North Dam Weekly Walkover Survey Report

Date:	27/09/2017
Inspected By:	P Tamerene, Vinay Mallikal, Jian Chen
Conditions: (ie. snow on ground, clear)	Clear, new freezing, windy, clear

Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Downstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, seepage, etc.) same as before	Yes	(No)
Crest of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Thermosyphons North Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.) superficial rust as before	Yes	(No)
Thermosyphons South Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.) river rust same as before	Yes	(No)
Instrumentation (on crest and downstream side)		
Any visible concerns? (bent, rusted, cracked, etc.)	Yes	(No)
Thermistors and Dataloggers		
Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	(No)
Suspended Sediment in TIA (When not frozen)		
Any suspended sediment in Tail Lake?	Yes	(No)
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015) same as before	(Yes)	No

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

North Dam Weekly Walkover Survey Report

Date:	5/10/2017
Inspected By:	P TOMASONE
Conditions:	(ie. snow on ground, clear) Snow onground, covered previously observed features

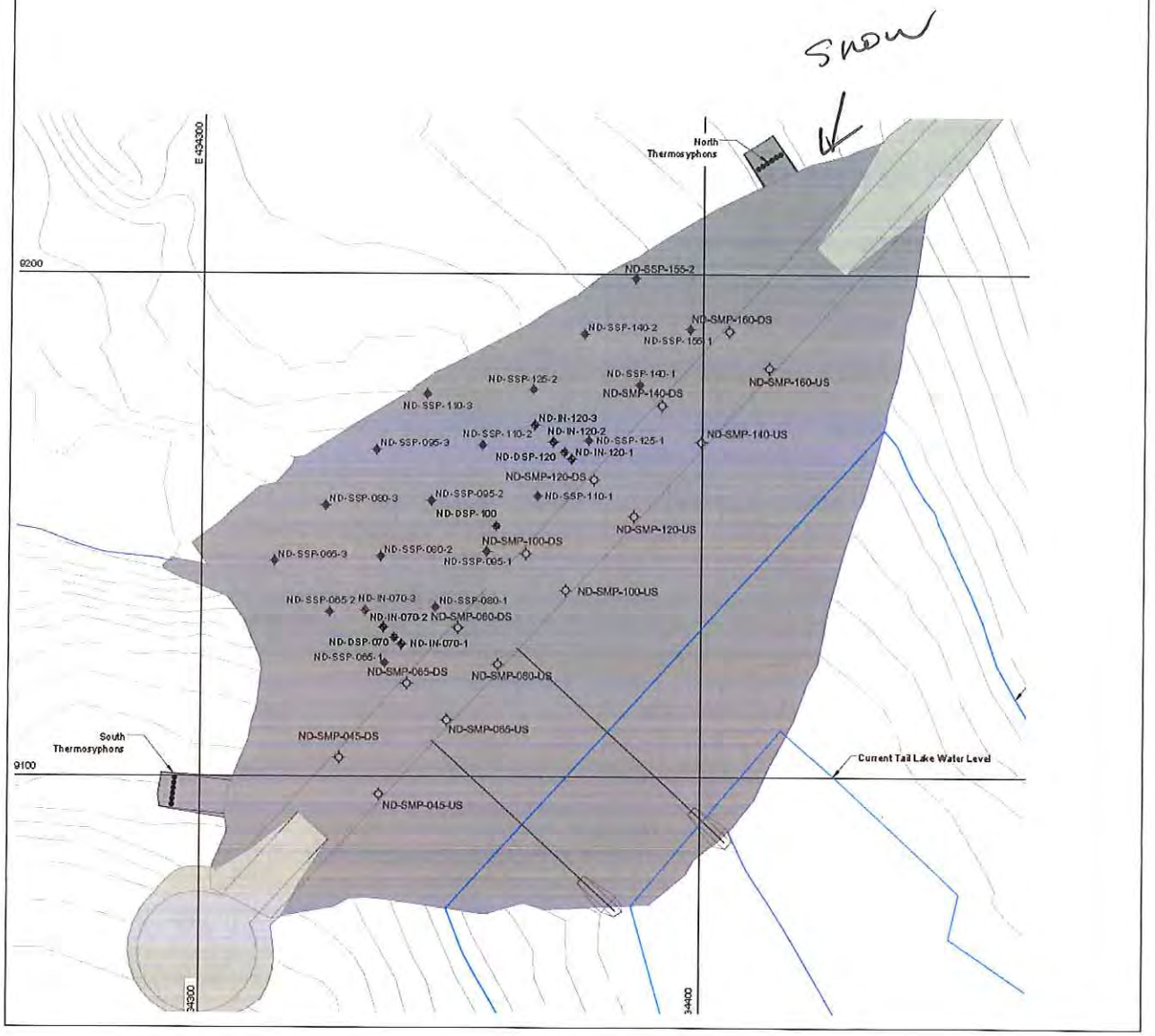
Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Downstream Side of Dam same as before Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	(No)
Crest of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Thermosyphons North Side superficial rust, some are before Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Thermosyphons South Side some are before Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Instrumentation (on crest and downstream side) Any visible concerns? (bent, rusted, cracked, etc.)	Yes	(No)
Thermistors and Dataloggers Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	(No)
Suspended Sediment in TIA (When not frozen) Any suspended sediment in Tail Lake? Frozen	Yes	No
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015)	Yes snow	(No)

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

Please provide any other observations you have made or items that did not fit in the space above



Photos:

Please collect the following photos: Photo from north end looking south along the dam Photo from south end looking north along the dam ☑
Other photos, please describe Photo of snow on downstream side

North Dam Weekly Walkover Survey Report

Date:	24/03/2018
Inspected By:	P TOMASONE, J PATEL
Conditions:	(ie. snow on ground, clear) snowy, frozen

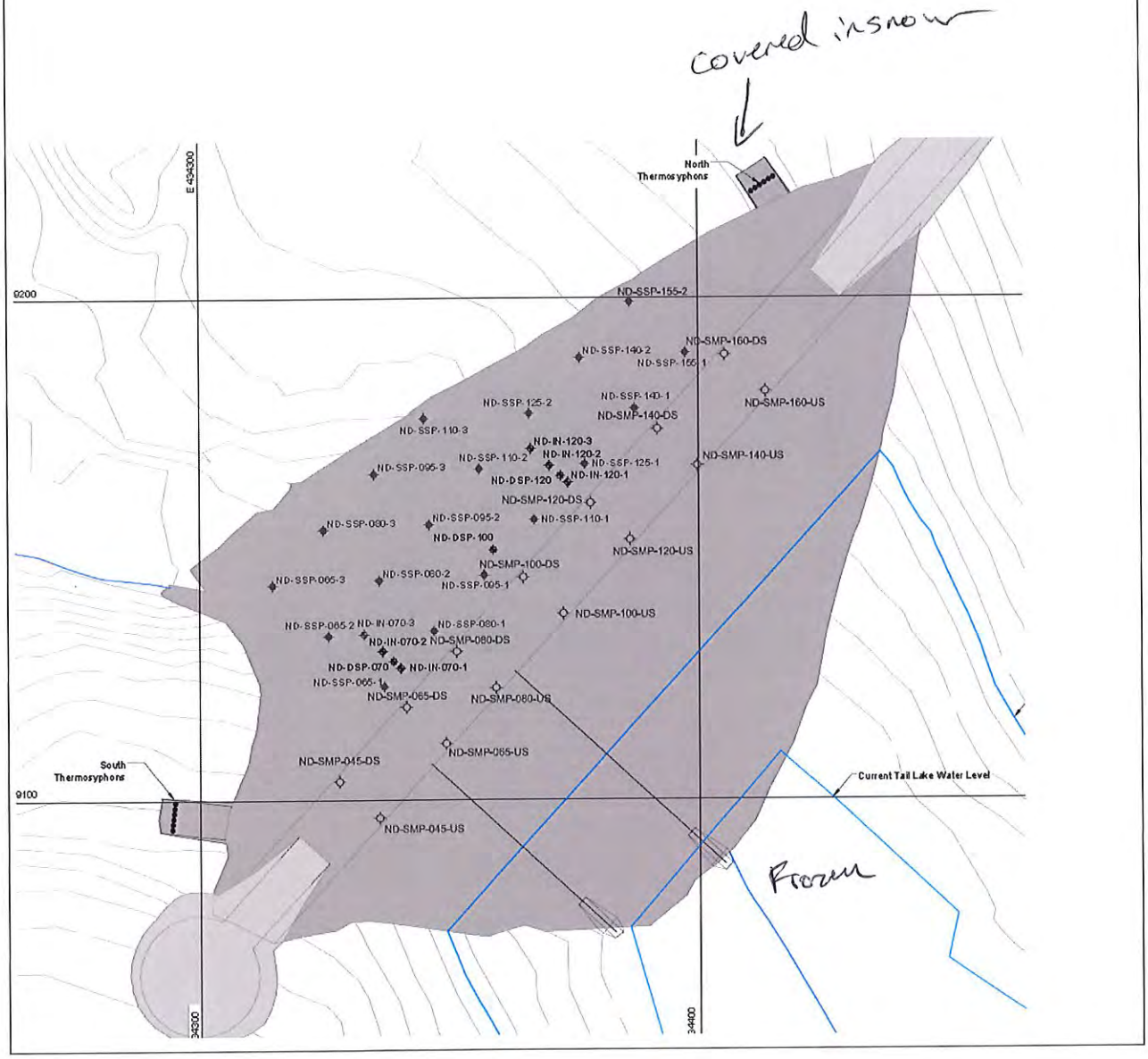
Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Downstream Side of Dam same as before Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	(No)
Crest of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Thermosyphons North Side superficial rust, Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.) same as before	Yes	(No)
Thermosyphons South Side superficial, same as before Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Instrumentation (on crest and downstream side) Any visible concerns? (bent, rusted, cracked, etc.)	Yes	(No)
Thermistors and Dataloggers & Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	(No)
Suspended Sediment in TIA (When not frozen) frozen, couldn't see Any suspended sediment in Tail Lake?	Yes	No
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015) covered in snow	Yes	(No)

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

Please provide any other observations you have made or items that did not fit in the space above



Photos:

Please collect the following photos: Photo from north end looking south along the dam Photo from south end looking north along the dam	☑ ☑
Other photos, please describe pictures everything is covered in snow or frozen	

North Dam Weekly Walkover Survey Report

Date:	16/May/2018
Inspected By:	P TOMASONE, J PATEL, S MCFADDEN
Conditions:	(ie. snow on ground, clear) SNOW

→ look for melt spots if there is snow

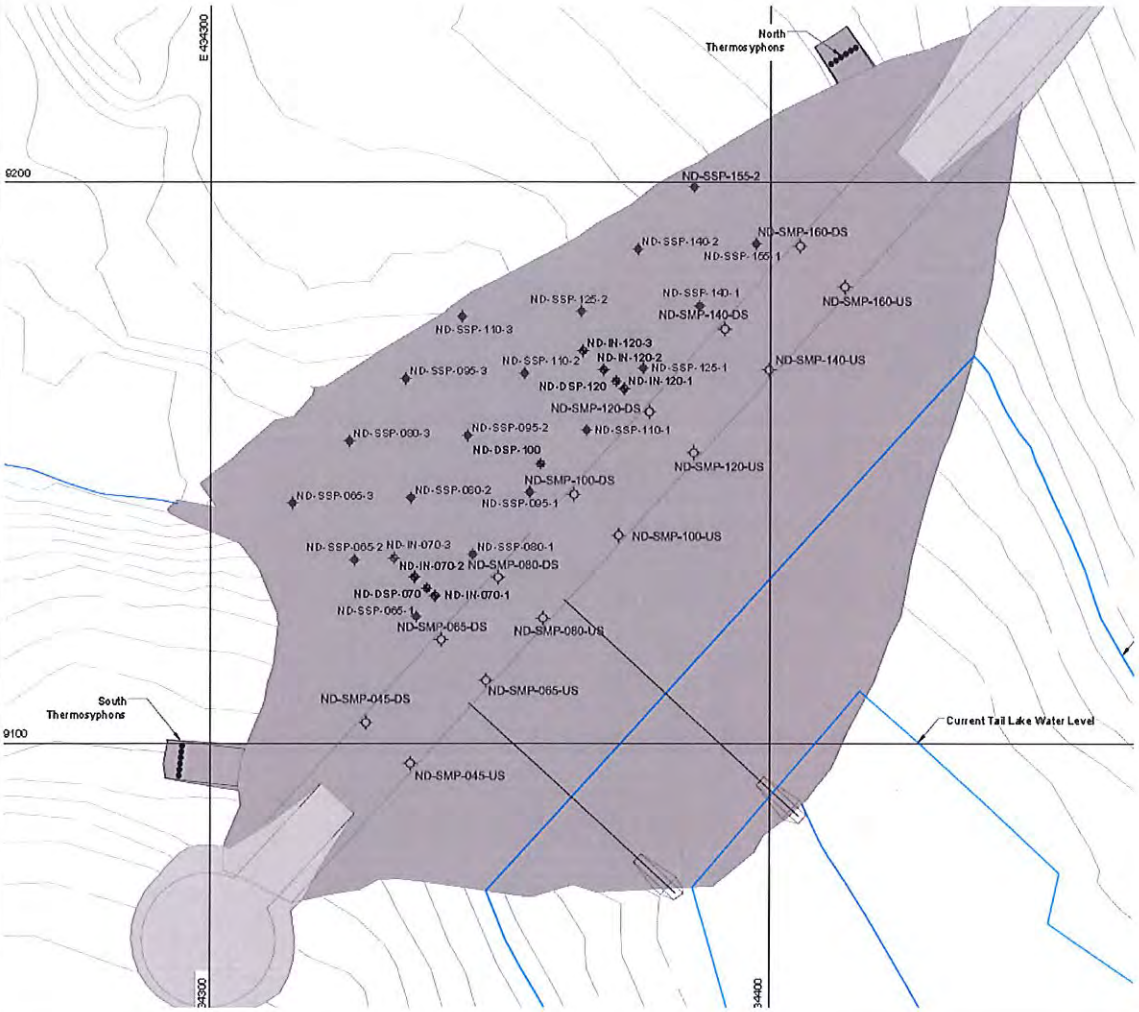
Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Downstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	(No)
Crest of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	(Yes)	(No)
Thermosyphons North Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	No
Thermosyphons South Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	No
Instrumentation (on crest and downstream side)		
Any visible concerns? (bent, rusted, cracked, etc.)	Yes	No
Thermistors and Dataloggers		
Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	No
Suspended Sediment in TIA (When not frozen) FROZEN		
Any suspended sediment in Tail Lake?	Yes	(No)
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015) SNOW	Yes	(No)

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

Please provide any other observations you have made or items that did not fit in the space above



Photos:

Please collect the following photos: Photo from north end looking south along the dam Photo from south end looking north along the dam	☐ ☐
Other photos, please describe	

North Dam Weekly Walkover Survey Report

Date:	27 Jun 2018
Inspected By:	Jag Patel , WAYNE CAREY (KIMD)
Conditions:	(ie. snow on ground, clear) – Clear conditions ✓

Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

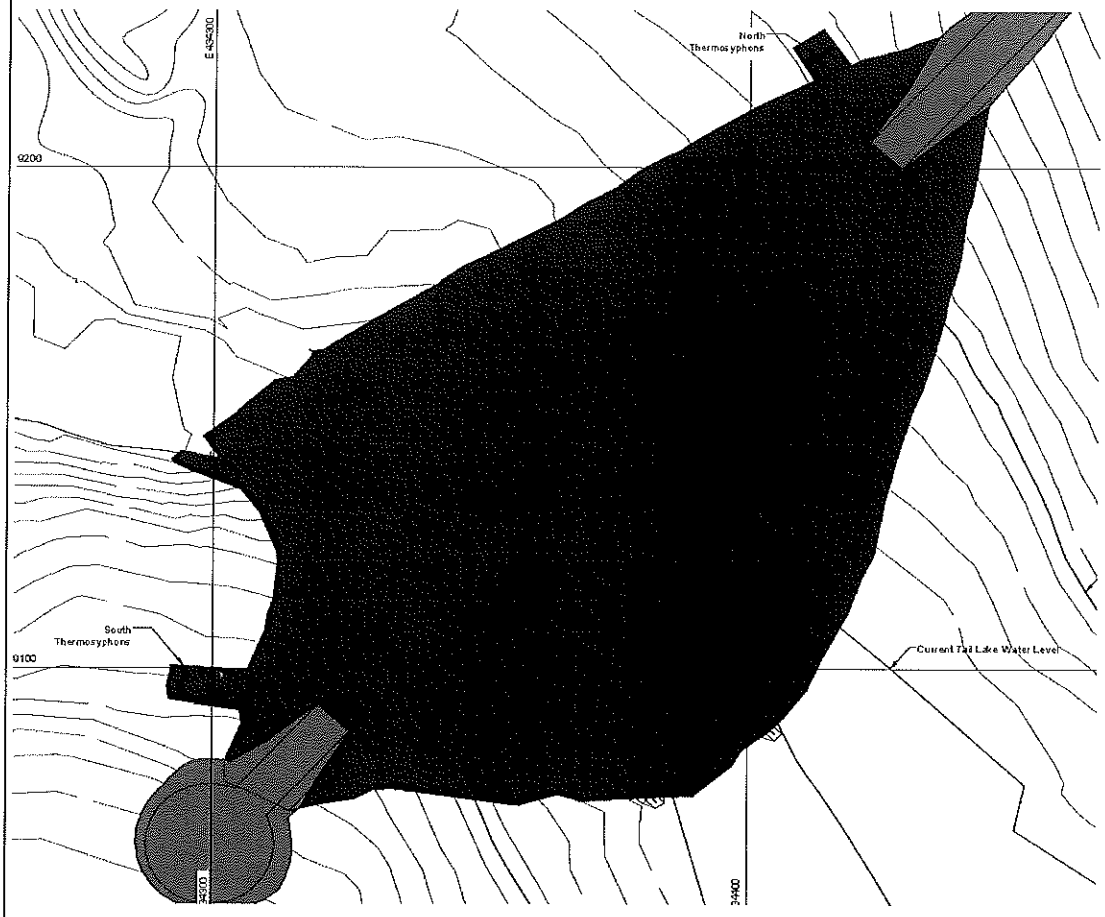
Upstream Side of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Downstream Side of Dam Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	(No)
Crest of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Thermosyphons North Side Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Thermosyphons South Side Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Instrumentation (on crest and downstream side) Any visible concerns? (bent, rusted, cracked, etc.)	Yes	(No)
Thermistors and Dataloggers Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	(No)
Suspended Sediment in TIA (When not frozen) Any suspended sediment in Tail Lake?	Yes	(No)
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015)	Yes	(No)

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

photos taken & uploaded in North Dam Inspection folder.

North Dam Weekly Walkover Survey Report

Please provide any other observations you have made or items that did not fit in the space above



Photos:

Please collect the following photos:	
Photo from north end looking south along the dam	☐
Photo from south end looking north along the dam	☐
Other photos, please describe – Photos taken	

North Dam Weekly Walkover Survey Report

Date:	24 July 2018
Inspected By:	Jagadish Patel
Conditions:	(ie. snow on ground, clear) Clear

Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Downstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	(No)
Crest of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Thermosyphons North Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Thermosyphons South Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Instrumentation (on crest and downstream side)		
Any visible concerns? (bent, rusted, cracked, etc.)	Yes	(No)
Thermistors and Dataloggers		
Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	(No)
Suspended Sediment in TIA (When not frozen)		
Any suspended sediment in Tail Lake?	Yes	(No)
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015)	Yes	(No)

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

Good Condition. No visible cracks or seepage.

North Dam Weekly Walkover Survey Report

Date:	Aug 10
Inspected By:	Jiancheng. Mike T. Sylvan. M.
Conditions:	(ie. snow on ground, clear) Clear

Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	(Yes)	No
Downstream Side of Dam Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	(No)
Crest of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Thermosyphons North Side Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Thermosyphons South Side Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Instrumentation (on crest and downstream side) Any visible concerns? (bent, rusted, cracked, etc.)	Yes	(No)
Thermistors and Dataloggers Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	(No)
Suspended Sediment in TIA (When not frozen) Any suspended sediment in Tail Lake?	Yes	(No)
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015)	Yes	(No)

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

Small crack at the fine gravel close to the water. it might exist long time. We have not done the inspection for a while not sure this exists before. it's very minor.

North Dam Weekly Walkover Survey Report

Date:	August 17
Inspected By:	Sylvain Mc Fadden
Conditions:	(ie. snow on ground, clear)

Visual Inspection:

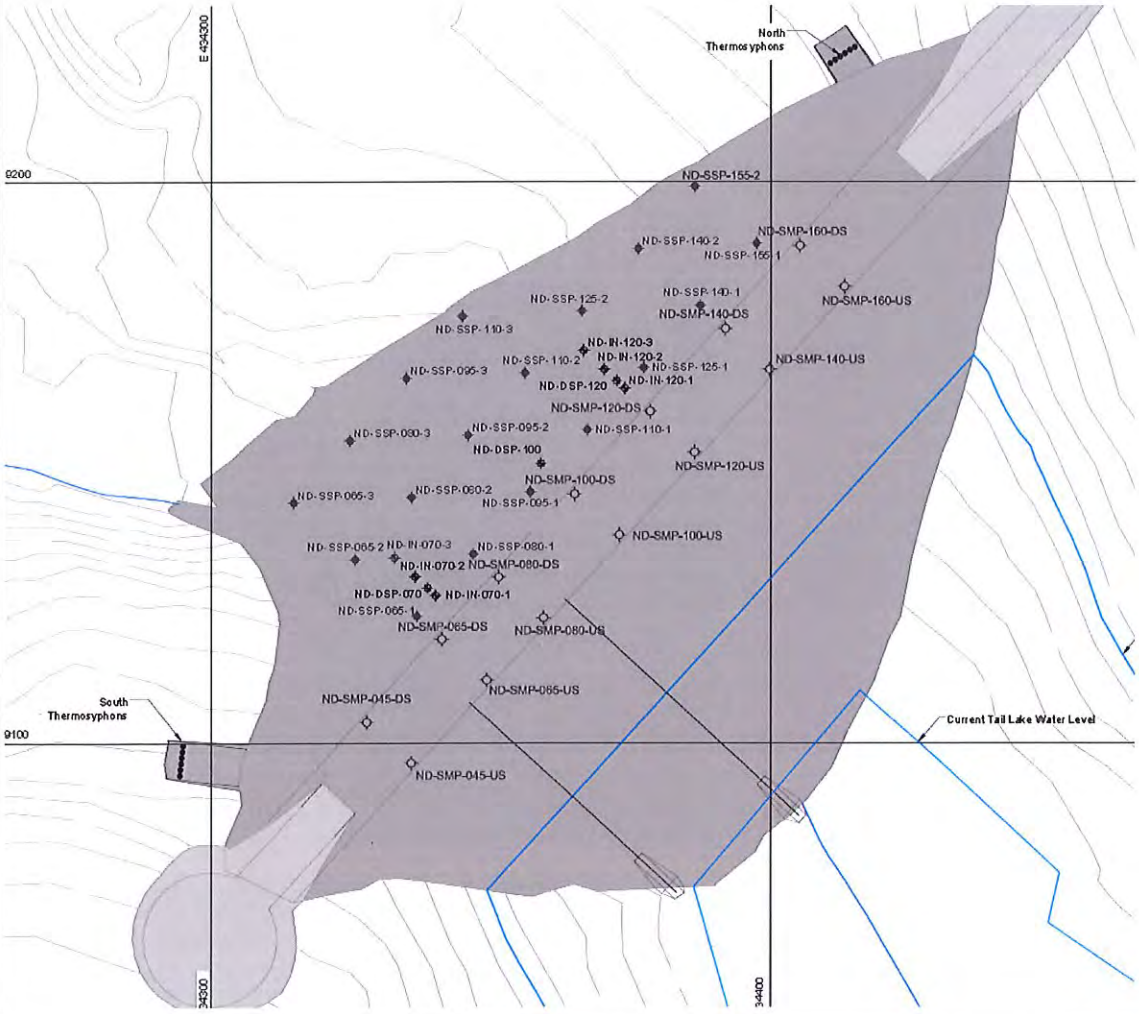
This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	No
Downstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	No
Crest of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	No
Thermosyphons North Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	No
Thermosyphons South Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	No
Instrumentation (on crest and downstream side)		
Any visible concerns? (bent, rusted, cracked, etc.)	Yes	No
Thermistors and Dataloggers		
Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	No
Suspended Sediment in TIA (When not frozen)		
Any suspended sediment in Tail Lake?	Yes	No
Water at the Toe of the Downstream Side of the Dam (If yes refer to Doris North – North Dam and Tail Lake Outflow Seepage Monitoring Work Plan 2015)	Yes	No

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

Sylvain Mc Fadden

Please provide any other observations you have made or items that did not fit in the space above



Photos:

Please collect the following photos: Photo from north end looking south along the dam Photo from south end looking north along the dam	☐ ☐
Other photos, please describe – Photos taken	

North Dam Weekly Walkover Survey Report

Date:	August 24th 2018
Inspected By:	Sylvain McFadden
Conditions:	(ie. snow on ground, clear)

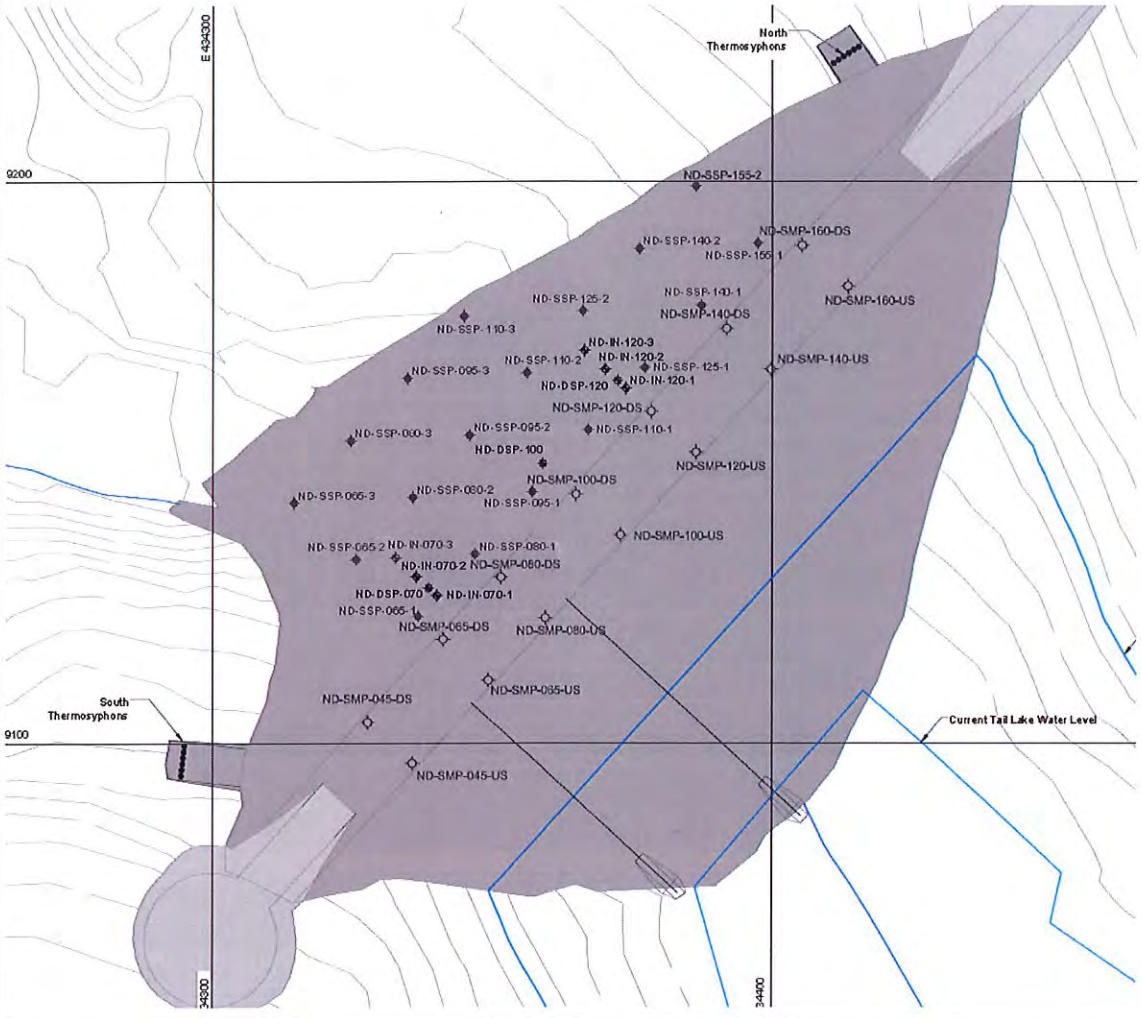
Visual Inspection:

This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and mmiller@srk.com

Upstream Side of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	No
Downstream Side of Dam Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	No
Crest of Dam Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	No
Thermosyphons North Side Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	No
Thermosyphons South Side Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	No
Instrumentation (on crest and downstream side) Any visible concerns? (bent, rusted, cracked, etc.)	Yes	No
Thermistors and Dataloggers Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	No

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

Please provide any other observations you have made or items that did not fit in the space above



Photos:

Please collect the following photos: Photo from north end looking south along the dam Photo from south end looking north along the dam	☑ ☐
Other photos, please describe	

North Dam Weekly Walkover Survey Report

Date:	20 OCT 2018
Inspected By:	JAG PATEL
Conditions:	(ie. snow on ground, clear) PARTLY COVERED WITH SNOW

Visual Inspection:

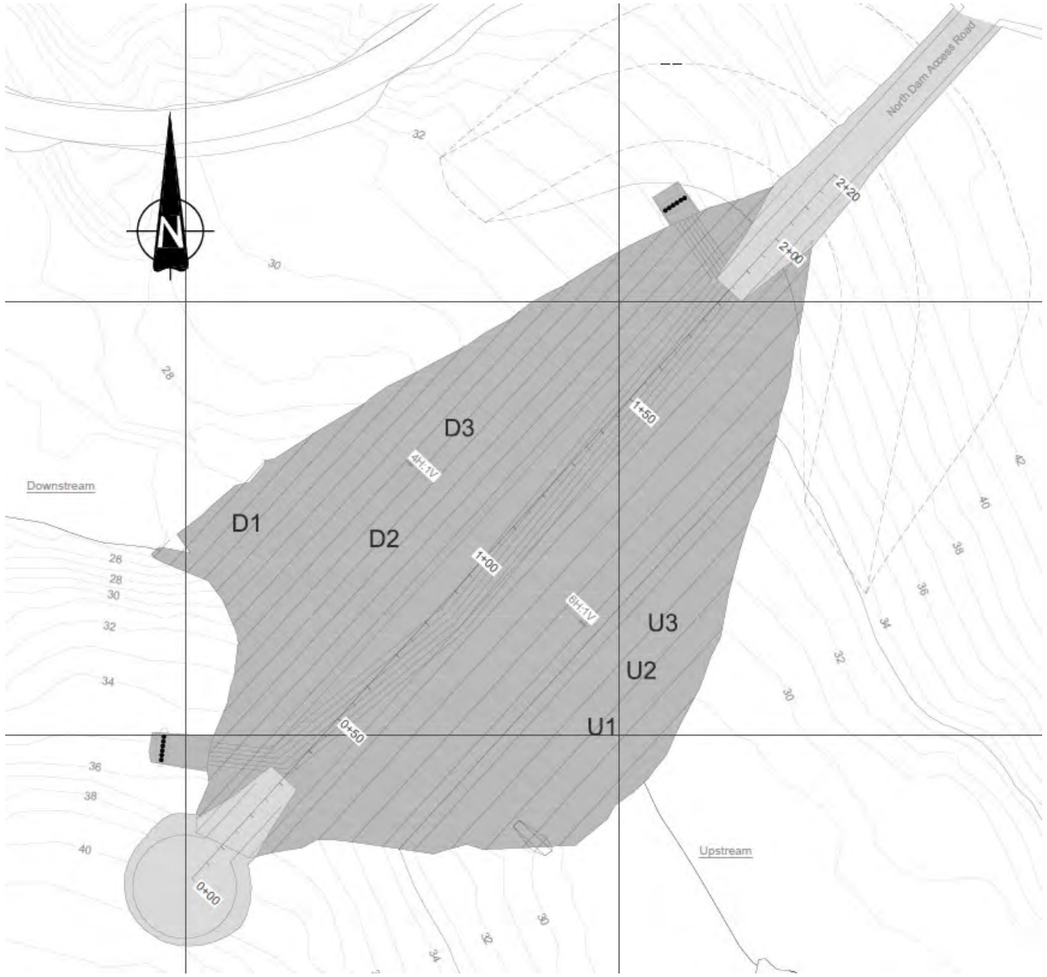
This weekly walkover survey report is a means to track the condition on the North Dam, please provide details on changes that have developed since the previous inspection and/or any observations of particular concern. All photos are appreciated. Please send the completed form (scans are fine) and any photos to hopebaymonitoring@srk.com and pluedke@srk.com

Upstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Downstream Side of Dam		
Any visible concerns? (cracks, depressions, erosion, seepage, etc.)	Yes	(No)
Crest of Dam		
Any visible concerns? (cracks, depressions, erosion, etc.)	Yes	(No)
Thermosyphons North Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Thermosyphons South Side		
Any visible concerns? (cracks, punctures, peeling paint, birds nests, etc.)	Yes	(No)
Instrumentation (on crest and downstream side)		
Any visible concerns? (bent, rusted, cracked, etc.)	Yes	(No)
Thermistors and Dataloggers		
Any visible concerns? (frayed or cut cables, damaged boxes, etc.)	Yes	(No)
Suspended Sediment in the TIA (When not frozen)		
Any suspended sediment visible in the reclaim pond?	Yes	(No)
Water at the Toe of the Downstream Side of the Dam		
Is water visible on the downstream side of the dam?	Yes	(No)

If you answered yes to any of the questions above please provide details and photos. Observations can be sketched on the figure provided on the next page. If seepage has been noted please estimate the flow.

NIL

Appendix H – Depression Monitoring



DEPRESSION TRACKING

ID	Location	Comments	Northing	Easting
U1	Upstream	First noted June 2014	7559104	434393
		Boundaries spray painted and ID given July 2014		
		No substantial changes from previous inspection		
U2	Upstream	First noted June 2014	7559117	434402
		Boundaries spray painted and ID given July 2014		
		No substantial changes from previous inspection		
U3	Upstream	First noted June 2014	7559128	434407
		Boundaries spray painted and ID given July 2014		
		July 4, 2015 - Expanding toward U2		
		No substantial changes from previous inspection		
D1	Downstream	Identified during 2014 annual geotechnical inspection, spray painted and given ID.	7559151	434311
		September 1, 2014 - expanded towards the south		
		September 20, 2014 - TMAC ESR noted the depression looks to have expanded, paint mark updated.		
		July 4, 2015 - Slight expansion toward the crest was noted in the daily report		
		No substantial changes from previous inspection		
D2	Downstream	First noted in 2013 Annual Geotechnical Inspection	7559147	434344
		September 14, 2014 - TMAC ESR noted that the depression may have expanded slightly		
		No substantial changes from previous inspection		
D3	Downstream	First noted in 2013 Annual Geotechnical Inspection	7559173	434360
		August 10, 2014 - larger area marked		
		No substantial changes from previous inspection		

Notes:

1. Depression locations are based on hand held GPS measurements, accuracy is at best +/- 4 m.
2. Other small depressions were removed from the tracking system in 2016. Only significant depression were carried forward from the 2016 Annual Inspection.

srk consulting

Job No: 1CT022.028
Filename: AppH_ND_AGI_DepressionTracking.pptx

TMAC RESOURCES

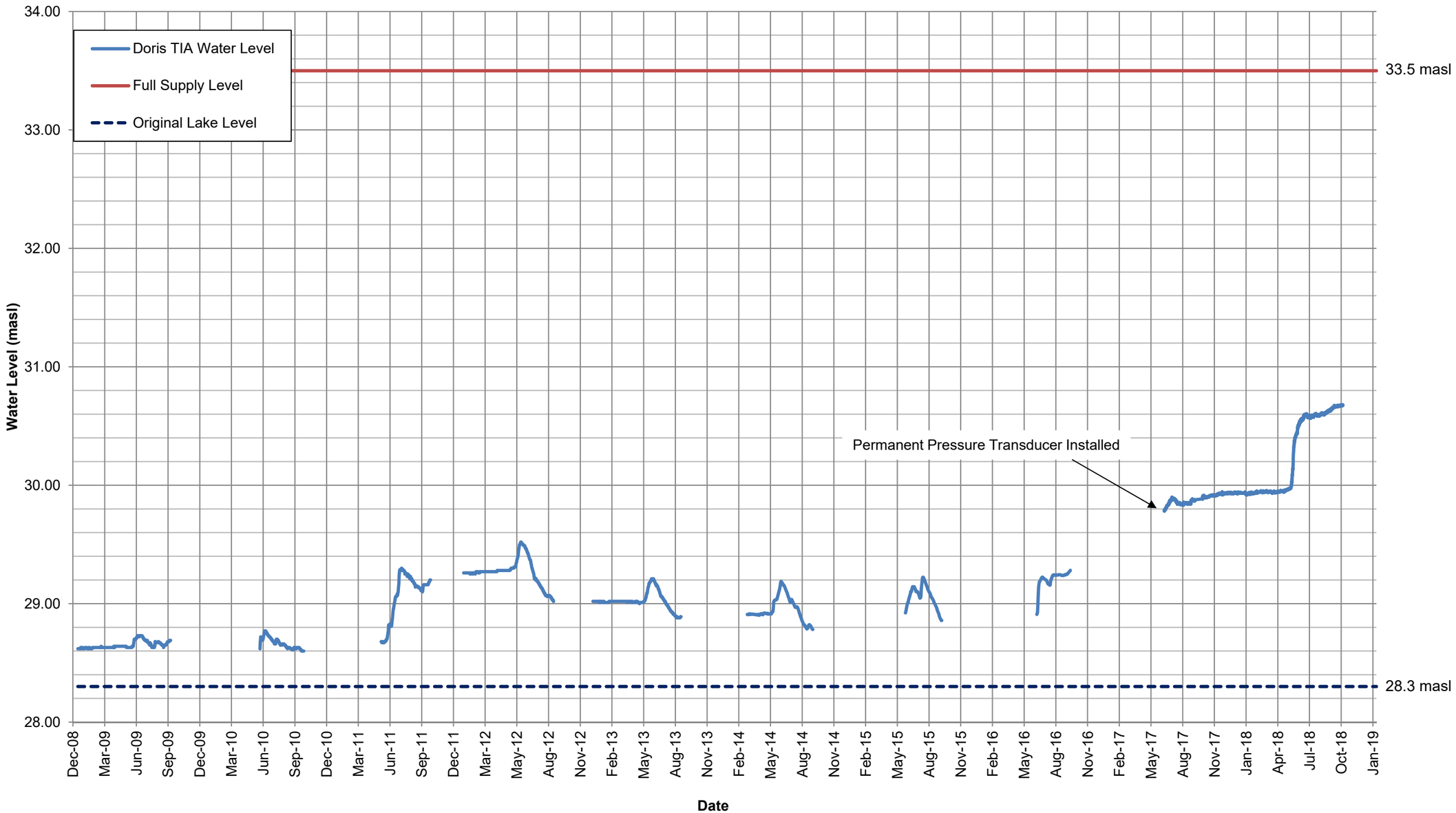
DORIS TIA

2018 Annual Geotechnical Inspection

Historic Depression Summary

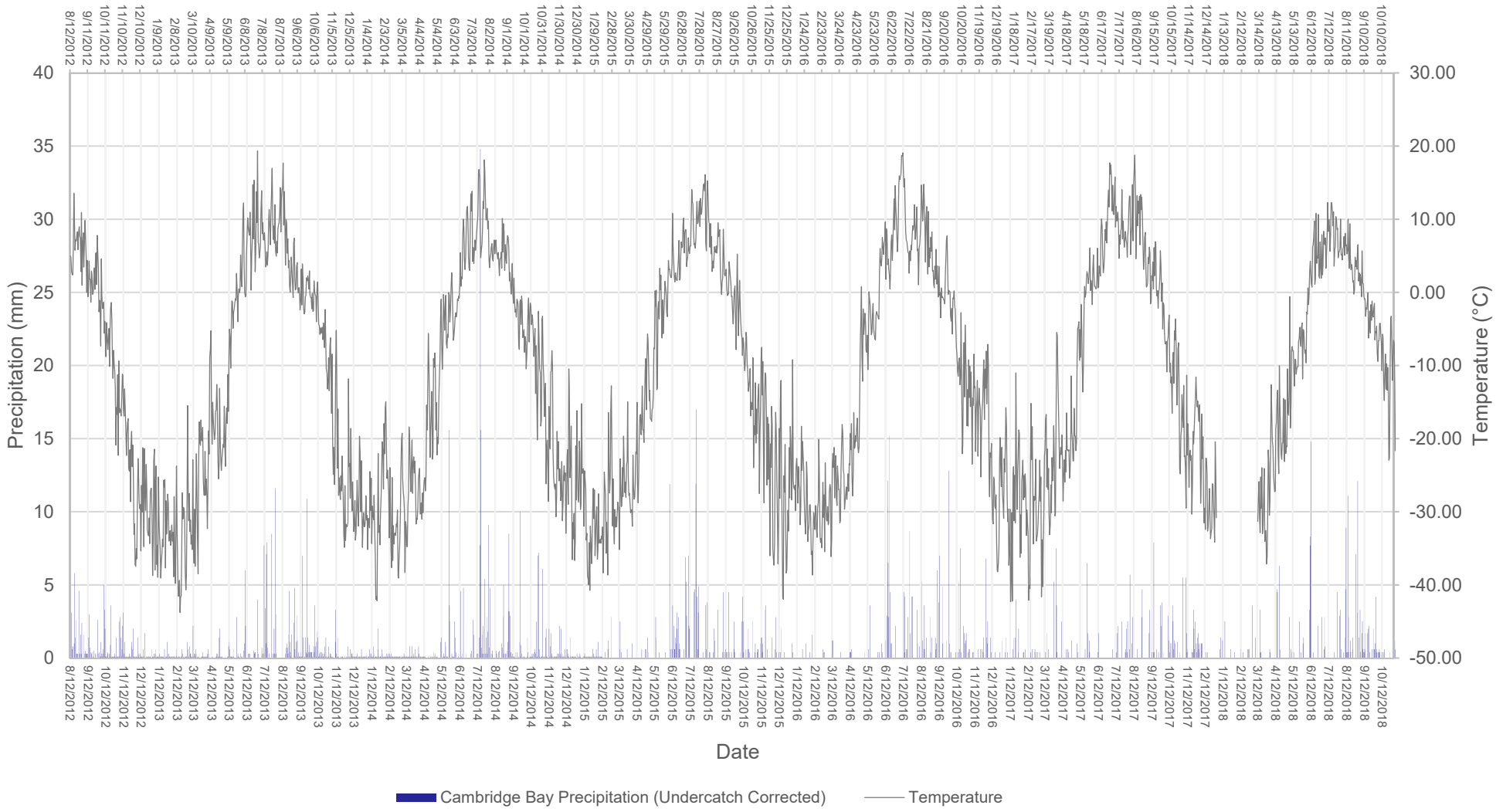
Date: Dec. 2018 | Approved: PDL | Figure: **H.1**

Appendix I – TIA Water Levels



srk consulting	TMAC RESOURCES	2018 Annual Geotechnical Inspection
Job No: 1CT022.028 Filename: AppendixI_WaterLevel.pptx	DORIS TIA	**TIA Reclaim Pond Water Level**
		Date: Dec. 2018 / Approved: PDL / Figure: **I.1**

Appendix J – Climate Data



Notes:

- This data is only intended as indicative precipitation for use in this report.

srk consulting	TMAC RESOURCES	2018 Annual Geotechnical Inspection
		Climate Data
Job No: 1CT022.028 Filename: AppendixJ_ClimateData.pptx	**DORIS TIA**	Date: Dec. 2017 / Approved: PDL / Figure: **J.1**

Appendix K – 2018 Seepage Review

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

T: +1.604.681.4196
F: +1.604.687.5532
vancouver@srk.com
www.srk.com

Memo

To:	Peter Luedke, EIT Maritz Rykaart, PhD, PEng Christopher Stevens, PhD	**Client:**	TMAC Resources Inc.
From:	Lisa Barazzuol, PGeo	**Project No:**	1CT022.027
Reviewed By:	Andrea Bowie, PEng	**Date:**	March 6, 2019
Subject:	2018 North Dam Seepage Water Quality Investigation, Hope Bay Project		

1 Background

The North Dam forms the northern boundary of the Doris TIA, within a narrow natural valley blocking the original Tail Lake outlet to Doris Lake. The structure impounds the Reclaim Pond and was designed as a water retaining structure. The dam has a central frozen core with a secondary upstream Geosynthetic Clay Liner (GCL). The dam is constructed from local quarry rock and consists of processed fines for the core, 150 mm nominal sized transition material, and a run of quarry (ROQ) outer shell. To ensure maintenance of frozen foundation conditions, the key trench of the dam is equipped with 12 horizontal thermosyphon evaporators. Seepage of water has been observed along the downstream toe of the dam near the former outlet of Tail Lake since after the first winter of dam construction in 2011. Key dates for North Dam construction and tailings impoundment area (TIA) operations are as follows:

- February 2011 – Initiation of North Dam construction (over two winter seasons),
- April 2012 – Completion of North Dam construction, and
- February 2017 – Effective start of tailings discharge.

In 2017, based on a recommendation from the Engineer or Record (EOR), TMAC Resources Inc. initiated a monitoring program of North Dam seepage (SRK 2018a), that includes water quality sampling and analysis of North Dam toe seepage and TIA Reclaim Pond water at SNP station TL-1. To understand the potential source of the toe seep, this memorandum presents a review of water quality data from North Dam toe seepage samples and SNP stations TL-1and TL-5 (tailings supernatant discharge from the mill).

The water quality assessment makes use of samples from SNP stations TL-1 and TL-5 that are monitored as part of, and in compliance with Water Licence 2AM-DOH1323 Amendment No. 1 (Nunavut Water Board 2016). However, the North Dam seepage monitoring program and associated data analysis presented herein is not a compliance requirement and is the context of the North Dam monitoring program and at the request of the EOR. Furthermore, TL-5 is not within the scope of the monitoring program outlined in SRK (2018a) but has been included in this memo to assess and understand the source loads to the TIA in the context of evaluating trends of geochemical tracers of the TIA Reclaim Pond.

2 Methods

2.1 2018 North Dam Toe Seepage Survey and Sampling Program

SRK Consulting (Canada) Inc. (2018a) outlines the North Dam toe seepage inspection and water quality monitoring program. In summary, TMAC conducts weekly inspections of the dam toe. If seepage is observed flowing at the dam toe, TMAC collects the following samples at a maximum frequency of once per week (Figure 2-1):

- North Dam toe seepage: field parameters and water quality samples for laboratory analysis are collected at all observed locations of seepage flow,
- TL-1 (reclaim pump): field parameters and water quality samples for laboratory analysis, and
- TIA Reclaim Pond water at upstream face of North Dam: field parameters only.

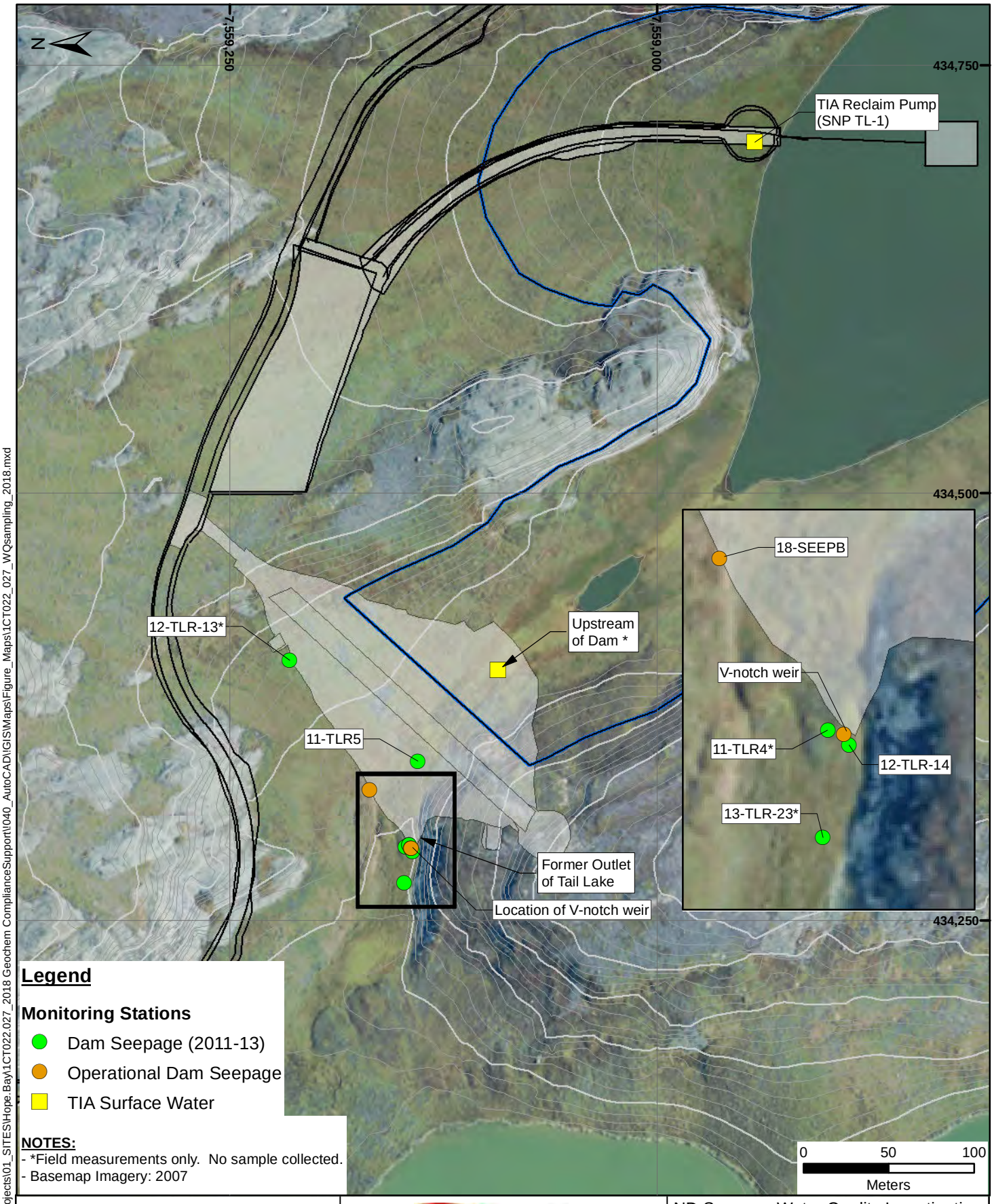
TMAC shipped samples to ALS Environmental in Burnaby, BC for the analysis of pH, electrical conductivity (EC), total alkalinity, sulphate, chloride, nutrients (ammonia, nitrate and nitrite), total cyanide, free cyanide, cyanate, and dissolved trace elements. At the time of sample collection, TMAC measured the following field parameters: pH, EC, oxidation-reduction potential (ORP), temperature, chloride and flow rate.

In 2018, TMAC collected 13 samples of seepage at the toe of the North Dam and TL-1 over a 13-week period between June 25 and September 10, 2018. Prior to June 25 and after September 10 seepage at the dam toe was frozen. For all weeks, one seepage sample was collected from the location of the v-notch weir (installed in July 2018) except during the week of June 25. During June 25, one sample of toe seepage was collected from the location of the v-notch weir and another sample collected at a second seepage location 20 m to the northeast (18-SEEPB). During the inspection on July 2, TMAC observed that the seep at 18-SEEPB was dry. Field measurements of TIA Reclaim Pond water were collected for five of the sampling events.

2.2 Water Quality Database Compilation

SRK compiled data provided by TMAC for the North Dam toe seepage assessment, with stations presented in Figure 2-1 and described Table 2-1. An overview of additional water quality sampling data included in this assessment is described as follows:

- North Dam seepage:
  - 2011 to 2014: opportunistic seepage survey along the downstream toe of the dam (SRK 2012 to 2014), and
  - 2017: seepage and monitoring program conducted as part of the North Dam seepage monitoring program (SRK 2018b). In 2017, all seepage samples were collected from the location of the v-notch weir;
- TL-1: samples collected as part of the surveillance network program (SNP) monitoring of TIA Reclaim Pond water, collected at the reclaim pump; and
- TL-5: samples collected as part of the SNP monitoring station of tailings supernatant, collected within the mill prior to discharge to the TIA.



Legend

Monitoring Stations

- Dam Seepage (2011-13)
- Operational Dam Seepage
- TIA Surface Water

NOTES:

- *Field measurements only. No sample collected.
- Basemap Imagery: 2007

srk consulting

TMAC RESOURCES

ND Seepage Water Quality Investigation

Seepage Monitoring Sampling Locations

Job No: 1CT022.027

Filename: 1CT022_027_WQsampling_2018

Doris TIA

Date:	Approved:	Figure:
Feb 2019	LB	2-1

Path: \\srk.ad\dfs\nalvan\Projects\01_SITES\Hope.Bay\1CT022.027_2018 Geochem ComplianceSupport\040_AutoCAD\GIS\Maps\Figure_Maps\1CT022_027_WQsampling_2018.mxd

SRK previously conducted data QA/QC of these data, as documented in SRK (2018b). A summary of data QA/QC of 2018 monitoring data is presented in Section 2.3.

Table 2-1: Data Sources

Station ID	Station Description	Years	Reference
North Dam seepage	Downstream toe	2011 to 2014; 2017 to 2018	SRK (2012, 2013, 2014, 2018b)
TIA Reclaim Pond water	Upstream face of North Dam	2017 to 2018	SRK (2018b)
TL-1	Reclaim Pump	2011 to 2018	SNP monitoring program
TL-5	Tailings supernatant discharge to TIA	2017 to 2018	SNP monitoring program

2.3 Quality Control for 2018 Analytical Data

SRK reviewed the 2018 water quality data and conducted a geochemical quality control (QC) program to validate the data. This is routine practice by SRK to ensure confidence in the analysis, through identifying any possible limitations of the data. Table 2-2 summarizes the outcomes of the QC program for 2018 North Dam seepage samples and Table 2-3 and Table 2-4 present the outcomes for TL-1 and TL-5, respectively. SRK flagged some data QC issues that related to field data measurements and sample collection that are summarized as follows:

- North Dam Seepage:
  - Comparison of field measurements with lab data: pH on August 6 and chloride on August 20.
- TL-1:
  - Comparison of field measurements with lab data: chloride on August 20, September 3, and September 10
  - Field EC on June 18 was anomalously low compared to overall data set. The value was confirmed with TMAC. This data point was excluded from data interpretation.
- TL-5:
  - The absence of dissolved metals and field data precluded several QC tests.
  - One sampling event included the collection of a field blank and duplicate. Results from these samples indicated some sediments were likely introduced during sample collection.

All other data were deemed acceptable. SRK accepted all data as received, except for the field EC measurement collected at TL-1 on June 18, which was not included in the data assessment.

Table 2-2: Summary of QA/QC Assessment of 2018 Data, North Dam Seepage Samples

QC Test	n	SRK QC Criteria	Results
Ion Balance			
Ion balance	13	EC>100 us/cm, %difference should be within ± 10%	All passed
Dissolved metals (Water)			
Comparison with total metals	13	Total metals>dissolved metals, (Total metals-dissolved metals)/average ≤ 30%, for values >10 DL. okay 10% of metal scan failing.	All passed
Field duplicate	1	For samples >10X detection limit (DL), % RPD within ± 30%, okay 10% of metal scan failing.	All passed
Lab Duplicate	2	For samples >10X detection limit (DL), % RPD within ± 30%, okay 10% of metal scan failing.	All passed
Lab Blank	29	Within specified tolerance ranges.	All passed
Standard reference material	6	Within specified tolerance ranges.	All passed
Physical tests			
pH lab vs field	15	Difference should not be greater than 1 pH unit	For August 6th sample, difference between lab and field pH is 1.13, (Lab Work Order L2142004).
Specific conductivity in lab v/s field	11	For samples >10X detection limit (DL), % RPD within ± 30%, okay.	All passed
Lab Duplicate	6	For samples >10X detection limit (DL), % RPD within ± 30%, okay.	All passed
Lab Blank	18	Within specified tolerance ranges.	All passed
Travel blank	0	<2x Detection Limit	-
Standard reference material	23	Within specified tolerance ranges.	All passed
Anions and Nutrients (Water)			
Field duplicate	3	For samples >10X detection limit (DL), % RPD within ± 30%, okay.	All passed
Lab Duplicate	4	For samples >10X detection limit (DL), % RPD within ± 30%, okay.	All passed
Lab Blank	63	Within specified tolerance ranges.	All passed
Standard reference material	13	Within specified tolerance ranges.	All passed
Cl lab vs field	4	For samples >10X detection limit (DL), % RPD within ± 30%, okay	Sample from August 20 failed with RPD=52%
Total S-IC and S-ICP comparison			
Comparison between S-IC and S-ICP	8	For samples >10X detection limit (DL), % RPD within ± 20%	All passed
Trends			
Trend analysis	All graph data	Check for anomalously high or low data	All passed

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Hope.Bay\1CT022.027_2018 Geochem ComplianceSupport\!020_Project_Data\Lab data\North dam\QAQC\[Summary Table QAQC_1CT022.027_2018_NorthDam_MAC.xls]Summary