Appendix J.6

Assessment of Alternatives for Storage of Mine Waste
Fifteen Mile Stream Gold Project,
Wood Environment & Infrastructure Americas.

Assessment of Alternatives for Storage of Mine Waste

Fifteen Mile Stream Gold Project
Trafalgar, Nova Scotia
ONS2001

Prepared for:

Atlantic Mining NS Inc.

409 Billybell Way, Mooseland Middle Musquodoboit, Nova Scotia B0N 1X0

October 2020

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October 23, 2020

Mr. James Millard
Manager, Environment and Community
Atlantic Mining NS Inc.
409 Billybell Way
Mooseland Middle Musquodoboit
Nova Scotia, B0N 1X0

Dear Mr. Millard

Wood Environment & Infrastructure Americas is pleased to submit the attached Assessment of Alternatives for the Storage of Mine Waste for the Fifteen Mile Stream Gold Project issued to support the Environmental Impact Statement.

This report outlines the alternatives considered for the storage of mine waste (mine rock) for the Fifteen Mile Stream Gold Project, using the multiple accounts assessment methodology required by Environment and Climate Change Canada, in accordance with the *Guidelines for the Assessment of Alternatives for Mine Waste Disposal*. Several storage locations / configurations were considered from the outset prior to arriving at the conclusions herein.

We greatly appreciate the opportunity to provide support for your Fifteen Mile Stream Gold Project. Should you have any questions regarding the study, please do not hesitate to contact us.

Sincerely,

Wood Environment & Infrastructure Americas
a Division of Wood Canada Limited

Prepared by:	Reviewed by:
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Senior Environmental Scientist	Associate Geoscientist

Assessment of Alternatives for Storage of Mine Waste

Fifteen Mile Stream Gold Project
Project Location
ONS2001

Prepared for:

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October 2020

Executive Summary

The Fifteen Mile Stream (FMS) Gold Project is a proposed open pit mine to be operated by Atlantic Mining NS Inc. (Atlantic). The FMS Gold Project is located at the eastern boundary of Halifax County, central Nova Scotia, approximately 95 kilometres (km) northeast of Halifax.

The FMS Gold Project involves a conventional truck-shovel open pit mine and a 5,500 tonnes per day (tpd) processing plant. Ore will be processed on site at a nominal production rate of approximately 5,500 tpd to produce gold concentrate for shipment offsite. The mining and processing of ore will produce approximately 13.4 million tonnes (Mt) of tailings and 24.4 Mt of waste rock over a mine life of approximately seven years. Tailings will be managed in a Tailings Management Facility (TMF), impounded by embankments constructed using a combination of run-of-mine non-potentially acid generating (NPAG) waste rock from open pit mining methods, and low-permeability glacial till material, sourced from local borrow sources.

At Atlantic's request, Wood Environment & Infrastructure Americas (Wood) has prepared this document to satisfy the requirements of Environment and Climate Change Canada for an assessment of alternatives for mine waste disposal, pursuant to a regulatory amendment of Schedule 2 of the *Metal and Diamond Mining Effluent Regulations* (MDMER). This report is being submitted as part of the revised environmental impact statement in response to the Impact Assessment of Canada's information requests.

This document outlines the potential tailings technology, tailings storage locations, selection criteria and methodology used to identify preferred alternatives for the management of tailings. A multiple accounts analysis (MAA) following the methodology outlined in the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Guidelines, Environment Canada 2011; as modified 2013) has been used to examine and compare different components and effects from mine waste storage, and to provide a decision-making tool which is transparent and defensible. Sensitivity analyses are provided to test the robustness of the MAA. The sensitivity analyses allow for different weightings of key MAA components and to evaluate differing values on potential environmental, technical, economic and social impacts.

Seven storage location candidates for the TMF and seven storage methods candidates for tailings deposition were considered. The pre-screening assessment identified six TMF alternatives (consisting of a combination of four locations and two tailings technologies) which were advanced for further consideration in the multiple accounts analysis. An additional alternative was included as an adjustment to one of the identified locations (Location #4) to avoid overprinting fish frequented waters. The analysis concluded that the preferred TMF alternative was Alternative B, which considers conventional slurry tailings disposal, in a TMF located to the east of the open pit (Location #4). This alternative will overprint a small headwater tributary to East Lake, which may require listing to Schedule 2 of the MDMER.

Sensitivity analyses were conducted to test the robustness of the assessment and the following scenarios were considered through the sensitivity analysis:

- Base case (prioritize environment, minimize project economics);
- All accounts weighted equally (reduce weighting bias);

- All accounts, sub-accounts and indicators weighted equally (remove weighting bias);
- Prioritize people, environment strongly considered (Socio-economics account weighted six, environmental account weighted four, technical account weighted two, project economics weighted one); and,
- Prioritize water (weight of all criteria related to water received a maximum weight).

The sensitivity analyses concluded that the results of the assessment would not be influenced by any of the scenarios listed above, with Alternative B remaining the preferred alternative in all scenarios.

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Glossary and Abbreviations

ARD	Acid Rock Drainage
Atlantic	Atlantic Mining NS Inc.
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
ESA	*Endangered Species Act*
FMS	Fifteen Mile Stream
FMS Study Area	For the purpose of the environmental assessment, this is the infrastructure footprint plus an associated buffer.
GHG	Greenhouse Gas
Guidelines	Guidelines for the Assessment of Alternatives for Mine Waste Disposal
IAA	*Impact Assessment Act*
IAAC	Impact Assessment Agency of Canada
MAA	Multiple Accounts Analysis
MDMER	*Metal and Diamond Mining Effluent Regulations*
ML	Metal Leaching
N/A	Not Applicable
NP	Neutralization Potential
NPV	Net Present Value
SAR	Species at Risk
SARA	*Species at Risk Act*
the Project	Fifteen Mile Stream Gold Project
TMF	Tailings Management Facility
Wood	Wood Environment & Infrastructure Americas

Units

H:V	ratio of horizontal units to vertical units
ha	hectares
km	kilometres
km^2	square kilometres
m	metres
m/s	metres per second
masl	metres above sea level
Mm	millimetres
Mm^3	million cubic metres
Mt	million tonnes
°C	degrees Celsius
t	tonnes
tpd	tonnes per day

1.0 INTRODUCTION

1.1 Background

The Fifteen Mile Stream (FMS) Gold Project is a proposed open pit mine to be operated by Atlantic Mining NS Inc. (Atlantic). The FMS Gold Project is located at the eastern boundary of Halifax County, central Nova Scotia, approximately 95 kilometres (km) northeast of Halifax. The property covers the historic Fifteen Mile Stream Gold District and is centered at UTM Zone 20, 4999404 N, 538584 E (NAD 83 CSRS; Figure 1).

The FMS Gold Project involves a conventional truck-shovel open pit mine and a 5,500 tonnes per day (tpd) processing plant. Ore will be processed on site at a nominal production rate of approximately 5,500 tpd to produce gold concentrate for shipment offsite. The mining and processing of ore will produce approximately 13.4 million tonnes (Mt) of tailings and 24.4 Mt of waste rock over a mine life of approximately seven years. Tailings will be managed in a Tailings Management Facility (TMF), impounded by embankments constructed using a combination of run-of-mine non-potentially acid generating (NPAG) waste rock from open pit mining methods, and low-permeability glacial till material, sourced from local borrow sources (Figure 2).

Atlantic presented its preferred option (TMF Option #4, also referred to as Alternative B in this report) to Fisheries and Oceans Canada (DFO) and Environment and Climate Change Canada (ECCC), which have determined that a regulatory amendment to Schedule 2 of the *Metal and Diamond Mining Effluent Regulations* (MDMER) will be required because waters frequented by fish will be overprinted at this location (Figure 3) [1].

An Environmental Impact Statement (EIS) for the Project was submitted to the Impact Assessment Agency of Canada (IAAC) in October 2019. IAAC determined that the EIS did not meet conformity requirements in November 2019. Based on the outstanding conformity requirements, and direction from the IAAC, additional information has been incorporated into the EIS, which is to be submitted in 2020.

At Atlantic's request, Wood Environment & Infrastructure Americas (Wood) has prepared this document to satisfy the ECCC requirement for an assessment of alternatives for mine waste disposal, pursuant to a regulatory amendment of Schedule 2 of the MDMER. This report is being submitted, as part of the EIS, to support the assessment of alternatives for the Project.

This document outlines the potential tailings technologies, storage locations, selection criteria and methodology used to identify preferred alternatives for mine waste storage (tailings). A multiple accounts analysis (MAA) following the methodology outlined in the Guidelines for the Assessment of Alternatives for Mine Waste Disposal (Guidelines, Environment Canada 2011; as modified 2013) has been used to examine and compare different components and effects from mine waste storage, and to provide a decision-making

[1] The determination of fish habitat for the purposes of the environmental assessment (as shown in Figure 3) was based on site-specific information delineated for the effects assessment. However, for the purposes of the Alternatives Assessment, it should be noted that the calculation of overprinted fish habitat (waterbody and watercourse) was based on provincially available data for all locations in order to allow comparison amongst the alternatives.

tool which is transparent and defensible. Sensitivity analyses were completed to remove bias and subjectivity from the assessment, and to test the robustness of the MAA. The sensitivity analyses allow for different weightings of key MAA components and to evaluate differing values on potential environmental, technical, economic and social impacts.

1.2 Tailings Production and Storage Requirements

Ore will be processed at a nominal production rate of approximately 5,500 tpd in an on-site processing plant. Processing at the FMS Mine Site will create two concentrate streams; a gravity concentrate and a float concentrate, resulting in approximately 13.4 Mt of tailings produced over the mine life. There will be 24.4 Mt of waste rock produced over a mine life of approximately seven years.

The gold concentrate produced at the FMS Gold Project will be transported to the Touquoy Mine site for further processing into gold doré bars using the existing carbon-in-leach (CIL) processing facility. Tailings generated from this processing at the Touquoy Mine site will be deposited into the exhausted Touquoy pit. All other aspects of the Touquoy Gold Project will remain as assessed and approved through the Nova Scotia environmental assessmenet process in 2008 and as approved and regulated under the Touquoy Industrial Approval under the Nova Scotia *Environment Act*.

Tailings deposition and storage for the FMS Gold Project is a key component for the operations and long-term closure strategy for the Project. The proposed TMF is located to the east of, and up-gradient from, the open pit. Positioning the TMF in this manner allows the mine facilities to be situated upstream of the open pit, simplifying surface water and groundwater management requirements for the FMS Project. The tailings slurry will be conveyed to the TMF by pipeline and deposited on a subaerial tailings beach from discharge points located along the embankment crest. A portion of a fish-frequented waterbody (WC39) will be overprinted by the TMF.

1.3 Assessment of Alternatives Overview

Under the MDMER, tailings are considered mine waste and cannot be deposited in natural fish-bearing waterbodies. However, the MDMER also includes a provision to designate natural waterbodies as tailings impoundment areas for the management of mine waste, as described below.

Per the *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (Guidelines; Environment Canada 2011, as modified 2013):

> *The MDMER stipulates that for mine waste to be deposited in a natural, fish-bearing waterbody, the waterbody must be listed in Schedule 2 of the Regulations, designating it as a tailings impoundment area (TIA). In the context of these guidelines, a TIA is a natural waterbody frequented by fish into which tailings, waste rock, low- grade ore, overburden and any effluent that contains any concentration of the deleterious substances specified in the MDMER, and of any pH, are disposed.*

Further, the Guidelines (Environment Canada 2016) states:

> [It is] strongly recommended that this assessment be undertaken during the EA to streamline the overall regulatory review process and minimize the time required to proceed with the MDMER amendment process.

For this reason, Atlantic is providing the Assessment of Alternatives for Mine Waste Disposal report with the revised EIS in parallel with the Federal environmental assessment (EA) process, pursuant to the *Canadian Environmental Assessment Act, 2012*.

The purpose of this assessment of alternatives is to objectively and rigorously assess feasible options for mine waste disposal at the Fifteen Mile Stream Gold Project in accordance with the Guidelines. The assessment of alternatives is broken into the following seven steps in the Guidelines:

Step 1. Identify candidate alternatives. Involves determining which methods and sites could be used for the storage of tailings.

Step 2. Pre-screening assessment to screen out any alternatives which have a fatal flaw, ensuring at least one alternative does not overprint natural waters frequented by fish.

Step 3. Alternative characterization. Characterize the alternatives from environmental, technical, project economics and socio-economic perspectives.

Step 4. Multiple-accounts ledger. The beginning of the MAA and includes setting up a ledger of evaluation criteria and measurement criteria (sub-accounts and indicators respectively).

Step 5. Value-based decision process. Each sub-account and indicator is assigned a value and weighted in importance (valuating, weighting and quantitative analysis).

Step 6. Sensitivity analysis. An analysis that adjusts weightings utilized in the value-based decision process to manage bias and subjectivity, recognizing that not all stakeholders will place the same importance on each effect.

Step 7. Document results. To improve readability of this document, the assessment of alternatives has been structured into six sections that reflect the above steps (Sections 5.0 to 10.0). Results for each step are documented in the corresponding section.

1.4 Additional Environmental Assessment and Regulatory Requirements

The Federal Regulation *Designating Physical Activities*, under the *Canadian Environmental Assessment Act*, 2012 (CEAA 2012), identifies the physical activities that constitute designated projects that could require completion of a Federal environmental assessment (EA). It was determined that the following section may have some relevance to the Project:

16 (c) The construction, operation, decommissioning, and abandonment of a new rare earth element mine or gold mine, other than a placer mine, with an ore production capacity of 600 t/day or more;

On May 22, 2018, Atlantic submitted a Project Description to IAAC for the FMS Gold Project. On July 16, 2018, IAAC decided that a Federal environmental assessment is required for the FMS Gold Project pursuant to the CEAA 2012 and commenced the EA on July 17, 2018.

The Provincial *Environmental Assessment Regulations* made under Section 49 of the *Environment Act* regulates the Government of Nova Scotia's EA process. Projects that trigger the EA process are sub-divided into two classes – Class I and Class II. The Project triggers a Class I EA in accordance with Schedule A, Section B (1a) of these regulations, as it is a project which involves:

> *A facility that extracts or processes metallic or non-metallic minerals.*

Many of the provincial permits anticipated to be required for the Project are regulated in accordance with the *Activities Designation Regulations* made under Section 66 of the *Environment Act*. An Industrial Approval (IA) will be required in accordance with Section 16(2d) of these regulations, as it is a project that involves:

> *A surface mine where an opening or excavation is made in the ground from the surface which may require the use of explosives for the purpose of procuring any mineral bearing ore, including coal, and any associated infrastructure.*

The IA process, known as Part V of the *Environment Act*, seeks to guide the Proponent in determining the way in which a project, after EA Approval, is to be monitored for compliance targets, objectives set through the EA process, and commitments made by proponents through various means such as public and Indigenous Peoples consultation.

Other activities required to facilitate the Project, including wetland and watercourse alteration and groundwater and surface water withdrawals, may require approvals in accordance with these regulations as well. These permitting requirements will be initiated once EA approval has been received from the province.

2.0 ENVIRONMENTAL CONDITIONS

The following sections provide a summary of the existing conditions for the FMS Gold Project. For further details, please refer to the Fifteen Mile Stream Gold Project Environmental Impact Statement (Atlantic Gold 2020).

2.1 Regional and Local Setting

The FMS Gold Project is located in a remote area of central Nova Scotia. The area is somewhat removed from the immediate climatic influence of the Atlantic Ocean and is characterized by warmer summers and cooler winters. The Project is located in the eastern ecoregion of Nova Scotia, which has a variety of landforms. The bedrock is highly visible in those areas where the glacial till is very thin. Where the till is thicker, the ridged topography is masked, and thick softwood forests occur (Neily et. al, 2003). The Project Area (PA) is comprised of disturbed areas from clear cutting and historical mining activities. On the shallow soils, repeated fires have reduced forest cover to scrub hardwoods with scattered conifers underlain by a dense layer of vegetation. On the deeper, well drained soils, stands of red spruce will be found whereas on the crests and upper slopes, stands of tolerant hardwood occur. Several mapped wetlands occur within the Project Area, along with a peatland ecosystem (Figure 4). Eighty-nine bird species have been identified within the Project Area, including 22 species classified as priority bird species. Thirteen mammal species were observed during field surveys. *Species at Risk Act* (SARA) listed species include Canada warbler (SARA, Threatened), Common Nighthawk (SARA, Threatened), Olive-sided Flycatcher (SARA, Threatened), Evening Grosbeak (SARA, Special Concern), Eastern Wood-Pewee (SARA, Special Concern) and Rusty Blackbird (SARA, Special Concern) and Blue Felt Lichen (SARA, Special Concern).

The Project is located in the East River Sheet Harbour Secondary Watershed, a moderately-sized watershed. Project infrastructure is located within the Seloam Brook tertiary watershed. The aquatic ecosystem within the FMS Study Area is characterized by acidic conditions, typical for the East River Sheet Harbour Watershed. Aquatic productivity has been evaluated as low-moderate, which is also typical for the watershed and the region in which the watershed lies. Habitat complexity is generally low and provides low quality habitat for Brook Trout and White Sucker. Overall, fish habitat quality within the FMS Study Area has been evaluated as predominantly low.

The nearest regional center is Sheet Harbour, located 33 km to the south, which provide basic supply needs to surrounding farm, fishing and forestry communities, Halifax is located 100 km to the west of Sheet Harbour. The proposed mine is located approximately 10 km north of the nearest residence (Figure 5) along Highway 374 and 24 km from the nearest federal Mi'kmaq community (Beaver Lake IR and Sheet Harbour IR). This area has very few permanent and seasonal cottages. The FMS Gold Project is situated within the Liscomb game sanctuary, and the closest wilderness areas is Toadfish Lakes, approximately 1.8 km south. The closest nature reserve is Abraham Lake which is 7 km west.

2.2 Physical Environment

2.2.1 Climate, Air Quality and Noise

The climate at the FMS Gold Project is characterized by a relatively moderate temperature regime that fluctuates between a typical low of approximately -6 °C in January and a high of 19 °C in July and August. Precipitation is greatest in the fall and winter months, and the proportion of snowfall in the winter months is less than 50%, further indicating the moderate climate conditions at the FMS Study Area. Potential evapotranspiration is about 40% of the total precipitation received on an average annual basis.

The Project is located in a relatively undeveloped rural region of Nova Scotia with very few industrial operations (occasional forestry operations) that would affect air quality. Ambient air concentration levels collected in 2004 in Seal Harbour (Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2) and Particulate Matter (PM) less than 2.5 microns ($PM_{2.5}$)), in 2016 at the National Air Pollution Surveillance station in Aylesford ($PM_{2.5}$), and ambient air concentration levels collected onsite (arsenic, mercury, total suspended particles and PM_{10}) were all found to be below the established Provincial regulations and objectives.

Background noise level (L_{90}), defined as the noise level which is exceeded 90% of the time was monitored and determined to be 25.9 dBA for the FMS Study Area. There is no evidence of seismic activity or volcanism naturally occurring in the area, and as a result, there were no ground vibrations recorded during the monitoring period.

2.2.2 Topography and Geology

The Project is located within the Eastern Ecoregion of the Acadian Ecozone, which is underlain primarily by quartzite and slate of the Meguma Supergroup. A variety of landforms are found in this ecoregion, including forest-covered rolling glacial till plains, drumlin fields, extensive exposed bedrock, and wetlands. Within this ecoregion, the Project is located within the Eastern Interior Ecodistrict, which is characterized by exposed or thinly covered bedrock with alternating ridge-and-valley topography. Where glacial till cover is thicker, the ridged topography is muted and covered by thick softwood forests. Glacial till thickness ranges from 1 to 10 m but averages less than 3 m within the ecodistrict, with the predominant soils being sandy loams, often quite stony and well drained, on glacial till (Neily et al. 2003).

The FMS Study Area site is bisected by Seloam Brook, which flows west from Seloam Lake to Fifteen Mile Stream. In turn, Fifteen Mile Stream flows southward into Anti-Dam Flowage which is the lowest elevation (approximately water level of 100 masl) in the Study Area. North of Seloam Brook, the topography is relatively flat and hosts numerous wetlands and intermittent watercourses, with elevations in the range of 110 to 120 masl. South of Seloam Brook, the topography is rolling, with fewer wetlands, and elevations that rise to 175 masl. Vegetation is dominated by stands of Balsam Fir, Spruce, Tamarack and Hemlock with isolated occurrences of hardwood.

The FMS Mine Site has been mined on several occasions beginning in 1868, and current soil and sediment quality throughout the Study Area is affected by the presence of historic waste rock and tailings. Mine tailings appear to be concentrated adjacent to Seloam Brook and range in thickness from 1.5 to 2.0 m.

Unprocessed waste rock is much more widespread within the FMS Study Area than tailings and found to have elevated concentrations of common heavy metals such as arsenic, iron and lead. Waste Rock Storage Areas (WRSA) were found present in the southwestern portion of the proposed open pit, along several trenches located to the south and east of the open pit and along the access road west of the proposed open pit. Historic tailings and waste rock were sampled within the FMS Study Area and the results of the analysis were compared to Tier 1 Environmental Quality Standards (EQS). This indicated that most metals were either not detected or were below Tier 1 EQS, but arsenic, lead and mercury were found to exceed Tier 1 EQS. Elevated arsenic concentrations are expected to be present across the FMS Study Area.

The FMS deposit is hosted in folded and faulted strata of the Moose River Formation within the axis and limbs of a north-dipping, overturned regional anticline. In this area, the anticline is commonly referred to as the Fifteen Mile Stream anticline; however, it may be equivalent to the Moose River–Beaver Dam anticline that hosts the Touquoy and Beaver Dam gold deposits to the southwest.

Within the FMS Study Area, the Moose River Formation is subdivided into several distinct units, which from youngest to oldest are:

1) Hanging Wall Turbidites: interbedded meta-sandstone and lesser meta-mudstone, locally hosting bedding-parallel quartz veins;
2) Orient Mudstone: green-grey, typically planar-bedded, silty meta-mudstone and siltstone, locally hosting pyrrhotite, arsenopyrite, and quartz veins;
3) McLean Sandstone: meta-sandstone with minor interbedded meta-mudstone; the latter commonly hosting quartz veins;
4) Seigel Mudstone: light to dark grey planar-bedded, silty meta-mudstone that commonly hosts quartz veins and high concentrations of pyrrhotite and, locally, arsenopyrite; and,
5) Footwall Turbidites: meta-sandstone beds with minor mudstone intervals that locally host bedding-parallel quartz veins.

The Orient and Seigel mudstones are the principal mineralized units, with lesser mineralization hosted by the McLean Sandstone and localized mineralization in folded Hanging Wall and Footwall Turbidites.

The rocks at the FMS Study Area have undergone regional chlorite–biotite greenschist facies metamorphism. Localized, hornfelsic, biotite porphyroblasts in meta-mudstone suggest that the rocks have also undergone localized contact metamorphism.

2.2.3 Geochemistry

Mine ore, waste rock and tailings were analyzed to determine the metal leaching / acid rock drainage properties (Atlantic Gold, 2018). The assessment included mineralogical analyses, acid-base accounting (ABA) tests, leach tests, Particle size distribution analyses, and humidity cell testing. Metallurgical tests undertaken provided representative tailings material for environmental static and kinetic testing. A summary of the key results includes:

- The FMS mine rock is composed primarily of quartz, feldspars, muscovite, biotite and chlorite. Pyrrhotite is the main sulphide mineral (up to 2.4 wt.%); however, significant pyrite is also present. Calcite is the main carbonate mineral present; humidity cell HC_4 contained significant calcite (9.8 wt.%) while the field bin subsample calcite content is 2.7%.
- Arsenic (As) is present as arsenic sulphide (arsenopyrite).
- The total sulphur (S) contents of the mine rock samples vary from 0.020% to 1.1%, including the ore samples. The median total S content of the ore samples is slightly higher relative to the median total S for the four main rock types (0.44 wt.% and 0.28 wt.% average, respectively). The majority of the total S is present as sulphide.
- The sulphide S contents, excluding the ore samples, range from 0.020% in a greywacke sample up to a maximum of 0.88% in an argillite sample, with median values falling between 0.18% (greywacke samples) and 0.35% (argillite samples). In the ore samples, the sulphide S contents range from 0.12% to 1.0% (median: 0.42%).
- The greywacke (GW) samples have the highest median modified Neutralization Potential (NP) value at 31 kg $CaCO_3$/t, while the argillite (AR) samples have the lowest median modified NP value (12 kg $CaCO_3$/t). The ore samples have a median modified NP of 16 kg $CaCO_3$/t, while the field bin subsample has a modified NP of 27 kg $CaCO_3$/t.
- Samples from the GW unit are generally non-potentially acid generating but samples from the other three lithologies and from the ore samples include Potentially Acid Generating (PAG) rock. There is a clear relationship of PAG% with the relative amount of argillite contained within the rock type: the argillite unit (<5% greywacke interbeds) shows the highest PAG proportion of 88%, while none of the greywacke samples are classified as PAG.
- Elements of potential concern based on the solid phase elemental analysis include Ag, As, Cu, Pb, Sb, and Zn. These elements, excluding Cu and Zn, are enriched by a factor greater than 10x above the average upper continental crust abundance (AUCCA) in one or more samples. Arsenic is elevated above 10x the AUCCA in all lithologies.
- The shake flask extraction (SFE) results indicate that As and Al are potential parameters of concern in runoff from the mine rock. Other parameters highlighted in the solid phase analyses were not above the federal water quality guidelines in the SFE leachate.
- Modelling results suggest that the NP will be depleted from the FMS mine rock between approximately 6 and 15 years. A conservative estimate for time to NP depletion for the static test samples indicates that approximately 50% of the PAG samples will become acidic within 10 years. This estimate does not consider the slower sulphide oxidation rates in colder temperatures, which would be expected to delay the onset of acid generation.

- The four tailings samples have variable but relatively low total S (0.085% to 0.25%), present dominantly as pyrrhotite. Using total S as a proxy to calculate acid potential, only one tailings sample is classified as potentially acid generating.
- Arsenic is the main parameter of concern in the tailings due to elevated concentrations in both the solid phase elemental analysis and in the SFE leachate. Arsenic concentrations increased over 18-week saturated column leachate test. The maximum As concentrations reached (0.35 mg/L) are 7 times the Canadian Council for Ministers of the Environment guideline.

2.2.4 Hydrogeology

Due to the relatively shallow depth to bedrock, and the low hydraulic conductivity of the bedrock unit, groundwater flow within the FMS Study Area is conceptualized as occurring mainly within the till, and upper (contact) portion of the bedrock. Site specific groundwater levels indicate that the water table is generally within the till or the upper few meters of the bedrock, supporting this conceptualization. Given the prevalence of wetlands and surface drainage features throughout the area, and the excess of the annual rainfall relative to evaporation, groundwater is likely to follow short localized flow paths, discharging to surface water features within proximity to areas of groundwater recharge. The degree of hydraulic connection amongst the smaller bedrock fracture systems is likely poor to moderate. There appears to be no large regional fault systems in the vicinity of the Project, and the smaller Seigel and Serpent faults do not appear to be capable of transmitting or storing large amounts of water (Atlantic Gold, 2020).

2.2.5 Hydrology

The FMS Gold Project is located in the East River Sheet Harbour Watershed is a moderately sized watershed, measuring at 57,666 hectares. The East River Sheet Harbour watershed is drained from north to south, connecting with the confluence with Fifteen Mile Stream and Twelve Mile Stream at Marshall Flowage, where it then drains south to the Atlantic Ocean at Sheet Harbour. Elevations within the watershed range from 210 masl in the headwater areas and gradually decreases to sea level (0 masl) at the final outlet at Sheet Harbour. The headwaters of the watershed are located along the topographic divide separating it from the St. Mary's Watershed to the northeast and the Liscomb River Watershed to the northwest. In the vicinity of the site, the Fifteen Mile Stream is the main mapped watercourse along with Seloam Lake and Anti-Dam Flowage as the major mapped waterbodies. The Seloam Brook tertiary watershed drains through the Project from northeast to west initiating in the tributaries of Seloam Lake that drains to Seloam Brook and into Fifteen Mile Stream and on to Anti-Dam Flowage. East Lake is located in the southeast corner of the FMS Study Area (Atlantic Gold, 2020).

The complex system of streams, lakes, bogs and wetlands is a direct result of the underlying bedrock geology, which creates relatively impermeable and poorly jointed rocks. This results in slow groundwater recharge and most of the excess surface water is retained on the surface, often called a 'deranged' drainage pattern. The regional hydrological station (St. Mary's River at Stillwater) indicate that the lowest flows occur during the summer months, which coincide with less precipitation and higher potential evapotranspiration. The consistency of flows through the winter months is supported by the presence of rainfall throughout the winter that moves water through the watersheds rather than storing precipitation in snowpack. The average annual runoff estimated at this station is 1,002 mm, or about 70% of the total annual precipitation. The discharge peaks are attenuated to a large extent by the numerous hydroelectric dams and associated reservoirs owned and operated by Nova Scotia Power (NSPI) through which runoff is routed (Seloam Lake, Anti Dam Flowage, Marshall Falls, Malay Falls, Ruth Falls and the Barrier Dam).

2.2.6 Surface Water Quality

The surface water quality observed in the FMS Study Area is typical of lakes and watercourses that are present within the geological terrain of the southern mainland of Nova Scotia. The geology within this region is dominated by Cambrian-aged bedrock and the hydrology is strongly controlled by bedrock outcrops that create irregular flow patterns. Baseline water quality is naturally influenced by the water-rock interactions and the weathering processes associated with the bedrock and overburden, as surface water moves through the watershed (Atlantic Gold, 2020).

The baseline surface water quality at the stations monitored in the FMS Study Area can be generally characterized as having acidic to near-neutral pH, low alkalinity and hardness, and low concentrations of nutrients. Concentrations of most parameters were observed to be consistently below federal and provincial water quality standards, with the exception of aluminum, arsenic, iron, zinc, copper and mercury. Background environmental baseline concentrations of some parameters exceeding surface water quality criteria is not uncommon, including within areas that are relatively pristine and not disturbed. Exceedances of naturally occurring concentrations of aluminum and iron may be attributed to an association with common mineral phases in bedrock and overburden, whereas exceedances of arsenic may be attributed to naturally occurring processes associated with surface water/groundwater interactions with weathered bedrock containing arsenic-bearing sulphides (e.g., arsenopyrite).

2.3 Biological Environment

2.3.1 Vegetation

The FMS Study Area is located in the Eastern Ecoregion of the Acadian Ecozone and the Eastern Interior Ecodistrict. The overall landscape within the FMS Study Area comprised of historic mining, historical and current timber harvesting activities consisting of regenerative vegetation as well as undisturbed mature canopies. There are eight ecosite types identified within the FMS Study Area which are generally within the dry to fresh moisture regime, and poor to rich nutrient regimes. These ecosites generally support vegetation types from the spruce-pine (SP) and the mixedwood (MW) forest groups. Generally, SP forest groups are associated with a natural disturbance regime of fire, which leads to stands dominated by spruce understorey vegetation tolerant of acidic, nutrient poor conditions. MW forest groups are early to late successional mixedwood vegetation. This group can be quite variable and difficult to categorize. Vegetation is found on a range of slope positions and most sites are non-rocky. Soils are mainly derived from glacial till deposits. Within the FMS Study Area, the dominant ecosite is AC6 which is characterized by well drained soils and poor nutrient regime which supports conifer species which have a tolerance towards acidic soils (Atlantic Gold, 2020).

Within the FMS Study Area, the diversity of species is moderate to high, especially considering the low fertility of soils within the FMS Study Area. This is attributed to the range of habitat types encountered, from natural aquatic systems, a variety of wetland types, and both intact and disturbed upland habitats. A total of 277 species of vascular plants were identified within the FMS Study Area, in which the majority is native, although within disturbed areas exotic species were more prevalent. Of the 16 Vegetation Types (VT), the single most dominant type is Balsam Fir – Red Maple. Given the dominance of nutrient poor acidic soils, other predominant types include conifer species as the dominant canopy layer, with ericaceous shrubs as the herbaceous layer.

The infertile soil, low summer temperature and moderate precipitation (122-137 cm/annum) result in wetlands that accumulate peat from sphagnum growth and forests that have a well-developed bryophyte layer which leads to low nutrient availability and an accumulation of organic matter. Many of the resulting wetlands are fens and bogs with stunted tree flora of Black Spruce, Tamarack and Red Maple and a shrub layer consisting of ericaceous shrubs reflecting the low nutrient status and acidity of the soil. The upland forest is also typically boreal with the hallmark Black Spruce and fir trees in a mat of Schreber's moss, Feather moss and *Bazzania trilobata*. Despite the general low productivity of the forest and its largely boreal tree signature (e.g. Black Spruce, Balsam Fir and Tamarack), White Pine and Red Spruce do occur in the more drained and richer (drumlin) sites and large individuals of these and of Black Spruce are scattered over the site.

2.3.2 Wetlands

The FMS Gold Project lies on a watershed divide, where wetlands to the north drain into Seloam Brook, while wetlands present in the southeast portion flow east into East Lake. To the northern extent, the hydrological flow generally follows Seloam Brook from Seloam Lake in the northeast, and continues west towards Fifteen Mile Stream. Wetland 2 is the predominant wetland complex that exists along Seloam Brook. This system has many side channels and other associated wetlands and is fed by tributaries from the east, and from the south. Toward the southern extent, one drainage basin collects water from several wetlands and continues to drain outside of the FMS Study Area directly into Antidam Flowage. In total, the 274 delineated wetlands account for 210 hectares, representing a land cover of 16.6% within the FMS Study Area. While many wetlands are associated with those main watercourse systems, the vast majority of wetlands are isolated or are only hydrologically connected to others by drainage instead of regulated watercourses (Atlantic Gold, 2019).

Wetlands are grouped into swamps, bogs, fens and marshes, and must have at least 50% vegetation cover. Wetland habitats lacking vegetation cover in low flow are discussed in the aquatic biology section. Swamps (defined as wetlands with standing or gently moving seasonal water, with waterlogged mineral and organic substrate, and dense coniferous / deciduous forest and tall shrub thicket vegetation) represent the most abundant wetland type, accounting for 70% of all wetlands. The majority of swamps delineated within the FMS Study Area are under one hectare in size. Bogs (defined as peatlands, often raised relative to the surrounding landscape, with at least 40 cm of peat consisting of sphagnum moss, ericaceous shrubs and Black Spruce) account for 18% of all wetlands within the FMS Study Area, and 15% of the total wetland area. They range in size from 0.027 hectares to 4.825 hectares. Fens (peatlands with a very slow internal seepage drainage and vegetation consisting of Black Spruce, Tamarack, sedges, grasses and various mosses) account for 3% of wetlands within the FMS Study Area, and 4% of the total wetland area. These wetland types ranged in size from 0.01 to 5.984 hectares. Wetland 2 (WL2) is a large wetland complex associated with Seloam Brook, that has been defined as a potential Wetland of Special Significance (WSS) due to an ACCDC record of Common Nighthawk (Nova Scotia *Endangered Species Act* (NSESA) and SARA threatened) (Atlantic Gold, 2020). It is dominated by low shrub fen habitat and disturbed by historic mine workings. The remaining wetlands are considered marshes, which are defined as periodically flooded areas with slow moving, nutrient-rich waters with mineral soil substrate, and characterized with emergent vegetation including reeds, rushes, sedges and the absence of woody vegetation.

Within these wetlands, evidence of mainland moose was observed, which may be foraging for aquatic vegetation during the summer as suitable habitat is present. Further, Blue Felt Lichen (special concern by SARA and COSEWIC, and vulnerable by the NSESA) was observed in several wetlands, typically in swamps or on the edges of wetland complexes growing on mature red maple. Suitable habitat for Blue Felt Lichen within wetlands is scattered throughout the FMS Study Area.

2.3.3 Wildlife

The FMS Study Area is located in a relatively remote, undeveloped landscape. The variety of both upland and wetland habitats identified throughout the FMS Study Area support a range of terrestrial fauna. Timber harvesting and associated forestry roads form the dominant land use pattern and disturbance regime within the FMS Study Area and the surrounding landscape. This land use within and surrounding the FMS Study Area has created edge habitats and openings in the canopy coverage to provide foraging opportunities for a variety of species (Atlantic Gold, 2020).

There were thirteen mammal species identified within the FMS Study Area, including Mainland Moose, American Black Bear, American Red Squirrel, Beaver, Bobcat, Coyote, North American Porcupine, North American River Otter, Red Fox, Short-tailed Weasel, Snowshoe Hare, vole spp., and White-tailed Deer. All of the mammal species are presumed to use parts of the site for foraging, breeding, denning, and raising young, at least periodically.

Herpetofaunal species within the FMS Study Area includes Common Garter Snake, Eastern American toad, Eastern smooth Green Snake, Green Frog, Northern Leopard Frog, Spring Peeper and Wood Frog. It is likely that other common herpetile species use habitat within the FMS Study Area, at least periodically, including Painted Turtle, Mink Frog, Pickerel Frog, Yellow-spotted Salamander, Northern Red-bellied Snake, and Northern Ring-necked Snake. Open-water wetlands and wetlands experiencing hydrological alteration soften provide breeding and foraging habitat for many herpetofauna species.

Of the 89 bird species observed during surveys within the FMS Study Area, 69 are protected under the *Migratory Bird Convention Act* (1994). Avian diversity and abundance is moderate to high in the area. A typical forest bird species assemblage was found in the FMS Study Area, along with birds typically found in interior forests. Passerines were the dominant species group across all seasons with non-passerine land birds such as Woodpecker and grouse species being the second most abundant group within the FMS Study Area. There were no large congregations of waterfowl or shorebird species within the FMS Study

Area. Raptors, both nocturnal and diurnal, were observed in low numbers with American Kestrel being the most abundant.

2.3.4 Species at Risk

The presence of wetlands, forested uplands, watercourses, clearings and fragmented habitats (resulting in edge habitats) provided suitable habitat for 22 priority bird species within the FMS Study Area (Atlantic Gold, 2020). However, only two probable breeding species were observed, including Canada Warbler (SARA – Threatened; NSESA – Endangered) and Olive-sided Flycatcher (SARA – Threatened; NSESA – Threatened).

Blue Felt Lichen (SARA – Special Concern; NSESA – Vulnerable) was observed within the FMS Study Area, within several wetlands and in upland habitat north of two wetlands. Blue Felt Lichen typically grows on mature Red Maple on the edge of swamps, lakes and rivers, but can also be found growing upland and on other hardwood species such as White Ash, Yellow Birch and Sugar Maple (COSEWIC, 2010).

Within the FMS Study Area, suitable habitat for Mainland Moose (NSESA – Endangered) is present at varying times of the year. Historical mining and timber harvesting have resulted in clearings, and subsequently, regenerative wood perennials which provide suitable foraging for moose in the winter months. Open waterbodies are also present which support aquatic vegetation which are often common foraging grounds for Mainland Moose in the summer months. In portions of the FMS Study Area, mature conifer stands also exist, which provide refuge for Mainland Moose during high snow fall events. Mainland Moose have been recorded within 12.7 km of the FMS Study Area, and evidence (scat and tracks) was observed in a range of habitats (including wetlands, cut blocks and access roads) within, and adjacent to the FMS Study Area during the collection of baseline environmental data.

With respect to other SAR from other groups, there is no evidence of vascular plants, amphibians/reptiles (including Wood and Snapping Turtles), bats and fish within the FMS Study Area. Despite the closest known bat hibernaculum being located approximately 35 km north east of the FMS Study Area (Moseley, 2007; EC, 2015), there is suitable bat foraging habitat but roosting sites are relatively rare due to lack of standing large coarse woody debris. Two priority fish species were observed (Brook Trout and Pearl Dace), despite there being limited quality spawning habitat for Brook Trout within the FMS Study Area.

2.3.5 Aquatic Biology

The FMS Study Area is located between Seloam Lake to the northeast and Fifteen Mile Stream to the west. Seloam Brook connects these two waterbodies, flowing through the FMS Gold Project from northeast to southwest (Atlantic Gold, 2020).

The aquatic ecosystem within the FMS Study Area is characterized by acidic conditions as is typical for the East River Sheet Harbour Watershed. Low pH levels, elevated temperatures and low dissolved oxygen concentrations limit fish habitat quality within select systems. Sediment and water quality are also impacted by the historic deposition of tailings. Aquatic productivity has been evaluated as low-moderate, which is also typical for the watershed and the region in which the watershed lies. Habitat complexity is generally lacking, with the majority of linear and open water features assessed as providing low quality habitat for Brook Trout and White Sucker. Only limited amounts of rearing and overwintering habitat, and even more limited amounts of spawning habitat have been identified within the FMS Study Area for these species. Overall, fish habitat quality within the FMS Study Area has been evaluated as predominantly low.

Fish habitat within the FMS Study Area sits within the East River Sheet Harbour Hydro system, which has experienced fish passage limitations for decades, and therefore does not provide a migratory pathway for anadromous or catadromous species. The FMS Gold Project is located within the East River Sheet Harbour Watershed, which is inaccessible to anadromous fish due to a series of water storage and hydroelectric dams constructed since the 1920s (O'Neil, Harvie and Longard, DFO, 1997). Dams are present along Fifteen Mile Stream including upstream of the Project at Seloam Lake, and directly downstream of the FMS Gold Project at the Anti-Dam Flowage. Further downstream, there are several dams on the East River Sheet Harbour: Marshall Falls, Malay Falls, Ruth Falls and the Barrier Dam, all of which are unpassable to fish except for Barrier Dam under high water conditions. Furthermore, fish passage is also limited in certain systems by boulder fields and areas of subterranean flow. In addition, there has been substantially degradation from historic mine workings and deposition of tailings. Historical mining activity around Fifteen Mile Stream and Seloam Brook dates back to 1878 (Drage, 2015). Alterations to watercourse morphology, location, and flow, has resulted in changes to fish habitat, populations, and distribution.

Despite these historic changes, the FMS Study Area provides foraging, passage, overwintering, spawning and/or rearing habitat for the following fish species: Banded Killifish, Brown Bullhead, Lake Chub, White Sucker, Brook Trout, Pearl Dace, and cyprinid species. Overall, relative fish abundance throughout the FMS Study Area is low.

2.3.5.1 Anti-Dam Flowage

Anti-Dam Flowage is located in the eastern section of the Sheet Harbour Hydro System drainage area and is the lowest receiving waterbody for the Seloam Brook watershed. Originally built in 1924, the reservoir regulates flow to lower reaches of Fifteen Mile Stream through one dam. The surface area of Anti-Dam Flowage measures 160.6 km^2, with the maximum depth range between 2.5 and 8 metres. Dissolved oxygen concentrations range between 9.4 and 11.1 mg/L and are relatively homogenous throughout the water column. No thermal stratification within the reservoir was observed during recent monitoring. Overall, temperature and dissolved oxygen concentrations throughout the water column on Anti-Dam Flowage were acceptable for aquatic life. Anti-Dam reservoir generally exhibits oligo-mesotrophic conditions, with seasonal peaks in primary productivity levels occurring in the summer, and lower productivity levels through the fall and winter. Historically documented fish species in Anti-Dam Flowage include Brook Trout, Brown Bullhead, White Sucker, Lake Chub, Ninespine Stickleback (NSDFA, 2017).

2.3.5.2 Watercourse 43 (WC-43)

Watercourse 43 (WC-43) is a first order headwater stream that drains surface water east through Wetland 65 (WL65) and is the primary inlet to East Lake. The watercourse originates within the western shrub swamp portion of a wetland complex. Here, the watercourse disperses through the wetland and flows underground in sections, eventually forming a channel which flows east through a main culvert under the logging road. Ponding was observed on the upstream side of the culvert, which is likely due to a debris blockage. East of the logging road, WC-43 splits and disperses through treed swamp habitat still in a channelized fashion.

The banks of WC-43 are well defined and entrenched. Outside of the immediate riparian fringe, there is no evidence of bidirectional flow between WC43 and WL65. Eventually WC-43 drains into fen habitat where the channel was observed to have flooded into WL65, a large wetland complex surrounding East Lake.

The downstream end of WC-43 contains a 30 m section, which has seasonal subsurface flow during low and average flows events, but during high flow events, there appears to be surficial connectivity. Downstream of this section, the watercourse re-channelizes as it continues to East Lake, and although it supports fish passage, it provides low quality fish habitat due to low pH and dissolved oxygen levels.

During trapping efforts in spring 2020, a single Brook Trout was identified in East Brook, and a single Ninespine Stickleback was identified in WC43 Reach 2 (below the 30 m section). Otherwise, no fish were captured or otherwise observed upstream of this section. A single Golden Shiner was captured in East Lake, and it is expected that any fish present in this system would have access up to the 30 m section, at least. On-going assessments are being completed to support understanding of this system under various flow regimes.

2.3.5.3 East Lake

East Lake is a small, shallow lake with a surface area of 6.2 ha, and depth range between 1 and 5 metres. Organic peatlands surround approximately 50% of the northern half of the lake (WL65). Adjacent to open water, the wetland is dominated by low, ericaceous shrubs. Mature, softwood-dominated forest surrounds the southern half of the lake. The shoreline of the lake is completely undeveloped. A beaver dam is present on the outflow tributary of East Lake. Littoral zone is gently sloped, and unshaded by any forest canopy cover. Floating peatland extends slightly into the waterbody along the eastern edge of the lake. Emergent vegetation, primarily Leatherleaf and Sweet Gale, is restricted to areas of floating fen vegetation. Littoral zone near upland, forested habitat is abrupt and generally lacking vegetation. The majority of the substrate is large, angular boulders, with some areas dominated by sand and organic material. Low pH and dissolved oxygen measurements indicate that water quality is likely a limiting a factor to fish habitat quality. Fish collection surveys conducted in East Lake resulted in very low catch records (one Golden Shiner), one Brook Trout (East Brook outflow) and one Ninespine Stickleback (WC-43 outflow).

2.3.5.4 Watercourse 12 (WC-12)

Watercourse 12 (WC-12) is a first-order headwater stream that originates as drainage from WL-27, flowing west to Seloam Brook. The uppermost reach of the watercourse, including an approximately 210 m section that is proposed to be overlain by the tailings management facility berm and collector ditches, is extremely intermittent. It is only periodically channelized, and drains subsurface but may be contiguous with downstream, fish-bearing reaches during extreme precipitation events. Multiple boulder fields were observed between wetland habitat, including one reach between WL-18 and WL-20. Boulder-bed channels were mostly devoid of vegetation but were also predominantly lacking surface water. This boulder-bed channel section was identified as a potential barrier to fish passage. This section is classified as low-quality fish habitat that may provide potential forage and refuge habitat in the intermittent channelized sections of the watercourse, which is inaccessible to fish at most times of the year. A subterranean flow regime limits passage up into this area of WC-12 except during extreme flow events.

Fish collection was conducted upstream and downstream of the boulder channel which exists between WL18 and WL20. Fish collection above the potential barrier resulted in the capture of one Brook Trout and ten Ninespine Stickleback, confirming that the either the barrier is passable to fish during high flow events, or a resident population of fish exists above the barrier. Below the potential barrier sampling captured one Ninespine Stickleback and two Brook Trout.

2.4 Human Environment

The nearest regional center is Sheet Harbour, which is located 100 km east of Halifax on the Eastern Shore, and 33 km south of the FMS Gold Project. It is a local service center that provides basic needs to the local economy that is largely dependent on fishing, forestry and some extractive industries. The FMS Gold Project is located in an area with very few permanent and seasonal cottages. The nearest residence is approximately 10 km north of the Project, along Highway 374. The nearest federal Mi'kmaq communities are Beaver Lake Indian Reserve (IR), 24 km southwest of the Project and Sheet Harbour IR, which is 24 km to the south of the Project. Both communities form part of the Millbrook First Nation, which is approximately 65 km to the west of the Project.

2.4.1 Lands and Resource Use

The region is primarily dependent on resource industries, predominantly forestry, agriculture, and to a lesser extent, mining/quarrying. Mineral exploration activity in the region has been constant for decades but has grown and declined over the years depending on the economic conditions of the day. The mining industry represents a significant potential source of employment in this region that has historically seen considerable mining focus over the last 150 years. Forestry and tourism have fluctuated significantly in response to prevailing economic conditions. Due to the strong dependence on the resource sector, the economy is typified by "boom and bust" patterns. These key activities are anticipated to continue to form the basis of the regional economy (Atlantic Gold, 2019).

2.4.2 Indigenous Traditional Use

The Project lies within Eskikewa'kik or the "skin dressing territory", which spans from Halifax County across to Guysborough County. Beaver Lake Indian Reserve 17 is located along Highway 224, approximately 24 km as the crow flies (56 km via provincial highway) from the Project; and, is a satellite community associated with Millbrook First Nation (Figure 6). The reserve was established on March 2, 1867 and is approximately 49.4 ha in size. There are five homes and four small seasonal cottages or hunting camps located on the property with an estimated population on reserve of 21 persons. The surrounding lands are used for traditional hunting and gathering. Sheet Harbour Indian Reserve 36 is located just west of the community of Sheet Harbour, approximately 24 km from the Project and is also a satellite community associated with Millbrook First Nation. The reserve is 32.7 ha in size. There are 9 homes and an estimated population on reserve of 25 people. There are currently no land claims registered with the Government of Canada for any of the Mi'kmaq communities in Nova Scotia within the Project Area.

Engagement with Millbrook First Nation, as the closest Mi'kmaq community, has also commenced to support identification of current uses of the land in close proximity to planned Project infrastructure. To date, no specific information relating to the current use of the land by the Mi'kmaq within and surrounding the Project Area has been revealed. There is no present indication of expected elevated current use within the Project Area based on distance to the nearest Mi'kmaq community and no observations of unique ecological features or species of elevated interest to the Mi'kmaq during baseline surveys to date. A Mi'kmaq Ecological Knowledge Study (MEKS) has been completed for the Project in accordance with the Mi'kmaq Ecological Knowledge Study Protocol (ANSMC, 2007). A Mi'kmaq Ecological Knowledge Study (MEKS) has been completed for the Project in accordance with the Mi'kmaq Ecological Knowledge Study Protocol (ANSMC, 2007). Atlantic understands the intrinsic value and sensitive nature of Indigenous traditional uses of the land. As a result, the Project has respectfully considered these values and made Project design changes, where possible, to minimize impacts to traditional use values.

2.4.3 Built Heritage and Archeology

In 2008, an archaeological screening and reconnaissance program was conducted in an area around the Egerton-McLean deposit to support proposed mine infrastructure. The reconnaissance noted six features, all believed to be associated with past mining operations, which were within close proximity to the Egerton-McLean deposit along the Seloam Lake road. It was recommended that the features and the high potential areas be subject to shovel testing and the industrial features subject to detailed documentation if any of them fell within areas of future development (Atlantic Gold, 2020).

The area was reinvestigated in 2017 to confirm the presence of the six features, and to implement a buffer zone for avoidance during exploratory drilling, including the remnants of the cellar of the New Egerton Gold Mining Company office, the wooden sill foundation of a 19th century school house and features of the New Egerton Gold Mining Company store. It was again recommended that any development around the identified features would require shovel testing and intensified historical research. In addition, any development planned outside of their original study area from 2008 should be subject to a larger search.

It should be noted that the archaeological study did not identify any Mi'kmaq resources. However, in the event that Mi'kmaq archaeological deposits are encountered during construction or operation of the Project, work will be halted in the vicinity of the discovery and immediate contact will be made with the Nova Scotia Museum and The Confederacy of Mainland Mi'kmaq.

3.0 PARTICIPATION AND CONSULTATION

Atlantic is committed to stakeholder and rightsholder consultation and engagement as part of the Project. Using key values of openness, transparency, collaboration and respect, Atlantic has continued to work with the local community, non-governmental organizations (NGOs), regulatory agencies, and interested members of the public for over a decade. Since 2019, Atlantic Gold has used the Community Relations Policy Statement, most recently updated in February 2020, issued by St. Barbara Ltd to guide community engagement efforts.

Both federal and provincial EA legislation requires consultation with the public to recognize concerns about adverse effects of the environment and identification of steps taken by Atlantic to address these concerns. Beyond the regulatory requirements, Atlantic strongly believes that meaningful engagement is crucial to the success of any development. Atlantic is committed to maintaining stakeholder consultation and engagement throughout the life of the Project.

3.1 Overall Approach

3.1.1 Public Engagement

A community engagement strategy has been developed by Atlantic for the Project and more generally for all its projects along the Eastern Shore area of Nova Scotia. The strategy sets out the formal engagement activities that Atlantic will undertake throughout all phases of its exploration activities and mining operations in Nova Scotia. This includes the construction, operation and closure of the Project, which includes the permitted Touquoy Mine Site and the proposed FMS Mine Site. Atlantic is also active in efforts to provide broader awareness relative to advanced exploration activities.

A successful community engagement strategy provides flexibility to allow adaptation to the needs of the community. In 2016, Atlantic developed its strategy for community engagement to coincide with the start of construction of the permitted Touquoy Gold Project and the development of the EA for the Project. This strategy raised awareness about the Touquoy Gold Project. In 2018, an engagement strategy was developed for Atlantic focused on the Fifteen Mile Stream Gold Project and the proposed Cochrane Hill Gold Project. This strategy is being continually updated and is paired with a broader communications plan for Atlantic to ensure messaging, communication and engagement initiatives are aligned and mutually supportive.

Community engagement also requires documenting and tracking all interactions, communications, and commitments. Atlantic uses stakeholder engagement software to plan, measure, and document engagements so that all stakeholder input and feedback is considered and integrated as appropriate.

3.1.2 Indigenous Engagement

Atlantic is committed to meaningful engagement of Indigenous Groups as part of the FMS Gold Project. Atlantic strongly believes that meaningful and long-term engagement of Indigenous Groups is crucial to the success of any development and is committed to maintaining engagement throughout the life of the Project, including beyond the EA process.

While the government's duty to consult cannot be delegated to proponents, procedural aspects can be delegated. Both the federal and provincial governments have requirements for consultation under the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult: 2011, and the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference. Further, the Nova Scotia *Environmental Assessment Regulations* include a requirement to identify concerns of Indigenous People about potential adverse effects and steps taken, or proposed to be taken, by the Proponent to address concerns, as well as the steps taken to identify these concerns. The information gathered by the Proponent during its engagement with Indigenous Peoples helps to contribute to the Crown's understanding of any potential adverse impacts of the Project on potential or established Aboriginal or treaty rights, title and related interests, and the effectiveness of measures proposed to avoid or minimize those impacts.

For Indigenous Groups with the potential to be most affected by the FMS Gold Project, it was expected that Atlantic would strive toward developing a productive and constructive relationship based on on-going dialogue with the groups in order to support information gathering and effects assessment. As part of planning for the FMS Gold Project, engagement began as part of planning and environmental assessment of the Touquoy Gold Project over a decade ago. This engagement has focused on the Assembly of Nova Scotia Mi'kmaq Chiefs and staff of the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), as well as Millbrook and Sipekne'katik First Nations.

3.2 Potentially Affected and Interested Stakeholders

A community engagement program with stakeholders commenced in February 2018 for the Project and consisted of discussions with the landowners on site access, local stakeholder groups and the surrounding community members.

In addition, regulatory consultation commenced in early 2017 for the Project, with an initial meeting to present the planned Project and to receive feedback on the regulatory regime and access regional expertise. Regular engagement through the Provincial "One Window Process: Mineral Development in Nova Scotia" has been ongoing since early 2018, in which regulator feedback was provided over the nature of scientific work being undertaken in relation to the environmental baseline studies during planning and design of the Project. Departments from federal and provincial governments that have been consulted on the Project, include:

- Impact Assessment Agency of Canada;
- Fisheries and Oceans Canada;
- Environment and Climate Change Canada;
- Canadian Wildlife Service;
- Health Canada;
- Transport Canada;
- Natural Resources Canada;
- Nova Scotia Environment;

- Nova Scotia Transportation and Infrastructure Renewal;
- Nova Scotia Lands and Forestry (formerly Nova Scotia Department of Natural Resources);
- Nova Scotia Energy and Mines (formerly Nova Scotia Department of Natural Resources); and
- Nova Scotia Office Aboriginal Affairs.

3.3 Potentially Affected and Interested Indigenous Groups

The Mi'kmaq are the original people of Nova Scotia and remain the predominant Indigenous Peoples within the Province. The courts have confirmed that the Mi'kmaq of Nova Scotia have both Aboriginal and Treaty rights protected under Section 35 of the *Constitution Act*. The nature and extent of those rights, as well as the responsibilities and authorities of governments with respect to those rights, are the subject of negotiation between the federal and provincial governments and the Mi’kmaq of Nova Scotia, as described above.

The Mi’kmaq of Nova Scotia maintains a claim of Aboriginal title to the lands and waters of Nova Scotia and adjacent areas of the offshore. The Mi'kmaq of Nova Scotia have a general interest in all lands and resources as the Mi’kmaq Nation maintain that they did not give up their land rights through treaty, voluntary cessation, or otherwise.

As part of engagement with the Mi’kmaq of Nova Scotia, the following Indigenous groups were listed in the FMS EIS Guidelines (CEAA, 2018) as being possibly affected by the Project. These include the thirteen Mi'kmaq First Nations in Nova Scotia, the Assembly of Nova Scotia Mi’kmaq Chiefs, and the Kwilmu’kw Maw-klusuaqn Negotiation Office (KMKNO):

- Acadia First Nation;
- Annapolis Valley First Nation;
- Bear River First Nation;
- Potlotek First Nation;
- Eskasoni First Nation;
- Glooscap First Nation;
- Membertou First Nation;
- Millbrook First Nation;
- Paq’tnkek First Nation;
- Pictou Landing First Nation;
- Sipekne’katik First Nation;
- Wagmatcook First Nation;
- We’koqma’q First Nation;

- Assembly of Nova Scotia Mi'kmaq Chiefs; and,
- KMKNO.

3.4 Existing Indigenous Consultation and Engagement Protocols

The Mi'kmaq of Nova Scotia, the Province of Nova Scotia and Canada adopted a Consultation Terms of Reference (TOR) which lays out a process for the parties to follow when governments wish to consult with the Mi'kmaq of Nova Scotia.

Nova Scotia has thirteen Mi'kmaq First Nations and the Assembly of Nova Scotia Mi'kmaq Chiefs represents eleven of the communities in consultation dealings with the Crown. KMKNO is the administrative group that represents the Assembly of Nova Scotia Mi'kmaq Chiefs in the consultation and negotiation processes with the Province of Nova Scotia and the Government of Canada.

The two Mi'kmaq communities in closest geographic proximity to the mine site are Millbrook and Sipekne'katik First Nations. The two communities conduct their own consultation through their elected Chief and Councils, rather than the KMKNO. Millbrook First Nation has two smaller communities near the Project: Beaver Lake Indian Reserve (IR#17) and Sheet Harbour (IR#36). These two communities are both approximately 24 km from the FMS Gold Project.

The Province of Nova Scotia provides advice to proponents on how they may engage with the Mi'kmaq of Nova Scotia through the Proponents Guide to Engagement with the Mi'kmaq of Nova Scotia.

3.5 Engagement Undertaken

3.5.1 Public Engagement Activities

While broader engagement on the FMS Gold Project has occurred for over a decade and will continue as per the public engagement strategy, specific community engagement activities have occurred to support the environmental assessment process for the Project since early 2018. Where possible, these processes will be used to support the development of this report. These may include, but not limited to, the following:

- Community Liaison Committee;
- Open Houses and Town Hall Meetings;
- Presentations and Meetings with Local Community Groups, Local Residents and Landowners; and,
- Community Bulletins (Newsletter).

The engagement to date associated with the preparation of the EIS for the FMS Gold Project has been documented, including a summary of issues raised related to the storage of mine waste and proponent responses. Further details can be found in Appendix K1 of the EIS.

3.5.2 Regulatory Engagement Activities

Regulator consultation activities have included one-on-one meetings, correspondence, meetings, workshops and site visits. On November 9, 2018, a site tour of the FMS Mine Site and Touquoy Mine Site was held, and was attended by IAAC, DFO, the provincial Office of Aboriginal Affairs, representatives from Millbrook First Nation and KMKNO, along with Atlantic staff and their consultants. In addition, a one-day site visit to the FMS Gold Project, including the Touquoy Mine Site, was held for interested provincial and federal regulators on December 7, 2018. Further details are provided in Appendix K1 of the EIS.

3.5.3 Indigenous Engagement Activities

Atlantic has developed an engagement strategy that describes the general engagement activities to be undertaken with the Mi'kmaq of Nova Scotia throughout all phases of project development and operations in Nova Scotia.

General engagement tools may include, but are not limited to:

- Face-to-Face meetings, presentations and dialogue;
- Open houses and town hall meetings;
- Regular outreach through phone calls, emails and exchange of information; and,
- Community newsletters.

The objective of Mi'kmaq engagement is:

- To ensure all information is shared and discussed;
- To gather information and views from Indigenous groups on the potential adverse impacts on Aboriginal or treaty rights, and related interests; and,
- To discuss potential avoidance, mitigation and compensation for impacts, where required.

A summary of ongoing engagement with the Mi'kmaq of Nova Scotia is included in Appendix K2 of the EIS.

3.6 Planned Engagement

Atlantic has a broad objective to continue to engage Indigenous groups, stakeholders and the public throughout the lifecycle of its projects.

Indigenous engagement planning needs to be flexible in order to respond to the concerns and interest of the Mi'kmaq. Atlantic is strongly committed to building and maintaining strong relationships with the Mi'kmaq of Nova Scotia and will continue its engagement with the Mi'kmaq of Nova Scotia in the spirit of cooperation, mutual benefit and respect.

4.0 METHODOLOGY

The methodology utilized to assess mineral waste alternatives follows from and is intended to be compliant with that prepared by Environment Canada (2013).

4.1 Step 1: Identify Candidate Alternatives

The first stage of the assessment of alternatives is to determine possible mine waste disposal alternatives. This includes different options and storage locations for mine waste disposal.

4.2 Step 2: Pre-Screening Assessment

The pre-screening assessment allows those alternatives that do not meet minimum specifications to be removed from the assessment process. By not meeting these minimum requirements, the alternative is considered to contain a fatal flaw that is so unfavourable or severe that it eliminates the disposal method or site as a candidate mine waste disposal alternative. Pre-screening criteria are formulated such that a yes or no response is possible. There must be no reasonable mitigation strategy that would eliminate a fatal flaw.

The deliverable for the pre-screening assessment is a summary table which shows all candidate alternatives and whether they are carried forward to the characterization step, or eliminated based on the fatal flaw analysis.

4.3 Step 3: Alternative Characterization

The reduced number of alternatives remaining after the pre-screening assessment are then characterized to:

- Ensure that all aspects of the alternative are properly considered; and
- Allow direct comparison between alternatives, ensuring complete transparency of the alternatives assessment process.

As described in the Guidelines, there is no ideal number of alternatives that should be carried through, but there should be at least three or more alternatives remaining and determined to be worthy of detailed assessment. At least one of these alternatives should not impact a natural waterbody that is frequented by fish, unless it can be demonstrated that this possibility does not reasonably exist based on site-specific circumstances.

Alternatives are characterized based on environmental, technical, project economic and socio-economic categories (accounts). Characterization criteria are selected by a multidisciplinary team representative of the above accounts.

Deliverables for the alternatives characterization include a description of each alternative, and a table of environmental, technical, project economics and socio-economic criteria.

4.4 Step 4: Multiple Accounts Ledger

Preliminary screening of alternatives can be used to eliminate alternatives with any fatal flaws, which can occur with minimal judgement. However, evaluation criteria used in the MAA considers the material impact, such as a benefit or loss, associated with each alternative.

A multiple accounts ledger includes a three-level hierarchy comprised of accounts, sub-accounts and indicators. Accounts identify the general area of consideration and include:

- Environmental;
- Technical;
- Project economic; and
- Socio-economic.

Each account is split into evaluation criteria (sub-accounts) that are used to determine the level of impact to the account. For example, an environmental account could contain sub-accounts that include terrestrial ecosystem impacts, aquatic ecosystem impacts, impacts to groundwater and impacts to air quality. Sub-accounts should conform to the following criteria detailed by Environment Canada (2013):

- Sub-accounts need to be impact driven;
- The sub-account must differentiate one alternative from another;
- The sub-account must be relevant to the account;
- The sub-account must be understandable, and unambiguously defined for clarity;
- Sub-accounts must not be redundant; and
- Sub-accounts should be judgmentally independent[2].

While sub-accounts measure impacts between the alternatives, they are often not easy to quantify and rank in a transparent manner. Measurement criteria (indicators) allow qualitative or quantitative measurement of the impact associated with each sub-account.

For the purposes of this MAA, each indicator has a six-point scale established that details how an alternative is valued, as suggested in the Guidelines (Environment Canada 2013). Based on consultant experience with other assessments of alternatives, for indicators measured by quantitative data, the six-point scale is set up to reflect and maximize the relative differences between each alternative. Typically, this results in one alternative with the best indicator value of six, one alternative with the lowest indicator value of one, while the remaining alternative is somewhere in the middle of the scale depending on its relative characteristics.

Qualitative scales are set up to cover a wider range of scenarios for added clarity and to ensure that an independent reviewer would also assign the same values. Typically, this results in the alternatives tending to have values towards the middle of the scale.

[2] One sub-account cannot depend on the value of another sub-account.

Deliverables for the multiple accounts ledger include a comprehensive list of accounts, sub-accounts and indicators, including rational for selection, and six-point value scales for each of the indicators.

4.5 Step 5: Value-Based Decision Process

4.5.1 Valuating

Each alternative is assigned a value for each indicator ranging from one to six. A six is assigned when the alternative meets the best criteria on the indicator value scale, and likewise a one is assigned when the alternative meets the worst criteria.

The deliverable for valuation is a summary table of values determined for each indicator.

4.5.2 Weighting

An experienced multidisciplinary team, with representatives from Atlantic and Wood, held a workshop to determine appropriate weightings for the subaccounts and indicators. Where possible, views of Indigenous communities and stakeholders as identified during consultation were considered when determining weights.

Weights were applied to each sub-account and indicator on a scale of one to six based on the relative importance of each sub-account and indicator. A weight of two is considered twice as important as a weight of one, likewise, a weight of four is twice as important as a weight of two. By design of the scale, no sub-account or indicator can be weighted more than six times more important than another sub-account or indicator. Where sub-accounts and indicators had less influence in differentiating two or more alternatives, the weightings were reduced, where appropriate, so as not to overemphasize these particular sub-accounts and indicators

4.5.2.1 Indicators and Sub-Accounts

The weights of indicators are comparable within each individual sub-account and cannot influence separate sub-accounts. In the event of only one indicator in a given sub-account, a weight of one was applied. Sub-account weights are only applicable within a given account and are not comparable across accounts.

The deliverable for weighting is a summary table of all weights assigned to the sub-accounts and indicators, including rationale for the selection of each weight.

4.5.2.2 Accounts

The base case account weights as suggested by ECCC (Environment Canada 2013; Section 2.6.2 therein) are as follows:

- Environment, 6;
- Technical, 3;
- Socio-economic, 3; and
- Project economics, 1.5.

As provided in the Guidelines, the base case includes weighting the environment account twice as important as the technical and socio-economic accounts, which in turn are weighted twice as important as the project economics account.

4.5.3 Quantitative Analysis

The MAA follows the methodology provided in Environment Canada (2013) as described below.

For each indicator, the indicator value (S) of each alternative is listed in one column. The weighting factor (W) is listed in another column and the combined indicator merit score (S × W) is calculated as the product of these values.

Indicator merit scores can be directly compared across alternatives, and likewise sub-account merit scores ($\Sigma\{S \times W\}$) can be directly compared across alternatives. However, to allow comparison of these values against values for other sub-accounts, the scores must be normalized to the same six-point scale used to score each indicator value. This is achieved by dividing the sub-account merit score by the sum of the weightings (ΣW) to yield a sub-account merit rating ($Rs = (\Sigma\{S \times W\}/ \Sigma W)$. This will again be a value between 1 and 6. This normalization is necessary to balance out different numbers of indicators and sub-accounts for each account. Without this normalization, the number of indicators associated with each sub-account, and the number of sub-accounts associated with each account, would have to be identical, otherwise the analysis will be skewed by accounts with more sub-accounts or indicators.

The same procedure of weighting and normalization is followed to determine account merit scores ($\Sigma\{Rs \times W\}$), and account merit ratings ($Ra = \Sigma(Rs \times W)/\Sigma W$). This process is repeated one final time, and an alternative merit score ($\Sigma\{Ra \times W\}$), and an alternative merit rating ($A = \Sigma(Ra \times W)/\Sigma W$), is determined for each of the alternatives

The deliverables for the quantitative analysis are summary tables showing calculations for the sub-account merit ratings, account merit ratings and alternative merit ratings.

4.6 Step 6: Sensitivity Analysis

In addition to the base case, additional scenarios are considered in order to evaluate the robustness of the analytical process and to determine the degree to which various options are influenced by the choice of weightings.

5.0 CANDIDATE ALTERNATIVES

Seven tailings management technologies and seven possible TMF locations were identified through the candidate alternative development process. The following provides a description of each storage method, a rationale behind the seven possible TMF locations, and a description of the seven candidates based on the tailings storage method and location to assess in the pre-screening assessment.

5.1 Tailings Technologies

5.1.1 Conventional Slurry Tailings

Conventional slurry tailings disposal is a common technology for surface tailings management. Tailings are pumped at a solids content of < 50% by weight to the TMF via pipeline and discharged subaerially. Tailings flow downgradient from the discharge points into the TMF to form a beach, with coarser material settling closer to the embankments, and finer grained material settling further into the impoundment. Water present in the tailings slurry, in addition to surface runoff from upstream catchment areas and direct precipitation on the TMF, form a tailings supernatant pond which can be used for water recycle and effluent aging. Developing a flatter angle tailings beach promotes overall tailings surface stability and makes it easier to revegetate exposed tailings beaches.

5.1.2 Thickened Tailings

Thickened (partially dewatered) tailings production involves using a variety of dewatering systems to produce partially dewatered tailings, which can be pumped to a storage area by pipeline at a higher solids content than conventional slurry tailings (typically in the range of 50 to 65% solids by weight). The consistency of the thickened tailings requires conventional impoundment dams for containment. Thickened tailings deposition is typically used where there is an advantage reclaiming more water in the mill, or where maintaining a smaller supernatant pond is desirable. In such an instance, more tailings can be stored with less dam volume, as opposed to developing a flatter deposited tailings profile, ultimately allowing for a reduced area the TMF overprints.

5.1.3 Paste Tailings

Ultra-thickened (paste) tailings are generally defined as being comprised of 65 to 75% solids by weight. Paste tailings are produced in specialized paste thickeners, or ultra-high-density thickeners, and have been dewatered to a point where they theoretically do not segregate when deposited and produce minimal bleed water. Despite this, paste tailings are not self-supporting and an impoundment for the paste tailings, as well as an impoundment for process water, would be required. A major challenge with paste tailings is flow velocity in the pipe, and as a result, positive displacement pumps are typically required over centrifugal pumps for transporting of paste tailings. The use of paste tailings for surface storage is not common. Paste tailing, sometimes combined with cement, is best-suited for backfill in underground workings, where transport and placement is aided by gravity.

Paste tailings are more appropriate for sites that operate in a significant water deficit and require a high level of water conservation, i.e. where water supply is significantly limited or prohibitively expensive.

5.1.4 Filtered Tailings

Filtered tailings production involves using a variety of dewatering and filtration systems to produce a relatively dry (unsaturated) tailings (typically > 70% solids content), which can be trucked or conveyed to a surface facility where they are spread and compacted in place to create a filtered tailings stack. This method of tailings management is primarily utilized in drier climates where water conservation is a critical issue, areas of high seismic activity not suitable for dams, as well as at some northern settings where the stacked tailings remain in an inert frozen state within permafrost. Confining berms or buttresses are typically required to support the filtered tailings stack, particularly in areas where maintaining the stack in an unsaturated condition is challenging (i.e. in areas with high annual precipitation or snowfall).

Use of filtered tailings will require a separate water management pond (or several) to store process water, contact water and storm water runoff from the filtered tailings stack, as water cannot be stored on the surface of the filtered tailings. The water management pond(s) must be large enough to manage storm water runoff and to provide a buffering volume for fluctuations in process water requirements and periods of low rainfall and/or runoff, such as during winter operations.

5.1.5 Cycloned Tailings

Cycloning tailings is a variant on a conventional slurry TMF where a conventional tailings slurry is pumped to the TMF and cyclones are used to mechanically separate coarse tailings (underflow) from fine tailings and effluent (overflow). The coarse tailings can be used as a dam construction material and lowers the total volume of tailings stored between dams.

The fine tailings (overflow) is stored as conventional slurry tailings behind the coarser material. Implementation of drainage zones are a key consideration for use of cyclone tailings as dam construction material, to avoid over-saturation or build-up of pore-pressure within the coarse fraction in the dam shell.

Cycloned tailings are typically used on projects where sufficient waste rock or borrow material is not available for dam construction or is a long distance from the TMF to render haulage costs prohibitively expensive.

5.1.6 Co-Disposal of Mine Waste

Co-disposal is the mixing of fine-grained mine waste material (i.e., tailings) with coarse-grained mine waste material (i.e., mine rock) into a single waste storage facility. Mixing of the tailings with mine rock promotes filling of voids to maximize density of the material. Several different terminologies for co-disposal are considered based on the point at where mixing occurs, or how the independent waste streams are placed including co-mingling (mine rock and tailings mixed at TMF), co-placement (mine rock and tailings placed separately in TMF) or co-deposition (mine rock and tailings layered).

5.2 Tailings Storage Locations

Ten potential tailings storage locations were initially identified, however three of the locations were considered repetitive and removed from consideration.

Further, open pits could be used for the deposition of tailings. Open pits, when completed, form a basin which can potentially be used to impound tailings without the use of dams. In this circumstance, a lobe of the open pit would be used for the deposition of mine waste when completed if appropriate topographic control is present, the open pit workings are effectively isolated from the deposition area, and the waste is stored in a manner that does not allow movement to active mining areas in the open pit. The FMS Gold Project propose a single open pit, with no lobes that could provide basins for the impoundment of tailings and supernatant during operations. Due to pit geometry, the majority of the storage capacity available in the open pit is unavailable until the end of the mine life, unless an engineeed structure is constructed within the operating pit. This would be further compounded by the need to have sufficient supernatant storage above the tailings to account for high precipitation events / periods. Even if the open pit could be utilized for tailings storage, only a small portion of the overall tailings stream could be directed to the open pit, necessitating a surface impoundment. The use of the open pit for storage of tailings has been screened out.

As a result, a total of seven TMF candidate locations (Figure 7) were selected based on engineering studies and the following criteria:

- The alternative location should be within an acceptable distance from the open pit;
- The alternative location should avoid encroaching upon or overprinting a major watershed divide, and encroaching into more than one watershed;
- The alternative location should avoid encroaching upon or overprinting a major waterbody (i.e. Seloam Lake or Anti-Dam Flowage);
- The alternative location should avoid encroaching upon or overprinting or substantially interfering with major provincial infrastructure; and,
- The alternative location should avoid encroaching upon or overprinting protected areas.

6.0 PRE-SCREENING ASSESSMENT

Prior to completing a comprehensive MAA, a pre-screening assessment is applied to determine whether any candidate alternatives have an inherent fatal flaw. If a candidate alternative is determined to have a fatal flaw it is not carried forward to the MAA.

6.1 Pre-Screening Criteria for Tailings Technologies

Pre-screening criteria developed for the FMS Gold Project assessment of alternative tailings technologies were:

- **Does the alternative method confer a substantial benefit over conventional technologies? (yes / no)**

  The management technology must offer significant advantages, without significant offsetting drawbacks, over the use of conventional slurry tailings for the conditions of the Project.

- **Does the alternative allow for disposal of a sufficient quantity of tailings? (yes / no)**

  Alternatives that can only manage a portion of the tailings generated are insufficient and will require other alternatives to be employed to meet Project needs. The total amount of tailings to be generated from the FMS Gold Project is 13.4 Mt.

The results of the pre-screening assessment for the candidate storage methods are provided in Table 1. A summary of the advantages and disadvantages for each candidate storage method is provided in Table 3.

6.2 Pre-Screening of Candidate Tailings Technologies

6.2.1 Conventional Slurry Tailings

The use of conventional slurry for deposition of tailings is standard practice at gold mines. Where required, tailings and effluent from the processing plant can be pre-treated using the SO_2 / air process to destroy cyanide and to precipitate heavy metals to concentration levels that are manageable through further effluent aging in a tailings pond. Alternatively, supernatant liquid or effluent can be treated at the TMF.

The tailings slurry produced at the processing plant can be pumped via pipeline to a surface impoundment which uses natural topography and constructed dams to contain the tailings slurry. A tailings pond forms on top of the tailings which is recycled back to the process plant. No fatal flaws are apparent for the use of conventional tailings slurry in a new TMF and this candidate tailings storage method has been carried forward to the MAA.

6.2.2 Thickened Tailings

The use of thickened tailings at a mine can offer some advantages over conventional slurry discharge as settled dry densities can be slightly higher with less water lost to tailings void space, and tailings may be deposited with a steeper beach, depending on the proportion of finer grained materials in the tailings stream. The topography around the Project does not require the use of thickened tailings for steeper tailings beaches and thickening of the tailings will not substantially reduce dam requirements. As thickened tailings storage methods do not lend any significant advantages over a conventional slurry and have additional power requirements / economic considerations, further review of thickened tailings is not warranted and this alternative has been screened from consideration in the MAA.

6.2.3 Paste Tailings

From an environmental and socio-economic perspective, the use of tailings as paste backfill to augment underground stability is ideal as it has fewer adverse human or environmental effect. The use of tailings in paste backfill can help improve the long-term stability of underground workings, but is much more costly, for purely disposal purposes, compared with use of a surface impoundment with good natural containment. As the FMS Gold Project is an open pit operation, this tailings storage method was eliminated from further consideration.

6.2.4 Filtered Tailings

Filtered tailings are best suited for arid sites which have a very limited supply of water and require maximum water recycle, areas of high seismic potential that are not suited to large dams, or arctic sites where a dry stack can be encapsulated by permafrost to minimize acid rock drainage (ARD) / metal leaching (ML). Although these conditions are not applicable to the FMS Gold Project, and the use of filtered tailings technology is unconventional in Nova Scotia, filtered tailings have an advantage over conventional slurry tailings as the tailings are dewatered at the plant site and no large tailings pond, positioned over tailings is required. This eliminates the potential for a dam breach releasing tailings and effluent with a high potential energy into the environment. No fatal flaws are apparent for the use of filtered stack tailings and this candidate tailings storage method has been carried forward to the MAA.

6.2.5 Cycloned Tailings

The primary advantages of employing cycloning technology are economic in nature as Atlantic would not require rockfill for its dam raises. The use of cycloning technology could increase the dam footprint (as the downstream slopes may be as flat as 5H:1V) and the impoundment at location #4 would still overprint water. In addition, the technology does not eliminate the need for a tailings pond located over tailings. Additional environmental concerns include increased dust generation potential, increased ARD / ML runoff potential from the exposed coarse tailings, and increased water management concerns. Technical constraints include underdrainage and managing winter deposition as ice buildup could lead to sinkhole development after the spring thaw. Socio-economic constraints include public perception of using tailings material for dam construction and increased fugitive dust. As cycloned tailings do not allow alternatives to avoid overprinting of water and do not eliminate the need for tailings ponds located over tailings, the use of cyclone tailings does not provide a substantial benefit over conventional slurry technology and this alternative has been eliminated from further consideration in the MAA.

6.2.6 Co-Disposal of Mine Waste

When tailings are co-mingled, the tailings may be dewatered to the point of a paste or filtered tailings or use conventional slurry tailings, prior to mixing with the mine rock. Co-mingling of tailings with mine rock not only has many of the same operational complexities as paste or filtered tailings, but additional complexity is introduced via the mixing process. Co-mingling of the two waste streams may result in the need for a larger facility, or multiple facilities, to contain the increased waste volume. Further, the increased equipment requirements (thickening, pumping and/or conveying, mixers, etc.) adds considerable capital and operating costs, which adversely impact the economic viability of the project. Co-mingling is not considered feasible for mine waste generated by the FMS Gold Project and is eliminated from further consideration.

6.3 Pre-Screening Criteria for Storage Locations

Pre-screening criteria developed for the FMS Gold Project assessment of alternative storage locations were:

- **Does the alternative location stay within the main primary watershed (and avoid overprinting a primary watershed divide)? (yes / no)**

  Alternatives that are located within a single primary watershed (i.e. East River Sheet Harbour Watershed) will minimize the risk for a greater distribution of potentially affected runoff from the TMF and reduce water management requirements.

- **Is the alternative location within Atlantic property boundary, or on lands which could be readily acquire? (yes / no)**

  Alternatives that are located off the property boundary will require Atlantic to acquire additional surface and mineral rights. This is expected to be difficult to achieve and will result in unacceptable Project delays.

The results of the pre-screening assessment for the candidate storage locations are provided in Table 2. A summary of the advantages and disadvantages for each candidate storage location is provided in Table 3.

6.4 Pre-Screening of Candidate Storage Locations

Seven TMF locations were identified at the preliminary stage (Figure 7).

The major watershed divide between East River Sheet Harbour Watershed and the Liscomb watershed is located approximately 3 km to the east of the open pit. Locations that straddle this divide increase the logistical difficulty of controlling seepage and discharge from the TMF. Therefore, TMF location #6 has been eliminated from the analysis.

Candidates located outside the property boundaries could be difficult or impossible to acquire while meeting Project timelines and should be excluded from further consideration. Location 1 and 3 are partly located on lands held by others, and have been eliminated as a candidate, as it would not be possible to obtain rights to build a tailings management facility.

Locations #2, #4, #5 and #7 were carried forward into the MAA. Candidate locations #1, #3 and #6 had fatal flaws and did not meet the pre-screening criteria to carry forward.

6.5 Alternatives for the Multiple Accounts Analysis

Based on the two tailings technologies, and four tailings storage locations that have been advanced through the pre-screening assessment (Sections 6.2 and 6.4), a total of eight possible alternatives exist. In the interest of having a focused and manageable MAA, consistent with the Guidelines (Environment Canada 2011), rather than assessing every possible combination, alternatives which make the most sense from a mine development perspective have been developed for consideration in the MAA. All candidates not eliminated in the pre-screening step are considered through the alternatives carried forward to the MAA. As a result, conventional slurry tailings were only considered for Location #2 and #7. The use of filtered tailings at Location #2 and #7 was not considered feasible due to incompatible site conditions and the haul distance required for delivery of the filtered tailings to these locations. An adjusted configuration for Location #4 was also considered which avoids fish-frequented waters (Alternative G).

Alternatives A, B, C, D, E, F and G were carried forward into the MAA. The other combinations of methodologies and locations had fatal flaws and did not meet the pre-screening criteria to carry forward.

	Location #2	Location #4	Location #5	Location #7
Alternative A	Slurry			
Alternative B		Slurry		
Alternative C		Filtered		
Alternative D			Slurry	
Alternative E			Filtered	
Alternative F				Slurry
Alternative G		Slurry		

6.5.1 Alternative A

Alternative A utilizes conventional slurry tailings, deposited at Location #2. Process water and contact water runoff would be managed within the TMF supernatant pond. This alternative would require MDMER Schedule 2 regulatory amendment.

6.5.2 Alternative B

Alternative B is the tailings approach presented in the EIS. It utilizes conventional slurry tailings, deposited at Location #4. Process water and contact water runoff would be managed within the TMF supernatant pond. This alternative would require MDMER Schedule 2 regulatory amendment.

6.5.3 Alternative C

Filtered stack tailings was one of the deposition methods carried forward from the pre-screening assessment. Alternative C utilizes filtered stack tailings deposition at Location #4. Process water and contact water runoff would be managed in two separate mine water management ponds, located downstream of the filtered tailings stack. Alternative C will require a MDMER Schedule 2 regulatory amendment for the TMF, but not for the mine water management ponds.

6.5.4 Alternative D

Alternative D utilizes conventional slurry tailings, deposited at Location #2. Process water and contact water runoff would be managed within the TMF supernatant pond. This alternative would require MDMER Schedule 2 regulatory amendment.

6.5.5 Alternative E

Alternative E utilizes filtered stack tailings deposition at Location #5. Process water and contact water runoff would be managed in two separate water management ponds, located downstream of the filtered tailings stack. Alternative C will also require a MDMER Schedule 2 regulatory amendment for the TMF, but not for the mine water management ponds.

6.5.6 Alternative F

Alternative F utilizes conventional slurry tailings, deposited at Location #2. Mine water would be managed within the TMF supernatant pond. This alternative would require MDMER Schedule 2 regulatory amendment.

6.5.7 Alternative G

Alternative G is a variant of Alternative B and was selected as the best alternative that avoids placing mine waste over waters frequented by fish, and accordingly has no MDMER Schedule 2 requirements. It utilizes conventional slurry tailings, deposited at Location #4.

7.0 ALTERNATIVES CHARACTERIZATION

Alternatives A, B, C, D, E, F and G met the pre-screening criteria and were carried forward into the MAA. This section provides a characterization of each of the remaining alternatives from the environmental, technical, project economics and socio-economic perspectives. A summary of the characterization for each alternative can be found in Table 4.

7.1 Alternative A: Location #2, Conventional Slurry Tailings

7.1.1 Overview

Alternative A utilizes conventional slurry tailings technology with the TMF to the northwest of the open pit (Location #2). It has the smallest site footprint with the TMF located the next furthest away from the centroid of the open pit of all the alternatives. The focus in designing Alternative A was to have an alternative that has a small footprint (Figure 8).

7.1.2 Environmental Characterization

Alternative A has 1.6 Mm^3 in water storage volume, within four water managements ponds including the TMF supernatant pond and three seepage management ponds. The closest receiving waterbody is Bear Brook, which is moderately sized. Alternative A will be completely located within one subwatershed, and the design will reduce flows (>25%) in 220.8 m of the associated watercourse of the impacted subwatershed, which is the smallest of all alternatives. There are no watercourse realignments associated with Alternative A, however it will impact the largest waterbody fish habitat (2.1 ha) and the second largest watercourse fish habitat (1,445 m)[3]. It is anticipated that there will be three watercourse crossings required to construct and operate Alternative A.

Alternative A has the smallest footprint at 90.2 ha, and will use the smallest amount of previously disturbed habitat (1.2 ha). Alternative A will impact the second smallest amount of wetland (6.3 ha) and it is anticipated that 8.4 ha of mainland moose habitat will be impacted. It is assumed that all watercourse habitat will support Brook Trout in some capacity and therefore 1,445 m will be impacted, which is the second largest.

Fugitive dust could be generated from Alternative A which has the smallest slurry tailings area (90 ha) during drier conditions and from the 4.6 km long access road during construction. The ability to minimize GHG emissions generated from the construction of the tailings starter dam are predicted to be very good, as clearing is within a relatively small area (98 ha), with a relatively small volume (2.16 Mm^3) of dam construction materials to be hauled over a moderate distance (<5 km). The distance from the centroid of Alternative A to the closest receptor is approximately 9.45 km, which is largest distance and would therefore have the smallest impact in terms of noise emissions.

[3] It should be noted that the calculation of overprinted fish habitat (waterbody and watercourse) for the purposes of the Alternatives Assessment was based on provincially available data for all four locations in order to allow comparison amongst the alternatives. The determination of fish habitat for the purposes of the environmental assessment (as shown in Figure 3) was based on site-specific information delineated for the effects assessment.

The closest protected area is the Abraham Lake Wilderness Area, which is approximately 4.5 km from the centroid of Alternative A.

In the event of a TMF dam failure, the magnitude of a failure would be dependent on the height and length of the dam. Alternative A has the second smallest dam height (29 m) with the second shortest dam length of 3.1 km. The most sensitive area downstream is Fifteen Mile Stream, which is located 0.2 km from Alternative A, and there is public infrastructure (road crossing for local road access) located 3 km further downstream.

7.1.3 Technical Characterization

The design of Alternative A has a storage efficiency (ratio of tailings storage volume to dam fill volume) of 6.4, which is the second highest. The dam volume of the final embankment for Alternative A is the second smallest (2.16 Mm^3). Tailings dams are required along a large portion of the perimeter, with a large primary dam and a connecting saddle dam. Alternative A provides generally good natural containment with some undulating topography within.

With respect to safety, there are four bends in Alternative A, which is the third smallest. It has a dam length of 3.1 km and dam height of 29 m, which are the second smallest measurements in both cases. It is based on a conventional slurry tailings design with four water management ponds and 3.45 km of seepage ditching.

For management of contact water runoff, Alternative A requires 820 m of ditching to divert non-contact water around the TMF, and a surplus water system consisting of two pumps and a 6.75 km long pipeline will transfer excess water to the water treatment plant, for treatment and release. It is anticipated that 158 ha of the associated watershed will be impacted, which is the fourth smallest of all alternatives. Approximately 3.45 km of seepage ditching will be required around the perimeter of the TMF, which is the second smallest. Alternative A will also require a 7.2 km long pipeline to return reclaim water from the TMF to the mill.

The starter embankment for Alternative A requires approximately 0.25 Mm^3 of dam fill materials to construct, which is the smallest. The final embankment for Alternative A would require an additional 1.91 Mm^3 of dam fill materials to construct, which is the second smallest, and the most additional seepage ditching (1.9 km) of all alternatives.

With respect to the ability to obtain the initial environmental permits, Alternative A has with minimal baseline geotechnical knowledge and minimal engineering studies completed for the conventional slurry tailings design. Consultation for Alternative A has been limited, and as a result, the anticipated permitting schedule would be considered moderate.

The straight-line distance between the processing facility and the TMF is 4.6 km. The elevation difference between the TMF and the mill for Alternative A is the smallest with the crest elevation of the final TMF embankment being 143 masl. As Alternative A uses a conventional slurry tailings design, the complexity of the processing is low, although it will require a tailings pipeline distance of 8.5 km, which will require a stronger pumping system. Given the pipeline length, there is an increased risk of freezing if not drained/

not in continuous use. Overall, the complexity of depositing tailings for this alternative is based on conventional slurry tailings deposition methodology and is therefore considered low complexity.

Alternative A will be constructed for conventional slurry tailings management, however but there is currently insuffient geotechnical data in the area of the dam to assess foundation conditions. It is anticipated that the distance to haul suitable dam construction materials would be less than 5 km.

7.1.4 Project Economics Characterization

Alternative A is projected to have the lowest overall costs out of the seven alternatives.

The capital cost of building Alternative A is the lowest, due to the small footprint requiring less area to clear and grub. The dam volume requires the smallest amount of material during the construction of the starter dam. The sustaining capital costs of Alternative A is the third lowest (higher than Alternative E and F), as the amount of dam material will increase during subsequent raises. The operating costs for Alternative A are the highest of the conventional slurry tailings options due to the distance and elevation difference required to pump the tailings and the reclaim water for processing. The closure and post-closure costs for Alternative A are the third lowest due to the size of the tailings area to be reclaimed, although there are substantial costs associated with the reclamation of the pumps and pipelines for this alternative.

Due to the lack of baseline geotechnical and environmental data for this location, there is required to complete additional detailed engineering studies and therefore there is risk that the ability to obtain the initial permit for this alternative may take an additional year. This could result in a decrease in the Project net present value by $7.6 million.

7.1.5 Socio-Economic Characterization

Loss of recreational fishing opportunities are the largest with Alternative A due to the loss of waterbody and watercourse habitat. The loss of commercial forest harvesting and ATV trails is the lowest with Alternative A. Where there will be an impact to private land ownership, this alternative will have the second largest impact.

The potential for fugitive dust is lower with the conventional slurry tailings design, compared to the filtered tailings, particularly with the smallest footprint (90 ha) for Alternative A, although it is located 4.6 km from the processing facility, which could generate dust from construction traffic. The potential for a hazard to the public is higher with Alternative A due to the proximity of the tailings facility to Fifteen Mile Stream (0.2 km) and the fact there is a public road crossing approximately 3 km downstream. The risk to workers from a potential failure with Alternative A is considered to be lower than the other alternatives due to the second lowest dam height of 29 m and the second farthest distance (8.5 km) from the mine workings, if it reached there at all.

Operational impacts from Alternative A are anticipated to be low. The visual impacts from the second lowest dam elevation will be low and the location of the TMF is the furthest from the closest sensitive receptor, which is 9.45 km further south.

Due to the fact this alternative has a low capital and operating cost, it is anticipated to be resilient to fluctuations in the market price of gold and it unlikely that there would be a need to place the operation in temporary care and maintenance. As a result, the impact to local jobs and business opportunities is unlikely to be impacted.

7.2 Alternative B: Location #4, Conventional Slurry Tailings

7.2.1 Overview

Alternative B utilizes conventional slurry tailings technology with the TMF located to the east of the open pit (Location #4). It has the second largest TMF footprint of all the alternatives and is in close proximity to the centroid of the open pit (Figure 9).

7.2.2 Environmental Characterization

Alternative B has 1.6 Mm^3 in water storage volume, within three water managements ponds including the TMF supernatant pond and two seepage management ponds. The closest receiving waterbody is Anti-Dam Flowage, which has a large assimilative capacity. Alternative B will be located over the watershed divide of two subwatersheds, and the design will reduce flows (>25%) in 5,136 m of the associated watercourses, which is the highest of all alternatives. There are no watercourse realignments associated with Alternative B, however it will not impact waterbody fish habitat but will impact the fourth largest amount of watercourse fish habitat (683 m). It is anticipated that there will be no watercourse crossings required to construct and operate Alternative B.

Alternative B has the second largest footprint at 142.8 ha, and will use the third largest amount of previously disturbed habitat (4.0 ha). Alternative B will impact the largest amount of wetland (12.1 ha) and it is anticipated to impact the largest amount of mainland moose habitat (12.1 ha). It is assumed that all watercourse habitat will support Brook Trout in some capacity and therefore 683 m will be impacted, which is the fourth largest of the alternatives.

Fugitive dust could be generated from Alternative B which has the second largest slurry tailings area (142.8 ha) during drier conditions although there would only be 0.8 km (third shortest) of access to generate dust during construction. The ability to minimize GHG emissions generated from the construction of the tailings starter dam are predicted to be very good, as clearing is within a moderately sized area (90 ha), with a small volume (1.22 Mm^3) of dam construction materials to be hauled over a short distance (<1.5 km). The distance from the centroid of Alternative B to the closest receptor is approximately 5.7 km, which is fifth largest distance and would therefore have the greater impact in terms of noise emissions.

The closest protected area is the Toadfish Lakes Wilderness Area, which is approximately 1.55 km from the centroid of Alternative B, the second smallest distance.

In the event of a TMF dam failure, the magnitude of a failure would be dependent on the height and length of the dam. Alternative B has the third smallest dam height (32 m) with the second shortest dam length of 3.1 km. The most sensitive area downstream is Fifteen Mile Stream, which is located 3.6 km from Alternative B, but there is public infrastructure (road crossing for a local road access) located 0.85 km downstream.

7.2.3 Technical Characterization

The design of Alternative B has a storage efficiency of 4, which is the third highest. The dam volume of the final embankment for Alternative B is the third smallest (3.93 Mm^3). Tailings dams are required along a large portion of the perimeter, with a large primary dam. Alternative B is located in topography that provides some advantages on the south edge.

With respect to safety, there are three bends in TMF dam for Alternative B, which is the second smallest. It has a dam length of 3.1 km and dam height of 32 m which are the third smallest. The TMF dam design is based on a rockfill structure for conventional slurry tailings with three water management ponds (two seepage ponds and one supernatant pond) and 2.74 km of seepage ditching.

For management of contact water runoff, Alternative B will not require any non-contact water ditching, and will require a surplus water management system consisting of a single pump and a 920 m long pipeline to transfer excess water to the water treatment plant. It is anticipated that 187 ha of the associated watershed will be impacted, which is the third largest of all alternatives. Approximately 2.74 km of seepage ditching will be required around the perimeter of the TMF, which is the fourth most. Alternative B will also require a 2.2 km long pipeline to return reclaim water from the TMF to the mill.

The starter embankment for Alternative B requires approximately 1.22 Mm^3 of dam fill material, which is the third largest. The final embankment for Alternative B would require an additional 2.71 Mm^3 of dam construction materials which is the fifth largest. In addition, it would require the third largest additional seepage ditching (1.2 km) of all alternatives.

With respect to the ability to obtain the initial environmental permits, Alternative B has with the most baseline geotechnical knowledge and preliminary engineering studies completed for the conventional slurry tailings design. Consultation for Alternative B has been ongoing, and as a result, the anticipated permitting schedule would be anticipated to be short.

The straight-line distance between the processing facility and the TMF is 0.8 km. The elevation difference between the TMF and the mill for Alternative B is the second smallest with the crest elevation of the final TMF embankment being 164 masl. As Alternative B uses a conventional slurry tailings design, the complexity of the processing is low, although it will require a tailings pipeline distance of 3.5 km. Given the pipeline length, there is only a moderate risk of freezing if not drained/ not in continuous use. Overall, the complexity of depositing tailings for this alternative is based on conventional slurry tailings deposition methodology and is therefore considered to be low complexity.

Alternative B will be constructed for a conventional slurry tailings management, and there is sufficient geotechnical data in the area of the TMF to assess foundation conditions. It is anticipated that the distance to haul suitable dam construction materials would be less than 1.5 km, which is the shortest distance.

7.2.4 Project Economics Characterization

Alternative B is projected to have the second lowest overall costs out of the seven alternatives.

The capital cost of building Alternative B is the fourth lowest, due to a larger footprint requiring additional area to clear and grub. The dam volume requires the fourth highest amount of material during the construction of the starter dam. The sustaining capital costs of Alternative B is the fourth smallest (higher than Alternative A, E and F), as the amount of dam material during subsequent raises will be average amount of all alternatives. The operating costs for Alternative B are the second lowest of the conventional slurry tailings options due to the distance and elevation required to pump the tailings and the reclaim water for processing. The closure and post-closure costs for Alternative B are the second highest due to the size of the tailings area to be reclaimed, although there are substantial costs associated with the reclamation of the pumps and pipelines for this alternative.

Due to the adequate amount of baseline geotechnical and environmental data for this location, and the development of preliminary engineering studies, there is minimal risk of the ability to obtain the initial permit for this alternative. This is not expected to change the net present value of the Project.

7.2.5 Socio-Economic Characterization

Loss of recreational fishing opportunities are the second smallest with Alternative B due to limited loss of waterbody and watercourse fish habitat. The loss of commercial forest harvesting is limited to 1 ha, however the loss of ATV trails is the fourth largest with Alternative B. There will be no impact to private land ownership with this alternative.

The potential for fugitive dust is lower with the conventional slurry tailings design, compared to the filtered tailings, particularly with the second largest footprint (142 ha) for Alternative B, although it is located 0.8 km from the processing facility, which will minimize the generation of dust from construction traffic. The potential for a hazard to the public is lower with Alternative B due to the distance of the tailings facility to Fifteen Mile Stream (3.6 km) although there is a public road crossing approximately 0.85 km downstream. The risk to workers from a potential failure with Alternative B is considered to be lower than the other alternatives due to the third lowest dam height of 32 m and the third farthest distance from the mine workings (3.5 km).

Operational impacts from Alternative B are anticipated to be moderate. The visual impacts from this alternative will be relatively low due to third lowest crest elevation of the dam (32 m) and the location of the TMF is the fourth furthest from the close sensitive receptor, to the south.

Due to the fact this alternative has a low capital and operating cost, it is anticipated to be resilient to fluctuations in the market price of gold and it unlikely that there would be a need to place the operation in temporary care and maintenance. As a result, the impact to local jobs and business opportunities is unlikely to be impacted.

7.3 Alternative C: Location #4, Filtered Tailings

7.3.1 Overview

Alternative C utilizes filtered tailings technology with the TMF located to the east of the open pit (Location #4), in the same general location as Alternative B. It has the fourth largest TMF footprint of all the alternatives and is in close proximity to the centroid of the open pit (Figure 10).

7.3.2 Environmental Characterization

Alternative C has a smaller water storage volume of 1.48 Mm^3, within six water managements ponds including two main water management ponds and four seepage management ponds. The closest receiving waterbody is Anti-Dam Flowage, which has a large assimilative capacity. Alternative C will be located over the watershed divide of two subwatersheds, and the design will indirectly result in a reduction of flows (>25%) along a 4,999 m length of the associated watercourses, which is the second largest of all alternatives. There are no watercourse realignments associated with Alternative C, and it will not directly overprint waterbody fish habitat but will directly overprint the third largest amount of watercourse fish habitat (831 m). It is anticipated that there will be no watercourse crossings required to construct and operate Alternative C.

Alternative C has the fourth largest footprint at 122.7 ha, and will use the fourth largest amount of previously disturbed habitat (3.5 ha). Alternative C will impact the second largest amount of wetland (11.3 ha) and it is anticipated to impact the second largest mainland moose habitat (11.3 ha). It is assumed that all watercourse habitat will support Brook Trout in some capacity and therefore 831 m will be impacted, which is the third largest of the alternatives.

Fugitive dust could be generated from Alternative C which has the largest filtered tailings area (122.7 ha) although the access road for construction of the TMF and deposition of tailings during operation would be 0.9 km (fourth smallest). The ability to minimize GHG emissions generated from the construction of the tailings starter dam and water management ponds are predicted to be very poor, as clearing is within a larger sized area (105 ha), with a small volume (1.04 Mm^3) of dam construction materials to be hauled over a short distance (<1.5 km) and nearly 40,000 trips to deposits the tailings during operations. The distance from the centroid of Alternative C to the closest receptor is approximately 5.8 km, which is third largest distance and would therefore have the greater impact in terms of noise emissions.

The closest protected area is the Toadfish Lakes Wilderness Area, which is approximately 1,527 m from the centroid of Alternative C, which is the smallest distance.

In the event of a TMF dam failure, the magnitude of a failure would be dependent on the height and length of the dam. In addition, there will be two water management ponds for this alternative, in which the northern pond will have a dam height of 10 m and length of 1.15 km. Alternative C has the smallest dam height (23 m) with the largest dam length of 4.0 km. The most sensitive area downstream is Fifteen Mile Stream, which is located 3.65 km from Alternative C, but there is public infrastructure (road crossing for a local road access) located 0.85 km downstream.

7.3.3 Technical Characterization

The design of Alternative C has a storage efficiency of 2.9, which is the third smallest. The total TMF dam volume required for Alternative C is the third smallest (4.37 Mm^3), with an additional 0.35 Mm^3 required to construct the water management ponds. Tailings dams are required around most of the perimeter, with a large primary dam. Alternative C is located in an area that provides limited opportunities to take advantages of natural topography on any side.

With respect to safety, there are eight bends in the TMF dam for Alternative C, which is the second largest. It has a dam length of 4.0 km and dam height of 23 m which is the shortest. The TMF dam design is based on a rockfill structure for filtered tailings with a surface area of 122.7 ha, two main water management ponds and 3.65 km of seepage ditching to manage fugitive dust and seepage.

For management of contact runoff, Alternative C will not require any non-contact water diversion ditches, and will require surplus water management systems from the two water management ponds consisting of a total of 3.74 km of pipeline, and a pump per pond to transfer excess water to the water treatment plant. It is anticipated that 210 ha of the associated watershed will be impacted, which is the second largest of all alternatives. Approximately 3.65 km of seepage ditching will be required around the perimeter of the TMF, which is the fourth largest (same as Alternative B). Alternative C will also require a 3.0 km long pipeline to return reclaim water from the TMF to the mill, which is the third largest.

The starter embankment for Alternative C requires approximately 0.69 Mm^3 of dam fill material, which is the third smallest. The final embankment for Alternative C would require the second largest amount of dam construction material, at an additional 3.68 Mm^3. In addition, it would require the fifth largest additional seepage ditching (850 m) of all alternatives.

With respect to the ability to obtain the initial environmental permits, Alternative C has good baseline geotechnical knowledge and some preliminary engineering studies completed for the filtered tailings design. Consultation for Alternative C has been limited, and as a result, the anticipated permitting schedule would be anticipated to be long primarily due to the use of a non-conventional technology.

As Alternative C uses a filtered tailings design, the complexity of the processing and tailings disposal is high due to extensive human invention required, particularly in transporting tailings at least a distance of 0.8 km (straight-line) from the processing facility. The elevation difference between the TMF and the mill for Alternative C is the largest with the crest elevation of the final TMF embankment being 173 masl.

Alternative C will be constructed for filtered tailings management and has good geotechnical data in the area of the TMF to assess foundation conditions. It is anticipated that the distance to haul suitable dam construction materials would be less than 1.5 km, which is the shortest distance.

7.3.4 Project Economics Characterization

Alternative C is projected to have the highest overall costs out of the seven alternatives.

The capital cost of building Alternative C is the third highest, due to a larger footprint requiring additional area to clear and grub, and the cost to construct a filter plant to dewater the tailings to obtain a filtered tailings product. The dam volume requires the fifth highest amount of material during the construction of the starter dam and water management ponds. The sustaining capital costs of Alternative C is the highest, as the amount of dam material will be the highest of the alternatives during subsequent raises. The operating costs for Alternative C are the second highest of the filtered tailings options, and second highest of all alternatives due to the cost to operate the filter plant and the costs to haul, place and compact the filtered tailings material. The closure and post-closure costs for Alternative C are the second lowest due to the limited amount of materials required to reclaim the area, although there are substantial costs associated with the reclamation of the pumps and pipelines (surplus and reclaim water) for this alternative.

Although there is an adequate amount of baseline geotechnical and environmental data for this location, and partial development of some preliminary engineering studies, there is a risk to the ability to obtain the initial permit for this alternative due to the use of a non-conventional technology. This could reduce the Project net present value by as much as $11.4 million.

7.3.5 Socio-Economic Characterization

Loss of recreational fishing opportunities are the third highest with Alternative C due to the loss of waterbody and watercourse fish habitat. There is no loss of commercial forest harvesting, however the loss of ATV trails is the second largest (1,284 m) with Alternative C. There will be no impact to private land ownership with this alternative.

The potential for fugitive dust with the filtered tailings design is high, particularly as Alternative C has the largest footprint (122 ha) of the filtered tailings option, and requires the approximately 40,000 truck trips to transport the tailings along a distance of 0.9 km from the processing facility. The potential for a hazard to the public is lower with Alternative C due to the distance of the tailings facility to Fifteen Mile Stream (3.6 km) although there is a public road crossing approximately 0.85 km downstream. The risk to workers from a potential failure with Alternative C is considered to be lower than the other alternatives due to the shortest dam height of 23 m and the shortest distance from the mine workings (0.8 km).

Operational impacts from Alternative C are anticipated to be moderate. The visual impacts from this alternative will be relatively low as the crest elevation of the dam is the lowest (23 m) and the location of the TMF is the third largest from the close sensitive receptor, to the south.

Due to the fact this alternative has a high capital and operating cost, it is not anticipated to be resilient to fluctuations in the market price of gold and may be at risk to place the operation in temporary care and maintenance. As a result, the impact to local jobs and business opportunities could be impacted.

7.4 Alternative D: Location #5, Conventional Slurry Tailings

7.4.1 Overview

Alternative D utilizes conventional slurry tailings management in a TMF that is is also located to the east of the open pit (Location #5; see Figure 11). It has the third largest TMF footprint of all the alternatives and is closer in proximity to the centroid of the open pit than Alternative B, C and G.

7.4.2 Environmental Characterization

Alternative D has a water storage volume of 1.6 Mm^3, with five water managements ponds including the TMF supernatant pond and four seepage management ponds. The closest receiving waterbody is Anti-Dam Flowage, which has a large assimilative capacity. Alternative D will be located over the watershed divide of three subwatersheds, and the design will indirectly result in a reduction of flows (>25%) along a 2,983 m length of the associated watercourses, which is the fourth smallest of all alternatives. There are no watercourse realignments associated with Alternative D, however it will directly overprint 0.1 ha of waterbody fish habitat and 205 m of watercourse fish habitat. It is anticipated that there will be no watercourse crossings required to construct and operate Alternative D.

Alternative D has the third largest footprint at 122.8 ha, and will use the largest amount of previously disturbed habitat (5.1 ha). Alternative D will impact the fourth largest amount of wetland (7.5 ha) and it is anticipated to impact the fifth largest mainland moose habitat (7.6 ha). It is assumed that all watercourse habitat will support Brook Trout in some capacity and therefore 205 m will be impacted, which is the second smallest of the alternatives.

Fugitive dust could be generated from Alternative D which has the third largest slurry tailings area (122.8 ha) during drier conditions although there would only be a distance of 0.5 km (shortest) to travel during construction which could generate dust. The ability to minimize GHG emissions generated from the construction of the tailings starter dam are predicted to be fair, as clearing is within a moderately sized area (88 ha), with a small volume (1.57 Mm^3) of dam construction materials to be hauled over a short distance (<1.5 km). The distance from the centroid of Alternative D to the closest receptor is approximately 5.6 km, which is seventh largest distance and would therefore have the greater impact in terms of noise emissions.

The closest protected area is the Toadfish Lakes Wilderness Area, which is approximately 1.7 km from the centroid of Alternative D, which is the fourth smallest.

In the event of a TMF dam failure, the magnitude of a failure would be dependent on the height and length of the dam. Alternative D has the second largest dam height (40 m) with the second longest dam length of 3,600 m. The most sensitive area downstream is Fifteen Mile Stream, which is located 2.9 km from Alternative D, but there is public infrastructure (road crossing for a local road access) located 0.85 km downstream.

7.4.3 Technical Characterization

The design of Alternative D has a storage efficiency of 2.8, which is the fifth largest. The dam volume of the final embankment for Alternative D is the second largest (4.59 Mm^3). Tailings dams are required along a large portion of the perimeter, with a large primary dam. Alternative D is located in an area that provides some opportunities to take advantage of natural topography, particularly on the south edge.

With respect to safety, there are six bends in the TMF dam for Alternative D, which is the third largest. It has a dam length of 3.6 km and dam height of 40 m which are the second largest. The TMF dam design is based on a rockfill structure for conventional slurry tailings with five water management ponds (four seepage ponds and one supernatant pond) and 3.5 km of seepage ditching.

For management of contact runoff, Alternative D will not require any non-contact water diversion ditches, and will require surplus water management systems consisting of a 1.25 km of pipeline and one pump to transfer excess water to the water treatment plant. It is anticipated that 155 ha of the associated watershed will be impacted, which is the second smallest of all alternatives. Approximately 3.5 km of seepage ditching will be required around the perimeter of the TMF, which is the third largest. Alternative D will also require a 2.2 km long pipeline to return reclaim water from the TMF to the mill, which is the second smallest.

The starter embankment for Alternative D requires approximately 1.57 Mm^3 of dam fill materials to construct, which is the largest. The final embankment for Alternative D would require an additional 3.02 Mm^3 of dam fill materials to construct, which is the third largest. In addition, it would require the fourth largest additional seepage ditching (1.0 km) of all alternatives.

With respect to the ability to obtain the initial environmental permits, Alternative D has some baseline geotechnical knowledge and some engineering studies completed for the conventional slurry tailings design. Consultation for Alternative D has been partial, and as a result, the anticipated permitting schedule would be anticipated to be moderate.

The straight-line distance between the processing facility and the TMF is 0.5 km. The elevation difference between the TMF and the mill for Alternative D is the third highest with the crest elevation of the final TMF embankment being 168 masl. As Alternative D uses a conventional slurry tailings design, the complexity of the processing is low, although it will require a tailings pipeline distance of 3.5 km. Given the pipeline length, there is a lower risk of freezing if not drained/ not in continuous use. Overall, the complexity of depositing tailings for this alternative is based on conventional slurry tailings deposition methodology and is therefore considered to be low complexity.

Alternative D will be constructed for conventional slurry tailings disposal, however there is currently limited geotechnical data in the area of the TMF dam to assess the suitability of foundation conditions. It is anticipated that the distance to haul suitable dam construction materials would be less than 1.5 km, which is the shortest distance.

7.4.4 Project Economics Characterization

Alternative D is projected to have the third lowest overall costs out of the seven alternatives.

The capital cost of building Alternative D is the second highest, due to the amount of dam construction material required. The dam volume requires the most amount of material during the construction of the starter dam. The sustaining capital costs of Alternative D is the third highest (less than Alternative C and G), as the amount of dam material required and area to be cleared will be greater than other alternatives during subsequent raises. The operating costs for Alternative D are the third lowest of the conventional slurry tailings options due to the distance and elevation required to pump the tailings and the reclaim water for processing. The closure and post-closure costs for Alternative D are the third highest due to the size of the tailings area to be reclaimed.

The amount of baseline geotechnical data would need to be increased, however there is adequate environmental data for this location. As a result, the development of preliminary engineering studies could be completed in a shorter period of time thereby reducing the risk associated with not obtaining the initial permit for this alternative. It is expected to reduce the net present value by approximately $3.8 million.

7.4.5 Socio-Economic Characterization

Loss of recreational fishing opportunities are the third smallest with Alternative D due to limited loss of waterbody and watercourse fish habitat. The loss of commercial forest harvesting is limited to 1.5 ha, however the loss of ATV trails is the second highest with Alternative D. There will be no impact to private land ownership with this alternative.

The potential for fugitive dust is lower with the conventional slurry tailings design, compared to the filtered tailings, particularly with the third largest footprint (122 ha) for Alternative D, although it is located 0.5 km from the processing facility, which will minimize the generation of dust from construction traffic.

The potential for a hazard to the public is lower with Alternative D due to the distance of the tailings facility to Fifteen Mile Stream (2.9 km) although there is a public road crossing approximately 0.85 km downstream.

The risk to workers from a potential failure with Alternative D is considered to be higher in comparison to the other alternatives due to the second highest dam height of 40 m and the third farthest distance from the mine workings (3.5 km).

Operational impacts from Alternative D are anticipated to be higher. The visual impacts from this alternative will be relatively high due to the second highest dam crest elevation (40 m), and the shortest distance from the TMF to the close sensitive receptor, to the south.

Due to the fact this alternative has a slightly higher capital and operating cost, it is anticipated to be influenced by fluctuations in the market price of gold and it could result in the need to place the operation in temporary care and maintenance. As a result, there is a potential risk to local jobs and business opportunities.

7.5 Alternative E: Location #5, Filtered Tailings

7.5.1 Overview

Alternative E utilizes filtered tailings management at a TMF that is also located to the east of the open pit (Location #5; see Figure 12). It has the second smallest TMF footprint of all the alternatives and is closer in proximity to the centroid of the open pit than Alternative B, C and G.

7.5.2 Environmental Characterization

Alternative E has the smallest water storage volume of 1.38 Mm^3, within six water managements ponds including two main water management ponds and four seepage management ponds. The closest receiving waterbody is Anti-Dam Flowage, which has a large assimilative capacity. Alternative E will be located over the watershed divide of three subwatersheds, and the design will indirectly result in a reduction of flows (>25%) along a 2,757 m length of the associated watercourses, which is the fifth largest of all alternatives. There are no watercourse realignments associated with Alternative E, and it will directly overprint 0.1 ha of waterbody fish habitat and the second smallest amount of watercourse fish habitat (122.4 m). It is anticipated that there will be no watercourse crossings required to construct and operate Alternative E.

Alternative E has the smallest footprint at 111.6 ha, and will use the fourth largest amount of previously disturbed habitat (3.9 ha). Alternative E will impact the least amount of wetland (5.7 ha) and it is anticipated to impact the smallest amount of mainland moose habitat (5.8 ha). It is assumed that all watercourse habitat will support Brook Trout in some capacity and therefore 122 m will be impacted, which is the second smallest of the alternatives.

Fugitive dust could be generated from Alternative E which has the smallest filtered tailings area (111 ha) although the access road for construction of the TMF and deposition of tailings during operation would be 0.6 km (shortest). The ability to minimize GHG emissions generated from the construction of the tailings starter dam and water management ponds are predicted to be poor, as clearing is within a larger sized area (105 ha), with a small volume (1.35 Mm^3) of dam construction materials to be hauled over a short distance (<1.5 km) and nearly 40,000 trips to deposits the tailings during operations. The distance from the centroid of Alternative E to the closest receptor is approximately 5.6 km, which is sixth largest distance and would therefore have the greater impact in terms of noise emissions.

The closest protected area is the Toadfish Lakes Wilderness Area, which is approximately 1.84 km from the centroid of Alternative E, which is the fifth shortest distance.

In the event of a TMF dam failure, the magnitude of a failure would be dependent on the height and length of the dam. In addition, there will be two water management ponds for this alternative, in which the northern pond will have a dam height of 11 m and length of 1.03 km. Alternative E has the highest dam height (48 m) with the largest dam length of 3.3 km. The most sensitive area downstream is Fifteen Mile Stream, which is located 2.7 km from Alternative E, but there is public infrastructure (road crossing for a local road access) located 0.85 km downstream.

7.5.3 Technical Characterization

The design of Alternative E has a storage efficiency of 2.5, which is the smallest. The total TMF dam volume for Alternative E is the fourth smallest (3.96 Mm^3), with an additional 0.62 Mm^3 required to construct the water management ponds. Tailings dams are required around all of the perimeter, with a large primary dam. Alternative E is located in topography that provides limited opportunities to take advantages of natural topography on any side.

With respect to safety, there are nine bends in the TMF dam for Alternative E, which is the largest. It has a dam length of 3.3 km and dam height of 48 m which is the highest. The TMF dam design is based on a rockfill structure for filtered tailings with a surface area of 111.6 ha, two main water management ponds and 5.69 km of seepage ditching to manage fugitive dust and seepage.

For management of contact water runoff, Alternative E will not require any non-contact water diversion ditches, and will require a surplus water management system for each water management pond consisting of one pump per pond, and a total of 1.47 km of pipeline, to transfer excess water to the water treatment plant. It is anticipated that 158 ha of the associated watershed will be impacted, which is the fifth largest of all alternatives. Approximately 5.69 km of seepage ditching will be required around the perimeter of the TMF, which is the largest. Alternative E will also require a 1.5 km long pipeline to return reclaim water from the TMF to the mill, which is the shortest.

The starter embankment for Alternative E requires approximately 1.09 Mm^3 of dam fill materials to construct, which is the fourth largest. The final embankment for Alternative E would require an additional 2.87 Mm^3 of dam fill materials to construct, which is the third largest. In addition, it would require the smallest amount of additional seepage ditching (0.7 km) of all alternatives.

With respect to the ability to obtain the initial environmental permits, Alternative E has good baseline geotechnical knowledge and some preliminary engineering studies completed for the filtered tailings design. Consultation for Alternative E has been limited, and as a result, the anticipated permitting schedule would be anticipated to be long primarily due to the use of a non-conventional technology.

As Alternative E uses a filtered tailings design, the complexity of the processing and tailings disposal is high due to extensive human invention required, particularly in transporting tailings a distance of 0.5 km (straight-line) from the processing facility. The elevation difference between the TMF and the mill for Alternative E is the second largest with the crest elevation of the final TMF embankment being 171 masl

Alternative E will be constructed for filtered tailings management, and there is limited geotechnical data in the area of the TMF to assess foundation conditions. It is anticipated that the distance to haul suitable dam construction materials would be less than 1.5 km, which is the smallest distance.

7.5.4 Project Economics Characterization

Alternative E is projected to have the second highest overall costs out of the seven alternatives.

The capital cost of building Alternative E is the highest, due to a footprint requiring additional area to clear and grub, the requirement of pipelines and other infrastructure, and the poor storage-to-dam volume ratio. The dam volume requires the second highest amount of material during the construction of the starter dam. The sustaining capital costs of Alternative E is the second lowest, primarily due to the limited requirement to grub the area after the initial work, during subsequent raises. The operating costs for Alternative E are the highest of the filtered tailings options, and highest of all alternatives due to the technology being used. The closure and post-closure costs for Alternative E are the lowest due to the limited amount of materials required to reclaim the area, although there are substantial costs associated with the reclamation of the access road for this alternative.

Although there is an adequate amount of baseline geotechnical and environmental data for this location, and partial development of some preliminary engineering studies, there is a risk to the ability to obtain the initial permit for this alternative due to the use of a non-conventional technology. This could reduce the Project net present value by as much as $11.4 million.

7.5.5 Socio-Economic Characterization

Loss of recreational fishing opportunities are the second smallest with Alternative E due to the limited loss of waterbody and watercourse fish habitat. There is a 1.1 ha loss of commercial forest harvesting, however the loss of ATV trails is the second smallest (679 m) with Alternative E. Where there will be an impact to private land ownership, this alternative will have a loss of 1.3 ha loss.

The potential for fugitive dust with the filtered tailings design is high, despite that Alternative E has the smallest footprint (111 ha) of the filtered tailings option, but still requires approximately 40,000 truck trips to transport the tailings along a distance of 0.6 km from the processing facility. The potential for a hazard to the public is lower with Alternative E due to the distance of the tailings facility to Fifteen Mile Stream (2.7 km) although there is a public road crossing approximately 0.85 km downstream. The risk to workers from a potential failure with Alternative E is considered to be higher than the other alternatives due to the highest dam height of 48 m and the shortest distance from the mine workings (0.5 km).

Operational impacts from Alternative E are anticipated to be higher. The visual impacts from this alternative will be relatively high as the crest elevation of the dam is the highest (48 m) and the location of the TMF is the fifth furthest from the close sensitive receptor, to the south.

Due to the fact this alternative has a high capital and operating cost, it is not anticipated to be resilient to fluctuations in the market price of gold and may be at risk to place the operation in temporary care and maintenance. As a result, the impact to local jobs and business opportunities could be impacted.

7.6 Alternative F: Location #7, Conventional Slurry Tailings

7.6.1 Overview

Alternative F utilizes conventional slurry tailings management with the TMF located to the west of the open pit (Location#7). It has the largest TMF footprint of all the alternatives and is located more than 4 km to the west of the centroid of the open pit (Figure 13).

7.6.2 Environmental Characterization

Alternative F has a water storage volume of 1.6 Mm^3 in, within three water managements ponds including the TMF supernatant pond and two seepage management ponds. The closest receiving waterbody is a tributary of Seloam Lake, which has a small assimilative capacity. Alternative F will be located within one subwatersheds, and the design will indirectly result in the reduction of flows (>25%) along a 1,975 m length of the associated watercourses, which is the second smallest of all alternatives. A required watercourse realignment of 198 m would be required for Alternative F to divert water around the TMF. In addition, Alternative F will directly overprint 0.4 ha of waterbody fish habitat and a total of 3.7 km of watercourse fish habitat. It is anticipated that there will two watercourse crossings required to construct and operate Alternative F.

Alternative F has the largest footprint at 158.2 ha, and will use the second largest amount of previously disturbed habitat (4.2 ha). Alternative F will impact the third largest amount of wetland (9.5 ha) and it is anticipated to impact the third largest mainland moose habitat (9.9 ha). It is assumed that all watercourse habitat will support Brook Trout in some capacity and therefore 3,687 m will be impacted, which is the largest, of the alternatives.

Fugitive dust could be generated from Alternative F which has the largest slurry tailings area (158 ha) during drier conditions and includes travel distance of 6.0 km (longest) during construction which could generate dust. The ability to minimize GHG emissions generated from the construction of the tailings starter dam are predicted to be fair, as clearing is within a moderately sized area (84 ha), with a small volume (0.39 Mm^3) of dam construction materials to be hauled over a long distance (<7.5 km). The distance from the centroid of Alternative F to the closest receptor is approximately 9.3 km, which is second largest distance and would therefore have a smaller impact in terms of noise emissions.

The closest protected area is the Abraham Lake Wilderness Area, which is approximately 2.2 km from the centroid of Alternative F, which is the second largest.

In the event of a TMF dam failure, the magnitude of a failure would be dependent on the height and length of the dam. Alternative F has the fourth largest dam height (32 m) with the shortest dam length of 2.05 km. The most sensitive area downstream is Fifteen Mile Stream, which is located 2.1 km from Alternative F, but there is a transmission line located 1.3 km and road crossing 2.0 km downstream of the TMF.

7.6.3 Technical Characterization

The design of Alternative F has a storage efficiency of 11.5, which is the largest and most favourable. The total dam volume for Alternative F is the smallest (1.37 Mm^3). Alternative F is located in a bowl like basin that provides excellent containment and is surrounded by high ground for most of the perimeter, with a moderate dam required at the outlet of the bowl.

With respect to safety, there are two bends in the TMF dam for Alternative F, which is the smallest number. It has a dam length of 2.05 km and dam height of 32 m which are the third largest. The TMF dam design is based on a rockfill structure for conventional slurry tailings with three water management ponds (two seepage ponds and one supernatant pond) and 2.2 km of seepage ditching.

For management of contact water runoff, Alternative F will require 3.1 km of ditching to divert non-contact water around the TMF, and a surplus water management system consisting of a 7.2 km long pipeline and two pumps to transfer excess water to the water treatment plant. It is anticipated that 235 ha of the associated watershed will be impacted, which is the largest of all alternatives. Approximately 2.2 km of seepage ditching will be required around the perimeter of the TMF, which is the smallest amount. Alternative F will also require a 7.7 km long pipeline to return reclaim water from the TMF to the mill, which is the longest.

The starter embankment for Alternative F would require approximately 0.38 Mm^3 to construct, which is the second smallest. The final embankment for Alternative F would require an additional 0.99 Mm^3 of dam fill material to construct, which is the smallest amount. In addition, it would require the second smallest amount of additional seepage ditching (0.8 km) of all alternatives.

With respect to the ability to obtain the initial environmental permits, Alternative F has minimal baseline geotechnical knowledge and engineering studies completed for a conventional slurry tailings design. Consultation for Alternative F has been limited, however given the use of conventional technology, the anticipated permitting schedule would be moderate.

The straight-line distance between the processing facility and the TMF is 6 km. The elevation difference between the TMF and the mill for Alternative F is the second smallest with the crest elevation of the final TMF embankment being 149 masl. As Alternative F uses a conventional slurry tailings design, the complexity of the processing is low, although it will require a tailings pipeline distance of 9 km. Given the pipeline length, there is a higher risk of freezing if not drained/ not in continuous use. Overall, the complexity of depositing tailings for this alternative is based on conventional slurry tailings deposition methodology and is therefore considered to be low complexity.

Alternative F will be constructed for conventional slurry tailings management, however, there is currently limited geotechnical data in the area of the TMF to assess the suitability of foundation conditions. It is anticipated that the distance to haul suitable dam construction materials would be less than 7.5 km, which is the longest distance.

7.6.4 Project Economics Characterization

Alternative F is projected to have the third highest overall costs out of the seven alternatives.

The capital cost of building Alternative F is the second lowest, due to the lower amount of dam construction material required. The dam volume requires the least amount of material during the construction of the starter dam. The sustaining capital costs of Alternative F is the second lowest (greater than Alternative E), although the amount of clearing will be greater than other alternatives during subsequent raises. The operating costs for Alternative F are the third highest of the conventional slurry tailings options due to the distance and elevation required to pump the tailings and the reclaim water for processing. The closure and post-closure costs for Alternative F are the highest due to the size of the tailings area to be reclaimed and the distance to transport materials.

The quality of baseline geotechnical data for this TMF alternative would need to be improved. Similarly, there are gaps in the environmental data for this location which would need to be improved. As a result, the development of preliminary engineering studies could be completed in a longer period of time thereby increasing the risk associated with not obtaining the initial permit for this alternative. It is expected to reduce the Project net present value by approximately $7.6 million.

7.6.5 Socio-Economic Characterization

Loss of recreational fishing opportunities are the second most with Alternative F due to a substantial loss of watercourse fish habitat. Alternative F will result in the largest loss of commercial forest harvesting at 4.6 ha, and the largest loss of ATV trails at 2.01 km. Where there will be an impact to private land ownership, this alternative will have the largest impact at 51.5 ha.

The potential for fugitive dust is lower with the conventional slurry tailings design, compared to the filtered tailings, particularly with the largest footprint (158 ha) for Alternative F, although it is located 6.0 km from the processing facility, which will increase the generation of dust from construction traffic. The potential for a hazard to the public is lower with Alternative F due to the distance of the tailings facility to Fifteen Mile Stream (2.1 km) although there is a transmission line and public road crossing within this distance. The risk to workers from a potential failure with Alternative F is considered to be higher in comparison to the other alternatives due to the third largest dam height of 32 m and the second farthest distance from the mine workings (6.0 km).

Operational impacts from Alternative F are anticipated to be higher. The visual impacts from this alternative will be moderate due to the third highest dam crest elevation (32 m), and the shortest distance from the TMF to the close sensitive receptor, to the south.

Due to the fact this alternative has the lowest capital and operating cost, it is not anticipated to be influenced by fluctuations in the market price of gold and, in fact, could reduce the need to place the operation in temporary care and maintenance. As a result, there is unlikely to be a risk to local jobs and business opportunities.

7.7 Alternative G: Location #4 (Adjusted), Conventional Slurry Tailings

7.7.1 Overview

Alternative G is a variation of Alternative B which adjusts the eastern limb of the TMF dam to avoid overprinting fish frequented waters. Similar to Alternative B, it utilizes conventional slurry tailings management with the TMF located to the east of the open pit (Location #4; see Figure 14). It has the third smallest TMF footprint of all the alternatives and is in close proximity to the centroid of the open pit.

7.7.2 Environmental Characterization

Alternative G has a water storage volume of 1.6 Mm^3 in, within three water managements ponds including the TMF supernatant pond and two seepage management ponds. The closest receiving waterbody is Anti-Dam Flowage, which has a large assimilative capacity. Alternative G will be located within one subwatersheds, and the design will result in the reduction of flows (>25%) along a 4,279 m length of the associated watercourses, which is the third largest of all alternatives. There is no required watercourse realignment for Alternative G. In addition, there will be no direct overprinting of waterbody or watercourse fish habitat. It is anticipated that there will no watercourse crossings required to construct and operate Alternative G.

Alternative G has the third largest footprint at 112.7 ha, and will use the second smallest amount of previously disturbed habitat (3.3 ha). Alternative G will impact the fifth largest amount of wetland (7.1 ha) and it is anticipated to impact the second smallest amount of mainland moose habitat (7.1 ha).

Fugitive dust could be generated from Alternative G which has the third smallest slurry tailings area (122 ha) during drier conditions and includes travel distance of 0.7 km (second shortest) during construction which could generate dust. The ability to minimize GHG emissions generated from the construction of the tailings starter dam are predicted to be fair, as clearing is within a small area (66 ha), with a moderate volume (1.27 Mm^3) of dam construction materials to be hauled over a short distance (<1.5 km). The distance from the centroid of Alternative F to the closest receptor is approximately 9.3 km, which is second largest distance and would therefore have a smaller impact in terms of noise emissions.

The closest protected area is the Toadfish Lakes Wilderness Area, which is approximately 1.6 km from the centroid of Alternative G, which is the third shortest.

In the event of a TMF dam failure, the magnitude of a failure would be dependent on the height and length of the dam. Alternative G has the third highest dam height (36 m) with the second longest dam length of 3.6 km. The most sensitive area downstream is Fifteen Mile Stream, which is located 3.6 km from Alternative G, with a road crossing located 0.85 km downstream.

7.7.3 Technical Characterization

The design of Alternative G has a storage efficiency of 2.94, which is the fourth highest. The total dam volume for Alternative G is the highest (4.98 Mm^3). Tailings dams are required along a large portion of the perimeter with a large primary dam. The TMF is located in topography that provides some advantages on the south edge.

With respect to safety, there are seven bends in the TMF dam for Alternative G, which is the third highest. It has a dam length of 3.6 km and dam height of 36 m which are the third highest. The TMF dam design is based on a rockfill structure for conventional slurry tailings management with three water management ponds (two seepage ponds and one supernatant pond) and 4.1 km of seepage ditching.

For management of contact water runoff, Alternative G will not require any non-contact water ditching, but will require a surplus water management system consisting of two pumps and a 0.82 km long pipeline to transfer excess water to the water treatment plant. It is anticipated that 145 ha of the associated watershed will be impacted, which is the smallest of all alternatives. Approximately 4.1 km of seepage ditching will be required around the perimeter of the TMF, which is the second largest. Alternative G will also require a 2.2 km long pipeline to return reclaim water from the TMF to the mill, which is the fourth largest.

The starter embankment for Alternative G requires approximately 1.27 Mm^3 of dam fill material to construct, which is the second largest. The final embankment for Alternative G would require an additional 3.71 Mm^3 of dam fill material to construct, which is the largest amount. In addition, it would require the second largest amount of additional seepage ditching (1.6 km) of all alternatives.

With respect to the ability to obtain the initial environmental permits, Alternative G has good baseline geotechnical knowledge and some engineering studies completed for a conventional slurry tailings design. Consultation for Alternative G has been limited, however given the use of conventional technology, the anticipated permitting schedule would be moderate.

The straight-line distance between the processing facility and the TMF is 0.7 km. The elevation difference between the TMF and the mill for Alternative C is the third largest with the crest elevation of the final TMF embankment being 168 masl. As Alternative G uses a conventional slurry tailings design, the complexity of the processing is low, although it will require a tailings pipeline distance of 3.5 km. Given the pipeline length, there is a lower risk of freezing if not drained/ not in continuous use. Overall, the complexity of depositing tailings for this alternative is based on conventional slurry tailings deposition methodology and is therefore considered to be low complexity.

Alternative G will be constructed for conventional slurry tailings management, and since there is an adequate amount of geotechnical data in the area of the TMF, the suitability of foundation conditions is considered good. It is anticipated that the distance to haul suitable dam construction materials would be less than 1.5 km, which is the shortest distance.

7.7.4 Project Economics Characterization

Alternative G is projected to have the fifth highest overall costs out of the seven alternatives.

The capital cost of building Alternative G is the third lowest, due to the minimal clearing and pipeline infrastructure required. The dam volume requires the third lowest amount of material during the construction of the starter dam. The sustaining capital costs of Alternative G is the second highest (greater than Alternative C), although the amount of dam construction materials and haulage will be greater than other alternatives during subsequent raises. The operating costs for Alternative G is the lowest of the conventional slurry tailings options due to the distance and elevation required to pump the tailings and the reclaim water for processing. The closure and post-closure costs for Alternative G are the fourth highest in comparison to other alternatives.

The quality of baseline geotechnical data for the TMF location may not need to be improved, however there may be inadequate environmental data for this location. As a result, the development of preliminary engineering studies could be completed in a shorter period of time thereby reducing the risk associated with not obtaining the initial permit for this alternative. It is expected to reduce the Project net present value by approximately $7.6 million.

7.7.5 Socio-Economic Characterization

Loss of recreational fishing opportunities are the smallest with Alternative G due no loss of fish habitat. Alternative G will result in a moderate loss of commercial forest harvesting at 1.3 ha, and the second smallest loss of ATV trails at 0.7 km. There will be no loss of private land ownership with this alternative.

The potential for fugitive dust is lower with the conventional slurry tailings design, compared to the filtered tailings, particularly with the third largest footprint (112 ha) for Alternative G, although it is located 0.7 km from the processing facility, which will slightly increase the generation of dust from construction traffic. The potential for a hazard to the public is lower with Alternative G due to the distance of the tailings facility to Fifteen Mile Stream (3.6 km) although there is a public road crossing 0.85 km downstream. The risk to workers from a potential failure with Alternative G is considered to be higher in comparison to the other alternatives due to the third highest dam height of 36 m and the second closest distance from the mine workings (0.7 km).

Operational impacts from Alternative G are anticipated to be higher. The visual impacts from this alternative will be moderate due to the third highest dam crest elevation (36 m), and the longer distance from the TMF to the close sensitive receptor, to the south.

Due to the fact this alternative has the third highest capital and operating cost, it is anticipated to be influenced by fluctuations in the market price of gold and, in fact, could increase the need to place the operation in temporary care and maintenance. As a result, there is a possibility of a risk to local jobs and business opportunities.

8.0 MULTIPLE ACCOUNTS LEDGER

8.1 Selection of Sub-Accounts and Indicators

Sub-accounts and indicators were chosen using the methodology described in Section 4.4 and in accordance with the Guidelines. Sub-accounts and indicators were chosen based on Project team experience with mine rock stockpiles and assessments of alternatives for other mining projects. The Project Team included both Atlantic staff and their consultants. During the preparation of the report, consultation with Indigenous communities was undertaken and feedback / input was sought to inform the report. This included the alternatives, accounts, subaccounts, indicators, measurement parameters and weightings.

A complete list of sub-accounts and indicators used to develop the multiple accounts ledger, including the rationale for their selection, is provided in Table 5.

Sub-accounts and indicators were chosen such that they would allow for a clear differentiation between the alternative locations. During characterization of the alternatives, it was noted that several indicators revealed little, or no, meaningful differences, between the alternatives. Therefore, in the interests of analyzing the alternatives relative to each other, and as per the Guidelines, these sub-accounts and indicators were removed from the MAA. Sub-accounts and indicators removed from the MAA include:

- **Environment, Terrestrial Resources – Loss of Interior Forest:** This indicator was removed as it is not expected to have any real difference in effects amongst the alternatives.
- **Environment, Terrestrial Resources – Loss of Old Forest:** This indicator was removed as none of the alternatives are expected to impact old forest.
- **Environment, Sensitive Species – Loss of Common Nighthawk Habitat:** This indicator was removed as none of the alternatives are expected to impact habitat for Common Nighthawk.
- **Environment, Sensitive Species – Loss of Canada Warbler Habitat:** This indicator was removed as there is insufficient data to assess all alternatives considered.
- **Environment, Terrestrial Resources – Number of SAR:** This indicator was removed as there is insufficient data to assess all alternatives considered.
- **Technical, Expansion Capacity – Ease of Obtaining Permits:** Removed as it was considered under the Maximum Expansion Capacity indicator.
- **Socioeconomic, Indigenous Land Use and Heritage Value – Loss of Access for Traditional Purposes:** This indicator was removed as the parameters used in characterizing the indicator were considered through the loss of ATV trails.

- **Socioeconomic, Indigenous Land Use and Heritage Value – Loss of Traditional Harvesting:** This sub-account has been removed as no specific information relating to traditional use has been identified for the alternative locations.

- **Socioeconomic, Indigenous Land Use and Heritage Value – Distance from Indigenous Sensitive Areas:** This sub-account has been removed as no specific no Indigenous sensitive areas have been identified near the alternatives.

- **Socioeconomic, Non-Indigenous Land Use – Loss of Hunting:** This indicator was removed as no specific information relating to traditional use has been identified for the alternative locations.

- **Socioeconomic, Non-Indigenous Land Use – Loss of Trapping:** This indicator was removed as there is insufficient data and/or specific trapping activity near all alternatives available to evaluate the alternatives considered.

- **Socioeconomic, Human Health and Public Safety – Loss of Public Infrastructure:** This indicator was removed as the parameters used in characterizing the indicator were considered through the hazard potential to the public indicator.

- **Socioeconomic, Human Health and Public Safety – Interference with Public Traffic:** Removed as only one alternative is expected to impact public traffic.

- **Socioeconomic, Archeological / Cultural Sites – Areas of Archeological potential:** This sub-account has been removed as no specific archaeological or cultural sites, including associated trails, travel routes and habitation sites, have been identified near the alternatives.

- **Socioeconomic, Local Economic Risk – Loss of Local Jobs:** This indicator was removed as the parameters used in characterizing the indicator were considered with the loss of business opportunities.

8.2 Valuating Criteria

Criteria used to calculate indicator values for each of the indicators in the multiple accounts ledger are provided in Table 6.

9.0 VALUE BASED DECISION PROCESS

9.1 Valuating

A multiple accounts ledger was developed for the seven alternatives considered through the MAA. Using the alternatives characterization (Table 4) and valuation criteria (Table 6), values have been determined for all indicators, which are presented in Table 7.

9.2 Weighting

In accordance with the Guidelines (Environment Canada 2013), weights have been applied to each account, sub-account and indicator, to reflect the relative importance of the criteria. The base case scenario uses the following weights established in the Guidelines for the primary accounts:

- Environmental (6);
- Technical (3);
- Project Economics (1.5); and
- Socio-Economic (3).

Overall, the Environmental account is weighted twice as important as the Technical and Socio-Economic accounts, which in turn are twice as important as the Project Economics account.

Weights for sub-accounts and indicators are presented in Table 8. As noted in Section 8.1, these weights were selected by a team of internal experts with experience related to the various accounts and disciplines. Where applicable, consideration was given to include the results of consultation with Indigenous groups and other stakeholders. Although subjective by nature, Atlantic believes the weights selected reflect the relative importance between the various criteria taking into account both technical experience and consultation efforts, and rationale for each weight is provided in Table 8.

9.3 Quantitative Analysis – Base Case

9.3.1 Indicators

Using the values and weights provided in Tables 7 and 8, respectively, the MAA was conducted for the base case scenario. The analysis of Environmental, Technical, Project Economics and Socio-economic indicators, and calculation of sub-account merit ratings is provided in Tables 9, 10, 11 and 12, respectively.

9.3.2 Sub-Accounts

The analysis of Environmental, Technical, Project Economics, and Socio-economic sub-accounts, and calculation of account merit ratings, is provided in Tables 13, 14, 15 and 16, respectively.

From an environmental perspective, Alternative G is the preferred alternative with an account merit rating of 5.2 out of a maximum of 6.0. Alternative D and E were the next preferred with both receiving an account merit rating of 4.8.

For the technical account, Alternative B is clearly the preferred alternative with an account merit rating of 4.5. Alternative F, the next most viable alternative received an account merit rating of 3.8.

From a Project Economics perspective, Alternative D is the preferred alternative, with an account merit rating of 4.4. Alternative B was the next most viable alternative from an economic perspective with an account merit rating of 4.3.

From a Socio-economics perspective, Alternatives A and B were the preferred alternatives with an account merit rating of 4.2. Alternative C and G were the next most viable alternatives with an account merit rating of 3.9 out of 6.0.

9.3.3 Base Case Results

Overall results of the MAA base case scenario, and calculation of alternative merit ratings, are provided in Table 17. The results are summarized as follows:

- The MAA found that Alternative B is the overall preferred alternative with an alternative merit rating of 4.4 out of a maximum of 6.0.
- Alternative G was the next most viable, with an alternative merit rating of 4.3.
- Alternative D received an alternative merit rating of 4.2, Alternative A received an alternative merit rating of 4.1, Alternative E received an alternative merit rating of 3.8 and both Alternative C and F received an alternative merit rating of 3.6.

10.0 SENSITIVITY ANALYSIS

Sensitivity analyses were carried out to evaluate the robustness of the analytical process, to manage bias and subjectivity, and to determine the degree to which various options are influenced by the choice of weightings.

Four scenarios were given consideration, in addition to the base case:

- Scenario 1: Base case;
- Scenario 2: All accounts weighted equally;
- Scenario 3: All accounts, sub-accounts and indicators weighted equally;
- Scenario 4: Prioritize people, environment strongly considered (Socio-economics account weighted six, environmental account weighted four, technical account weighted two, project economics weighted one); and
- Scenario 5: Prioritize water (weight of all criteria related to water received a maximum weight).

The results of the sensitivity analyses are documented in Table 18. Quantitative analysis tables for the sensitivity analyses can be found in Appendix A. The sensitivity analyses found that the results of the MAA is robust and not sensitive to change. For all scenarios, the relative order of preference did not change from the base case results and Alternative B remained preferred in all cases.

11.0 CONCLUSION

Using the MAA methodology, the preferred alternative for the mine waste disposal for the Fifteen Mile Stream Gold Project is Alternative B with an alternative merit rating of 4.4 out of a maximum of 6.0. The runner-up alternative (Alternative G) has an alternative merit rating of 4.3. Alternative D has an alternative merit rating of 4.2. Alternative A has an alternative merit rating of 4.1, Alternative E has an alternative merit rating of 3.8, and Alternative C and F both have an alternative merit rating of 3.6. Alternative B, the preferred alternative is shown in Figure 15.

A sensitivity analysis comprised of four additional scenarios was carried out to evaluate the robustness of the analytical process and to determine the degree to which various options are influenced by the choice of weightings. The sensitivity analysis found that the Multiple Accounts Analysis is robust and not sensitive to change. For all scenarios, Alternative B remained the preferred alternative however the order of preference tended towards Alternative A then Alternative G compared to the base case results.

12.0 REFERENCES

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13.0 CLOSING

This Assessment of Alternatives for Storage of Mine Waste has been prepared by Wood for the sole benefit of Atlantic for specific application to the Fifteen Mile Stream Gold Project. The quality of information, conclusions and estimates contained herein are consistent with the level of effort involved in Wood's services and based on: i) information available at the time of preparation, and ii) the assumptions, conditions and qualifications set forth in this document. This report is intended to be used by Atlantic and its nominated representatives only, subject to the terms and conditions of its contract with Wood. Any other use of, or reliance on, this report by any third party is at that party's sole risk. This report has been prepared in accordance with generally accepted industry-standard practices. No other warranty, expressed or implied, is made.

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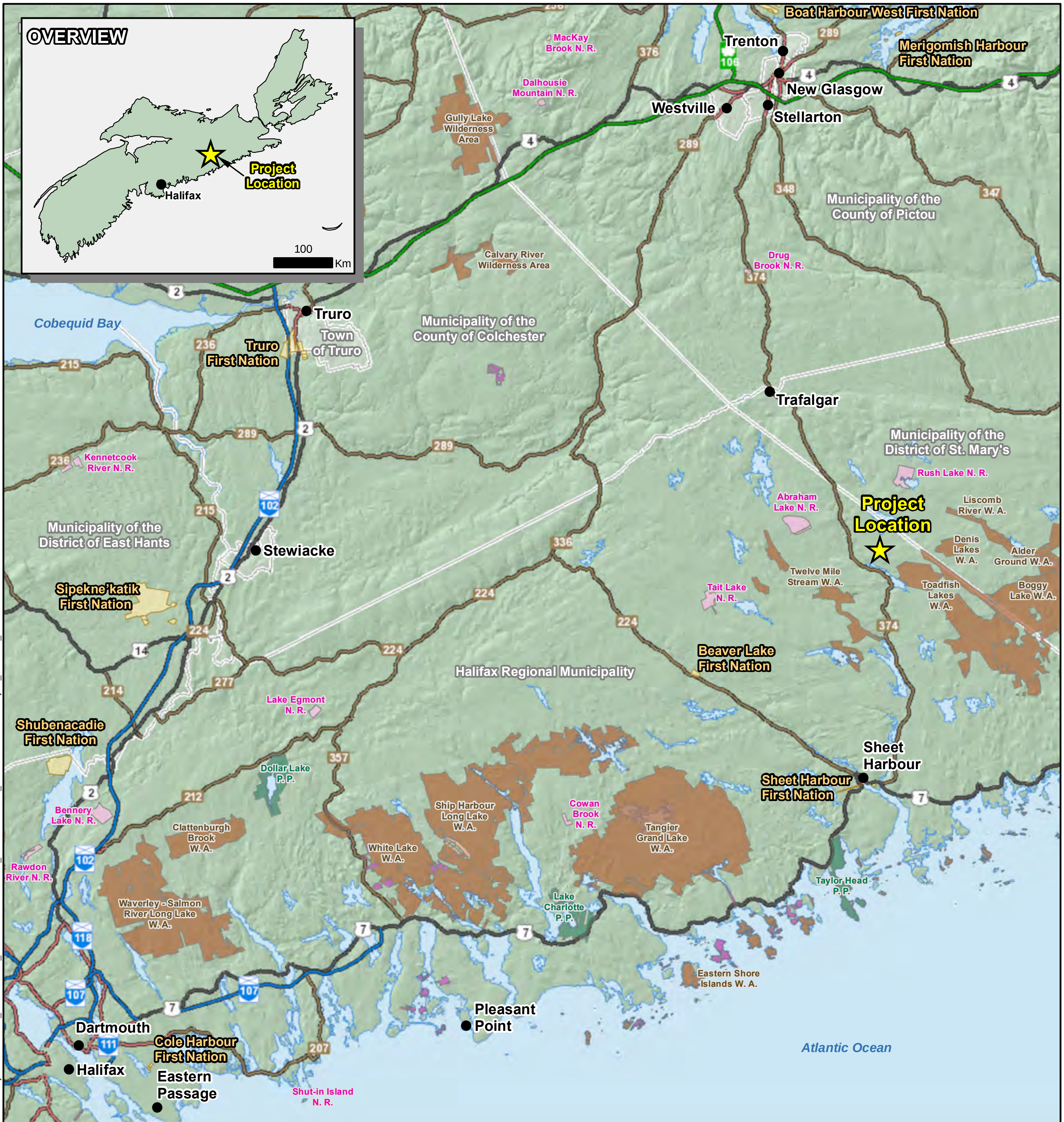

LEGEND

Project Location

Name ● City / Town

Name Municipal Boundary

Name First Nation Reserves

Protected Areas

Conservation Easement

Land Trust Property

N. R. Nature Reserve

P. P. Provincial Park

W. A. Wilderness Area

0 5 10 20 30 40 50 Kilometres

NOTES:
- Topogarphic base data extracted from Nova Scotia GeoPortal and Web Mapping Service.

Datum: NAD83
Projection: UTM Zone 20N

Atlantic Gold
A St Barbara Ltd Company

wood.

FIFTEEN MILE STREAM GOLD PROJECT

Project Location

PROJECT N°: ONS2001	**FIGURE: 1**
SCALE: 1:550,000	DATE: July 2020

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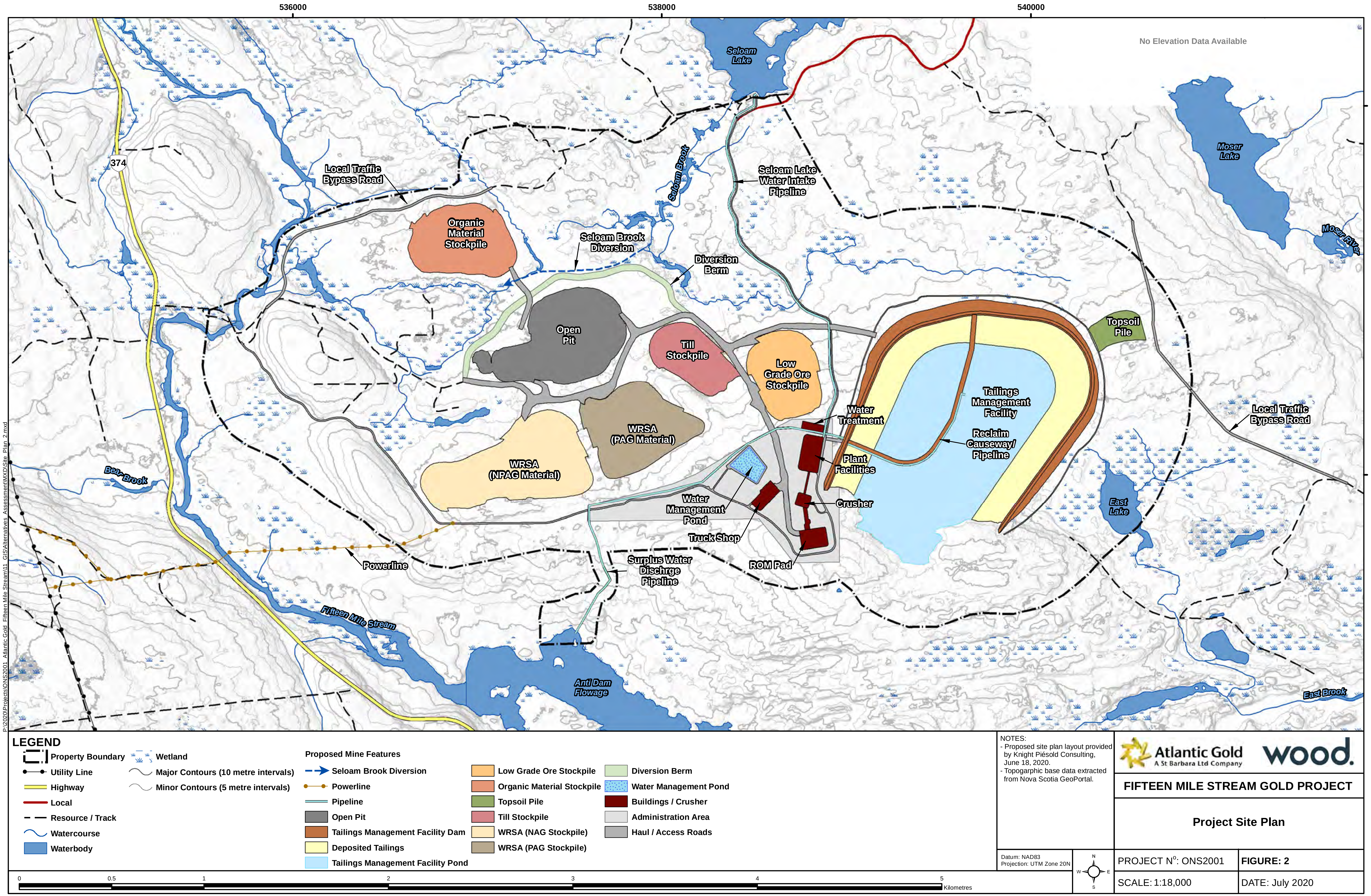
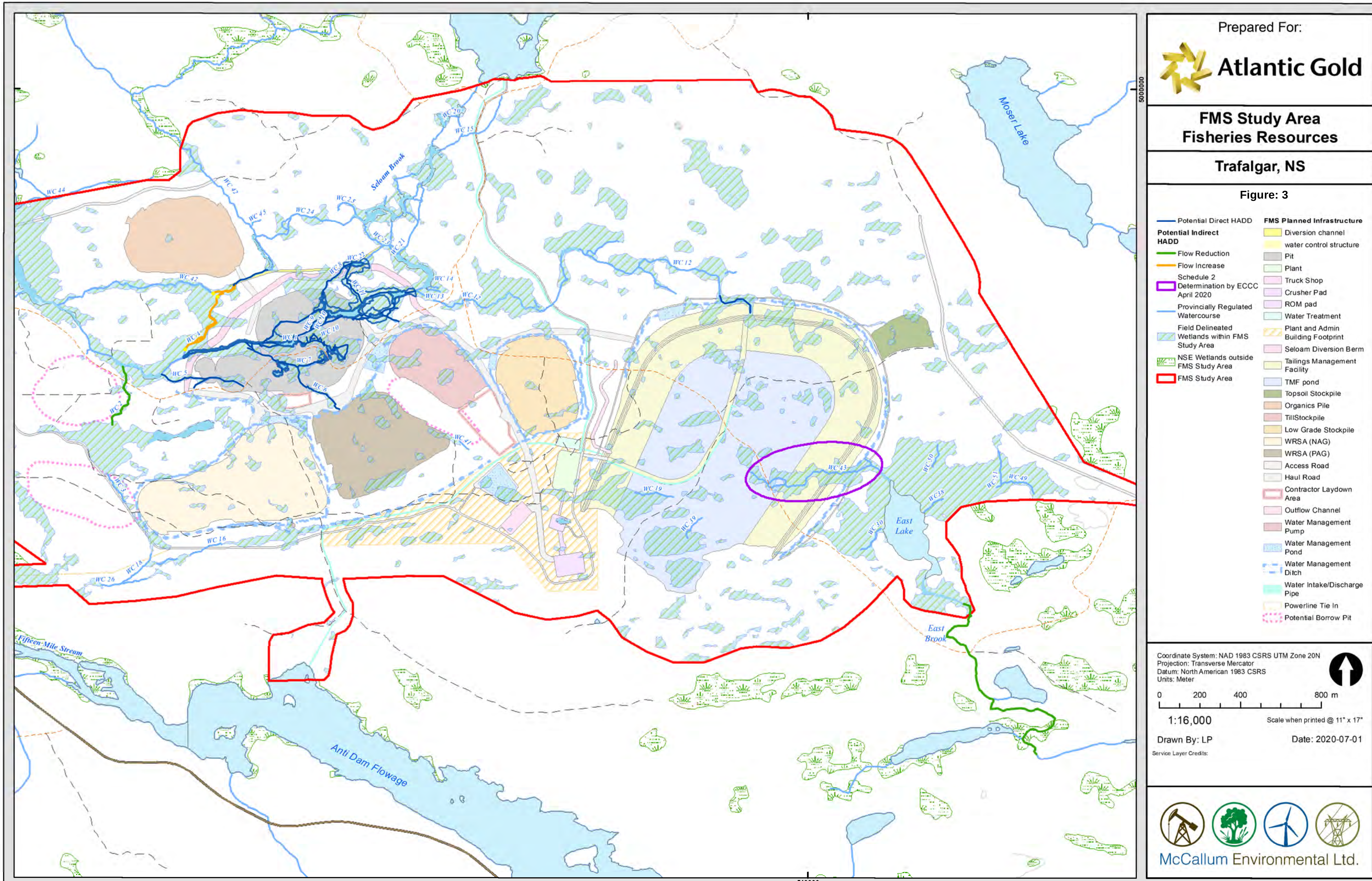


536000
538000
540000
5000000
4998000
No Elevation Data Available
Seloam Lake
374
Local Traffic Bypass Road
Seloam Brook
Seloam Lake Water Intake Pipeline
Moser Lake
Moser River
Organic Material Stockpile
Seloam Brook Diversion
Diversion Berm
Open Pit
Till Stockpile
Low Grade Ore Stockpile
Topsoil Pile
Tailings Management Facility
Reclaim Causeway/ Pipeline
Water Treatment
Plant Facilities
Crusher
WRSA (PAG Material)
WRSA (NPAG Material)
Water Management Pond
Truck Shop
ROM Pad
Surplus Water Dischrge Pipeline
Powerline
Bear Brook
Fifteen Mile Stream
Anti Dam Flowage
East Lake
East Brook
LEGEND
Property Boundary
Utility Line
Highway
Local
Resource / Track
Watercourse
Waterbody
Wetland
Major Contours (10 metre intervals)
Minor Contours (5 metre intervals)
Proposed Mine Features
Seloam Brook Diversion
Powerline
Pipeline
Open Pit
Tailings Management Facility Dam
Deposited Tailings
Tailings Management Facility Pond
Low Grade Ore Stockpile
Organic Material Stockpile
Topsoil Pile
Till Stockpile
WRSA (NAG Stockpile)
WRSA (PAG Stockpile)
Diversion Berm
Water Management Pond
Buildings / Crusher
Administration Area
Haul / Access Roads
NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.
Datum: NAD83
Projection: UTM Zone 20N
Atlantic Gold
A St Barbara Ltd Company
wood.
FIFTEEN MILE STREAM GOLD PROJECT
Project Site Plan
PROJECT N°: ONS2001
FIGURE: 2
SCALE: 1:18,000
DATE: July 2020
0 0.5 1 2 3 4 5 Kilometres


Prepared For:
Atlantic Gold
FMS Study Area
Fisheries Resources
Trafalgar, NS
Figure: 3
Potential Direct HADD
Potential Indirect HADD
Flow Reduction
Flow Increase
Schedule 2 Determination by ECCC April 2020
Provincially Regulated Watercourse
Field Delineated Wetlands within FMS Study Area
NSE Wetlands outside FMS Study Area
FMS Study Area
FMS Planned Infrastructure
Diversion channel
water control structure
Pit
Plant
Truck Shop
Crusher Pad
ROM pad
Water Treatment
Plant and Admin Building Footprint
Seloam Diversion Berm
Tailings Management Facility
TMF pond
Topsoil Stockpile
Organics Pile
TillStockpile
Low Grade Stockpile
WRSA (NAG)
WRSA (PAG)
Access Road
Haul Road
Contractor Laydown Area
Outflow Channel
Water Management Pump
Water Management Pond
Water Management Ditch
Water Intake/Discharge Pipe
Powerline Tie In
Potential Borrow Pit
Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter
0 200 400 800 m
1:16,000
Scale when printed @ 11" x 17"
Drawn By: LP
Date: 2020-07-01
Service Layer Credits:
McCallum Environmental Ltd.
Moser Lake
Seloam Brook
East Lake
East Brook
Fifteen Mile Stream
Anti Dam Flowage
WC 44
WC 42
WC 45
WC 24
WC 25
WC 23
WC 21
WC 22
WC 20
WC 15
WC 14
WC 13
WC 12
WC 11
WC 10
WC 9
WC 8
WC 7
WC 6
WC 5
WC 4
WC 3
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WC 43
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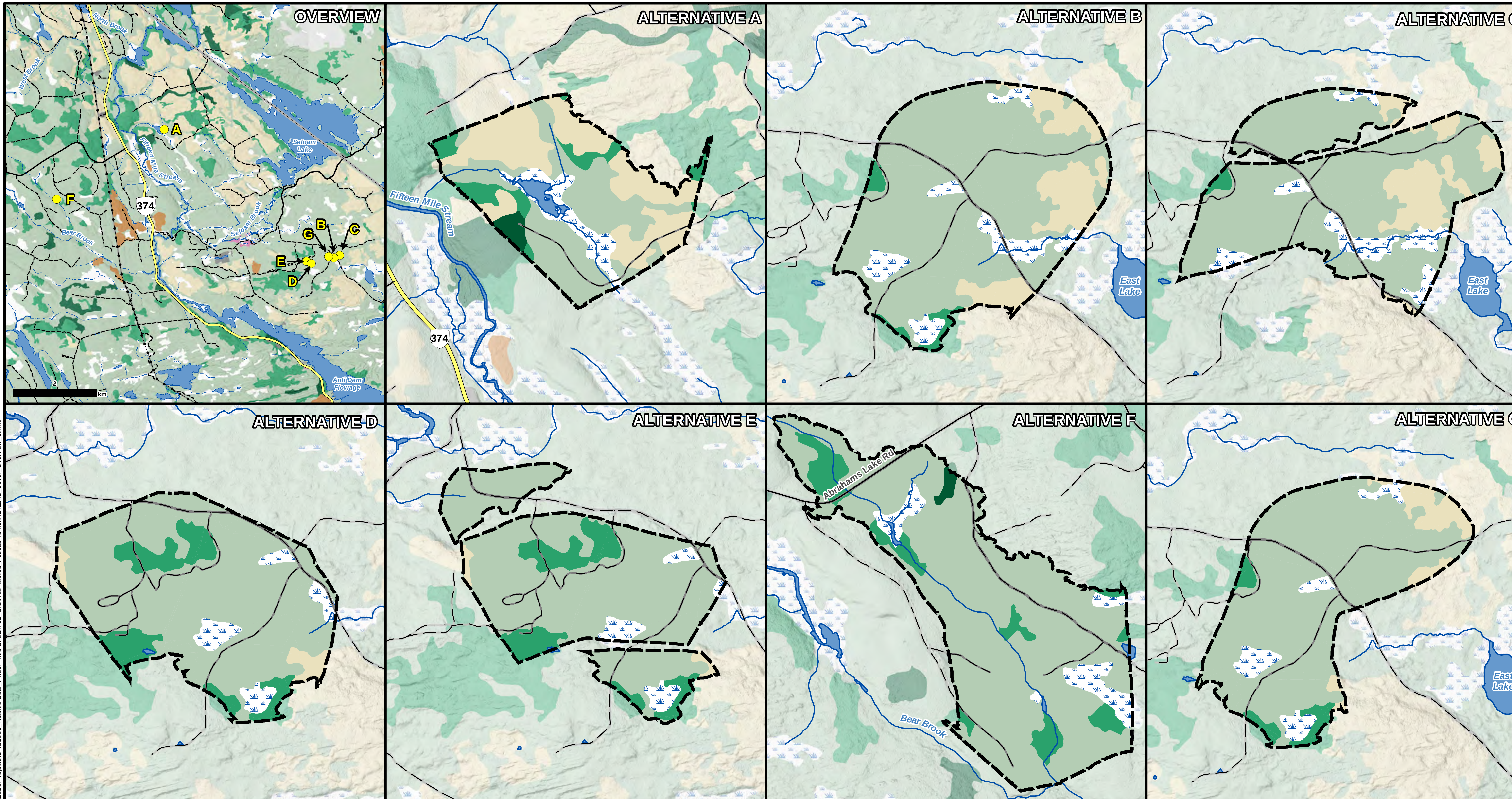
WC 50
WC 51
5000000
540000



LEGEND

- Tailings Management Facility Alternative Centroid
- Tailings Management Facility Alternative Footprint
- Municipal Boundary
- Highway
- Local
- Resource / Track
- Utility Line

Land Cover

Forested	Non-forested
Hardwood	Disturbed
Softwood	Rock/Barren
Mixedwood	Wetland
Harvested	Waterbody
Unclassified	Watercourse
Brush and Alder	

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

0 0.5 1 2 3 4 5 Kilometres

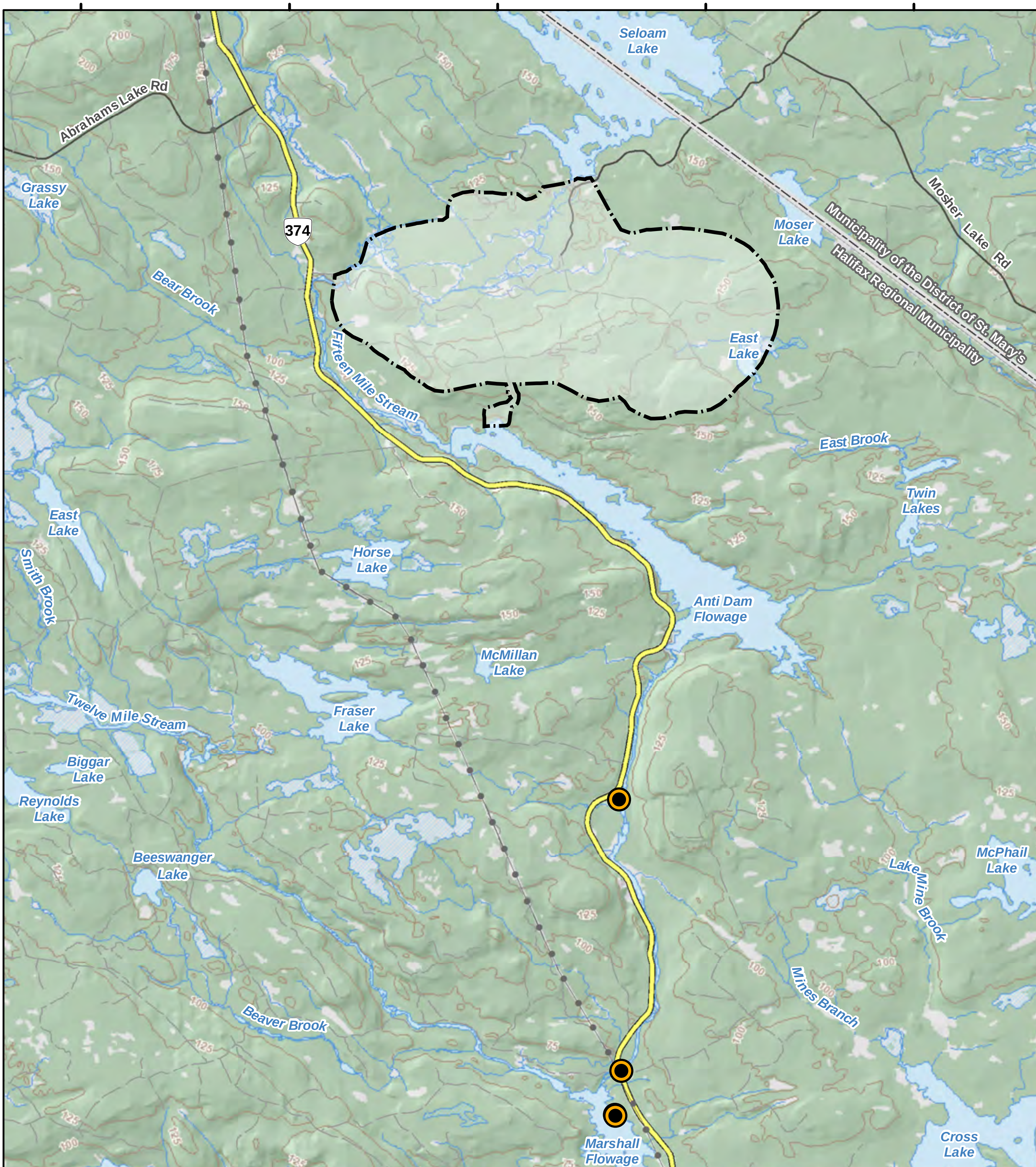
Atlantic Gold
A St Barbara Ltd Company
wood.

FIFTEEN MILE STREAM GOLD PROJECT

Land Cover at the Project Site

PROJECT Nº: ONS2001	FIGURE: 4
SCALE: 1:20,000	DATE: July 2020

P:\2020\Projects\ONS2001_Atlantic Gold_Fifteen Mile Stream\11_GIS\Alternatives_Assessment\MXD\Land_Cover_Overview_3.mxd



P:\2020\Projects\ONS2001_Atlantic Gold_Fifteen Mile Stream\11_GIS\Alternatives_Assessment\MXD\Nearby_Receptor_Locations_2.mxd

LEGEND

- Property Boundary
- Nearby Receptors
- Highway
- Local
- Resource / Track
- Contours (5 metre intervals)
- Municipal Boundary
- Utility Line
- Watercourse
- Wetland
- Waterbody

NOTES:
- Topogarphic base data extracted from Nova Scotia GeoPortal.
- Receptor locations and property boundary provided by McCallum Environmental Ltd.

Datum: NAD83
Projection: UTM Zone 20N

0 0.5 1 2 3 4 5 Kilometres

N W E S

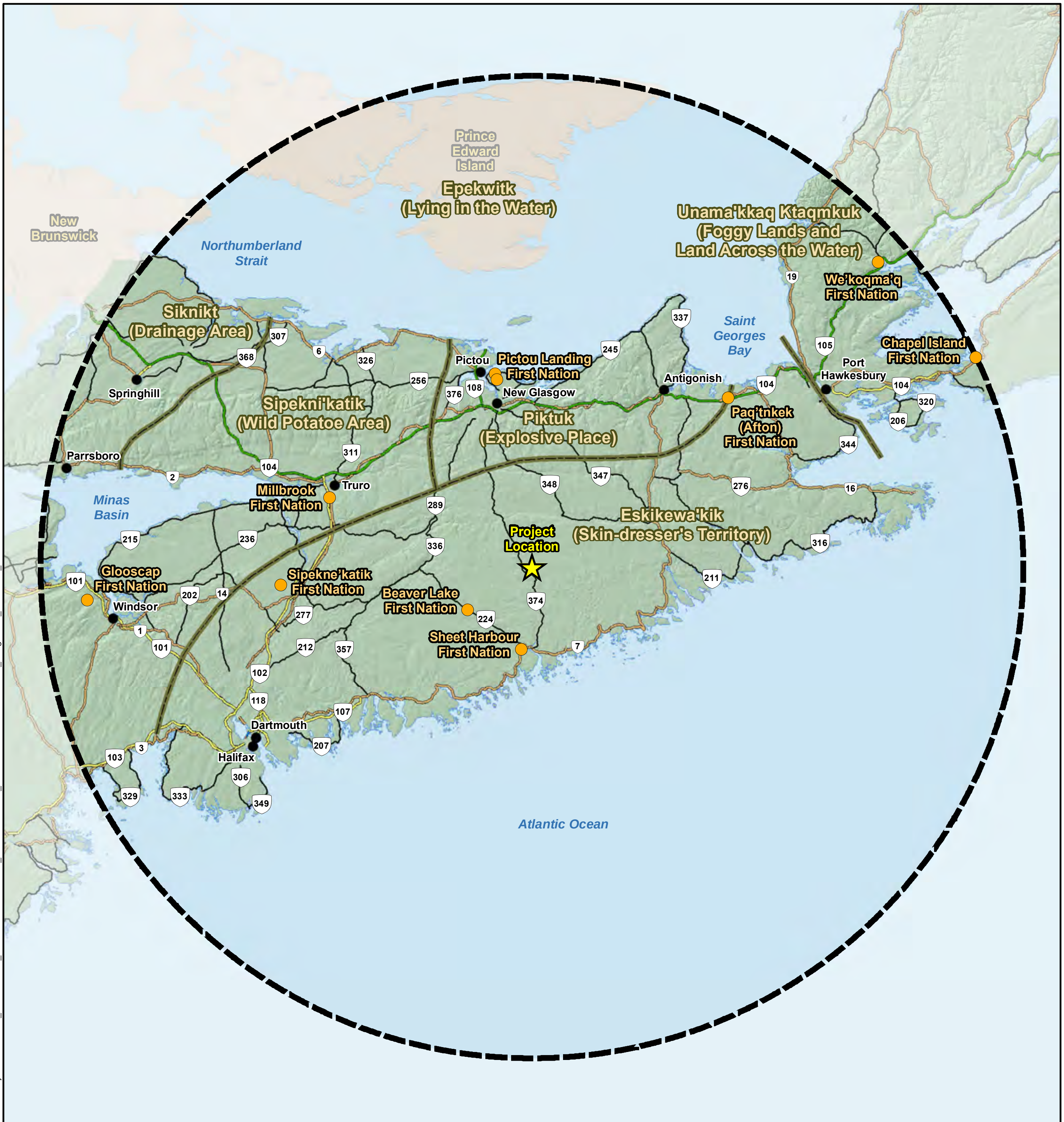
Atlantic Gold A St Barbara Ltd Company

wood.

FIFTEEN MILE STREAM GOLD PROJECT

Nearby Receptors at the Project Site

PROJECT N^{o}: ONS2001	**FIGURE: 5**
SCALE: 1:65,000	DATE: July 2020



P:\2020\Projects\ONS2001_Atlantic Gold_Fifteen Mile Stream\11_GIS\Alternatives_Assessment\MXD\Traditional_Indigenous_Territories_2.mxd

LEGEND

- Project Location
- 150 km from the Project Location
- Name First Nation Communities
- Name City / Town
- Name Seven Districts of Mi'kmaq
- Trans-Canada Highway
- Highway
- Arterial Roads
- Collector Roads

0 12.5 25 50 75 100 125 Kilometres

NOTES:
- Topogarphic base data extracted from Nova Scotia GeoPortal and Web Mapping Service.

Datum: NAD83
Projection: UTM Zone 20N

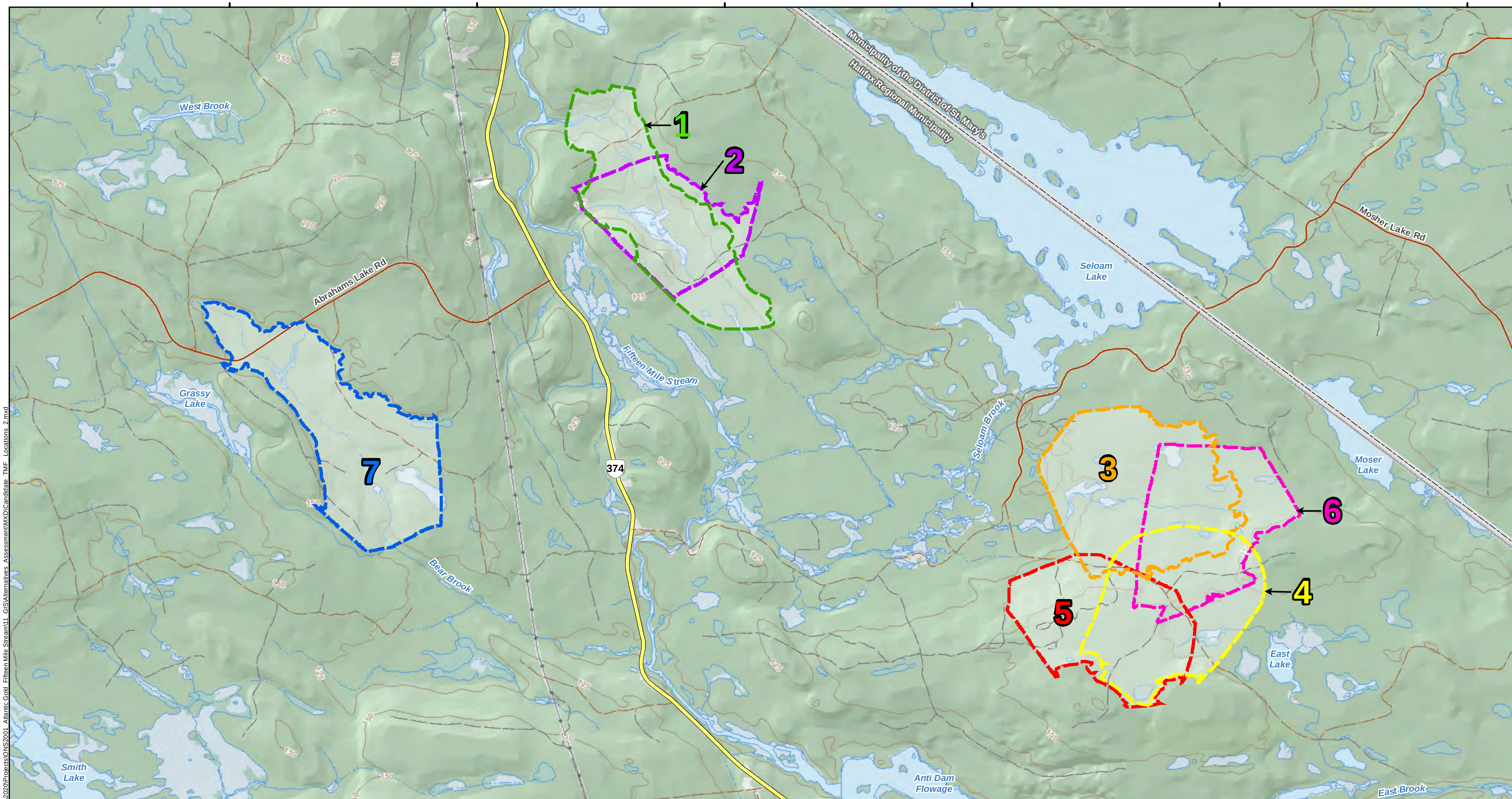
Atlantic Gold
A St Barbara Ltd Company

wood.

FIFTEEN MILE STREAM GOLD PROJECT

Traditional Indigenous Territories

PROJECT N°: ONS2001	**FIGURE: 6**
SCALE: 1:1,600,000	DATE: July 2020



LEGEND

- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Wetland
- Waterbody
- Contours (5 metre intervals)
- Municipal Boundary

Candidate Tailings Management Facility

- Location 1
- Location 2
- Location 3
- Location 4
- Location 5
- Location 6
- Location 7

0 0.5 1 2 3 4 5 Kilometres

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

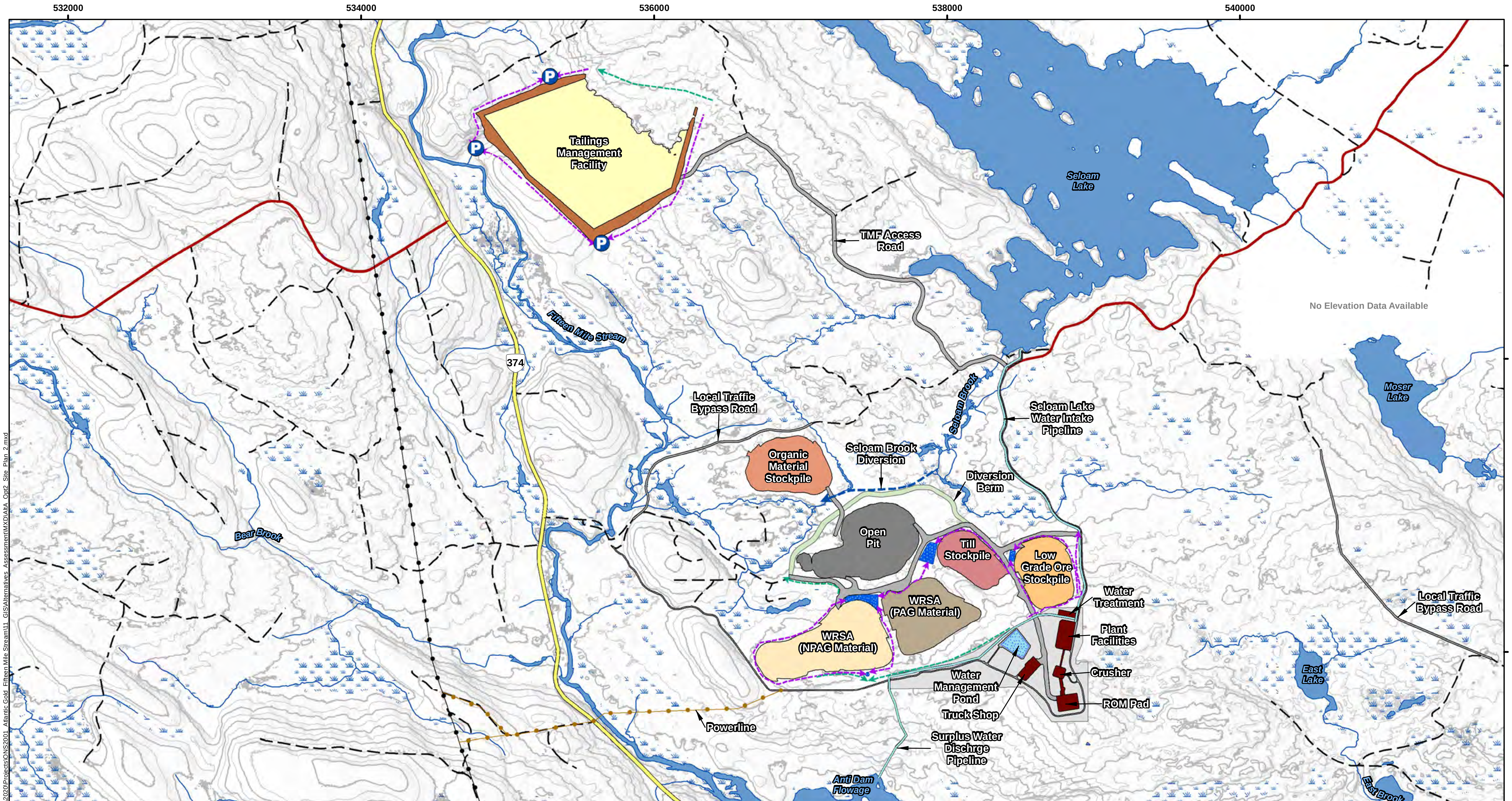
Atlantic Gold A St Barbara Ltd Company | wood.

FIFTEEN MILE STREAM GOLD PROJECT

Candidate Tailings Management Facility Locations

PROJECT N°: ONS2001	**FIGURE: 7**
SCALE: 1:30,000	DATE: July 2020

P:\2020\Projects\ONS2001_Atlantic Gold_Fifteen Mile Stream\11_GIS\Alternatives_Assessment\MXD\Candidate_TMF_Locations_2.mxd



LEGEND

- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Waterbody
- Wetland
- Major Contours (10 metre intervals)
- Minor Contours (5 metre intervals)

Proposed Mine Features

- Watercourse Diversion
- Non-contact Water Diversion Ditch
- Seepage Collection Ditch
- Powerline
- Pipeline
- Open Pit
- TMF Seepage Collection Ponds
- Tailings Management Facility Dam
- Deposited Tailings
- Diversion Berm
- Seepage Collection Ponds
- Water Management Pond
- Low Grade Ore Stockpile
- Organic Material Stockpile
- Till Stockpile
- WRSA (NAG Stockpile)
- WRSA (PAG Stockpile)
- Buildings / Crusher
- Administration Area
- Haul / Access Roads

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

0 0.5 1 2 3 4 5 Kilometres

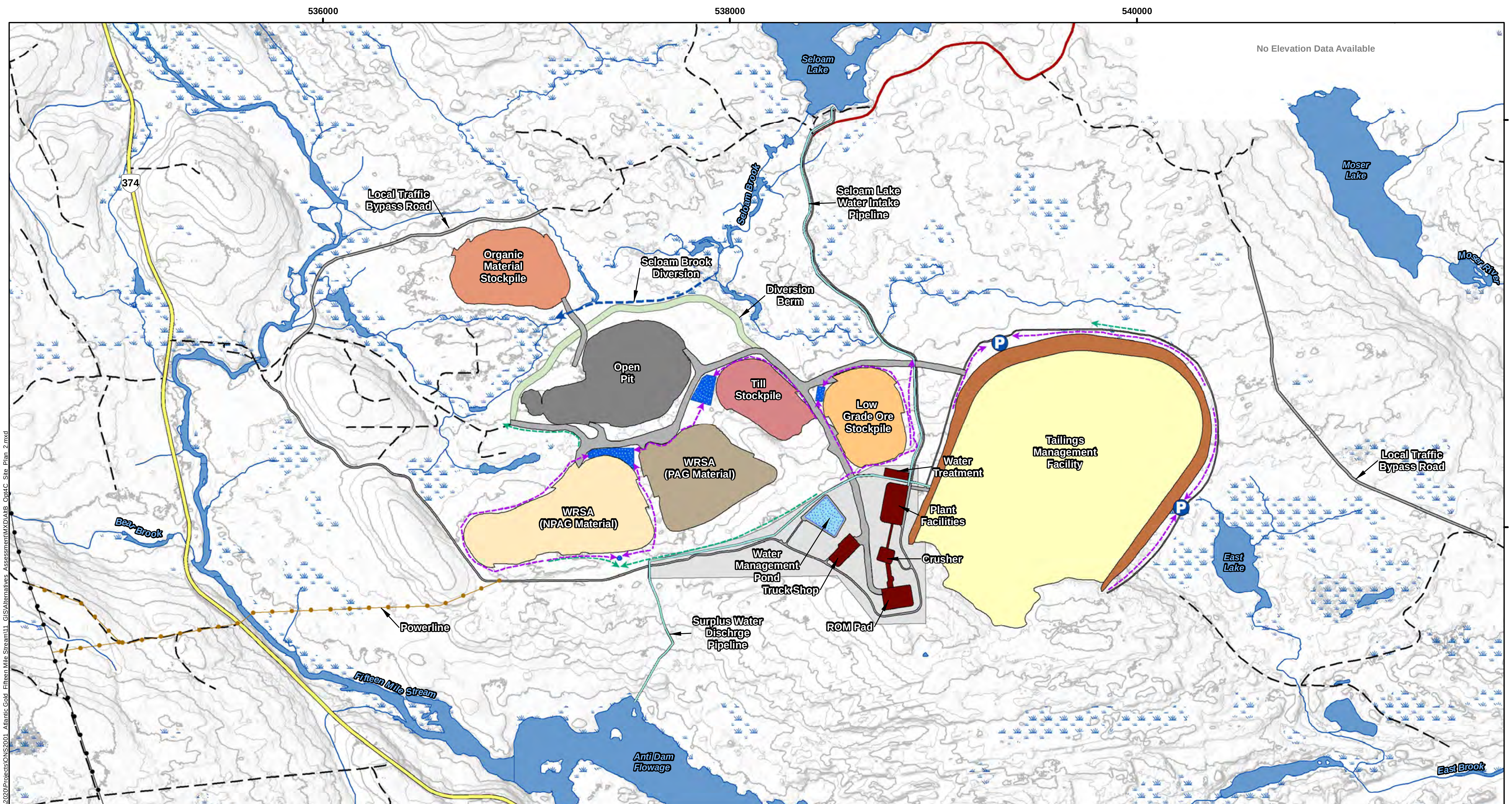
Atlantic Gold
A St Barbara Ltd Company
wood.

FIFTEEN MILE STREAM GOLD PROJECT

Alternative A Configuration

PROJECT N°: ONS2001	FIGURE: 8
SCALE: 1:25,000	DATE: July 2020

P:\2020\Projects\ONS2001_Atlantic Gold_Fifteen Mile Stream\11_GIS\Alternatives_Assessment\MXD\AA_Opt2_Site_Plan_2.mxd



LEGEND

- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Waterbody
- Wetland
- Major Contours (10 metre intervals)
- Minor Contours (5 metre intervals)

Proposed Mine Features

- Watercourse Diversion
- Non-contact Water Diversion Ditch
- Seepage Collection Ditch
- Powerline
- Pipeline
- Open Pit
- TMF Seepage Collection Ponds
- Tailings Managment Facility Dam
- Deposited Tailings
- Diversion Berm
- Seepage Collection Ponds
- Water Management Pond
- Low Grade Ore Stockpile
- Organic Material Stockpile
- Till Stockpile
- WRSA (NAG Stockpile)
- WRSA (PAG Stockpile)
- Buildings / Crusher
- Administration Area
- Haul / Access Roads

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

0 0.5 1 2 3 4 5 Kilometres

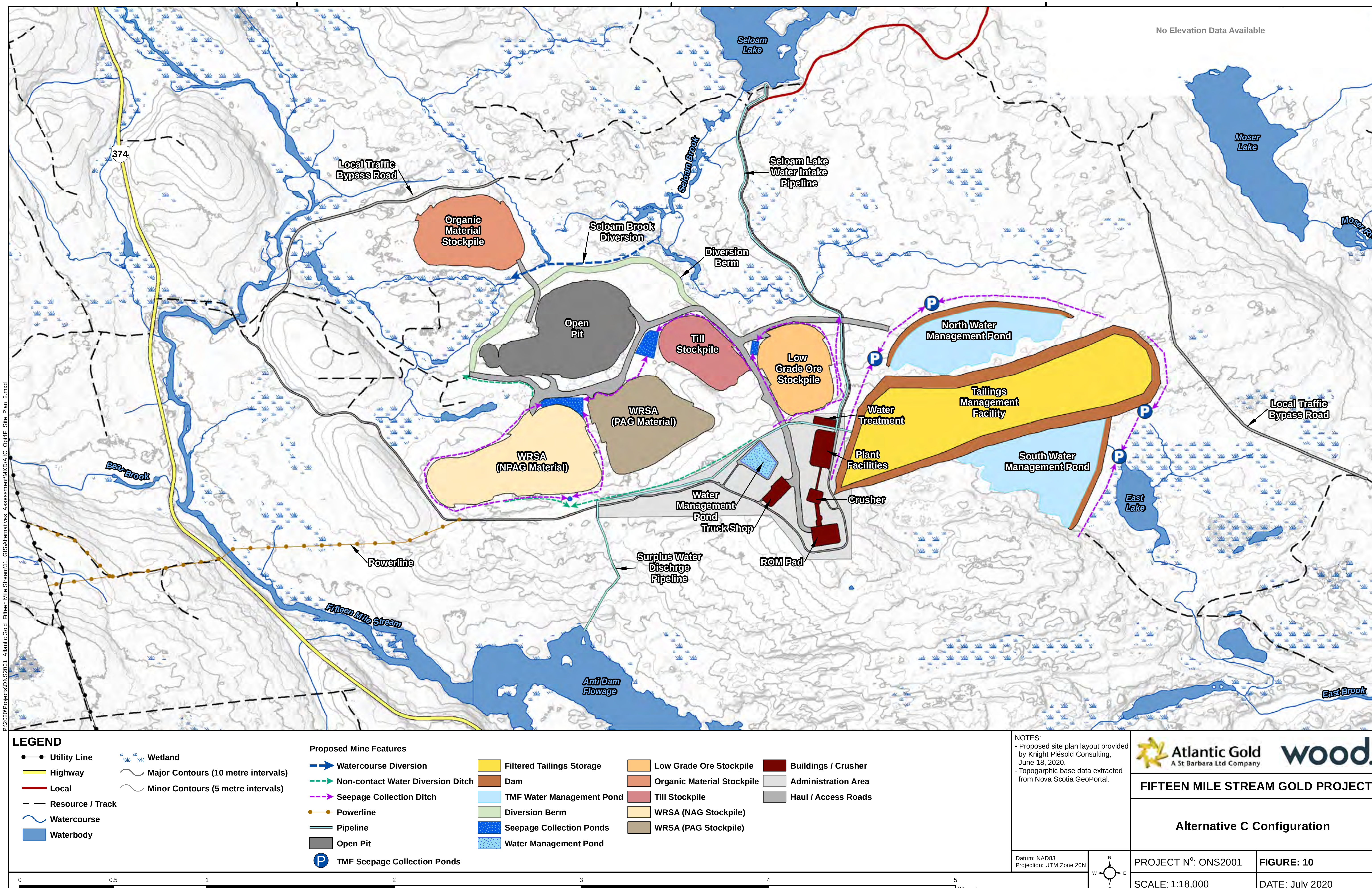
Atlantic Gold A St Barbara Ltd Company | wood.

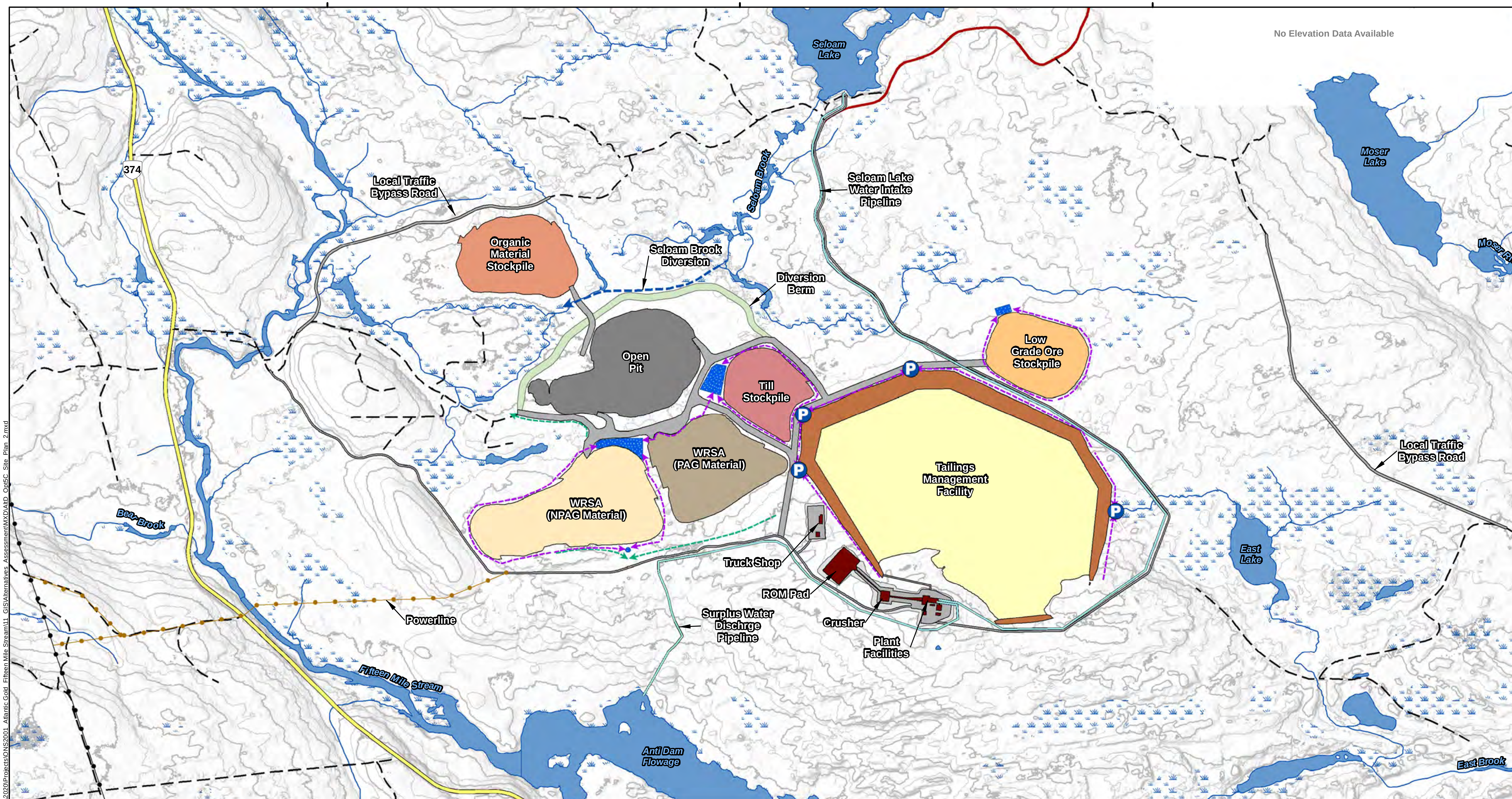
FIFTEEN MILE STREAM GOLD PROJECT

Alternative B Configuration

PROJECT N°: ONS2001 | **FIGURE: 9**

SCALE: 1:18,000 | DATE: July 2020


536000
538000
540000
5000000
4998000
No Elevation Data Available
Seloam Lake
Moser Lake
Moser River
374
Local Traffic Bypass Road
Seloam Brook
Seloam Lake Water Intake Pipeline
Organic Material Stockpile
Seloam Brook Diversion
Diversion Berm
Open Pit
Till Stockpile
Low Grade Ore Stockpile
North Water Management Pond
Tailings Management Facility
Local Traffic Bypass Road
Water Treatment
Plant Facilities
South Water Management Pond
WRSA (PAG Material)
WRSA (NPAG Material)
Bear Brook
Water Management Pond
Crusher
Truck Shop
East Lake
ROM Pad
Powerline
Surplus Water Dischrge Pipeline
Fifteen Mile Stream
Anti Dam Flowage
East Brook
LEGEND
Utility Line
Highway
Local
Resource / Track
Watercourse
Waterbody
Wetland
Major Contours (10 metre intervals)
Minor Contours (5 metre intervals)
Proposed Mine Features
Watercourse Diversion
Non-contact Water Diversion Ditch
Seepage Collection Ditch
Powerline
Pipeline
Open Pit
TMF Seepage Collection Ponds
Filtered Tailings Storage
Dam
TMF Water Management Pond
Diversion Berm
Seepage Collection Ponds
Water Management Pond
Low Grade Ore Stockpile
Organic Material Stockpile
Till Stockpile
WRSA (NAG Stockpile)
WRSA (PAG Stockpile)
Buildings / Crusher
Administration Area
Haul / Access Roads
NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.
Datum: NAD83
Projection: UTM Zone 20N
Atlantic Gold
A St Barbara Ltd Company
wood.
FIFTEEN MILE STREAM GOLD PROJECT
Alternative C Configuration
PROJECT N°: ONS2001
FIGURE: 10
SCALE: 1:18,000
DATE: July 2020
0 0.5 1 2 3 4 5 Kilometres



LEGEND

- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Waterbody
- Wetland
- Major Contours (10 metre intervals)
- Minor Contours (5 metre intervals)

Proposed Mine Features

- Watercourse Diversion
- Non-contact Water Diversion Ditch
- Seepage Collection Ditch
- Powerline
- Pipeline
- Open Pit
- TMF Seepage Collection Ponds
- Tailings Managment Facility Dam
- Deposited Tailings
- Diversion Berm
- Seepage Collection Ponds
- Low Grade Ore Stockpile
- Organic Material Stockpile
- Till Stockpile
- WRSA (NAG Stockpile)
- WRSA (PAG Stockpile)
- Buildings / Crusher
- Administration Area
- Haul / Access Roads

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

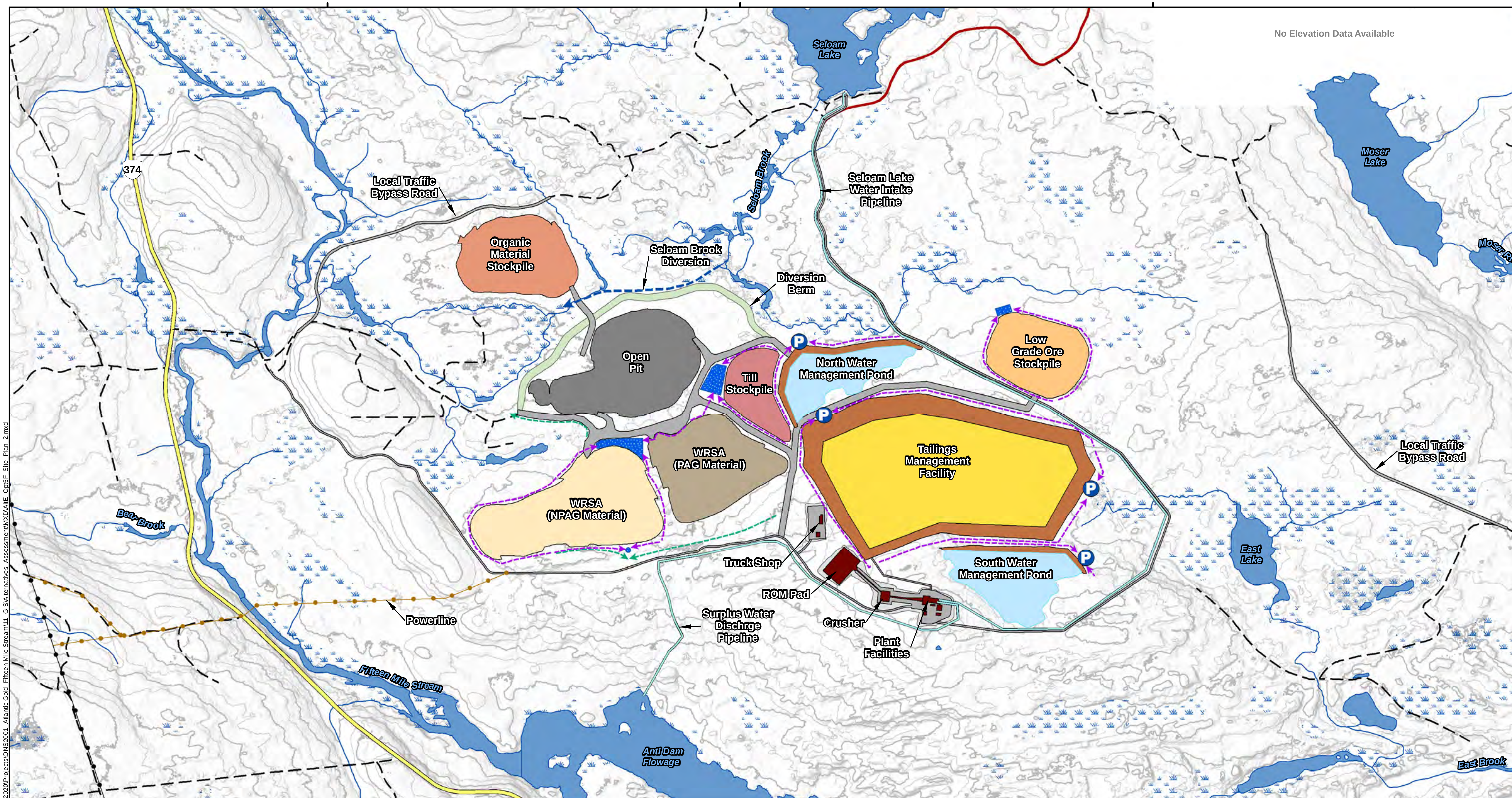
0 0.5 1 2 3 4 5 Kilometres

Atlantic Gold A St Barbara Ltd Company | wood.

FIFTEEN MILE STREAM GOLD PROJECT

Alternative D Configuration

PROJECT N°: ONS2001	FIGURE: 11
SCALE: 1:18,000	DATE: July 2020



LEGEND

- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Waterbody
- Wetland
- Major Contours (10 metre intervals)
- Minor Contours (5 metre intervals)

Proposed Mine Features

- Watercourse Diversion
- Non-contact Water Diversion Ditch
- Seepage Collection Ditch
- Powerline
- Pipeline
- Open Pit
- TMF Seepage Collection Ponds
- Dam
- TMF Water Management Pond
- Filtered Tailings Storage
- Diversion Berm
- Seepage Collection Ponds
- Low Grade Ore Stockpile
- Organic Material Stockpile
- Till Stockpile
- WRSA (NAG Stockpile)
- WRSA (PAG Stockpile)
- Buildings / Crusher
- Administration Area
- Haul / Access Roads

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

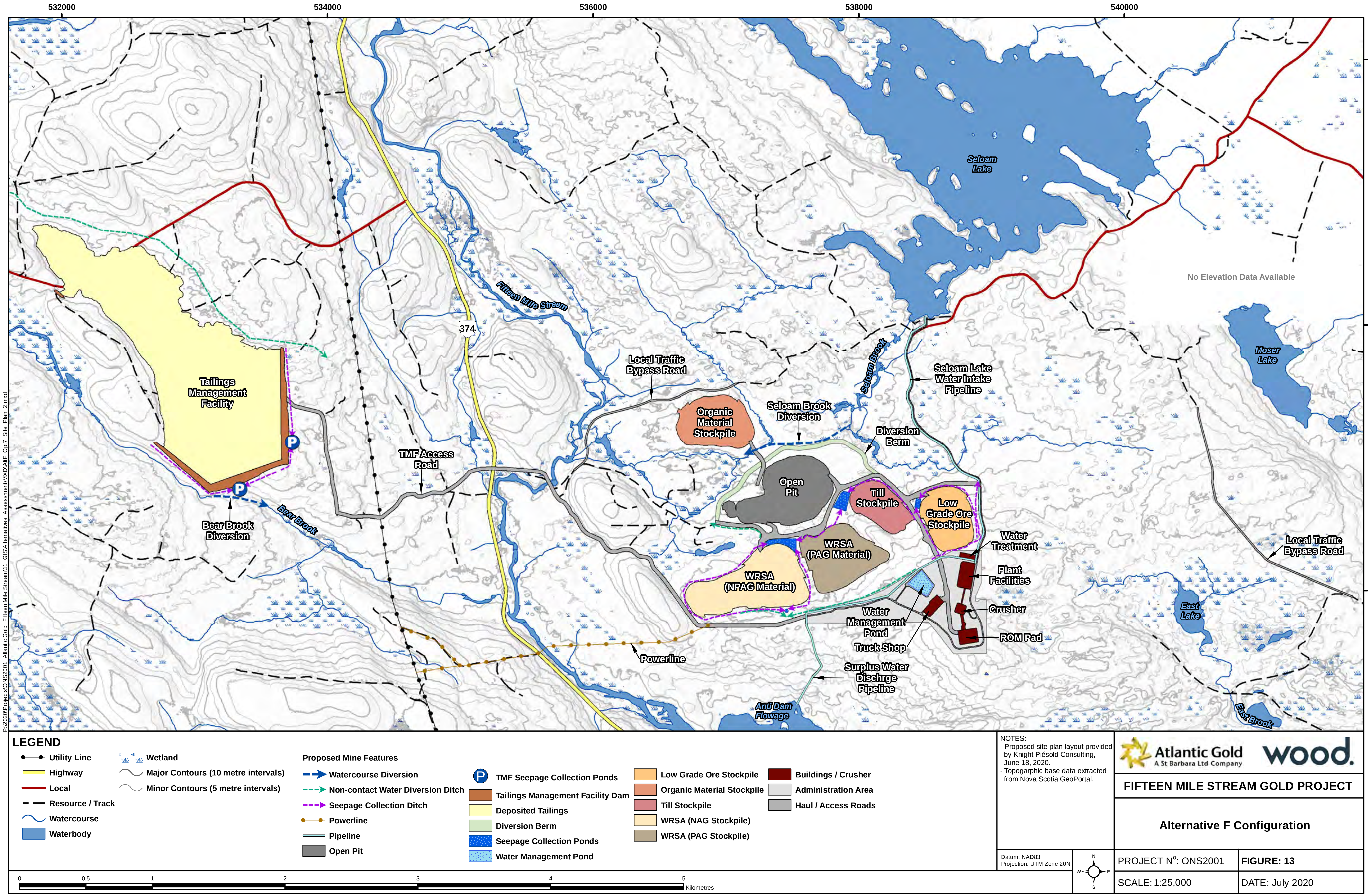
0 0.5 1 2 3 4 5 Kilometres

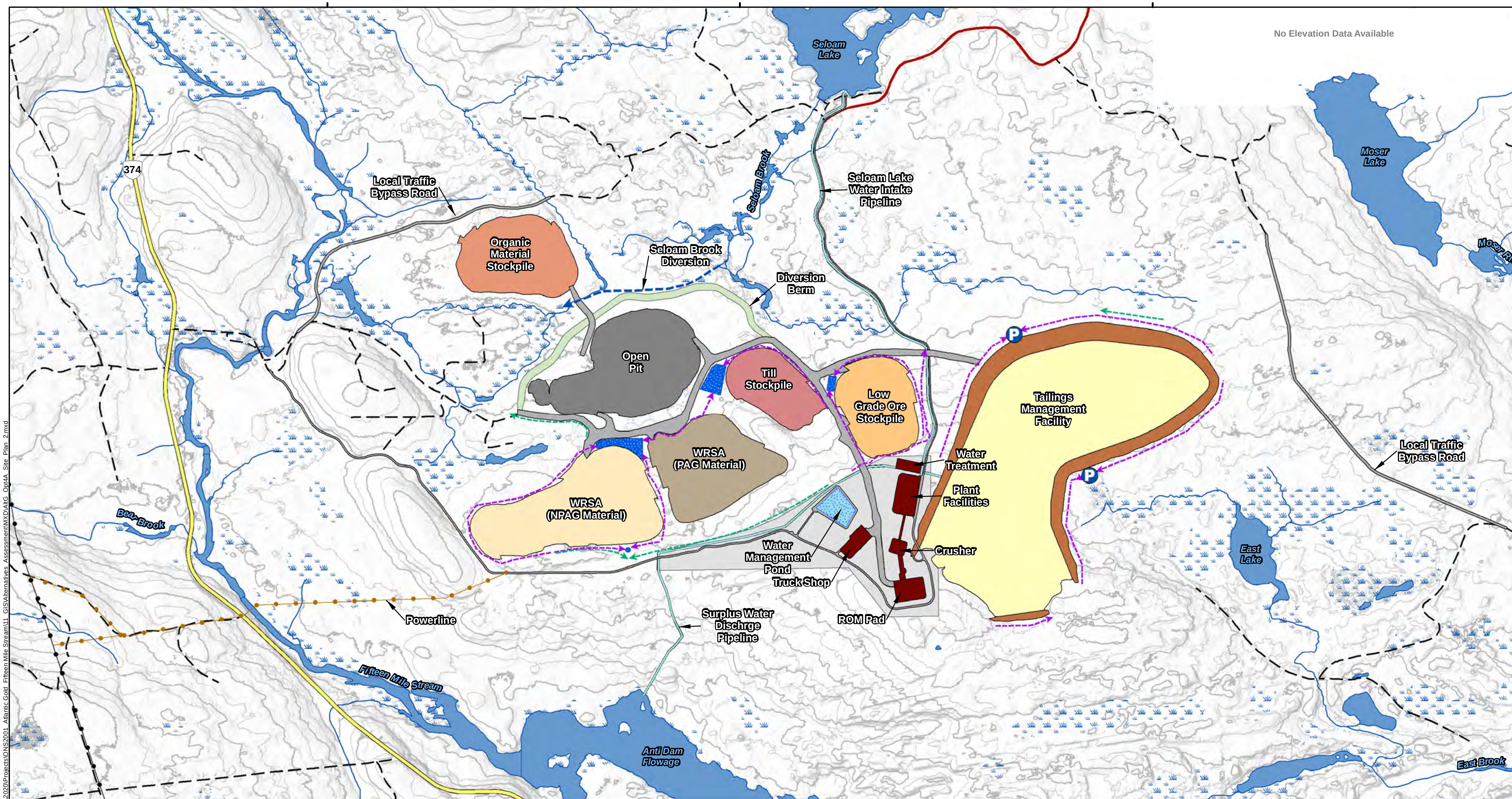
Atlantic Gold A St Barbara Ltd Company | wood.

FIFTEEN MILE STREAM GOLD PROJECT

Alternative E Configuration

PROJECT N°: ONS2001	FIGURE: 12
SCALE: 1:18,000	DATE: July 2020


532000
534000
536000
538000
540000
5002000
5000000
4998000
Seloam Lake
No Elevation Data Available
Moser Lake
Fifteen Mile Stream
374
Tailings Management Facility
Local Traffic Bypass Road
Organic Material Stockpile
Seloam Brook Diversion
Seloam Brook
Seloam Lake Water Intake Pipeline
Diversion Berm
TMF Access Road
Open Pit
Till Stockpile
Low Grade Ore Stockpile
Water Treatment
Local Traffic Bypass Road
WRSA (PAG Material)
WRSA (NPAG Material)
Plant Facilities
Crusher
Water Management Pond
ROM Pad
Truck Shop
East Lake
Bear Brook Diversion
Bear Brook
Powerline
Surplus Water Dischrge Pipeline
Anti Dam Flowage
East Brook
P:\2020\Projects\ONS2001_Atlantic Gold_Fifteen Mile Stream\11_GIS\Alternatives_Assessment\MXD\Alt F_Opt7_Site_Plan_2.mxd
LEGEND
Utility Line
Highway
Local
Resource / Track
Watercourse
Waterbody
Wetland
Major Contours (10 metre intervals)
Minor Contours (5 metre intervals)
Proposed Mine Features
Watercourse Diversion
Non-contact Water Diversion Ditch
Seepage Collection Ditch
Powerline
Pipeline
Open Pit
TMF Seepage Collection Ponds
Tailings Management Facility Dam
Deposited Tailings
Diversion Berm
Seepage Collection Ponds
Water Management Pond
Low Grade Ore Stockpile
Organic Material Stockpile
Till Stockpile
WRSA (NAG Stockpile)
WRSA (PAG Stockpile)
Buildings / Crusher
Administration Area
Haul / Access Roads
NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.
Atlantic Gold
A St Barbara Ltd Company
wood.
FIFTEEN MILE STREAM GOLD PROJECT
Alternative F Configuration
Datum: NAD83
Projection: UTM Zone 20N
PROJECT N°: ONS2001
FIGURE: 13
SCALE: 1:25,000
DATE: July 2020
0 0.5 1 2 3 4 5
Kilometres



LEGEND

- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Waterbody
- Wetland
- Major Contours (10 metre intervals)
- Minor Contours (5 metre intervals)

Proposed Mine Features

- Watercourse Diversion
- Non-contact Water Diversion Ditch
- Seepage Collection Ditch
- Powerline
- Pipeline
- Open Pit
- TMF Seepage Collection Ponds
- Tailings Management Facility Dam
- Deposited Tailings
- Diversion Berm
- Seepage Collection Ponds
- Water Management Pond
- Low Grade Ore Stockpile
- Organic Material Stockpile
- Till Stockpile
- WRSA (NAG Stockpile)
- WRSA (PAG Stockpile)
- Buildings / Crusher
- Administration Area
- Haul / Access Roads

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

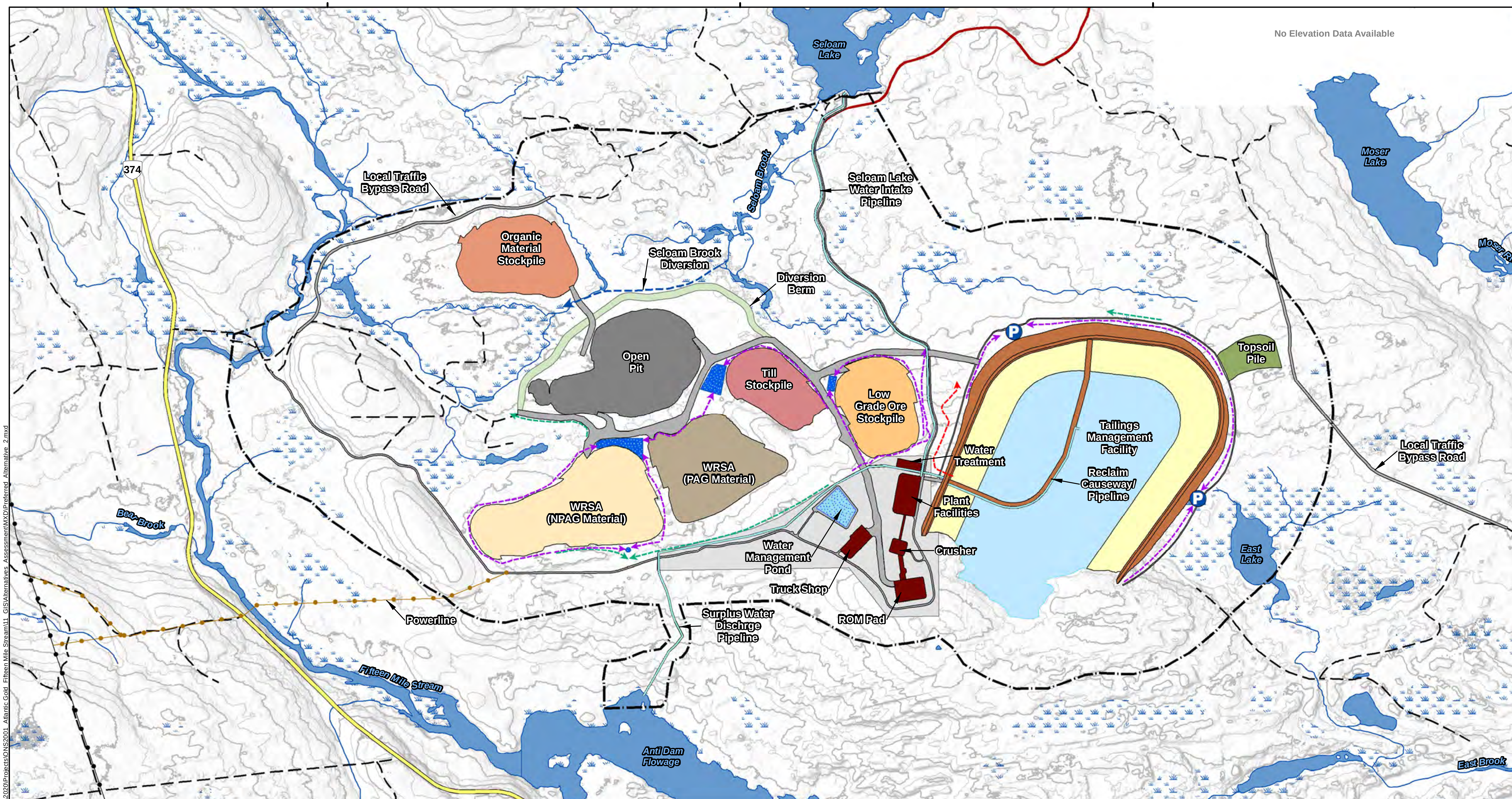
0 0.5 1 2 3 4 5 Kilometres

Atlantic Gold A St Barbara Ltd Company | wood.

FIFTEEN MILE STREAM GOLD PROJECT

Alternative G Configuration

PROJECT N°: ONS2001	FIGURE: 14
SCALE: 1:18,000	DATE: July 2020



LEGEND

- Property Boundary
- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Waterbody
- Wetland
- Major Contours (10 metre intervals)
- Minor Contours (5 metre intervals)

Proposed Mine Features

- Seloam Brook Diversion
- Emergency Spillway
- Non-contact Water Diversion Ditch
- Seepage Collection Ditch
- Powerline
- Pipeline
- Open Pit
- TMF Seepage Collection Ponds
- Tailings Management Facility Dam
- Deposited Tailings
- Tailings Management Facility Pond
- Low Grade Ore Stockpile
- Organic Material Stockpile
- Topsoil Pile
- Till Stockpile
- WRSA (NAG Stockpile)
- WRSA (PAG Stockpile)
- Diversion Berm
- Water Management Pond
- Seepage Collection Ponds
- Buildings / Crusher
- Administration Area
- Haul / Access Roads

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

0 0.5 1 2 3 4 5 Kilometres

Atlantic Gold A St Barbara Ltd Company
wood.

FIFTEEN MILE STREAM GOLD PROJECT

Preferred Alternative

PROJECT N°: ONS2001	FIGURE: 15
SCALE: 1:18,000	DATE: July 2020

Table 1: Storage Method Pre-Screening Assessment Summary Table

Pre-Screening Criteria	Rationale	Storage Methods Candidates					
		Conventional Slurry	Thickened Tailings	Paste Tailings	Filtered Tailings	Cycloned Tailings	Co-Disposal
Does the alternative method confer a substantial benefit over conventional technologies?	The disposal method must offer significant advantages, without significant offsetting drawbacks, over the use of conventional slurry tailings for the conditions of the Project.	Yes	No	No	Yes	No	NA
Does the alternative allow for disposal of a sufficient quantity of tailings?	Alternatives that can only manage a portion of the tailings generated are insufficient and will require other alternatives to be employed to meet Project needs.	Yes	Yes	Yes	Yes	Yes	No
	Candidate forward to Alternatives Assessment?	**Yes**	No	No	**Yes**	No	No

Table 2: Storage Location Pre-Screening Assessment Summary Table

Pre-Screening Criteria	Rationale	Storage Location Candidates						
		Alternative #1	Alternative #2	Alternative #3	Alternative #4	Alternative #5	Alternative #6	Alternative #7
Does the alternative location stay within the main watershed (and avoid overprinting a major watershed divide)?	Alternatives that are located within a single watershed will minimize the risk for a greater distribution of potentially affected runoff from the TMF and reduce water management requirements.	Yes	Yes	Yes	Yes	Yes	No	Yes
Is the alternative location within Atlantic property boundary, or on lands which could be readily acquire?	Alternatives that are located off the property boundary will require Atlantic to acquire additional surface and mineral rights. This is expected to be difficult to achieve and will result in unacceptable Project delays.	No	Yes	No	Yes	Yes	Yes	Yes
	Candidate forward to Alternatives Assessment?	No	**Yes**	No	**Yes**	**Yes**	No	**Yes**

Table 3: Storage Method and Location Advantages and Disadvantages

Candidate Alternative	Advantages	Disadvantages
Storage Methods		
Conventional Slurry Tailings	• Conventional technology that is regularly used in Nova Scotia • Less dust emissions than filtered / thickened tailings • Lower costs than filtered tailings and thickened tailings • Tailings can be transported via pipeline	• More water 'lost' to void spaces between tailings than in filtered / thickened tailings (this may be an advantage from a technical perspective as the Fifteen Mine Stream Project currently has an excess of water in its inventory) • Extensive dams may be required • Deposition scheduling dependent on dam raises
Thickened Tailings	• Tailings could be deposited on a slope, slightly lowering the height of dams, depending on topography • Improved water recycle (this may be a disadvantage from a technical perspective due to the current excess of water in the Fifteen Mine Stream Project inventory) • Tailings can be transported via pipeline • Reduction in water storage / retaining pond volume • Reduced risk of environmental damage in the event of a dam breach (less water to aid in the transport of tailings downstream) • Reduced seepage rates	• Enhanced thickening systems are costly to construct and operate • Greater dust emissions than from conventional slurry deposition • Steeper tailings slopes are more prone to erosion and are more difficult to re-vegetate at closure • Extensive dams may be required • Deposition scheduling dependent on dam raises • Does not noticeably reduce footprint of TMF compared to conventional slurry • Does not eliminate the need for a tailings pond located over tailings • Higher capital costs than conventional tailings disposal (positive displacement pumps for paste tailings may be required, possible water treatment plant) • High operating costs with respect to thickening and transport • Risk of not achieving desired consistency from thickeners due to variability in ore type, inconsistent feed • Over-estimating beach slope angle in design can result in complications in construction schedules where future raises have to be brought forward to prevent loss of freeboard • If not deposited in relatively thin layers (~0.3 m), may be difficult to allow for desiccation and strength gain in net precipitation environments and therefore greater risk of ice inclusion in the winter and loss of storage capacity as the life of the facility progresses
Paste Tailings	• Water storage and retaining ponds can be reduced or even eliminated. • Higher beach slope angles can reduce the footprint of the facility while storing the same volume of material. • As there is little water, there is a reduced risk of environmental damage if an embankment breach occurs. • Reduced seepage from the stored paste tailings.	• Expensive positive displacement pumps are usually required for paste tailings discharge • High operating costs associated with the thickening and transportation of paste compared to other methods. • Requires high levels of operational invention to maintain consistent output. • Not proven at scale
Filtered Tailings	• Maximum water recycle (this may be a disadvantage from a technical perspective due to predicted excess water inventory for the Fifteen Mine Stream Project) • No requirement for starter dam / deposition can begin immediately • Tailings can be deposited in stockpiles • No starter dam scheduling restrictions • Smaller footprint than conventional slurry TMF	• Filtration systems are very costly to operate • Dust generation from the filtered tailings could make regulatory approvals difficult or impossible to acquire • Tailings must be transported by truck or conveyer • Technology is not typically used in Nova Scotia (too warm to encapsulate in permafrost, intense water recycle is typically only used for arid environments,) • Runoff capture systems would be required

Candidate Alternative	Advantages	Disadvantages
	• No requirement for a tailings pond positioned over tailings	• Large holding pond required near plant site • Water treatment plant required
Cycloned Tailings	• Uses tailings as a dam construction material • Smaller volume of tailings fines to be stored • Less haul traffic to construct dams • Lower cost dam construction method	• Extensive dams may be required • Does not noticeably reduce footprint of the TMF compared to conventional slurry • Does not eliminate the need for tailings pond located over tailings • Increased dust emissions • Challenging water management • Challenging winter deposition • Anticipated negative public perception of dams constructed of tailings
Co-disposal of Mine Waste	• The strength and rapid stabilization of the co-disposal waste allows early access onto the tailings for rehabilitation • Does not generally require retention embankments which thus eliminates the risk of embankment breach and transportation of tailings outside the storage zone • Can significantly reduce the generation of acid associated with sulphide bearing coarse mine waste, as the tailings are much less pervious to water and atmospheric oxygen than coarse mine waste	• Controlling the deposition strategy to optimize the blending of the coarse and fine waste feeds. This is only really economic where the two feeds can be pumped together or blended for in-pit storage
Open Pit Disposal	• Minimal environmental and socio-economic effects / no loss of undisturbed habitat / compact site footprint • Existing open pit provides excellent containment and avoids the need for impoundment dams • No requirement for starter dams / deposition can begin immediately	• Seasonally limited (deposition not possible during winter months) • Unable to store tailings until late in the project life; a surface impound would be required in tandem with this option
Storage Locations		
Location #1	• Shorter dam heights • Located within an area that provides good topographic containment	• Located outside a 7 km distance from the open pit • Located on lands owned by others and may not be obtained by Atlantic • Will overprint an intermittent watercourse • Overprints waters frequented by fish / MDMER Schedule 2 considerations • Very far from ore processing plant • Limited geotechnical information for this location • No engineering design is well advanced • Located within more than one watershed • Requires a long distance to transport tailings
Location #2	• Located within a 7 km distance from the open pit • Located within one watershed • Located within an area that provides good topographic containment	• Located on lands owned by others and may not be obtained by Atlantic • Overprints waters frequented by fish / MDMER Schedule 2 considerations • Very far from ore processing plant • Limited geotechnical information for this location • No engineering design is well advanced • Requires a long distance to transport tailings

Candidate Alternative	Advantages	Disadvantages
Location #3	• Close to processing plant • Requires a relatively short distance to transport tailings	• Will overprint an intermittent watercourse • Overprints waters frequented by fish / MDMER Schedule 2 considerations • Limited geotechnical information for this location • No engineering design is well advanced • Located within more than one watershed
Location #4	• Located within a 7 km distance from the open pit • Close to processing plant • Engineering design is well advanced; this location is proposed in the EIS process and in community engagement, which reduces duplication of engineering design and reduces risk of delays in the environmental assessment process. • Requires moderately short dam heights	• Will overprint an intermittent watercourse • Overprints waters frequented by fish / MDMER Schedule 2 considerations • Located within more than one watershed
Location #5	• Located within a 7 km distance from the open pit • TMF footprint does not overprint natural waters frequented by fish • Close to processing plant • Requires a relatively short distance to transport tailings	• No engineering design is well advanced • Located within more than one watershed • Requires high dam heights
Location #6	• Located within a 7 km distance from the open pit • Requires a relatively short distance to transport tailings	• Overlaps a major watershed divide • Will overprint an intermittent watercourse • Overprints waters frequented by fish / MDMER Schedule 2 considerations • Limited geotechnical information for this location • No engineering design is well advanced • Located within more than one watershed
Location #7	• Located within a 7 km distance from the open pit • Located within one watershed • Located within an area that provides good topographic containment	• Will overprint an intermittent watercourse • Overprints waters frequented by fish / MDMER Schedule 2 considerations • Very far from ore processing plant • Requires haul roads, tailings pipelines and reclaim lines to cross Highway 374 • Large length of road where mine haul traffic would interact with public traffic • Limited geotechnical information for this location • No engineering design is well advanced • Requires a long distance to transport tailings

Table 4: Alternatives Characterization

Account	Sub-Account	Indicator	Parameter	Unit	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Environment	Water Quality	Water Treatment Requirements	Qualitative scale	—	Water storage volume of 1.6 Mm³ in, with 4 water managements ponds and a moderate receiving waterbody (Bear Brook).	Water storage volume of 1.6 Mm³, with 3 water managements ponds and a large receiving waterbody (Anti-Dam Flowage).	Water storage volume of 1.48 Mm³ in, with 6 water managements ponds and a large receiving waterbody (Anti-Dam Flowage).	Water storage volume of 1.6 Mm³ in, with 5 water managements ponds and a large receiving waterbody (Anti-Dam Flowage).	Water storage volume of 1.38 Mm³ in, with 6 water managements ponds and a large receiving waterbody (Anti-Dam Flowage).	Water storage volume of 1.6 Mm³ in, with 3 water managements ponds and a small receiving waterbody (tributary to Seloam Lake).	Water storage volume of 1.6 Mm³ in, with 3 water managements ponds and a large receiving waterbody (Anti-Dam Flowage).
		Flexibility for Water Treatment and Recycle	Number of water management ponds	#	4 (TMF Supernatant Pond + 3 seepage ponds)	3 (TMF Supernatant Pond + 2 seepage ponds)	6 (2 water management ponds + 4 seepage ponds)	5 (TMF Supernatant Pond + 4 seepage ponds)	6 (2 water management ponds + 4 seepage ponds)	3 (TMF Supernatant Pond + 2 seepage ponds)	3 (TMF Supernatant Pond + 2 seepage ponds)
	Hydrology	Catchment Impacted	Length of stream where loss is over 25%	m	220	5136	4990	2983	2757	1975	4280
		Number of Affected Sub-watersheds	Number of sub-watersheds	#	1	2	2	3	3	1	2
	Aquatic Resources	Loss of Fish Habitat (waterbody)	Area of waterbody	ha	2.1	0	0	0.1	0.1	0.4	0
		Loss of Fish Habitat (watercourse)	Length of watercourse	m	1445	683	831	205	122	3687	0
		Number of new crossings	Number of crossings	#	3	0	0	0	0	2	0
	Terrestrial Resources	Loss of Wetland	Area of wetland	ha	6.3	12.1	11.3	7.5	5.7	9.5	7.1
		Use of Disturbed Habitat	Area of disturbed habitat	ha	1.2	4	3.5	5.1	3.9	4.2	3.3
		Footprint	Area	ha	90.2	142.8	122.7	122.8	111.6	158.2	112.7
	Sensitive Species	Loss of Mainland Moose Habitat	Area of potential habitat	ha	8.4	12.1	11.3	7.6	5.8	9.9	7.1
		Loss of Brook Trout Habitat	Length of watercourse	m	1445	683	831	205	122	3687	0
	Atmospheric Emissions	Fugitive Dust	Qualitative scale	—	Conventional slurry tailings with a footprint of 90 ha located 4.6 km from the processing facility	Conventional slurry tailings with a footprint of 142 ha located 0.8 km from the processing facility	Filtered tailings with a footprint of 122 ha located 0.9 km from the processing facility	Conventional slurry tailings with a footprint of 122 ha and located 0.5 km from the processing facility	Filtered tailings with a footprint of 111 ha located 0.6 km from processing facility	Conventional slurry tailings with a footprint of 158 ha located 6.0 km from processing facility	Conventional slurry tailings with a footprint of 112 ha located 0.7 km from the processing facility
		GHG Emissions	Qualitative scale	—	Conventional slurry tailings facility with a small area required for clearing, and a small volume of dam	Conventional slurry tailings facility with a moderate area required for clearing, and a small volume of dam	Filtered tailings facility with a large area required for clearing, and large volume of dam construction	Conventional slurry tailings facility with a moderate area required for clearing, and substantial volume of dam	Conventional slurry tailings with a small area to be cleared, with a moderate volume of dam construction	Conventional slurry tailings facility with a moderate area required for clearing, and small volume of dam	Conventional slurry tailings facility with a moderate area required for clearing, and substantial volume of dam

Account	Sub-Account	Indicator	Parameter	Unit	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
					construction materials hauled over a moderate distance.	construction materials hauled over a short distance.	materials to be hauled over a short distance. Requires hauling 40,000 truckloads of filtered tailings throughout operations	construction materials hauled over a short distance.	materials to hauled over a short distance. Requires hauling 40,000 truckloads of filtered tailings throughout operations	construction materials hauled over a long distance	construction materials hauled over a short distance
		Noise Emissions	Distance from TMF to receptor	km	9.45	5.74	5.81	5.56	5.62	9.32	5.76
	Protected Areas	Proximity to Protected Areas	Distance from TMF to nearest protected area	m	4501 (Abraham Lake Wilderness Area)	1552 (Toadfish Lakes Wilderness Area)	1528 (Toadfish Lakes Wilderness Area)	1729 (Toadfish Lakes Wilderness Area)	1840 (Toadfish Lakes Wilderness Area)	2164 (Abraham Lake Wilderness Area)	1647 (Toadfish Lakes Wilderness Area)
	Hazard Potential to the Environment	Magnitude of Failure	Qualitative scale	—	Conventional slurry tailings facility with a dam height of 29 m and dam length of 3,100 m	Conventional slurry tailings facility with a dam height of 32 m and dam length of 3,100 m	Filtered tailings facility with one downstream water management pond, a dam height of 23 m and dam length of 4,000 m	Conventional slurry tailings facility with a dam height of 40 m and dam length of 3,600 m	Filtered tailings facility with one downstream water management pond, a 48 m high dam and length of 3,300 m	Conventional slurry tailings facility with a dam height of 32 m and dam length of 2,050 m	Conventional slurry tailings facility with a dam height of 36 m and dam length of 3,600 m
		Downstream Sensitivities	Qualitative scale	—	Conventional slurry tailings located 0.2 km from Fifteen Mile Stream with road crossing located 3 km downstream.	Conventional slurry tailings located 3.55 km from Fifteen Mile Stream with road crossing located 0.85 km downstream.	Filtered tailings with water management ponds located within 3.65 km of Fifteen Mile Stream and road crossings within 0.85 km.	Conventional slurry tailings located 2.87 km from Fifteen Mile Stream with road crossing located 0.85 km downstream.	Filtered tailings with water management ponds located within 2.69 km of Fifteen Mile Stream and road crossings within 0.85 km.	Conventional slurry tailings located 2.1 km from Fifteen Mile Stream with road crossing and transmission line within the pathway.	Conventional slurry tailings located 3.55 km from Fifteen Mile Stream with a road crossing located 0.85 km downstream.
Technical	Design Factors	Storage to Dam Volume Ratio	Ratio	#	6.4	4	2.9	2.8	2.5	11.5	2.94
		Dam Volume	Volume of material	Mm^3	2.16	3.93	4.37	4.59	3.96	1.37	4.98
		Natural Topographic Containment	Qualitative scale	—	Tailings dams are required along a large portion of the perimeter with a large primary dam and a connecting saddle dam. Located in an area that provides generally good	Tailings dams are required along a large portion of the perimeter with a large primary dam. Located in topography that provides some advantages on the south edge.	Tailings dams are required around the total perimeter and the TMF provides generally good natural containment with some undulating topography	Tailings dam are required along a large portion of the perimeter with a large primary dam. Located in topography that provides some advantages on the south edge.	Tailings dams are required around the total perimeter. Located in topography that provides limited advantages,	A bowl like basin provides excellent containment and is surrounded by high ground for most of the perimeter, and a moderate dam is required at the outlet of the bowl	Tailings dams are required along a large portion of the perimeter with a large primary dam. Located in topography that provides some advantages on the south edge.

Account	Sub-Account	Indicator	Parameter	Unit	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
					natural containment with some undulating topography						
	Safety Factors	Monitoring Requirements	Length of dams	m	3,100	3,100	4,000	3,600	3,300	2,050	3,600
		Dam Height	Final dam height	m	29	32	23	40	48	32	36
		Impoundment Configuration	Number of bends	#	4	3	8	6	9	2	7
		Contaminant Management	Qualitative scale	—	Conventional slurry tailings with 4 water management ponds and 3,450 m of seepage ditching	Conventional slurry tailings with 3 water management ponds and 3,650 m of seepage ditching	Filtered tailings with a travel distance of 3 km and a TMF surface area of 122.7 ha	Conventional slurry tailings with 5 water management ponds and 3,700 m of seepage ditching	Filtered tailings with a travel distance of 1.5 km and a TMF surface area of 111.6 ha	Conventional slurry tailings with 3 water management ponds and 2,200 m of seepage ditching	Conventional slurry tailings with 3 water management ponds and 4,546 m of seepage ditching
	Water Management	Length of Seepage Ditching	Length of ditches	m	3,450	2,750	3,675	3,525	5,675	2,125	4,100
		Number of Pumps and Pipelines	Qualitative scale	—	Alternative requires a 6,750 m long pipeline, 2 pumps, and 820 m of ditches	Alternative requires a 920 m pipeline, 1 pump, and no ditches	Alternative requires 3,740 m of pipeline, 2 pumps, and no ditches	Alternative requires 1,250 m of pipeline, 1 pump, and no ditches	Alternative requires 1,470 m of pipeline, 2 pumps, and no ditches	Alternative requires 7,200 m of pipeline, 2 pumps, and 3,100 m of ditches	Alternative requires 820 m of pipeline, 2 pumps, and no ditches
		Impacts to Annual Water Balance	Impacted catchment area	ha	158	187	210	155	158	235	145
		Reclaim Water Return	Distance to mill	km	7.2	2.2	3	2.2	1.5	7.7	2.2
	Final Embankment Configuration	Final Embankment Construction	Qualitative scale	—	Final embankment would require approximately 1.91 Mm^3 of dam construction materials and 1,900 m of new seepage ditching	Final embankment would require approximately 2.71 Mm^3 of dam construction materials and 1,200 m of new seepage ditching	Final embankment would require approximately 3.68 Mm^3 of dam construction materials and 850 m of new seepage ditching	Final embankment would require approximately 3.02 Mm^3 of dam construction materials and 1,000 m of new seepage ditching	Final embankment would require approximately 2.87 Mm^3 of dam construction materials and 700 m of new seepage ditching	Final embankment would require approximately 0.99 Mm^3 of dam construction materials and 800 m of new seepage ditching	Final embankment would require approximately 3.71 Mm^3 of dam construction materials and 1,600 m of new seepage ditching
	Compliance with Environmental Approvals	Ease of Obtaining Initial Permits	Qualitative scale	—	Conventional slurry tailings with no baseline knowledge and minimal engineering studies completed. Consultation has not occurred, and the anticipated	Conventional slurry tailings with good baseline knowledge and preliminary engineering studies completed. Consultation has occurred, and the anticipated	Filtered tailings with good baseline knowledge and some engineering studies completed. Consultation has partially occurred, and the anticipated	Conventional slurry tailings with good baseline knowledge and minimal engineering studies completed. Consultation has partially occurred, and	Filtered tailings with good baseline knowledge and some engineering studies completed. Consultation has partially occurred, and the anticipated	Conventional slurry tailings with no baseline knowledge and minimal engineering studies completed. Consultation has not occurred, and the anticipated	Conventional slurry tailings with good baseline knowledge and preliminary engineering studies completed. Consultation has not occurred, and the

Account	Sub-Account	Indicator	Parameter	Unit	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
					permitting schedule would be moderate.	permitting schedule would be short.	permitting schedule would be long.	the anticipated permitting schedule would be moderate	permitting schedule would be long.	permitting schedule would be moderate	anticipated permitting schedule would be moderate
	Complexity of Operations	Tailings Disposal	Qualitative scale	—	Conventional slurry tailings process located 4.6 km from process facility	Conventional slurry tailings process located 0.8 km from process facility	Filtered tailings process requiring extensive human intervention to deposit tailings, located 0.8 km from process facility	Conventional slurry tailings process located 0.5 km from process facility	Filtered tailings process requiring extensive human intervention to deposit tailings, located 0.5 km from process facility	Conventional slurry tailings process located 6.0 km from process facility	Conventional slurry tailings process located 0.7 km from process facility
		Processing Complexity	Qualitative scale	—	Conventional slurry tailings with a pipeline distance of 8.5 km, which will require higher pumping system	Conventional slurry tailings with a pipeline distance of 3.5 km	Filtered tailings with higher system complexity due to a travel distance of 3 km and 6 water management ponds	Conventional slurry tailings	Filtered tailings with higher system complexity due to a travel distance of 1.5 km and 6 water management ponds	Conventional slurry tailings with a pipeline distance of 9 km, which will require higher pumping system	Conventional slurry tailings with a pipeline distance of 3.5 km
		Distance from the Mill	Distance	km	4.6	0.8	0.8	0.5	0.5	6	0.7
		Elevation from the Mill	Elevation of dam crest	masl	143	164	173	168	171	149	168
		Climatic Challenges	Qualitative scale	—	Conventional slurry tailings with an 8.5 km pipeline, with an increased risk of freezing	Conventional slurry tailings with a 3.5 km pipeline	Filtered tailings, located 3.0 km away, with higher potential for operational delays due tailings freezing and materials handling challenges during winter	Conventional slurry tailings with a 3.5 km pipeline	Filtered tailings, located 1.5 km away, with higher potential for operational delays due tailings freezing and materials handling challenges during winter	Conventional slurry tailings with a 9.0 km pipeline, with an increased risk of freezing	Conventional slurry tailings with a 3.5 km pipeline
	Constructability	Material Availability	Distance to suitable materials	km	5	1.5	1.5	1.5	1.5	7.5	1.5
		Foundation Suitability	Qualitative scale	—	Dam constructed for conventional slurry tailings, with unknown foundation conditions	Dam constructed for conventional slurry tailings, with foundation conditions	Dam constructed for filtered tailings, with well understood foundation conditions	Dam constructed for conventional slurry tailings, with well understood foundation conditions	Dam constructed for filtered tailings with well understood foundation conditions	Dam constructed for conventional slurry tailings, with unknown foundation conditions	Dam constructed for conventional slurry tailings, with well understood foundation conditions
Project Economics	Total TMF Costs	Initial Capital Costs	Cost (millions)	$	22.52	13.83	47.12	18.26	55.39	25.75	13.83
		Sustaining Capital Costs	Cost (millions)	$	13.73	14.55	20.57	15.61	12.96	10.1	19.03
		Operating Costs	Cost (millions)	$	6.25	2.16	63.37	2.67	64.21	5.53	2.29
		Closure Costs	Cost (millions)	$	10.93	14.47	10.92	11.77	10.51	22.68	11.07

Account	Sub-Account	Indicator	Parameter	Unit	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
		Post-Closure Costs	Cost (millions)	$	2.42	2.42	3.12	2.81	2.58	1.60	2.81
		Ancillary Costs	Cost (millions)	$	6.09	2.94	3.36	1.41	1.1	12.07	0.23
	Economic Risks	Projected Timeline for Permits	Change in NPV	$	7.6	0	11.4	3.8	11.4	7.6	7.6
		Projected Timeline for Start of Operations	Qualitative scale	—	Conventional slurry tailings with no baseline knowledge and minimal engineering studies completed. Consultation has not occurred, and the anticipated permitting schedule would be moderate.	Conventional slurry tailings with good baseline knowledge and preliminary engineering studies completed. Consultation has occurred, and the anticipated permitting schedule would be short.	Filtered tailings with good baseline knowledge and some engineering studies completed. Consultation has partially occurred, and the anticipated permitting schedule would be long.	Conventional slurry tailings with good baseline knowledge and minimal engineering studies completed. Consultation has partially occurred, and the anticipated permitting schedule would be moderate	Filtered tailings with good baseline knowledge and some engineering studies completed. Consultation has partially occurred, and the anticipated permitting schedule would be long.	Conventional slurry tailings with no baseline knowledge and minimal engineering studies completed. Consultation has not occurred, and the anticipated permitting schedule would be moderate	Conventional slurry tailings with good baseline knowledge and preliminary engineering studies completed. Consultation has not occurred, and the anticipated permitting schedule would be moderate
Socioeconomics	Land Use	Loss of Fishing	Area of aquatic habitat	ha	2.39	0.14	0.17	0.14	0.12	1.14	0.0
		Loss of Commercial Forest Harvesting	Area of forest lost	ha	0.0	1.0	0.0	1.5	1.1	4.6	1.3
		Loss of ATV Trails	Length of trails lost	km	0.00	1.24	1.28	1.31	0.68	2.01	0.72
		Loss of Private Land Ownership	Area of private lands	ha	46.4	0	0	0	1.3	51.5	0
	Human Health and Public Safety	Fugitive Dust	Qualitative scale	—	Conventional slurry tailings with a footprint of 90 ha located 4.6 km from the processing facility	Conventional slurry tailings with a footprint of 142 ha located 0.8 km from the processing facility	Filtered tailings with a footprint of 122 ha located 0.8 km from the processing facility	Conventional slurry tailings with a footprint of 122 ha and located 0.5 km from the processing facility	Filtered tailings with a footprint of 111 ha located 0.5 km from processing facility	Conventional slurry tailings with a footprint of 158 ha located 6.0 km from processing facility	Conventional slurry tailings with a footprint of 112 ha located 0.7 km from the processing facility
		Hazard Potential to the Public	Qualitative scale	—	Conventional slurry tailings located 0.2 km from Fifteen Mile Stream with a road crossing located 3 km downstream	Conventional slurry tailings located 3.55 km from Fifteen Mile Stream with road crossing located 0.85 km downstream	Filtered tailings with water management ponds located within 3.65 km of Fifteen Mile Stream and road crossings within 0.85 km	Conventional slurry tailings located 2.87 km from Fifteen Mile Stream with road crossing located 0.85 km downstream	Filtered tailings with water management ponds located within 2.69 km of Fifteen Mile Stream and road crossings within 0.85 km	Conventional slurry tailings located 2.1 km from Fifteen Mile Stream with road crossings and transmission line within the pathway	Conventional slurry tailings located 3.55 km from Fifteen Mile Stream with road crossing located 0.85 km downstream
		Risk to Workers	Qualitative scale	—	Conventional tailings TMF located 4.6 km from mine workings with a	Conventional tailings TMF located 0.8 km from mine workings with a	Filtered tailings TMF located 0.8 km from mine workings with a	Conventional tailings TMF located 0.5 km from mine workings with a	Filtered tailings TMF located 0.5 km from mine workings with a	Conventional tailings TMF located 6.0 km from mine workings with a	Conventional tailings TMF located 0.7 km from mine workings with a

Account	Sub-Account	Indicator	Parameter	Unit	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
					dam height of 29 m.	dam height of 32 m.	dam height of 23 m.	dam height of 40 m.	dam height of 48 m.	dam height of 32 m.	dam height of 36 m.
	Operational Impact	Change in Aesthetics / Visual Impacts	Dam Height	m	29	32	23	40	48	32	36
		Noise Emissions	Distance from TMF to receptor	km	9.45	5.74	5.81	5.56	5.62	9.32	5.76
	Local Economic Risk	Loss of Local Jobs and Business Opportunities	Qualitative scale	—	There is no change in the capital and operational costs associated with the TMF alternative.	There is no change in the capital and operational costs associated with the TMF alternative.	There is a significant increase in the capital and operational costs associated with the TMF alternative.	There is a minor increase in the capital and operational costs associated with the TMF alternative.	There is a significant increase in the capital and operational costs associated with the TMF alternative.	There is slight reduction in the capital and operational costs associated with the TMF alternative.	There is a minor increase in the capital and operational costs associated with the TMF alternative.

Table 5: Rationale for Selection of Sub-Accounts and Indicators

Account	Sub-Account	Sub-Account Rationale	Indicator	Indicator Rationale
Environmental	Water Quality	Changes to water quality could harm aquatic species and other animals using the water.	Water Treatment Requirements	Alternatives have water treatment concepts intended to meet all applicable discharge criteria; however, alternatives that have more water being discharged will have greater loading on the receiver. Additionally, alternatives with greater water storage capacity will be better able to manage upset conditions such as during periods of poorer water quality, maintenance / repair cycles in treatment facilities, and high precipitation events.
			Flexibility for Water Treatment and Recycle	Alternatives which could pump excess water amongst multiple ponds to allow extra aging and water treatment before discharge to the environment are preferred. Conversely, alternatives that have minimal capacity to handle excess water will have rigid discharge requirements that are less able to manage changes to the water balance.
	Hydrology	Localized hydrology can be altered by the TMF alternatives through direct overprinting of drainage channels or by changes to the flows and water levels in nearby waters.	Catchment Impacted	Once the perimeter ditch surrounding the TMF has been constructed, precipitation that falls within the catchment areas that the TMF overprints will be captured into the site water balance, resulting in the loss of catchment area to adjacent watercourses. This has the potential to alter the hydrologic environment by reducing flows in adjacent watercourses that have reduced catchment areas. Alternatives resulting in greater flow reductions, measured at the nearest downstream permanent watercourse, could negatively affect hydrological regimes and reduce fish and fish habitat and should therefore be avoided.
			Number of Affected Sub-watersheds	To maintain a compact site footprint and limit the extent of environmental effects, Atlantic prefers to keep the majority of the Project footprint within the minimum number of sub-watersheds, to the extent practicable. Alternatives that extend into additional sub-watersheds could affect surface water and ground water quantities. Alternatives that are limited to a single sub-watershed are preferred as they will maintain a compact footprint and limit the overall extent of Project effects.
	Aquatic Resources	All the alternatives have been sited to avoid lakes and large rivers. However, several of the alternatives would overprint waters frequented by fish, resulting in a change to fish habitat that would require fish habitat offset in accordance with the *Fisheries Act* and the MDMER.	Loss of Fish Habitat (Waterbodies)	There are numerous waterbodies surrounding the Project site that are fish bearing. Although large waterbodies have been avoided by all of the alternatives carried forward to the MAA, some of the alternatives would overprint smaller ponds. These alternatives would require that new fish habitat be constructed under the *Fisheries Act* so no net loss of habitat would occur. Alternatives that overprint waterbodies should be avoided.
			Loss of Fish Habitat (Watercourses)	There are (intermittent, and/or permanently flowing) watercourses around the Project site that flow throughout the year and are considered main channel to these tributaries. Baseline studies determined these creeks to be fish bearing, and overprinting would affect fish and fish habitat. Alternatives that overprint main stem watercourses should be avoided.
			Number of Watercourse Crossings	Haul roads and pipelines that cross watercourses have the potential to affect fish habitat by altering the embankments, channel and substrate characteristics. Vehicle traffic over crossings can further affect the quality of fish habitat. Alternatives that do not require roads or pipelines to cross watercourses are preferred.
	Terrestrial Resources	Overprinting of land for the TMF and ancillary infrastructure results in direct habitat loss, although some habitat can	Loss of Wetland	Wetlands have a high ecological value due to their productivity and large fauna and flora diversity. Alternatives that overprint wetlands should be avoided.

Account	Sub-Account	Sub-Account Rationale	Indicator	Indicator Rationale
		be restored at closure. Terrestrial ecosystems vary within the Project site from dense forests to cleared land and can be assigned an ecological value. Alternatives that allow for a more compact site footprint and overprint areas that avoid higher value habitat would have less of an impact on the terrestrial ecosystem.	Use of Disturbed Habitat	Areas around the Project have previously been cleared for forestry and/or disturbed by mineral development, and remain today as meadows and sparsely covered forests. These lands have a relatively low ecological value compared to other ecosystems. Alternatives that utilize these lands are preferred.
			Footprint	Total footprint is a good metric for estimating impacts to terrestrial resources. In general, smaller TMFs would have less effects on flora and fauna.
			Loss of Forested Area	Forests have a high ecological value due to their importance to the local fauna and flora. Historical land use changes in the area, including forestry, have altered the natural ecosystem within the Project site from predominantly forested pre-industrial conditions. Due to their ecological value, areas covered by dense or mature forests should be avoided.
	Sensitive Species	Some species are sensitive or at risk from disappearing in Nova Scotia or in Canada and have been afforded special protections. Alternatives that have greater potential to harm these species should be avoided.	Loss of Mainland Moose Habitat	Mainland Moose have been observed near the Project site where they forage for aquatic vegetation within wetlands during the summer. Mainland Moose are listed as Endangered through the Provincial ESA.
			Loss of Brook Trout Habitat	Brook trout are priority species (S3) that have been observed near the Project site and potentially forage, rear and overwinter near the Project site. Brook Trout are of great social importance recreationally as one of Nova Scotia's most important sports fish and is also an important fish for the Mi'kmaq of Nova Scotia. Brook Trout prefers well-oxygenated, coldwater systems typically with groundwater inputs.
	Atmospheric Emissions	Several areas in close proximity to the Project have been assigned Provincial protection due to their recreational, ecological, or unique geological value. Alternatives that are more likely to affect these protected areas should be avoided.	Fugitive Dust	Alternatives have the potential to result in fugitive dust emissions when tailings are mechanically disturbed by air currents, or by ground disturbance during hauling of materials or construction activities. In addition to reducing air quality, fugitive dust could be deposited in nearby lakes and rivers, affecting aquatic species, as well as on nearby vegetation. Alternatives that generate less fugitive dust, or contain fugitive dust emissions to near the affected Project area, will result in less disturbance to the atmosphere and are preferred from an air quality perspective.
			GHG Emissions	Atlantic recognizes that GHG emissions are a global problem partially resulting from the burning of fossil fuels. Although emissions from the Project will not affect the immediate surrounding area, they add to global GHG emissions and ultimately contribute to climate change. Alternatives with reduced hauling requirements will emit less GHGs and are therefore preferred.
			Noise Emissions	Construction / operation of the TMF will result in noise emissions that increase ambient sound levels. Published literature has identified that sound emissions levels from 50 to 60 'A'-weighted decibels (dBA) can mask important communication signals in wildlife (Dooling and Popper, 2007). The ECCC 'Avoiding harm to migratory birds' website (ECCC, 2017) suggests sound levels exceeding 50 dBA are disruptive to wildlife, especially migratory birds. Alternatives with a compact footprint and limited construction windows will reduce noise emissions and are preferred.
	Protected Areas	Several areas in close proximity to the Project have been assigned Provincial protection due to their recreational, ecological, or unique geological value. Alternatives that are more likely to affect these protected areas should be avoided.	Proximity to Protected Wilderness Areas	Toadfish Lakes and Boggy Lake Wilderness Areas are located southeast of the Project. Toadfish Lakes Wilderness Area is part of a provincially-significant assemblage of protected river corridors, lakes and woodlands that provides refuge for species sensitive to disturbance, such as endangered mainland moose. Greater distance from the alternatives to the Toadfish Lakes Wilderness Area are preferred to minimize any potential effects. Boggy Lake Wilderness Area protects a representative portion of the Eastern Shore (Moser River) Drumlins Natural Landscape, which includes aquatic habitat and corridors of natural forest used by

Account	Sub-Account	Sub-Account Rationale	Indicator	Indicator Rationale
				many species for travel, feeding and shelter. Greater distance from the alternatives to the Wilderness Areas are preferred to minimize any potential effects.
	Hazard Potential to the Environment	From an environmental perspective, the hazard potential of the alternatives assesses the overall risk to the aquatic and terrestrial environments in the unlikely event of a TMF failure.	Magnitude of Failure	The TMF for the Project would be constructed to meet all appropriate factors of safety regardless of the alternative. That stated, the alternatives differ in the potential environmental effects in the unlikely event of a failure, based on the tailings deposition technology (solids content) and the reclaim pond location. Alternatives that utilize tailings deposition with a higher solids content with the reclaim pond outside of the containment dams would reduce the magnitude of any potential failure and are preferred.
			Downstream Sensitivities	The potential environmental effects in the unlikely event of a failure could impact sensitive downstream habitats. Alternatives that are located upstream of less sensitive downstream habitats are preferred.
Technical	Design Factors	Design factors include some of the key factors that contribute to technical complexity of the TMF alternatives. Alternatives that are less technically challenging are generally preferred.	Storage to Dam Volume Ratio	Reducing the storage volume to dam volume ratio can increase the efficiency of the TMF. Further, alternatives with high storage volume to dam volume ratios are generally easier to construct and require less material to build and are preferred.
			Dam Volume	Dam volume considers the number, length and height of the combined dams required for a particular alternative. Minimizing the dam volume is preferred.
			Natural Topographic Containment	The natural topography around the Project site includes large bedrock outcrops that provide more suitable containment (less porous, greater stability, and no earth moving requirements) compared to conventional rockfill dams, and reduces the need for relatively flat slopes on a filtered stack. Natural topographic containment also improves water management for diversions and seepage collection. Design should maximize the use of natural topography for containment.
	Safety Factors	Safety is a primary concern when designing the TMF and each alternative can be constructed to the necessary factor of safety. However, some technical factors have the potential to increase the risk or consequence of failure and should therefore be avoided.	Monitoring Requirements	Atlantic will be required to monitor and maintain the TMF following closure until the regulatory authority has deemed the site remediated and no further monitoring is required. Alternatives with more dams will increase the safety risk, thereby requiring additional monitoring during operation and are less preferred.
			Dam Height	There is generally a proportional increase in potential consequence of dam failure with an increase in TMF height. In the unlikely event of failure, taller facilities have greater potential energy to move materials. Shorter dam heights are therefore considered to incur less risk and are the preferred alternative.
			Impoundment Configuration	Dams are ideally constructed between two bedrock outcrops for maximum stability. Bends in dams are weaker points in the structure and these areas are more prone to failure than straight sections over comparable straight sections. Alternatives that avoid bends in the dams are preferred.
			Contaminant Management	Alternatives have the potential to result in fugitive dust and particulate matter emissions when tailings are mechanically disturbed by air currents, or by ground disturbance during hauling of materials, or construction activities. As particulate matter from tailings filtered stack may contain metals in the dust, Provincial approvals may include the requirement for air quality to meet specified criteria at the property boundary. Alternatives that are more likely to generate air emissions, or create air emissions near the property boundary will the risk of non-compliance with environmental approvals and should be avoided. In addition, alternatives have water treatment concepts intended to ensure that all applicable discharge criteria are met; however, alternatives that have higher water quality concerns (ARD) may have greater

Account	Sub-Account	Sub-Account Rationale	Indicator	Indicator Rationale
				loading on the receiver. Alternatives that have greater water storage capacity are better able to manage these conditions.
	Water Management	Water management is a primary consideration when designing both the TMF. Reclaim water is an integral part of processing and there needs to be sufficient storage or water on site at all times. However, excess water on site will require treatment prior to discharge to ensure environmental protection.	Length of Seepage Ditching	As required by the MDMER, each alternative will be equipped with seepage collection infrastructure, including ditching and seepage collection ponds to prevent contact water from leaving the site. Alternatives with less ditching will allow for easier compliance with the MDMER and are preferred.
			Number of Pumps and Pipelines	In addition to the seepage collection infrastructure, all alternatives would be equipped with a runoff collection system, which would likely include perimeter ditching as well as collection ponds in low-lying areas. Contact water captured from runoff or seepage will be pumped into the TMF supernatant pond and may subsequently be pumped to the process plant for recycle or to the water treatment plant (if necessary) before being discharged. Alternatives with fewer pumps and pipelines are preferred.
			Impacts to Annual Water Balance	A conceptual water balance of the Project site has determined that water will accumulate in the site inventory and will require treatment prior to discharge to the environment. Alternatives with tailings dewatering processes or larger catchment areas will result in additional water requiring treatment and management. The currently envisioned water treatment plant may not meet the needs of some of the alternatives and additional water management infrastructure could be required such as a larger treatment plant. Alternatives with increased quantities of water requiring treatment should be avoided.
			Reclaim Water Return	Each alternative will require that the seepage and runoff collected in either the seepage collection ponds and the reclaim pond be pumped back to the ore processing plant for use in the process plant to maintain the closed-loop water management approach. There will be technical challenges associated with the distance reclaim water required to be pumped back to the ore processing plant for use such as line inspections, maintenance and operating in winter conditions. Alternatives that have a shorter distance to pump reclaim water back to the ore processing plant are preferred from a technical perspective.
	Final Embankment Configuration	Although Atlantic cannot speculate on future reserves / resources, it is conceivable that with ongoing mineral exploration in the area a new mineral reserve could be discovered or existing reserves expanded. The mining of additional ore would increase the quantity of tailings requiring storage. Alternatives that allow for future TMF expansion increase the feasibility of and technical flexibility of potential mine expansions.	Final Embankment Construction	In the event that additional ore reserves are identified, it may be advantageous from a technical perspective to expand the TMF as opposed to constructing a new cell. Alternatives with smaller amount of materials and infrastructure required to construct to a final embankment that will accommodate for the expansion capacity are preferred.
	Compliance with Environmental Approvals	The chosen alternative would need to complete provincial regulatory processes prior to use, and would need to comply with all environmental approvals. Alternatives with environmental approvals that are	Ease of Obtaining Initial Permits	Alternatives using proven technology will have fewer technical challenges and less socio-environmental concerns. The ability to obtain permits for these alternatives would be less challenging.

Account	Sub-Account	Sub-Account Rationale	Indicator	Indicator Rationale
		expected to be technically challenging to comply with could result in Atlantic being in noncompliance.		
	Complexity of Operations	The operation of the alternative depends on technical solutions to process tailings, transport to the tailings management facility and manage water. Alternatives that require a complex set of components and operation increase the risk of downtime, intervention and overall inefficiency.	Tailings Disposal	The effort required in depositing tailings in the TMF is considered when designing the alternatives. The more complex the process of depositing tailings, the more susceptible the Project is to unforeseen problems and plant downtime. Alternatives that require infrequent intervention to deposit tailings in the TMF are preferred from a technical perspective.
			Processing Complexity	The more complex the process of dewatering tailings, the more susceptible the Project is to unforeseen problems and plant downtime. Alternatives that require infrequent intervention to dewater tailings in the TMF are preferred from a technical perspective.
			Distance from the Mill	Alternatives that are situated further from the ore processing plant have greater transportation infrastructure requirements such as longer haul roads, reclaim pipelines and tailings pipelines. Greater transportation infrastructure requirements increase the likelihood of incurring technical challenges with the surrounding terrain (e.g. river crossings, steep hills, etc.). Additionally, distance from the ore processing plant is the primary considerations for filtered stack tailings as they need to be hauled or conveyed to the TMF. Alternatives that are located close to the ore processing plant are preferred.
			Elevation from the Mill	The elevation differential between the alternative and the mill is proportional to the effort and complexity of operations to transport tailings. A low differential is preferred.
			Climatic Challenges	Operating a TMF could have challenges as a result of cold or wet weather. Alternatives more prone to challenges common in the Nova Scotia during winter and wet seasons should be avoided.
	Constructability	The ability to construct the alternative depends on site conditions and the availability of materials necessary for the facility.	Material Availability	Rockfill dams will require large quantities of rock to construct as well as other grain sizes such as filter, transition or bedding material. The dam materials may need to be manufactured or sourced elsewhere depending on the quantities and site availability.
			Foundation Suitability	TMF alternatives are ideally situated on hard rock for foundational stability, and when located over overburden, free draining material is preferred to reduce potential for excess pore pressure buildup within the dam foundations. Alternatives positioned over more stable or free draining ground are preferred from a technical design perspective.
Project Economics	Total TMF Costs	Overall costs of constructing, operating and closing the alternative.	Initial Capital Costs	Capital costs required for the TMF are a key consideration when designing the structure. TMFs often require extensive dam construction, and earth works or costly dewatering plants. Other capital costs include site clearing, infrastructure for water management and treatment, access roads, pipelines and seepage collection infrastructure.
			Sustaining Capital Costs	TMF impoundment dams are generally one of the greatest costs associated with mines where tailings are deposited as a conventional slurry or filtered tailings. Typically, they are constructed over the operating life of the mine as dam raises to defer the cost.
			Operating Costs	Operational costs associated with tailings deposition and water management directly affect Project economics as these expenses occur at regular intervals throughout the life of the mine.

Account	Sub-Account	Sub-Account Rationale	Indicator	Indicator Rationale
			Closure Costs	The closure costs associated with the TMF include the cost of decommissioning and rehabilitating the site to a stable and more ecologically productive state, in accordance with regulatory requirements. Extensive closure costs will increase the requirement for closure bonding and will ultimately affect overall project financial performance.
			Post-Closure Costs	Post-closure costs generally include long term dam monitoring and maintenance or water treatment if needed.
			Ancillary Costs	Some of the alternatives will result in ancillary costs that will impact project economics, such as fish habitat offsetting. Alternatives with less ancillary costs are preferred.
	Economic Risk	Some of the alternatives bring inherent risk to Project economics, could result in schedule delays and risk overall Project viability.	Projected Timeline for Permits	There is the possibility that some alternatives could result in the delay or rejection of environmental approvals, ultimately delaying Project construction and operations. This would have a significant cost to Atlantic and would impact the overall feasibility of the Project.
			Projected Timeline for Start of Operation	Some of the TMF alternatives will have additional technical or environmental requirements before proceeding with construction. This could result in the delay in the commencement of operations, which would have a significant cost to Atlantic and would impact the overall feasibility of the Project.
Socioeconomics	Land Use	The Project is located in an area that is sparsely populated with infrequent land use. Atlantic understands the importance of traditional land use and heritage values to Indigenous peoples in the vicinity of the Project, and have taken the necessary steps through engagement to better understand what these values are and how to effectively mitigate negative Project effects. Minimizing or avoiding potential effects to local people's values is an integral part of Project development, along with balancing these values with the need for regional economic development. Alternatives that avoid interference with existing land uses are preferred.	Loss of Fishing	Fishing is common throughout the region and alternatives that affect less lake habitat are preferred.
			Loss of Commercial Forest Harvesting	During the site preparation and construction phase of the Project, the merchantable timber from the Project area may be removed by local forestry companies. Following closure and reclamation, the area overprinted by the TMF will be unavailable for forestry. Alternatives with a smaller TMF will have less effects to long term forestry in the Project vicinity.
			Loss of ATV trails	There is the potential that local residents utilize the cleared area running through the Project site for recreation, including ATVing and snowmobiling. Alternatives less likely to restrict or alter access along recreational trails are preferred.
			Loss of Private Land Ownership	Some of the lands in the area adjacent to the Project site are privately owned, and alternatives that overprint or encroach on these lands could result in a loss of private land ownership.
	Human Health and Public Safety	Alternatives that have the potential to harm human health and public safety should be avoided.	Fugitive Dust	TMF alternatives have the potential to increase the risk to public health and safety from exposure to fugitive dust coming off the TMF. The quantity of fugitive dust production is considered to be proportional to the level of dewatering to the tailings prior to deposition as well as the total surface area of the TMF that is subject to wind erosion. Alternatives that increase the risk to public health and safety from fugitive dust exposure should be avoided.

Account	Sub-Account	Sub-Account Rationale	Indicator	Indicator Rationale
			Hazard Potential to the Public	Each alternative will be designed and construction to meet all appropriate factors of safety. That stated, some of the alternatives have a greater hazard potential in regards to public safety based on the fluidity of the tailings in the unlikely event of a failure, and the distance from the nearest cottage, or infrastructure (road) used by the public. Alternatives that increase the risk to the health and safety of the public should be avoided.
			Risk to Workers	The TMF alternatives have the potential to increase risk to worker health, such as exposure to dust, TMF failure, water management failure. Alternatives with less risk to worker health are preferred.
	Operational Impact (Noise and Aesthetics)	The Project is located in an area that is sparsely populated with infrequent land use. As a result of the TMF, there could be effects to these local people including noise emissions, and aesthetics that could affect their enjoyment of the area.	Change in Aesthetics / Visual Impacts	During the EA process, Indigenous peoples and local stakeholders identified the importance of the visual aesthetics of the natural landscape. The maximum elevation of the TMF was assessed as being proportional to the visibility of the alternatives. Alternatives with a lower maximum elevation are preferred from an aesthetics perspective as surrounding terrain would conceal more of the TMF.
			Noise Emissions	The construction of the TMF impoundment dams in the case of conventional slurry and thickened tailings, along with the transportation and contouring of the TMF in the case of filtered tailings deposition, will all result in noise emissions. Although noise levels will need to be limited to the regulatory limits at receptor locations, noise produced by TMF construction could be considered a nuisance in the vicinity of the Project. Alternatives with greater construction requirements should be avoided.
	Local economic Risk	The cost of constructing, operating and closing a TMF contributes to the overall gold production costs for a Project. Alternatives with a costlier TMF would have a higher overall gold production cost. Should the globe price of gold decrease below the gold production cost for an extended period, Atlantic could be in a situation where it is forced to enter a period of care and maintenance, or early closure. During this state, the primary economic benefits of the Project on the local economy would be lost.	Loss of Local Jobs and Business Opportunities	The Project has the potential to be a major contributor to the local economy. Alternatives with very tight economic margins are more prone to volatility in gold prices and the Canadian dollar, which could result in suspension of operations and entering a care and maintenance phase. This would negatively affect local employment and business opportunities.

Table 6: Multiple Accounts Analysis Valuating Criteria

Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value					
					6 (Highest)	5	4	3	2	1 (Lowest)
Environment	Water Quality	Water Treatment Requirements	Qualitative scale	—	Very High – large water storage volume capacity, with a large	High – large water storage volume capacity, with a large receiving	Moderate to High - large water storage volume capacity, with a	Low to Moderate - large water storage volume capacity, with a	Low – moderate water storage volume capacity, with a large	Very Low – moderate water storage volume capacity, with a

Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value 6 (Highest)	5	4	3	2	1 (Lowest)
					receiving waterbody and numerous water managements ponds	waterbody and few water managements ponds	moderate receiving waterbody and numerous water managements ponds	small receiving waterbody and numerous water managements ponds	receiving waterbody and numerous water managements ponds	moderate -large receiving waterbody and few water managements ponds
		Flexibility for Water Treatment and Recycle	Qualitative scale	—	>6	6	5	4	3	<3
	Hydrology	Watercourse Realignments	Length of realignment	m	<14	14.5 to 43	43.5 to 70	70.5 to 99	99.5 to 127	>127
		Catchment Impacted	Length of stream where loss is over 25%	m	<500	500 to 1,250	1,251 to 2,000	2,001 to 2,750	2,751 to 3,500	>3,500
		Number of Affected Sub-watersheds	Number of sub-watersheds	#	1	2	3	4	5	>5
	Aquatic Resources	Loss of Fish Habitat (waterbody)	Area of waterbody	ha	<0.15	016 to 0.45	0.46 to 0.75	0.76 to 1.05	1.06 to 1.35	>1.35
		Loss of Fish Habitat (watercourse)	Length of watercourse	m	<263	264 to 790	791 to 1,315	1,316 to 1,844	1,845 to 2,370	>2,370
		Number of new crossings	Number of crossings	#	0	1	2	3	4	>4
	Terrestrial Resources	Loss of Wetland	Area of wetland	ha	<6	6 to 7	7 to 8	8 to 9	9 to 10	>10
		Use of Disturbed Habitat	Area of disturbed habitat	ha	<1.5	1.5 to 2.0	2.1 to 2.5	2.6 to 3.1	3.2 to 3.7	>3.7
		Footprint	Area	ha	<95	95 to 104	105 to 114	115 to 124	125 to 134	>134
		Loss of Forested Area	Area	ha	<85	85 to 94	95 to 104	105 to 114	115 to 120	>120
	Sensitive Species	Loss of Mainland Moose Habitat	Area of potential habitat	ha	<6.3	6.3 to 7.1	7.2 to 8.0	8.1 to 8.9	9.0 to 9.9	>9.9
		Loss of Brook Trout Habitat	Area of potential habitat	ha	<263	263 to 790	791 to 1,317	1,318 to 1,844	1,845 to 2,370	>2,370
	Atmospheric Emissions	Fugitive Dust	Qualitative scale	—	Excellent - Conventional slurry tailings with a small footprint (<113 ha) and short distance to processing facility (<1 km)	Very Good - Conventional slurry tailings with a small footprint (<113 ha) or a short distance to the processing facility (<1 km)	Good - Conventional slurry tailings with a large footprint (>122 ha) and large distance to processing facility (>5 km)	Fair - Filtered tailings with a small footprint (<113 ha) and small distance to processing facility (<1 km)	Poor - Filtered tailings with a small footprint (<113 ha) or small distance to processing facility (<1 km)	Very Poor - Filtered tailings with a large footprint (<122 ha) and large distance to processing facility (<5 km)
		GHG Emissions	Qualitative scale	—	Excellent - Construction of a conventional slurry tailings facility with a small area required for clearing, and minimal volume of dam construction materials to haul over a short distance	Very Good - Construction of a conventional slurry tailings facility with a small to moderate area required for clearing. Tailings dam requires minimal to moderate volume of dam construction materials to haul over a short to moderate distance	Good - Construction of a conventional slurry tailings facility with a large area required for clearing, and substantial volume of dam construction materials to haul over a long distance	Fair - Construction of a filtered tailings facility with a small area required for clearing, and minimal volume of dam construction materials to haul over a short distance. Requires hauling of filtered tailings during operation.	Poor - Conventional slurry tailings with a small area to clear. Tailings dam requires minimal to moderate volume of dam construction materials to haul over a short to moderate distance. Requires hauling of filtered tailings during operation.	Very Poor - Construction of a filtered tailings facility with a large area required for clearing, and substantial volume of dam construction materials to haul over a large distance. Requires hauling of filtered tailings during operation.
		Noise Emissions	Distance from TMF to receptor	m	>7,751	7,251 to 7,750	6,751 to 7,250	6,251 to 6,750	5,750 to 6,250	<6,250

Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value					
					6 (Highest)	5	4	3	2	1 (Lowest)
	Protected Areas	Proximity to Protected Areas	Distance from TMF to protected area	m	>3,440	3,015 to 3,440	2,591 to 3,014	2,166 to 2,590	1,740 to 2,165	<1,740
	Hazard Potential to the Environment	Magnitude of Failure	Qualitative scale	—	Excellent - Filtered tailings with no downstream water management ponds and low, short dam	Very Good - Filtered tailings, with a downstream water management pond and a high dam or long dam length	Good - Filtered tailings, with numerous downstream water management ponds and a high, long dam	Fair - Slurry tailings with a supernatant pond with a low height dam and short length dam	Poor - Slurry tailings with a supernatant pond and a moderate to high dam or moderate to long dam length	Very Poor - Slurry tailings with a supernatant pond and a high height dam and high length dam
		Downstream Sensitivities	Qualitative scale	—	Excellent - Filtered tailings water management ponds located over 3 km from Fifteen Mile Stream.	Very Good - Filtered tailings water management ponds located less then 3 km from Fifteen Mile Stream.	Good - Conventional slurry tailings located over 3 km from Fifteen Mile Stream.	Fair - Conventional slurry tailings located between 1 and 3 km from Fifteen Mile Stream.	Poor - Conventional slurry tailings located between 1 and 3 km from Fifteen Mile Stream, with infrastructure potentially impacted.	Very Poor - Conventional slurry tailings located over 3 km from Fifteen Mile Stream.
Technical	Design Factors	Storage to Dam Volume Ratio	Ratio	#	>8.3	7.1 to 8.3	5.7 to 7.0	4.5 to 5.6	3.1 to 4.4	<3.1
		Dam Volume	Volume of material	Mm^3	<1.60	1.60 to 2.19	2.2 to 2.69	2.7 to 3.19	3.2 to 3.79	>3.8
		Natural Topographic Containment	Qualitative scale	—	Excellent - a bowl like basin provides excellent containment and is surrounded by high ground for most of the perimeter, a small dam / seepage collection ditch may be required at the outlet of the bowl	Very Good – a bowl like basin provides very good containment and is generally surrounded by high ground, dams / seepage collection are required along the downgradient side and limited saddle dam may be required between areas of high ground	Good – dams / seepage collection are required along a large portion of the perimeter with a large primary dam and many saddle dams, the height and volume of most saddle dams is limited due to some topographic advantages, topography within TMF may provide good natural containment	Fair – surrounding topography provides limited advantages and extensive dams / seepage collection required for majority of perimeter, varying topography within TMF may reduce total storage capacity	Poor - perimeter or near perimeter dams / seepage collection required, topography within TMF notably reduces storage capacity	Very Poor - perimeter dams / seepage collection required with no natural containment, high ground such as a hill within the TMF significantly reduces storage capacity
	Safety Factors	Monitoring Requirements	Length of dams	m	<2,190	2,190 to 2,467	2,468 to 2,745	2,746 to 3,024	3,025 to 3,303	>3,303
		Dam Height	Final dam height	m	<25	25.0 to 28.0	28.1 to 32.0	32.1 to 35.5	35.6 to 39.1	>39.1
		Impoundment Configuration	Number of bends	#	<3	3	4	5	6	>6
		Contaminant Management	Qualitative scale	—	Excellent - Conventional slurry tailings with many water management ponds and	Very Good - Conventional slurry tailings with few water management ponds or a large	Good - Conventional slurry tailings with few water management ponds and a large	Fair - Filtered tailings with a short travel distance and small TMF surface area	Poor - Filtered tailings with a moderate/long travel distance or moderate/large TMF surface area	Vary Poor - Filtered tailings with a long travel distance and large TMF surface area

Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value					
					6 (Highest)	5	4	3	2	1 (Lowest)
					minimal required seepage ditching	length of seepage ditching	length of seepage ditching			
	Water Management	Length of Seepage Ditching	Length	km	<2,380	2,380 to 2,885	2,886 to 3,394	3,395 to 3,899	3,900 to 4,400	>4400
		Number of Pumps and Pipelines	Quantity	#	Excellent - Requires a short surplus water pipeline length, with no pumps and no ditches	Very Good - Requires a short surplus water pipeline length, with 1 to 2 pumps and no ditches	Good - Requires a moderate surplus water pipeline length, with 1 to 2 pumps and no ditches	Fair - Requires a moderate surplus water pipeline length, with 1 to 2 pumps and little to moderate ditch length	Poor - Requires a long surplus water pipeline length with numerous pumps and little to moderate ditch length	Very Poor - Requires a long surplus water pipeline length with numerous pumps and a long ditch length
		Impacts to Annual Water Balance	Impacted Catchment Area	ha	<151	151 to 164	165 to 175	176 to 190	191 to 205	>205
		Reclaim Water Return	Distance to mill	km	<1.9	1.9 to 2.7	2.8 to 3.6	3.7 to 4.6	4.7 to 5.5	>5.5
	Final Embankment Configuration	Final Embankment Construction	Qualitative scale based on incremental volume of final dam and length of ditching required for expansion of dam	—	Excellent - Final embankment requires limited materials (<3,000,000 m^3) and minimal new ditching (<999 m)	Very Good - Final embankment requires limited materials (<3,000,000 m^3) and moderate new ditching (1,000 to 1,500 m)	Good - Final embankment requires limited materials (<3,000,000 m^3) and substantial new ditching (>1,500 m)	Fair - Final embankment requires significant materials (>3,000,000 m^3) and minimal new ditching (<999 m)	Poor - Final embankment requires significant materials (>3,000,000 m^3) and moderate new ditching (1,000 to 1,500 m)	Very Poor - Final embankment requires significant materials (>3,000,000 m^3) and substantial new ditching (>1,500 m)
	Compliance with Environmental Approvals	Ease of Obtaining Initial Permits	Qualitative scale	—	Very Easy - Conventional slurry tailings with good baseline knowledge and preliminary engineering studies completed. The alternative has been adequately consulted upon during the EA process, and it is anticipated to take a short time for permitting.	Easy - Conventional slurry tailings with some baseline knowledge and preliminary engineering studies completed. The alternative has been partly consulted upon during the EA process, and it is anticipated to take a short to moderate time for permitting.	Easy to Moderate - Conventional slurry tailings with no baseline knowledge or preliminary engineering studies completed. The alternative has not been consulted upon during the EA process, and it is anticipated to take a moderate time for permitting.	Moderate to Difficult - Filtered tailings with good baseline knowledge and preliminary engineering studies completed. The alternative has been consulted upon during the EA process, and it is anticipated to take a moderate to long time for permitting, due to unfamiliar technology.	Difficult - Filtered tailings with some baseline knowledge and engineering studies completed. The alternative has been partly consulted upon during the EA process, but it is anticipated to take a long time for permitting, due to unfamiliar technology.	Very Difficult - Filtered tailings with no baseline knowledge or engineering studies completed. The alternative has not been consulted upon during the EA process, and it is anticipated to take a very long time for permitting, due to unfamiliar technology.
	Complexity of Operations	Tailings Disposal	Qualitative scale	—	Excellent - Little human intervention required to dewater and deposit the tailings into the TMF; TMF located <1 km from the processing plant	Very Good - Little human intervention required to dewater and deposit the tailings into the TMF; TMF located between 1 and 5 km from the processing plant	Good - Little human intervention required to dewater and deposit the tailings into the TMF; TMF located >5 km from the processing plant	Fair - Extensive human intervention required to dewater and deposit the tailings into the TMF; TMF located <1 km from the processing plant	Poor - Extensive human intervention required to dewater and deposit the tailings into the TMF; TMF located between 1 and 5 km from the processing plant	Very Poor - Extensive human intervention required to dewater and deposit the tailings into the TMF; TMF located >5 km from the processing plant

Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value					
					6 (Highest)	5	4	3	2	1 (Lowest)
		Processing Complexity	Qualitative scale	—	Excellent - Conventional slurry tailings with a short pipeline distance	Very Good - Conventional slurry tailings with a moderate pipeline distance	Good - Conventional slurry tailings with a long pipeline distance	Fair - Filtered tailings with a short travel distance and few water management ponds	Poor - Filtered tailings with a moderate to long travel distance or large number of water management ponds	Very Poor - Filtered tailings with a long travel distance and large number of water management ponds
		Distance from the Mill	Distance	km	<1.0	1.0 to 1.7	1.8 to 2.5	2.6 to 3.3	3.4 to 4.0	>4.0
		Elevation from the Mill	Elevation of dam crest	masl	<145	145 to 149	150 to 153	154 to 158	159 to 162	>162
		Climatic Challenges	Qualitative scale	—	Very Low – conventional slurry technology with shorter total pipeline length (<2 km)	Low – conventional slurry technology with moderate total pipeline length (~2 to 5 km)	Low to Moderate – conventional slurry technology with longer total pipeline length (>5 km)	Moderate to High – filtered tailings technology (requires thinner tailings layers and immediate compaction in frozen conditions, heated truck beds), with shorter distance to TMF (<2 km)	High - filtered tailings technology (requires thinner tailings layers and immediate compaction in frozen conditions, heated truck beds), with moderate distance to TMF (~2 to 5 km)	Very High - filtered tailings technology (requires thinner tailings layers and immediate compaction in frozen conditions, heated truck beds), with longer distance to TMF (>5 km)
	Constructability	Material Availability	Distance to suitable materials	km	<2	2 to 3	3 to 4	4 to 5	5 to 6	>6
		Foundation Suitability	Qualitative scale	—	Filtered stack with good foundations conditions	Filtered stack with poor foundations conditions	Filtered stack with unknown foundations conditions	Conventional slurry dams with good foundations conditions	Conventional slurry dams with poor foundations conditions	Conventional slurry dams with unknown foundations conditions
Project Economics	Total TMF Costs	Initial Capital Costs	Cost (millions)	$	<17	17 to 22.9	23 to 28.9	29 to 34.9	35 to 41	>41
		Sustaining Capital Costs	Cost (millions)	$	<10.80	10.80 to 12.30	12.31 to 13.84	13.85 to 15.34	15.35 to 16.80	16.80
		Operating Costs	Cost (millions)	$	<6.6	6.6 to 15.4	15.5 to 24.2	24.31 to 33.1	33.2 to 42	>42
		Closure Costs	Cost (millions)	$	<11.38	11.38 to 13.12	13.13 to 14.86	14.87 to 16.60	16.61 to 18.33	>18.33
		Post-Closure Costs	Cost (millions)	$	<1.70	1.71 to 1.93	1.94 to 2.14	2.15 to 2.36	2.37 to 2.60	>2.60
		Ancillary Costs	Cost (millions)	$	<1.08	1.08 to 2.77	2.78 to 4.46	4.47 to 6.15	6.16 to 7.84	>7.84
	Economic Risks	Projected Timeline for Permits	Change in NPV	$	<1.0	1.0 to 2.5	2.6 to 4.0	4.1 to 5.5	5.6 to 7.0	>7.0
		Projected Timeline for Start of Operations	Qualitative scale	—	Conventional slurry tailings with good baseline knowledge and preliminary engineering studies completed. The alternative has been adequately consulted upon during the EA process, and it is anticipated to take	Conventional slurry tailings with some baseline knowledge and preliminary engineering studies completed. The alternative has been partly consulted upon during the EA process, and it is anticipated to take	Conventional slurry tailings with no baseline knowledge or preliminary engineering studies completed. The alternative has not been consulted upon during the EA process, and it is anticipated to take	Filtered tailings with good baseline knowledge and preliminary engineering studies completed. The alternative has been consulted upon during the EA process, and it is anticipated to take a moderate	Filtered tailings with some baseline knowledge and preliminary engineering studies completed. The alternative has been partly consulted upon during the EA process, and it is anticipated to take a long time for	Filtered tailings with good baseline knowledge and preliminary engineering studies completed. The alternative has not been consulted upon during the EA process, and it is anticipated to take

Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value					
					6 (Highest)	5	4	3	2	1 (Lowest)
					a short time for permitting.	a short to moderate time for permitting.	a moderate time for permitting.	to long time for permitting, due to unfamiliar technology.	permitting, due to unfamiliar technology.	a very long time for permitting, due to unfamiliar technology.
Socioeconomics	Land Use	Loss of Fishing	Area of aquatic habitat	m^2	<1,200	1,201 to 1,500	1,501 to 2,000	2,001 to 2,750	2,751 to 3,500	>3,500
		Loss of Commercial Forest Harvesting	Area of commercial forest lost	ha	<0.33	0.33 to 0.99	1.00 to 1.64	1.65 to 2.30	2.31 to 2.96	>2.96
		Loss of ATV Trails	Length of trails lost	m	<100	100 to 400	401 to 700	701 to 1000	1001 to 1300	>1300
		Loss of Private Land Ownership	Area of private lands	ha	<10	10 to 20	21 to 30	31 to 40	41 to 50	>50
	Human Health and Public Safety	Fugitive Dust	Qualitative scale	—	Excellent - Conventional slurry tailings with a small footprint (<113 ha) and short distance to processing facility (<1 km)	Very Good - Conventional slurry tailings with a small footprint (<113 ha) or a short distance to the processing facility (<1 km)	Good - Conventional slurry tailings with a large footprint (>122 ha) and large distance to processing facility (>5 km)	Fair - Filtered tailings with a small footprint (<113 ha) and small distance to processing facility (<1 km)	Poor - Filtered tailings with a small footprint (<113 ha) or small distance to processing facility (<1 km)	Very Poor - Filtered tailings with a large footprint (<122 ha) and large distance to processing facility (<5 km)
		Hazard Potential to the Public	Qualitative scale	—	Excellent - Filtered tailings water management ponds located over 3 km from Fifteen Mile Stream.	Very Good - Filtered tailings water management ponds located less than 3 km from Fifteen Mile Stream.	Good - Conventional slurry tailings located over 3 km from Fifteen Mile Stream.	Fair - Conventional slurry tailings located between 1 and 3 km from Fifteen Mile Stream.	Poor - Conventional slurry tailings located between 1 and 3 km from Fifteen Mile Stream, with infrastructure potentially impacted.	Very Poor - Conventional slurry tailings located over 3 km from Fifteen Mile Stream.
		Risk to Workers	Qualitative scale	—	Excellent – Conventional slurry TMF located remote (>2 km) from mine workings and a low dam height (<35 m)	Very Good – Conventional slurry TMF located near (<2 km) mine workings or with high dams (>35 m)	Good – Conventional tailings TMF located near (<2 km) mine workings and with high dams (>35 m)	Fair - Filtered tailings TMF located remote (>2 km) from mine workings and a low dam height (<35 m)	Poor – Filtered stack TMF located near (<2 km) mine workings or with high dams (>35 m)	Very Poor – Conventional slurry tailings located less than 3 km from Fifteen Mile Stream, with infrastructure potentially impacted.
	Operational Impact	Change in Aesthetics / Visual Impacts	Qualitative scale	—	<25	25.0 to 28.0	28.1 to 32.0	32.1 to 35.5	35.6 to 39.1	>39.1
		Noise Emissions	Distance from TMF to receptor	m	>7,750	7,251 to 7,750	6,751 to 7,250	6,251 to 6,750	5,750 to 6,250	<5,750
	Local Economic Risk	Loss of Local Jobs and Business Opportunities	Qualitative scale	—	Excellent – The capital and operational costs associated with the TMF are substantially less than the base case and highly resilient to large	Very Good – The capital and operational costs associated with the TMF are less expensive than the base case and it is unlikely that large fluctuations in	Good – The capital and operational costs associated with the TMF are not different then the base case and would not be susceptible to large gold price	Fair – The capital and operational costs associated with the TMF are slightly more expensive then the base case and the mine may be potentially	Poor – The capital and operational costs associated with the TMF are more expensive then the base case and there is the possibility that the mine would be	Very Poor – The capital and operational costs associated with the TMF are significantly higher than the base case and it is highly likely that the

Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value					
					6 (Highest)	5	4	3	2	1 (Lowest)
					fluctuations in gold price	gold price would result in temporary care and maintenance	fluctuations, which could result in temporary care and maintenance until prices improve	susceptible to moderate gold price fluctuations, which would result in temporary care and maintenance probable until gold prices improve	susceptible to minor fluctuations in gold price, which would result in temporary care and maintenance until gold prices increase	mine would be susceptible to minor fluctuations in gold price, which would result in a forced shutdown and early mine closure likely

Table 7: Multiple Accounts Analysis Values

			Indicator Value						
Account	Sub-Account	Indicator	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Environment	Water Quality	Water Treatment Requirements	4	5	2	6	1	3	5
		Flexibility for Water Treatment and Recycle	3	2	5	4	5	2	2
	Hydrology	Catchment Impacted	6	1	1	2	2	4	1
		Number of Affected Sub-watersheds	6	5	5	4	4	6	5
	Aquatic Resources	Loss of Fish Habitat (waterbody)	1	6	6	6	6	5	6
		Loss of Fish Habitat (watercourse)	3	5	4	6	6	1	6
		Number of new crossings	2	6	6	6	6	4	6
	Terrestrial Resources	Loss of Wetland	5	1	1	4	6	2	4
		Use of Disturbed Habitat	6	1	2	1	1	1	5
		Footprint	6	1	3	3	4	1	4
		Loss of Forest	6	1	3	3	4	1	4
	Sensitive Species	Loss of Mainland Moose Habitat	3	1	1	4	6	2	5
		Loss of Brook Trout Habitat	3	5	4	6	6	1	6
	Atmospheric Emissions	Fugitive Dust	5	5	2	6	3	4	6
		GHG Emissions	5	5	1	4	2	4	4
		Noise Emissions	6	1	2	1	1	6	2
	Protected Areas	Proximity to Protected Areas	6	1	1	1	2	3	1
	Hazard Potential to the Environment	Magnitude of Failure	2	2	5	1	5	2	2
		Downstream Sensitivities	1	4	6	2	5	2	4
Technical	Design Factors	Storage to Dam Volume Ratio	4	2	1	1	1	6	1
		Dam Volume	5	1	1	1	1	6	1
		Natural Topographic Containment	3	4	3	4	4	5	3
	Safety Factors	Monitoring Requirements	2	2	1	1	2	6	1
		Dam Height	4	4	6	1	1	4	2
		Impoundment Configuration	4	5	1	2	1	6	1
		Contaminant Management	5	5	2	6	2	5	4
	Water Management	Length of Seepage Ditching	3	5	3	3	1	6	2
		Number of Pumps and Pipelines	2	5	2	4	4	1	5
		Impacts to Annual Water Balance	5	3	1	5	5	1	6
		Reclaim Water Return	1	5	4	5	6	1	5
	Final Embankment Configuration	Final Embankment Construction	4	5	3	2	6	6	1
	Compliance with Environmental Approvals	Ease of Obtaining Initial Permits	4	6	2	5	2	4	4
	Complexity of Operations	Tailings Disposal	5	6	2	6	3	4	6
		Processing Complexity	4	5	2	5	2	4	5
		Distance from the Mill	1	6	6	6	6	1	6
		Elevation from the Mill	6	1	1	1	1	5	1
		Climatic Challenges	4	5	2	5	3	4	5
	Constructability	Material Availability	2	6	6	6	6	1	6
		Foundation Suitability	1	3	6	3	6	1	3

			Indicator Value						
Account	**Sub-Account**	**Indicator**	**Alternative A**	**Alternative B**	**Alternative C**	**Alternative D**	**Alternative E**	**Alternative F**	**Alternative G**
Economics	Total TMF Costs	Initial Capital Costs	5	6	1	5	1	4	6
		Sustaining Capital Costs	4	3	1	2	4	6	1
		Operating Costs	6	6	1	6	1	6	6
		Closure Costs	6	4	6	5	6	1	6
		Post-Closure Costs	2	3	1	1	2	6	1
		Ancillary Costs	3	4	4	5	5	1	6
	Economic Risks	Projected Timeline for Permits	1	6	1	4	1	1	1
		Projected Timeline for Start of Operations	4	6	2	5	2	4	4
Socioeconomics	Land Use	Loss of Recreational Fishing	1	4	4	4	5	1	6
		Loss of Commercial Forest Harvesting	6	4	6	4	4	1	4
		Loss of ATV Trails	6	2	2	1	4	1	3
		Loss of Private Land Ownership	2	6	6	6	6	1	6
	Human Health and Public Safety	Fugitive Dust	5	5	2	6	3	4	6
		Hazard Potential to the Public	1	4	6	2	5	2	4
		Risk to Workers	6	6	4	5	1	6	5
	Operational Impact	Change in Aesthetics / Visual Impacts	4	4	6	1	1	4	2
		Noise Emissions	6	1	2	1	1	6	2
	Local Economic Risk	Loss of Local Jobs and Business Opportunities	4	4	1	3	1	5	3

Table 8: Sub-Accounts and Indicators Weightings and Rationale

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
Environment	6	Water Quality	5	Ensuring local water quality is not significantly adversely affected by the deposition of tailings is of overriding environmental concern when designing a TMF. Tailings effluent requires management to meet discharge criteria and prevent effects to receiving waters. A weight of five was assigned.	Water Treatment Requirements	6	Water treatment for the conventional slurry alternatives will occur in the tailings pond as sunlight and volatilization processes break down cyanide and ammonia residuals and suspended solids settle. Ponds with more volume have a longer residency time to allow more treatment. The filtered stack alternatives will require a water treatment plant to ensure the larger flows are treated in accordance with discharge criteria. A high weight of six was assigned.
					Flexibility for Water Treatment and Recycle	2	Alternatives which could pump excess water from the tailings pond to other water management ponds will allow extra aging and water treatment before discharge to the environment. The addition of additional ponds will greatly improve the residency time of tailings effluent and allow batch treatment for pH and metals. Conversely, alternatives that do not have capacity to manage excess or inventories are prone to situations which could affect water quality. A low weight of two was assigned.
		Hydrology	3	The hydrology of the area and how the TMF will affect the natural drainage of a region is extensively considered when designing the TMF. Alternatives can directly overprint watercourses that are important for the drainage of the region, and will alter catchment areas, reducing the quantity of water reporting to nearby watercourses and waterbodies. However, mitigation measures can be implemented to reduce the overall effects to the regional hydrology, such as watercourse realignments, and this sub-account was not considered as influential to the environmental effects of the Project as some of the other subaccounts. A moderately low weight of three has been assigned.	Catchment Impacted	5	The potential to negatively affect hydrologic environment by reducing flows in adjacent watercourses due to a reduced catchment area, could reduce fish and fish habitat and as a result, a high weight of five was assigned.
					Number of Affected Sub-watersheds	5	Alternatives that overprint a sub-watershed divide will have added technical challenges from a water management perspective. There would be increased technical difficulties in seepage collection as well as the potential for a larger water quality monitoring program to demonstrate compliance with the MDMER. A moderate weight of five has been assigned.
		Aquatic Resources	6	Fish and fish habitat is protected Federally under the *Fisheries Act*, and is regulated in the MDMER so that no net loss of fish habitat will occur as a result of the Project. However, natural fish habitat will be affected to differing severities by each of the alternatives depending on the amount and type of fish habitat lost or altered. Because of the importance placed on fish habitat by Federal legislation and it is the overarching reason for this assessment of alternatives, a maximum weight of six has been assigned.	Loss of Fish Habitat (waterbody)	5	Although one of the primary design criteria for the TMF was to avoid waters frequented by fish, due to the large quantity of surface water in the area, some of the alternatives would overprint watercourses in the form of tributaries and creeks. Watercourse fish habitat is considered to be more ecologically productive than ponds and provides spawning areas for a large number of aquatic species. For these reasons, a high weight of five has been assigned for watercourse fish habitat removal.
					Loss of Fish Habitat (watercourse)	6	Some alternatives would overprint waterbodies provides habitat for fish. A high weight of six has been assigned for waterbody fish habitat removal.
					Number of Watercourse Crossings	3	Haul roads and pipelines that cross watercourses around the Project could have localized effects to the embankment, channel and substrate characteristics. Additionally, vehicle traffic over the watercourse crossings can further exacerbate the effects to fish habitat during operations by vibration and by road material migrating into the watercourse. However,

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
							watercourse crossings are considered to have less effects to fish habitat than a direct loss of habitat, as there would be available habitat remaining within those watercourses. Therefore, relative to the other indicators, a moderate weight of three has been assigned.
		Terrestrial Resources	2	Due to no viable options for the tailings to be deposited underground in former mine workings, surface impoundment of the tailings is required. This requires that large areas of terrestrial habitat are overprinted based on the required size of the TMF. Due to the regional abundance of terrestrial habitat available compared to aquatic habitat, and different Federal and Provincial legislation placed on terrestrial habitat, a low weight of two has been assigned.	Loss of Wetland	5	Wetland habitat has a high ecological value relative to other habitat types, and generally contains a large variety of fauna and flora that can only be found in wetland environments. A high weight of five has been assigned to reflect the overall productivity of wetland environments, as well as the large area of wetland loss for some of the alternatives.
					Use of Disturbed Habitat	6	Recently disturbed lands have a relatively low ecological value compared to other ecosystems and are overrepresented relative to pre-industrial conditions. Alternatives that overprint recently disturbed land are preferred, and as a result, a high weight has been assigned to this indicator.
					Footprint	3	Alternatives that are located distant from the ore processing plant will segregate habitat corridors, extend other Project effects, and increase the likelihood of vehicle collisions with wildlife through increased haul road distances and physical barriers. As a result, a moderate weight of three has been assigned.
					Loss of Forest	5	Forests represent good quality habitat for many native terrestrial fauna and flora and have a high ecological value. However, due to the overall abundance of forest habitat in the area compared to wetland habitat, a high weight of five has been assigned.
		Sensitive Species	3	A weight of three was assigned as species of special concern have been observed near the Project and several sensitive species occur within the footprint of one of the alternatives.	Loss of Mainland Moose Habitat	4	Mainland Moose have been observed near the Project site where they forage for aquatic vegetation within wetlands during the summer. Mainland Moose are listed as Endangered through the Provincial ESA. A moderate weight of four has been assigned to this indicator.
					Loss of Brook Trout Habitat	6	As Brook Trout are of great social importance recreationally as one of Nova Scotia's most important sports fish and is also an important fish for the Mi'kmaq of Nova Scotia, a high weight of six has been assigned to this indicator.
		Atmospheric Emissions	4	During construction and operations of the TMF, the alternatives will vary in their air quality and noise emissions to the surrounding environment. The TMF will be a contributor to the fugitive dust, GHG emissions, and noise that is produced as a result of the Project. From an environmental perspective, the effects of air quality and noise will be small in comparison to some of the other sub-accounts. However, based on the importance of these effects to a localized and global scale	Fugitive Dust	6	Fugitive dust can be produced from TMFs when exposed tailings are mechanically disturbed by air currents. This fugitive dust can deposit on nearby vegetation, waterbodies, and watercourses and can degrade the aquatic and terrestrial habitat of the areas affected. Some alternatives would produce large quantities of fugitive dust, of which the effects would be difficult to mitigate completely. A high weight of six has been assigned to reflect the potential amount of fugitive dust being produced and the resulting environmental effects.

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
				from an environmental perspective, a moderate weight of four has been assigned.	GHG Emissions	5	Atlantic recognizes the importance of GHG reduction to slow climate change effects on a global scale. Although GHG emissions from the Project will be very small compared to total emissions in Nova Scotia and Canada, given the national priority, a moderate weight of two was given to this indicator.
					Noise Emissions	3	Activities from the construction of the TMF and deposition of tailings have the potential to increase ambient sound levels. Increased ambient sound can be disruptive to wildlife and potentially deter wildlife from the area. However, as this indicator would affect certain wildlife and the effects are not expected to extend far from the TMF, a moderate weight of three has been assigned.
		Protected Areas	1	The Project and the TMF alternatives are located in proximity to several wilderness areas. The regional boundary avoided alternatives that directly affected these protected areas. As only indirect effects remain, a very low weight of one was assigned.	Proximity to Protected Areas	1	There is only one indicator in this sub-account, therefore a weight of one was assigned.
		Hazard Potential to the Environment	6	The hazard potential of the TMF has been assessed from an environmental perspective on the potential environmental damage that could occur in the unlikely event of a TMF failure. As a result, a high weight of six has been assigned.	Magnitude of Failure	2	As the alternatives will utilize tailings deposition with a higher solids content which would reduce the magnitude of any potential failure, and the TMF would be constructed to meet all appropriate factors of safety regardless of the alternative., a low weight of two was given to this indicator.
					Downstream Sensitivities	6	The potential environmental effects in the unlikely event of a failure could impact sensitive downstream habitats. As a result, a high weight of six has been assigned.
Technical	3	Design Factors	3	Design factors include some of the key factors that contribute to technical complexity of the TMF alternatives. Alternatives that are less technically challenging are generally preferred. A moderate weight of three has been assigned to reflect the importance of design factors.	Storage to Dam Volume Ratio	4	Storage to dam volume ratio is one of the primary considerations when designing and locating a TMF for conventional slurry or thickened tailings transported via pipeline. A moderate weight of four has been assigned to reflect the importance of an efficient TMF location and site layout that utilizes natural topography, which would greatly reduce the construction requirements of the TMF.
					Dam Volume	6	Dam volume considers the number, length and height of the combined dams required for a particular alternative. Minimizing the dam volume is preferred as it reduces construction and operational risks. As a result, a high weight of six was assigned.
					Natural Topographic Containment	2	From a technical perspective, and for long term stability, TMFs should be sited to take advantage of natural topographic containment when possible. A low weight of two was assigned.

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
		Safety Factors	6	Safety is a primary concern when designing the TMF and each alternative can be constructed to the necessary factor of safety. However, some technical factors have the potential to increase the risk or consequence of failure and should therefore be avoided. As a result, a high weight of six has been assigned.	Monitoring Requirements	3	Atlantic will be required to monitor and maintain the TMF following closure until the regulatory authority has deemed the site remediated and no further monitoring is required. Alternatives with more dams will increase the safety risk, thereby requiring additional monitoring during operation and are less preferred. A moderate weight of three was assigned.
					Dam Height	6	The height of the TMF is generally proportional to the potential energy stored in the tailings and reclaim pond and has the potential to cause more damage in the unlikely event of a dam break. Additionally, the height increases the energy required to haul the fill material to the top of the dams for construction and the energy for pumping to deposit the tailings over the dams. Although a greater dam height is not desirable, and a high weight of six was therefore assigned.
					Impoundment Configuration	6	Dams are ideally constructed between two areas of high ground in a straight line. When a dam is required to bend, such as in perimeter dam, weaker areas more prone to failure develop at the bends. This can be partially offset by building larger dams with more buttressing in these areas. A high weight of six was assigned.
					Contaminant Management	5	Alternatives will be required by provincial approvals to manage contaminates such as fugitive dust that contain metals, and effluent with high levels of contaminates. Alternatives will require water treatment concepts to ensure that all applicable discharge criteria are met. Alternatives that have greater water storage capacity are better able to manage these conditions. As a result, a high weight of five was assigned.
		Water Management	5	One of the primary considerations taken into account when designing the TMF is the ability to manage water within and around the facility to comply with the MDMER seepage collection requirements and maintain a water inventory for ore processing. Some alternatives have complex or extensive seepage collection infrastructures that can increase the difficulty of MDMER compliance. A high weight of five has been assigned to this sub-account to reflect the importance water management has on the Project.	Length of Seepage Ditching	5	During the construction phase, seepage collection infrastructure would be required around the TMF for compliance with MDMER and would include collection ditching and seepage collection ponds. The greater the number of ponds and the length of the collection ditching, the greater the complexity of capturing all the seepage from the TMF and increasing the likelihood of seepage evading the collecting system. A moderately high weight of five has been assigned.
					Number of Pumps and Pipelines	3	Alternatives equipped with a runoff collection system, such as perimeter ditching and pumping, will be used to manage water in the tailings supernatant pond for reuse or treatment. Alternatives with more water manage, will have more pumps and pipelines to maintain and operate. As a result, a moderate weight of three was assigned.
					Impacts to Annual Water Balance	3	Alternatives with tailings dewatering processes or larger catchment areas will result in additional water requiring treatment and management. Alternatives with increased quantities of water requiring treatment should be avoided. A moderate weight of three was assigned.

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
					Reclaim Water Return	6	Each alternative will require that the seepage and runoff collected in either the seepage collection ponds or the reclaim pond be pumped back to the ore processing plant to be used in processing to maintain a closed-loop water management approach and to reduce water taking from elsewhere. There will be technical challenges associated with the distance water is required to be pumped back to the ore processing plant for use, including additional sumps and a longer reclaim pipeline to maintain. A high weight of six has been assigned.
		Final Embankment Configuration	2	Additional ore could be identified in the vicinity of the Project that is economically viable for Atlantic to pursue. It would be technically advantageous to expand the existing TMF structure either vertically or laterally as opposed to constructing a new TMF that overprints more undisturbed habitat and surface water and that requires new access infrastructure. A low weight of two has been assigned to this indicator.	Final Embankment Construction	6	Alternatives with a smaller incremental addition to the embankment will more easily support expansion and allow more flexibility in the event additional resources are developed. A high weight of six was assigned.
		Compliance with Environmental Approvals	5	The chosen alternative would need to complete provincial regulatory processes prior to use and would need to comply with all environmental approvals. Alternatives with environmental approvals that are expected to be technically challenging to comply with could result in Atlantic being in noncompliance. As a result, a high weight of five was assigned.	Ease of Obtaining Initial Permits	1	There is only one indicator in this sub-account, therefore a weight of one was assigned.
		Complexity of Operations	4	Alternatives that use a design that is unconventional or unprecedented at the required Project scale are inherently more complex to operate. This may result in unforeseen problems and significant intervention during operations. A moderate weight of four has been assigned to reflect the inherent challenges with different technologies.	Tailings Disposal	6	The level of effort required in depositing tailings in the TMF is a key consideration when designing alternative. The more complex the process of depositing tailings, the more susceptible the Project is to unforeseen problems and plant downtime. Alternatives that require infrequent intervention to deposit tailings in the TMF are preferred from a technical perspective. As a result, a high weight of six was assigned.
					Processing Complexity	5	Alternatives that require frequent intervention are more complex to operate and creates more susceptibility for the Project due to unforeseen problems and plant downtime. As a result, a high weight of five was assigned.
					Distance from the Mill	5	Alternatives that are situated further from the ore processing plant have greater transportation infrastructure requirements, and increased likelihood of incurring technical challenges with the surrounding terrain (e.g. river crossings, steep hills, etc.). These factors increase the level of complexity, and a high weight of five was assigned.
					Elevation from the Mill	3	The elevation differential between the alternative and the mill is proportional to the effort and complexity of operations to transport tailings. A moderate weight of three was assigned.

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
					Climatic Challenges	4	Climatic challenges such as significant precipitation and cold weather may impact the operation of filtered tailings technologies which could be disruptive in winter, particularly during storms and heavy snowfall events. Haul trucks must run regularly to avoid stockpiling and double handling of materials at the filtration plant, but blizzard conditions could interfere with haul cycles during white out conditions. Filtered tailings technology requires application in thinner layers and immediate compaction to meet compaction specifications in frozen conditions, and compaction could be delayed by typical winter weather. A moderate weight of four was assigned to reflect climatic challenges.
		Constructability	4	The primary considerations when designing a TMF is the construction suitability. Alternatives that are difficult to construct will have much greater impacts to the Project schedule and can cascade into effects to other accounts and sub-accounts. The moderate weight of four has been assigned to this sub-account.	Material Availability	4	This indicator refers to the ease of acquiring the aggregate and rockfill resources needed to construct the TMF dams. Some of the alternatives may require securing or manufacturing new sources of transition and bedding material. A moderate weight of four was assigned.
					Foundation Suitability	6	Foundation suitability is the primary consideration when designing and locating a TMF facility from a technical perspective, which is ideally situated on bedrock or foundation with high shear strength. It is very technically challenging to mitigate against poor foundation for dam construction to ensure appropriate dam stability, therefore the highest weight of six has been assigned to reflect the essential nature of this indicator.
Project Economics	1.5	Total TMF Costs	6	Overall costs of constructing, operating and closing the alternative will have large influence on the preferred alternative. As a result, a maximum weight of six has been assigned to reflect the importance of controlling costs.	Initial Capital Costs	5	Initial capital costs to construct the TMF alternatives are expected to be the most sensitive costs as these expenses cannot be deferred to revenue and have a disproportionate influence on the net present value of the Project. Although each alternative is potentially economically viable, alternatives with greater capex costs incur substantial risk to Project economics. A high weight of five has been assigned to reflect the importance of controlling initial capital costs.
					Sustaining Capital Costs	4	Sustaining capital costs are generally one of the greatest costs associated with alternatives that employ conventional slurry tailings deposition technologies. Impoundment dams for these alternatives will undergo continuous dam raises during operations until the specified heights are reached to allow for sufficient tailings retention. This is expected to be one of the most expensive expenditures of the Project, however as these dam raises can be purchased through revenue and are less economically sensitive, a slightly lower weight of four has been assigned compared to initial capital costs.
					Operating Costs	6	Operation costs are generally one of the greatest costs associated with alternatives that employ filtered tailings deposition technology. The energy, labour, and materials required to dewater tailings, as well as transport filtered tailings via haul truck or conveyer can have substantial effects to Project economics. This is expected to be one of the most expensive

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
							expenditures of the Project, although these operational costs will come from revenue and are less economically sensitive. Regardless, a high weight of six has been assigned.
					Closure Costs	2	Atlantic is required to submit reclamation security to the provincial government prior to the commencement of the construction phase of the Project. This financial assurance will need to be sufficient to cover the costs of implementing the closure plan, such that a third party could carry out the closure plan, if required. A low weight of two has been assigned to reflect the relatively low cost of the financial insurance compared to capital costs and operation costs of the Project.
					Post-Closure Costs	2	Post-closure costs were assessed as the monitoring and maintenance costs of the TMF until the provincial government has deemed the site adequately remediated. This work will be routine and would be a very small cost compared to other sub-accounts. A low weight of two has been assigned to post-closure costs.
					Ancillary Costs	4	Alternatives that overprint watercourses and waterbodies frequented by fish will require habitat offsets. These costs are lower than other TMF related costs, and some alternatives will have habitat offsetting included in a realignment channel. A moderate weight of four has been assigned to reflect the habitat offset costs associated with the Project.
		Economic Risks	4	Some of the alternatives bring inherent risk to Project economics, could result in schedule delays and risk overall Project viability. Compared to other cost factors, there is less certainty this will occur and as a result, a low weight of two was assigned.	Projected Timeline for Permits	6	Alternatives that could result in the delay or rejection of environmental approvals, would delay Project construction and operations, and thus have a significant cost to Atlantic by impacting the overall feasibility of the Project. This risk is significant enough that a moderately high weight of six has been assigned.
					Projected Timeline for Start of Operations	5	Some of the TMF alternatives will have additional technical or environmental requirements before proceeding with construction, which could result in the delay in the commencement of operations, thereby having a significant cost to Atlantic and the overall feasibility of the Project. As a result, a moderately high weight of five has been assigned.
Socioeconomics	3	Land Use	3	Atlantic is committed to minimizing or avoiding potential effects to Indigenous and the public’s values as an integral part of Project development, along with balancing these values with the need for regional economic development. A moderately low weight of three has been assigned.	Loss of Fishing	2	Local residents may fish in waterbodies surrounding and throughout the Project area. Although fishing opportunities may be lost, habitat offsetting would replace these areas and a low weight of two was assigned.
					Loss of Commercial Forest Harvesting	4	Merchantable timber from the Project area will be overprinted by the TMF and will be unavailable for forestry. Alternatives with a smaller TMF will have less effects to long term forestry in the Project vicinity. As a result, a high weight of six was assigned.

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
					Loss of ATV Trails	2	Several ATV trails runs through the Project area which provide access to valued areas but are being realigned. A low weight of two was assigned.
					Loss of Private Land Ownership	2	Some of the lands in the area adjacent to the Project site are privately owned, and alternatives that overprint or encroach on these lands could result in a loss of private land ownership. However, due to the infrequent land use and the ability of Atlantic to compensate for this land, a low weight of two was assigned.
		Human Health and Public Safety	5	Atlantic recognizes that it is the utmost importance of avoiding the potential to harm human health and public safety. A potential loss of life or infringement to public safety is unacceptable and a high weight of five has been assigned.	Fugitive Dust	5	There is a risk that the area around the TMF would exceed the human health-based criteria for fugitive dust and these areas would have public access restrictions. A moderate weight of five has been assigned to this indicator.
					Hazard Potential to the Public	6	The TMF will be constructed to meet the necessary factors of safety and a TMF failure is highly unlikely. That stated, the hazard potential of the TMF was assessed to be the potential to affect infrastructure in the unlikely event a TMF failure did occur. As a result, a maximum weight of six has been assigned.
					Risk to Workers	6	TMF alternatives have the potential to increase the risk to worker health and safety from exposure to fugitive dust coming off the TMF. This risk could affect large areas and large numbers of personnel working around the TMF and be more difficult to manage due to the spatial extent of the effect and the difficulty of managing worker's use of PPE. Further, there is a risk of worker injury during construction of the TMF. Although the number of people a workplace incident could affect is much smaller than the risk of fugitive dust, the severity of potential injuries that could be sustained from an incident would be much greater. As a result, a high weight of six has been assigned.
		Operational Impact	3	Project and TMF alternatives could affect enjoyment of the land, although the area is sparsely populated with infrequent land use. Some of these effects can be mitigated or compensated and a moderately weight of three has been assigned.	Change in Aesthetics / Visual Impacts	6	During the EA process, Indigenous groups and local stakeholders identified the importance of visual aesthetics of the natural landscape. The maximum elevation of the TMF was assessed as being proportional to the visibility of the TMF in lakes around the immediate Project area. Due to the importance of the visual aesthetics of the Project on the natural landscape, identified by multiple groups, a high weight of six was assigned.
					Noise Emissions	3	Noise from the TMF alternatives will be audible at some receptor locations, as well as in the general vicinity of the TMF. This noise could be considered a nuisance to stakeholders and land users around the Project. Since noise was not a concern extensively identified by local stakeholders compared to other operation impacts and aesthetics from the Project, and the need to meet regulatory criteria, a moderately low weight of three has been assigned.

Account	Weight	Sub-Account	Weight	Sub-Account Weight Rationale	Indicator	Weight	Indicator Weight Rationale
		Local Economic Risk	2	Due to the small size of the surrounding population, employment and business opportunities could impact the local economy. Should the Project enter a period of care and maintenance or early closure, these economic opportunities could be lost and could impact the local employment. A low weight of two has been assigned.	Loss of Local Jobs and Business Opportunities	1	Alternatives that are more sensitive to fluctuations in gold price and the Canadian dollar have a higher risk of shutting down the project during these fluctuations. If the Project is placed in care and maintenance local employment and business opportunities would be significantly affected. A high weight of one was assigned

Table 9: Environmental Indicator Analysis

Subaccount	Indicator	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
			Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Water Quality	Water Treatment Requirements	6	4	24	5	30	2	12	6	36	1	6	3	18	5	30
	Flexibility for Water Treatment and Recycle	2	3	6	2	4	5	10	4	8	5	10	2	4	2	4
	Subaccount Merit Score		30		34		22		44		16		22		34	
	Subaccount Merit Rating		**3.8**		**4.3**		**2.8**		**5.5**		**2.0**		**2.8**		**4.3**	
Hydrology	Catchment Impacted	5	1	5	1	5	1	5	2	10	2	10	4	20	1	5
	Number of Affected Sub-watersheds	5	5	25	5	25	5	25	4	20	4	20	6	30	5	25
	Subaccount Merit Score		30		30		30		30		30		50		30	
	Subaccount Merit Rating		**3.0**		**3.0**		**3.0**		**3.0**		**3.0**		**5.0**		**3.0**	
Aquatic Resources	Loss of Fish Habitat (waterbody)	5	6	30	6	30	6	30	6	30	6	30	5	25	6	30
	Loss of Fish Habitat (watercourse)	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Number of new crossings	3	6	18	6	18	6	18	6	18	6	18	4	12	6	18
	Subaccount Merit Score		78		78		72		84		84		43		84	
	Subaccount Merit Rating		**5.6**		**5.6**		**5.1**		**6.0**		**6.0**		**3.1**		**6.0**	
Terrestrial Resources	Loss of Wetland	5	1	5	1	5	1	5	4	20	6	30	2	10	4	20
	Use of Disturbed Habitat	6	1	6	1	6	2	12	1	6	1	6	1	6	5	30
	Footprint	3	1	3	1	3	3	9	3	9	4	12	1	3	4	12
	Loss of Forest	5	1	5	1	5	3	15	3	15	4	20	1	5	4	20
	Subaccount Merit Score		19		19		41		50		68		24		82	
	Subaccount Merit Rating		**1.0**		**1.0**		**2.2**		**2.6**		**3.6**		**1.3**		**4.3**	
Sensitive Species	Loss of Mainland Moose Habitat	4	1	4	1	4	1	4	4	16	6	24	2	8	5	20
	Loss of Brook Trout Habitat	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Subaccount Merit Score		34		34		28		52		60		14		56	
	Subaccount Merit Rating		**3.4**		**3.4**		**2.8**		**5.2**		**6.0**		**1.4**		**5.6**	
Atmospheric Emissions	Fugitive Dust	6	5	30	5	30	2	12	6	36	3	18	4	24	6	36
	GHG Emissions	5	5	25	5	25	1	5	4	20	2	10	4	20	4	20
	Noise Emissions	3	1	3	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		58		58		23		59		31		62		62	
	Subaccount Merit Rating		**4.1**		**4.1**		**1.6**		**4.2**		**2.2**		**4.4**		**4.4**	

Subaccount	Indicator	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
			Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Protected Areas	Proximity to Protected Areas	1	1	1	1	1	1	1	1	1	2	2	3	3	1	1
	Subaccount Merit Score		1		1		1		1		2		3		1	
	Subaccount Merit Rating		**1.0**		**1.0**		**1.0**		**1.0**		**2.0**		**3.0**		**1.0**	

Subaccount	Indicator	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
			Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Hazard Potential to the Environment	Magnitude of Failure	2	2	4	2	4	5	10	1	2	5	10	2	4	2	4
	Downstream Sensitivities	6	4	24	4	24	6	36	2	12	5	30	2	12	4	24
	Subaccount Merit Score		28		28		46		14		40		16		28	
	Subaccount Merit Rating		**3.5**		**3.5**		**5.8**		**1.8**		**5.0**		**2.0**		**3.5**	

Table 10: Technical Indicator Analysis

Subaccount	Indicator		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
		Weight	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Design Factors	Storage to Dam Volume Ratio	4	4	16	2	8	1	4	1	4	1	4	6	24	1	4
	Dam Volume	6	5	30	1	6	1	6	1	6	1	6	6	36	1	6
	Natural Topographic Containment	2	3	6	4	8	3	6	4	8	4	8	5	10	3	6
	Subaccount Merit Score		52		22		16		18		18		70		16	
	Subaccount Merit Rating		**4.3**		**1.8**		**1.3**		**1.5**		**1.5**		**5.8**		**1.3**	
Safety Factors	Monitoring Requirements	3	2	6	2	6	1	3	1	3	2	6	6	18	1	3
	Dam Height	6	4	24	4	24	6	36	1	6	1	6	4	24	2	12
	Impoundment Configuration	6	4	24	5	30	1	6	2	12	1	6	6	36	1	6
	Contaminant Management	5	5	25	5	25	2	10	6	30	2	10	5	25	4	20
	Subaccount Merit Score		79		85		55		51		28		103		41	
	Subaccount Merit Rating		**4.0**		**4.3**		**2.8**		**2.6**		**1.4**		**5.2**		**2.1**	
Water Management	Length of Ditching	5	3	15	5	25	3	15	3	15	1	5	6	30	2	10
	Number of Pumps and Pipelines	3	2	6	5	15	2	6	4	12	4	12	1	3	5	15
	Impacts to Annual Water Balance	3	5	15	3	9	1	3	5	15	5	15	1	3	6	18
	Reclaim Water Return	6	1	6	5	30	4	24	5	30	6	36	1	6	5	30
	Subaccount Merit Score		42		79		48		72		68		42		73	
	Subaccount Merit Rating		**2.5**		**4.6**		**2.8**		**4.2**		**4.0**		**2.5**		**4.3**	
Final Embankment Configuration	Final Embankment Construction	6	4	24	5	30	3	18	2	12	6	36	6	36	1	6
	Subaccount Merit Score		24		30		18		12		36		36		6	
	Subaccount Merit Rating		**4.0**		**5.0**		**3.0**		**2.0**		**6.0**		**6.0**		**1.0**	
Compliance with Environmental Approvals	Ease of Obtaining Initial Permits	1	4	4	6	6	2	2	5	5	2	2	4	4	4	4
	Subaccount Merit Score		4		6		2		5		2		4		4	
	Subaccount Merit Rating		**4.0**		**6.0**		**2.0**		**5.0**		**2.0**		**4.0**		**4.0**	
Complexity of Operations	Tailings Disposal	6	5	30	6	36	2	12	6	36	3	18	4	24	6	36
	Processing Complexity	5	4	20	5	25	2	10	5	25	2	10	4	20	5	25
	Distance from the Mill	5	1	5	6	30	6	30	6	30	6	30	1	5	6	30
	Elevation from the Mill	3	6	18	1	3	1	3	1	3	1	3	5	15	1	3
	Climatic Challenges	4	4	16	5	20	2	8	5	20	3	12	4	16	5	20
	Subaccount Merit Score		89		114		63		114		73		80		114	
	Subaccount Merit Rating		**3.9**		**5.0**		**2.7**		**5.0**		**3.2**		**3.5**		**5.0**	

Subaccount	Indicator		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
		Weight	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Constructability	Material Availability	4	2	8	6	24	6	24	6	24	6	24	1	4	6	24
	Foundation Suitability	6	1	6	3	18	6	36	3	18	6	36	1	6	3	18
	Subaccount Merit Score		14		42		60		42		60		10		42	
	Subaccount Merit Rating		**1.4**		**4.2**		**6.0**		**4.2**		**6.0**		**1.0**		**4.2**	

Table 11: Project Economics Indicator Analysis

Subaccount	Indicator	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
			Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Total TMF Costs	Initial Capital Costs	5	5	25	3	15	1	5	5	25	6	30	4	20	6	30
	Sustaining Capital Costs	4	4	16	6	24	1	4	2	8	1	4	6	24	1	4
	Operating Costs	6	6	36	3	18	1	6	6	36	4	24	6	36	6	36
	Closure Costs	2	6	12	6	12	6	12	5	10	1	2	1	2	6	12
	Post-Closure Costs	2	2	4	4	8	1	2	1	2	6	12	6	12	1	2
	Ancillary Costs	4	3	12	3	12	4	16	5	20	2	8	1	4	6	24
	Subaccount Merit Score		105		89		45		101		80		98		108	
	Subaccount Merit Rating		**4.6**		**3.9**		**2.0**		**4.4**		**3.5**		**4.3**		**4.7**	

Economic Risks	Projected Timeline for Permits	6	1	6	4	24	1	6	4	24	5	30	1	6	1	6
	Projected Timeline for Start of Operations	5	4	20	6	30	2	10	5	25	1	5	4	20	4	20
	Subaccount Merit Score		26		54		16		49		35		26		26	
	Subaccount Merit Rating		**2.4**		**4.9**		**1.5**		**4.5**		**3.2**		**2.4**		**2.4**	

Table 12: Socio-economic Indicator Analysis

Subaccount	Indicator	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
			Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Land Use	Loss of Recreational Fishing	2	1	2	4	8	4	8	4	8	5	10	1	2	6	12
	Loss of Commercial Forest Harvesting	4	6	24	4	16	6	24	4	16	4	16	1	4	4	16
	Loss of ATV Trails	2	6	12	2	4	2	4	1	2	4	8	1	2	3	6
	Loss of Private Land Ownership	2	2	4	6	12	6	12	6	12	6	12	1	2	6	12
	Subaccount Merit Score		42		40		48		38		46		10		46	
	Subaccount Merit Rating		**4.2**		**4.0**		**4.8**		**3.8**		**4.6**		**1.0**		**4.6**	
Human Health and Public Safety	Fugitive Dust	5	5	25	5	25	2	10	6	30	3	15	4	20	6	30
	Hazard Potential to the Public	6	1	6	4	24	6	36	2	12	5	30	2	12	4	24
	Risk to Workers	6	6	36	6	36	4	24	5	30	1	6	6	36	5	30
	Subaccount Merit Score		67		85		70		72		51		68		84	
	Subaccount Merit Rating		**3.9**		**5.0**		**4.1**		**4.2**		**3.0**		**4.0**		**4.9**	
Operational Impact	Change in Aesthetics / Visual Impacts	6	4	24	4	24	6	36	1	6	1	6	4	24	2	12
	Noise Emissions	3	6	18	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		42		27		42		9		9		42		18	
	Subaccount Merit Rating		**4.7**		**3.0**		**4.7**		**1.0**		**1.0**		**4.7**		**2.0**	
Local Economic Risk	Loss of Local Jobs and Business Opportunities	1	4	4	4	4	1	1	3	3	1	1	5	5	3	3
	Subaccount Merit Score		4		4		1		3		1		5		3	
	Subaccount Merit Rating		**4.0**		**4.0**		**1.0**		**3.0**		**1.0**		**5.0**		**3.0**	

Table 13: Environmental Account Analysis

Subaccount	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Water Quality	5	3.8	19	4.3	21	2.8	14	5.5	28	2.0	10	2.8	14	4.3	21
Hydrology	3	3.0	9	3.0	9	3.0	9	3.0	9	3.0	9	5.0	15	3.0	9
Aquatic Resources	6	5.6	33	5.6	33	5.1	31	6.0	36	6.0	36	3.1	18	6.0	36
Terrestrial Resources	2	1.0	2	1.0	2	2.2	4	2.6	5	3.6	7	1.3	3	4.3	9
Sensitive Species	3	3.4	10	3.4	10	2.8	8	5.2	16	6.0	18	1.4	4	5.6	17
Atmospheric Emissions	4	4.1	17	4.1	17	1.6	7	4.2	17	2.2	9	4.4	18	4.4	18
Protected Areas	1	1.0	1	1.0	1	1.0	1	1.0	1	2.0	2	3.0	3	1.0	1
Hazard Potential to the Environment	6	3.5	21	3.5	21	5.8	35	1.8	11	5.0	30	2.0	12	3.5	21
Account Merit Score		112		114		108		122		121		87		131	
Account Merit Rating		**4.4**		**4.5**		**4.3**		**4.8**		**4.8**		**3.4**		**5.2**	

Table 14: Technical Account Analysis

Subaccount	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Design Factors	3	4.3	13	1.8	6	1.8	5	1.5	5	1.5	5	5.8	18	1.3	4
Safety Factors	6	4.0	24	4.3	26	2.8	17	2.6	15	1.4	8	5.2	31	2.1	12
Water Management	5	2.5	12	4.6	23	2.8	14	4.2	21	4.0	20	2.5	12	4.3	21
Final Embankment Configuration	2	4.0	8	5.0	10	3.0	6	2.0	4	6.0	12	6.0	12	1.0	2
Compliance with Environmental Approvals	5	4.0	20	6.0	30	2.0	10	5.0	25	2.0	10	4.0	20	4.0	20
Complexity of Operations	4	3.9	15	5.0	20	2.7	11	5.0	20	3.2	13	3.5	14	5.0	20
Constructability	4	1.4	6	4.2	17	6.0	24	4.2	17	6.0	24	1.0	4	4.2	17
Account Merit Score		98		131		86		107		92		111		96	
Account Merit Rating		**3.4**		**4.5**		**3.0**		**3.7**		**3.2**		**3.8**		**3.3**	

Table 15: Project Economics Sub-Account Analysis

Subaccount	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Total TMF Costs	6	4.6	27	3.9	23	2.0	12	4.4	26	3.5	21	4.3	26	4.7	28
Economic Risks	4	2.4	9	4.9	20	1.5	6	4.5	18	3.2	13	2.4	9	2.4	9
Account Merit Score		37		43		18		44		34		35		38	
Account Merit Rating		**3.7**		**4.3**		**1.8**		**4.4**		**3.4**		**3.5**		**3.8**	

Table 16: Socio-economic Sub-Account Analysis

Subaccount	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Land Use	3	4.2	13	4.0	12	4.8	14	3.8	11	4.6	14	1.0	3	4.6	14
Human Health and Public Safety	5	3.9	20	5.0	25	4.1	21	4.2	21	3.0	15	4.0	20	4.9	25
Operational Impact	3	4.7	14	3.0	9	4.7	14	1.0	3	1.0	3	4.7	14	2.0	6
Local Economic Risk	2	4.0	8	4.0	8	1.0	2	3.0	6	1.0	2	5.0	10	3.0	6
Account Merit Score		54		54		51		42		34		47		51	
Account Merit Rating		**4.2**		**4.2**		**3.9**		**3.2**		**2.6**		**3.6**		**3.9**	

Table 17: MAA Base Case Results

Account	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Environment	6	4.4	26	4.5	27	4.3	26	4.8	29	4.8	29	3.4	20	5.2	31
Technical	3	3.4	10	4.5	14	3.0	9	3.7	11	3.2	9	3.8	11	3.3	10
Economics	1.5	3.7	6	4.3	6	1.8	3	4.4	7	3.4	5	3.5	5	3.8	6
Socioeconomics	3	4.2	13	4.2	12	3.9	12	3.2	10	2.6	8	3.6	11	3.9	12
Alternative Merit Score		55		60		49		56		51		48		58	
Alternative Merit Rating		4.1		**4.4**		3.6		4.2		3.8		3.6		4.3	

Table 18: Sensitivity Analysis

Scenario	Alternative Merit Rating						
	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F	Alternative G
Base Case	4.1	**4.4**	3.6	4.2	3.8	3.6	4.3
Scenario 2	3.9	**4.4**	3.2	4.0	3.5	3.6	4.0
Scenario 3	3.0	**3.5**	2.3	3.0	2.6	3.0	2.9
Scenario 4	4.1	**4.3**	3.7	3.9	3.4	3.6	4.2
Scenario 5	4.2	**4.6**	3.9	4.4	4.1	3.8	4.5

Appendix A

Multiple Accounts Analysis Tables from Sensitivity Analysis

Scenario 1: Base Case

(See Tables 9 to 17, in Main Text)

Scenario 2:

Equal Accounts Weights

Scenario 2: Equal Accounts Weights Summary

Account	Weighting	Sub-account	Weighting	Indicator	Weighting
Environment	1	Water Quality	5	Water Treatment Requirements	6
				Flexibility for Water Treatment and Recycle	2
		Hydrology	3	Catchment Area	5
				Number of Affected Sub-watersheds	5
		Aquatic Resources	6	Loss of Fish Habitat (waterbody)	5
				Loss of Fish Habitat (watercourse)	6
				Number of new crossings	3
		Terrestrial Resources	2	Loss of Wetland	5
				Use of Disturbed Habitat	6
				Footprint	3
				Loss of Forest	5
		Sensitive Species	3	Loss of Mainland Moose Habitat	4
				Loss of Brook Trout Habitat	6
		Atmospheric Emissions	4	Fugitive Dust	6
				GHG Emissions	5
				Noise Emissions	3
		Protected Areas	1	Proximity to Protected Areas	1
		Hazard Potential to the Environment	6	Magnitude of Failure	2
				Downstream Sensitivities	6
Technical	1	Design Factors	3	Storage to Dam Volume Ratio	4
				Dam Volume	6
				Natural Topographic Containment	2
		Safety Factors	6	Monitoring Requirements	3
				Dam Height	6
				Impoundment Configuration	6
				Contaminant Management	5
		Water Management	5	Length of Ditching	5
				Number of Pumps and Pipelines	3
				Impacts to Annual Water Balance	3
				Reclaim Water Return	6
		Expansion Capacity	2	Maximum Expansion Capacity	6
		Compliance with Environmental Approvals	5	Ease of Obtaining Initial Permits	1
		Complexity of Operations	4	Tailings Disposal	6
				Processing Complexity	5
				Distance from the Mill	5
				Elevation from the Mill	3
				Climatic Challenges	4
		Constructability	4	Material Availability	4
				Foundation Suitability	6
Economics	1	Total Costs	6	Initial Capital Costs	5
				Sustaining Capital Costs	4
				Operating Costs	6
				Closure Costs	2
				Post-Closure Costs	2
				Ancillary Costs	4
		Economic Risks	4	Projected Timeline for Permits	6
				Projected Timeline for Start of Operations	5
Socioeconomics	1	Non-Indigenous Land Use	3	Loss of Recreational Fishing	2
				Loss of Commercial Forest Harvesting	4
				Loss of ATV Trails	2
				Loss of Private Land Ownership	2
		Human Health and Public Safety	5	Fugitive Dust	5
				Hazard Potential to the Public	6
				Risk to Workers	6
		Operational Impact	3	Change in Aesthetics / Visual Impacts	6
				Noise Emissions	3
		Local Economic Risk	2	Loss of Local Jobs and Business Opportunities	1

Scenario 2: Environmental Account Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water Quality	Water Treatment Requirements	6	4	24	5	30	2	12	6	36	1	6	3	18	5	30
	Flexibility for Water Treatment and Recycle	2	3	6	2	4	5	10	4	8	5	10	2	4	2	4
	Subaccount Merit Score		30		34		22		44		16		22		34	
	Subaccount Merit Rating		**3.8**		**4.3**		**2.8**		**5.5**		**2.0**		**2.8**		**4.3**	
Hydrology	Catchment Area	5	1	5	1	5	1	5	2	10	2	10	4	20	1	5
	Number of Affected Sub-watersheds	5	5	25	5	25	5	25	4	20	4	20	6	30	5	25
	Subaccount Merit Score		30		30		30		30		30		50		30	
	Subaccount Merit Rating		**3.0**		**3.0**		**3.0**		**3.0**		**3.0**		**5.0**		**3.0**	
Aquatic Resources	Loss of Fish Habitat (waterbody)	5	6	30	6	30	6	30	6	30	6	30	5	25	6	30
	Loss of Fish Habitat (watercourse)	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Number of new crossings	3	6	18	6	18	6	18	6	18	6	18	4	12	6	18
	Subaccount Merit Score		78		78		72		84		84		43		84	
	Subaccount Merit Rating		**5.6**		**5.6**		**5.1**		**6.0**		**6.0**		**3.1**		**6.0**	
Terrestrial Resources	Loss of Wetland	5	1	5	1	5	1	5	4	20	6	30	2	10	4	20
	Use of Disturbed Habitat	6	1	6	1	6	2	12	1	6	1	6	1	6	5	30
	Footprint	3	1	3	1	3	3	9	3	9	4	12	1	3	4	12
	Loss of Forest	5	1	5	1	5	3	15	3	15	4	20	1	5	4	20
	Subaccount Merit Score		19		19		41		50		68		24		82	
	Subaccount Merit Rating		**1.0**		**1.0**		**2.2**		**2.6**		**3.6**		**1.3**		**4.3**	
Sensitive Species	Loss of Mainland Moose Habitat	4	1	4	1	4	1	4	4	16	6	24	2	8	5	20
	Loss of Brook Trout Habitat	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Subaccount Merit Score		34		34		28		52		60		14		56	
	Subaccount Merit Rating		**3.4**		**3.4**		**2.8**		**5.2**		**6.0**		**1.4**		**5.6**	
Atmospheric Emissions	Fugitive Dust	6	5	30	5	30	2	12	6	36	3	18	4	24	6	36
	GHG Emissions	5	5	25	5	25	1	5	4	20	2	10	4	20	4	20
	Noise Emissions	3	1	3	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		58		58		23		59		31		62		62	
	Subaccount Merit Rating		**4.1**		**4.1**		**1.6**		**4.2**		**2.2**		**4.4**		**4.4**	
Protected Areas	Proximity to Protected Areas	1	1	1	1	1	1	1	1	1	2	2	3	3	1	1
	Subaccount Merit Score		1		1		1		1		2		3		1	
	Subaccount Merit Rating		**1.0**		**1.0**		**1.0**		**1.0**		**2.0**		**3.0**		**1.0**	
d Potential to the Enviro	Magnitude of Failure	2	2	4	2	4	5	10	1	2	5	10	2	4	2	4
	Downstream Sensitivities	6	4	24	4	24	6	36	2	12	5	30	2	12	4	24
	Subaccount Merit Score		28		28		46		14		40		16		28	
	Subaccount Merit Rating		**3.5**		**3.5**		**5.8**		**1.8**		**5.0**		**2.0**		**3.5**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	5	3.8	18.8	4.3	21.3	2.8	13.8	5.5	27.5	2.0	10.0	2.8	13.8	4.3	21.3
Hydrology	3	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	5.0	15.0	3.0	9.0
Aquatic Resources	6	5.6	33.4	5.6	33.4	5.1	30.9	6.0	36.0	6.0	36.0	3.1	18.4	6.0	36.0
Terrestrial Resources	2	1.0	2.0	1.0	2.0	2.2	4.3	2.6	5.3	3.6	7.2	1.3	2.5	4.3	8.6
Sensitive Species	3	3.4	10.2	3.4	10.2	2.8	8.4	5.2	15.6	6.0	18.0	1.4	4.2	5.6	16.8
Atmospheric Emissions	4	4.1	16.6	4.1	16.6	1.6	6.6	4.2	16.9	2.2	8.9	4.4	17.7	4.4	17.7
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	6	3.5	21.0	3.5	21.0	5.8	34.5	1.8	10.5	5.0	30.0	2.0	12.0	3.5	21.0
Account Merit Score		112.0		114.5		108.4		121.7		121.0		86.6		131.4	
Account Merit Rating		**4.4**		**4.5**		**4.3**		**4.8**		**4.8**		**3.4**		**5.2**	

Scenario 2: Technical Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Design Factors	Storage to Dam Volume Ratio	4	4	16	2	8	1	4	1	4	1	4	6	24	1	4
	Dam Volume	6	5	30	1	6	2	12	1	6	1	6	6	36	1	6
	Natural Topographic Containment	2	3	6	4	8	3	6	4	8	4	8	5	10	3	6
	Subaccount Merit Score		52		22		22		18		18		70		16	
	Subaccount Merit Rating		**4.3**		**1.8**		**1.8**		**1.5**		**1.5**		**5.8**		**1.3**	
Safety Factors	Monitoring Requirements	3	2	6	2	6	1	3	1	3	2	6	6	18	1	3
	Dam Height	6	4	24	4	24	6	36	1	6	1	6	4	24	2	12
	Impoundment Configuration	6	4	24	5	30	1	6	2	12	1	6	6	36	1	6
	Contaminant Management	5	5	25	5	25	2	10	6	30	2	10	5	25	4	20
	Subaccount Merit Score		79		85		55		51		28		103		41	
	Subaccount Merit Rating		**4.0**		**4.3**		**2.8**		**2.6**		**1.4**		**5.2**		**2.1**	
Water Management	Length of Ditching	5	3	15	5	25	3	15	3	15	1	5	6	30	2	10
	Number of Pumps and Pipelines	3	2	6	5	15	2	6	4	12	4	12	1	3	5	15
	Impacts to Annual Water Balance	3	5	15	3	9	1	3	5	15	5	15	1	3	6	18
	Reclaim Water Return	6	1	6	5	30	4	24	5	30	6	36	1	6	5	30
	Subaccount Merit Score		42		79		48		72		68		42		73	
	Subaccount Merit Rating		**2.5**		**4.6**		**2.8**		**4.2**		**4.0**		**2.5**		**4.3**	
Expansion Capacity	Maximum Expansion Capacity	6	4	24	5	30	3	18	2	12	6	36	6	36	1	6
	Subaccount Merit Score		24		30		18		12		36		36		6	
	Subaccount Merit Rating		**4.0**		**5.0**		**3.0**		**2.0**		**6.0**		**6.0**		**1.0**	
Compliance with Environmental Approvals	Ease of Obtaining Initial Permits	1	4	4	6	6	2	2	5	5	2	2	4	4	4	4
	Subaccount Merit Score		4		6		2		5		2		4		4	
	Subaccount Merit Rating		**4.0**		**6.0**		**2.0**		**5.0**		**2.0**		**4.0**		**4.0**	
Complexity of Operations	Tailings Disposal	6	5	30	6	36	2	12	6	36	3	18	4	24	6	36
	Processing Complexity	5	4	20	5	25	2	10	5	25	2	10	4	20	5	25
	Distance from the Mill	5	1	5	6	30	6	30	6	30	6	30	1	5	6	30
	Elevation from the Mill	3	6	18	1	3	1	3	1	3	1	3	5	15	1	3
	Climatic Challenges	4	4	16	5	20	2	8	5	20	3	12	4	16	5	20
	Subaccount Merit Score		89		114		63		114		73		80		114	
	Subaccount Merit Rating		**3.9**		**5.0**		**2.7**		**5.0**		**3.2**		**3.5**		**5.0**	
Constructability	Material Availability	4	2	8	6	24	6	24	6	24	6	24	1	4	6	24
	Foundation Suitability	6	1	6	3	18	6	36	3	18	6	36	1	6	3	18
	Subaccount Merit Score		14		42		60		42		60		10		42	
	Subaccount Merit Rating		**1.4**		**4.2**		**6.0**		**4.2**		**6.0**		**1.0**		**4.2**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Design Factors	3	4.3	13.0	1.8	5.5	1.8	5.5	1.5	4.5	1.5	4.5	5.8	17.5	1.3	4.0
Safety Factors	6	4.0	23.7	4.3	25.5	2.8	16.5	2.6	15.3	1.4	8.4	5.2	30.9	2.1	12.3
Water Management	5	2.5	12.4	4.6	23.2	2.8	14.1	4.2	21.2	4.0	20.0	2.5	12.4	4.3	21.5
Expansion Capacity	2	4.0	8.0	5.0	10.0	3.0	6.0	2.0	4.0	6.0	12.0	6.0	12.0	1.0	2.0
Compliance with Environmental Approvals	5	4.0	20.0	6.0	30.0	2.0	10.0	5.0	25.0	2.0	10.0	4.0	20.0	4.0	20.0
Complexity of Operations	4	3.9	15.5	5.0	19.8	2.7	11.0	5.0	19.8	3.2	12.7	3.5	13.9	5.0	19.8
Constructability	4	1.4	5.6	4.2	16.8	6.0	24.0	4.2	16.8	6.0	24.0	1.0	4.0	4.2	16.8
Account Merit Score		98.1		130.9		87.1		106.6		91.6		110.7		96.4	
Account Merit Rating		**3.4**		**4.5**		**3.0**		**3.7**		**3.2**		**3.8**		**3.3**	

Scenario 2: Project Economics Indicator Analysis

Subaccount	Indicator	Weight	Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
			Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Total Costs	Initial Capital Costs	5	5	25	3	15	1	5	5	25	6	30	4	20	6	30
	Sustaining Capital Costs	4	4	16	6	24	1	4	2	8	1	4	6	24	1	4
	Operating Costs	6	6	36	3	18	1	6	6	36	4	24	6	36	6	36
	Closure Costs	2	6	12	6	12	6	12	5	10	1	2	1	2	6	12
	Post-Closure Costs	2	2	4	4	8	1	2	1	2	6	12	6	12	1	2
	Ancillary Costs	4	3	12	3	12	4	16	5	20	2	8	1	4	6	24
	Subaccount Merit Score		105		89		45		101		80		98		108	
	Subaccount Merit Rating		**4.6**		**3.9**		**2.0**		**4.4**		**3.5**		**4.3**		**4.7**	

Subaccount	Indicator	Weight	Alternative A Value	Alternative A Score	Alternative B Value	Alternative B Score	Alternative C Value	Alternative C Score	Alternative D Value	Alternative D Score	Alternative E Value	Alternative E Score	Alternative F Value	Alternative F Score	Alternative G Value	Alternative G Score
Economic Risks	Projected Timeline for Permits	6	1	6	4	24	1	6	4	24	5	30	1	6	1	6
	Projected Timeline for Start of Operations	5	4	20	6	30	2	10	5	25	1	5	4	20	4	20
	Subaccount Merit Score		26		54		16		49		35		26		26	
	Subaccount Merit Rating		**2.4**		**4.9**		**1.5**		**4.5**		**3.2**		**2.4**		**2.4**	

Subaccount	Weight	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Total Costs	6	4.6	27.4	3.9	23.2	2.0	11.7	4.4	26.3	3.5	20.9	4.3	25.6	4.7	28.2
Economic Risks	4	2.4	9.5	4.9	19.6	1.5	5.8	4.5	17.8	3.2	12.7	2.4	9.5	2.4	9.5
Account Merit Score		36.8		42.9		17.6		44.2		33.6		35.0		37.6	
Account Merit Rating		**3.7**		**4.3**		**1.8**		**4.4**		**3.4**		**3.5**		**3.8**	

Scenario 2: Socioeconomics Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Non-Indigenous Land Use	Loss of Recreational Fishing	2	1	2	4	8	4	8	4	8	5	10	1	2	6	12
	Loss of Commercial Forest Harvesting	4	6	24	4	16	6	24	4	16	4	16	1	4	4	16
	Loss of ATV Trails	2	6	12	2	4	2	4	1	2	4	8	1	2	3	6
	Loss of Private Land Ownership	2	2	4	6	12	6	12	6	12	6	12	1	2	6	12
	Subaccount Merit Score		42		40		48		38		46		10		46	
	Subaccount Merit Rating		**4.2**		**4.0**		**4.8**		**3.8**		**4.6**		**1.0**		**4.6**	
Human Health and Public Safety	Fugitive Dust	5	5	25	5	25	2	10	6	30	3	15	4	20	6	30
	Hazard Potential to the Public	6	1	6	4	24	6	36	2	12	5	30	2	12	4	24
	Risk to Workers	6	6	36	6	36	4	24	5	30	1	6	6	36	5	30
	Subaccount Merit Score		67		85		70		72		51		68		84	
	Subaccount Merit Rating		**3.9**		**5.0**		**4.1**		**4.2**		**3.0**		**4.0**		**4.9**	
Operational Impact	Change in Aesthetics / Visual Impacts	6	4	24	4	24	6	36	1	6	1	6	4	24	2	12
	Noise Emissions	3	6	18	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		42		27		42		9		9		42		18	
	Subaccount Merit Rating		**4.7**		**3.0**		**4.7**		**1.0**		**1.0**		**4.7**		**2.0**	
Local Economic Risk	Loss of Local Jobs and Business Opportunities	1	4	4	4	4	1	1	3	3	1	1	5	5	3	3
	Subaccount Merit Score		4		4		1		3		1		5		3	
	Subaccount Merit Rating		**4.0**		**4.0**		**1.0**		**3.0**		**1.0**		**5.0**		**3.0**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Non-Indigenous Land Use	3	4.2	13	4.0	12	4.8	14	3.8	11	4.6	14	1.0	3	4.6	14
Human Health and Public Safety	5	3.9	20	5.0	25	4.1	21	4.2	21	3.0	15	4.0	20	4.9	25
Operational Impact	3	4.7	14	3.0	9	4.7	14	1.0	3	1.0	3	4.7	14	2.0	6
Local Economic Risk	2	4.0	8	4.0	8	1.0	2	3.0	6	1.0	2	5.0	10	3.0	6
Account Merit Score		54		54		51		42		34		47		51	
Account Merit Rating		**4.2**		**4.2**		**3.9**		**3.2**		**2.6**		**3.6**		**3.9**	

Scenario 2: Environmental Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	5	3.8	18.8	4.3	21.3	2.8	13.8	5.5	27.5	2.0	10.0	2.8	13.8	4.3	21.3
Hydrology	3	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	5.0	15.0	3.0	9.0
Aquatic Resources	6	5.6	33.4	5.6	33.4	5.1	30.9	6.0	36.0	6.0	36.0	3.1	18.4	6.0	36.0
Terrestrial Resources	2	1.0	2.0	1.0	2.0	2.2	4.3	2.6	5.3	3.6	7.2	1.3	2.5	4.3	8.6
Sensitive Species	3	3.4	10.2	3.4	10.2	2.8	8.4	5.2	15.6	6.0	18.0	1.4	4.2	5.6	16.8
Atmospheric Emissions	4	4.1	16.6	4.1	16.6	1.6	6.6	4.2	16.9	2.2	8.9	4.4	17.7	4.4	17.7
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	6	3.5	21.0	3.5	21.0	5.8	34.5	1.8	10.5	5.0	30.0	2.0	12.0	3.5	21.0
Account Merit Score		112.0		114.5		108.4		121.7		121.0		86.6		131.4	
Account Merit Rating		**4.4**		**4.5**		**4.3**		**4.8**		**4.8**		**3.4**		**5.2**	

Scenario 2: Technical Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Design Factors	3	4.3	13.0	1.8	5.5	1.8	5.5	1.5	4.5	1.5	4.5	5.8	17.5	1.3	4.0
Safety Factors	6	4.0	23.7	4.3	25.5	2.8	16.5	2.6	15.3	1.4	8.4	5.2	30.9	2.1	12.3
Water Management	5	2.5	12.4	4.6	23.2	2.8	14.1	4.2	21.2	4.0	20.0	2.5	12.4	4.3	21.5
Expansion Capacity	2	4.0	8.0	5.0	10.0	3.0	6.0	2.0	4.0	6.0	12.0	6.0	12.0	1.0	2.0
Compliance with Environmental Approvals	5	4.0	20.0	6.0	30.0	2.0	10.0	5.0	25.0	2.0	10.0	4.0	20.0	4.0	20.0
Complexity of Operations	4	3.9	15.5	5.0	19.8	2.7	11.0	5.0	19.8	3.2	12.7	3.5	13.9	5.0	19.8
Constructability	4	1.4	5.6	4.2	16.8	6.0	24.0	4.2	16.8	6.0	24.0	1.0	4.0	4.2	16.8
Account Merit Score		98.1		130.9		87.1		106.6		91.6		110.7		96.4	
Account Merit Rating		**3.4**		**4.5**		**3.0**		**3.7**		**3.2**		**3.8**		**3.3**	

Scenario 2: Project Economics Account Analysis

Subaccount	Weight	Alternative A Rating	Alternative A Score	Alternative B Rating	Alternative B Score	Alternative C Rating	Alternative C Score	Alternative D Rating	Alternative D Score	Alternative E Rating	Alternative E Score	Alternative F Rating	Alternative F Score	Alternative G Rating	Alternative G Score
Total Costs	6	4.6	27.4	3.9	23.2	2.0	11.7	4.4	26.3	3.5	20.9	4.3	25.6	4.7	28.2
Economic Risks	4	2.4	9.5	4.9	19.6	1.5	5.8	4.5	17.8	3.2	12.7	2.4	9.5	2.4	9.5
Account Merit Score		36.8		42.9		17.6		44.2		33.6		35.0		37.6	
Account Merit Rating		**3.7**		**4.3**		**1.8**		**4.4**		**3.4**		**3.5**		**3.8**	

Scenario 2: Socioeconomics Account Analysis

Subaccount	Weight	Alternative A Rating	Alternative A Score	Alternative B Rating	Alternative B Score	Alternative C Rating	Alternative C Score	Alternative D Rating	Alternative D Score	Alternative E Rating	Alternative E Score	Alternative F Rating	Alternative F Score	Alternative G Rating	Alternative G Score
Non-Indigenous Land Use	3	4.2	13	4.0	12	4.8	14	3.8	11	4.6	14	1.0	3	4.6	14
Human Health and Public Safety	5	3.9	20	5.0	25	4.1	21	4.2	21	3.0	15	4.0	20	4.9	25
Operational Impact	3	4.7	14	3.0	9	4.7	14	1.0	3	1.0	3	4.7	14	2.0	6
Local Economic Risk	2	4.0	8	4.0	8	1.0	2	3.0	6	1.0	2	5.0	10	3.0	6
Account Merit Score		54		54		51		42		34		47		51	
Account Merit Rating		**4.2**		**4.2**		**3.9**		**3.2**		**2.6**		**3.6**		**3.9**	

Scenario 2: Equal Accounts Weights Summary

Account	Weight	Alternative A Rating	Alternative A Score	Alternative B Rating	Alternative B Score	Alternative C Rating	Alternative C Score	Alternative D Rating	Alternative D Score	Alternative E Rating	Alternative E Score	Alternative F Rating	Alternative F Score	Alternative G Rating	Alternative G Score
Environment	1	4.4	4	4.5	5	4.3	4	4.8	5	4.8	5	3.4	3	5.2	5
Technical	1	3.4	3	4.5	5	3.0	3	3.7	4	3.2	3	3.8	4	3.3	3
Economics	1	3.7	4	4.3	4	1.8	2	4.4	4	3.4	3	3.5	4	3.8	4
Socioeconomics	1	4.2	4	4.2	4	3.9	4	3.2	3	2.6	3	3.6	4	3.9	4
Alternative Merit Score		16		17		13		16		14		14		16	
Alternative Merit Rating		**3.9**		**4.4**		**3.2**		**4.0**		**3.5**		**3.6**		**4.0**	

Scenario 3:

All Weights Equal

Scenario 3: All Weights Equal Summary

Account	Weighting	Sub-account	Weighting	Indicator	Weighting
Environment	1	Water Quality	1	Water Treatment Requirements	1
				Flexibility for Water Treatment and Recycle	1
		Hydrology	1	Catchment Area	1
				Number of Affected Sub-watersheds	1
		Aquatic Resources	1	Loss of Fish Habitat (waterbody)	1
				Loss of Fish Habitat (watercourse)	1
				Number of new crossings	1
		Terrestrial Resources	1	Loss of Wetland	1
				Use of Disturbed Habitat	1
				Footprint	1
				Loss of Forest	1
		Sensitive Species	1	Loss of Mainland Moose Habitat	1
				Loss of Brook Trout Habitat	1
		Atmospheric Emissions	1	Fugitive Dust	1
				GHG Emissions	1
				Noise Emissions	1
		Protected Areas	1	Proximity to Protected Areas	1
		Hazard Potential to the Environment	1	Magnitude of Failure	1
				Downstream Sensitivities	1
Technical	1	Design Factors	1	Storage to Dam Volume Ratio	1
				Dam Volume	1
				Natural Topographic Containment	1
		Safety Factors	1	Monitoring Requirements	1
				Dam Height	1
				Impoundment Configuration	1
				Contaminant Management	1
		Water Management	1	Length of Ditching	1
				Number of Pumps and Pipelines	1
				Impacts to Annual Water Balance	1
				Reclaim Water Return	1
		Expansion Capacity	1	Maximum Expansion Capacity	1
		Compliance with Environmental Approvals	1	Ease of Obtaining Initial Permits	1
		Complexity of Operations	1	Tailings Disposal	1
				Processing Complexity	1
				Distance from the Mill	1
				Elevation from the Mill	1
				Climatic Challenges	1
		Constructability	1	Material Availability	1
				Foundation Suitability	1
Economics	1	Total Costs	1	Initial Capital Costs	1
				Sustaining Capital Costs	1
				Operating Costs	1
				Closure Costs	1
				Post-Closure Costs	1
				Ancillary Costs	1
		Economic Risks	1	Projected Timeline for Permits	1
				Projected Timeline for Start of Operations	1
Socioeconomics	1	Non-Indigenous Land Use	1	Loss of Recreational Fishing	1
				Loss of Commercial Forest Harvesting	1
				Loss of ATV Trails	1
				Loss of Private Land Ownership	1
		Human Health and Public Safety	1	Fugitive Dust	1
				Hazard Potential to the Public	1
				Risk to Workers	1
		Operational Impact	1	Change in Aesthetics / Visual Impacts	1
				Noise Emissions	1
		Local Economic Risk	1	Loss of Local Jobs and Business Opportunities	1

Scenario 3: Environmental Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water Quality	Water Treatment Requirements	1	4	4	5	5	2	2	6	6	1	1	3	3	5	5
	Flexibility for Water Treatment and Recycle	1	3	3	2	2	5	5	4	4	5	5	2	2	2	2
	Subaccount Merit Score		7		7		7		10		6		5		7	
	Subaccount Merit Rating		**3.5**		**3.5**		**3.5**		**5.0**		**3.0**		**2.5**		**3.5**	
Hydrology	Catchment Area	1	1	1	1	1	1	1	2	2	2	2	4	4	1	1
	Number of Affected Sub-watersheds	1	5	5	5	5	5	5	4	4	4	4	6	6	5	5
	Subaccount Merit Score		6		6		6		6		6		10		6	
	Subaccount Merit Rating		**3.0**		**3.0**		**3.0**		**3.0**		**3.0**		**5.0**		**3.0**	
Aquatic Resources	Loss of Fish Habitat (waterbody)	1	6	6	6	6	6	6	6	6	6	6	5	5	6	6
	Loss of Fish Habitat (watercourse)	1	5	5	5	5	4	4	6	6	6	6	1	1	6	6
	Number of new crossings	1	6	6	6	6	6	6	6	6	6	6	4	4	6	6
	Subaccount Merit Score		17		17		16		18		18		10		18	
	Subaccount Merit Rating		**5.7**		**5.7**		**5.3**		**6.0**		**6.0**		**3.3**		**6.0**	
Terrestrial Resources	Loss of Wetland	1	1	1	1	1	1	1	4	4	6	6	2	2	4	4
	Use of Disturbed Habitat	1	1	1	1	1	2	2	1	1	1	1	1	1	5	5
	Footprint	1	1	1	1	1	3	3	3	3	4	4	1	1	4	4
	Loss of Forest	1	1	1	1	1	3	3	3	3	4	4	1	1	4	4
	Subaccount Merit Score		4		4		9		11		15		5		17	
	Subaccount Merit Rating		**1.0**		**1.0**		**2.3**		**2.8**		**3.8**		**1.3**		**4.3**	
Sensitive Species	Loss of Mainland Moose Habitat	1	1	1	1	1	1	1	4	4	6	6	2	2	5	5
	Loss of Brook Trout Habitat	1	5	5	5	5	4	4	6	6	6	6	1	1	6	6
	Subaccount Merit Score		6		6		5		10		12		3		11	
	Subaccount Merit Rating		**3.0**		**3.0**		**2.5**		**5.0**		**6.0**		**1.5**		**5.5**	
Atmospheric Emissions	Fugitive Dust	1	5	5	5	5	2	2	6	6	3	3	4	4	6	6
	GHG Emissions	1	5	5	5	5	1	1	4	4	2	2	4	4	4	4
	Noise Emissions	1	1	1	1	1	2	2	1	1	1	1	6	6	2	2
	Subaccount Merit Score		11		11		5		11		6		14		12	
	Subaccount Merit Rating		**3.7**		**3.7**		**1.7**		**3.7**		**2.0**		**4.7**		**4.0**	
Protected Areas	Proximity to Protected Areas	1	1	1	1	1	1	1	1	1	2	2	3	3	1	1
	Subaccount Merit Score		1		1		1		1		2		3		1	
	Subaccount Merit Rating		**1.0**		**1.0**		**1.0**		**1.0**		**2.0**		**3.0**		**1.0**	
Hazard Potential to the Environment	Magnitude of Failure	1	2	2	2	2	5	5	1	1	5	5	2	2	2	2
	Downstream Sensitivities	1	4	4	4	4	6	6	2	2	5	5	2	2	4	4
	Subaccount Merit Score		6		6		11		3		10		4		6	
	Subaccount Merit Rating		**3.0**		**3.0**		**5.5**		**1.5**		**5.0**		**2.0**		**3.0**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	1	3.5	3.5	3.5	3.5	3.5	3.5	5.0	5.0	3.0	3.0	2.5	2.5	3.5	3.5
Hydrology	1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	3.0
Aquatic Resources	1	5.7	5.7	5.7	5.7	5.3	5.3	6.0	6.0	6.0	6.0	3.3	3.3	6.0	6.0
Terrestrial Resources	1	1.0	1.0	1.0	1.0	2.3	2.3	2.8	2.8	3.8	3.8	1.3	1.3	4.3	4.3
Sensitive Species	1	3.0	3.0	3.0	3.0	2.5	2.5	5.0	5.0	6.0	6.0	1.5	1.5	5.5	5.5
Atmospheric Emissions	1	3.7	3.7	3.7	3.7	1.7	1.7	3.7	3.7	2.0	2.0	4.7	4.7	4.0	4.0
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	1	3.0	3.0	3.0	3.0	5.5	5.5	1.5	1.5	5.0	5.0	2.0	2.0	3.0	3.0
Account Merit Score		23.8		23.8		24.8		27.9		30.8		23.3		30.3	
Account Merit Rating		**1.0**		**1.0**		**1.0**		**1.2**		**1.3**		**1.0**		**1.3**	

Scenario 3: Technical Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Design Factors	Storage to Dam Volume Ratio	1	4	4	2	2	1	1	1	1	1	1	6	6	1	1
	Dam Volume	1	5	5	1	1	2	2	1	1	1	1	6	6	1	1
	Natural Topographic Containment	1	3	3	4	4	3	3	4	4	4	4	5	5	3	3
	Subaccount Merit Score		12		7		6		6		6		17		5	
	Subaccount Merit Rating		**4.0**		**2.3**		**2.0**		**2.0**		**2.0**		**5.7**		**1.7**	
Safety Factors	Monitoring Requirements	1	2	2	2	2	1	1	1	1	2	2	6	6	1	1
	Dam Height	1	4	4	4	4	6	6	1	1	1	1	4	4	2	2
	Impoundment Configuration	1	4	4	5	5	1	1	2	2	1	1	6	6	1	1
	Contaminant Management	1	5	5	5	5	2	2	6	6	2	2	5	5	4	4
	Subaccount Merit Score		15		16		10		10		6		21		8	
	Subaccount Merit Rating		**3.8**		**4.0**		**2.5**		**2.5**		**1.5**		**5.3**		**2.0**	
Water Management	Length of Ditching	1	3	3	5	5	3	3	3	3	1	1	6	6	2	2
	Number of Pumps and Pipelines	1	2	2	5	5	2	2	4	4	4	4	1	1	5	5
	Impacts to Annual Water Balance	1	5	5	3	3	1	1	5	5	5	5	1	1	6	6
	Reclaim Water Return	1	1	1	5	5	4	4	5	5	6	6	1	1	5	5
	Subaccount Merit Score		11		18		10		17		16		9		18	
	Subaccount Merit Rating		**2.8**		**4.5**		**2.5**		**4.3**		**4.0**		**2.3**		**4.5**	
Expansion Capacity	Maximum Expansion Capacity	1	4	4	5	5	3	3	2	2	6	6	6	6	1	1
	Subaccount Merit Score		4		5		3		2		6		6		1	
	Subaccount Merit Rating		**4.0**		**5.0**		**3.0**		**2.0**		**6.0**		**6.0**		**1.0**	
Compliance with Environmental Approvals	Ease of Obtaining Initial Permits	1	4	4	6	6	2	2	5	5	2	2	4	4	4	4
	Subaccount Merit Score		4		6		2		5		2		4		4	
	Subaccount Merit Rating		**4.0**		**6.0**		**2.0**		**5.0**		**2.0**		**4.0**		**4.0**	
Complexity of Operations	Tailings Disposal	1	5	5	6	6	2	2	6	6	3	3	4	4	6	6
	Processing Complexity	1	4	4	5	5	2	2	5	5	2	2	4	4	5	5
	Distance from the Mill	1	1	1	6	6	6	6	6	6	6	6	1	1	6	6
	Elevation from the Mill	1	6	6	1	1	1	1	1	1	1	1	5	5	1	1
	Climatic Challenges	1	4	4	5	5	2	2	5	5	3	3	4	4	5	5
	Subaccount Merit Score		20		23		13		23		15		18		23	
	Subaccount Merit Rating		**4.0**		**4.6**		**2.6**		**4.6**		**3.0**		**3.6**		**4.6**	
Constructability	Material Availability	1	2	2	6	6	6	6	6	6	6	6	1	1	6	6
	Foundation Suitability	1	1	1	3	3	6	6	3	3	6	6	1	1	3	3
	Subaccount Merit Score		3		9		12		9		12		2		9	
	Subaccount Merit Rating		**1.5**		**4.5**		**6.0**		**4.5**		**6.0**		**1.0**		**4.5**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Design Factors	1	4.0	4.0	2.3	2.3	2.0	2.0	2.0	2.0	2.0	2.0	5.7	5.7	1.7	1.7
Safety Factors	1	3.8	3.8	4.0	4.0	2.5	2.5	2.5	2.5	1.5	1.5	5.3	5.3	2.0	2.0
Water Management	1	2.8	2.8	4.5	4.5	2.5	2.5	4.3	4.3	4.0	4.0	2.3	2.3	4.5	4.5
Expansion Capacity	1	4.0	4.0	5.0	5.0	3.0	3.0	2.0	2.0	6.0	6.0	6.0	6.0	1.0	1.0
Compliance with Environmental Approvals	1	4.0	4.0	6.0	6.0	2.0	2.0	5.0	5.0	2.0	2.0	4.0	4.0	4.0	4.0
Complexity of Operations	1	4.0	4.0	4.6	4.6	2.6	2.6	4.6	4.6	3.0	3.0	3.6	3.6	4.6	4.6
Constructability	1	1.5	1.5	4.5	4.5	6.0	6.0	4.5	4.5	6.0	6.0	1.0	1.0	4.5	4.5
Account Merit Score		24.0		30.9		20.6		24.9		24.5		27.8		22.3	
Account Merit Rating		**3.4**		**4.4**		**2.9**		**3.6**		**3.5**		**4.0**		**3.2**	

Scenario 3: Project Economics Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Total Costs	Initial Capital Costs	1	5	5	3	3	1	1	5	5	6	6	4	4	6	6
	Sustaining Capital Costs	1	4	4	6	6	1	1	2	2	1	1	6	6	1	1
	Operating Costs	1	6	6	3	3	1	1	6	6	4	4	6	6	6	6
	Closure Costs	1	6	6	6	6	6	6	5	5	1	1	1	1	6	6
	Post-Closure Costs	1	2	2	4	4	1	1	1	1	6	6	6	6	1	1
	Ancillary Costs	1	3	3	3	3	4	4	5	5	2	2	1	1	6	6
	Subaccount Merit Score		26		25		14		24		20		24		26	
	Subaccount Merit Rating		**4.3**		**4.2**		**2.3**		**4.0**		**3.3**		**4.0**		**4.3**	
Economic Risks	Projected Timeline for Permits	1	1	1	4	4	1	1	4	4	5	5	1	1	1	1
	Projected Timeline for Start of Operations	1	4	4	6	6	2	2	5	5	1	1	4	4	4	4
	Subaccount Merit Score		5		10		3		9		6		5		5	
	Subaccount Merit Rating		**2.5**		**5.0**		**1.5**		**4.5**		**3.0**		**2.5**		**2.5**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Total Costs	1	4.3	4.3	4.2	4.2	2.3	2.3	4.0	4.0	3.3	3.3	4.0	4.0	4.3	4.3
Economic Risks	1	2.5	2.5	5.0	5.0	1.5	1.5	4.5	4.5	3.0	3.0	2.5	2.5	2.5	2.5
Account Merit Score		6.8		9.2		3.8		8.5		6.3		6.5		6.8	
Account Merit Rating		**3.4**		**4.6**		**1.9**		**4.3**		**3.2**		**3.3**		**3.4**	

Scenario 3: Socioeconomics Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Non-Indigenous Land Use	Loss of Recreational Fishing	1	1	1	4	4	4	4	4	4	5	5	1	1	6	6
	Loss of Commercial Forest Harvesting	1	6	6	4	4	6	6	4	4	4	4	1	1	4	4
	Loss of ATV Trails	1	6	6	2	2	2	2	1	1	4	4	1	1	3	3
	Loss of Private Land Ownership	1	2	2	6	6	6	6	6	6	6	6	1	1	6	6
	Subaccount Merit Score		15		16		18		15		19		4		19	
	Subaccount Merit Rating		**3.8**		**4.0**		**4.5**		**3.8**		**4.8**		**1.0**		**4.8**	
Human Health and Public Safety	Fugitive Dust	1	5	5	5	5	2	2	6	6	3	3	4	4	6	6
	Hazard Potential to the Public	1	1	1	4	4	6	6	2	2	5	5	2	2	4	4
	Risk to Workers	1	6	6	6	6	4	4	5	5	1	1	6	6	5	5
	Subaccount Merit Score		12		15		12		13		9		12		15	
	Subaccount Merit Rating		**4.0**		**5.0**		**4.0**		**4.3**		**3.0**		**4.0**		**5.0**	
Operational Impact	Change in Aesthetics / Visual Impacts	1	4	4	4	4	6	6	1	1	1	1	4	4	2	2
	Noise Emissions	1	6	6	1	1	2	2	1	1	1	1	6	6	2	2
	Subaccount Merit Score		10		5		8		2		2		10		4	
	Subaccount Merit Rating		**5.0**		**2.5**		**4.0**		**1.0**		**1.0**		**5.0**		**2.0**	
Local Economic Risk	Loss of Local Jobs and Business Opportunities	1	4	4	4	4	1	1	3	3	1	1	5	5	3	3
	Subaccount Merit Score		4		4		1		3		1		5		3	
	Subaccount Merit Rating		**4.0**		**4.0**		**1.0**		**3.0**		**1.0**		**5.0**		**3.0**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Non-Indigenous Land Use	1	3.8	4	4.0	4	4.5	5	3.8	4	4.8	5	1.0	1	4.8	5
Human Health and Public Safety	1	4.0	4	5.0	5	4.0	4	4.3	4	3.0	3	4.0	4	5.0	5
Operational Impact	1	5.0	5	2.5	3	4.0	4	1.0	1	1.0	1	5.0	5	2.0	2
Local Economic Risk	1	4.0	4	4.0	4	1.0	1	3.0	3	1.0	1	5.0	5	3.0	3
Account Merit Score		17		16		14		12		10		15		15	
Account Merit Rating		**4.2**		**3.9**		**3.4**		**3.0**		**2.4**		**3.8**		**3.7**	

Scenario 3: Environmental Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	1	3.5	3.5	3.5	3.5	3.5	3.5	5.0	5.0	3.0	3.0	2.5	2.5	3.5	3.5
Hydrology	1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	5.0	5.0	3.0	3.0
Aquatic Resources	1	5.7	5.7	5.7	5.7	5.3	5.3	6.0	6.0	6.0	6.0	3.3	3.3	6.0	6.0
Terrestrial Resources	1	1.0	1.0	1.0	1.0	2.3	2.3	2.8	2.8	3.8	3.8	1.3	1.3	4.3	4.3
Sensitive Species	1	3.0	3.0	3.0	3.0	2.5	2.5	5.0	5.0	6.0	6.0	1.5	1.5	5.5	5.5
Atmospheric Emissions	1	3.7	3.7	3.7	3.7	1.7	1.7	3.7	3.7	2.0	2.0	4.7	4.7	4.0	4.0
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	1	3.0	3.0	3.0	3.0	5.5	5.5	1.5	1.5	5.0	5.0	2.0	2.0	3.0	3.0
Account Merit Score		23.8		23.8		24.8		27.9		30.8		23.3		30.3	
Account Merit Rating		**1.0**		**1.0**		**1.0**		**1.2**		**1.3**		**1.0**		**1.3**	

Scenario 3: Technical Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Design Factors	1	4.0	4.0	2.3	2.3	2.0	2.0	2.0	2.0	2.0	2.0	5.7	5.7	1.7	1.7
Safety Factors	1	3.8	3.8	4.0	4.0	2.5	2.5	2.5	2.5	1.5	1.5	5.3	5.3	2.0	2.0
Water Management	1	2.8	2.8	4.5	4.5	2.5	2.5	4.3	4.3	4.0	4.0	2.3	2.3	4.5	4.5
Expansion Capacity	1	4.0	4.0	5.0	5.0	3.0	3.0	2.0	2.0	6.0	6.0	6.0	6.0	1.0	1.0
Compliance with Environmental Approvals	1	4.0	4.0	6.0	6.0	2.0	2.0	5.0	5.0	2.0	2.0	4.0	4.0	4.0	4.0
Complexity of Operations	1	4.0	4.0	4.6	4.6	2.6	2.6	4.6	4.6	3.0	3.0	3.6	3.6	4.6	4.6
Constructability	1	1.5	1.5	4.5	4.5	6.0	6.0	4.5	4.5	6.0	6.0	1.0	1.0	4.5	4.5
Account Merit Score		24.0		30.9		20.6		24.9		24.5		27.8		22.3	
Account Merit Rating		**3.4**		**4.4**		**2.9**		**3.6**		**3.5**		**4.0**		**3.2**	

Scenario 3: Project Economics Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Total Costs	1	4.3	4.3	4.2	4.2	2.3	2.3	4.0	4.0	3.3	3.3	4.0	4.0	4.3	4.3
Economic Risks	1	2.5	2.5	5.0	5.0	1.5	1.5	4.5	4.5	3.0	3.0	2.5	2.5	2.5	2.5
Account Merit Score		6.8		9.2		3.8		8.5		6.3		6.5		6.8	
Account Merit Rating		**3.4**		**4.6**		**1.9**		**4.3**		**3.2**		**3.3**		**3.4**	

Scenario 3: Socioeconomics Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Non-Indigenous Land Use	1	3.8	4	4.0	4	4.5	5	3.8	4	4.8	5	1.0	1	4.8	5
Human Health and Public Safety	1	4.0	4	5.0	5	4.0	4	4.3	4	3.0	3	4.0	4	5.0	5
Operational Impact	1	5.0	5	2.5	3	4.0	4	1.0	1	1.0	1	5.0	5	2.0	2
Local Economic Risk	1	4.0	4	4.0	4	1.0	1	3.0	3	1.0	1	5.0	5	3.0	3
Account Merit Score		17		16		14		12		10		15		15	
Account Merit Rating		**4.2**		**3.9**		**3.4**		**3.0**		**2.4**		**3.8**		**3.7**	

Scenario 3: All Weights Equal Summary

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Environment	1	1.0	1	1.0	1	1.0	1	1.2	1	1.3	1	1.0	1	1.3	1
Technical	1	3.4	3	4.4	4	2.9	3	3.6	4	3.5	4	4.0	4	3.2	3
Economics	1	3.4	3	4.6	5	1.9	2	4.3	4	3.2	3	3.3	3	3.4	3
Socioeconomics	1	4.2	4	3.9	4	3.4	3	3.0	3	2.4	2	3.8	4	3.7	4
Alternative Merit Score		12.0		13.9		9.3		12.0		10.4		11.9		11.6	
Alternative Merit Rating		**3.0**		**3.5**		**2.3**		**3.0**		**2.6**		**3.0**		**2.9**	

Scenario 4:

Prioritize People

Scenario 4: Prioritize People Weight Summary

Account	Weighting	Sub-account	Weighting	Indicator	Weighting
Environment	4	Water Quality	5	Water Treatment Requirements	6
				Flexibility for Water Treatment and Recycle	2
		Hydrology	3	Catchment Area	5
				Number of Affected Sub-watersheds	5
		Aquatic Resources	6	Loss of Fish Habitat (waterbody)	5
				Loss of Fish Habitat (watercourse)	6
				Number of new crossings	3
		Terrestrial Resources	2	Loss of Wetland	5
				Use of Disturbed Habitat	6
				Footprint	3
				Loss of Forest	5
		Sensitive Species	3	Loss of Mainland Moose Habitat	4
				Loss of Brook Trout Habitat	6
		Atmospheric Emissions	4	Fugitive Dust	6
				GHG Emissions	5
				Noise Emissions	3
		Protected Areas	1	Proximity to Protected Areas	1
		Hazard Potential to the Environment	6	Magnitude of Failure	2
				Downstream Sensitivities	6
Technical	2	Design Factors	3	Storage to Dam Volume Ratio	4
				Dam Volume	6
				Natural Topographic Containment	2
		Safety Factors	6	Monitoring Requirements	3
				Dam Height	6
				Impoundment Configuration	6
				Contaminant Management	5
		Water Management	5	Length of Ditching	3
				Number of Pumps and Pipelines	3
				Impacts to Annual Water Balance	4
				Reclaim Water Return	6
		Expansion Capacity	2	Maximum Expansion Capacity	6
		Compliance with Environmental Approvals	5	Ease of Obtaining Initial Permits	1
		Complexity of Operations	4	Tailings Disposal	6
				Processing Complexity	5
				Distance from the Mill	5
				Elevation from the Mill	3
				Climatic Challenges	4
		Constructability	4	Material Availability	4
				Foundation Suitability	6
Economics	1	Total Costs	6	Initial Capital Costs	5
				Sustaining Capital Costs	4
				Operating Costs	6
				Closure Costs	2
				Post-Closure Costs	2
				Ancillary Costs	4
		Economic Risks	4	Projected Timeline for Permits	6
				Projected Timeline for Start of Operations	5
Socioeconomics	6	Non-Indigenous Land Use	3	Loss of Recreational Fishing	2
				Loss of Commercial Forest Harvesting	4
				Loss of ATV Trails	2
				Loss of Private Land Ownership	2
		Human Health and Public Safety	5	Fugitive Dust	5
				Hazard Potential to the Public	6
				Risk to Workers	6
		Operational Impact	3	Change in Aesthetics / Visual Impacts	4
				Noise Emissions	3
		Local Economic Risk	2	Loss of Local Jobs and Business Opportunities	1

Scenario 4: Environmental Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water Quality	Water Treatment Requirements	6	4	24	5	30	2	12	6	36	1	6	3	18	5	30
	Flexibility for Water Treatment and Recycle	2	3	6	2	4	5	10	4	8	5	10	2	4	2	4
	Subaccount Merit Score		30		34		22		44		16		22		34	
	Subaccount Merit Rating		**3.8**		**4.3**		**2.8**		**5.5**		**2.0**		**2.8**		**4.3**	
Hydrology	Catchment Area	5	1	5	1	5	1	5	2	10	2	10	4	20	1	5
	Number of Affected Sub-watersheds	5	5	25	5	25	5	25	4	20	4	20	6	30	5	25
	Subaccount Merit Score		30		30		30		30		30		50		30	
	Subaccount Merit Rating		**3.0**		**3.0**		**3.0**		**3.0**		**3.0**		**5.0**		**3.0**	
Aquatic Resources	Loss of Fish Habitat (waterbody)	5	6	30	6	30	6	30	6	30	6	30	5	25	6	30
	Loss of Fish Habitat (watercourse)	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Number of new crossings	3	6	18	6	18	6	18	6	18	6	18	4	12	6	18
	Subaccount Merit Score		78		78		72		84		84		43		84	
	Subaccount Merit Rating		**5.6**		**5.6**		**5.1**		**6.0**		**6.0**		**3.1**		**6.0**	
Terrestrial Resources	Loss of Wetland	5	1	5	1	5	1	5	4	20	6	30	2	10	4	20
	Use of Disturbed Habitat	6	1	6	1	6	2	12	1	6	1	6	1	6	5	30
	Footprint	3	1	3	1	3	3	9	3	9	4	12	1	3	4	12
	Loss of Forest	5	1	5	1	5	3	15	3	15	4	20	1	5	4	20
	Subaccount Merit Score		19		19		41		50		68		24		82	
	Subaccount Merit Rating		**1.0**		**1.0**		**2.2**		**2.6**		**3.6**		**1.3**		**4.3**	
Sensitive Species	Loss of Mainland Moose Habitat	4	1	4	1	4	1	4	4	16	6	24	2	8	5	20
	Loss of Brook Trout Habitat	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Loss of Canada Warbler Habitat	0	1	0	1	0	2	0	4	0	6	0	1	0	5	0
	Subaccount Merit Score		34		34		28		52		60		14		56	
	Subaccount Merit Rating		**3.4**		**3.4**		**2.8**		**5.2**		**6.0**		**1.4**		**5.6**	
Atmospheric Emissions	Fugitive Dust	6	5	30	5	30	2	12	6	36	3	18	4	24	6	36
	GHG Emissions	5	5	25	5	25	1	5	4	20	2	10	4	20	4	20
	Noise Emissions	3	1	3	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		58		58		23		59		31		62		62	
	Subaccount Merit Rating		**4.1**		**4.1**		**1.6**		**4.2**		**2.2**		**4.4**		**4.4**	
Protected Areas	Proximity to Protected Areas	1	1	1	1	1	1	1	1	1	2	2	3	3	1	1
	Subaccount Merit Score		1		1		1		1		2		3		1	
	Subaccount Merit Rating		**1.0**		**1.0**		**1.0**		**1.0**		**2.0**		**3.0**		**1.0**	
Hazard Potential to the Environment	Magnitude of Failure	2	2	4	2	4	5	10	1	2	5	10	2	4	2	4
	Downstream Sensitivities	6	4	24	4	24	6	36	2	12	5	30	2	12	4	24
	Subaccount Merit Score		28		28		46		14		40		16		28	
	Subaccount Merit Rating		**3.5**		**3.5**		**5.8**		**1.8**		**5.0**		**2.0**		**3.5**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	5	3.8	18.8	4.3	21.3	2.8	13.8	5.5	27.5	2.0	10.0	2.8	13.8	4.3	21.3
Hydrology	3	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	5.0	15.0	3.0	9.0
Aquatic Resources	6	5.6	33.4	5.6	33.4	5.1	30.9	6.0	36.0	6.0	36.0	3.1	18.4	6.0	36.0
Terrestrial Resources	2	1.0	2.0	1.0	2.0	2.2	4.3	2.6	5.3	3.6	7.2	1.3	2.5	4.3	8.6
Sensitive Species	3	3.4	10.2	3.4	10.2	2.8	8.4	5.2	15.6	6.0	18.0	1.4	4.2	5.6	16.8
Atmospheric Emissions	4	4.1	16.6	4.1	16.6	1.6	6.6	4.2	16.9	2.2	8.9	4.4	17.7	4.4	17.7
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	6	3.5	21.0	3.5	21.0	5.8	34.5	1.8	10.5	5.0	30.0	2.0	12.0	3.5	21.0
Account Merit Score		112.0		114.5		108.4		121.7		121.0		86.6		131.4	
Account Merit Rating		**4.4**		**4.5**		**4.3**		**4.8**		**4.8**		**3.4**		**5.2**	

Scenario 4: Technical Indicator Analysis

Subaccour	Indicator	Weight	Alternative A Value	Alternative A Score	Alternative B Value	Alternative B Score	Alternative C Value	Alternative C Score	Alternative D Value	Alternative D Score	Alternative E Value	Alternative E Score	Alternative F Value	Alternative F Score	Alternative G Value	Alternative G Score
Design Factors	Storage to Dam Volume Ratio	4	4	16	2	8	1	4	1	4	1	4	6	24	1	4
	Dam Volume	6	5	30	1	6	2	12	1	6	1	6	6	36	1	6
	Natural Topographic Containment	2	3	6	4	8	3	6	4	8	4	8	5	10	3	6
	Subaccount Merit Score		52		22		22		18		18		70		16	
	Subaccount Merit Rating		**4.3**		**1.8**		**1.8**		**1.5**		**1.5**		**5.8**		**1.3**	
Safety Factors	Monitoring Requirements	3	2	6	2	6	1	3	1	3	2	6	6	18	1	3
	Dam Height	6	4	24	4	24	6	36	1	6	1	6	4	24	2	12
	Impoundment Configuration	6	4	24	5	30	1	6	2	12	1	6	6	36	1	6
	Contaminant Management	5	5	25	5	25	2	10	6	30	2	10	5	25	4	20
	Subaccount Merit Score		79		85		55		51		28		103		41	
	Subaccount Merit Rating		**4.0**		**4.3**		**2.8**		**2.6**		**1.4**		**5.2**		**2.1**	
Water Management	Length of Ditching	3	3	9	5	15	3	9	3	9	1	3	6	18	2	6
	Number of Pumps and Pipelines	3	2	6	5	15	2	6	4	12	4	12	1	3	5	15
	Impacts to Annual Water Balance	4	5	20	3	12	1	4	5	20	5	20	1	4	6	24
	Reclaim Water Return	6	1	6	5	30	4	24	5	30	6	36	1	6	5	30
	Subaccount Merit Score		41		72		43		71		71		31		75	
	Subaccount Merit Rating		**2.6**		**4.5**		**2.7**		**4.4**		**4.4**		**1.9**		**4.7**	
Expansion Capacity	Maximum Expansion Capacity	6	4	24	5	30	3	18	2	12	6	36	6	36	1	6
	Subaccount Merit Score		24		30		18		12		36		36		6	
	Subaccount Merit Rating		**4.0**		**5.0**		**3.0**		**2.0**		**6.0**		**6.0**		**1.0**	
Compliance with Environmental	Ease of Obtaining Initial Permits	1	4	4	6	6	2	2	5	5	2	2	4	4	4	4
	Subaccount Merit Score		4		6		2		5		2		4		4	
	Subaccount Merit Rating		**4.0**		**6.0**		**2.0**		**5.0**		**2.0**		**4.0**		**4.0**	
Complexity of Operations	Tailings Disposal	6	5	30	6	36	2	12	6	36	3	18	4	24	6	36
	Processing Complexity	5	4	20	5	25	2	10	5	25	2	10	4	20	5	25
	Distance from the Mill	5	1	5	6	30	6	30	6	30	6	30	1	5	6	30
	Elevation from the Mill	3	6	18	1	3	1	3	1	3	1	3	5	15	1	3
	Climatic Challenges	4	4	16	5	20	2	8	5	20	3	12	4	16	5	20
	Subaccount Merit Score		89		114		63		114		73		80		114	
	Subaccount Merit Rating		**3.9**		**5.0**		**2.7**		**5.0**		**3.2**		**3.5**		**5.0**	
Constructability	Material Availability	4	2	8	6	24	6	24	6	24	6	24	1	4	6	24
	Foundation Suitability	6	1	6	3	18	6	36	3	18	6	36	1	6	3	18
	Subaccount Merit Score		14		42		60		42		60		10		42	
	Subaccount Merit Rating		**1.4**		**4.2**		**6.0**		**4.2**		**6.0**		**1.0**		**4.2**	

Subaccount	Weight	A Rating	A Score	B Rating	B Score	C Rating	C Score	D Rating	D Score	E Rating	E Score	F Rating	F Score	G Rating	G Score
Design Factors	3	4.3	13.0	1.8	5.5	1.8	5.5	1.5	4.5	1.5	4.5	5.8	17.5	1.3	4.0
Safety Factors	6	4.0	23.7	4.3	25.5	2.8	16.5	2.6	15.3	1.4	8.4	5.2	30.9	2.1	12.3
Water Management	5	2.6	12.8	4.5	22.5	2.7	13.4	4.4	22.2	4.4	22.2	1.9	9.7	4.7	23.4
Expansion Capacity	2	4.0	8.0	5.0	10.0	3.0	6.0	2.0	4.0	6.0	12.0	6.0	12.0	1.0	2.0
Compliance with Environmental Approvals	5	4.0	20.0	6.0	30.0	2.0	10.0	5.0	25.0	2.0	10.0	4.0	20.0	4.0	20.0
Complexity of Operations	4	3.9	15.5	5.0	19.8	2.7	11.0	5.0	19.8	3.2	12.7	3.5	13.9	5.0	19.8
Constructability	4	1.4	5.6	4.2	16.8	6.0	24.0	4.2	16.8	6.0	24.0	1.0	4.0	4.2	16.8
Account Merit Score		98.6		130.1		86.4		107.6		93.8		108.0		98.4	
Account Merit Rating		**3.4**		**4.5**		**3.0**		**3.7**		**3.2**		**3.7**		**3.4**	

Scenario 4: Project Economics Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Total Costs	Initial Capital Costs	5	5	25	3	15	1	5	5	25	6	30	4	20	6	30
	Sustaining Capital Costs	4	4	16	6	24	1	4	2	8	1	4	6	24	1	4
	Operating Costs	6	6	36	3	18	1	6	6	36	4	24	6	36	6	36
	Closure Costs	2	6	12	6	12	6	12	5	10	1	2	1	2	6	12
	Post-Closure Costs	2	2	4	4	8	1	2	1	2	6	12	6	12	1	2
	Ancillary Costs	4	3	12	3	12	4	16	5	20	2	8	1	4	6	24
	Subaccount Merit Score		105		89		45		101		80		98		108	
	Subaccount Merit Rating		**4.6**		**3.9**		**2.0**		**4.4**		**3.5**		**4.3**		**4.7**	
Economic Risks	Projected Timeline for Permits	6	1	6	4	24	1	6	4	24	5	30	1	6	1	6
	Projected Timeline for Start of Operations	5	4	20	6	30	2	10	5	25	1	5	4	20	4	20
	Subaccount Merit Score		26		54		16		49		35		26		26	
	Subaccount Merit Rating		**2.4**		**4.9**		**1.5**		**4.5**		**3.2**		**2.4**		**2.4**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Total Costs	6	4.6	27.4	3.9	23.2	2.0	11.7	4.4	26.3	3.5	20.9	4.3	25.6	4.7	28.2
Economic Risks	4	2.4	9.5	4.9	19.6	1.5	5.8	4.5	17.8	3.2	12.7	2.4	9.5	2.4	9.5
Account Merit Score		36.8		42.9		17.6		44.2		33.6		35.0		37.6	
Account Merit Rating		**3.7**		**4.3**		**1.8**		**4.4**		**3.4**		**3.5**		**3.8**	

Scenario 4: Socioeconomics Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Non-Indigenous Land Use	Loss of Recreational Fishing	2	1	2	4	8	4	8	4	8	5	10	1	2	6	12
	Loss of Commercial Forest Harvesting	4	6	24	4	16	6	24	4	16	4	16	1	4	4	16
	Loss of ATV Trails	2	6	12	2	4	2	4	1	2	4	8	1	2	3	6
	Loss of Private Land Ownership	2	2	4	6	12	6	12	6	12	6	12	1	2	6	12
	Subaccount Merit Score		42		40		48		38		46		10		46	
	Subaccount Merit Rating		**4.2**		**4.0**		**4.8**		**3.8**		**4.6**		**1.0**		**4.6**	
Human Health and Public Safety	Fugitive Dust	5	5	25	5	25	2	10	6	30	3	15	4	20	6	30
	Hazard Potential to the Public	6	1	6	4	24	6	36	2	12	5	30	2	12	4	24
	Risk to Workers	6	6	36	6	36	4	24	5	30	1	6	6	36	5	30
	Subaccount Merit Score		67		85		70		72		51		68		84	
	Subaccount Merit Rating		**3.9**		**5.0**		**4.1**		**4.2**		**3.0**		**4.0**		**4.9**	
Operational Impact	Change in Aesthetics / Visual Impacts	4	4	16	4	16	6	24	1	4	1	4	4	16	2	8
	Noise Emissions	3	6	18	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		34		19		30		7		7		34		14	
	Subaccount Merit Rating		**4.9**		**2.7**		**4.3**		**1.0**		**1.0**		**4.9**		**2.0**	
Local Economic Risk	Loss of Local Jobs and Business Opportunities	1	4	4	4	4	1	1	3	3	1	1	5	5	3	3
	Subaccount Merit Score		4		4		1		3		1		5		3	
	Subaccount Merit Rating		**4.0**		**4.0**		**1.0**		**3.0**		**1.0**		**5.0**		**3.0**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Non-Indigenous Land Use	3	4.2	13	4.0	12	4.8	14	3.8	11	4.6	14	1.0	3	4.6	14
Human Health and Public Safety	5	3.9	20	5.0	25	4.1	21	4.2	21	3.0	15	4.0	20	4.9	25
Operational Impact	3	4.9	15	2.7	8	4.3	13	1.0	3	1.0	3	4.9	15	2.0	6
Local Economic Risk	2	4.0	8	4.0	8	1.0	2	3.0	6	1.0	2	5.0	10	3.0	6
Account Merit Score		55		53		50		42		34		48		51	
Account Merit Rating		**4.2**		**4.1**		**3.8**		**3.2**		**2.6**		**3.7**		**3.9**	

Scenario 4: Environmental Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	5	3.8	18.8	4.3	21.3	2.8	13.8	5.5	27.5	2.0	10.0	2.8	13.8	4.3	21.3
Hydrology	3	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	3.0	9.0	5.0	15.0	3.0	9.0
Aquatic Resources	6	5.6	33.4	5.6	33.4	5.1	30.9	6.0	36.0	6.0	36.0	3.1	18.4	6.0	36.0
Terrestrial Resources	2	1.0	2.0	1.0	2.0	2.2	4.3	2.6	5.3	3.6	7.2	1.3	2.5	4.3	8.6
Sensitive Species	3	3.4	10.2	3.4	10.2	2.8	8.4	5.2	15.6	6.0	18.0	1.4	4.2	5.6	16.8
Atmospheric Emissions	4	4.1	16.6	4.1	16.6	1.6	6.6	4.2	16.9	2.2	8.9	4.4	17.7	4.4	17.7
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	6	3.5	21.0	3.5	21.0	5.8	34.5	1.8	10.5	5.0	30.0	2.0	12.0	3.5	21.0
Account Merit Score		112.0		114.5		108.4		121.7		121.0		86.6		131.4	
Account Merit Rating		**4.4**		**4.5**		**4.3**		**4.8**		**4.8**		**3.4**		**5.2**	

Scenario 4: Technical Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Design Factors	3	4.3	13.0	1.8	5.5	1.8	5.5	1.5	4.5	1.5	4.5	5.8	17.5	1.3	4.0
Safety Factors	6	4.0	23.7	4.3	25.5	2.8	16.5	2.6	15.3	1.4	8.4	5.2	30.9	2.1	12.3
Water Management	5	2.6	12.8	4.5	22.5	2.7	13.4	4.4	22.2	4.4	22.2	1.9	9.7	4.7	23.4
Expansion Capacity	2	4.0	8.0	5.0	10.0	3.0	6.0	2.0	4.0	6.0	12.0	6.0	12.0	1.0	2.0
Compliance with Environmental Approvals	5	4.0	20.0	6.0	30.0	2.0	10.0	5.0	25.0	2.0	10.0	4.0	20.0	4.0	20.0
Complexity of Operations	4	3.9	15.5	5.0	19.8	2.7	11.0	5.0	19.8	3.2	12.7	3.5	13.9	5.0	19.8
Constructability	4	1.4	5.6	4.2	16.8	6.0	24.0	4.2	16.8	6.0	24.0	1.0	4.0	4.2	16.8
Account Merit Score		98.6		130.1		86.4		107.6		93.8		108.0		98.4	
Account Merit Rating		**3.4**		**4.5**		**3.0**		**3.7**		**3.2**		**3.7**		**3.4**	

Scenario 4: Project Economics Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Total Costs	6	4.6	27.4	3.9	23.2	2.0	11.7	4.4	26.3	3.5	20.9	4.3	25.6	4.7	28.2
Economic Risks	4	2.4	9.5	4.9	19.6	1.5	5.8	4.5	17.8	3.2	12.7	2.4	9.5	2.4	9.5
Account Merit Score		36.8		42.9		17.6		44.2		33.6		35.0		37.6	
Account Merit Rating		**3.7**		**4.3**		**1.8**		**4.4**		**3.4**		**3.5**		**3.8**	

Scenario 4: Socioeconomics Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Non-Indigenous Land Use	3	4.2	13	4.0	12	4.8	14	3.8	11	4.6	14	1.0	3	4.6	14
Human Health and Public Safety	5	3.9	20	5.0	25	4.1	21	4.2	21	3.0	15	4.0	20	4.9	25
Operational Impact	3	4.9	15	2.7	8	4.3	13	1.0	3	1.0	3	4.9	15	2.0	6
Local Economic Risk	2	4.0	8	4.0	8	1.0	2	3.0	6	1.0	2	5.0	10	3.0	6
Account Merit Score		55		53		50		42		34		48		51	
Account Merit Rating		**4.2**		**4.1**		**3.8**		**3.2**		**2.6**		**3.7**		**3.9**	

Scenario 4: Prioritize People Weights Summary

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Environment	4	4.4	18	4.5	18	4.3	17	4.8	19	4.8	19	3.4	14	5.2	21
Technical	2	3.4	7	4.5	9	3.0	6	3.7	7	3.2	6	3.7	7	3.5	7
Economics	1	3.7	4	4.3	4	1.8	2	4.4	4	3.4	3	3.5	4	3.8	4
Socioeconomics	6	4.2	25	4.1	25	3.8	23	3.2	19	2.6	16	3.7	22	3.9	23
Alternative Merit Score		53		56		48		50		45		47		55	
Alternative Merit Rating		**4.1**		**4.3**		**3.7**		**3.9**		**3.4**		**3.6**		**4.2**	

Scenario 5:

Prioritize Water

Scenario 5: Prioritize Water Weight Summary

Account	Weighting	Sub-account	Weighting	Indicator	Weighting
Environment	6	Water Quality	6	Water Treatment Requirements	6
				Flexibility for Water Treatment and Recycle	6
		Hydrology	6	Catchment Area	6
				Number of Affected Sub-watersheds	6
		Aquatic Resources	6	Loss of Fish Habitat (waterbody)	6
				Loss of Fish Habitat (watercourse)	6
				Number of new crossings	3
		Terrestrial Resources	2	Loss of Wetland	5
				Use of Disturbed Habitat	6
				Footprint	3
				Loss of Forest	5
		Sensitive Species	3	Loss of Mainland Moose Habitat	4
				Loss of Brook Trout Habitat	6
		Atmospheric Emissions	4	Fugitive Dust	6
				GHG Emissions	5
				Noise Emissions	3
		Protected Areas	1	Proximity to Protected Areas	1
		Hazard Potential to the Environment	6	Magnitude of Failure	2
				Downstream Sensitivities	6
Technical	3	Design Factors	3	Storage to Dam Volume Ratio	4
				Dam Volume	6
				Natural Topographic Containment	2
		Safety Factors	6	Monitoring Requirements	3
				Dam Height	6
				Impoundment Configuration	6
				Contaminant Management	5
		Water Management	6	Length of Ditching	6
				Number of Pumps and Pipelines	6
				Impacts to Annual Water Balance	6
				Reclaim Water Return	6
		Expansion Capacity	2	Maximum Expansion Capacity	6
		Compliance with Environmental Approvals	5	Ease of Obtaining Initial Permits	1
		Complexity of Operations	4	Tailings Disposal	6
				Processing Complexity	5
				Distance from the Mill	5
				Elevation from the Mill	3
				Climatic Challenges	4
		Constructability	4	Material Availability	4
				Foundation Suitability	6
Economics	1.5	Total Costs	6	Initial Capital Costs	5
				Sustaining Capital Costs	4
				Operating Costs	6
				Closure Costs	2
				Post-Closure Costs	2
				Ancillary Costs	6
		Economic Risks	4	Projected Timeline for Permits	6
				Projected Timeline for Start of Operations	5
Socioeconomics	3	Non-Indigenous Land Use	3	Loss of Recreational Fishing	6
				Loss of Commercial Forest Harvesting	4
				Loss of ATV Trails	2
				Loss of Private Land Ownership	2
		Human Health and Public Safety	5	Fugitive Dust	5
				Hazard Potential to the Public	6
				Risk to Workers	6
		Operational Impact	3	Change in Aesthetics / Visual Impacts	4
				Noise Emissions	3
		Local Economic Risk	2	Loss of Local Jobs and Business Opportunities	1

Scenario 5: Environmental Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Water Quality	Water Treatment Requirements	6	4	24	5	30	2	12	6	36	1	6	3	18	5	30
	Flexibility for Water Treatment and Recycle	6	3	18	2	12	5	30	4	24	5	30	2	12	2	12
	Subaccount Merit Score		42		42		42		60		36		30		42	
	Subaccount Merit Rating		**3.5**		**3.5**		**3.5**		**5.0**		**3.0**		**2.5**		**3.5**	
Hydrology	Catchment Area	6	1	6	1	6	1	6	2	12	2	12	4	24	1	6
	Number of Affected Sub-watersheds	6	5	30	5	30	5	30	4	24	4	24	6	36	5	30
	Subaccount Merit Score		36		36		36		36		36		60		36	
	Subaccount Merit Rating		**3.0**		**3.0**		**3.0**		**3.0**		**3.0**		**5.0**		**3.0**	
Aquatic Resources	Loss of Fish Habitat (waterbody)	6	6	36	6	36	6	36	6	36	6	36	5	30	6	36
	Loss of Fish Habitat (watercourse)	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Number of new crossings	3	6	18	6	18	6	18	6	18	6	18	4	12	6	18
	Subaccount Merit Score		84		84		78		90		90		48		90	
	Subaccount Merit Rating		**5.6**		**5.6**		**5.2**		**6.0**		**6.0**		**3.2**		**6.0**	
Terrestrial Resources	Loss of Wetland	5	1	5	1	5	1	5	4	20	6	30	2	10	4	20
	Use of Disturbed Habitat	6	1	6	1	6	2	12	1	6	1	6	1	6	5	30
	Footprint	3	1	3	1	3	3	9	3	9	4	12	1	3	4	12
	Loss of Forest	5	1	5	1	5	3	15	3	15	4	20	1	5	4	20
	Subaccount Merit Score		19		19		41		50		68		24		82	
	Subaccount Merit Rating		**1.0**		**1.0**		**2.2**		**2.6**		**3.6**		**1.3**		**4.3**	
Sensitive Species	Loss of Mainland Moose Habitat	4	1	4	1	4	1	4	4	16	6	24	2	8	5	20
	Loss of Brook Trout Habitat	6	5	30	5	30	4	24	6	36	6	36	1	6	6	36
	Subaccount Merit Score		34		34		28		52		60		14		56	
	Subaccount Merit Rating		**3.4**		**3.4**		**2.8**		**5.2**		**6.0**		**1.4**		**5.6**	
Atmospheric Emissions	Fugitive Dust	6	5	30	5	30	2	12	6	36	3	18	4	24	6	36
	GHG Emissions	5	5	25	5	25	1	5	4	20	2	10	4	20	4	20
	Noise Emissions	3	1	3	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		58		58		23		59		31		62		62	
	Subaccount Merit Rating		**4.1**		**4.1**		**1.6**		**4.2**		**2.2**		**4.4**		**4.4**	
Protected Areas	Proximity to Protected Areas	1	1	1	1	1	1	1	1	1	2	2	3	3	1	1
	Subaccount Merit Score		1		1		1		1		2		3		1	
	Subaccount Merit Rating		**1.0**		**1.0**		**1.0**		**1.0**		**2.0**		**3.0**		**1.0**	
Hazard Potential to the Environment	Magnitude of Failure	2	2	4	2	4	5	10	1	2	5	10	2	4	2	4
	Downstream Sensitivities	6	4	24	4	24	6	36	2	12	5	30	2	12	4	24
	Subaccount Merit Score		28		28		46		14		40		16		28	
	Subaccount Merit Rating		**3.5**		**3.5**		**5.8**		**1.8**		**5.0**		**2.0**		**3.5**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	6	3.5	21.0	3.5	21.0	3.5	21.0	5.0	30.0	3.0	18.0	2.5	15.0	3.5	21.0
Hydrology	6	3.0	18.0	3.0	18.0	3.0	18.0	3.0	18.0	3.0	18.0	5.0	30.0	3.0	18.0
Aquatic Resources	6	5.6	33.6	5.6	33.6	5.2	31.2	6.0	36.0	6.0	36.0	3.2	19.2	6.0	36.0
Terrestrial Resources	2	1.0	2.0	1.0	2.0	2.2	4.3	2.6	5.3	3.6	7.2	1.3	2.5	4.3	8.6
Sensitive Species	3	3.4	10.2	3.4	10.2	2.8	8.4	5.2	15.6	6.0	18.0	1.4	4.2	5.6	16.8
Atmospheric Emissions	4	4.1	16.6	4.1	16.6	1.6	6.6	4.2	16.9	2.2	8.9	4.4	17.7	4.4	17.7
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	6	3.5	21.0	3.5	21.0	5.8	34.5	1.8	10.5	5.0	30.0	2.0	12.0	3.5	21.0
Account Merit Score		123.4		123.4		125.0		133.2		138.0		103.6		140.1	
Account Merit Rating		**4.9**		**4.9**		**5.0**		**5.3**		**5.5**		**4.1**		**5.6**	

Scenario 5: Technical Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	Indicator	Weight	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score	Value	Score
Design Factors	Storage to Dam Volume Ratio	4	4	16	2	8	1	4	1	4	1	4	6	24	1	4
	Dam Volume	6	5	30	1	6	2	12	1	6	1	6	6	36	1	6
	Natural Topographic Containment	2	3	6	4	8	3	6	4	8	4	8	5	10	3	6
	Subaccount Merit Score		52		22		22		18		18		70		16	
	Subaccount Merit Rating		**4.3**		**1.8**		**1.8**		**1.5**		**1.5**		**5.8**		**1.3**	
Safety Factors	Monitoring Requirements	3	2	6	2	6	1	3	1	3	2	6	6	18	1	3
	Dam Height	6	4	24	4	24	6	36	1	6	1	6	4	24	2	12
	Impoundment Configuration	6	4	24	5	30	1	6	2	12	1	6	6	36	1	6
	Contaminant Management	5	5	25	5	25	2	10	6	30	2	10	5	25	4	20
	Subaccount Merit Score		79		85		55		51		28		103		41	
	Subaccount Merit Rating		**4.0**		**4.3**		**2.8**		**2.6**		**1.4**		**5.2**		**2.1**	
Water Management	Length of Ditching	6	3	18	5	30	3	18	3	18	1	6	6	36	2	12
	Number of Pumps and Pipelines	6	2	12	5	30	2	12	4	24	4	24	1	6	5	30
	Impacts to Annual Water Balance	6	5	30	3	18	1	6	5	30	5	30	1	6	6	36
	Reclaim Water Return	6	1	6	5	30	4	24	5	30	6	36	1	6	5	30
	Subaccount Merit Score		66		108		60		102		96		54		108	
	Subaccount Merit Rating		**2.8**		**4.5**		**2.5**		**4.3**		**4.0**		**2.3**		**4.5**	
Expansion Capacity	Maximum Expansion Capacity	6	4	24	5	30	3	18	2	12	6	36	6	36	1	6
	Subaccount Merit Score		24		30		18		12		36		36		6	
	Subaccount Merit Rating		**4.0**		**5.0**		**3.0**		**2.0**		**6.0**		**6.0**		**1.0**	
Compliance with Environmental Approvals	Ease of Obtaining Initial Permits	1	4	4	6	6	2	2	5	5	2	2	4	4	4	4
	Subaccount Merit Score		4		6		2		5		2		4		4	
	Subaccount Merit Rating		**4.0**		**6.0**		**2.0**		**5.0**		**2.0**		**4.0**		**4.0**	
Complexity of Operations	Tailings Disposal	6	5	30	6	36	2	12	6	36	3	18	4	24	6	36
	Processing Complexity	5	4	20	5	25	2	10	5	25	2	10	4	20	5	25
	Distance from the Mill	5	1	5	6	30	6	30	6	30	6	30	1	5	6	30
	Elevation from the Mill	3	6	18	1	3	1	3	1	3	1	3	5	15	1	3
	Climatic Challenges	4	4	16	5	20	2	8	5	20	3	12	4	16	5	20
	Subaccount Merit Score		89		114		63		114		73		80		114	
	Subaccount Merit Rating		**3.9**		**5.0**		**2.7**		**5.0**		**3.2**		**3.5**		**5.0**	
Constructability	Material Availability	4	2	8	6	24	6	24	6	24	6	24	1	4	6	24
	Foundation Suitability	6	1	6	3	18	6	36	3	18	6	36	1	6	3	18
	Subaccount Merit Score		14		42		60		42		60		10		42	
	Subaccount Merit Rating		**1.4**		**4.2**		**6.0**		**4.2**		**6.0**		**1.0**		**4.2**	

Subaccount	Weight	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Design Factors	3	4.3	13.0	1.8	5.5	1.8	5.5	1.5	4.5	1.5	4.5	5.8	17.5	1.3	4.0
Safety Factors	6	4.0	23.7	4.3	25.5	2.8	16.5	2.6	15.3	1.4	8.4	5.2	30.9	2.1	12.3
Water Management	6	2.8	16.5	4.5	27.0	2.5	15.0	4.3	25.5	4.0	24.0	2.3	13.5	4.5	27.0
Expansion Capacity	2	4.0	8.0	5.0	10.0	3.0	6.0	2.0	4.0	6.0	12.0	6.0	12.0	1.0	2.0
Compliance with Environmental Approvals	5	4.0	20.0	6.0	30.0	2.0	10.0	5.0	25.0	2.0	10.0	4.0	20.0	4.0	20.0
Complexity of Operations	4	3.9	15.5	5.0	19.8	2.7	11.0	5.0	19.8	3.2	12.7	3.5	13.9	5.0	19.8
Constructability	4	1.4	5.6	4.2	16.8	6.0	24.0	4.2	16.8	6.0	24.0	1.0	4.0	4.2	16.8
Account Merit Score		102.3		134.6		88.0		110.9		95.6		111.8		101.9	
Account Merit Rating		**3.4**		**4.5**		**2.9**		**3.7**		**3.2**		**3.7**		**3.4**	

Scenario 5: Project Economics Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Total Costs	Initial Capital Costs	5	5	25	3	15	1	5	5	25	6	30	4	20	6	30
	Sustaining Capital Costs	4	4	16	6	24	1	4	2	8	1	4	6	24	1	4
	Operating Costs	6	6	36	3	18	1	6	6	36	4	24	6	36	6	36
	Closure Costs	2	6	12	6	12	6	12	5	10	1	2	1	2	6	12
	Post-Closure Costs	2	2	4	4	8	1	2	1	2	6	12	6	12	1	2
	Ancillary Costs	6	3	18	3	18	4	24	5	30	2	12	1	6	6	36
	Subaccount Merit Score		111		95		53		111		84		100		120	
	Subaccount Merit Rating		**4.4**		**3.8**		**2.1**		**4.4**		**3.4**		**4.0**		**4.8**	
Economic Risks	Projected Timeline for Permits	6	1	6	4	24	1	6	4	24	5	30	1	6	1	6
	Projected Timeline for Start of Operations	5	4	20	6	30	2	10	5	25	1	5	4	20	4	20
	Subaccount Merit Score		26		54		16		49		35		26		26	
	Subaccount Merit Rating		**2.4**		**4.9**		**1.5**		**4.5**		**3.2**		**2.4**		**2.4**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Total Costs	6	4.4	26.6	3.8	22.8	2.1	12.7	4.4	26.6	3.4	20.2	4.0	24.0	4.8	28.8
Economic Risks	4	2.4	9.5	4.9	19.6	1.5	5.8	4.5	17.8	3.2	12.7	2.4	9.5	2.4	9.5
Account Merit Score		36.1		42.4		18.5		44.5		32.9		33.5		38.3	
Account Merit Rating		**3.6**		**4.2**		**1.9**		**4.4**		**3.3**		**3.3**		**3.8**	

Scenario 5: Socioeconomics Indicator Analysis

			Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Indicator**	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Non-Indigenous Land Use	Loss of Recreational Fishing	6	1	6	4	24	4	24	4	24	5	30	1	6	6	36
	Loss of Commercial Forest Harvesting	4	6	24	4	16	6	24	4	16	4	16	1	4	4	16
	Loss of ATV Trails	2	6	12	2	4	2	4	1	2	4	8	1	2	3	6
	Loss of Private Land Ownership	2	2	4	6	12	6	12	6	12	6	12	1	2	6	12
	Subaccount Merit Score		46		56		64		54		66		14		70	
	Subaccount Merit Rating		**3.3**		**4.0**		**4.6**		**3.9**		**4.7**		**1.0**		**5.0**	
Human Health and Public Safety	Fugitive Dust	5	5	25	5	25	2	10	6	30	3	15	4	20	6	30
	Hazard Potential to the Public	6	1	6	4	24	6	36	2	12	5	30	2	12	4	24
	Risk to Workers	6	6	36	6	36	4	24	5	30	1	6	6	36	5	30
	Subaccount Merit Score		67		85		70		72		51		68		84	
	Subaccount Merit Rating		**3.9**		**5.0**		**4.1**		**4.2**		**3.0**		**4.0**		**4.9**	
Operational Impact	Change in Aesthetics / Visual Impacts	4	4	16	4	16	6	24	1	4	1	4	4	16	2	8
	Noise Emissions	3	6	18	1	3	2	6	1	3	1	3	6	18	2	6
	Subaccount Merit Score		34		19		30		7		7		34		14	
	Subaccount Merit Rating		**4.9**		**2.7**		**4.3**		**1.0**		**1.0**		**4.9**		**2.0**	
Local Economic Risk	Loss of Local Jobs and Business Opportunities	1	4	4	4	4	1	1	3	3	1	1	5	5	3	3
	Subaccount Merit Score		4		4		1		3		1		5		3	
	Subaccount Merit Rating		**4.0**		**4.0**		**1.0**		**3.0**		**1.0**		**5.0**		**3.0**	

Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Non-Indigenous Land Use	3	3.3	10	4.0	12	4.6	14	3.9	12	4.7	14	1.0	3	5.0	15
Human Health and Public Safety	5	3.9	20	5.0	25	4.1	21	4.2	21	3.0	15	4.0	20	4.9	25
Operational Impact	3	4.9	15	2.7	8	4.3	13	1.0	3	1.0	3	4.9	15	2.0	6
Local Economic Risk	2	4.0	8	4.0	8	1.0	2	3.0	6	1.0	2	5.0	10	3.0	6
Account Merit Score		52		53		49		42		34		48		52	
Account Merit Rating		**4.0**		**4.1**		**3.8**		**3.2**		**2.6**		**3.7**		**4.0**	

Scenario 5: Environmental Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Water Quality	6	3.5	21.0	3.5	21.0	3.5	21.0	5.0	30.0	3.0	18.0	2.5	15.0	3.5	21.0
Hydrology	6	3.0	18.0	3.0	18.0	3.0	18.0	3.0	18.0	3.0	18.0	5.0	30.0	3.0	18.0
Aquatic Resources	6	5.6	33.6	5.6	33.6	5.2	31.2	6.0	36.0	6.0	36.0	3.2	19.2	6.0	36.0
Terrestrial Resources	2	1.0	2.0	1.0	2.0	2.2	4.3	2.6	5.3	3.6	7.2	1.3	2.5	4.3	8.6
Sensitive Species	3	3.4	10.2	3.4	10.2	2.8	8.4	5.2	15.6	6.0	18.0	1.4	4.2	5.6	16.8
Atmospheric Emissions	4	4.1	16.6	4.1	16.6	1.6	6.6	4.2	16.9	2.2	8.9	4.4	17.7	4.4	17.7
Protected Areas	1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	3.0	3.0	1.0	1.0
Hazard Potential to the Environment	6	3.5	21.0	3.5	21.0	5.8	34.5	1.8	10.5	5.0	30.0	2.0	12.0	3.5	21.0
Account Merit Score		123.4		123.4		125.0		133.2		138.0		103.6		140.1	
Account Merit Rating		**4.9**		**4.9**		**5.0**		**5.3**		**5.5**		**4.1**		**5.6**	

Scenario 5: Technical Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Design Factors	3	4.3	13.0	1.8	5.5	1.8	5.5	1.5	4.5	1.5	4.5	5.8	17.5	1.3	4.0
Safety Factors	6	4.0	23.7	4.3	25.5	2.8	16.5	2.6	15.3	1.4	8.4	5.2	30.9	2.1	12.3
Water Management	6	2.8	16.5	4.5	27.0	2.5	15.0	4.3	25.5	4.0	24.0	2.3	13.5	4.5	27.0
Expansion Capacity	2	4.0	8.0	5.0	10.0	3.0	6.0	2.0	4.0	6.0	12.0	6.0	12.0	1.0	2.0
Compliance with Environmental Approvals	5	4.0	20.0	6.0	30.0	2.0	10.0	5.0	25.0	2.0	10.0	4.0	20.0	4.0	20.0
Complexity of Operations	4	3.9	15.5	5.0	19.8	2.7	11.0	5.0	19.8	3.2	12.7	3.5	13.9	5.0	19.8
Constructability	4	1.4	5.6	4.2	16.8	6.0	24.0	4.2	16.8	6.0	24.0	1.0	4.0	4.2	16.8
Account Merit Score		102.3		134.6		88.0		110.9		95.6		111.8		101.9	
Account Merit Rating		**3.4**		**4.5**		**2.9**		**3.7**		**3.2**		**3.7**		**3.4**	

Scenario 5: Project Economics Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Total Costs	6	4.4	26.6	3.8	22.8	2.1	12.7	4.4	26.6	3.4	20.2	4.0	24.0	4.8	28.8
Economic Risks	4	2.4	9.5	4.9	19.6	1.5	5.8	4.5	17.8	3.2	12.7	2.4	9.5	2.4	9.5
Account Merit Score		36.1		42.4		18.5		44.5		32.9		33.5		38.3	
Account Merit Rating		**3.6**		**4.2**		**1.9**		**4.4**		**3.3**		**3.3**		**3.8**	

Scenario 5: Socioeconomics Account Analysis

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Subaccount	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Non-Indigenous Land Use	3	3.3	10	4.0	12	4.6	14	3.9	12	4.7	14	1.0	3	5.0	15
Human Health and Public Safety	5	3.9	20	5.0	25	4.1	21	4.2	21	3.0	15	4.0	20	4.9	25
Operational Impact	3	4.9	15	2.7	8	4.3	13	1.0	3	1.0	3	4.9	15	2.0	6
Local Economic Risk	2	4.0	8	4.0	8	1.0	2	3.0	6	1.0	2	5.0	10	3.0	6
Account Merit Score		52		53		49		42		34		48		52	
Account Merit Rating		**4.0**		**4.1**		**3.8**		**3.2**		**2.6**		**3.7**		**4.0**	

Scenario 5: Prioritize Water Weights Summary

		Alternative A		Alternative B		Alternative C		Alternative D		Alternative E		Alternative F		Alternative G	
Account	**Weight**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**	**Rating**	**Score**
Environment	6	4.9	29	4.9	29	5.0	30	5.3	32	5.5	33	4.1	25	5.6	33
Technical	3	3.4	10	4.5	13	2.9	9	3.7	11	3.2	10	3.7	11	3.4	10
Economics	1.5	3.6	5	4.2	6	1.9	3	4.4	7	3.3	5	3.3	5	3.8	6
Socioeconomics	3	4.0	12	4.1	12	3.8	11	3.2	10	2.6	8	3.7	11	4.0	12
Alternative Merit Score		57		62		53		59		55		52		61	
Alternative Merit Rating		**4.2**		**4.6**		**3.9**		**4.4**		**4.1**		**3.8**		**4.5**	

wood.

Appendix J.7

Fish Habitat Offset Plan: Preliminary Concept Update,

Wood Environment & Infrastructure Solutions

Fish Habitat Offset Plan: Preliminary Concept Update

Fifteen Mile Stream Project
Project # ONS2001

Prepared for:

Atlantic Mining Nova Scotia Inc.
595 Burrard Street, Suite 3083, Vancouver, BC, V7X 1L3

October 2020

Fish Habitat Offset Plan: Preliminary Concept Update

Fifteen Mile Stream Project
Atlantic Mining Nova Scotia Inc.

Project # ONS2001

Prepared for:

Atlantic Mining Nova Scotia Inc.
595 Burrard Street, Suite 3083, Vancouver, BC, V7X 1L3

Prepared by:

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited
133 Crosbie Road
St. John's, NL A1B 4A5
Canada
T: 709-722-7023
October 2020

Executive Summary

Atlantic Mining Nova Scotia is Inc. proposing a gold mine and processing facility at Fifteen Mile Stream (FMS) called the Fifteen Mile Stream Gold Project (the Project). While mitigation measures are being developed to minimize Project effects, the location of the ore body and the required infrastructure is likely to cause the permanent loss of fish and fish habitat. Any Harmful Alteration, Disruption, or Destruction (HADD) of fish habitat will require authorization under Section 35 of the *Fisheries Act*. Additionally, any deposit of mineral waste (overburden, waste rock, effluent) in waters frequented by fish will require waterbodies to be listed in Schedule 2 of the Metal Diamond Mining Effluent Regulations (MDMER) in accordance with Section 36 of the *Fisheries Act*.

This document has been prepared to provide preliminary quantification of aquatic habitat potentially affected by the Project and to outline the conceptual offset measures proposed to compensate for any HADD determination. The intent is to further demonstrate that mitigation avoidance measures have been considered to minimize the overall HADD on fish and fish habitat and that the fish habitat offsetting concepts for the Project can meet the requirements of the *Fisheries Act*. The document provides Fisheries and Oceans Canada (DFO) with information to determine if measures to offset unavoidable HADD of fish habitat (as defined in the *Fisheries Act*) are reasonable and can be achieved. The impacts and offsetting concepts described will serve as the basis for ongoing consultation with Indigenous Groups and stakeholders and to ultimately support an application for authorization of HADD of fish habitat as required by the *Fisheries Act*.

As part of the early project planning and site assessment efforts, multiple site layouts were considered for both project efficiencies and the avoidance of impacts to fish frequented waters. Although components such as the open pit are fixed due to the orebody, other project footprints such as stockpiles, the TMF and road networks have some flexibility in their location. To this end, the Project team reviewed multiple locations and site plans for these features, before selecting the proposed arrangement. Extensive field investigations have not identified fish presence within the footprint of the Proposed TMF. However, correspondence with Environment and Climate Change Canada (ECCC) have indicated that a portion of WC-43 may be considered a waterbody frequented by fish, and as such would require listing in schedule 2 of the MDMER, unless additional fish sampling can clearly demonstrate that fish are not present at any time.

HADD Estimation

Using the identified fish species currently known to utilize this habitat, Habitat Suitability Index (HSI) values were generated for each species life stage using DFO data for water velocities, water depth, substrate, and where appropriate, emergent vegetation. Using these suitabilities, final Habitat Equivalent Units (HEUs) for the lost habitat were generated with the highest species life stage HEU value used to conservatively represent the overall HEU and therefore the HADD.

Efforts have been made to minimize residual effects of the Project on fish and fish habitat and to avoid HADD wherever possible. However, portions of Project infrastructure will result in the loss of existing fish habitat that is currently utilized by resident fish species. Table A provides a summary of the quantity of fish habitat to be lost by the project, its calculated Habitat Equivalent Units, mitigation habitat used to reduce overall habitat losses (and its Habitat Equivalent Units), and the overall residual habitat losses. It is understood that the final HADD determination will be provided by DFO; however, this preliminary

quantification is provided to show that the offset concepts described can be designed to meet HADD quantity expectations, including any offset ratios.

Offset Concepts

Offsetting alternatives provided have been developed consistent with DFO's guidance Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the *Fisheries Act*; however, preferred offsetting options will be further refined based on discussions with DFO and relevant stakeholders during the detailed offset planning process. It is also possible that alternative approaches not listed could be integrated into any Final Authorization Application (via an offsetting Plan) if required. Conceptual offset planning should enable DFO and others to assess the alternatives for feasibility and acceptability. Several concepts that have been considered feasible at the concept stage and, based on habitat needs of resident species and experience on similar offset designs, have a high degree of successful implementation.

The biological habitat design of the **Seloam Brook Realignment Channel** will provide suitable habitat features for spawning, rearing and migration. The channel realignment design will include an integrated floodplain and natural channel design principles to develop highly suitable fish habitat with biological features to mitigate a large portion of the habitat losses within Seloam Brook and avoid additional HADD. Habitat design will incorporate features to mimic characteristics within the existing habitat that will be lost but will also include increased species-specific spawning habitat to provide greater productivity potential. The channel will have a better-defined flow path to improve fish passage through the reach and mitigate the braided configuration of the existing habitat, caused by past mining activities, and will utilize the consolidated flow to maximize habitat stability and suitability.

In addition to the Seloam Brook realignment design, additional **off-channel habitat** would be constructed within the Seloam / Trafalgar Brook ecological unit. While the exact locations require further investigation of geotechnical, hydrogeological, and terrain constraints, the proposed concept is to install rock weir riffle enhancements immediately downstream of all mitigation structures and excavate ponds as off-channel habitat adjacent to the existing channel. The proposed objective is the creation of at least 6,300 Habitat Equivalent Units of high-quality pond and stream habitat to offset a portion of the remaining habitat units lost related to existing stream and open water habitat within the Project infrastructure footprint and TMF. The exact locations of the measure will need further adjustment to reflect ongoing flow modeling efforts, but sufficient areas exist adjacent to the Project to provide a high degree of certainty for this alternative.

The same concept and general methodology described for onsite could be applied to other locations offsite (i.e., outside the Selaom / Trafalgar Brook ecological unit), should it be required or should it be deemed more beneficial to fish populations in other locations than those near the Project area. This offsite alternative, however, was ranked lower due to greater risks and challenges related to land tenure and not being a direct benefit within the watershed(s) being affected by the Project.

Measures to **improve existing fisheries knowledge** in areas of interest to Indigenous communities could provide information related to possible future habitat rehabilitation options, additional habitat utilization, and/or species distributions / movement patterns in Nova Scotia, particularly in areas near the Project. The exact format of complementary measures will depend on consultations between Atlantic Mining Nova Scotia Inc. representatives and local Indigenous communities. While complementary measures are typically limited to a maximum of 10% of the offset plan, this option can provide additional avenues for alternative offset options. This alternative was ranked as third highest due to its flexibility and ability to align with specific interests of stakeholders.

Additional options investigated included the **rehabilitation / restoration of degraded aquatic habitats** both within and beyond former mining areas including old stream realignments, dewatered / infilled stream reaches, and man-made barriers. Restoration methods are well-known and can be very successful if used in the proper location. Discussions with groups involved in the planning of remediation of former mining areas indicate that additional coordination may be challenging due to land tenure challenges and liabilities; however, alternate locations may be identified through consultations with local stakeholders and Indigenous communities. These would be considered if required; however, are a lower overall ranking due to numerous uncertainties with their implementation.

Engagement

Engagement is a key component of Atlantic Mining Nova Scotia Inc.'s approach to the planning and implementation of its projects and other business activities. Several engagement initiatives have been undertaken in relation to the Project, with further engagement in progress or being planned. This includes discussions with relevant government departments and agencies, Indigenous communities and stakeholder organizations.

The Environmental Impact Statement documents describe previous and ongoing engagement initiatives related to the Project with Indigenous groups and the public. To continue in the vein of open communications on the Project, Atlantic Mining Nova Scotia Inc. is committed to meeting with and/or providing information to stakeholders at the appropriate time to discuss any offsetting plans.

Summary

Efforts have been made to minimize residual effects of the Project on fish and fish habitat and to avoid HADD wherever possible, however; portions of Project infrastructure will result in the loss of existing fish habitat that is currently utilized by resident fish species. It is understood that the final HADD determination will be provided by DFO; however, this preliminary quantification is provided to show that the offset concepts described can be designed to meet HADD quantity expectations, including any offset ratios.

Table A: Summary of Habitat Lost and Mitigations for FMS Project Infrastructure Footprint and TMF

Habitat measure	Project Area	Habitat Type	Total Habitat Area (m^2)	HEU (m^2)	Description
Lost	Infrastructure Footprint	Stream	8,334	3,333	Highest Habitat Equivalent Unit for adult Brook Trout.
		Open Water	19,113	4,730	Highest Habitat Equivalent Unit for both spawning and adult Brook Trout.
		Wetland	51,179	0	No Habitat Equivalent Unit value.
	TMF	Stream	1,947	953	Highest Habitat Equivalent Unit for adult White Sucker.
		Open Water	0	-	No open water habitat present
		Wetland	0	-	No wetland habitat present
Total			**80,573**	**9,016**	
Mitigation	Realignment	Stream	4,640	4,640	Will be designed as suitable for all species present within the footprint.
	Flood Area	Open Water	84,449	20,901	Will be designed as suitable as possible for all species present with adult Brook Trout as the habitat template.
		Wetland	0	-	No emergent vegetation habitat will be designed or constructed.
Total			**89,089**	**25,541**	
Residual HADD				**-16,525**	Net increase in Habitat Equivalent Units with the development of appropriate mitigations

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ATV – All Terrain Vehicle
UTV – Utility Terrain Vehicle
cfs – Cubic Feet per Second
m^3/s – Cubic Metres per Second
m – Metre
m/s – Metres per Second
FMS - Fifteen Mile Stream
HADD - Harmful Alteration, Disruption, or Destruction
MDMER - Metal Diamond Mining Effluent Regulations

1.0 Introduction

Atlantic Mining Nova Scotia Inc. is proposing a gold mine and processing facility at Fifteen Mile Stream (FMS) called the Fifteen Mile Stream Gold Project (the Project). It is located in the East River Sheet Harbour watershed approximately 100 km northeast of Halifax, Nova Scotia (Figure 1). While mitigation measures are being developed to minimize Project effects, the location of the ore bodies and the required infrastructure is likely to cause the permanent loss of fish and fish habitat. Any Harmful Alteration, Disruption, or Destruction (HADD) of fish habitat will require authorization under Section 35 of the *Fisheries Act*. Additionally, any deposit of mineral waste (overburden, waste rock, effluent) in waters frequented by fish will require waterbodies to be listed in Schedule 2 of the Metal Diamond Mining Effluent Regulations (MDMER) in accordance with Section 36 of the *Fisheries Act*.

This document has been prepared to provide preliminary quantification of aquatic habitat potentially affected by the Project and to outline the conceptual offset measures proposed to compensate for any HADD determination. This Plan is supported by and builds upon the previous studies and documentation completed by McCallum Environmental Ltd, Knight-Piesold Consulting, and others. Detailed baseline aquatic habitat data has been collected by McCallum Environmental Ltd. personnel and where ongoing model and design work is applicable, it has been included or referenced.

The intent of this document is to further demonstrate that mitigation avoidance measures have been considered to minimize the overall HADD on fish and fish habitat and that the fish habitat offsetting concepts for the Project can meet the requirements of the *Fisheries Act*. The document will provide Fisheries and Oceans Canada (DFO) with the information necessary to determine if measures to offset unavoidable HADD of fish habitat (as defined in the Fisheries Act) are reasonable and can be achieved. The Conceptual Offsetting Plan has the following objectives:

1. Describe the fish species, habitat and population productivity being affected by the proposed Project;
2. Identify the likely residual effects of the Project that will result in HADD of fish habitat; and
3. Describe the proposed concepts to offset the loss of fish productive capacity.

The organization of this report is based on DFO guidance concerning the Fisheries Protection Policy, fish habitat offsetting, and the content of applications for *Fisheries Act* Authorization (DFO, 2013, 2019a, 2019b). The impacts and offsetting concepts described will serve as the basis for ongoing consultation with Indigenous Groups and stakeholders and to ultimately support an application for authorization of HADD of fish habitat as required by the *Fisheries Act*.

1.1 Project Contact Information

Proponent:

Names and address of Owner
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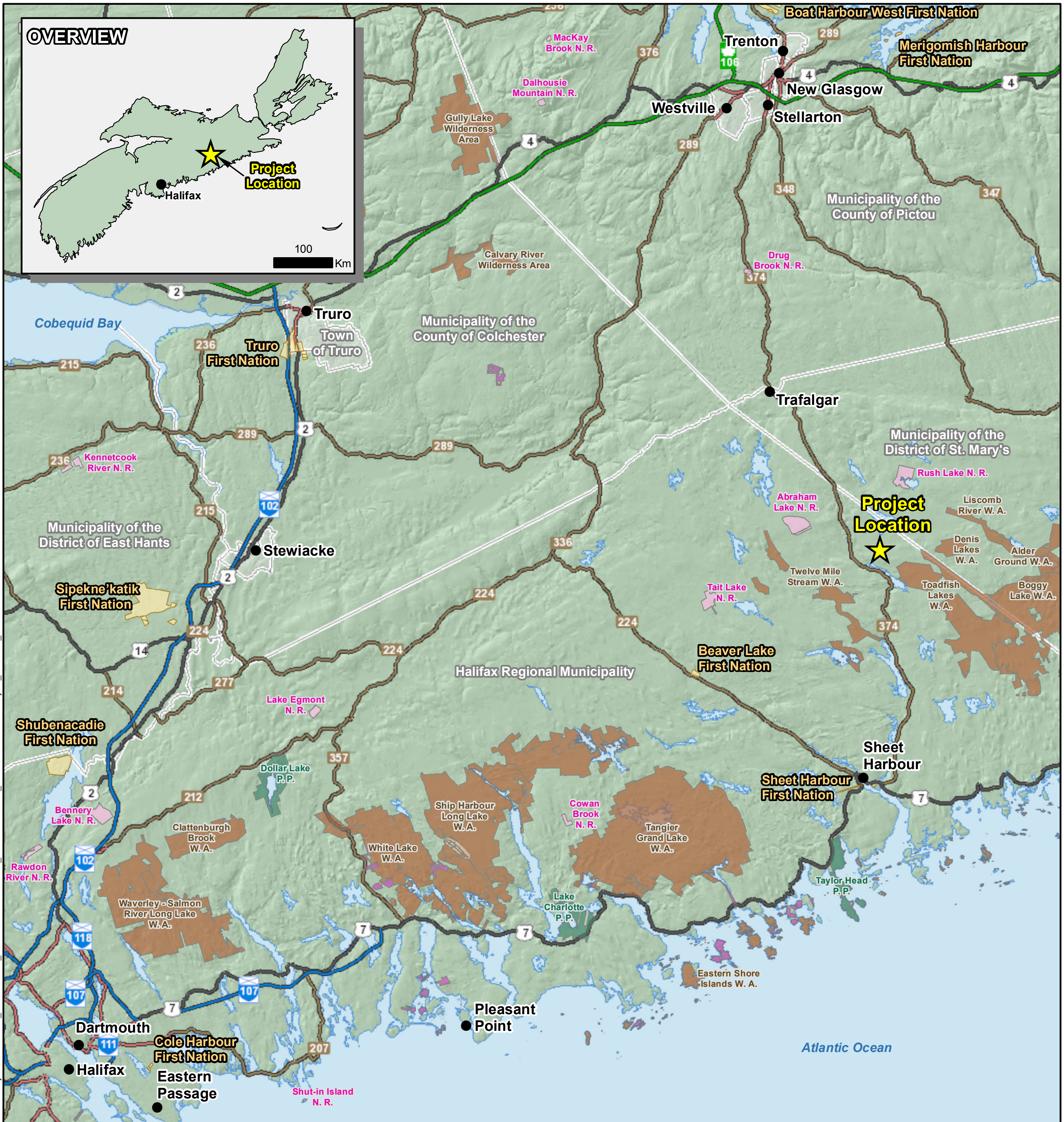
Authorized Contact Person
Attention to:
James Millard
Manager Environment and Community
Tel: 902.499.7910
Email: jmillard@atlanticgoldcorporation.com

Mr. Millard is an authorized representative for the Proponent and will be the signing authority for the Application(s), on behalf of the Proponent.



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LEGEND

- ★ Project Location
- Name ● City / Town
- Name Municipal Boundary
- Name First Nation Reserves

Protected Areas

- Conservation Easement
- Land Trust Property
- N. R. Nature Reserve
- P. P. Provincial Park
- W. A. Wilderness Area

NOTES:
- Topogarphic base data extracted from Nova Scotia GeoPortal and Web Mapping Service.

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FIFTEEN MILE STREAM GOLD PROJECT

Project Location

Datum: NAD83
Projection: UTM Zone 20N

0 5 10 20 30 40 50 Kilometres

PROJECT N°: ONS2001	**FIGURE: 1**
SCALE: 1:550,000	DATE: July 2020

2.0 Regulatory Context

DFO's Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the *Fisheries Act* (DFO 2019) states the following:

> *Works, undertakings or activities resulting in the death of fish or the harmful alteration, disruption or destruction of fish habitat are prohibited under the Fisheries Act unless otherwise authorized. Before approving works, undertakings or activities that will result in the death of fish and/or the harmful alteration, disruption or destruction of fish habitat, Fisheries and Oceans Canada (the Department), must consider if there are alternatives that avoid adverse effects on fish and fish habitat. If the adverse effects on fish and fish habitat are unavoidable, the Department must consider if there are measures to mitigate that would reduce or minimize those adverse effects. Finally, if there are any residual effects, then the Department must consider measures to offset or counterbalance the death of fish and the harmful alteration, disruption or destruction of fish habitat.*

The project is currently undergoing provincial and federal environmental assessment under the Nova Scotia Environment Act and Canadian Environmental Assessment Act, 2012 respectively. The assessment document describes the residual effects on fish and fish habitat when full project mitigations have been considered. As part of the planning and permitting process, the environmental assessment documents and this conceptual offset plan will be reviewed by DFO to confirm the likely residual effects of the Project on fish and fish habitat and the need for a Federal Fisheries Authorization. Subsequently, a *Fisheries Act* Application for Authorization including a detailed offsetting plan will be developed.

In addition to likely residual impacts that constitute a HADD; any fish and fish habitat that may be subject to a Metals and Diamond Mine effluent Regulation Schedule 2 designation and accordingly a fish habitat compensation process has also been included within this document.

2.1 Document Overview

This document is organized into the following sections:

- Brief Description of the Proposed Undertaking and Activities (Section 3);
- Existing Aquatic Habitat (Section 4);
- HADD and Schedule 2 Habitat Quantification (Section 5); and
- Habitat Offset Concepts (Section 6)

3.0 Proposed Work, Undertaking and Activities

The Project is proposed to be developed in association with the currently operating Touquoy Mine. The Project is to be permitted and operated as a separate satellite surface mine operating at a rate of approximately two million tonnes (Mt) of gold-bearing ore per year. FMS ore will be crushed and concentrated through on site processing to produce a gold concentrate which will be hauled by on-road highway trucks to the Touquoy Mine Site carbon-in-leach (CIL) processing facility, a distance of just over 76 km on existing public roads, for final processing into gold ore bars. This will eliminate the need for a separate CIL cyanide leach circuit at the FMS Mine Site to support the Project. The FMS concentrate will be processed at the Touquoy Mine Site in conjunction with ore supply from Touquoy, Beaver Dam and Cochrane Hill surface mines.

The mine will operate for 7 years and will employ up to 200 persons including both salaried and hourly personnel. At the cessation of mining activities, the site will be reclaimed in accordance with federal and provincial requirements.

Operations at the Project location will include mining, crushing, ore processing and concentration, and operation of a waste rock storage facility (WRSF), ore stockpiles, and a tailings management facility (TMF). Tailings will be generated from the on-site mill processing and deposited into an above ground TMF. Infrastructure will include crushing facilities, fine ore stockpile and reclaim, concentrator facilities, maintenance facilities, fuel storage, office infrastructure, and site haul roads.

Power will be supplied via a small 5.3 km long spur transmission line and sub-station from an existing 69 kV, north-south hydroelectric transmission line located west of Highway 374. The sub-station will step the voltage down to 25 kV.

Development of the Open Pit will require the realignment of Seloam Brook. An 800 m realignment channel will be constructed to divert Seloam Brook to the north of the pit.

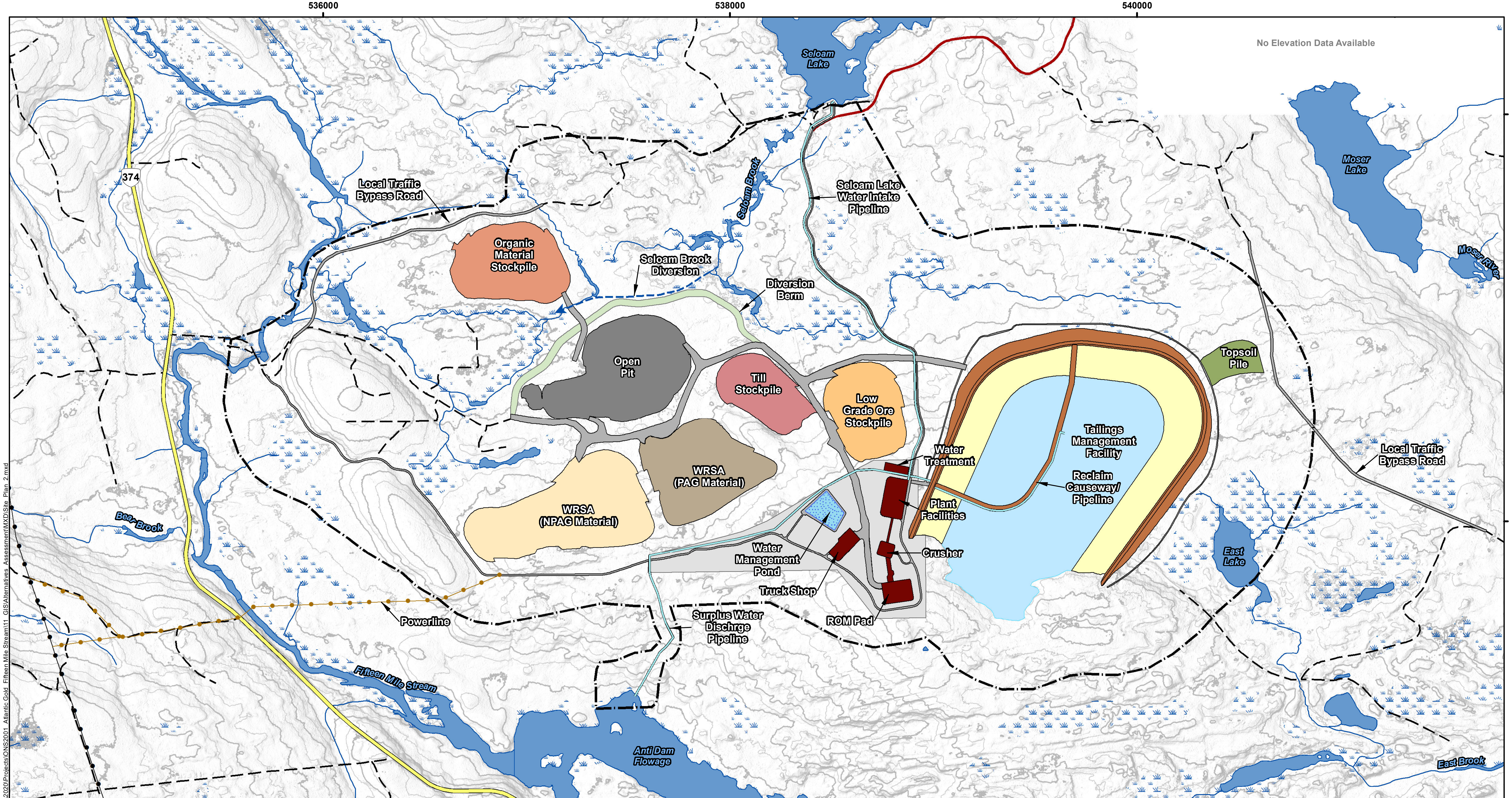
The total infrastructure footprint of the Project is approximately 375 ha and will consist of the following primary components:

- Open pit for extracting ore and waste rock;
- Mine site haul roads;
- Local traffic bypass roads;
- Powerline;
- Waste rock storage area (WRSA);
- Overburden till piles;
- Topsoil and organics storage piles;
- Separate run of mine (ROM) stockpile and low-grade ore (LGO) stockpile;
- Seloam Brook realignment and realignment berms around open pit;

- Crusher and concentrator facilities;
- Tailings management facility (TMF); and
- Water management system including water discharge.

The Project layout is shown on Figure 2. In addition to the components listed above, the Project will include all temporary activities associated with construction including temporary stockpiles, laydown areas, access roads, water management, temporary flow isolation, environmental control measures (e.g., silt fencing), temporary facilities, and creek crossings, where required.

Detailed descriptions of the Project components and their interactions with the environment can be found in the Fifteen Mile Stream Project Environmental Impact Statement / Environmental Assessment (EA) documentation.



LEGEND

- Property Boundary
- Utility Line
- Highway
- Local
- Resource / Track
- Watercourse
- Waterbody
- Wetland
- Major Contours (10 metre intervals)
- Minor Contours (5 metre intervals)

Proposed Mine Features

- Seloam Brook Diversion
- Powerline
- Pipeline
- Open Pit
- Tailings Management Facility Dam
- Deposited Tailings
- Tailings Management Facility Pond
- Low Grade Ore Stockpile
- Organic Material Stockpile
- Topsoil Pile
- Till Stockpile
- WRSA (NAG Stockpile)
- WRSA (PAG Stockpile)
- Diversion Berm
- Water Management Pond
- Buildings / Crusher
- Administration Area
- Haul / Access Roads

0 0.5 1 2 3 4 5 Kilometres

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

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FIFTEEN MILE STREAM GOLD PROJECT

Project Site Plan

PROJECT N°: ONS2001	**FIGURE: 2**
SCALE: 1:18,000	DATE: July 2020

4.0 Existing Fish and Fish Habitat

The first step of the HADD determination process is to identify whether fish habitat is present within an area to be potentially impacted by a project. If fish habitat is present, fish species utilizing that habitat, including their different life stages, are identified and the habitat to be potentially impacted is classified and quantified. Fish habitat is defined in the *Fisheries Act* as '*spawning grounds and nursery, rearing, food supply and migration areas on which fish depend, directly or indirectly, in order to carry out their life processes*'. Thus, fish habitat is comprised of the physical, chemical and biological attributes of the environment. Therefore, a standardized classification system that provides accurate information on fish habitat is essential when conducting habitat assessments (DFO 2012).

The existing fish habitat within the Project Study Area have been described and quantified using fish and fish habitat data collected using a variety of methods. Sampling was completed by McCallum Environmental Ltd. throughout 2017-2020. This data has been used to determine fish habitat and species presence and to complete a quantification process for HADD determination using methods to calculate species habitat suitability and habitat utilization indices. All watershed drainages defined as potential fish bearing waters, and therefore fish habitat, as per federal (see above) or provincial definitions were surveyed in terms of physical and chemical characteristics. To determine fish species presences and suitability of the watershed drainages as fish habitat, surveys were completed using electrofishing (index and quantitative), fyke nets, eel pots, minnow traps, and environmental DNA. The results provide the data required to delineate fish species presence, distribution, estimates of fish abundance within the FMS Project footprint.

4.1 Fish Species and Abundance

A series of surveys including electrofishing, fyke netting, eel pots, and minnow traps were deployed within the Project Study Area to determine the fish species present. Species abundance estimates were developing using electrofishing Catch-per-Unit Effort (CPUE) indices, standardized to 300 seconds of effort (Scruton and Gibson 1995).

The species identified within the Project Area have been used in the Habitat Suitability and Habitat Utilization Index calculations as part of the HADD and Offset determination processes.

Within the Project Study Area, a total of 8 fish species have been captured which include Brook Trout (*Salvelinus fontinalis*), White Sucker (*Catostomus commersoni*), Lake Chub (*Couesius plumbeus*), Ninespine Stickleback (*Pungitius pungitius*), Golden shiner (*Notemigonus crysoleucas*), Brown Bullhead (*Ameiurus nebulosus*), Banded Killifish (*Fundulus diaphanous*) and Pearl Dace (*Margariscus margarita*). Within the Project Footprint where waterbodies will be impacted, four species have been captured; Brook Trout, Lake Chub, Pearl Dace, and White Sucker (Table 1). While abundance was generally low, any habitat affected within the Project Area will be quantified using all four species confirmed present.

The efforts to further delineate species distribution using other methods are ongoing and results can be updated as they become available. This will be important in the delineation of Schedule 2 requirements.

4.2 Habitat Characterization

The characterization of fish habitat for the purposes of determining HADD to fish habitat and MDMER Schedule 2 waterbodies requires a quantitative process that removes as much subjectivity as possible so that final determinations are defensible in approach and rationale. A revised federal habitat classification and quantification system was developed by DFO Newfoundland and Labrador Region to assist in assessing proposed developments for potential to cause HADD of fish habitat. An overview of the process is provided below based on information contained within McCarthy et al. (2007) and DFO (2012). While developed in a different region of Atlantic Canada, it is adjacent and appropriate for the similar dominant maritime fish complex found within the Project footprint.

There have been many habitat descriptions and habitat survey methodologies developed and used both within Atlantic Canada (e.g., Beak 1980; Scruton et al. 1992; Scruton and Gibson 1993; 1995; Sooley et al. 1998; DFO 2000), elsewhere in North America (e.g., Bisson et al. 1982; Oswood and Barber 1982; Barber et al. 1981; Platts et al. 1983; McCain et al. 1990; Osborne et al. 1991; Nickelson et al. 1992; Newbury and Gaboury 1993; Flosi and Reynolds 1994; Hawkins et al. 1993; Armatrout 1996; McMahon et al. 1996; Bain and Stevenson 1999) and Norway (Borsanyi 1982; Borsanyi et al. 2002).

The former Beak (1980) method, which has previously been utilized to characterize habitat is limited by its focus on salmonid species, mainly Atlantic Salmon (*Salmo salar*) and to a lesser degree Brook Trout (*Salvelinus fontinalis*), as evident in the descriptions. The revised classification system used within this document attempts to broaden the classification of habitat types (Table 2) to encompass all freshwater species, thereby contributing to a more consistent approach to HADD quantification (DFO 2012).

Each habitat type contains discrete as possible gradient, substrate types, water depth, and velocity ranges which have been determined using the described biological 'preferences' outlined in Grant and Lee (2004). It should be noted that not all habitat parameter descriptions are exclusive of all others (e.g., water depth); however, the combined parameters and the tiered approach to characterization based on gradient initially, then substrate, then water depth / velocity offer a reasonable designation of most habitat types encountered.

Each stream reach potentially affected by the Project has been identified using the existing project infrastructure layout and the existing aquatic habitat mapping (Figure 3). As shown in subsequent sections, mitigations to avoid negative effects to habitat beyond the project footprint have been incorporated to minimize HADD resulting from the Project. Mitigations include best available infrastructure placement to avoid unnecessary loss of fish habitat and stream realignments to maintain habitat suitability, connectivity and downstream flows.

Each habitat type has been characterized via surveys using standard methodologies to gather important diagnostic measurements such as reach length (m), reach wetted and bankfull width (m), reach slope (%), stream substrate composition (% composition), water depths (m), water velocities (m/s), and riparian habitat (% cover). The data was used to determine the overall habitat area within each reach as well as the habitat suitability, based on measured stream substrate, water depths, and water velocities (habitat parameters) for each fish species identified within the Project footprint.

Habitat suitability values were calculated for applicable life stages for each species; spawning, young-of-year, juvenile, and adult. The final calculation of a Habitat Utilization Index (HUI) for each species life stage is completed by multiplying the final habitat suitability value and the habitat area for each reach. Total HUI values for all reaches are combined for an overall Species life stage HUI value. To be conservative and to ensure that all species and life stages possibly utilizing the habitat are accounted for, the highest Species life stage HUI calculated represents the largest habitat loss and is therefore used to quantify the

HADD for the purpose of offset planning and authorization. This procedure has been completed for Section 35 HADD determination and Schedule 2 separately.

Using avoidance and mitigations, only those habitats within the footprint as well as those directly downstream that would no longer receive adequate flows are shown as these are considered HADD (Table 3). Quantification of the habitat in terms of species life stage HUI values are provided below.

Table 1: Summary of Electrofishing Catch-per-Unit Effort (CPUE) within the Project Footprint

Species	Total Catch (fish)	Total Effort (seconds)	CPUE (fish/300 seconds)
Brook Trout	8	1673	1.43
Lake Chub	8		1.43
Pearl Dace	1		0.18
White Sucker	3		0.54
Total	20	1673	3.59

Table 2: Descriptions of Riverine Habitat Classifications (as per DFO 2012).

Habitat Type	Habitat Parameter	Description
Fast Water	**Mean Water Velocity**	**> 0.5 m/s.**
	Stream Gradient	**Generally, > 4%.**
Rapid	General Description	Considerable white water[1] present.
	Mean Water Velocity	> 0.5 m/s.
	Mean Water Depth	< 0.6 m.
	Substrate	Usually dominated by boulder (Coarse[2]) and rubble (Medium[2]) with finer substrates (Medium and Fine[2]) possibly present in smaller amounts. Larger boulders typically break the surface.
	Stream Gradient	Generally, 4-7%.
Falls / Chute / Cascade	General Description	Mainly white-water present. The dominating feature is a rapid change in stream gradient with most water free-falling over a vertical drop or series of drops.
	Mean Water Velocity	> 0.5 m/s.
	Mean Water Depth	Variable and will depend on degree of constriction of stream banks.
	Substrate	Dominated by bedrock and/or large boulders (Coarse).
	Stream Gradient	> 7% and can be as high as 100%.
Run	General Description	Relatively swift flowing, laminar[3] and non-turbulent.
	Mean Water Velocity	> 0.5 m/s.
	Mean Water Depth	> 0.3 m.
	Substrate	Predominantly gravel, cobble and rubble (Medium) with some boulder (Coarse) and sand (Fine) in smaller amounts.
	Stream Gradient	Typically, < 4% (exception to gradient rule of thumb).
Moderate Water	**Mean Water Velocity**	**0.2-0.5 m/s.**
	Stream Gradient	**>1 and < 4%.**
Riffle	General Description	Relatively shallow and characterized by a turbulent surface[4] with little or no white water.
	Mean Water Velocity	0.2 – 0.5 m/s.
	Mean Water Depth	< 0.3 m.
	Substrate	Typically dominated by gravel and cobble (Medium) with some finer substrates present, such as sand (Fine). A small number of larger substrates (Coarse) may be present, which may break the surface.[5]
	Stream Gradient	Generally, >1 and < 4%.
Steady / Flat	General Description	Relatively slow-flowing, width is usually wider than stream average and generally has a flat bottom.
	Mean Water Velocity	0.2 - 0.5 m/s.
	Mean Water Depth	>0.2 m.
	Substrate	Predominantly sand and finer substrates (Fine) with some gravel and cobble (Medium).
	Stream Gradient	> 1 and < 4%.
Slow Water	**Mean Water Velocity**	**Generally, < 0.2 m/s (some eddies can be up to 0.4 m/s).**
	Stream Gradient	**< 1%.**
Plunge / Trench / Debris Pools	General Description	Generally caused by increased erosion near or around a larger, embedded object in the stream such as a rock or log or created by upstream water impoundment resulting from a complete, or near complete, channel blockage. These pool types may be classified as an entire reach (e.g., pools greater than 60% of the stream width) or as sub-divisions of a fast water habitat.
	Mean Water Velocity	< 0.2 m/s.

Habitat Type	Habitat Parameter	Description
	Mean Water Depth	> 0.5 m depending on stream size (e.g., may be shallower in smaller systems).
	Substrate	Highly variable (i.e., coarse, medium or fine substrates).
	Stream Gradient	Generally, < 1%.
Eddy	General Description	Relatively small pools caused by a combination of damming and scour: however, scour is the dominant forming action. Formation is due to a partial obstruction to stream flow from boulders, roots and/or logs. Partial blockage of flow creates erosion near obstruction. It is typically < 60% of the stream width and hence will be a sub-division of a faster-water habitat type (e.g., Run with 20% eddies).
	Mean Water Velocity	Typically, < 0.4 m/s, but can be variable.
	Mean Water Depth	> 0.3 m. May vary depending on obstruction type, orientation, streambed and bank material and flows experienced.
	Substrate	Predominantly sand, silt and organics (Fine) with some gravels (Medium) in smaller amounts.
	Stream Gradient	Variable.

Notes:

1 White water is present when hydraulic jumps are sufficient to entrain air bubbles which disturb the water surface and reduces visibility of objects in the water.

2 Coarse, Medium and Fine substrate types are classified according to the Standard Methods Guide for the Classification / Quantification of Lacustrine Habitat in Newfoundland and Labrador (Bradbury et al. 2001).

3 Laminar describes the surface of the water as smooth and glass-like with no reduced visibility of objects in the water.

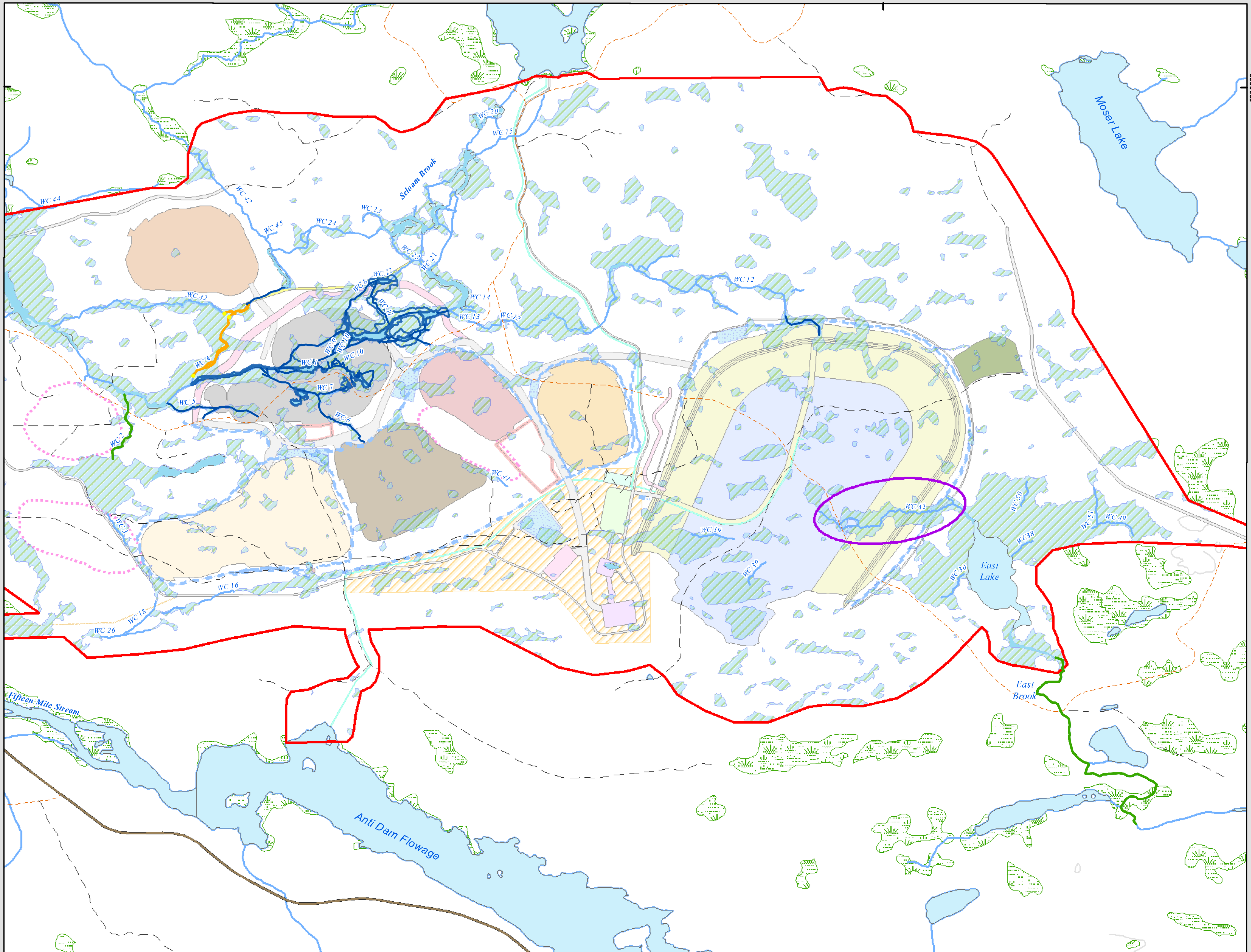
4 Turbulence is present if there are local patches of white water or if water movement disturbs a portion of the surface.

5 Pocket water often constitutes an important component of riffles in Newfoundland and Labrador and is characterized by a predominance of larger substrates (e.g., boulders) breaking the surface. The result is a riffle with many eddies around the boulders.

Table 3: Summary of Project Area Watercourses and Key Diagnostic Features within the Project Infrastructure Footprint and the TMF

Watercourse	Project Area	Area (m^2)	Habitat	Slope (%)	Mean Depth (m)	Dominant Substrate	Emergent Vegetation Coverage
1 (Seloam Brook)	Infrastructure Footprint	3,804	Steady	1.30	0.58	Boulder	0
5*		397	Riffle	1.98	0.15	Detritus	0
6*		135	Steady	1.31	0.30	Fines	0
7*		1,005	Pool	0.45	0.50	Fines	0
8*		920	Steady	1.26	0.60	Detritus	0
9*		102	Pool	0.39	0.40	-	0
10*		56	Pool	0.84	0.40	-	0
11*		916	Pool	0.51	0.25	Detritus	0
22*		490	Pool	0.62	0.73	Boulder	0
42.4 (Trafalgar Creek)		509	Steady	1.00	0.45	Boulder	0
Open Water*		19,113	Pool	<1.00	1.00	Detritus	0
Wetlands*		51,179	Pool	<1.00	1.00	Detritus	100
12*	Dam Footprint	314	Pool	0.83	0.38	Detritus	0
43 (East Brook)	TMF	1,633	Pool	0.50	0.30	Detritus	0

* a tributary or braided reach of Seloam Brook (Figure 3).



Prepared For:

Atlantic Gold

FMS Study Area Fisheries Resources

Trafalgar, NS

Figure: 3

Potential Direct HADD

Potential Indirect HADD

- Flow Reduction
- Flow Increase
- Schedule 2 Determination by ECCC April 2020
- Provincially Regulated Watercourse
- Field Delineated Wetlands within FMS Study Area
- NSE Wetlands outside FMS Study Area
- FMS Study Area

FMS Planned Infrastructure

- Diversion channel
- water control structure
- Pit
- Plant
- Truck Shop
- Crusher Pad
- ROM pad
- Water Treatment
- Plant and Admin Building Footprint
- Seloam Diversion Berm
- Tailings Management Facility
- TMF pond
- Topsoil Stockpile
- Organics Pile
- TillStockpile
- Low Grade Stockpile
- WRSA (NAG)
- WRSA (PAG)
- Access Road
- Haul Road
- Contractor Laydown Area
- Outflow Channel
- Water Management Pump
- Water Management Pond
- Water Management Ditch
- Water Intake/Discharge Pipe
- Powerline Tie In
- Potential Borrow Pit

Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 200 400 800 m

1:16,000

Scale when printed @ 11" x 17"

Drawn By: LP

Date: 2020-07-01

Service Layer Credits:

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5.0 HADD and Schedule 2 Quantification

Fish habitat components, their function and attributes, and the fish populations that rely on them (e.g., aquatic ecosystems) are dynamic and complex. It can be more difficult, costly and uncertain to restore, enhance, or create, aquatic ecosystems than it is to avoid adverse effects in the first place. For this reason, the DFO emphasizes measures to avoid and mitigate as the preferred steps in the hierarchy of project planning, followed by measures to offset HADD as a means of last resort.

The Policy's hierarchies are listed below along with a summary of how they have been considered with this Project. The three levels include:

- Measures to Avoid;
- Measures to Mitigate; and
- Measures to Offset.

Note that the existing EIS has further details on the project, avoidance measures, mitigations, and effects assessment for Fish and Fish Habitat (Section 6.8). This information is not reproduced here but rather synthesized to bring forward key avoidance strategies, mitigations, and possible offsetting strategies related to DFO's 'hierarchy of measures.' The first two measures, avoidance and mitigation, are provided here prior to HADD quantification. Concept measures to offset the remaining HADD are provided in Section 6.0.

5.1 Measures to Avoid

Measures to Avoid for the conservation and protection of fish habitat is the first and most important step in the hierarchy of measures and therefore have been the major focus of this project to date. There have been a number of measures put in place to avoid and minimize the effects on Fish and Fish Habitat.

5.1.1 Site Plan Alternatives

As part of the early project planning and site assessment efforts, multiple site layouts were considered for both project efficiencies and the avoidance of impacts to fish frequented waters. Although components such as the open pit are fixed due to the orebody, other project footprints such as stockpiles, the TMF and road networks have some flexibility in their location. To this end, the Project team reviewed multiple locations and site plans for these features, before selecting the proposed arrangement. In some cases, this effort was dovetailed with requirements associated with the MDMER alternatives assessment for mine waste disposal. The alternatives assessment involved a review of multiple possible locations for the TMF and considered each under a variety of factors (accounts) such as environmental, socioeconomics, technical and economic considerations.

The selected, or preferred, TMF includes the location and configuration as outlined in Figure 3. To date extensive fish sampling throughout 2018-2020 have not captured fish within the TMF footprint. Additionally, environmental DNA samples collected both upstream and downstream of the barrier on WC43 supports the sampling conclusion that no fish frequent the limited standing water within the TMF boundary upstream of a natural barrier. However, due to uncertainty and data limitations at the time and the need to apply a precautionary approach; a portion of WC-43 within the TMF (Figure 3) has been determined as a potential waters frequented by Fish and will require listing under Schedule 2 of the MDMER unless it can be clearly demonstrated to not be frequented by fish. Ongoing fish collection efforts are intended to address this uncertainty.

5.2 Measures to Mitigate

Measures to mitigate any adverse effects on fish and fish habitat include both standard best practices that are implemented through all phases of the Project (e.g., construction, operation, decommissioning) and site-specific mitigation designs. Measures to Mitigate and minimize losses or reduced productivity of fish habitat have been established at several locations within the Project. Site-specific mitigation designs include the Seloam Brook realignment, habitat erosion / siltation measures, and fish relocation activities.

5.2.1 Standard Measures and Best Practices

To avoid or mitigate additional loss of waters frequented by fish or harm to fish habitat during implementation of the plan, a combination of site-specific mitigation measures as defined in permits, approvals or EA commitments and best management practices will be used. Measures and standards would include but not be limited to construction water management; erosion and sedimentation controls; and, timing windows to protect sensitive life cycle periods.

Where possible the offset and compensation measures will be constructed in advance of major Project impacts. This approach will allow for the initial development and stabilization of the works to be achieved, and significant colonization of the new replacement habitats by adjacent fish communities at the same time that fisheries impacts occur. Any changes to the approximate time periods specified in the final plan would require notification and approval by DFO in advance of the revised schedule.

A list of typical measures, standards and contingency measures that will be implemented during the Project to avoid or mitigate impacts to fish habitat are shown in Table 4.

Considering the extensive planning, the ongoing consultation with Indigenous groups and stakeholders, and the use of proven mitigation measures, AGC is confident that the Project can be constructed, operated, and rehabilitated and closed, in an environmentally responsible and safe manner that minimizes impacts to fish habitat.

5.2.2 Seloam Brook Realignment

A portion of Seloam Brook flows through the open pit location and receives drainage from the surrounding infrastructure area. To maintain creek connectivity, and to prevent flooding of the open pit, this portion of the stream will be realigned. A realignment channel approximately 800 m long will be constructed to convey flows around the north side of the proposed open pit and a proposed realignment berm. The realignment channel and berm will isolate the mine site from the watercourse, maintain fish connectivity around the project footprint, and maintain connectivity between upstream portions of Seloam Brook, Seloam Lake and WC12 to Trafalgar Creek and the lower portion of Seloam Brook (Figure 4).

Table 4: List of Measures and Standards, Success Criteria and Contingency Measures

Measure or Standard	Success Criteria	Contingency
Sediment and erosion control measures associated with the work will be in place prior to substantial ground disturbance and throughout the duration of construction	No visible sediment entering natural waterbodies as a result of ground disturbance	Stop the work that is resulting in sediment release until effective controls are implemented. Maintain supply of erosion and sediment control supplies on site to repair, replace or supplement control measures as needed.
Observe timing constraints for in-water work	Conduct in water work during preferred window (June 1 and Sept. 30)	Exemption from timing period may be requested from Regulators
Minimize duration of in-water work to the extent practicable.	Work continues in continuous manner to completion.	Monitor contractor's effort and implement additional site planning as needed. Ensure materials are available to complete the construction continuously as needed.
Undertake in-water activities in isolation of open or flowing water to avoid introducing sediment into the watercourse.	Work areas are effectively isolated from flowing water.	Stop works that are not isolated from flowing water. Isolate work area and remove fish from work area before continuing works. Maintain a sufficient supply of pumps and materials on site to isolate flows.
Follow DFO guidance on protection of fish during blasting near fish frequented waters	Maintain acceptable offsets, pressure changes and particle velocities to avoid harm to fish.	Monitor effectiveness of mitigation when appropriate offsets cannot be maintained. Adjust timing, size and timing of charges as needed.
Stabilize shoreline or banks disturbed by any activity associated with the works.	Shorelines are mostly stable and not eroding.	Grade bank to stable slope if necessary. Use temporary or permanent bank stabilization material to stabilize banks.
Remove fish from areas where waterbodies are to be abandoned or isolated from the active stream channel due to the works.	No dead or stranded fish within the work areas.	If stranded or distressed fish are observed in the work area, stop work causing distress, and continue fish removal.
Screen or use other deterrents at any pump intakes to prevent entrainment or impingement of fish as per DFO end of pipe code of practice	No fish entrained or impinged at pump intakes.	If fish are entrained or impinged, implement corrective action by, either repairing or supplementing the exclusion measure in place.
Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks.	Machinery arrives on site in clean condition.	Have an area or location on site to clean equipment to a suitable condition on arrival or as required.
Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water.	No deleterious substances entering waterbodies.	Follow site response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit on site.

Initial project plans involved using a simple diversion channel to provide hydraulic conveyance of flows around the open pit and through the project site; and to mitigate the fragmentation of habitat upstream and downstream of the project. Based on comments and subsequent discussions between the project team and stakeholders; AGC has decided to design an enhanced and ecologically focused channel realignment to provide additional mitigation and replacement for the affected fish habitat. The channel realignment design will include an integrated floodplain and natural channel design principles to develop highly suitable fish habitat with biological features to mitigate a large portion of the habitat losses within Seloam Brook and avoid additional HADD. Habitat design will incorporate features to mimic characteristics within the existing habitat that will be lost but will also include increased species-specific spawning habitat to provide greater productivity potential. The channel will have a better-defined flow path to improve fish passage through the reach and mitigate the braided configuration of the existing habitat, caused by past mining activities, and will utilize the consolidated flow to maximize habitat stability and suitability. The existing engineering assessment conducted during the initial diversion channel concept, shows that flows could be conveyed around the Project infrastructure within a confined realignment configuration. However, additional features such as an integrated floodplain area that would take advantage of the natural flow regime would provide increased habitat complexity and suitability as per the schematic shown in Figure 4.

The realignment will allow adequate conditions, particularly water depths for fish habitat and migration under normal flow conditions at Mean Annual Discharge (MAD) as well at 1 in 20-year Mean Annual Dry conditions. Using flows estimated at key periods within the Seloam Brook hydrologic regime (Table 5), estimates of flow and habitat conditions within the conceptual floodplain design were completed. The realignment channel configuration was based on the general outline provided in Figure 4; however, the following parameters / assumptions were also input to the design:

1. The main stream channel had to contain at least the flows expected during the (MAD) at 0.82 m^3/s.

2. The main stream channel had to contain water depths capable of fish passage during the 1:20 Annual Dry Flow at 0.28 m^3/s.

3. The overall channel slope, based on Knight-Pieshold data, was assumed to be 0.5 %.

4. The overall main channel roughness, based on Knight-Pieshold data on existing, local streams, was assumed to be 0.06.

5. The overall floodplain channel roughness, based on Knight-Pieshold data, was assumed to be 0.10.

Based on the above considerations and general main stream / floodplain configuration, the channel and floodplain design was modelled using the Wetted Perimeter Method (WPM; Newbury and Gaboury 1993) and AutoCAD to estimate water levels, water depths, and water velocities within the designed channel (Appendix A).

The AutoCAD model was run for the four flow scenarios in Table 5. Table 6 below provides the model results. The main stream channel was modified to ensure it would contain the MAD. The main stream channel was designed with a bottom width of 1.5 m and side slopes of 1:2. As shown in Table 6, an estimated flow of around 1.0m^3/s will remain within the main channel before overtopping into the floodplain. The width of the stream with this flow is estimated at 2.90 m. The model outputs also indicate that a mean water depth within the main stream will remain near 0.25-0.30 m during the 1:20 Dry Annual flow if the channel is designed similar to existing habitat.

Table 5: Realignment Flow Conditions based on Information provided by Knight-Pieshold (2020)

Flow Scenario included in Design	Inflow Location	Discharge Input (m^3/s)
1 in 20 Year Annual Dry	Seloam Reservoir (Brook)	0.22
	Southeast Inflow	0.02
	Trafalgar Brook	0.04
	Total	**0.28**
Mean Annual Flow (MAF)	Seloam Reservoir (Brook)	0.64
	Southeast Inflow	0.07
	Trafalgar Brook	0.11
	Total	**0.82**
Q10 (10-year high flow)	Seloam Reservoir (Brook)	4.8
	Southeast Inflow	2.5
	Trafalgar Brook	3.8
	Total	**11.1**
Q200 (200-year high flow)	Seloam Reservoir (Brook)	11.2
	Southeast Inflow	4.4
	Trafalgar Brook	6.6
	Total	**22.2**

Table 6: Model Output at Identified Flow Conditions within the Seloam Brook Realignment Preliminary Design

Flow Condition (m^3/s)	Estimated Model Discharge (m^3/s)	Wetted Width (m)	Mean Water Velocity (m/s)	Mean Water Depth (m)	Maximum Water Depth (m)
1:20 Dry Annual (0.28)	0.28	2.16	0.47	0.28	0.33
MAF (0.82)	1.05	2.90	0.68	0.53	0.70
Q10 (11.1)	11.32	42.19	0.49	0.55	1.53
Q200 (22.2)	22.26	44.03	0.62	0.82	1.85

Flows in excess of 1.0 m^3/s are shown to overtop the main stream channel into the floodplain. Flows as high as the 200-year event would easily be contained within the existing topography or a constructed floodplain.

Modelling of predicted flows under various scenarios provided above provides greater certainty and confirms the preliminary realignment channel can provide adequate flow capacity and habitat conditions. The preliminary design currently includes two inlet structures to convey water from the Seloam Reservoir and Trafalgar Creek tributaries (WC42) into the Realignment Channel. It will also cross a haul road where an energy dissipation pool will be constructed at the outlet of a culvert. The haul road crossing is designed to pass the 1 in 200-year flood event and the inlets, outlet, and energy dissipation pool will include riprap armor to protect against erosion during high flow events and facilitate fish passage.

The Seloam Brook Realignment Channel will be designed to provide high quality fish habitat and fish passage. Accordingly, the proposed realignment will mimic existing conditions in the surrounding watercourses to the extent practical, while alleviating some existing limitations such as the braided channels to enhance fish passage opportunities. Design considerations related to layout of habitat features and their effects on water resistance and habitat stability will be completed during final design and include habitat features proposed by stakeholders during consultation. Based on preliminary modeling results, the total estimated minimum area of realignment that would be available to fish within the existing engineered preliminary design during MAD conditions is 2,320 m^2 (800 m long x 2.9 m wide wetted width). It is currently assumed that with additional habitat features including wetland / floodplain features, this would conservatively be at least double to 4,640 m^2.

5.2.2.1 Seloam Brook Realignment Scheduling

DFO can consider and apply an offset ratio to the final HADD determination to account for uncertainties in the mitigation and offset concept options and likelihood of success as well as any delays or gaps in the timing between offset creation and the HADD occurring.

While the construction of the Seloam Brook Realignment is a mitigation to limit project based HADD, the timing is important in achieving this objective. The timing of the realignment, and therefore the fish habitat design features, will occur as one of the initial project construction activities because it will effectively realign stream flows away from other required project areas. As a result, no delay or gap in fish habitat mitigation / offset and habitat loss is anticipated. In fact, the fish habitat within the realignment will be constructed and completed prior to the majority of HADD activities.

5.2.3 Flow Management

To minimize potential erosion of existing fish habitat downstream of the Seloam Brook Realignment Channel outflow, flow control structures are being designed to reduce water velocity, and therefore scour energy, as flows enter the downstream north and south channels of Trafalgar Creek (Golder 2020). The preliminary design of the channel account for water control structures that will not only moderate flows and control downstream flow energy but will also maintain connectivity. The control structures will take the form of constructed riffles, adding additional spawning habitat features into the overall design.

The majority of the habitat being lost within the Project area consists of wider, deep pools and areas of floating emergent vegetation, typical of very low-gradient, open water / wetland habitat (Table 3). While the Habitat Suitability Indices for the fish species life stages that currently reside within the Project area are low for these habitat types, they do offer habitat complexity and some habitat refuge capacity during low-flow seasonal periods. Therefore, consideration is being given to providing similar habitat in the area of the Realignment Channel outflow that will mimic these conditions through proper placement of the flow control structures (riffles) and design of expanded low-gradient, open water / wetland habitat. While the open water / wetland habitat being lost within the Project area consists of fine organic substrates and deeper water, habitat at the Realignment Channel outflow can be constructed that will have more suitable habitat features but still mitigate a portion of open water / wetland habitat being lost within the same watershed / ecological unit.

The existing wetland complex currently experiences water level fluctuations on an annual basis due to management of the NSPI dam infrastructure on Seloam Lake. As a result, these existing wetlands are able to manage and have adapted to fluctuating water conditions. Proper placement of water control structures within Trafalgar Creek downstream of the Realignment outflow can cause strategic backwater effects (ponding) on the upstream side. Based on current placement and modelling (Appendix B – Golder Seloam Realignment Hydraulic Modelling Memorandum), existing downstream wetlands can be expected to experience flooding to a maximum, steady state depth of approximately 0.4 m, as modelled for mean average discharge rates with the addition of conceptual flow restrictions during operations.

Through ongoing design considerations, mitigation features such as proper depth excavations and larger shoreline and bottom substrates could increase suitability of any large, low-lying areas. The location of the water control structures will be finalized with the concept of maintaining downstream stability and maximizing upstream open water / wetland habitat mitigation without incurring additional HADD and reducing the amount of HADD resulting from the loss of existing channels in the open pit area. Based on modeling results, the total estimated area of additional open water / wetland that could be developed by this measure is approximately 84,449 m^2.

5.2.4 Fish Relocation

Locations requiring fish relocation include those sections of Seloam Brook as well as adjoining tributaries within the Project area / infrastructure will be identified prior to construction. The following outlines the general tasks required to complete the capture and relocation of fish.

5.2.4.1 Permitting

Upon issuance of an authorization under section 35 of the *Fisheries Act*, general permits required for fish relocation include an experimental license from DFO to handle fish, and a relocation permit to move fish from one waterbody to another (particularly if transfers are required outside the fish's resident watershed). Within the Project area, all fish can be relocated to other portions of their resident watershed. Given the numbers of fish captured in baseline habitat characterization, numbers of fish are anticipated to be low; and such it is expected that the adjacent waterbodies can accommodate the numbers of transferred fish.

5.2.4.2 Tributary Isolation and Relocation

Barrier netting typically used in stream population estimates will be erected at the mouths of each tributary and left in place throughout activities to keep the tributaries isolated. Once isolated, electrofishing will be completed throughout each to capture and remove fish. Fish will be collected in aerated coolers and transported to the release location. Efforts in deeper steadies will include the use of fyke nets, eel pots, and minnow traps (shallow-water traps), as well as angling to capture fish. Fishing gear will be set by experienced personnel using standard techniques outlined in standard work instructions and training. Gear will be checked regularly and reset such that an estimate of depletion can be determined.

5.2.5 Mitigation Monitoring

Monitoring of standard mitigations described above are to be outlined in the Project Environmental Management System (EMS) Framework Document and associated Environmental Protection Plan (EPP) which will be in place prior to construction activities to minimize possible disturbances of fish and fish habitat. To ensure that the measures and standards described are implemented as proposed, AGC onsite monitors (or designates) will monitor construction and implementation of this plan. Monitoring will clearly defined in the final offset plan, and DFO Authorizations, and be reported to DFO in an "as constructed" report provided following the works being completed. The "as constructed" monitoring report will document the construction of the offset and works as per the approved plans, and a summary of the mitigation measures and any contingency measures implemented to prevent further impacts to fish habitat. A detailed photographic record will be taken during implementation of the plan using consistent vantage points prior to, during and post construction.

5.3 Measures to Offset

A summary of the likely residual HADD and Schedule 2 habitat quantification is provided below. Standard mitigations as well as project-specific avoidances and redesigns have minimized the HADD to only those habitats where avoidance and further mitigation is not possible. It is understood that the final HADD determination will be provided by DFO; however, this preliminary quantification is provided to show that the offset concepts described in Section 6 can be designed to meet HADD quantity expectations, including any offset ratios.

5.3.1 Project Footprint (Section 35 HADD)

Using the identified fish species currently known to utilize this habitat, Habitat Suitability Index (HIS) values were generated for each species life stage using DFO data for water velocities, water depth, substrate, and where appropriate, emergent vegetation (Table 7). Using these suitabilities, the final Habitat Equivalent Units (HEUs) for the lost habitat were generated (Table 8) with the highest species life stage HEU value used to conservatively represent the overall HEU and therefore the HADD. The HADD value for each habitat type is provided in Section 6.1.

5.3.2 Project Footprint (Potential Schedule 2)

Extensive field investigations have not identified fish presence within the footprint of the Proposed TMF. However, correspondence with Environment and Climate Change Canada (ECCC) have indicated that a portion of WC-43 may be considered a waterbody frequented by fish, and as such would require listing in schedule 2 of the MDMER, unless additional fish sampling can clearly demonstrate that fish are not present at any time. The habitat within the TMF boundary and that portion of just outside the boundary estimated to be dewatered due to the TMF is a total of 1,947 m^2 as shown in Table 3. Using the identified fish species currently known to utilize this habitat, Habitat Suitability Values were generated for each species life stage (Table 9). Using these suitabilities, the final Habitat Equivalent Units (HEUs) for the lost habitat within the TMF were generated (Table 10) with the highest species life stage HEU value used to conservatively represent the HEU and therefore the HADD. The HADD value for habitat types within the TMF is provided in Section 6.1.

5.3.3 Downstream Effects

With the mitigations described above related to the Seloam Brook Realignment Channel to maintain water flows through the lower portions of the north and south channel of Trafalgar Creek and the flow energy control structures at the outflow of the realignment channel, no harmful downstream effects to fish and fish habitat are anticipated beyond the Project area.

Flow reduction will occur from the Project due to drainage area reduction in two tributaries; WC2 and East Brook (see green highlighted tributaries in Figure 3), and it is expected that the reduction in flow will be approximately equal to the quantity of drainage area reduction due to the Project. For the purpose of the

EA the project has used a threshold of 25% flow reduction as an indication of whether harmful alteration (HADD) will occur. Any area with a reduction of 25% or greater have been conservatively identified as being impacted for resident fish and the total area fully included in the HADD quantification. However, the quantity of habitat alteration due to a decrease or increase in flow would not cause complete habitat loss, and we anticipate that this value will be adjusted in future versions of this plan to account for more detailed analysis. For example, estimates of any reduced flow on fish habitat will be completed using methods such as Wetted Perimeter analysis which calculates a flow reduction whereby any further decreases would cause severe habitat reductions (point of inflection).

5.3.4 Habitat Connectivity

Habitat connectivity between the fish habitat on the upstream and downstream areas of the Project area will be maintained with the installation of the Seloam Brook Realignment Channel along with biological features to assist in habitat utilization and migration. Therefore, no connectivity effects are anticipated.

Table 7: Summary Habitat Suitability Indices for each Species Life Stage within the Project Infrastructure Footprint Area

Habitat	Brook Trout				White Sucker				Lake Chub				Pearl Dace			
	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult
Pool	0.13	0.24	0.28	0.32	0.08	0.35	0.01	0.49	0.34	0.34	0.10	0.28	0.03	0.03	0.03	0.03
Rapids	0.13	0.40	0.42	0.41	0.15	0.70	0.00	1.00	0.71	0.71	0.21	0.42	0.20	0.20	0.20	0.20
Riffle	0.15	0.22	0.42	0.27	0.08	0.42	0.04	0.84	0.58	0.65	0.21	0.42	0.02	0.02	0.02	0.02
Steady	0.19	0.31	0.36	0.45	0.10	0.29	0.07	0.36	0.31	0.42	0.17	0.36	0.06	0.06	0.06	0.06
Open Water	0.25	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 8: Summary of Habitat Equivalent Units for each Species Life Stage within the Project Infrastructure Footprint Area

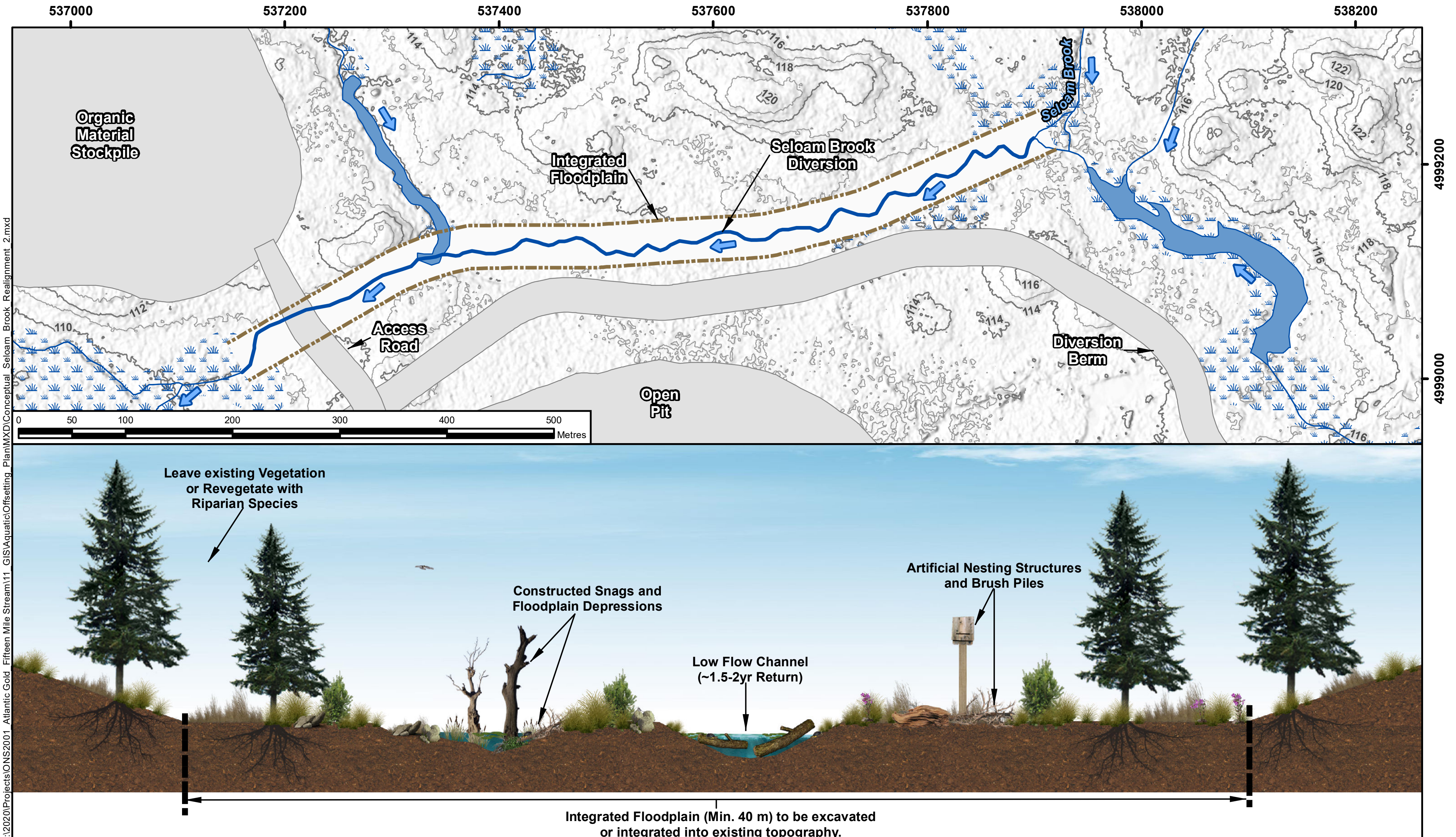
Habitat	Existing Habitat Area	Brook Trout				White Sucker				Lake Chub				Pearl Dace			
		Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult
Pool	2569	341.6	622.7	713.3	830.8	196.1	893.9	16.1	1257.6	861.8	861.8	249.2	713.3	75.8	75.8	75.8	75.8
Rapids	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riffle	397	59.1	88.5	165.9	105.3	32.0	168.4	17.7	331.8	231.1	260.0	82.9	165.9	9.6	9.6	9.6	9.6
Steady	5368	1036.6	1689.0	1922.3	2397.5	517.3	1578.2	355.8	1922.3	1688.0	2260.7	937.1	1922.3	306.7	298.6	298.6	298.6
Open Water	19113	4730.5	0.0	0.0	4730.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wetlands	51179	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	78626.0	6167.7	2400.2	2801.4	**8064.1**	745.4	2640.5	389.6	3511.6	2781.0	3382.6	1269.3	2801.4	392.1	383.9	383.9	383.9

Table 9: Summary Habitat Suitability Indices for each Species Life Stage within the TMF Footprint Area

Habitat	Brook Trout				White Sucker				Lake Chub				Pearl Dace			
	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult
Pool	0.13	0.24	0.28	0.32	0.08	0.35	0.01	0.49	0.34	0.34	0.10	0.28	0.03	0.03	0.03	0.03
Rapids	0.13	0.40	0.42	0.41	0.15	0.70	0.00	1.00	0.71	0.71	0.21	0.42	0.20	0.20	0.20	0.20
Riffle	0.15	0.22	0.42	0.27	0.08	0.42	0.04	0.84	0.58	0.65	0.21	0.42	0.02	0.02	0.02	0.02
Steady	0.19	0.31	0.36	0.45	0.10	0.29	0.07	0.36	0.31	0.42	0.17	0.36	0.06	0.06	0.06	0.06
Open Water	0.25	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wetlands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 10: Summary of Habitat Equivalent Units for each Species Life Stage within the TMF Footprint Area

Habitat	Existing Habitat Area	Brook Trout				White Sucker				Lake Chub				Pearl Dace			
		Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult	Spawning	YOY	Juvenile	Adult
Pool	1954	258.89	471.95	540.57	629.64	148.62	677.51	12.17	953.10	653.16	0.00	188.87	540.57	57.42	0.00	0.00	0.00
Rapids	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Riffle	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Steady	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Water	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wetlands	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1954	258.89	471.95	540.57	629.64	148.62	677.51	12.17	**953.10**	653.16	0.00	188.87	540.57	57.42	0.00	0.00	0.00



LEGEND

- Seloam Brook Diversion Channel (Representative - Design to be Developed)
- Integrated Floodplain
- Proposed Mine Feature
- Watercourse
- Waterbody
- Wetland
- Major Contours (2 metre intervals)
- Minor Contours (1 metre intervals)
- Flow Direction

NOTES:
- Proposed site plan layout provided by Knight Piésold Consulting, June 18, 2020.
- Topogarphic base data extracted from Nova Scotia GeoPortal.

Datum: NAD83
Projection: UTM Zone 20N

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FIFTEEN MILE STREAM GOLD PROJECT

Conceptual Seloam Brook Channel Realignment

PROJECT N°: ONS2001	FIGURE: 4
SCALE: AS SHOWN	DATE: August 2020

6.0 Conceptual Habitat Offsets

The Project would result in the permanent loss of fish habitat and its associated productive capacity, through a portion of Seloam Brook and additional tributaries within the Project area. Proven techniques in similar geographic settings for similar fish species provide the greatest likelihood of offsetting lost productive capacity for the long term, are least likely to fail structurally, and require the least amount of maintenance. Low-risk options that are biologically relevant were prioritized during the development of this Concept Offsetting Plan.

The technical feasibility of the proposed offsetting options was assessed in consideration of the site conditions present, including topography, geomorphology, hydrology, site accessibility, and the type of physical works proposed.

The current assumption is that a minimum 1:1 gain-to-loss ratio of Habitat Equivalent Units is necessary to satisfy DFO's Fish and Fish Habitat Protection Policy Statement guidance; and, that this ratio will increase to account for any uncertainties with the offset measures or time lags between habitat losses and offsets. Greater fish habitat offsetting ratios may also be required if the offsetting plan includes options that utilize techniques with long lag-times before they become fully functional. Equivalency of the proposed offsets is also considered relative to the productivity, importance, and quality of net fish habitat losses identified in the HADD determination.

The information below is a list of preliminary information and strategies to offset remaining HADD after measures to avoid and mitigate have been accounted. Preferred offsetting options will be further refined based on discussions with DFO and relevant stakeholders during the detailed offset planning process. It is also possible that alternative approaches not listed could be integrated into any Final Authorization Application (via an offsetting Plan) if required. The offsetting alternatives provided below have been developed consistent with DFO’s guidance Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the *Fisheries Act* (hereafter this Policy).

6.1 Residual Offset Requirements (HADD)

Efforts have been made to minimize residual effects of the Project on fish and fish habitat and to avoid HADD wherever possible (Section 5). However, portions of Project infrastructure will result in the loss of existing fish habitat that is currently utilized by resident fish species. Table 9 provides a summary of the quantity of fish habitat to be lost by the project, its calculated Habitat Equivalent Units, mitigation habitat used to reduce overall habitat losses (and its Habitat Equivalent Units), and the overall residual habitat losses. Note that Table 9 reflects a large area of open water developed by the channel and flow realignment / management, and that additional discussion with DFO will be required to determine the final offsetting ratio required for the project.

6.1.1 Offset Concepts

Conceptual offset planning has begun to enable DFO and others to assess the alternatives for feasibility and acceptability. Provided below are several concepts that have been considered feasible at the concept stage and, based on habitat needs of resident species and experience on similar offset designs, have a high degree of successfully being implemented.

Several concepts have been identified for preliminary assessment. Each was assessed using a ranked scale (Table 10) across numerous categories that describe various aspects of option feasibility (Table 11).

Potential options were evaluated by consideration of multiple criteria including:

- Adherence to DFO's principles and policy for offsetting;
- Location within the Seloam Brook watershed and close to the Project site;
- Self-sustaining;
- Technically feasible and economically viable; and
- Provide similar "in-kind" habitat as an offset.

The identified potential offsetting concepts (Tables 12, 13 and 14) were developed without detailed consultation with Indigenous Groups, agency, or public groups and are therefore considered preliminary; however, the options identified conform to the criteria and provide offset habitat located within the same ecological unit / watershed and provide habitat types and suitabilities similar to the habitat being lost.

6.2 Alternative 1 - Seloam Brook Realignment Channel

The biological habitat design of the Seloam Brook Realignment Channel will provide suitable habitat features for spawning, rearing and migration. The concept has been previously described as a mitigation measure in Section 5.2.2. It is carried into this section as it directly affects the quantity of HADD that will require offsetting.

6.3 Alternative 2 – Onsite Open Water Habitat

Similar to the creation of open water habitat within the mitigation described in Section 5.2.3, additional off-channel habitat would be constructed within the Seloam / Trafalgar Brook ecological unit. While the exact locations require further investigation of geotechnical, hydrogeological, and terrain constraints, the general description has been provided below.

The Seloam Brook habitat improvements are proposed downstream of the realignment channel and flood area described in Section 5.2.3. The proposed concept is to install rock weir riffle enhancements immediately downstream of all mitigation structures and excavate ponds as off-channel habitat adjacent to the existing channel. The proposed objective is the creation of at least 6,300 Habitat Equivalent Units of high-quality pond and stream habitat to offset a portion of the remaining habitat units lost related to existing stream and open water habitat within the Project infrastructure footprint and TMF. The exact locations of the measure will need further adjustment to reflect ongoing flow modeling efforts, but sufficient areas exist adjacent to the Project to provide a high degree of certainty for this alternative.

The rock weir riffle enhancements will require the addition of coarse rock and fine gravel to create a riffle pool type stream profile along the existing channel reach. Riffle pool spacing would be determined at the next stage of design once additional site information is collected. The stream reach would be suitable for rearing by several species and potential spawning by Brook Trout and White Sucker.

The benefits and uncertainty associated with the proposed pond offsetting measures are primarily associated with the low-lying areas where they would be most effectively created. Typically, by mid-summer it is assumed that the water levels in the stream will be lower than the surrounding low-lying areas, and that material can be removed without direct interference from flows in the adjacent creek. Construction requires the installation of a berm along the margins of the channel to allow machine access. The limitations to construction involve the stability of these margins and their potential to support heavy machinery. Constructing the ponds without heavy machinery is considered unfeasible. Alternatively, excavations could occur during the winter months when travel across frozen ground would reduce impacts of heavy machinery, minimize the need for berm / access construction, and allow easy removal of frozen material, particularly in low-lying areas where the water table would cause possible issues for excavation / removal.

Constructing the rock riffle weirs without heavy machinery is also considered unfeasible. Similar to open water excavations, access and placement of rock weirs during the winter months is possible if proper surveys are completed prior to snow / freeze up. This method has been conducted in other offset constructions and avoids the need to remove riparian vegetation, heavy equipment access clearing / construction, and costly revegetation activities.

Further investigations would be required, if deemed an appropriate concept, to finalize the design. The concept is also easily scalable to cover larger, or smaller, areas, if required providing adequate locations are accessible and within Atlantic Mining Nova Scotia Inc.'s land tenure.

6.4 Alternative 5 - Complementary Measures

Measures to improve existing fisheries knowledge in areas of interest to Indigenous communities could provide information related to possible future habitat rehabilitation options, additional habitat utilization, and/or species distributions / movement patterns in Nova Scotia, particularly in areas near the Project. The exact format of complementary measures will depend on consultations between Atlantic Mining Nova Scotia Inc. representatives and local Indigenous communities. While complementary measures are typically limited to a maximum of 10% of the offset plan, this option can provide additional avenues for alternative offset options. As shown in Table 12, this alternative was ranked as third highest due to its flexibility and ability to align with specific interests of stakeholders.

6.5 Alternative 3 - Offsite Open Water Habitat

Open water habitat creation is a well-known, successful method used in numerous offset plans to provide suitable young-of-year, juvenile, and adult habitat for most of the species identified within the Project footprint. Other local species may also utilize the habitat for spawning. The same concept and general methodology described for onsite (Section 6.3) could be applied to other locations offsite (i.e., outside the Selaom / Trafalgar Brook ecological unit), should it be required or should it be deemed more beneficial to fish populations in other locations than those near the Project area. This offsite alternative was ranked lower due to greater risks and challenges related to land tenure and not being a direct benefit within the watershed(s) being affected by the Project.

6.6 Alternative 4 and Alternative 6

Additional options (Alternatives 4 and 6) investigated included the rehabilitation / restoration of degraded aquatic habitats both within and beyond former mining areas including old stream realignments, dewatered / infilled stream reaches, and man-made barriers. Restoration methods are well-known and can be very successful if used in the proper location. Discussions with groups involved in the planning of remediation of former mining areas indicate that additional coordination may be challenging due to land tenure challenges and liabilities; however, alternate locations may be identified through consultations with local stakeholders and Indigenous communities. These would be considered if required; however, are a lower overall ranking due to numerous uncertainties with their implementation.

Table 11: Summary of Habitat Lost and Mitigations for FMS Project Infrastructure Footprint and TMF

Habitat Measure	Project Area	Habitat Type	Total Habitat Area (m^2)	HEU (m^2)	Description
Lost	Infrastructure Footprint	Stream	8,334	3,333	Highest Habitat Equivalent Unit for adult Brook Trout
		Open Water	19,113	4,730	Highest Habitat Equivalent Unit for both spawning and adult Brook Trout
		Wetland	51,179	0	No Habitat Equivalent Unit value
	TMF	Stream	1,947	953	Highest Habitat Equivalent Unit for adult White Sucker
		Open Water	0	-	No open water habitat present
		Wetland	0	-	No wetland habitat present
Total			**80,573**	**9,016**	
Mitigation	Realignment	Stream	4,640	4,640	Will be designed as suitable for all species present within the footprint
	Flood Area	Open Water	84,449	20,901	Will be designed as suitable as possible for all species present with adult Brook Trout as the habitat template
		Wetland	0	-	No emergent vegetation habitat will be designed or constructed
Total			**89,089**	**25,541**	
Residual HADD				**-16,525**	Net increase in Habitat Equivalent Units with the development of appropriate mitigations

Table 12: Ranking Scale Legend for Candidate Fish Habitat Offset Options

Rank Scale	Rank Meaning	Rank Definition
1	Very Low	Very Low feasibility and/or certainty of the proposed offset alternative relative to the specific category
2	Low	Low feasibility and/or certainty of the proposed offset alternative relative to the specific category
3	Moderate	Moderate feasibility and/or certainty of the proposed offset alternative relative to the specific category
4	Moderate to Good	Moderate to Good feasibility and/or certainty of the proposed offset alternative relative to the specific category
5	Good	Good feasibility and/or certainty of the proposed offset alternative relative to the specific category
6	Very Good	Very Good feasibility and/or certainty of the proposed offset alternative relative to the specific category

Table 13: Definition of Categories for Candidate Compensation Concept / Options

Categories	Definition
Overall rank	Rank is order of highest cumulative ranking scores (an overall rank of 1 being the highest or more likely feasible alternatives).
Alternative	Description of alternative, representing the type of alternative (i.e., channel realignment, new pond basin, existing habitat enhancement).
Simplicity of concept and pre-design info needs	Simplicity ranking, with 1 being the least simple and 6 being the simplest. Lower rankings will require more extensive field programming, modelling, engineering design, and/or time to obtain necessary pre-design information.
Monitoring simplicity and success certainty	Monitoring success simplicity ranking, with 1 being the least simple and 6 being the simplest. Effort required to establish certainty of project success through monitoring.
Operational relevance	Relevance to facilitation of project site development. High relevance (e.g., 6) means the alternative also facilitates site infrastructure development.
Compatibility with existing land use	Brief description of existing land use and proposed offsetting alternative feasibility / compatibility with this land use type. Proposed offset alternative relevance to the existing land use, habitat type or fishery. High compatibility (e.g., 6) means the alternative is highly compatible with existing land use.
Habitat area gain - portion of constructed or restored habitat credited to offset balance	The proportion of the total area required to be compensated that the specific alternative can provide. New habitats receive highest values (100%= very high) while habitat enhancement may only receive partial credit.
Habitat area gain – percent of total offset amount required	The percent of the total area required to be compensated that the specific alternative can provide. This percent can be broken up into two groups: watercourse % and waterbody %. Higher values are awarded to larger alternatives.
Construction implementation and required controls	Level of controls and implementation required during the specific alternative construction to prevent additional environmental damage. Higher values are awarded where fewer controls are needed
Construction certainty	Feasibility of constructing the specific offset alternative, including access to the offset location and terrain type. High certainty (e.g., 6) means the constructability is highly certain.
Land tenure certainty	Certainty that Proponent will have tenure of the lands proposed to be included in the specific offsetting alternative. High certainty (e.g., 6) means the lands are under control of Proponent.
Relative cost per type of offset measure	Cost of the specific offset alternative relative to other proposed alternatives within the matrix. High relative cost (e.g., 1) means the cost is higher then other alternatives.
Stakeholder interest (aligns with interests of several groups, increases Diversity of fish community *	How well the specific offset alternative aligns with the interests of different stakeholder groups and provincial management objectives. Higher values are awarded to alternatives with high stakeholder alignment.
Cumulative score (highest is most preferred)	Cumulative score of the specific offset alternative using the rank scale (Table 10).

* Stakeholder interest is preliminary based on regulatory guidance and anticipated community interest. This ranking will need to be confirmed during consultation efforts.

Table 13: Candidate Compensation Concept / Options Matrix

Overall Rank	Alternative	Simplicity of Concept and Pre-design Information Needs	Monitoring Simplicity and Success Certainty	Operational Relevance	Compatibility with Existing Land Use and Ecological Relevance	Habitat Area Gain		Construction Implementation and required controls	Construction Certainty	Land Tenure Certainty	Relative Cost per Type of Compensation / Offset Measure	*Stakeholder Interest (Aligns with Interests of Several Groups, Increases Diversity of Fish Community)	Cumulative Score (Highest is Most Preferred)
						Portion of Constructed or Restored Habitat Credited to Compensation / Offset Balance	Percent of Total Compensation Amount Required						
1	Note: This alternative is considered mitigation and not an offset Alternative 1 Required Watercourse Realignments: Seloam Brook	Very Good (6) Realignments are common practice. Basic Fisheries and engineering values needed from Reference Habitat to replicate habitat. Most information is available or readily obtainable.	Very Good (6) Monitoring is simple and relies on comparison to baseline reference values. Relatively short duration 3-10 years. Similar habitat should have similar fish values.	Very Good (6) (simple diversion channel required to divert water around Open Pit and to maintain downstream flow to brook. Additional design features can be readily integrated to convert the diversion concept into a full ecologically functional realignment channel with integrated floodplain.	Land Use Good (4) Mostly wetland and existing aquatic corridor. Ecological Relevance Very Good (6) High relevance as realignment channel will connect to and potentially enhance permanent water features, maintaining fish passage within watershed.	Very Good (6) Nearly 100 % of the realigned channel should be credited to the Plan **as mitigation credit.** May result in additional Mitigation or Offset "Habitat Units" by addressing limiting conditions of existing channel. Any existing fish bearing waters in the alignment may only receive partial credit.	Good (5) The realignment can be used to mitigate total impact area / habitat units but requires confirmation of ratio of mitigation with DFO. Estimated Habitat Equivalent Units within the realignment channel, using appropriate habitat features is 5,600 m^2.	Moderate to Good (4) Sizeable drainage area results in larger water management needs. Existing creek flows will need to be bypassed during construction. Can use existing channel and construct most of the new alignment in isolation with cofferdams.	Good (5) Good access to site via site roads and planed infrastructure. New channel construction is relatively common and predictable. Actual new alignment is in soft wetland terrain and will require winter construction and or a new construction access road.	Very Good (6) All areas are under control of Proponent.	Moderate (3) Cost per unit of creek realignment is high, but cost of open water from inundation is low.	Moderate to Good (4) Option is in immediate project area as per preferences of DFO. Other stakeholders require further consultation, but concept has been previously proposed in Project documents. Includes sportfish potential (Brook Trout) but access may be limited for recreational purposes.	60
2	Alternative 2 Excavate new open water Basins on site. Online open water constructed in Seloam Brook Downstream of the Realignment Channel, or elsewhere on AGC lands	Good (5) Pond development is simple concept. Basic Fisheries and engineering values needed from reference lakes to replicate habitat. Most information is available or readily obtainable. Engineering studies required to predict ground conditions and hydraulic suitability.	Good (5) Monitoring is simple and relies on comparison to baseline reference values. Relatively short duration 3-10 years. Similar habitat should have similar fish values.	Low (2) Not required to facilitate project site development.	Land Use Good (4) Mostly wetland. Some terrestrial land use is affected. Ecological Relevance Good (5) Options to improve deficiencies in existing habitat, particularly locally affected species.	Very Good (6) 100 percentage of the new basin should be credited to the compensation.	Very Good (6) Large areas available and can most likely provide 100% of required area	Good (5) New basins can be constructed in isolation and filled prior to connection. Excavations and habitat placements within new pond footprint will require moderately complex sediment and erosion control planning to protect existing waterbody (e.g., downstream brook and lake) during construction.	Good (5) Good access to site via site roads and planed infrastructure. New pond construction is relatively predictable. Alignment is in soft wetland terrain and may require winter construction and or a new construction access road. Material disposal is assumed possible in existing mine impoundment areas.	Very Good (6) Areas are under control of Proponent. Options may require third party agreement.	Moderate (3) Waterbody / pool construction cost is Moderate.	Moderate to Good (4) Option is in immediate project area as per preferences of DFO. Includes sportfish potential (Brook Trout) but access may be limited for recreational purposes	56

Overall Rank	Alternative	Simplicity of Concept and Pre-design Information Needs	Monitoring Simplicity and Success Certainty	Operational Relevance	Compatibility with Existing Land Use and Ecological Relevance	Habitat Area Gain		Construction Implementation and required controls	Construction Certainty	Land Tenure Certainty	Relative Cost per Type of Compensation / Offset Measure	*Stakeholder Interest (Aligns with Interests of Several Groups, Increases Diversity of Fish Community)	Cumulative Score (Highest is Most Preferred)
						Portion of Constructed or Restored Habitat Credited to Compensation / Offset Balance	Percent of Total Compensation Amount Required						
3	Alternative 5 Complementary Measures	Good (5) Measures improve existing fisheries knowledge in areas of interest to Indigenous communities. Success is measured by the collection of data and greater understanding.	Moderate to Good (4) Monitoring is simple and relies on collection and analysis of data. Duration varies depending on study. Often relies on multiple groups collaborating.	Moderate (3) Not required to facilitate project site development but topic of study may interact with the site development.	Land Use Assumed Good (5) Studies generally examine existing aquatic habitat / fisheries. Good (5) Ecological Relevance High as the measure informs management decisions and can be relevant to ongoing project activities and other projects / initiatives.	Moderate (3) Value varies - habitat credit is given up to maximum of 10% of the Offset requirements.	Low (2) Maximum of 10% of the Plan.	Good (5) Generally, has limited construction and relies on study design and sampling logistics.	Good (5) Generally, has limited construction and relies on study design and sampling logistics.	Moderate (3) Landowner likely agreeable to works but may require agreements.	Moderate (3). Generally, cost effective to conduct studies, but values may be prorated to overall plan cost.	Very Good (6) Works are generally requested / proposed by Indigenous Communities and/or public and have interest of federal gov. public and FN.	49
4	Alternative 3 Excavate new pond Basins - offsite Online Ponds constructed in adjacent waterbodies outside of AGC lands. West R. sheet Harbor?	Good (5) Pond development is simple concept. Basic Fisheries and engineering values needed from reference lakes to replicate habitat. Most information is available or readily obtainable. Engineering studies required to predict ground conditions and hydraulic suitability.	Good (5) Monitoring is simple and relies on comparison to baseline reference values. Relatively short duration 3-10 years. Similar habitat should have similar fish values.	Low (2) Not required to facilitate project site development.	Land Use uncertain (3) Ecological Relevance Moderate to Good (5) Options to improve deficiencies in existing habitat; however, additional baseline data may be required.	Very Good (6) 100 percentage of the new basin should be credited to the compensation.	Good but Uncertain (4) Large areas may be available to provide 100% of required area but requires further study.	Good (5) New basins can be constructed in isolation and filled prior to connection. Excavations and habitat placements within new pond footprint will require moderately complex sediment and erosion control planning to protect existing waterbodies during construction.	Uncertain (3) Offsite access to site via site roads is uncertain and would require further study. New pond construction is relatively predictable. Alignment may be in soft wetland terrain and may require winter construction and or a new construction access road.	Moderate (3) Options will/ may require third party agreement.	Moderate (3) Waterbody construction cost is Moderate.	Moderate (3) Works are somewhat removed from site and area of impact. Works are in area of interest and should have support of regulators, providing onsite options are not viable. Includes sportfish potential	47
5	Alternative 4 Restoration of degraded habitats in former mining areas. Includes barrier removal considerations. Possible collaboration with NS Lands	Moderate (3) Measures improve existing habitat and require detailed existing habitat values to compare to predicted values. Option has been prepared to concept level by Remedial action group (NS Lands). Requires planning and agreements with multiple groups.	Moderate (3) Post construction comparison must demonstrate that channel improvements have transferred to increased productivity. May require higher effort over 5-10 years to clearly demonstrate success. Unless physical completion is success metric.	Low (2) Not required to facilitate project site development and further removed from site.	Land Use Very Good (6) Existing channel / aquatic habitat. Very Good (6) Ecological Relevance Is high with restoration of former habitat, but option has lower certainty of ecological success.	Moderate (3) The channel is existing and only partial credit for improvement will be given and/or will be based on relative productivity increases.	Moderate (3) Creek Length/ habitat area to meet Project requirements is uncertain due to partial credit. Uncertainty related to water quality effects of former mining operations also requires consideration.	Moderate (3) Will require complex sediment and erosion control and water management planning to protect existing waterbodies during construction. May require complex schedule dependant on others (e.g., containment cells).	Good (5) Access unknow without further study. Habitat rehabilitation methods relatively standard.	Moderate to Good (4) Landowner likely agreeable to works but requires agreements.	Poor (2) Cost per unit of creek / channel is unknown but expected to be high due to contamination controls.	Good (5) Works are furthest removed from site but in area of impact. Works are in "area of concern" and have interest of federal gov. public and FN.	45

Overall Rank	Alternative	Simplicity of Concept and Pre-design Information Needs	Monitoring Simplicity and Success Certainty	Operational Relevance	Compatibility with Existing Land Use and Ecological Relevance	Habitat Area Gain		Construction Implementation and required controls	Construction Certainty	Land Tenure Certainty	Relative Cost per Type of Compensation / Offset Measure	*Stakeholder Interest (Aligns with Interests of Several Groups, Increases Diversity of Fish Community)	Cumulative Score (Highest is Most Preferred)
						Portion of Constructed or Restored Habitat Credited to Compensation / Offset Balance	Percent of Total Compensation Amount Required						
5	Alternative 6 Restoration of degraded habitats in other watersheds outside the Project Area. May include removal of fish barriers. Possible collaboration with Indigenous Groups or other NS conservation groups	Moderate (3) Measures improve existing habitat and require detailed existing habitat values to compare to predicted values. Option has not been prepared to concept level as data required would be on a location-by-location basis.	Moderate (3) Post construction comparison must demonstrate that channel improvements have transferred to increased productivity. May require higher effort over 5-10 years to clearly demonstrate success. Unless physical completion is success metric.	Low (2) Not required to facilitate project site development and further removed from site.	Land Use Very Good (6) Existing channel / aquatic habitat. Good (5) Ecological Relevance Is high with restoration of former habitat that can be focused on target recreational species, but option has lower certainty of ecological success.	Moderate (3) The channel is existing and only partial credit for improvement will be given and/or will be based on relative productivity increases.	Moderate (3) Creek Length / habitat area to meet Project requirements is uncertain due to partial credit.	Moderate (3) Will require complex sediment and erosion control and water management planning to protect existing waterbodies during construction.	Good (5) Access unknow without further study. Habitat rehabilitation methods relatively standard.	Moderate to Good (4) Landowner likely agreeable to works but requires agreements.	Moderate (3) Cost per unit of creek / channel is unknown but expected to be high; however, lower uncertainty related to possible previous contamination.	Good (5) Works are furthest removed from site but would be in an area identified as requiring rehabilitation and would have interest of federal gov. public and FN.	45

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7.0 Monitoring

As part of a detailed offset plan and once the offset measures have been selected, a monitoring program will be developed in consultation with DFO; and included in the final offset plan and Fisheries Authorization.

8.0 Consultations

Engagement is a key component of Atlantic Mining Nova Scotia Inc.'s approach to the planning and implementation of its projects and other business activities. A number of engagement initiatives have been undertaken in relation to the Project, with further engagement in progress or being planned. This includes discussions with relevant government departments and agencies, Indigenous communities and stakeholder organizations.

Sections 3 and 4 of the EIS describe previous and ongoing engagement initiatives related to the Project with Indigenous groups and the public. To continue in the vein of open communications on the Project, Atlantic Mining Nova Scotia Inc. is committed to meeting with and/or providing information to stakeholders at the appropriate time to discuss any offsetting plans.

9.0 List of Supporting Documents

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Appendix A

Wood Seloam Brook Realignment Section Model Results

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited
133 Crosbie Road
PO Box 13216
St. John's, NL A1B 4A5
Canada
T: 709-722-7023

October 9, 2020

James Millard
Manager, Environment & Community
Atlantic Mining NS Inc.
409 Billybell Way
Mooseland, Middle Musquodoboit, NS B0N 1X0
James.Millard@atlanticgold.ca

Dear James,

RE: Seloam Brook Realignment Section Model Results

As we further our fish habitat offset concept, Wood has completed preliminary flow design estimates of the Seloam Brook realignment habitat. The modelling that was completed uses existing hydrological data generated from previous diversion channel designs to estimate the flow parameters (water depth, velocity, and wetted perimeter) within the conceptual realignment channel. The estimates generated will provide greater certainty to the design team and regulators that the concept can convey the anticipated flows and can be sustainable beyond the life of mining operations.

Provided below are the results of the preliminary flow design estimates. This information will be further advanced during the detailed design work required for final Fisheries Act approvals.

Typical Seloam Brook Realignment Configuration

Initial configuration of the Seloam Brook realignment channel includes a stream channel as well as a surrounding integrated flood plain area (**Figure** 1). The concept being that the stream channel will be the primary fish habitat and will contain the anticipated principle flows while the flood plain will allow high-flow events such as spring freshets and extreme storm events to pass, similar to a natural wetland/flood plain ecosystem. The channel and floodplain would both be designed to provide substrates, morphology and cover in the high suitability range for the fish species known to exist in the system and to provide ecological function for other species of wildlife that depend on creek corridors.

Hydrology and Stream Flow Events

The flows used to design the stream channel and flood plain have been based on previous analytical work completed by Knight-Pieshold Consulting during the design of the previous Seloam Book Diversion channel which did not include a habitat-based flood plain. While the diversion was less habitat-focused, the flows estimated from historic hydrologic records and measures remain valid and were used in this revised integrated floodplain design. **Table** 1 provides a summary of the flows at typical key periods within the hydrologic regime predicted for the realignment channel. The estimated flows have been determined separately for each flow input to the realignment channel; Seloam Brook (reservoir flows), Southeast inflow, and Trafalgar Creek. While each will intersect the realignment channel at different locations, the combined flow from all inputs was included in the preliminary design as a precautionary measure to ensure that maximum predicted flows can be conveyed within the entire realignment habitat features.

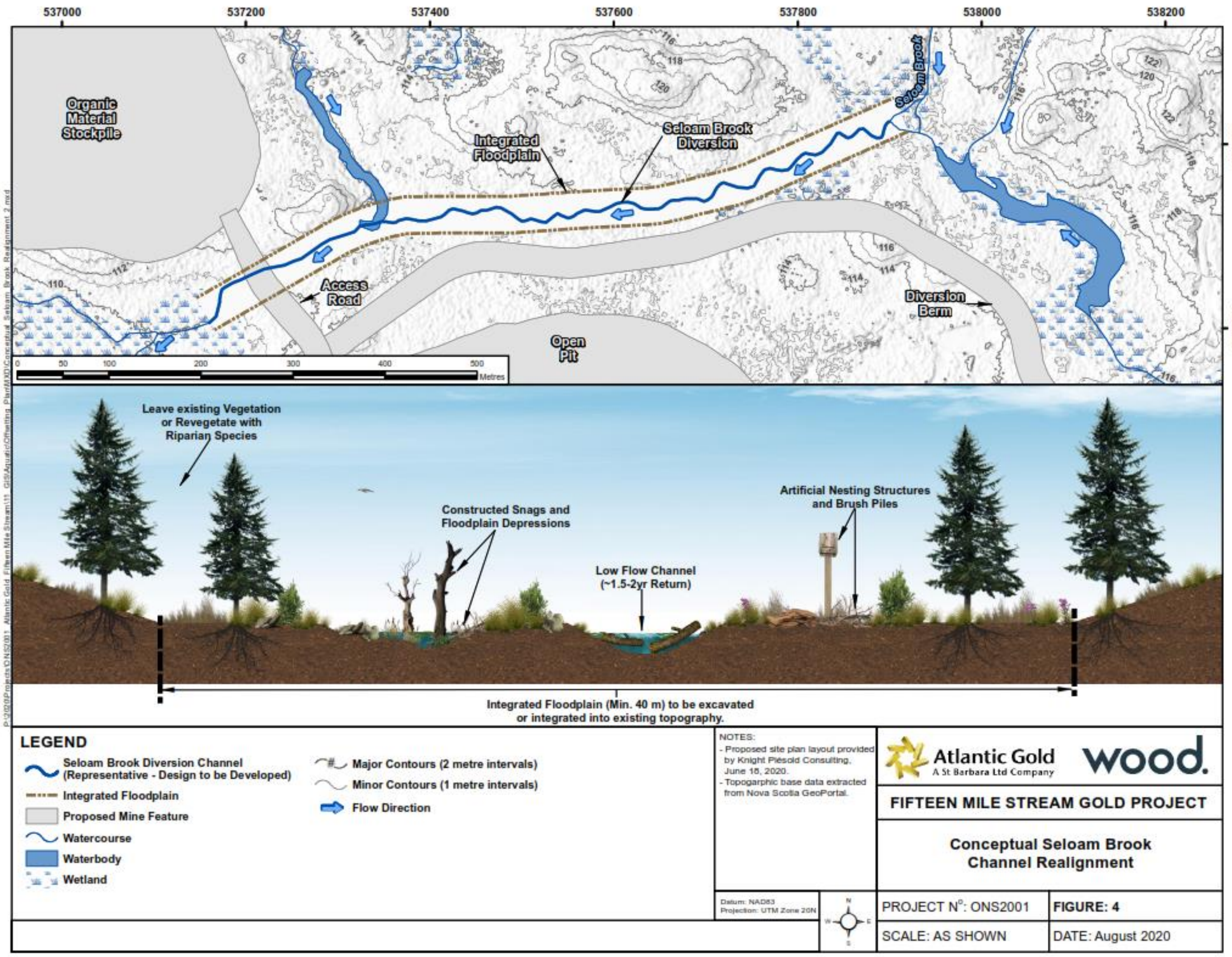

Figure 1: General stream/flood plain concept, Seloam Brook Realignment Channel.

Table 1: Realignment Flow Conditions based on information provided by Knight-Pieshold (2020)

Flow Scenario Included in Design	Inflow Location	Discharge Input (m^3/s)
1 in 20 Year Annual Dry	Seloam Reservoir (Brook)	0.22
	Southeast Inflow	0.02
	Trafalgar Brook	0.04
	Total	**0.28**
Mean Annual Flow (MAF)	Seloam Reservoir (Brook)	0.64
	Southeast Inflow	0.07
	Trafalgar Brook	0.11
	Total	**0.82**
Q10 (10-year high flow)	Seloam Reservoir (Brook)	4.8
	Southeast Inflow	2.5
	Trafalgar Brook	3.8
	Total	**11.1**
Q200 (200-year high flow)	Seloam Reservoir (Brook)	11.2
	Southeast Inflow	4.4
	Trafalgar Brook	6.6
	Total	**22.2**

Realignment Channel Considerations

The initial diversion channel design completed by Knight-Pieshold Consulting (2020) provided general conditions at the realignment location such as overall slope and measures of existing, local stream conditions. These were also incorporated into the habitat design where required.

The realignment channel configuration was based on the general outline provided in **Figure** 1; however, the following parameters/objectives were also input to the design:

1. The main stream (low flow) channel had to contain at least the flows expected during the Mean Annual Flow (MAF) at $0.82m^3/s$;
2. The main stream channel had to contain water depths capable of maintaining fish passage during the 1:20 Annual Dry Flow at $0.28m^3/s$;
3. The overall channel slope, based on Knight-Pieshold data, was assumed to be 0.5%;
4. The overall main channel roughness, based on Knight-Pieshold data on existing, local streams, was assumed to be 0.06;
5. The overall flood plain channel roughness, based on Knight-Pieshold data, was assumed to be 0.10.

These parameters are considered reasonable metrics for assessment of the conceptual channel. An updated detailed flow model will be further developed during detailed design to support the approvals process and to refine the habitat design.

Realignment Channel Configuration and Modelling

Based on the above considerations and general main stream / flood plain configuration, the channel and flood plain design was modelled. The Wetted Perimeter Method (WPM; Newbury and Gaboury 1993) was used in AutoCAD to model water levels, water depths, and water velocities within the designed channel.

The WPM is a fixed flow hydraulic rating method based on the hydraulic relationship between flow (i.e. discharge) and wetted river perimeter at selected transect(s) (Stalnaker et al. 1994). Using the relationship, the flow corresponding to a wetted perimeter (wetted width of the stream cross section), can be estimated using Manning's equation. The equation was applied to the key flow periods in **Table** 1 to estimate habitat conditions. Manning's equation is given by

$$\text{Velocity (m/s)} = R^{2/3} * S^{1/2} / n \qquad \text{where}$$

R = Hydraulic radius (Area (m^2) / wetted perimeter (m))
S = stream slope at transect
n = Manning's n.

The equation assumes that the transect used to represent the habitat is a suitable index of habitat for the full stream.

An AutoCAD realignment cross section was created (**Figure** 2) to model flow conditions. Using Manning's equation, the habitat conditions were simulated. Modelled values of wetted width (m), mean water velocity (m/s), and mean / maximum water depths (m) were estimated. Based on data from Knight-Pieshold Consulting (2020), mean channel slope (S) was input at 0.005 (i.e., 0.5% slope) and Manning's roughness values for the main channel (n) were input at 0.060 with the flood plain roughness at 0.100. To estimate conditions during flood periods, the Manning's value was estimated using a weighted mean of the two roughness values and the relative proportion of the wetted area within each habitat type (n = 0.096).

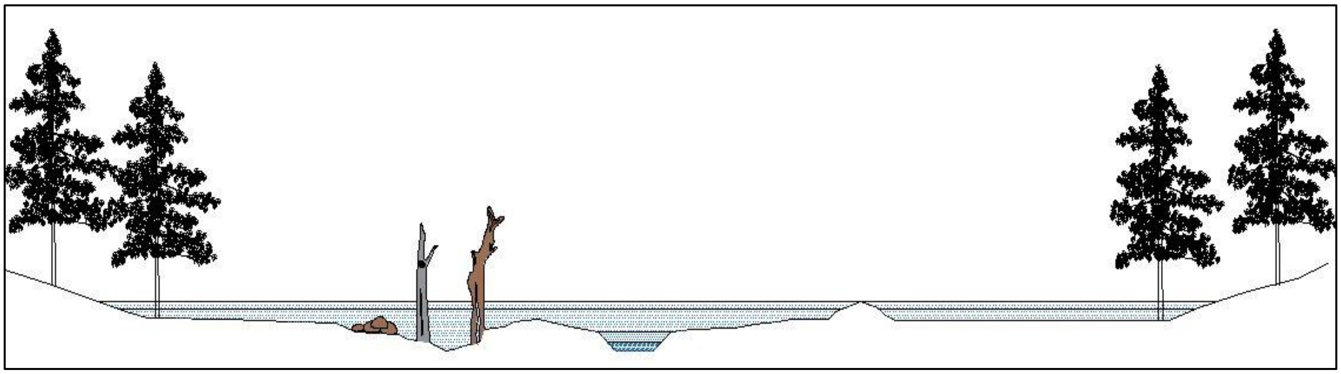

Figure 2: AutoCAD profile of Seloam Brook Realignment.

Model Results

The AutoCAD model was run at the four design flow scenarios in **Table** 1. **Table** 2 below provides the model results. The main stream channel was modified to ensure it would contain the MAF. The main stream channel was designed with a bottom width of 1.5m and side slopes of 1:2. As shown in **Table** 2, an estimated flow of around 1.0m^3/s will remain within the main channel before overtopping into the flood plain. The width of the stream at this flow is estimated at 2.90m. The model outputs also indicate that a mean water depth within the main stream channel will remain near 0.25-0.30m during the 1:20 Dry Annual flow if the channel is designed similar to existing habitat.

Flows in excess of 1.0m^3/s are shown to overtop the main stream channel into the flood plain mimicking the function of a natural channel condition. The modelled results show that flows as high as the 200-year event would easily be contained within the conceptual flood plain, and or within a combination of constructed channel and natural topography.

Table 2: Model output at identified flow conditions within the Seloam Brook Realignment preliminary design

Flow Condition (m3/s)	Estimated Model Discharge (m3/s)	Wetted Width (m)	Mean Water Velocity (m/s)	Mean Water Depth (m)	Maximum Water Depth (m)
1:20 Dry Annual (0.28)	0.28	2.16	0.47	0.28	0.33
MAF (0.82)	1.05	2.90	0.68	0.53	0.70
Q10 (11.1)	11.32	42.19	0.49	0.55	1.53
Q200 (22.2)	22.26	44.03	0.62	0.82	1.85

Summary

As shown by the model results for the preliminary channel design, an overall general flood plain width of 40-45m will easily contain the predicted 1:200 year flood event and that a main channel of 1.5m in bottom width and overall total wetted width of 3.0m would be capable of providing fish habitat similar to existing channel conditions. Greater detail regarding final channel design, 2-D extent of extreme flows, and possible use of existing topography to provide more natural flood conditions will be completed during the Fisheries Act authorization process.

Closure

The results of the modelling exercise are based on the general assumptions of the method and baseline conditions/information provided by others. The information has been generated to demonstrate that the preliminary Seloam Brook Realignment design can accommodate the design flows, and provide fish habitat and wetland/flood plain characteristics during low and high flow conditions.

Yours sincerely,

Wood Environment & Infrastructure Solutions,

a Division of Wood Canada Limited

Prepared by:

Matthew Gosse, BSc
Biologist

Reviewed by:

James McCarthy, MSc, CFP
Senior Associate Biologist, Ecosystem Insight Lead

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Appendix B

Golder Seloam Realignment Hydraulic Modelling Memorandum

Atlantic Gold

Appendix B.9

Final – Seloam Brook Realignment Hydraulic Analysis, Downstream Environment Technical Memo, Golder Associates

GOLDER

TECHNICAL MEMORANDUM

DATE October 15, 2020

Project No. 1895674-Rev1

TO Jim Millard
Atlantic Mining NS Corp

CC Meghan Milloy, McCallum Environmental

FROM Shannon Percival; Steve Kaufman

EMAIL Shannon_Percival@golder.com

SELOAM BROOK REALIGNMENT
HYDRAULIC ANALYSIS – DOWNSTREAM ENVIRONMENT
FIFTEEN MILE STREAM PROJECT

Introduction

Golder Associates Ltd. (Golder) was retained by Atlantic Mining NS Corp (AMNS), a wholly owned subsidiary of St. Barbara Ltd., to complete hydraulic modelling to support the on-going Environmental Impact Statement (EIS) for the Fifteen Mile Stream Gold Project (the Project). The Project is located 115 km east of Halifax, in Halifax county, in the province of Nova Scotia. The hydraulic modelling, as described herein, is specific to the planned Seloam Brook Realignment and the downstream receiving waterways that drain to Fifteen Mile Stream, and was completed in order to further investigate the conceptual placement of features downstream of the constructed channel that could reduce stream energy (velocity) and provide potential additional aquatic habitat.

Background

The Seloam Brook watershed consists of drainage from the following three main inflows:

- Seloam Brook from the outlet of Seloam Reservoir.
- Trafalgar Creek from the northern unregulated reaches of the watershed.
- An un-named waterway (termed WC-12 in accompanying EIS documentation) that drains the eastern reaches of the watershed.

These inflows discharge to a wetland complex that in turn drains west to Fifteen Mile Stream (Figure 1).

Project infrastructure will require the diversion of the main Seloam Brook tributary and the inflows from WC12 to the north of its existing path around the planned Open Pit (Figure 2). Therefore, a feasibility-level design of the Seloam Brook Realignment was completed by Knight Piésold (KP; 2020) and is referred to as "the Realignment" herein. Through further project development analysis and discussion, there was recognition that the Realignment as designed by KP had the potential to provide additional opportunity for habitat and fisheries offsetting. Wood Environment and Infrastructure Solutions, a Division of Wood Canada Limited (Wood; 2020), provided a revised and conceptual plan for the Realignment that incorporated these types of features and a more meandering low-flow stream alignment than the design proposed by KP (2020).

The net effect of the Realignment will be to route the main channel of Seloam Book and inflows from WC-12 to alternate receiving waterways within the Seloam Brook watershed. The purpose of the hydraulic modelling described in this memorandum is, therefore, to simulate the discharge pathways and water velocity for the receiving waterways downstream of the Realignment and to provide conceptual options for stream energy dissipation in the downstream environment.

Site Setting – Downstream Environment

At the outlet of the Realignment, flow diverges via a "North Channel" and a "South Channel". The North Channel flows west before its confluence with the main Seloam Brook reach, while the South Channel flows south to join with the main Seloam Brook reach (Figure 2).

Based on aerial imagery and field data provided by McCallum Environmental Limited (MEL), the North Channel is characterized as having a channel width ranging from 2.0 to 4.0 m, with floodplains dominated by grasses and alders. The South Channel is characterized as having a channel width ranging from approximately 2.0 m up to approximately 15.0 m with beaver activity noted within this area. Similar to the North Channel, the flood plains of the South Channel were noted to be dominated by grasses and alders. These characteristics indicate that the North Channel and South Channel are both low-gradient and low-energy components of the overall Seloam Brook watershed.

Methods and Model Inputs

A site-specific Hydraulic Engineering Centre River Analysis System (HEC-RAS) model was developed for the Realignment and downstream environment to the discharge of Seloam Brook to Fifteen Mile Stream. The model incorporated:

1) High-level design details from KP (2020), such as slope, dimensions, and outlet energy dissipation pad.

2) Estimated downstream (North Channel, South Channel, and Seloam Brook) stream and flood plain dimensions and stream bed roughness.

The Realignment design, as revised by Wood, was not modelled, rather, the range of stream velocity estimated through the revised design (Wood 2020) was compared from those modelled using the KP (2020) design for applicability to this downstream hydraulic assessment.

Modelling Conditions

In order to assess the North Channel and South Channel, the hydraulic model was simulated with the following conditions:

1) Baseline Conditions: An estimated existing discharge through the North Channel and South Channel.

1) Operations Conditions: An estimated future discharge through the North Channel and South Channel and downstream Seloam Brook, with the Realignment and several conceptual downstream energy dissipation features incorporated.

Seloam Brook Realignment Design

A feasibility-level design of the channel for the Realignment was completed by KP (2020). The dimensions of the channel, as proposed by KP (2020), were used in the model and are provided in Table 1.

Table 1: Seloam Brook Realignment Channel Key Dimensions

Location	Channel Slope (%)	Minimum Channel Depth (m)	Channel Base Width (m)	Channel Side Slope (H:V)
Seloam Brook Realignment	0.5	1.5	1.0	2:1

Natural Channels

Estimated stream gradient profiles for the North Channel and South Channel are summarized in Figure 3 and Figure 4. While stream and floodplain dimensions and grades were estimated based on the available topographic data and input from MEL, further characterization of these streams is ongoing in 2020 that can refine these estimates. The model input data used for the natural channels are summarized in Table 2.

Table 2: Natural Channel Parameters

Parameter	North Channel	South Channel
Channel Width Range	2.0 m to 4.0 m	2.0 m to 15.0 m
Maximum Channel Slope	2.6%	0.7%
Average Channel Slope	0.5%	0.3%

Stream Discharge

For consistency with EIS hydrology documentation, the hydraulic model was simulated for the average annual and the 95th percentile stream discharge conditions. Hydrological modelling completed for the EIS simulated flows at the outlet of Fifteen Mile Stream and, so, these flows were pro-rated by contributing upstream watershed size as inputs to the North Channel and South Channel from the Realignment. For the Operations Conditions scenario, the Realignment, and associated changes to watersheds as a result of infrastructure were accounted for.

Results

Stream Velocity

Baseline Conditions

While discharge provides an estimate of the total water moving through the system, it is the velocity of the water that drives the energy potential that leads to changes in stream morphology (sediment transport and deposition). Therefore, the focus of these results is on velocity in the receiving waterways.

Under mean discharge rates, simulated baseline water velocities through the North Channel ranged from 0.7 m/s to less than 0.1 m/s, with an average of approximately 0.2 m/s. Through the South Channel, simulated baseline stream velocity ranged from 0.6 m/s to less than 0.1 m/s, with an average of 0.2 m/s under mean discharge rates (Table 3).

For the 95th percentile discharge rate, simulated baseline stream velocity in the North Channel ranged from 0.8 m/s to less than 0.1 m/s, with an average of 0.3 m/s. For the South Channel simulated baseline stream velocity ranged from 0.7 m/s to less than 0.1 m/s, with an average of 0.3 m/s (Table 3).

Table 3: Baseline Conditions Stream Velocity

	Baseline Conditions					
	Mean Discharge			95th Percentile Discharge		
	Maximum – Velocity (m/s)	Average – Velocity (m/s)	Minimum – Velocity (m/s)	Maximum – Velocity (m/s)	Average – Velocity (m/s)	Minimum – Velocity (m/s)
North Channel	0.7	0.2	<0.1	0.8	0.3	<0.1
South Channel	0.6	0.2	<0.1	0.7	0.3	<0.1

Operations Conditions

Through an iterative process, energy dissipation features were added to the model domain that were intended to reduce stream velocity in the North Channel and South Channel. These features were conceptually considered to be check berms that would span the channel and floodplain. The optimization of the size, composition, and shape of these features will require additional study and collaboration with aquatic habitat disciplines. Conceptual placement of these structures is provided on Figure 5.

For the mean discharge scenario, simulated stream velocity through the North Channel ranged from 0.7 m/s to less than 0.1 m/s, with an average of approximately 0.2 m/s (Table 4). Through the South Channel, simulated stream velocity ranged from 0.3 m/s to less than 0.1 m/s, with an average of 0.1 m/s (Table 4).

For the 95th percentile discharge rate, simulated stream velocity in the North Channel ranged from 0.8 m/s to less than 1 m/s, with an average of 0.3 m/s (Table 4). In the South Channel, simulated stream velocity ranged from 0.5 m/s to less than 0.1 m/s, with an average of 0.2 m/s (Table 4).

Table 4: Operations Conditions Stream Velocity

	Operations Conditions					
	Mean Discharge			95th Percentile Discharge		
	Maximum – Velocity (m/s)	Average – Velocity (m/s)	Minimum – Velocity (m/s)	Maximum – Velocity (m/s)	Average – Velocity (m/s)	Minimum – Velocity (m/s)
North Channel	0.7	0.3	0.1	0.8	0.3	<0.1
South Channel	0.3	0.1	<0.1	0.5	0.2	<0.1

The range in simulated velocity along the channel lengths in Baseline Conditions and Operations Conditions are summarized in Figure 6 through Figure 9. Stream velocity simulated along the North Channel and South Channel in the Operation Conditions were similar to those simulated in the Baseline Conditions.

Stream velocity estimated for within the revised realignment plan (Wood 2020) are in the same order of magnitude of the analysis completed herein. These Wood (2020) estimates were for within the channel and not reflective of the plunge pool/dissipation basin incorporated in KP (2020). Therefore, it is likely that the conceptual placement and applicability of these downstream features remain consistent with this hydraulic modelling.

Flooding Extent

Under the Operation Conditions, the flood extent was also simulated with the addition of the structures. The resulting simulated flood extents for the mean average discharge rates and the 95th percentile of discharge rates are displayed on Figure 10 and Figure 11, respectively. In both scenarios, the flood extent was simulated with depths ranging from 1.8 m within the channel to a maximum depth of approximately 0.4 m in the floodplain.

Sediment Mobility

Simulated stream velocity was equal to or above 0.1 m/s for the North Channel and South Channel under Baseline and Operational Conditions. Typically, water velocity above 0.1 m/s have sufficient energy to mobilize finer particles such as silts and clays. With geomorphic analysis underway on these water features, additional detail will become available on the composition and potential mobility of sediments and the stability of the existing stream system. In turn, this work can inform the appropriate design of the Realignment and the downstream energy dissipation features.

Conclusions

The South Channel and North Channel of the Seloam Brook watershed were simulated within a hydraulic model. The model was simulated for under Baseline Conditions and Operations Conditions and for a mean discharge scenario, and a 95th percentile discharge scenario.

An increase in discharge (and stream velocity), as a result of the Realignment through tributaries of Seloam Brook, were simulated to be mitigated by the placement of energy dissipation features in the North Channel and South Channel. These conceptual features decrease overall simulated stream velocity (energy and sediment transport capability) to those simulated under Baseline Conditions. As a trade off, the flooded extent of the channels may occur. Therefore, additional studies will need to be completed that consider the optimization of the size, placement, and design of these features and associated additional potential aquatic habitat.

References

Knight Piésold Consulting (KP), 2020. Seloam Brook Diversion Channel Design. File No. VA101-00708/04-A.01.

Wood Environment and Infrastructure Solutions, a Division of Wood Canada Limited (Wood), 2020. Seloam Brook Realignment Section Model Results.

Closure

We trust that this memorandum meets your current requirements. Should you have questions regarding this memorandum please contact the undersigned.

Golder Associates Ltd.

Shannon Percival, B.Eng.,
EIT *Water Resource Specialist*

Steve Kaufman, M.Sc., EP
Associate, Hydrologist

SP/SK/sm

Attachments: Figures 1 to 11

https://golderassociates.sharepoint.com/sites/23819g/deliverables/1895674-xx realignment memo/rev 1 - october 2020/1895674-tm-rev1-atlantic gold hydraulic modelling 15oct_2020.docx

LEGEND

- Surface Water Flow Direction
- Watercourse
- Waterbody

KEY MAP

0 400 800

1:20,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. MCCALLUM ENVIRONMENTAL LTD. EIS PROJECT AREA, (VER. 190313, RECEIVED 2019-03-18).
2. MCCALLUM ENVIRONMENTAL LTD. PROPOSED INFRASTRUCTURE, (VER. 190620, RECEIVED 2019-06-28).

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 20 VERTICAL DATUM: CGVD28

CLIENT
ATLANTIC MINING NS CORP

Atlantic Gold

PROJECT
FIFTEEN MILE STREAM GOLD PROJECT

TITLE
EXISTING FLOW PATHS

CONSULTANT

GOLDER

YYYY-MM-DD	2020-10-15
DESIGNED	---
PREPARED	RRD
REVIEWED	SP
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
1895674	0032	1	1

25mm

LEGEND

- Surface Water Flow Direction
- Watercourse
- Waterbody
- Infrastructure

0 400 800

1:20,000 METRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. MCCALLUM ENVIRONMENTAL LTD. EIS PROJECT AREA, (VER.190313, RECEIVED 2019-03-18).
2. MCCALLUM ENVIRONMENTAL LTD. PROPOSED INFRASTRUCTURE, (VER.190620, RECEIVED 2019-06-28).
PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 20 VERTICAL DATUM: CGVD28

CLIENT
ATLANTIC MINING NS CORP

Atlantic Gold

PROJECT
FIFTEEN MILE STREAM GOLD PROJECT

TITLE
OPERATIONAL FLOW PATHS

CONSULTANT

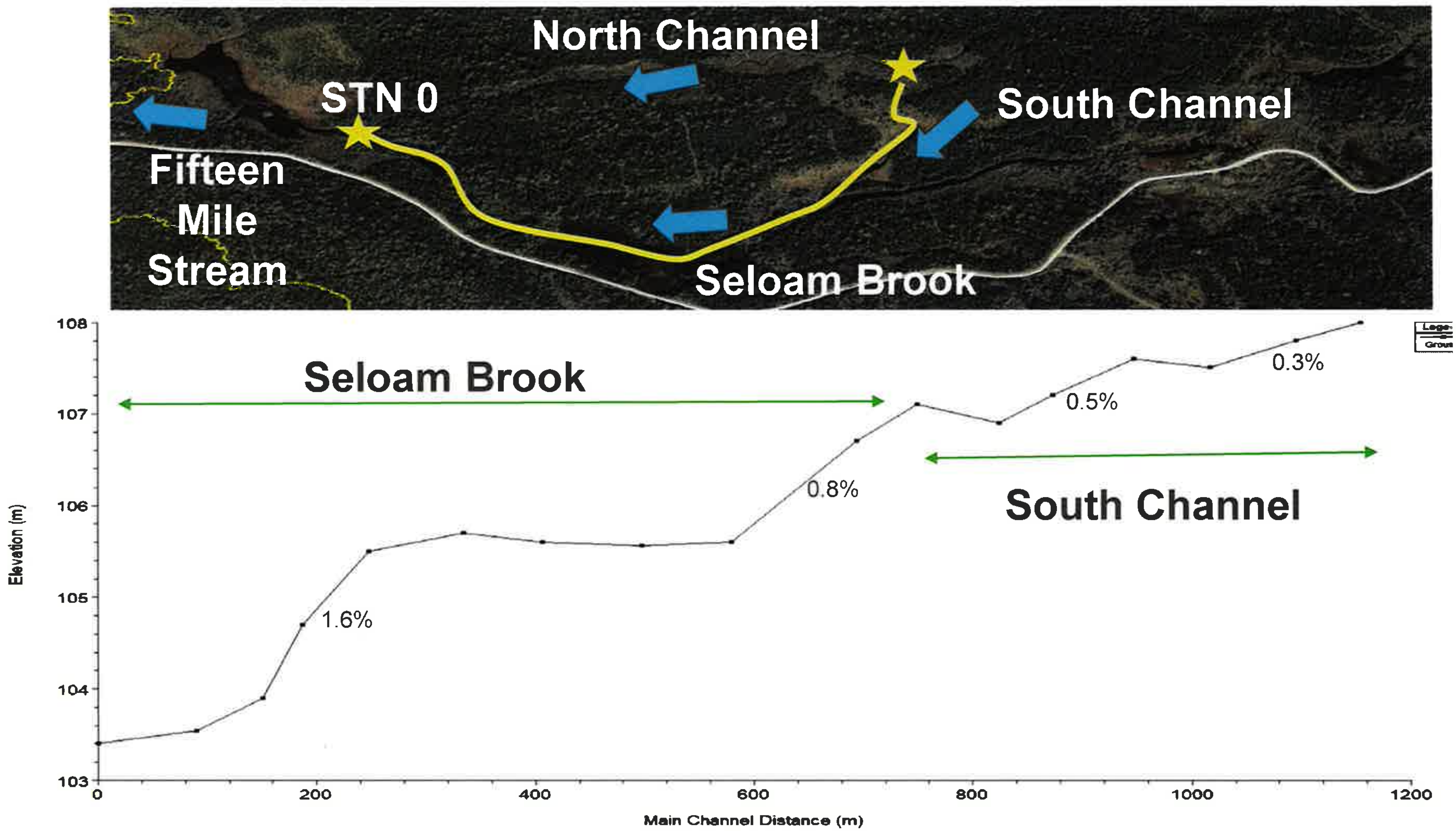
GOLDER

YYYY-MM-DD	2020-10-15
DESIGNED	---
PREPARED	RRD
REVIEWED	SP
APPROVED	SK

PROJECT NO.	CONTROL	0	FIGURE
1895674	0032	1	2

Atlantic Mining NS Corp
Seloam Brook Realignment – Hydraulic Analysis
South Channel and Seloam Brook Profile

FIGURE 3



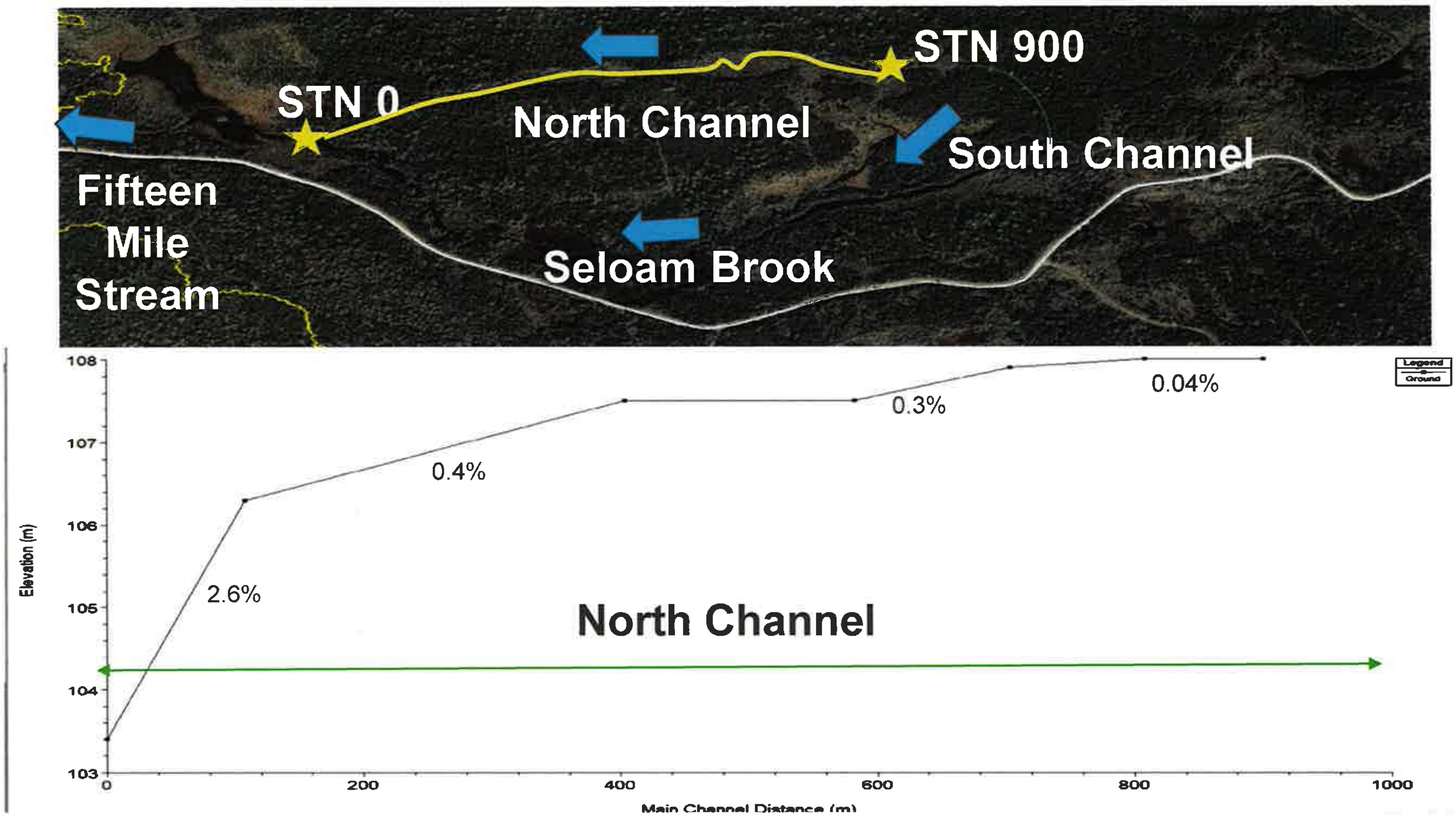
GOLDER

Date: October 2020
Project: 1895674

Drawn By: SF
Checked By: SK

Atlantic Mining NS Corp
Seloam Brook Realignment – Hydraulic Analysis
North Channel Profile

FIGURE 4



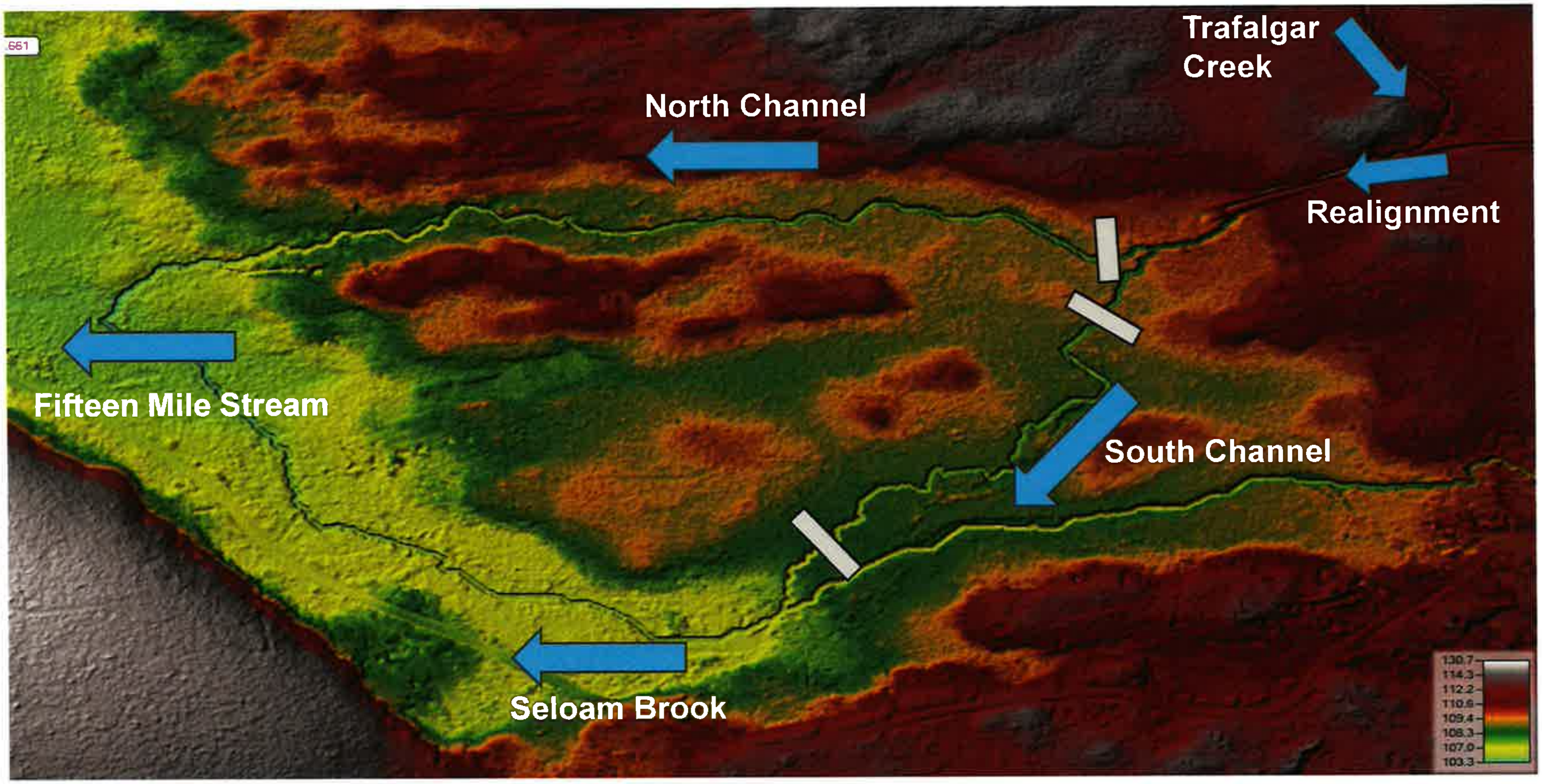
GOLDER

Date: October 2020
Project: 1895674

Drawn By: SF
Checked By: SK

Atlantic Mining NS Corp
Seloam Brook Realignment – Hydraulic Analysis
Operations Conditions – Conceptual Downstream Structure Placement

FIGURE 5



Energy Dissipation Feature

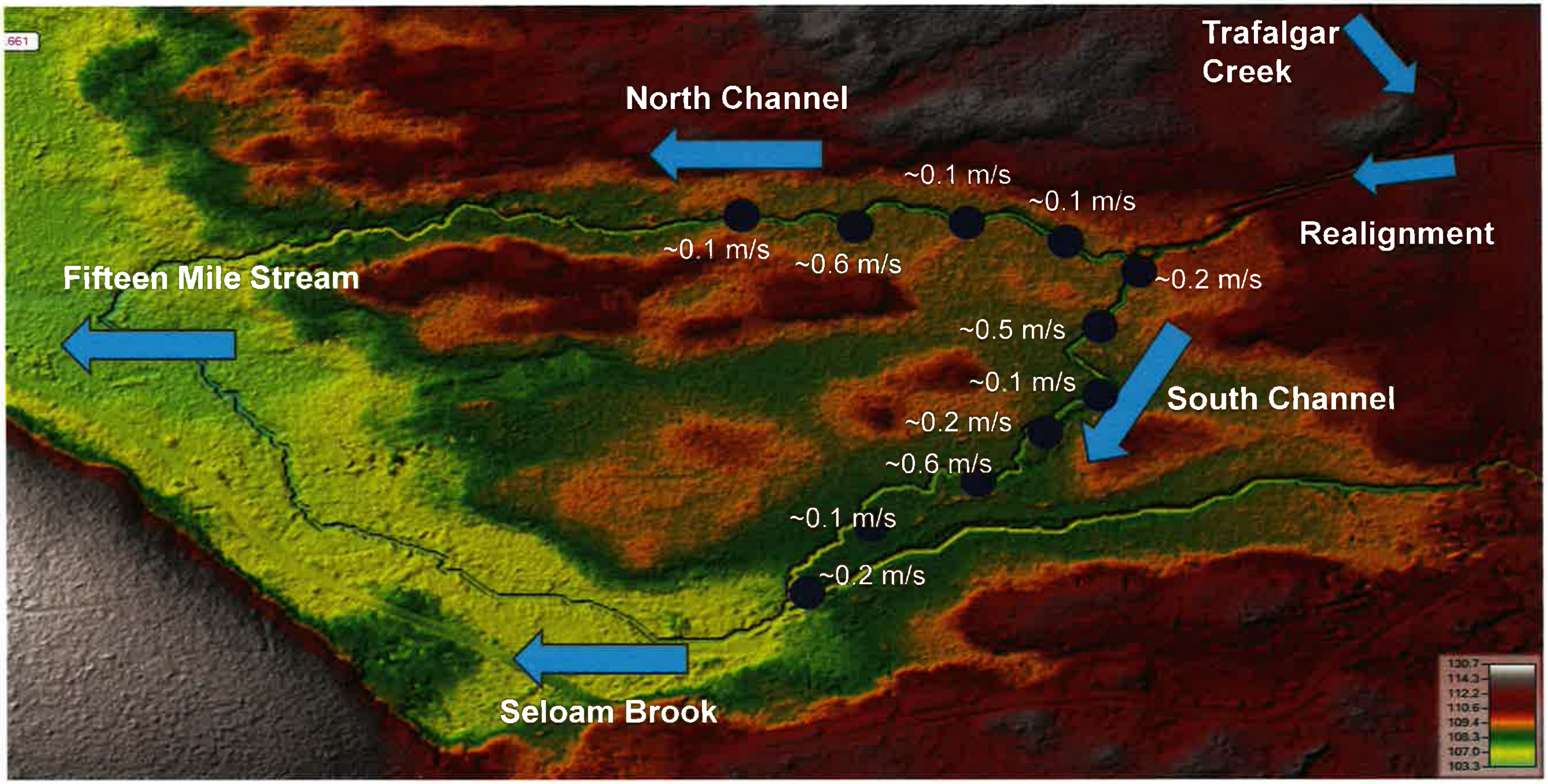
GOLDER

Date: October 2020
Project: 1895674

Drawn By: SF
Checked By: SK

Atlantic Mining NS Corp
Seloam Brook Realignment – Hydraulic Analysis
Baseline Conditions – Mean Discharge Rate
North Channel and South Channel Stream Velocity

FIGURE 6



● Velocity simulation location

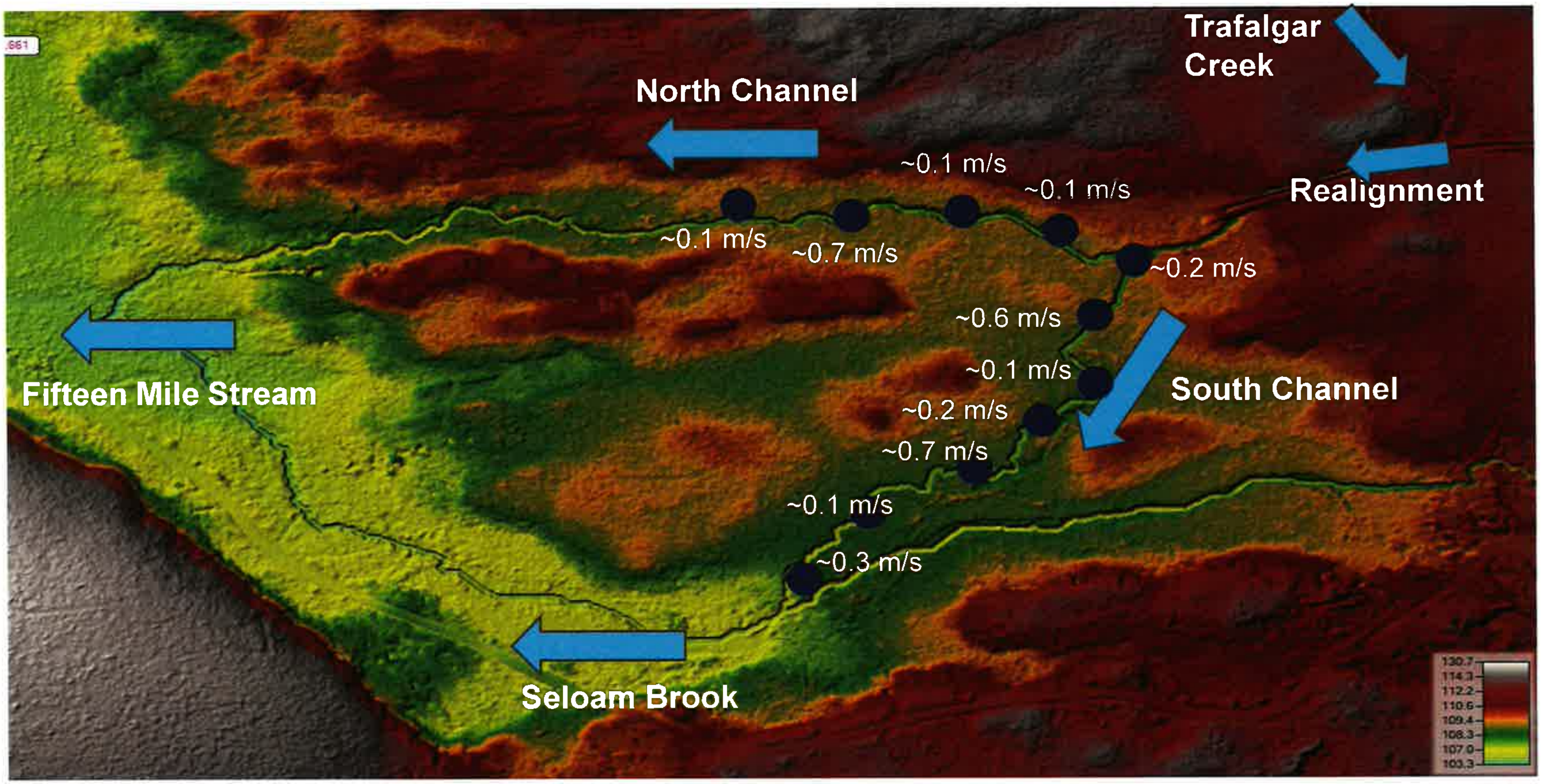
GOLDER

Date: October 2020
Project: 1895674

Drawn By: SF
Checked By: SK

Atlantic Mining NS Corp
Seloam Brook Realignment – Hydraulic Analysis
Baseline Conditions – 95th Percentile Discharge Rate
North Channel and South Channel Stream Velocity

FIGURE 7



● Velocity simulation location

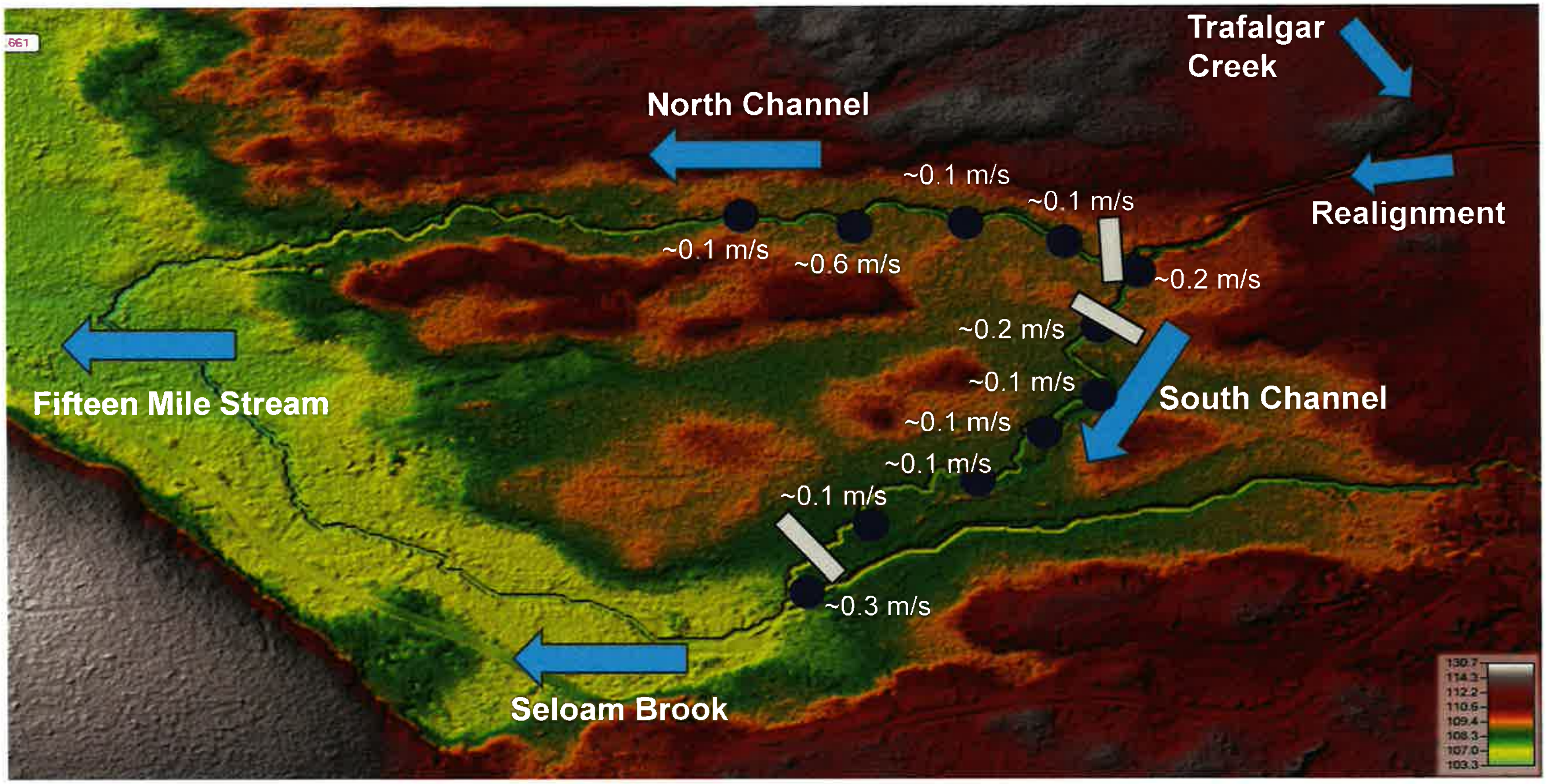
GOLDER

Date: October 2020
Project: 1895674

Drawn By: SF
Checked By: SK

Atlantic Mining NS Corp
Seloam Brook Realignment – Hydraulic Analysis
Operations Conditions – Mean Discharge Rate
North Channel and South Channel Stream Velocity

FIGURE 8



Velocity simulation location

Energy Dissipation Feature

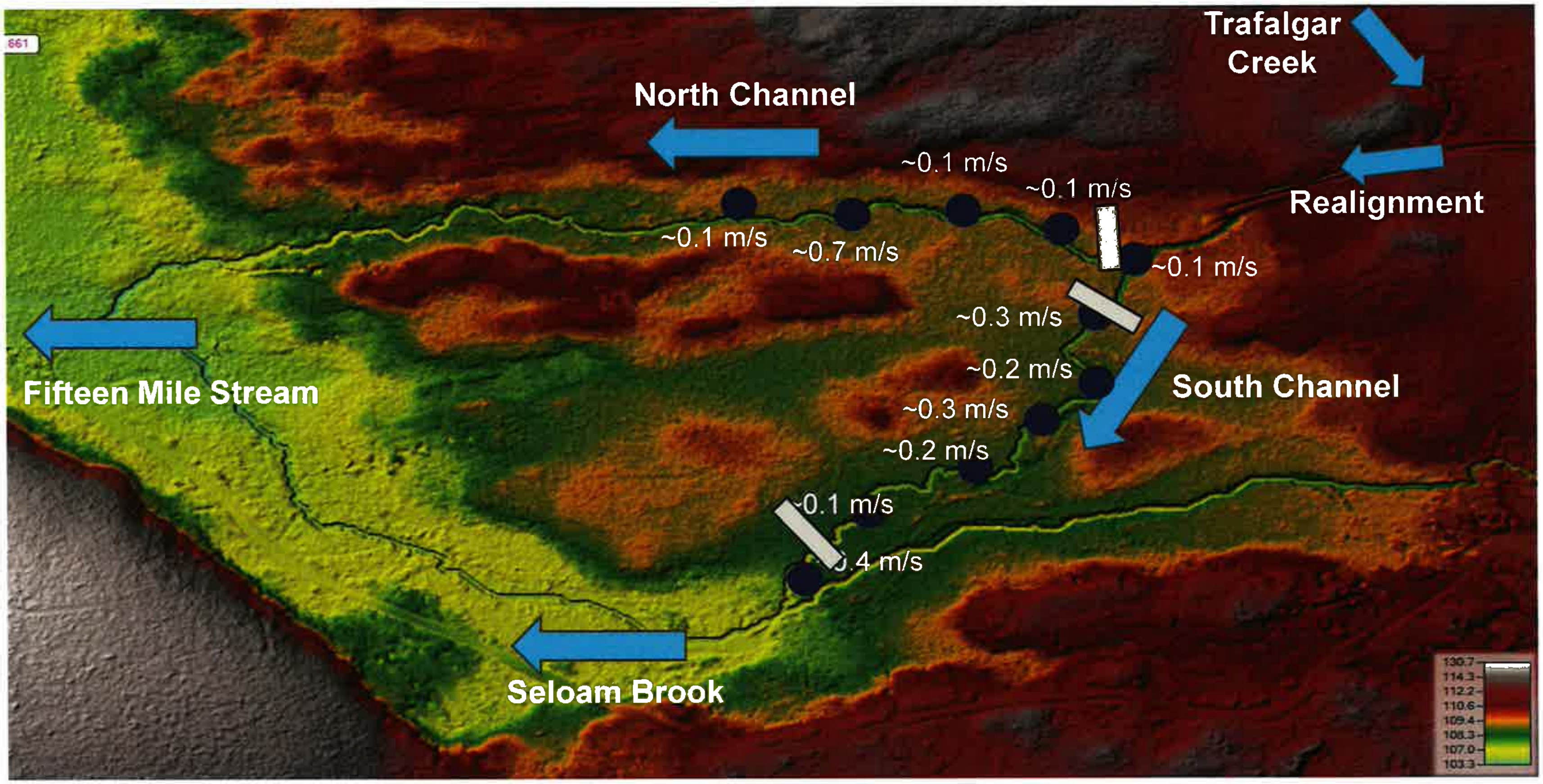
GOLDER

Date: October 2020
Project: 1895674

Drawn By: SF
Checked By: SK

Atlantic Mining NS Corp
Seloam Brook Realignment – Hydraulic Analysis
Operations Conditions – 95th Percentile Discharge Rate
North Channel and South Channel Stream Velocity

FIGURE 9



Velocity simulation location

Energy Dissipation Feature

GOLDER

Date: October 2020
Project: 1895674

Drawn By: SF
Checked By: SK

LEGEND

simulated Flooded Extent

0 80 160

1:4,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. MCCALLUM ENVIRONMENTAL LTD. EIS PROJECT AREA, (VER.190313, RECEIVED 2019-03-18).
2. MCCALLUM ENVIRONMENTAL LTD. PROPOSED INFRASTRUCTURE, (VER.190620, RECEIVED 2019-06-28).

PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
COORDINATE SYSTEM: UTM ZONE 20 VERTICAL DATUM: CGVD28

CLIENT

ATLANTIC MINING NS CORP

Atlantic Gold

PROJECT

FIFTEEN MILE STREAM GOLD PROJECT

TITLE

FLOODED EXTENT - AVERAGE ANNUAL DISCHARGE

CONSULTANT

GOLDER

YYYY-MM-DD	2020-10-15
DESIGNED	---
PREPARED	RRD
REVIEWED	SP
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
1895674	0032	1	10

25mm

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

PATH: A:_Clients\ATLANTIC_GOLD\FifteenMileStream_CochraneHill\99_PROJ\1895674\40_PROD\0032\1895674-0032-CS-0005.mxd PRINTED ON: 2020-10-15 AT: 11:05:36 AM

LEGEND

Simulated Flooded Extent

0 80 160

1:4,000 METRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. MCCALLUM ENVIRONMENTAL LTD. EIS PROJECT AREA, (VER.190313, RECEIVED 2019-03-18).
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PROJECTION: TRANSVERSE MERCATOR DATUM: NAD 83
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CLIENT
ATLANTIC MINING NS CORP

Atlantic Gold

PROJECT
FIFTEEN MILE STREAM GOLD PROJECT

TITLE
FLOODED EXTENT -95TH PERCENTILE DISCHARGE

CONSULTANT

GOLDER

YYYY-MM-DD	2020-10-15
DESIGNED	—
PREPARED	RRD
REVIEWED	SP
APPROVED	SK

PROJECT NO.	CONTROL	REV.	FIGURE
1895674	0032	1	11

25mm
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B