WHALE TAIL PIT PROJECT

Groundwater Monitoring Plan

In Accordance with:
Project Certificate No. 008, T&C 15 and 16

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Division

Version 3

April 2020

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) received a Project Certificate No.008 from the Nunavut Impact Review Board for the development of the Whale Tail Pit, a satellite deposit located on the Amaruq Exploration property.

The deposit will be mined as an open pit (i.e., Whale Tail Pit), and ore will be hauled by truck to the approved infrastructure at Meadowbank Mine for milling. Approximately 8.3 million tonnes (Mt) of ore will be mined from the open pit and processed over a three to four-year mine life. Ore from Whale Tail Pit will be crushed on site after which it will be transported to Meadowbank Mine for milling. The mill rate will be approximately 9,000 to 12,000 tonnes per day.

During mining, groundwater will flow into the open pit. This water is naturally high in total dissolved solids and will not be directly discharged out of the active mine site without treatment. Water management during mine operations will involve a variety of activities, described in detail in the Water Management Plan (WMP) developed for the Project (Agnico Eagle 2018a).

This Groundwater Management Plan (GWMP) reflects the commitments made with respect to submissions provided during the technical review of the FEIS, to comply with Terms and Conditions No. 15 and 16 included in the Project Certificate. This version of the plan includes:

1. Sampling results of the multi-level Westbay well system, that were completed in March 2019;
2. Thermal analyses completed in 2019;
3. Updated groundwater inflow and total dissolved solids (TDS) quality predictions based on supplemental data collection since the FEIS in support of the annual update to the water quality and water balance models.
4. Groundwater monitoring plan for horizontal and vertical groundwater flow; and,
5. Threshold and adaptive management plan related to the groundwater management.

Additional groundwater modelling efforts were completed in support of the site wide water quality and water balance models. The additional modelling was completed to update groundwater inflow predictions based on data collected at the site since submission of the FEIS (i.e., between 2016 and 2019).

The GWMP was updated to include additional monitoring of the horizontal and vertical groundwater flow to validate the prediction of these groundwater flow conditions during the operation of the Whale Tail pit and to confirm alignment of pit seepage monitoring to requirements in the water licence No. 2AM-WTP1826.

Agnico Eagle would like to clarify the monitoring requirements related to the Waste Rock Storage Facility (WRSF) are addressed in the approved ARD-ML monitoring plan, Water Quality and Flow Monitoring Plan, Water Management Plan and Waste Management Plan, as any seepage emanating from the WRSF is considered as a surface water management issue. The groundwater monitoring plan focus on the definition of the groundwater quality and flow reporting to the pit lake created before, during and after the excavation of the ore body.

DISTRIBUTION LIST

Agnico – Geology Superintendent

Agnico – Engineering Superintendent

Agnico – Geotechnical Coordinator

Agnico – Environment Superintendent

Agnico – Environment General Supervisor

Agnico – Environmental Coordinator

DOCUMENT CONTROL

Version	Date (YMD)	Section	Revision
1	2018-05-30	All	To address Project Certificate No. 008. T&C 15 and 16
2	2018/11/8	1.1, 2.4, 2.5	To address ECCC and CIRNAC recommendations issued in October 2018
2 Rev. 1	2019/02/19	All	To address NWB and CIRNAC comments discussed on February 13, 2019
3	2020/04/21	All	To address NIRB and CIRNAC comments and provide updated information based on supplemental data collection and modelling.

Prepared by:
Golder Associates & Agnico Eagle Mines Limited - Meadowbank Division

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1 INTRODUCTION

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) received Project Certificate No.008 from the Nunavut Impact Review Board (NIRB) for the development of the Whale Tail Pit (the Project), a satellite deposit located on the Amaruq Exploration property. The Amaruq Exploration property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of the Meadowbank Mine in the Kivalliq region of Nunavut (Figure 1). The deposit will be mined as an open pit, and ore will be hauled by truck to the approved infrastructure at Meadowbank Mine for milling.

This document presents Groundwater Monitoring Plan (GWMP) for the Whale Tail Pit. Overall water management for operations, closure, and post-closure is described in the Agnico Eagle Water Management Plan (WMP) (Agnico Eagle 2020a). The WMP provides descriptions of the water control structures and associated design criteria.

1.1 CONCORDANCE

Meadowbank Mine is an approved mining operation and Agnico Eagle is planning to extend the life of the mine by constructing and operating the Project. The Project was subject to an environmental review established by Article 12, Part 5 of the Nunavut Agreement. In June 2016, Agnico Eagle submitted a Final Environmental Impact Statement (FEIS) seeking a reconsideration of the Meadowbank Mine Project Certificate (No. 004/File No. 03MN107) and Type A Water Licence Amendment (No. 2AM-MEA1525) from the NIRB.

On July 2016, the NIRB determined that the proposed Project required a separate screening assessment under the Nunavut Agreement and the *Nunavut Planning and Project Assessment Act* (NuPPAA). A separate Project Certificate (NIRB Project Certificate No. 008) was issued for the Project on March 15, 2018 by the NIRB. This GWMP reflects the commitments made with respect to submissions provided during the technical review of the FEIS, to comply with Terms and Conditions No. 15 and 16 included in the Project Certificate, and to commitments made with respect to submissions provided during review of the 2018 Annual Groundwater Monitoring Report and V.2.1 of the GWMP.

This version of the plan includes:

1. Sampling results of the multi-level Westbay well system, that were completed in March 2019;

2. Thermal analyses completed in 2019;

3. Updated groundwater inflow and TDS quality predictions based on supplemental data collection since the FEIS in support of the annual update to the water quality and water balance models.

4. Groundwater monitoring plan for horizontal and vertical groundwater flow; and,
5. Threshold and adaptive management plan related to the groundwater management.

Additional modelling efforts were completed in 2018 following submission of the FEIS in support of the water quality predictions at closure and post-closure. The additional modelling that were completed are: post-closure hydrogeological modelling in combination with the diffusion model; and, the pit lake hydrodynamic model and receiving lake (Mammoth Lake) hydrodynamic model.

The results of these studies indicated that arsenic release from the submerged pit wall (arsenic diffusion) will not affect water quality in the pit lake; and, mass transfer to water is very low even under the conservative assumptions of the calculations. Results from these studies further indicate that the seepage into and out of the pit lake are negligible in volume, particularly compared to surface water exchanged annually during post-closure when flows are re-established based on average climate year watershed runoff. The combination of results corroborates to support that the hydrogeological regime around the pit lake is not critical to pit lake water quality.

Agnico Eagle considers that the uncertainty related to the arsenic-related water quality issues emanate from the Water Rock Storage Facility and the fill water in the proposed pit lake created after the excavation of the ore body, are addressed, and the NIRB Project Certificate No. 008 terms and conditions No. 15 and 16 has been fulfilled.

The GWMP (v.2.1) was approved on the 25 April 2019 with the condition the Licensee shall ensure that details of seepage monitoring, fully aligned with the Licence requirements and Licensee's commitments, are included with the next update to the Plan.

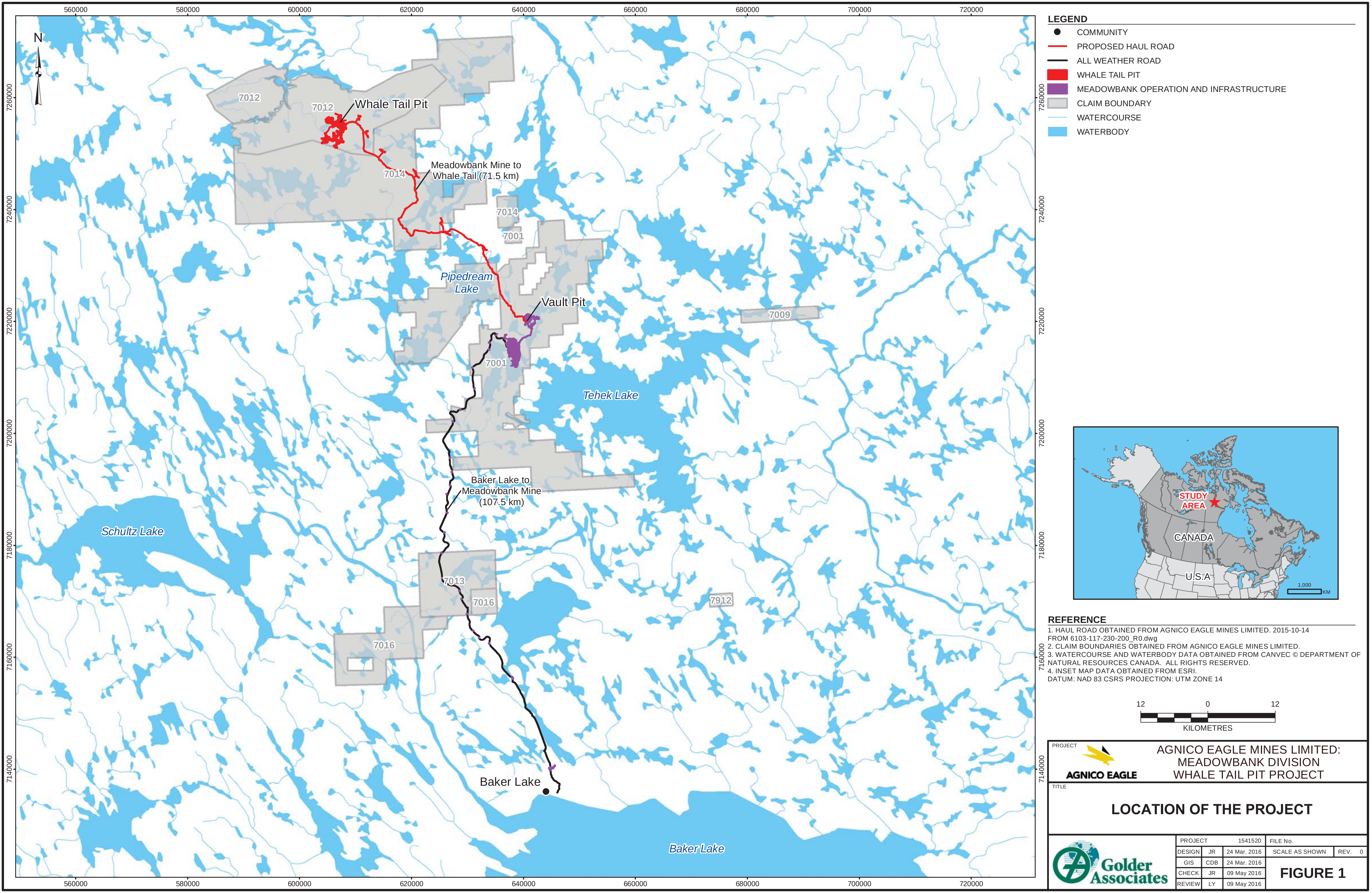
The GWMP was updated to include additional monitoring of the horizontal and vertical groundwater flow in 2019 to validate the prediction of these groundwater flow conditions during the operation of the Whale Tail pit, and to confirm alignment of pit seepage monitoring to requirements in the water licence No. 2AM-WTP1826. It was also updated to reflect additional groundwater modelling efforts completed in support of the site-wide water quality and water balance models based on the supplemental data collection up to the end of 2019.

Agnico Eagle would like to clarify the monitoring requirements related to the Waste Rock Storage Facility (WRSF) are addressed in the approved ARD-ML monitoring plan, Water Quality and Flow Monitoring Plan, Water Management Plan and Waste Management Plan, as any seepage emanating from the WRSF is considered as a surface water management issue. The groundwater monitoring plan focus on the definition of the groundwater quality and flow reporting to the pit lake created before, during and after the excavation of the ore body.

1.2 OBJECTIVES

The objective of the GWMP is to provide consolidated information on groundwater management for the Project. The GWMP is divided into the following components:

- Introductory section (Section 1)
- A brief summary of the physical and hydrogeological setting at the mine site, the mine development plan and pit inflow predictions (Section 2). This section has been updated to reflect the results of supplemental data collection since the FEIS, which is presented in Section 2.3
- A description of the groundwater monitoring program (Section 3)
- A summary of procedures for quality assurance and quality control (QA/QC) (Section 4)



LEGEND

●	COMMUNITY
—	PROPOSED HAUL ROAD
—	ALL WEATHER ROAD
🟥	WHALE TAIL PIT
🟪	MEADOWBANK OPERATION AND INFRASTRUCTURE
▨	CLAIM BOUNDARY
—	WATERCOURSE
🟦	WATERBODY

REFERENCE

1. HAUL ROAD OBTAINED FROM AGNICO EAGLE MINES LIMITED. 2015-10-14 FROM 6103-117-230-200_R0.dwg
2. CLAIM BOUNDARIES OBTAINED FROM AGNICO EAGLE MINES LIMITED.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. INSET MAP DATA OBTAINED FROM ESRI.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

12 0 12
KILOMETRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
LOCATION OF THE PROJECT

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	JR	24 Mar. 2016	SCALE AS SHOWN	REV. 0
GIS	CDB	24 Mar. 2016	FIGURE 1	
CHECK	JR	09 May 2016		
REVIEW	LY	09 May 2016		

Y:\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\1300_Documentation\1340_Project_Description\Report\1541520_FIG_1.1-1_PROJECT_LOCATION.mxd

2 BACKGROUND

2.1 SITE CONDITIONS

The Project is located in Canada's Northern Arctic ecozone. This region includes most of Canada's Arctic Archipelago and northern regions of continental Nunavut and the Northwest Territories. This ecoregion is classified as a polar desert and is characterized by long cold winters and short cool summers. The mean air temperatures in June to September is approximately 7 degrees Celsius (°C) and -20.6 °C in October to May.

Average annual precipitation at Meadowbank Mine is 142.6 mm (1998 to 2004). The annual precipitation at site generally falls as rain between June and September, and snow between October and May. However, snowfall can occur at any time of the year.

Based on data for Baker Lake (120 km to the south), and from experience ice auguring within the Meadowbank Mine lakes in the winter, the mean maximum lake ice thickness over Whale Tail Lake is expected to be 2.25 m. During the winter collection of water quality baseline data in Whale Tail Lake in April 2016, ice thickness was confirmed to be 2 m.

The surficial geology of the Project area shows strong evidence of glacial activity and is dominated by veneers and blankets of till overlying undulating bedrock. Bedrock frequently outcrops in isolated exposures, elevated plateaus and elongated ridges. Lakes and ponds are abundant, occupying approximately 16% of the area.

The local overburden consists of till with a silty sand matrix and clasts that range from granule gravel to large boulders in size. Glaciofluvial deposits in the form of eskers and terraces are found in the northeast section of the satellite deposit and they continue in a southeast direction intersecting the haul road in several locations.

The bedrock geology in the Project area consists of Archean and Proterozoic supercrustal sequences and plutonic rocks.

2.2 HYDROGEOLOGY SETTING

2.2.1 Conceptual Model

The Project is in an area of continuous permafrost. In this region, the layer of permanently frozen subsoil and rock is generally deep and overlain by an active layer that thaws during summer. The depth of the active layer is typically expected to range between one and three metres. Depending on lake size, depth, and thermal storage capacity, the talik (unfrozen ground surrounded by permafrost) beneath lakes may fully penetrate the permafrost layer resulting in an open talik. Circular lakes with a radius greater than 300 m, or elongated lakes with a half-width of at least 150 m, are assumed to be connected to the deep groundwater flow regime through open taliks. The thickness of the permafrost outside of the influence of lakes is estimated to be between 452 m and 522 m.

In areas of continuous permafrost, there are two groundwater flow regimes: a deep groundwater flow regime beneath permafrost, and a shallow groundwater flow regime located in the active (seasonally thawed) layer near the ground surface. With the exception of areas of taliks beneath lakes, the two groundwater regimes are isolated from one another by thick permafrost.

The shallow groundwater regime is active only seasonally during the summer months, and the magnitude of the flow in this layer is expected to be several times less than runoff from snowmelt. Groundwater in the active layer primarily flows to local depressions and ponds that drain to larger lakes; therefore, the total travel distance would generally extend only to the nearest pond, lake, or stream. Water in the active layer is stored in ground ice during the cold season and is then released with the ice thaws in late spring or early summer, thus providing flow to surface. During the warm season, groundwater in the active layer is recharged primarily by precipitation.

Permafrost reduces the hydraulic conductivity of the bedrock by several orders of magnitude (Burt and Williams 1976; McCauley et al. 2002). Consequently, the permafrost in the rock would be virtually impermeable to groundwater flow. The shallow groundwater flow regime, therefore, has little to no hydraulic connection with the deep groundwater regime which is overlain by thick and continuous permafrost.

Groundwater flow within the deep groundwater flow regime is limited to the sub-permafrost zone. This deep groundwater flow regime is connected to the ground surface by open taliks underlying larger lakes. Taliks exist beneath lakes that have enough depth so that they do not freeze to the bottom over the winter. If the lake is sufficiently large and deep, the talik can extend down to the deep groundwater regime. These taliks are referred to as open talik. If the talik does not extend down to the deep groundwater, it is referred to as a closed or an isolated talik. The width and shape of lakes in the Hydrogeology Baseline Study area were reviewed to estimate if open taliks could be present below the lakes (FEIS Volume 6 Appendix 6.A). Based on 1-D analytical solutions presented in Burn (2002), Golder estimated that open taliks could be present for circular lakes with a radius of approximately 300 m and for elongated lakes with a half-width of approximately 150 m. Beneath smaller lakes that do not free to the bottom over the winter, a talik bulb may form; however, the talik bulb is not expected to extend to the deep groundwater flow system. Generally, deep groundwater will flow from higher elevation lakes with open taliks to lower elevation lakes with open taliks. To a lesser degree, groundwater beneath the permafrost is influenced by density differences due to saline water conditions (density-driven flow).

Below the active layer, permafrost underlies the land surrounding the lakes, which restricts the lateral or horizontal flow of groundwater and restricts the recharge of the sub-permafrost groundwater flow system by precipitation. Multiple thermistors in the land surrounding Whale Tail Lake, in combination with thermal modelling, indicate the permafrost extends to 452 m to 522 m below ground surface in areas outside of the influence of lakes. In particular, thermistor data recorded at AMQ15-452, AMQ17-1233, AMQ17-1337 and AMQ17-1277A (Golder 2019c) indicates the presence of permafrost between Whale Tail Lake and Nemo lake, and therefore the absence of horizontal groundwater flow in the upper 452 to 522 m of bedrock.

Groundwater flow is controlled by surface water elevations in lakes with open talik; water moves vertically through the open talik to the underlying sub-permafrost groundwater flow system. The elevations of the lakes with expected open taliks in the baseline study area indicate that Whale Tail Lake is likely a groundwater discharge zone at the south end of the Lake (upward vertical hydraulic gradient), with flow from Lake A60 to Whale Tail Lake, and a groundwater recharge zone at the north end of the Lake (downward hydraulic gradient), with groundwater flow from Whale Tail Lake to Lake DS1, as presented on the Figure 2 showing the hydrogeology baseline study area. Whale Tail Pit is located in the north basin and therefore a downward vertical hydraulic gradient is expected (Figure 3). This was verified by hydraulic head monitoring at the Westbay Well system, which had a measured downward hydraulic gradient of 0.006 to 0.008 m/m, which is equivalent to what would be expected based on the relative lake elevation of Whale Tail Lake and Lake DS1 (Golder 2019a; Golder 2019d).

Figure 2: Hydrogeology Baseline Study Area

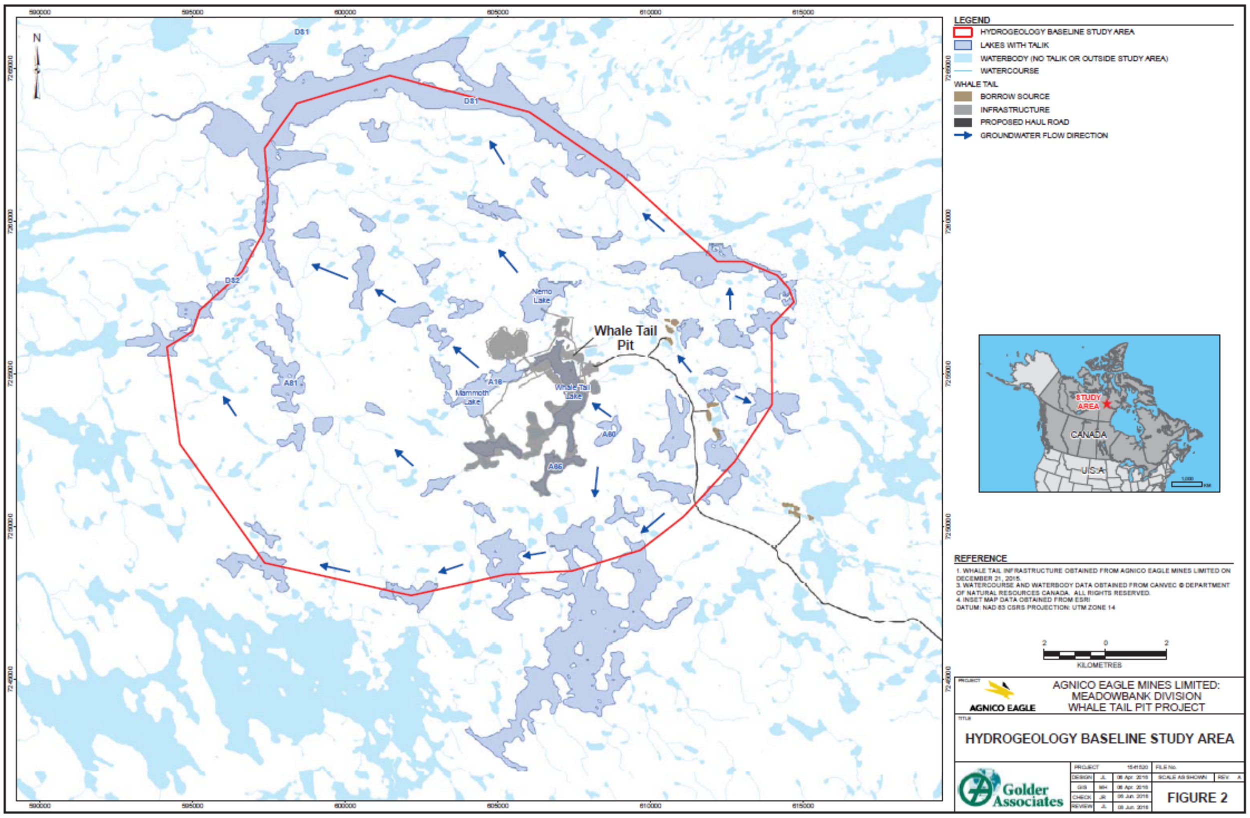
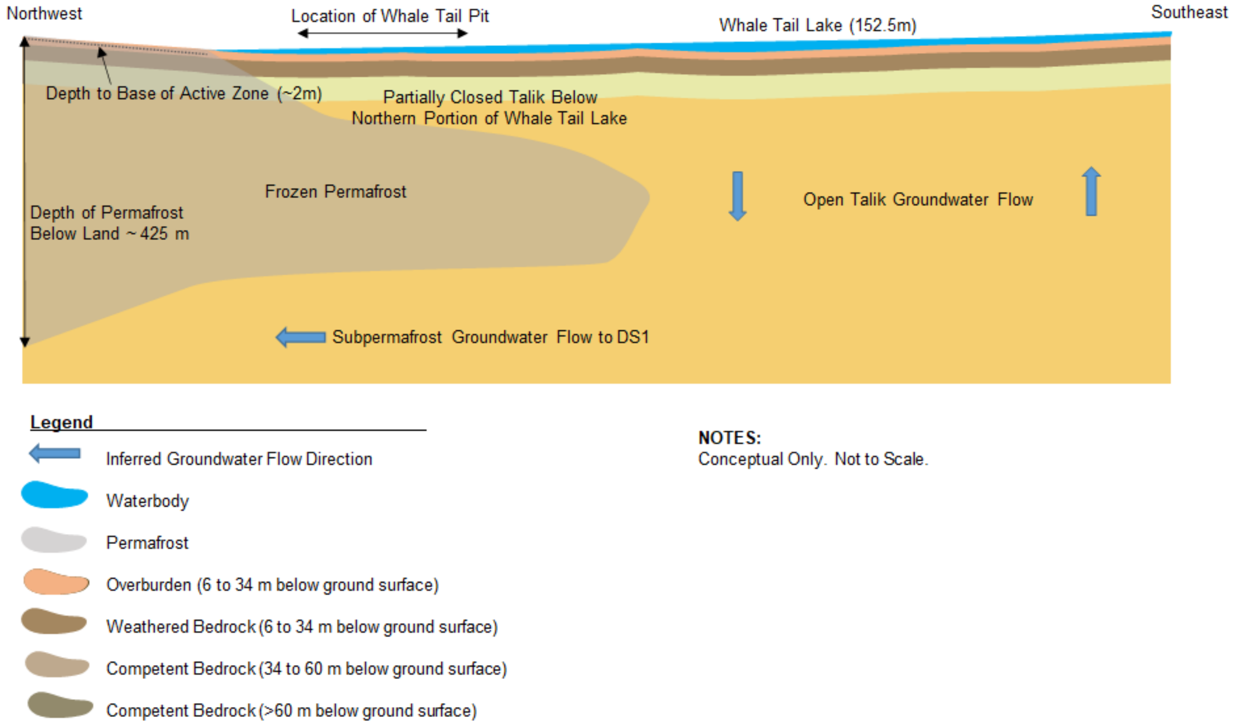
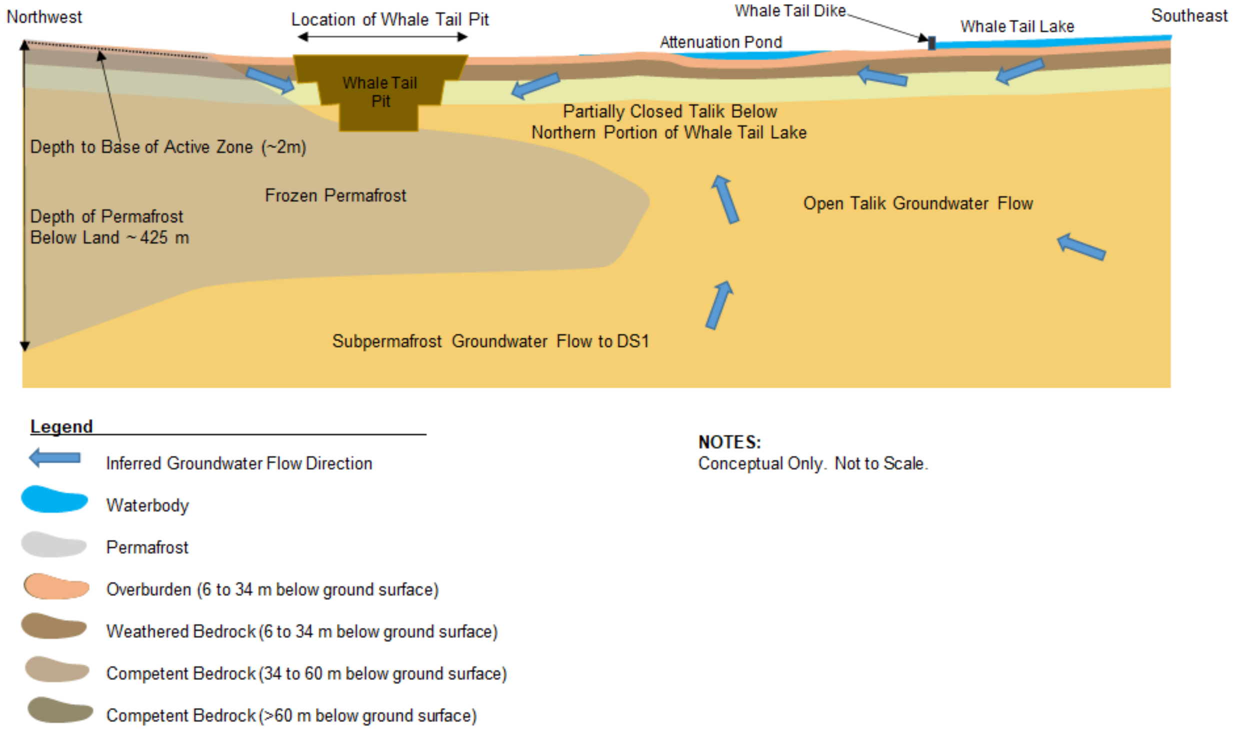


Figure 3: Conceptual Model of Pre-Mining Deep Groundwater Flow Regime - Cross-Section View



Below Whale Tail Lake, a talik is expected to form a continuous channel that is closed in the northern portion of Whale Tail Lake below the open pit and becomes open towards the south and central portion of the lake. This conclusion is supported by updated two-dimensional thermal modelling based on site-specific thermistor data (Section 2.3.3). As shown in Figure 4, during mining the open pit will act as a sink for groundwater flow, with seepage faces developing along the pit walls. In response to mining of the open pit, groundwater will be induced to flow through bedrock to the open pit. Mine inflow will primarily originate from Whale Tail Lake, the attenuation pond between the pit and Whale Tail dike, and potentially deep bedrock. The quality of mine inflow will be a result of the mixing from each of these sources.

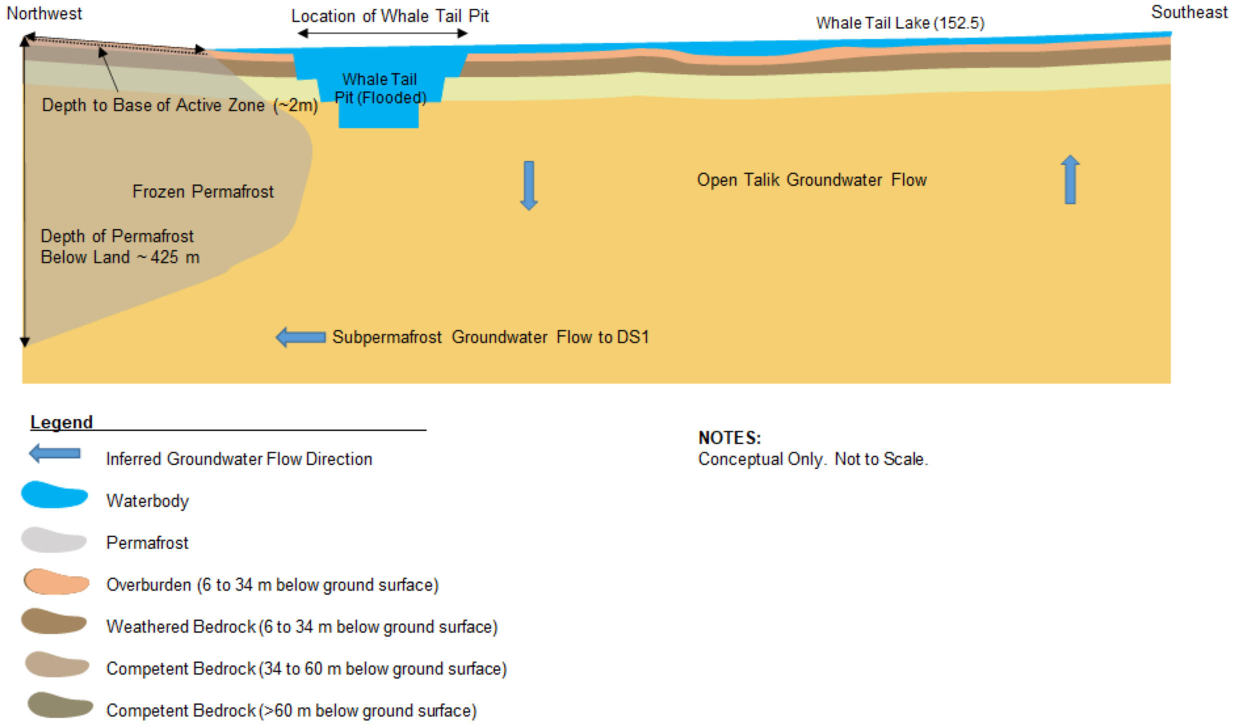
Figure 4: Conceptual Model of Deep Groundwater Flow Regime during Mining - Cross-Section View



NOTES:
Conceptual Only. Not to Scale.

During closure (Figure 5), the open pit will be flooded with water from a variety of sources including: water pumped from the flooded South Whale Tail watershed until the original Whale Tail Lake level is reached (152.5 m), the north-east watershed following the breach of the North-East dike, groundwater originating from nearby lakes underlain by open taliks, connate water and water pumped from the attenuation pond. This process will dissipate the large hydraulic head differences established during mine operations in the vicinity of the mine workings. The rate of groundwater inflow will decrease as the water level in the open pit rises. From the start of closure and following the formation of the pit lake in post-closure, permafrost below the pit is expected to thaw slowly. The thermal regime in the vicinity of the pit will be monitored, as outlined in the Thermal Monitoring Plan for the Project (Agnico Eagle 2020b).

Figure 5: Conceptual Model of Deep Groundwater Flow Regime in Long-Term Post-Closure - Cross-Section View



2.2.2 Post-Closure Hydrogeological and Thermal Analysis

Hydrogeological analysis was conducted to assess the post-closure groundwater regime in the vicinity of the Whale Tail Pit (Golder 2018a). The intent of the study was to consider post-closure changes in the groundwater regime once the pit lake reaches its ultimate elevation and the influence, if any, that these changes may have on water quality in the flooded pit. As part of the analysis, the predicted changes in the permafrost regime, based on a post-closure thermal assessment, were incorporated into the hydrogeological model. The results of the hydrogeological assessment provided input into a concurrent study that assessed water quality in the flooded pit (Golder 2018c). Overall, groundwater was found to be a minor component of the flooded pit lake water quality due to the small predicted seepage rates from the pit in relation to typical surface water exchanges.

Results of the post-closure thermal assessment (Golder 2018b) included:

- During pit flooding, the warm pit lake temperature impacts mostly the upper portion of the permafrost under the pit, and a talik starts to form around the pit wall and floor.

- The permafrost under the pit lake continues to thaw during the long-term post-closure stage, and the open talik expands towards the northern edge of the pit lake (land side). The majority of the permafrost under the pit lake is thawed 300 years after closure.

- The steady-state model indicates the pit lake would thaw the permafrost in the long-term, and eventually somewhat reduce the permafrost depth to the northwest of the pit. A significantly longer time (in the order of 10,000 years) is likely required for the pit lake to reach the steady-state thermal conditions**.** Permafrost is still predicted to the north of the pit, restricting the horizontal flow of groundwater to towards Nemo Lake where the permafrost is present.

As summarized above, with the exception of deep sub-permafrost groundwater flow, groundwater flow during closure will be similar to pre-development conditions and limited to the area of talik below Whale Tail Lake and the developed pit lake during closure. Horizontal flow beneath land will be restricted by the presence of permafrost below the active layer. Thermal analysis indicates that although permafrost degradation below the pit footprint will occur, permafrost will be present below the land outside of the pit lake and other lakes with talik (i.e., including between the pit and Nemo Lake).

Predictions from the hydrogeological modelling were an input into a concurrent study that assessed overall water quality in the flooded pit (Golder 2018c). Arsenic loading rate from the Whale Tail pit north wall has been determined from the completion of the Arsenic diffusion model (Golder 2018d) and integrated to the Whale Tail Pit hydrodynamic model (Golder 2018c). Result of the hydrodynamic model are:

- The concentration of TDS will remain below site specific water quality objectives at all times. TDS will peak at just below 25mg/L in year 2025, and thereafter decrease over time. Concentration of TDS will stabilize at approximately 11mg/L by 2055.

- The concentration of arsenic will remain below site specific water quality objectives at all times. Arsenic will peak at just below 0.025mg/L in year 2025, and thereafter decrease over time. Concentration of arsenic will stabilize at approximately 0.0025mg/L by 2055.

- The concentration of total phosphorous will remain below site specific water quality objectives at all times. Total phosphorus will peak at just above 0.007mg/L in year 2025, and thereafter decrease over time. Concentration of total phosphorus will stabilize at approximately 0.0025 mg/L by 2055.

The pit lake in the long-term is expected to be a source of groundwater recharge, with seepage loss rates negligible compared to the 3,000,000+ m^3 of surface water exchanged annually post-closure when surface water flows are re-established, based on average climate year watershed runoff. This groundwater loss rate is estimated to represent 0.02% of the total surface water exchanged annually. This indicates that uncertainty in the hydraulic gradient and groundwater flow is not critical to the long-term assessment of pit lake water quality. As presented in Golder (2018) recent monitoring of the hydraulic gradient, and calculated fluxes based on this gradient suggest that the predicted post-closure seepage rates are reasonable based on the measured data.

2.2.3 Groundwater Volumes and Quality

Potential groundwater inflow quantity and quality with respect to total dissolved solids was updated in 2020 in support of the annual update to the site wide water balance and water quality models. The results of this work are documented in the 2019 Groundwater Management Monitoring Report (Golder 2020). These updated flow predictions reflects updated thermal modelling and the supplemental hydraulic conductivity and TDS water quality data collected at the Site since the FEIS in accordance with Project Certificate Term and Condition No. 16b and 16c, as described in Golder (2020) and in Section 2.3.

A summary of the updated predictions for mining and pit filling (EA Scenario) is presented on Table 1 and Table 2. In 2020, following dewatering of the North Basin of Whale Tail Lake, mining is expected to intersect unfrozen rock, and groundwater inflow to the pit is predicted to be 940 m^3/day. The groundwater inflow to the open pit was predicted to slightly decrease in 2021 to 680 m^3/day. The higher inflow in 2020 is attributed to additional groundwater inflow from storage. The overall inflow to the pit does not increase significantly as the pit deepens because the flow of groundwater is primarily through the permeable shallow (weathered) bedrock. The predicted peak quantity of groundwater inflow into the open pit during mining for the updated EA scenario is approximately 3.4 times the groundwater inflow predicted for the FEIS. As discussed in the V2.1 of the GWMP, this change resulted from the supplemental data collection indicating a higher shallow bedrock hydraulic conductivity.

For post closure, the long-term pit lake discharge to the sub-permafrost groundwater flow system is predicted to be less than 1 m^3/day, which is consistent with previous post-closure analysis (Golder 2018a) and estimates made using field monitoring data (Section 2.3.4). This prediction assumes the permafrost below the pit fully degrades, connecting the bedrock below the lake to the sub-permafrost flow system through an open talik.

Table 1: 2020 Predicted Groundwater Inflow to the Open Pit during Operations and Closure

Phase	Period	Groundwater Inflow (m^3/day)	TDS Concentration (mg/L)
Dewatering	2019	895	120
Mining	2020	940	175
	2021	680	170
	January 2020 to July 2020	675	160
Filling	2022	640	155
	2023	580	150
	2024	450	150
	2025	260	150
	2026	65	145
	2027	-255	-
	2028	-5	-
Post Closure	-	<1	-

Note: Positive flow rate values indicate flow to the pit and negative values indicate flow to bedrock.

TDS = total dissolved solids; m^3/day = cubic metres per day; mg/L = milligrams per litre

Table 2: 2020 Predicted Groundwater Inflow to the Attenuation Pond during Operations and Closure

Phase	Period	Groundwater Inflow (m^3/day)	TDS Concentration (mg/L)	Pond Outflow (m3/day)
Dewatering	2019	-	-	-
Mining	2020	265	280	320
	2021	125	365	430
	January 2020 to July 2020	120	320	430
Filling	2022	120	300	430
	2023	115	270	395
	2024	120	220	310
	2025	135	180	185
	2026	145	150	85
	2027	25	150	660
	2028	-5 to 5	-	5
Post Closure	-	NA	NA	NA

TDS = total dissolved solids; m^3/day = cubic metres per day; mg/L = milligrams per litre; NA = Not Applicable

2.3 ADDITIONAL DATA COLLECTION

Project Certificate Term and Condition No. 15 indicates the need to collect additional site-specific hydrogeologic data in key areas of the Project during the pre-development, construction and operational phases. Agnico Eagle has commenced with the collection and documentation of this data, and a summary of the results is presented below. This data was considered in the model used to provide the updated predicted pit inflows and TDS water quality in Section 2.2.3.

2.3.1 Groundwater Quality

At the time of the FEIS, a representative sample of deep groundwater had not been collected and data collected at the Meadowbank Mine was used to infer the TDS profile at the project. A Westbay well system was installed on site between March and April in 2016. The borehole was drilled to a depth of 499 m. The well was installed to monitor hydraulic heads, test hydraulic conductivity, and collect groundwater samples from multiple intervals (Golder 2016c).

Since 2016, groundwater samples were collected from the Westbay in November 2018 and March 2019 along with the measurement of vertical hydraulic gradient (Golder 2019a; 2019d). The 2018 and 2019 program estimated groundwater quality were in the same range as previously estimated. The calculated groundwater TDS were slightly higher in 2018, which was attributed to the higher proportion of residual drilling water in the sample; 2019 concentrations estimated from piezometer data with low residual drilling water were similar to 2016 measurements The concentrations of metals and arsenic were low. Given that the arsenic concentrations are similar to the assumptions adopted in the geochemical models (low arsenic in formation groundwater), groundwater arsenic content is still not likely to have a significant effect on mine surface water quality. Considering that the estimated groundwater quality are in the same range as estimated in 2016, and that the vertical gradients measured at the Westbay Ports (Section 2.3.4) are consistent with the conceptual model in the FEIS, an additional Westbay well installation is not recommended.

Data collected from the Westbay were used in the recent update of groundwater model to provide updated predictions of groundwater inflow and TDS quality in support of the site wide water quality and water balance model updates. The TDS profile adopted in the model update, based on the sampling to date is presented in Figure 6.

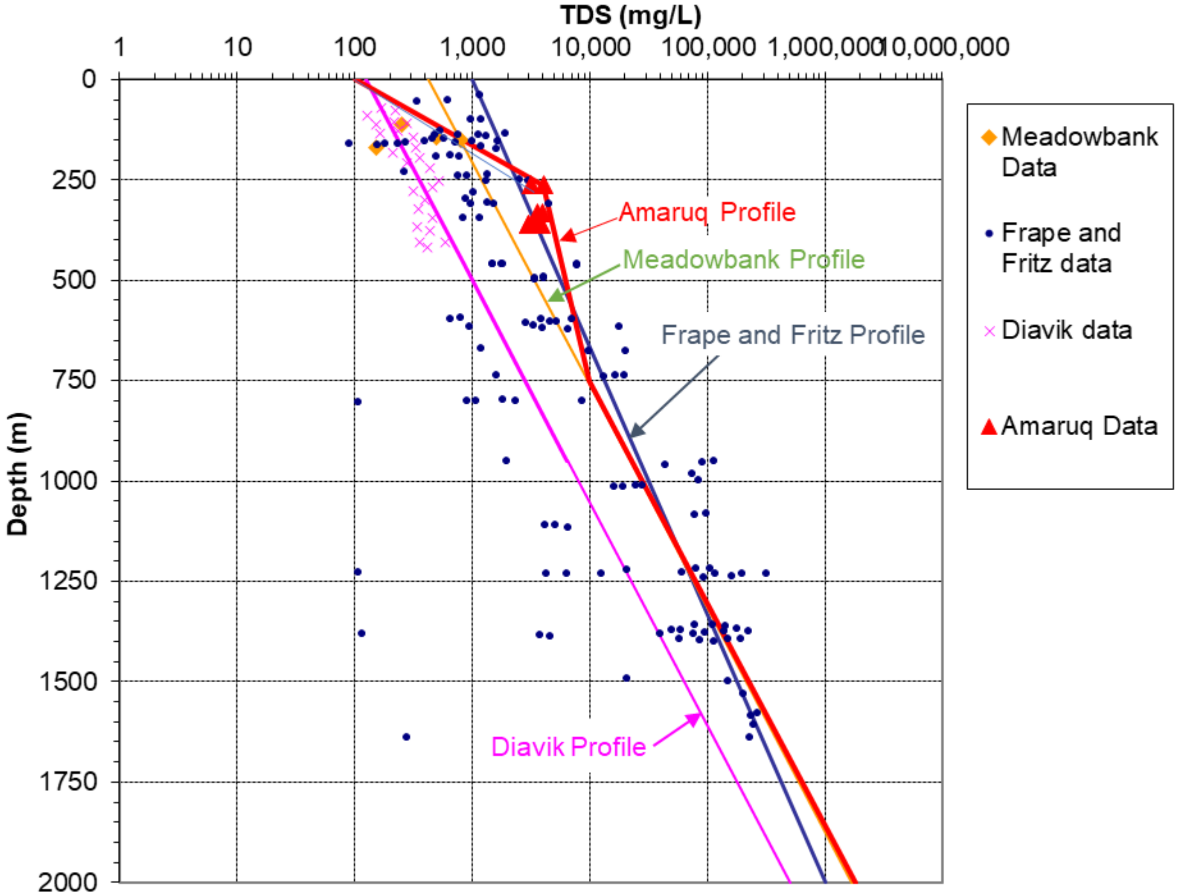


Figure 6: TDS Profile Incorporated in Numerical Model

2.3.2 Hydraulic Conductivity Testing

Supplemental hydrogeological investigations have been undertaken between 2015 and 2018 to further characterize the hydraulic conductivity of the bedrock in the vicinity of the Whale Tail Pit. These investigations have been documented in reports by Knight Piesold (2016), Golder (2016a, 2017; 2019b), and SNC (2017). These investigations included the completion of over 50 packer tests in unfrozen areas of bedrock (i.e., within the talik or below the regional permafrost).

Data collected from these four supplemental investigations, in combination with the available FEIS data, indicate the bulk bedrock hydraulic conductivity, estimated based on the geometric averages, ranges from 1 x 10^{-5} m/s near surface (i.e., up to depths of 40 m) to approximately 8 x 10^{-10} m/s at greater depths (Figure 7). As part of the FEIS, the hydraulic conductivity was estimated to be between 1 x 10^{-8} and 2 x 10^{-7} m/s. Consistent with the FEIS, higher hydraulic conductivities than the geometric averages were adopted for the updated groundwater inflow predictions, presented as the Updated EA scenario on Figure 7. The Updated EA Scenario is designed to be a reasonable, yet more conservative, assessment of potential groundwater inflow quantity and TDS quality[1] than values that might be adopted for mine operation planning (i.e., Base Case Scenario in the FEIS). Results from the more conservative Updated EA Scenario are used in the updated Site-Wide Water Balance and Water Quality model.

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[1] Consistent with previous modelling in the FEIS Addendum, TDS concentrations do not account for loading from lakes and Whale Tail Attenuation Pond. TDS from these sources accounted for in Site Wide Water Quality analysis.

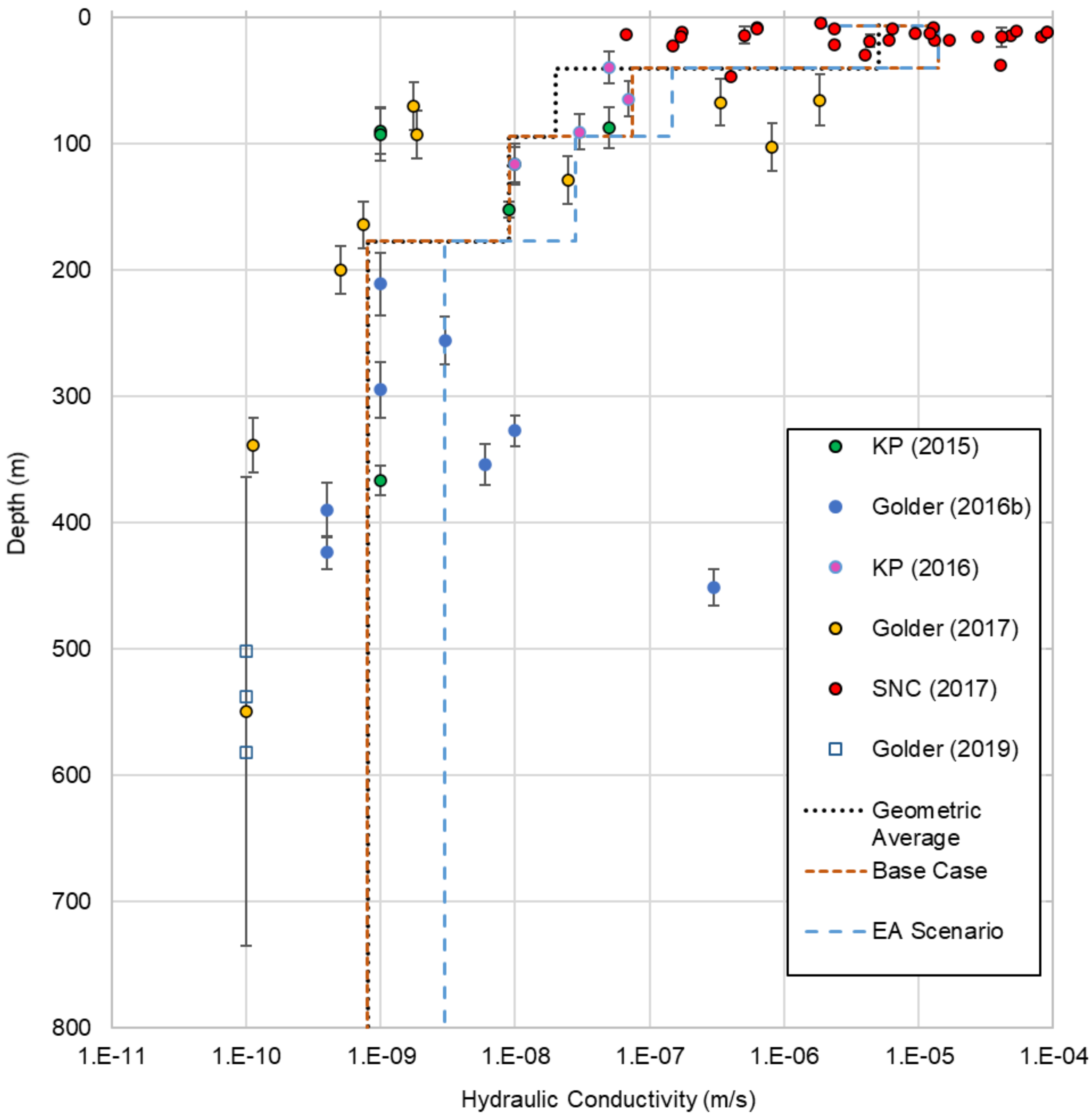

Figure 7: Updated Hydraulic Conductivity Profile Following Supplemental Data Collection

2.3.3 Thermal Monitoring in Support Assessment of Groundwater Flow Direction

Updated thermal modelling was completed in April 2019, which involved the calibration of the two-dimensional (2D) thermal models to measured data at ten thermistors near the Whale Tail Pit area. A report was prepared documenting the work and is presented as Attachment B. Results from the thermal modelling were used to develop a 3D representation of the permafrost in the Whale Tail Lake area. Based on the April 2019 thermal modelling and the available thermistor data, the permafrost characteristics in the Project area are summarized below:

- The depth of permafrost outside of the influence of lakes is estimated to be between 452 m and 522 m based on thermal gradients and ground temperatures at the lowest portions of the thermistor strings. The depth of permafrost increases with increasing distance from lakes with taliks.
- Considering the 2D thermal modelling and 3D block model, the assessment indicated that:
  - Under the northern portion of the lake below Whale Tail Pit, there is likely a closed talik formation
  - Open talik conditions are probable in the southern portion of the lake where the Whale Tail Lake becomes wider
  - Permafrost depth is between 480 m and 550 m for ground away from the Whale Tail Lake, and between 350 m and 450 m below surface in portions beneath the Whale Tail Lake where a closed talik is present.
  - The cryopeg thickness at the bottom of the permafrost is likely between 20 m to 30 m.

Review of the 2D thermal analysis and 3D block model indicates that the predicted closed and open taliks are consistent with the previously understood conceptual hydrogeological conditions. Relative to the FEIS, the depth of the closed talik below the northern portion of the lake is slightly less resulting in the base of the Phase 1 pit being located within the permafrost underlying the talik (previously the pit bottom was slightly above the underlying permafrost).

Data reviewed in the April 2019 modelling report included four thermistors installed between Nemo Lake and Whale Tail Pit. These four thermistors each indicate the presence of deep permafrost below land and confirm the horizontal groundwater flow below the active layer is restricted by permafrost in at least the upper 425 m. It also confirms that the sub-horizontal groundwater flow system can only be recharged by vertical flow through open taliks beneath sufficiently large lakes, such as Whale Tail and Nemo.

On-going thermal monitoring at the Site is documented in the Whale Tail Pit Project Thermal Monitoring Report 2020, dated March 2020.

2.3.4 Verification of Horizontal and Vertical Groundwater Flow Direction

The vertical movement of groundwater flow through the open talik is being monitored using the Westbay Well system (AMQ16-626) to measure the vertical hydraulic gradient. This monitoring verified the direction of groundwater flow and can be used in combination with the measured bedrock hydraulic conductivity to estimate the groundwater flux near Whale Tail Pit.

The data collected at AMQ16-626 (Golder 2019d), indicates the presence of a downward hydraulic gradient of 0.006 m/m. This gradient is consistent with the estimated gradient derived from looking at the relative elevation of Whale Tail Lake and DS1 and the gradient recorded in 2018 (0.008 m/m; Golder 2019a). DS1 is the predicted receptor from water in the area of Whale Tail Pit and Underground. Figure 2 is presenting location of Whale Tail Lake and DS1 Lake.

For the depth interval over which the hydraulic head was measured (326 to 456 mbgs), the estimated hydraulic conductivity of the bedrock based on test data presented on Figure 3 is 8 x 10^{-10} (geometric average). As part of the Updated EA scenario, a higher hydraulic conductivity of 3 x 10^{-9} was assessed. Considering the range of measured gradients (0.006 to 0.008), the updated assessment of bedrock hydraulic conductivity (8 x10^{-10} to 3 x 10^{-9}) and an assumed effective porosity of 0.001 (Maidment 1992; Stober and Bucher 2007), the estimated downward groundwater flow velocity during pre-development is between approximately 0.2 m/yr and 0.8 m/yr.

Gradients measured during this monitoring program are considered a reasonable interpretation of what long-term gradients could be post-closure following the formation of the pit lake. Recharge and discharge from the base of Whale Tail Lake or a flooded pit lake will be controlled by the vertical hydraulic gradients and the bedrock hydraulic conductivity near the base of the permafrost. Considering the approximate area of the Whale Tail Pit (0.5 km^2), the range in bedrock hydraulic conductivity (8 x10^{-10} to 3 x 10^{-9} m/s), and the measured downward gradients (0.006 to 0.008), the data would indicate long-term groundwater flux would be approximately 0.2 m^3/day to 1 m^3/day. Overall, the estimated flux is similar to the long-term predicted discharge from the pit lake at post-closure (less than 1 m^3/day; Golder 2020) and supports the conclusion in the FEIS that long-term predicted flows from the pit lake to the groundwater flow system will be negligible relative to the surface water exchange into the pit lake. Of note, if the hydraulic conductivity of the bedrock was the values assumed in the original FEIS (1 x 10^{-8} m/s), the predicted flux would still be small (up to 3.5 m^3/day) and negligible relative to the surface water exchange into the pit lake.

3 GROUNDWATER MONITORING PLAN

Water quantity and quality monitoring data will be used to verify the predicted water quality and quantity trends and to conduct adaptive management should differing trends be observed. Monitoring will be initiated at the start of mining and continue during operations and closure.

The GWMP will be further defined as the open pit is developed and will be conducted in agreement with the WMP for the Project. In compliance with Part B, Item 17 of Type A Water Licence 2AM-WTP1826, the GWMP will be reviewed annually.

3.1 HORIZONTAL AND VERTICAL GROUNDWATER FLOW MONITORING

Thermal monitoring will continue at installed thermistors to monitor the presence of permafrost below the active layer during construction and operations phases. The monitoring will continue until such time as a thermistor is destroyed by active mining, and, at a minimum, will be monitored at four times per year per the 2AM-WTP1826 Water Licence. AMQ17-1233 is located outside of the pit footprint and will be used to monitor permafrost conditions between Nemo Lake and Whale Tail Pit. The thermistor data will be used to verify the presence of permafrost and the restricted horizontal movement of groundwater below the active layer due to permafrost in the upper 452 to 522 m of bedrock. Additional details on thermal monitoring are provided in the Thermal Monitoring Plan, Version 3.

As part of the Whale Tail Dike Operation Maintenance and Surveillance manual, performance of the Whale Tail dike will be monitored with different instruments (e.g. piezometers) located in the principal horizontal groundwater flow pathway between Whale Tail South Basin and the Whale Tail pit. Piezometer readings and water level in the Whale Tail South Basin and the Attenuation Pond will be available to calibrate the hydrogeological model during operation if deemed necessary.

Vertical groundwater flow conditions in the area of Whale Tail Pit will be monitored by the Westbay Well system. Agnico Eagle will be sampling the Westbay Well system commencing in March 2019 and will continue to sample and report on an annual basis during the Construction and Operations Phases. The monitoring will include the measurement of the vertical hydraulic gradient and the collection of groundwater samples. During operations, this data will be supplemented by the direct measurement of groundwater quality in the seepage inflow to the pit (Section 3.2). Water sampling parameters will be consistent with the sump sampling and seepage parameters planned for the pit (Section 3.2.2).

Data collected during construction and operations phases will be used to develop an appropriate monitoring for closure and will be documented in the Interim Closure and Reclamation Plan.

3.2 GROUNDWATER QUANTITY AND QUALITY MONITORING

3.2.1 Water Quantity

Seepage observations will be monitored and recorded pursuant to Part I, Item 8 in accordance with Part I Item 15 of Water License 2AM-WTP1826. Seepage locations are too be determined (ST-S-1 TBD).

Agnico Eagle would like to clarify the monitoring requirements related to the Waste Rock Storage Facility (WRSF) are addressed in the approved ARD-ML monitoring plan, Water Quality and Flow Monitoring Plan, Water Management Plan and Waste Management Plan, as any seepage emanating from the WRSF is considered as a surface water management issue. The groundwater monitoring plan focus on the definition of the groundwater quality and flow reporting to the pit lake created before, during and after the excavation of the ore body.

Groundwater inflow to the open pit will be collected in sumps prior to being pumped to surface. Water collected in the sumps represents the bulk, or combined inflow to the open pit, and may include other sources of water, such as precipitation. During construction and operations, groundwater inflow to the pit will be evaluated four time per calendar year as per Water Licence 2AM-WTP1826 requirements. Management of the pumped-out water is described in the WMP.

The above flow monitoring will be supplemented by pit seepage assessments to be completed twice a year for the first two years and once a year starting in the third year and continuing until the end of operations. In the first two years of pit development, one of the seepage surveys will be conducted in early summer, following snow melt and thawing of any ice in the pit walls, and then again in late August. In the following years of mining, one survey will be conducted in August of each year. The objective of the seepage surveys is to identify preferential groundwater flow pathways in the walls of the open pit, if present, and to determine their relative contribution to the groundwater inflow to the pit with respect to water quantity and quality.

3.2.2 Water Quality

During the operations phase, the quality of water from the sumps (either at the sump or at end of pipe at the surface ST-WT-4) will be monitored four time per calendar year as per Water Licence 2AM-WTP1826 requirements.

Pit seepage monitoring sampling locations are to be defined (ST-S-1 TBD) and will be collected and recorded in accordance with Schedule I Table 2 requirements. Water samples will be collected from pit seeps in the pit walls if there is sufficient water for analysis and if access to the seep is possible and safe. Sampling data will be collected from locations to be decided, based on seepage observations, and will highlight seeps collected in the vicinity of lithologies with high acid rock draining and metal leaching (ARD/ML) potential. As per Water Licence 2AM-WTP-1826 requirements, seep samples will be analysed at a minimum for Group 1 parameters: pH, temperature, turbidity, hardness, alkalinity, chloride, fluoride, ammonia nitrogen, nitrite, nitrate, orthophosphate, total phosphorus, total metals (aluminium, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, zinc) sulphate, TDS, and total suspended solids (TSS).

Water samples will be collected from the Westbay Monitoring Well (AMQ16-626) annually during operations and closure. Given the Westbay well had to be installed through permafrost, removal of groundwater for well development, purging and sampling must be carried out using a small volume sampler which substantially lengthens the time requirement for these activities for each port (months). Consequently, the sampling program prioritizes key ports that optimized groundwater quality data collection; each port is accessed for hydraulic pressure measurements. Water samples will be collected from Ports 4 and 3 for assessment of groundwater quality. Ports 2 and 6 may also sampled for qualitative evaluation of groundwater quality and checks on if the aquifer near the sampling port has been naturally flushed of the drilling water over time. Additional information on sampling rational is provided in the 2019 Groundwater Monitoring report.

For Westbay groundwater samples each sample, field parameters will be recorded (pH, temperature, turbidity, salinity and electrical conductivity). As per Water Licence 2AM-WTP1826 requirements, Westbay samples will be analysed at a minimum for Group 2 parameters:

- Total and Dissolved Metals: aluminium, antimony, arsenic, boron, barium, beryllium, cadmium, copper, chromium, iron, lithium, manganese, mercury, molybdenum, nickel, lead, selenium, tin, strontium, titanium, thallium, uranium, vanadium and zinc.
- Nutrients: ammonia-nitrogen, total kjeldahl nitrogen, nitrate nitrogen, nitrite-nitrogen, ortho-phosphate, total phosphorous, total organic carbon, total dissolved organic carbon and reactive silica.
- Conventional Parameters: bicarbonate alkalinity, chloride, carbonate alkalinity, conductivity, hardness, calcium, potassium, magnesium, sodium, sulphate, pH, total alkalinity, total dissolved solids, total suspended solids and turbidity.

Additional chemical analyses may be required to more completely characterize the chemical loading from the mine water. The additional analyses will be dependent on monitoring results.

3.3 DATA COMPILATION AND UPDATES TO GROUNDWATER MODEL

Groundwater monitoring data will be compiled into a Project-specific database and evaluated for trends in groundwater data with respect to pit and underground inflow quantity and quality.

Measured groundwater inflow rates will be compared to model predictions on an annual basis. If significant variations from model predictions are observed, the assumptions behind the data will be reviewed and the analysis updated if required. In addition, updates to the groundwater model will be made if operational changes occur as the open pit advances which could significantly alter groundwater inflow or quality.

Variations that would be considered significant and would be triggers for review of the data include:

- Groundwater inflow quantity to the mine, based on rolling monthly average of inflow over six consecutive months, is 20% higher than predicted groundwater inflow. The six-month averaging period of observation is based on observed seasonal variations in inflow quantities in mines situated in continuous permafrost regions, where half the year there is virtually no surface water component of flow to the pit.

- Collected water samples that indicate that the TDS is more than 25% higher than the estimated water quality, based on a 6-month rolling average.

- Temperature profiles observed in the sentinel thermistors (AMQ17-1233 and AMQ17-337) located between Nemo Lake and Whale Tail Lake are showing sign of permafrost degradation below the active layer.

- Observed inflow quantity and quality is lower than expected would not be of concern and/or effect water management plans on-site. Model updates or analysis would therefore not be conducted if predicted inflow quantity and quality is higher than observed conditions.

If the first three variations are triggered, the groundwater and/ or permafrost data would be assessed to evaluate trends, the potential causes of the triggers and the potential for long-term effects associated with the variation. If for example, the greater than predicted inflows were correlated to a short-term effect such as freezing in the pit walls, changes in mining rate, freshet or transient drainage of a high storage feature, then further reassessment of groundwater inflows may not be required, and the adaptive management of these short-term effects would be evaluated under the Water Management Plan (WMP). However, if the effects of these variations is found to be potentially long term, this may warrant review of the model and/or permafrost calibration and predictions.

Table 4 presents the adaptive management plan with respect to groundwater monitoring. The design of the water management infrastructure includes contingencies in case of unplanned events. The Whale Tail attenuation pond can handle higher groundwater inflows and the Operation Water Treatment Plan (O-WTP) is designed to handle total flow rates 60% higher than planned (including surface and groundwater inflows reporting to the Attenuation Pond). O-WTP has the capacity to treat more than five times increase in groundwater inflows from the one predicted during operation. Moreover, if the inflows are greater than this then there is the capacity to store water within the pit and adjust the mining plan to deal with extra inflows. In any case, all contact water will be managed within the pit area.

The groundwater management strategies: the ponds, sumps and water conveyance strategies around the pit can be modified to mitigate the effect of additional groundwater volume or salinity prior to treatment and discharge. The water conveyance strategy will be evaluated and optimized during operations and closure to maintain post-closure commitments. Other engineering solutions such as depressurization wells, grouting and thermosiphons may be considered, if warranted.

If one of the thresholds in Table 4 is triggered and it is found to be a potentially long-term effect, then hydrogeological and thermal analyses will be required to define the best solution to address the exceedance. Agnico Eagle considers that adaptive management must be based on well informed decisions and may include re-calibration of the thermal and hydrogeological models, predictions based on these re-calibrations, and revised Site-Wide water balance and Site-Wide water quality forecasts.

Table 4: Groundwater Adaptive Management Plan

Threshold	Consequence	Likelihood	Adaptive Management
Groundwater inflows to the mine, based on rolling monthly average of inflow over six consecutive months, is 20% higher than predicted groundwater inflow	• Higher water volume to treat during operation • Potential to compromise storage capacity of the attenuation pond • Impact on mining sequence	Low	O-WTP have 60% contingency to manage higher inflow to attenuation pond (forecasted peak operation flow in the water balance is 1,300m^3/h during 12h a day vs treatment capacity of 1,800 m^3/h during 24h per day); O-WTP have the capacity to treat more than five times increase in groundwater inflows from the one predicted during operation; Attenuation pond has 50% contingency to manage higher groundwater inflow; Assess situation by performing additional inspection, monitoring and field investigation; Review hydrogeological model, Site-wide water balance and Site-wide water quality forecast with updated data; Review water management strategy (e.g. temporary storing water in the pit); Evaluate potential long-term mitigations (e.g., grouting); Review water management strategy.
Collected groundwater samples that indicate that the TDS is more than 25% higher than the estimated groundwater quality, based on rolling monthly average over 6 consecutive months	• Higher TDS water quality to treat during operation • Compromise storage capacity of the attenuation pond • Potential to reduce water treatment efficiency and management plan if not meeting Metal and Diamond Mining Effluent Regulations • Impact on mining sequence	Low	O-WTP have 60% contingency to manage higher inflow to attenuation (forecasted peak operation flow in the water balance is 1,300m3/h during 12h a day vs treatment capacity of 1,800m3/h during 24h per day); O-WTP have the capacity to treat more than five times increase in groundwater inflows from the one predicted during operation; Flow to the pit is dominated by seepage loss from the Attenuation Pond and seepage from the South Basin of Whale Tail Lake. As the groundwater inflow to the pit is representing a small ratio of the overall water inflows in the attenuation pond,

Threshold	Consequence	Likelihood	Adaptive Management
			water treatment efficiency should not be impacted significantly by uncertainty in the groundwater TDS; Assess situation by performing additional inspection, monitoring and field investigation; Review hydrogeological model, Site-wide water balance and site-wide water quality forecast with updated data; Evaluate additional treatment and storage capacity required to manage flow in operation (e.g. storing water in the pit); Evaluate potential long-term mitigations (e.g. grouting, thermosiphon); Review water management strategy.
Temperature profile observed in the sentinel thermistor (AMQ17-1233) located between Nemo Lake and Whale Tail Lake are showing sign of permafrost degradation below the active layer.	• Horizontal groundwater flow observed between Whale Tail Pit north wall and Nemo Lake. • Potential for groundwater seepage to pit sump/pit lake. • Increased water treatment requirement.	Unlikely	Assess situation by performing additional inspection, monitoring and field investigation; Review thermal model, hydrogeological model, Site-wide water balance and site-wide water quality forecast with updated data; Install new thermistor(s) to evaluate the extent of the permafrost degradation; Evaluate additional treatment and storage capacity required to manage flow in operation (e.g. storing water in the pit); Evaluate potential long-term mitigations as depressurization wells, grouting, thermosiphon Review water management strategy. Evaluate need for new groundwater well to evaluate groundwater flow conditions.

Thresholds, triggers and the adaptive management plan presented in this version of the GWMP are consisted with version 2.1 of GWMP which was approved by NWB in 2019 (NWB 2019).

4 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality. Specific QA and QC procedures that will be followed during sampling performed for the GWMP are described in Section 4.1 and 4.2.

4.1 QUALITY ASSURANCE

Quality assurance protocols will be diligently followed so data are of known, acceptable, and defensible quality. There are three areas of internal and external management, which are outlined in more detail below.

4.1.1 Field Staff Training and Operations

To make certain that field data collected are of known, acceptable, and defensible quality, field staff will be trained to be proficient in standardized field groundwater sampling procedures, data recording, and equipment operations applicable to the GWMP. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage and shipping protocols.

4.1.2 Laboratory

To make sure that high quality data are generated, accredited laboratories that will be selected for sample analysis. Accreditation programs are utilised by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control.

4.1.3 Office Operations

A data management system will be utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the GWMP. Relevant elements will include, but are not limited to the following:

- all required samples are collected;
- chain-of-custody and analytical request forms are completed and correct;
- proper labelling and documentation procedures are followed, and samples will be delivered to the appropriate locations in a timely manner;
- laboratory data will be promptly reviewed once they are received to validate data quality;
- sample data entered into a Mine-specific groundwater quality database will be compared to final laboratory reports to confirm data accuracy; and

- appropriate logic checks will be completed to ensure the accuracy of the calculations.

4.2 QUALITY CONTROL

The QC component will consist of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples.

Sample bottle preparation, field measurement and sampling handling QC procedures include the following:

- Sample bottles will be kept in a clean environment, capped at all times, and stored in clean shipping containers. Samplers will keep their hands clean, wear gloves, and refrain from eating or smoking while sampling.

- Where sampling equipment must be reused at multiple sampling locations, sampling equipment will be cleaned appropriately between locations.

- Temperature, pH, and specific conductivity will be measured in the field using hand held meters (e.g., YSI water quality sondes).

- Samples will be cooled to between 4°C and 10˚C as soon as possible after collection. Care will be taken when packaging samples for transport to the laboratory to maintain the appropriate temperature (between 4°C and 10˚C) and minimize the possibility of rupture. Where appropriate, samples will be treated with preservatives to minimize physical, chemical, biological processes that may alter the chemistry of the sample between sample collection and analysis.

- Samples will be shipped to the laboratory as soon as reasonably possible to minimize sample hold times. If for any reason, samples do not reach the laboratory within the maximum sample hold time for individual parameters, the results of the specific parameters will be qualified, or the samples will not be analysed for the specific parameters.

- Chain of custody sample submission forms will be completed by field sampling staff and will be submitted with the samples to the laboratory.

- Only staff with the appropriate training in the applicable sampling techniques will conduct water sampling.

Quality control procedures implemented will consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and split/duplicate water samples. These are defined as follows:

- Field Blank: A sample will be prepared in the field using laboratory-provided deionized water to fill a set of sample containers, which will then be submitted to the laboratory for the same analysis as the field water samples. Field blanks will be used to detect potential sample contamination during collection, shipping and analysis.

- Travel Blank: A sample will be prepared and preserved at the analytical laboratory prior to the sampling trip using laboratory-provided deionized water. The sample will remain unopened throughout the duration of the sampling trip. Travel blanks will be used to detect potential sample contamination during transport and storage.

- Duplicate Sample: Two samples will be collected from a sampling location using identical sampling procedures. They will be labelled, preserved individually and submitted for identical analyses. Duplicate samples will be used to assess variability in water quality at the sampling site. Duplicate will be collected and submitted for analyses at approximately, 10% of sampling locations. For smaller batches of samples (less than 10), at least one duplicate will be collected and submitted for analysis.

Additional QA/QC procedures that will be applied to the seepage survey component of the GWMP will include:

- Location – Universal Transverse Mercator (UTM) coordinates of seepage will be defined through the use of a hand-held Global Positioning System (GPS) unit and will be recorded in the field log book with a photograph of each pit wall.

- Sample Labels – appropriate sample nomenclature will be assigned to the sample labels that will define sample locations, sample type, year, and designation. These labels will distinguish between samples collected from seeps versus samples collected from sumps.

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APPENDIX A – 2019 WESTBAY SYSTEM GROUNDWATER MONITRORING INVESTIGATION

TECHNICAL MEMORANDUM

DATE 29 July2019

Project No. 18108905-303-TM-Rev0

TO Michel Groleau
Agnico Eagle Mines Ltd.

FROM Valerie Bertrand, Jennifer Levenick

EMAIL vbertrand@golder.com

2019 AMQ16-626 WESTBAY GROUNDWATER MONITORING INVESTIGATION, AMARUQ, NUNAVUT

1.0 INTRODUCTION

Agnico Eagle Mines Limited – Meadowbank Division (Agnico Eagle) is developing the Whale Tail Pit Project that was approved by the Nunavut Impact Review Board (NIRB). The property is a 408 square kilometre (km^2) site located on Inuit Owned Land approximately 150 kilometres (km) north of the hamlet of Baker Lake and approximately 50 km northwest of the Meadowbank Mine in the Kivalliq Region of Nunavut.

As part of the Approved Project baseline studies, groundwater samples were collected from a Westbay monitoring well installed in borehole AMQ16-626, drilled in March and April 2016 targeting the area of the talik below Whale Tail Lake near future mine developments. Agnico Eagle retained Nuqsana Golder Engineering and Environmental Inc. (Nuqsana Golder) to complete a three-week groundwater monitoring program during spring 2019. The objective of the program was to obtain additional pre-development hydraulic head and groundwater quality data in support of the Whale Tail Pit Project Certificate No. 008, Term and Condition No. 15 (TC15) (NIRB 2018).

This technical memorandum provides an interpretation of the data collected from AMQ16-626 in 2019 with respect to hydraulic gradients and groundwater quality. The collected data was reviewed in the context of conceptual model and predictions of the numerical model for the Whale Tail Pit Project to evaluate if follow-up assessment is required (i.e., if significant differences in the model assumptions or predictions was indicated by the collected data).

2.0 BACKGROUND

2.1 Westbay Well Installation

A Westbay groundwater well system was installed on site between March and April in 2016 to obtain groundwater quality and verify the vertical hydraulic gradient within the talik of Whale Tail Lake, in the area of future mine development, to define future effects of the mine workings on the groundwater flow regime and overall site water quality from development to post-closure.

The well was installed in the purpose-specific borehole (AMQ16-626) which was drilled at an inclination of -69 degrees, an azimuth of 152.6 degrees and advanced to a depth of 499 m along the borehole, through massive diorite throughout the borehole. The Westbay well was designed to tap discrete zones of unfrozen bedrock and, if encountered, zones of higher hydraulic conductivity that were observed during drilling and well testing conducted prior to well installation. Six sampling ports were installed at and below the depth of anticipated ramp development (0 to 385 metres below ground surface [mbgs]). The locations of the ports are provided in Table 1. Borehole drilling, packer test results along the borehole and well installation details are documented in Golder (2016b). A schematic of the Westbay well instrument that was installed in borehole AMQ160626 is included in Appendix A for reference.

Table 1: Borehole AMQ16-626 Westbay System Zones

Sampling Interval	Depth Along Borehole			Depth Below Ground Surface		
	From	To	Length	From	To	Thickness
	(mah)	(mah)	(m)	(mbgs)	(mbgs)	(m)
Port 6	276.0	287.4	11.4	257.7	268.3	10.6
Port 5	298.9	310.3	11.4	279.0	289.7	10.6
Port 4	349.3	359.1	9.8	326.1	335.2	9.1
Port 3	381.3	392.7	11.4	356.0	366.6	10.6
Port 2	440.8	452.2	11.4	411.5	422.2	10.6
Port 1	488.1	499.0	10.9	455.7	465.9	10.2

Notes: Depth values were provided by Westbay Instruments Completion Report.
m = metres; mah = metres along the hole, relative to top of hole; mbgs = metres below ground surface.

Upon completion of the installation in 2016, the well was used to collect groundwater samples from select intervals that were within and below the proposed development; Ports 3, 4, and 6 ranging in depths from 276 m to 392 m. Sampling methods, data interpretation and water quality results were presented in Golder 2016a. The total dissolved solids (TDS) content in the Formation groundwater[1] was determined to range between 3,198 mg/L and 4,042 mg/L (Golder 2016a).

The groundwater quality were used to predict groundwater inflow salinity into future mine developments, which were used as input to operational and post-closure hydrogeological and permafrost models (Golder 2018a), and as input to the Whale Tail pit lake hydrodynamic model (Golder 2018b). These models were ultimately used to assess effects of hydrogeological processes on site contact water quality during development, operations and closure and on pit lake water quality during closure and post-closure.

The results of the compendium of these studies for the Whale Tail Pit Project indicated that mass transfer from the pit to the pit lake is very low, that groundwater seepage into and out of the pit lake are negligible in volume, particularly compared to surface water exchanged annually during post-closure when flows are re-established based on average climate yearly watershed runoff. The combination of results supports the conclusion that the hydrogeological regime around the pit lake is not critical to pit lake water quality at post-closure.

Groundwater quality and hydraulic head data collected as part of the 2018 (Golder 2019a) and 2019 monitoring programs add to the pre-operational database of results and were used to verify model inputs and model outcomes obtained to date.

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[1] Formation water in this report refers to the natural groundwater in the rock formation, as opposed to sampled water which is a mixture of drilling water and true groundwater.

2.2 Groundwater Monitoring Program

The 2019 groundwater monitoring program was completed to support the requirements of the Groundwater Monitoring Program stated in TC15 (NIRB 2018). TC15 requirements were as follows:

> *Subject to the additional direction and requirements of the Nunavut Water Board, the Proponent shall prepare and implement a Groundwater Monitoring Plan that, at a minimum includes:*
>
> - *The collection of additional site-specific hydraulic data (e.g., from new monitoring wells) in key areas during the pre-development, construction and operation phases;*
> - *Definition of vertical and horizontal groundwater flows in the project development areas; and*
> - *Delineates monitoring plans for both vertical and horizontal ground water.*

The groundwater monitoring program documented in this technical memorandum consisted of measurements of hydraulic head (vertical gradients) and sampling of the Formation groundwater to evaluate groundwater quality with depth.

Groundwater monitoring data collected at this stage is representative of the pre-development condition of the project, and therefore an evaluation of trends in flow quantity and quality is not possible for the operational and closure phases. Results of the monitoring has been compared to assumptions adopted in the initial conditions for groundwater conceptual and numerical models and has been used to assess if the post-closure predictions are likely reasonable in consideration of the observed vertical hydraulic gradients and flow directions in the 2019 monitoring program.

2.3 Thresholds for Additional Assessment or Adaptive Management

Groundwater monitoring data collected thus far in the pre-development and construction phases are being compiled into a Project-specific database that documents the existing range of groundwater flow and quality prior to open pit development. These data will be used in combination with future data collected during operational and closure phases of the Project to evaluate trends with respect to the quantity and quality of groundwater inflow to Whale Tail open pit.

Measured groundwater inflow rates and groundwater quality will be compared to the Approved Project FEIS model predictions on an annual basis. If significant variations between actual mine inflow and model predictions are observed, the assumptions behind the modeled data will be reviewed and the analysis updated if required. In addition, updates to the groundwater model will be made if operational changes occur as the open pit advances which could significantly alter actual open pit groundwater inflow or quality.

Variations between actual data and modeled data that would be considered significant include:

- Actual groundwater inflows to the mine, based on rolling monthly average of inflow over six consecutive months, is 20% higher than predicted groundwater inflow in the model.
- Groundwater quality data collected from seeps of groundwater flowing into the pit indicate that the concentration of total dissolved solids (TDS) is more than 25% higher than the estimated water quality.

If the above variations are observed during operation, the groundwater data (quantity and quality) would be assessed to evaluate trends, the potential causes of the greater than expected groundwater inflow quantity or quality, and the potential for long-term effect associated with the groundwater flow or quality. If the greater than predicted flows were correlated to a short-term effect such as freezing in the pit walls, changes in mining rate, freshet or transient drainage of a high storage feature, then further reassessment of groundwater inflows may not be required, and the adaptive management of these short-term effects would be evaluated under the Water Management Plan.

If the greater than predicted flows or quality would be considered as potentially long term, consideration will be given to reviewing the model calibration. The six-month averaging period of observation is based on observed seasonal variations in inflow quantities in mines situated in permafrost regions.

If model re-calibration is deemed necessary, future groundwater inflow quantity and quality would be predicted using this re-calibrated model and new results will be considered as part of the adaptive management of the groundwater quantity contribution to the Water Management Plan.

Modification of groundwater management strategies: the ponds, sumps and water conveyance strategies around the pit can be modified to mitigate the effect of additional groundwater volume or salinity prior to treatment and discharge. The water conveyance strategy will be evaluated and optimized during operations and closure to maintain post-closure commitment.

Groundwater monitoring data collected at this stage is representative of the pre-development and initial construction condition of the project, and therefore an evaluation of trends in flow quantity and quality is not possible for the operational and closure phases. Results of the monitoring has been compared to assumptions adopted in the initial conditions for groundwater conceptual and numerical models and has been used to assess if the post-closure predictions are likely reasonable in consideration of the observed vertical hydraulic gradients and flow directions in this March 2019 monitoring program.

3.0 2019 GROUNDWATER MONITORING PROGRAM

3.1 Objectives

The objectives of the program are as follows:

- To collect site-specific hydraulic head data through the measurement of the hydrostatic pressure profile from the existing Westbay well installed in borehole AMQ16-626.
- Assess the vertical hydraulic gradient and groundwater flow direction in that location of the Whale Tail Lake talik.
- Collect groundwater samples from the Westbay Well for chemical analysis in target sample intervals, adding to the database of groundwater quality results which will be used to compare against water quality samples collected from the open pit during operation and closure.

3.2 Monitoring Methods

3.2.1 Hydraulic Head Measurements and Assessment of Vertical Hydraulic Gradients

Hydraulic heads were derived from the formation pressures measured at each monitoring port installed along the Westbay system. The formation pressure for each monitoring port was measured on March 16, 2019 using the Mosdax sampler manufactured and supplied by Westbay Instruments (refer to Appendix B for instrument calibration record).

3.2.2 Groundwater Sampling

Groundwater samples were collected from fixed ports in the Westbay well system that are positioned at different intervals along the hole to assess baseline groundwater chemistry with depth. As part of the designated 2019 program samples were collected from Ports 2, 3, 4 and 6. Port 1 was not sampled because of its elevated residual fluorescein and based on the limited development completed to date but field measurements of fluorescein content and electrical conductivity were recorded. Port 5 was meant to measure hydraulic pressure only, it was not intended for collection of groundwater samples. The Westbay well being installed through permafrost, removal of groundwater for well development, purging and sampling must be carried out using a small volume sampler which substantially lengthens the time requirement for these activities for each port (months). Consequently, the sampling program prioritizes key ports that optimize groundwater quality data collection; all ports are accessed for hydraulic pressure measurements. The rational for ports selected for sampling is provided below.

- Ports 4 and 3, which are located within the anticipated ramp development zone, were targeted for sampling because these intervals had been previously developed in 2016 (i.e. drill water had been largely removed from the interval).
- Port 6 is interpreted to be located within the cryopeg zone (temperature below 0 degrees where water still flows). In the cyropeg groundwater has the potential to yield variable water quality even following periods of sufficient development (Golder 2019a) because this zone is partially frozen, salt could concentrate in the liquid phase relative to ice, and the liquid phase is likely preferentially conveyed to the sampling device. A groundwater sample was collected from Port 6 to verify previous sampling results.
- Port 2 was sampled, although it was less developed than the other intervals in 2016, to document if the aquifer is being naturally flushed of the drilling water over time.

Throughout the development and upon water sample collection, field chemical parameters (pH, conductivity, fluorescein content and temperature) were measured in order to track the fluid introduced into the Formation by drilling and to follow the removal of this fluid from the formation during development and sampling of groundwater. Fluorescein tracer was added to the 2016 drilling water to differentiate between the drilling fluid and the Formation water. It is assumed that drilling water is the only source of fluorescein introduced during the 2016 drilling activities of borehole AMQ16-626 such that it is a reliable tracer of introduced water into the Formation. Fluorescein content was measured using the AquaFluor handheld Fluorometer manufactured by Turner Designs. Temperature, pH and electrical conductivity values were measured with a Hanna Combo tester (HI 98130). A drilling water content of less than 5% (estimated using fluorescein content) is targeted in order to provide a reliable estimate of Formation groundwater quality. Higher residual drilling fluid content can be used for this purpose but decreases the precision of the calculation of groundwater quality. Information on each of the Ports that were purged is presented in Table 2.

Table 2: Summary of AMQ16-626 2019 Westbay Well Monitoring Program - Development

Port	Sampling Port Interval (mah)		Final 2016 Sample Parameters		Total Volume Removed in 2016 (L)	Final 2018 Sample Parameters		Total Volume Removed in 2018 (L)	Final 2019 Field Parameters		Total Volume Removed in 2019 (L)	2016 – 2019 Cumulative Volume Removed (L)
	To	From	F	EC		F	EC		F	EC		
6	276	287	48 [9%]	4.6	282	87 [17%]	9.0	8.25	62.76 [12%]	9.59	9	299.25
4	350	359	93 [18%]	4.9	1850	73 [14%]	14.8	13.25	120.0 [22%]	22.08	41	1,909.25
3	382	392	114 [22%]	7.5	177	97 [19%]	7.6	12.5	44.1 [9%]	5.27	76	265.5
2	441	452	120 [23%]	23	424	78 [15%]	17.7	6.25	201.7 [39%]	32.48	8	437.25
1	488	499	550	4.8	50	248 [48%]	9.4	0.25	137 [27%]	10.69	2	52.25

Notes: mah = metres along hole, relative to ground surface; F = fluorescein content (ppb); [%] = denotes F percentage achieved; EC = electrical conductivity (mS/cm)

F target for sampling based on removal of most of the drilling water introduced into the Formation in 2016 determined based on F content of the raw water sample. A minimum of 90% removal is targeted (90 % of 512 ppb). The average F content of drill water in 2016 was 512 ppb (F ranged between 173 and 1000 ppb during 2016 drilling activities)

2016 Sampling Targets – 90% target was not achieved during the allocated development period. Sample collected upon stabilization of field parameters (EC and F)

2018 Sampling Targets – collect sample to obtain groundwater quality information at a specific point in time

2019 sampling Targets – Port 3 (50 ppb, 10% target of initial F measured in 2016), Port 4 (coupled decreasing trends of F and EC as time permits) and Ports 2 and 6 (1 day each, as time permits).

Groundwater sampling was preformed using the Westbay Mosdax sampler in a similar fashion as the previous development and sampling programs completed in 2016 and 2018. The Mosdax sampler collects 1 Litre of groundwater at a time (per sampling instrument descent into the well); multiple sampler runs were carried out to collect one complete groundwater sample set from each interval. Information on the sampling completed in each Port is presented in Table 2 and Table 3.

Table 3: Summary of AMQ16-626 Westbay Well 2019 Monitoring Program – Sample Collection

Sample Port	Sampling Interval (mah)		Volume of Water Removed in 2019 (L)	Sample Date	Groundwater Parameters at Sampling Period (average field measured during sampling runs)		
	From	To			Residual Fluorescein (ppb)	Electrical Conductivity (mS/cm)	pH
6	276.0	287.4	9	3-Apr-19	74.08 ± 9.5	9.64	6.27
4	349.3	359.1	41	2-Apr-19	120.46 ± 2.1	22.28	6.84
3	381.3	392.7	76	29-Mar-19	55.82 ± 2.8	4.74	6.84
2	440.8	452.2	8	30-Mar-19	175.94 ± 18.9	29.67	8.35
1	488.1	499.0	2	not sampled	-	-	-

Notes: m = metres; mah = metres along hole; relative to ground surface; L = litres; ± standard deviation

Groundwater samples were collected in triplicate from sample Ports 2 and 3 and in duplicate from sample intervals 4 and 6 (due to time constraints). Groundwater samples were filtered and preserved in the field, as required, and collected in laboratory-supplied bottles which were packed and shipped to the analytical laboratory following the collection of each sample. Duplicate samples collected from Ports 3 and 2 were submitted for analysis, while the third sample set was kept on site as backup and disposed of upon receipt of the samples by the analytical laboratory. Field blanks were also collected for quality assurance/quality control (QA/QC) purposes. Analysis of general chemistry was completed at ALS Environmental (ALS) in Vancouver for the following parameters:

- Physical tests, including hardness, pH, conductivity, total suspended solids and total dissolved solids
- Anions and nutrients, including alkalinity, ammonia, bicarbonate, bromide, carbonate, chloride, fluoride, nitrate, nitrite, phosphorus (total and dissolved) and sulphate
- Metals (dissolved and total), including aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, selenium, silicon, silver, sodium, strontium, sulfur, tellurium, thallium, tin, titanium, uranium, vanadium and zinc. Additional metals were also analyzed by the analytical laboratory as part of the metals package, however they are not of interest to the project and will not be discussed herein out: cesium, rhenium, rubidium, sulfur, thorium, tungsten, yttrium and zirconium
- Petroleum Hydrocarbons, including total petroleum hydrocarbons (C10-C50)
- Radioactive Ions, including Radium 226
- Silicate (as requested by Agnico Eagle)

Certificates of analysis from ALS are included in Appendix C.

3.3 Evaluation of Formation Water Quality

To properly assess the quality and salinity of true rock Formation groundwater, the drilling fluid present in the sampling interval must be removed as much as possible by purging. The amount of drilling fluid present in the Formation is estimated from the concentration of fluorescein in the raw groundwater sample at each interval, compared to the fluorescein content of the drilling fluid used during drilling of the borehole. In 2016 upon well installation, the sampling intervals were purged to remove as much of the drilling fluid as possible within the task schedule, prior to collecting a sample for chemical analysis.

In 2019, the fluorescein and electrical conductivity of groundwater was monitored during sampling in the field and compared to data from the end of development in 2016 and 2018 to assess whether the interval remained purged and still reflected true Formation groundwater quality. Fluorescein and conductivity were within the range of values recorded in 2016 for Ports 6 and 3, but higher in Ports 4 and 2 as compared to 2018. Groundwater samples were collected and submitted for chemical analysis from Ports 6, 4, 3 and 2.

The following summarizes the calculations made to estimate true Formation water quality and TDS from field measurements of electrical conductivity and laboratory analytical results of raw groundwater samples in 2019 and drilling water fluid in 2016, consistent with the approach used to calculate the Formation water quality from the 2018 investigation (Golder 2019a).

1) **Estimation of the chemistry of the drilling fluid introduced in the Formation during the 2016 well borehole drilling and installation activities.** The drilling fluid consisted of very low TDS lake water to which was added a concentrated brine. The range of composition of the drill fluid (the dilute brine) was estimated by comparing both the initial and maximum conductivity values measured in samples from the Formation (for each port 6, 4, 3, and 2; conductivity varied between sampling ports) against the conductivity of the concentrated brine[2]. This Dilute Brine Factor was used to calculate composition of the drilling fluid introduced into the sampling interval during the 2016 drilling and well installation activities as per equation (1) below.

$$(1) \qquad Dilute\ Brine\ Factor_{Port\ i} = \frac{Field\ Conductivity_{Port\ i}}{Brine\ Conductivity_{calculated}}$$

This calculation assumes an insignificant proportion of formation water is present immediately after drilling, which is a fair assumption given that a high volume of drilling water was lost to the Formation (Golder, 2016a).

The drilling brine composition for each parameter was calculated from the product of the dilution brine factors and the chemistry of the drilling brine fluid for each port per equation (2).

$$(2) \qquad Dilute\ Brine_{Port\ i} = Laboratory\ Result_{Brine} \times Dilution\ Brine\ Factor_{Port\ i}$$

2) **Calculation of the proportion of drill brine remaining in the Formation upon sampling.** This was calculated based on the amount of residual fluorescein measured upon sample collection at each port in 2019 compared to the initial fluorescein content of the drilling fluid measured in 2016 (i.e. 512.7 ppb).

3) **Removal of the drilling fluid chemistry from the raw groundwater sample analysis.** The concentration of constituents from the drilling fluid are removed from the reported analytical results for each chemical constituent per the below equation (3). The 2019 laboratory results are provided in Appendix C.

$$(3) \qquad Groundwater\ Quality_{calculated} = Laboratory\ Result - \frac{Proportion\ of\ Drill\ Brine \times Dilute\ Brine\ Chemistry}{Proportion\ of\ Formation\ Water}$$

The estimated chemistry of the drilling brine, proportion of residual drilling brine and Formation water for each sampling port are summarized in Table 4. The calculated groundwater quality for Ports 6, 4, 3 and 2 are summarized in Table 5.

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[2] Brine conductivity was estimated from the calculated TDS of the drilling brine fluid using a conversion factor of 0.75 which is appropriate for brine solutions (Rusydi, 2017). Brine TDS was calculated based on constituent concentrations (refer to Table 4 and Appendix C). Laboratory-reported TDS and conductivity were not reliable as they exceeded instrument calibration.

4.0 RESULTS AND DISCUSSION

4.1 Hydraulic Head Profile and Groundwater Flow Direction Below Whale Tail Lake

The planned Whale Tail Pit is located within a closed talik below the North Basin of Whale Tail Lake. The closed talik is inferred to transition to open talik below the South Basin due to the increased width and depth of the lake towards the south. The water table below both basins will be equivalent to the lake surface elevation.

Permafrost underlies the land surrounding the lake, which restricts the lateral flow of groundwater to the talik and restricts the recharge of the sub-permafrost groundwater flow system by precipitation. Groundwater flow is controlled by surface water elevations in lakes with open talik; water moves vertically through the open talik to the underlying sub-permafrost groundwater flow system. In effect, lakes with open taliks in continuous permafrost regions are equivalent to large monitoring wells.

AMQ16-626 was installed to evaluate groundwater quality in the unfrozen bedrock and to verify the hydraulic gradient that exists below Whale Tail Lake. The hydraulic gradient, in combination with the bedrock hydraulic conductivity, will control the potential flux to or from Whale Tail Lake, and the flooded Whale Tail Pit post-closure.

Table 6 summarizes the calculated hydraulic heads based on the measured pressure in each sampling port. Although Port 6 (shallowest interval) is included in Table 6, it is suspected that this port may be in the cryopeg near the permafrost contact, which could affect the measured hydraulic head. This inference is supported by the formation temperature measured in 2018, which is less than zero (Golder 2019a). In 2019, stabilized temperature readings were not recorded. Data from the deeper ports, which are confirmed to be in unfrozen rock based on the formation temperature measured in 2018, were used to assess the vertical gradient.

Table 6: AMQ16-626 Westbay Well Hydraulic Heads (16 March 2019)

Port/Zone	Measurement Interval (mah)		Measurement Interval (mbgs)		Port Depth (mah)	Port Depth (mbgs)	Calculated Depth to Water (mbgs)	Calculated Hydraulic Head (masl)
	From	To	From	To				
6	276.0	287.4	257.7	268.3	276.2	257.9	1.3	153.2
4	349.3	359.1	326.1	335.2	349.5	326.3	1.4	153.1
3	381.3	392.7	356.0	366.6	381.5	356.2	0.8	153.7
2	440.8	452.2	411.5	422.2	441.0	411.7	1.9	152.6
1	488.1	499.0	455.7	465.9	488.3	455.9	2.2	152.3

Notes: m = metres; mah = metres along hole relative to ground surface (borehole angled to surface); mbgs = metres below ground surface (vertical down from surface); masl = metres above sea level (elevation)

Source: Golder (2016a).

The data collected at AMQ16-626 in March 2019 indicates the overall downward gradient is present between the shallowest and deepest port, which is consistent with the observations in November 2018 and modelling results, which predicts that groundwater flows downwards from Whale Tail Lake and upwards to DS1. Data collected at Port 3 somewhat deviates with this trend, and in consideration of the 2018 data, it is suspected a recording error was made in the field during the 2019 measurement. During future monitoring events, the hydraulic head will be calculated in the field to identify these potential errors, and allow for re-measurement, if needed. Assuming the measured hydraulic head is representative of the midpoint of the measurement interval, a downward hydraulic gradient of 0.006 m/m was present between Ports 1 and 4. This hydraulic gradient is similar to what was measured in November 2018 (0.008 m/m).

Based on the geometric average of test data collected at the site, the hydraulic conductivity of the deep bedrock is estimated to be 8 x 10^{-10} m/s (Golder 2019c). This data and geometric average consider data available at the time of the FEIS submission for the Approved Project, and supplemental data collection since its submission. The expanded hydraulic conductivity data set was also presented in the Attachment B of the Groundwater Management Monitoring Report (Golder 2019b). Consistent with the development of the EA Scenario in the FEIS, an upper bound estimate of deep bedrock hydraulic conductivity was assumed to be three times the geometric average (3 x 10^{-9} m/s).

Considering the range in deep bedrock hydraulic conductivity (8 x 10^{-10} m/s to 3 x 10^{-9} m/s), the measured hydraulic gradients in 2018 and 2019 (0.008 to 0.006), and assuming an effective porosity of 0.001 (Maidment 1992; Stober and Bucher 2007), the estimated downward groundwater flow velocity is between approximately 0.2 m/yr and 0.8 m/yr. The lower end of this range is considered the most likely groundwater velocity, as it is based on the geometric average of the hydraulic conductivity measurements in the deep bedrock (8 x 10^{-10} m/s).

Gradients measured during this monitoring program are considered a reasonable interpretation of what long-term gradients could be post-closure following the formation of the pit lake. Recharge and discharge from the base of Whale Tail Lake or a flooded pit lake will be controlled by the vertical hydraulic gradients and the bedrock hydraulic conductivity near the base of the permafrost. Considering the approximate area of the Whale Tail Pit (0.5 km^2), the updated range in bedrock hydraulic conductivity since the FEIS (8 x 10^{-10} to 3 x 10^{-9} m/s), and the measured downward gradients (0.006 to 0.008), the data would indicate long-term downward groundwater flux would be between approximately 0.2 m^3/day to 1 m^3/day. This groundwater flux is lower than historical estimates of groundwater flux (up to 11 m^3/yr; Golder 2019a), and reflects the increased hydraulic testing of the bedrock, which has resulted in a lower interpreted bedrock hydraulic conductivity (Golder 2019c).

Overall, the estimated downward groundwater flux is similar to the long-term predicted discharge from the Whale Tail pit lake at post-closure for the Approved Project (1.7 m^3/day; Golder 2016c) and supports the conclusion in the FEIS that long-term predicted flows from the pit lake to the groundwater flow system will be negligible relative to the surface water exchange into the pit lake.

4.2 Groundwater Quality

Field measurements of electrical conductivity and fluorescein concentration serve, in part, to evaluate whether the groundwater accessed via the Westbay well sampling ports continues to be representative of Formation groundwater quality.

The electrical conductivity and fluorescein concentrations measured in water pumped from ports 6, 4, 3, 2, and 1 of the Westbay well throughout the sampling programs since well installation in 2016, are summarized in Figures 1. A detail of development for the 2019 program is shown on Figure 2. Field measurements of electrical conductivity and fluorescein recorded at the time of sampling are summarized in Table 3. The values are averages from the subsamples collected to obtain the required volume of water for analysis.

Figure 3 depicts the hydraulic conductivity measured at the borehole prior to installing the Westbay well (Golder, 2016c), along with fluorescein content and electrical conductivity measured after purging and prior to sampling in the 2016, 2018 and 2019 field programs. This figure illustrates that the fluorescein content is relatively stable at Ports 3 and 6; trending toward stability at Port 4; and still elevated at Ports 2 and 1. Although still elevated, the declining trend in fluorescein content observed in the most conductive zone (i.e. Port 1) likely represents natural flushing over time. Elevated fluorescein content in samples is indicative of a high proportion of drilling fluid in groundwater and therefore, not representative of Formation groundwater quality.

Groundwater samples were collected from Ports 6, 4, 3, and 2. Port 1 was not sampled because of its elevated residual fluorescein and based on the limited development completed to date but field measurements of fluorescein content and electrical conductivity were recorded. Field activities prioritized obtaining representative samples of groundwater quality from Port 3 as this interval has been the most developed previously, then to continue the development of Port 4 for the remainder of the scheduled field work. Sampling and limited development of intervals 6 and 2 were also planned. The field schedule remaining after sampling of Ports 3 and 6 allowed for limited development of Ports 2 and 4. Field measurements of fluorescein and electrical conductivity at Ports 2 and 4 in 2019 indicate that these zones are still not representative of Formation groundwater. These ports were nonetheless sampled to track the evolution of groundwater quality with natural flushing which, in time, is expected to displace drilling fluids and return the interval to pre-drilling groundwater quality.

Calculated Formation groundwater quality is shown in Table 5, presenting the estimated range of constituent concentrations of Formation water at each Port sampled in 2016, 2018 and 2019. Analytical results on raw samples are included in Appendix C. The results of the 2019 groundwater quality data for Ports 6 and 3 are generally within the same order of magnitude to those reported in 2016 albeit slightly higher than in 2016, except for a few parameters. This is attributed to the higher proportion of drilling brine fluid in the Formation from samples collected in 2019 compared to 2016. Formation groundwater quality at Ports 2 and 4 was calculated but results are considered approximations only; the elevated proportion of drilling brine in the samples decreases the accuracy of the estimate[3].

The following provides an assessment of water quality at each Port.

Port 6

The temperature measured by the Mosdax sampler during the 2018 pressure profile at Port 6 was below zero (-0.17 °C; Golder, 2019a). Considering the calculated freezing point depression of 0.2 °C suggests Port 6 is within the basal cryopeg. The cryopeg zone is interpreted to extend to at least 258 m depth (top interval of Port 6) within the vicinity of the Westbay well. Groundwater from the cryopeg (Port 6) flows through the permeable (unfrozen) sections of the aquifer. Throughout the 2019 monitoring program, electrical conductivity and fluorescein progressed at different rates during purging (conductivity stabilized while fluorescein content continued to decrease over time; Figure 2) possibly because of partial freezing of drilling water and likely exclusion of fluorescein in ice (i.e., potential variability of fluorescein within the cryopeg).

The estimation of true Formation groundwater quality was completed per the method described in Section 2.3. Table 5 presents the minimum and maximum of the range of calculated concentrations of Formation water at Port 6 sampled in 2016, 2018, and 2019 for comparison.

The 2019 field-measured groundwater electrical conductivity and/or fluorescein content at the port remained within the same order of magnitude albeit slightly higher than values recorded at the end of the well development period in 2016 and 2018 (electrical conductivity only). This suggests that groundwater quality at that location remained relatively stable and thus, is anticipated to be representative of Formation water. The results of the 2019 groundwater quality estimation (Table 5) are also within the same order of magnitude but slightly higher than those previously reported in 2016 and 2018, with the exception of a few parameters.

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[3] The variability in fluorescein and brine content of the drilling fluid induces uncertainty of the drilling brine composition; the effect of this is controlled by removal of drilling brine via purging (Golder 2016b).

Based on the 2019 calculations of groundwater quality at Port 6, the concentration of trace metals and arsenic in groundwater is low. The 2019 calculated radium-226 concentration is estimated to be 1 Bq/L and above the MDMER limit of 0.37 Bq/L slightly higher than the 2016 concentration range (i.e., 0.43 to 0.52 Bq/L). Radium 226 is a naturally occurring element in deep bedrock groundwater.

The 2016 data is considered the most reliable based on the lower fluorescein content measured at the time of sampling; however, the 2019 data is considered valid. The initial model input is still considered accurate and consistent with the 2019 data and therefore the new data does not warrant revising the conceptual model of groundwater TDS.

Port 4

The 2019 field-measured groundwater fluorescein content and electrical conductivity at Port 4 were higher than values recorded at the end of the well development period in 2016 and 2018. The increasing trend observed in 2018 continued throughout the 2019 investigation, but conductivity and fluorescein trended toward stabilization at the end of the 2019 program. Higher 2019 fluorescein content and electrical conductivity is believed to represent an influx of drilling fluid present in undeveloped zones that migrated back into the Port 4 sampling interval. The higher proportion of drilling fluid in the Formation and in the samples collected results in a lower accuracy of calculated groundwater quality from samples collected in 2019 compared to those collected in 2016 after a more complete purge.

The groundwater quality was calculated but is not considered sufficiently reliable to use for validation of results because of the large proportion of residual drilling fluid present in the sample collected. Given the absence of radium-226 in the drilling fluid, concentrations of radium-226 in the raw water sample suggests MDMER criteria could be exceeded for this constituent. Radium 226 is a naturally occurring element in deep bedrock groundwater.

Given the higher fluorescein content of the groundwater sample collected in 2019 compared to the sample collected in 2016 at Port 4, the 2016 data is considered to be more reliable in representing Formation groundwater quality. The initial model input is still considered accurate and the new data does not warrant revising the conceptual model of groundwater TDS.

Port 3

The 2019 field-measured fluorescein content and electrical conductivity at Port 3 were similar to values recorded at the end of the well development period in 2016, suggesting that water quality remains representative of Formation groundwater in this zone. Concentrations of fluorescein and electrical conductivity continued to decrease throughout the 2019 monitoring program in Port 3 (Figure 2), where the fluorescein content dropped to below the 2016 level. A lower proportion of drill fluid was present in the 2019 sample than in 2016.

Estimated Formation groundwater quality is included in Table 5. The results of the 2019 groundwater quality data are within the same order of magnitude to those reported in 2016, albeit slightly lower with the exception of a few parameters. Compared to 2018 data, the 2019 water sample had a lower fluorescein content and therefore are considered more reliable.

Arsenic and radium-226 concentrations at Port 3 are estimated to be low and in the same order of magnitude as concentration ranges calculated in 2016. Calculated concentrations arsenic and radium-226 at Port 3 meet the Water license and MDMER criteria respectively.

The 2019 data are considered to be valid and is consistent with the 2016 data. The initial model input is still considered accurate and the new data does not warrant revising the conceptual model of groundwater TDS.

Port 2

The 2019 field-measured groundwater fluorescein content and electrical conductivity increased throughout the limited development program (refer to Figure 2). Values were higher than in 2016 and 2018 and continued to increase throughout the brief purging period in 2019. Given the continued high proportion of drilling brine, a proper estimation of Formation groundwater quality is not deemed possible for from this Port at this time.

Summary

Based on the groundwater monitoring programs completed to date, the Formation groundwater quality calculated as part of the 2016 investigation at Ports 6 and 4, and the 2016 and 2019 investigation at Port 3 are considered sufficiently reliable to assess Formation groundwater quality.

Based on the above-stated results from Ports 6, 4 and 3, the TDS content of Formation groundwater is estimated to range between 2,980 mg/L and 4,042 mg/L. This range in TDS is consistent with the developed conceptual model (which ranged between 3,198 and 4,042 mg/L) and no changes to the model are warranted. The TDS profile that was adopted in the FEIS for the Approved Project is presented in Figure 4, along with the TDS data that is considered to be reliable from 2016 and 2019.

Arsenic concentrations in samples collected from the groundwater sampling ports in 2019 were low and consistent with previous reliable data collected from the Westbay well. Radium-226 in groundwater is slightly higher in 2019 at Port 6 and Port 3 and consistent with previous reliable data, this constituent may exceed MDMER criteria in Formation groundwater.

5.0 QUALITY ASSURANCE/QUALITY CONTROL

Groundwater samples were collected from Ports 2 and 3 in triplicate and submitted in duplicate for analysis to the analytical laboratory as part of the quality assurance/quality control (‘QA/QC’) protocol. In addition, field blanks were also submitted for analysis of select parameters. The analytical laboratory performs equipment blanks as a method of internal QA/QC verification.

Analytical repeatability was tested by assessing the similarity between duplicate pairs of results. For each duplicate pairs of analysis where both results were higher than 5 times the method detection limit (MDL), the relative percent difference (RPD) was calculated as follows:

$$\text{RPD} = \frac{\text{absolute [difference (concentration of a given parameter)]}}{\text{[average (concentration of a given parameter)]}} \times 100$$

Per USEPA recommended methods (USEPA, 1994), an RPD of 20% or less was considered acceptable. Where one or both results of the duplicate pair were less than 5 times the MDL, a margin of +/- MDL was considered acceptable.

Table 7 presents the RPD or +/- MDL value calculated from the duplicate pair of results. Approximately 50% of duplicate pairs of analyses had one or both results below the method detection limit and consequently could not be assessed for repeatability. QA/QC results for the duplicate samples were within acceptable tolerance limits (RPD or +/- MDL) with the exception of duplicate concentrations of total chromium and iron in Port 3 as well as duplicate concentrations of total and dissolved concentrations of chromium, iron, nickel and zinc in Port 2. All other trace components and major elements for samples are considered adequately repeatable. The results of the analysis of the travel blank and equipment blanks submitted to the ALS indicate all parameters to be below the laboratory method detection limit, with the exception of elevated concentrations of total and dissolved zinc in the equipment blank (L2253513-5) submitted to the lab along with samples collected from Ports 2 and 3. The concentrations of zinc reported in the field blank were an order of magnitude higher than those reported in the Westbay well samples. The elevated concentrations of zinc in the equipment blank may be the result of leaching from the stainless steel Westbay sample bottles. Therefore, detected concentrations of zinc reported in 2019 for port 3 may not be qualitative.

The original brine fluid was analyzed by Multilab analytical laboratory. TDS values were also calculated from the laboratory results in order to assess potential discrepancies between the ionic balance and uncertainty of the results (refer to Tables 4 and 7). The results of the field, calculated, and laboratory measured values were within reasonable range limits for all samples, with the exception of the brine fluid. The TDS result reported for the brine fluid (36,946 mg/L) was significantly less than the calculated value (130,500 mg/L). The laboratory measured TDS and consequently electrical conductivity (55.42 mS/cm) of the brine fluid were deemed unreliable due to the ionic imbalance discrepancy. The calculated TDS of the brine fluid was used to correct the groundwater quality data as discussed in Section 2.3 of the report (Golder 2019a).

Uncertainty in the calculated groundwater water quality results from the variability in drill water composition augmented by probable mixing between aquifer zones having different levels of development (purging of drill water); this has an influence on the accuracy of all calculated groundwater quality; the effect of which is decreased with lower drilling brine proportion. The 2019 data remain valid to estimate water quality at Port 3 and 6, however the Port 6 2016 results may be a more accurate representation of Formation groundwater quality than 2019 based on the lower fluorescein content measured in the samples. Based on the elevated concentrations of electrical conductivity, fluorescein content and lab measured TDS values, all indicative of the presence of drilling brine, samples collected from Ports 4 and 2 in 2019 do not offer an accurate representation of Formation groundwater quality.

6.0 CONCLUSION

The 2019 Westbay Well field program was carried out in support of the Whale Tail Pit Project Certificate No. 008, Term and Condition No. 15, to obtain additional pre-development groundwater quality data and to verify the hydraulic gradient. These data were used to verify modelling assumptions related to the groundwater quality and the hydraulic gradient near the mine development areas.

Hydraulic head measurements in 2018 and 2019 indicate that a downward vertical hydraulic gradient is present in the North Basin of Whale Tail Lake, which is consistent with the conceptual understanding of groundwater flow directions and the predicted conditions post-closure following the formation of the Whale Tail Pit Lake. Revisions to the numerical or conceptual models is not considered necessary based on the vertical gradients as the data is consistent the model assumptions.

Groundwater quality was estimated from the samples collected, subtracting the effect of residual drilling water in the Formation (in the raw water sample). The 2019 program estimated groundwater quality at Ports 6 and 3 are in the same range as estimated in 2016 and the data collected from these ports were considered reliable. Conductivity and fluorescein values were higher in water sampled from Ports 4 and 2 in 2019 compared to 2016, consequently the data collected from these ports is considered less reliable to evaluate groundwater quality than the data collected in 2016. The assumptions for the conceptual model, which were developed based on 2016 data are consistent with the recent data collection in Ports 6 and 3, are still considered to be appropriate. Changes to the water management plan are therefore not considered necessary based on the data presented in this report.

The concentrations of metals and arsenic in groundwater at Ports 6 and 3 are low similar to previous reliable data. Given that the arsenic concentrations remain similar to the assumptions adopted in the geochemical models (low arsenic in Formation groundwater), the contention that groundwater arsenic content is not likely to have a significant effect on mine surface water quality is still valid.

7.0 STUDY LIMITATIONS

This technical memorandum was prepared for the exclusive use of Agnico Eagle Mines Limited. The technical memorandum, which specifically includes all tables and attachments, is based on data and information collected by Golder Associates Ltd. and is based solely on the conditions of the property at the time of the work, supplemented by historical information and data obtained by Golder Associates Ltd. as described in this technical memorandum.

Golder Associates Ltd. has relied in good faith on all information provided and does not accept responsibility for any deficiency, misstatements, or inaccuracies contained in the technical memorandum as a result of omissions, misinterpretation, or fraudulent acts of the persons contacted or errors or omissions in the reviewed documentation.

The services performed, as described in this technical memorandum, were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this technical memorandum, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this technical memorandum.

The findings and conclusions of this technical memorandum are valid only as of the date of this technical memorandum and for the locations investigated. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this technical memorandum and provide amendments as required.

8.0 CLOSURE

We trust this report meets your needs at this time. Should you have any questions, please do not hesitate to contact the undersigned.

Golder Associates Ltd.

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https://golderassociates.sharepoint.com/sites/102627/technical work/reporting/westbay/rev 0/18108905-303-tm-westbay gw monitoring_rev0_29july19.docx

Attachments: Tables 4, 5, 7
Figure 1 – 2016, 2018 and 2019 Development Record
Figure 2 – 2019 Development Record
Figure 3 – AMQ16-626 Electrical Conductivity, Fluorescein and Hydraulic Conductivity Depth Profile
Figure 4 – TDS Profile Adopted in the FEIS for the Approved Project
Appendix A – AMQ16-626 Westbay System Installation Details
Appendix B – Westbay Instruments Mosdax Sampler Calibration Reports
Appendix C – 2019 Laboratory Certificates of Analysis
Appendix D – 2016 Laboratory Certificate of Analysis – Brine Fluid

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature
Date July 29/2019
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

9.0 REFERENCES

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Table 4
Dilute Brine Chemistry Westbay Well AMQ16-626
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample		Brine Fluid	Calculated Dilute Brine Port 6		Calculated Dilute Brine Port 4		Calculated Dilute Brine Port 3		Dilute Brine Port 2	
			Initial Brine	Maximum Brine	Initial Brine	Maximum Brine	Initial Brine	Maximum Brine	Initial Brine	Maximum Brine
Date		17-Apr-16	21-Jul-16	21-Jul-16	24-Apr-16	27-Apr-16	02-Sep-16	02-Sep-16	08-Aug-16	09-Aug-16
Field measured parameters	**Units**									
Fluorescein Concentration	mg/L	512.70	138.00	158.10	512.70	341.90	445.90	437.20	133.00	397.10
Drilling Fluid Proportion		1.00	0.27	0.31	1.00	0.67	0.87	0.85	0.26	0.77
Formation Water Proportion		0.00	0.73	0.69	0.00	0.33	0.13	0.15	0.74	0.23
Initial Conductivity Reading	uS/cm	0	10240	12210	3810	19400	52280	53800	11700	19980
Dilution of Brine Factor in Port		0.00	0.06	0.07	0.02	0.11	0.30	0.31	0.07	0.11
Conventional Parameters										
Total dissolved solids (calculated)	mg/L	130500	7680	3122	2858	14550	39210	40350	8775	14985
Total dissolved solids (lab)	mg/L	36946	-	-	-	-	-	-	-	-
pH	S.U.	10	11.25	7.40	12	11	11	11	11	11
Conductivity (lab)	uS/cm	55420	-	-	-	-	-	-	-	-
Conductivity (calculated)	uS/cm	174000	10240	4684	3810	19400	52280	53800	11700	19980
Reported Hardness	mg $CaCO_3$/L	105554	6212	2230	2311	11769	31715	32637	7098	12121
Alkalinity	mg $CaCO_3$/L	145.0	8.5	38.0	3.2	16.2	43.6	44.8	9.8	16.7
Bicarbonate (HCO3)	mg $CaCO_3$/L	27.0	1.6	38.0	0.6	3.0	8.1	8.3	1.8	3.1
Major ions										
Calcium (Ca)	mg/L	42266	2487	2966	925	4712	12699	13068	12699	13068
Magnesium (Mg)	mg/L	3.9	0.2	0.3	0.1	0.4	1.2	1.2	1.2	1.2
Potassium (K)	mg/L	1717	101	120	38	191	516	531	516	531
Sodium (Na)	mg/L	838	49	59	18	93	252	259	252	259
Bromide (Br)	mg/L	1066	63	75	23	119	320	330	320	330
Chloride (Cl)	mg/L	83700	4926	5873	1833	9332	25149	25880	25149	25880
Fluoride (F)	mg/L	0.06	0.004	0.004	0.001	0.01	0.02	0.02	0.02	0.02
Sulphate (SO4)	mg SO_4/L	<0.6	0	0	0	0	0	0	0	0
Nutrients										
Nitrates (NO3)	mg N/L	0.54	0.03	0.04	0.01	0.06	0.2	0.2	0.04	0.06
Nitrites (NO2)	mg N/L	0.06	0.004	0.004	0.001	0.007	0.02	0.02	0.004	0.007

Table 4
Dilute Brine Chemistry Westbay Well AMQ16-626
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample		Brine Fluid	Calculated Dilute Brine Port 6		Calculated Dilute Brine Port 4		Calculated Dilute Brine Port 3		Dilute Brine Port 2	
			Initial Brine	Maximum Brine	Initial Brine	Maximum Brine	Initial Brine	Maximum Brine	Initial Brine	Maximum Brine
Date		17-Apr-16	21-Jul-16	21-Jul-16	24-Apr-16	27-Apr-16	02-Sep-16	02-Sep-16	08-Aug-16	09-Aug-16
Field measured parameters	**Units**									
Fluorescein Concentration	mg/L	512.70	138.00	158.10	512.70	341.90	445.90	437.20	133.00	397.10
Drilling Fluid Proportion		1.00	0.27	0.31	1.00	0.67	0.87	0.85	0.26	0.77
Formation Water Proportion		0.00	0.73	0.69	0.00	0.33	0.13	0.15	0.74	0.23
Initial Conductivity Reading	uS/cm	0	10240	12210	3810	19400	52280	53800	11700	19980
Dilution of Brine Factor in Port		0.00	0.06	0.07	0.02	0.11	0.30	0.31	0.07	0.11
Metals (dissolved)										
Aluminum (Al)	mg/L	0.5	0.03	0.03	0.01	0.06	0.1	0.2	0.03	0.06
Antimony (Sb)	mg/L	0.035	0.002	0.002	0.001	0.004	0.011	0.011	0.002	0.004
Silver (Ag)	mg/L	<0.0001	0	0	0	0	0	0	0	0
Arsenic (As)	mg/L	0.8	0.05	0.05	0.02	0.09	0.2	0.2	0.05	0.09
Barium (Ba)	mg/L	0.1	0.007	0.008	0.002	0.01	0.03	0.03	0.008	0.013
Berillium (Be)	mg/L	<0.0005	0	0	0	0	0	0	0	0
Bismuth (Bi)	mg/L	<0.0005	0	0	0	0	0	0	0	0
Boron (B)	mg/L	13.2	0.8	0.9	0.3	1.5	4.0	4.1	0.9	1.5
Cadmium (Cd)	mg/L	<0.00002	0	0	0	0	0	0	0	0
Chromium (Cr)	mg/L	<0.0006	0	0	0	0	0	0	0	0
Cobalt (Co)	mg/L	0.0406	0.002	0.003	0.001	0.005	0.012	0.013	0.003	0.005
Copper (Cu)	mg/L	0.0039	0.0002	0.0003	0.0001	0.0004	0.0012	0.0012	0.0003	0.0004
Tin (Sn)	mg/L	<0.001	0	0	0	0	0	0	0	0
Iron (Fe)	mg/L	2.6	0.2	0.2	0.1	0.3	0.8	0.8	0.2	0.3
Lithium (Li)	mg/L	34.52	2.0	2.4	0.8	3.8	10.4	10.7	2.3	4.0
Manganese (Mn)	mg/L	<0.0005	0	0	0	0	0	0	0	0
Mercury (Hg)	mg/L	0.0	0.00002	0.00003	0.00001	0.00004	0.00012	0.00012	0.00003	0.00004
Dissolved Mercury (Hg)	mg/L	-	0.00002	0.00003	0.00001	0.00004	0.00012	0.00012	0.00003	0.00004
Molybdenum (Mo)	mg/L	<0.0005	0	0	0	0	0	0	0	0
Nickel (Ni)	mg/L	1.35	0.08	0.09	0.03	0.15	0.41	0.42	0.09	0.16
Lead (Pb)	mg/L	<0.0003	0	0	0	0	0	0	0	0
Selenium (Se)	mg/L	3.83	0.23	0.27	0.08	0.43	1.15	1.18	0.26	0.44
Silica (Si)	mg/L	2.93	0.17	0.21	0.06	0.33	0.88	0.91	0.2	0.34
Strontium (Sr)	mg/L	656.0	38.61	46.03	14.36	73.14	197.1	202.83	44.11	75.33
Telluride (Te)	mg/L	<0.0005	0	0	0	0	0	0	0	0
Thallium (Tl)	mg/L	<0.002	0	0	0	0	0	0	0	0
Titanium (Ti)	mg/L	45.2	2.66	3.17	0.99	5.04	13.58	13.98	3.04	5.19
Uranium (U)	mg/L	-	0	0	0	0	0	0	0	0
Vanadium (V)	mg/L	<0.001	0	0	0	0	0	0	0	0
Zinc (Zn)	mg/L	<0.0005	0	0	0	0	0	0	0	0
Radioactive Ions										
Radium (Ra 226)	Bq/L	<0.066	0	0	0	0	0	0	0	0
Hydrocarbons										
Hydrocarbons (C10-C50)	mg/L	0	0	0	0	0	0	0	0	0
QA/QC										
Calculated TDS (lab)	-	130500	-	-	-	-	-	-	-	-
Lab measured vs Calculated TDS	-	28%	-	-	-	-	-	-	-	-
Lab measured TDS vs Conductivity	-	0.7	-	-	-	-	-	-	-	-
Calculated TDS vs Calculated Conductivity	-	0.8	-	-	-	-	-	-	-	-

Table 5
Rock Formation Groundwater Quality Corrected to Remove Residual Drilling Water
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample		**Port 6**						**Port 4**				**Port 3**					
Date		2-Aug-2016		13-Nov-2018		3-Apr-2019		20-Jul-2016		11-Nov-2018		14-Sep-2016		12-Nov-2018		29-Mar-2019	
Drilling Fluid Proportion		0.04	0.24	0.16		0.14		0.09	0.18	0.13		0.08	0.18	0.20		0.11	
Formation Water Proportion		0.96	0.76	0.84		0.86		0.91	0.82	0.87		0.92	0.82	0.80		0.89	
Sampling interval depth (metres along borehole)		274.0 m - 287.4 m						349.3 m - 359.1 m				381.3 m - 392.7 m					
Sampling interval vertical depth (metres)		257.7 m - 268.3 m						326.1 m - 335.2 m				356.0 m - 366.6 m					
Estimated concentration range (calculated)		minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	mininum	maximum	minimum	maximum	minimum	maximum
Average Field measured parameters																	
Fluoroscein	ppb	41.77		83.54		74.08		93.00		66.21		81.90		100.05		55.82	
pH	S.U.	-	-	6.36		6.27		-	-	7.50		-	-	8.35		6.93	
Conductivity	uS/cm	4610		9083		9644		6650		14555		4450		7500		4747	
Conventional parameters																	
Total dissolved solids	mg/L	3198	4042	4681	5171	5712	5962	3581	3966	7970	9945	3483	3918	<4980	<5100	<2980	<2990
pH	S.U.	7.41	7.27	6.50	6.57	6.29	6.29	7.87	7.82	6.88	6.91	7.96	7.91	7.31	7.41	6.73	6.84
Conductivity	uS/cm	4797	6042	8041	8496	8388	8720	5366	5938	13084	15511	5220	5866	<7350	<7530	<4660	<4730
Reported Hardness	mg $CaCO_3$/L	2397	3030	2883	3127	3167	3369	2627	2910	4169	5582	1680	1891	<2600	<2740	<1300	<1320
Alkalinity	mg $CaCO_3$/L	40	51	30	31	34	34	18	20	9	11	52	58	51	52	54	54
Bicarbonate (HCO3)	mg $CaCO_3$/L	40	51	31	32	35	35	18	20	11	12	52	58	60	61	58	59
Major ions																	
Calcium (Ca)	mg/L	960	1213	1071	1164	1194	1275	1032	1143	1563	2125	671	756	<1040	<1090	<521	<528
Magnesium (Mg)	mg/L	22	27	51	51	44	44	12	14	62	66	1	1	1	1	<1.0	<1.0
Potassium (K)	mg/L	8	10	<20	<20	11	11	38	42	67	67	16	18	<38	<40	<11.5	<11.8
Sodium (Na)	mg/L	232	293	287	293	308	310	267	296	341	365	306	344	285	313	323	332
Bromide (Br)	mg/L	25	32	34	37	40	42	32	35	51	77	22	25	<32.5	<32.7	<17	<18.2
Chloride (Cl)	mg/L	2089	2641	2453	2697	2959	3119	2582	2860	3818	5722	1714	1929	<2700	<2700	<1580	<1580
Fluoride (F)	mg/L	0.21	0.27	<1.0	<1.0	<1.0	<1.0	0.5	0.5	<1.0	<1.0	1.1	1.2	<1.0	<1.0	<0.80	<0.80
Sulphate (SO4)	mg SO_4/L	-	-	<15	<15	<15	<15	-	-	<15	<15	-	-	<15	<15	<6.0	<6.0
Nutrients																	
Ammonia N (NH3+NH4)	mg N/L	-	-	<0.437	<0.443	<0.466	<0.466	-	-	<0.157	<0.158	-	-	0.169	0.173	0.103	0.106
Nitrates (NO3)	mg N/L	0.063	0.079	<0.25	<0.25	<0.25	<0.25	0.06	0.06	<0.25	<0.25	0.016	0.018	<0.25	<0.25	<0.10	<0.10
Nitrites (NO2)	mg N/L	0.010	0.013	<0.050	<0.050	<0.050	<0.050	0.011	0.012	<0.050	<0.050	0.038	0.043	<0.050	<0.050	<0.020	<0.020
Total Phosphorous (P)	mg P/L	0.021	0.026	<0.0043	<0.0043	<0.0020	<0.0020	0.011	0.012	0.01	0.01	0.049	0.055	0.01	0.01	0.003	0.005

Table 5
Rock Formation Groundwater Quality Corrected to Remove Residual Drilling Water
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample		**Port 6**						**Port 4**				**Port 3**					
Date		2-Aug-2016		13-Nov-2018		3-Apr-2019		20-Jul-2016		11-Nov-2018		14-Sep-2016		12-Nov-2018		29-Mar-2019	
Drilling Fluid Proportion		0.04	0.24	0.16		0.14		0.09	0.18	0.13		0.08	0.18	0.20		0.11	
Formation Water Proportion		0.96	0.76	0.84		0.86		0.91	0.82	0.87		0.92	0.82	0.80		0.89	
Sampling interval depth (metres along borehole)		274.0 m - 287.4 m						349.3 m - 359.1 m				381.3 m - 392.7 m					
Sampling interval vertical depth (metres)		257.7 m - 268.3 m						326.1 m - 335.2 m				356.0 m - 366.6 m					
Estimated concentration range (calculated)		minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	minimum	maximum	mininum	maximum	minimum	maximum	minimum	maximum
Metals (dissolved)																	
Aluminum (Al)	mg/L	<0.006	<0.006	<0.0050	<0.0050	<0.0050	<0.0050	-	-	0.0005	0.008	-	-	<0.0115	<0.0126	<0.0067	<0.0069
Antimony (Sb)	mg/L	0.0002	0.0003	0.001	0.001	<0.0010	<0.0010	0.003	0.004	0.001	0.002	0.0026	0.0029	0.001	0.001	0.00001	0.0002
Silver (Ag)	mg/L	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.0001	<0.0001	<0.00010	<0.00010	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)	mg/L	0.0050	0.0063	<0.0021	<0.0024	<0.0025	<0.0025	0.0031	0.0035	<0.0020	<0.0020	<0.0005	<0.0005	<0.0034	<0.0034	<0.002	<0.002
Barium (Ba)	mg/L	0.528	0.667	0.947	0.976	0.999	0.999	0.134	0.148	0.533	0.561	0.057	0.065	0.098	0.104	0.064	0.065
Berillium (Be)	mg/L	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)	mg/L	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)	mg/L	0.3	0.4	0.2	0.3	0.2	0.2	0.6	0.6	0.8	1.0	0.5	0.6	0.3	0.3	0.3	0.4
Cadmium (Cd)	mg/L	-	0.00003	<0.000050	<0.000050	0.00002	0.00002	<0.00002	<0.00002	<0.000050	<0.000050	<0.00002	<0.00002	<0.000050	<0.000050	<0.000010	<0.000010
Chromium (Cr)	mg/L	0.007	0.009	<0.00050	<0.00050	<0.00050	<0.00050	0.005	0.006	<0.00050	<0.00050	0.005	0.005	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)	mg/L	0.002	0.002	<0.000050	<0.000050	<0.000050	<0.000050	0.002	0.002	<0.000050	<0.000050	0.001	0.001	<0.000050	<0.000050	<0.000050	<0.000050
Copper (Cu)	mg/L	0.005	0.007	<0.00050	<0.00050	<0.00020	<0.00020	0.0020	0.0023	<0.00050	<0.00050	0.0046	0.0052	<0.00050	<0.00050	<0.00020	<0.00020
Tin (Sn)	mg/L	0.0010	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	0.0011	0.0012	<0.0010	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)	mg/L	0.2	0.2	0.3	0.3	0.3	0.3	0.1	0.2	0.1	0.1	0.1	0.1	<0.018	<0.019	<0.010	<0.010
Lithium (Li)	mg/L	0.3	0.4	0.1	0.2	0.1	0.2	0.6	0.7	1.1	1.6	0.3	0.3	<0.749	<0.779	<0.156	<0.163
Manganese (Mn)	mg/L	0.0	0.0	0.1	0.1	0.1	0.1	0.02	0.02	0.09	0.10	0.01	0.01	0.02	0.02	0.005	0.01
Mercury (Hg)	mg/L	0.0008	0.0010	<0.000010	<0.000010	<0.0000050	<0.0000050	0.0028	0.0031	<0.000010	<0.000010	0.00215	0.00242	<0.000010	<0.000010	<0.0000050	<0.0000050
Dissolved Mercury (Hg)	mg/L	0.0005	0.0006	<0.000010	<0.000010	<0.0000050	<0.0000050	0.0031	0.0034	<0.000010	<0.000010	0.00217	0.00244	<0.000010	<0.000010	<0.0000050	<0.0000050
Molybdenum (Mo)	mg/L	0.02	0.02	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.005	0.005
Nickel (Ni)	mg/L	0.05	0.06	<0.00050	<0.00050	<0.00050	<0.00050	0.05	0.05	<0.00050	<0.00050	0.04	0.05	<0.00050	<0.00050	<0.00050	<0.00050
Lead (Pb)	mg/L	<0.0003	<0.0003	<0.00030	<0.00030	<0.000050	<0.000050	0.0027	0.0030	<0.00030	<0.00030	<0.0003	<0.0003	<0.00030	<0.00030	<0.000050	<0.000050
Selenium (Se)	mg/L	0.1	0.1	<0.0020	<0.0020	<0.00050	<0.00050	0.12	0.13	<0.0020	<0.0020	0.08	0.09	<0.0020	<0.0020	<0.00074	<0.00081
Silica (Si)	mg/L	4.0	5.1	3.2	3.3	3.2	3.2	4.2	4.6	2.5	2.6	4.3	4.8	3.5	3.5	3.5	3.6
Strontium (Sr)	mg/L	13.2	16.7	14.3	16.0	16.0	17.2	18.9	20.9	27.7	36.5	12.7	14.2	<16.9	<17.2	<8.7	<8.8
Telluride (Te)	mg/L	<0.0005	<0.0005	<0.00050	<0.00050	0.001	0.001	<0.0005	<0.0005	<0.00050	<0.00050	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050
Thallium (Tl)	mg/L	<0.0008	<0.0008	<0.000050	<0.000050	<0.000050	<0.000050	<0.0008	<0.0008	<0.000050	<0.000050	<0.0008	<0.0008	<0.000050	<0.000050	<0.000050	<0.000050
Titanium (Ti)	mg/L	0.3	0.4	<0.0050	<0.0050	<0.0050	<0.0050	0.3	0.4	<0.0050	<0.0050	0.2	0.3	<0.0050	<0.0050	<0.0050	<0.0050
Uranium (U)	mg/L	<0.001	<0.001	0.02	0.03	0.03	0.03	<0.001	<0.001	0.05	0.05	0.06	0.07	0.09	0.09	<0.000050	<0.000050
Vanadium (V)	mg/L	0.002	0.002	<0.000050	<0.000050	<0.000050	<0.000050	<0.0005	<0.0005	<0.000050	<0.000050	<0.001	<0.001	0.00020	0.00020	<0.00050	<0.00050
Zinc (Zn)	mg/L	1.3	1.7	<0.00050	<0.00050	<0.00050	<0.00050	0.63	0.70	<0.00050	<0.00050	<0.0005	<0.0005	<0.00050	<0.00050	0.004	0.005
Radioactive Ions																	
Radium (Ra226)	Bq/L	0.4	0.5	-	-	1.0	1.0	0.1	0.1	-	-	0.2	0.2	-	-	0.2	0.2
Hydrocarbons																	
Hydrocarbons (C10-C50)	mg/L	0.2	0.2	-	-	<0.52	<0.52	<0.1	<0.1	-	-	0.27	0.31	-	-	<0.52	<0.52
Silicate																	
Silicate (as SiO2)	mg/L	-	-	-	-	<50	<50	<0.1	<0.1	-	-	-	-	-	-	7.5	7.6

Table 7
QA/QC of Rock Formation Groundwater Quality
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample			**Port 6**	**Port 4**		**Travel Blank**
Date			3-Apr-2019	2-Apr-2019		3-Apr-2019
Certificate No.			L2255221-3	L2255221-2		L2255221-1
Sample ID	**Units**	**MDL**	PORT 6	PORT 4	**MDL**	ALS Travel Blank
Paramètres						
Physical Tests (Water)						
Conductivity	uS/cm	2	8940	21300	2	<2.0
pH	pH	0.1	6.36	6.75	0.1	5.83
Total Suspended Solids	mg/L	3	5.1	9.1	3	<3.0
Total Dissolved Solids	mg/L	15	6210	13300	3	<3.0
Anions and Nutrients						
Alkalinity, Bicarbonate (as CaCO3)	mg/L	1.0	30.3	18.7	1	<1.0
Alkalinity, Carbonate (as CaCO3)	mg/L	1.0	<1.0	<1.0	1	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	1.0	<1.0	<1.0	1	<1.0
Alkalinity, Total (as CaCO3)	mg/L	1.0	30.3	18.7	1	<1.0
Ammonia, Total (as N)	mg/L	0.0050	0.466	0.238	0.005	<0.0050
Bromide (Br)	mg/L	1	44.8	99.6	0.05	<0.050
Chloride (Cl)	mg/L	2	3380	7430	0.1	<0.10
Fluoride (F)	mg/L	0.8	<1.0	<2.0	0.02	<0.020
Nitrate (as N)	mg/L	0.1	<0.25	<0.50	0.005	<0.0050
Nitrite (as N)	mg/L	0.02	<0.050	<0.10	0.001	<0.0010
Phosphorus (P)-Total	mg/L	0.002	<0.0020	0.0065	0.002	<0.0020
Silicate (as SiO2)	mg/L	0.5	<50	<50	0.5	<0.50
Sulfate (SO4)	mg/L	6	<15	<30	0.3	<0.30
Physical Tests						
Hardness (as CaCO3)	mg/L	4.8	3780	10200	4.8	<4.8
Dissolved Metals						
Aluminum (Al)-Dissolved	mg/L	0.005	<0.0050	0.008	0.005	-
Antimony (Sb)-Dissolved	mg/L	0.001	<0.0010	0.0025	0.001	-
Arsenic (As)-Dissolved	mg/L	0.0004	0.00245	0.0026	0.0004	-
Barium (Ba)-Dissolved	mg/L	0.001	0.856	0.538	0.001	-
Beryllium (Be)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Bismuth (Bi)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Boron (B)-Dissolved	mg/L	0.3	0.32	0.94	0.3	-
Cadmium (Cd)-Dissolved	mg/L	0.00001	0.000018	0.000018	0.00001	-
Calcium (Ca)-Dissolved	mg/L	1	1450	4000	1	-
Cesium (Cs)-Dissolved	mg/L	0.0005	<0.00050	0.00115	0.0005	-
Chromium (Cr)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Cobalt (Co)-Dissolved	mg/L	0.00005	<0.000050	0.00008	0.00005	-
Copper (Cu)-Dissolved	mg/L	0.0002	<0.00020	0.00042	0.0002	-
Gallium (Ga)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Iron (Fe)-Dissolved	mg/L	0.01	0.275	0.059	0.01	-
Lead (Pb)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	0.00005	-
Lithium (Li)-Dissolved	mg/L	0.02	0.427	2.8	0.02	-
Magnesium (Mg)-Dissolved	mg/L	1	37.8	42.4	1	-
Manganese (Mn)-Dissolved	mg/L	0.0001	0.0981	0.0855	0.0001	-
Mercury (Hg)-Dissolved	mg/L	0.000005	<0.0000050	<0.0000050	0.000005	-
Molybdenum (Mo)-Dissolved	mg/L	0.0001	0.0217	0.0192	0.0001	-
Nickel (Ni)-Dissolved	mg/L	0.0005	<0.00050	0.00139	0.0005	-
Phosphorus (P)-Dissolved	mg/L	0.05	<0.050	<0.050	0.05	-
Potassium (K)-Dissolved	mg/L	1	11.2	159	1	-
Rhenium (Re)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Rubidium (Rb)-Dissolved	mg/L	0.005	0.0161	0.167	0.005	-
Selenium (Se)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Silicon (Si)-Dissolved	mg/L	0.5	2.75	2.39	0.5	-
Silver (Ag)-Dissolved	mg/L	0.0001	<0.00010	<0.00010	0.0001	-
Sodium (Na)-Dissolved	mg/L	2.5	272	389	2.5	-
Strontium (Sr)-Dissolved	mg/L	0.01	20.3	66.3	0.01	-
Sulfur (S)-Dissolved	mg/L	5	<5.0	<5.0	5	-
Tellurium (Te)-Dissolved	mg/L	0.0005	0.00108	0.00406	0.0005	-
Thallium (Tl)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	0.00005	-
Thorium (Th)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Tin (Sn)-Dissolved	mg/L	0.001	<0.0010	<0.0010	0.001	-
Titanium (Ti)-Dissolved	mg/L	0.005	<0.0050	<0.0050	0.005	-
Tungsten (W)-Dissolved	mg/L	0.001	0.0225	0.0636	0.001	-
Uranium (U)-Dissolved	mg/L	0.00005	<0.000050	0.000072	0.00005	-
Vanadium (V)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Yttrium (Y)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-
Zinc (Zn)-Dissolved	mg/L	0.001	0.03	0.0184	0.001	-
Zirconium (Zr)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-

Table 7
QA/QC of Rock Formation Groundwater Quality
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample			**Port 6**	**Port 4**		**Travel Blank**
Date			3-Apr-2019	2-Apr-2019		3-Apr-2019
Certificate No.			L2255221-3	L2255221-2		L2255221-1
Sample ID			PORT 6	PORT 4		ALS Travel Blank
Paramètres	**Units**	**MDL**			**MDL**	
Total Metals						
Aluminum (Al)-Total	mg/L	0.005	0.017	<0.025	0.005	<0.0050
Antimony (Sb)-Total	mg/L	0.001	<0.0030	<0.0050	0.001	<0.0010
Arsenic (As)-Total	mg/L	0.0004	0.0029	0.0035	0.0004	<0.00040
Barium (Ba)-Total	mg/L	0.001	0.793	0.483	0.001	<0.0010
Beryllium (Be)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Bismuth (Bi)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Boron (B)-Total	mg/L	0.3	<0.90	<1.5	0.3	<0.30
Cadmium (Cd)-Total	mg/L	0.00001	<0.000030	<0.000050	0.00001	<0.000010
Calcium (Ca)-Total	mg/L	1	1360	3720	1	<1.0
Cesium (Cs)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Chromium (Cr)-Total	mg/L	0.0005	0.0139	0.0027	0.0005	<0.00050
Cobalt (Co)-Total	mg/L	0.00005	0.00024	<0.00025	0.00005	<0.000050
Copper (Cu)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Gallium (Ga)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Iron (Fe)-Total	mg/L	0.01	0.448	0.267	0.01	<0.010
Lead (Pb)-Total	mg/L	0.00005	0.00026	<0.00025	0.00005	<0.000050
Lithium (Li)-Total	mg/L	0.02	0.466	2.71	0.02	<0.020
Magnesium (Mg)-Total	mg/L	1	41.2	47.7	1	<1.0
Manganese (Mn)-Total	mg/L	0.0002	0.0977	0.0819	0.0002	<0.00020
Mercury (Hg)-Total	mg/L	0.000005	<0.0000050	<0.0000050	0.000005	<0.0000050
Molybdenum (Mo)-Total	mg/L	0.0001	0.0225	0.0165	0.0001	<0.00010
Nickel (Ni)-Total	mg/L	0.0005	0.0095	0.0029	0.0005	<0.00050
Phosphorus (P)-Total	mg/L	0.05	<0.15	<0.25	0.05	<0.050
Potassium (K)-Total	mg/L	1	10	128	1	<1.0
Rhenium (Re)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Rubidium (Rb)-Total	mg/L	0.005	0.016	0.15	0.005	<0.0050
Selenium (Se)-Total	mg/L	0.0005	0.0028	<0.0025	0.0005	<0.00050
Silicon (Si)-Total	mg/L	0.5	2.53	2.39	0.5	<0.50
Silver (Ag)-Total	mg/L	0.0001	<0.00030	<0.00050	0.0001	<0.00010
Sodium (Na)-Total	mg/L	2.5	282	446	2.5	<2.5
Strontium (Sr)-Total	mg/L	0.01	19.5	60.2	0.01	<0.010
Sulfur (S)-Total	mg/L	5	<15	<25	5	<5.0
Tellurium (Te)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Thallium (Tl)-Total	mg/L	0.00005	<0.00015	<0.00025	0.00005	<0.000050
Thorium (Th)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Tin (Sn)-Total	mg/L	0.001	<0.0030	<0.0050	0.001	<0.0010
Titanium (Ti)-Total	mg/L	0.005	<0.015	<0.025	0.005	<0.0050
Tungsten (W)-Total	mg/L	0.001	0.0205	0.0572	0.001	<0.0010
Uranium (U)-Total	mg/L	0.00005	<0.00015	<0.00025	0.00005	<0.000050
Vanadium (V)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Yttrium (Y)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Zinc (Zn)-Total	mg/L	0.003	0.93	0.6	0.003	<0.0030
Zirconium (Zr)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050
Radioactive Ions						
Radium (Ra 226)	Bq/L	0.0085	0.85	1.3	0.0079	<0.0079
Hydrocarbons						
F2 (C10-C16)	mg/L	0.3	<0.30	<0.30	0.3	<0.30
F3 (C16-C34)	mg/L	0.3	<0.30	<0.30	0.3	<0.30
F4 (C34-C50)	mg/L	0.3	<0.30	<0.30	0.3	<0.30
TPH (C10-C50)	mg/L	0.52	<0.52	<0.52	0.52	<0.52
						QA/QC
Calculated TDS (lab)	mg/L	-	5170	12000	-	-
Lab measured vs Calculated TDS	-	-	144%	160%	-	-
Lab measured TDS vs conductivity	-	-	0.7	0.6	-	-

Notes:

Concentrations are mg/L unless otherwise noted.

MDL - Method Detecion Limit

RPD = relative percent difference

RPD value exceeds 20%

- parameter was not analyzed

-- not calculated (one or both result below MDL)

Table 7
QA/QC of Rock Formation Groundwater Quality
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample			Port 6	Port 4		Travel Blank	Port 3				Port 2				Equipment Blank
Date			3-Apr-2019	2-Apr-2019		3-Apr-2019	29-Mar-2019		RPD		30-Mar-2019		RPD		31-Mar-2019
Certificate No.			L2255221-3	L2255221-2		L2255221-1	L2253513-1	L2253513-2			L2253513-3	L2253513-4			L2253513-5
Sample ID			PORT 6	PORT 4		ALS Travel Blank	PORT 3	PORT 33			PORT 2	PORT 22			Field Blank
Paramètres	Units	MDL			MDL					MDL				MDL	
Physical Tests (Water)															
Conductivity	uS/cm	2	8940	21300	2	<2.0	4660	4730	1%	2	24300	24200	0%	2	<2.0
pH	pH	0.1	6.36	6.75	0.1	5.83	6.78	6.89	2%	0.1	7.07	7.07	0%	0.1	5.27
Total Suspended Solids	mg/L	3	5.1	9.1	3	<3.0	<3.0	<3.0	--	3	4.3	7.1	49%	3	<3.0
Total Dissolved Solids	mg/L	15	6210	13300	3	<3.0	2980	2990	0%	3	19300	19600	2%	3	<3.0
Anions and Nutrients															
Alkalinity, Bicarbonate (as CaCO3)	mg/L	1.0	30.3	18.7	1	<1.0	53	53.1	0.2%	1.0	57	57	1%	1	<1.0
Alkalinity, Carbonate (as CaCO3)	mg/L	1.0	<1.0	<1.0	1	<1.0	<1.0	<1.0	--	1.0	<1.0	<1.0	--	1	<1.0
Alkalinity, Hydroxide (as CaCO3)	mg/L	1.0	<1.0	<1.0	1	<1.0	<1.0	<1.0	--	1.0	<1.0	<1.0	--	1	<1.0
Alkalinity, Total (as CaCO3)	mg/L	1.0	30.3	18.7	1	<1.0	53	53.1	0.2%	1.0	57	57	1%	1	<1.0
Ammonia, Total (as N)	mg/L	0.0050	0.466	0.238	0.005	<0.0050	0.092	0.0943	2%	0.0050	0.207	0.202	2%	0.005	<0.0050
Bromide (Br)	mg/L	1	44.8	99.6	0.05	<0.050	18.2	17	7%	5	129	123	5%	0.05	<0.050
Chloride (Cl)	mg/L	2	3380	7430	0.1	<0.10	1580	1580	0%	10	9910	9340	6%	0.1	<0.10
Fluoride (F)	mg/L	0.8	<1.0	<2.0	0.02	<0.020	<0.80	<0.80	--	2	<2.0	<2.0	--	0.02	<0.020
Nitrate (as N)	mg/L	0.1	<0.25	<0.50	0.005	<0.0050	<0.10	<0.10	--	0.5	<0.50	<0.50	--	0.005	<0.0050
Nitrite (as N)	mg/L	0.02	<0.050	<0.10	0.001	<0.0010	<0.020	<0.020	--	0.1	<0.10	<0.10	--	0.001	<0.0010
Phosphorus (P)-Total	mg/L	0.002	<0.0020	0.0065	0.002	<0.0020	0.0029	0.0041	< 5xMDL	0.002	0.0068	0.0296	< 5xMDL	0.002	<0.0020
Silicate (as SiO2)	mg/L	0.5	<50	<50	0.5	<0.50	6.80	6.65	2%	5	<5.0	<5.0	--	0.5	<0.50
Sulfate (SO4)	mg/L	6	<15	<30	0.3	<0.30	<6.0	<6.0	--	30	<30	<30	--	0.3	<0.30
Physical Tests															
Hardness (as CaCO3)	mg/L	4.8	3780	10200	4.8	<4.8	1320	1300	1.5%	21	12700	12400	2%	4.8	<4.8
Dissolved Metals															
Aluminum (Al)-Dissolved	mg/L	0.005	<0.0050	0.008	0.005	-	0.0067	0.0069	3%	0.005	0.041	0.062	41%	0.005	<0.0050
Antimony (Sb)-Dissolved	mg/L	0.001	<0.0010	0.0025	0.001	-	0.0013	0.0012	8%	0.001	<0.0050	<0.0050	--	0.001	<0.0010
Arsenic (As)-Dissolved	mg/L	0.0004	0.00245	0.0026	0.0004	-	0.00203	0.00199	2%	0.0004	0.0024	0.0023	4%	0.0004	<0.00040
Barium (Ba)-Dissolved	mg/L	0.001	0.856	0.538	0.001	-	0.0609	0.0619	2%	0.001	0.13	0.139	7%	0.001	<0.0010
Beryllium (Be)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Bismuth (Bi)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Boron (B)-Dissolved	mg/L	0.3	0.32	0.94	0.3	-	0.75	0.79	5%	1.5	1.8	1.9	5%	0.3	<0.30
Cadmium (Cd)-Dissolved	mg/L	0.00001	0.000018	0.000018	0.00001	-	<0.000010	<0.000010	--	0.00001	<0.000050	<0.000050	--	0.00001	<0.000010
Calcium (Ca)-Dissolved	mg/L	1	1450	4000	1	-	528	521	1%	1	4400	4660	6%	1	<1.0
Cesium (Cs)-Dissolved	mg/L	0.0005	<0.00050	0.00115	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Chromium (Cr)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	0.0075	0.029	118%	0.0005	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.00005	<0.000050	0.00008	0.00005	-	<0.000050	<0.000050	--	0.00005	<0.00025	0.00044	--	0.00005	<0.000050
Copper (Cu)-Dissolved	mg/L	0.0002	<0.00020	0.00042	0.0002	-	<0.00020	<0.00020	--	0.0002	<0.0025	<0.0025	--	0.0002	<0.00020
Gallium (Ga)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Iron (Fe)-Dissolved	mg/L	0.01	0.275	0.059	0.01	-	<0.010	<0.010	--	0.01	0.184	0.319	54%	0.01	<0.010
Lead (Pb)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	0.00005	-	<0.000050	<0.000050	--	0.00005	0.00091	0.00106	15%	0.00005	<0.000050
Lithium (Li)-Dissolved	mg/L	0.02	0.427	2.8	0.02	-	0.163	0.156	4%	0.1	3.31	3.56	7%	0.02	<0.020
Magnesium (Mg)-Dissolved	mg/L	1	37.8	42.4	1	-	<1.0	<1.0	--	5	<5.0	<5.0	--	1	<1.0
Manganese (Mn)-Dissolved	mg/L	0.0001	0.0981	0.0855	0.0001	-	0.00454	0.00428	6%	0.0001	0.0258	0.029	12%	0.0001	<0.00010
Mercury (Hg)-Dissolved	mg/L	0.000005	<0.0000050	<0.0000050	0.000005	-	<0.0000050	<0.0000050	--	0.000005	<0.0000050	<0.0000050	--	0.000005	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	0.0001	0.0217	0.0192	0.0001	-	0.00416	0.00418	0.5%	0.0001	0.0118	0.0154	26%	0.0001	<0.00010
Nickel (Ni)-Dissolved	mg/L	0.0005	<0.00050	0.00139	0.0005	-	<0.00050	<0.00050	--	0.0005	0.0059	0.0206	111%	0.0005	<0.00050
Phosphorus (P)-Dissolved	mg/L	0.05	<0.050	<0.050	0.05	-	<0.050	<0.050	--	0.05	<0.25	<0.25	--	0.05	<0.050
Potassium (K)-Dissolved	mg/L	1	11.2	159	1	-	11.8	11.5	3%	5	169	187	10%	1	<1.0
Rhenium (Re)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Rubidium (Rb)-Dissolved	mg/L	0.005	0.0161	0.167	0.005	-	0.0179	0.0176	2%	0.005	0.226	0.245	8%	0.005	<0.0050
Selenium (Se)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	0.00081	0.00074	9%	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Silicon (Si)-Dissolved	mg/L	0.5	2.75	2.39	0.5	-	3.34	3.18	5%	0.5	2.87	3.07	7%	0.5	<0.50
Silver (Ag)-Dissolved	mg/L	0.0001	<0.00010	<0.00010	0.0001	-	<0.00010	<0.00010	--	0.0001	<0.00025	<0.00050	--	0.0001	<0.00010
Sodium (Na)-Dissolved	mg/L	2.5	272	389	2.5	-	323	316	2%	2.5	486	502	3%	2.5	<2.5
Strontium (Sr)-Dissolved	mg/L	0.01	20.3	66.3	0.01	-	8.65	8.76	1%	0.01	68.7	77.6	12%	0.01	<0.010
Sulfur (S)-Dissolved	mg/L	5	<5.0	<5.0	5	-	<5.0	<5.0	--	5	<25	<25	--	5	<5.0
Tellurium (Te)-Dissolved	mg/L	0.0005	0.00108	0.00406	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Thallium (Tl)-Dissolved	mg/L	0.00005	<0.000050	<0.000050	0.00005	-	<0.000050	<0.000050	--	0.00005	<0.00025	<0.00025	--	0.00005	<0.000050
Thorium (Th)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Tin (Sn)-Dissolved	mg/L	0.001	<0.0010	<0.0010	0.001	-	<0.0010	<0.0010	--	0.001	<0.0050	<0.0050	--	0.001	<0.0010
Titanium (Ti)-Dissolved	mg/L	0.005	<0.0050	<0.0050	0.005	-	<0.0050	<0.0050	--	0.005	<0.025	<0.025	--	0.005	<0.0050
Tungsten (W)-Dissolved	mg/L	0.001	0.0225	0.0636	0.001	-	0.0388	0.0383	1%	0.001	0.0767	0.0819	7%	0.001	<0.0010
Uranium (U)-Dissolved	mg/L	0.00005	<0.000050	0.000072	0.00005	-	<0.000050	<0.000050	--	0.00005	<0.00025	<0.00025	--	0.00005	<0.000050
Vanadium (V)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Yttrium (Y)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.001	0.03	0.0184	0.001	-	0.0052	0.0041	<5xMDL	0.001	0.465	0.77	49%	0.001	0.0148
Zirconium (Zr)-Dissolved	mg/L	0.0005	<0.00050	<0.00050	0.0005	-	<0.00050	<0.00050	--	0.0005	<0.0025	<0.0025	--	0.0005	<0.00050

Table 7
QA/QC of Rock Formation Groundwater Quality
Whale Tail Lake Talik
Whale Tail Project, Nunavut

Sample			Port 6	Port 4		Travel Blank	Port 3				Port 2				Equipment Blank
Date			3-Apr-2019	2-Apr-2019		3-Apr-2019	29-Mar-2019		RPD		30-Mar-2019		RPD		31-Mar-2019
Certificate No.			L2255221-3	L2255221-2		L2255221-1	L2253513-1	L2253513-2			L2253513-3	L2253513-4			L2253513-5
Sample ID			PORT 6	PORT 4		ALS Travel Blank	PORT 3	PORT 33			PORT 2	PORT 22			Field Blank
Paramètres	Units	MDL			MDL					MDL				MDL	
Total Metals															
Aluminum (Al)-Total	mg/L	0.005	0.017	<0.025	0.005	<0.0050	0.014	0.0139	1%	0.025	0.041	0.062	<5xMDL	0.005	<0.0050
Antimony (Sb)-Total	mg/L	0.001	<0.0030	<0.0050	0.001	<0.0010	0.0017	0.0017	0%	0.005	<0.0050	<0.0050	--	0.001	<0.0010
Arsenic (As)-Total	mg/L	0.0004	0.0029	0.0035	0.0004	<0.00040	0.00228	0.00238	4%	0.002	0.0024	0.0023	4%	0.0004	<0.00040
Barium (Ba)-Total	mg/L	0.001	0.793	0.483	0.001	<0.0010	0.0571	0.0595	4%	0.005	0.13	0.139	7%	0.001	<0.0010
Beryllium (Be)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Bismuth (Bi)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Boron (B)-Total	mg/L	0.3	<0.90	<1.5	0.3	<0.30	0.7	0.78	11%	1.5	1.8	1.9	5%	0.3	<0.30
Cadmium (Cd)-Total	mg/L	0.00001	<0.000030	<0.000050	0.00001	<0.000010	<0.000010	<0.000010	--	0.00005	<0.000050	<0.000050	--	0.00001	<0.000010
Calcium (Ca)-Total	mg/L	1	1360	3720	1	<1.0	535	526	2%	5	4400	4660	6%	1	<1.0
Cesium (Cs)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Chromium (Cr)-Total	mg/L	0.0005	0.0139	0.0027	0.0005	<0.00050	0.0116	0.00706	49%	0.0025	0.0075	0.029	118%	0.0005	<0.00050
Cobalt (Co)-Total	mg/L	0.00005	0.00024	<0.00025	0.00005	<0.000050	0.00018	0.000115	<5xMDL	0.00025	<0.00025	0.00044	--	0.00005	<0.000050
Copper (Cu)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Gallium (Ga)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Iron (Fe)-Total	mg/L	0.01	0.448	0.267	0.01	<0.010	0.082	0.059	<5xMDL	0.005	0.184	0.319	54%	0.01	<0.010
Lead (Pb)-Total	mg/L	0.00005	0.00026	<0.00025	0.00005	<0.000050	0.000159	0.000148	7%	0.00025	0.00091	0.00106	15%	0.00005	<0.000050
Lithium (Li)-Total	mg/L	0.02	0.466	2.71	0.02	<0.020	0.173	0.176	2%	0.1	3.31	3.56	7%	0.02	<0.020
Magnesium (Mg)-Total	mg/L	1	41.2	47.7	1	<1.0	<1.0	<1.0	--	5	<5.0	<5.0	--	1	<1.0
Manganese (Mn)-Total	mg/L	0.0002	0.0977	0.0819	0.0002	<0.00020	0.00629	0.00576	9%	0.001	0.0258	0.029	12%	0.0002	<0.00020
Mercury (Hg)-Total	mg/L	0.000005	<0.0000050	<0.0000050	0.000005	<0.0000050	<0.0000050	<0.0000050	--	0.000005	<0.0000050	<0.0000050	--	0.000005	<0.0000050
Molybdenum (Mo)-Total	mg/L	0.0001	0.0225	0.0165	0.0001	<0.00010	0.00584	0.00514	13%	0.0005	0.0118	0.0154	26%	0.0001	<0.00010
Nickel (Ni)-Total	mg/L	0.0005	0.0095	0.0029	0.0005	<0.00050	0.00776	0.00494	44%	0.0025	0.0059	0.0206	111%	0.0005	<0.00050
Phosphorus (P)-Total	mg/L	0.05	<0.15	<0.25	0.05	<0.050	<0.050	<0.050	--	0.25	<0.25	<0.25	--	0.05	<0.050
Potassium (K)-Total	mg/L	1	10	128	1	<1.0	11.5	12	4%	5	169	187	10%	1	<1.0
Rhenium (Re)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Rubidium (Rb)-Total	mg/L	0.005	0.016	0.15	0.005	<0.0050	0.0175	0.0179	2%	0.025	0.226	0.245	8%	0.005	<0.0050
Selenium (Se)-Total	mg/L	0.0005	0.0028	<0.0025	0.0005	<0.00050	0.00252	0.00113	<5xMDL	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Silicon (Si)-Total	mg/L	0.5	2.53	2.39	0.5	<0.50	3.5	3.49	0.3%	0.5	2.87	3.07	7%	0.5	<0.50
Silver (Ag)-Total	mg/L	0.0001	<0.00030	<0.00050	0.0001	<0.00010	<0.00010	<0.00010	--	0.00025	<0.00025	<0.00050	--	0.0001	<0.00010
Sodium (Na)-Total	mg/L	2.5	282	446	2.5	<2.5	343	339	1%	2.5	486	502	3%	2.5	<2.5
Strontium (Sr)-Total	mg/L	0.01	19.5	60.2	0.01	<0.010	8.23	8.13	1%	0.05	68.7	77.6	12%	0.01	<0.010
Sulfur (S)-Total	mg/L	5	<15	<25	5	<5.0	<5.0	<5.0	--	25	<25	<25	--	5	<5.0
Tellurium (Te)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Thallium (Tl)-Total	mg/L	0.00005	<0.00015	<0.00025	0.00005	<0.000050	<0.000050	<0.000050	--	0.00025	<0.00025	<0.00025	--	0.00005	<0.000050
Thorium (Th)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Tin (Sn)-Total	mg/L	0.001	<0.0030	<0.0050	0.001	<0.0010	<0.0010	<0.0010	--	0.005	<0.0050	<0.0050	--	0.001	<0.0010
Titanium (Ti)-Total	mg/L	0.005	<0.015	<0.025	0.005	<0.0050	<0.0050	<0.0050	--	0.025	<0.025	<0.025	--	0.005	<0.0050
Tungsten (W)-Total	mg/L	0.001	0.0205	0.0572	0.001	<0.0010	0.0361	0.036	0.3%	0.005	0.0767	0.0819	7%	0.001	<0.0010
Uranium (U)-Total	mg/L	0.00005	<0.00015	<0.00025	0.00005	<0.000050	<0.000050	<0.000050	--	0.00025	<0.00025	<0.00025	--	0.00005	<0.000050
Vanadium (V)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Yttrium (Y)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Zinc (Zn)-Total	mg/L	0.003	0.93	0.6	0.003	<0.0030	0.507	0.476	6%	0.015	0.465	0.77	49%	0.003	0.0135
Zirconium (Zr)-Total	mg/L	0.0005	<0.0015	<0.0025	0.0005	<0.00050	<0.00050	<0.00050	--	0.0025	<0.0025	<0.0025	--	0.0005	<0.00050
Radioactive Ions															
Radium (Ra 226)	Bq/L	0.0085	0.85	1.3	0.0079	<0.0079	0.19	0.2	5%	0.011	1.4	1.8	<5xMDL	0.0080	<0.0080
Hydrocarbons															
F2 (C10-C16)	mg/L	0.3	<0.30	<0.30	0.3	<0.30	<0.30	<0.30	--	0.3	<0.30	<0.30	--	0.3	<0.30
F3 (C16-C34)	mg/L	0.3	<0.30	<0.30	0.3	<0.30	<0.30	<0.30	--	0.3	<0.30	<0.30	--	0.3	<0.30
F4 (C34-C50)	mg/L	0.3	<0.30	<0.30	0.3	<0.30	<0.30	<0.30	--	0.3	<0.30	<0.30	--	0.3	<0.30
TPH (C10-C50)	mg/L	0.52	<0.52	<0.52	0.52	<0.52	<0.52	<0.52	--	0.52	<0.52	<0.52	--	0.52	<0.52
						QA/QC									
Calculated TDS (lab)	mg/L	-	5170	12000	-	-	2470	2460	-	-	15700	15000	-	-	-
Lab measured vs Calculated TDS	-	-	144%	160%	-	-	156%	158%	-	-	126%	123%	-	-	-
Lab measured TDS vs conductivity	-	-	0.7	0.6	-	-	0.6	0.6	-	-	0.8	0.8	-	-	-

Notes:

Concentrations are mg/L unless otherwise noted.

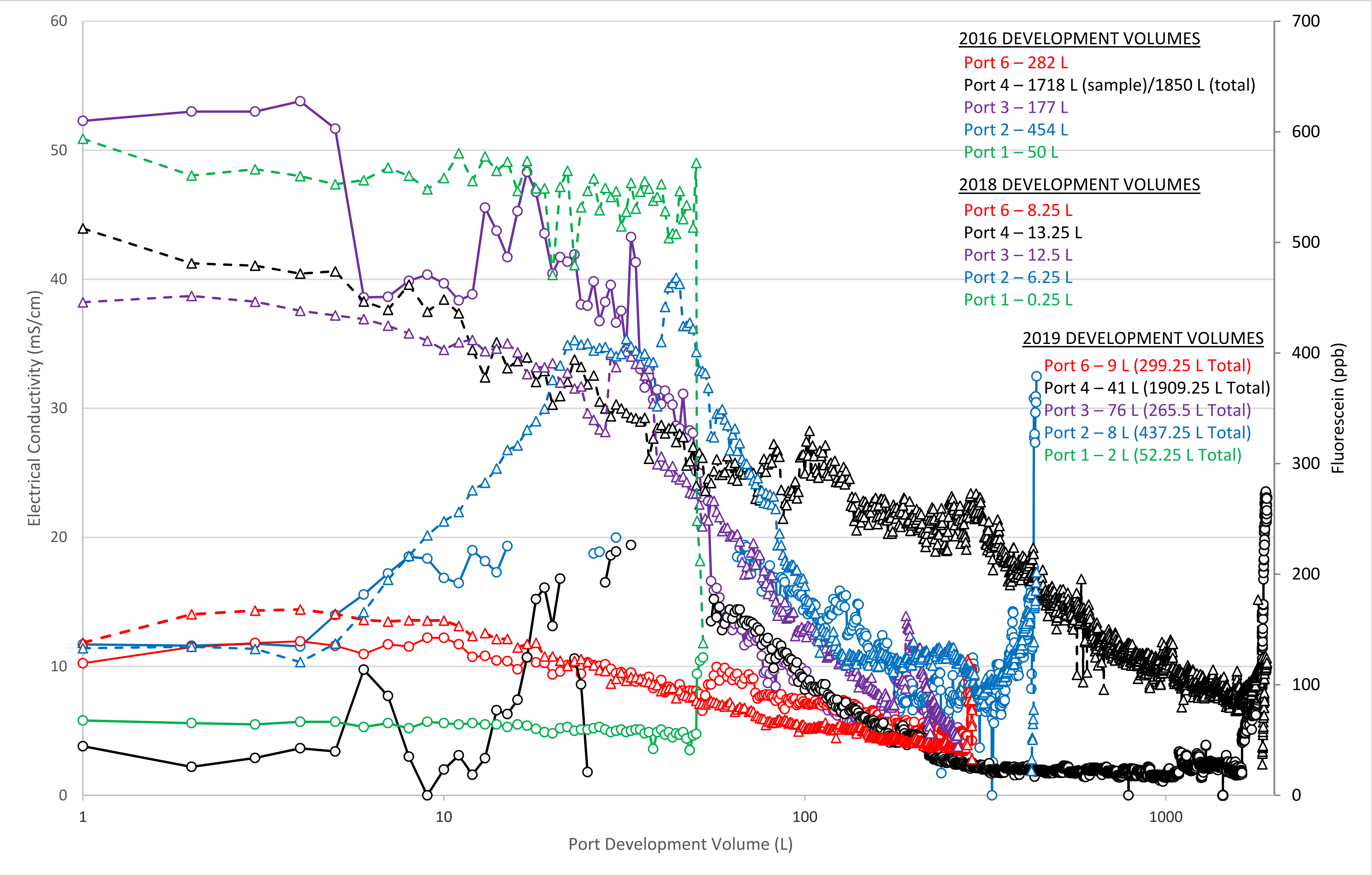
MDL - Method Detecion Limit

RPD = relative percent difference

RPD value exceeds 20%

- parameter was not analyzed

-- not calculated (one or both result below MDL)



Notes: —○— conductivity
- - △ - - fluorescein

Colours **Port 6**, **Port 4**, **Port 3**, **Port 2** and Port 1
Disconnected points (Ports 2 and 4) correspond to missing electrical conductivity field measurements

CLIENT
AGNICO EAGLE MINES LIMITED

CONSULTANT
GOLDER

YYYY-MM-DD	2019-05-21
PREPARED	DH
DESIGN	--
REVIEW	X
APPROVED	X

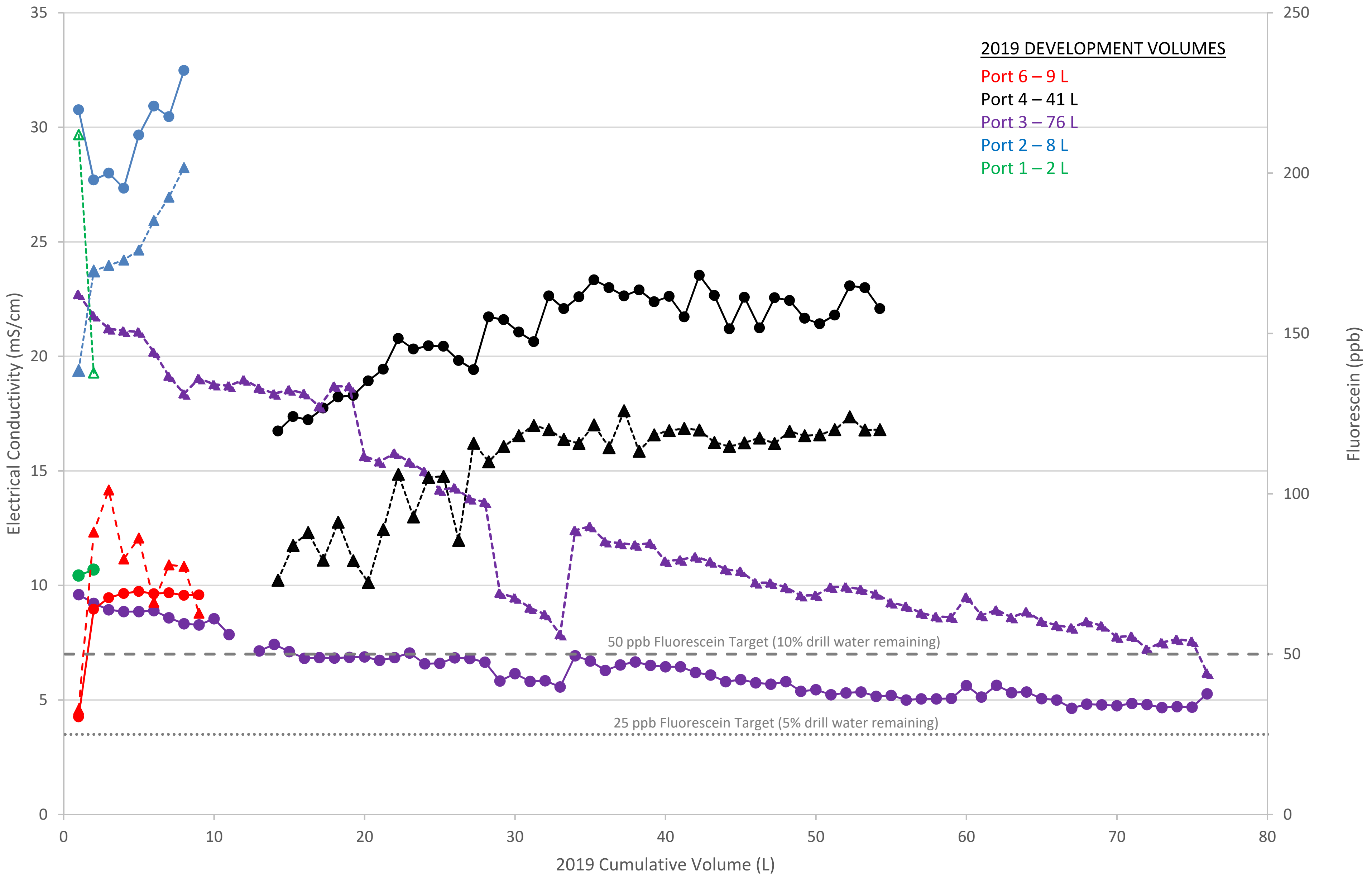
PROJECT
2019 WESTBAY SYSTEM GROUNDWATER MONITORING INVESTIGATION

TITLE
2016, 2018 and 2019 DEVELOPMENT RECORD

PROJECT No.
18108905-303

Rev.

FIGURE 1



Notes: ●— conductivity
- -▲- - fluorescein

Volumes reported at time of sample collection and/or end of development (for Port 1)

Colours Port 6, **Port 4**, Port 3, Port 2 and Port 1

CLIENT
AGNICO EAGLE MINES LIMITED

CONSULTANT
GOLDER

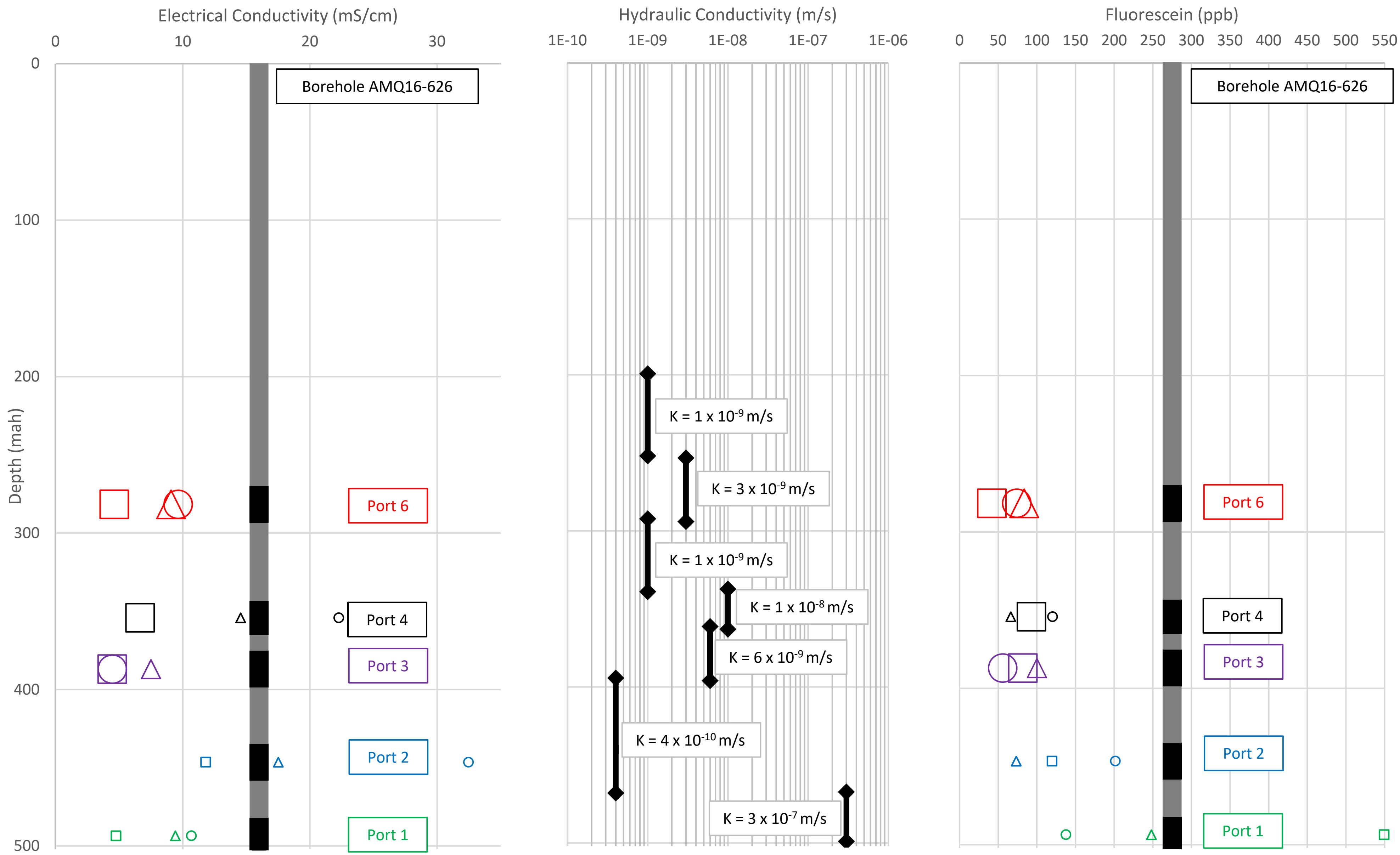
YYYY-MM-DD	2019-02-08
PREPARED	DH
DESIGN	--
REVIEW	X
APPROVED	X

PROJECT
2019 WESTBAY SYSTEM GROUNDWATER MONITORING INVESTIGATION

TITLE
2019 DEVELOPMENT RECORD

PROJECT No. 18108905-303
Rev.

FIGURE 2



Notes: □ 2016 Data
△ 2018 Data
○ 2019 Data
Symbol size corresponds to degree of development (i.e. small symbol – insufficient development, reduced reliability of inferred Formation quality vs large symbol)
Colours Port 6, Port 4, Port 3, Port 2 & Port 1
mah – metres along borehole

CLIENT
AGNICO EAGLE MINES LIMITED

CONSULTANT
GOLDER

YYYY-MM-DD	2019-05-21
PREPARED	DH
DESIGN	--
REVIEW	X
APPROVED	X

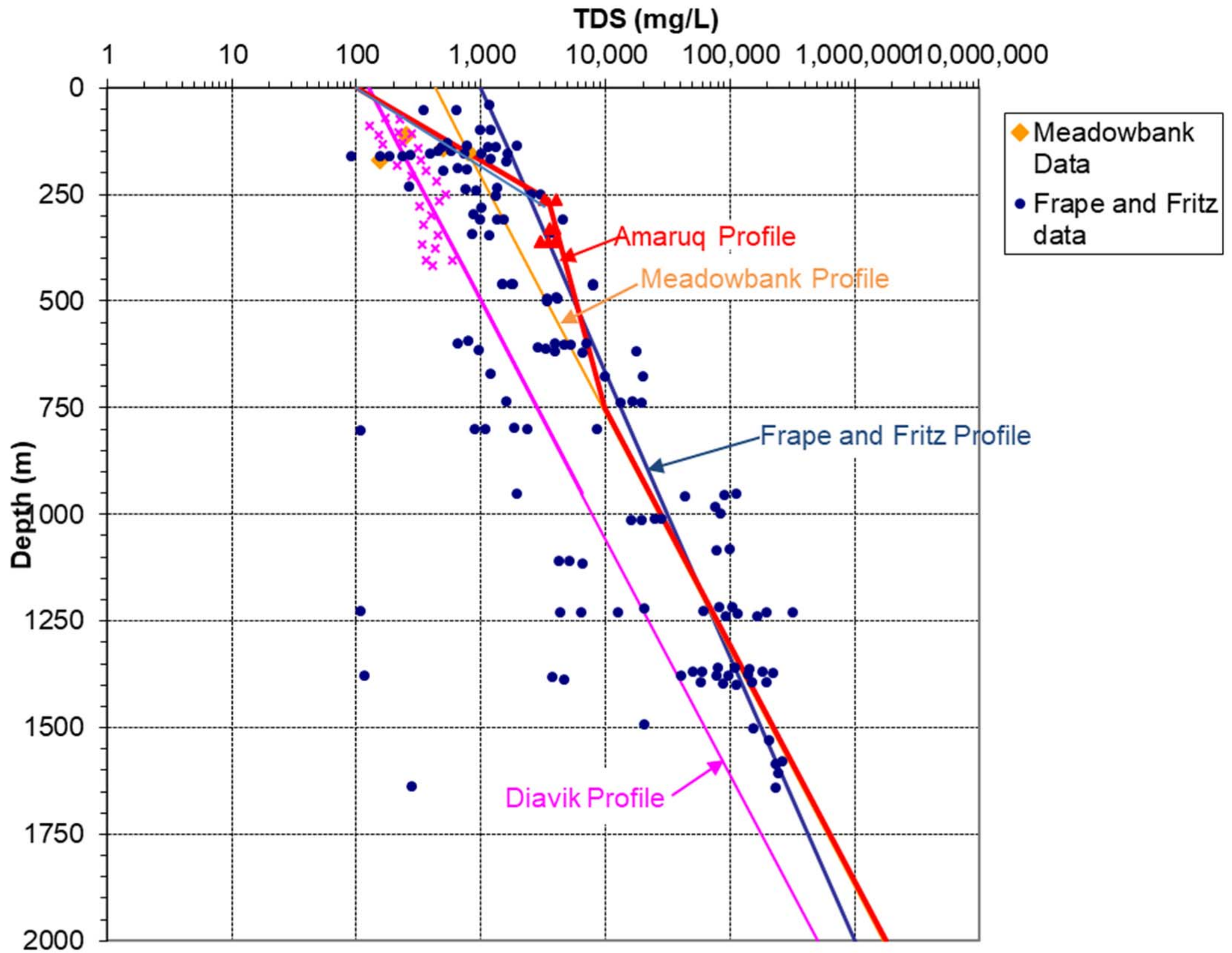
PROJECT
2019 WESTBAY SYSTEM GROUNDWATER MONITORING INVESTIGATION

TITLE
AMQ16-626 Electrical Conductivity, Fluorescein and Hydraulic Conductivity Depth Profile

PROJECT No.
18108905-303

Rev.

FIGURE 3



CLIENT
AGNICO EAGLE MINES LIMITED

CONSULTANT

GOLDER

YYYY-MM-DD 2019-05-21
PREPARED DH
DESIGN --
REVIEW X
APPROVED X

PROJECT
2019 WESTBAY SYSTEM GROUNDWATER MONITORING INVESTIGATION

TITLE
TDS Profile Adopted in the FEIS for the Approved Project

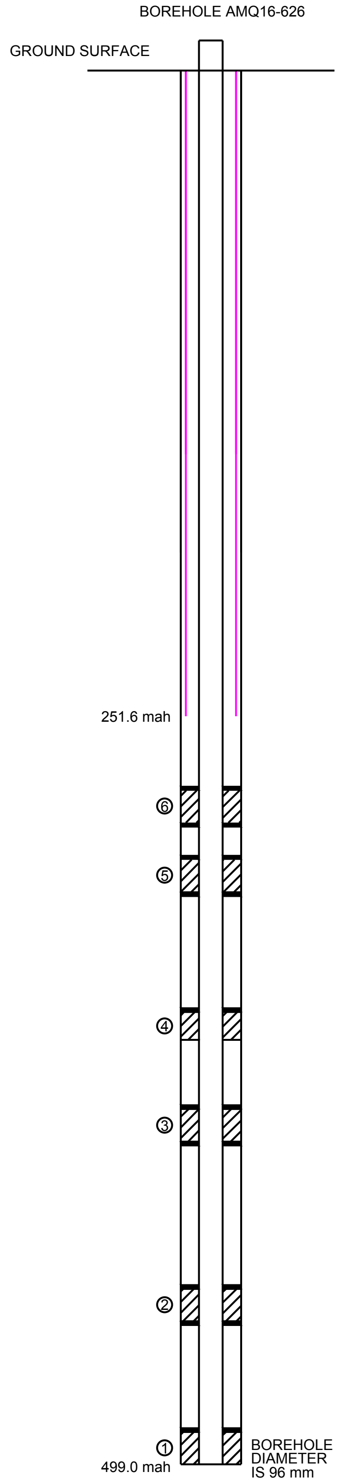
PROJECT No.
18108905-303

Rev.

FIGURE 4

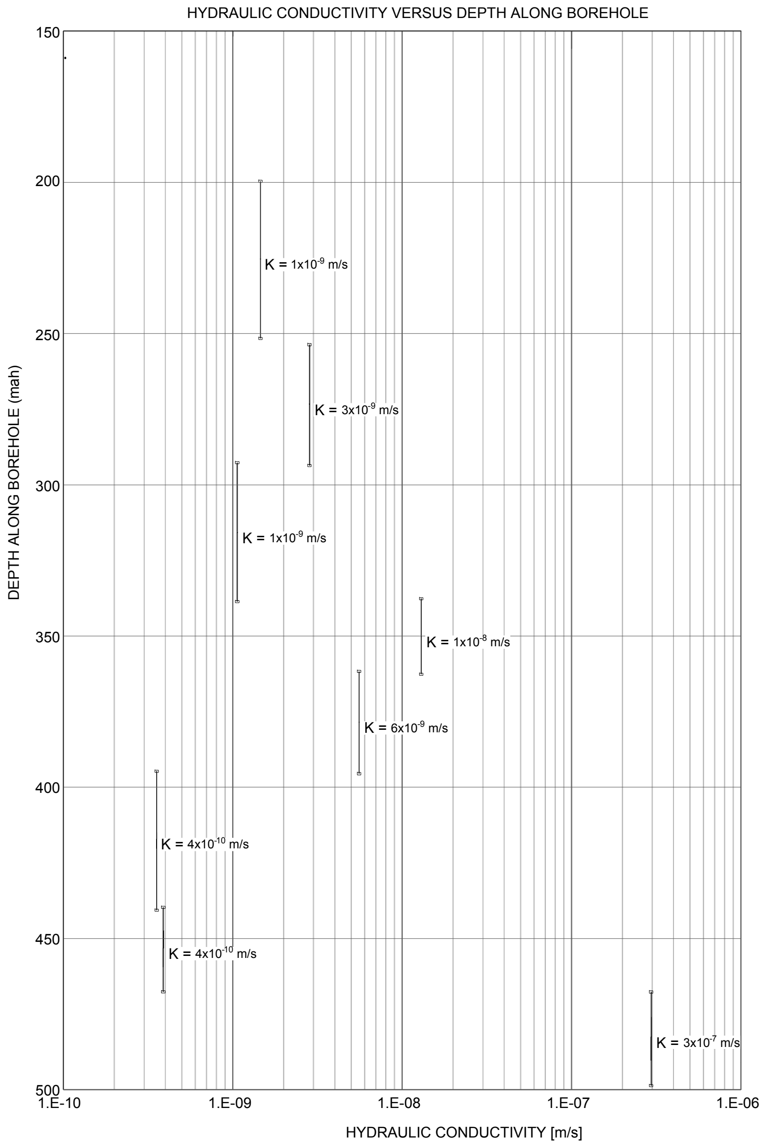
APPENDIX A

AMQ160626 Westbay System Installation Details



WESTBAY SYSTEM ZONE DEPTH SUMMARY

ZONE	DEPTH ALONG HOLE			VERTICAL DEPTH		
	FROM	TO	LENGTH	FROM	TO	THICKNESS
	(mah)	(mah)	(m)	(mbgs)	(mbgs)	(m)
6	276.0	287.4	11.4	257.7	268.3	10.6
5	298.9	310.3	11.4	279	289.7	10.6
4	349.3	359.1	9.8	326.1	335.2	9.1
3	381.3	392.7	11.4	356.0	366.6	10.6
2	440.8	452.2	11.4	411.5	422.2	10.6
1	488.1	499.0	10.9	455.7	465.9	10.2



LEGEND

▬	PACKER	K	HYDRAULIC CONDUCTIVITY
① ▨	WESTBAY MONITORING ZONE	mah	METRES ALONG BOREHOLE, RELATIVE TO GROUND SURFACE
—	STEEL CASING	mbgs	METRES BELOW GROUND SURFACE
		m/s	METRES PER SECOND

NOTES

1. ALL UNITS ARE IN METERS UNLESS OTHERWISE NOTED
2. PERMAFROST ASSUMED 200 m ALONG HOLE ALIGNMENT.
3. DRILL RODS TO 251.6 m ALONG HOLE.
4. BOREHOLE LOCATED IN UTM NAD 83 ZONE 14, N =7255363.5 E = 607181.68 ELEVATION = 154.46 m.
5. AVERAGE BOREHOLE INCLINATION IS 69°.

NOT TO SCALE
SCHEMATIC ONLY

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
0	2016-07-06	ISSUED FOR FINAL	JJ	PP	DV	DC
A	2016-05-27	ISSUED FOR REVIEW	JJ	PP		

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
WHALE TAIL PIT PROJECT
NUNAVUT, CANADA

TITLE

AMQ16-626 WESTBAY SYSTEM INSTALLATION DETAILS

Golder Associates

PROJECT No.	1649355.4000.3000		FILE No.	1649355-4000-3000-03
DESIGN	JJ	2016-07-06	SCALE	NOT TO SCALE
CADD	PP	2016-07-06	FIGURE	3
CHECK	DV	2016-07-06		
REVIEW	DC	2016-07-06		

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1649355\02_PRODUCTION\4000\3000\DWG\1649355-4000-3000-03.dwg | Layout: AMQ16-626 WESTBAY SYSTEM INSTALLATION DETAILS | Modified: ppajouhesh 05/26/2016 1:35 PM | Plotted: ppajouhesh 07/06/2016

APPENDIX B

Westbay Instruments Mosdax Sampler Calibration Reports

MOSDAX Calibration Report 1: EMS - 2653 Module 1393

Full Scale: 2000 (psia)

File: E:\DATA\CAL\0-2018\2000\5JUNE2-1\02653

Pressure Reference: Paroscientific Model 42K-101 S/N 59937

Range: 2K PSI

Date of last reference to traceable standard: Oct 5 2017

EMS - 2653 Jun 05 07:21:40 2018
Range 1   Temp 3.2° C

Ref Pres (psia)	Error (psia)	(% FS)
14.710	0.033	0.002
193.556	-0.035	-0.002
393.645	-0.060	-0.003
592.405	-0.084	-0.004
792.635	-0.086	-0.004
991.406	-0.034	-0.002
1190.983	-0.058	-0.003
1390.360	-0.043	-0.002
1589.131	0.027	0.001
1788.616	0.029	0.001
1990.489	-0.174	-0.009
1819.261	0.070	0.004
1620.036	0.056	0.003
1413.330	0.062	0.003
1211.986	0.077	0.004
1009.674	0.060	0.003
807.939	0.060	0.003
606.818	0.054	0.003
406.413	-0.004	0.000
206.210	0.050	0.002
14.727	0.050	0.003

EMS - 2653 Jun 05 02:31:32 2018
Range 2   Temp 10.2° C

Ref Pres (psia)	Error (psia)	(% FS)
14.708	-0.053	-0.003
192.410	-0.077	-0.004
393.839	-0.119	-0.006
592.676	-0.157	-0.008
792.170	-0.141	-0.007
991.220	-0.011	-0.001
1190.818	-0.111	-0.006
1389.783	-0.023	-0.001
1589.250	0.108	0.005
1789.150	0.041	0.002
1990.481	0.064	0.003
1818.525	0.102	0.005
1619.742	0.094	0.005
1413.044	0.093	0.005
1217.553	0.063	0.003
1009.353	0.092	0.005
808.096	-0.031	-0.002
607.340	-0.057	-0.003
406.398	-0.075	-0.004
205.799	0.017	0.001
14.705	-0.052	-0.003

EMS - 2653 Jun 04 21:30:38 2018
Range 3   Temp 20.1° C

Ref Pres (psia)	Error (psia)	(% FS)
14.739	-0.004	0.000
194.053	0.004	0.000
393.092	-0.022	-0.001
593.152	-0.030	-0.002
792.298	-0.006	0.000
991.666	-0.027	-0.001
1191.095	-0.177	-0.009
1389.222	-0.073	-0.004
1589.547	-0.007	0.000
1788.425	-0.007	0.000
1990.256	-0.023	-0.001
1818.673	0.031	0.002
1615.832	0.108	0.005
1414.262	0.033	0.002
1215.621	-0.051	-0.003
1009.884	0.132	0.007
807.824	0.077	0.004
615.725	-0.003	0.000
406.364	-0.010	0.000
205.698	0.069	0.003
14.743	0.003	0.000

EMS - 2653 Jun 04 16:34:31 2018
Range 4   Temp 29.8° C

Ref Pres (psia)	Error (psia)	(% FS)
14.754	0.030	0.001
193.480	-0.014	-0.001
393.032	-0.034	-0.002
592.483	-0.030	-0.001
792.754	0.019	0.001
991.110	0.097	0.005
1191.415	-0.038	-0.002
1390.037	-0.020	-0.001
1588.463	0.003	0.000
1788.797	0.075	0.004
1990.520	-0.035	-0.002
1818.799	0.003	0.000
1619.341	0.068	0.003
1413.488	0.038	0.002
1211.694	0.026	0.001
1007.402	0.180	0.009
807.671	0.135	0.007
606.918	0.046	0.002
406.653	0.036	0.002
205.799	0.053	0.003
14.761	0.036	0.002

EMS - 2653 Jun 04 11:23:49 2018
Range 5   Temp 39.6° C

Ref Pres (psia)	Error (psia)	(% FS)
14.757	-0.001	0.000
190.670	-0.082	-0.004
393.473	-0.130	-0.007
593.303	-0.106	-0.005
790.836	-0.067	-0.003
991.220	0.008	0.000
1191.109	-0.127	-0.006
1390.133	-0.101	-0.005
1590.290	0.000	0.000
1789.154	-0.018	-0.001
1990.498	-0.012	-0.001
1818.208	0.040	0.002
1618.827	0.042	0.002
1413.424	0.002	0.000
1212.970	-0.091	-0.005
1009.825	0.053	0.003
807.826	-0.014	-0.001
606.620	-0.122	-0.006
406.227	-0.078	-0.004
205.718	-0.047	-0.002
14.760	-0.058	-0.003

Issued by

Westbay Instruments

MOSDAX Calibration Report 2: EMS - 2653 Module 1393

Full Scale: 2000 (psia)

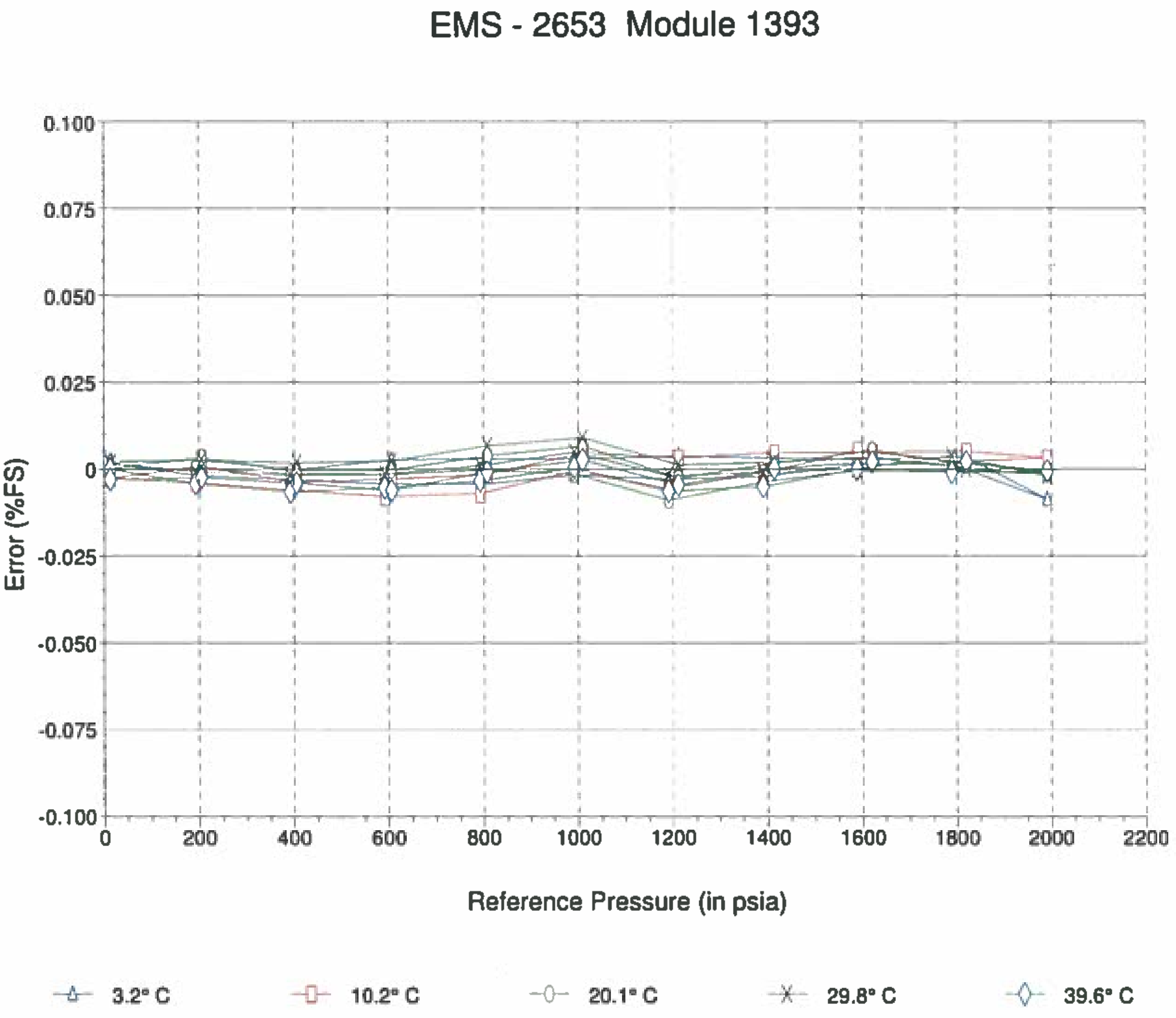
File: E:\DATA\CAL\0-2018\2000\5JUNE2~1\02653

Pressure Reference: Paroscientific Model 42K-101 S/N 59937

Range: 2K PSI

Date of last reference to traceable standard: Oct 5 2017

Plot of Error vs. Reference Pressure



Comments

Issued by

Westbay Instruments

MOSDAX Calibration Report 1: EMS - 5239 Module 3019

Full Scale: 2000 (psia)

File: E:\DATA\CAL\0-2019\2K\21FEB2~1\05239

Pressure Reference: Paroscientific Model 42K-101 S/N 59937

Range: 2K PSI

Date of last reference to traceable standard: Oct 5 2017

EMS - 5239 Feb 21 13:16:29 2019
Range 1   Temp 3.2° C

Ref Pres (psia)	Error (psia)	(% FS)
14.804	-0.163	-0.008
194.487	0.014	0.001
390.179	-0.067	-0.003
593.031	0.045	0.002
789.444	-0.074	-0.004
991.575	-0.137	-0.007
1192.000	-0.073	-0.004
1390.458	-0.208	-0.010
1589.054	-0.084	-0.004
1786.851	0.018	0.001
1986.956	0.054	0.003
1816.362	-0.096	-0.005
1618.050	-0.133	-0.007
1413.486	-0.061	-0.003
1212.916	-0.085	-0.004
1009.275	-0.044	-0.002
807.674	0.055	0.003
606.505	0.100	0.005
406.873	0.118	0.006
205.868	0.082	0.004
14.795	-0.172	-0.009

EMS - 5239 Feb 21 08:33:43 2019
Range 2   Temp 10.2° C

Ref Pres (psia)	Error (psia)	(% FS)
14.817	-0.097	-0.005
193.074	0.029	0.001
393.218	0.098	0.005
593.224	0.119	0.006
792.947	0.037	0.002
992.123	-0.043	-0.002
1190.659	-0.012	-0.001
1390.137	-0.080	-0.004
1589.920	-0.075	-0.004
1788.944	0.021	0.001
1987.148	0.249	0.012
1816.346	0.178	0.009
1616.246	0.041	0.002
1414.032	-0.013	-0.001
1205.963	0.013	0.001
1009.556	0.078	0.004
807.804	0.136	0.007
606.633	0.066	0.003
406.257	0.136	0.007
206.123	0.026	0.001
14.813	-0.182	-0.009

EMS - 5239 Feb 21 03:50:55 2019
Range 3   Temp 19.9° C

Ref Pres (psia)	Error (psia)	(% FS)
14.785	-0.114	-0.006
192.759	0.001	0.000
389.865	0.048	0.002
593.528	0.063	0.003
792.968	0.038	0.002
992.520	-0.077	-0.004
1191.374	-0.113	-0.006
1389.650	-0.076	-0.004
1590.224	-0.047	-0.002
1789.417	0.080	0.004
1987.047	0.248	0.012
1815.391	0.134	0.007
1617.486	0.078	0.004
1413.023	0.064	0.003
1213.269	0.064	0.003
1019.100	0.098	0.005
807.775	0.027	0.001
606.584	0.152	0.008
407.197	0.066	0.003
206.774	0.028	0.001
14.789	-0.180	-0.009

EMS - 5239 Feb 20 23:07:39 2019
Range 4   Temp 29.8° C

Ref Pres (psia)	Error (psia)	(% FS)
14.777	-0.143	-0.007
194.505	-0.051	-0.003
390.763	0.029	0.001
592.862	-0.044	-0.002
791.922	-0.170	-0.009
991.867	-0.146	-0.007
1191.582	-0.173	-0.009
1390.037	-0.291	-0.015
1588.987	-0.226	-0.011
1789.078	-0.110	-0.005
1987.547	0.053	0.003
1817.961	-0.031	-0.002
1618.112	-0.133	-0.007
1413.679	-0.133	-0.007
1214.322	-0.037	-0.002
1009.278	-0.023	-0.001
807.618	-0.048	-0.002
606.717	0.018	0.001
406.329	0.010	0.001
206.564	0.019	0.001
14.793	-0.061	-0.003

EMS - 5239 Feb 20 18:20:11 2019
Range 5   Temp 39.6° C

Ref Pres (psia)	Error (psia)	(% FS)
14.688	-0.114	-0.006
192.678	0.018	0.001
393.297	0.005	0.000
592.933	0.038	0.002
792.936	-0.005	0.000
992.115	0.016	0.001
1191.335	0.109	0.005
1389.111	-0.054	-0.003
1589.837	-0.009	0.000
1781.524	0.117	0.006
1986.689	0.304	0.015
1816.914	0.154	0.008
1615.561	0.032	0.002
1413.112	0.009	0.000
1213.523	0.128	0.006
1009.449	0.127	0.006
807.448	0.113	0.006
606.509	0.084	0.004
406.320	0.079	0.004
205.860	-0.012	-0.001
14.704	-0.100	-0.005

Issued by

Westbay Instruments

MOSDAX Calibration Report 2: EMS - 5239 Module 3019

File: E:\DATA\CAL\0-2019\2K\21FEB2~1\05239

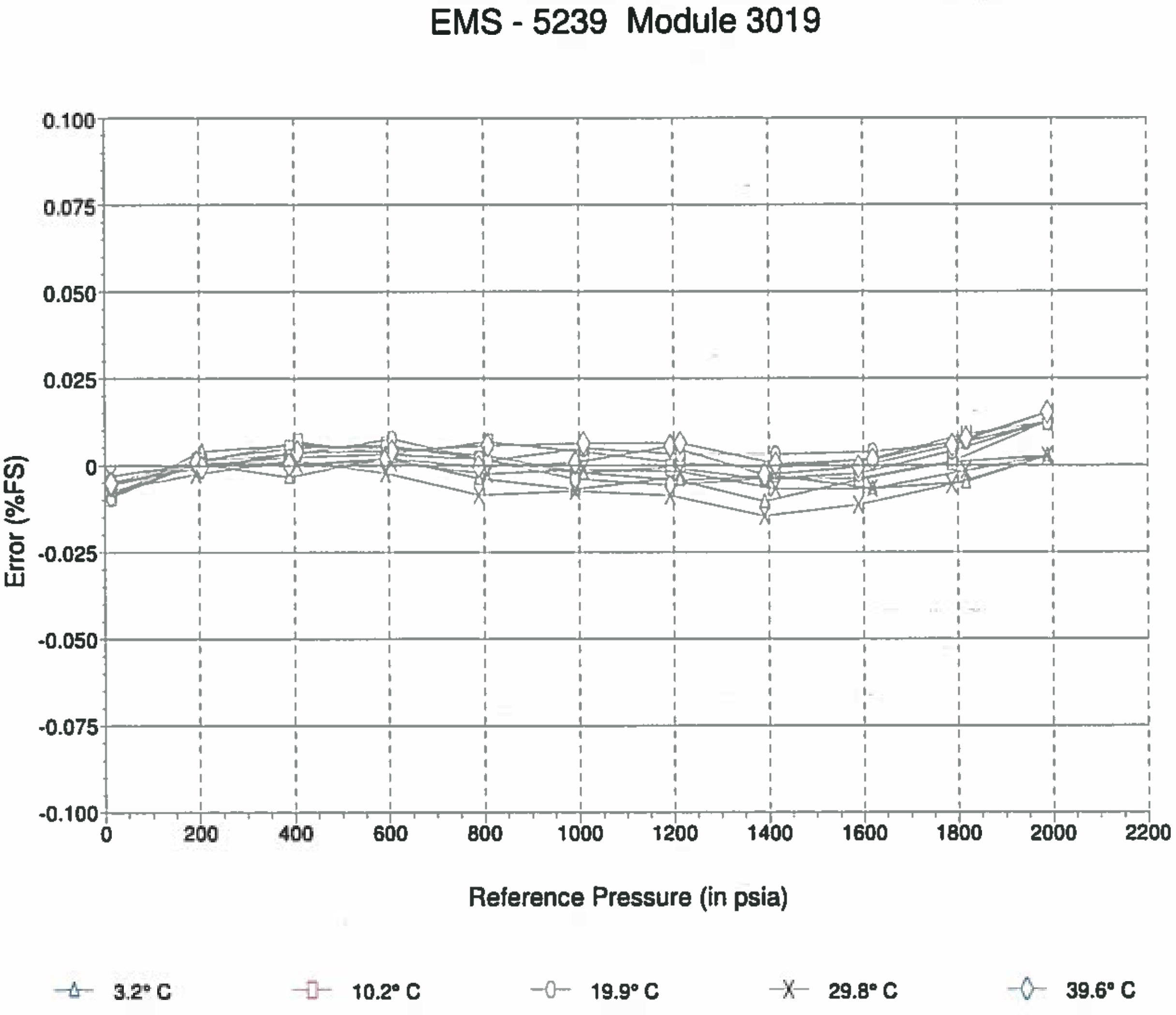
Full Scale: 2000 (psia)

Pressure Reference: Paroscientific Model 42K-101 S/N 59937

Range: 2K PSI

Date of last reference to traceable standard: Oct 5 2017

Plot of Error vs. Reference Pressure



Comments

Issued by

APPENDIX C

2019 Laboratory Certificates of Analysis

AGNICO-EAGLE MINES LTD.
ATTN: Jenyfer Mosquera
Nunavut Permitting Lead
11600 rue Louis-Bisson, Suite 540
Mirabel QC J7N 1G9

Date Received: 04-APR-19
Report Date: 17-MAY-19 14:48 (MT)
Version: FINAL REV. 3

Client Phone: - -

Certificate of Analysis

Lab Work Order #: L2253513

Project P.O. #: NOT SUBMITTED
Job Reference: 18108905
C of C Numbers: 18-1789310
Legal Site Desc:

Comments: ADDITIONAL 13-MAY-19 15:57
Radium-226 data is presented in 2 separate reports (1904131 and 1904211) provided by ALS Fort Collins. Both reports are embedded within this PDF.

15-MAY-2019 Report now including calculated TDS result.

17-MAY-2019 This report includes corrected TDS results for samples L2253513-1 and -2 (Port 3 and Port 33 respectively) as a result of a requested re-check.

H McKenzie

Heather McKenzie
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2253513-1	L2253513-2	L2253513-3	L2253513-4	L2253513-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Other
	Sampled Date	29-MAR-19	29-MAR-19	30-MAR-19	30-MAR-19	31-MAR-19
	Sampled Time	09:30	09:30	09:00	09:00	10:00
	Client ID	PORT 3	PORT 33	PORT 2	PORT 22	FIELD BLANK
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	1320	1300	12700	12400	<4.8
Total Metals	Aluminum (Al)-Total (mg/L)	0.0140	0.0139	0.041	0.062	<0.0050
	Antimony (Sb)-Total (mg/L)	0.0017	0.0017	<0.0050 DLA	<0.0050 DLA	<0.0010
	Arsenic (As)-Total (mg/L)	0.00228	0.00238	0.0024	0.0023	<0.00040
	Barium (Ba)-Total (mg/L)	0.0571	0.0595	0.130	0.139	<0.0010
	Beryllium (Be)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Boron (B)-Total (mg/L)	0.70	0.78	1.8	1.9	<0.30
	Cadmium (Cd)-Total (mg/L)	<0.000010	<0.000010	<0.000050 DLA	<0.000050 DLA	<0.000010
	Calcium (Ca)-Total (mg/L)	535	526	4400 DTC	4660	<1.0
	Cesium (Cs)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Chromium (Cr)-Total (mg/L)	0.0116	0.00706	0.0075	0.0290	<0.00050
	Cobalt (Co)-Total (mg/L)	0.000180	0.000115	<0.00025 DLA	0.00044	<0.000050
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Gallium (Ga)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Iron (Fe)-Total (mg/L)	0.082	0.059	0.184	0.319	<0.010
	Lead (Pb)-Total (mg/L)	0.000159	0.000148	0.00091	0.00106	<0.000050
	Lithium (Li)-Total (mg/L)	0.173	0.176	3.31 DTC	3.56 DTC	<0.020
	Magnesium (Mg)-Total (mg/L)	<1.0	<1.0	<5.0 DLA	<5.0 DLA	<1.0
	Manganese (Mn)-Total (mg/L)	0.00629	0.00576	0.0258	0.0290	<0.00020
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)	0.00584	0.00514	0.0118	0.0154	<0.00010
	Nickel (Ni)-Total (mg/L)	0.00776	0.00494	0.0059	0.0206	<0.00050
	Phosphorus (P)-Total (mg/L)	<0.050	<0.050	<0.25 DLA	<0.25 DLA	<0.050
	Potassium (K)-Total (mg/L)	11.5	12.0	169 DTC	187	<1.0
	Rhenium (Re)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Rubidium (Rb)-Total (mg/L)	0.0175	0.0179	0.226	0.245	<0.0050
	Selenium (Se)-Total (mg/L)	0.00252	0.00113	<0.0025 DLA	<0.0025 DLA	<0.00050
	Silicon (Si)-Total (mg/L)	3.50	3.49	2.87	3.07	<0.50
	Silver (Ag)-Total (mg/L)	<0.00010	<0.00010	<0.00025 DLM	<0.00050 DLA	<0.00010
	Sodium (Na)-Total (mg/L)	343	339	486	502	<2.5
	Strontium (Sr)-Total (mg/L)	8.23	8.13	68.7 DTC	77.6	<0.010
	Sulfur (S)-Total (mg/L)	<5.0	<5.0	<25 DLA	<25 DLA	<5.0
	Tellurium (Te)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Thallium (Tl)-Total (mg/L)	<0.000050	<0.000050	<0.00025 DLA	<0.00025 DLA	<0.000050
	Thorium (Th)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Tin (Sn)-Total (mg/L)	<0.0010	<0.0010	<0.0050 DLA	<0.0050 DLA	<0.0010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L2253513-1	L2253513-2	L2253513-3	L2253513-4	L2253513-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Other
	Sampled Date	29-MAR-19	29-MAR-19	30-MAR-19	30-MAR-19	31-MAR-19
	Sampled Time	09:30	09:30	09:00	09:00	10:00
	Client ID	PORT 3	PORT 33	PORT 2	PORT 22	FIELD BLANK
Grouping	**Analyte**					
SEAWATER						
Total Metals	Titanium (Ti)-Total (mg/L)	<0.0050	<0.0050	<0.025 DLA	<0.025 DLA	<0.0050
	Tungsten (W)-Total (mg/L)	0.0361	0.0360	0.0767	0.0819	<0.0010
	Uranium (U)-Total (mg/L)	<0.000050	<0.000050	<0.00025 DLA	<0.00025 DLA	<0.000050
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Yttrium (Y)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
	Zinc (Zn)-Total (mg/L)	0.507	0.476	0.465	0.770	0.0135 RRV
	Zirconium (Zr)-Total (mg/L)	<0.00050	<0.00050	<0.0025 DLA	<0.0025 DLA	<0.00050
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0067	0.0069	0.0102	0.0106	<0.0050
	Antimony (Sb)-Dissolved (mg/L)	0.0013	0.0012	0.0017	0.0016	<0.0010
	Arsenic (As)-Dissolved (mg/L)	0.00203	0.00199	0.00200	0.00189	<0.00040
	Barium (Ba)-Dissolved (mg/L)	0.0609	0.0619	0.168	0.171	<0.0010
	Beryllium (Be)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Dissolved (mg/L)	0.75	0.79	2.1	2.2	<0.30
	Cadmium (Cd)-Dissolved (mg/L)	<0.000010	<0.000010	0.000015	0.000016	<0.000010
	Calcium (Ca)-Dissolved (mg/L)	528	521	5090	4960	<1.0
	Cesium (Cs)-Dissolved (mg/L)	<0.00050	<0.00050	0.00285	0.00284	<0.00050
	Chromium (Cr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Dissolved (mg/L)	<0.000050	<0.000050	0.000098	0.000096	<0.000050
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020	0.00028	0.00029	<0.00020
	Gallium (Ga)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	0.011	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.163	0.156	4.10	4.16	<0.020
	Magnesium (Mg)-Dissolved (mg/L)	<1.0	<1.0	<5.0 DLA	<5.0 DLA	<1.0
	Manganese (Mn)-Dissolved (mg/L)	0.00454	0.00428	0.0231	0.0231	<0.00010
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00416	0.00418	0.0143	0.0145	<0.00010
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050	0.00161	0.00167	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	11.8	11.5	198	233	<1.0
	Rhenium (Re)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Rubidium (Rb)-Dissolved (mg/L)	0.0179	0.0176	0.274	0.270	<0.0050
	Selenium (Se)-Dissolved (mg/L)	0.00081	0.00074	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Dissolved (mg/L)	3.34	3.18	2.61	2.65	<0.50

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID **Description** **Sampled Date** **Sampled Time** **Client ID**	L2253513-1 Groundwater 29-MAR-19 09:30 PORT 3	L2253513-2 Groundwater 29-MAR-19 09:30 PORT 33	L2253513-3 Groundwater 30-MAR-19 09:00 PORT 2	L2253513-4 Groundwater 30-MAR-19 09:00 PORT 22	L2253513-5 Other 31-MAR-19 10:00 FIELD BLANK
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Sodium (Na)-Dissolved (mg/L)	323	316	455	450	<2.5
	Strontium (Sr)-Dissolved (mg/L)	8.65	8.76	92.6	92.5	<0.010
	Sulfur (S)-Dissolved (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Tellurium (Te)-Dissolved (mg/L)	<0.00050	<0.00050	0.00600	0.00653	<0.00050
	Thallium (Tl)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Thorium (Th)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Tin (Sn)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Titanium (Ti)-Dissolved (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Tungsten (W)-Dissolved (mg/L)	0.0388	0.0383	0.0875	0.0890	<0.0010
	Uranium (U)-Dissolved (mg/L)	<0.000050	<0.000050	0.000135	0.000131	<0.000050
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Yttrium (Y)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0052	0.0041	0.0063	0.0108	RRV 0.0148
	Zirconium (Zr)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2253513-1	L2253513-2	L2253513-3	L2253513-4	L2253513-5
	Description	Groundwater	Groundwater	Groundwater	Groundwater	Other
	Sampled Date	29-MAR-19	29-MAR-19	30-MAR-19	30-MAR-19	31-MAR-19
	Sampled Time	09:30	09:30	09:00	09:00	10:00
	Client ID	PORT 3	PORT 33	PORT 2	PORT 22	FIELD BLANK
Grouping	**Analyte**					
WATER						
Field Tests	Conductivity, Client Supplied (uS/cm)	4750	4750	29670	29670	10
Physical Tests	Conductivity (uS/cm)	4660	4730	24300	24200	<2.0
	pH (pH)	6.78	6.89	7.07	7.07	5.27
	Total Suspended Solids (mg/L)	<3.0	<3.0	4.3	7.1	<3.0
	Total Dissolved Solids (mg/L)	2980 HTD	2990 HTD	19300	19600	<3.0
	TDS (Calculated) (mg/L)	2470	2460	15700	15000	<1.0
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	53.0	53.1	56.7	57.3	<1.0
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	53.0	53.1	56.7	57.3	<1.0
	Ammonia, Total (as N) (mg/L)	0.0920	0.0943	0.207	0.202	<0.0050
	Bromide (Br) (mg/L)	18.2	17.0	129	123	<0.050
	Chloride (Cl) (mg/L)	1580	1580	9910	9340	<0.10
	Fluoride (F) (mg/L)	<0.80 DLCI	<0.80 DLCI	<2.0 DLDS	<2.0 DLDS	<0.020
	Nitrate (as N) (mg/L)	<0.10 DLDS	<0.10 DLDS	<0.50 DLDS	<0.50 DLDS	<0.0050
	Nitrite (as N) (mg/L)	<0.020 DLDS	<0.020 DLDS	<0.10 DLDS	<0.10 DLDS	<0.0010
	Phosphorus (P)-Total (mg/L)	0.0029	0.0041	0.0068	0.0296	<0.0020
	Silicate (as SiO2) (mg/L)	6.80	6.65	<5.0 DLM	<5.0 DLM	<0.50
	Sulfate (SO4) (mg/L)	<6.0 DLDS	<6.0 DLDS	<30 DLDS	<30 DLDS	<0.30
	Anion Sum (meq/L)	45.5	45.6	281	265	<0.10
	Cation Sum (meq/L)	40.7	40.1	279	273	<0.10
	Cation - Anion Balance (%)	-5.6	-6.5	-0.3	1.5	0.0
Hydrocarbons	F2 (C10-C16) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	F3 (C16-C34) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	F4 (C34-C50) (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	TPH (C10-C50) (mg/L)	<0.52	<0.52	<0.52	<0.52	<0.52
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	103.9	112.1	105.9	101.6	102.9
Radiological Parameters	Ra-226 (Bq/L)	0.19	0.20	1.4 DLRC	1.8	<0.0080

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Laboratory Control Sample	Boron (B)-Dissolved	MES	L2253513-3, -4
Laboratory Control Sample	Lithium (Li)-Dissolved	MES	L2253513-3, -4
Laboratory Control Sample	Tellurium (Te)-Dissolved	MES	L2253513-3, -4
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2253513-1, -2, -5
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Boron (B)-Dissolved	MS-B	L2253513-1, -2, -5
Matrix Spike	Boron (B)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2253513-1, -2, -5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2253513-1, -2, -5
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2253513-1, -2, -5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2253513-3, -4
Matrix Spike	Phosphorus (P)-Total	MS-B	L2253513-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLRC	Detection Limit Raised for RadioChemistry test due to sample matrix (e.g. high TDS) or instrument detector conditions.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-TITR-VA	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-VA	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-L-IC-N-VA	Water	Chloride in Water by IC (Low Level)	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
EC-PCT-VA	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.

This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.

ALS Test Code	Matrix	Test Description	Method Reference**
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-VA	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

ALS Test Code	Matrix	Test Description	Method Reference**
F2-F4-ME-FID-VA	Water	CCME F2-F4 Hydrocarbons in Water	CCME CWS-PHC, Pub #1310, Dec 2001

F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the

Reference Information

Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.

HARDNESS-CALC-VA Seawater Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-DIS-C-CVAFS-VA Seawater Diss. Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

HG-TOT-C-CVAFS-VA Seawater Total Mercury in Seawater by CVAFS PUGET SOUND PROTOCOLS, EPA 245.7

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-F-HMI-CCMS-VA Seawater Diss. Metals in Seawater by CRC ICPMS APHA 3030B/EPA 6020B (mod)

Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).

MET-DIS-C-LOW-MS-VA Seawater Diss. Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-T-HB-F-HMI-MS-VA Seawater Tot Metals in Seawater by CRC ICPMS (BC) EPA 200.2/6020B (mod)

Seawater samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.

MET-TOT-C-LOW-MS-VA Seawater Total Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

Reference Information

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TPH(C10-C50)-CALC-CL Water Total Petroleum Hydrocarbons (C10-C50) CCME CWS-PHC, Pub #1310, Dec 2001

TPH (C10-C50) is determined as the sum of CCME F2, F3 and F4. The CCME F2-F4 test includes an in-situ silica gel cleanup to remove polar organic constituents that are not representative of petroleum hydrocarbons. Even after silica gel cleanup, some non-petroleum source hydrocarbons may be detected by this test.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

18-1789310

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Wednesday, April 17, 2019

Heather McKenzie
ALS Environmental
8081 Lougheed Hwy, Suite 100
Burnaby, BC V5A 1W9

Re: ALS Workorder: 1904131
Project Name:
Project Number: L2253513

Dear Ms. McKenzie:

Three water samples were received from ALS Environmental, on 4/8/2019. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1904131

Radium-226:
The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1904131
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L2253513
Client PO Number: L2253513

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2253513-1	1904131-1		WATER	29-Mar-19	
L2253513-2	1904131-2		WATER	29-Mar-19	
L2253513-5	1904131-3		WATER	31-Mar-19	

ALS Environmental

L2253513

VANCOUVER

1904131

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# L2253513
ALS requires QC data to be provided with your final results.

Please see enclosed 3 **sample(s) in** 3 **Container(s)**

	SAMPLE NUMBER	**ANALYTICAL REQUIRED**	**DATE SAMPLED** / **DUE DATE**	**Priority Flag**
1	**L2253513-1 PORT 3**		**3/29/2019**	
		Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	4/26/2019	
2	**L2253513-2 PORT 33**		**3/29/2019**	
		Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	4/26/2019	
3	**L2253513-5 FIELD BLANK**		**3/31/2019**	
		Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	4/26/2019	

Subcontract Info Contact: Walter Lin (604) 253-4188

Analysis and reporting info contact: Heather McKenzie
8081 LOUGHEED HWY
SUITE 100
BURNABY,BC V5A 1W9
Phone: (604) 253-4188

NEW Reporting Contacts:
1.Account Manager Listed Below
2.ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL)
3.ALSE.CASDG@ALSGlobal.com (EDD/Database Formats)

Email: Heather.McKenzie@alsglobal.com

Please email confirmation of receipt to: **Heather.McKenzie@alsglobal.com**

Shipped By: ____________ Date Shipped: ____________

Received By: Emily Lyons Date Received: 04.08.19 0825

Verified By: ____________ Date Verified: ____________

Temperature: ____________

Sample Integrity Issues: ____________

ALS Environmental - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS - Burnaby

Workorder No: 1904131

Project Manager: KMO

Initials: Ew

Date: 04·08·19

1. Are airbills / shipping documents present and/or removable?		DROP OFF	[✓ YES]	NO
2. Are custody seals on **shipping** containers intact?		[✓ NONE]	YES	NO *
3. Are custody seals on **sample** containers intact?		[✓ NONE]	YES	NO *
4. Is there a COC (chain-of-custody) present?			[✓ YES]	NO *
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)			[✓ YES]	NO *
6. Are short-hold samples present?			YES	[✓ NO]
7. Are all samples within holding times for the requested analyses?			[✓ YES]	NO *
8. Were all sample containers received intact? (not broken or leaking)			[✓ YES]	NO *
9. Is there sufficient sample for the requested analyses?			[✓ YES]	NO *
10. Are all samples in the proper containers for the requested analyses?			[✓ YES]	NO *
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)		N/A	YES	[✓ NO *]
12. Are all aqueous non-preserved samples pH 4-9?		[✓ N/A]	YES	NO *
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)		[✓ N/A]	YES	NO
14. Were the samples shipped on ice?			[✓ YES]	NO
15. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 [✓ #3] #4	RAD ONLY	YES	[✓ NO]

Cooler #: 1

Temperature (°C): 12.0

No. of custody seals on cooler: 0

DOT Survey/ Acceptance Information

External µR/hr reading: 8

Background µR/hr reading: 10

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)

*** Please provide details here for NO responses to gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.**

#11) Samples 1 and 2 each had initial pHs of 3. 1mL of HNO_3 (lot#197345) was added to each bottle. The final pH of each bottle was 1.6.

All client bottle ID's vs ALS lab ID's double-checked by: Ew

If applicable, was the client contacted? YES / NO / NA Contact: Date/Time:

Project Manager Signature / Date: 4/8/19

Form 201r27.xls
(02/11/2019)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

1904131

ORIGIN ID:YBYA (604) 253-4188
HARJIT GILL
ALS ENVIRONMENTAL LAB GROUP
LOUGHEED HIGHWAY

BURNABY, BC V5A1W9
CANADA CA

SHIP DATE: 05APR19
ACTWGT: 10.00 LB MAN
CAD: 0347419/CAFE3211

BILL SENDER

TO SAMPLE RECEVING
ALS ENVIRONMANTAL
225 COMMERCE DRIVE

FORT COLLINS CO 80524
(970) 490-1511 REF: SUBLETS
DEPT: SUBLET

(US)

551C1/D7E5/104C

8-0
12.0

FedEx.
Express

E

J181118080502urr

10:30A
INTL PRIORITY

TRK# 4897 4512 8418
0430

XH FTCA

80524
CO-US DEN

After printing this label:
CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH
1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

DEFINITIONS: On the Air Waybill 'We', 'Our', 'us' and 'FedEx' refer to Federal Express Corporation, its subsidiaries and branches and their respective employees, agents and independent contractors. 'You' and 'your' refer to the shipper, its employees, principals and agents. If your shipment originates outside the United States, your contract of carriage is with the Federal Express subsidiary, branch or independent contractor who originally accepts the shipment from you. 'Package' means any container or envelope that is accepted by us for delivery, including any such items tendered by you utilizing our automated systems, meters, manifests or waybills. 'Shipment' means all packages, which are tendered to and accepted by us on a single Air Waybill.

AGREEMENT TO TERMS. By giving us your shipment, you agree, regardless of whether you sign the front of this Air Waybill, for yourself and as agent for and on behalf of any other person having an interest in this shipment, to all terms on this NON-NEGOTIABLE Air Waybill. In any applicable tariff, and in our current Service Guide or Standard Conditions of Carriage, copies of which are available upon request. If there is a conflict between this Air Waybill and either the tariff, Service Guide or Standard Conditions then in effect, the tariff and the terms of any customer automation agreement between the shipper and Federal Express will control(the Service Guide or Standard Conditions have secondary priority). No one is authorized to alter or modify the terms of our agreement. This Air Waybill shall be binding on us when the shipment is accepted.

YOUR OBLIGATIONS: You warrant that each article in the shipment is properly described on this Air Waybill and is acceptable for transport by us, and that the shipment is propely marked, addressed (including postal codes) and packaged to ensure safe transportation with ordinary care in handling.

NOTE CONCERNING LIMITATIONS OF LIABILITY. Air Carriage Notice. If the carriage of your shipment by air involves an ultimate destination or stop in a country other than the country of departure, the Warsaw Convention, an international treaty relating to international carriage by air, may be applicable, which treaty would then govern and in most cases limit our liability for loss or delay of or damage to your shipment. In the U.S. the Warsaw Convention limits our liability to U.S. $9.07 per pound (U.S. $20.38 per kilogram). Unless you declare a higher value for carriage as described below. The interpretation of the Warsaw Convention liability limits may vary in other countries. There are no stopping places which are agreed at the time of tender of the shipment and we reserve the right to route shipments in any way we deem appropriate.

Road Transport Notice. Shipments transported partly or solely by road be it explicit agreement to do so or not-in, to, from a country which is party to the Convention on the Contract for the International Carriage of Goods by Road (the 'CMR') are subject to the terms and conditions of the CMR, notwithstanding any other provisions of this Agreement to the contrary. For these shipments transported solely by road, if a conflict arises between the provisions of the CMR and this Air Waybill the terms of the CMR shall prevail.

Limitation of Liability, If not governed by the Warsaw Convention or the CMR as described above, our maximum liability for loss, damage or delay is limited by this Air Waybill to U.S. $100 per shipment or U.S. $9.07 per pound (U.S. $20.38 per kilo) (or equivalent local currency), whichever is greater, unless you declare a higher value for carriage as descibed below. FedEx does not provide cargo liability or all-risk insurance, but you may pay an additional charge to each additional U.S. $100 (or equivalent local currency) of described value for carriage. If a higher value for carriage is declared and the additional charge is paid, FedEx maximum liability will be the lesser of the declared value for carriage or your actual damages.

LIABILITIES NOT ASSUMED. IN ANY EVENT, WE WON'T BE LIABLE FOR ANY DAMAGES WHETHER DIRECT , INCIDENTAL, SPECIAL OR CONSEQUENTIAL , IN EXCESS OF THE DECLARED VALUE FOR CARRIAGE (INCLUDING BUT NOT LIMITED TO LOSS OF INCOME OR,PROFITS) WHETHER OR NOT WE HAD ANY KNOWLEDGE THAT SUCH DAMAGES MIGHT BE INCURRED, UNLESS SUCH DAMAGES WERE CAUSED BY OUR OWN WILLFUL MICONDUCT OR GROSS NEGLIGENCE.

We won't be liable for your actions or omissions, including but not limited to incorrect declaration of cargo, improper or insufficient packing, securing, marking or addressing of the shipment, or for the acts or omissions of the recipient or anyone else with an interest in the shipment. Also we won't be liable if you (or) the recipient violate any of the terms of our agreement. We won't be liable for loss of or damage to shipments of cash, currency or other prohibited items. We won't be liable for loss, damages or delay caused by events we cannot control, including but not limited to acts of God, perils of the air, weather conditions mechanical delays, acts of public enemies, war, strikes, civil commotions, or acts or omissions of public authorities (including customs and health officials) with actual or apparent authority.

NO WARRANTIES. We make no warranties, express or implied.

CLAIM FOR LOSS, DAMAGE FOR DELAY. ALL CLAIMS MUST BE NOTIFIED TO US WITHIN 15 DAYS AFTER DELIVERY OF THE SHIPMENT FAILING WHICH NO ACTION FOR DAMAGES MAY BE BROUGHT. All claims for loss, non-delivery or mis-delivery must be received by us within 90 days after the shipment is accepted by us. The right to damages against us shall be extinguished unless an action is brought within two years from the date of delivery of the shipment or from date on which the shipment should have been delivered. Within 30 days after notification to us (of) the claim, it must be documented by sending us all relevant information about it. We are not obligated to act on any claim until all transportation charges have been paid; the claim amount may not be deducted from those charges. If the recipient accepts the shipment without noting any damage on the delivery record, we will assume the shipment was delivered in good condition. In order for us to consider a claim for damages, the content(s), original shipping cartons, and packing must be available to us for inspection.

RIGHT TO INSPECT. Your shipment may, at our option or at the request of governmental authorities, be opened and inspected by us or such authorities or us at any time.

CUSTOMS CLEARANCE. It is your responsibility to provide proper customs documentation and confirmation, where required.

EXPORT CONTROL. You authorize Federal Express to act as fowarding agent for you for export control and customs purposes. You hereby certify that all statements and information contained in this air waybill relating to exportation are true and correct. Furthermore, you understand that civil and criminal penalties, including forfeiture and sale, may be imposed for making false or fraudulent statements or for the violation of any United States laws on exportation, including but not limited to, 13 USC Sec. 305; 22 USC Sec 401; 18 USC Sec. 1001; 50 USC app. 2410.

MANDATORY LAW. Insofar as any provision contained or referred to in this air Waybill may be contrary to any applicable international treaty, law government regulations, orders or requirements such provision shall remain in effect as a part of our agreement to the extent that it is not overridden. The invalidity or unenforceability of any provision shall not affect any other part of this Air Waybill. Unless otherwise indicated the Sender's address indicated on the face of this Waybill is the place of execution and the place of departure, and Recipient's address listed on the face of this Waybill is the place of destination. Unless otherwise indicated Federal Express Corporation, P.O. Box 727, Memphis, TN 38194 USA is the first carrier of this shipment.

Client:	ALS Environmental	**Date:**	*17-Apr-19*
Project:	L2253513	**Work Order:**	1904131
Sample ID:	L2253513-1	**Lab ID:**	1904131-1
Legal Location:		**Matrix:**	WATER
Collection Date:	3/29/2019	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/9/2019**		PrepBy: **JXH**
Ra-226	**0.19 (+/- 0.052)**		**0.0055**	**BQ/l**	NA	4/16/2019 12:10
Carr: BARIUM	*90.9*		*40-110*	*%REC*	DL = NA	4/16/2019 12:10

Client: ALS Environmental

Project: L2253513

Sample ID: L2253513-2

Legal Location:

Collection Date: 3/29/2019

Date: *17-Apr-19*

Work Order: 1904131

Lab ID: 1904131-2

Matrix: WATER

Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/9/2019**		PrepBy: **JXH**
Ra-226	**0.20 (+/- 0.054)**		**0.0085**	**BQ/l**	NA	4/16/2019 12:10
Carr: BARIUM	*91.3*		*40-110*	*%REC*	DL = NA	4/16/2019 12:10

Client:	ALS Environmental	**Date:**	*17-Apr-19*
Project:	L2253513	**Work Order:**	1904131
Sample ID:	L2253513-5	**Lab ID:**	1904131-3
Legal Location:		**Matrix:**	WATER
Collection Date:	3/31/2019	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/9/2019**		PrepBy: **JXH**
Ra-226	0.0024 (+/- 0.0046)	U	0.008	BQ/l	NA	4/16/2019 12:10
Carr: BARIUM	*87.6*		*40-110*	*%REC*	DL = NA	4/16/2019 12:10

Client:	ALS Environmental	**Date:**	*17-Apr-19*
Project:	L2253513	**Work Order:**	1904131
Sample ID:	L2253513-5	**Lab ID:**	1904131-3
Legal Location:		**Matrix:**	WATER
Collection Date:	3/31/2019	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC

U or ND - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).

U or ND - Indicates that the compound was analyzed for but not detected.

E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.

M - Duplicate injection precision was not met.

N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.

Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.

* - Duplicate analysis (relative percent difference) not within control limits.

S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.

B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.

E - Analyte concentration exceeds the upper level of the calibration range.

J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).

A - A tentatively identified compound is a suspected aldol-condensation product.

X - The analyte was diluted below an accurate quantitation level.

* - The spike recovery is equal to or outside the control criteria used.

+ - The relative percent difference (RPD) equals or exceeds the control criteria.

G - A pattern resembling gasoline was detected in this sample.

D - A pattern resembling diesel was detected in this sample.

M - A pattern resembling motor oil was detected in this sample.

C - A pattern resembling crude oil was detected in this sample.

4 - A pattern resembling JP-4 was detected in this sample.

5 - A pattern resembling JP-5 was detected in this sample.

H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.

L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.

Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: *4/17/2019 3:12:*

QC BATCH REPORT

Client: ALS Environmental
Work Order: 1904131
Project: L2253513

Batch ID: **RE190409-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE190409-1** Units: **BQ/l** Analysis Date: **4/16/2019 12:59**
Client ID: Run ID: **RE190409-1A** Prep Date: **4/9/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.96 (+/- 0.489)	0.0186	1.771		111	67-120					P,M3
Carr: BARIUM	13900		15340		90.4	40-110					

LCSD Sample ID: **RE190409-1** Units: **BQ/l** Analysis Date: **4/16/2019 12:59**
Client ID: Run ID: **RE190409-1A** Prep Date: **4/9/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.65 (+/- 0.414)	0.0184	1.771		93.2	67-120		1.96	0.5	2.1	P,M3
Carr: BARIUM	14600		15330		95.4	40-110		13900			

MB Sample ID: **RE190409-1** Units: **BQ/l** Analysis Date: **4/16/2019 12:59**
Client ID: Run ID: **RE190409-1A** Prep Date: **4/9/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	-0.00049 (+/- 0.0045)	0.0088									U
Carr: BARIUM	14000		15330		91.6	40-110					

The following samples were analyzed in this batch: 1904131-1 1904131-2 1904131-3

Ft. Collins, Colorado LIMS Version: 6.895

Wednesday, April 24, 2019

Heather McKenzie
ALS Environmental
8081 Lougheed Hwy, Suite 100
Burnaby, BC V5A 1W9

Re: ALS Workorder: 1904211
Project Name:
Project Number: L2253513

Dear Ms. McKenzie:

Two water samples were received from ALS Environmental, on 4/11/2019. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1904211

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1904211
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L2253513
Client PO Number: L2253513

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2253513-3	1904211-1		WATER	30-Mar-19	
L2253513-4	1904211-2		WATER	30-Mar-19	

L2253513

VANCOUVER

ALS Environmental

Subcontract Request Form

1904211

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# *L2253513*
ALS requires QC data to be provided with your final results.

Please see enclosed 2 **sample(s) in** 2 **Container(s)**

SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED DUE DATE	Priority Flag
~~L2253513-1 PORT 2~~		~~3/29/2019~~	
	~~Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)~~	~~4/26/2019~~	
~~L2253513-2 PORT 22~~		~~3/29/2019~~	
	~~Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)~~	~~4/26/2019~~	
1 L2253513-3 PORT 2		**3/30/2019**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	4/26/2019	
2 L2253513-4 PORT 22		**3/30/2019**	
	Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	4/26/2019	
~~L2253513-5 FIELD BLANK~~		~~3/31/2019~~	
	~~Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)~~	~~4/26/2019~~	

Subcontract Info Contact: Walter Lin (604) 253-4188

Analysis and reporting info contact: Heather McKenzie
8081 LOUGHEED HWY
SUITE 100
BURNABY,BC V5A 1W9
Phone: (604) 253-4188
Email: Heather.McKenzie@alsglobal.com

NEW Reporting Contacts:
1.Account Manager Listed Below
2.ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL)
3.ALSE.CASDG@ALSGlobal.com (EDD/Database Formats)

Please email confirmation of receipt to: **Heather.McKenzie@alsglobal.com**

Shipped By: ______ Date Shipped: ______

Received By: Kayleefier Date Received: 4/11/19 1255

Verified By: ______ Date Verified: ______

Temperature: 7.3

Sample Integrity Issues: ______

ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: ALS Burnaby
Workorder No: 1904211
Project Manager: Katie
Initials: KP
Date: 4/11/19

1.	Are airbills / shipping documents present and/or removable?		DROP OFF	[✓ YES]	NO
2.	Are custody seals on **shipping** containers intact?		[✓ NONE]	YES	NO *
3.	Are custody seals on **sample** containers intact?		[✓ NONE]	YES	NO *
4.	Is there a COC (chain-of-custody) present?			[✓ YES]	NO *
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)			[✓ YES]	NO *
6.	Are short-hold samples present?			YES	[✓ NO]
7.	Are all samples within holding times for the requested analyses?			[✓ YES]	NO *
8.	Were all sample containers received intact? (not broken or leaking)			[✓ YES]	NO *
9.	Is there sufficient sample for the requested analyses?			[✓ YES]	NO *
10.	Are all samples in the proper containers for the requested analyses?			[✓ YES]	NO *
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)		N/A	YES	[✓ NO *]
12.	Are all aqueous non-preserved samples pH 4-9?		[✓ N/A]	YES	NO *
13.	Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)		[✓ N/A]	YES	NO
14.	Were the samples shipped on ice?			[✓ YES]	NO
15.	Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 [✓ #3] #4	RAD ONLY	YES	[✓ NO]

Cooler #:	1							
Temperature (°C):	7.3							
No. of custody seals on cooler:	0							
External µR/hr reading:	8							
Background µR/hr reading:	10							

DOT Survey/ Acceptance Information

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] / NO / NA (If no, see Form 008.)

*** Please provide details here for NO responses to gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.**

pH of port 2, port 22, ~~port 4,~~ ~~and port 6~~ was above 2. Added concentrated HNO3 to each. Lot 197345. 4/12/19

~~port 4 1.0mL HNO3 for pH < 2~~
port 2 1.0mL HNO3 for pH < 2 4/12/19
~~port 6 .5mL HNO3 for pH < 2~~
port 22 1.0mL HNO3 for pH < 2

All client bottle ID's vs ALS lab ID's double-checked by: KP

If applicable, was the client contacted? YES / NO / NA Contact: ____ Date/Time: ____

Project Manager Signature / Date: 4/12/19

Form 201r27.xls
(02/11/2019)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

1904211

ORIGIN ID:YBYA (604) 253-4188
HARJIT GILL
ALS ENVIRONMENTAL LAB GROUP
LOUGHEED HIGHWAY

BURNABY, BC V5A1W9
CANADA, CA

Ship Date: 10APR19
ActWgt: 15.00 LB MAN
CAD: 0347419/CAFE3211

BILL SENDER
EIN/VAT:

TO SAMPLE RECEVING
ALS ENVIRONMANTAL
225 COMMERCE DRIVE

FORT COLLINS, CO 80524

(970) 490-1511

(US)

E

J181118060520uv

AWB

XH FTCA

PKG TYPE: CUSTOMER

8-0

7.3

TRK# 4897 4512 8473

Form
0430

10:30A
INTL PRIORITY

REF: Sublets
DESC1:environmental water samples for anlysis only.
DESC2:
DESC3:
DESC4:

COUNTRY MFG: CA
CARRIAGE VALUE: 0.00 CAD
CUSTOMS VALUE: 5.00 CAD

SIGN: HARJIT GILL
T/C: S *********
D/T: R

These commodities, technology, or software were exported from Canada in accordance with the export administration regulations. Diversion contrary to Canadian law prohibited. The Warsaw Convention may apply and will govern and in most cases limit the libility of Federal Express for loss or delay of or damage to your shipment. Subject to the conditions of the contract.

FEDEX AWB COPY - PLEASE PLACE IN POUCH

After printing this label:
FEDEX AWB COPY - PLEASE PLACE BEHIND CONSIGNEE COPY
1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

SAMPLE SUMMARY REPORT

Client:	ALS Environmental		**Date:**	*24-Apr-19*
Project:	L2253513		**Work Order:**	1904211
Sample ID:	L2253513-3		**Lab ID:**	1904211-1
Legal Location:			**Matrix:**	WATER
Collection Date:	3/30/2019		**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/12/2019**		PrepBy: **JXH**
Ra-226	**1.4 (+/- 0.34)**	M3	**0.011**	**BQ/l**	NA	4/23/2019 11:21
Carr: BARIUM	*82.4*		*40-110*	*%REC*	DL = NA	4/23/2019 11:21

Client:	ALS Environmental	**Date:**	*24-Apr-19*
Project:	L2253513	**Work Order:**	1904211
Sample ID:	L2253513-4	**Lab ID:**	1904211-2
Legal Location:		**Matrix:**	WATER
Collection Date:	3/30/2019	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/12/2019**		PrepBy: **JXH**
Ra-226	**1.8 (+/- 0.44)**		**0.009**	**BQ/l**	NA	4/23/2019 11:21
Carr: BARIUM	*82.6*		*40-110*	*%REC*	DL = NA	4/23/2019 11:21

Client:	ALS Environmental	**Date:**	*24-Apr-19*
Project:	L2253513	**Work Order:**	1904211
Sample ID:	L2253513-4	**Lab ID:**	1904211-2
Legal Location:		**Matrix:**	WATER
Collection Date:	3/30/2019	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: *4/24/2019 12:25*

Client: ALS Environmental
Work Order: 1904211
Project: L2253513

QC BATCH REPORT

Batch ID: **RE190412-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE190412-1** Units: **BQ/l** Analysis Date: **4/23/2019 11:21**
Client ID: Run ID: **RE1904112-1A** Prep Date: **4/12/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.76 (+/- 0.443)	0.0101	1.771		99.6	67-120					P,M3
Carr: BARIUM	14600		15750		92.8	40-110					

LCSD Sample ID: **RE190412-1** Units: **BQ/l** Analysis Date: **4/23/2019 11:21**
Client ID: Run ID: **RE1904112-1A** Prep Date: **4/12/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.78 (+/- 0.448)	0.0121	1.771		101	67-120		1.76	0.03	2.1	P,M3
Carr: BARIUM	15000		15730		95.4	40-110		14600			

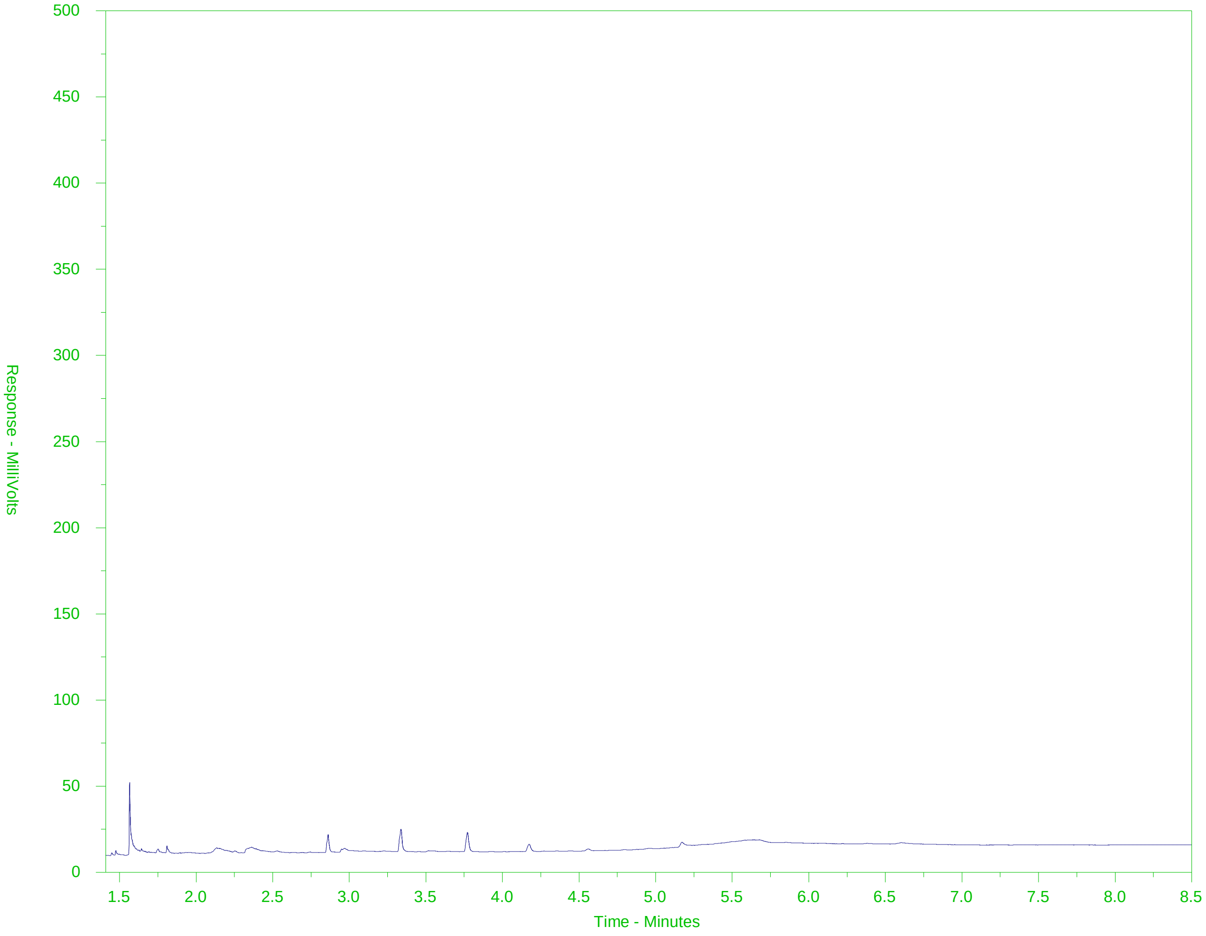
MB Sample ID: **RE190412-1** Units: **BQ/l** Analysis Date: **4/23/2019 11:21**
Client ID: Run ID: **RE1904112-1A** Prep Date: **4/12/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	-0.00051 (+/- 0.0030)	0.0067									U
Carr: BARIUM	14400		15740		91.3	40-110					

The following samples were analyzed in this batch: 1904211-1 1904211-2

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2253513-C-1
Client Sample ID: PORT 3



←—— F2 ——→←—————— F3 ——————→←—— F4 ——→

nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F

←Gasoline→ ←—————— Motor Oils/ Lube Oils/ Grease ——————→

←——— Diesel/ Jet Fuels ———→

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

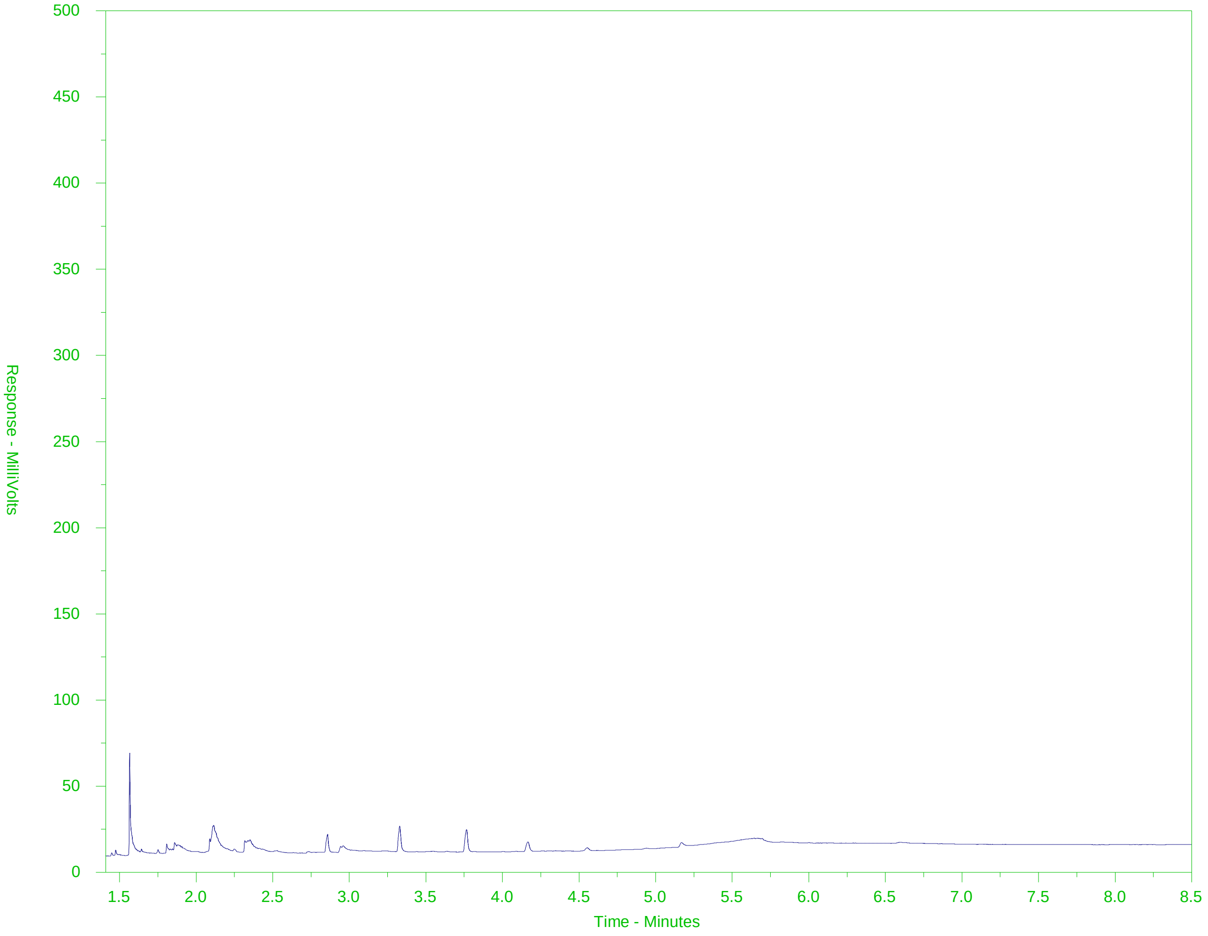
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2253513-C-2
Client Sample ID: PORT 33



←—— F2 ——→←—— F3		——→←—— F4 ——→	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
←Gasoline→	←—— Motor Oils/ Lube Oils/ Grease ——→		
←—— Diesel/ Jet Fuels ——→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

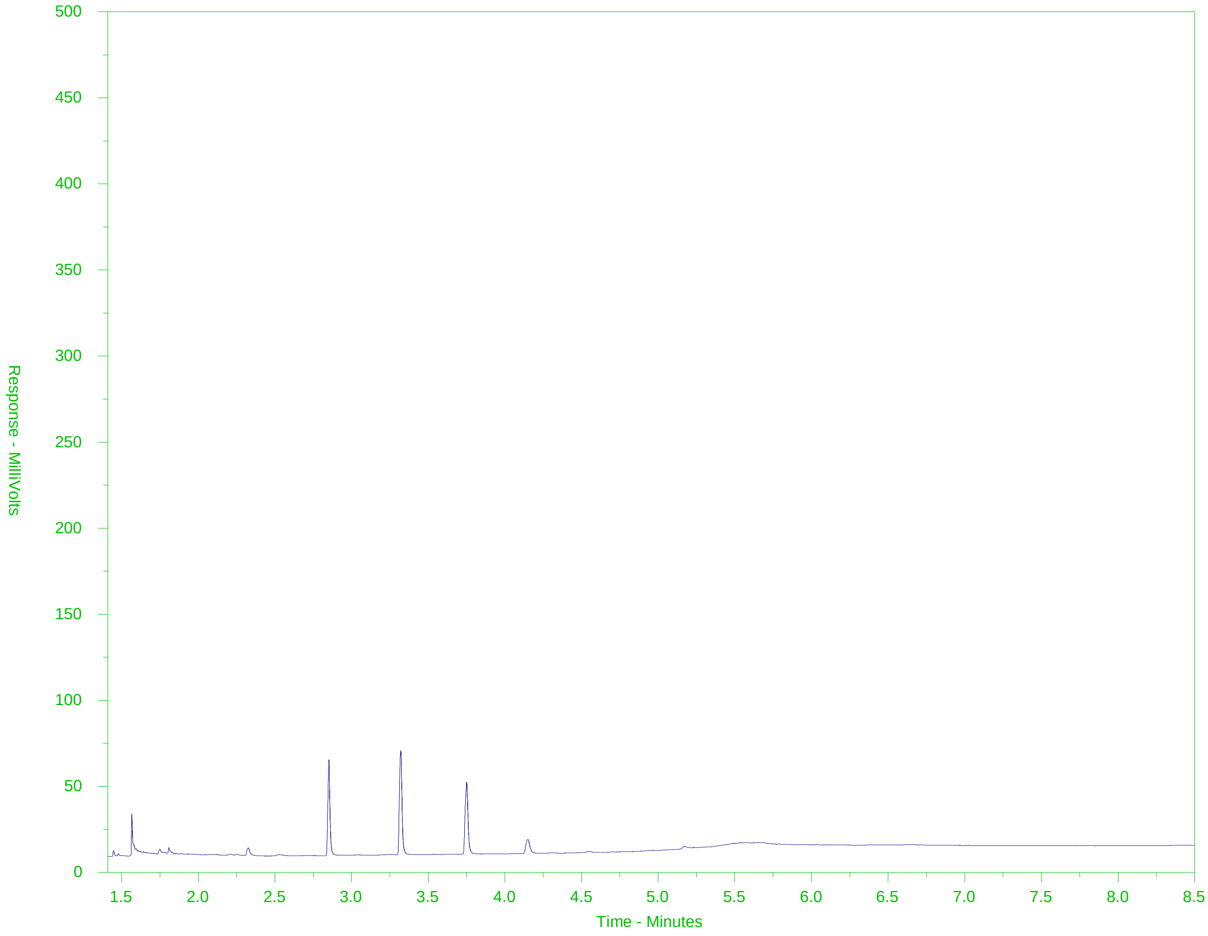
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2253513-C-3
Client Sample ID: PORT 2



←— F2 —→	←— F3 —→	←— F4 —→	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
←Gasoline→	←— Motor Oils/ Lube Oils/ Grease —→		
←— Diesel/ Jet Fuels —→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

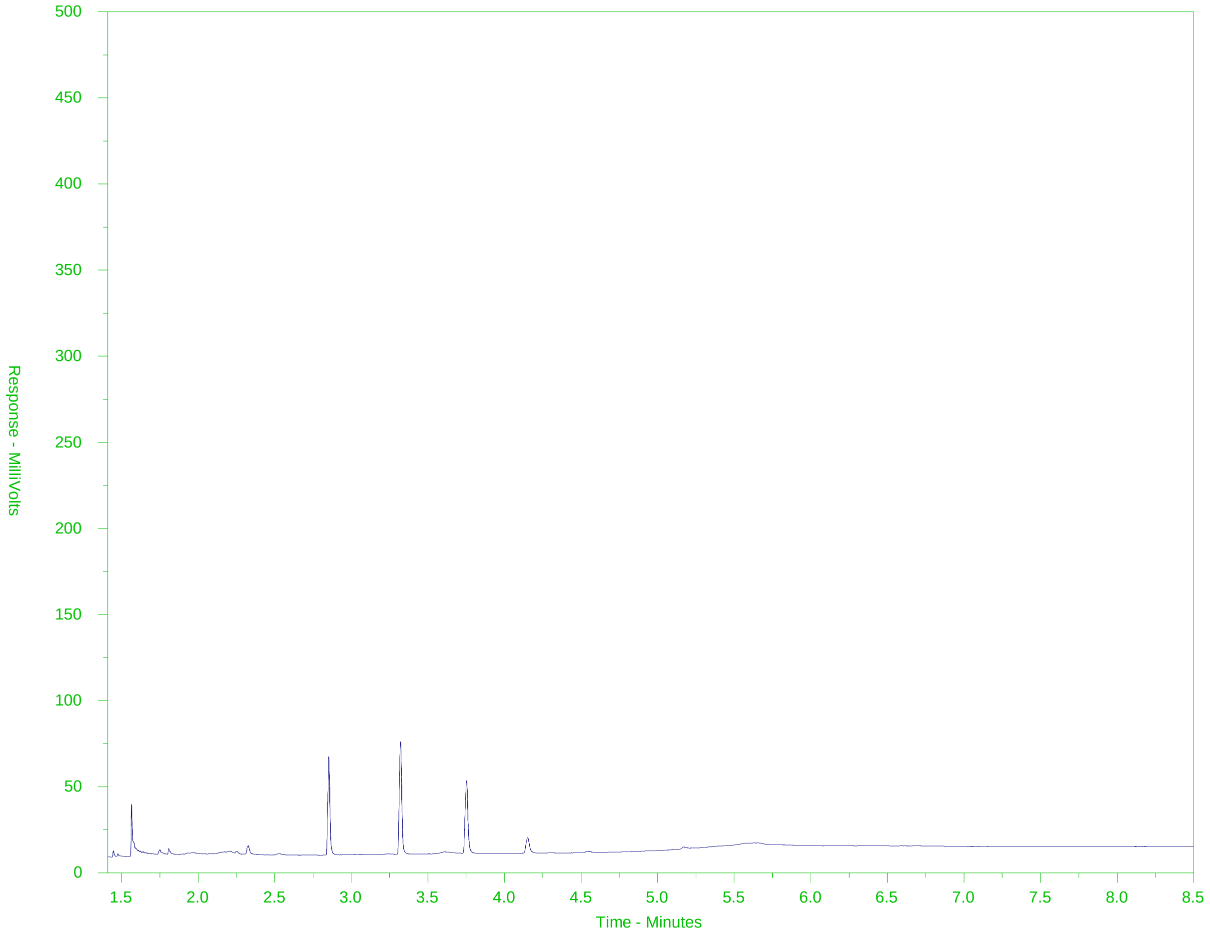
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2253513-C-4
Client Sample ID: PORT 22



←— F2 —→	←— F3	—→←— F4 —→	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
←Gasoline→	←— Motor Oils/ Lube Oils/ Grease —→		
←— Diesel/ Jet Fuels —→			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

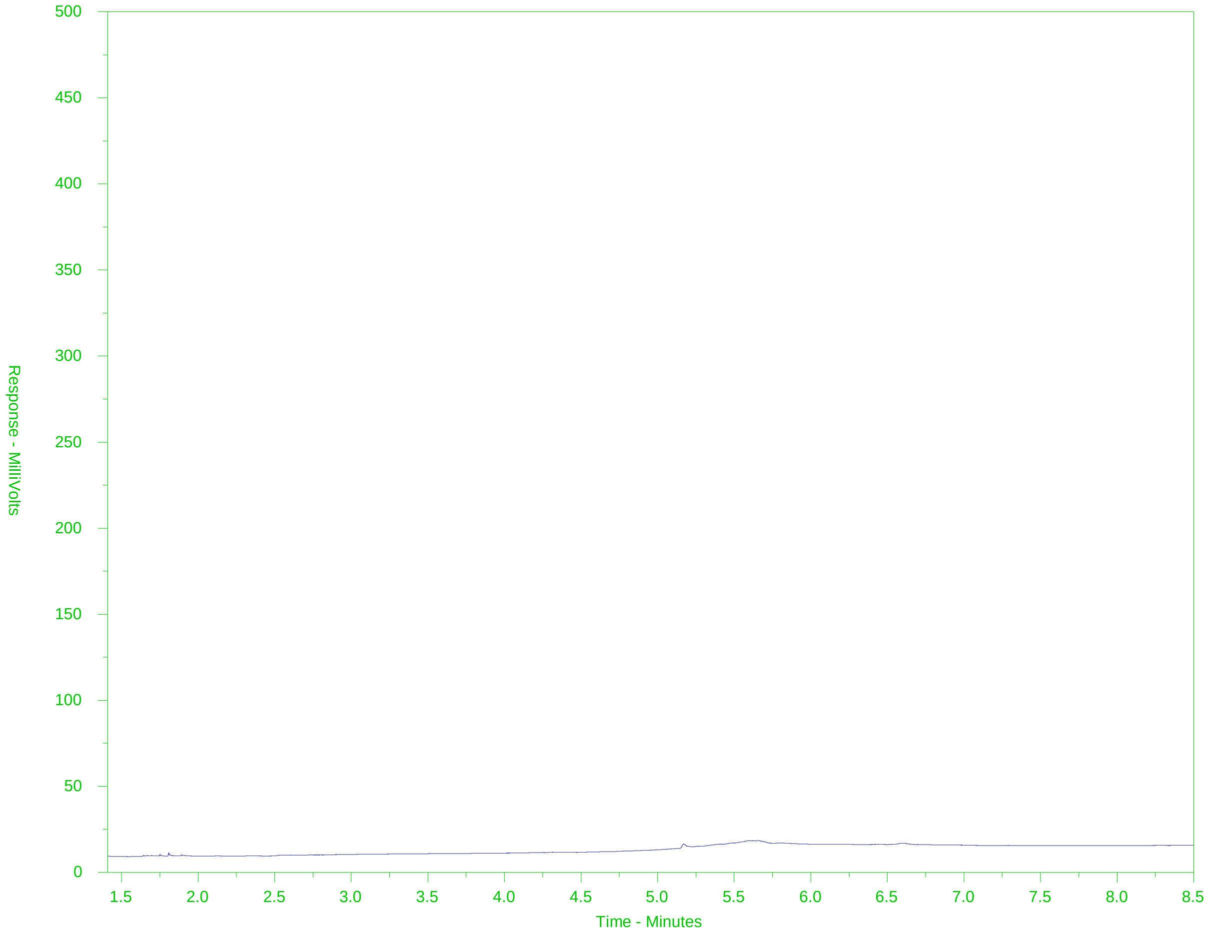
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2253513-C-5
Client Sample ID: FIELD BLANK



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
← Gasoline →	← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # 18-1789310

Page 1 of 1

Report To
Company: Agnico-Eagle Mines Limited
Contact: Jenyfer Mosquera
Address: 11600 rue Louis-Bisson, Suite 540 - Mirabel
Quebec, Canada J7N 1G9
Phone: 819-759-3555 Fax: x 4608170

Invoice To Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report? ☐ Yes ☐ No
Company:
Contact:
Address:
Phone: Fax:

Lab Work Order # (lab use only)

Report Format / Distribution
☑ Standard ☐ Other
☑ PDF ☑ Excel ☐ Digital ☐ Fax
Email 1: jenyfer.mosquera@agnicoeagle.com
Email 2: dholtze@golder.com; Akowalchuk@golder.com
Email 3: valerie_bertrand@golder.com

Client / Project Information
Job #: 18108905
PO / AFE:
LSD:
Quote #: Q72802

ALS Contact: Heather Mckenzie
Sampler: A.Kowalchuk

Service Requested (Rush for routine analysis subject to availability)
● Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	DISSOVLED METALS	TOTAL METALS	TOTAL NUTRIENTS	GENERAL CHEMISTRY	Ra226	PHC C10-C50	Reactive Silica		AVG Conductivity - 4.75 mS/cm	AVG Conductivity - 29.67 mS/cm	AVG Conductivity - 0.01 mS/cm	On Hold		Number of Containers
					F		P		P									
	Port 3	29-Mar-19	9:30	Groundwater	X	X	X	X	X	X	X		X					9
	Port 33	29-Mar-19	9:30	Groundwater	X	X	X	X	X	X	X		X					9
	Port 2	30-Mar-19	9:00	Groundwater	X	X	X	X	X	X	X			X		X		9
	Port 22	30-Mar-19	9:00	Groundwater	X	X	X	X	X	X	X			X		X		9
	Field Blank	31-Mar-19	10:00	Other	X	X	X	X	X	X	X				X			9

L2253513-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Adrian Kowalchuk	Date (dd-mmm-yy) 31-Mar-19	Time (hh-mm) 16:30	Received by: JC	Date: APR - 4 2019	Time: 835Am	Temperature: 11 °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

Emailed revised COC

ALS Environmental

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

COC # 18-1789310

Page 1 of 1

Report To
Company: Agnico-Eagle Mines Limited
Contact: Jenyfer Mosquera
Address: 11600 rue Louis-Bisson, Suite 540 - Mirabel
Quebec, Canada J7N 1G9
Phone: 819-759-3555 Fax: x 4608170

Invoice To Same as Report ? ☑ Yes ☐ No
Hardcopy of Invoice with Report? ☐ Yes ☐ No
Company:
Contact:
Address:
Phone: Fax:

Lab Work Order # (lab use only)

Report Format / Distribution
☑ Standard ☐ Other
☑ PDF ☑ Excel ☐ Digital ☐ Fax
Email 1: jenyfer.mosquera@agnicoeagle.com
Email 2: dholtze@golder.com; Akowalchuk@golder.com
Email 3: valerie_bertrand@golder.com

Client / Project Information
Job #: 18108905
PO / AFE:
LSD:
Quote #: Q72802

ALS Contact: Heather Mckenzie
Sampler: A.Kowalchuk

Service Requested (Rush for routine analysis subject to availability)
● Regular (Standard Turnaround Times - Business Days)
○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Analysis Request
Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	DISSOVLED METALS	TOTAL METALS	TOTAL PHOSPHORUS	MAJOR IONS, TDS, TSS	Ra226	PHC C10-C50	Reactive Silica		AVG Conductivity - 4.75 mS/cm	AVG Conductivity - 29.67 mS/cm	AVG Conductivity - 0.01 mS/cm	ON HOLD		Number of Containers
					F		P		P									
	Port 3	29-Mar-19	9:30	Groundwater	X	X	X	X	X	X	X		X					9
	Port 33	29-Mar-19	9:30	Groundwater	X	X	X	X	X	X	X		X					9
	Port 2	30-Mar-19	9:00	Groundwater	X	X	X	X	X	X	X			X		X		9
	Port 22	30-Mar-19	9:00	Groundwater	X	X	X	X	X	X	X			X		X		9
	Field Blank	31-Mar-19	10:00	Other	X	X	X	X	X	X	X				X			9

L2253513-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.
By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.
Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by: Adrian Kowalchuk	Date (dd-mmm-yy) 31-Mar-19	Time (hh-mm) 16:30	Received by: JC	Date: APR - 4 2019	Time: 835Am	Temperature: 11' °C	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF

Rcvd COC with any

NA-FM-0326d v07 Front / 19 August 2013

AGNICO-EAGLE MINES LTD.
ATTN: Jenyfer Mosquera
Nunavut Permitting Lead
11600 rue Louis-Bisson, Suite 540
Mirabel QC J7N 1G9

Date Received: 09-APR-19
Report Date: 16-MAY-19 16:13 (MT)
Version: FINAL REV. 2

Client Phone: --

Certificate of Analysis

Lab Work Order #: L2255221

Project P.O. #:	NOT SUBMITTED
Job Reference:	18108905
C of C Numbers:	18-1789310
Legal Site Desc:	

Comments: ADDITIONAL 13-MAY-19 15:59

16-MAY-2019 Report now including calculated TDS results.

H McKenzie

Heather McKenzie
Account Manager

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2255221-1	L2255221-2	L2255221-3		
	Description	Other	GroundWater	GroundWater		
	Sampled Date	03-APR-19	02-APR-19	03-APR-19		
	Sampled Time	08:00	14:30	10:20		
	Client ID	ALS TRAVEL BLANK	PORT 4	PORT 6		
Grouping	**Analyte**					
SEAWATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	<4.8 HTC	10200	3780		
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0050	<0.025 DLA	0.017		
	Antimony (Sb)-Total (mg/L)	<0.0010	<0.0050 DLA	<0.0030 DLA		
	Arsenic (As)-Total (mg/L)	<0.00040	0.0035	0.0029		
	Barium (Ba)-Total (mg/L)	<0.0010	0.483	0.793		
	Beryllium (Be)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Bismuth (Bi)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Boron (B)-Total (mg/L)	<0.30	<1.5 DLA	<0.90 DLA		
	Cadmium (Cd)-Total (mg/L)	<0.000010	<0.000050 DLA	<0.000030 DLA		
	Calcium (Ca)-Total (mg/L)	<1.0	3720	1360		
	Cesium (Cs)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Chromium (Cr)-Total (mg/L)	<0.00050	0.0027	0.0139		
	Cobalt (Co)-Total (mg/L)	<0.000050	<0.00025 DLA	0.00024		
	Copper (Cu)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Gallium (Ga)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Iron (Fe)-Total (mg/L)	<0.010	0.267	0.448		
	Lead (Pb)-Total (mg/L)	<0.000050	<0.00025 DLA	0.00026		
	Lithium (Li)-Total (mg/L)	<0.020	2.71	0.466		
	Magnesium (Mg)-Total (mg/L)	<1.0	47.7	41.2		
	Manganese (Mn)-Total (mg/L)	<0.00020	0.0819	0.0977		
	Mercury (Hg)-Total (mg/L)	<0.0000050	<0.0000050	<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	<0.00010	0.0165	0.0225		
	Nickel (Ni)-Total (mg/L)	<0.00050	0.0029	0.0095		
	Phosphorus (P)-Total (mg/L)	<0.050	<0.25 DLA	<0.15 DLA		
	Potassium (K)-Total (mg/L)	<1.0	128	10.0		
	Rhenium (Re)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Rubidium (Rb)-Total (mg/L)	<0.0050	0.150	0.016		
	Selenium (Se)-Total (mg/L)	<0.00050	<0.0025 DLA	0.0028		
	Silicon (Si)-Total (mg/L)	<0.50	2.39	2.53		
	Silver (Ag)-Total (mg/L)	<0.00010	<0.00050 DLA	<0.00030 DLA		
	Sodium (Na)-Total (mg/L)	<2.5	446	282		
	Strontium (Sr)-Total (mg/L)	<0.010	60.2	19.5		
	Sulfur (S)-Total (mg/L)	<5.0	<25 DLA	<15 DLA		
	Tellurium (Te)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Thallium (Tl)-Total (mg/L)	<0.000050	<0.00025 DLA	<0.00015 DLA		
	Thorium (Th)-Total (mg/L)	<0.00050	<0.0025 DLA	<0.0015 DLA		
	Tin (Sn)-Total (mg/L)	<0.0010	<0.0050 DLA	<0.0030 DLA		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L2255221-1	L2255221-2	L2255221-3		
	Description	Other	GroundWater	GroundWater		
	Sampled Date	03-APR-19	02-APR-19	03-APR-19		
	Sampled Time	08:00	14:30	10:20		
	Client ID	ALS TRAVEL BLANK	PORT 4	PORT 6		
Grouping	**Analyte**					
SEAWATER						
Total Metals	Titanium (Ti)-Total (mg/L)	<0.0050	DLA <0.025	DLA <0.015		
	Tungsten (W)-Total (mg/L)	<0.0010	0.0572	0.0205		
	Uranium (U)-Total (mg/L)	<0.000050	DLA <0.00025	DLA <0.00015		
	Vanadium (V)-Total (mg/L)	<0.00050	DLA <0.0025	DLA <0.0015		
	Yttrium (Y)-Total (mg/L)	<0.00050	DLA <0.0025	DLA <0.0015		
	Zinc (Zn)-Total (mg/L)	<0.0030	0.600	0.930		
	Zirconium (Zr)-Total (mg/L)	<0.00050	DLA <0.0025	DLA <0.0015		
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD	FIELD		
	Dissolved Metals Filtration Location		FIELD	FIELD		
	Aluminum (Al)-Dissolved (mg/L)		0.0080	<0.0050		
	Antimony (Sb)-Dissolved (mg/L)		0.0025	<0.0010		
	Arsenic (As)-Dissolved (mg/L)		0.00260	0.00245		
	Barium (Ba)-Dissolved (mg/L)		0.538	0.856		
	Beryllium (Be)-Dissolved (mg/L)		<0.00050	<0.00050		
	Bismuth (Bi)-Dissolved (mg/L)		<0.00050	<0.00050		
	Boron (B)-Dissolved (mg/L)		0.94	0.32		
	Cadmium (Cd)-Dissolved (mg/L)		0.000018	0.000018		
	Calcium (Ca)-Dissolved (mg/L)		4000	1450		
	Cesium (Cs)-Dissolved (mg/L)		0.00115	<0.00050		
	Chromium (Cr)-Dissolved (mg/L)		<0.00050	<0.00050		
	Cobalt (Co)-Dissolved (mg/L)		0.000080	<0.000050		
	Copper (Cu)-Dissolved (mg/L)		0.00042	<0.00020		
	Gallium (Ga)-Dissolved (mg/L)		<0.00050	<0.00050		
	Iron (Fe)-Dissolved (mg/L)		0.059	0.275		
	Lead (Pb)-Dissolved (mg/L)		<0.000050	<0.000050		
	Lithium (Li)-Dissolved (mg/L)		2.80	0.427		
	Magnesium (Mg)-Dissolved (mg/L)		42.4	37.8		
	Manganese (Mn)-Dissolved (mg/L)		0.0855	0.0981		
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)		0.0192	0.0217		
	Nickel (Ni)-Dissolved (mg/L)		0.00139	<0.00050		
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050		
	Potassium (K)-Dissolved (mg/L)		159	11.2		
	Rhenium (Re)-Dissolved (mg/L)		<0.00050	<0.00050		
	Rubidium (Rb)-Dissolved (mg/L)		0.167	0.0161		
	Selenium (Se)-Dissolved (mg/L)		<0.00050	<0.00050		
	Silicon (Si)-Dissolved (mg/L)		2.39	2.75		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2255221-1	L2255221-2	L2255221-3		
	Description	Other	GroundWater	GroundWater		
	Sampled Date	03-APR-19	02-APR-19	03-APR-19		
	Sampled Time	08:00	14:30	10:20		
	Client ID	ALS TRAVEL BLANK	PORT 4	PORT 6		
Grouping	**Analyte**					
SEAWATER						
Dissolved Metals	Silver (Ag)-Dissolved (mg/L)		<0.00010	<0.00010		
	Sodium (Na)-Dissolved (mg/L)		389	272		
	Strontium (Sr)-Dissolved (mg/L)		66.3	20.3		
	Sulfur (S)-Dissolved (mg/L)		<5.0	<5.0		
	Tellurium (Te)-Dissolved (mg/L)		0.00406	0.00108		
	Thallium (Tl)-Dissolved (mg/L)		<0.000050	<0.000050		
	Thorium (Th)-Dissolved (mg/L)		<0.00050	<0.00050		
	Tin (Sn)-Dissolved (mg/L)		<0.0010	<0.0010		
	Titanium (Ti)-Dissolved (mg/L)		<0.0050	<0.0050		
	Tungsten (W)-Dissolved (mg/L)		0.0636	0.0225		
	Uranium (U)-Dissolved (mg/L)		0.000072	<0.000050		
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050		
	Yttrium (Y)-Dissolved (mg/L)		<0.00050	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)		0.0184	0.0300		
	Zirconium (Zr)-Dissolved (mg/L)		<0.00050	<0.00050		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

	Sample ID	L2255221-1	L2255221-2	L2255221-3		
	Description	Other	GroundWater	GroundWater		
	Sampled Date	03-APR-19	02-APR-19	03-APR-19		
	Sampled Time	08:00	14:30	10:20		
	Client ID	ALS TRAVEL BLANK	PORT 4	PORT 6		
Grouping	**Analyte**					
WATER						
Field Tests	Conductivity, Client Supplied (uS/cm)		22280	9640		
Physical Tests	Conductivity (uS/cm)	<2.0	21300	8940		
	pH (pH)	5.83	6.75	6.36		
	Total Suspended Solids (mg/L)	<3.0	9.1	5.1		
	Total Dissolved Solids (mg/L)	<3.0	13300	6210		
	TDS (Calculated) (mg/L)	<1.0	12000	5170		
Anions and Nutrients	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	<1.0	18.7	30.3		
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0	<1.0		
	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	18.7	30.3		
	Ammonia, Total (as N) (mg/L)	<0.0050	0.238	0.466		
	Bromide (Br) (mg/L)	<0.050	99.6	44.8		
	Chloride (Cl) (mg/L)	<0.10	7430	3380		
	Fluoride (F) (mg/L)	<0.020	DLDS <2.0	DLDS <1.0		
	Nitrate (as N) (mg/L)	<0.0050	DLDS <0.50	DLDS <0.25		
	Nitrite (as N) (mg/L)	<0.0010	DLDS <0.10	DLDS <0.050		
	Phosphorus (P)-Total (mg/L)	<0.0020	0.0065	<0.0020		
	Silicate (as SiO2) (mg/L)	<0.50	DLM <50	DLM <50		
	Sulfate (SO4) (mg/L)	<0.30	DLDS <30	DLDS <15		
	Anion Sum (meq/L)	<0.10	210	95.8		
	Cation Sum (meq/L)	<0.10	224	87.6		
	Cation - Anion Balance (%)	0.0	3.3	-4.5		
Hydrocarbons	F2 (C10-C16) (mg/L)	<0.30	<0.30	<0.30		
	F3 (C16-C34) (mg/L)	<0.30	<0.30	<0.30		
	F4 (C34-C50) (mg/L)	<0.30	<0.30	<0.30		
	TPH (C10-C50) (mg/L)	<0.52	<0.52	<0.52		
	Surrogate: 2-Bromobenzotrifluoride, F2-F4 (%)	89.5	96.7	96.5		
Radiological Parameters	Ra-226 (Bq/L)	<0.0079	1.3	0.85		

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Laboratory Control Sample	Boron (B)-Dissolved	MES	L2255221-2, -3
Laboratory Control Sample	Lithium (Li)-Dissolved	MES	L2255221-2, -3
Laboratory Control Sample	Tellurium (Te)-Dissolved	MES	L2255221-2, -3
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2255221-2, -3
Matrix Spike	Boron (B)-Dissolved	MS-B	L2255221-2, -3
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2255221-2, -3
Matrix Spike	Lithium (Li)-Dissolved	MS-B	L2255221-2, -3
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2255221-2, -3
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2255221-2, -3
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2255221-2, -3
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2255221-2, -3

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

<table>
<tr><th>ALS Test Code</th><th>Matrix</th><th>Test Description</th><th>Method Reference**</th></tr>
<tr><td>ALK-TITR-VA</td><td>Water</td><td>Alkalinity Species by Titration</td><td>APHA 2320 Alkalinity</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.</td></tr>
<tr><td>BR-L-IC-N-VA</td><td>Water</td><td>Bromide in Water by IC (Low Level)</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>CL-L-IC-N-VA</td><td>Water</td><td>Chloride in Water by IC (Low Level)</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>EC-PCT-VA</td><td>Water</td><td>Conductivity (Automated)</td><td>APHA 2510 Auto. Conduc.</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.</td></tr>
<tr><td>EC-SCREEN-VA</td><td>Water</td><td>Conductivity Screen (Internal Use Only)</td><td>APHA 2510</td></tr>
<tr><td colspan="4">Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.</td></tr>
<tr><td>F-IC-N-VA</td><td>Water</td><td>Fluoride in Water by IC</td><td>EPA 300.1 (mod)</td></tr>
<tr><td colspan="4">Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.</td></tr>
<tr><td>F2-F4-ME-FID-VA</td><td>Water</td><td>CCME F2-F4 Hydrocarbons in Water</td><td>CCME CWS-PHC, Pub #1310, Dec 2001</td></tr>
<tr><td colspan="4">F2-F4 is extracted from water using a hexane micro-extraction technique. Instrumental analysis is by GC-FID, as per the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Tier 1 Method, CCME, Dec 2001.</td></tr>
<tr><td>HARDNESS-CALC-VA</td><td>Seawater</td><td>Hardness</td><td>APHA 2340B</td></tr>
<tr><td colspan="4">Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.</td></tr>
<tr><td>HG-DIS-C-CVAFS-VA</td><td>Seawater</td><td>Diss. Mercury in Seawater by CVAFS</td><td>PUGET SOUND PROTOCOLS, EPA 245.7</td></tr>
<tr><td colspan="4">This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by filtration (EPA Method 3005A) and involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).</td></tr>
<tr><td>HG-TOT-C-CVAFS-VA</td><td>Seawater</td><td>Total Mercury in Seawater by CVAFS</td><td>PUGET SOUND PROTOCOLS, EPA 245.7</td></tr>
</table>

Reference Information

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedure involves a cold-oxidation of the acidified seawater sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

IONBALANCE-VA Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-F-HMI-CCMS-VA Seawater Diss. Metals in Seawater by CRC ICPMS APHA 3030B/EPA 6020B (mod)

Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).

MET-D-HMI-CCMS-VA Seawater Diss. Metals in Seawater by CRC ICPMS APHA 3030B/EPA 6020B (mod)

Seawater samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS (HMI Mode).

MET-DIS-C-LOW-MS-VA Seawater Diss. Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-T-HB-F-HMI-MS-VA Seawater Tot Metals in Seawater by CRC ICPMS (BC) EPA 200.2/6020B (mod)

Seawater samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS (HMI Mode). This method is compliant with digestion requirements of the British Columbia Environmental Laboratory Manual.

MET-TOT-C-LOW-MS-VA Seawater Total Metals in Seawater by ICPMS PUGET SOUND PROTOCOLS, EPA 6020A

This analysis is carried out using procedures adapted from "Recommended Guidelines for Measuring Metals in Puget Sound Marine Water, Sediment, and Tissue Samples" prepared for the United States Environmental Protection Agency and the Puget Sound Water Quality Authority, 1995. The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005A). Instrumental analysis is by atomic inductively coupled plasma - mass spectrometry (EPA Method 6020A).

NH3-F-VA Water Ammonia in Water by Fluorescence J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-VA Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-L-IC-N-VA Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

P-T-PRES-COL-VA Water Total P in Water by Colour APHA 4500-P Phosphorus

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.
Samples with very high dissolved solids (i.e. seawaters, brackish waters) may produce a negative bias by this method. Alternate methods are available for these types of samples.

Arsenic (5+), at elevated levels, is a positive interference on colourimetric phosphate analysis.

PH-PCT-VA Water pH by Meter (Automated) APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

RA226-MMER-FC Water Ra226 by Alpha Scint, MDC=0.01 Bq/L EPA 903.1

SILICATE-COL-VA Water Silicate by Colourimetric analysis APHA 4500-SiO2 E.

This analysis is carried out using procedures adapted from APHA Method 4500-SiO2 E. "Silica". Silicate (molybdate-reactive silica) is determined by the molybdosilicate-heteropoly blue colourimetric method. Arsenic (5+) above 100 mg/L is a negative interference on this test.

SO4-IC-N-VA Water Sulfate in Water by IC EPA 300.1 (mod)

Reference Information

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TDS-CALC-VA Water TDS (Calculated) APHA 1030E (20TH EDITION)

This analysis is carried out using procedures adapted from APHA 1030E "Checking Correctness of Analyses".
The Total Dissolved Solids result is calculated from measured concentrations of anions and cations in the sample.

TDS-LOW-VA Water Low Level TDS (3.0mg/L) by Gravimetric APHA 2540C

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total dissolved solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

TPH(C10-C50)-CALC-CL Water Total Petroleum Hydrocarbons (C10-C50) CCME CWS-PHC, Pub #1310, Dec 2001

TPH (C10-C50) is determined as the sum of CCME F2, F3 and F4. The CCME F2-F4 test includes an in-situ silica gel cleanup to remove polar organic constituents that are not representative of petroleum hydrocarbons. Even after silica gel cleanup, some non-petroleum source hydrocarbons may be detected by this test.

TSS-VA Water Total Suspended Solids by Gravimetric APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius.
Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
FC	ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

18-1789310

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Wednesday, April 24, 2019

Heather McKenzie
ALS Environmental
8081 Lougheed Hwy, Suite 100
Burnaby, BC V5A 1W9

Re: ALS Workorder: 1904213
Project Name:
Project Number: L2255221

Dear Ms. McKenzie:

Three water samples were received from ALS Environmental, on 4/11/2019. The samples were scheduled for the following analysis:

Radium-226

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. OBrien
Project Manager

ALS Environmental – Fort Collins is accredited by the following accreditation bodies for various testing scopes in accordance with requirements of each accreditation body. All testing is performed under the laboratory management system, which is maintained to meet these requirement and regulations. Please contact the laboratory or accreditation body for the current scope testing parameters.

ALS Environmental – Fort Collins	
Accreditation Body	License or Certification Number
AIHA	214884
Alaska (AK)	UST-086
Alaska (AK)	CO01099
Arizona (AZ)	AZ0742
California (CA)	06251CA
Colorado (CO)	CO01099
Florida (FL)	E87914
Idaho (ID)	CO01099
Kansas (KS)	E-10381
Kentucky (KY)	90137
PJ-LA (DoD ELAP/ISO 170250)	95377
Louisiana (LA)	05057
Maryland (MD)	285
Missouri (MO)	175
Nebraska(NE)	NE-OS-24-13
Nevada (NV)	CO000782008A
New York (NY)	12036
North Dakota (ND)	R-057
Oklahoma (OK)	1301
Pennsylvania (PA)	68-03116
Tennessee (TN)	2976
Texas (TX)	T104704241
Utah (UT)	CO01099
Washington (WA)	C1280

1904213

Radium-226:

The samples were prepared and analyzed according to the current revision of SOP 783.

All acceptance criteria were met.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1904213
Client Name: ALS Environmental
Client Project Name:
Client Project Number: L2255221
Client PO Number: L2255221

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
L2255221-1	1904213-1		WATER	03-Apr-19	
L2255221-2	1904213-2		WATER	02-Apr-19	
L2255221-3	1904213-3		WATER	03-Apr-19	

L2255221

VANCOUVER

ALS Environmental

Subcontract Request Form

1904213

Subcontract To:

ALS ENVIRONMENTAL - FORT COLLINS, COLORADO, USA
225 COMMERCE DRIVE
FORT COLLINS,CO 80524

NOTES: Please reference on final report and invoice: PO# L2255221
ALS requires QC data to be provided with your final results.

Please see enclosed 3 sample(s) in 3 Container(s)

	SAMPLE NUMBER	ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
1	**L2255221-1 ALS TRAVEL BLANK**		**4/3/2019**	
		Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	5/1/2019	
2	**L2255221-2 PORT 4**		**4/2/2019**	
		Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	5/1/2019	
3	**L2255221-3 PORT 6**		**4/3/2019**	
		Ra226 by Alpha Scint, MDC=0.01 Bq/L (RA226-MMER-FC 1)	5/1/2019	

Subcontract Info Contact: Walter Lin (604) 253-4188

Analysis and reporting info contact: Heather McKenzie
8081 LOUGHEED HWY
SUITE 100
BURNABY,BC V5A 1W9
Phone: (604) 253-4188

NEW Reporting Contacts:
1.Account Manager Listed Below
2.ALSEVDataSublet@ALSGlobal.com (PDF / EXCEL)
3.ALSE.CASDG@ALSGlobal.com (EDD/Database Formats)

Email: Heather.McKenzie@alsglobal.com

Please email confirmation of receipt to: Heather.McKenzie@alsglobal.com

Shipped By: ______ Date Shipped: ______

Received By: KayleePier Date Received: 4/11/19 1255

Verified By: ______ Date Verified: ______

Temperature: 7.3

Sample Integrity Issues: ______

ALS Environmental - Fort Collins

CONDITION OF SAMPLE UPON RECEIPT FORM 1904213

Client: ALS Burnaby

Workorder No: ~~1904214~~ KP 4/11/19

Project Manager: Katie

Initials: KP

Date: 4/11/19

1. Are airbills / shipping documents present and/or removable?	DROP OFF	[✓ YES]	NO
2. Are custody seals on **shipping** containers intact?	[✓ NONE]	YES	NO *
3. Are custody seals on **sample** containers intact?	[✓ NONE]	YES	NO *
4. Is there a COC (chain-of-custody) present?		[✓ YES]	NO *
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		[✓ YES]	NO *
6. Are short-hold samples present?		YES	[✓ NO]
7. Are all samples within holding times for the requested analyses?		[✓ YES]	NO *
8. Were all sample containers received intact? (not broken or leaking)		[✓ YES]	NO *
9. Is there sufficient sample for the requested analyses?		[✓ YES]	NO *
10. Are all samples in the proper containers for the requested analyses?		[✓ YES]	NO *
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)	N/A	YES	[✓ NO *]
12. Are all aqueous non-preserved samples pH 4-9?	[✓ N/A]	YES	NO *
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)	[✓ N/A]	YES	NO
14. Were the samples shipped on ice?		[✓ YES]	NO
15. Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: #1 [✓ #3] #4	RAD ONLY	YES	[✓ NO]

Cooler #: 1

Temperature (°C): 7.3

No. of custody seals on cooler: 0

DOT Survey/ Acceptance Information

External μR/hr reading: 8

Background μR/hr reading: 10

Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? [✓ YES] NO / NA (If no, see Form 008.)

*** Please provide details here for NO responses to gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.**

pH of ~~port 2, port 22~~, port 4, and port 6 was above 2. Added concentrated HNO_3 to each. Lot 197345.
4/12/19

port 4 1.0mL HNO_3 for pH < 2
~~port 2 1.0mL HNO_3 for pH < 2~~
port 6 .5mL HNO_3 for pH < 2
~~port 22 1.0mL HNO_3 for pH < 2~~ 4/12/19

All client bottle ID's vs ALS lab ID's double-checked by: KP

If applicable, was the client contacted? YES / NO / NA Contact: Date/Time:

Project Manager Signature / Date: 4/12/19

Form 201r27.xls
(02/11/2019)

*IR Gun #1, VWR SN 170560549
*IR Gun #3, VWR SN 170647571
*IR Gun #4, Oakton, SN 2372220101-0002

1904213

ORIGIN ID:YBYA (604) 253-4188
HARJIT GILL
ALS ENVIRONMENTAL LAB GROUP
LOUGHEED HIGHWAY

BURNABY, BC V5A1W9
CANADA CA

SHIP DATE: 10APR19
ACTWGT: 15.00 LB MAN
CAD: 0347419/CAFE3211

BILL SENDER

TO SAMPLE RECEVING
ALS ENVIRONMANTAL
225 COMMERCE DRIVE

FORT COLLINS CO 80524 (US)
(970) 490-1511 REF: SUBLETS
DEPT: SUBLET

8-0
7.3

551C1/D7E5/104C

FedEx.
Express

E

J181118068582uv

10:30A
INTL PRIORITY

TRK# 4897 4512 8473
0430

XH FTCA

80524
CO-US DEN

After printing this label:

CONSIGNEE COPY - PLEASE PLACE IN FRONT OF POUCH

1. Fold the printed page along the horizontal line.
2. Place label in shipping pouch and affix it to your shipment.

DEFINITIONS: On the Air Waybill 'We', 'Our', 'us' and 'FedEx' refer to Federal Express Corporation, its subsidiaries and branches and their respective employees, agents and independent contractors. 'You' and 'your' refer to the shipper, its employees, principals and agents. If your shipment originates outside the United States, your contract of carriage is with the Federal Express subsidiary, branch or independent contractor who originally accepts the shipment from you. 'Package' means any container or envelope that is accepted by us for delivery, including any such items tendered by you utilizing our automated systems, meters, manifests or waybills. 'Shipment' means all packages, which are tendered to and accepted by us on a single Air Waybill.

AGREEMENT TO TERMS. By giving us your shipment, you agree, regardless of whether you sign the front of this Air Waybill, for yourself and as agent for and on behalf of any other person having an interest in this shipment, to all terms on this NON-NEGOTIABLE Air Waybill. In any applicable tariff, and in our current Service Guide or Standard Conditions of Carriage, copies of which are available upon request. If there is a conflict between this Air Waybill and either the tariff, Service Guide or Standard Conditions then in effect, the tariff and the terms of any customer automation agreement between the shipper and Federal Express will control(the Service Guide or Standard Conditions have secondary priority). No one is authorized to alter or modify the terms of our agreement. This Air Waybill shall be binding on us when the shipment is accepted.

YOUR OBLIGATIONS: You warrant that each article in the shipment is properly described on this Air Waybill and is acceptable for transport by us, and that the shipment is properly marked, addressed (including postal codes) and packaged to ensure safe transportation with ordinary care in handling.

NOTE CONCERNING LIMITATIONS OF LIABILITY. Air Carriage Notice. If the carriage of your shipment by air involves an ultimate destination or stop in a country other than the country of departure, the Warsaw Convention, an international treaty relating to international carriage by air, may be applicable, which treaty would then govern and in most cases limit our liability for loss or delay of or damage to your shipment. In the U.S. the Warsaw Convention limits our liability to U.S. $9.07 per pound (U.S. $20.38 per kilogram). Unless you declare a higher value for carriage as described below. The interpretation of the Warsaw Convention liability limits may vary in other countries. There are no stopping places which are agreed at the time of tender of the shipment and we reserve the right to route shipments in any way we deem appropriate.

Road Transport Notice. Shipments transported partly or solely by road be it explicit agreement to do so or not-in, to, from a country which is party to the Convention on the Contract for the International Carriage of Goods by Road (the 'CMR') are subject to the terms and conditions of the CMR, notwithstanding any other provisions of this Agreement to the contrary. For these shipments transported solely by road, if a conflict arises between the provisions of the CMR and this Air Waybill the terms of the CMR shall prevail.

Limitation of Liability, if not governed by the Warsaw Convention or the CMR as described above, our maximum liability for loss, damage or delay is limited by this Air Waybill to U.S. $100 per shipment or U.S. $9.07 per pound (U.S. $20.38 per kilo) (or equivalent local currency), whichever is greater, unless you declare a higher value for carriage as described below. FedEx does not provide cargo liability or all-risk insurance, but you may pay an additional charge to each additional U.S. $100 (or equivalent local currency) of described value for carriage. If a higher value for carriage is declared and the additional charge is paid, FedEx maximum liability will be the lesser of the declared value for carriage or your actual damages.

LIABILITIES NOT ASSUMED. IN ANY EVENT, WE WON'T BE LIABLE FOR ANY DAMAGES WHETHER DIRECT , INCIDENTAL, SPECIAL OR CONSEQUENTIAL , IN EXCESS OF THE DECLARED VALUE FOR CARRIAGE (INCLUDING BUT NOT LIMITED TO LOSS OF INCOME OR PROFITS) WHETHER OR NOT WE HAD ANY KNOWLEDGE THAT SUCH DAMAGES MIGHT BE INCURRED, UNLESS SUCH DAMAGES WERE CAUSED BY OUR OWN WILLFUL MICONDUCT OR GROSS NEGLIGENCE.

We won't be liable for your actions or omissions, including but not limited to incorrect declaration of cargo, improper or insufficient packing, securing, marking or addressing of the shipment, or for the acts or omissions of the recipient or anyone else with an interest in the shipment. Also we won't be liable if you (or) the recipient violate any of the terms of our agreement. We won't be liable for loss of or damage to shipments of cash, currency or other prohibited items. We won't be liable for loss, damages or delay caused by events we cannot control, including but not limited to acts of God, perils of the air, weather conditions mechanical delays, acts of public enemies, war, strikes, civil commotions, or acts or omissions of public authorities (including customs and health officials) with actual or apparent authority.

NO WARRANTIES. We make no warranties, express or implied.

CLAIM FOR LOSS, DAMAGE FOR DELAY. ALL CLAIMS MUST BE NOTIFIED TO US WITHIN 15 DAYS AFTER DELIVERY OF THE SHIPMENT FAILING WHICH NO ACTION FOR DAMAGES MAY BE BROUGHT. All claims for loss, non-delivery or mis-delivery must be received by us within 90 days after the shipment is accepted by us. The right to damages against us shall be extinguished unless an action is brought within two years from the date of delivery of the shipment or from date on which the shipment should have been delivered. Within 30 days after notification to us (of) the claim, it must be documented by sending us all relevant information about it. We are not obligated to act on any claim until all transportation charges have been paid; the claim amount may not be deducted from those charges. If the recipient accepts the shipment without noting any damage on the delivery record, we will assume the shipment was delivered in good condition. In order for us to consider a claim for damages, the content(s), original shipping cartons, and packing must be available to us for inspection.

RIGHT TO INSPECT. Your shipment may, at our option or at the request of governmental authorities, be opened and inspected by us or such authorities or us at any time.

CUSTOMS CLEARANCE. It is your responsibility to provide proper customs documentation and confirmation, where required.

EXPORT CONTROL. You authorize Federal Express to act as forwarding agent for you for export control and customs purposes. You hereby certify that all statements and information contained in this air waybill relating to exportation are true and correct. Furthermore, you understand that civil and criminal penalties, including forfeiture and sale, may be imposed for making false or fraudulent statements or for the violation of any United States laws on exportation, including but not limited to, 13 USC Sec. 305; 22 USC Sec 401; 18 USC Sec. 1001; 50 USC app. 2410.

MANDATORY LAW. Insofar as any provision contained or referred to in this air Waybill may be contrary to any applicable international treaty, law government regulations, orders or requirements such provision shall remain in effect as a part of our agreement to the extent that it is not overridden. The invalidity or unenforceability of any provision shall not affect any other part of this Air Waybill. Unless otherwise indicated the Sender's address indicated on the face of this Waybill is the place of execution and the place of departure, and Recipient's address listed on the face of this Waybill is the place of destination. Unless otherwise indicated Federal Express Corporation, P.O. Box 727, Memphis, TN 38194 USA is the first carrier of this shipment.

Client:	ALS Environmental	**Date:**	*24-Apr-19*
Project:	L2255221	**Work Order:**	1904213
Sample ID:	L2255221-1	**Lab ID:**	1904213-1
Legal Location:		**Matrix:**	WATER
Collection Date:	4/3/2019	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/12/2019**		PrepBy: **JXH**
Ra-226	-0.00065 (+/- 0.0035)	U	0.0079	BQ/l	NA	4/23/2019 11:21
Carr: BARIUM	*96*		*40-110*	*%REC*	DL = NA	4/23/2019 11:21

Client:	ALS Environmental	**Date:**	*24-Apr-19*
Project:	L2255221	**Work Order:**	1904213
Sample ID:	L2255221-2	**Lab ID:**	1904213-2
Legal Location:		**Matrix:**	WATER
Collection Date:	4/2/2019	**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/12/2019**		PrepBy: **JXH**
Ra-226	**1.3 (+/- 0.32)**		**0.0073**	**BQ/l**	NA	4/23/2019 11:21
Carr: BARIUM	*91.3*		*40-110*	*%REC*	DL = NA	4/23/2019 11:21

SAMPLE SUMMARY REPORT

Client:	ALS Environmental		**Date:**	*24-Apr-19*
Project:	L2255221		**Work Order:**	1904213
Sample ID:	L2255221-3		**Lab ID:**	1904213-3
Legal Location:			**Matrix:**	WATER
Collection Date:	4/3/2019		**Percent Moisture:**	

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
Radium-226 by Radon Emanation - Method 903.1		**SOP 783**		Prep Date: **4/12/2019**		PrepBy: **JXH**
Ra-226	**0.85 (+/- 0.21)**		**0.0052**	**BQ/l**	NA	4/23/2019 11:21
Carr: BARIUM	*95.4*		*40-110*	*%REC*	DL = NA	4/23/2019 11:21

Client: ALS Environmental
Date: *24-Apr-19*
Project: L2255221
Work Order: 1904213
Sample ID: L2255221-3
Lab ID: 1904213-3
Legal Location:
Matrix: WATER
Collection Date: 4/3/2019
Percent Moisture:

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed

Explanation of Qualifiers

Radiochemistry:

- "Report Limit" is the MDC
U or ND - Result is less than the sample specific MDC.
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
Y2 - Chemical Yield outside default limits.
W - DER is greater than Warning Limit of 1.42
* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.
# - Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.
G - Sample density differs by more than 15% of LCS density.
D - DER is greater than Control Limit
M - Requested MDC not met.
M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
L - LCS Recovery below lower control limit.
H - LCS Recovery above upper control limit.
P - LCS, Matrix Spike Recovery within control limits.
N - Matrix Spike Recovery outside control limits
NC - Not Calculated for duplicate results less than 5 times MDC
B - Analyte concentration greater than MDC.
B3 - Analyte concentration greater than MDC but less than Requested MDC.

Inorganics:

B - Result is less than the requested reporting limit but greater than the instrument method detection limit (MDL).
U or ND - Indicates that the compound was analyzed for but not detected.
E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
M - Duplicate injection precision was not met.
N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
* - Duplicate analysis (relative percent difference) not within control limits.
S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.

Organics:

U or ND - Indicates that the compound was analyzed for but not detected.
B - Analyte is detected in the associated method blank as well as in the sample. It indicates probable blank contamination and warns the data user.
E - Analyte concentration exceeds the upper level of the calibration range.
J - Estimated value. The result is less than the reporting limit but greater than the instrument method detection limit (MDL).
A - A tentatively identified compound is a suspected aldol-condensation product.
X - The analyte was diluted below an accurate quantitation level.
* - The spike recovery is equal to or outside the control criteria used.
\+ - The relative percent difference (RPD) equals or exceeds the control criteria.
G - A pattern resembling gasoline was detected in this sample.
D - A pattern resembling diesel was detected in this sample.
M - A pattern resembling motor oil was detected in this sample.
C - A pattern resembling crude oil was detected in this sample.
4 - A pattern resembling JP-4 was detected in this sample.
5 - A pattern resembling JP-5 was detected in this sample.
H - Indicates that the fuel pattern was in the heavier end of the retention time window for the analyte of interest.
L - Indicates that the fuel pattern was in the lighter end of the retention time window for the analyte of interest.
Z - This flag indicates that a significant fraction of the reported result did not resemble the patterns of any of the following petroleum hydrocarbon products:
- gasoline
- JP-8
- diesel
- mineral spirits
- motor oil
- Stoddard solvent
- bunker C

ALS -- Fort Collins

Date: *4/24/2019 12:27*

Client: ALS Environmental
Work Order: 1904213
Project: L2255221

QC BATCH REPORT

Batch ID: **RE190412-1-1** Instrument ID **Alpha Scin** Method: **Radium-226 by Radon Emanation**

LCS Sample ID: **RE190412-1** Units: **BQ/l** Analysis Date: **4/23/2019 11:21**
Client ID: Run ID: **RE1904112-1A** Prep Date: **4/12/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.76 (+/- 0.443)	0.0101	1.771		99.6	67-120					P,M3
Carr: BARIUM	14600		15750		92.8	40-110					

LCSD Sample ID: **RE190412-1** Units: **BQ/l** Analysis Date: **4/23/2019 11:21**
Client ID: Run ID: **RE1904112-1A** Prep Date: **4/12/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	1.78 (+/- 0.448)	0.0121	1.771		101	67-120		1.76	0.03	2.1	P,M3
Carr: BARIUM	15000		15730		95.4	40-110		14600			

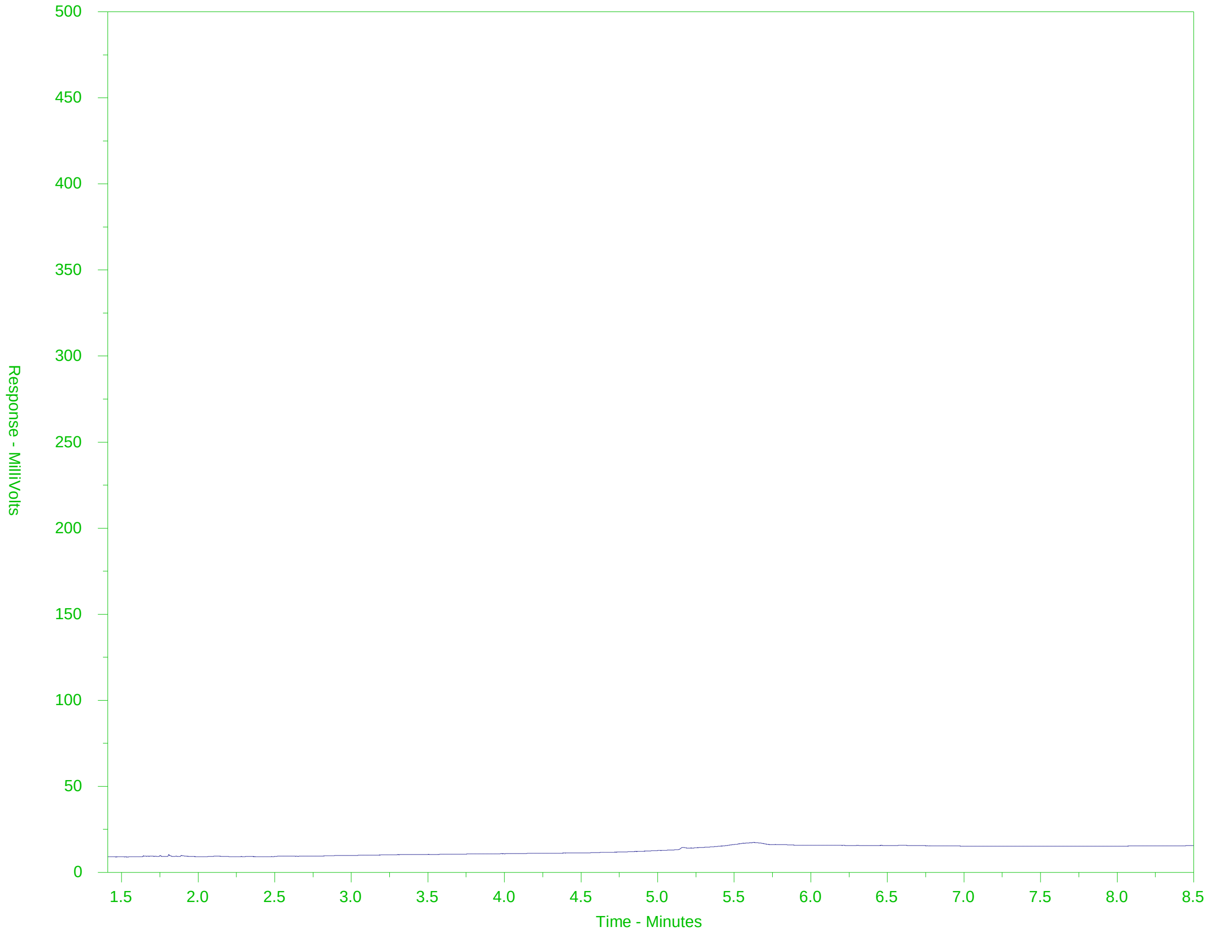
MB Sample ID: **RE190412-1** Units: **BQ/l** Analysis Date: **4/23/2019 11:21**
Client ID: Run ID: **RE1904112-1A** Prep Date: **4/12/2019** DF: **NA**

Analyte	Result	ReportLimit	SPK Val	SPK Ref Value	%REC	Control Limit	Decision Level	DER Ref	DER	DER Limit	Qual
Ra-226	-0.00051 (+/- 0.0030)	0.0067									U
Carr: BARIUM	14400		15740		91.3	40-110					

The following samples were analyzed in this batch: 1904213-1 1904213-2 1904213-3

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2255221-C-1
Client Sample ID: ALS TRAVEL BLANK



←—— F2 ——→	←—— F3 ——	——→	←—— F4 ——→
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
←Gasoline→	←—— Motor Oils/ Lube Oils/ Grease	——	——→
←—— Diesel/ Jet Fuels	——→		

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

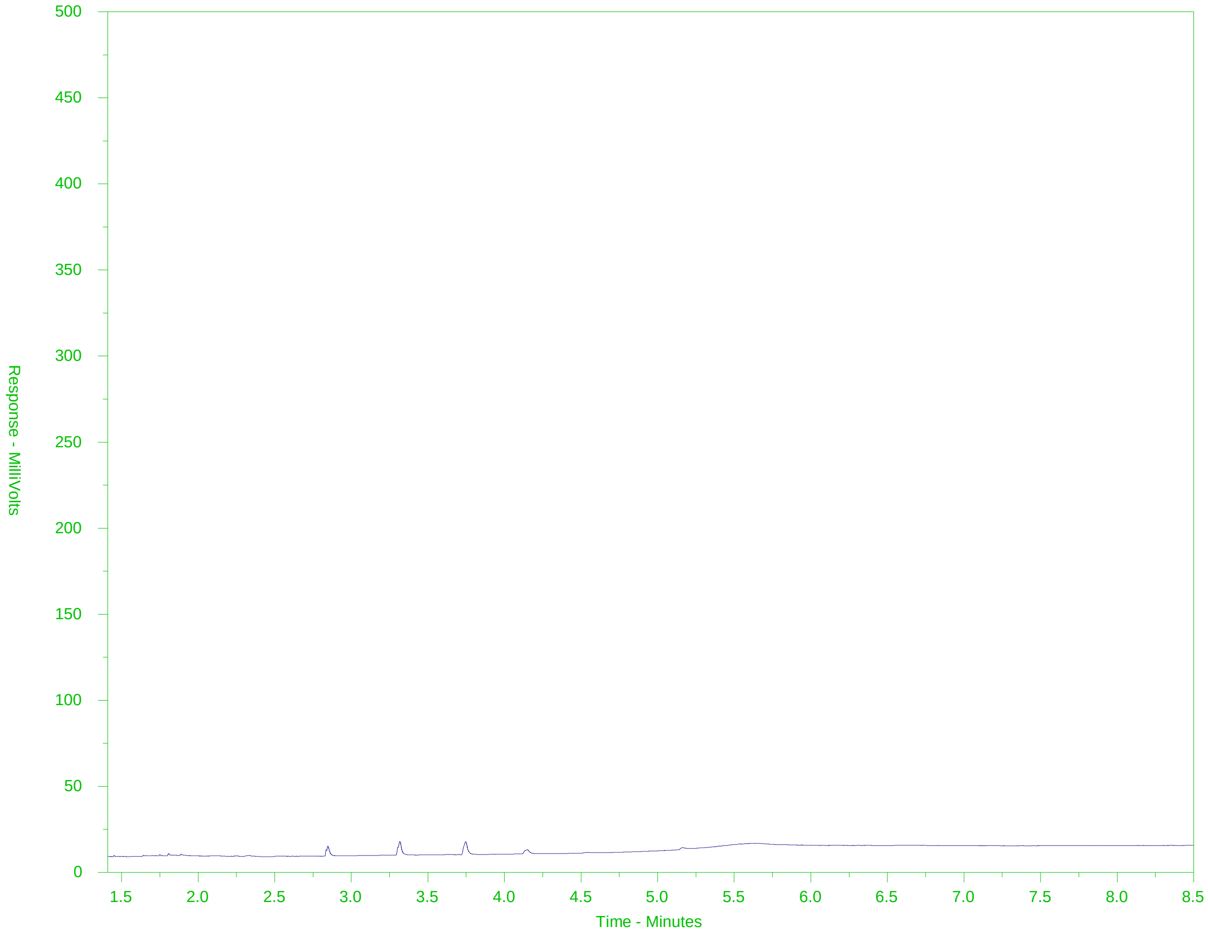
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2255221-C-2
Client Sample ID: PORT 4



← F2 →	← F3 →		← F4 →
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
←Gasoline→	← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

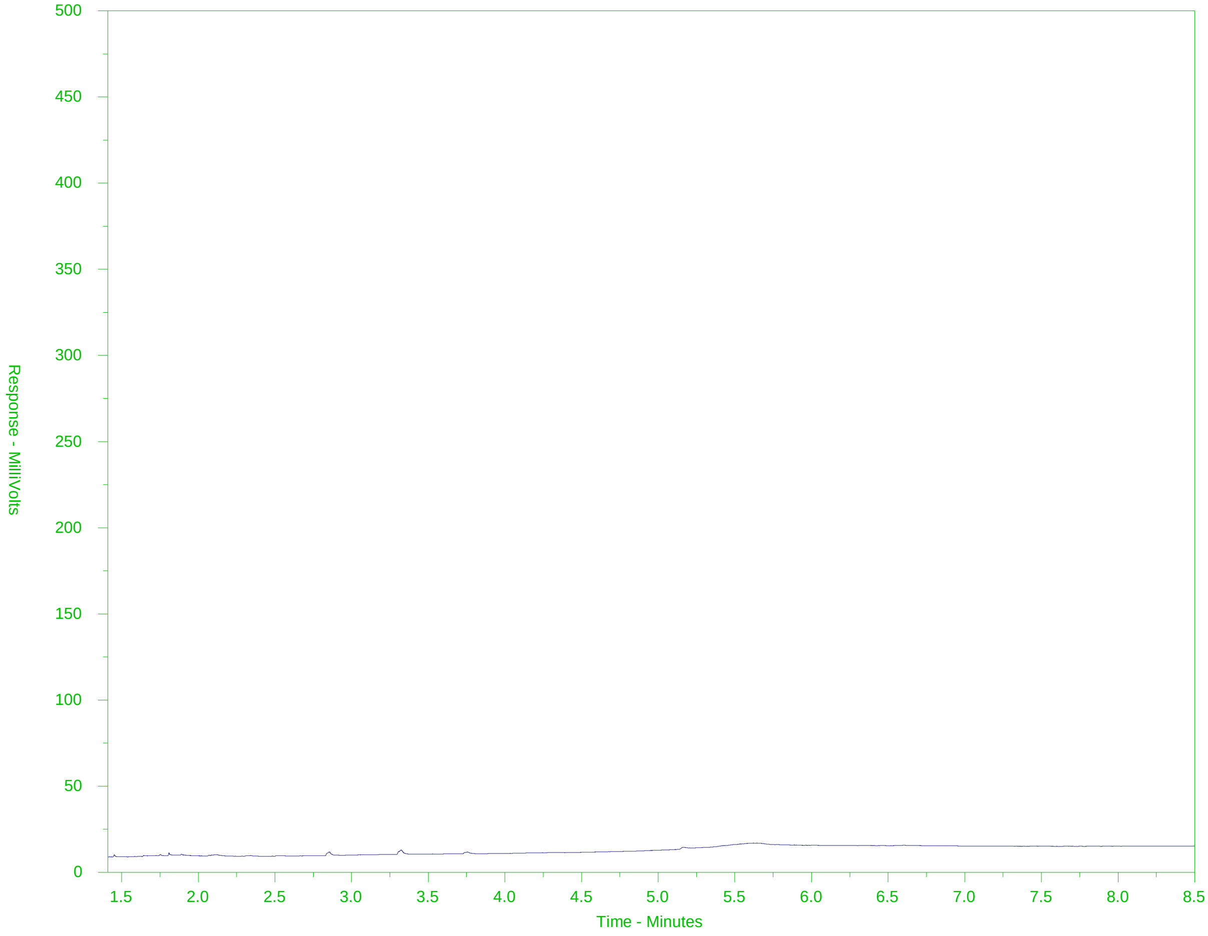
The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT

ALS Sample ID: L2255221-C-3
Client Sample ID: PORT 6



← F2 →	← F3 →	← F4 →	
nC10	nC16	nC34	nC50
174°C 346°F	287°C 549°F	481°C 898°F	575°C 1067°F
←Gasoline→	← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →			

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # 18-1789310

Page 1 of 1

Report To

Company: Agnico-Eagle Mines Limited

Contact: Jenyfer Mosquera

Address: 11600 rue Louis-Bisson, Suite 540 - Mirabel
Quebec, Canada J7N 1G9

Phone: 819-759-3555 Fax: x 4608170

Report Format / Distribution

☑ Standard ☐ Other

☑ PDF ☑ Excel ☐ Digital ☐ Fax

Email 1: jenyfer.mosquera@agnicoeagle.com

Email 2: dholtze@golder.com; Akowalchuk@golder.com

Email 3: valerie_bertrand@golder.com

Service Requested (Rush for routine analysis subject to availability)

● Regular (Standard Turnaround Times - Business Days)

○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT

○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT

○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT

Invoice To Same as Report ? ☑ Yes ☐ No

Hardcopy of Invoice with Report? ☐ Yes ☐ No

Company:

Contact:

Address:

Phone: Fax:

Client / Project Information

Job #: 18108905

PO / AFE:

LSD:

Quote #: Q72802

Lab Work Order # (lab use only)

ALS Contact: Heather Mckenzie

Sampler: A.Kowalchuk

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	DISSOVLED METALS	TOTAL METALS	TOTAL PHOSPHORUS	MAJOR IONS, TDS, TSS	Ra226	PHC C10-C50	Reactive Silica		AVG Conductivity - 9.64 mS/cm	AVG Conductivity - 22.28 mS/cm	Hold for Analysis			Number of Containers
					F		P		P									
	ALS Travel Blank	03-Apr-19	8:00	Other		X	X	X	X	X	X							7
	Port 4	02-Apr-19	14:30	Groundwater	X	X	X	X	X	X	X			X	X			9
	Port 6	03-Apr-19	10:20	Groundwater	X	X	X	X	X	X	X		X		X			9

L2255221-COFC

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Adrian Kowalchuk	4-Apr-19	8:30		Apr 9, 19	8:50am	13 °C				

NA-FM-0326d v07 Front / 19 August 2013

APPENDIX D

2016 Laboratory Certificate of Analysis – Brine Fluid

Certificat d'analyse

Client : **Agnico-Eagle CSD - Amaruq Study**

Responsable : Mme Odrée-Maude Vachon
Adresse : CSD

tél.: (819) 759-3555 ()
fax.: (000) 000-0000

Numéro de projet : V-52584

Lieu de prélèvement :	Brine Fluid	Date de prélèvement :	17 avril 2016
Échantillon :	Brine Fluid	Heure de prélèvement :	N/D
Nom du préleveur :	N/D	Date de réception :	19 avril 2016
Type d'échantillon :	Eau surface		
Réseau:			

Certificat corrigé, remplace le certificat V-52584 émis le 09 mai 2016

Les résultats ne se rapportent qu'aux échantillons soumis pour analyse.

Les échantillons seront conservés pendant 30 jours à partir de la date du rapport à moins d'avis écrit du client.

Sauf indication contraire, tous les échantillons ont été reçus en bon état.

Certificat d'analyse

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid
Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Paramètres	Résultats	Méthode d'analyse	Date d'analyse
Aluminium (Al)	0.498 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Antimoine (Sb)	0.0354 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Argent (Ag)	<0.0001 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Arsenic (As)	0.7662 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Baryum (Ba)	0.1126 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Béryllium (Be)	<0.0005 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Bicarbonate (HCO3)	27 mg CaCO3/L	M-TIT-1.0	19 avril 2016
Bismuth (Bi)	<0.0005 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Bore (B)	13.2 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Bromures	1066 mg/L	Sous-traitance\Multilab Direct	22 avril 2016
Cadmium (Cd)	<0.00002 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Calcium (Ca)	42266 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Carbone inorganique total (C.I.T.	2.1 mg/L	M-COT-1.0	19 avril 2016
Carbone organique total (C.O.T.)	28.5 mg/L	M-COT-1.0	19 avril 2016
Chlorure (Cl)	83700 mg/L	Sous-traitance\Multilab Direct	29 avril 2016
Chrome (Cr)	<0.0006 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Cobalt (Co)	0.0406 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Conductivité	55420 µmhos/cm	M-TIT-1.0	19 avril 2016
Cuivre (Cu)	0.0039 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Dureté	105554 mg CaCO3/L	Sous-traitance\Multilab Direct	20 avril 2016
Étain (Sn)	<0.001 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Fer (Fe)	2.60 mg/L	Sous-traitance\Multilab Direct	22 avril 2016
Fluorures (F)	0.06 mg/L	Sous-traitance\Multilab Direct	27 avril 2016
Lithium (Li)	34.52 mg/L	Sous-traitance\Multilab Direct	22 avril 2016
Magnésium (Mg)	3.92 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Manganèse (Mn)	<0.0005 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Mercure (Hg)	0.00039 mg/L	Sous-traitance\Multilab Direct	21 avril 2016
Molybdene (Mo)	<0.0005 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
NH3 (NH3 non-ionisé)	1.52 mg N/L	Sous-traitance\Multilab Direct	20 avril 2016
NH4	0.67 mg N/L	Sous-traitance\Multilab Direct	20 avril 2016
Nickel (Ni)	1.350 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Nitrates (NO3)	0.54 mg N/L	Sous-traitance\Multilab Direct	19 avril 2016
Nitrites (NO2)	0.06 mg N/L	Sous-traitance\Multilab Direct	21 avril 2016
pH	10.02	M-TIT-1.0	19 avril 2016
Plomb (Pb)	<0.0003 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Potassium (K)	1717 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Radium (RA 226)	<0.066 Becquerels/L	M-RA-2.0	02 mai 2016
Sélénium (Se)	3.83 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Silice (Si)	2.93 mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Sodium (Na)	838 mg/L	Sous-traitance\Multilab Direct	20 avril 2016

Sauf indication contraire, tous les échantillons ont été reçus en bon état.

Certificat d'analyse

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid

Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Paramètres	Résultats		Méthode d'analyse	Date d'analyse
Solides dissous	36946	mg/L	M-TIT-1.0	19 avril 2016
Solides totaux	149736	mg/L	M-SOLI-1.0	27 avril 2016
Strontium (Sr)	656	mg/L	Sous-traitance\Multilab Direct	22 avril 2016
Tellure (Te)	<0.0005	mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Thallium (Tl)	<0.002	mg/L	Sous-traitance\Multilab Direct	22 avril 2016
Titane (Ti)	45.2	mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Uranium (U)	<0.001	mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Vanadium (V)	<0.0005	mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Zinc (Zn)	<0.001	mg/L	Sous-traitance\Multilab Direct	20 avril 2016
Alcalinité	145	mg CaCO3/L	M-TIT-1.0	20 avril 2016
Sulfate (SO4)	<0.6	mg SO4/L	Sous-traitance\Multilab Direct	12 mai 2016

Limite de détection rapportée

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid
Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Paramètre	Valeur	Unité	Méthode	Accréditation
Aluminium (Al)	0.006	mg/L	Sous-traitance	
Antimoine (Sb)	0.0001	mg/L	Sous-traitance	Oui
Argent (Ag)	0.0001	mg/L	Sous-traitance	Oui
Arsenic (As)	0.0005	mg/L	Sous-traitance	Oui
Baryum (Ba)	0.0005	mg/L	Sous-traitance	Oui
Béryllium (Be)	0.0005	mg/L	Sous-traitance	
Bicarbonate (HCO3)	2	mg CaCO3/L	M-TIT-1.0	
Bismuth (Bi)	0.0005	mg/L	Sous-traitance	
Bore (B)	0.01	mg/L	Sous-traitance	Oui
Bromures	0.01	mg/L	Sous-traitance	
Cadmium (Cd)	0.00002	mg/L	Sous-traitance	Oui
Calcium (Ca)	0.03	mg/L	Sous-traitance	Oui
Carbone inorganique total (C.I.T.	0.2	mg/L	M-COT-1.0	--
Carbone organique total (C.O.T.)	0.2	mg/L	M-COT-1.0	Oui
Chlorure (Cl)	0.5	mg/L	Sous-traitance	Oui
Chrome (Cr)	0.0006	mg/L	Sous-traitance	Oui
Cobalt (Co)	0.0005	mg/L	Sous-traitance	
Conductivité	1	µmhos/cm	M-TIT-1.0	Oui
Cuivre (Cu)	0.0005	mg/L	Sous-traitance	Oui
Dureté	1	mg CaCO3/L	Sous-traitance	
Étain (Sn)	0.001	mg/L	Sous-traitance	Oui
Fer (Fe)	0.01	mg/L	Sous-traitance	Oui
Fluorures (F)	0.02	mg/L	Sous-traitance	Oui
Lithium (Li)	0.005	mg/L	Sous-traitance	
Magnésium (Mg)	0.02	mg/L	Sous-traitance	Oui
Manganèse (Mn)	0.0005	mg/L	Sous-traitance	Oui
Mercure (Hg)	0.00001	mg/L	Sous-traitance	Oui
Molybdene (Mo)	0.0005	mg/L	Sous-traitance	Oui
NH3 (NH3 non-ionisé)	0.01	mg N/L	Sous-traitance	-
NH4	0.01	mg N/L	Sous-traitance	-
Nickel (Ni)	0.0005	mg/L	Sous-traitance	Oui
Nitrates (NO3)	0.01	mg N/L	Sous-traitance	Oui
Nitrites (NO2)	0.01	mg N/L	Sous-traitance	Oui
pH			M-TIT-1.0	Oui
Plomb (Pb)	0.0003	mg/L	Sous-traitance	Oui
Potassium (K)	0.05	mg/L	Sous-traitance	
Radium (RA 226)	0.002	Becquerels/L	M-RA-2.0	Oui
Sélénium (Se)	0.001	mg/L	Sous-traitance	Oui
Silice (Si)	0.01	mg/L	Sous-traitance	
Sodium (Na)	0.05	mg/L	Sous-traitance	Oui

Limite de détection rapportée

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid
Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Paramètre	Valeur	Unité	Méthode	Accréditation
Solides dissous	1	mg/L	M-TIT-1.0	
Solides totaux	2	mg/L	M-SOLI-1.0	Oui
Strontium (Sr)	0.005	mg/L	Sous-traitance	
Tellure (Te)	0.0005	mg/L	Sous-traitance	
Thallium (Tl)	0.002	mg/L	Sous-traitance	
Titane (Ti)	0.01	mg/L	Sous-traitance	
Uranium (U)	0.001	mg/L	Sous-traitance	
Vanadium (V)	0.0005	mg/L	Sous-traitance	Oui
Zinc (Zn)	0.001	mg/L	Sous-traitance	Oui
Alcalinité	2	mg CaCO3/L	M-TIT-1.0	
Sulfate (SO4)	0.6	mg SO4/L	Sous-traitance	Oui

Sauf indication contraire, tous les échantillons ont été reçus en bon état.
Toute reproduction, sinon en entier, est interdite sans l'autorisation écrite du laboratoire.

Certificat contrôle qualité

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid
Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Paramètres		
Alcalinité mg CaCO3/L	Nom Standard	STD alcalinité
	Valeur obtenue	144
	Justesse	99.3%
	Intervalle	123 - 167
Aluminium (Al) mg/L	Blanc	<0.006
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	6.82
	Justesse	92.9%
	Intervalle	5.10 - 7.64
Antimoine (Sb) mg/L	Blanc	<0.0001
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	0.2049
	Justesse	92.3%
	Intervalle	0.178 - 0.266
Argent (Ag) mg/L	Blanc	<0.0001
	Nom Standard	DMR-0009-2016-Ag
	Valeur obtenue	0.6004
	Justesse	82.9%
	Intervalle	0.579 - 0.869
Arsenic (As) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	0.2700
	Justesse	95.4%
	Intervalle	0.198 - 0.368
Baryum (Ba) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	2.572
	Justesse	94.2%
	Intervalle	1.94 - 2.92
Béryllium (Be) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	1.900
	Justesse	88.2%
	Intervalle	1.36 - 2.04
Bismuth (Bi) mg/L	Blanc	<0.0005
Bore (B) mg/L	Blanc	<0.01
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	3.43
	Justesse	83.7%
	Intervalle	2.36 - 3.54

Certificat contrôle qualité

Numéro de projet : V-52584

Échantillon : Brine Fluid

Lieu de prélèvement : Brine Fluid

Date de prélèvement : 17 avril 2016

Heure de prélèvement : N/D

Paramètres		
Bromures mg/L	Blanc	<0.01
	Nom Standard	DMR-0123-2016-Br
	Valeur obtenue	5.39
	Justesse	95.7%
	Intervalle	4.50 - 6.76
Cadmium (Cd) mg/L	Blanc	<0.00002
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	0.89802
	Justesse	99.8%
	Intervalle	0.720 - 1.080
Calcium (Ca) mg/L	Blanc	<0.03
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	17.1
	Justesse	98.3%
	Intervalle	13.9 - 20.9
Chlorure (Cl) mg/L	Blanc	<0.5
	Nom Standard	DMR-0175-2016-Cl
	Valeur obtenue	53.7
	Justesse	96.7%
	Intervalle	46 - 58
Chrome (Cr) mg/L	Blanc	<0.0006
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	4.115
	Justesse	98.4%
	Intervalle	3.24 - 4.86
Cobalt (Co) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	1.549
	Justesse	99.9%
	Intervalle	1.24 - 1.86
Conductivité µmhos/cm	Nom Standard	STD cond maison
	Valeur obtenue	1407
	Justesse	99.4%
	Intervalle	1203 - 1627
Cuivre (Cu) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	1.379
	Justesse	94.7%
	Intervalle	1.05 - 1.57
Étain (Sn) mg/L	Blanc	<0.001

Certificat contrôle qualité

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid

Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Paramètres		
Fer (Fe) mg/L	Blanc	<0.01
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	16.0
	Justesse	88.1%
	Intervalle	11.4 - 17.2
Lithium (Li) mg/L	Blanc	<0.005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	0.827
	Justesse	97.8%
	Intervalle	0.677 - 1.015
Magnésium (Mg) mg/L	Blanc	<0.02
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	8.04
	Justesse	89.4%
	Intervalle	5.82 - 8.72
Manganèse (Mn) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	3.781
	Justesse	97.2%
	Intervalle	3.11 - 4.67
Mercure (Hg) mg/L	Blanc	<0.00001
	Nom Standard	DMR-0123-2016-HgEu
	Valeur obtenue	0.00062
	Justesse	93.9%
	Intervalle	0.00040 - 0.00092
Molybdene (Mo) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	0.6382
	Justesse	90.1%
	Intervalle	0.566 - 0.850
Nickel (Ni) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	1.110
	Justesse	98.2%
	Intervalle	0.90 - 1.36
Nitrates (NO3) mg N/L	Blanc	<0.01
Nitrites (NO2) mg N/L	Blanc	<0.01
	Nom Standard	DMR-0175-2016-NO2
	Valeur obtenue	1.97
	Justesse	97.5%

Certificat contrôle qualité

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid

Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Paramètres		
	Intervalle	1.72 - 2.32
pH	Nom Standard	STD pH 7.0
	Valeur obtenue	7.01
	Justesse	99.9%
	Intervalle	6.96 - 7.04
Plomb (Pb) mg/L	Blanc	<0.0003
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	0.9397
	Justesse	96.6%
	Intervalle	0.727 - 1.091
Potassium (K) mg/L	Blanc	<0.05
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	20.2
	Justesse	89%
	Intervalle	14.6 - 21.8
Radium (RA 226) Becquerels/L	Blanc	<0.002
	Nom Standard	STD 45462
	Valeur obtenue	0.0700
	Justesse	85%
	Intervalle	0.0700 - 0.0948
Sélénium (Se) mg/L	Blanc	<0.001
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	1.33
	Justesse	98.5%
	Intervalle	1.08 - 1.62
Sodium (Na) mg/L	Blanc	<0.05
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	29.0
	Justesse	91%
	Intervalle	21.3 - 31.9
Solides totaux mg/L	Blanc	<2
	Nom Standard	DMR-0124-2016-3
	Valeur obtenue	289
	Justesse	99%
	Intervalle	243 - 329
Strontium (Sr) mg/L	Blanc	<0.005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	1.25
	Justesse	97.7%
	Intervalle	1.02 - 1.54

Certificat contrôle qualité

Numéro de projet : V-52584

Échantillon : Brine Fluid

Lieu de prélèvement : Brine Fluid

Date de prélèvement : 17 avril 2016

Heure de prélèvement : N/D

Paramètres		
Sulfate (SO4) mg SO4/L	Blanc	<0.6
	Nom Standard	DMR-0175-2016-SO4
	Valeur obtenue	71.2
	Justesse	93.7%
	Intervalle	60.3 - 73.7
Tellure (Te) mg/L	Blanc	<0.0005
Thallium (Tl) mg/L	Blanc	<0.002
	Nom Standard	Tl-S140909023-1000ppm
	Valeur obtenue	989
	Justesse	98.9%
	Intervalle	800 - 1200
Titane (Ti) mg/L	Blanc	<0.01
Uranium (U) mg/L	Blanc	<0.001
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	1.93
	Justesse	90.3%
	Intervalle	1.41 - 2.11
Vanadium (V) mg/L	Blanc	<0.0005
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	2.023
	Justesse	98.3%
	Intervalle	1.59 - 2.39
Zinc (Zn) mg/L	Blanc	<0.001
	Nom Standard	DMR-0009-2016-Eu
	Valeur obtenue	4.67
	Justesse	97.7%
	Intervalle	3.82 - 5.74

Sauf indication contraire, tous les échantillons ont été reçus en bon état.

Toute reproduction, sinon en entier, est interdite sans l'autorisation écrite du laboratoire.

Informations supplémentaires

Numéro de projet : V-52584

Échantillon : Brine Fluid
Lieu de prélèvement : Brine Fluid

Date de prélèvement : 17 avril 2016
Heure de prélèvement : N/D

Méthode laboratoire	Méthode de référence
M-MET-3.0	MA.200-Mét. 1.2
M-TIT-1.0	MA.303-Titr Auto 2.0
M-CL-2.0	MA.300-Ions 1.3
M-CI-1.0	MA.300-Anions 1.0
M-NITR-2.0	MA.300-NO3 2.0
M-RA-2.0	APHA 7500-Ra B et EPA P.13 (EMSL-CI)
M-SOLI-1.0	MA.104-S.S. 1.1
M-SULF-2.0	MA.300-Ions 1.3

Sauf indication contraire, tous les échantillons ont été reçus en bon état.

APPENDIX B – WHALE TAIL PIT POST-CLOSURE PIT LAKE THERMAL ASSESSMENT

GOLDER

TECHNICAL MEMORANDUM

DATE 30 July 2018

1789310-174-TM-Rev0

TO Jamie Quesnel
Agnico Eagle Mines Limited

CC Michel Groleau, Valérie Bertrand

FROM Colin McGrath, Jianfeng Chen, Don Chorley, and Serge Ouellet

EMAIL
Jianfeng_Chen@golder.com

WHALE TAIL PIT
POST-CLOSURE PIT LAKE THERMAL ASSESSMENT

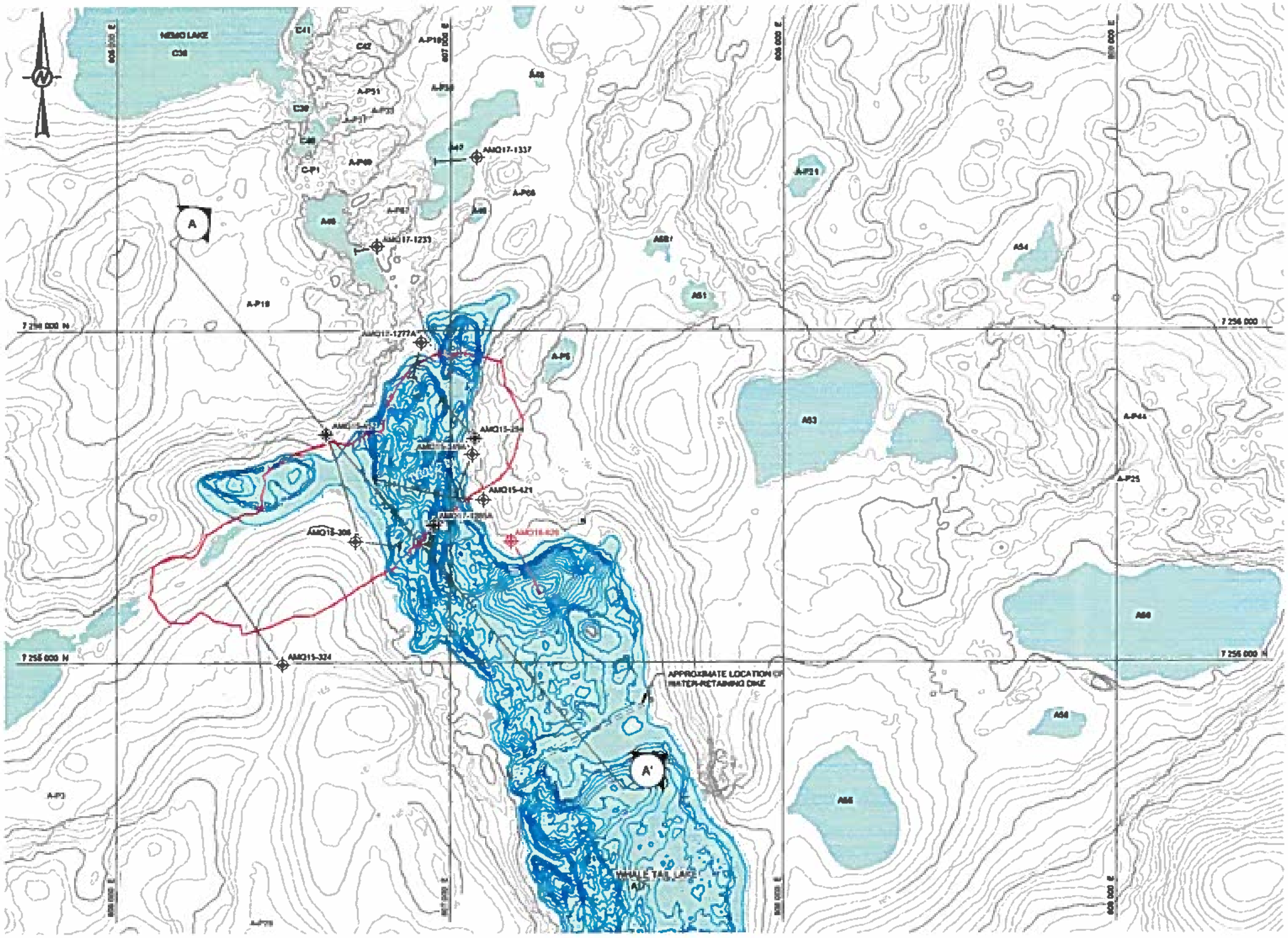
1.0 INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is currently evaluating the potential development for mining the Whale Tail Pit Project (Project), a satellite deposit located on the Amaruq exploration property in Nunavut. The Amaruq property is a 408 km^2 site located in Inuit Owned Land approximately 150 km north of the hamlet of Baker Lake and approximately 50 km northwest of Agnico Eagle's operating Meadowbank Mine.

The following technical memorandum presents the assumptions and results of two-dimensional (2D) thermal analysis that was conducted in support of post-closure hydrogeological modelling for the Whale Tail Pit (Golder 2018a). The thermal analysis was conducted to evaluate how quickly the permafrost below Whale Tail Pit could melt following the formation of the Whale Tail Pit Lake during closure. The location of Whale Tail Pit is presented on Figure 1.

The thermal assessment included a review of the original Whale Tail Lake talik formation estimation based on available thermistor data at the time of the FEIS, the previous assessment completed by Golder (2017a), the current ground thermal conditions in the Whale Tail Lake area, and thermal changes during and after flooding the Whale Tail Pit.

This technical memorandum presents a summary of the updated evaluation of permafrost conditions based on the available thermistor data to October 2017, and the numerical modelling results of predicted thermal conditions under the Whale Tail Pit Lake post-closure.



NOTE(S)
1. ALL UNITS ARE IN METERS UNLESS NOTED OTHERWISE.
2. CONTOUR INTERVAL 1m MINOR AND 5m MAJOR.

REFERENCE
BASE PLAN AND BATHYMETRY DATA RECEIVED FROM AGNICO EAGLE MINES LTD. DATE RECEIVED NOVEMBER 25, 2018.
CAD FILE: COURBES2M_AMARUQ_GLOBAL_UTM14_20150828.DWG
CAD FILE: 1666864-21008-CM-0002.DWG
CAD FILE: 61-000-142-001_R0BLOC.DWG

CLIENT
AGNICO EAGLE
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

YYYY-MM-DD	2018-07-30
DESIGNED	CTM
PREPARED	CB
REVIEWED	SO
APPROVED	JFC

PROJECT
WHALE TAIL PIT PROJECT
POST CLOSURE PIT LAKE THERMAL ANALYSIS
NUNAVUT

TITLE
SITE PLAN AND SECTION LOCATION

PROJECT NO	PHASE-TASK-DOC#	REV	FIGURE
1789310	1000/12020/174	0	1

2.0 BACKGROUND

The Project is located in the zone of continuous permafrost. The land surface of the Project is underlain by permafrost except under the lake where water is too deep to freeze to the bottom during winter. Taliks (areas of unfrozen ground) are expected beneath a water body where the water depth is greater than the ice thickness. Closed talik formations consist of a depression in the permafrost table below relatively shallower and smaller lakes. Open talik formations that penetrate through the permafrost and connect the lake waterbody with the sub-permafrost hydrogeological regime are to be expected for relatively deeper and larger lakes in the Project area.

A previous site investigation on the Project completed by Knight Piésold (Knight Piésold 2015) between June and October of 2015 included the installation of six thermistors in the vicinity of the proposed development of Whale Tail Lake to collect ground temperature data.

The project site permafrost conditions were initially assessed by Knight Piésold (2015). A further review on site thermistor data was carried out by Golder during the thermal assessment for the Whale Tail Lake, with a summary of the thermal conditions presented in Golder (2017a). An additional four thermistors were installed within the vicinity of Whale Tail Lake in 2017 by Golder.

Based on site investigation data, soils in the project area are typically medium to coarse grained glacial till and colluvium with high coarse fragment content overlying bedrock at shallow depths. The six thermistor boreholes drilled in 2015 indicated soil thicknesses varying from 6.1 to 12.4 m. Review of existing data indicates the soil thicknesses varying from about 1 m to 12 m in the proposed waste rock storage facility area located northwest of the proposed pit. Underlying the soil, bedrock in the area generally consists of a stratigraphic sequence of greywacke, komatiite, and ultramafics, with varying thicknesses.

A mean annual air temperature for the site is of -11.3 °C, based on climate data provided by Agnico Eagle (Golder 2016a, Agnico Eagle 2016). Climate normal for Baker Lake between 1981 and 2000 shows a mean annual air temperature of -11.2 °C (Golder 2017b). Table 1 presents a summary of average air temperature at the site and at the Baker Lake climate station. The mean monthly temperatures of the two sets of data are similar. Mean monthly temperatures from Meadowbank site based on camp site data from 1997 to 2003 is included in the table for comparison (Golder 2003). The Meadowbank data gives a similar annual average of -11.1 °C.

Table 1: Mean Monthly Air Temperatures

	Whale Tail Project (Golder 2016a, Agnico Eagle 2016)	Meadowbank Project (1997 - 2003) (Golder 2003)	Baker Lake Climate Normal (1981 to 2000)
Unit	**°C**	**°C**	**°C**
January	-31.3	-31.6	-31.2
February	-31.1	-31.7	-31.0
March	-26.3	-25.5	-26.2
April	-17.0	-17.2	-17.0
May	-6.4	-5.6	-6.3
June	4.9	3.8	4.8
July	11.6	12.4	11.6
August	9.8	9.9	9.8
September	3.1	3.3	3.1
October	-6.5	-7.6	-6.4
November	-19.3	-18.0	-19.3
December	-26.8	-25.6	-26.5
Average	**-11.3**	**-11.1**	**-11.2**

3.0 SITE PERMAFROST CONDITIONS

The following sections present a summary of site-specific permafrost conditions based on the available thermistor data.

3.1 Thermistor Installation

The locations of the existing thermistors are shown in Figure 1; Table 2 presents a summary of thermistor data obtained to date.

Table 2: Thermistor Location and Installation Summary

Borehole	Collar Coordinates					Drilled Length (m)	Thermistor	Status[c]
	Northing	Easting	Elevation	Inclination (deg)	Azimuth (deg)		Depth Below Ground Surface (m)	
AMQ15-294	607,073.2	7,255,676.1	155.9	-45.18	322.7	220.5	144.4	Functioning
AMQ15-306	606,714.8	7,255,363.8	154.9	-45.41	96.3	201.0	141.5	Functioning[b]
AMQ15-324	606,496.8	7,254,995.2	161.8	-55.46	325.5	505.0	317.4	Functioning
AMQ15-349A	607,064.9	7,255,627.5	155.3	-45.32	204.4	202.5	140.6	Not functioning
AMQ15-421	607,098.3	7,255,490.8	155.1	-51.31	273.9	501.0	388.3	Not functioning
AMQ15-452	606,627.2	7,255,687.9	156.2	-49.98	159.5	501.0	382.3	Functioning
AMQ17-1265A	606,950.1	7,255,413.6	152.5	-80.0	196.0	425.0	349.6[a]	Functioning
AMQ17-1233	606,777.7	7,256,253.8	161.9	-59.06	252.7	156.0	132.4	Functioning
AMQ17-1337	607,078.4	7,256,522.0	155.2	-59.62	260.4	250.0	218.0	Functioning
AMQ17-1277A	606,911.1	7,255,963.6	153.2	-60.17	193.1	250.0	217.4	Functioning

a) Depth below lake water (ice) level.
b) Only the top node is functioning.
c) Based on information provided by Agnico Eagle in April 2018

3.2 Thermistor Data Summary

Table 3 presents a summary of the permafrost information estimated from the ten thermistors on site. The parameters were estimated using average values from September 2015 to October 2017. Ground temperature plots for the thermistor data is presented in Attachment 1.

Based on the thermistor data, the findings on the permafrost characteristics in the project area remain similar to those presented in Golder (2017a), with following updates:

- The thermistor AMQ17-1337 suggested deeper permafrost in the area away from deep lakes of up to 495 m, compared to the 427 m depth from the thermistor AMQ15-324
- The temperatures at the depths of zero amplitude changed slightly, they are now in the range of -3.0 °C to -8.4 °C (-3.1 °C to -8.6 °C reported in Golder 2017a)
- The thermistor AMQ17-1265A installed within the lake suggests the talik depth at this location is about 112 m from the lake water level

No additional groundwater quality and freezing point depression data were provided during this assessment; these are assumed to remain unchanged since the last assessment (Golder 2016b).

Table 3: Summary of Permafrost Conditions from Site Thermistors

Hole ID	Approx. Collar Distance to Lake (m)	Thermistor Location	Zero Annual Amplitude		Mean Annual Ground Temperature (°C)$^{(a)}$	Geothermal Gradient (°C/m)	Estimated Permafrost Depth (metres below ground or lake surface)
			Approximate Depth (m)	Approximate Temperature (°C)			
AMQ15-294	31	Beneath Whale Tail Lake	19	-3.0	-3.5	Insufficient depth	Insufficient depth
AMQ15-306	55	Beneath Whale Tail Lake	20	-7.4	-8.1	Insufficient depth	Insufficient depth
AMQ15-324	370	On land	35	-8.4	-9.9	0.025$^{(b)}$	427
AMQ15-349A	40	Beneath Whale Tail Lake	18	-5.2	-5.2	Insufficient depth	Insufficient depth
AMQ15-421	40	Beneath Whale Tail Lake	24	-3.6	-3.9	0.005$^{(c)}$	445
AMQ15-452	50	Beneath Whale Tail Lake	23	-3.6	-3.4	0.011$^{(d)}$	468
AMQ17-1265A	0 (within Whale Tail Lake)	Beneath Whale Tail Lake	N/A	N/A	N/A	0.016$^{(e)}$	343 (including 112 m lake talik)
AMQ17-1233	21	Beneath A49 Lake	Insufficient depth	Insufficient depth	Insufficient depth	Insufficient depth	Insufficient depth
AMQ17-1337	12	Beneath A47 Lake	Insufficient depth	Insufficient depth	-9.5	0.019$^{(f)}$	495
AMQ17-1277A	29	Beneath Whale Tail Lake	Insufficient depth	Insufficient depth	Insufficient depth	Insufficient depth	Insufficient depth

a) Estimated by projecting best fit line to surface.
b) Based on thermistor data from 105.1 to 282.1 m depth.
c) Based on thermistor data below 271.8 m depth.
d) Based on thermistor data below 248.4 m depth.
e) Based on thermistor data below 290.5 m depth.
f) Based on thermistor data below 166.2 m depth.

4.0 PIT LAKE THERMAL MODEL

Two-dimensional thermal modelling was carried out using the finite element program, TEMP/W, of GeoStudio 2007 (Ver. 7.23), developed by GEO-SLOPE International Ltd. This section presents the model scenarios, input parameters, and assumptions.

Golder previously conducted thermal modelling to evaluate the permafrost and talik conditions in the Whale Tail Lake and project area (Golder 2017a), and conducted thermal modelling for the cover of the Whale Tail waste rock storage facility (Golder 2017b, 2018b). A number of model parameters used in these assessments were adopted for this pit lake thermal modelling.

For the purpose of providing input to the pit hydrogeological modelling, the section A shown in Figure 1 was selected for thermal modelling of the post-closure pit lake. The modelling included the following steps.

- Evaluate the current condition of permafrost regime under Whale Tail Lake by reviewing of the existing thermistor data and the 2017 Whale Tail Lake thermal assessment results (Golder 2017a).
- Estimate the ground thermal conditions when the Whale Tail Pit is mined out, for use as the initial condition.
- Run a transient thermal model with the pit being flooded based on the proposed flooding schedule, to estimate the evolution of the permafrost regime during flooding at closure. The model stops when most of the permafrost under the pit lake thaws.
- Continue running the model to evaluate long-term permafrost regime, after the water-retaining dike is breached, and the Whale Tail Lake (South Basin) and the fully flooded Whale Tail Pit Lake are merged.
- Run a steady-state thermal model for the pit lake to estimate the ultimate permafrost regime.

4.1 Material Properties

Consistent with Golder (2017a), for the purposes of this thermal assessment, each model assumed a uniform thickness of 12 m of till overlying bedrock both on land and under the lake, except the pit lake. No lake bed sediment or weathered bedrock materials were included in the models. It is expected that the material properties of the bedrock will have a more significant effect on the thermal conditions than the soil due to the relative thickness of the soil compared to the bedrock. Material properties and depths used in the thermal models are summarized in Table 4. The material thermal properties were referenced from typical values presented in Andersland and Ladanyi (2004) and are consistent with Golder (2017a and b).

Table 4: Material Thermal Properties Used in the Models

Material	Assumed Volumetric Water Content	Thermal Conductivity (W/m-°C)		Volumetric Heat Capacity (MJ/m^3-°C)		Assumed Depth Below Ground surface (m)
		Frozen	Unfrozen	Frozen	Unfrozen	
Till	30%	1.8	1.5	2.0	2.5	0 to 12
Bedrock	1%	3.0	3.0	2.0	2.0	>12

The thermal models were solved considering groundwater with a phase change temperature of 0 °C. The addition of salinity in the groundwater would result in a freezing point depression and could lower the phase change temperature to below 0 °C if salinity is high enough. The freezing point depression was not modelled directly. A Westbay well system is installed in borehole AMQ16-626. Groundwater samples collected from the Westbay system at depths from 276 m to 392 m indicated a salinity range of 0.3% to 0.4% (Golder 2016b). This salinity level indicates an approximate 0.2 °C of freezing point depression and is considered to have minor impact to the evolution of the thermal regime around the pit lake.

4.2 Boundary Conditions

4.2.1 Ground Surface Temperature

The monthly ground surface temperature function was estimated through numerical modelling using daily climate data from Baker Lake, and review of existing thermistor data from the Whale Tail site (Golder 2017b). Ground surface temperatures are often observed to be warmer than the air temperatures in permafrost regions. Figure 2 shows the ground surface temperature function used in the model, as well as the Baker Lake normal air temperatures from 1981 to 2010. The mean annual ground temperature is about -7.3 °C, which lies in the range of -3.4 to -9.9 °C, projected from the thermistor data (Table 3) and is considered to be reasonable for use in the transient model.

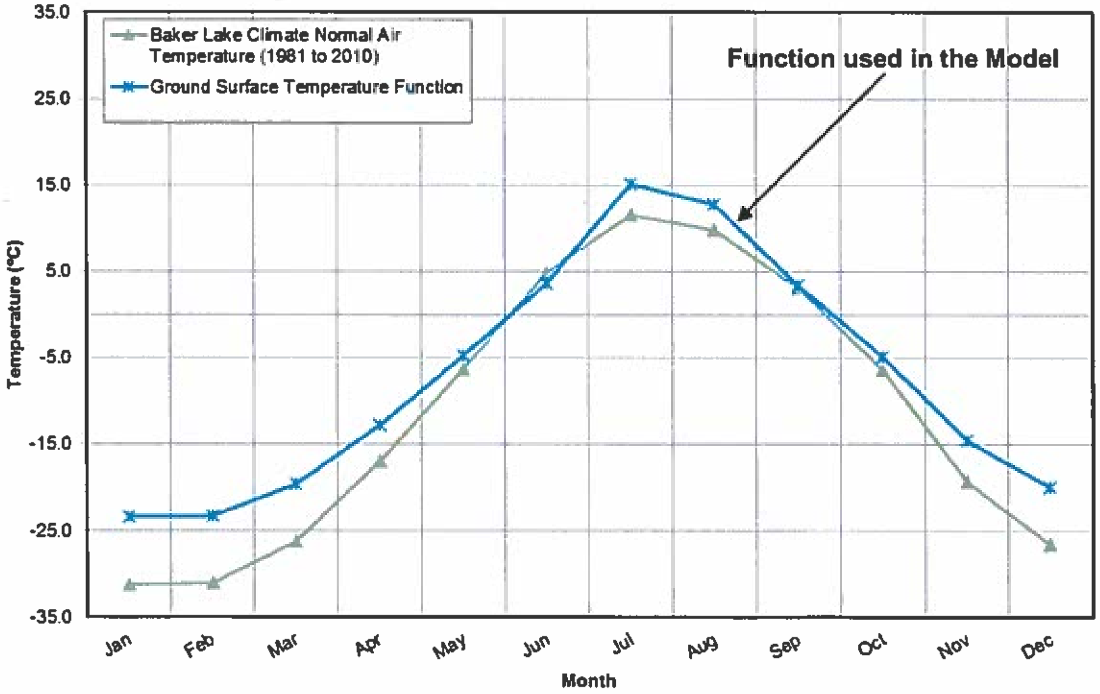


Figure 2: Monthly Air and Ground Surface Temperature Functions

4.2.2 Geothermal Gradient

A geothermal heat flux of 0.048 J/sec was applied to the models as the lower boundary condition based on the assumed bedrock thermal conductivity of 3.0 W/m-°C and a geothermal gradient of 0.016°C/m (Golder 2017a). This thermal gradient is consistent with the one estimated during the Meadowbank Project baseline study (Golder 2003).

4.2.3 Pit Lake Bottom Temperature

Typically, a mean annual lake bottom temperature is related to water depth in a permafrost region: the deeper the lake, the higher the expected mean annual lake bottom temperature. The mean annual lake bottom temperature is typically higher than the mean annual ground surface temperature in a permafrost region.

Deep pit lake temperatures tend to stabilize near +4°C at which the maximum water density typically occurs for fresh water and low salinity water. An assessment of the variation of the pit lake temperature was not carried out at this stage. A review of measured pit lake bottom temperatures from Pieters and Lawrence (2014) and Crusius et al. (2002) indicates the following:

- +3.5°C at about 110 m depth for Zone 2 Pit Lake at Colomac Mine located 250 km north of Yellowknife, NWT
- +5°C at about 90 m depth for Faro Pit Lake at Faro Mine near Faro, Yukon
- +4.5°C at about 60 m depth for Grum Pit Lake at Faro Mine near Faro, Yukon
- +4.2°C at about 50 m depth for Vangorda Pit Lake at Faro Mine near Faro, Yukon
- +5.2°C at about 120 m depth at Main Zone Pit Lake at Equity Mine near Houston, BC
- +5.5°C at about 40 m depth at Waterline Pit Lake at Equity Mine near Houston, BC

For the purpose of the modelling, the Whale Tail Pit Lake was assumed to have a constant mean annual bottom temperature of +4°C in all models based on the above review. Due to the depth of the proposed Whale Tail Pit Lake, meromictic conditions are expected to develop. When meromictic conditions are present, mixing of the surface and deep water is inhibited (stratification) which results in a stable bottom temperature.

For the relatively shallow lake area near the proposed water-retaining dike (Whale Tail Dike), a constant temperature of +2°C was assumed for the lake bottom.

4.3 Model Scenario and Assumptions

Pit flooding was adopted according to the mine schedule adopted in the 3D hydrogeological model at the time of the FEIS (Appendix 6-B of the FEIS). This 3D hydrogeological model also forms the basis of the post-closure prediction of groundwater inflows to the flooded pit lake. This thermal model was designed to provide reasonable assumptions for a conservative approach to melting of permafrost for the groundwater modelling. Since the FEIS, some changes in filling schedule have been potentially identified; however, for the scale of analysis being adopted and evaluated in the post-closure hydrogeological analysis, these changes will not significantly affect predictions of groundwater inflow quantity and quality to the pit lake. Pit flooding was assumed in the FEIS to commence in 2022 and was expected to reach the top of the pit / base of Whale Tail Lake (138 masl) in 2025. Subsequent re-flooding of Whale Tail Lake (North Basin) will continue until 2028. The assumed yearly water elevations during flooding is shown in Figure 3, and Table 5.

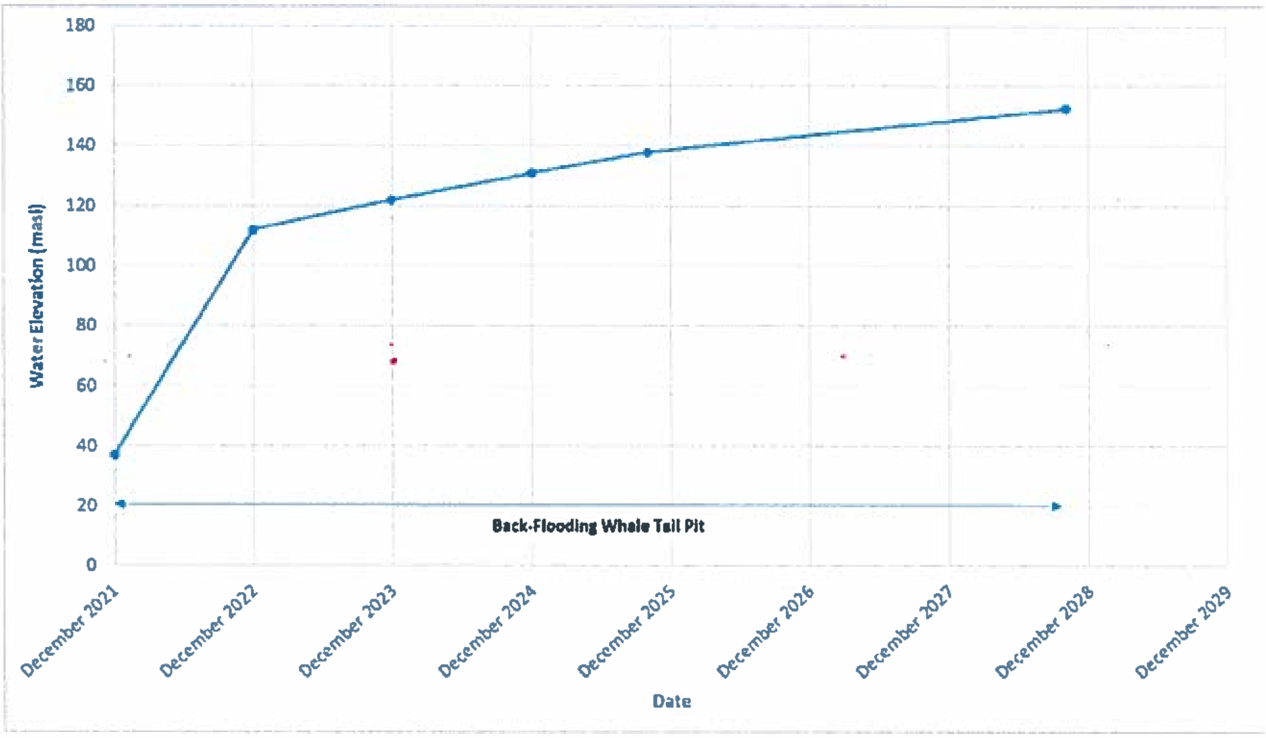


Figure 3: Whale Tail Pit Flooding Schedule from FEIS

The modelling scenario was developed to simulate the proposed Whale Tail Pit flooding elevations from years 1 to 7 as presented in Table 5.

Table 5: Thermal Model Back-Flooding Elevations

Year	Whale Tail Pit Back-Flooding Elevation (masl)
1	112
2	122
3	131
4	138
7	152.5

The post-closure pit lake and Whale Tail Lake are assumed to maintain the elevation of 152.5 masl.

The modelling was completed up to 300 years from start of flooding for the section through the centreline of the ultimate pit configuration. The model used the ground surface temperature function and a daily time step without consideration for any climate change. This hypothetical scenario assumed climatic conditions in 300 years remain similar to current site conditions.

The thermal modelling was completed to support the post-closure groundwater modelling in which the time to penetrate through the permafrost beneath the proposed Whale Tail Pit Lake was required. Climate change may accelerate slightly the warming progress of the upper ground thermal regime. This is considered to be insignificant for the purpose of supporting the hydrogeological study and therefore consideration for climate change was not included in the thermal model.

4.4 Thermal Conditions Prior to Flooding

Section A is located within Whale Tail Lake, in the longitudinal direction. Modelling the entire section is not expected to be appropriate to estimate the initial thermal conditions before pit flooding, as the lateral thermal impacts from surrounding colder ground cannot be accounted for in two dimensions. Instead, the initial thermal regime along section A was interpolated by modelling a steady-state condition of the northern terrace at the proposed Whale Tail Pit, the ground temperature data from thermistor AMQ17-1265A, and previous thermal analysis of the Whale Tail Lake completed by Golder (2017a). Based on the ground temperature profile from AMQ17-1265A, the extent of permafrost is expected to occur from El. 40.8 masl to -191 masl at the southeast side of the pit on section A. The assumed initial conditions are presented on Figure 2-1 of Attachment 2.

For the purpose of this assessment, the majority of the thermal regime prior to mining was assumed to be the same as when the mining is complete due to the short duration of mining. Some freeze-back during the pit mining is expected and was estimated to form a part of the initial thermal condition for the post-closure period.

5.0 SUMMARY OF MODEL RESULTS FOR THE POST-CLOSURE PERIOD

Post closure thermal modelling and hydrogeological analysis was not completed as part of the FEIS. In response to an information request regarding post closure groundwater flow, thermal modelling has been carried out to provide input to the hydrogeological study for post closure. The modelling was specifically conducted to evaluate how quickly the permafrost below Whale Tail Pit could melt following the formation of the Whale Tail Pit Lake during closure.

Several assumptions were made for the thermal modelling to evaluate when the permafrost below the pit could melt. The model results are presented in Figures 2-1 to 2-6 of Attachment 2 including:

- The assumed initial thermal conditions prior to pit flooding.
- Thermal conditions during the pit flooding in closure.
- Zero degree isolines at select years of post-closure, up to year 300.
- Steady-state thermal conditions for the post-closure pit lake.

The following findings are based on the model results:

- During pit flooding, the warm pit lake temperature impacts mostly the upper portion of the permafrost under the pit, and talik zones starts to occur around the pit wall and floor.
- The permafrost under the pit lake continues to thaw during the long term post-closure stage, and the open talik expands from the lake side (south) to the land side (north). The majority of the permafrost under the pit lake is thawed 300 years after closure.

- The steady-state model indicates the pit lake would thaw the permafrost in the long-term, and eventually reduce the permafrost depth under the ground northwest of the pit. A significantly longer time (in the order of 10,000 years) is likely required for the pit lake to reach the steady-state thermal conditions.

6.0 CLOSURE

The reader is referred to the Study Limitations, which follows the text and forms an integral part of this technical memorandum.

We trust this document satisfies you current requirements. If you have any questions or require further assistance, please do not hesitate to contact the undersigned.

GOLDER ASSOCIATES LTD.

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Attachments: Study Limitations
Attachment 1: Thermistor Readings
Attachment 2: Thermal Model Results

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature
Date 31 July 2018
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

https://golderassociates.sharepoint.com/sites/19830g/1000_phase1commitments/reports_all subphases/thermal modelling/rev0/1789310-174-tm-rev0-phase1whaletailpit post-closurethermal.docx

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STUDY LIMITATIONS

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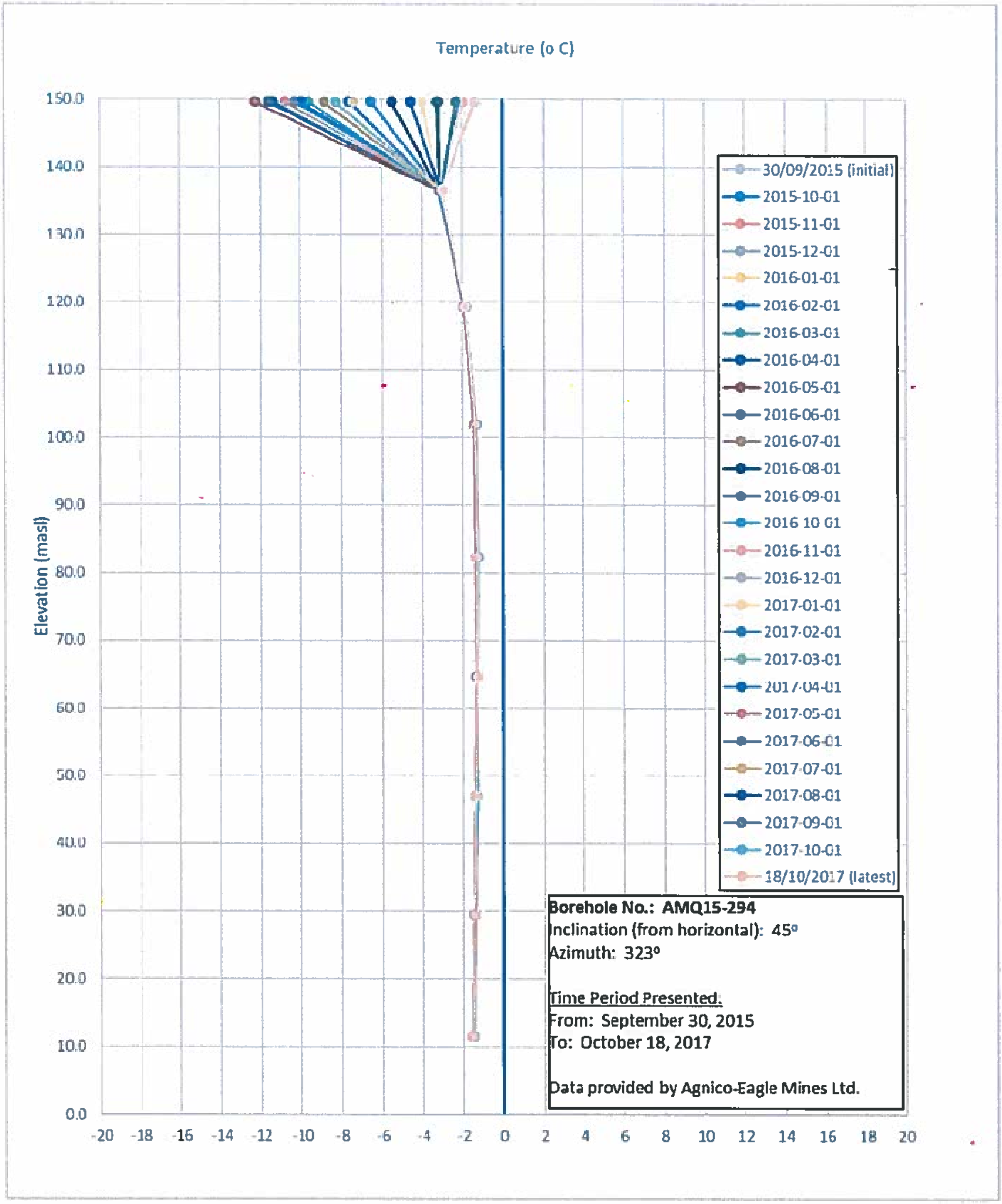
ATTACHMENT 1

Thermistor Readings



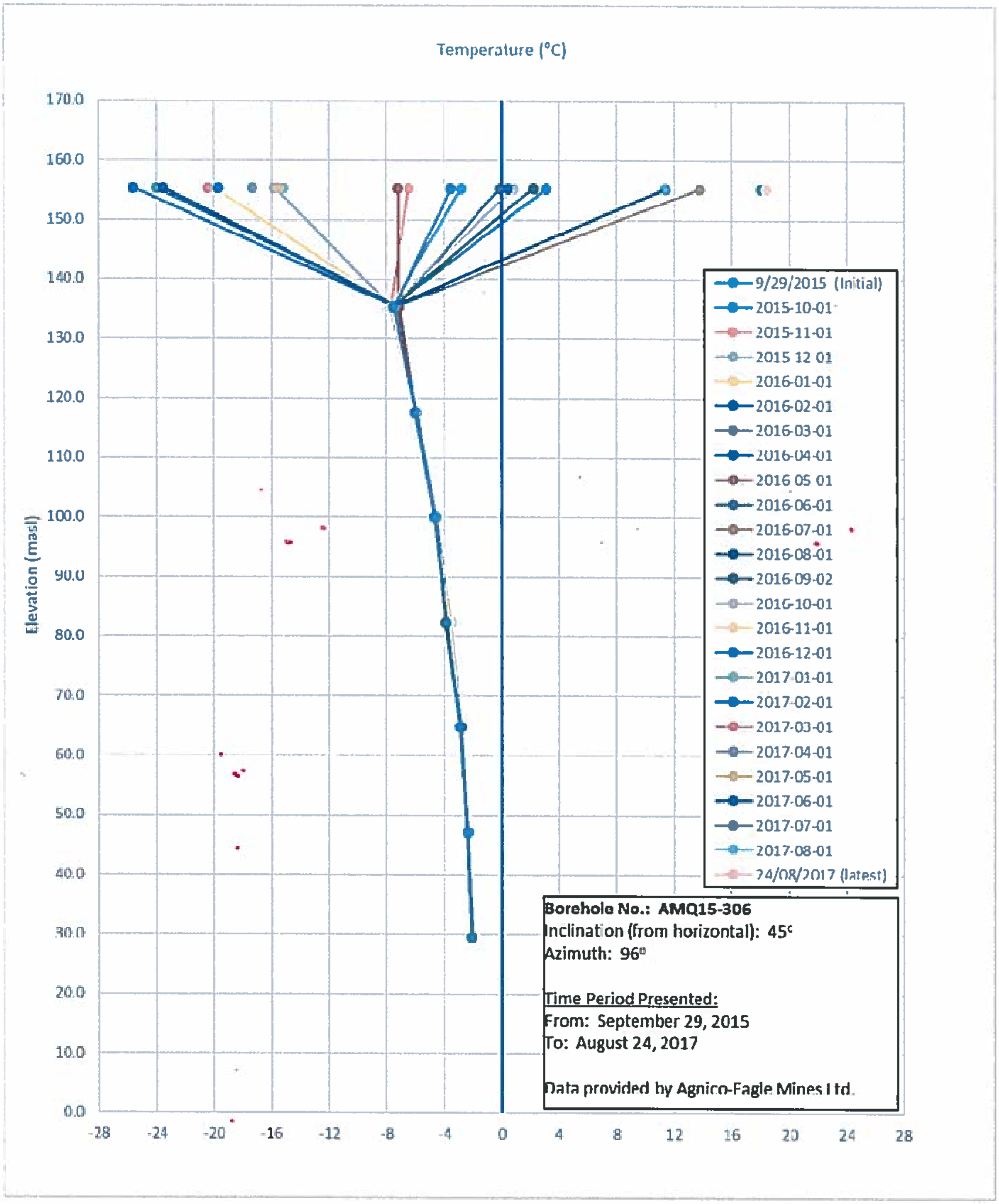
Borehole No.: AMQ15-294
Inclination (from horizontal): 45°
Azimuth: 323°

Time Period Presented.
From: September 30, 2015
To: October 18, 2017

Data provided by Agnico-Eagle Mines Ltd.

NOTE: Readings are shown once per month for clarity.

CLIENT	AGNICO EAGLE MINES LTD.
PROJECT	WHALE TAIL PIT PROJECT WHALE TAIL LAKE THERMAL ASSESSMENT NUNAVUT
CONSULTANT	GOLDER
YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC
TITLE	THERMISTOR AMQ15-294 2015/2017 READINGS
PROJECT No.	1789310
PHASE/TASK	1000/12020
Rev.	0
FIGURE	1-1



NOTE: Readings are shown once per month for clarity.

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ15-306 2015/2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
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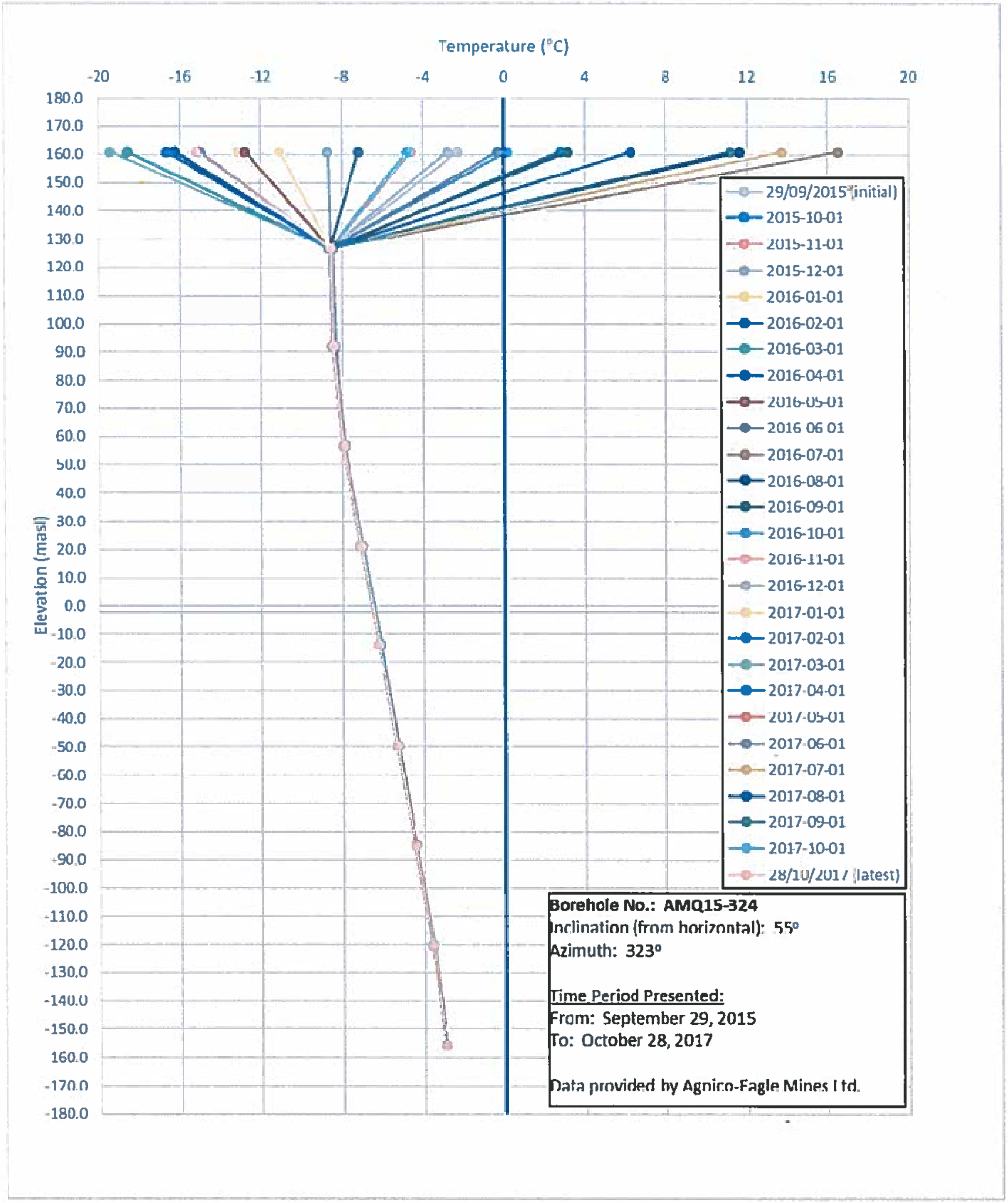

Borehole No.: AMQ15-324
Inclination (from horizontal): 55°
Azimuth: 323°

Time Period Presented:
From: September 29, 2015
To: October 28, 2017

Data provided by Agnico-Eagle Mines Ltd.

NOTE: Readings are shown once per month for clarity.

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ15-324 2015/2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
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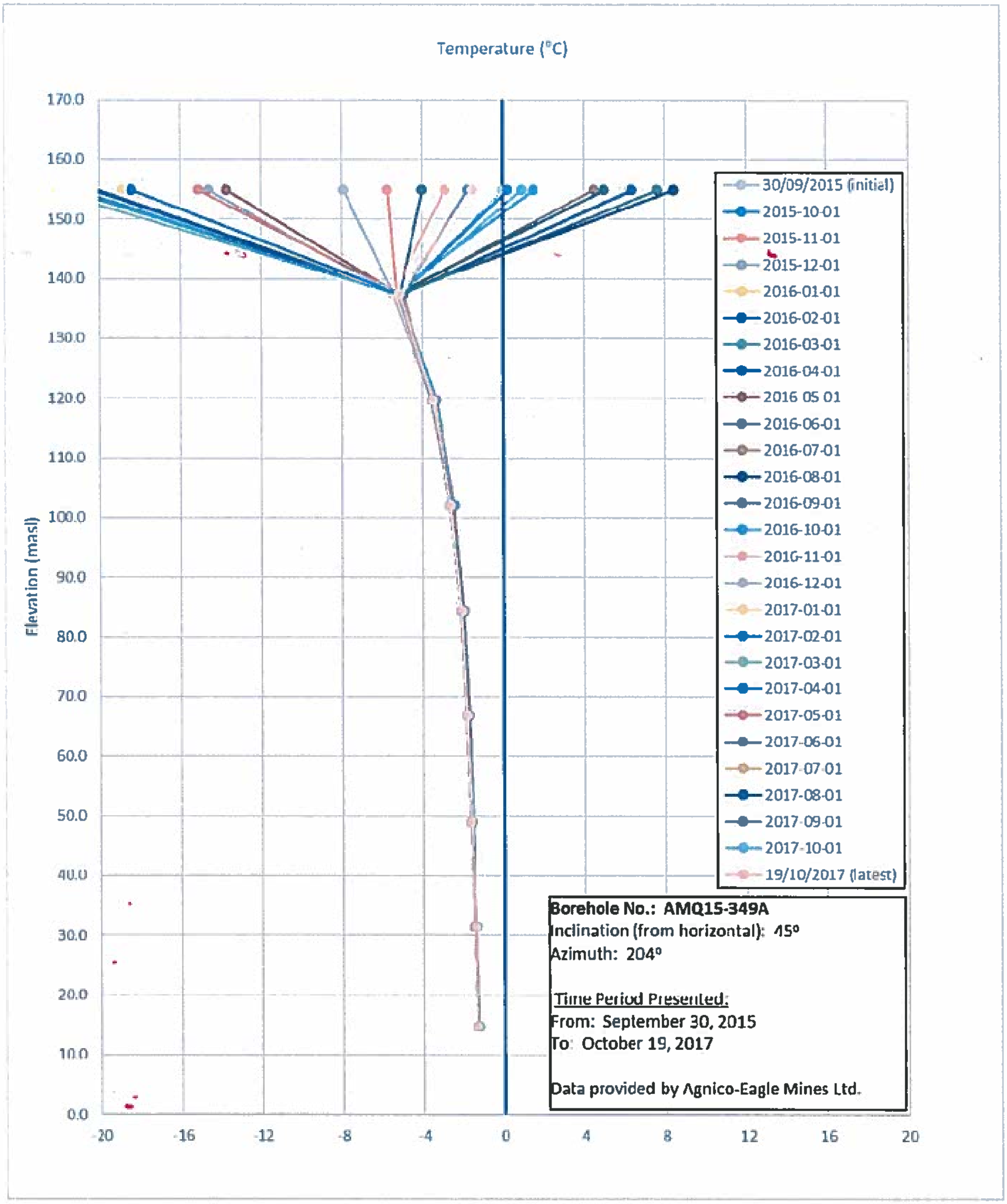

NOTE: Readings are shown once per month for clarity.

CLIENT
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

TITLE
THERMISTOR AMQ15-349A 2015/2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
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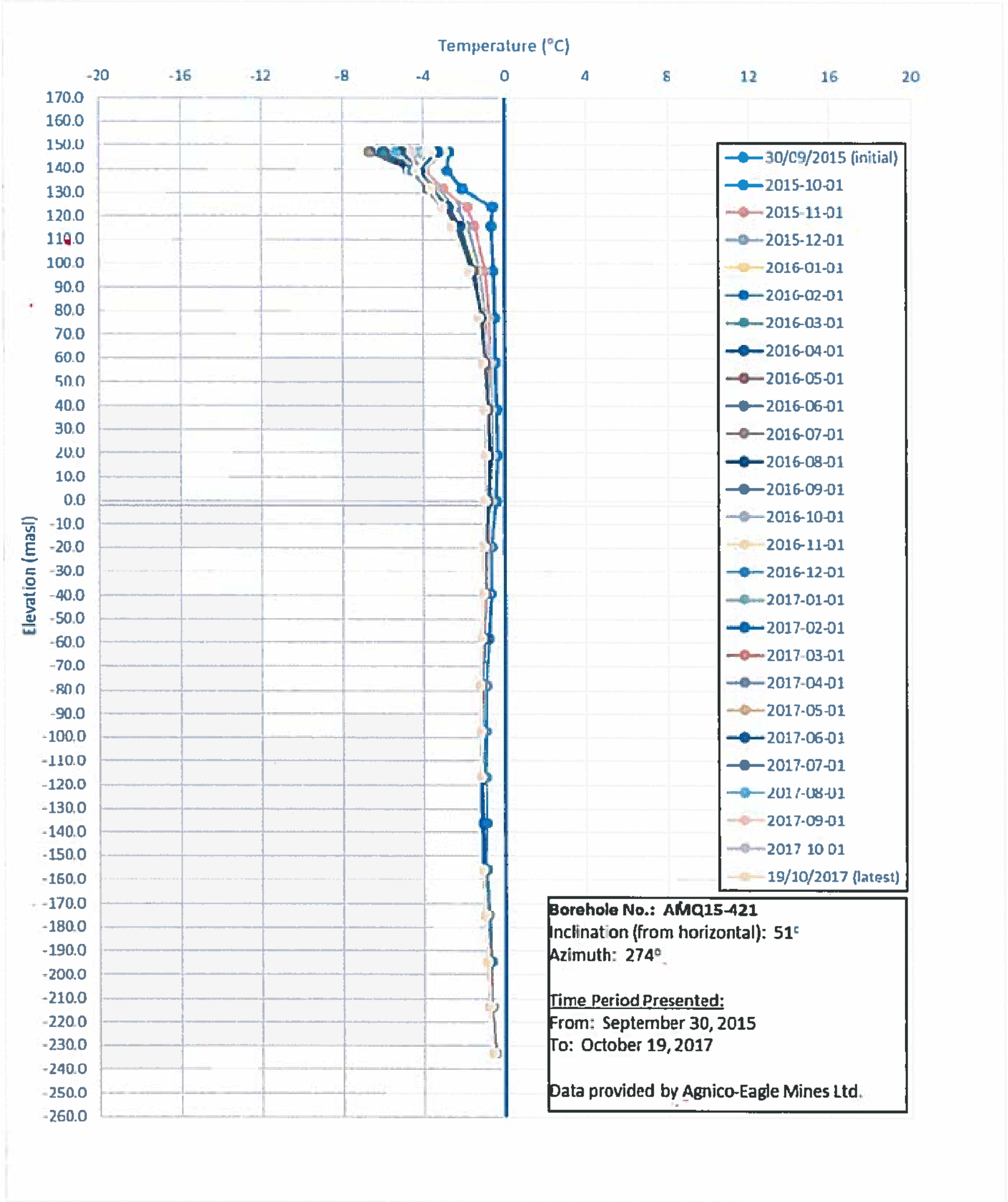

Borehole No.: AMQ15-421
Inclination (from horizontal): 51°
Azimuth: 274°

Time Period Presented:
From: September 30, 2015
To: October 19, 2017

Data provided by Agnico-Eagle Mines Ltd.

NOTE: Readings are shown once per month for clarity.

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ15-421 2015/2017 READINGS

PROJECT No	PHASE/TASK	Rev	FIGURE
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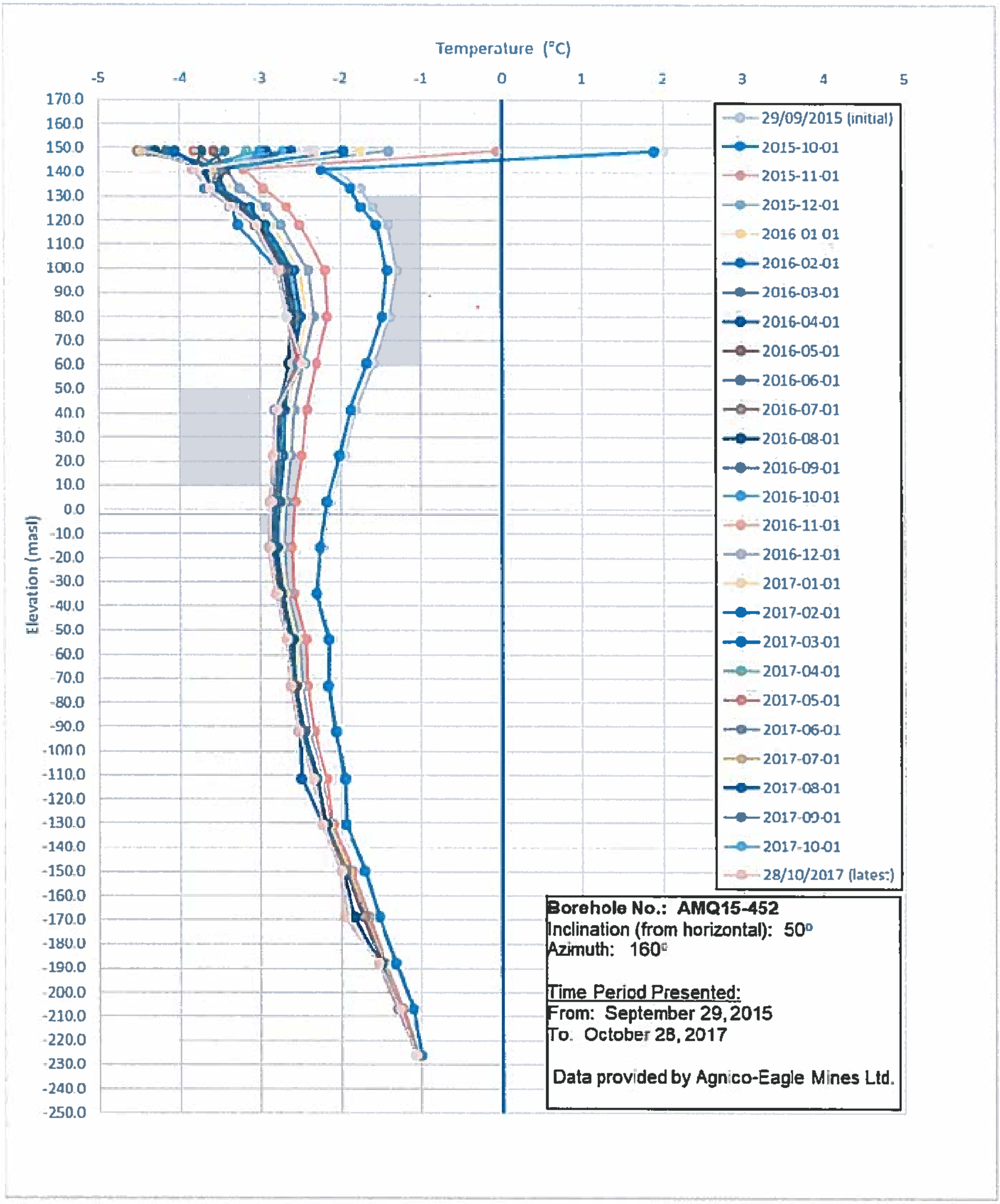

Borehole No.: AMQ15-452
Inclination (from horizontal): 50°
Azimuth: 160°

Time Period Presented:
From: September 29, 2015
To: October 28, 2017

Data provided by Agnico-Eagle Mines Ltd.

NOTE: Readings are shown once per month for clarity.

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ15-452 2015/2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
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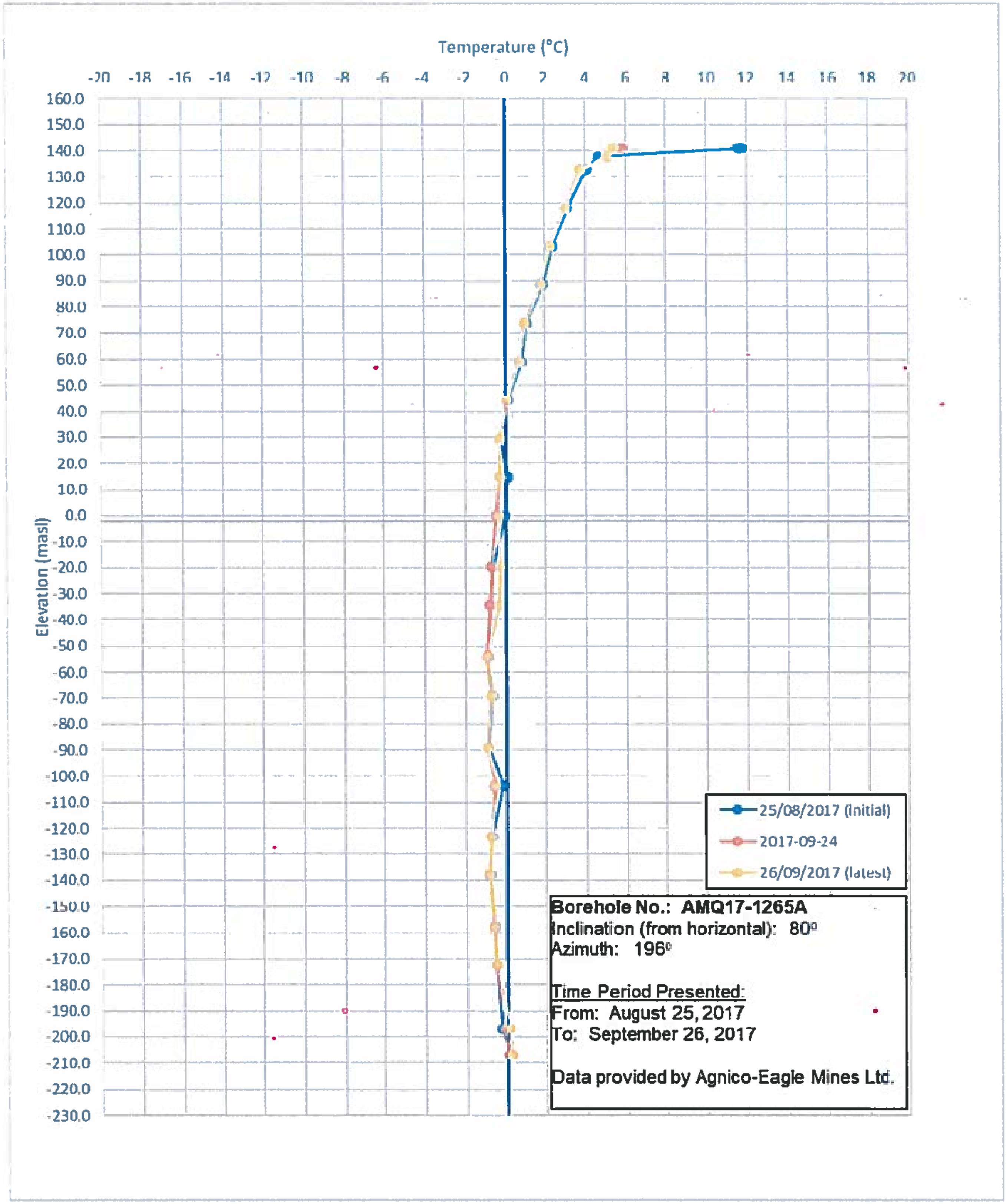


Borehole No.: AMQ17-1265A
Inclination (from horizontal): 80°
Azimuth: 196°

Time Period Presented:
From: August 25, 2017
To: September 26, 2017

Data provided by Agnico-Eagle Mines Ltd.

CLIENT
AGNICO EAGLE MINES LTD.

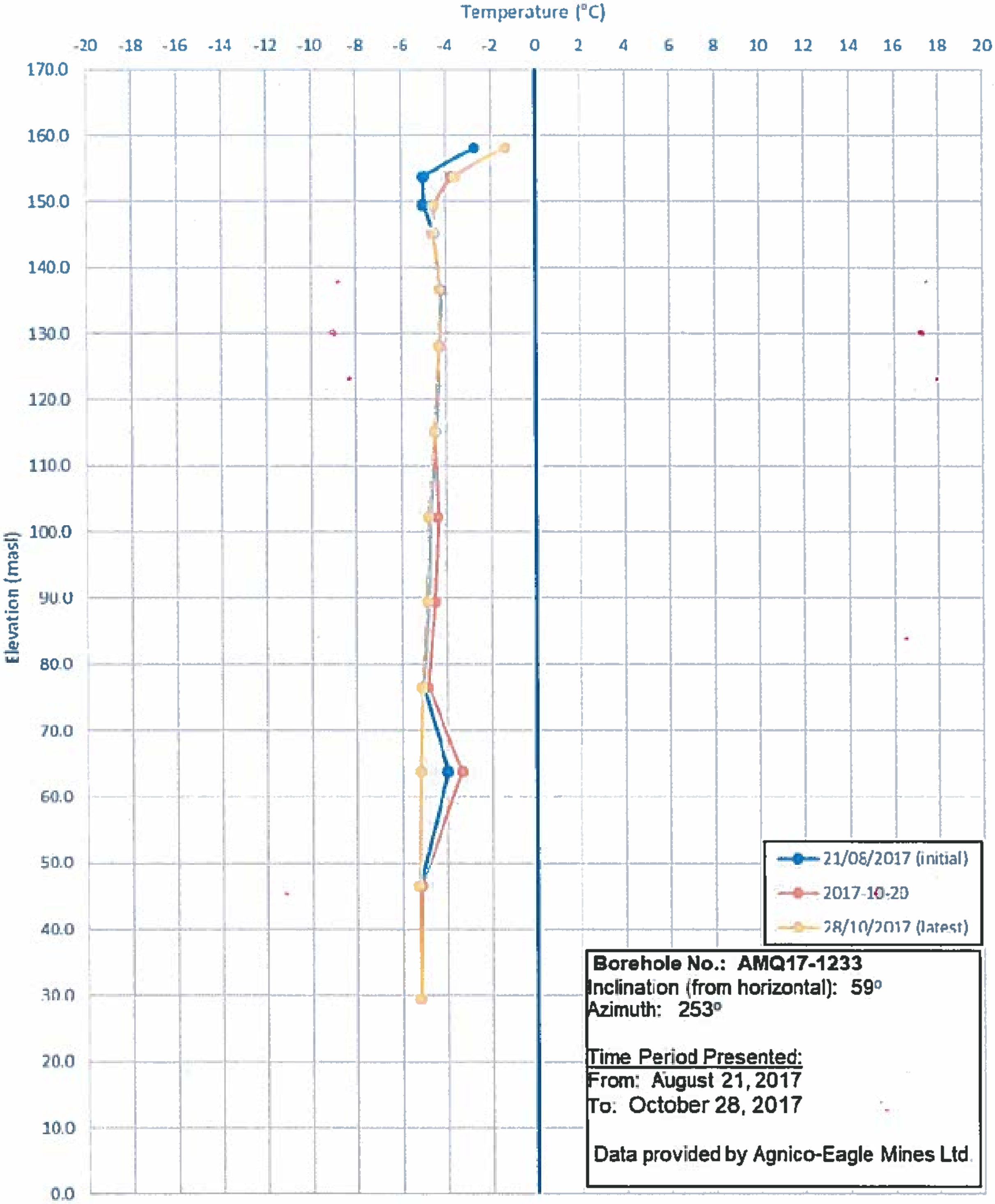
PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ17-1265A 2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
1789310	1000/12020	0	1-7



Borehole No.: AMQ17-1233
Inclination (from horizontal): 59°
Azimuth: 253°

Time Period Presented:
From: August 21, 2017
To: October 28, 2017

Data provided by Agnico-Eagle Mines Ltd.

CLIENT
AGNICO EAGLE MINES LTD.

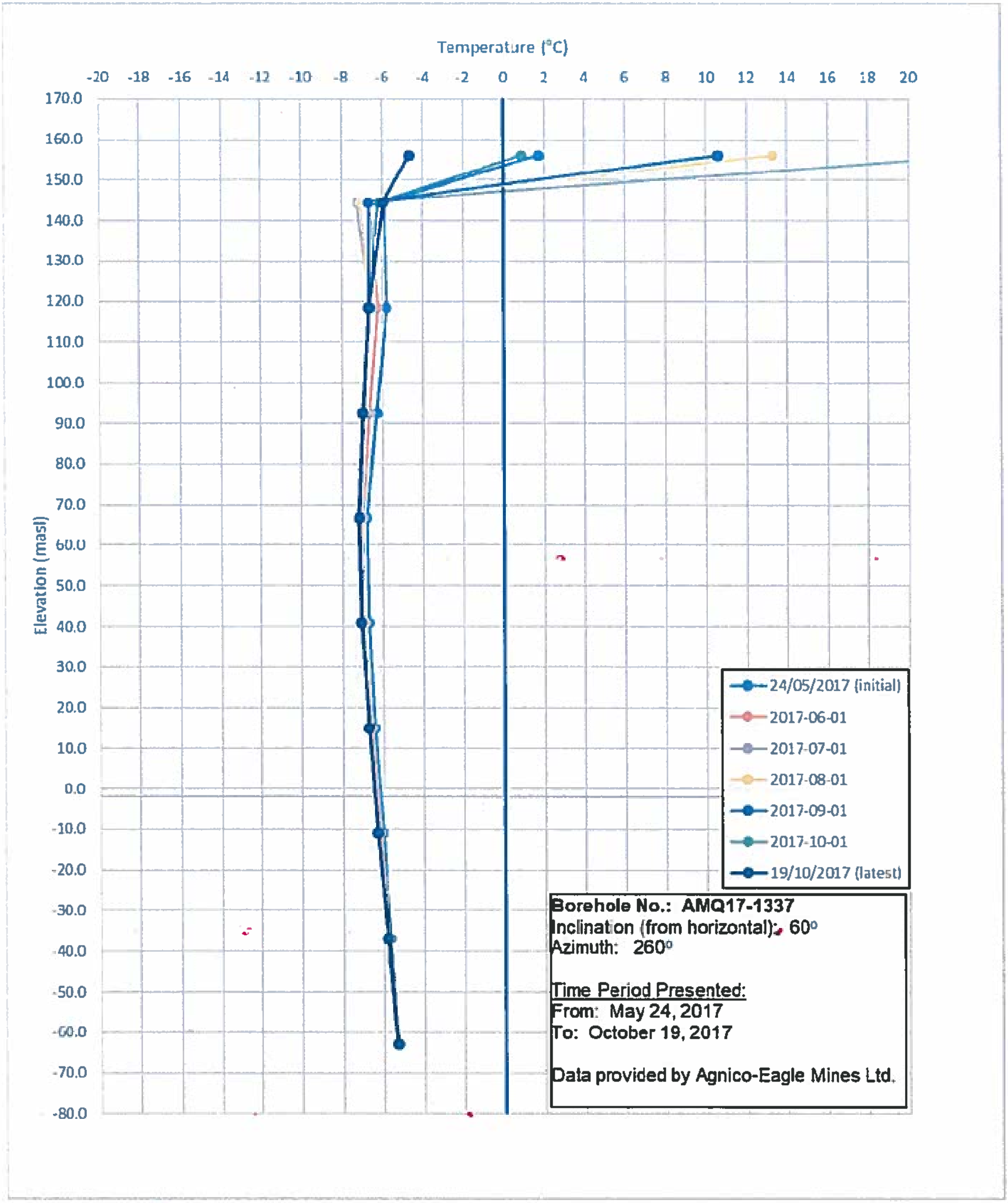
PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ17-1233 2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
1789310	1000/12020	0	1-8



Borehole No.: AMQ17-1337
Inclination (from horizontal): 60°
Azimuth: 260°

Time Period Presented:
From: May 24, 2017
To: October 19, 2017

Data provided by Agnico-Eagle Mines Ltd.

NOTE: Readings are shown once per month for clarity.

CLIENT
AGNICO EAGLE MINES LTD.

PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

CONSULTANT
GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ17-1337 2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
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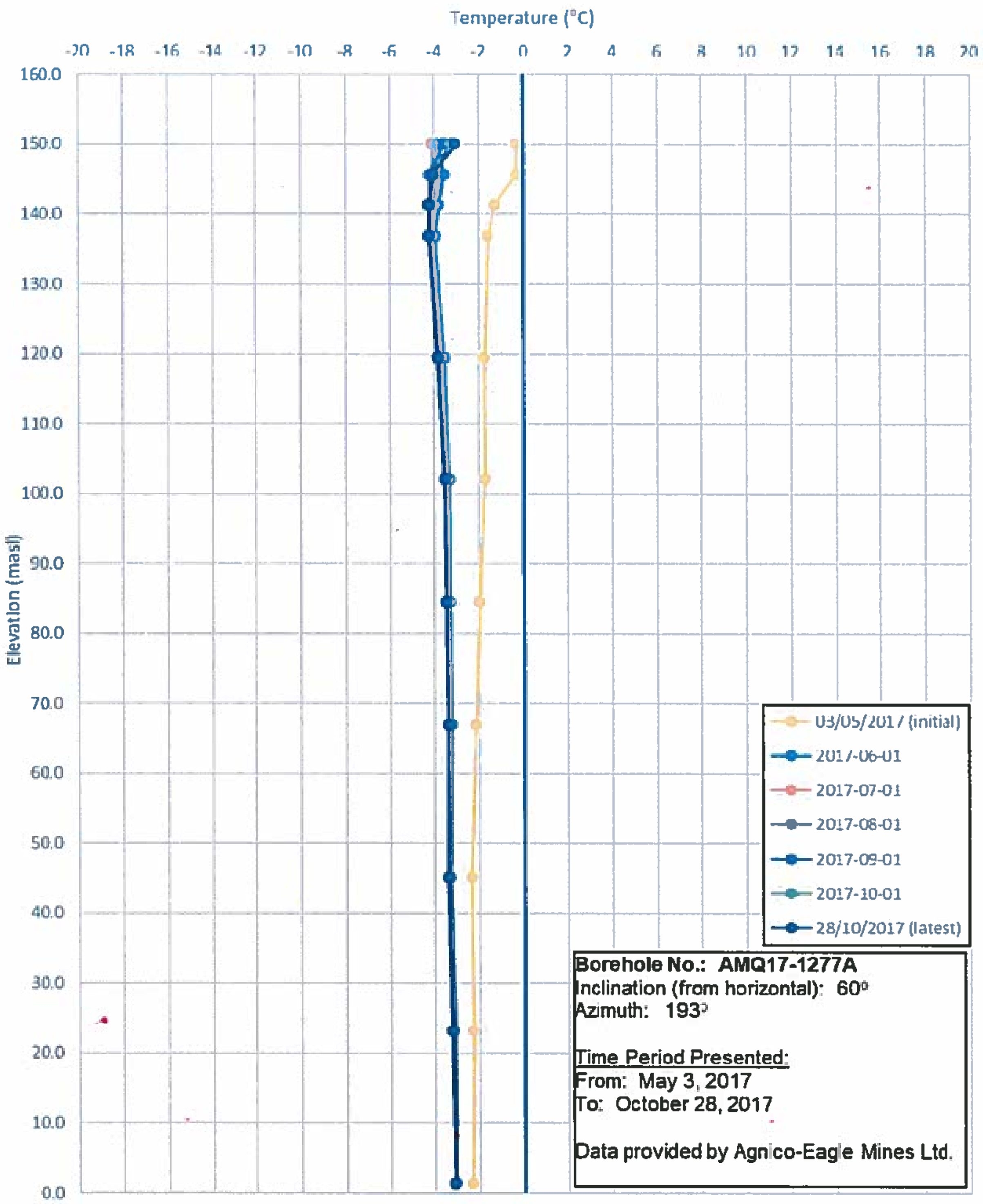


Borehole No.: AMQ17-1277A
Inclination (from horizontal): 60°
Azimuth: 193°

Time Period Presented:
From: May 3, 2017
To: October 28, 2017

Data provided by Agnico-Eagle Mines Ltd.

NOTE: Readings are shown once per month for clarity.

CLIENT AGNICO EAGLE MINES LTD.	PROJECT WHALE TAIL PIT PROJECT WHALE TAIL LAKE THERMAL ASSESSMENT NUNAVUT

CONSULTANT

GOLDER

YYYY-MM-DD	2018-01-19
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

TITLE
THERMISTOR AMQ17-1277A 2017 READINGS

PROJECT No.	PHASE/TASK	Rev.	FIGURE
1789310	1000/12020	0	1-10

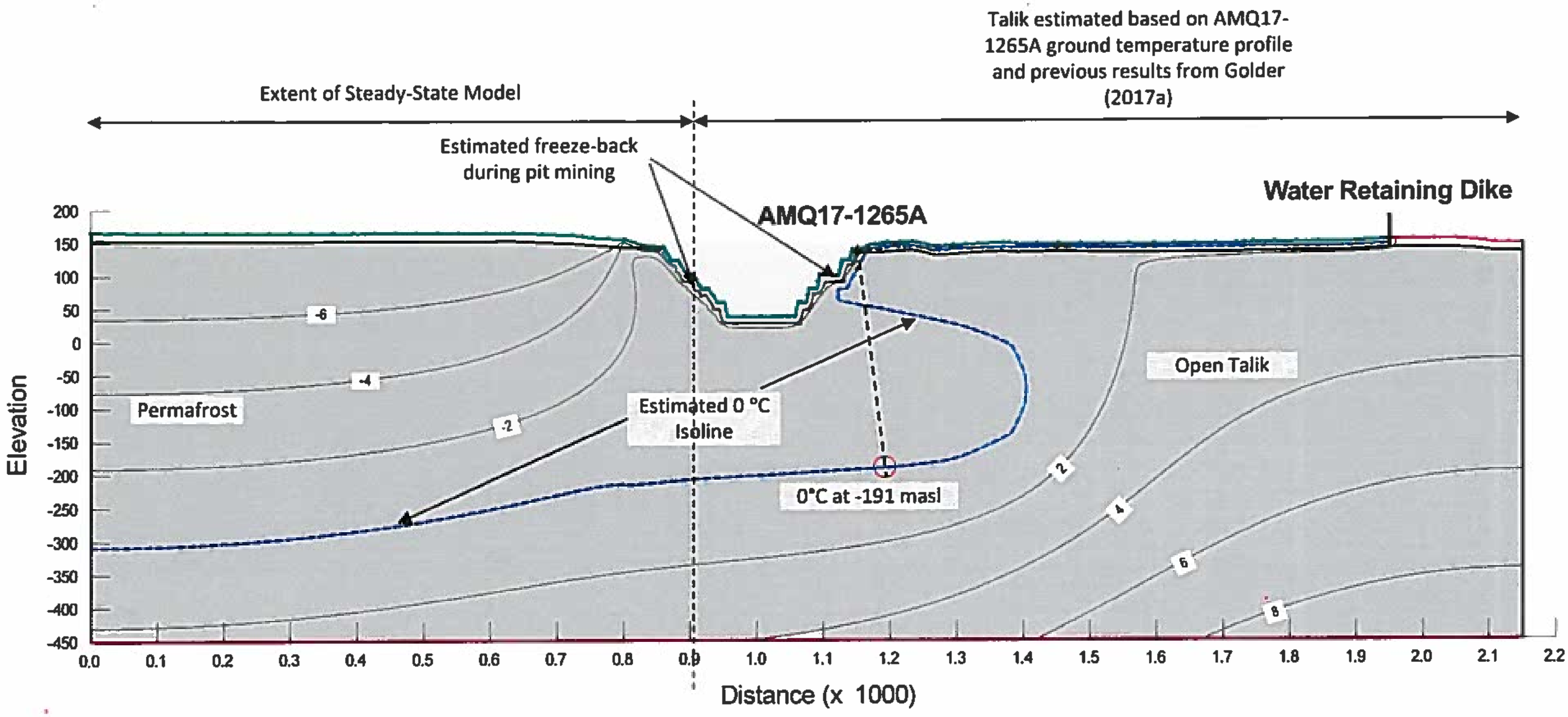
Path: O:\Active\2018\03 Proj\1789310 AEM\Whale Tail\05100 Permafrost\Background

1 in
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

ATTACHMENT 2

Thermal Model Results

Path: O:\Active\2016\3 Proj\1665859 Agnico Eagle_Water Mgmt_Whale Tail\1789310_Thermal\Thermal Analysis



File Name: Phase 1 Section.gsz

Notes

1. Location of thermistor AMQ17-1265A is approximate.
2. Temperature contour interval 2 °C.

CLIENT
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

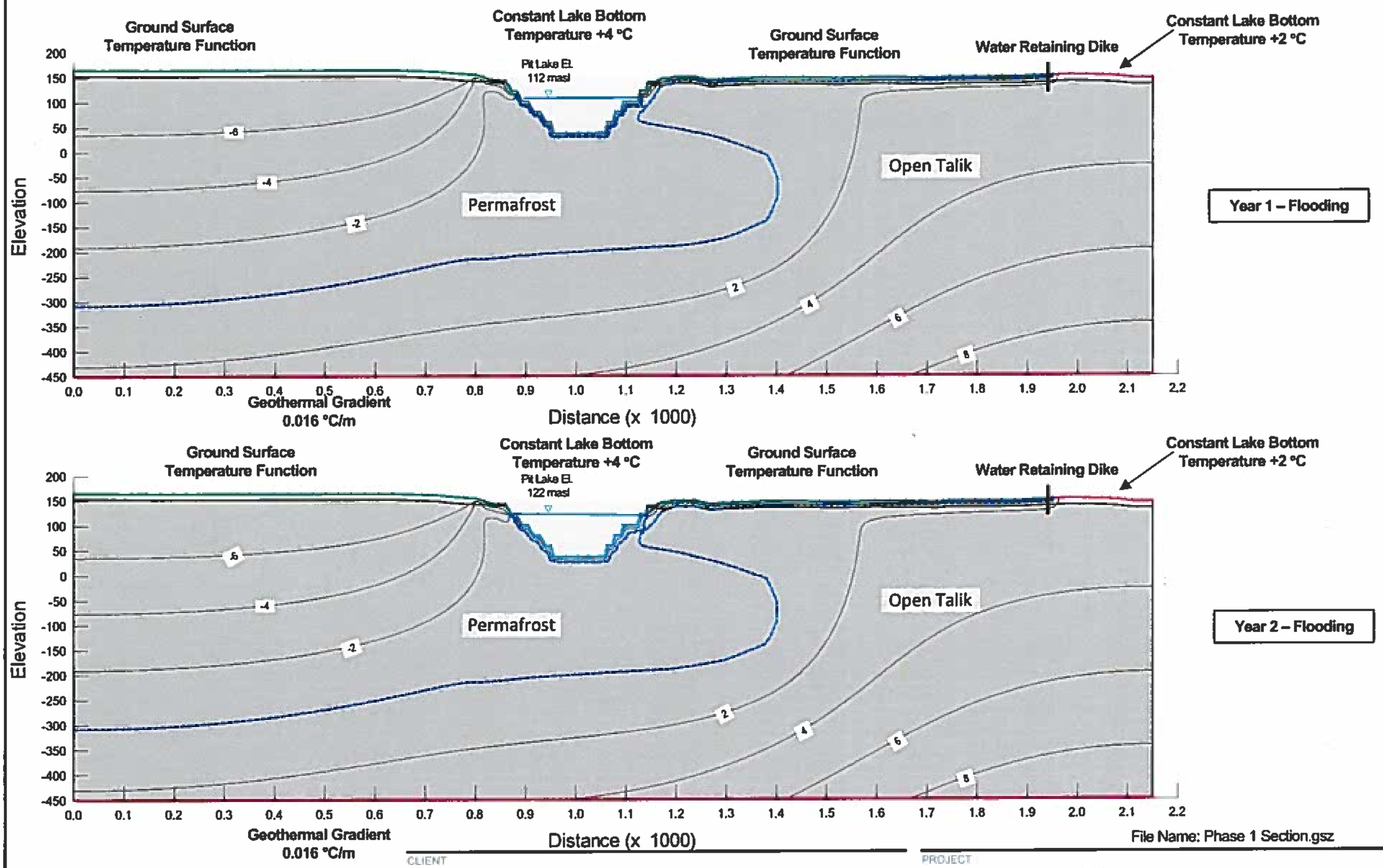
YYYY-MM-DD	2018-04-03
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

PROJECT
WHALE TAIL PIT PROJECT
POST-CLOSURE PIT LAKE THERMAL ANALYSIS
NUNAVUT

TITLE
TRANSIENT THERMAL MODELLING
ASSUMED INITIAL CONDITION
BEFORE PIT FLOODING

PROJECT No	Phase/Task	Rev	Figure
1789310	1000/12020	0	2-1

Path: O:\Active\2016\3 Proj\1665659 Agnico Eagle_Water Mgmt_Whale Tail\1789310_Thermal\Thermal Analysis



File Name: Phase 1 Section.gsz

Notes

1. Location of thermistor AMQ17-1265A is approximate.
2. Temperature contour interval 2 °C.

CLIENT
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

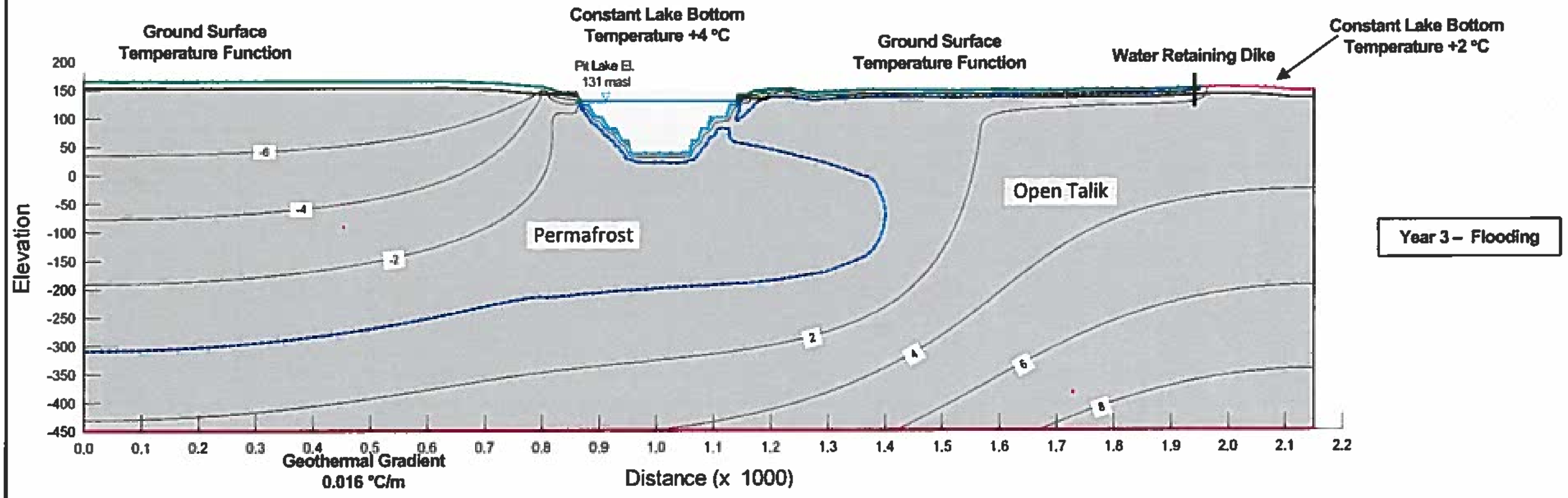
YYYY-MM-DD	2018-04-03
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

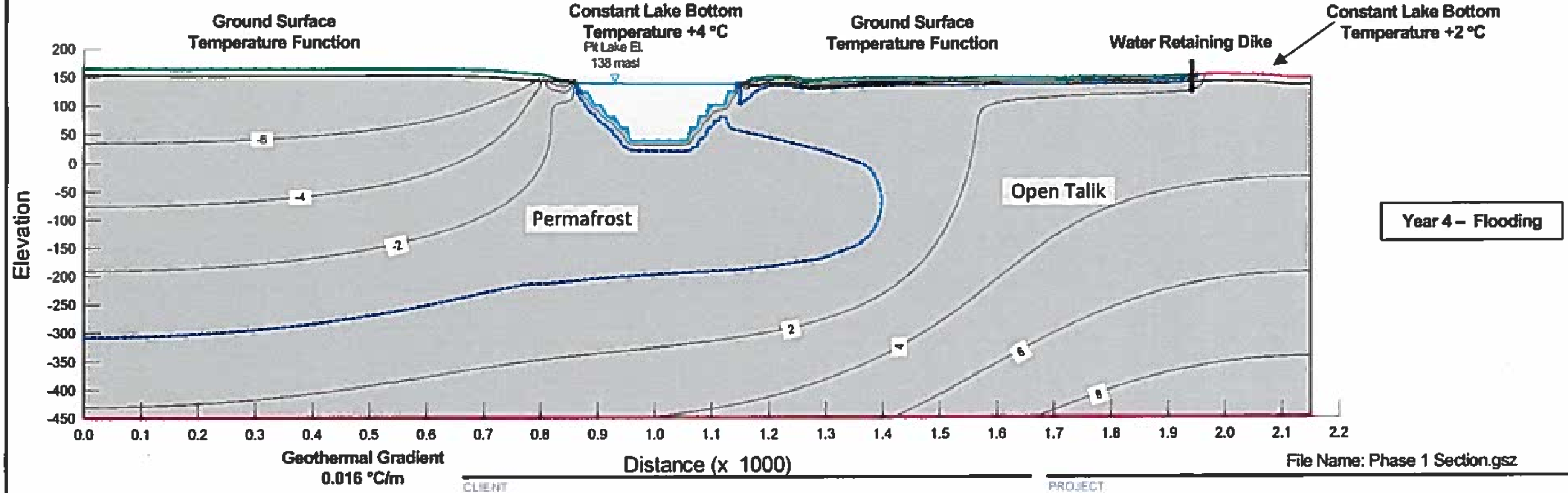
PROJECT
WHALE TAIL PIT PROJECT
POST-CLOSURE PIT LAKE THERMAL ANALYSIS
NUNAVUT

TITLE
TRANSIENT THERMAL MODELLING
PIT FLOODING
YEARS 1 & 2

PROJECT No	Phase/Task	Rev	Figure
1789310	1000/12020	0	2-2

Path: O:\Active\2016\3 Proj\1665859 Agnico Eagle_Water Mgmt_Whale Tail\1789310_Thermal\Thermal Analysis





File Name: Phase 1 Section.gsz

Notes

1. Location of thermistor AMQ17-1265A is approximate.
2. Temperature contour interval 2 °C.

CLIENT
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

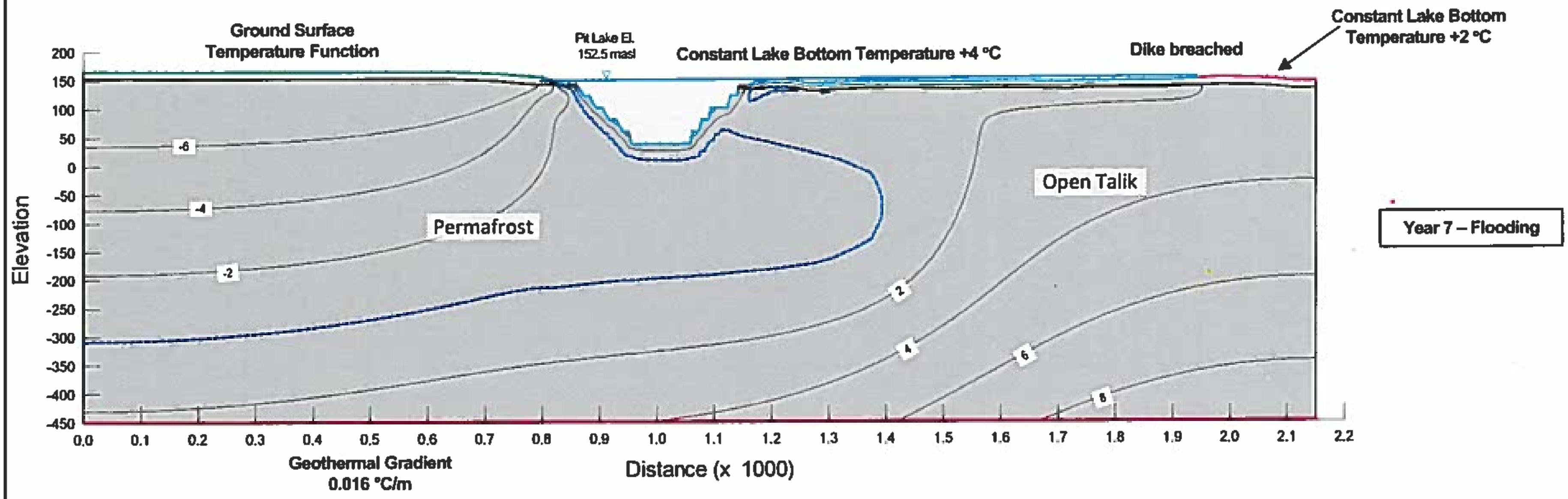
YYYY-MM-DD	2018-04-03
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

PROJECT
WHALE TAIL PIT PROJECT
POST-CLOSURE PIT LAKE THERMAL ANALYSIS
NUNAVUT

TITLE
TRANSIENT THERMAL MODELLING
PIT FLOODING
YEARS 3 & 4

PROJECT No	Phase/Task	Rev	Figure
1789310	1000/12020	0	2-3

Path: O:\Active\2016\3 Proj\1665859 Agnico Eagle_Water Mgmt_Whale Tail\1789310_Thermal\Thermal Analysis



File Name: Phase 1 Section.gsz

Notes

1. Location of thermistor AMQ17-1265A is approximate.
2. Temperature contour interval 2 °C.

CLIENT
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

YYYY-MM-DD	2018-04-03
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

PROJECT
WHALE TAIL PIT PROJECT
POST-CLOSURE PIT LAKE THERMAL ANALYSIS
NUNAVUT

TITLE
TRANSIENT THERMAL MODELLING
PIT FLOODING
YEAR 7

PROJECT No	Phase/Task	Rev	Figure
1789310	1000/12020	0	2-4

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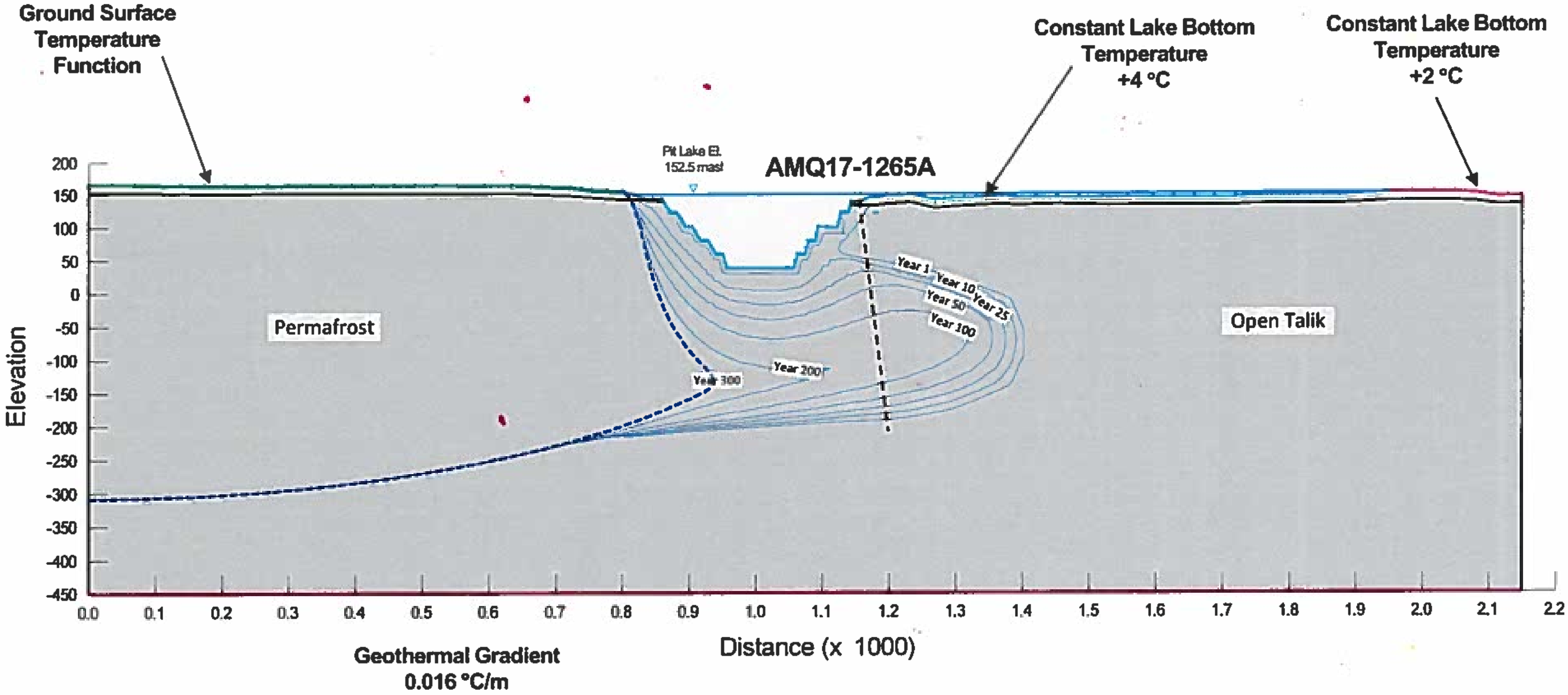


File Name: Phase 1 Section.gsz

Notes

1. Location of thermistor AMQ17-1265A is approximate.
2. The 300 year isotherm includes the 7 years of back-flooding.

CLIENT
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

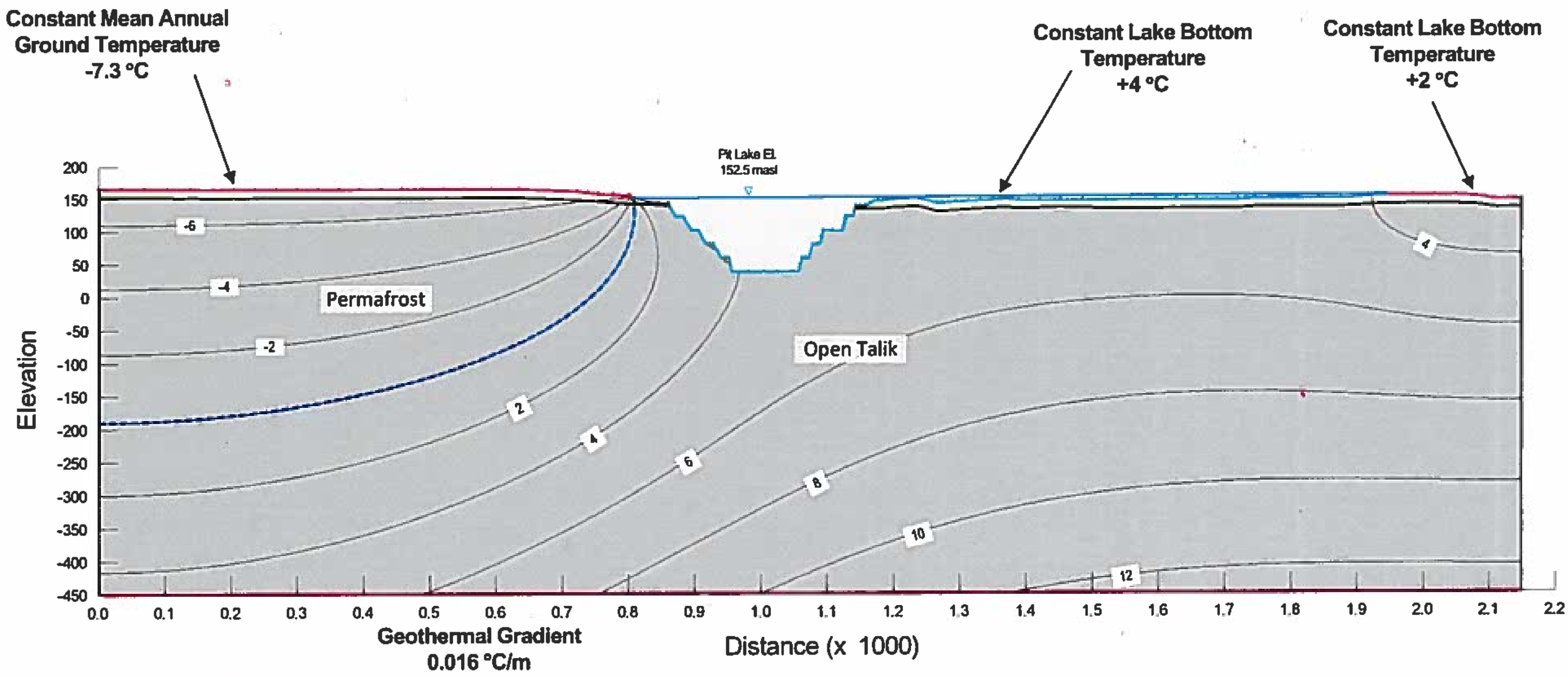
YYYY-MM-DD	2018-04-03
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

PROJECT
WHALE TAIL PIT PROJECT
POST-CLOSURE PIT LAKE THERMAL ANALYSIS
NUNAVUT

TITLE
TRANSIENT THERMAL MODELLING
POST-CLOSURE PIT LAKE
ZERO DEGREE ISOTHERMS AT SELECT YEARS

PROJECT No.	Phase/Task	Rev.	Figure
1789310	1000/12020	0	2-5

Path: O:\Active\2016\3 Proj\1665859 Agnico Eagle_Water Mgmt_Whale Tail\1789310_Thermal\Thermal Analysis



Notes

1. Location of thermistor AMQ17-1265A is approximate.
2. Temperature contour interval 2 °C.

File Name: Phase 1 Section.gsz

CLIENT
AGNICO EAGLE MINES LTD.

CONSULTANT
GOLDER

YYYY-MM-DD	2018-04-03
PREPARED	CTM
DESIGN	CTM
REVIEW	SO
APPROVED	JFC

PROJECT
WHALE TAIL PIT PROJECT
POST-CLOSURE PIT LAKE THERMAL ANALYSIS
NUNAVUT

TITLE
STEADY-STATE THERMAL MODELLING
POST-CLOSURE PIT LAKE
THERMAL REGIME

PROJECT No	Phase/Task	Rev	Figure
1789310	1000/12020	0	2-6

APPENDIX C – 2019 UPDATED WHALE TAIL LAKE THERMAL ASSESSMENT

REPORT

Whale Tail Lake Thermal Assessment

Submitted to:

Agnico Eagle Mines Limited - Meadowbank Division

Submitted by:

Golder Associates Ltd.

6925 Century Avenue, Suite #100, Mississauga, Ontario, L5N 7K2, Canada

+1 905 567 4444

18108905-276-RPT-Rev0

April 2019

Table of Contents

TABLES

APPENDICES

1.0 INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is planning mining of the Whale Tail Pit Project, a satellite deposit located on the Amaruq exploration property in Nunavut. The project site is located approximately 50 km northwest of Agnico Eagle's operating Meadowbank Mine.

Agnico Eagle plans to mine the Whale Tail deposit by open pit and underground mining. Agnico Eagle holds an advanced exploration Type B licence (2BB-MEA1318) for the underground development, which requires minimizing contact water discharge during the ramp advancement. The proposed ramp extends down to an elevation of about 225 m below sea level (or about 375 m below Whale Tail Lake surface level). To the extent possible according to the orebody depth, the ramp needs to be maintained within the permafrost regime to minimize the groundwater inflow into the ramp. Figure 1 shows the Amaruq Exploration site plan with Whale Tail Lake bathymetry, proposed mine facility locations, proposed open pit outlines, and thermistor locations. This figure also shows the locations of seven cross sections (A to G) used to prepare thermal models to evaluate current permafrost conditions in the project area.

Golder Associates Ltd. (Golder) was retained to carry out a thermal assessment for the Project to:

- Evaluate existing permafrost characteristics in the Whale Tail Lake and Project area.
- Evaluate existing talik conditions under the Whale Tail Lake adjacent to the Project site.

This report presents a review and summary of estimated permafrost conditions based on available thermistor data to date, as well as the results of a thermal modelling exercise prepared to assess permafrost conditions and the extent of talik formations beneath the Whale Tail Lake.

2.0 SITE CONDITIONS

2.1 Regional Permafrost Conditions

The Whale Tail Pit Project is in the zone of continuous permafrost. Permafrost refers to subsurface soil or rock where temperatures remain at or below 0ºC for at least two consecutive years. This is synonymous with perennially cryotic ground, which may be frozen, partially frozen, or non-frozen depending on the ice/water content of the ground, and the salinity of the groundwater. The base of the permafrost is expected to be an undulating surface and the actual depth to permafrost is variable.

The land surface of the Whale Tail Pit Project is underlain by permafrost except under the lake where water is too deep to freeze to the bottom during winter. Taliks (areas of unfrozen ground) are expected beneath a water body where the water depth is greater than the ice thickness. Closed talik formations show a depression in the permafrost table below relatively shallower and smaller lakes. Open talik formations that penetrate through the permafrost and connect the lake waterbody with the sub-permafrost regime are to be expected for relatively deeper and larger lakes in the Project area.

Published data regarding permafrost indicates that the ground ice content in the region is expected to be between 0% and 10% (dry permafrost) based on Natural Resources Canada (1995).

2.2 Subsurface Geology

The Whale Tail deposit is in the northern portion of the Whale Tail Lake. Based on previous site investigation data, soils in the project area are typically medium to coarse grained glacial till and colluvium with high coarse fragment content overlying bedrock at shallow depths (less than 1 m). Saturated soil layers overlying frozen layers have been observed on site. A review of the records of the six thermistor boreholes indicates soil thicknesses varying from 6.1 to 12.4 m. Underlying the soil, bedrock in the area generally consists of a stratigraphic sequence of greywacke, komatiite, and ultramafics, with varying thicknesses.

2.3 Site Climatic Conditions

Table 1 presents a summary of the site climate data for air temperature and precipitation. A mean annual air temperature of -11.3 °C was obtained for the site, based on climate data provided by Agnico Eagle (Golder 2016a).

Table 1: Mean Climate Characteristics (Golder 2016a)

Month	Mean Air Temperature (°c)	Monthly Precipitation	
		Rainfall (mm)	Snowfall Water Equivalent (mm)
January	-31.3	0	11
February	-31.1	0	9
March	-26.3	0	14
April	-17.0	0.5	20
May	-6.4	6	12
June	4.9	21	5
July	11.6	45	0
August	9.8	48	2
September	3.1	40	11
October	-6.5	7	34
November	-19.3	0	26
December	-26.8	0	16
Annual	-11.3	168	160

The thermal modelling exercise described in this document was prepared to allow for assessment of existing permafrost conditions in the project site, and therefore does not incorporate climate change in the long-term. Climate change is anticipated to be minimal and to have no impact on permafrost conditions during the operational stage of the Project.

2.4 Lake Elevation and Temperature

Lake elevation measurements for Whale Tail Lake were available from 25 July 2016 to 4 September 2016. The lake elevation varies from 151.2 m above sea level (masl) to 152.7 masl with an average elevation of 151.7 masl. The average depth of Whale Tail Lake is 4.4 m based on the bathymetry provided by Agnico Eagle. Based on bathymetry data, the maximum lake depth is 16.7 m, located in the area near borehole AMQ16-626 (Figure 1) and where the project's attenuation pond is planned.

Golder (2016b) reported that water temperature in the Whale Tail Lake ranged from 9 to 11.5°C during the summer months in 2015. In May 2017, thermistor AMQ17-1265A was installed in the Whale Tail Lake with its upper two beads being in water, which can be used as reference for lake water temperature at that location where the lake is about 11 m deep. Few scattered data for this thermistor was available between August and September 2017, and between July 2018 and the end of October 2018. During this period, the maximum lake temperature was 13.9 °C on July 26, 2018, the minimum lake temperature was 0.08°C measured on September 28, 2018, and the average water temperature was 3.2 °C. Winter lake water temperature data was not available at the time of this study, but it is anticipated that the average annual lake temperature would be lower when considering lake winter temperatures. Typically, mean annual lake temperature is related to the depth of water in a permafrost region: the deeper the lake, the higher the lake bottom temperature. A typical lake bottom temperature range for northern lakes is +2 °C to +4 °C based on literature review and past project experience in the area (Burn 2002; Golder 2003).

3.0 SITE PERMAFROST CONDITIONS

The following sections present a summary of site permafrost conditions estimated based directly on available thermistor data and, indirectly on a Westbay well system.

3.1 Site Thermistor

3.1.1 Locations

The location of active thermistors within the vicinity of the area of interest is shown in Figure 1 and Table 2 presents a summary of installation information.

Table 2: Borehole and Thermistor Summary

Borehole	Collar Coordinates				Drilled Length (m)	Thermistor
	Northing (m)	Easting (m)	Inclination (°)	Azimuth (°)		Depth Below Ground Surface (m)
AMQ15-294	607,073	7,255,676	-45	221	323	144
AMQ15-306	606,715	7,255,364	-45	96	201	141
AMQ15-324	606,497	7,254,995	-45	300	501	317
AMQ15-349A	607,065	7,255,628	-45	204	203	141
AMQ15-421	607,098	7,255,491	-51	274	501	388
AMQ15-452	606,627	7,255,688	-50	106	501	382
AMQ17-1265A	606,950	7,255,414	-80	198	366	350
AMQ17-1233	606,778	7,256,254	-59	255	156	132
AMQ17-1337	607,078	7,256,522	-60	262	252	218
AMQ17-1277A	606,911	7,255,964	-61	195	252	217

3.1.2 Thermistors Data Summary

Table 3 presents a summary of the permafrost conditions estimated from site thermistors and used as reference for calibration of thermal models as described in Section 4.

Table 3: Summary of Permafrost Conditions in Site Thermistors

Hole ID	Approx. Collar Distance to Lake (m)	Zero Annual Amplitude		Temperature at location of Thermistor Tip (°C)	Thermal Gradient (°C/m) (b)	Estimated Permafrost Depth (m) (c)
		Approximate Depth (m)	Approximate Temperature (°C)			
AMQ15-294	31	19	-3.1	-1.5	0.004	507
AMQ15-306	55	20	-7.4	-2.1 (a)	0.052	164
AMQ15-324	370	35	-8.6	-3.0	0.022	452
AMQ15-349A	40	18	-5.2	-1.4	0.011	262
AMQ15-421	40	26	-3.1	-0.5	0.004	522
AMQ15-452	50	23	-3.3	-1.1	0.012	472
AMQ17-1265A	n/a	20	2.7	-0.35	0.006	410
AMQ17-1233	32	10	-4.6	-5.2	-0.013	Insufficient data
AMQ17-1337	12	37	-6.6	-5.3	0.017	535
AMQ17-1277A	32	14	-4.2	-3.2	0.004	>600

a) For AMQ15-306, temperature about 17 m above the thermistor tip due to erratic temperature readings below that point.
b) Gradients estimated based on temperature data along the lower 70 to 100 m of thermistor lines.
c) Estimated based on temperature at thermistors' tips and thermistor's thermal gradients

The parameters were estimated using average temperature values up to November 2018. It should be noted that these thermistors were installed adjacent to the Whale Tail Lake, and the thermal conditions are likely influenced by the warm (relative to the ground surface temperatures) lake water temperatures.

3.2 Westbay Well System

A Westbay well system that was installed on site with a drilled depth of 499 m, was completed from March to April in 2016 for monitoring of hydraulic heads, testing of hydraulic conductivity, and collection of groundwater samples from multiple intervals within this single borehole (Golder 2016c).

The 2018 groundwater monitoring program (Golder 2019) indicates that water samples were collected from fixed ports along the Westbay system between 276 m and 499 m below the ground surface, which suggests that the Westbay system is installed in open talik, or water sampling would not have been possible in depth. This information was also taken into consideration for calibration of the thermal models described in Section 4.

Groundwater salinity based on Total Dissolved Solids (TDS) data from the 2016 water sampling program varied between 3198 mg/L and 4100 mg/L, with an average of 3700 mg/L. Salinity estimated from the 2016 program is more accurate than 2018 data due to issues with water purge in 2018, as described in Golder 2019. Based on Andersland and Ladanyi (2004), this average salinity level would cause a depression in the freezing point of water from 0 ^{o}C to -0.21 ^{o}C, which was taken into consideration when estimating the limits of the cryopeg zone based on results of the thermal models.

4.0 THERMAL MODEL

To assess permafrost conditions in the project site and the extent of talik formations beneath the Whale Tail Lake, steady state two-dimensional (2D) thermal modelling was carried out using the finite element program TEMP/W of GeoStudio 2019 (Version 10.0), developed by GEO-SLOPE international Ltd. (GEO-SLOPE 2019).

The 2D thermal models were prepared for seven cross sections defined along the underground mine developments in areas influenced by the Whale Tail Lake and for areas away from the lake to evaluate the extent of talik formations in the project site. Following completion of the 2D models, a three-dimensional (3D) block model was completed using the software Datamine Studio RM (v1.4.175.0), developed by Datamine Corporate Ltd. The 3D block was prepared based on results obtained from the 2D sections as control reference temperatures.

This section presents the modelling limitations, assumptions, modelling approach, input parameters, and results.

4.1 Model Limitations

This study consisted of steady state 2D thermal models prepared for several cross sections defined within the Project site as shown in Figure 1. The models constitute a simplification of the field reality and carry limitations that shall be taken into consideration during interpretation of model results. The most important model limitations are as follows:

- The 2D nature of the thermal models can only capture heat transfer along the cross sections and does not incorporate 3D heat transfer coming from adjacent areas. This limitation has stronger impact on model results for cross sections that include large stretches of the Whale Tail Lake, or sections crossing shallow and narrow lakes, where the 3D nature of heat transfer from adjacent ground would greatly limit the impact of the lake on permafrost conditions. This limitation was partially overcome by using wide cross sections and adjusting the mean temperature of shallow lakes.
- Results of steady-state models show a condition where an equilibrium is attained among all the model input parameters and boundary conditions, including material thermal properties, ground and lake surface temperatures and upward heat flux coming from the earth. The permafrost has formed over many millennia and its conditions adjust continuously to changes in surface conditions such as ground and lake temperatures. This means that current permafrost conditions might not represent an equilibrium and therefore model results can differ from real field conditions. This limitation was partially overcome by calibrating the models against site thermistors data, but field information is limited compared to the size of area modelled.
- The 3D block was prepared using information from the 2D thermal models as reference. The model interpolates temperatures in-between cross sections along with additional control temperatures along the Whale Tail Lake. Therefore, the spatial distribution of the cross sections affects the model accuracy, with interpolation between cross sections that are separated by large distances being less accurate then interpolation between cross sections that are nearby.

4.2 Model Approach and Calibration Process

Steady-state thermal modelling was performed initially along six cross sections (A to F) as shown in Figure 1. The locations of the cross sections were defined in such a way that allowed for models to be partially calibrated based on data from existing site thermistors. Locations of the different cross sections were also defined to provide an estimate of current permafrost conditions along the alignment of the proposed underground mining and in areas where the existence of open or closed talik is uncertain.

The calibration process consisted of adjusting model input parameters until the predicted temperature profiles were in good agreement with measured temperatures along reference thermistors located near each of the cross sections. The following model input parameters were adjusted during the calibration process:

- Material thermal properties;
- Mean surface ground temperature;
- Mean Whale Tail Lake temperature;
- Mean temperature of shallow lakes other than the Whale Tail Lake; and
- Thermal gradients in areas under the Whale Tail Lake and away from the lake, based on site thermistors as presented in Table 3.

The models were considered calibrated when the same set of input parameters could be applied to the different cross sections and result in predicted temperature profiles that were in reasonable agreement with the thermistors data used as reference in each individual section. It should be noted that the thermistors were not aligned with the cross sections and their relative locations were defined using perpendicular projections onto the cross sections.

In addition to the cross sections A to F, a new cross section G was later included in the southern portion of the Whale Tail Lake parallel to Sections A and C (as shown in Figure 1), and closer to the planned location of the Whale Tail Dike where the nature of talik, whether open or closed, is uncertain. Section G was not used for calibration purpose, and ground temperatures were rather computed using the calibrated model input parameters obtained from Sections A to F. Nevertheless, a temperature profile computed for Section G was compared to measured temperatures along the thermistor AMQ15-306, which although is far away from the section, presents similarities in terms of the distance from the lake and dipping direction.

Table 4 summarizes the thermistors used as reference for calibration of each section. As Sections D and F had only one nearby thermistor, information from one additional thermistor was added to the calibration process for each of these sections. Although the added thermistors were far from the sections’ alignments, their locations had similarities in terms of ground conditions and distance from the lake.

Table 4: Thermistors used for calibration for each section.

Cross-section	Thermistor near section	Thermistor far from section
A	AMQ15_421	
	AMQ15-324	
	AMQ17-1265A	
B (not used for calibration)	AMQ15-421	
	AMQ 17-1265A	
C	AMQ15-306	
	AMQ15_349A	
D	AMQ15-324	AMQ15-452
E	AMQ15-294	
	AMQ17-1277A	
	AMQ17-1233	
F	AMQ17-1337	AMQ15-324
G (not used for calibration)		AMQ15-306

Based on the calibration approach described above, calibration of Section B was not achieved. This section included thermistors AMQ15-421, which shows temperatures below the freezing point all along the thermistor string, and AMQ17-1265A, which shows the existence of a closed talik about 115 m deep underlain by frozen ground. However, the calibrated input parameters that produced good calibration results for Sections A, C, D, E, and F predicted temperatures in Section B along the alignments of AMQ15-421 and AMQ17-1265A that were always above the freezing point, suggesting the existence of an open talik in those locations, which isn't consistent with the reference calibration thermistors. It would not be possible to calibrate Section B unless a specific set of input parameter was defined only for this section and using temperature of the Whale Tail Lake that would be neither consistent with field measurements nor realistic. Therefore, Section B was deemed not possible to be calibrated and was further discarded.

For the other sections (i.e., A, C, D, E, and F), the calibration process resulted in two sets of model input parameters that produced predicted temperature profiles in general agreement with the reference calibration thermistors, but with variable depths of permafrost. Model results using the calibrated input parameter for Scenario 1 predicted a shallower permafrost location compared to model predictions using the calibrated input parameters defined in Scenario 2.

Model results for Sections A, C, D, E, F and G using the calibrated input parameters defined for Scenario 1 and Scenario 2, including temperature distribution, permafrost limits, and plots comparing predicted vs. measured temperatures from the reference calibration thermistors, are presented in Appendix A (Figures A1 to A6) and Appendix B (Figures B1 to B6), respectively. The modelled temperatures were in good agreement with the thermistor data in the end of the calibration process. The calibrated parameters were then applied to Section G to model the permafrost and talik conditions underneath a wider stretch of the Whale Tail Lake.

The calibrated model input parameters and boundary conditions are presented in the next sections.

4.3 Material Properties

The thermal properties adopted for the overburden and bedrock in the end of the calibration phase are summarized in Table 5. The thermal properties were based on typical values presented in Andersland and Ladanyi (2004) and were adjusted during the model calibration process.

It is expected that that the thermal properties of the bedrock will have a more significant effect on thermal conditions than the overburden soils because of the relatively shallow layer of overburden compared to the bedrock. Each section assumed a thickness of overburden till of about 12 m underlain by close to 600 m of bedrock to an elevation of -450 m below sea level at the base of the model geometry.

Table 5: Material Thermal Properties Used in the Models

Material	Volumetric Water Content	Thermal Conductivity (W/m-°C)		Volumetric Heat Capacity (MJ/m3-°C)	
		Frozen	Unfrozen	Frozen	Unfrozen
Till	30%	1.8	1.5	2.0	2.5
Bedrock	1%	3.0	3.0	2.0	2.0

The thermal models were simplified using constant thermal conductivities without considering phase change. This assumption is considered reasonable as the bedrock is expected to have low water content and the latent heat due to phase change is not significant.

The thermal models were solved considering groundwater with a phase change temperature of 0 °C. Salinity in the groundwater would result in a freezing point depression and would possibly lower the phase change temperature below 0 °C. However, considering the very low water content assumed for the bedrock, the effect of salinity would have no important impact on the model results in terms of predicted permafrost limits in the project site. Considerations to water salinity and water flow through zones with temperatures slightly below 0^{o}C are made in the hydrogeology modelling component of this study presented in a separate document.

4.4 Boundary Conditions

As discussed in Section 4.2, the calibration process resulted in two sets of model input parameters that produced model predicted temperature profiles generally in good agreement with temperature profiles measured at the locations of the reference thermistor strings in each cross section (as presented in Appendices A and B). Specifically, both sets of calibration parameters resulted in predicted temperature profiles that were consistent with temperature measured along thermistor AMQ17-1265A, which was a key reference thermistor for calibration purposes due to its strategic installation location in the lake, crossing talik and permafrost zones.

As the predicted depths of permafrost limits are affected by the model input parameters, thermal models were prepared using the two sets of calibration parameters for model sensitivity purposes, in an attempt to define the lower and upper bounds of predicted permafrost limits. The model input parameters defined for the two calibration scenarios are described below.

4.4.1 Calibrated Scenario 1

The calibrated boundary conditions for Scenario 1 models were as follows:

- A mean ground surface temperature of -10 °C was used as the model upper boundary condition outside of the Whale Tail Lake. This temperature is considered reasonable as compared with the -11.3 °C mean annual air temperature.
- Mean annual Whale Tail Lake bottom temperatures between 0°C and +3°C depending on lake depth as follows, assuming an average lake elevation of 151.7 m.
    - 0^{o}C for lake depth less than 1 m;
    - 2^{o}C for lake depths between 1 and 4 m; and
    - 3^{o}C for portions of the Whale Tail Lake deeper than 4 m.
- For the shallow lakes or ponds that appear in Sections E and F, a mean annual lake bottom temperature of -7 °C was applied in the end of the calibration process. As described in Section 4.1, this approach was required to deal with limitations associated with the two-dimensional nature of the models.
- A heat flux of 0.048 J/sec was defined as the model lower boundary condition based on a bedrock thermal conductivity of 3 W/m-°C and a thermal gradient of 0.016 °C/m. The adopted geothermal gradient is in line with the thermal gradients estimated from thermistors data as summarized in Table 3.

4.4.2 Calibrated Scenario 2

The calibrated boundary conditions for Scenario 2 models were as follows:

- A ground surface temperature of -9.5 °C was applied to ground surface outside of the Whale Tail Lake.
- A mean annual lake bottom temperature of +3 °C was applied to the Whale Tail Lake irrespective of lake depth.
- For the shallow lakes or ponds that appear in Sections E and F, a mean annual lake bottom temperature of -7 °C was applied.
- A heat flux of 0.048 J/sec (geothermal gradient of 0.016 °C/m) was applied as the lower boundary condition of the model geometry in areas away from the Whale Tail Lake.
    - A heat flux of 0.018 J/sec (geothermal gradient of 0.006 °C/m) was applied at the base of the model geometry for areas beneath the Whale Tail Lake. This was based upon the lower thermal gradients estimated for thermistors located mostly under the Whale Tail Lake, specifically thermistor AMQ17-1265A, which is installed in the lake and shows thermal gradient of 0.0058 ^{o}C/m for the lower 100 m of the thermistor string.

4.5 Three-Dimensional Block Model

A 3D block model was produced from the results of the 2D thermal modelling using Datamine Studio software, following the procedures summarized below.

- A block model volume was described to encompass the 2D thermal sections.
- Blocks of size of 20 m in Easting, 20 m in Northing and 10 m in Elevation were created below topography down to a depth of -450 m (i.e., base of the 2D thermal model cross sections).
- Temperature was estimated into each block using the temperature contours obtained from the 2D thermal sections, with the following controls applied:
  - Inverse power of distance cubed estimation methodology; 2D section temperature values closer to the block centroid carry more weight than those further away.
  - An elliptical search volume with a 5:1 horizontal to vertical anisotropy; horizontal continuity carries more weight than vertical continuity. The maximum search distance was 800 m horizontally.
  - Data points from at least two sections were needed to contribute to a block estimate.
  - The Whale Tail Lake boundary was used as a constraint, such that 2D section temperature values inside and outside the lake boundary had differing weights applied based on depth below surface. This results in the lake acting as a hard boundary close to the topographic surface and an increasingly soft boundary with increasing depth from the topographic surface. This constraint was necessary to prevent smoothing of temperature values across the lake boundary, which, when close to the topographic surface, results in positive temperature values outside the lake boundary.

Figure 2 shows the arrangement of the 2D cross sections used as input for the 3D block model.

5.0 MODEL RESULTS

5.1 Two-Dimensional Thermal Models

Permafrost limits computed for Sections A, C, D, E, F and G for both calibration Scenarios 1 and 2 are presented in Figures 3 to 8, which also show the estimated extent of the cryopeg zone where water could potentially flow through ground frozen at temperature of -0.21ºC due to the effect of salinity. Details of temperature distribution, as well as comparison of predicted temperature profiles with thermistor data are provided in Appendices A and B.

Section A was cut through the proposed underground ramp as shown in Figures 1 and 3, where the lake is approximately 300 m wide. Thermistors AMQ15-421 and AMQ17-1265A were projected onto the section to allow for comparison of predicted vs. measured temperature profiles under the Whale Tail Lake. In addition, thermistor AMQ15-324 was projected onto the section to represent ground temperature away from the lake. Plots of predicted temperatures compared to measured temperatures are presented in Appendices A and B for the calibration models Scenarios 1 and 2, respectively.

The thermal results indicate a closed talik formation underneath the lake for both calibration scenarios, which is consistent with temperature data obtained from thermistor AMQ17-1265A installed in the lake, and AMQ15-421 installed adjacent to the lake but that dips toward the Whale Tail Lake. In terms of permafrost depth, the predicted location of permafrost under the Whale Tail Lake was about 100 m shallower for Scenario 1 (lower permafrost limit approximately 350 m below lake level) compared to Scenario 2 (lower permafrost limit about 450 m below lake level). The location of permafrost in areas away from the lake was similar for both calibration scenarios with permafrost depth of about 480 m below ground.

The model results for Section A obtained for Scenario 1 suggest that the lower 25 m of the proposed underground ramp shown in Figure 3 may be in unfrozen ground. Based on the model results, the cryopeg zone extends to a maximum of 20 to 30 m above the base of permafrost.

Section C was also modelled through the proposed underground ramp as shown in Figures 1 and 4, where the lake is approximately 300 m wide. Thermistors AMQ15-306 and AMQ15-349A were projected onto the section to compare measured temperatures to the model results under the Whale Tail Lake; both thermistors' collars are located near the lake and dip toward ground portions beneath the lake. Plots of measured vs. predicted temperatures are presented in Appendices A and B.

Results of the thermal models indicate a closed talik formation underneath the lake for both scenarios, which is consistent with thermistor data. The location of the lower permafrost limit below the closed talik under the lake was about 100 m shallower for Scenario 1 (about 325 m below the lake) compared to Scenario 2 (about 425 m below the lake). The proposed ramp layout shown in Figure 4 indicates that the lower 50 m of the ramp may be in unfrozen ground for the calibration Scenario 1. The models also predict a permafrost depth of about 500 m below ground in areas away from the Whale Tail Lake.

Section D was modelled through the proposed underground ramp perpendicular to Sections A and C as shown in Figures 1 and 5, where the lake is approximately 200 m wide. The thermistor AMQ15-452 was projected onto the section to compare measured temperatures with the model results under the whale Tail Lake, while the projection of thermistor AMQ15-324 is in ground away from the lake. Details of computed vs. measured temperatures are presented in Appendices A and B.

The thermal results indicate a closed talik formation underneath the lake for both scenarios, in good agreement with the reference thermistor data. The lower permafrost limit computed for Scenario 1 was about 50 m shallower then computed for Scenario 2 (i.e., 450 m and 500 m below the lake, respectively). The model results suggest that the proposed ramp layout shown in Figure 5 will be in frozen ground for both scenarios. The models also predicted permafrost depth of about 510 m below ground in areas away from the Whale Tail Lake.

Section E was modelled to assess the talik beneath the lake south of the proposed ramp. The section crosses the Whale Tail Lake at different locations as shown in Figure 1 and 6. The lake width in the middle of the section is approximately 300 m and at the south end of the section it is about 350 m. The models predicted that, for both calibration scenarios, the area south of the proposed underground ramp will be in open talik. The model also results suggest that the proposed ramp layout shown in Figure 6 will be in frozen ground for both scenarios.

Section E was modelled to assess the nature of talik beneath the lake south of the proposed ramp. The section crosses the Whale Tail Lake at different locations as shown in Figure 1 and 6. The lake width in the middle of the section is approximately 300 m and at the south end of the section it is about 350 m. The models predicted that, for both calibration scenarios, the area south of the proposed underground ramp will be in open talik.

The predicted open talik in Section E is heavily influenced by the extent of lake in the two-dimensional configuration of the model. There were no thermistors available for model calibration in the south portion of Section E, and calibration based on thermistors installed north of the proposed ramp (i.e., AMQ15-294 and AMQ17-277A) showed model predicted temperature profiles generally warmer than measured temperatures (as presented in Appendices A and B). Therefore, the actual permafrost conditions beneath and in-between the two portions of the Whale Tail Lake that appear in Section E are possibly colder than predicted by the models.

Section E is perpendicular to the alignment of the proposed ramp, so the projected ramp location is shown in Figure 6 for reference. The upper 200 m of the ramp is relatively close to Section E, and the model results indicate that portion of the ramp will be in frozen ground. The lower portion of the ramp dips away from Section E and therefore model results cannot be used to evaluate whether that area would be in talik or not.

Section F was modelled to assess permafrost conditions away from the Whale Tail Lake as shown in Figures 1 and 7. Section F mainly passes through ground and crosses two small shallow lakes close to the north end of the section. The permafrost depth was estimated to be 500 m and 550 m below ground surface for Scenario 1 and Scenario 2, respectively.

The calibrated parameters were then applied to Section G, where the lake is approximately 500 m wide, to assess permafrost limits and the extent of the open talik predicted in Section E. Temperature profiles from thermistor (AMQ15-306) were extrapolated and projected onto Section G to evaluate consistency of the model predicted temperatures with the actual measurements. Although predicted temperatures were warmer than measured temperatures for both calibration scenarios, the thermal model indicates the existence of an open talik beneath the Whale Tail Lake as shown in Figure 8.

5.2 Three-Dimensional Block Model

The 3D block model was prepared using results obtained from the 2D models for the calibration Scenario 1, which predicted a shallower permafrost compared to the calibration Scenario 2. Although both Scenarios 1 and 2 had good agreement with temperature profiles obtained from the reference thermistors, the shallower permafrost predicted in Scenario 1 is considered to be a more critical scenario as it shows more of the underground may be located in unfrozen rock.

Results of the 3D block model were exported to CSV format with the following columns: X (Easting), Y (Northing), Z (Elevation) and Temperature, for use in the hydrogeology model. Figure 9 shows a 3D plot of the 0^{o}C isoline computed based on the results of the 2D thermal modelling.

The model representation of temperature is good where the sections are close together and where sections of different orientations contribute to the temperature estimates. The model is less reliable as distance from sections increases. Also, although the lake constraint worked well, it was not completely successful within the entire block model.

The 3D block model is a basic construct and is intended for guidance rather than providing a definitive picture of temperature and permafrost limits in 3D. As the results obtained from the 2D thermal models are used as input for the 3D block, any limitation carried forward from the 2D models impacts the results of the 3D block model. Additional refinements would be necessary if the model was to be used for detailed understanding of permafrost limits in the Project site.

6.0 SUMMARY AND RECOMMENDATIONS

Golder has carried out thermistor data review and numerical modelling of the lake talik formations for the Whale Tail Lake area. Based on the latest thermistor data available, the permafrost characteristics in the project area are summarized below:

- The depth of permafrost in the Project site is estimated to be between 452 m and 522 m based on thermal gradients and ground temperatures at the lowest portions of the thermistor strings.
- The estimated depth of zero amplitude from the temperature profiles ranges from 18 m to 35 m.
- The temperatures at the depths of zero amplitude are in the range of -3.1 °C to -8.6 °C for on land thermistors and 2.7 °C for AMQ17-1265A.
- Temperatures in depth at the locations of the thermistors' tip vary between -0.35°C for AMQ17-1265A and -3 °C for AMQ15-324.
- The geothermal gradient estimated based on the lowest 70 to 100 m of the thermistor strings is in the range of 0.004 °C/m (AMQ15-294) to 0.052 °C/m (AMQ15-306).

The results of numerical modelling thermal assessment indicate that:

- Under the northern portion of the lake along the proposed ramp area, there is likely a closed talik formation.
- Open talik formations are probable in the southern portion of the lake where the Whale Tail Lake becomes wider.
- Permafrost depth between 480 m and 550 m for ground away from the Whale Tail Lake, and between 350 m and 450 m below surface in portions beneath the Whale Tail Lake.

The thermal model indicated that the lower 25 to 50 m of the proposed exploration ramp alignment in the northern portion of the lake may be in unfrozen ground. This range might be extended depending on salinity levels in the water that will result in depression of the water freezing point. A depression of the freezing point of about 0.2 °C (i.e. water freezing at temperature of -0.2°C instead of 0 °C) would result in about an additional 20 to 35 m of the ramp being subject to groundwater inflow based on predictions of the extent of the cryopeg zone in the models as shown in Figures 3 to 8.

The minimum ground temperature measured by thermistor AMQ17-1265A below the closed talik portion in the Whale Tail Lake is about -1°C, while ground temperature at the tip of the thermistor is -0.35°C. As mentioned above, increasing salinity levels will cause the freezing point of water to depress; the higher the salinity the greater the extent groundwater can flow through frozen ground. An estimation based on Andersland O.B. (2004) shows that groundwater salinity would need to be about 1.8% for the freezing point to depress to -1°C, in which condition water could potentially flow through frozen ground beneath the Whale Tail Lake and into the ramp. The average water salinity is currently estimated as 0.37% with a freezing point depression of -0.21°C, suggesting that water would not flow through the closed talik under the Whale Tail lake at current salinity conditions. Nevertheless, close monitoring of groundwater salinity levels during operation will be required to assess the extent of groundwater flow.

Sections E and F used information from thermistors AMQ17-1233 and AMQ17-1337, respectively, as reference for model calibration. These thermistors are installed within the proposed footprint of the IVR open pit, which will have an ultimate base elevation of 46 masl. Based on the results obtained for Sections E and F, the permafrost limits below thermistors AMQ17-1233 and AMQ17-1377 will be below the base of the IVR Pit.

Based on the thermal model results and thermistor data, it is interpreted that the ultimate base of the Whale Tail open pit (i.e. -127 masl) is expected to be within the permafrost regime, and the upper portion in the talik zone beneath the lake.

There currently are no deep thermistors installed in the south portion of the Whale Tail Lake, where the existence of open or closed talik is uncertain. Although results of water sampling obtained from the Westbay well system and results of the thermal models suggest there is open talik formation in that area, it is recommended that Agnico Eagle considers the installation of supplemental deep thermistors in the south portion of the lake to confirm this assumption.

7.0 CLOSURE

The reader is referred to the Study Limitations, which follows the text and forms an integral part of this technical memorandum.

We trust this document satisfies you current requirements. If you have any questions or require further assistance, please do not hesitate to contact the undersigned.

Signature Page

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2019-04-08
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https://golderassociates.sharepoint.com/sites/102627/technical work/01_thermal-modelling/reporting/rev0/18108905-276-rpt-thermalmodel_whaletaillake-rev0.docx

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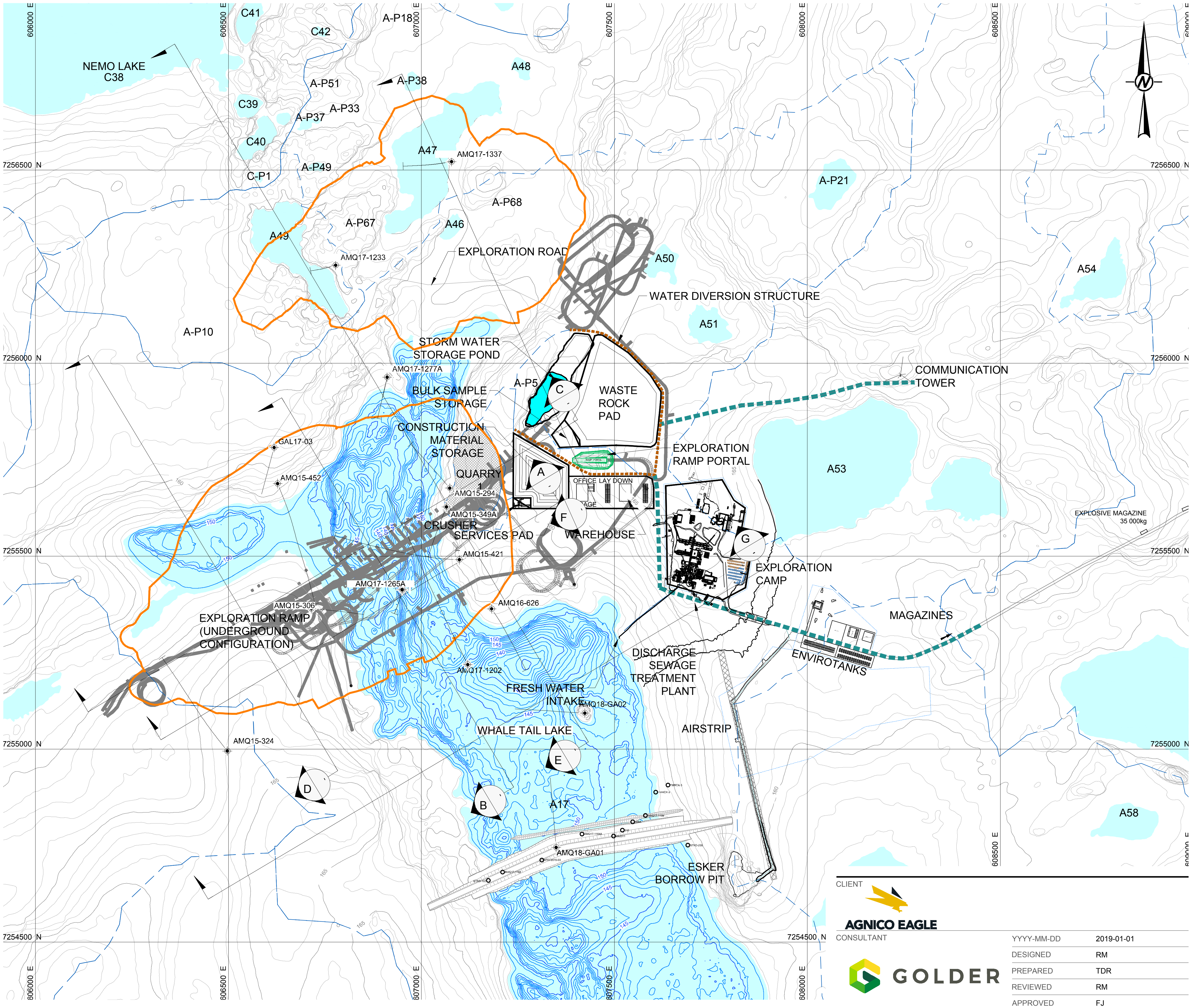
FIGURES



LEGEND

▬	ROAD
▬ ▬ ▬	TEMPORARY ROAD
— — —	NATURAL WATERSHED
- - - -	DITCH
- - - -	WATER DIVERSION STRUCTURE
-------	INTAKE (FRESHWATER PIPE)
——	EXPLORATION ROAD
○—┤	THERMISTOR
▬	AMQ-POTENTIAL PIT

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CLIENT
AGNICO EAGLE

CONSULTANT
GOLDER

YYYY-MM-DD	2019-01-01
DESIGNED	RM
PREPARED	TDR
REVIEWED	RM
APPROVED	FJ

PROJECT
WHALE TAIL PIT PROJECT
WHALE TAIL LAKE THERMAL ASSESSMENT
NUNAVUT

TITLE
SITE PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
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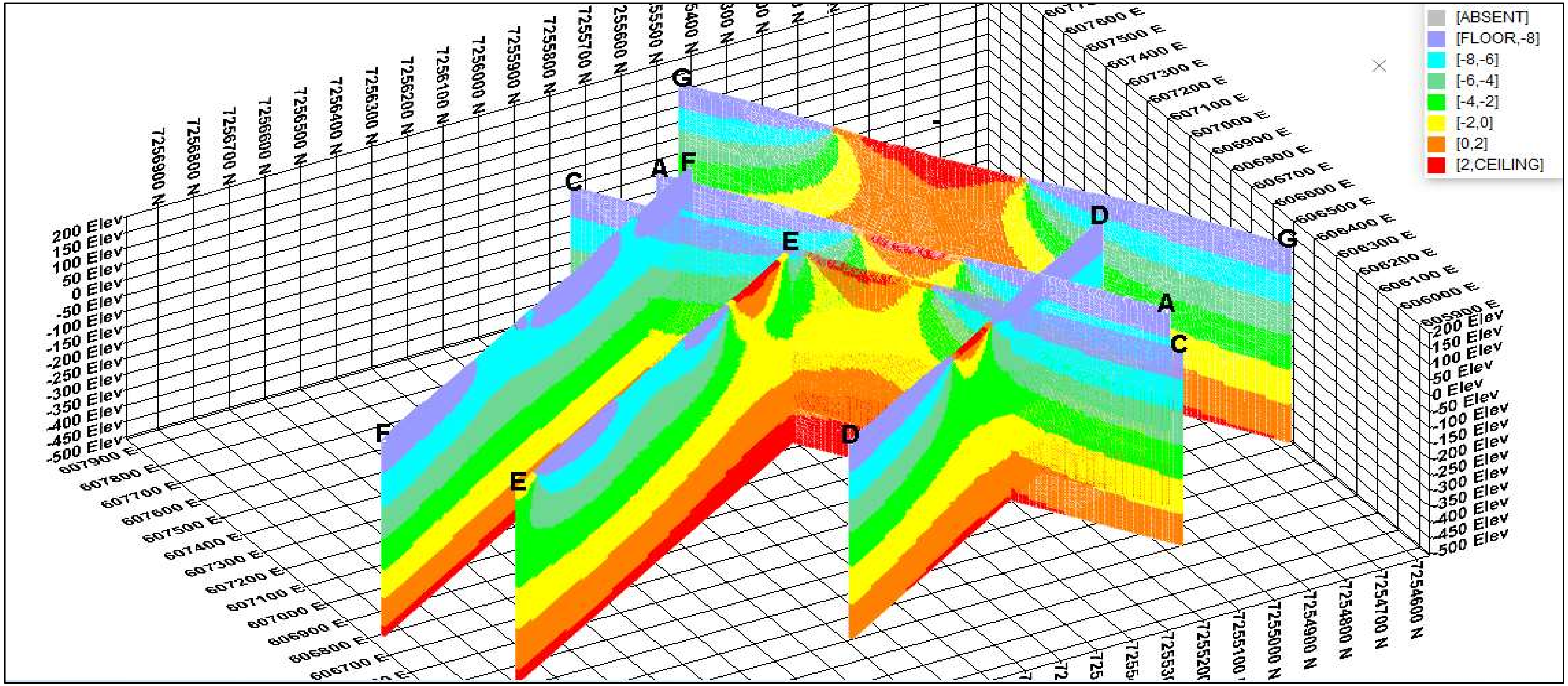


Client:
Agnico Eagle Mines Ltd.

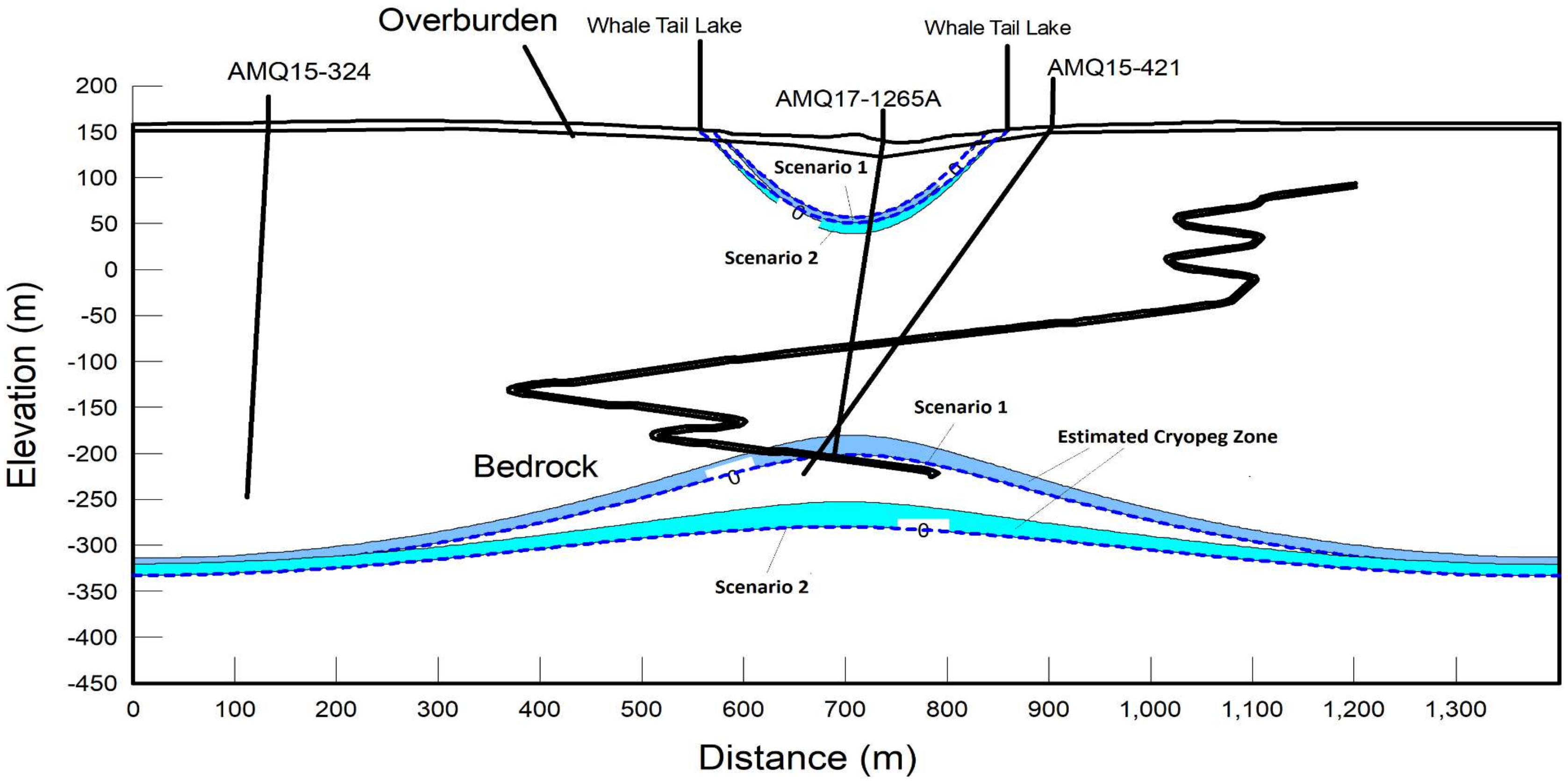
GOLDER

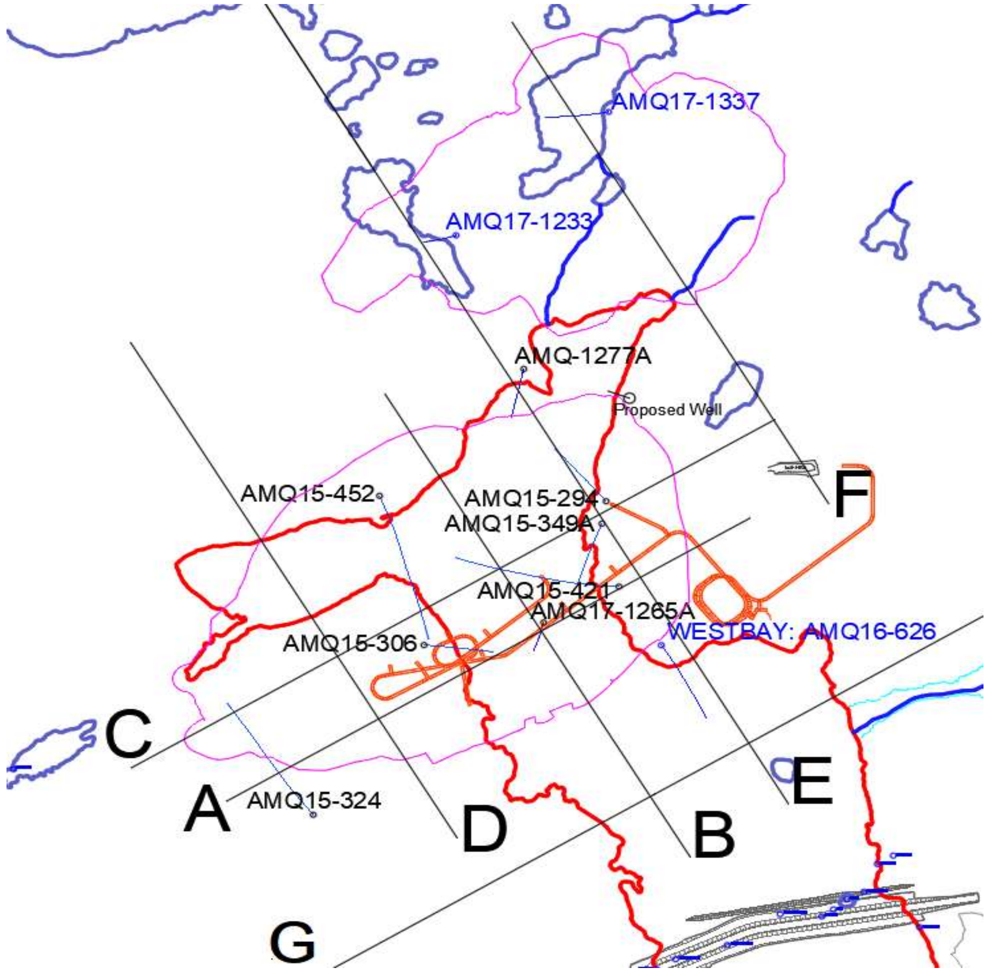
Date: Mar-19
Design: RM
Check: FJ
Review:

Project: Whale Tail Pit Project

Title: 2D-thermal section used as input to create the 3D-thermal model

Project No.	Phase	Version	Figure No.:
18108905			2





Zero Temperature Isoline - - - - - - - -

Scenario	1
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Scenario	2
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

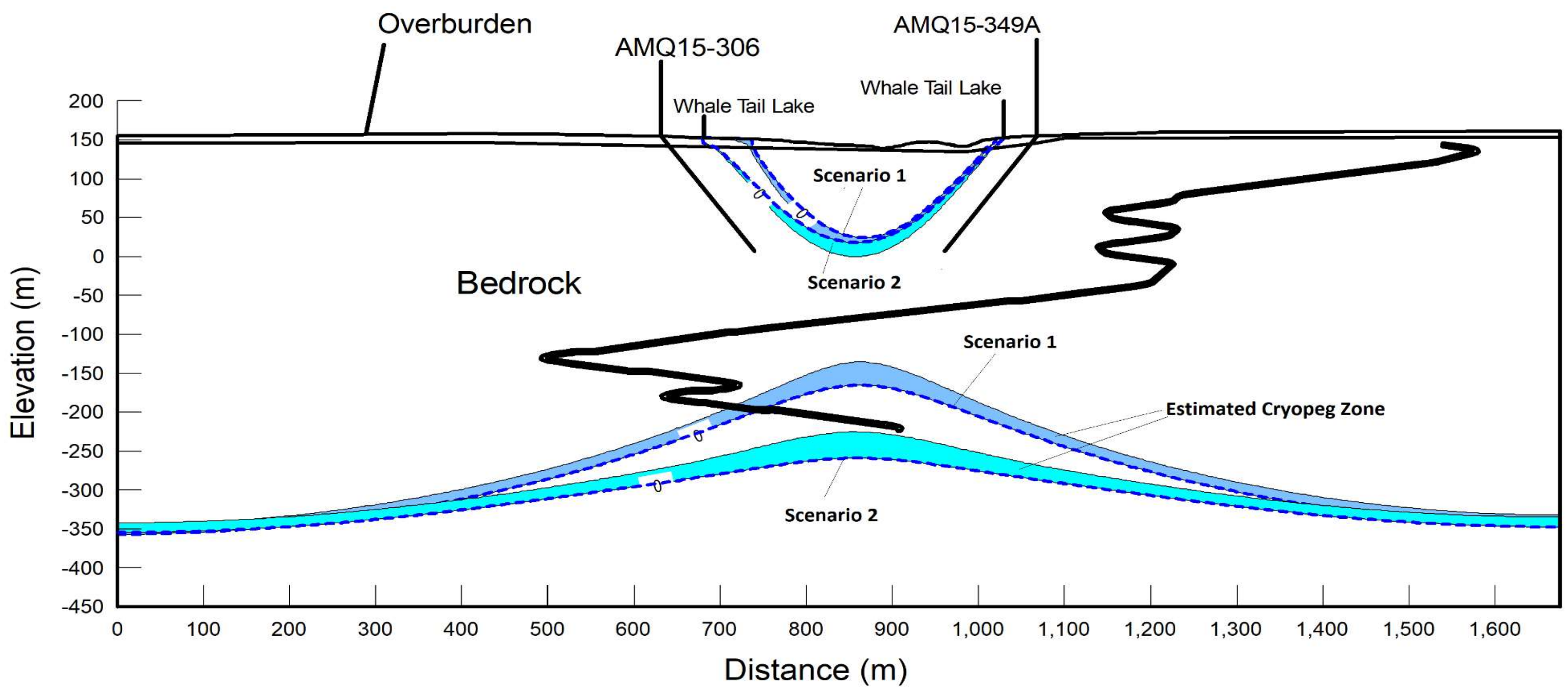
Project: Whale Tail Pit Project

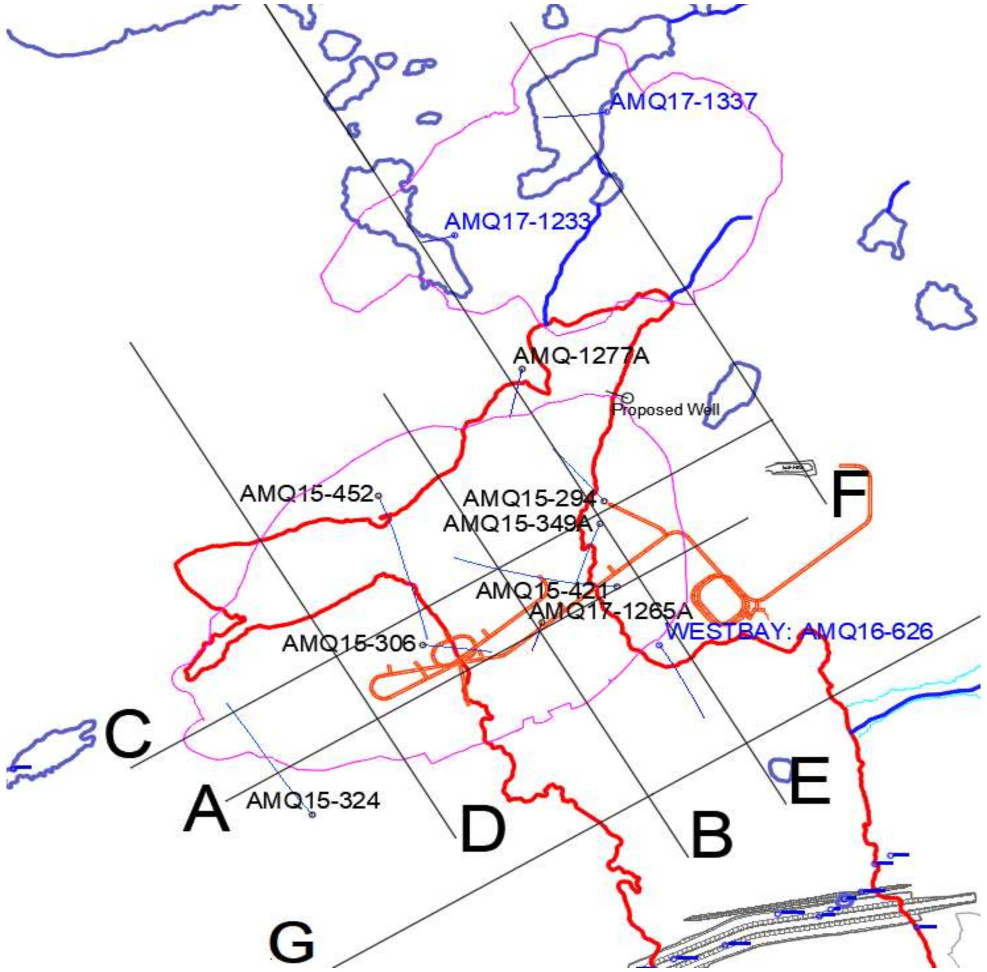
GOLDER

Date:	Mar-19
Design:	RM
Check:	FJ
Review:	

Title: Thermal Model Calibration - Scenarios 1 & 2 - Section A

Project No.	Phase	Version	Figure No.:
18108905			**3**





Zero Temperature Isoline - - - - - - -

Scenario	1
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Scenario	2
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

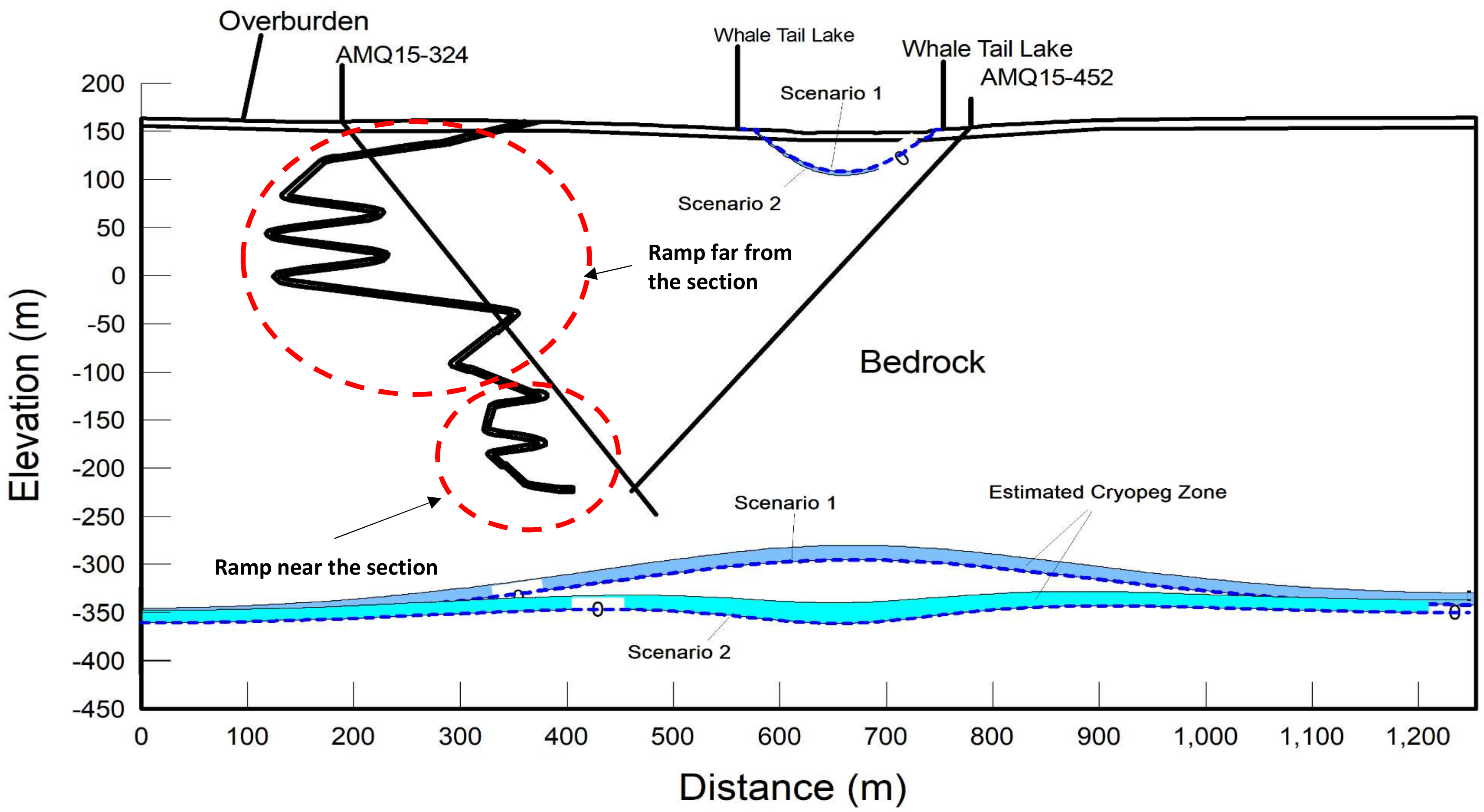
Project: Whale Tail Pit Project

GOLDER

Date:	Mar-19
Design:	RM
Check:	FJ
Review:	

Title: Thermal Model Calibration - Scenarios 1 & 2- Section C

Project No.	Phase	Version	Figure No.:
18108905			4



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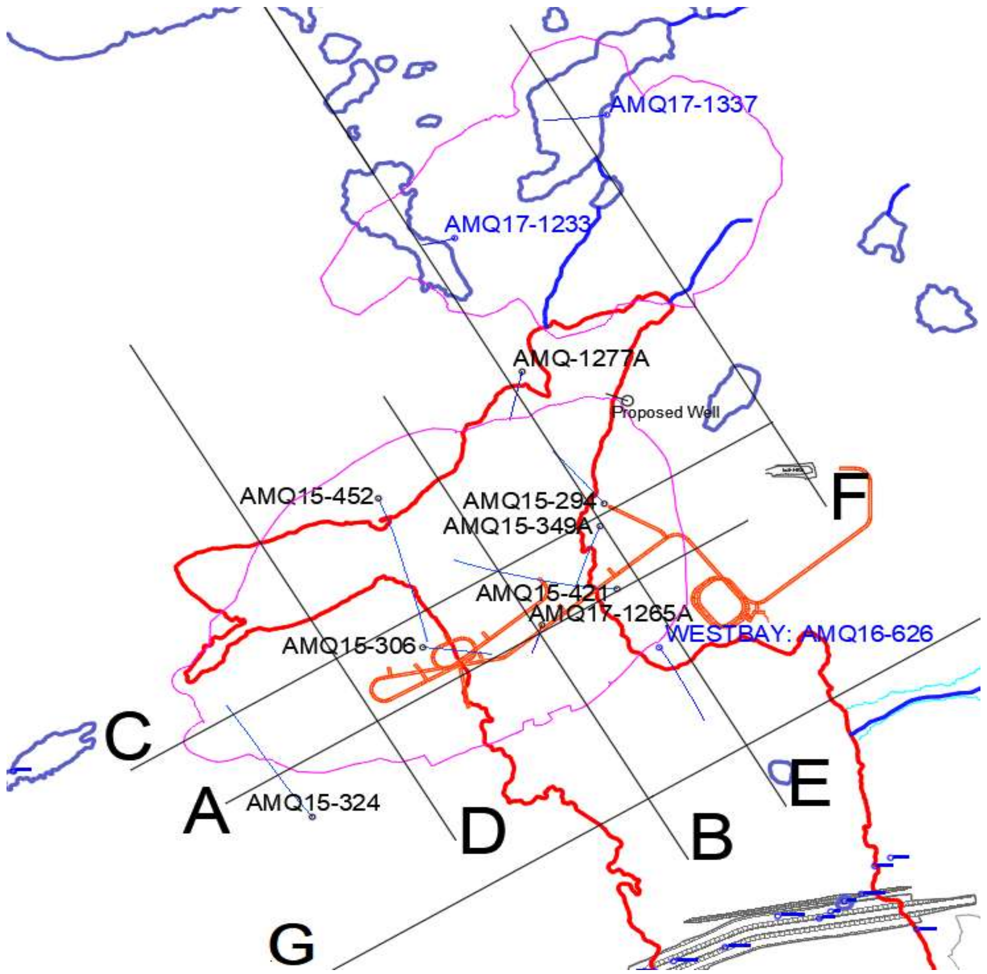


Scenario	1
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Scenario	2
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

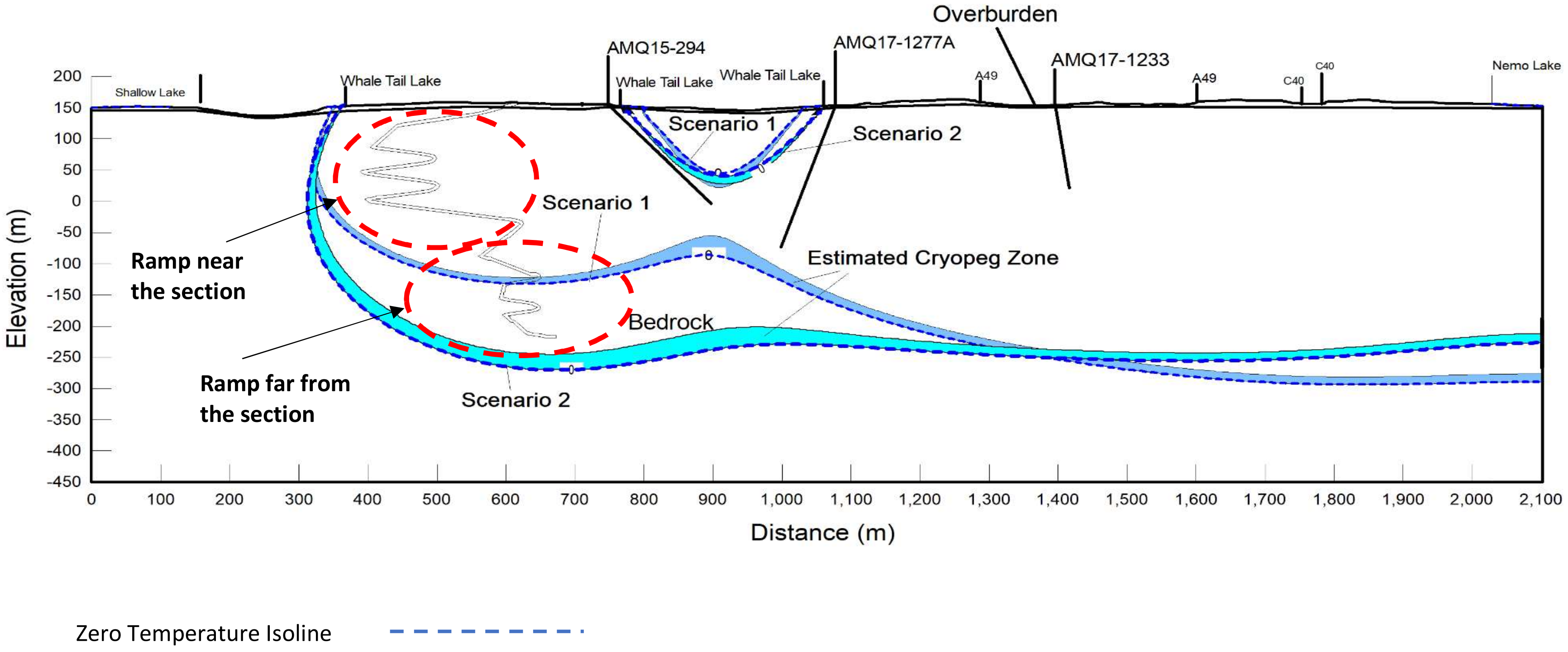
GOLDER

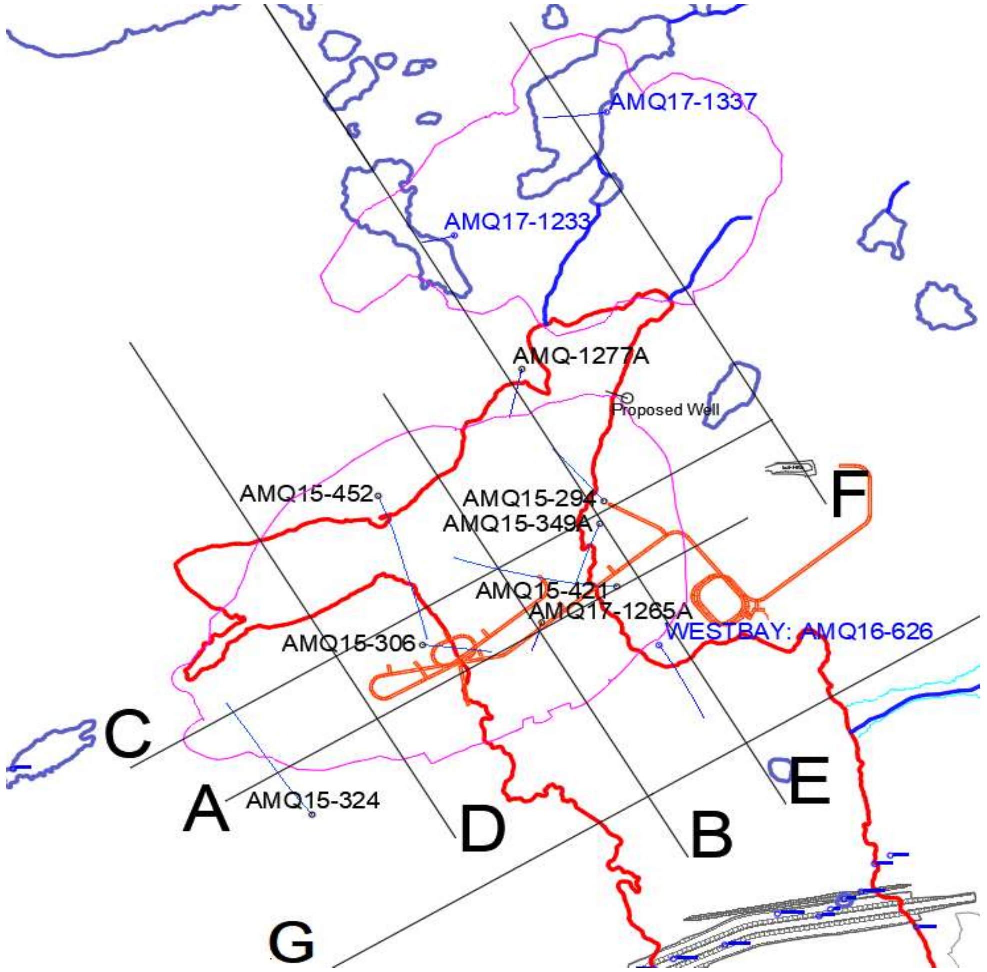
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	

Project: Whale Tail Pit Project

Title: Thermal Model Calibration - Scenarios 1 & 2 - Section D

Project No.	Phase	Version	Figure No.:
18108905			**5**





Scenario	1
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	-7
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Scenario	2
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	-7
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

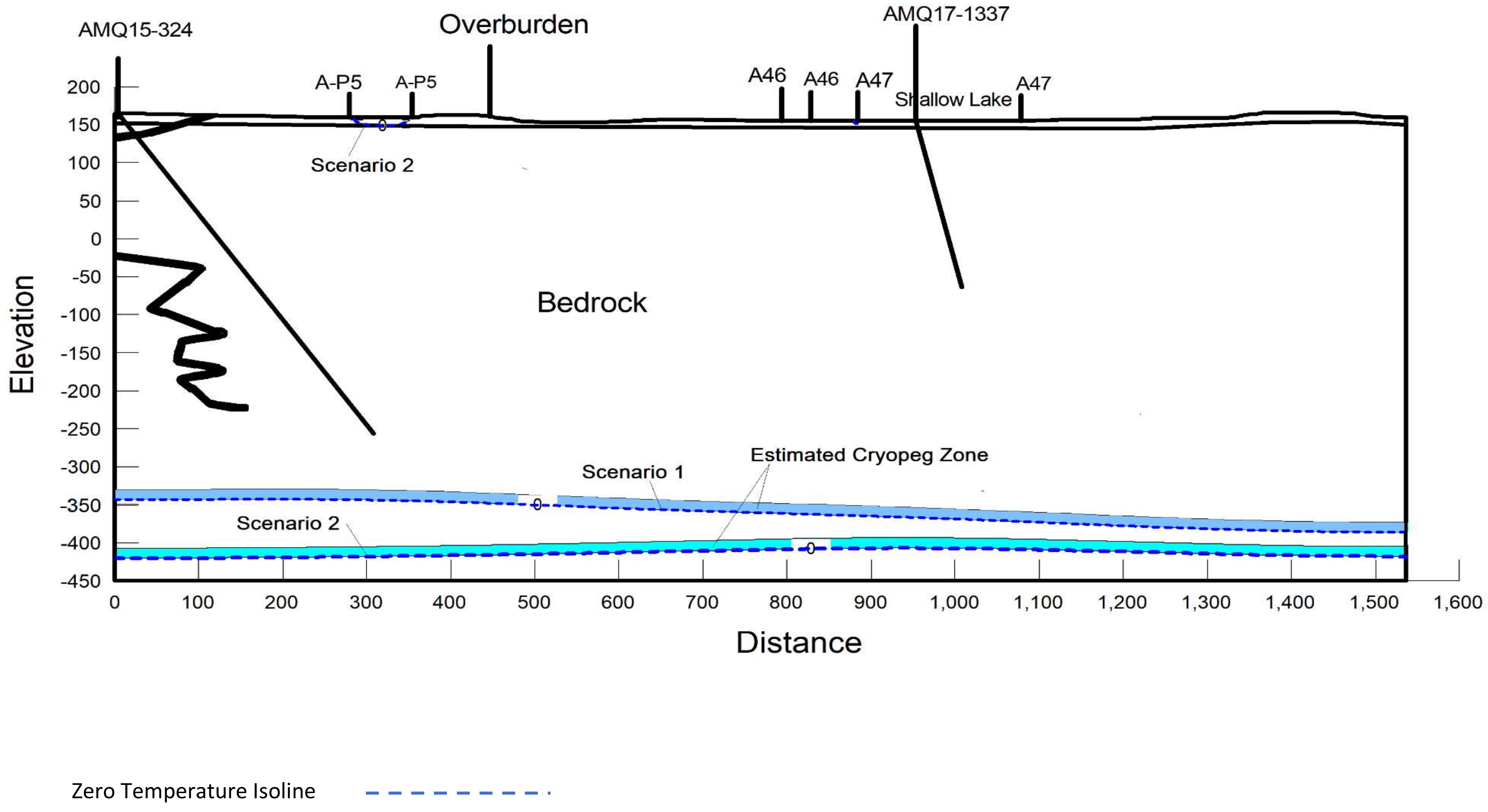
Client:
Agnico Eagle Mines Ltd.

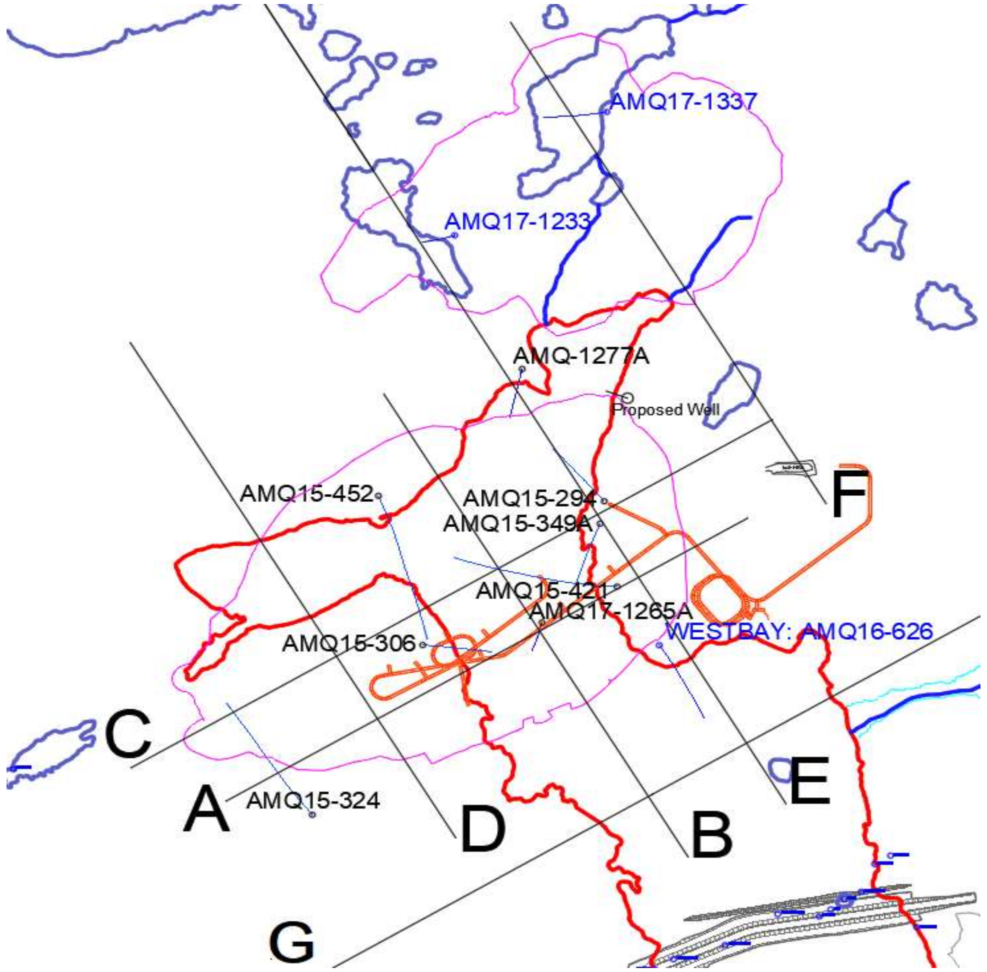
Project: Whale Tail Pit Project

Date:	Mar-19
Design:	RM
Check:	FJ
Review:	

Title: Thermal Model Calibration - Scenarios 1 & 2 - Section E

Project No.	Phase	Version	Figure No.:
18108905			6





Scenario	1
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	n/a
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	-7
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Scenario	2
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	n/a
Other shallow lake Temperature (oC)	-7
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	n/a n/a

Client:
Agnico Eagle Mines Ltd.

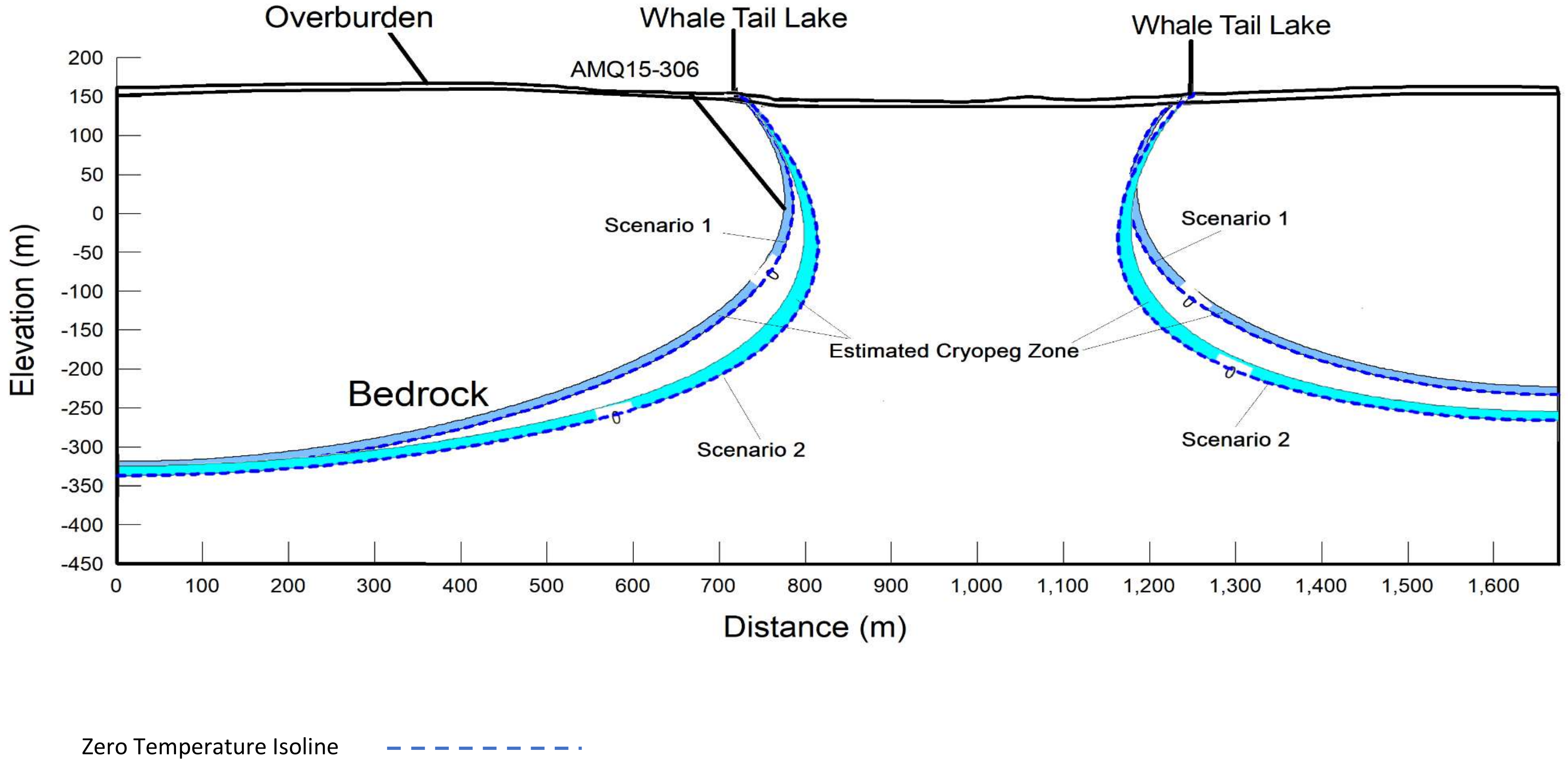
GOLDER

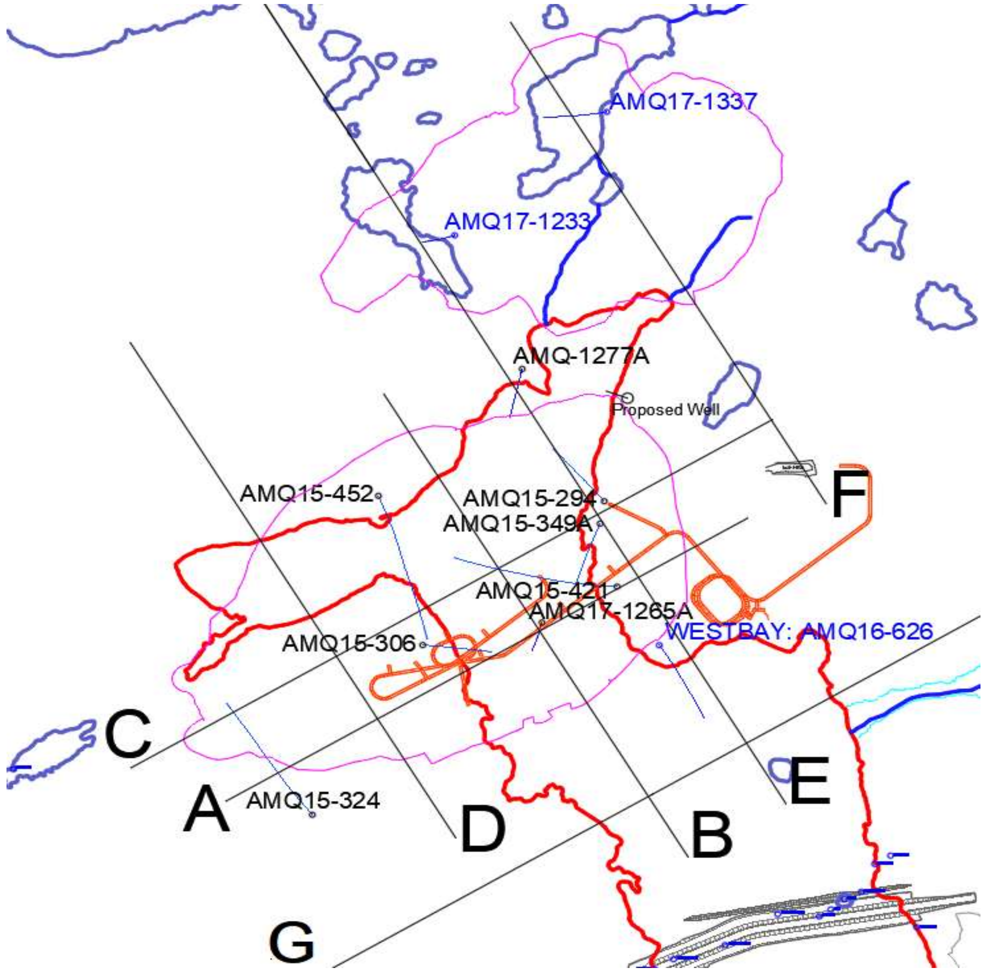
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	

Project: Whale Tail Pit Project

Title: Thermal Model Calibration - Scenarios 1 & 2 - Section F

Project No.	Phase	Version	Figure No.:
18108905			7





Scenario	1
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Scenario	2
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

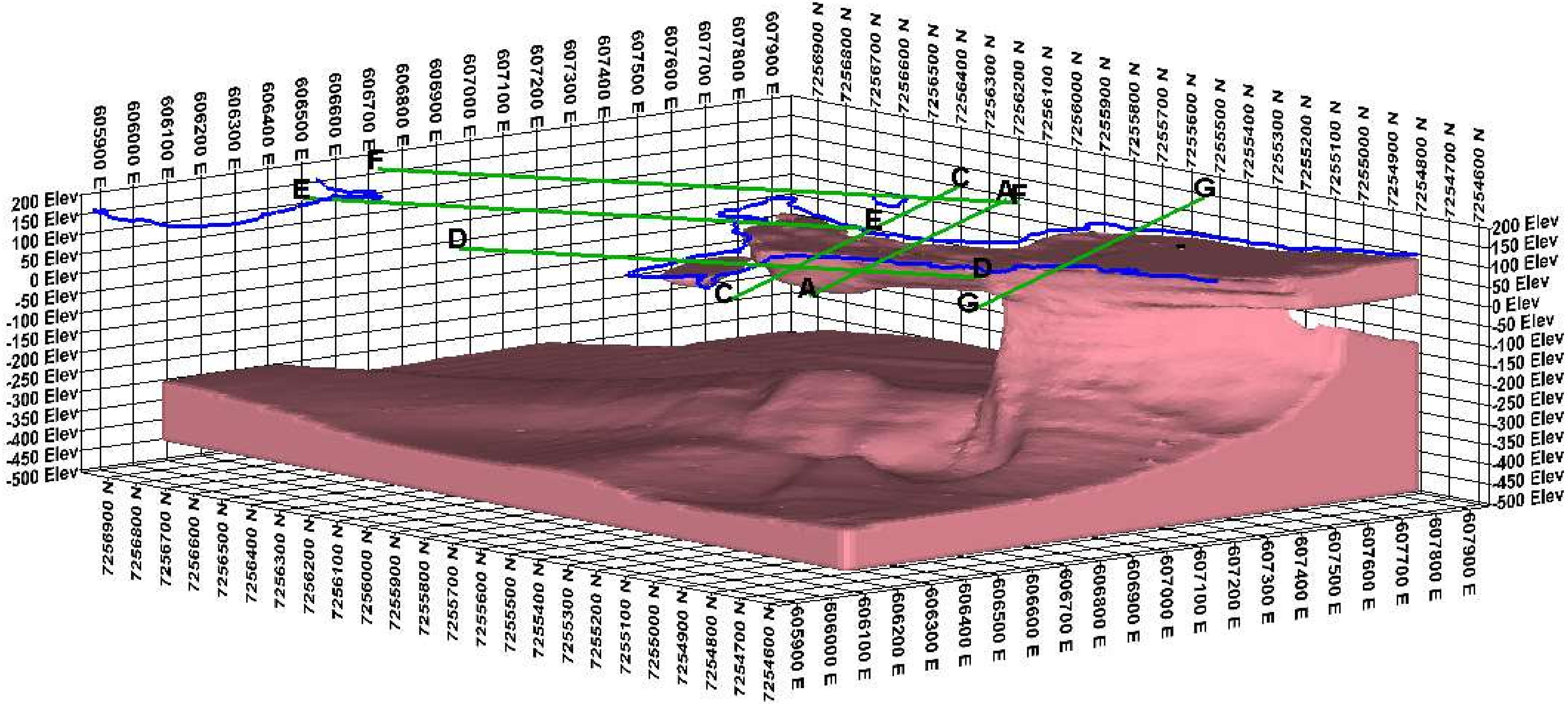
GOLDER

Date:	Mar-19
Design:	RM
Check:	FJ
Review:	

Project: Whale Tail Pit Project

Title: Thermal Model Calibration - Scenarios 1 & 2 - Section G

Project No.	Phase	Version	Figure No.:
18108905			**8**



Client:
Agnico Eagle Mines Ltd.

GOLDER

Date: Mar-19
Design: RM
Check: FJ
Review:

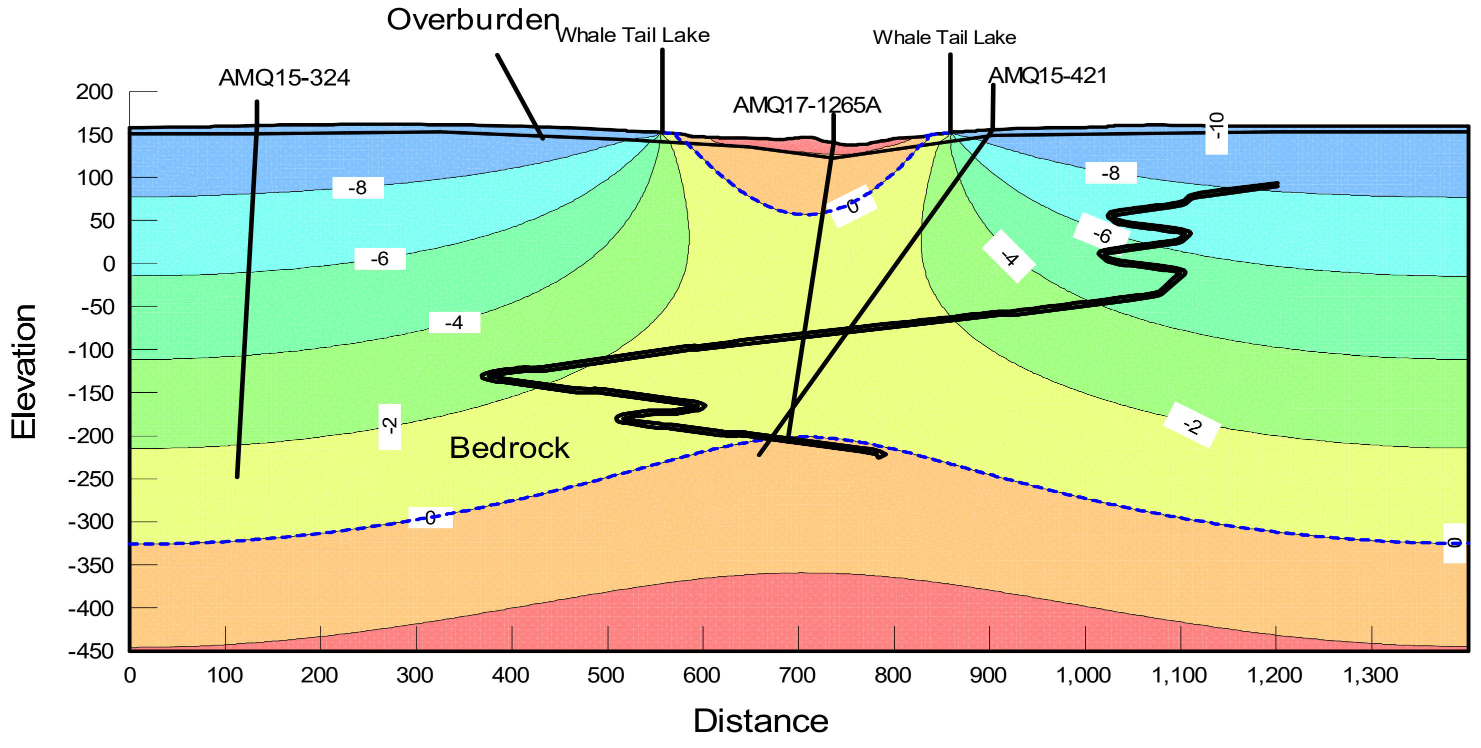
Project: Whale Tail Pit Project

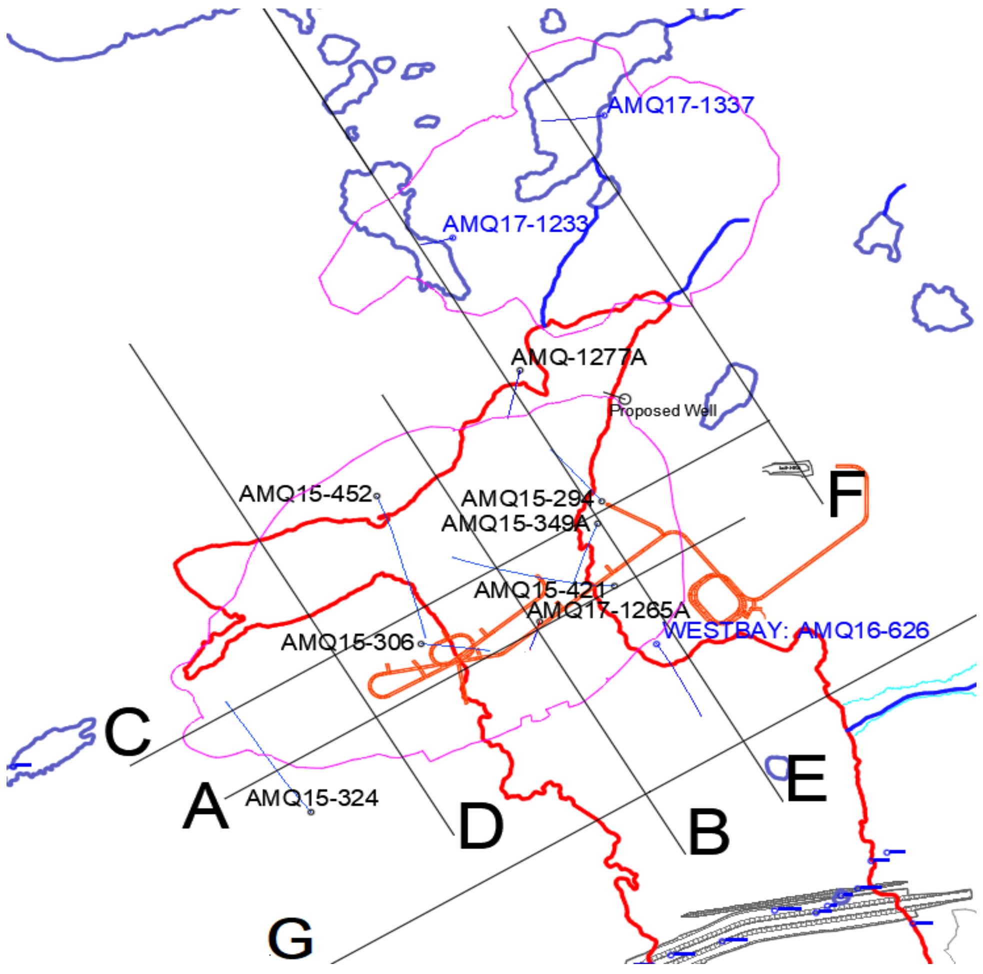
Title: Zero-degree iso-surface produced from the 3D thermal model

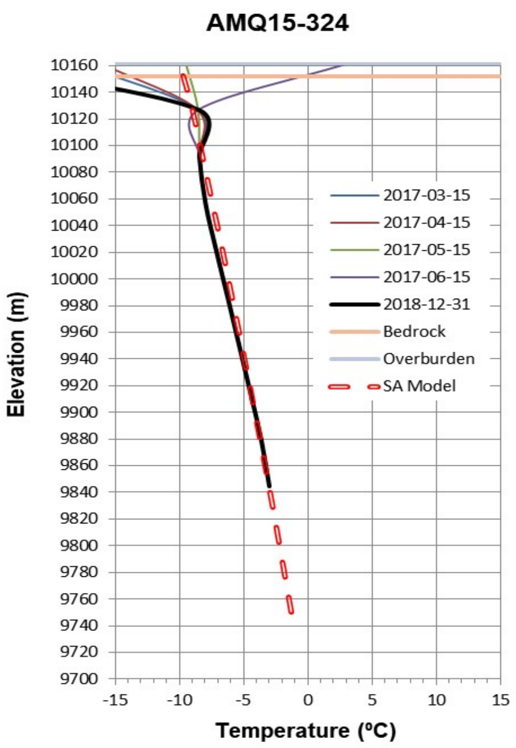
Project No.	Phase	Version	Figure No.:
18108905			**9**

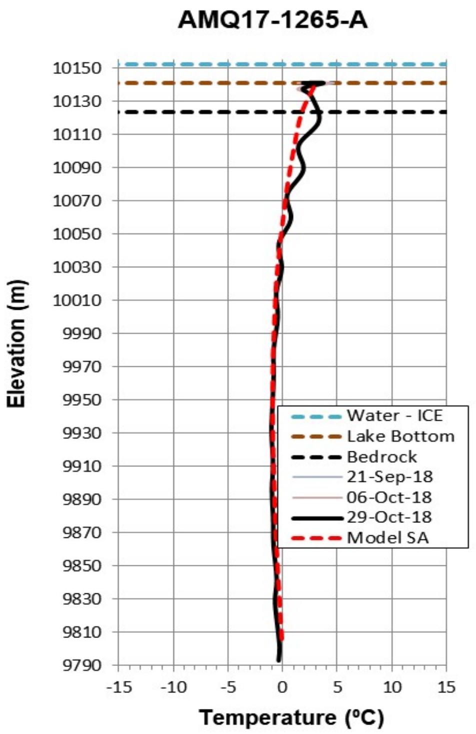
APPENDIX A

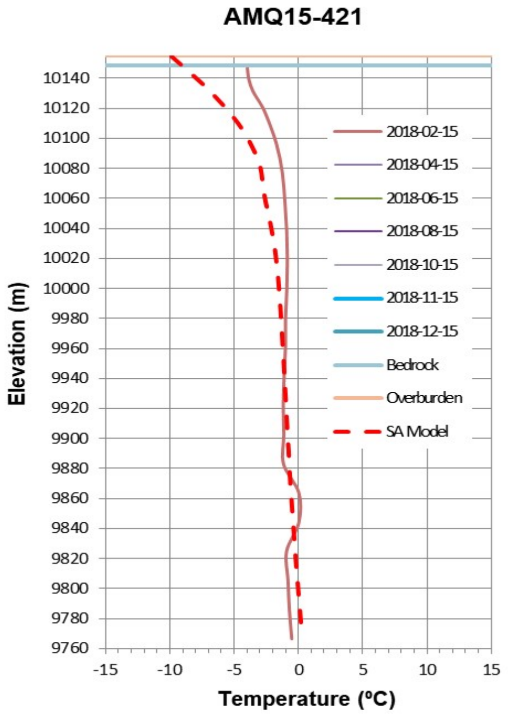
Thermal Model Calibration - Scenario 1











Section	A-A
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Client:
Agnico Eagle Mines Ltd.

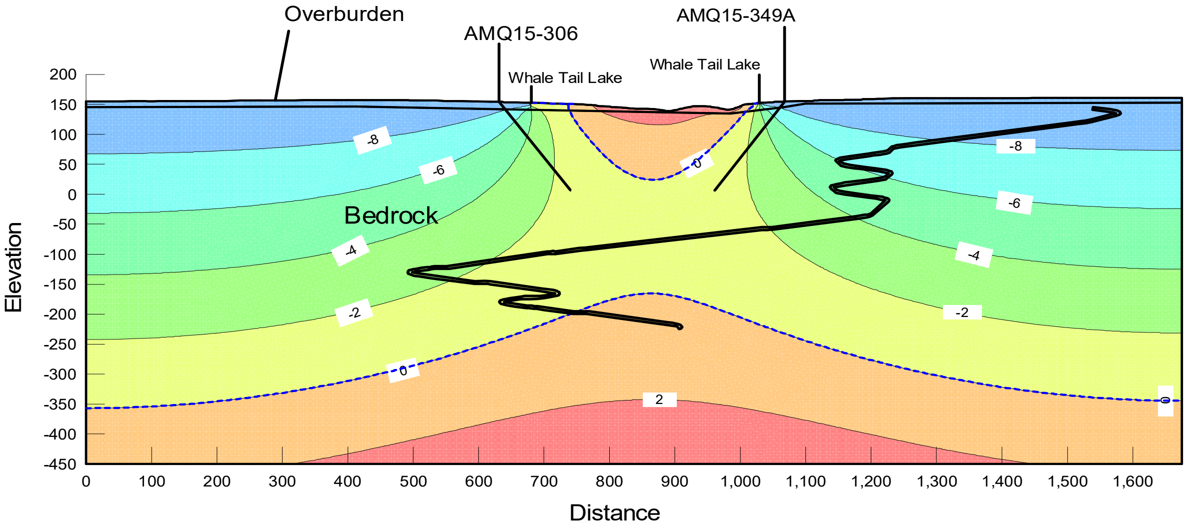
GOLDER

Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

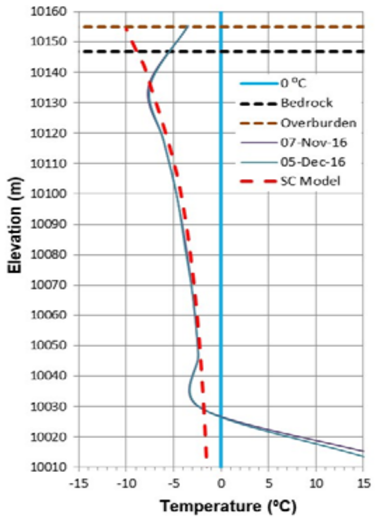
Project: Whale Tail Pit Project

Title: Thermal Model Calibration - Scenario 1 - Section A

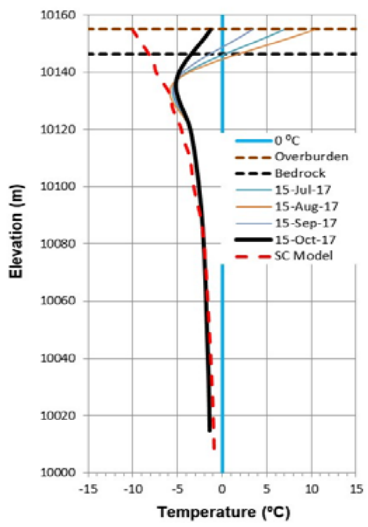
Project No.	Phase	Version	Figure No.:
18108905			**A1**

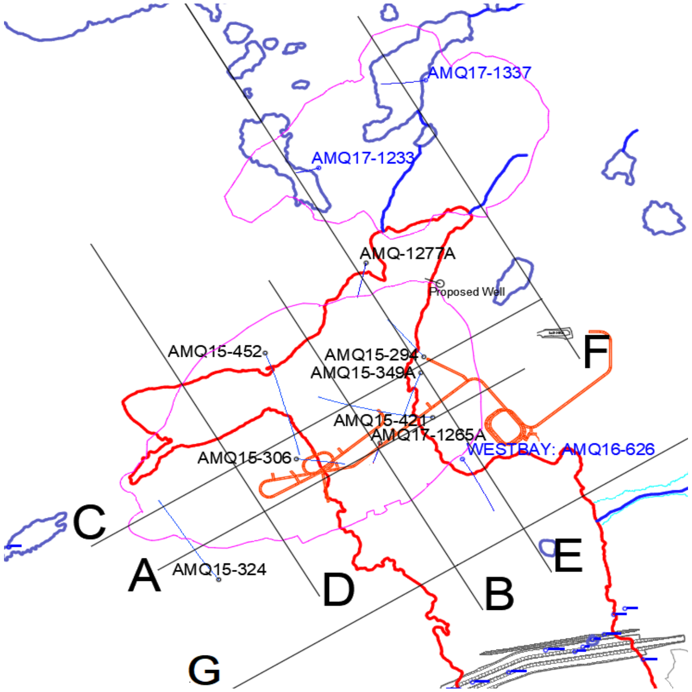


AMQ15-306



AMQ15-349A





Section	C-C
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

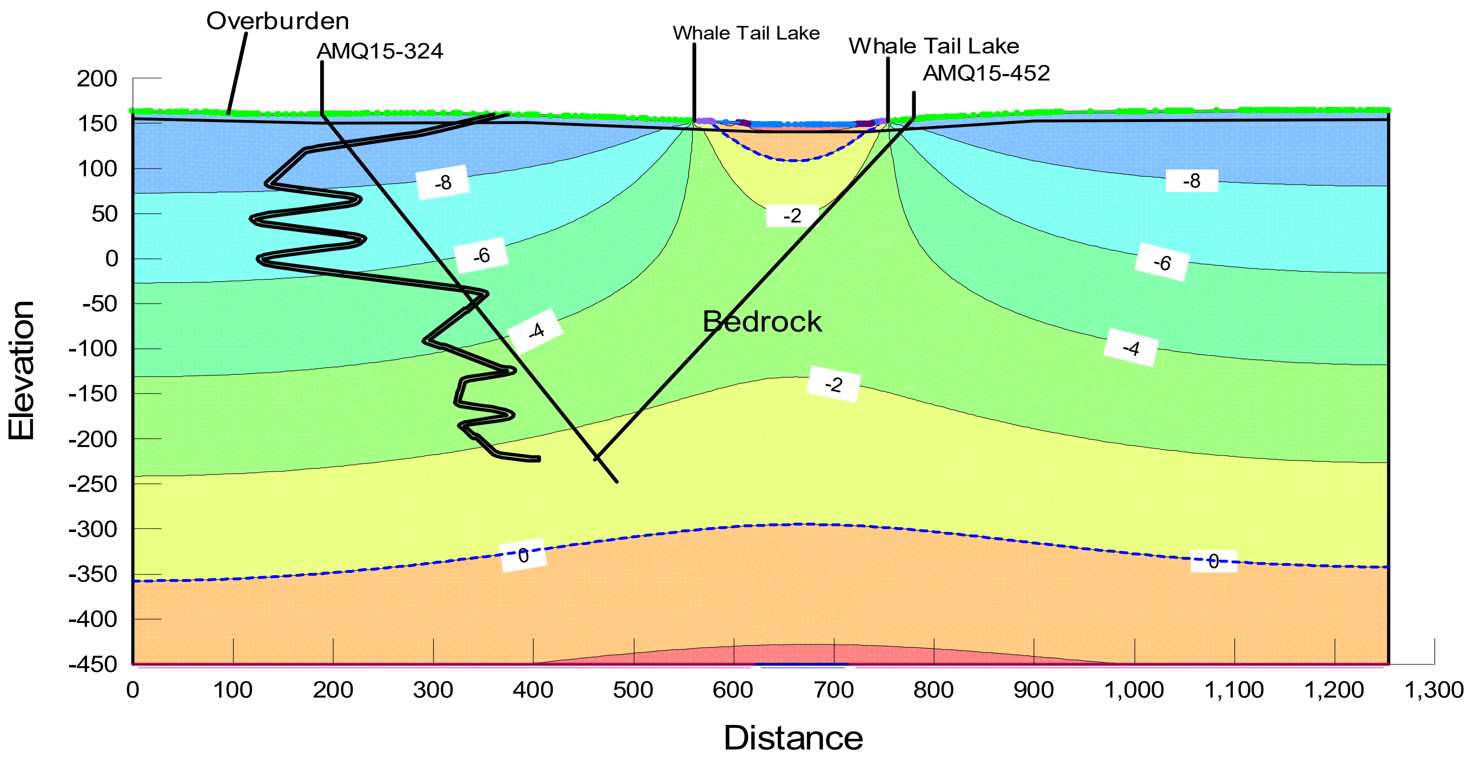
Client:
Agnico Eagle Mines Ltd.

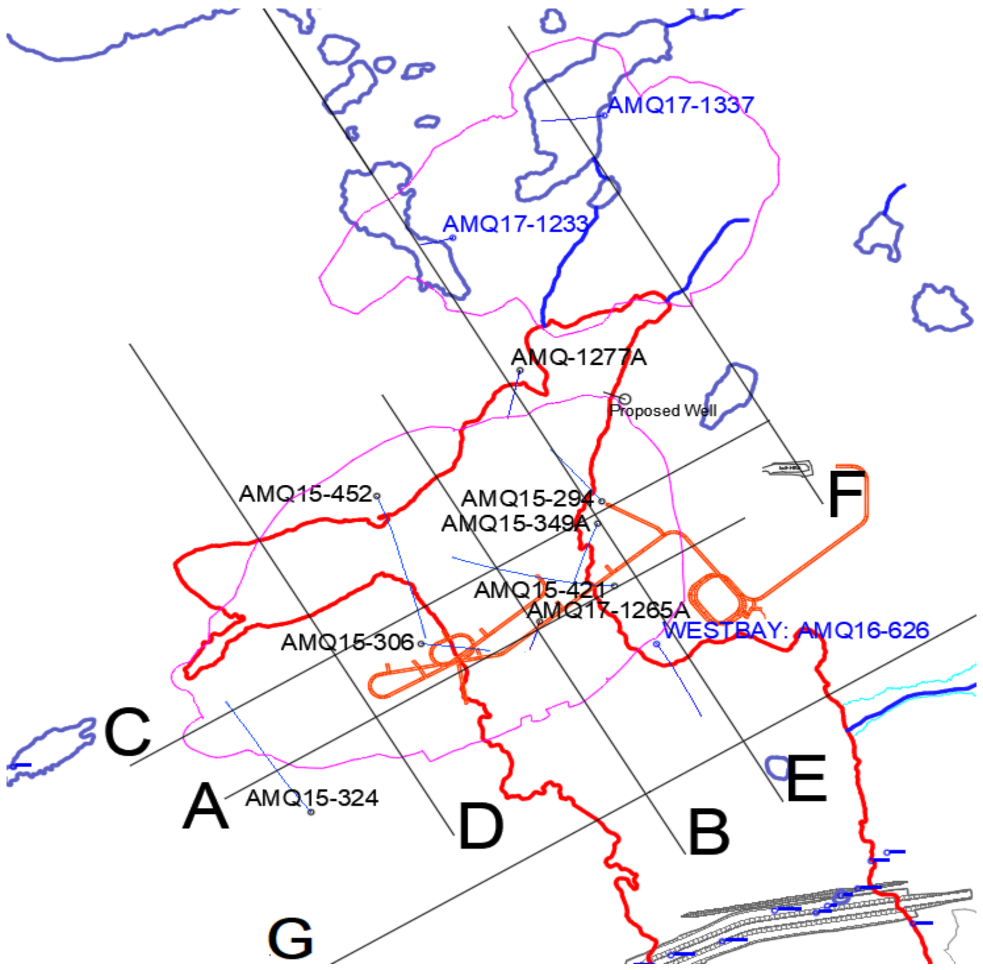
Project: Whale Tail Pit Project

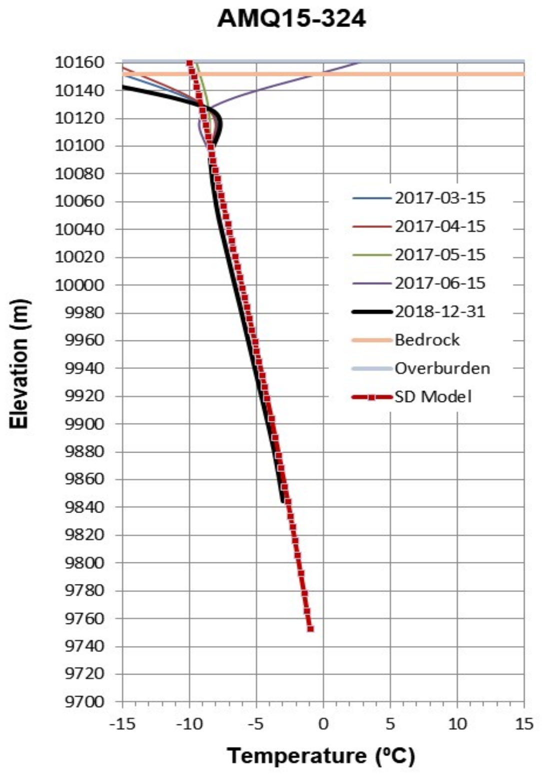
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

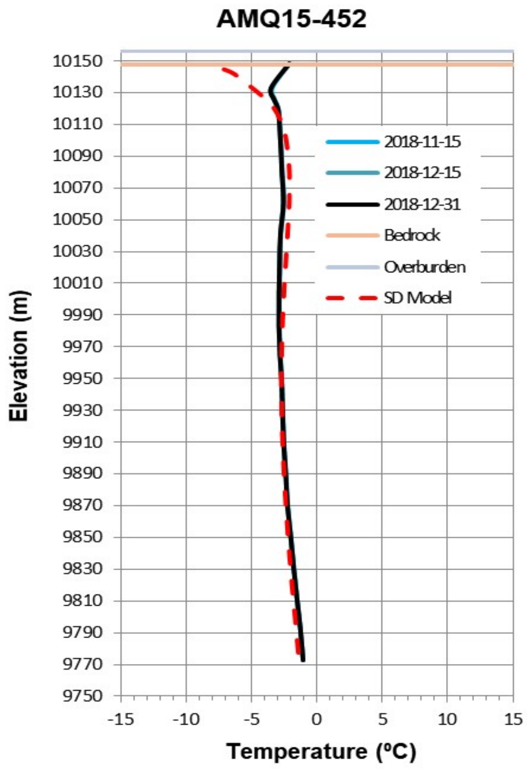
Title: Thermal Model Calibration - Scenario 1 - Section C

Project No.	Phase	Version	Figure No.:
18108905			**A2**









Section	D-D
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Client:
Agnico Eagle Mines Ltd.

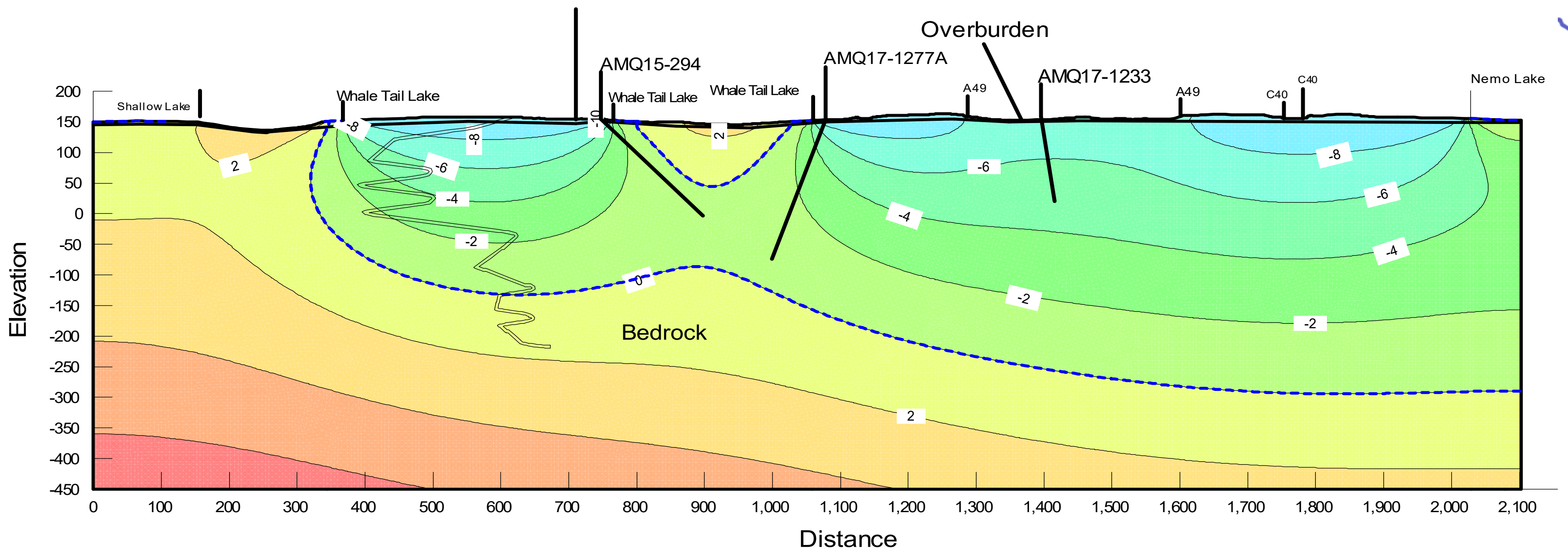
GOLDER

Date: Mar-19
Design: RM
Check: FJ
Review: JL

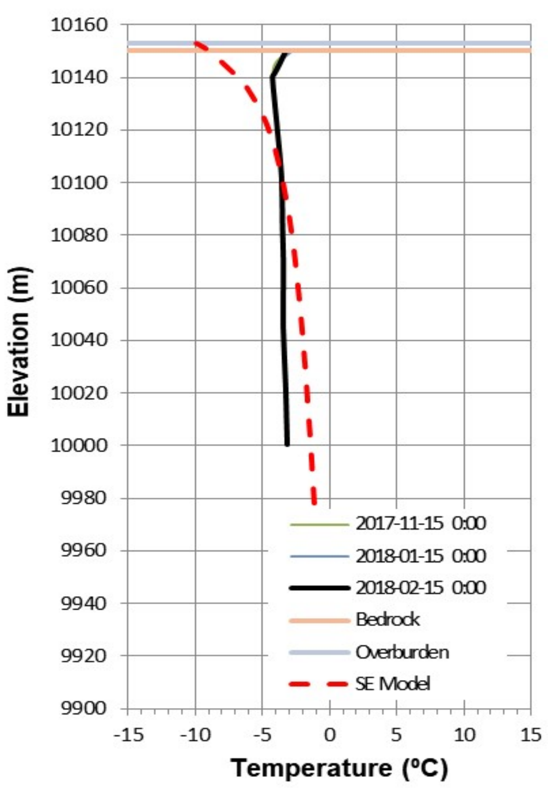
Project: Whale Tail Pit Project

Title: Thermal Model Calibration - Scenario 1 - Section D

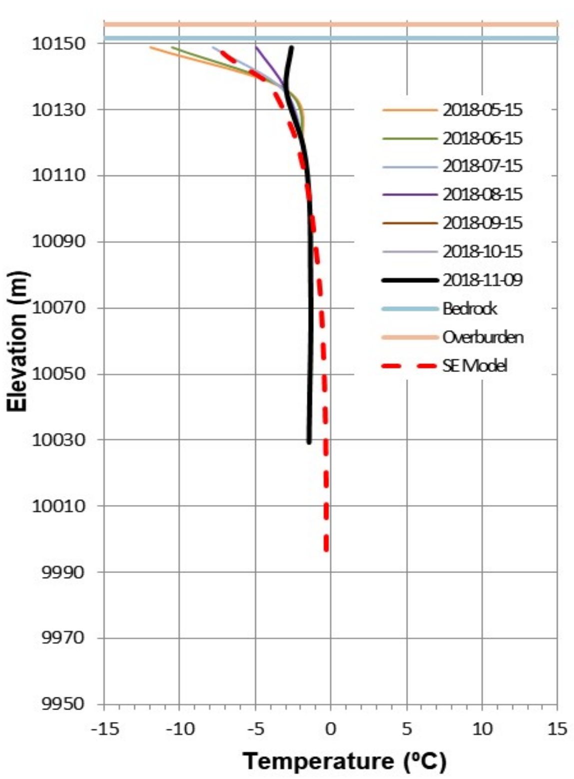
Project No.	Phase	Version	Figure No.:
18108905			**A3**



AMQ17-1277A



AMQ15-294



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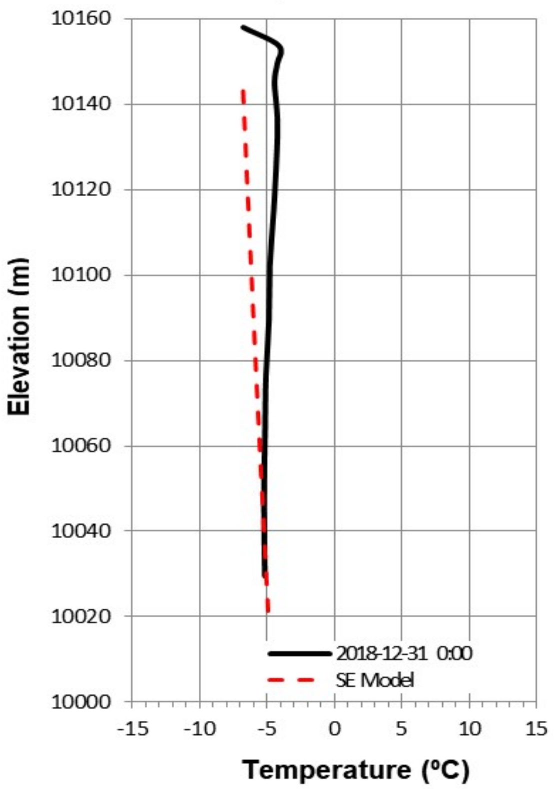
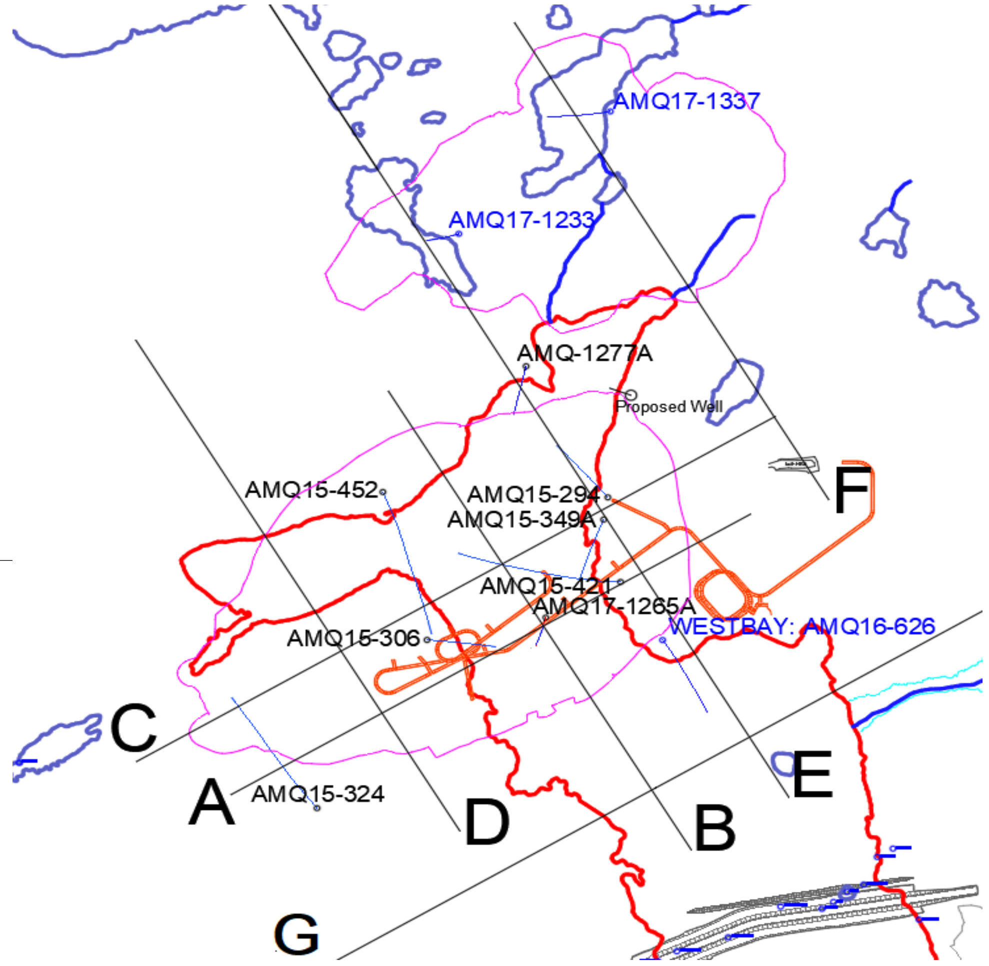




Section	E-E
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	-7
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Client:
Agnico Eagle Mines Ltd.

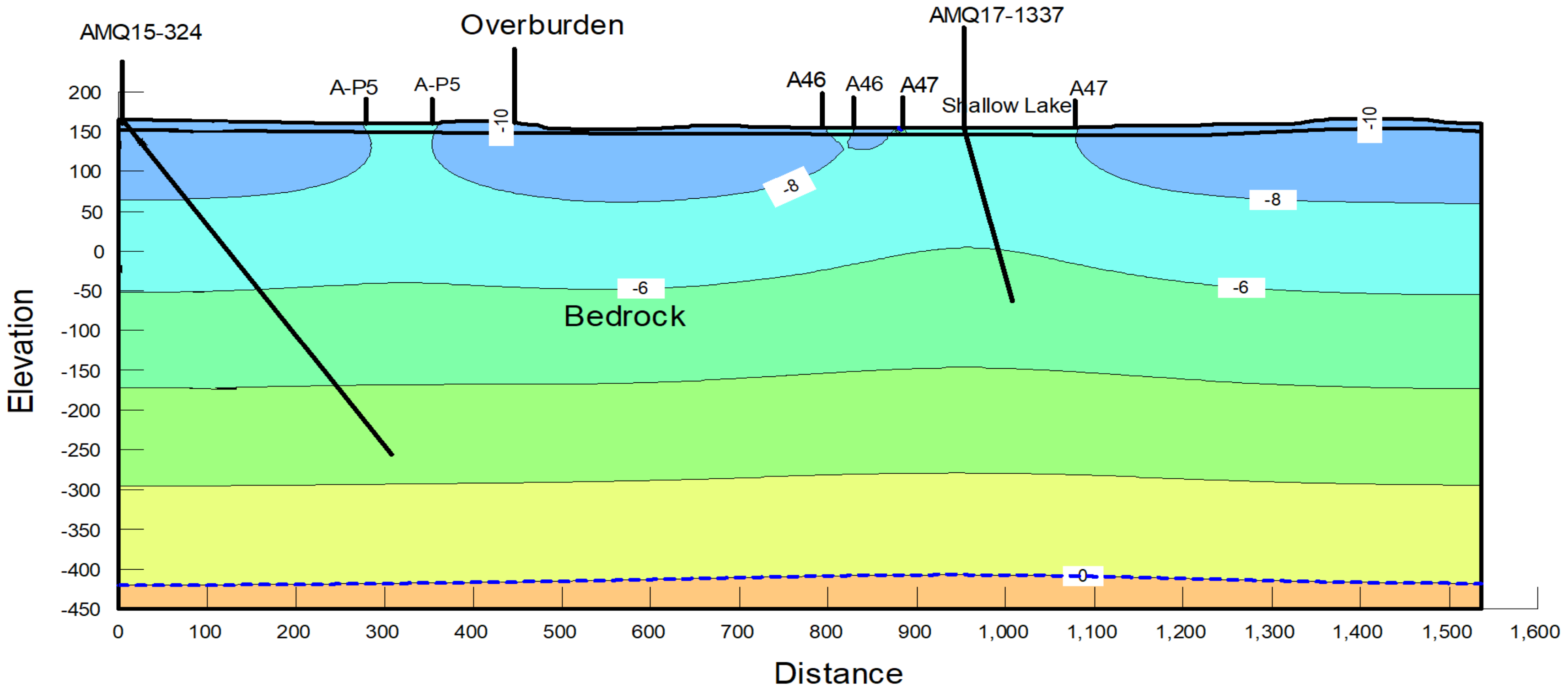
GOLDER

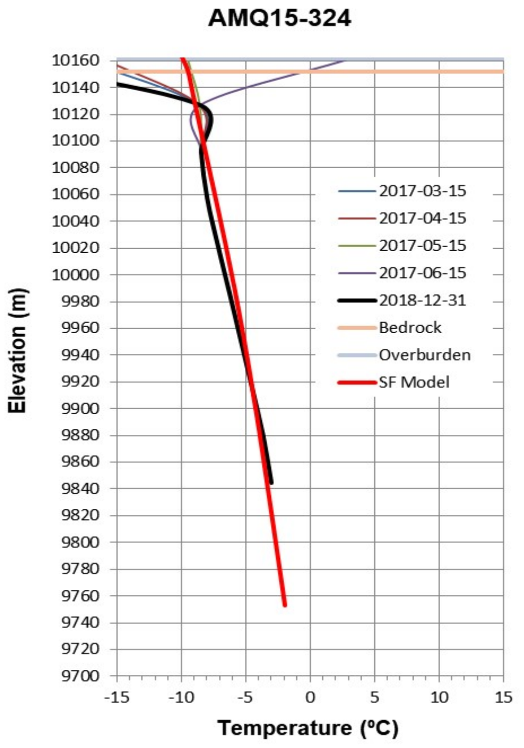
Date: Mar-19
Design: RM
Check: FJ
Review: JL

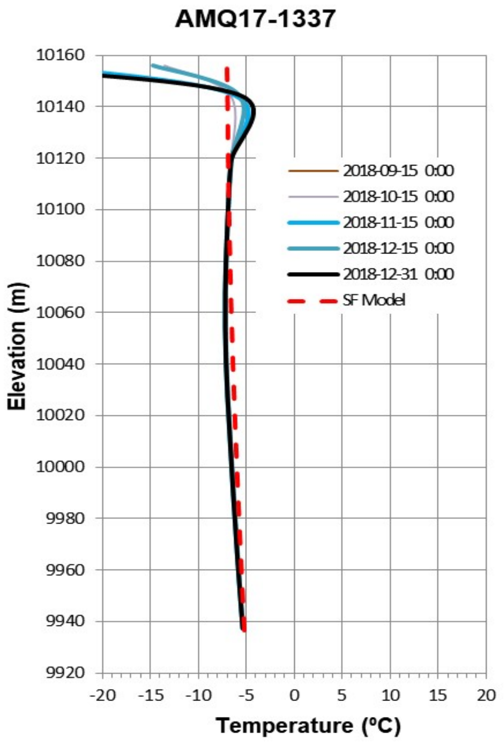
Project: Whale Tail Pit Project

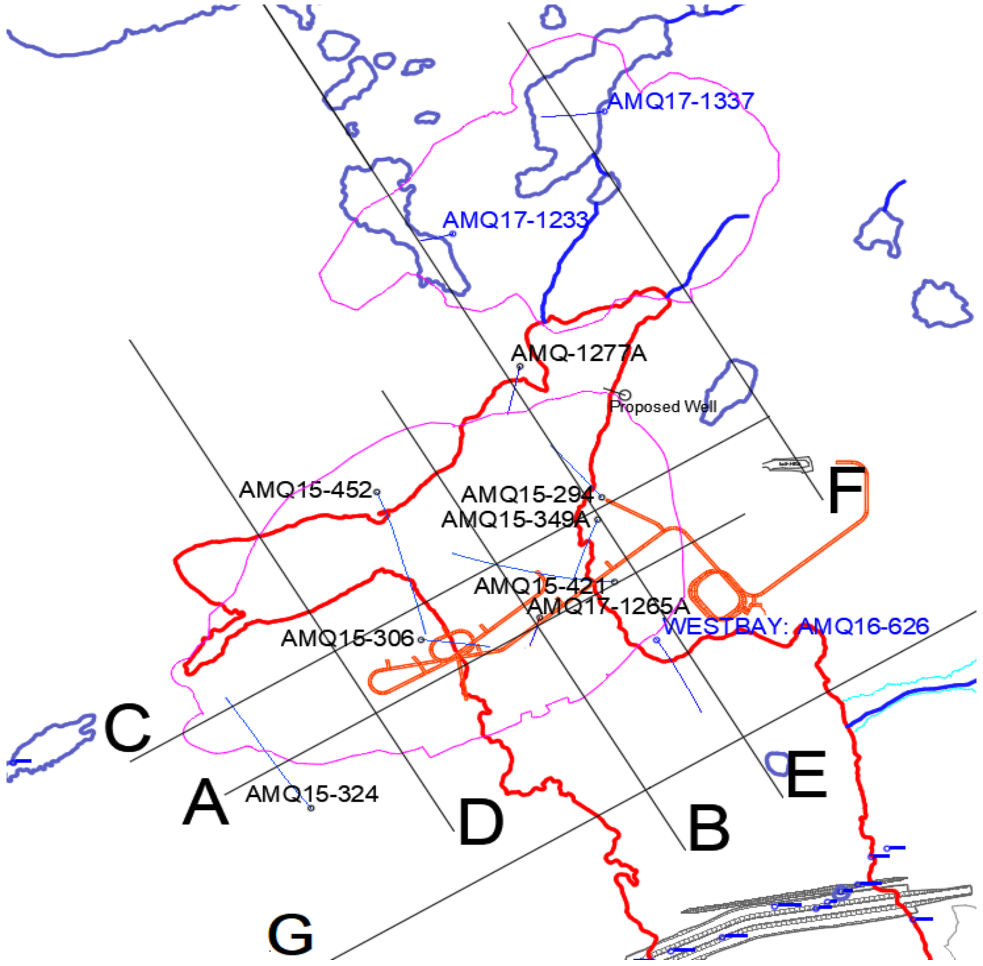
Title: Thermal Model Calibration - Scenario 1 - Section E

Project No.	Phase	Version	Figure No.:
18108905			**A4**









Section	F-F
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	n/a
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	-7
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Client:
Agnico Eagle Mines Ltd.

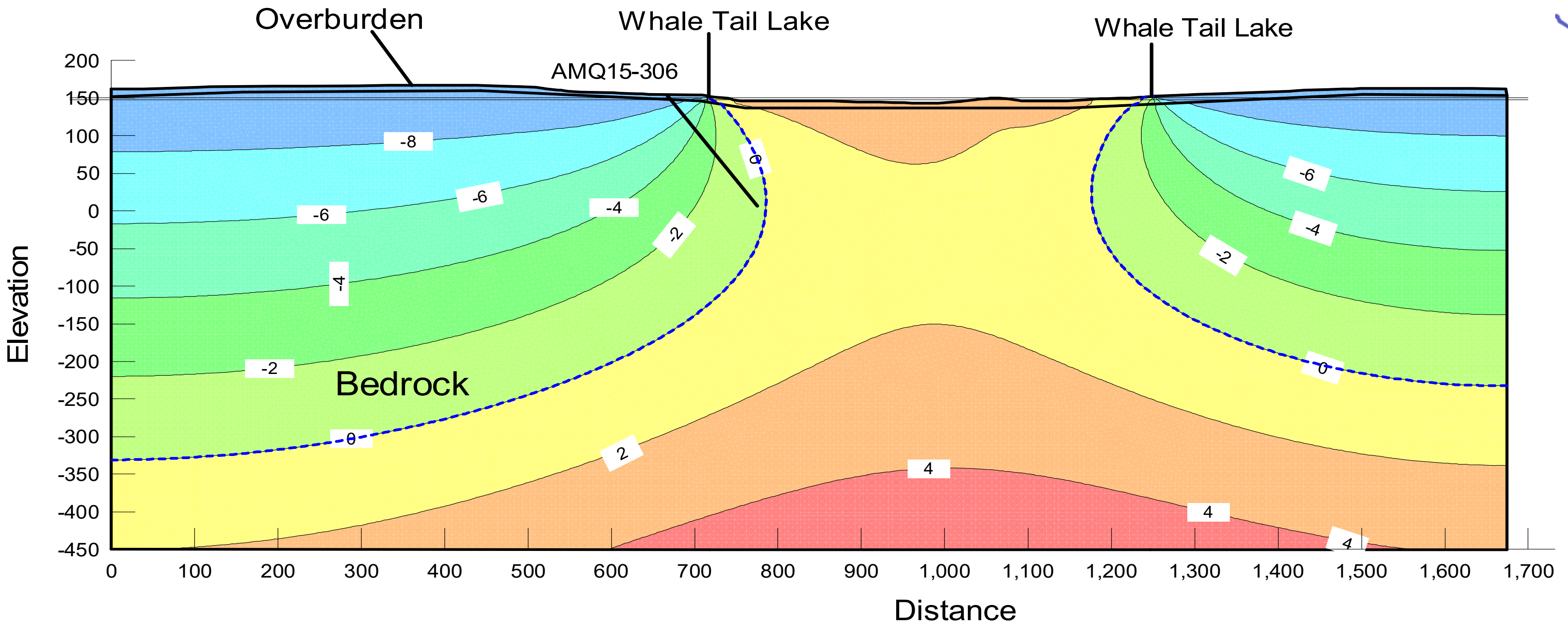
GOLDER

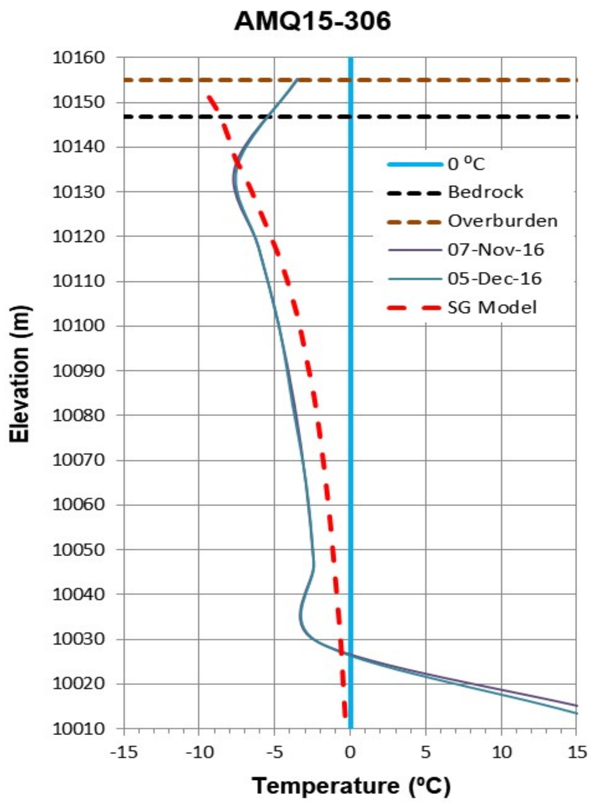
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

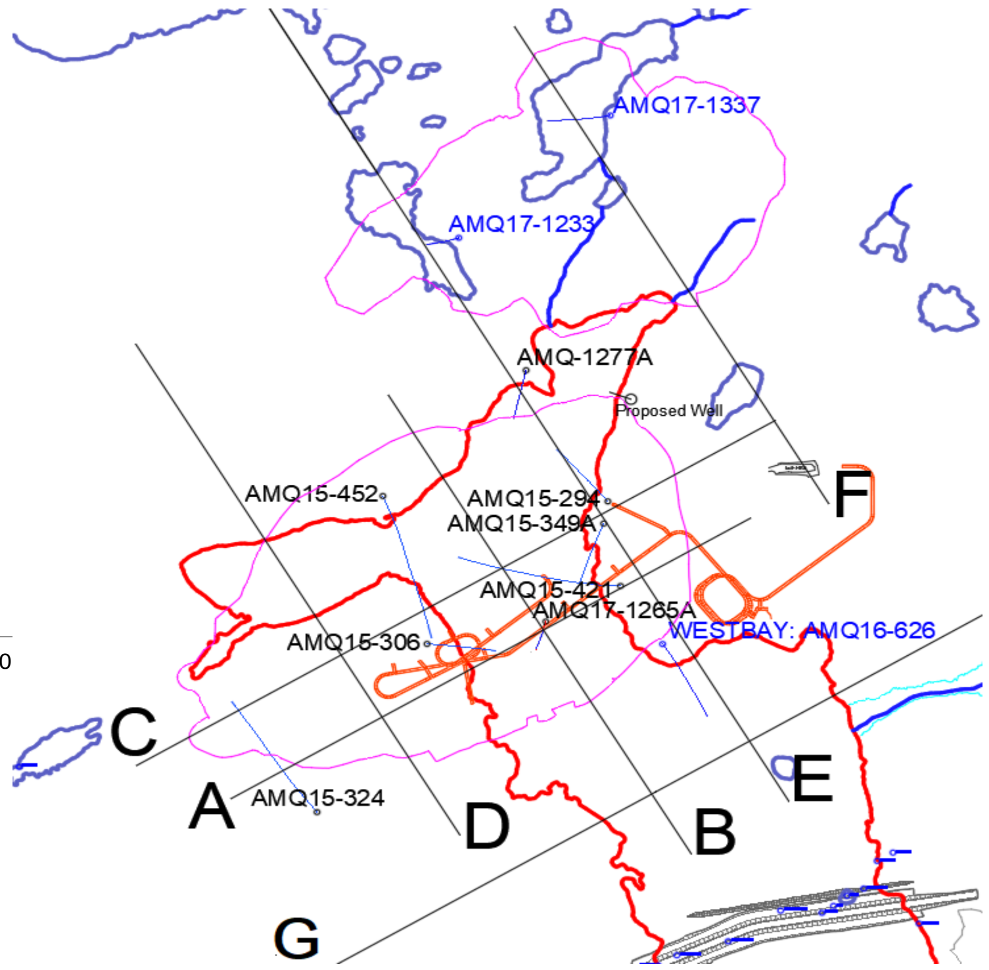
Project: Whale Tail Pit Project

Title: Thermal Model Calibration - Scenario 1 - Section F

Project No.	Phase	Version	Figure No.:
18108905			**A5**







Section	G-G
Ground Temperature (oC)	-10
Whale Tail Lake Temperature (oC)	0 to 3
Shallow Lakes Temperature – other than Whale Tail Lake (oC)	n/a
Heat Flux (J/s)	0.048
Thermal Gradient (oC/m)	0.016

Client:
Agnico Eagle Mines Ltd.

GOLDER

Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

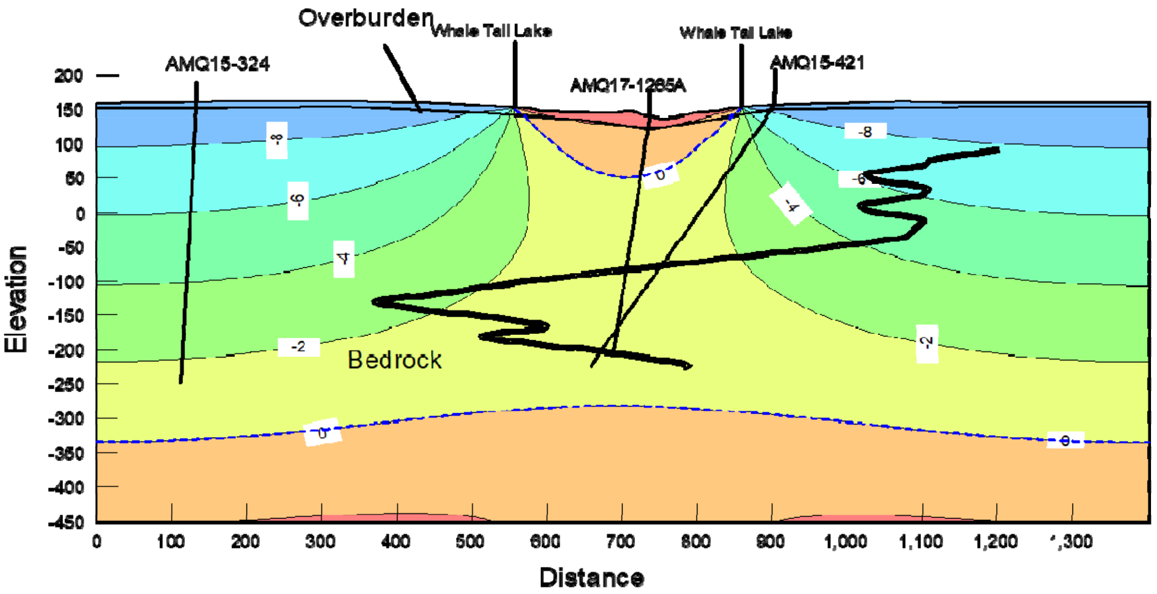
Project: Whale Tail Pit Project

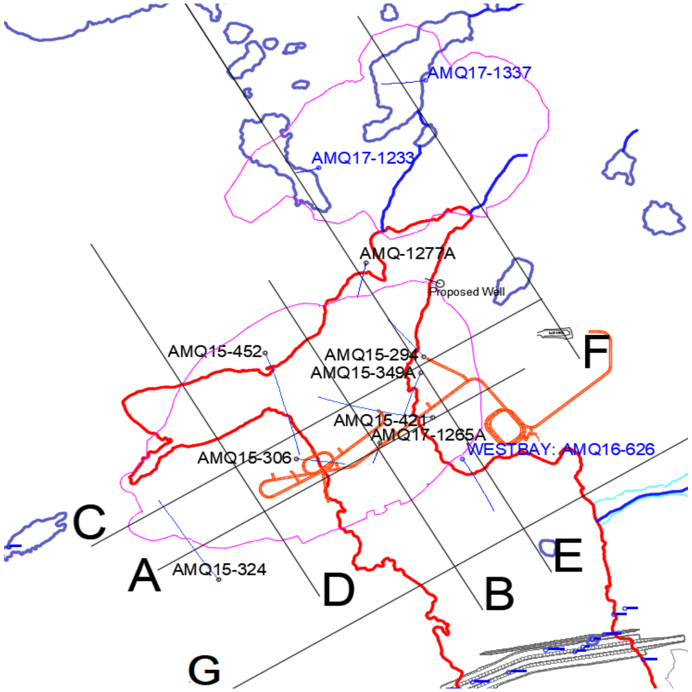
Title: Thermal Model Calibration - Scenario 1 - Section G

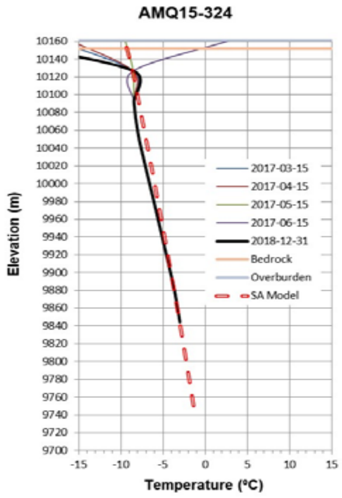
Project No.	Phase	Version	Figure No.:
18108905			**A6**

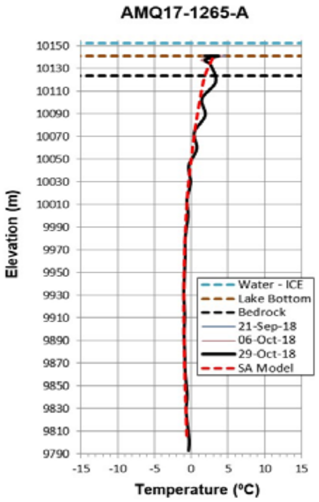
APPENDIX B

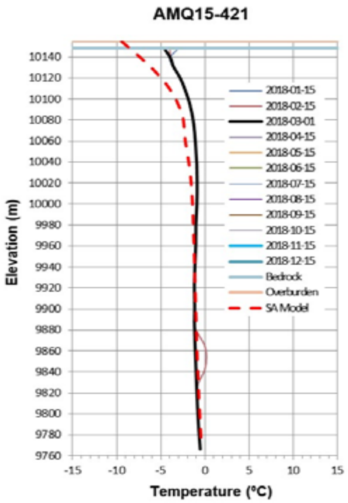
Thermal Model Calibration - Scenario 2











Section	A-A
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

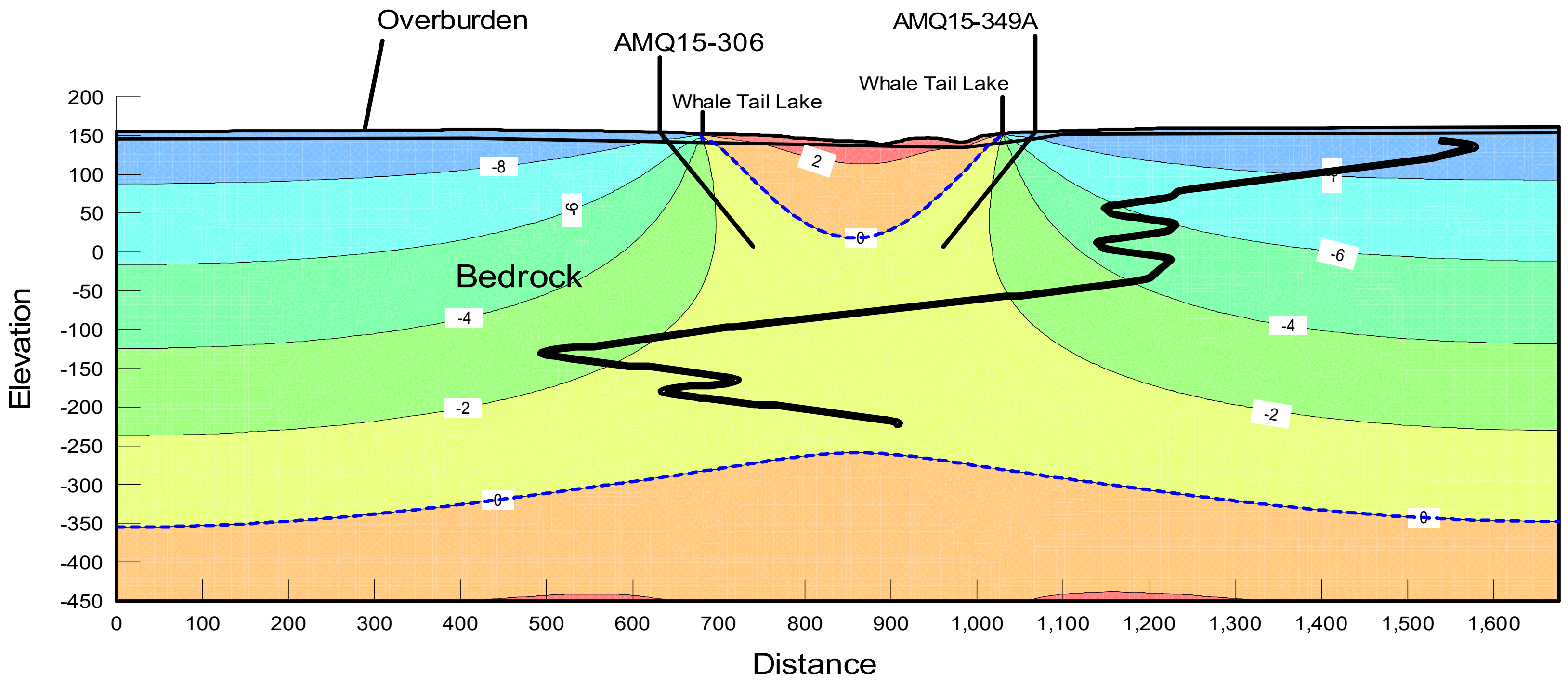
Client:
Agnico Eagle Mines Ltd.

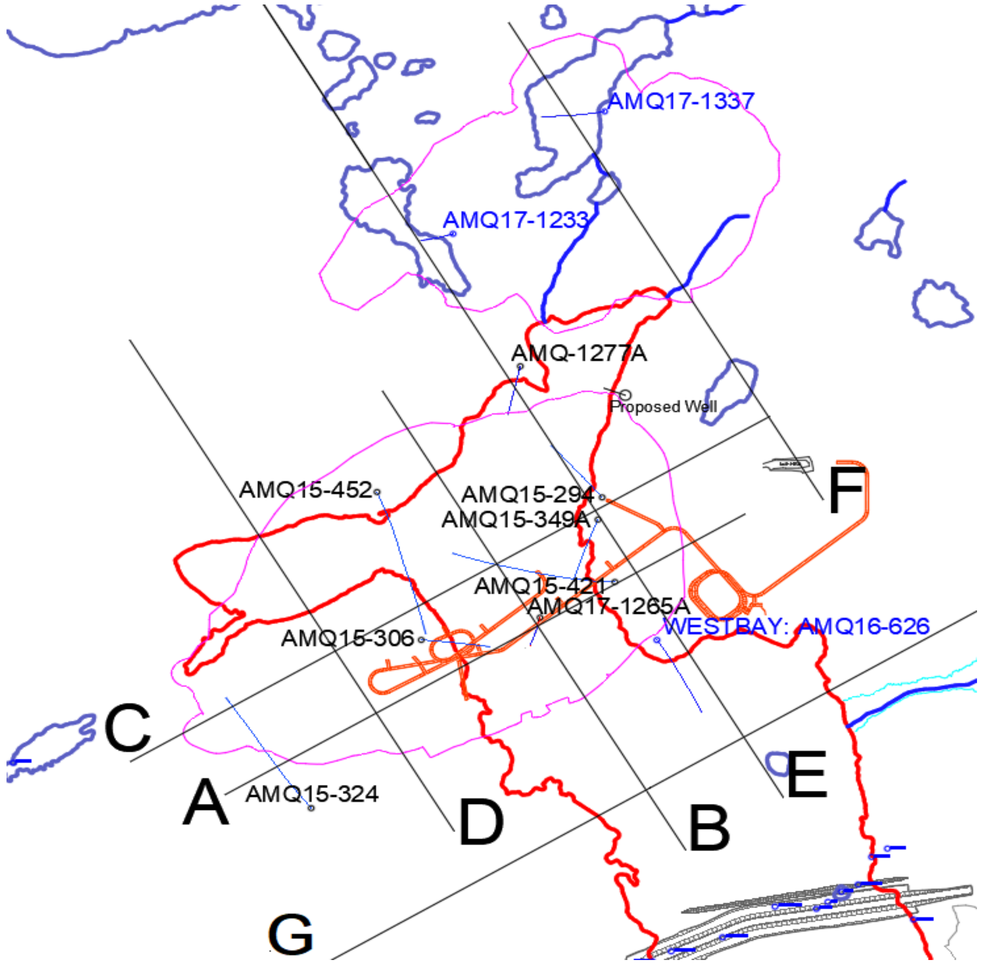
Project: Whale Tail Pit Project

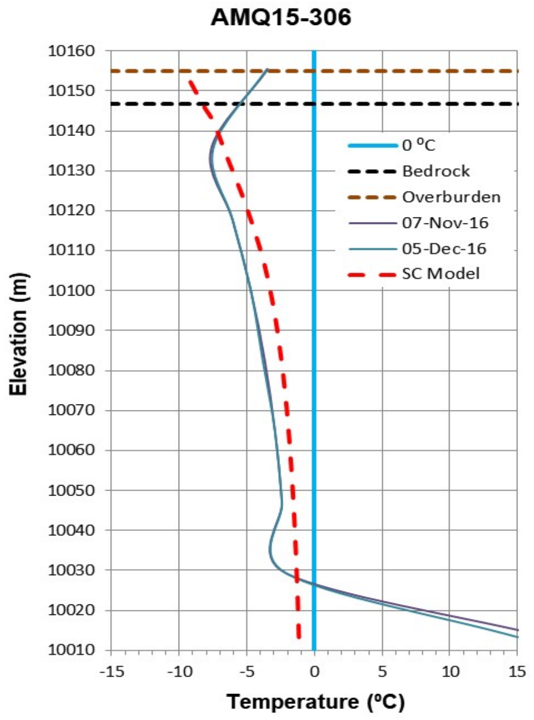
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

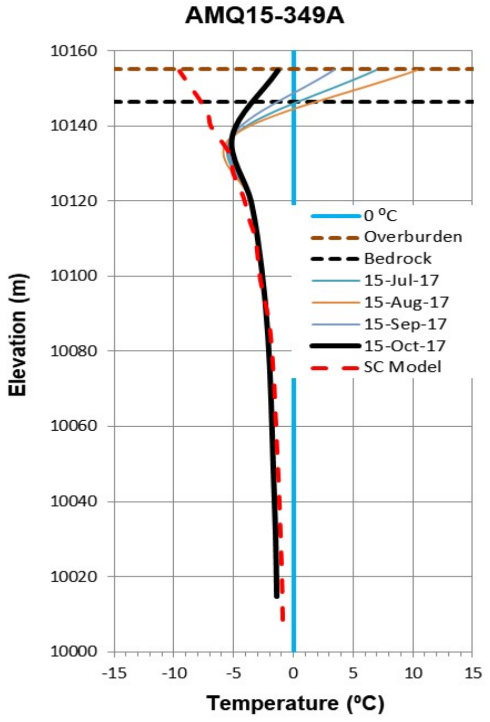
Title: Thermal Model Calibration - Scenario 2 - Section A

Project No.	Phase	Version	Figure No.:
18108905			**B1**









Section	C-C
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

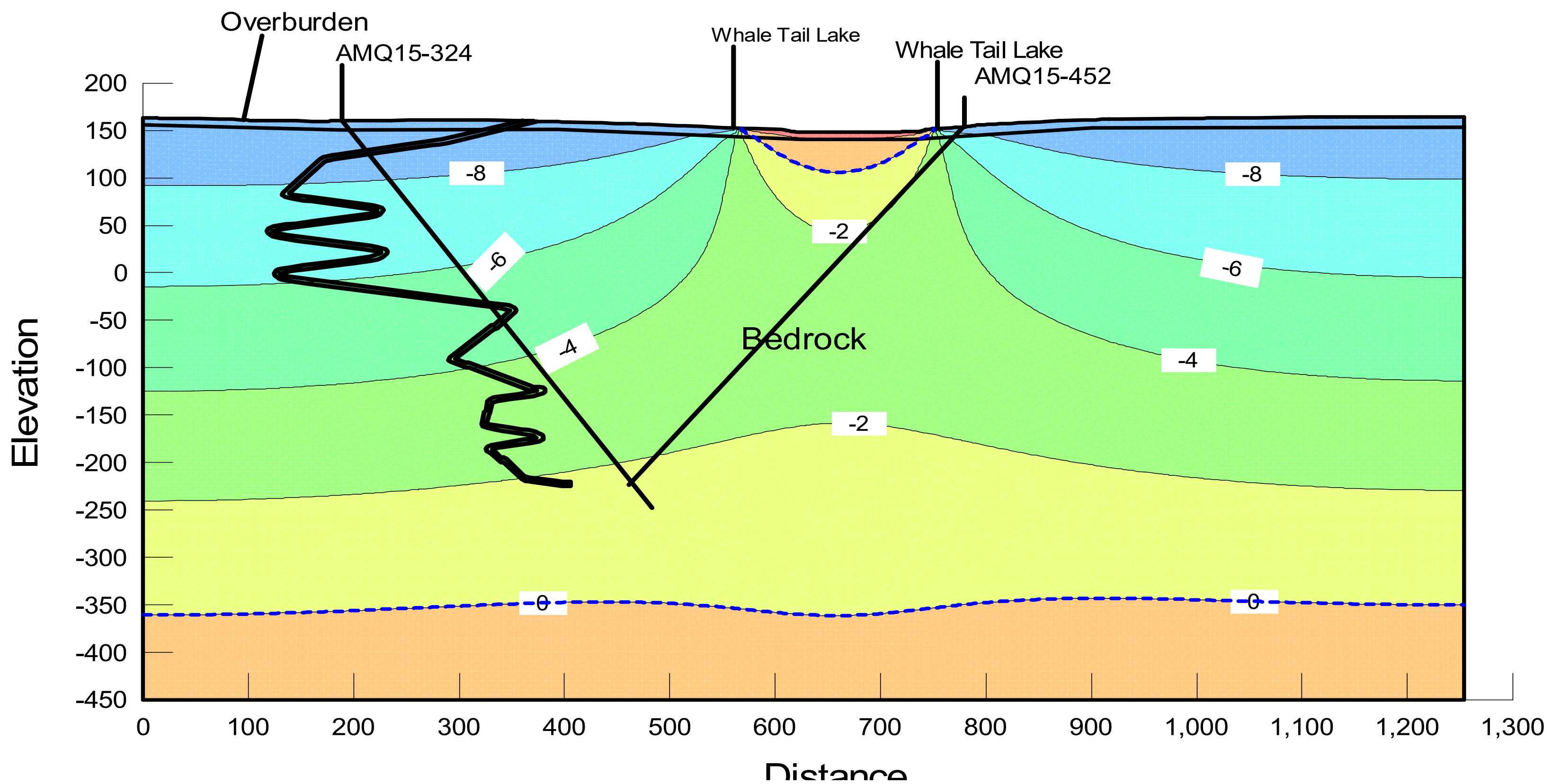
Project: Whale Tail Pit Project

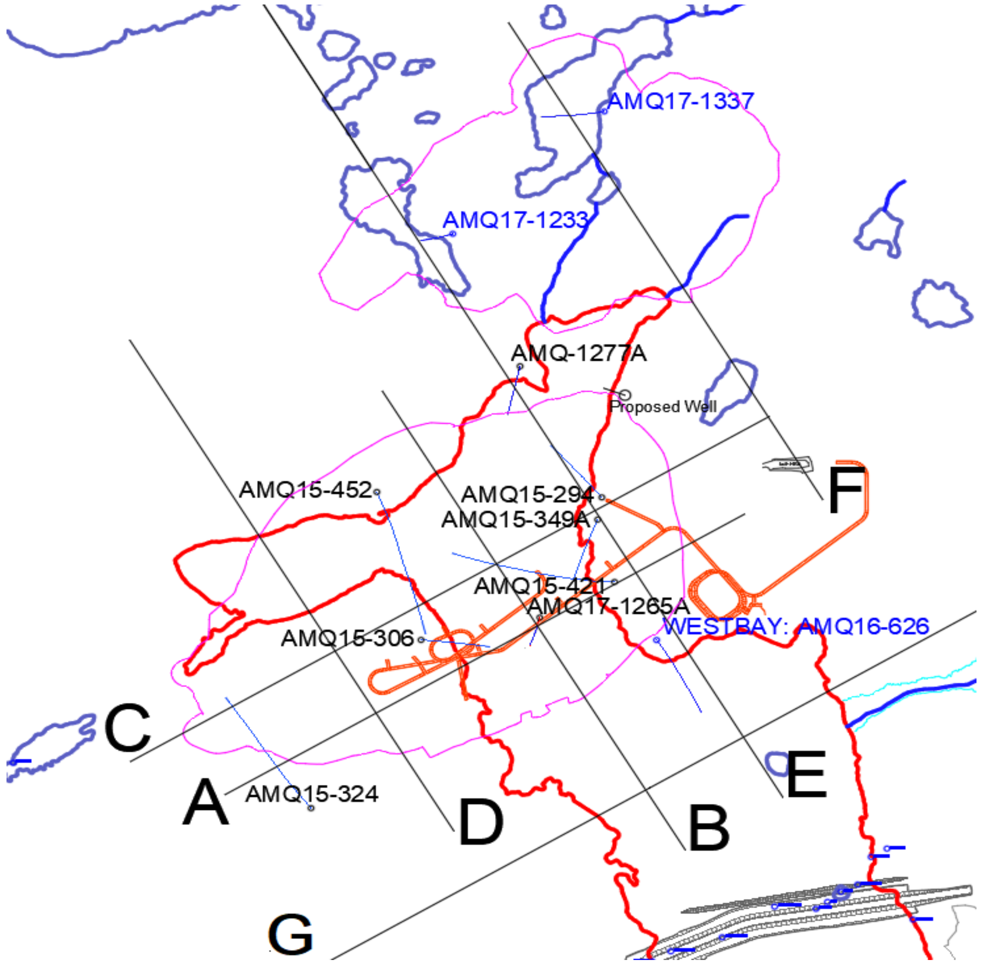
GOLDER

Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

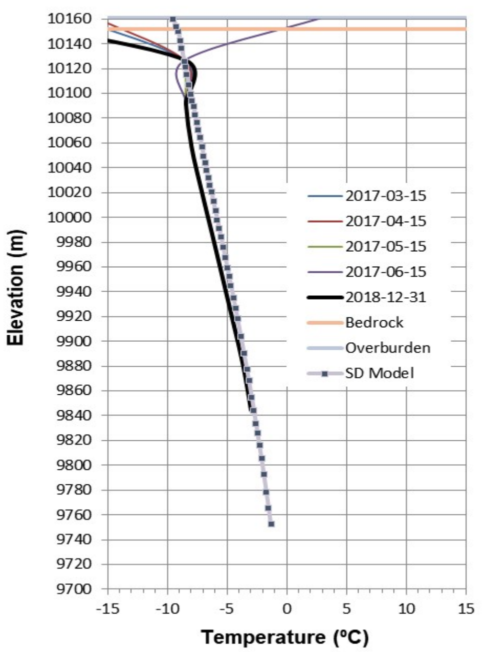
Title: Thermal Model Calibration - Scenario 2- Section C

Project No.	Phase	Version	Figure No.:
18108905			**B2**

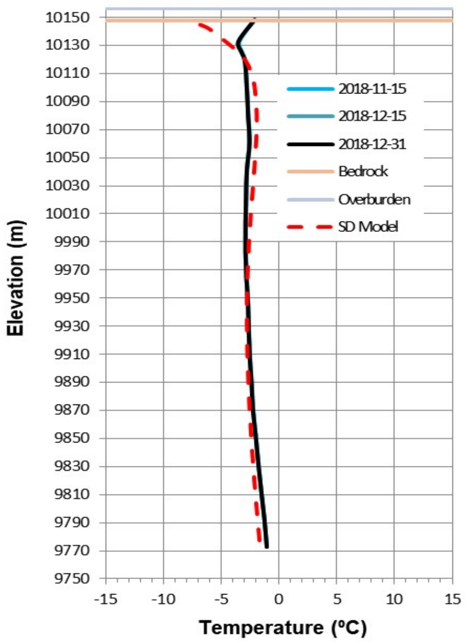




AMQ15-324



AMQ15-452



Section	D-D
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

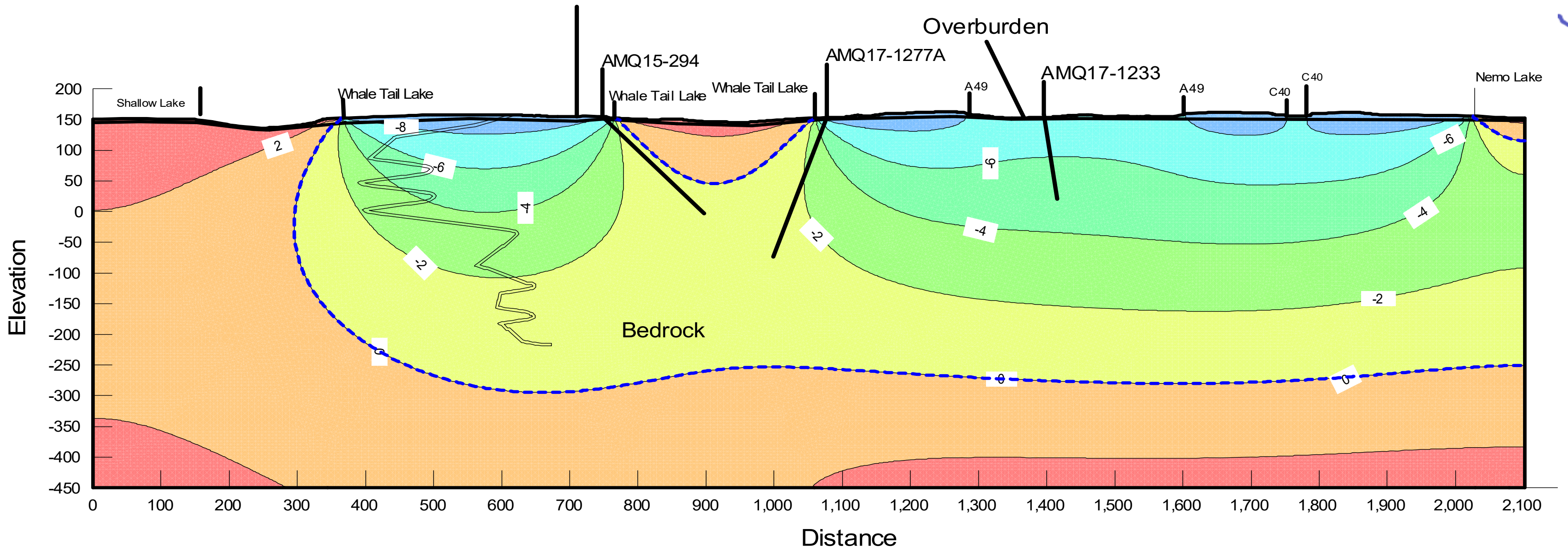
GOLDER

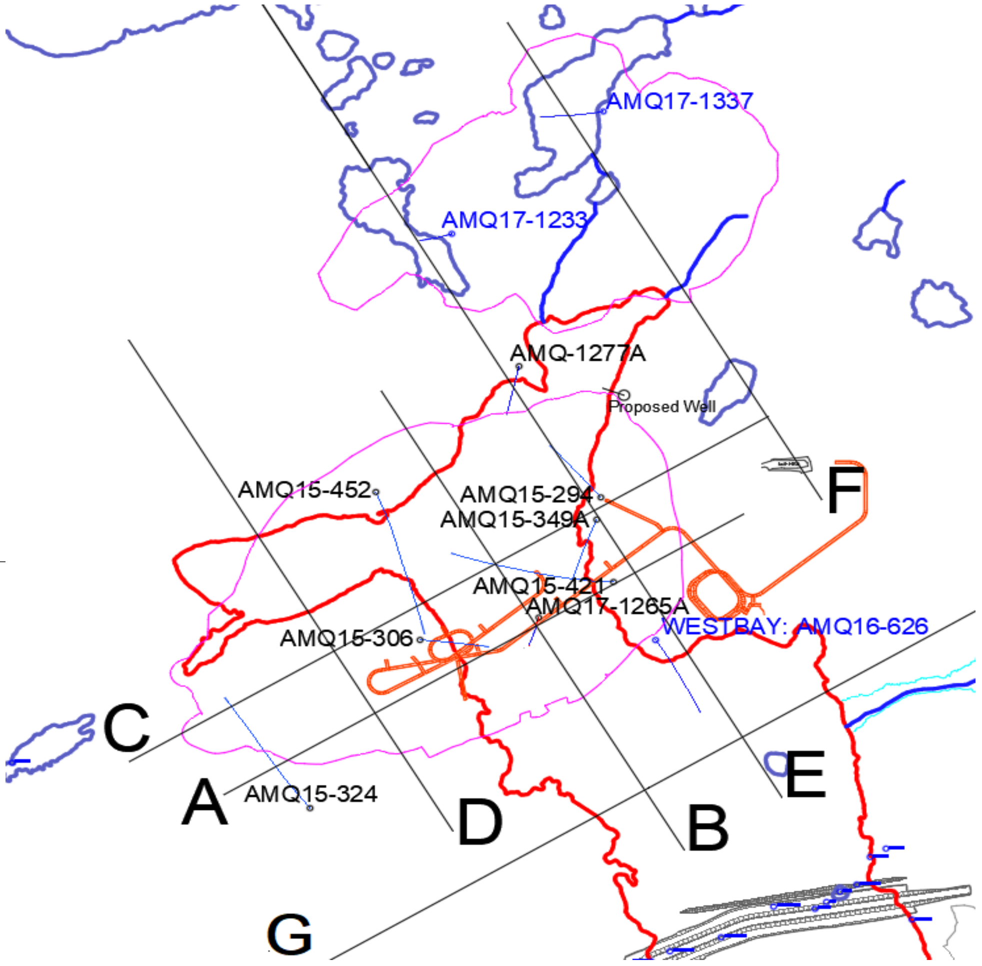
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

Project: Whale Tail Pit Project

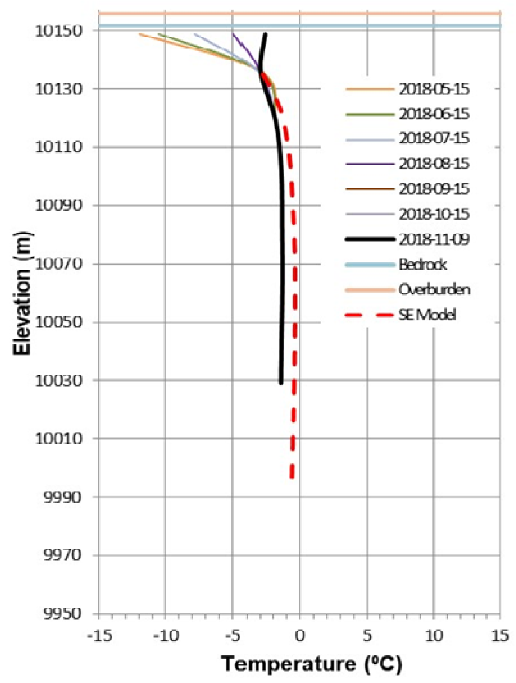
Title: Thermal Model Calibration - Scenario 2 - Section D

Project No.	Phase	Version	Figure No.:
18108905			B3





AMQ15-294



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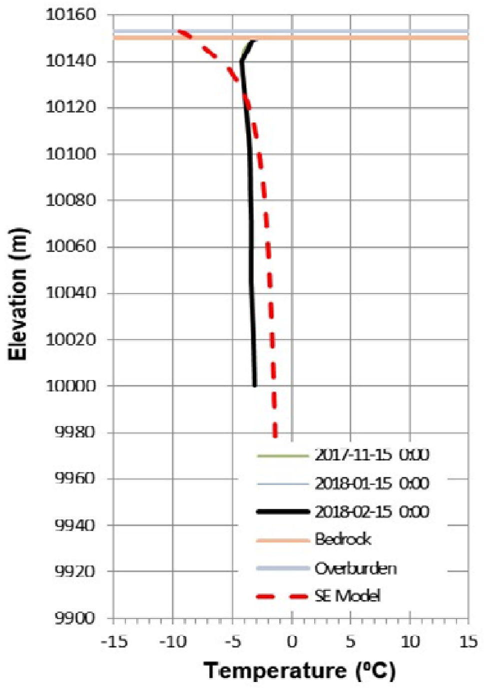

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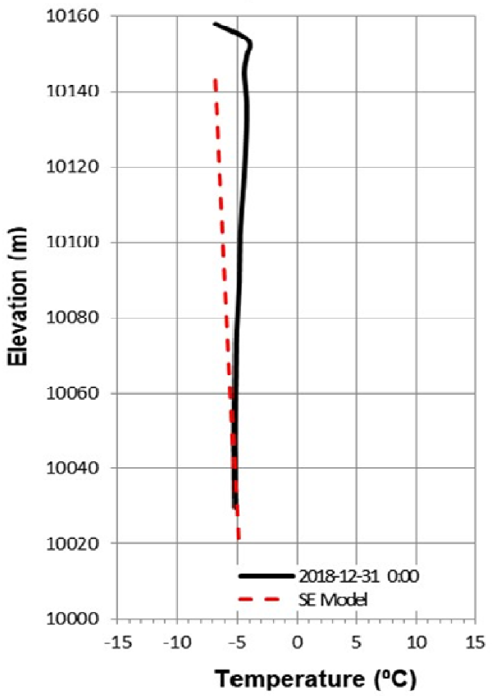


Section	E-E
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	-7
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

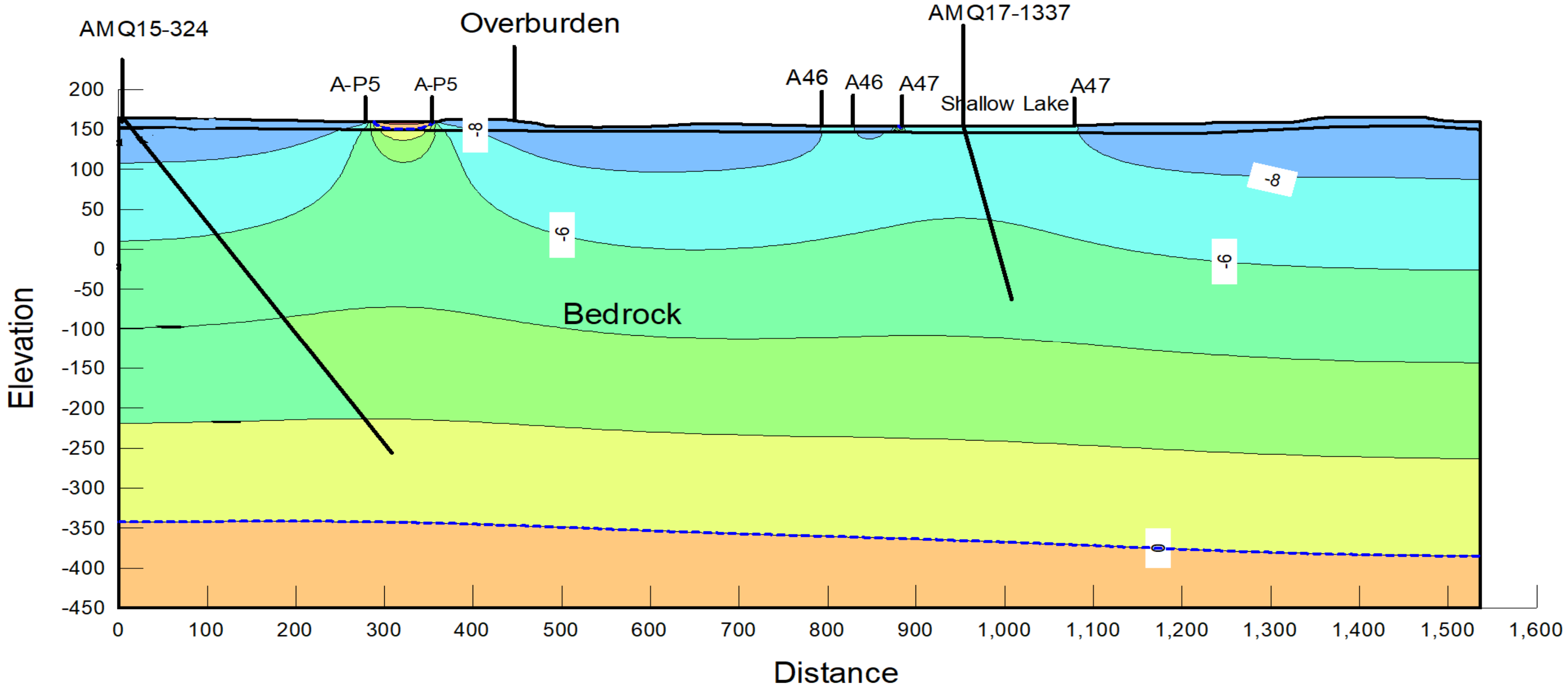
GOLDER

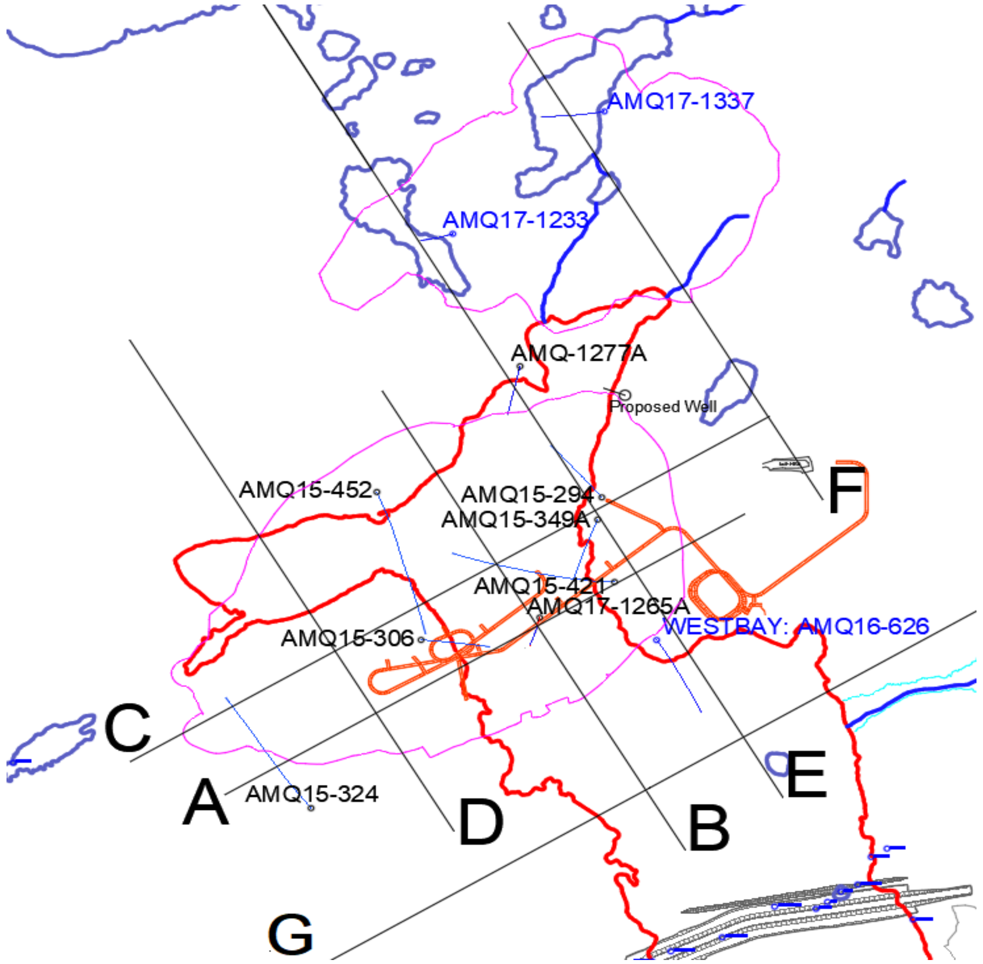
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

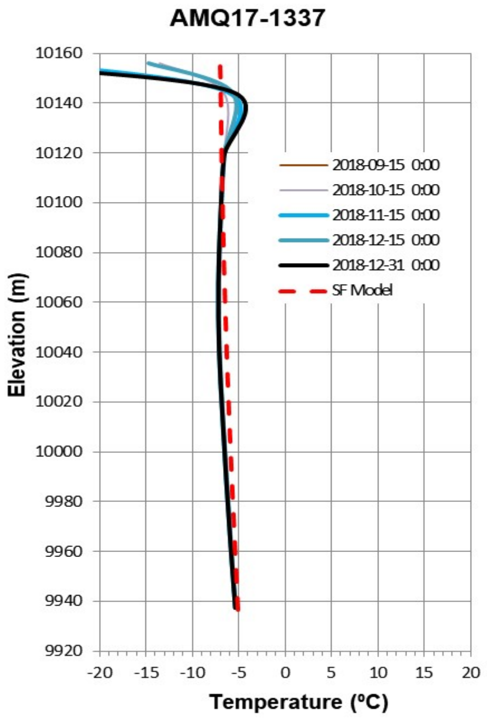
Project: Whale Tail Pit Project

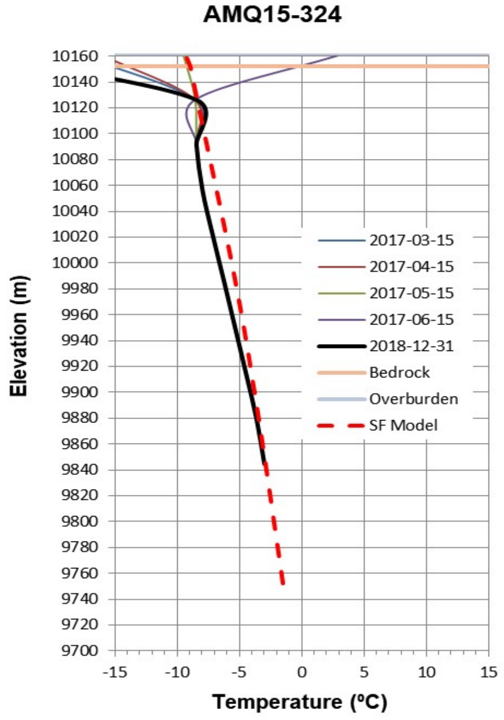
Title: Thermal Model Calibration - Scenario 2 - Section E

Project No.	Phase	Version	Figure No.:
18108905			**B4**









Section	F-F
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	n/a
Other shallow lake Temperature (oC)	-7
Heat Flux (beneath ground) J/s	0.048
Thermal Gradient (oC/m)	0.016
Heat Flux (beneath WT Lake) J/s	n/a
Thermal Gradient (oC/m)	n/a

Client:
Agnico Eagle Mines Ltd.

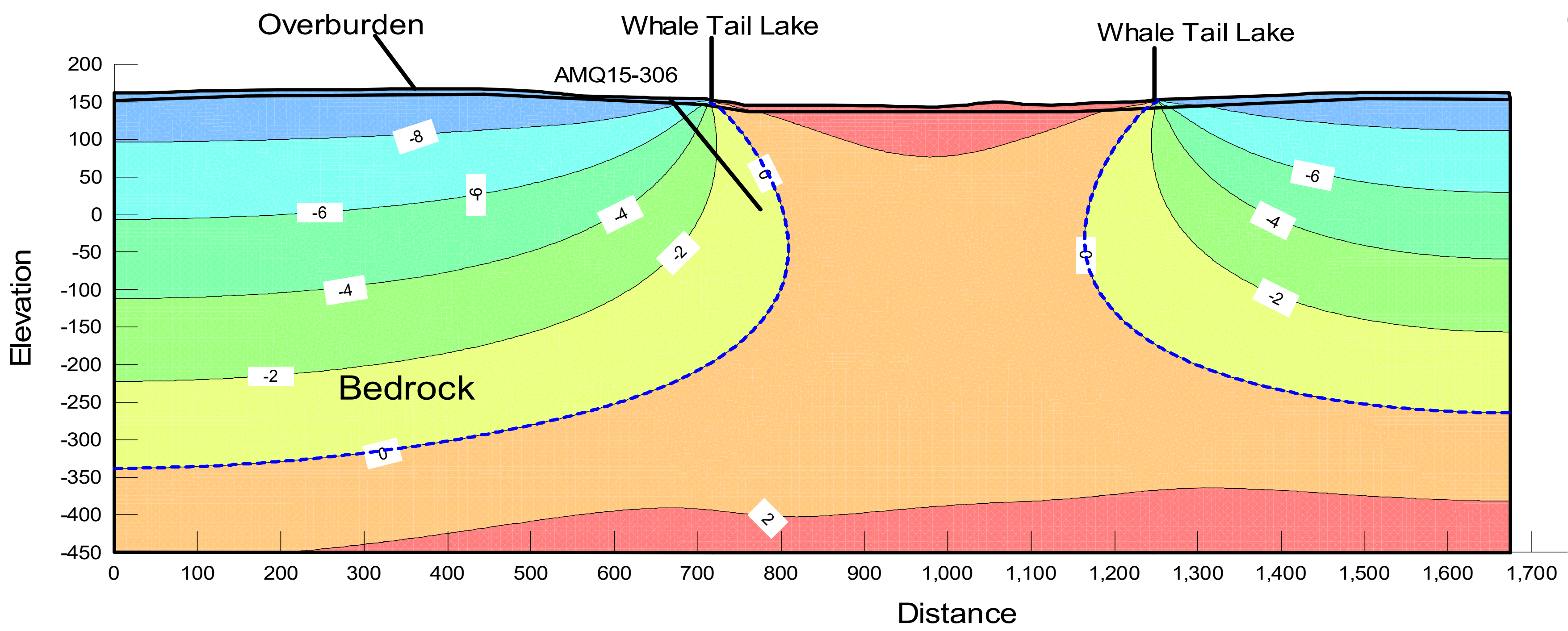
Project: Whale Tail Pit Project

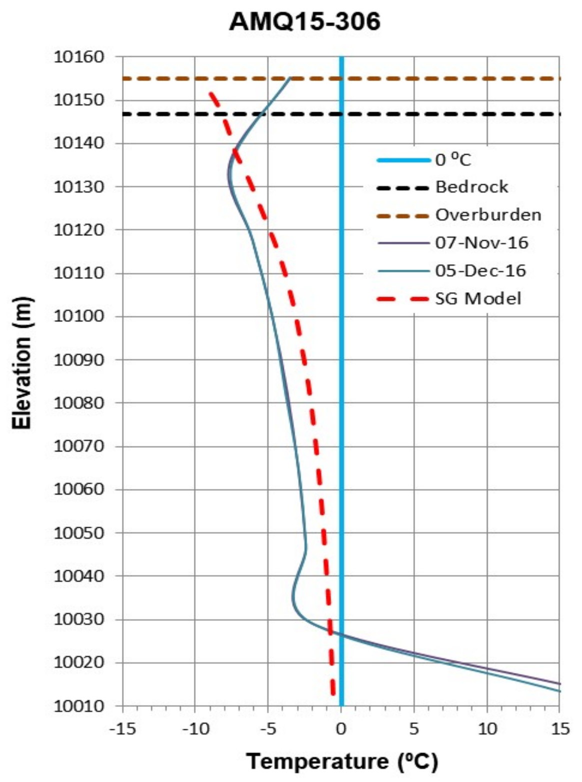
GOLDER

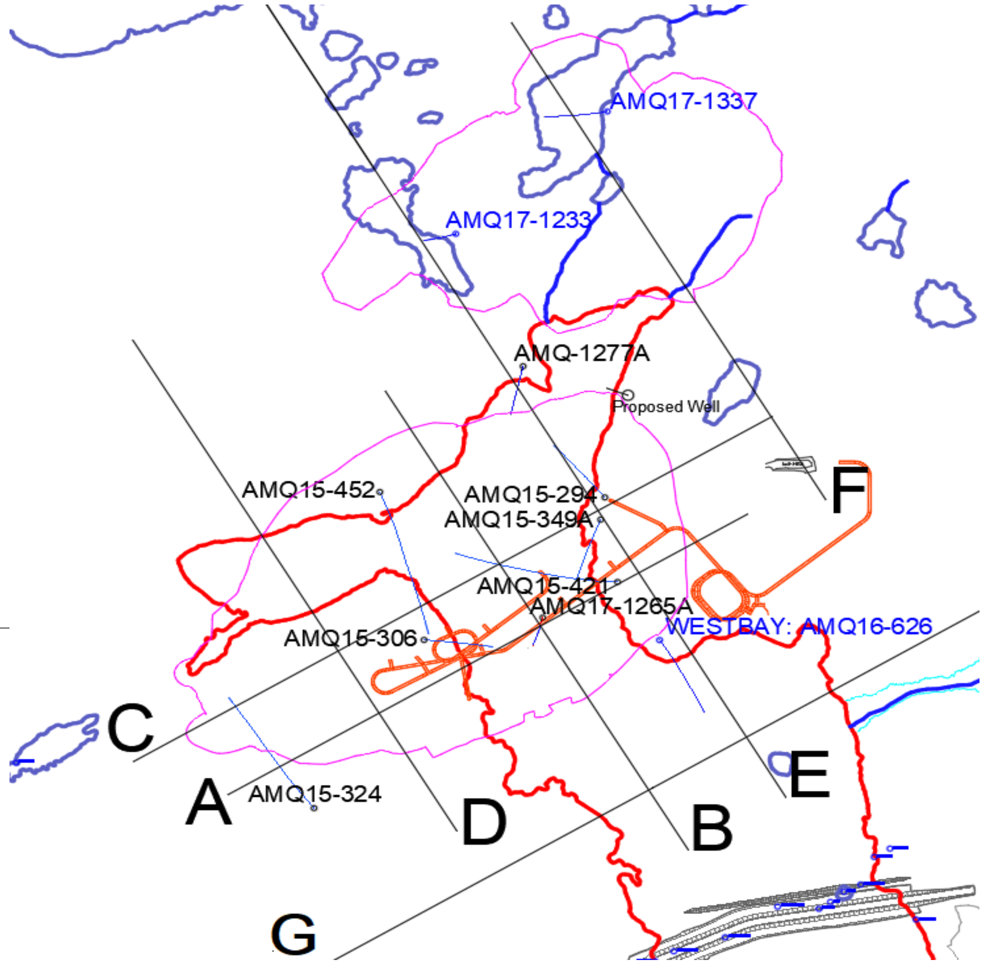
Date:	Mar-19
Design:	RM
Check:	FJ
Review:	JL

Title: Thermal Model Calibration - Scenario 2 - Section F

Project No.	Phase	Version	Figure No.:
18108905			**B5**







Section	G-G
Ground Temperature (oC)	-9.5
Whale Tail Lake Temperature (oC)	3
Other shallow lake Temperature (oC)	n/a
Heat Flux (beneath ground) J/s Thermal Gradient (oC/m)	0.048 0.016
Heat Flux (beneath WT Lake) J/s Thermal Gradient (oC/m)	0.018 0.006

Client:
Agnico Eagle Mines Ltd.

GOLDER

Date: Mar-19
Design: RM
Check: FJ
Review: JL

Project: Whale Tail Pit Project

Title: Thermal Model Calibration - Scenario 2 - Section G

Project No.	Phase	Version	Figure No.:
18108905			**B6**

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