Appendix 20

Whale Tail 16-HCAA-00370 2019 Serious Harm Mitigation Report

AGNICO EAGLE

TECHNICAL MEMORANDUM

Date: April 21st, 2020

To: Boyan Tracz, José Audet-Lecouffe, Edyta Ratajczyk, Alasdair Beattie (DFO)

From: Robin Allard, Nancy Duquet-Harvey, Marie-Pier Marcil (Agnico Eagle), Leilan Baxter (Consultant to Agnico Eagle)

Re: 2019 Report on the Implementation and Monitoring of Measures to Mitigate and Avoid Serious Harm to Fish – Whale Tail Pit Project

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1.1 BACKGROUND

In July, 2018, Agnico Eagle Mines Ltd. (Agnico) was issued *Fisheries Act* Authorization (FAA) 16-HCAA-00370 for the Whale Tail Pit project. Approved fish habitat offsetting related to this Authorization is described in the Fish Habitat Offsetting Plan for Whale Tail Pit (March, 2018).

This Technical Memorandum was developed in response to Condition 3 of the FAA, which relates to monitoring and reporting of measures and standards to avoid and mitigate serious harm to fish. In particular, it addresses Condition 3.1 of the FAA:

Condition 3.1: ***The Proponent shall monitor the implementation of avoidance and mitigation measures referred to in section 2 of this authorization, and provide a stand-alone report to DFO, by March 31, annually and indicate whether the measures and standards to avoid and mitigate serious harm to fish were conducted according to the conditions of this authorization.***

Section 1.2 of this document summarizes the implementation of measures and standards to avoid and mitigate serious harm to fish, as identified in Section 2.3 of the FAA. Avoidance and mitigation measures as listed in Section 2.3 of the FAA are:

1. Adherence to the *General Fish-out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut* (Tyson et al., 2011);

2. Adherence to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Fisheries and Oceans Canada, 1995) for any and all intake in waterbodies that support fish;

3. Development of a Blasting Mitigation Plan, which shall adhere to the guidance in *Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000 – 2002* (Cott and Hanna, 2005);

4. Adherence to the *Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut* (Fisheries and Oceans Canada, 2010);

5. Ensure that all project infrastructure in watercourses is designed and constructed in such a manner that it does not unduly prevent or limit the movement of water or fish species in fish bearing streams and rivers, unless otherwise authorized by Fisheries and Oceans Canada.

Where appropriate, dated photographs with GPS coordinates and inspection reports are provided to demonstrate effective implementation of these mitigation measures and standards, as described in Condition 3.1.3 of the FAA.

Details of any contingency measures that were required to be followed to prevent further impacts in the event that mitigation did not function properly are provided, according to Condition 3.1.4 of the FAA.

As described in Condition 3.1.1, Section 1.3 of this report also summarizes the monitoring results related to fish and fish habitat contained in the documents listed in Section 2.4[1] of the FAA, and Section 1.4 provides an evaluation of the effectiveness of these programs (and other relevant monitoring programs) in validating changes to fish and fish habitat predicted in the Proponent's EIS . The referenced documents from Section 2.4 of the FAA are:

1. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update Whale Tail Pit Addendum (May 2018)

2. Water Quality and Flow Monitoring Plan (Version 3, May 2018)

3. Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (Version 1, January 2017)

4. Conceptual Whale Tail Lake (North Basin) Fish-out Work Plan

1.2 IMPLEMENTATION OF AVOIDANCE AND MITIGATION MEASURES

A commentary on the implementation of each FAA-listed measure to avoid or mitigate serious harm to fish and fish habitat in 2019 is provided below.

1.2.1 Adherence to the General Fish-out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut (Tyson et al., 2011)

The fishout approved under FAA 16-HCAA-00370 for Whale Tail Lake North Basin was complete in 2018. No fish-outs were conducted in 2019.

[1] Condition 3.1.1 of FAA 16-HCAA-00370 references Section 2.3. However, review of the requirements of this condition lead to the interpretation that the text intended to refer to Section 2.4.

1.2.2 Adherence to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Fisheries and Oceans Canada, 1995) for any and all intake in waterbodies that support fish

Construction of the freshwater intake in Nemo Lake occurred in 2018. As described in the 2018 Report on the Implementation and Monitoring of Measures to Mitigate and Avoid Serious Harm to Fish – Whale Tail Pit Project, construction adhered to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Fisheries and Oceans Canada, 1995) and the design was approved by DFO. The as-built report including drawings and photographs was provided to NWB in 2019[2].

In 2019, pumping of water from the Northeast Pond and Whale Tail South was also required for water management purposes. In placement of these temporary freshwater intakes consideration was also give to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Fisheries and Oceans Canada, 1995), as both areas are waterbodies that support fish. Nonetheless, in late August, a number of ninespine sticklebacks were impinged and killed on the intake screen of one of two pumps in the Northeast pond area. DFO was notified on August 29th, 2019 (see letter, Appendix A). The pump was stopped until mitigation measures were put in place to prevent reoccurrence. Mitigation measures consisted of inspecting the intake pump and downstream lake area on a daily basis, and modifying the pumping intake location in a manner to limit access by small-bodied fish.

1.2.3 Development of a Blasting Mitigation Plan

In accordance with this condition, Agnico has developed a Blast Monitoring Program (Version 3, March 2019). As described in the 2018 Report on the Implementation and Monitoring of Measures to Mitigate and Avoid Serious Harm to Fish – Whale Tail Pit Project, this plan adheres to the guidance in the document “Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000 – 2002” (Cott and Hanna, 2005) and “Guidelines for the Use of Explosives In or Near Canadian Waters” (Wright and Hopky, 1998) as modified by the DFO for use in the north.

In February 2019, Agnico submitted to DFO a specific Technical Memorandum regarding blast monitoring and mitigation for construction of the Mammoth Dike (Appendix A).

In September 2019, Agnico also submitted to DFO a specific Technical Memorandum regarding blast monitoring and mitigation for construction of the Whale Tail South Channel (Appendix A).

Every blast is monitored with an Instantel Minimate Blaster to ensure that vibrations generated by blasting are less than 13 mm/sec and the overpressure is under 50 KPa at the nearest fish-bearing waterbody. The results of blast monitoring are systematically analyzed by the Engineering department within the 24 hours following the blasting operation. The blast monitoring results are interpreted and a blast mitigation plan is implemented immediately if the vibrations or the

[2] Available here: ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-WTP1826%20Agnico/3%20TECH/D%20CONSTRUCTION/D15/

overpressure exceed the guidelines. According to DFO review of the September 2019 Technical Memorandum for construction of the Whale Tail South Channel (Appendix A), Agnico will also advise DFO of an exceedance of these guidelines within 72 h.

1.2.4 Adherence to the *Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut* (Fisheries and Oceans Canada, 2010)

In 2019, winter water withdrawal occurred for the freshwater intake from Nemo Lake only. Withdrawal volumes conformed with the *Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut* (Fisheries and Oceans Canada, 2010) – i.e. total under-ice withdrawal will not exceed 10% of the available water volume.

As described in Agnico's response to DFO's Technical Comment 2.2.2 on the Whale Tail Pit Expansion Project Water License Amendment application (October 7, 2019), the available under-ice volume of Nemo Lake was calculated as 6,169,226 m^3. For calculating under-ice volumes, hydrological statistics were extracted from the elevation-volume table (Table A-19) provided in Appendix 6-M of the Final Environmental Impact Statement (FEIS) for the Whale Tail Pit Project. The calculations assumed a 2-m ice thickness during winter.

Estimated total under-ice water withdrawal from Nemo Lake in 2019 was 40,327 m^3 (total withdrawal for January – June and September – December), which is less than 10% of the available under-ice volume (616,923 m^3).

1.2.5 Ensure that all project infrastructure in watercourses is designed and constructed in such a manner that it does not unduly prevent or limit the movement of water or fish species in fish bearing streams and rivers, unless otherwise authorized by Fisheries and Oceans Canada.

In 2019, designs for the East Diversion Channel including culvert construction designs for roads 1 and 13 were submitted to NWB[3] and were available for DFO review between March 6 and 27. No comments from DFO were received, and on May 3 the NWB approved the Design Report. However, this channel was not constructed.

Similarly, design reports were submitted to the NWB for the South Whale Tail Channel and road 24 culvert[4] and were available for DFO review. DFO comments were submitted on August 21, 2019 and Agnico's responses were provided on August 29. On September 9, DFO confirmed that their concerns were addressed, and on September 12, 2019 the NWB approved the Design Report.

[3]Available here: ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-WTP1826%20Agnico/3%20TECH/D%20CONSTRUCTION/D1,%20D2/East%20Diversion%20Channel/

[4] Available here: ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-WTP1826%20Agnico/3%20TECH/D%20CONSTRUCTION/D1,%20D2/South%20Whale%20Tail%20Diversion%20Channel%20&%20Road%2024/

As-built reports for these construction projects, including photographs, will be provided to NWB 90 days after the construction completion, as required according to the Project's Type A Water License (2AM-WTP1826) Part D Item 15.

In 2019, as-built reports including photographs were provided to NWB for the following construction projects in watercourses that were designed and approved in 2018[5]:

- Road 11 culvert (culverts for roads 8, 9, and 22 were included in the same Design Report approved in 2018, but have not yet been constructed).

1.3 SUMMARY OF MONITORING RESULTS

As required by Condition 3.1.1, summaries of the monitoring results related to fish and fish habitat contained in the documents listed in Section 2.4[6] of the FAA are provided below. The referenced documents are:

1. Core Receiving Environment Monitoring Program (CREMP): 2015 Plan Update Whale Tail Pit Addendum (May 2018)

2. Water Quality and Flow Monitoring Plan (Version 3, May 2018)

3. Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (Version 1, January 2017)

4. Conceptual Whale Tail Lake (North Basin) Fish-out Work Plan

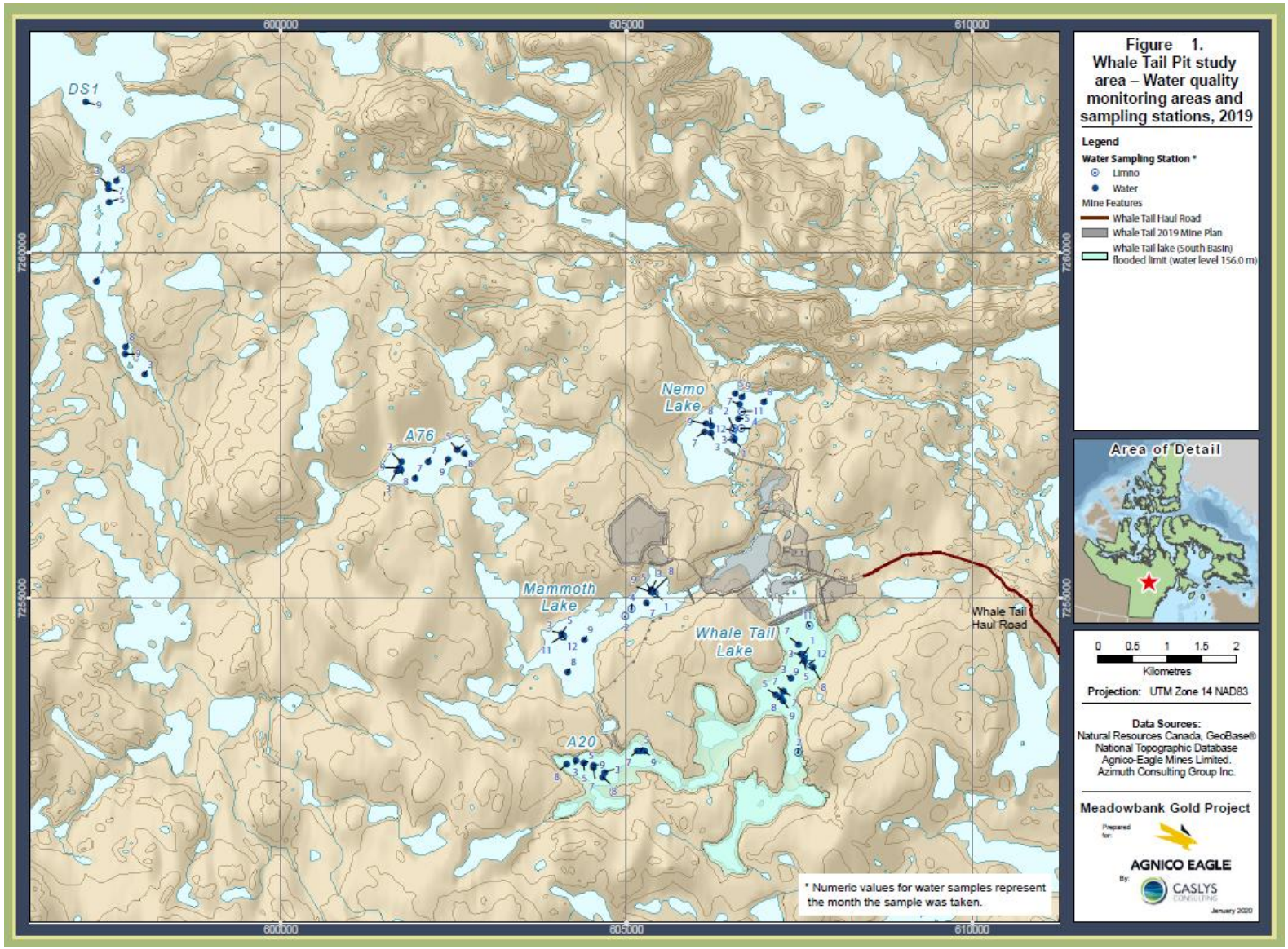
1.3.1 CREMP – Whale Tail Pit Project

The 2019 CREMP Whale Tail study lakes are shown in Figure 1 below. 2019 represents the first full year where most Whale Tail study area lakes were fully under an impact designation and potentially under the influence of mine activities. Whale Tail Lake - South Basin (WTS) and Mammoth Lake (MAM) transitioned from control to impact in 2018 after the onset of construction activities on the Whale Tail Dike. The status of Lake A20, Lake A76, Lake DS1 switched to impact in January 2019, while Nemo Lake (NEM) transitioned in July 2019. This was the first year that formal statistical analysis using the Before/After Control/Impact (BACI) framework at the Whale Tail study lakes. Early warning triggers specific to the Whale Tail study lakes were derived in 2019 for water chemistry and sediment chemistry parameters to facilitate this analysis. Changes were assessed by screening the yearly mean concentrations at each monitoring area against the newly

[5] Available here: ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-WTP1826%20Agnico/3%20TECH/D%20CONSTRUCTION/D15/

[6] Condition 3.1.1 of FAA 16-HCAA-00370 references Section 2.3. However, review of the requirements of this condition lead to the interpretation that the text intended to refer to Section 2.4.

developed trigger values; parameter/area combinations exceeding their respective trigger value were subject to formal BACI analysis to determine if the changes were statistically significant.


600000
605000
610000
7260000
7250000
DS1
A76
Nemo Lake
Mammoth Lake
Whale Tail Lake
A20
Whale Tail Haul Road
* Numeric values for water samples represent the month the sample was taken.
Figure 1.
Whale Tail Pit study area – Water quality monitoring areas and sampling stations, 2019
Legend
Water Sampling Station *
Limno
Water
Mine Features
Whale Tail Haul Road
Whale Tail 2019 Mine Plan
Whale Tail lake (South Basin) flooded limit (water level 156.0 m)
Area of Detail
0 0.5 1 1.5 2
Kilometres
Projection: UTM Zone 14 NAD83
Data Sources:
Natural Resources Canada, GeoBase®
National Topographic Database
Agnico-Eagle Mines Limited.
Azimuth Consulting Group Inc.
Meadowbank Gold Project
Prepared for:
AGNICO EAGLE
By:
CASLYS CONSULTING
January 2020

1.3.1.1 Water Quality

Key results, including some parameters that increased but remained below their triggers, were as follows:

Observed increases in ammonia and TKN appeared to be related to regional trends, with elevated concentrations also occurring at the reference areas INUG and PDL. Nitrate and nitrite showed increases at MAM, WTS and NEM but remained below their triggers. Total phosphorous (TP), total organic carbon (TOC) and dissolved organic carbon (DOC) showed a statistically significant increases at WTS, likely the result of inputs from flooded terrestrial habitats following impoundment.

Statistically significant increases above trigger values were observed at near field (NF) areas WTS and/or MAM for total alkalinity, conductivity, hardness, calcium, potassium, magnesium, sodium, TDS, total and dissolved lithium and total titanium. The statistically significant increases extended to mid-field (MF) area Lake A76 for calcium, potassium and magnesium.

Yearly mean concentrations of the following parameters in MAM exceeded FEIS water quality model results, but did not exceed the order-of-magnitude estimate of uncertainty associated with this model: ammonia, chloride, calcium, magnesium, TDS, total aluminum, total barium, total lithium, and total strontium.

These results are similar to the trends seen over the years at the Meadowbank study lakes, and represent increases above baseline/reference conditions only; none of the analytes with statistically significant increases exceeding trigger values in 2019 have CCME effects-based guidelines for the protection of aquatic life. Despite early warning triggers for WT and MAM and some FEIS predictions for MAM being exceeded in 2019, the absolute concentrations of these parameters remain far lower than concentrations associated with adverse effects to aquatic life.

1.3.1.2 Sediment

Sediment grab samples were collected in 2019 to support analysis of the benthic invertebrate community assessment. Changes in sediment chemistry data are formally evaluated on a three-year cycle as part of the sediment coring program (timing coincides with the EEM cycle). Coring is scheduled for August 2020. No statistical analysis was completed on sediment chemistry from grab samples in 2019; however, data from grab samples were screened against trigger values and, where applicable, threshold values. Concentrations measured in the various lakes in 2019 were comparable to results reported in previous annual monitoring reports. Furthermore, there was no evidence of upwards trends for metals with effects-based thresholds.

1.3.1.3 Phytoplankton and Benthic Invertebrate Communities

Results for 2019 did not indicate a change to phytoplankton community structure (e.g., richness), which is a good indicator that there was no significant increase in the concentrations of metals at WTS and MAM (the lakes most likely to be impacted by mine activities). There was, however, a statistically significant apparent increase in biomass in WTS and a notable, but not statistically significant, increase in MAM. While biomass at WTS and MAM were higher than seen during baseline monitoring, the apparent increases were also driven by lower biomass at the reference area INUG relative to previous years. Thus, the biomass results for 2019 appear due to the combined influence of natural variability and mining-related activities.

Increased nutrient loading due to flooding of WTS is the most likely explanation for increased primary productivity. Interestingly, these changes did not extend to Lake A20 although it too was flooded and connected to Whale Tail Lake. In addition, the increases seen at MAM did not appear to extend down the watershed to Lake A76.

Although total abundance of benthic invertebrates tends to be low, within-area variability can be substantial. Taxa richness, unlike abundance, is considerably less variable, both temporally (i.e., inter-annually) and spatially (i.e., among the different lakes). The typical number of taxa identified among the various study areas is 10 to 15. The range observed in 2019 was slightly lower in WTS than 2018 but within the range of baseline conditions. All other study areas were also comparable with baseline conditions. The comparatively high taxa richness, combined with no apparent change in abundance, demonstrates that mine activities did not alter the structure or function of the benthos community in 2019.

1.3.2 Water Quality and Flow Monitoring Plan - Whale Tail Pit Project

Results of monitoring conducted in 2019 under the Water Quality and Flow Monitoring Plan (Version 3, March 2018) for sites with NWB Water License criteria are summarized here by monitoring activity and station ID.

1.3.2.1 Construction Activities

No water quality monitoring under this plan was required in relation to construction activities at the Whale Tail site in 2019.

1.3.2.2 Dewatering Activities

Whale Tail Lake – North Basin Dewatering

Monitoring results for Whale Tail Lake – North Basin dewatering (and dike construction) are provided here under Section 1.3.3.

1.3.2.3 Mine Site Water Collection System

Whale Tail Dike Seepage (ST-WT-17)

During dewatering operations of the Whale Tail North Basin, a small inflow of water was observed out of the downstream toe of Whale Tail Dike (WTD) in a low spot. In September 2019, Agnico communicated with the NWB to discuss water management strategy regarding the Whale Tail Dike seepage. As dewatering of the Whale Tail North Basin was not completed and Whale Tail Dike construction activity were still ongoing in 2019, Agnico proposed to manage water from WTD seepage as part of the dewatering of the Whale Tail North Basin. Seepage, along with dewatering effluent was processed via the WTP, when needed, and then discharged to Mammoth Lake or Whale Tail South. As this was part of the dewatering strategy, water continued to be monitored for Water License 2AM-WTP1826 Part D Item 7. Once the access of the downstream toe was safe and possible, water quality sampling was also conducted at a minimum on a monthly as per the seepage requirements of the NWB water license (no license limits). Results for Whale Tail North Basin dewatering are discussed in Section 1.3.3, below.

Whale Tail South Transfer (ST-WT-25)

On September 6th, 2019, a meeting was held between Agnico and NWB to discuss the Whale Tail Project Water Management Strategy. The strategy included the Whale Tail South Basin (WTS) non-contact water transfer to Mammoth Lake. This pumping activity is to lower and then maintain water levels in WTS in order to allow for the construction of the Whale Tail South Channel (SWTC) and preserve dike integrity. The objective of this activity was to temporarily substitute passive flow via the SWTC with a pumping alternative that would comply with the original intent of the approved water balance and Water License 2AM-WTP1826 (same origin and destination of water). Water quality monitoring followed NWB Water License 2AM-WTP1826 Part F Item 6 and Schedule I Table 1 - Group 3, which are the criteria required for water flowing though the Whale Tail South Channel.

Water transfer started on October 21st, 2019 and ended on December 18th, 2019. A total volume of 1,701,213 m^3 was transferred in 2019. As per Water License Part F Item 6, the effluent from this discharge did not exceed the maximum authorized TSS grab sample concentration of 30 mg/L and the maximum authorized monthly mean concentration of 15 mg/ L.

North-East Pond to Nemo Watershed

In August 15, 2019, Agnico submitted a request to NWB regarding a new water management strategy. The Water Management Plan indicated that non-contact water from the North-East Pond watershed would overflow by gravity toward Nemo Lake once the North-East (NE) Dike was operational. The NE Dike was constructed in Q1 2019 and became operational during freshet of 2019. During a routine inspection in July 2019, it was observed that the topography toward Nemo Lake would not allow water to overflow naturally before overtopping the dike liner. Since then, water has been pumped from NE Pond toward the project site adding pressure on dewatering activity.

With NWB approval, Agnico began pumping non-contact water from the NE Pond to the tundra in the Nemo watershed beginning on August 18, 2019. This system will be used to empty the NE Pond when required and would be operational until NE Dike is dismantled (which is planned prior

to freshet 2021). The NE Pond is also planned to become the IVR Pit as part of the Whale Tail Expansion Project, once approved.

Pumps were used and their intake were positioned in area where there is sufficient water depth. To minimize impact on the receiving environment the line installed in the tundra will be made of Mineflex and the discharge location have an energy dissipating pad to avoid erosion. Existing access were used to position the pump, intake and discharge.

Agnico was not expecting any concerns relating to water quality as this is non-contact water from NE Pond. To ensure compliance with the Water License 2AM-WTP1826 (WL), Agnico monitored the effluent of the NE Pond for TSS as per WL Part F Item 6.

A total volume of 523,014 m^3 was transferred in 2019 to AP-5 pond, Whale Tail North or to the tundra in the watershed of Nemo Lake. From that amount, 275,701 m^3 was pumped to the tundra from August 18, 2019 to October 2nd, 2019. As per Water License Part F Item 6, the effluent from this discharge did not exceed the maximum authorized TSS grab sample concentration of 30 mg/L and the maximum authorized monthly mean concentration of 15 mg/L.

Quarry 1 Discharge

Water from Quarry 1 was discharged from July 20th to October 23rd, 2019 following the approval from CIRNAC on July 18th, 2019. Water was treated via the WTP, and then discharged to Mammoth Lake temporary diffuser. Starting on August 26th, water was discharged without treatment through the permanent diffuser, as water quality was below the regulatory limits. A total volume of 599,040 m^3 of water from Quarry 1 was discharged during this period.

Agnico monitored the discharge water as per Water License Part F Item 4, and the effluent from this discharge did not exceed any NWB limits (pH, TSS, TDS, total ammonia, metals, and oil and grease).

Effluent Discharged from AP-5 and Trench-water Containment Pond (ST-WT-MEA-4)

As per Water License 2BB-MEA1828 Part D Item 17, a 10 days' notice was sent to CIRNAC's Inspector on June 21st to advise the start of the pumping of AP-5 containment pool to the tundra. On September 9th, 2019, Agnico contacted the NWB to discuss the AP-5 discharge to tundra with the NWB and proposed to continue to use the pond for managing excessive non-contact water on site. On September 10th, the NWB agreed to the proposed water management strategy. On September 10th, Agnico contacted the CIRNAC Inspector to notify that following higher than anticipated precipitation during July and August, discharges from AP-5 were higher than originally estimated, and thus it was anticipated that an additional 1,000,000 m^3 of compliant water would be discharged to the tundra over the next few weeks. Flow dissipaters were put in place at the discharge locations to prohibit erosion from the discharge. As per the requirements of the Water License, weekly samples were taken during discharge, and all results met criteria in accordance with Part D, Item 14 of the NWB 2BB Water License. A total volume of 1,080,667 m^3 of water was discharged to tundra towards the Nemo watershed from July 11th to September 26th, 2019.

1.3.2.4 Whale Tail Haul Road and Quarries Water Quality Monitoring

Pre-freshet and freshet inspections were conducted at crossings along the Whale Tail Haul Road, eskers and quarries in 2019. These inspections are conducted to document the presence/absence of flow, erosional concerns and turbidity plumes and to ensure that runoff, if any, would be free of any visible sheen and would not impact the environment. Freshet leaders were hired in 2019 and were only dedicated, on a daily basis, to the inspection of Whale Tail Haul Road including the esker, quarries, culvert and bridges. If needed, mitigation measures, such as straw booms or turbidity barriers, were put in place as prevention measures. No issues with runoff water inside the eskers/quarries, culvert or bridge to any waterbodies were noted in 2019.

Weekly inspections are also conducted along the Whale Tail Haul Road and eskers/quarries on a year round basis. During the freshet and open water season, any visual turbidity plumes or erosion along the road, culverts, bridge or eskers/quarries are documented by Environmental Technicians. In 2019, no visual turbidity plumes or erosion was observed.

1.3.3 Water Quality Monitoring and Management Plan for Dike Construction and Dewatering – Whale Tail Pit Project

Construction of two dewatering dikes (Whale Tail Dike and Mammoth Dike) was required as a component of water management activities for the Whale Tail Pit project, along with dewatering of the north basin of Whale Tail Lake. The Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (the Plan; January, 2017) was developed to provide details of water quality monitoring and management actions for dike construction and dewatering activities. Total suspended solids (TSS) and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during construction and dewatering.

In-water construction of the Whale Tail Dike concluded in 2018. However, above-water construction occurred in January and February, 2019, and water quality monitoring was conducted during this time according to the Plan.

In-water construction of Mammoth Dike began on February 15 and was completed on March 17, 2019. Water quality monitoring also occurred in relation to this construction.

Dewatering of Whale Tail Lake – North Basin began on March 5, 2019, and continued through the end of the year, with water quality monitoring conducted as required.

1.3.3.1 Dike Construction Monitoring

Results of water quality monitoring during dike construction are compared to NWB Type A Water License criteria for TSS. Monitoring occurred in five general locations: upstream and downstream of the Whale Tail Dike, downstream of the Mammoth Dike, as well as broad survey locations in Whale Tail Lake (South Basin) and Mammoth Lake. For each location, turbidity depth profiles were recorded at four monitoring stations using a handheld meter, and values were converted to TSS using a site-specific, approved regression equation. All turbidity/TSS monitoring results for all compliance stations were within NWB Water License criteria, so no supplemental management actions were required to be implemented to mitigate impacts to fish and fish habitat. Planned

mitigation measures and their implementation during in-water construction for both dewatering dike are described in Table 1.

Complete laboratory water quality analyses (major ion, nutrients, metals) were conducted approximately weekly at dike monitoring stations (Whale Tail South, Mammoth Lake, impounded Whale Tail North), but there are no applicable criteria for these results. For reference, results were compared to CCME Water Quality Guidelines for the Protection of Aquatic Life. Several exceedances of these guidelines occurred, which is similar to construction of the Bay-Goose and East Dikes (2009 – 2011), and the 2018 Whale Tail Dike construction monitoring results. Parameters exceeding the guidelines were: total phosphorus (ultra-oligotrophic guideline - Mammoth Lake and Whale Tail North); total copper (1 sample in all locations); selenium (2 samples in Whale Tail North); thallium and zinc (1 sample each in Mammoth Lake). While no CCME guidelines are available for any dissolved metal except aluminum, results of the dissolved metals analysis were compared to guidelines for total metals where exceedances occurred, as in the Bay-Goose Dike construction monitoring report (Azimuth, 2010). Typically, it is the dissolved fraction which presents the greatest potential for toxicity, since particulate-bound metals are less bioavailable. Dissolved metals only marginally exceeded CCME guidelines in three cases: one sample of copper and two samples of selenium in Whale Tail Lake North Basin. The 2019 CREMP report provides a complete analysis of receiving environment water quality impacts.

Table 1. Mitigation measures to control release of TSS during construction of dewatering dikes, as described in the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering, Section 4.1 (January, 2017).

Planned Mitigation Measure	Implementation	
	Whale Tail Dike (July 27 – August 27, 2018)	**Mammoth Dike (February 15 - March 17, 2019)**
Deploy one length of turbidity curtains downstream of the dike and ensure curtains are situated in appropriate locations to minimize escape of sediments below the curtains.	Completed – three sets of turbidity curtains were deployed downstream of the dike.	Not required
Minimize water current out of the construction area to reduce potential for outflow of turbid water; this will be done by 1), if permits are received, slow-pace winter construction of a causeway about 25 m wide (the downstream portion of the dike), and 2) open-water installation of pumps in front of the rock platform deposition creating a no-current to inward-current zone inside the curtains. This should create an	Completed (open water construction occurred) - water was pumped during causeway construction, and treated for TSS prior to discharge to Whale Tail North Basin	No current – fully frozen conditions on both sides of the construction zone.

Planned Mitigation Measure	Implementation	
	Whale Tail Dike (July 27 – August 27, 2018)	**Mammoth Dike (February 15 - March 17, 2019)**
average negative pressure and will cause 'clean' water to move through the causeway into the trench, that will be backfilled with gravel to form the cutoff wall.		
Provide a wind-breaker to protect turbidity curtains against the effects of high winds; this will be achieved by winter construction of the causeway or by rapidly advancing the platform immediately once the lake is open water. Since the causeway is the downstream portion of the dike, it will be the same height as the dike. The concept of the causeway was developed based on observations from the 2009 wind storm event that the integrity of the inner curtain portion closer to the rock platform was not affected by wind activity.	Wind breaker was not needed. Curtains were inspected daily and adjusted if needed.	N/A
Following the construction of the causeway, install curtains that have a reduced height and length to make them less prone to breakage from wind action; this will be achieved by 1) installation of the inner turbidity curtains in small cell-like patterns along the causeway to prevent wholesale breakage of the curtain due to effect of high winds, and 2) installation of outer curtains, as much as possible, in depths of no more than 10 m to reduce the effects of high winds.	Curtains were installed prior to work and inspected as above.	N/A
Reduction of the TSS loading inside the turbidity curtains; this is achieved by 1) the	Completed - pumping and treating of water during causeway construction was	N/A – fully frozen conditions

Planned Mitigation Measure	Implementation	
	Whale Tail Dike (July 27 – August 27, 2018)	Mammoth Dike (February 15 - March 17, 2019)
above mentioned pumping of water in front of the rock platform construction, and 2) pumping of water from the trench (the water with the highest TSS concentrations), both to be treated at the dewatering water treatment plant.	conducted as described above.	
Winter-only: Advance the rock platform at a very slow rate (approx. 2400 tonnes/d).	N/A	N/A – fully frozen conditions
Winter-only: Use a shovel to deposit rock through the ice openings.	N/A	N/A – fully frozen conditions

1.3.3.2 Whale Tail North Dewatering Monitoring

Dewatering of Whale Tail Lake – North Basin began on March 5, 2019, and continued through the end of the year. Water was discharged from Whale Tail North Basin to both Whale Tail South Basin and Mammoth Lake in 2019. Dewatering of Whale Tail North Basin to Whale Tail South Basin (compliance sample location ST-DD-7) occurred from March 5 – April 9, 2019, May 3 – 17, May 24 – 29, June 17, June 22 – 30, July 9 – 18, and October 4 – December 31. Treatment of effluent at the water treatment plant (WTP) prior to discharge occurred in November and December in association with dike seepage discharge. Dewatering of Whale Tail North Basin to Mammoth Lake (compliance sample location ST-DD-9) occurred from July 1 – 8, July 13 – September 28, and October 2 – 26. Water was treated at the WTP for TSS prior to discharge throughout this time.

Monitoring during dewatering was primarily focused on effluent monitoring at the water intake pumps or at the outlets of the water treatment plant (if treatment was required) for compliance purposes (NWB Water License Part D Item 7 – criteria for TSS, turbidity, pH, and total aluminum). Water samples were also collected approximately weekly (weather permitting) in the receiving environment at a distance of 30 -100 m from water discharge locations (ST-DD-8, ST-DD-10) in Mammoth Lake and Whale Tail Lake (South Basin). No compliance criteria were in place for receiving environment monitoring, but results of the laboratory TSS analysis were compared to CCME Water Quality Guidelines for the Protection of Aquatic Life, for reference.

Results of water quality monitoring for dewatering effluent indicated four isolated incidents when individual TSS or turbidity concentrations exceeded NWB Type A Water License criteria for the short-term maximum (STM). One duplicate sample exceeded the STM for total aluminum. The

Maximum Monthly Mean (MMM) was not exceeded for any parameter. Based on standard operating procedures identified in the Plan, supplemental management actions were not required. Planned mitigation measures consisted of locating intake pipes at a sufficient distance from shore (minimum 10 meters) and, to the extent possible, in areas with highest water depth.

No receiving environment samples in Whale Tail South or Mammoth Lake exceeded CCME guidelines for TSS.

1.3.3.3 Water Level Monitoring

Total volumes of water discharged to Whale Tail Lake South Basin and Mammoth Lake during dewatering of Whale Tail Lake North Basin in 2019 are shown in Table 2, along with FEIS predictions.

While more water was discharged to Mammoth Lake and less was discharged to Whale Tail South Basin than predicted, overall, the total dewatering discharge volume was within 7% of the predicted value.

Table 2. Dewatering volumes to Mammoth Lake during the dewatering phase (FEIS App. 6-E, Section 5.2). *Dike seepage, not dewatering discharge – discussed with and reported to NWB but not included in total for comparison to FEIS prediction.

Date	Whale Tail Lake South Basin		Mammoth Lake	
	Predicted Volume (m^3)	Actual Volume (m^3)	Predicted Volume (m^3)	Actual Volume (m^3)
February 2019	3,064,850			
March 2019		1,045,966		
April 2019		296,645		
May 2019		598,603		
June 2019			720,000	147,552
July 2019		207,328	689,829	427,192
August 2019			32,002	747,074
September 2019			137,031	865,282
October 2019		(186,230*)		604,556
November 2019		(397,748*)		
December 2019		(353,131*)		
Total	*3,064,850*	*2,148,542*	*1,578,862*	*2,791,656*

Comparison to FEIS Prediction

Total FEIS Predicted Discharge	Total Discharged
4,643,712 m^3	4,940,198 m^3

Water levels in Whale Tail Lake South Basin as measured throughout 2019 using piezometric data are shown in Figure 2, along with measurements during the construction phase (2018; measured by GPS survey), available baseline measurements (2015), and FEIS predictions (from FEIS Appendix 6-F).

Due to record rainfall, water levels in the Whale Tail South flood zone exceeded FEIS predictions beginning in July, 2019, but did not reach the maximum final water level of 156 masl, which was

predicted to occur in 2020. Active pumping of water from Whale Tail South Basin to Mammoth Lake began in October following consultations with NWB on water management, and by mid-November, water levels declined below predictions. Construction of the Whale Tail South Channel between Lake A20 and Mammoth Lake is underway. This channel will passively manage the water level in WTS moving forward.

Water levels in Mammoth Lake as measured throughout 2018 (construction period) and 2019 (dewatering period) by GPS survey are shown in Figure 3, along with available baseline measurements (2015).

As shown in Table 3, FEIS predictions (FEIS Appendix 6-F) indicated that mean monthly water levels in Mammoth Lake would decline up to 12 cm below baseline values during the dewatering period (2019). However, measured baseline data for Mammoth Lake is only available for 3 time points in 2015, and baseline water levels were not modeled as a component of the FEIS. As a result, quantitative comparisons of measured values to FEIS predictions are not feasible.

Overall, however, measured water levels in 2019 were within the range of measured baseline values (2015).

Table 3. Predicted change in water levels compared to baseline in Mammoth Lake during the dewatering phase (2019). From FEIS Appendix 6-E.

Project Phase	June	July	August	September	October
Construction	-0.16	-0.16	-0.11	-0.14	-0.13
Dewatering (2019)	-0.12	-0.04	-0.05	-0.09	-0.10
Operations (2020+)	+0.01	-0.02	0.00	+0.01	0.00

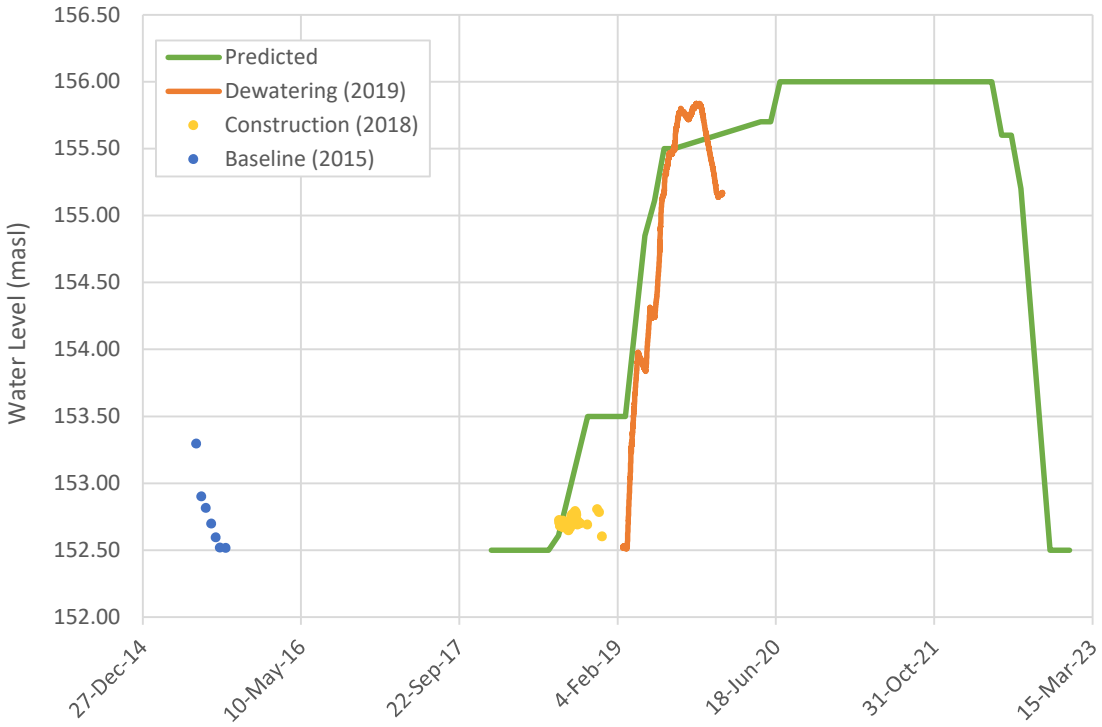


Figure 1. Measured and FEIS-predicted water levels in Whale Tail Lake South. Predicted water levels from FEIS Appendix 6-F.

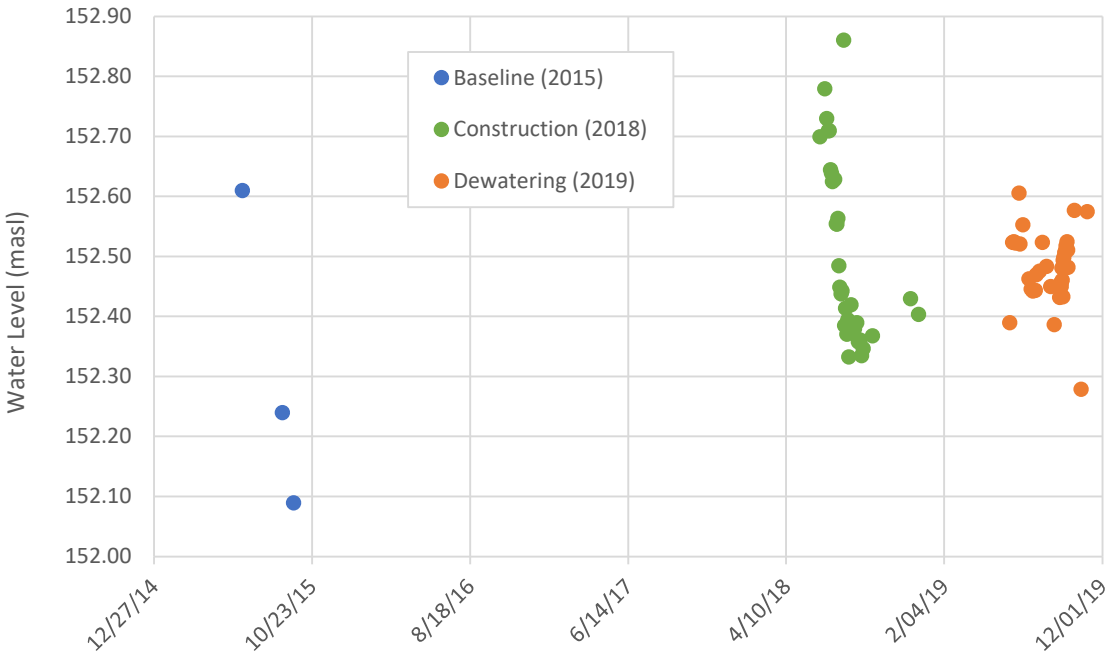


Figure 2. Measured water levels in Mammoth Lake.

1.3.4 Conceptual Whale Tail Lake (North Basin) Fish-out Work Plan

The fishout of Whale Tail Lake (North Basin) at the Meadowbank site took place from August 13 to September 28, 2018, and followed the Conceptual Whale Tail Lake (North Basin) Fishout Work Plan (February 2017), which was developed in consultation with the retained fisheries consultant (North/South Consultants Ltd.) and Fisheries and Oceans Canada (DFO). A complete report on fishout methods and results is provided in the Whale Tail Lake Fish-out Report (sent to DFO March 14, 2019, and summarized in the 2018 Report on the Implementation and Monitoring of Measures to Mitigate and Avoid Serious Harm to Fish – Whale Tail Pit Project.

1.4 EVALUATION OF EFFECTIVENESS

According to Condition 3.1.1 of 16-HCAA-00370, the following sections provide a review of the impacts to fish and fish habitat predicted in the Whale Tail Pit Project FEIS (Golder, 2016; Volume 6, Section 6.5), along with a comparison to the actual impacts measured through various relevant monitoring programs. Where monitoring was able to address all potential causes of impacts identified in the FEIS for this time point of the Project, the monitoring programs are considered effective.

1.4.1 Summary of Predicted and Measured Residual Impacts

The FEIS for the Whale Tail Pit Project assessed potential direct and indirect effects to fish and fish habitat as a result of Project activities. Residual impacts were associated with dike construction, lake dewatering, water diversion (terrestrial flooding), pit re-flooding, and effluent discharge. A summary of predictions for residual impacts to fish and fish habitat (FEIS Volume 6, Section 6.5, as summarized in Volume 3, Table 3-C-7) and the measured impacts in 2019 is provided in Table 4.

Table 4. Predicted and measured impacts to fish and fish habitat for the Whale Tail Site during the constructions and operations period (primary pathways according to FEIS Volume 3, Table 3-C-7). NA = not assessed. Where required, further discussion is provided in Section 1.4.2. *FEIS values differ slightly from those calculated under the Whale Tail Pit Fish Habitat Offsetting Plan (March, 2018). Both are provided for comparison purposes. Baseline water elevations used for the FEIS calculations were not specified, and these are an important factor in footprint calculations. ***Azimuth (2017) Whale Tail Pit project: Predicted changes in Fish Mercury Concentrations in the Flooded Area of Whale Tail Lake (South Basin). Prepared for Agnico Eagle Mines Ltd., Meadowbank Division. February 2017.*

Effects Pathway	Predicted Impact		Monitoring Program	Measured Impact 2019
The construction of the Northeast, Whale Tail, and Mammoth dikes, and Whale Tail Pit, and the dewatering of the diked area in Lake A17 (Whale Tail Lake) and Lake A16 (Mammoth Lake) will result in the direct loss or alteration of fish habitat.	FEIS values (footprints during operations phase, baseline water elevations not specified)*: Mammoth Dike: 0.07 ha Mammoth Lake dewatering: 0.93 ha Whale Tail Dike: 3.98 ha Whale Tail dewatering: 64.58 ha	Offsetting Plan values (footprints during operations phase, with baseline water elevations)*: Mammoth Dike area above water + dewatering: 1.2 ha (152.57 masl) Whale Tail Dike area above water + dewatering: 69.5 ha (153.02 masl)	As-built Reports upon construction completion	NA – to be calculated following completion of the as-built reports for Whale Tail and Mammoth Dikes (est. 2020)
The construction of the North-East, Whale Tail, and Mammoth dikes will alter access to tributary streams and lakes (i.e., habitat connectivity) in the LSA, and may result in habitat loss for Lake Trout, Arctic Char, and Round Whitefish.	Minor effect on fish population abundance		Fish Habitat Offsetting Plan – Complementary Measures	NA (post-flooding hydroacoustic surveys to be completed prior to drawdown)
During the construction of the Whale Tail, Mammoth, and WRSF dikes, water diversions will result in a reduction of water levels in Lake A16 (Mammoth Lake) and downstream locations, affecting fish and fish habitat.	Slight decrease in Mammoth Lake water level and discharge flows from baseline; moderate effect to population abundance and distribution of VC fish species		Water level monitoring under Water Quality Monitoring and Management Plan for Dike Construction and Dewatering	Mammoth Lake water levels within baseline (see Section 1.3.3.3)

Effects Pathway	Predicted Impact		Monitoring Program	Measured Impact 2019
Water diversions for the Whale Tail and Northeast dikes during construction and operations will flood tributary lakes and streams, and will result in the alteration of habitat.	FEIS operations phase prediction: Northeast flood zone: Lake A46 +3.5 masl to 156.66 masl or 34 ha, consuming lakes A47, A48, A113, Pond A-P38, and Pond A-P68 including 412 m of flooded streams. Whale Tail South flood zone: +3.5 masl (to 156 masl), surface area increase from 369 ha (all flood zone lakes) to 513 ha, consuming Lakes A18, A19, A20, A21, A22, A55, A62, A63, A65, Pond A-P1, and Pond A-P53; resulting in new lake habitat. 1988 m of stream habitat flooded causing decrease in forage fish.	Offsetting Plan operations phase assumption: Northeast flood zone is assumed lost fish habitat. Whale Tail South flood zone: +3.5 masl (to 156 masl), resulting in 130.9 ha of habitat gains	Water level monitoring under Water Quality Monitoring and Management Plan for Dike Construction and Dewatering	Northeast flood zone: Inc to 156.66 masl – see discussion Section 1.4.2 below. Whale Tail South flood zone: NA (flooding not complete in 2019)
Flooding of Whale Tail South could result in increased total mercury concentrations in fish.	0.9 – 1.75 µg/g ww (95% CI) for a 550 mm Lake Trout**		Fish tissue analysis under the CREMP's Mercury Monitoring Plan (MMP)	NA (will be assessed in 2020 per MMP)
The dewatering of the diked area in Lake A17 (Whale Tail Lake) and Lake A16 (Mammoth Lake) will result in the removal and subsequent mortality of fish from the area during the proposed fish-out.	Est. loss: 870 kg or 3346 fish		2018 Whale Tail Lake Fishout Report	776.6 kg and 3078 fish
Release of treated mine effluent (including sources from sewage, WRSF pond, and attenuation pond contact) may cause changes to surface water quality and sediment quality (i.e., nutrient and metal concentrations) in Mammoth Lake in operations and closure.	Changes in water quality, primarily a predicted increase in dissolved phosphorus concentrations.		CREMP	No exceedance of FEIS water quality predictions for phosphorus.
	Increase in sediment-bound phosphorus.		CREMP	NA (statistical analysis will occur in 2020)
	Increase in phytoplankton biomass and altered species composition in Mammoth Lake and downstream lakes.		CREMP	Increase in phytoplankton biomass in MAM. See

Effects Pathway	Predicted Impact	Monitoring Program	Measured Impact
			2019
			discussion, Section 1.4.2.1, below.
	Increase in secondary production (zooplankton) and altered species composition in Mammoth Lake and downstream lakes.	None	NA
	Possible delayed increase in benthic invertebrate abundance and biomass.	CREMP	No mine-related impacts on benthic invertebrate community.
	Possible increase in fish abundance due to food resources.	Fish Habitat Offsetting Plan – Complementary Measures	NA (post-flooding hydroacoustic surveys to be completed prior to drawdown)
	Possible moderate reduction in overwintering habitat due to DO depletion (closure phase).	CREMP	NA (closure phase monitoring)

1.4.2 Discussion

Where impacts are exceeded or potentially exceeded based on monitoring results (as identified above), a discussion is provided here. Most FEIS predictions for fish were based on changes to habitat areas as a result of dewatering of Whale Tail Lake North and associated terrestrial flooding. Since flooding is anticipated to be complete in 2020, final validation of those predictions has not yet been made. Where quantitative comparisons could be made in 2019 (Northeast Pond water levels, Mammoth Lake water levels, fishout results, changes to water and sediment quality), impacts have not exceeded predictions.

However, since residual impacts on fish and fish habitat due to changes in lower trophic levels were predicted, but those predictions were not quantitative, a discussion is provided here. In addition, water levels in the northeast pond exceeded predictions for 2019 (but not maximum flood predictions) and alternate water management strategies had to be implemented. Impacts on FEIS predictions are discussed.

1.4.2.1 Lower Trophic Level Changes

Predicted impacts to fish and fish habitat associated with changes in lower trophic levels primarily stem from a predicted increase in nutrient concentrations due to water management and effluent discharge to Mammoth Lake. In 2019, concentrations of nutrients generally increased compared to baseline values in Mammoth Lake (2019 CREMP Report, Section 5.3.2). However, FEIS predictions were only exceeded for the annual average ammonia-N concentration, and this exceedance was identified as likely due to natural variability. Phosphorus concentrations are predicted in the FEIS to increase beyond the meso-eutrophic trigger (>0.035 mg/L) in Mammoth Lake during the operations phase. However, results to date indicate concentrations are still just above the ultra-oligotrophic trigger (0.004 mg/L), as shown in Figure 4.

While phytoplankton results for 2019 did not indicate a change to community structure (e.g., richness), there was a notable, but not statistically significant, increase in Mammoth Lake (Figure 4). While biomass was higher than seen during baseline monitoring, the apparent increases were also driven by lower biomass at the reference area (INUG) relative to previous years. Thus, the biomass results for 2019 appear due to the combined influence of natural variability and mining-related activities.

No significant mine-related changes in benthic invertebrates were observed in 2019, although FEIS predictions indicated impacts may be delayed, and sediment quality will be assessed formally in 2020.

Overall, FEIS predictions for changes to lower trophic levels in Mammoth Lake were not quantitative, but nutrient concentrations and primary production have increased slightly, as anticipated. Observed changes at this point appear to be relatively minor.

Figure 3. Measured concentrations of total phosphorus for the Whale Tail Site CREMP lakes and reference lakes. Red dashed line indicate the CREMP trigger value.

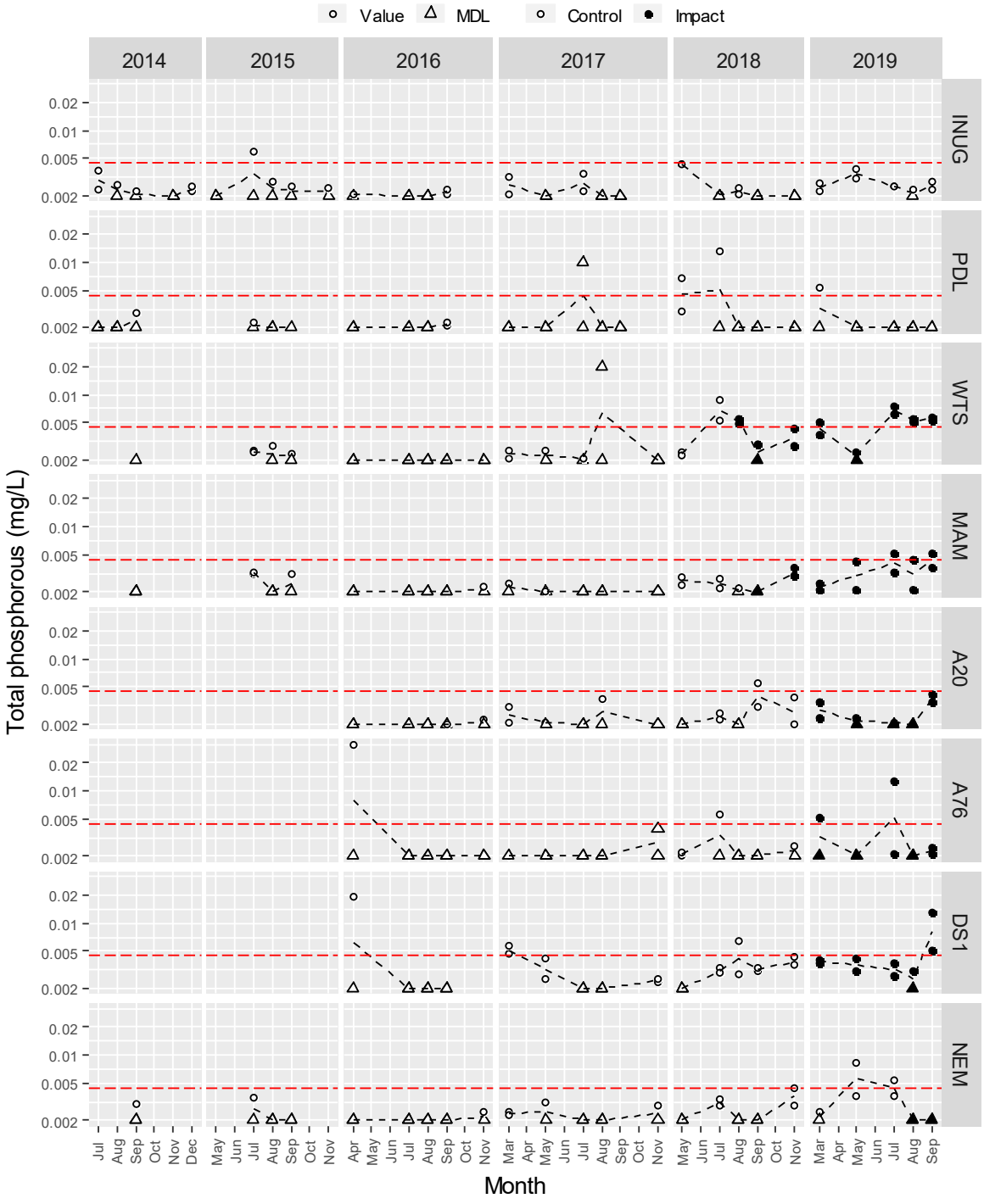
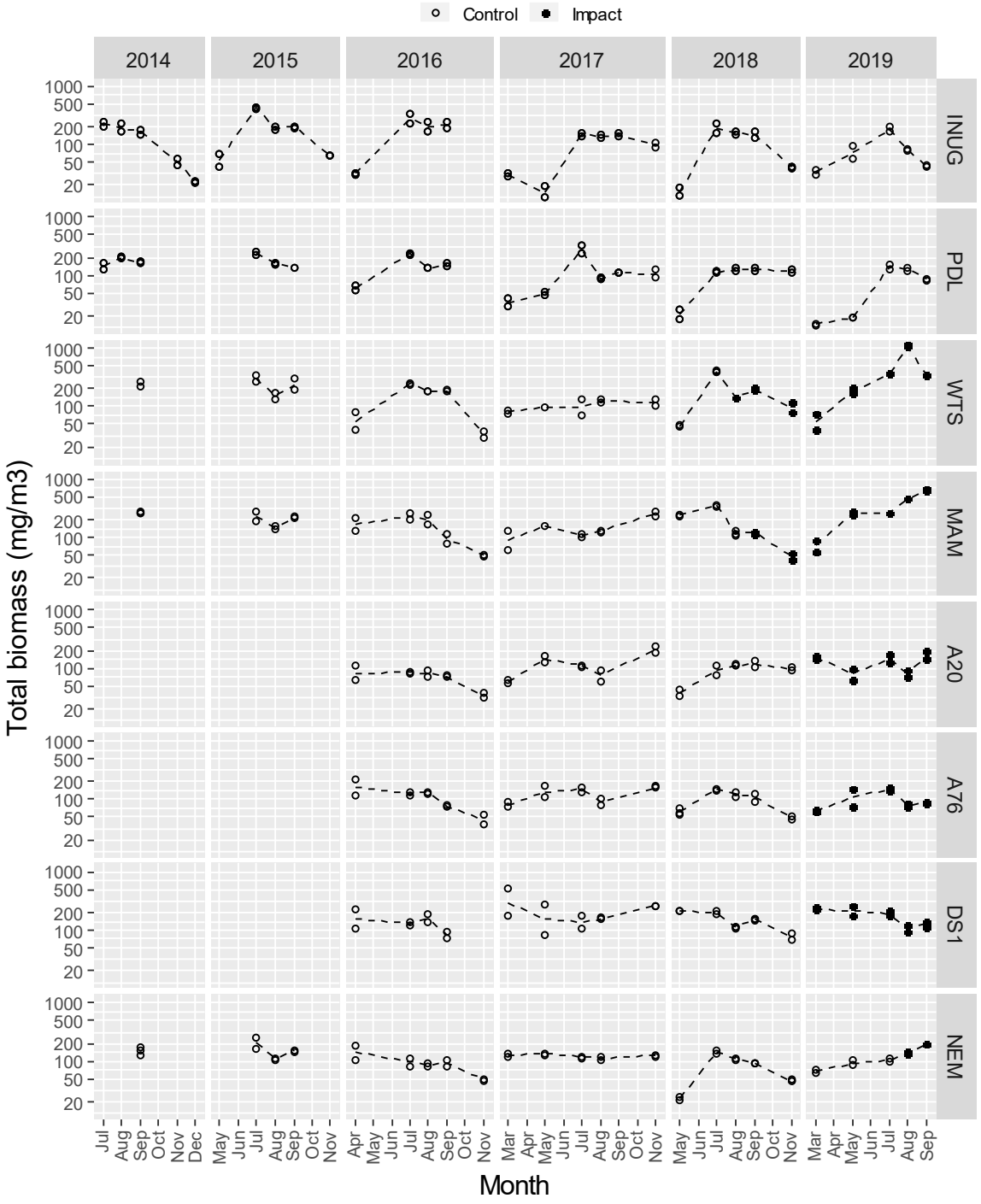


Figure 4. Total phytoplankton biomass in Whale Tail Site CREMP lakes and reference lakes.



1.4.2.2 Northeast Pond Water Levels

The Northeast Dike was constructed from September 2018 to February 2019, causing flooding of a terrestrial zone and diverting non-contact water in this area from the Whale Tail Lake (A) watershed to the Nemo Lake (C) watershed. FEIS water management plans indicated that this flood water would increase to the maximum elevation of 156.66 masl following freshet in 2020, and then flow naturally through a tundra pond system to Nemo Lake. For Lake A46, adjacent to the Northeast dike and within the flood zone, this represents an increase in water levels by 3.5 m, from approximately 154.43 masl to 156.66 masl.

The maximum predicted flood level in this area (156.66 masl) was reached on July 6, 2019 (Figure 4). At that point, it was observed that the topography toward Nemo Lake would not allow water to overflow naturally before overtopping the dike liner. As a result, following discussions with NWB, water has been pumped out of that area since July 2019, resulting in reduced water levels. Water will continue to be pumped out of this area towards the Nemo Lake in 2020, to retain the integrity of the Northeast Dike.

While this represents a change from the FEIS water management strategy, it does not affect final predictions of impacts to fish and fish habitat, because the ponds and tributaries within this flood zone were assumed lost as fish habitat in the approved Whale Tail Pit Fish Habitat Offsetting Plan (March, 2018).

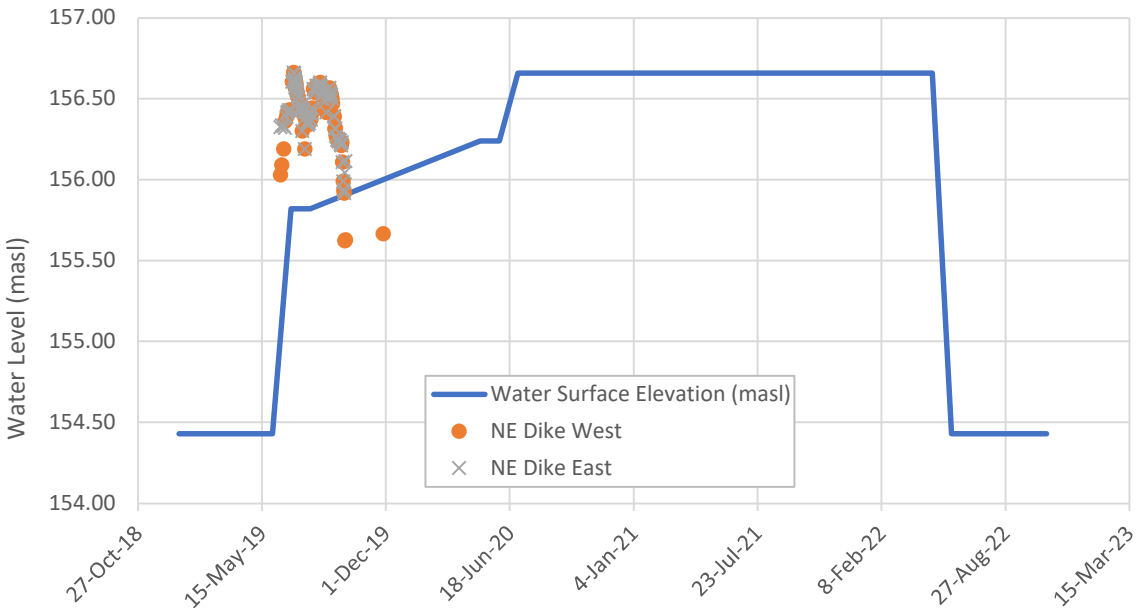


Figure 5. Measured and FEIS-predicted water levels in the Northeast Diversion flood zone. Predicted water levels from FEIS Appendix 6-F.

1.4.3 Effectiveness of Monitoring

Based on the results in Table 3, existing monitoring is able to effectively address all FEIS predictions for changes to fish and fish habitat, with the exception of predicted impacts to zooplankton.

Zooplankton has not been included in standard CREMP monitoring due to difficulties obtaining sufficient statistical power due to very high natural variability. As part of a two-year consultative process to ensure that the program was meeting its intended goal of protecting the aquatic receiving environment, the study design of the CREMP was formally reviewed in 2010-2012, culminating in the preparation of the CREMP Design Document 2012 (Azimuth, 2012). This review included zooplankton (based on data collected in 2010 and 2011) to formally assess their suitability as monitoring components in the CREMP. The CREMP Design Document 2012 (Azimuth, 2012) included recommendations on each component with regards to sample timing, frequency, and number of samples required (sampling effort). These recommendations (which were subsequently approved) were derived from statistical testing (using the BACI or BA framework) and used power analysis to determine the adequacy of statistical power to detect a change in a particular variable from baseline levels to the relevant trigger value. The review supported the initial decisions regarding zooplankton, due to low statistical power to detect effects.

References

Azimuth, 2012. Core Receiving Environment Monitoring Program (CREMP): Design Document 2012, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico- Eagle Mines Ltd., Baker Lake, NU. December, 2012.

Azimuth (Azimuth Consulting Group Partnership), 2010. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction Monitoring 2009, Meadowbank Gold Project, Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico-Eagle Mines Ltd., Vancouver BC. March 2010.

Golder (Golder Associates), 2016. Final Environmental Impact Statement for the Whale Tail Pit Project. Volumes 1 – 8. Report Number: 1541520. Prepared by Golder Associates for Agnico Eagle Mines Ltd. June, 2016.

APPENDIX A

Documentation:

Letter to DFO re. Impingement of Stickleback on Northeast Pond Pump Intake Screen

Memos to DFO re. Blast Monitoring and Mitigation for Construction of the Mammoth Dike and South Whale Tail Channel

AGNICO EAGLE

August 27th, 2019

Sally Wong
Fisheries Protection Biologist
Fisheries and Oceans Canada
Suite 301, 5204 50th Avenue
Yellowknife, NWT
X1A 1E2

Re: Agnico Eagle Whale Tail Project – Stickleback Mortalities

Dear Sally Wong,

Agnico Eagle would like to notify you on small bodied fish being impacted by a pumping infrastructure located at the Whale Tail Pit operations. As such, find below information in relation to this event.

The Whale Tail Pit Water Management Plan indicates that non-contact water from the North-East Pond (Figure 1) watershed will overflow by gravity toward Nemo Lake once the North-East (NE) Dike is operational. The NE Dike was constructed in Q1 2019 and became operational during freshet of 2019. During a routine inspection in July 2019, it was observed that the topography toward Nemo Lake would not allow water to overflow naturally before overtopping the dike liner. Starting on July 5th, water has been pumped from NE Pond toward the project site or tundra. Two pumps were thus installed. A main pumping infrastructures on the North-East Dike with the intake located as located with the intake near the dike and a second pump on the north side of the area (Figure 2 below), discharging within the same areas. The main pump has been stopped since August 21st but Agnico had kept the second pump in operation.

On August 27, it was bought to Agnico's attention that some Stickleback were being impinged and killed on the intake screen of the second pump. It was not possible at this moment to estimate the number of Stickleback impinged or killed. This second pump has now been stopped. Before any pumping resumes within this area, mitigation measures will be put in place to prevent this from reoccurring. These measures will consist of daily inspection of the intake pump and downstream lake and to modify the pumping intake location in a manner that hat will restrict this area to small bodied fish.

10 200, Route de Preissac, Rouyn-Noranda, Québec, Canada J0Y 1C0
Tél : 819.759.3700 Sans frais : 1.888.822.6714 agnicoeagle.com

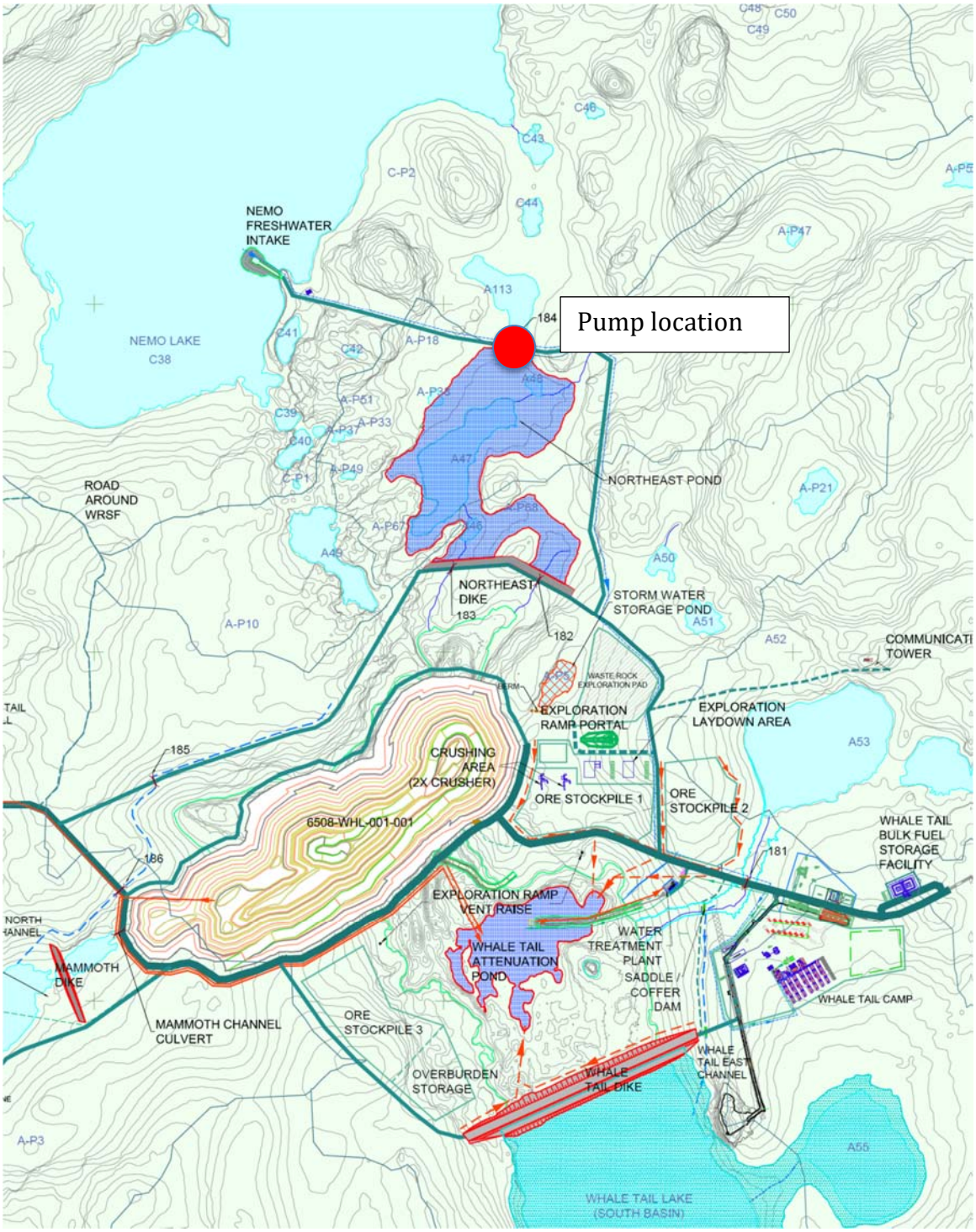


Figure 1: Whale Tail Site General View

10 200, Route de Preissac, Rouyn-Noranda, Québec, Canada J0Y 1C0
Tél : 819.759.3700 Sans frais : 1.888.822.6714 agnicoeagle.com

Figure 2: Pump Location (on road) at the north side of NE Pond

10 200, Route de Preissac, Rouyn-Noranda, Québec, Canada J0Y 1C0
Tél : 819.759.3700 Sans frais : 1.888.822.6714 agnicoeagle.com

Should you have any questions, recommendation or require further information, Agnico remains available at your convenience.

Regards,

Agnico Eagle Mines Limited – Meadowbank Division

Robin Allard
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Environment General Supervisor

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AGNICO EAGLE

Memo

To: Department of Fisheries and Ocean (DFO)

From: Patrice Gagnon, Pier-Eric McDonald

CC: Meadowbank Environment

Date: February 5th, 2019

Subject: Blasting Activities – Mammoth Dike construction

1. Introduction

Agnico Eagle plans to build the Mammoth Dike that will allow for the mining of the Whale Tail Pit. One of the construction activities consists of drill & blasting (D&B) the foundation of the dike. That area is located on a very shallow shoreline of Mammoth Lake and this activity is critical for assuring the performance of the dike. Since this activity is close to a water body, Agnico aims to comply with the DFO's Guidelines for Use of Explosives in or Near Canadian Fisheries Waters. In addition to the federal guidelines, Condition 2.3.3 of the Fisheries Authorization 16-HCAA-00370 states: '*The Proponent shall develop a blasting mitigation plan in consultation with DFO to ensure effects on fish and fish habitat are minimized, as per Nunavut Impact Review Board Project Certificate No. 008 Condition 22. The blasting mitigation plan shall be submitted to DFO prior to construction for approval, and shall adhere to the guidance provided in the Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000-2002 (Cott and Hanna, 2005)'*. The recommendations outlined in this document are objects of DFO's most recent recommendations on blast practices close to waterbodies.

This memo presents the proposed monitoring and mitigation measures required for Dike construction works that Agnico has developed to respect the above mentioned guidelines. Those requirements and their underlying mitigations proposed by Agnico are being referred to as a "Blasting Mitigation Plan" which consist of both Section 4 and 5 of this present document. This memo will be communicated to all personal involved with drill and blast activities.

2. Description of Blasting Activities & Current Site Conditions

2.1 Description of Blasting Activities and Associated Computations

Drill and Blast of the Mammoth Dike foundation is required as per the Design Report, approved on December 5, 2018 as part of NWB Water License 2AM-WTP1826, in order to get to the proper foundation elevation and frozen conditions to install the liner in the key trench (impervious part of the dike). This will ensure the dike performs as per design's intent by ensuring that its foundation is on frozen material not prone to thaw settlement and of low hydraulic conductivity. Drill and blast activities are planned to be undertaken close to the center line of the dike while respecting the requirements mentioned in Section 3. The blasting activities are planned to occur in the months of February/March 2019 so the construction is completed before the thawing season for construction effectiveness and for being as far away from free water (fish bearing habitat). The extent of the blasting area is presented in Appendix A.

The drilling and loading design specific for this blast was performed by Agnico's drill and blast engineers, it is shown in Appendix E and F. This design was used to compute the setback distance. The instantaneous pressure change (IPC) threshold is maximum 50 kPa, as recommended by DFO in "Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies". Those detailed computations are shown in Appendix D and are taken from Appendix II & III of DFO's document 'The Use of Explosives in or Near Canadian Fisheries Waters'. It should be noted that Guideline 9 from 'The Use of Explosives in or Near Canadian Fisheries Waters' that states that the setback requirement to respect the 13 mm*s-1 from spawning beds is found to be the most stringent guideline regarding setback distances to respect. Also, Appendix B below presents the fish habitats type and it can be seen that the Mammoth Dike's alignment and proposed blasting area is in a low risk zone and more than 115m away from any critical areas and that is greater than any of the setback distances computed.

2.2 Current Site conditions

Mammoth Lake bathymetry and fish habitat survey indicate a shallow depth (<2m) that is continuous up to the closest fish habitat shown in Appendix B. Past years ice survey profile at the end of January indicate that there is at least 1.1m thickness of ice and recent ice cutting with the auger indicate at least 1.2m as per blade length reference. Hence, it is Agnico's interpretation

that the lake is likely frozen from top to bottom for at least 116m from the blasting area to both the deeper portion and fish bearing habitat. This interpretation is consistent with the recommendation detailed in the 'Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies" (Cott and Hanna, 2005) stating that no seismic exploration should be conducted in waterbodies not frozen to the bottom.

Furthermore, Appendix C shows the data of thermistor MD-2015-02 located in the deeper portion of the water channel linking Whale Tail Lake to Mammoth Lake and also located in the key trench of the dike. It was installed as part of SNC Lavalin field investigation for dike design and reveals that after December 10th, all the thermistor beads exhibit frozen conditions meaning no blasting under water will be undertaken for this specific activity on which most recommendations of Cott and Hanna (2005) are based. Nevertheless, Agnico is committed to follow the recommendations where they are summarized in Section 3 and how it intends to address them which is shown in Sections 4 & 5.

3. Review of Existing Guidelines and Recommendations

3.1 DFO's Guidelines for Use of Explosives in or Near Canadian Fisheries Waters

Agnico intends to comply with the nine (9) *guidelines of the document "Guidelines for Use of Explosives in or Near Canadian Fisheries Waters" summarize* below. For Guideline no 8, Agnico will use a more stringent ICP of 50 kPa as recommended by DFO in the Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies (Cott and Hanna, 2005):

1. *Proponents considering the use of explosives are encouraged to consult the appropriate DFO Regional/Area authorities as early as possible in their planning process to identify possible alternatives to the use of explosives, the biological resources and their habitats at risk, and/or effective mitigation measures.*

2. *Where provincial or territorial resource management agencies, or aboriginal resource management boards undertake the administration of fisheries, the proponent is encouraged to consult with the relevant authorities.*

3. *The use of confined or, in particular, unconfined explosives in or near Canadian fisheries waters is discouraged, and proponents are encouraged to utilize other potentially less destructive methods wherever possible.*

4. *No use of ammonium nitrate-fuel oil mixtures occurs in or near water due to the production of toxic by-products (ammonia).*

5. *After loading a charge in a hole, the hole is to be back-filled (stemmed) with angular gravel to the level of the substrate/water interface or the hole collapsed to confine the force of the explosion to the formation being fractured. The angular gravel is to have a particle size of approximately 1/12th the diameter of the borehole.*

6. *All "shock-tubes" and detonation wires are to be recovered and removed after each blast.*

7. *No explosive is to be knowingly detonated within 500 m of any marine mammal (or no visual contact from an observer using 7x35-power binocular).*

8. *No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swimbladder of a fish.*

9. *No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm•s-1 in a spawning bed during the period of egg incubation.*

3.2 Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies" (Cott and Hanna, 2005)

Below are recommendations from "Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies", NWT 2000-2002 (Cott and Hanna, 2005) that Agnico intends to follow:

1. *Seismic exploration should not be conducted under water-bodies not frozen to the bottom in the NWT due to the unpredictability of IPC (Instantaneous Pressure Change) and absence of proven mitigation to suppress the negative effects of a detonated charge.*

2. *Guidelines should be used as intended, as "guidelines", and be adjusted to site-specific conditions accordingly, not applied as a mitigation.*

3. *Ice profiling on waterbodies should be used as a tool to determine the extent of bottom-fast ice.*

4. *Proven mitigation to minimize the impact on fish from the effects of high IPC should be available on site in the event that an unforeseen event occurs, such as a shallow buried charge.*

5. *For any explosive-based seismic program, a protocol must be developed that clearly indicates what is expected, how monitoring is to be conducted, what and how information is to be recorded, and when the results are to be submitted. The protocol should be designed well in advance of the proposed seismic exploration program, and be a joint effort between industry and regulators.*

6. *Initial testing should be conducted to determine site-specific charge size/burial depth combinations.*

7. *Charge burial depth must be accurately measured and confirmed.*

8. *A maximum threshold of <50kpa should be set for testing and production seismic operations.*

9. *Monitoring equipment should be capable of monitoring at the highest frequency available, currently 65,000s-1 is standard.*

10. *A pre-determined number of production holes should be monitored to confirm the adequacy of the site-specific charge size/burial depth combinations for the entire project area.*

11. *When designing a program to monitor activities of industry, it is important that the requirements be practical and considers the technical and environmental conditions in which the industry is bound to operate.*

4. Proposed Monitoring Plan

The Blast Mitigation Plan is outlined in this present section for the monitoring and Section 5 for the mitigations. Both section are meant to address the guidelines and recommendations described in the previous section of this memo.

Agnico will monitor blast vibrations with Instantel Minimate™ seismograph monitoring devices to be installed as indicated by the manufacturer at the same location every blast. Note that one station is suggested on each side of the dike. Those locations are to be in a representative area on the shoreline and outside the footprint of dike construction. Refer to Appendix A for proposed locations of the existing and new proposed station. Such practices are consistent with the current practices at Meadowbank and Whale Tail, plus it ensures redundancy of recording units and respects the recommendation regarding the type of equipment to be used that is consistent with industry standards.

The whole blast footprint shall be shot in at least 3 sequences of equivalent holes quantity in such a way that after each blast, the recorded values and post-blast visual assessment shall be analyzed and documented by competent personal so adjustments on the next blasting sequences could be brought forward if the guidelines are not respected or exceeded. Lastly, in case of a “no data” event, Agnico will investigate the cause to assess whether the error is human or material related and bring corrective measures where applicable.

5. Potential Mitigation Measures

Agnico already has practices that are aligned with some requirements of Section 3 regardless if a blast is in proximity to a waterbody or not, for example: holes are backfilled with angular ¾” net gravel, emulsion is used which is not soluble in water, blasters inspect the blast area after each blast and design parameters are optimized.

Although Agnico is confident that actual practices and design will comply with the requirements of Section 3, a handful of potential mitigation measures were identified that could be applied should the first sequence exceeds the requirements. Those are developed from a combination of literature and past experiences at Meadowbank that have proven to be successful, namely:

- Drill on small diameters hole as low as 3” to limit vibrations;

- The explosive charge in each hole (powder factor) shall be reduced to the minimum judged practical in the design phase of the blast and re-adjusted if required after the first sequence;

- Number of holes blasting per delay and blast geometry shall be reduced to a minimum as much as practical in the tying plan produced by the D&B engineer to limit vibrations to respect the computations shown in Appendix D;

- The blasting area might be broken down to smaller blast patterns and more sequences, to be blasted in a chronological manner.

- Agnico will perform a 2nd visual inspection of the area around the blast after each blast and remove any shock tubes or detonators that might have been projected outside the perimeter. If visual inspection reveals blasting accessories on the iced surface of the Mammoth Lake, the blaster will advise the Engineering Department so that the material is removed via appropriate procedures;

- Quality control by competent personal could be performed after the first blast sequence to ensure that no overloading occurs in such a way that the maximum charge per hole respects the design that was used as in input for the Instantaneous Pressure Change and Vibrations computations for calculating the setback distances;

- In the event where projections are judged problematic, blasting mats or geotextile could be applied over the whole blasting sequence with an appropriate amount of aggregates over it in such a way that the energy is kept in the rock mass as opposed to sending projections and deleterious blasting material in the air.

6. Closure

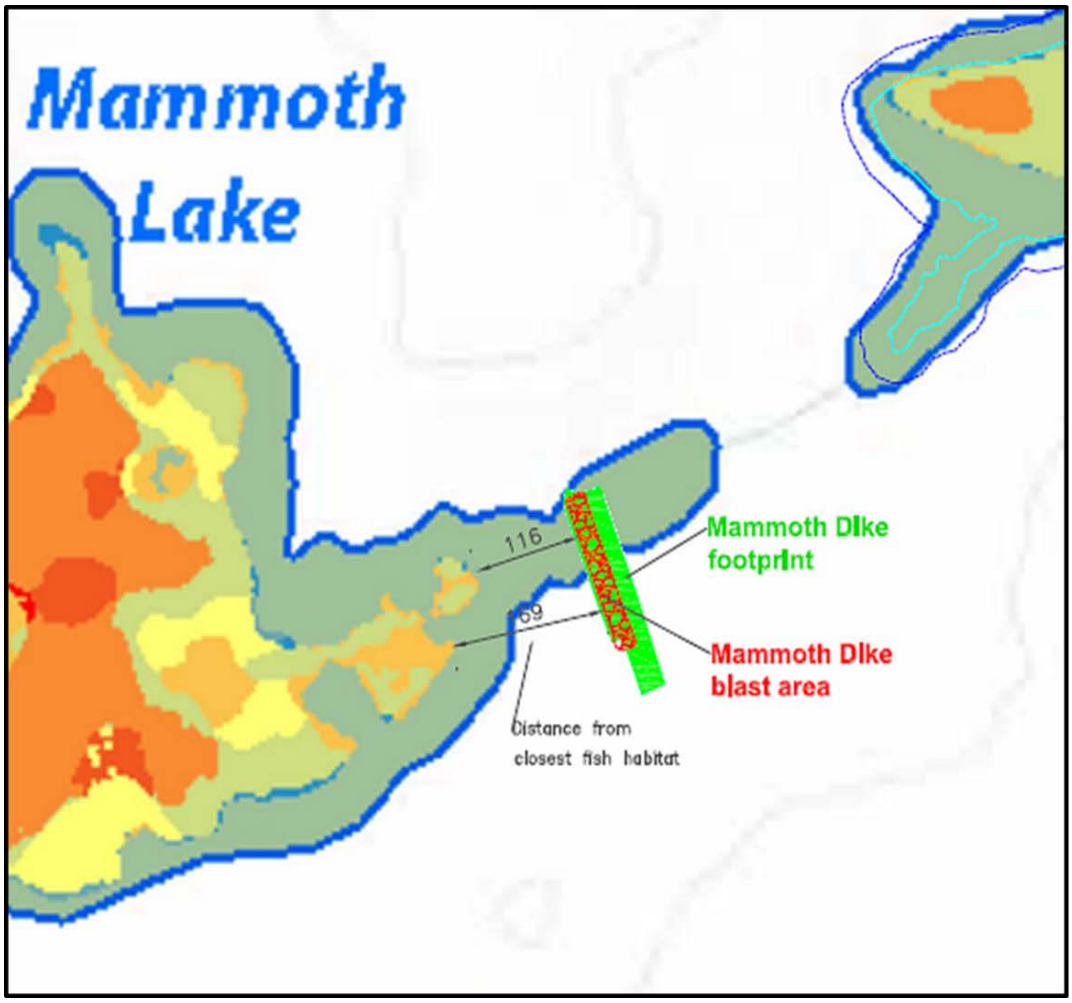
This memo communicates Agnico intent's on Drill and Blast activities and the rationale behind it on a construction and design standpoint. Site specific conditions also show that free water is expected to be further than the maximal setback distance to respect, so is the closest spawning bed. Also, it is clear that site specific designs are meeting the computational requirements of the guidelines and recommendations that DFO proposes to comply.

Agnico took into consideration guidelines and recommendations to comply and then built a monitoring program accordingly. Lastly, Agnico listed realistic and practical mitigations that could be implemented should the first blast sequence show unfavourable results which is also consistent with DFO’s guidelines and Cott & Hanna’s set of recommendations.

APPENDIX A – Proposed Blast Monitoring Stations


Existing blast
monitoring station
116
MAMMOTH DIKE
Proposed blast
monitoring station
169

Appendix B: Fish Habitat Types



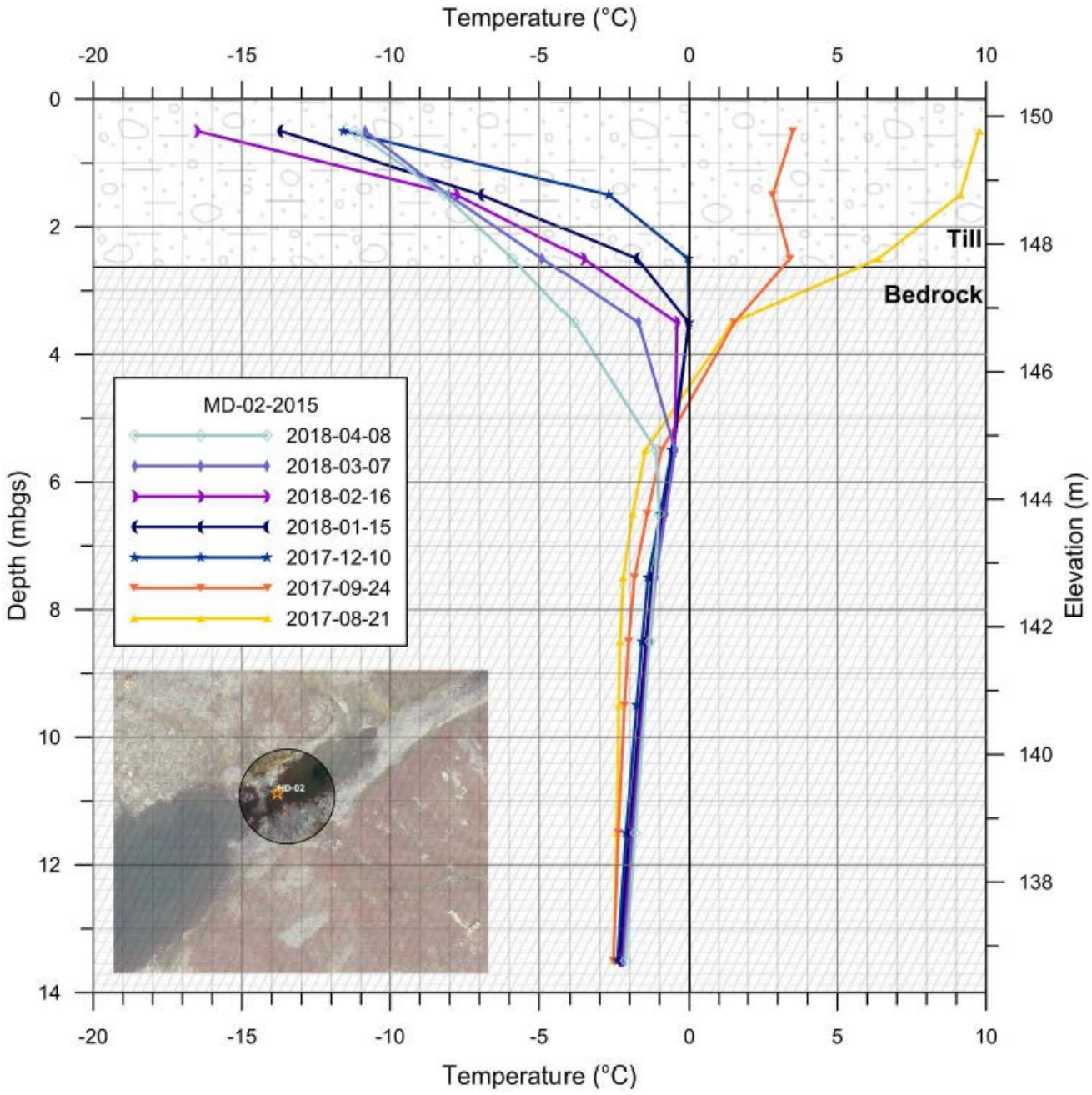
Habitat Type

1
2
3
4
5
6
7
8
9

Habitat Type	Criteria	
	Depth Zone	Substrate
1	<2 m	Fines
2	<2 m	Mixed
3	<2 m	Coarse
4	2-4 m	Fines
5	2-4 m	Mixed
6	2-4 m	Coarse
7	> 4 m	Fines
8	> 4 m	Mixed
9	> 4 m	Coarse

Whale Tail Habitat Types
Pre-Construction

Appendix C: Thermistor MD-2015-02 data


Temperature (°C)
-20
-15
-10
-5
0
5
10
Depth (mbgs)
0
2
4
6
8
10
12
14
Elevation (m)
150
148
146
144
142
140
138
Till
Bedrock
MD-02-2015
2018-04-08
2018-03-07
2018-02-16
2018-01-15
2017-12-10
2017-09-24
2017-08-21
MD-02
Temperature (°C)

Appendix D: Blasting setback distance calculations on 4.5” hole diameter – 50 kPa requirement

			Guideline 8	Guideline 9
Hole diameter (in)	4.5	**Description**	Instantaneous pressure change over 50 Kpa in the swimbladder of a fish	Peak particule velocity greater than 13mm/s in a spawning bedduring the period of egg incubation
Charge Length (m)	3.2			
Explosives Qty (Kg)	37			
		Radius to respect (m)	43.7	100.4

Set back distance required to meet 50Kpa Guideline

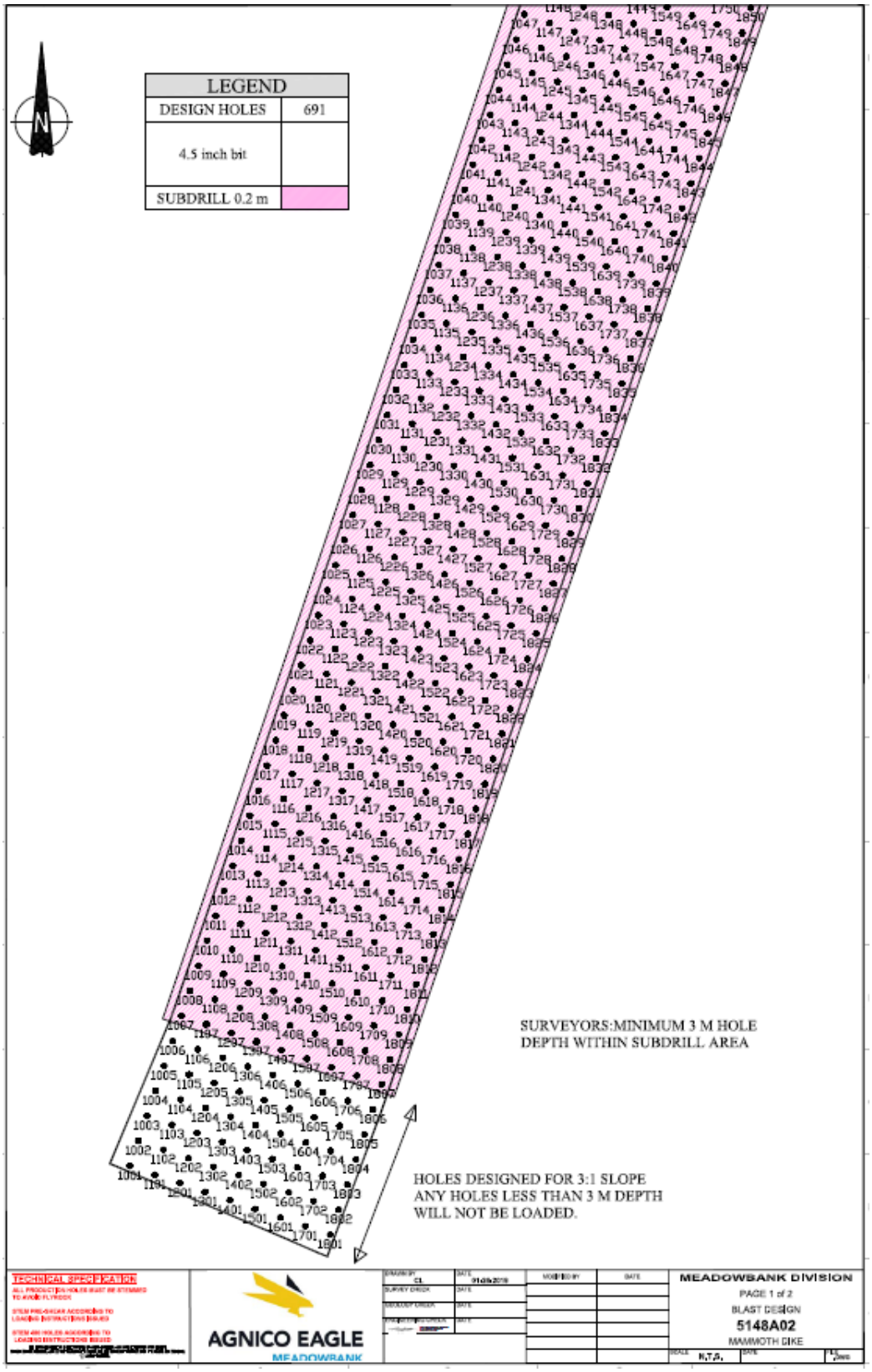
Dw	1	g/cm3	Zw/Zr=	0.249993	
Cw	146300	cm/s			
Dr	1.92	g/cm3			
Cr	304800	cm/s			
Pw	50	KPa			
			Pw=	0.399991	*Pr
Hole diameter	4.5	in			
	11.43	cm	Pr=	125.0027	KPa
Emuls. Density	0.00113	Kg/cm3	Pr=	1250027	dynes (g*cm/s2)
Charge per meter	11.59473	Kg/m			
Charge length	3.2	m*	Vr=	4.27202	cm/s
Explosive Qty	37.10315	Kg			
			R=	43.70786	m

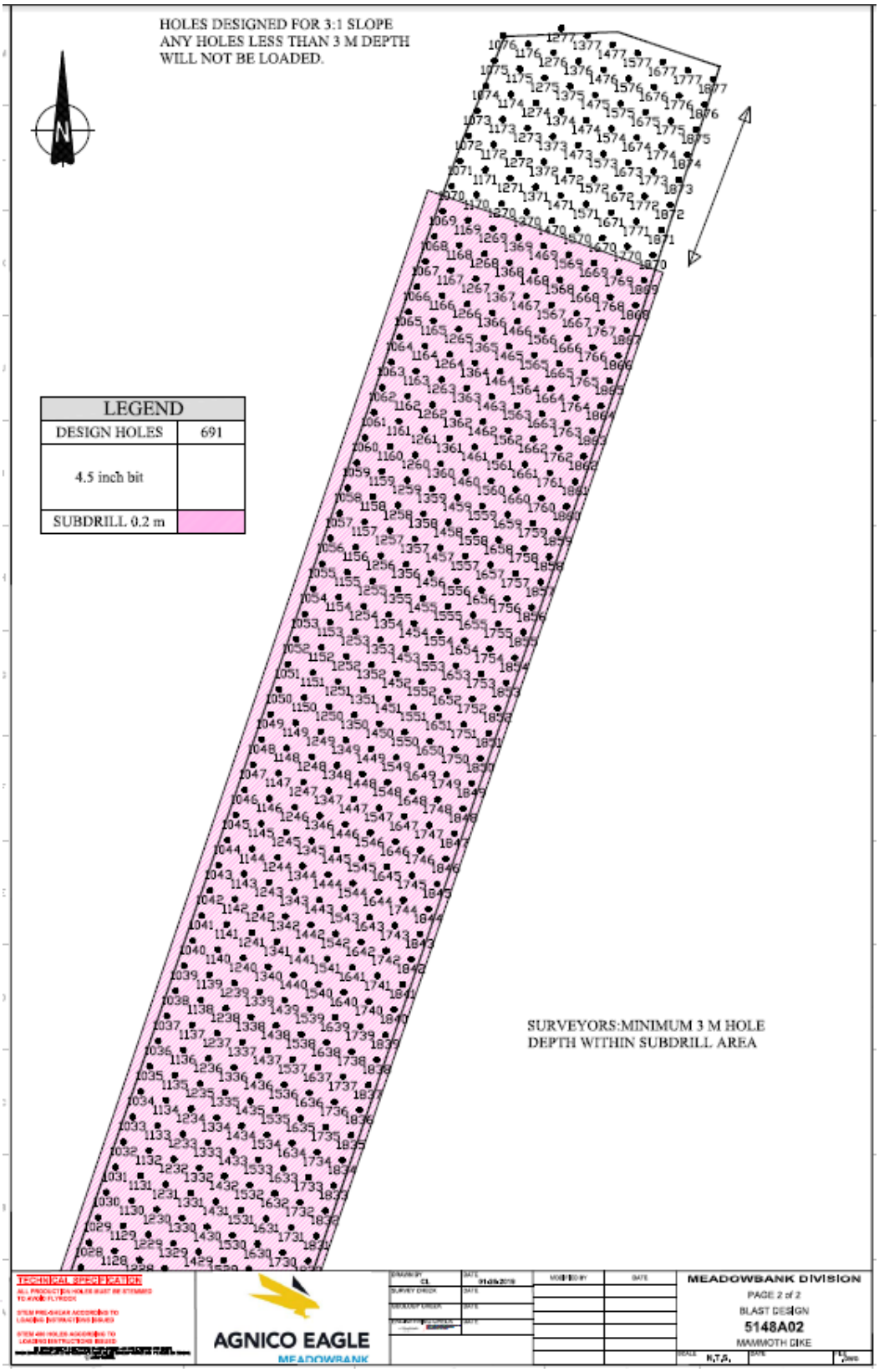
** Using target floor elevation 148.8 with SNC's design highest Natural ground between cut B-B & C-C of 153masl and also considering Loading instructions plans collar Length specified by D&B engineers (1*

Set back distance required to meet 13mm/s Guideline

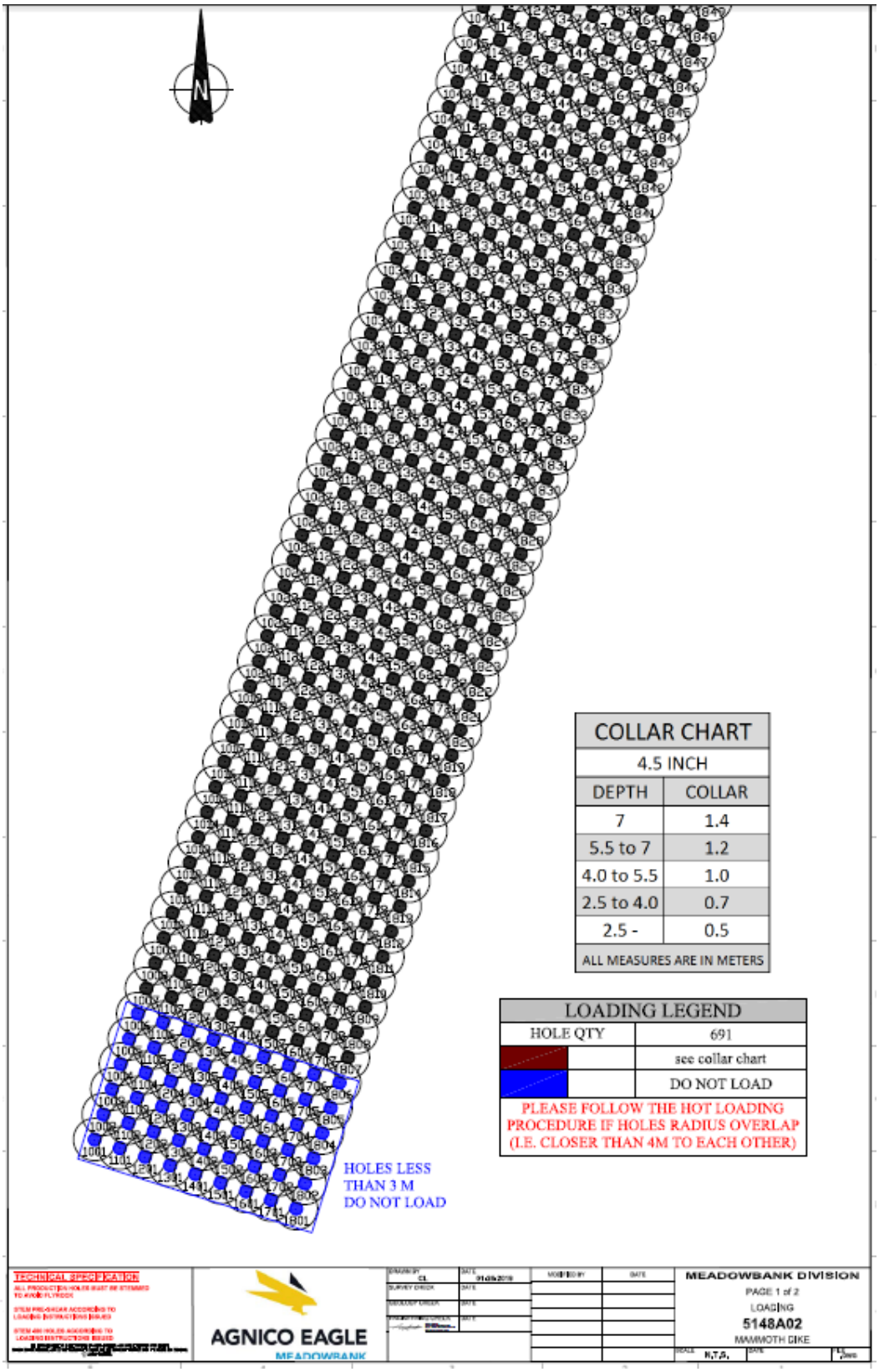
Vr	1.13	cm/s	R=	100.3532	m

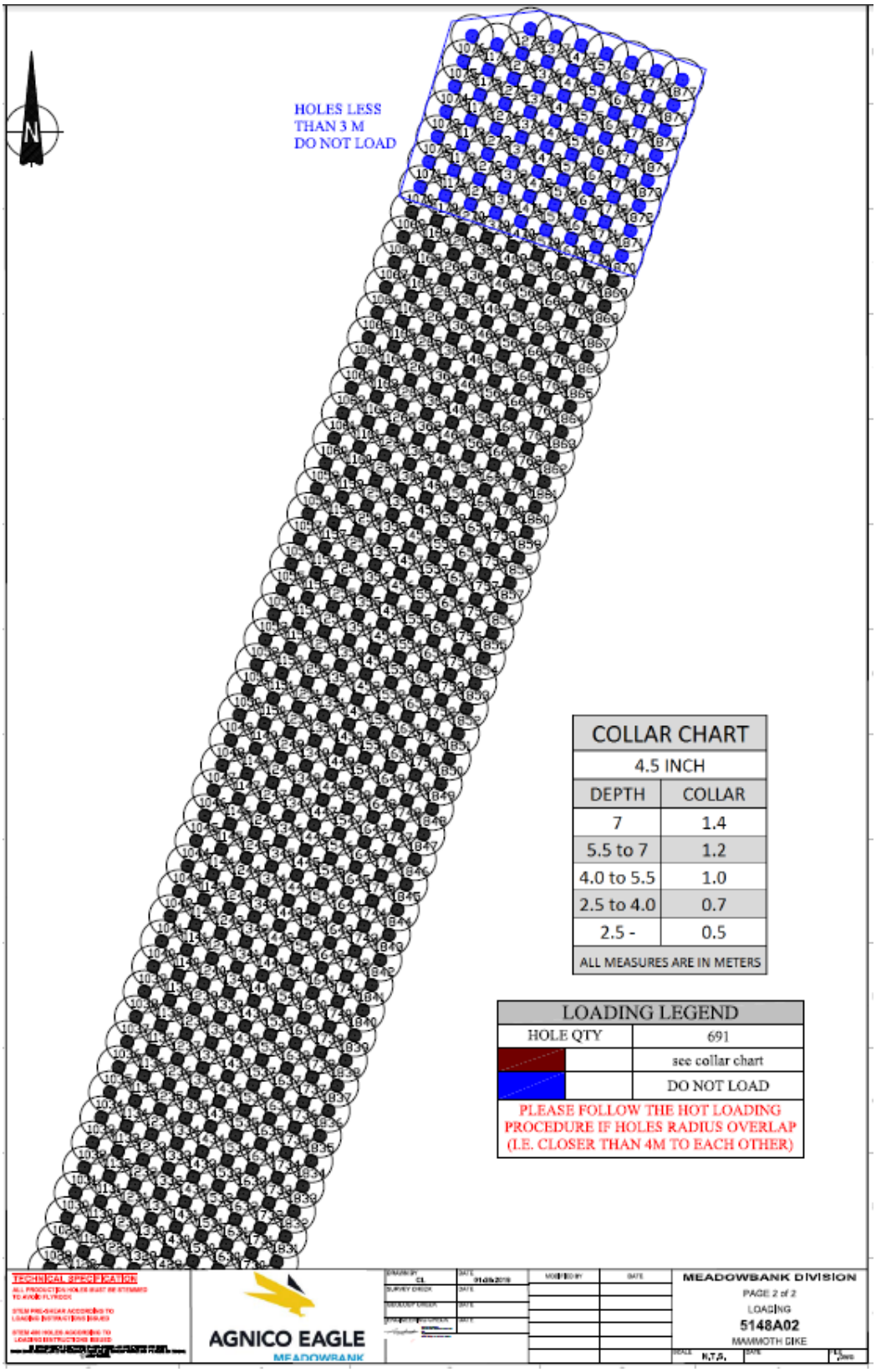
Appendix E: Drilling Design


LEGEND
DESIGN HOLES 691
4.5 inch bit
SUBDRILL 0.2 m
N
SURVEYORS:MINIMUM 3 M HOLE DEPTH WITHIN SUBDRILL AREA
HOLES DESIGNED FOR 3:1 SLOPE
ANY HOLES LESS THAN 3 M DEPTH
WILL NOT BE LOADED.
AGNICO EAGLE
MEADOWBANK
MEADOWBANK DIVISION
PAGE 1 of 2
BLAST DESIGN
5148A02
MAMMOTH DIKE


HOLES DESIGNED FOR 3:1 SLOPE
ANY HOLES LESS THAN 3 M DEPTH
WILL NOT BE LOADED.
N
LEGEND
DESIGN HOLES 691
4.5 inch bit
SUBDRILL 0.2 m
SURVEYORS:MINIMUM 3 M HOLE
DEPTH WITHIN SUBDRILL AREA
AGNICO EAGLE
MEADOWBANK
MEADOWBANK DIVISION
PAGE 2 of 2
BLAST DESIGN
5148A02
MAMMOTH DIKE

Appendix F: Loading Design


N
HOLES LESS
THAN 3 M
DO NOT LOAD
COLLAR CHART
4.5 INCH
DEPTH | COLLAR
7 | 1.4
5.5 to 7 | 1.2
4.0 to 5.5 | 1.0
2.5 to 4.0 | 0.7
2.5 - | 0.5
ALL MEASURES ARE IN METERS
LOADING LEGEND
HOLE QTY | 691
see collar chart
DO NOT LOAD
PLEASE FOLLOW THE HOT LOADING PROCEDURE IF HOLES RADIUS OVERLAP (I.E. CLOSER THAN 4M TO EACH OTHER)
AGNICO EAGLE
MEADOWBANK
MEADOWBANK DIVISION
PAGE 1 of 2
LOADING
5148A02
MAMMOTH DIKE


HOLES LESS
THAN 3 M
DO NOT LOAD
N
COLLAR CHART
4.5 INCH
DEPTH
COLLAR
7
1.4
5.5 to 7
1.2
4.0 to 5.5
1.0
2.5 to 4.0
0.7
2.5 -
0.5
ALL MEASURES ARE IN METERS
LOADING LEGEND
HOLE QTY
691
see collar chart
DO NOT LOAD
PLEASE FOLLOW THE HOT LOADING
PROCEDURE IF HOLES RADIUS OVERLAP
(I.E. CLOSER THAN 4M TO EACH OTHER)
AGNICO EAGLE
MEADOWBANK
MEADOWBANK DIVISION
PAGE 2 of 2
LOADING
5148A02
MAMMOTH BIKE

AGNICO EAGLE

Memo

To: Fisheries and Ocean Canada (DFO)

From: Patrice Gagnon, Pier-Eric McDonald

CC: Meadowbank Environment

Date: September 20th 2019

Subject: Blasting Activities – South Whale Tail Channel construction

1. Introduction

Agnico Eagle (Agnico) plans to build the South Whale Tail Channel (SWTC) that is part to the Whale Tail Dike system. The SWTC will convey water to Mammoth Lake to control the water level in Whale Tail South (WTS) at the operational level of Whale Tail Dike. One of the construction activities consists of drill & blasting (D&B) the bedrock or frozen ground portion expected from 2019 field investigation campaign. The drilling and blasting needs will be evaluated based on temperature and foundation condition however, it could be expected that poor bedrock conditions located around 280m from the Mammoth Lake shore be required. Furthermore, most of the excavation is expected to be in the till active layer, however it could be anticipated that frozen till below that active layer (typically 2m depth) be necessary to drill and blast for reaching the proper channel invert elevation. In that case D&B might reach close to either Mammoth or Whale Tail Lake. Since this activity may be close to a water body if blasting is deemed required, Agnico aims to comply with the DFO's Guidelines for Use of Explosives in or Near Canadian Fisheries Waters. In addition to the federal guidelines, condition 2.3.3 of the Fisheries Authorization 16-HCAA-00370 states: '*The Proponent shall develop a blasting mitigation plan in consultation with DFO to ensure effects on fish and fish habitat are minimized, as per Nunavut Impact Review Board Project Certificate No. 008 Condition 22. The blasting mitigation plan shall be submitted to DFO prior to construction for approval, and shall adhere to the guidance provided in the Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000-2002 (Cott and Hanna, 2005)*'. The recommendations outlined in this document are objects of DFO's most recent recommendations on blast practices close to waterbodies.

This memo presents the proposed monitoring and mitigation measures required for Dike construction works that Agnico has developed to respect the above mentioned guidelines. Those requirements and their underlying mitigations proposed by Agnico are being referred to as a “Blasting Mitigation Plan” which consist of both section 4 and 5 of this present document. This memo will be communicated to all personal involved with drill and blast activities.

2. Description of Blasting Activities & Current Site Conditions

2.1 Description of Blasting Activities and Associated Computations

Drill and Blast of the SWTC may be required as per the Design Report approved on September 12, 2019 as part of NWB Water License 2AM-WTP1826, in order to get to the proper foundation elevation. Drill and blast activities are planned to be undertaken on an “as needed” basis based on field conditions while respecting the requirements mentioned in Section 3. The blasting activities are planned to occur between September and December so the construction is completed before the thawing season for the construction to meet its design objective. The extent of the blasting area is presented in Appendix D.

The drilling and loading design specific for this blast was performed by Agnico’s drill and blast engineers, it is shown in Appendix D and E. This design was used to compute the setback distance. The instantaneous pressure change threshold is maximum 50 KPa, as recommended by DFO in “Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies”. Those detailed computations are shown in Appendix C and are taken from Appendix II & III of DFO’s document: The Use of Explosives in or Near Canadian Fisheries Waters. It should be noted that Guideline 9 that states that the setback requirement to respect the 13 mm*s-1 from spawning beds is found to be the most stringent guideline regarding setback distances to respect. Also, Appendix B below presents the fish habitats type and it can be seen that the SWTC likely blasting area is in a low risk zone and more than 150m away from the worst case potential blasting area (highest charge combined with closest blast proximity). That worst case distance is either equal or greater than any of the setback distances computed.

3. Review of Existing Guidelines and Recommendations

3.1 DFO's Guidelines for Use of Explosives in or Near Canadian Fisheries Waters

Agnico intends to comply with the nine (9) guidelines of the document "Guidelines for Use of Explosives in or Near Canadian Fisheries Waters" summarize below. For guideline no 8, Agnico will use a more stringent ICP of 50 kPa as recommended by DFO in the Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies (Cott and Hanna, 2005):

1. *Proponents considering the use of explosives are encouraged to consult the appropriate DFO Regional/Area authorities (Appendix I) as early as possible in their planning process to identify possible alternatives to the use of explosives, the biological resources and their habitats at risk, and/or effective mitigation measures.*

2. *Where provincial or territorial resource management agencies, or aboriginal resource management boards undertake the administration of fisheries, the proponent is encouraged to consult with the relevant authorities.*

3. *The use of confined or, in particular, unconfined explosives in or near Canadian fisheries waters is discouraged, and proponents are encouraged to utilize other potentially less destructive methods wherever possible.*

4. *No use of ammonium nitrate-fuel oil mixtures occurs in or near water due to the production of toxic by-products (ammonia).*

5. *After loading a charge in a hole, the hole is to be back-filled (stemmed) with angular gravel to the level of the substrate/water interface or the hole collapsed to confine the force of the explosion to the formation being fractured. The angular gravel is to have a particle size of approximately 1/12th the diameter of the borehole.*

6. *All "shock-tubes" and detonation wires are to be recovered and removed after each blast.*

7. *No explosive is to be knowingly detonated within 500 m of any marine mammal (or no visual contact from an observer using 7x35-power binocular).*

8. *No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swimbladder of a fish.*

9. *No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm•s-1 in a spawning bed during the period of egg incubation.*

3.2 Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies (Cott and Hanna, 2005)

Below are recommendations from "Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies", NWT 2000-2002 (Cott and Hanna, 2005) that Agnico intends to follow.

1. *Seismic exploration should not be conducted under water-bodies not frozen to the bottom in the NWT due to the unpredictability of IPC (Instantaneous Pressure Change) and absence of proven mitigation to suppress the negative effects of a detonated charge.*

2. *Guidelines should be used as intended, as "guidelines", and be adjusted to site-specific conditions accordingly, not applied as a mitigation.*

3. *Ice profiling on waterbodies should be used as a tool to determine the extent of bottom-fast ice.*

4. *Proven mitigation to minimize the impact on fish from the effects of high IPC should be available on site in the event that an unforeseen event occurs, such as a shallow buried charge.*

5. *For any explosive-based seismic program, a protocol must be developed that clearly indicates what is expected, how monitoring is to be conducted, what and how information is to be recorded, and when the results are to be submitted. The protocol should be designed well in advance of the proposed seismic exploration program, and be a joint effort between industry and regulators.*

6. *Initial testing should be conducted to determine site-specific charge size/burial depth combinations.*

7. *Charge burial depth must be accurately measured and confirmed.*

8. *A maximum threshold of <50kpa should be set for testing and production seismic operations.*

9. *Monitoring equipment should be capable of monitoring at the highest frequency available, currently 65,000s-1 is standard.*

10. *A pre-determined number of production holes should be monitored to confirm the adequacy of the site-specific charge size/burial depth combinations for the entire project area.*

11. *When designing a program to monitor activities of industry, it is important that the requirements be practical and considers the technical and environmental conditions in which the industry is bound to operate.*

4. Proposed Monitoring Plan

The Blast Mitigation Plan is outlined in this present section for the monitoring and section 5 for the mitigations. Both section are meant to address the guidelines and recommendations described in the previous section of this memo.

Agnico will monitor blast vibrations with Instantel Minimate™ seismograph monitoring devices to be installed as indicated by the manufacturer at the same location every blast, results could be sent on demand. Note that one station is suggested on each lake, i.e. Whale Tail Lake South Basin and Mammoth Lake. Those locations are to be in a representative area on the shoreline and outside the footprint of channel construction, additionally, they are somewhat equal to the closest possible proximity of a blast to a waterbody as the crow flies in order to be representative. Refer to Appendix A for proposed locations of the existing and new proposed station. Such practices are consistent with the current practices at Meadowbank and Whale Tail and it respects the recommendation 9 regarding the type of equipment to be used that is consistent with industry standards.

The whole blast footprint shall be shot in small sequences as much as practical with limited number of holes quantity per sequence in such a way that after each blast, the recorded values and post-blast visual assessment shall be analyzed and documented by competent personal so adjustments on the next blasting sequences could be brought forward if the guidelines are not respected or exceeded. Lastly, in case of a “no data” event, Agnico will investigate the cause to assess whether the error is human or material and bring corrective measures where applicable.

5. Potential mitigation measures

Agnico already has practices that are aligned with some requirements of section 3 regardless if a blast is in proximity to a waterbody or not, for example: holes are backfilled with angular ¾” net gravel, emulsion is used which is not soluble in water, blasters inspect the blast area after each blast, design parameters are optimized, etc.

Although Agnico is confident that actual practices and design will comply with the requirements of Section 3, a handful of potential mitigation measures were identified that could be applied should the first sequence exceeds the requirements. Those are developed from a combination of literature and past experiences at Meadowbank that have proven to be successful, namely:

- Drill on small diameters hole as low as 3” to limit vibrations;
- The explosive charge in each hole (powder factor) shall be reduced to the minimum judged practical in the design phase of the blast and re-adjusted if required after the first sequence;
- Number of holes blasting per delay and blast geometry shall be reduced to a minimum as much as practical in the tying plan produced by the D&B engineer to limit vibrations to respect the computations shown in Appendix C which represent a worst case (highest charge expected compounded with closest possible proximity to waterbody);
- The blasting area might be broken down to smaller blast patterns and more sequences, to be blasted in a chronological manner, starting away from away bodies and moving closer where possible;
- A worker will perform a 2nd visual inspection of the area around the blast after each blast and remove any shock tubes or detonators that might have been projected outside the perimeter. If visual inspection reveals blasting accessories on the iced surface of the

Mammoth lake, the blaster will advise the Agnico personal so that the material is removed via appropriate procedures;

- Quality control by competent personal could be performed after the first blast sequence to ensure that no overloading occurs in such a way that the maximum charge per hole respects the design that was used as in input for the Instantaneous Pressure Change and Vibrations computations for calculating the setback distances;

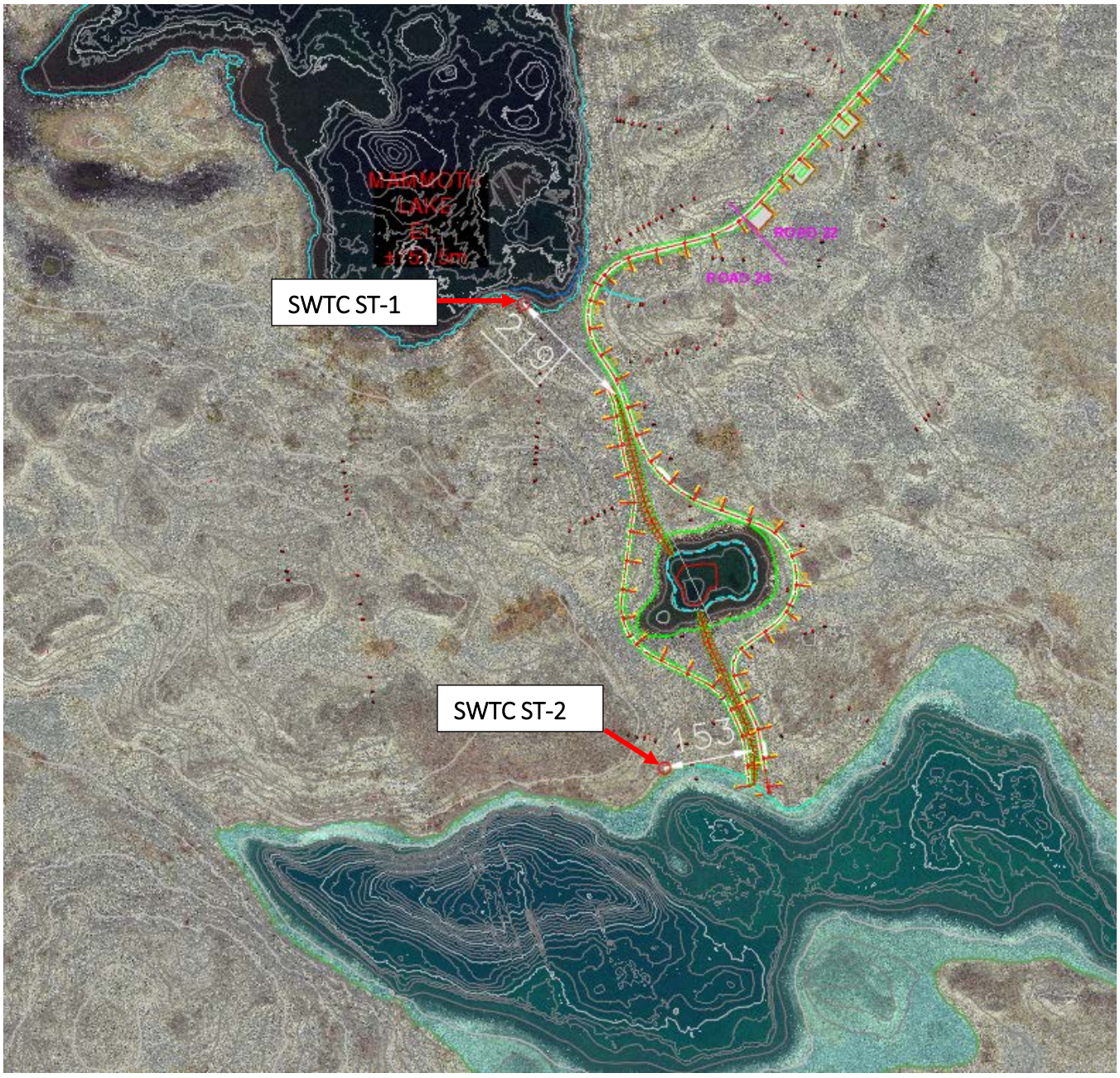
- In the event where projections are judged problematic, blasting mats or geotextile could be applied over the whole blasting sequence with an appropriate amount of aggregates over it in such a way that the energy is kept in the rock mass as opposed to sending projections and deleterious blasting material in the air.

6. Closure

This memo communicates Agnico intent's on Drill and Blast activities and the rationale behind it on a construction and design standpoint. It is shown that the closest possible blasting distance is equal or further that the most stringent setback guideline. Also, it is clear that site specific designs are meeting the computational requirements of the guidelines and recommendations that DFO proposes to comply.

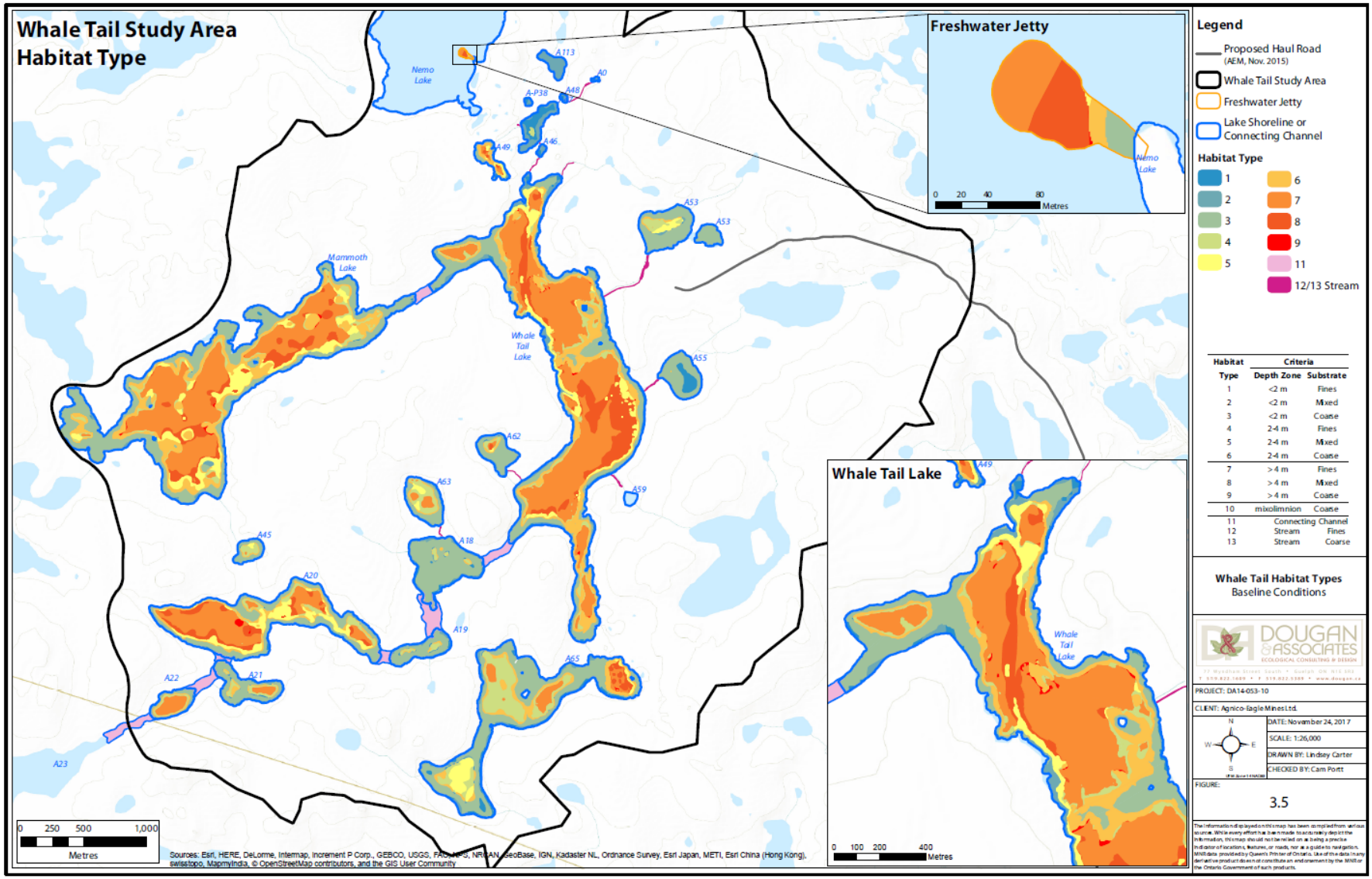
Agnico took knowledge of the guidelines and recommendations to comply and then built a monitoring program accordingly. Lastly, Agnico listed realistic and practical mitigations that could be implemented should the first blast sequence show unfavourable results which is also consistent with DFO's guidelines and Cott & Hanna's set of recommendations.

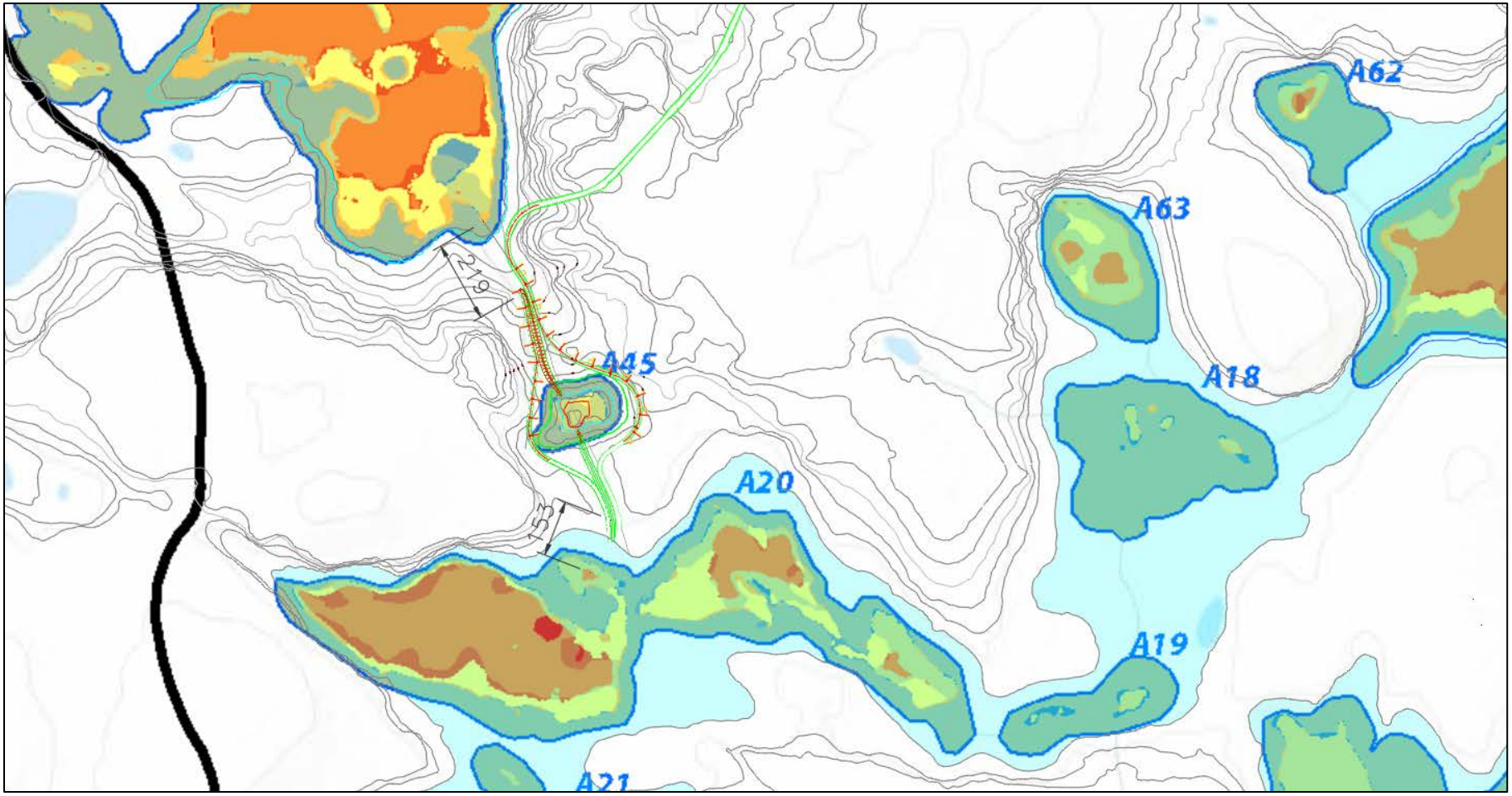
APPENDIX A – Proposed Blast Monitoring Stations


MAMMOTH
LAKE
El.
SWTC ST-1
ROAD 22
ROAD 23
SWTC ST-2
153

Appendix B: Fish Habitat Type

AGNICO EAGLE




A62
A63
A18
A45
A20
A19
A21
219
53

Appendix C: Blasting setback distance calculations on 4.5” hole diameter – 50 Kpa requirement

			Guideline 8	Guideline 9
Hole diameter (in)	4.5	Description	Instantaneous pressure change over 50 Kpa in the swimbladder of a fish	Peak particule velocity greater than 13mm/s in a spawning bedduring the period of egg incubation
Charge Length (m)	3.2			
Explosives Qty (Kg)	80			
		Radius to respect (m)	64.2	147.4

Set back distance required to meet 50Kpa Guideline

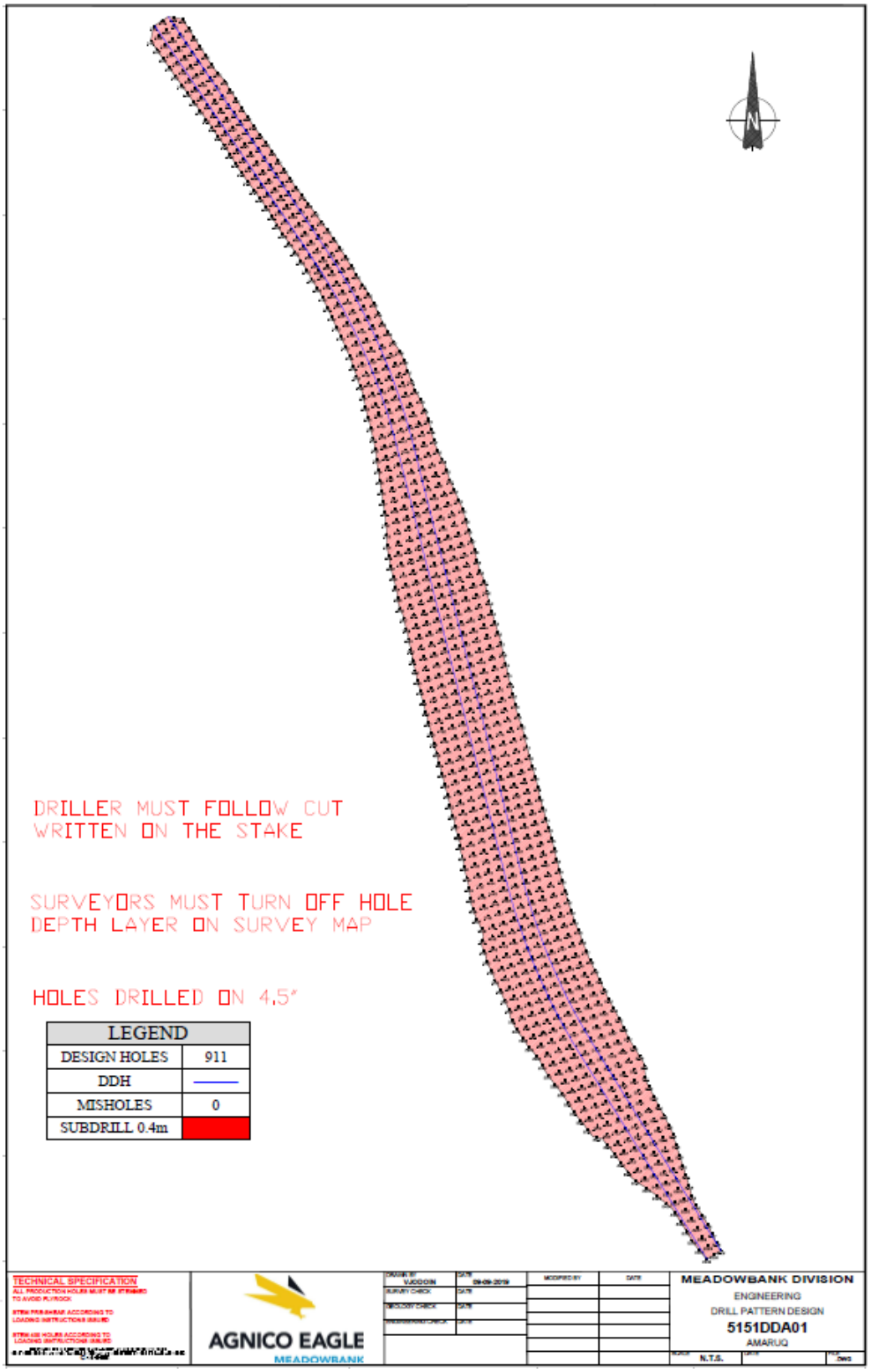
Dw	1	g/cm3	Zw/Zr=	0.249993
Cw	146300	cm/s		
Dr	1.92	g/cm3		
Cr	304800	cm/s		
Pw	50	KPa		
			Pw=	0.399991 *Pr
Hole diameter	4.5	in		
	11.43	cm	Pr=	125.0027 KPa
Emuls. Density	0.00113	Kg/cm3	Pr=	1250027 dynes (g*cm/s2)
Charge per meter	11.59473	Kg/m		
Charge length	3.2	m*	Vr=	4.27202 cm/s
Explosive Qty	80	Kg		
			R=	64.17992 m

** Using target floor elevation 148.8 with SNC's design highest Natural ground between cut B-B & C-C of 153masl and also considering Loading instructions plans collar Length specified by D&B engineers (1m)*

Set back distance required to meet 13mm/s Guideline

Vr	1.13	cm/s	R=	147.3571 m

Appendix D: Drilling Design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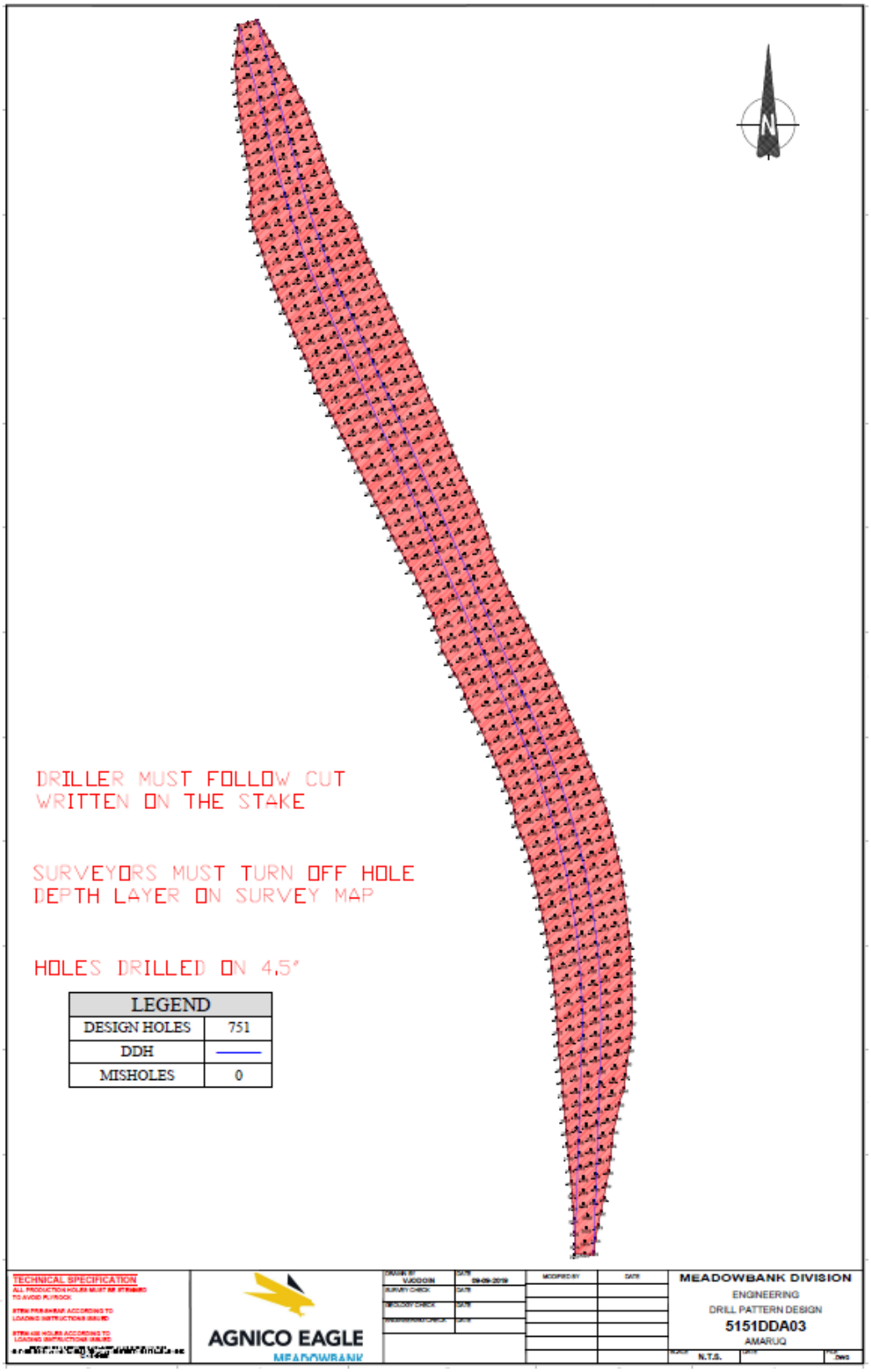
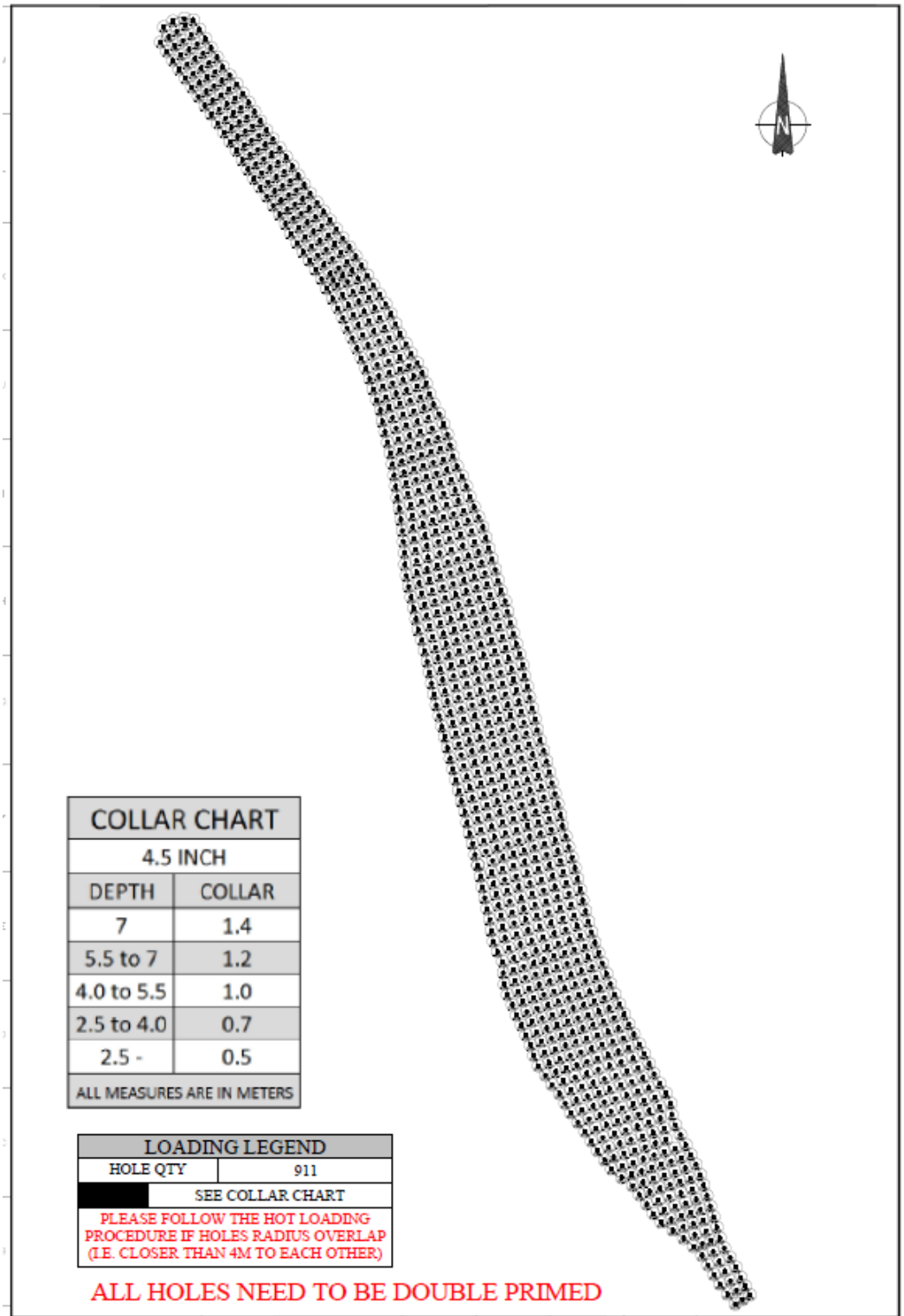
DRILLER MUST FOLLOW CUT
WRITTEN ON THE STAKE
SURVEYORS MUST TURN OFF HOLE
DEPTH LAYER ON SURVEY MAP
HOLES DRILLED ON 4.5'
LEGEND
DESIGN HOLES 911
DDH
MISHOLES 0
SUBDRILL 0.4m
TECHNICAL SPECIFICATION
AGNICO EAGLE
MEADOWBANK
MEADOWBANK DIVISION
ENGINEERING
DRILL PATTERN DESIGN
5151DDA01
AMARUQ
N.T.S.


N
DRILLER MUST FOLLOW CUT
WRITTEN ON THE STAKE
SURVEYORS MUST TURN OFF HOLE
DEPTH LAYER ON SURVEY MAP
HOLES DRILLED ON 4.5'
LEGEND
DESIGN HOLES 751
DDH
MISHOLES 0
TECHNICAL SPECIFICATION
AGNICO EAGLE
MEADOWBANK
MEADOWBANK DIVISION
ENGINEERING
DRILL PATTERN DESIGN
5151DDA03
AMARUQ
N.T.S.

Appendix E: Loading Design



COLLAR CHART	
4.5 INCH	
DEPTH	COLLAR
7	1.4
5.5 to 7	1.2
4.0 to 5.5	1.0
2.5 to 4.0	0.7
2.5 -	0.5
ALL MEASURES ARE IN METERS	

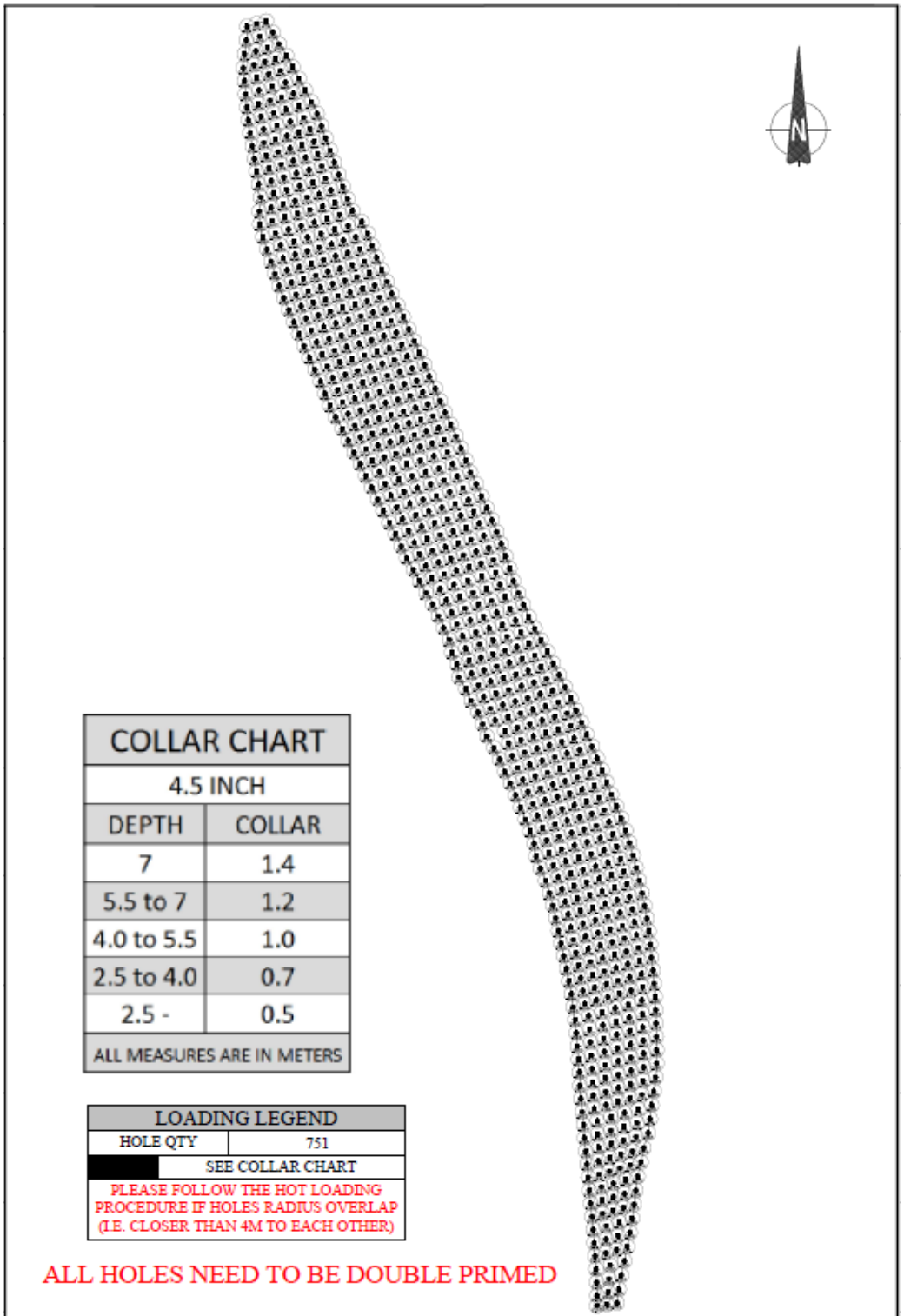
LOADING LEGEND	
HOLE QTY	911
	SEE COLLAR CHART
PLEASE FOLLOW THE HOT LOADING PROCEDURE IF HOLES RADIUS OVERLAP (I.E. CLOSER THAN 4M TO EACH OTHER)	

ALL HOLES NEED TO BE DOUBLE PRIMED

TECHNICAL SPECIFICATION

AGNICO EAGLE
MEADOWBANK

MEADOWBANK DIVISION
ENGINEERING
LOADING PLAN
5151DDA01
AMARUQ
N.T.S.



COLLAR CHART	
4.5 INCH	
DEPTH	COLLAR
7	1.4
5.5 to 7	1.2
4.0 to 5.5	1.0
2.5 to 4.0	0.7
2.5 -	0.5
ALL MEASURES ARE IN METERS	

LOADING LEGEND	
HOLE QTY	751
	SEE COLLAR CHART
PLEASE FOLLOW THE HOT LOADING PROCEDURE IF HOLES RADIUS OVERLAP (I.E. CLOSER THAN 4M TO EACH OTHER)	

ALL HOLES NEED TO BE DOUBLE PRIMED

TECHNICAL SPECIFICATION
ALL PRODUCTION HOLES MUST BE STEMMED TO AVOID FLYROCK
STEM PRIMABAR ACCORDING TO LOADING INSTRUCTIONS (INLINE)
STEM ASE HOLES ACCORDING TO LOADING INSTRUCTIONS (INLINE)

AGNICO EAGLE
MEADOWBANK

DRAWN BY	DATE
V.JODOIN	09-09-2019
SURVEY CHECK	DATE
GEOLOGY CHECK	DATE
ENGINEERING CHECK	DATE

MODIFIED BY	DATE

MEADOWBANK DIVISION
ENGINEERING
LOADING PLAN
5151DDA03
AMARUQ
SCALE N.T.S. DATE REV Dwg