in various Soils	2019	Functioning properly
Dam B2	Vibrating Wire Piezometer	B2-PZ-01	Upstream	2.9	165.25	162.37	Rockfill	2006	Functioning properly
		B2-PZ-02	Upstream	2.6	164.75	162.19	Rockfill	2006	Functioning properly
		B2-PZ-03	Upstream	2.7	164.50	161.81	Silty Clay	2006	Functioning properly
		B2-PZ-04	Upstream	2.6	164.00	161.45	Silty Clay	2006	Functioning properly
		B2-PZ-05	Upstream	2.8	165.00	162.17	Clay fill	2006	Functioning properly
		B2-PZ-06	Upstream	4.5	165.00	160.53	Silty Clay	2006	Functioning properly
		B2-PZ-07	Upstream	4.2	165.00	160.78	Silty Clay	2006	Functioning properly
		B2-PZ-08	Upstream	0.7	163.30	162.65	Silty Clay	2006	Not functioning since 2015
	Settlement Plate	S01	Downstream toe	0.3	167.50	167.20	Rockfill	2007	Functioning properly.
		S02	Downstream toe	0.3	167.12	166.82	Rockfill	2007	Functioning properly.
		S03	Downstream toe	0.3	166.77	166.47	Rockfill	2007	Functioning properly.
		S04	Downstream toe	0.3	166.60	166.30	Rockfill	2007	Functioning properly.
		S05	Downstream toe	0.3	166.55	166.25	Rockfill	2007	Functioning properly.
		S06	Downstream toe	0.3	166.77	166.47	Rockfill	2007	Functioning properly.
		S13	Upstream crest	0.3	168.05	167.75	Rockfill	2007	Functioning properly.
		S14	Upstream crest	0.3	167.84	167.54	Rockfill	2007	Functioning properly
		S15	Upstream crest	0.3	167.52	167.22	Rockfill	2007	Functioning properly
		S16	Upstream crest	0.3	167.51	167.21	Rockfill	2007	Functioning properly
		S17	Upstream crest	0.3	168.07	167.77	Rockfill	2007	Functioning properly
		S18	Upstream crest	0.3	168.28	167.98	Rockfill	2007	Functioning properly
		S19	Upstream crest	0.3	168.62	168.32	Rockfill	2007	Functioning properly
		S20	Upstream crest	0.3	168.94	168.64	Rockfill	2007	Functioning properly
		S21	Upstream toe	0.3	165.47	165.17	Rockfill	2007	Functioning properly.
		S22	Upstream toe	0.3	165.30	165.00	Rockfill	2007	Functioning properly.
		S23	Upstream toe	0.3	165.28	164.98	Rockfill	2007	Functioning properly.
	Survey Monument	S07	Upstream crest	0.0		167.64	Ground surface	2016	Functioning properly
		S08	Upstream crest	0.0		167.65	Ground surface	2016	Functioning properly
		S09	Upstream crest	0.0		167.64	Ground surface	2016	Functioning properly
		S10	Upstream crest	0.0		167.62	Ground surface	2016	Functioning properly
		S11	Upstream crest	0.0		167.70	Ground surface	2016	Functioning properly
		S12	Upstream crest	0.0		167.77	Ground surface	2016	Functioning properly
		S27	Downstream toe	0.0		166.43	Ground surface	2017	Functioning properly
		S28	Downstream toe	0.0		166.85	Ground surface	2017	Functioning properly
		S29	Downstream toe	0.0		166.69	Ground surface	2017	Functioning properly
		S30	Downstream toe	0.0		166.99	Ground surface	2017	Functioning properly
		S31	Downstream toe	0.0		167.41	Ground surface	2017	Functioning properly.
		S32	Downstream toe	0.0		167.78	Ground surface	2017	Functioning properly
		S33	Downstream toe	0.0		168.13	Ground surface	2017	Functioning properly
		S34	Downstream toe	0.0		168.47	Ground surface	2017	Pin bent due to heavy equipment, not monitored
		S24	Upstream toe	0.0		164.28	Ground surface	2007	Destroyed
		S25	Upstream toe	0.0		164.40	Ground surface	2007	Destroyed
		S26	Upstream toe	0.0		164.93	Ground surface	2007	Destroyed

* negative depth indicates above ground.

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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Golder Associates Ltd.
Model:		VW2100-0.7
Serial Number:		**VW50778**
Mfg Number:		P101579
Range:		700.0 kPa
Temperature:		23.0 °C
Barometric Pressure:		1018.3 millibars
Work Order Number:		217383
Cable Length:		20 meters
Cable Markings:		527770 m - 527789 m
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 kΩ

Applied Pressure (kPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (kPa)	Linearity Error (% FS)	Calculated Polynomial (kPa)	Polynomial Error (% FS)
0.0	9243	9236	9239	-1.3	-0.19	0.3	0.05
140.0	8547	8542	8544	139.9	-0.02	139.6	-0.06
280.0	7852	7847	7849	281.0	0.14	279.7	-0.04
420.0	7159	7155	7157	421.5	0.22	420.3	0.04
560.0	6473	6470	6472	560.8	0.11	560.5	0.07
700.0	5795	5796	5796	698.0	-0.28	699.6	-0.05
				Max. Error (%):	0.28		0.07

Linear Calibration Factor: **CF = 2.0307E-01 kPa/B unit**
Temperature Correction Factor: **Tk = 1.0407E-01 kPa/°C rise**

Polynomial Gage Factors:

A = 1.0200E-06 kPa/(B unit)² B = -2.1841E-01 kPa/B unit C = ________ kPa

Pressure is calculated with the following equations:
Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$
Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

Users must establish site zero readings for calculation purposes
Polynomial $C = -[A(L_0^2) + B(L_0)]$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in kPa
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz²/1000 ie: 1700 Hz = 2890 B units

	Date (dd/mm/yy)	VW Reading (B units)	Temperature (°C)	Baro (mbar)
Shipped Zero Readings:	5-Jun-18	9240	21.5	1016.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: I. Kurchavov IK Date: 5-Jun-18

Applied Science Technologists and Technicians of British Columbia 26732 JAMES CHU CTech

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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Golder Associates Ltd.
Model:		VW2100-0.7
Serial Number:		**VW50779**
Mfg Number:		P101580
Range:		700.0 kPa
Temperature:		23.0 °C
Barometric Pressure:		1017.5 millibars
Work Order Number:		217383
Cable Length:		20 meters
Cable Markings:		527790 m - 527809 m
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 kΩ

Applied Pressure (kPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (kPa)	Linearity Error (% FS)	Calculated Polynomial (kPa)	Polynomial Error (% FS)
0.0	8906	8894	8900	0.8	0.11	0.1	0.02
140.0	8145	8136	8140	139.7	-0.04	139.9	-0.02
280.0	7381	7374	7378	279.3	-0.09	279.9	-0.02
420.0	6615	6608	6612	419.5	-0.07	420.1	0.01
560.0	5846	5841	5844	560.1	0.01	560.2	0.03
700.0	5076	5076	5076	700.5	0.07	699.9	-0.02
				Max. Error (%):	0.11		0.03

Linear Calibration Factor: CF = 1.8301E-01 kPa/B unit
Temperature Correction Factor: Tk = 3.7975E-02 kPa/°C rise

Polynomial Gage Factors:

A = -3.3680E-07 kPa/(B unit)² B = -1.7831E-01 kPa/B unit C = ______ kPa

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

Users must establish site zero readings for calculation purposes
Polynomial $C = -[A(L_0^2) + B(L_0)]$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in kPa
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = $Hz^2/1000$ ie: 1700 Hz = 2890 B units

	Date (dd/mm/yy)	VW Reading (B units)	Temperature (°C)	Baro (mbar)
Shipped Zero Readings:	5-Jun-18	8898	21.5	1016.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: I. Kurchavov IK Date: 5-Jun-18

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Document Number.: ELL0130K

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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Golder Associates Ltd.
Model:		VW2100-0.7
Serial Number:		**VW50780**
Mfg Number:		P101581
Range:		700.0 kPa
Temperature:		23.0 °C
Barometric Pressure:		1017.5 millibars
Work Order Number:		217383
Cable Length:		20 meters
Cable Markings:		527750 m - 527769 m
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 kΩ

Applied Pressure (kPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (kPa)	Linearity Error (% FS)	Calculated Polynomial (kPa)	Polynomial Error (% FS)
0.0	9084	9077	9081	1.4	0.20	0.2	0.02
140.0	8303	8297	8300	139.5	-0.07	139.8	-0.03
280.0	7516	7510	7513	278.9	-0.16	279.9	-0.02
420.0	6723	6718	6721	419.1	-0.14	420.1	0.01
560.0	5926	5923	5924	560.0	0.00	560.2	0.03
700.0	5126	5127	5126	701.1	0.16	699.8	-0.02
				Max. Error (%):	0.20		0.03

Linear Calibration Factor: CF = **1.7695E-01 kPa/B unit**
Temperature Correction Factor: Tk = **1.0573E-01 kPa/°C rise**

Polynomial Gage Factors:

A = -6.1688E-07 kPa/(B unit)² B = -1.6819E-01 kPa/B unit C = ________ kPa

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

Users must establish site zero readings for calculation purposes
Polynomial $C = -[A(L_0^2) + B(L_0)]$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in kPa
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz²/1000 ie: 1700 Hz = 2890 B units

	Date (dd/mm/yy)	VW Reading (B units)	Temperature (°C)	Baro (mbar)
Shipped Zero Readings:	5-Jun-18	9083	21.6	1016.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: I. Kurchavov IK Date: 5-Jun-18

Applied Science Technologists and Technicians of British Columbia 26732 JAMES CHU CTech

rst INSTRUMENTS
innovation in geotechnical instrumentation

Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Golder Associates Ltd.
Model:		VW2100-0.7
Serial Number:		**VW50781**
Mfg Number:		P101582
Range:		700.0 kPa
Temperature:		23.0 °C
Barometric Pressure:		1017.5 millibars
Work Order Number:		217383
Cable Length:		25 meters
Cable Markings:		527724 m - 527749 m
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 kΩ

Applied Pressure (kPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (kPa)	Linearity Error (% FS)	Calculated Polynomial (kPa)	Polynomial Error (% FS)
0.0	8829	8819	8824	0.0	0.00	0.2	0.03
140.0	8121	8114	8118	139.8	-0.03	139.8	-0.03
280.0	7414	7407	7410	279.9	-0.02	279.7	-0.04
420.0	6704	6699	6701	420.3	0.04	420.1	0.02
560.0	5995	5991	5993	560.5	0.07	560.5	0.06
700.0	5291	5291	5291	699.5	-0.07	699.7	-0.04
			Max. Error (%):		0.07		0.06

Linear Calibration Factor: CF = **1.9801E-01** kPa/B unit
Temperature Correction Factor: Tk = **6.5839E-02** kPa/°C rise

Polynomial Gage Factors:

A = 1.1083E-07 kPa/(B unit)² B = -1.9958E-01 kPa/B unit C = ________ kPa

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

Users must establish site zero readings for calculation purposes
Polynomial $C = -[A(L_0^2) + B(L_0)]$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in kPa
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz²/1000 ie: 1700 Hz = 2890 B units

	Date (dd/mm/yy)	VW Reading (B units)	Temperature (°C)	Baro (mbar)
Shipped Zero Readings:	5-Jun-18	8822	21.5	1016.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: I. Kurchavov IK Date: 5-Jun-18

Applied Science Technologists and Technicians of British Columbia 26732 JAMES CHU CTech

Document Number.: ELL0130K

MIG0106B

innovation in geotechnical instrumentation

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Calibration Record

Vibrating Wire Piezometer

Customer: Golder Associates Ltd.
Model: VW2100-0.7
Serial Number: **VW50782**
Mfg Number: P101583
Range: 700.0 kPa
Temperature: 23.0 °C
Barometric Pressure: 1017.5 millibars
Work Order Number: 217383
Cable Length: 25 meters
Cable Markings: 527699 m - 527723 m
Cable Colour Code: Red / Black (Coil) Green / White (Thermistor)
Cable Type: EL380004
Thermistor Type: 3 kΩ

Applied Pressure (kPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (kPa)	Linearity Error (% FS)	Calculated Polynomial (kPa)	Polynomial Error (% FS)
0.0	8913	8904	8909	-0.1	-0.01	0.1	0.02
140.0	8206	8199	8202	139.9	-0.02	139.9	-0.02
280.0	7499	7492	7496	280.0	0.00	279.8	-0.02
420.0	6790	6786	6788	420.2	0.03	420.1	0.01
560.0	6083	6080	6081	560.3	0.04	560.3	0.04
700.0	5378	5378	5378	699.6	-0.05	699.8	-0.02
				Max. Error (%):	0.05		0.04

Linear Calibration Factor: CF = **1.9818E-01 kPa/B unit**
Temperature Correction Factor: Tk = **4.6077E-02 kPa/°C rise**

Polynomial Gage Factors:

A = 1.1091E-07 kPa/(B unit)² B = -1.9977E-01 kPa/B unit C = ________ kPa

Pressure is calculated with the following equations:
Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$
Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

Users must establish site zero readings for calculation purposes
Polynomial $C = -[A(L_0^2) + B(L_0)]$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in kPa
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = $Hz^2/1000$ ie: 1700 Hz = 2890 B units

	Date (dd/mm/yy)	VW Reading (B units)	Temperature (°C)	Baro (mbar)
Shipped Zero Readings:	5-Jun-18	8906	21.5	1016.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: I. Kurchavov IK Date: 5-Jun-18

Applied Science Technologists and Technicians of British Columbia
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Document Number.: ELL0130K
MIG0106B

innovation in geotechnical instrumentation

Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:		Golder Associates Ltd.
Model:		VW2100-0.7
Serial Number:		**VW50783**
Mfg Number:		P101584
Range:		700.0 kPa
Temperature:		23.0 °C
Barometric Pressure:		1018.3 millibars
Work Order Number:		217383
Cable Length:		30 meters
Cable Markings:		526169 m - 526198 m
Cable Colour Code:	Red / Black (Coil)	Green / White (Thermistor)
Cable Type:		EL380004
Thermistor Type:		3 kΩ

Applied Pressure (kPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (kPa)	Linearity Error (% FS)	Calculated Polynomial (kPa)	Polynomial Error (% FS)
0.0	9103	9089	9096	1.7	0.24	0.0	0.00
140.0	8299	8289	8294	139.7	-0.05	140.0	0.00
280.0	7491	7483	7487	278.6	-0.20	279.9	-0.01
420.0	6677	6669	6673	418.7	-0.19	420.0	0.00
560.0	5856	5851	5853	559.7	-0.04	560.1	0.01
700.0	5029	5029	5029	701.6	0.23	699.9	-0.01
				Max. Error (%):	0.24		0.01

Linear Calibration Factor: CF = 1.7209E-01 kPa/B unit
Temperature Correction Factor: Tk = 1.0325E-02 kPa/°C rise

Polynomial Gage Factors:

A = -7.4691E-07 kPa/(B unit)² B = -1.6154E-01 kPa/B unit C = ______ kPa

Pressure is calculated with the following equations:

Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$

Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

Users must establish site zero readings for calculation purposes

Polynomial $C = -[A(L_0^2) + B(L_0)]$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in kPa
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = $Hz^2/1000$ ie: 1700 Hz = 2890 B units

	Date (dd/mm/yy)	VW Reading (B units)	Temperature (°C)	Baro (mbar)
Shipped Zero Readings:	5-Jun-18	9095	21.6	1016.0

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: I. Kurchavov IK Date: 5-Jun-18

Applied Science Technologists and Technicians of British Columbia 26732 JAMES CHU CTech

Document Number.: ELL0130K

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Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Piezometer

Customer:	DI-CORP -CALGARY
Sales Order:	225862
Customer ID:	
Model:	VW2100-1.0
Serial Number:	VW70615
Mfg Number:	P121262
Range:	1.0 MPa
Cable Length:	35 meters
Cable Marking:	984606 m to 984641 m
Cable Type:	EL380004HDL
Cable Colour Code:	Red/Black (Coil) Green/White (Thermistor)
Thermistor Type:	3K

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	8748	8750	8749	-0.000	-0.02	0.000	0.04
0.200	7958	7958	7958	0.200	-0.04	0.200	-0.05
0.400	7164	7165	7164	0.400	0.01	0.400	-0.03
0.600	6371	6371	6371	0.601	0.06	0.600	0.02
0.800	5578	5579	5579	0.801	0.08	0.801	0.07
1.000	4794	4795	4794	0.999	-0.10	1.000	-0.04
Max Error (%)					0.10		0.07

Linear Calibration Factor: CF = **2.5269e-04** MPa/B unit
Temperature Correction Factor: Tk = **-1.2729e-04** MPa/°C rise

Polynomial Gauge Factor:
A = **2.6559e-10** MPa/(B unit)² B = **-2.5628e-04** MPa/B unit C = **calculate (see below)** MPa

Users must establish site zero readings for calculation purposes
Polynomial $C = -[A(L_0^2) + B(L_0)]$

Pressure is calculated with the following equations:
Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$
Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in MPa
B units = Hz²/1000 ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	29 Oct 2020	8735	21.7	1020.4

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Kailah Toews **Date:** 29/10/2020

Approved: Ora Nygren **Date:** 29/10/2020

MIG0106C

Calibration Record

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Monitor with Confidence

Vibrating Wire Piezometer

Customer:	DI-CORP -CALGARY
Sales Order:	225862
Customer ID:	
Model:	VW2100-1.0
Serial Number:	VW70616
Mfg Number:	P122291
Range:	1.0 MPa
Cable Length:	35 meters
Cable Marking:	984570 m to 984605 m
Cable Type:	EL380004HDL
Cable Colour Code:	Red/Black (Coil) Green/White (Thermistor)
Thermistor Type:	3K

Applied Pressure (MPa)	First Reading (B units)	Second Reading (B units)	Average Reading (B units)	Calculated Linear (MPa)	Linearity Error (%FS)	Calculated Polynomial (MPa)	Polynomial Error (%FS)
0.000	8859	8860	8860	0.001	0.09	0.000	0.03
0.200	8112	8113	8112	0.200	-0.05	0.200	-0.04
0.400	7360	7361	7361	0.399	-0.08	0.400	-0.02
0.600	6606	6607	6606	0.600	-0.03	0.600	0.02
0.800	5851	5852	5852	0.800	0.02	0.800	0.04
1.000	5098	5099	5099	1.000	0.04	1.000	-0.03
Max Error (%)					0.09		0.04

Linear Calibration Factor: CF = 2.6574e-04 MPa/B unit
Temperature Correction Factor: Tk = -8.2379e-05 MPa/°C rise

Polynomial Gauge Factor:
A = -3.4391e-10 MPa/(B unit)² **B = -2.6094e-04 MPa/B unit** **C = calculate (see below) MPa**

Users must establish site zero readings for calculation purposes
Polynomial $C = -[A(L_0^2) + B(L_0)]$

Pressure is calculated with the following equations:
Linear: $P = CF(L_0 - L) - Tk(T_0 - T) + (S_0 - S)$
Polynomial: $P = A(L^2) + B(L) + C - Tk(T_0 - T) + (S_0 - S)$

L_0, L = initial (installation) and current readings, in B units
T_0, T = initial (installation) and current temperature, in °C
S_0, S = initial (installation) and current barometric pressure readings, in MPa
B units = Hz²/1000 ie: 1700 Hz = 2890 B units

Shipped Zero Readings:	Date	VW Reading (B Units)	Temperature (°C)	Baro (mbar)
	29 Oct 2020	8846	21.7	1020.4

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Technician: Kailah Toews **Date:** 29/10/2020

Approved: Ora Nygren **Date:** 29/10/2020

MIG0106C

#1

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6219
Mfg Number		06-3828
Range:		70.0 kPa
Date of Calibration:		8-Mar-06
Temperature:		22.4 °C
Barometric Pressure:		996.6 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	9242	0.0	9243	0.0	9243	0.0	-0.06	0.00
14.0	8453	14.0	8455	14.0	8454	14.0	0.02	0.00
28.0	7667	28.0	7667	28.0	7667	28.0	0.06	0.01
42.0	6883	42.0	6882	42.0	6883	42.0	0.03	-0.01
56.0	6098	56.0	6098	56.0	6098	56.0	0.01	0.00
70.0	5315	70.0	5315	70.0	5315	70.0	-0.05	0.00
						Max. Error (%):	0.06	0.01

Linear Calibration Factor:	C.F.=	0.01782 kPa/B unit
Regression Zero:	At Calibration Bi =	9240.1 B unit
Temperature Correction Factor:	Tk =	0.03874 kPa/°C rise

Polynomial Gage Factors (kPa) A: 1.9349E-08 B: -0.018106 C: 165.69

Pressure is calculated with the following equations:
Linear, $P(kPa) = C.F. \times (Li - Lc) - [Tk (Ti - Tc)] + [0.10 (Bi - Bc)]$
Polynomial: $P(kPa)=A(Lc)^2+BLc+C+Tk(Tc-Ti)-[0.10(Bc-Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Mar-06	9236.0	23.3	992.4
Shipped Zero Readings:	20-Feb-07	9222.3	18.7	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: H.Chang HC Date: 20-Feb-07

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Applied Science Technologists and Technicians of British Columbia
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AScT

Document Number.: ELL0130H

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#2

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6216
Mfg Number		06-3825
Range:		70.0 kPa
Date of Calibration:		8-Mar-06
Temperature:		22.4 °C
Barometric Pressure:		996.6 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	9252	0.0	9252	0.0	9252	0.0	-0.07	-0.01
14.0	8645	14.0	8646	14.0	8646	14.0	0.02	0.01
28.0	8040	28.0	8040	28.0	8040	28.0	0.07	0.02
42.0	7437	42.0	7437	42.0	7437	42.0	0.04	-0.01
56.0	6835	56.0	6834	56.0	6835	56.0	-0.01	-0.02
70.0	6231	70.0	6232	70.0	6232	70.0	-0.04	0.01
						Max. Error (%):	0.07	0.02

Linear Calibration Factor:	C.F.=	0.02318 kPa/B unit
Regression Zero:	At Calibration Bi =	9250.0 B unit
Temperature Correction Factor:	Tk =	0.02870 kPa/°C rise

Polynomial Gage Factors (kPa) A: 3.3472E-08 B: -0.023699 C: 216.39

Pressure is calculated with the following equations:
Linear, P(kPa) = C.F. X (Li - Lc) - [Tk (Ti - Tc)] + [0.10 (Bi - Bc)]
Polynomial: $P(kPa)=A(Lc)^2+BLc+C+Tk(Tc-Ti)-[0.10(Bc-Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Mar-06	9243.0	23.8	992.4
Shipped Zero Readings:	20-Feb-07	9224.0	18.6	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: H.Chang HC Date: 20-Feb-07

Applied Science Technologists and Technicians of British Columbia 22724 A.C. AL CULLEY AScT

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

#3

Calibration Record

rst INSTRUMENTS
200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6223
Mfg Number		06-17611
Range:		70.0 kPa
Date of Calibration:		9-Oct-06
Temperature:		23.2 °C
Barometric Pressure:		994.2 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	9099	0.0	9100	0.0	9100	0.0	-0.07	-0.01
14.0	8286	14.0	8286	14.0	8286	14.0	0.04	0.03
28.0	7478	28.0	7478	28.0	7478	28.0	0.01	-0.04
42.0	6667	42.0	6667	42.0	6667	42.0	0.06	0.01
56.0	5859	56.0	5859	56.0	5859	56.0	0.03	0.01
70.0	5054	70.0	5053	70.0	5054	70.0	-0.07	-0.01
						Max. Error (%):	0.07	0.04

Linear Calibration Factor:	**C.F.=**	**0.01730**	**kPa/B unit**
Regression Zero:	**At Calibration Bi =**	**9096.8**	**B unit**
Temperature Correction Factor:	**Tk =**	**-0.02748**	**kPa/°C rise**

Polynomial Gage Factors (kPa) **A:** 1.8877E-08 **B:** -0.017568 **C:** 158.29

Pressure is calculated with the following equations:

Linear, $P(kPa) = C.F. \times (Li - Lc) - [Tk (Ti - Tc)] + [0.10 (Bi - Bc)]$

Polynomial: $P(kPa)=A(Lc)^2+BLc+C+Tk(Tc-Ti)-[0.10(Bc-Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Oct-06	9031.0	23.8	1003.2
Shipped Zero Readings:	20-Feb-07	9071.4	19.2	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = $Hz^2 / 1000$ ie: 1700Hz = 2890 B units

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Technician: H.Chang HC Date: 20-Feb-07

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

#4

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6217
Mfg Number		06-3826
Range:		70.0 kPa
Date of Calibration:		8-Mar-06
Temperature:		22.4 °C
Barometric Pressure:		996.6 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	9228	0.0	9228	0.0	9228	-0.1	-0.16	0.04
14.0	8461	14.0	8460	14.0	8461	14.0	0.00	-0.04
28.0	7694	28.0	7694	28.0	7694	28.1	0.13	-0.02
42.0	6934	42.0	6935	42.0	6935	42.1	0.08	-0.07
56.0	6168	56.0	6168	56.0	6168	56.2	0.22	0.18
70.0	5425	70.0	5426	70.0	5426	69.8	-0.28	-0.09
						Max. Error (%):	0.28	0.18

Linear Calibration Factor:	**C.F.=**	**0.01839 kPa/B unit**
Regression Zero:	**At Calibration Bi =**	**9222.0 B unit**
Temperature Correction Factor:	**Tk =**	**0.05158 kPa/°C rise**

Polynomial Gage Factors (kPa) **A:** 7.0581E-08 **B:** -0.019420 **C:** 173.23

Pressure is calculated with the following equations:
Linear, P(kPa) = C.F. X (Li - Lc) - [Tk (Ti - Tc)] + [0.10 (Bi - Bc)]
Polynomial: $P(kPa)=A(Lc)^2+BLc+C+Tk(Tc-Ti)-[0.10(Bc-Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Mar-06	9222.0	23.5	992.4
Shipped Zero Readings:	20-Feb-07	9206.0	18.3	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: H.Chang HC Date: 20-Feb-07

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This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

#5

rst INSTRUMENTS

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6222
Mfg Number		06-17610
Range:		70.0 kPa
Date of Calibration:		9-Oct-06
Temperature:		23.2 °C
Barometric Pressure:		994.2 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	8960	0.0	8962	0.0	8961	-0.1	-0.11	0.01
14.0	8102	14.0	8101	14.0	8102	14.0	0.01	-0.02
28.0	7244	28.0	7243	28.0	7244	28.1	0.09	0.00
42.0	6389	42.0	6388	42.0	6389	42.1	0.11	0.01
56.0	5539	56.0	5536	56.0	5538	56.0	0.03	0.01
70.0	4692	70.0	4688	70.0	4690	69.9	-0.13	-0.01
						Max. Error (%):	0.13	0.02

Linear Calibration Factor:	**C.F.=**	**0.01639 kPa/B unit**
Regression Zero:	**At Calibration Bi =**	**8956.2 B unit**
Temperature Correction Factor:	**Tk =**	**-0.03513 kPa/°C rise**

Polynomial Gage Factors (kPa) **A:** 3.5281E-08 **B:** -0.016868 **C:** 148.33

Pressure is calculated with the following equations:

Linear, $P(kPa) = C.F. \times (Li - Lc) - [Tk(Ti - Tc)] + [0.10(Bi - Bc)]$

Polynomial: $P(kPa) = A(Lc)^2 + BLc + C + Tk(Tc - Ti) - [0.10(Bc - Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Oct-06	8888.0	24.4	1003.2
Shipped Zero Readings:	20-Feb-07	8929.0	19.1	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: H.Chang HC Date: 20-Feb-07

Applied Science Technologists and Technicians of British Columbia 22724 A.C. AL CULLEY AScT

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

#6

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6218
Mfg Number		06-3827
Range:		70.0 kPa
Date of Calibration:		8-Mar-06
Temperature:		22.4 °C
Barometric Pressure:		996.6 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	9218	0.0	9218	0.0	9218	-0.1	-0.12	0.01
14.0	8411	14.0	8412	14.0	8412	14.0	0.01	-0.02
28.0	7606	28.0	7607	28.0	7607	28.1	0.10	0.00
42.0	6805	42.0	6805	42.0	6805	42.1	0.10	0.00
56.0	6006	56.0	6006	56.0	6006	56.0	0.04	0.02
70.0	5212	70.0	5212	70.0	5212	69.9	-0.14	-0.01
						Max. Error (%):	0.14	0.02

Linear Calibration Factor:	C.F.=	0.01747 kPa/B unit
Regression Zero:	At Calibration Bi =	9213.3 B unit
Temperature Correction Factor:	Tk =	0.05213 kPa/°C rise

Polynomial Gage Factors (kPa) A: 4.2019E-08 B: -0.018076 C: 163.06

Pressure is calculated with the following equations:
Linear, P(kPa) = C.F. X (Li - Lc) - [Tk (Ti - Tc)] + [0.10 (Bi - Bc)]
Polynomial: $P(kPa)=A(Lc)^2+BLc+C+Tk(Tc-Ti)-[0.10(Bc-Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Mar-06	9211.0	23.6	992.4
Shipped Zero Readings:	20-Feb-07	9200.0	18.5	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: H.Chang HC Date: 20-Feb-07

Applied Science Technologists and Technicians of British Columbia
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This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Calibration Record

#7

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6220
Mfg Number		06-17608
Range:		70.0 kPa
Date of Calibration:		9-Oct-06
Temperature:		23.2 °C
Barometric Pressure:		994.2 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	8873	0.0	8874	0.0	8874	-0.2	-0.22	0.04
14.0	8025	14.0	8024	14.0	8025	14.0	-0.01	-0.06
28.0	7176	28.0	7177	28.0	7177	28.1	0.19	-0.03
42.0	6335	42.0	6335	42.0	6335	42.2	0.22	0.01
56.0	5499	56.0	5499	56.0	5499	56.1	0.13	0.08
70.0	4679	70.0	4677	70.0	4678	69.8	-0.32	-0.05
						Max. Error (%):	0.32	0.08

Linear Calibration Factor:	**C.F.=**	**0.01667**	**kPa/B unit**
Regression Zero:	**At Calibration Bi =**	**8864.1**	**B unit**
Temperature Correction Factor:	**Tk =**	**-0.03195**	**kPa/°C rise**

Polynomial Gage Factors (kPa) **A:** 7.9312E-08 **B:** -0.017743 **C:** 151.23

Pressure is calculated with the following equations:
Linear, P(kPa) = C.F. X (Li - Lc) - [Tk (Ti - Tc)] + [0.10 (Bi - Bc)]
Polynomial: $P(kPa)=A(Lc)^2+BLc+C+Tk(Tc-Ti)-[0.10(Bc-Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Oct-06	8802.0	24.6	1003.2
Shipped Zero Readings:	20-Feb-07	8847.5	18.9	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Technician: H.Chang HC Date: 20-Feb-07

Applied Science Technologists and Technicians of British Columbia 22724 A.C. AL CULLEY AScT

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

#8

Calibration Record

200 - 2050 Hartley Ave., Coquitlam, British Columbia, Canada V3K 6W5
Tel: 604.540.1100 • Fax: 604.540.1005 • Toll Free: 1.800.665.5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Vibrating Wire Pressure Transducer

Customer:		DETON'CHO/NUNA JOINT VENTURE
Model:		VW2100-0.07
Serial Number:		VW6221
Mfg Number		06-17609
Range:		70.0 kPa
Date of Calibration:		9-Oct-06
Temperature:		23.2 °C
Barometric Pressure:		994.2 millibars
W.O. Number:		Q08162
Cable Length:		30 meters
Cable Colour Code:	red / black (coil)	green / white (thermistor)
Cable Insulation	Polyurethane	
Thermistor type:		3 Kohms

Applied Pressure (kPa)	First Reading (B units)	Applied Pressure (kPa)	Second Reading (B units)	Average Pressure (kPa)	Average Readings (B units)	Calculated Linear (kPa)	Linearity F.S. Error (%)	Polynomial Fit (% FS)
0.0	9048	0.0	9048	0.0	9048	0.0	-0.02	0.01
14.0	8225	14.0	8226	14.0	8226	14.0	-0.01	-0.02
28.0	7402	28.0	7401	28.0	7402	28.0	0.03	0.00
42.0	6580	42.0	6578	42.0	6579	42.0	0.04	0.01
56.0	5759	56.0	5758	56.0	5759	56.0	0.00	0.00
70.0	4939	70.0	4937	70.0	4938	70.0	-0.04	0.00
						Max. Error (%):	0.04	0.02

Linear Calibration Factor:	**C.F.=**	**0.01703 kPa/B unit**
Regression Zero:	**At Calibration Bi =**	**9047.0 B unit**
Temperature Correction Factor:	**Tk =**	**0.00012 kPa/°C rise**

Polynomial Gage Factors (kPa) **A:** **1.0801E-08** **B: -0.017181** **C: 154.57**

Pressure is calculated with the following equations:

Linear, P(kPa) = C.F. X (Li - Lc) - [Tk (Ti - Tc)] + [0.10 (Bi - Bc)]

Polynomial: $P(kPa)=A(Lc)^2+BLc+C+Tk(Tc-Ti)-[0.10(Bc-Bi)]$

	Date (dd/mm/yr)	VW Readout Pos. B (Li)	Temp °C (Ti)	Baro (Bi)
Factory Zero Readings:	17-Oct-06	8979.0	24.6	1003.2
Shipped Zero Readings:	20-Feb-07	9015.1	19.0	1001.0

Li, Lc = initial (at installation) and current readings
Ti, Tc = initial (at installation) and current temperature, in °C
Bi, Bc = initial (at installation) and current barometric pressure readings, in millibars
B units = B scale output of VW 2102, VW 2104, VW 2106 and DT 2011 readouts
B units = Hz^2 / 1000 ie: 1700Hz = 2890 B units

Applied Science Technologists and Technicians of British Columbia
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Technician: H.Chang HC Date: 20-Feb-07

This instrument has been calibrated using standards traceable to the NIST in compliance with ANSI Z540-1

Certificate of Compliance

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RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Thermistor Strings

Customer:	Golder Associates Ltd.	Number of Points:	18
Work Order:	217425	Length:	27 m
Thermistor Type:	3 kΩ		

This is to certify that Thermistor String S/N: TS4700 meets the RST Instruments specifications for the product.

Technician: J. Berg Date: 15 June 2018

THM0008B

Applied Science Technologists and Technicians of British Columbia
26732
JAMES CHU
CTech

Resistance versus Temperature Relationship 3000 Ohm NTC Thermistors

Ohms	Temp	Ohms	Temp	Ohms	Temp	Ohms	Temp	Ohms	Temp
201.1K	-50	16.60K	-10	2417	30	525.4	70	153.2	110
187.3K	-49	15.72K	-9	2317	31	507.8	71	149.0	111
174.5K	-48	14.90K	-8	2221	32	490.9	72	145.0	112
162.7K	-47	14.12K	-7	2130	33	474.7	73	141.1	113
151.7K	-46	13.39K	-6	2042	34	459.0	74	137.2	114
141.6K	-45	12.70K	-5	1959	35	444.0	75	133.6	115
132.2K	-44	12.05K	-4	1880	36	429.5	76	130.0	116
123.5K	-43	11.44K	-3	1805	37	415.6	77	126.5	117
115.4K	-42	10.86K	-2	1733	38	402.2	78	123.2	118
107.9K	-41	10.31K	-1	1664	39	389.3	79	119.9	119
101.0K	-40	9796	0	1598	40	376.9	80	116.8	120
94.48K	-39	9310	1	1535	41	364.9	81	113.8	121
88.46K	-38	8851	2	1475	42	353.4	82	110.8	122
82.87K	-37	8417	3	1418	43	342..2	83	107.9	123
77.99K	-36	8006	4	1363	44	331.5	84	105.2	124
72.81K	-35	7618	5	1310	45	321.2	85	102.5	125
68.30K	-35	7252	6	1260	46	311.3	86	99.9	126
64.09K	-33	6905	7	1212	47	301.7	87	97.3	127
60.17K	-32	6576	8	1167	48	282.4	88	94.9	128
56.51K	-31	6265	9	1123	49	283.5	89	92.5	129
53.10K	-30	5971	10	1081	50	274.9	90	90.2	130
49.91K	-29	56.92	11	1040	51	266.6	91	87.9	131
46.94K	-28	5427	12	1002	52	258.6	92	85.7	132
44.16K	-27	5177	13	965	53	250.9	93	83.6	134
39.13K	-25	4714	15	895.8	55	236.2	95	79.6	135
36.86K	-24	4500	16	863.3	56	229.3	96	77.6	136
34.73K	-23	4297	17	832.2	57	222.6	97	75.8	137
32.74K	-22	4105	18	802.3	58	216.1	98	73.9	138
30.87K	-21	3922	19	773.7	59	209.8	99	72.2	139
29.13K	-20	3748	20	746.3	60	203.8	100	70.4	140
27.49K	-19	3583	21	719.9	61	197.9	101	68.8	141
25.95K	-18	3426	22	694.7	62	192.2	102	67.1	142
24.51K	-17	3277	23	670.4	63	186.8	103	65.5	143
23.16K	-16	3135	24	647.1	64	181.5	104	64.0	144
21.89K	-15	3000	25	624.7	65	176.4	105	62.5	145
20.70K	-14	2872	26	603.3	66	171.4	106	61.1	146
19.58K	-13	2750	27	582.6	67	166.7	107	59.6	147
18.52K	-12	2633	28	562.8	68	162.0	108	58.3	148
17.53K	-11	2523	29	543.7	69	157.6	109	56.8	149
								55.6	150

Temperature calculated using:

Steinhart-Hart Linearization

$$T_C = \frac{1}{C_0 + C_1(\ln R) + C_3(\ln R)^3} - 273.15$$

3000 Ohm @ 25C NTC Thermistor

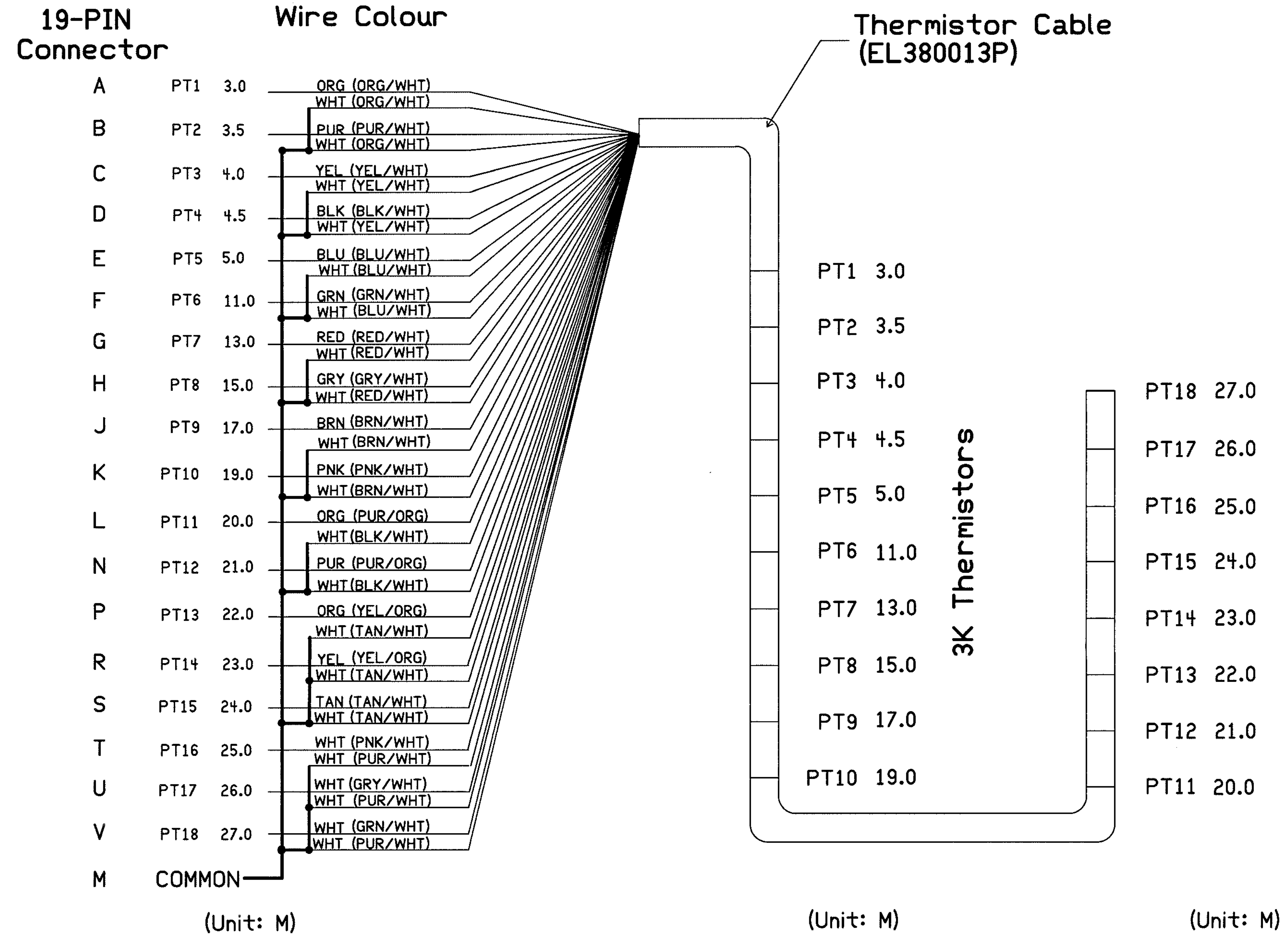
C_0= 0.0014051

C_1= 0.0002369

C_3= 0.0000001019

lnR= Natural Log of Resistance

T_c= Temperature in °C



S/N: TS4700

Co:	RST INSTRUMENTS LTD		
Title:	THERMISTOR CABLE-18PT/27M		
J/N:	THW0312/WO217425	Revision:	A
Author:	BL	Size:	A
Date:	2018-06-04	Sheet	1 of 1

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Certificate of Compliance

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e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Thermistor Strings

Customer: DI-Corp
Work Order: 225862
Thermistor Type: 3 kΩ

Number of Points: 16
Length: 23 m

This is to certify that Thermistor String S/N: TS5263 meets the RST Instruments specifications for the product.

Technician: J. Monsalvez J.M

Date: 29 October 2020

THM0008B

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e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Thermistor Strings

Customer: DI-Corp
Work Order: 225862
Thermistor Type: 3 kΩ

Number of Points: 16
Length: 27 m

This is to certify that Thermistor Strings S/N: TS5264 – TS5266 meet the RST Instruments specifications for the product.

Technician: J. Monsalvez J.M

Date: 29 October 2020

THM0008B

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Certificate of Compliance

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Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Thermistor Strings

Customer: DI-Corp
Work Order: 225862
Thermistor Type: 3 kΩ

Number of Points: 16
Length: 31 m

This is to certify that Thermistor Strings S/N: TS5267 – TS5270 meet the RST Instruments specifications for the product.

Technician: J. Monsalvez J.M

Date: 29 October 2020

THM0008B

OCT 29 2020
DATE
ZS
NAME

Certificate of Compliance

innovation in geotechnical instrumentation

RST Instruments Ltd., 11545 Kingston St., Maple Ridge, British Columbia, Canada V2X 0Z5
Tel: 604 540 1100 • Fax: 604 540 1005 • Toll Free: 1 800 665 5599 (North America only)
e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Thermistor Strings

Customer: DI-Corp
Work Order: 225862
Thermistor Type: 3 kΩ

Number of Points: 16
Length: 35 m

This is to certify that Thermistor Strings S/N: TS5271 – TS5273 meet the RST Instruments specifications for the product.

Technician: J. Monsalvez J.M

Date: 29 October 2020

THM0008B

OCT 29 2020
DATE
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NAME

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geotechnical
instrumentation

Certificate of Compliance

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e-mail: info@rstinstruments.com • Website: www.rstinstruments.com

Thermistor Strings

Customer: DI-Corp
Work Order: 225862
Thermistor Type: 3 kΩ

Number of Points: 16
Length: 41 m

This is to certify that Thermistor String S/N: TS5274 meets the RST Instruments specifications for the product.

Technician: J. Monsalvez J.M

Date: 29 October 2020

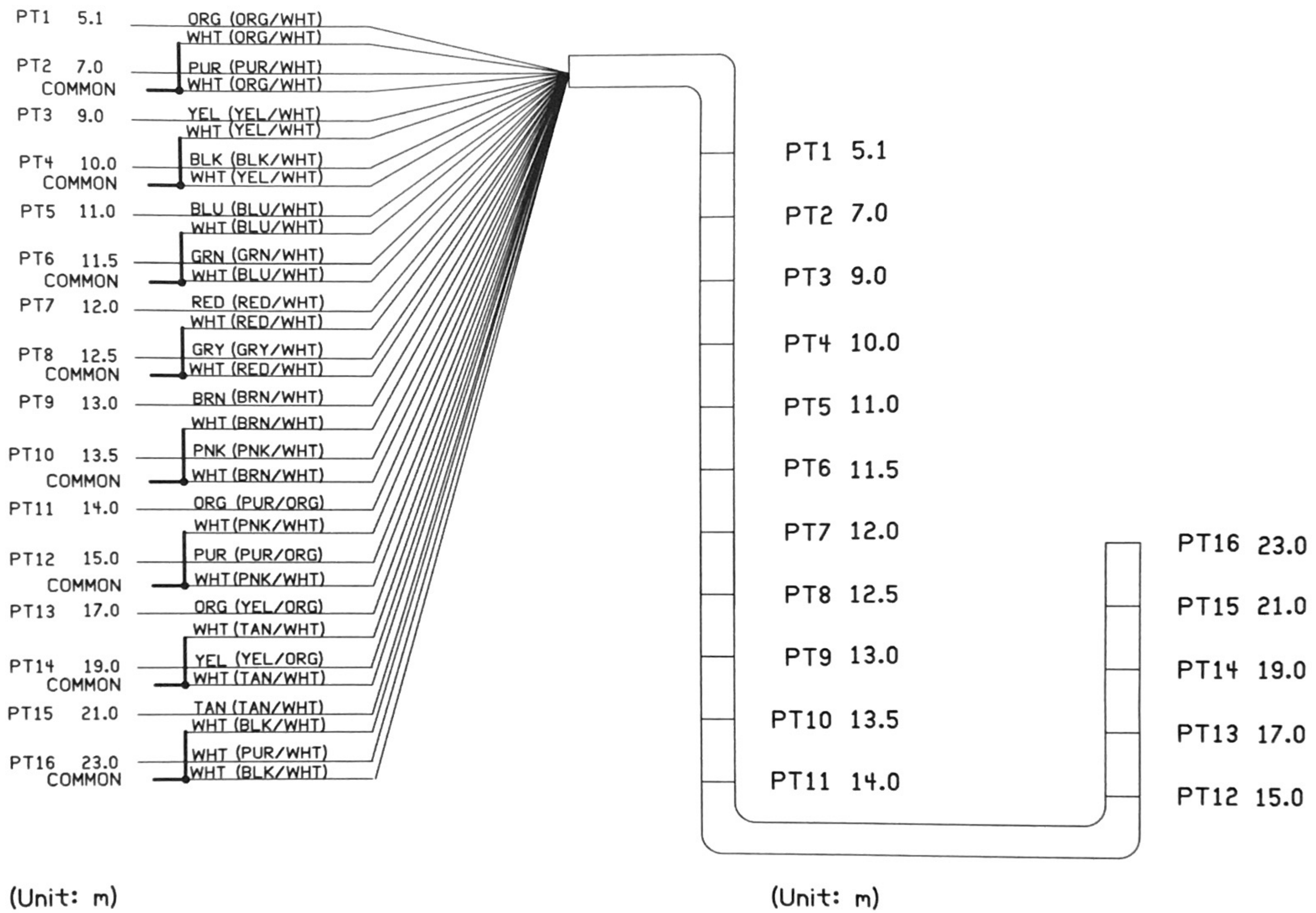
THM0006B

OCT 29 2020
DATE
ZS
NAME

Wire Colour

PT1, PT2, PT3 marked with red heat shrink

ORG (PUR/ORG) marked with black heat shrink

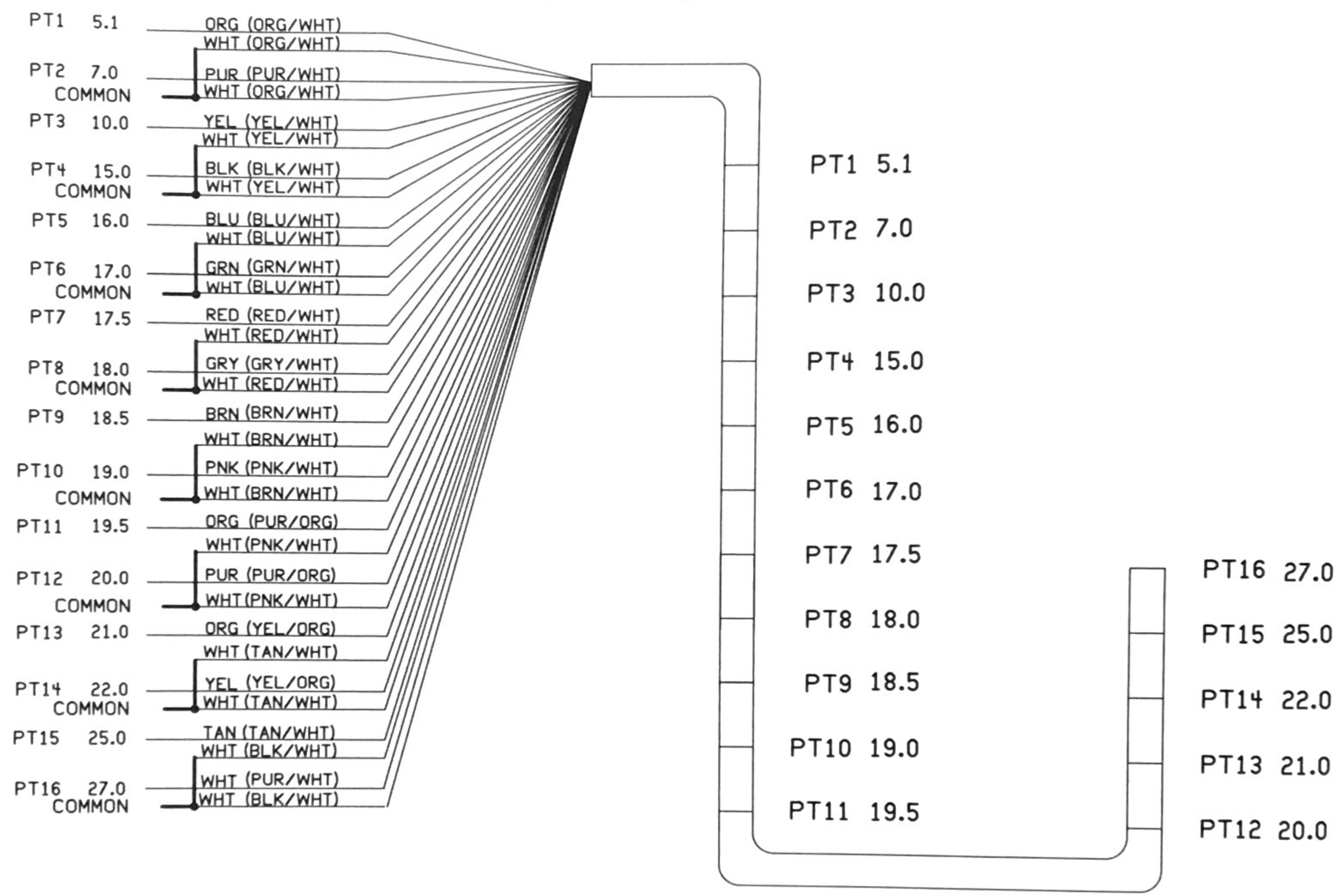


Serial Number(s):	TS5263
Cable Type:	EL380013P
No. of Points:	16
Thermistor Value:	3kOhm +/- 0.1degC

Co:	RST INSTRUMENTS LTD				
Title:	THERMISTOR CABLE - 16PT/23m				
J/N:	THW0425/S0225862			Revision:	A
Author:	OU	CHK'D	APPRV'D	Size:	A
Date:	2020-10-02				

Wire Colour

PT1, PT2, PT3 marked with red heat shrink
ORG (PUR/ORG) marked with black heat shrink



(Unit: m)

(Unit: m)

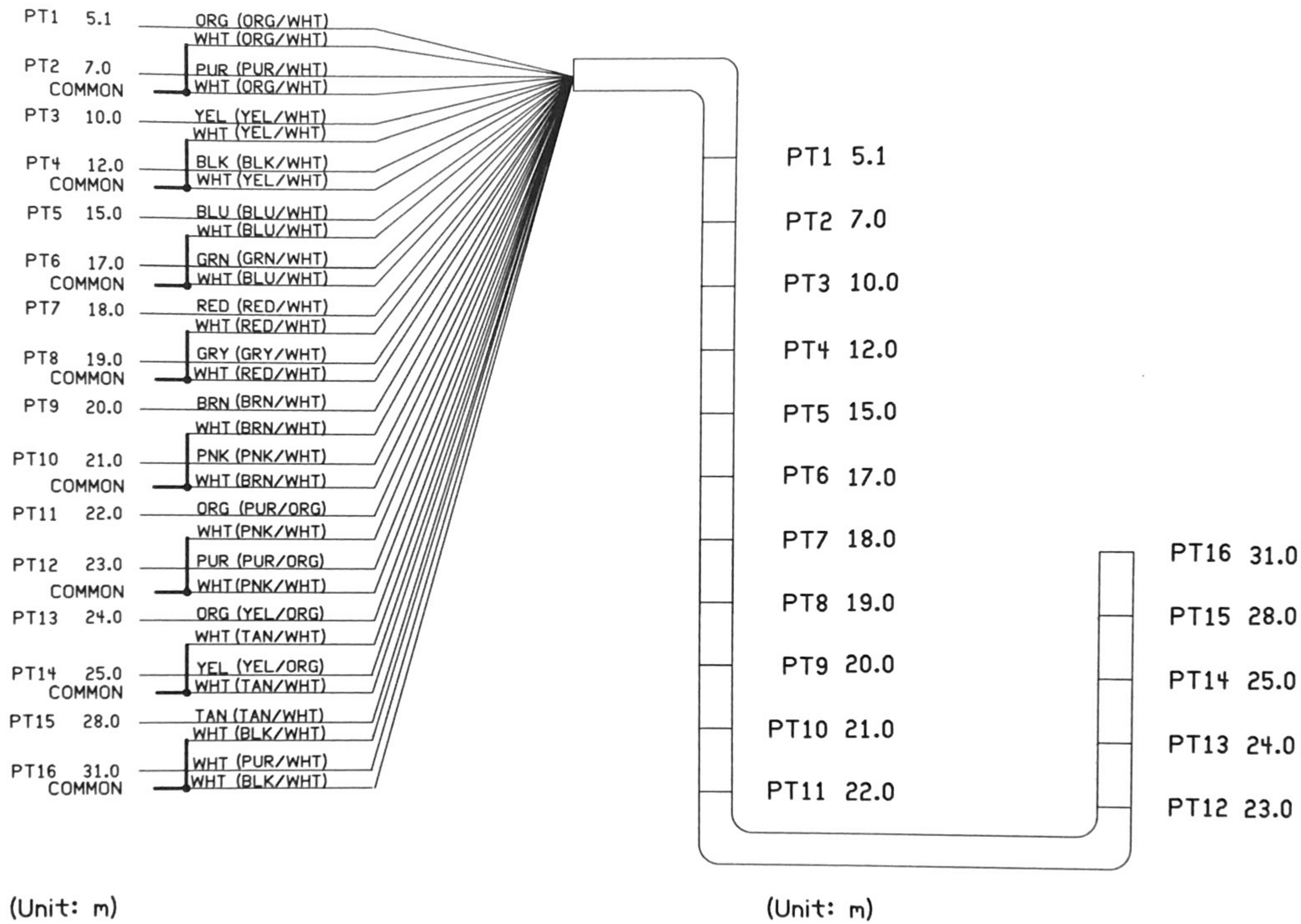
Serial Number(s):	TS5264-TS5266
Cable Type:	EL380013P
No. of Points:	16
Thermistor Value:	3kOhm +/- 0.1degC

Co:	RST INSTRUMENTS LTD			
Title:	THERMISTOR CABLE - 16PT/27m			
J/N:	THW0422/SO225862			Revision: A
Author:	OU	CHK'D	APPRV'D	Size: A
Date:	2020-10-02			

Wire Colour

PT1, PT2, PT3 marked with red heat shrink

ORG (PUR/ORG) marked with black heat shrink



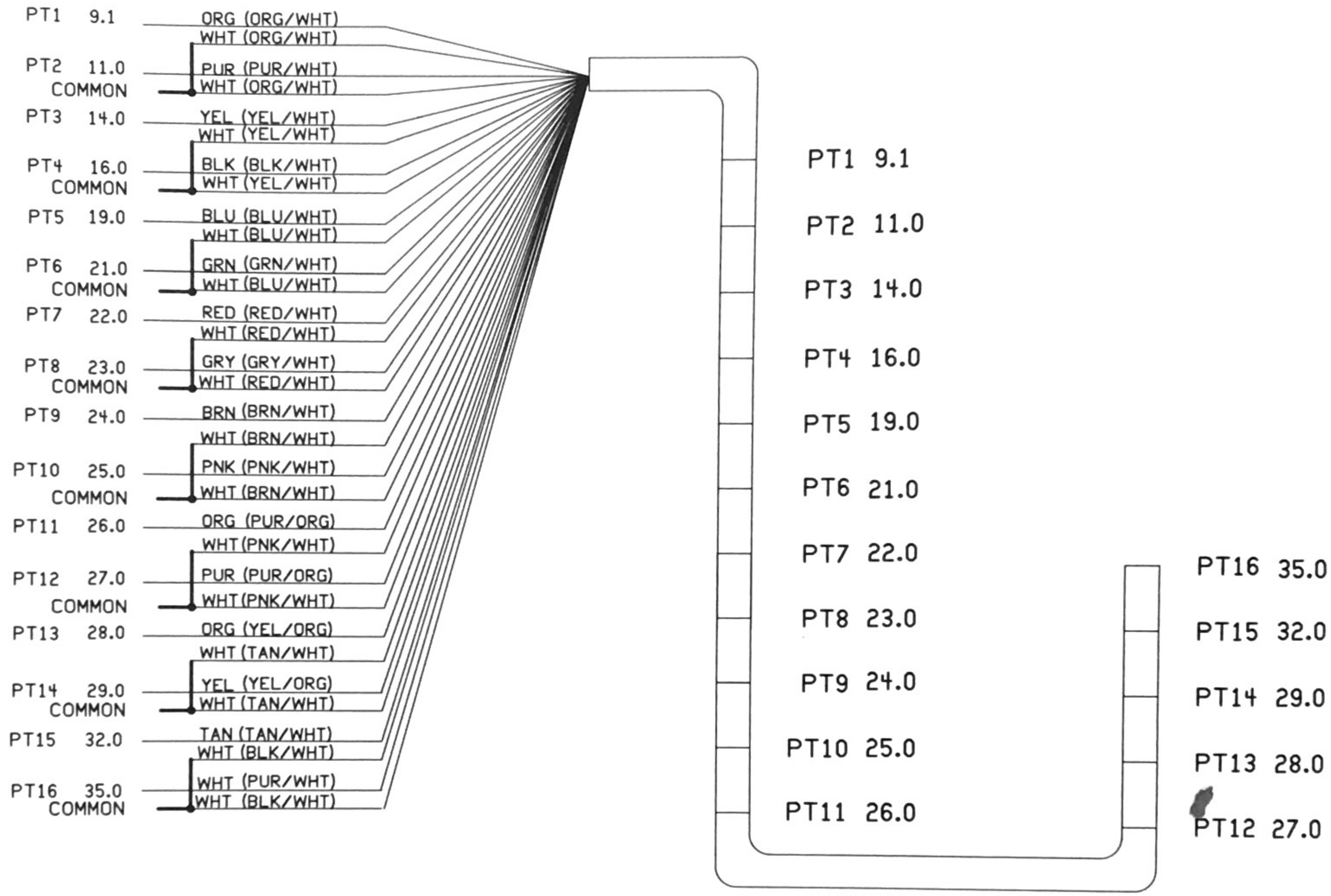
Serial Number(s):	TS5267-TS5270
Cable Type:	EL380013P
No. of Points:	16
Thermistor Value:	3kOhm +/- 0.1degC

Co:	RST INSTRUMENTS LTD		
Title:	THERMISTOR CABLE - 16PT/31m		
J/N:	THW0421/SO225862	Revision:	A
Author:	OU CHK'D APPRV'D	Size:	A
Date:	2020-10-02		

Wire Colour

PT1, PT2, PT3 marked with red heat shrink

ORG (PUR/ORG) marked with black heat shrink



(Unit: m)

(Unit: m)

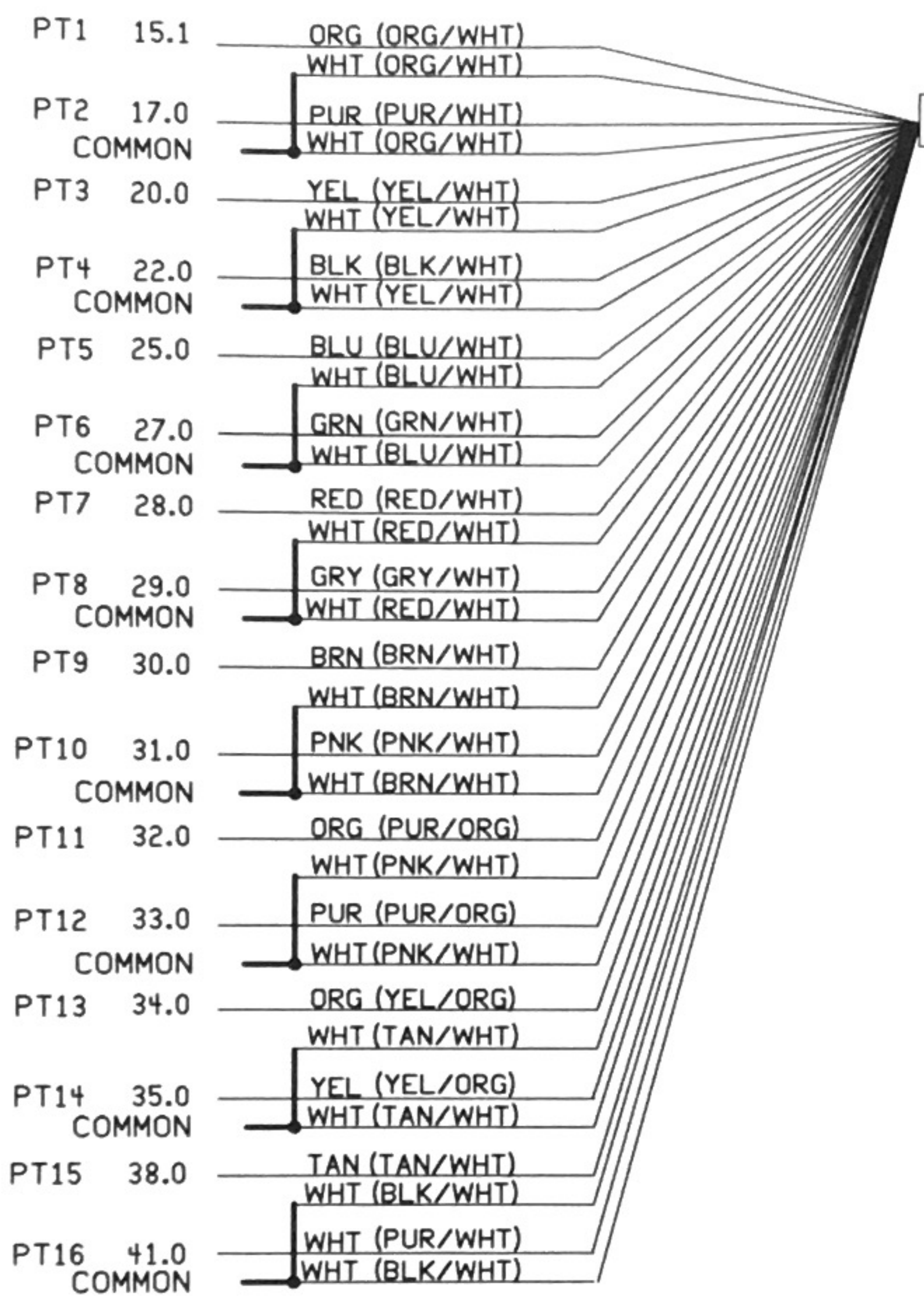
Serial Number(s):	TS5271-TS5273
Cable Type:	EL380013P
No. of Points:	16
Thermistor Value:	3kOhm +/- 0.1degC

Co:	RST INSTRUMENTS LTD				
Title:	THERMISTOR CABLE - 16PT/35m				
J/N:	THW0423/SO225862			Revision:	A
Author:	OU	CHK'D	APPRV'D	Size:	A
Date:	2020-10-02				

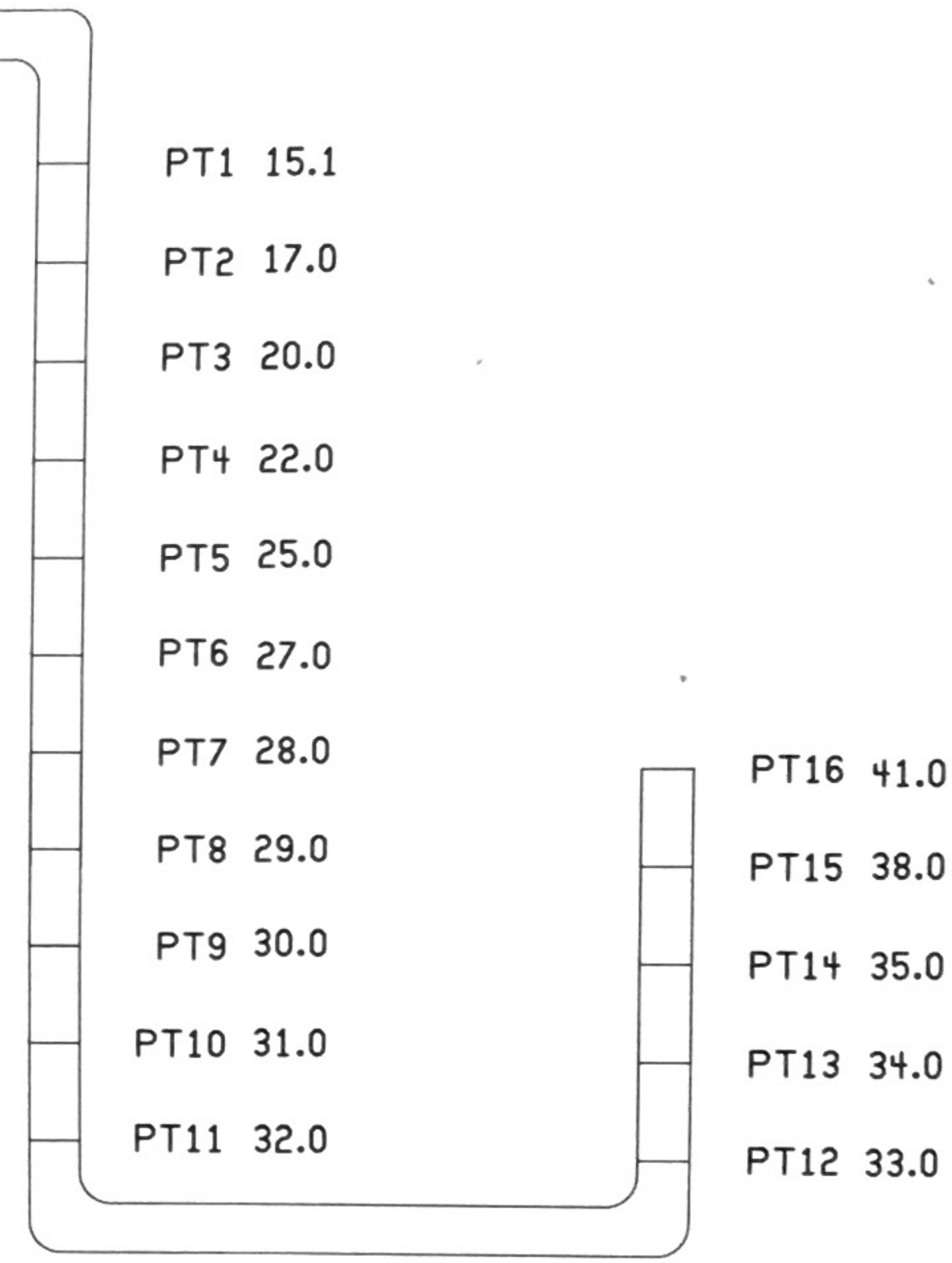
Wire Colour

PT1, PT2, PT3 marked with red heat shrink

ORG (PUR/ORG) marked with black heat shrink



(Unit: m)



(Unit: m)

Serial Number(s):	TS5274
Cable Type:	EL380013P
No. of Points:	16
Thermistor Value:	3kOhm +/- 0.1degC

Co:	RST INSTRUMENTS LTD				
Title:	THERMISTOR CABLE - 16PT/41m				
J/N:	THW0424/SO225862			Revision:	A
Author:	OU	CHK'D	APPRV'D	Size:	A
Date:	2020-10-02				

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