2 PROJECT DESCRIPTION

2.1 Introduction

2.1.1 Summary of the Project Description Before the Updates

The proposed Beaver Dam Mine Project includes construction, operation, decommissioning, and reclamation of an open pit gold mine in Marinette, Nova Scotia. As proposed, the Beaver Dam Mine Project would have an ore production rate of 2.1 million tonnes per year, over a four-year period. Ore from the project would be crushed and transported approximately 31 kilometres by road to the Moose River (Touquoy) mine for processing. Beaver Dam mine tailings will be deposited sub aqueously in the mined-out Touquoy pit. The Beaver Dam mine site includes an open pit, mine site haul roads, waste material storage areas, primary crusher and administrative.

The Project Area (PA), therefore, includes:

- Beaver Dam Mine Site –mining, waste rock and water management;
- Haul Road – transport of ore to Touquoy Mine Site; and
- Touquoy Mine Site – processing ore and tailings disposal in the mined-out pit.

2.1.2 Summary of Updates to Project Description

AMNS has updated the project description to include five years of operations. The maximum ore production rate is 2.1 million tonnes per year (Mt/y) that will range from 0.75 to 2.1 Mt/y over the five years. Components of the project still include an open pit, mine site haul roads, waste material storage piles, ore stockpiles, optional primary crusher and operational facilities, and water management. Addition geochemical work indicated that there is potential for potential acid generative (PAG) material that requires segregation into a separate stockpile that will require an engineered cover at closure. Advances in detailed engineering include an option to undertake the operations without a primary crusher, using mine equipment within the pit (e.g., jawbreaker) to crush ore for transport. This assessment considers options with and without a primary crusher is described. Water management structures have been updated to include ponds that are sized to consider extreme weather events (i.e., Hurricane Beth) and climate change. Overall updates to the project footprint have been undertaken to avoid and/or minimize direct impacts to lichens, wetlands, and waterbodies courses.

Additional studies on haul trucks have been undertaken to reduce the overall number of truck trips to an anticipated average of 190 truck trips (i.e., one-way trips) a day over the life of mine. The Preferred Alternative Road, which would require additional disturbance, is no longer considered in the updated as part of the Haul Road design. It may be necessary to use the Public Roads during start-up (i.e., 6 to 8 months) depending on approval and permitting timelines and construction restrictions.

Engagement undertaken in 2020 and 2021 indicated there was considerable concern regarding limitation of access along the Haul Road. A by-pass road will be constructed parallel and adjacent to proposed Haul Road to mitigate concerns raised by both the Mi’kmaq of Nova Scotia and members of the public. The bypass road will be constructed to allow light truck and recreational vehicles access while the haul road is in operation.

The Project Area (PA), therefore, includes:

- Beaver Dam Mine Site – mining ore, managing waste rock storage, and water management;
- Haul Road – transport of ore to Touquoy Mine Site and will include; and
- Touquoy Mine Site – processing ore and tailings disposal in the mined-out pit.

St. Barbara is committed to carbon neutrality across its mining operations by 2050. AMNS is continually looking for opportunities target carbon neutrally by 2025. Although advances in technologies including hydrogen cells in mine fleets are being developing, they are currently not technically and commercially viable option at the Beaver Dam Mine Site. Other assessments are being undertaken is evaluating if wind energy can be used to supply energy to Touquoy mill.

2.1.3 Overview of Updates

An overview of updates to the Project Description and corresponding sections is provided in Table 2-1.1.

Table 2.1-1: Updated and Unchanged Subsections from the 2019 Revised Environmental Impact Statement – Project Description

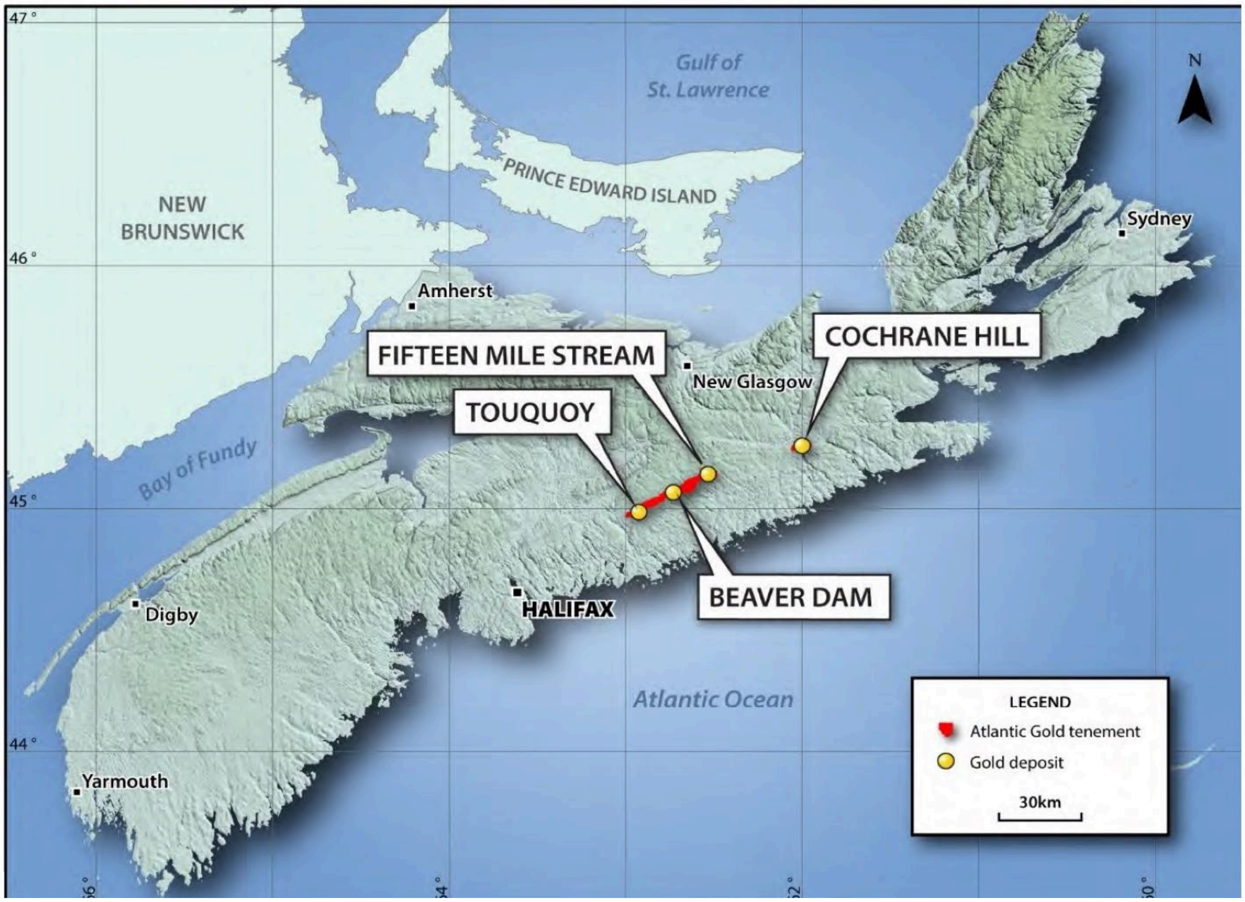
Project Description from the 2019 Revised EIS Submission	Updated in 2021	Reason for Update
2.1 Introduction	New	Project Summary based on 2019 Revised EIS and Summary based on Updated 2021 EIS
2.2 Ownership and Tenements	Update	New ownership; lease boundary updates due in changes in Project layout
2.3 Project Location	Limited Update	Updates Description of Project and included new figures
2.4 Ecological Setting	Limited Update	Updated description
2.5 Project History	Limited Update	Updated based on new Phase I and II information on historic mining activities
2.6 Geology and Resources	New	Additional information on geology and resources
2.7 Project Components	Updated	Updates to reflect updates to mining components at Beaver Dam Mine; Removal of the Preferred Alternative Haul Road Route and updates to Touquoy processing and tailings disposal
2.8 Project Schedule	Updated	Increase in Project Operations from 3.5 years to 5 years and updates to active and post-closure
2.9 Active and Post Closure	Updated	Updated to reflect draft Reclamation and Closure Plan
2.10 Preferred Means of Carrying Out Project	No Change	
2.11 Conclusion	Limited Updates	Updates based on Socio-Economic Information

2.2 Ownership and Tenements

2.2.1 Ownership

Atlantic Mining NS Inc. (AMNS), formerly Atlantic Gold, is wholly owned by St Barbara Limited (St Barbara) that completed the acquisition of Atlantic Corporation on July 19, 2019. The proposed Beaver Dam Mine and existing Touquoy Mine are 100% owned by AMNS. The company is focused on growing gold production in Nova Scotia beginning with its Moose River Consolidated phase one open pit gold mine at Touquoy, which declared commercial production in March 2018. The life of mine expansion involves satellite deposits at Beaver Dam, Fifteen Mile Stream and Cochrane Hill (Figure 2.2-1).

Figure 2.2-1: Atlantic Mining NS Inc. (St Barbara) Projects



2.2.2 Mineral Tenures

2.2.2.1 Beaver Dam Property

Mineral exploration and mining licences are issued by the Nova Scotia Department of Energy and Mines (NSDEM) under the *Mineral Resources Act* of 2016 (amended in 2018). Exploration licences are granted for two-year terms, and are renewable indefinitely, provided certain annual conditions are met. Exploration licences can contain a maximum of 80 bordering mineral claims. Mining licences are granted for 20-year terms and can be renewed an indefinite number of times at the discretion of the Minister for Natural Resources.

The Beaver Dam property is held under two exploration license EL50421 and EL51852. The EL EL50421 comprises 76 contiguous claims that cover an area of approximately 1, 230 ha and EL51852 comprises 7 claims and covers 113 ha. Exploration Licence 50421 is an amalgamation of EL 05920 and EL 06175, which was reissued as EL 50421 in August 2014. Exploration Licence 05920 represented the amalgamation of three pre-existing Exploration Licences 00047, 04790 and 04516. The Exploration Licences were regrouped in 2003 as EL 05920 and reissued by the NSDEM in 2005. The Mineral Tenure details are provided in Table 2.2-1 and Figure 2.2-2.

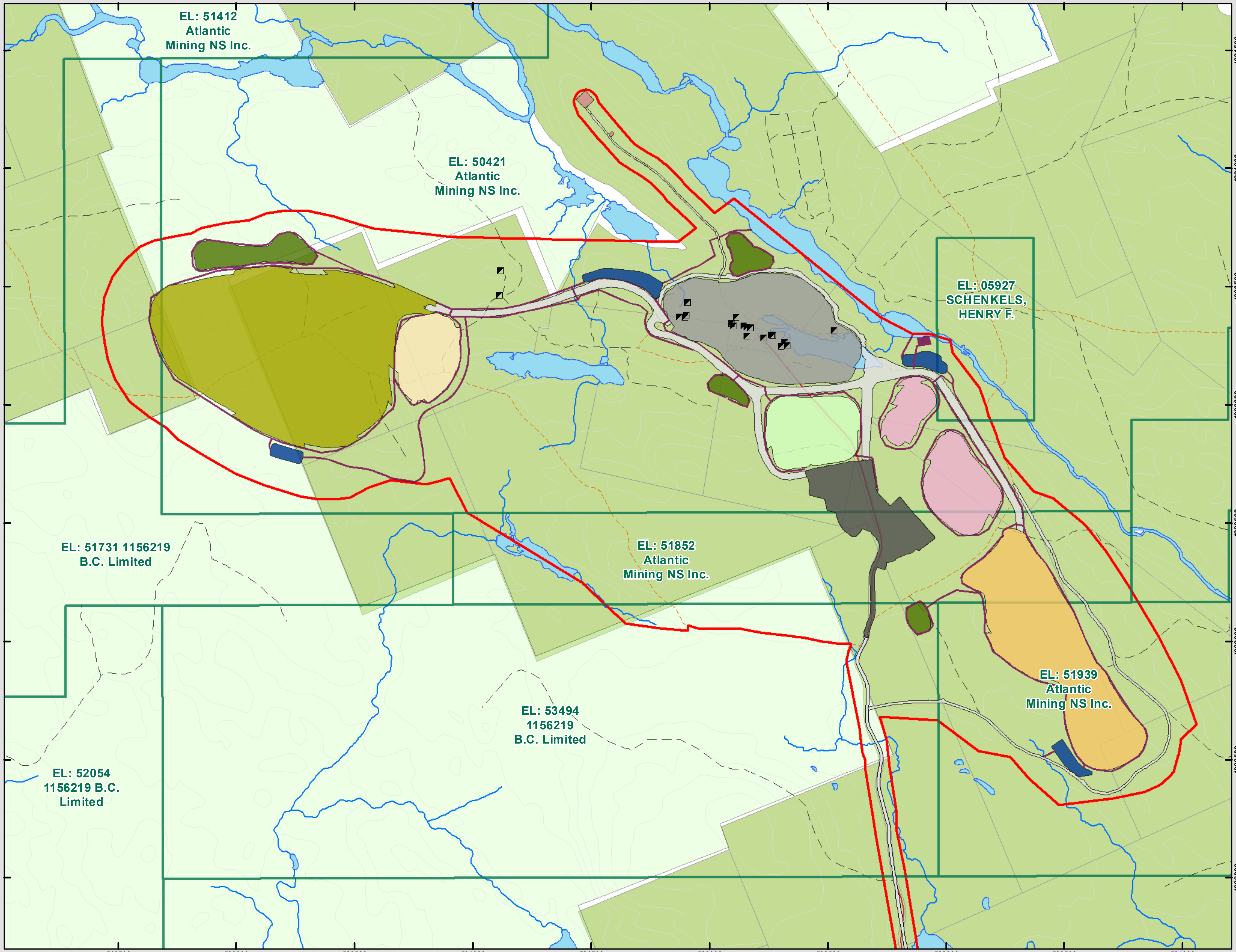
Prepared For:

Atlantic Gold

FIGURE 2.2-2

Beaver Dam Mine Project

Exploration License Boundaries



Proposed Infrastructure

- Crusher Pad
- Open Pit
- Low Grade Stockpile
- NAG Stockpile
- PAG Stockpile
- Organic Material Stockpile
- Topsoil Stockpile
- Till Stockpile
- Explosive Storage
- Road
- Settling Pond
- Water Management
- Historical Mine Workings
- Topo Line - 5m contour
- Local Road
- Dry Weather / Seasonal Road
- Track
- NSTDB Watercourse
- Lake
- Crown Lands (Not surveyed)
- Northern Timber (Not surveyed)
- Exploration Licence
- Project Area

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

0 125 250 500 m

1:15,000 Scale when printed @ 11" x 17"

Drawn By: LP
Reviewed By: XX

Date: 2021-04-12

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X Exploration License Boundaries

Table 2.2-1: Mineral Tenures

EI	Holder	Granted	Location	NTS	Tract	Claims	No.	Regional Municipality
Beaver Dam								
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	58	EFKLOPQ	7	Halifax
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	59	EFGHJKLMNOPQ	12	Halifax
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	60	EFGHJKLMNOPQ	12	Halifax
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	61	ABCDEFGH	8	Halifax
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	62	ABCDEFGHJKLM	12	Halifax
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	63	ABCDEFGHJKLMPQ	14	Halifax
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	64	DEFKLMNOPQ	10	Halifax
50421	AMNS	13-May-76	Beaver Dam	11 E 02 A	65	N	1	Halifax
51852	AMNS	07-Dec-15	Beaver Dam	11 E 02 A	58	CD	2	Halifax
51852	AMNS	07-Dec-15	Beaver Dam	11 E 02 A	59	ABCD	4	Halifax
51852	AMNS	07-Dec-15	Beaver Dam	11 E 02 A	60	A	1	Halifax

Haul Road does not require mineral leases because not extracting materials.

2.2.2.2 Touquoy Property

Mineral rights to the Touquoy Property are wholly owned by AMNS and consist of one mineral lease (MLE11-1) comprising 49 claims and covering 793 hectares (ha), and one adjoining Exploration License (EL10377) comprising 64 claims and covering 1,036 ha.

2.2.3 Surface Rights

2.2.3.1 Beaver Dam Property

Under the current *Mineral Resources Act*, prospectors and exploration companies must obtain permission from the landowner (whether private or Crown) prior to accessing licences.

At the Beaver Dam Mine Site, AMNS is in process of negotiation surface titles with Northern Timber Nova Scotia Corporation (Northern Timber) as well as applying for crown land lease parcels. Surface leases have been negotiated on portion of the haul road (i.e., near the intersection of the Mooseland Road). The remaining surface rights are currently under negotiations with Northern Timber and applications crown lease parcels.

2.2.3.2 Haul Road

The Haul Road will be under lease from Forestry companies and/or part of a purchasing arrangement, which is currently being negotiated.

2.2.3.3 Touquoy Property

At Touquoy, AMNS holds (i.e., holds fee simple title to and possesses) of the private land required for the operation of the Touquoy mining operation. A Crown land lease to seven parcels of Crown land was granted in June 2014. The lease is for a 10-year term, renewable for a further 10 years.

2.3 Project Location

The Project consists of the Beaver Dam Mine Property (i.e., mining and storing of waste rock), a 31-kilometre (km) haul road that connects to the two sites and the Touquoy Property (i.e., processing, and depositing tailings) (Figure 2.3-1). This collective area is defined as the Project Area (PA) (Figure 2.3-1). The Project will result in approximately 243 hectares (ha) of direct habitat disturbance from infrastructure placement, of which 34 ha, or 14% is on crown land.

2.3.1 Beaver Dam Mine

The Beaver Dam Mine Property is in Marinette, Regional Municipality of Halifax Area, Nova Scotia, which is approximately 85 km northeast of Halifax. The Beaver Lake IR is located approximately 6 km of the Beaver Dam gold deposit and 5 km from the intersection of the Beaver Dam Mines Road and Highway 224. The community of Mooseland is approximate 1 km from the intersection of the Beaver Dam Haul Road and the Mooseland Road. Goods and services needed are generally sourced from Halifax/Dartmouth. The Beaver Dam Mine layout is provided in Figure 2.3-2. The Beaver Dam Mine infrastructure placement (i.e., mine site footprint or layout) will result in approximately 208 ha of direct habitat disturbance, of which 26 ha, or 14%, is on crown land. The approximate centre point of the Beaver Dam Mine Site is 521319 E 4990700 N (UTM Zone 20 NAD83 CSRS).

2.3.2 Haul Road

The Haul Road extends from the Beaver Dam Mine Site to the Touquoy Mine Site (Figure 2.3-3). Bypass roads to allow light truck traffic and recreational vehicles (e.g., ATV and snowmobiles) to maintain access during operations will be constructed adjacent and parallel to portions of the Haul Road. The approximate disturbance area of the Haul Roads is 25 ha and bypass roads are expected to disturb approximately 10 ha, with a total disturbance area of 35 ha, of which 10 ha, or 30% is on crown land. The Haul Road consists of the following four main segments:

- 7.2 km existing Beaver Dam Mines Road, that extends east from the proposed mine site to Highway 224, which will be upgraded to support ore transport and will include bypass road.
- 4 km of new constructed road west of Highway 224 to connect the Haul Road to an existing forestry road, this section will not include bypass road.
- 8.2 km existing forestry road that extends east to the Mooseland Road, referred to locally as the Dump Road, will be upgraded to support ore transport truck and will include bypass road.
- 10.7 km Mooseland Road that will be upgraded by Department of Transportation and Infrastructure Renewal (TIR) extends north along the Mooseland Road to the existing Touquoy Mine. By-pass roads crossing and parking area is currently being considered in the design to address safety concerns by local residents.

It may be necessary to use the Public Roads during start-up (i.e., 6 to 8 months) depending on approval and permitting timelines and construction restrictions.

2.3.3 Touquoy Mine

The Touquoy property is located 60 km northeast of Halifax, Nova Scotia, which is centered on the former mining village of Moose River Gold Mines. Halifax provides the majority of goods and services required by the Project. The closest population centres are Middle Musquodoboit located 20 km to the northwest and approximately 12 km from the community of Mooseland which is located to the southeast. The Touquoy Mine Site is shown in Figure 2.3-4. There is no anticipated disturbance to the exiting Touquoy Mine site that will result from processing Beaver Dam ore. The approximate centre point of the Touquoy property is 505280.58E 505280.58N UTM Zone20 NAD83 CSRS.

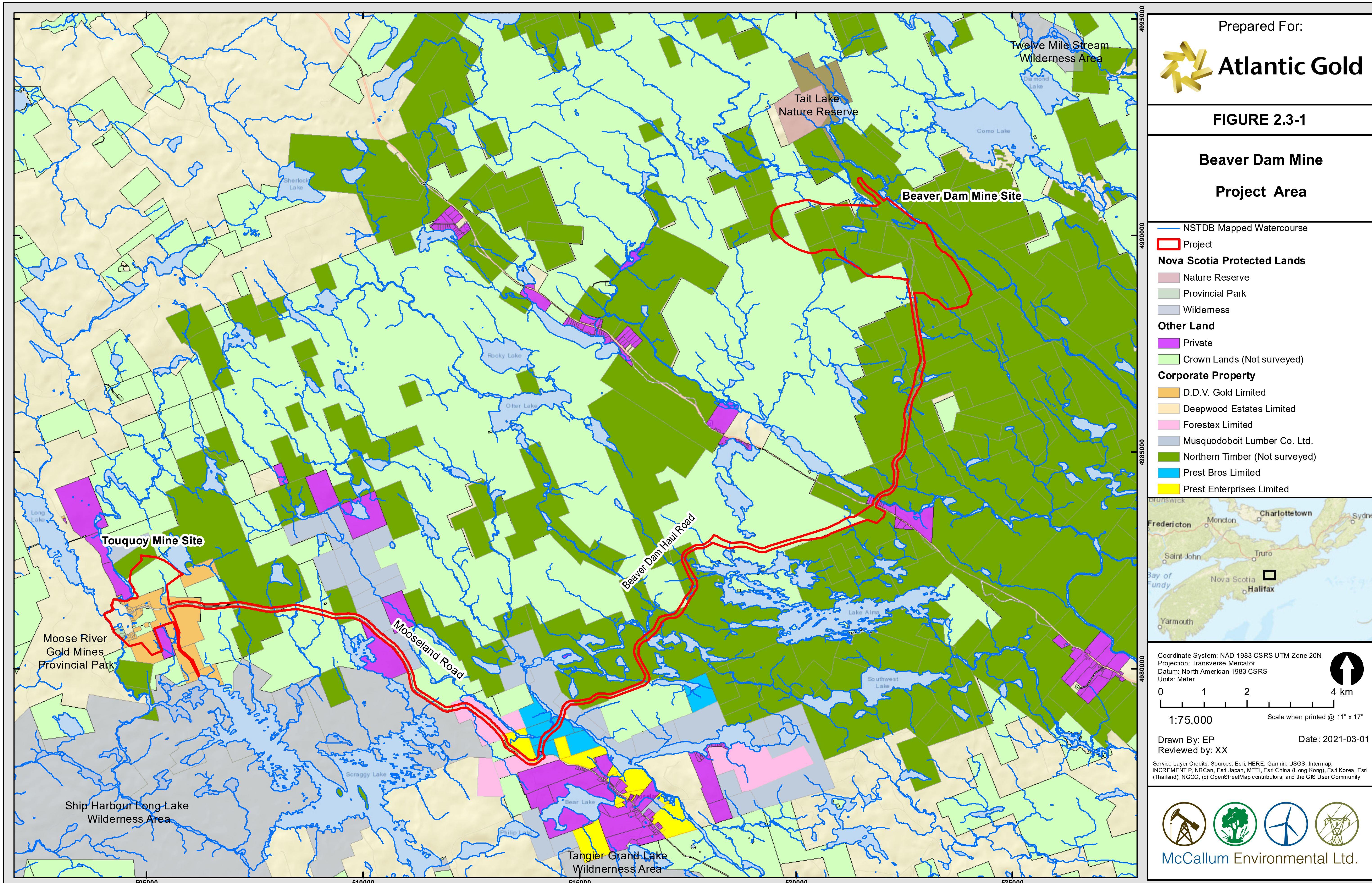


FIGURE 2.3-1

Beaver Dam Mine Project Area

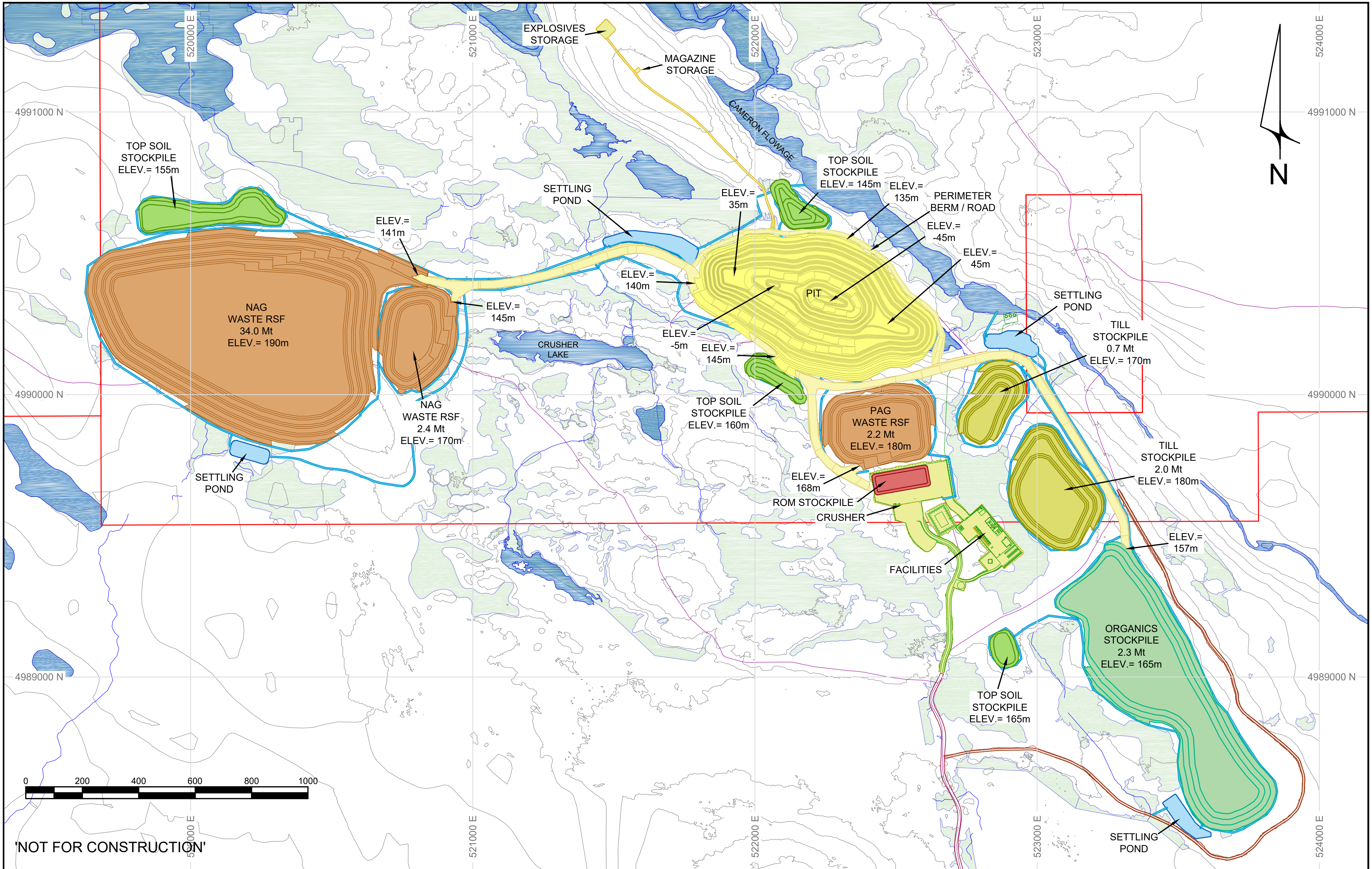


FIGURE 2.3-2
BEAVER DAM MINE PROJECT MINE SITE LAYOUT

DATE:	2021/05/12	APPR'D BY:	MS
DRAWN BY:	DH	FILE:	EOP 2027 (210512)
		PROJECT:	AG_BVD_2021

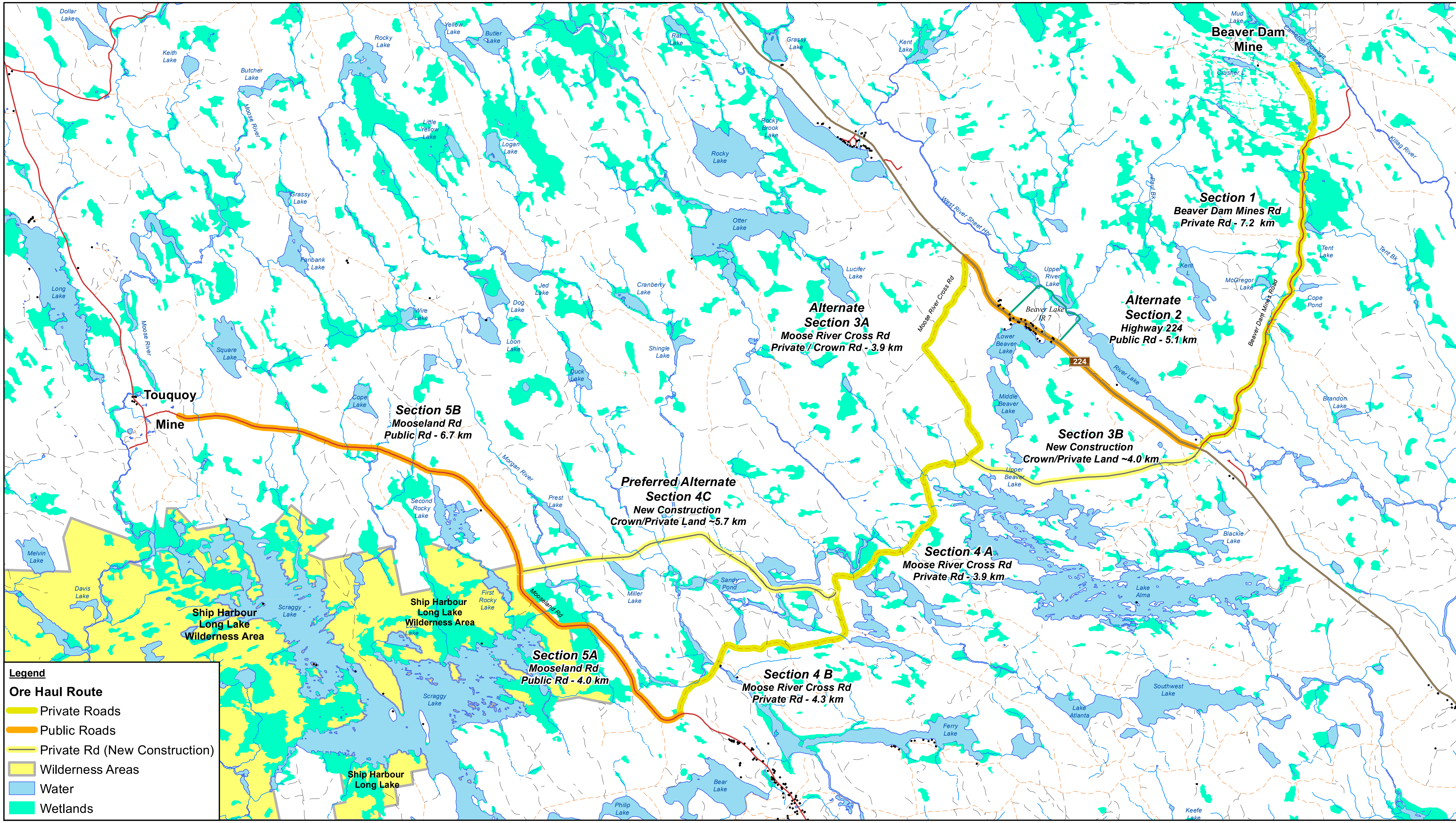
Moose Mountain Technical Services

Atlantic Gold
A St Barbara Ltd Company

LEGEND

- PROPOSED PITS
- WASTE RSF
- HAUL ROAD
- MINE FACILITES PAD
- ORE STOCKPILES
- TOPSOIL STOCKPILE
- TILL STOCKPILE
- WET TILL STOCKPILE
- WETLANDS
- LAKES
- WATER MANAGEMENT DITCH
- WATER MANAGEMENT POND
- CLEAN WATER DITCH
- SITE INFRASTRUCTURE
- CULVERT
- SITE ACCESS
- ROAD DETOUR
- EXISTING ROADS
- WATERCOURSE
- MINERAL CLAIMS BOUNDARY
- TOPOGRAPHY

CONTOURS AT 5m INTERVALS



Source: Service Nova Scotia (Water, Wetlands, Roads), NS Environment (Protected Areas), Atlantic Gold (Route)

0 600 1,200 1,800
Metres

Coordinate System:
NAD 1983 CSRS UTM Zone 20N

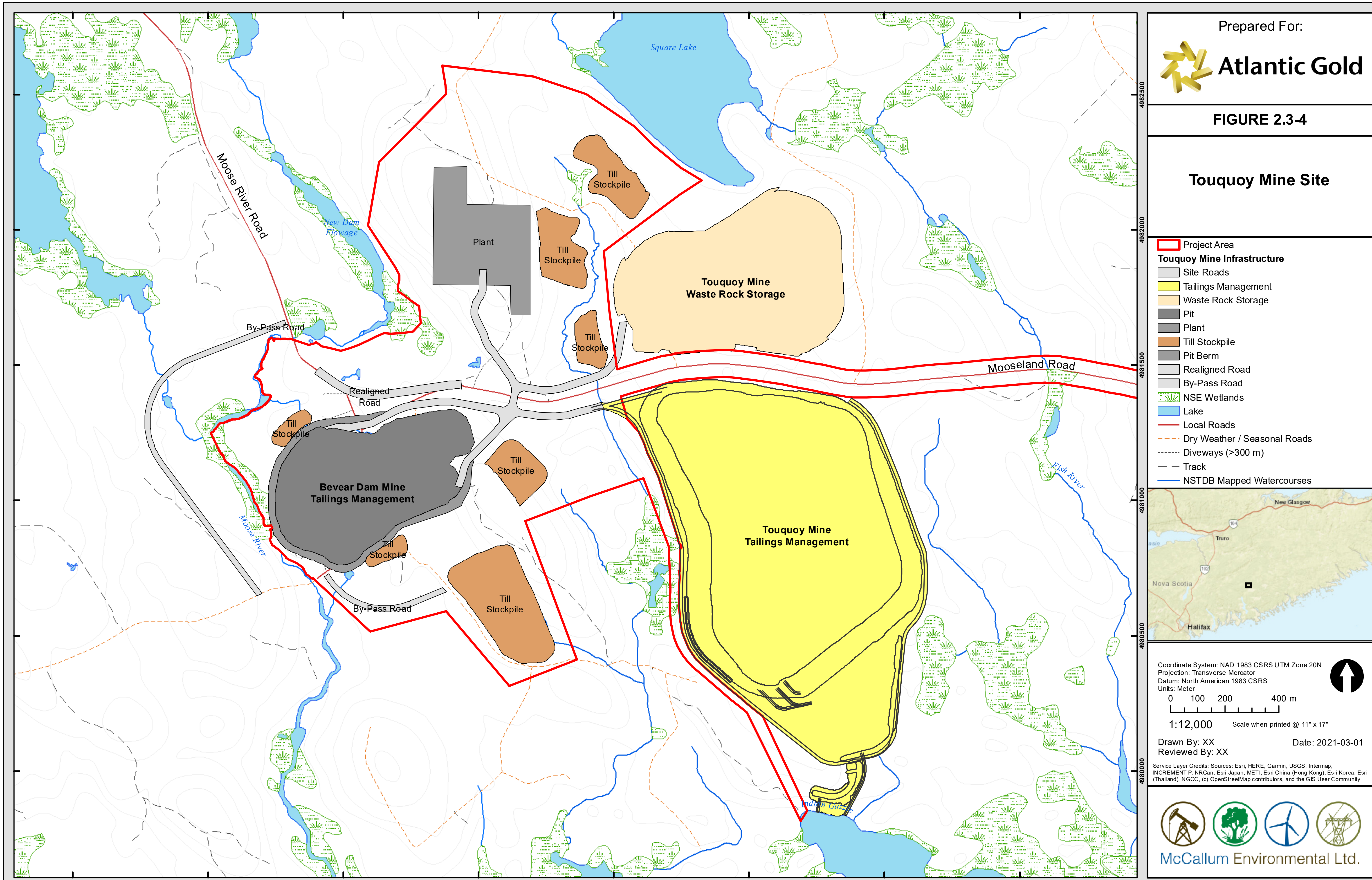
ATLANTIC GOLD CORPORATION
MARINETTE, HALIFAX CO., NOVA SCOTIA
ENVIRONMENTAL IMPACT STATEMENT - BEAVER DAM MINE

088664
Feb 14, 2019

HAUL ROAD ROUTE WITH ALTERNATES

FIGURE 2.3-3

GIS File: I:\GIS_DATA\Projects\6-chars\08----\088---\088664 Atlantic BD\088664(004)\Revised2018\088664(004)GIS-DA008.mxd


Prepared For:
Atlantic Gold
FIGURE 2.3-4
Touquoy Mine Site
Project Area
Touquoy Mine Infrastructure
Site Roads
Tailings Management
Waste Rock Storage
Pit
Plant
Till Stockpile
Pit Berm
Realigned Road
By-Pass Road
NSE Wetlands
Lake
Local Roads
Dry Weather / Seasonal Roads
Diveways (>300 m)
Track
NSTDB Mapped Watercourses
New Glasgow
Truro
Nova Scotia
Halifax
Coordinate System: NAD 1983 CSRS UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter
0 100 200 400 m
1:12,000
Scale when printed @ 11" x 17"
Drawn By: XX
Reviewed By: XX
Date: 2021-03-01
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
McCallum Environmental Ltd.
Document Name: BD_EIS_Fig2.1-X General Touquoy Arrangement
Square Lake
Moose River Road
New Dam Flowage
Plant
Till Stockpile
Touquoy Mine Waste Rock Storage
By-Pass Road
Realigned Road
Mooseland Road
Bevear Dam Mine Tailings Management
Touquoy Mine Tailings Management
Moose River
Fish River
503500
504000
504500
505000
505500
506000
506500
507000
4982500
4982000
4981500
4981000
4980500
4980000

2.4 Ecological Setting

2.4.1 Physiography and Drainage

The proposed Beaver Dam Mine and Touquoy Mine is located within the Eastern Drumlins ecodistrict, a further subdivision of the Eastern ecoregion of NS. The ecodistrict is characterized by drumlin fields with generally north-south oriented drumlins. Beaver Dam is an area of low topographic relief with most of the area being around 140 metres above sea level (masl) with scattered drumlins reaching 160 masl.

At the Beaver Dam Mine drainage is to the southeast along a number of poorly drained streams and shallow lakes. Drainage in the area generally flows to the southeast along poorly drained streams, shallow lakes, and wetlands that eventually drain into Cameron Flowage and the Killag River. A drainage divide is present within the proposed Beaver Dam Mine Site, with drainage towards the south through Paul Brook (AMNS 2021). Locally, water in the eastern portion of the Site is directed toward an artificial historical settling pond with the remains of a dam that is maintaining the water level in the pond. Overflow from the historical settling pond is directed into Cameron Flowage and the Killag River. There are a number of boggy areas within the property. The Cameron Flowage/Killag River, Crusher Lake, Mud Lake, Tent Brook and Cope Brook (Beaver Dam Mine Site area) and associated drainage are the watercourses that will receive direct discharge and/or their catchment area. The vegetation consists of spruce, fir, and some hardwood. Logging has been widely carried out more recently including clear cutting in the immediate area of the deposit. Historic mining has occurred within the proposed Beaver Dam Mine property, which is detailed in Section 2.5 and Section 6.5 (Geology, Soils and Sediment Quality).

The Haul Road is located in generally low-lying area with a mosaic of upland forests and wetlands. Forestry is the main land use that continues in the area and the existing road was constructed to allow access for logging. There is evidence of historic mining along the haul road.

At Touquoy Mine catchment areas drain mainly to the Moose River and its tributaries with the southern area of the property draining to Scraggy Lake. The runoff from the site infrastructure areas has been altered and is managed and controlled by means of collection ditches and ponds with collected water being discharged to Scraggy Lake. Fish River drains Square Lake to Scraggy Lake and both lakes are part of the Fish River Watershed that flows west and then south into Lake Charlotte, eventually draining to Ship Harbour.

2.4.2 Climate

The Project is located inland and somewhat removed from the immediate climatic influence of the Atlantic Ocean. It is characterized by warmer summers and cooler winters. Daily rainfall, snowfall and mean temperature data were obtained from the Environment Canada Middle Musquodoboit Climate Station (Climate ID 8203535) for a 41-year period between 1968 to 2016. Monthly lake evaporation normals were obtained from the Environment Canada Truro Climate Station (Climate ID 8205990), which is the closest climate station to the Project that collects lake evaporation data.

The average monthly temperature at the Site ranges from a low of -6.2°C in January to a high of 18.5°C in July. The lowest average total monthly precipitation occurs in June (94.8 millimetres [mm]), while the highest occurs in November (137.1 mm). Hurricanes are also possible in this region. The largest hurricane on record, recorded at Halifax International Airport (approximately 80 km west of the Site), was Hurricane Beth in 1971 with 296.4 mm of rainfall over 48 hours. This has been considered in the development of water management structures (i.e., settling ponds and diversion ditches) at the Beaver Dam Mine Site (Section 2.7.2.9).

Nova Scotia Environment and Climate Change (NSECC) provides climate change projections across the province (NSE 2020). The two climate regions nearest the Project (i.e., Halifax Regional Municipality and Truro, NS) project a 5% increase in short period rainfall intensity for the 2020s according to NSE (2020). As such, a 5% increase to the historic Intensity, Duration and Frequency (IDF) curve was incorporated into the design of water management structures at Beaver Dam Mine site and are therefore sized to consider climate change Appendix P.4 (Mine Water Management Plan).

2.4.3 Current Land Use

The Project occurs within an area used for forestry with existing road used to access logging areas. The area is used by recreational hunters and fishers. The existing roads are used by light vehicles and recreational vehicles to access areas lakes and rivers as well as access east of the Killag River where there are camps and gathering sites. AMNS has and continues to undertake geological and geotechnical drilling to support the EIS and mine plans. Environmental monitoring is ongoing to support the Project.

The Nova Scotia Salmon Association (NSSA) leads the West River Sheet Harbour Acid Mitigation Project, which involves the operation and maintenance of automated lime dosers on both the Killag River and the West River (NSSA 2020). The lime doser on the Killag River is situated downstream from the proposed Project. The lime dosers are intended to buffer the naturally low pH of river water downstream to a more suitable pH to support Atlantic salmon and brook trout (NSSA 2020). In addition to these liming efforts, the NSSA conducts monitoring of Atlantic salmon (e.g., annual smolt monitoring, adult monitoring, electrofishing surveys) as well as other ecosystem components, such as invertebrates and water chemistry (NSSA 2020).

Touquoy Mine is currently an operating mine and land use in the area includes recreation, hunting and fishing as well as traditional land pursuits.

2.4.4 Traditional Land Use

The Confederacy of Mainland Mi'kmaq (CMM) was retained in 2009 by GHD Limited on behalf of the AMNS to complete a Mi'kmaq Ecological Knowledge Study (MEKS; Appendix M.1) for the proposed Project at the Beaver Dam Mine Site. In 2015, CMM was retained to update the MEKS, due to changes in the Haul Road to include approximately 4 km of new construction. CMM was then retained again in 2016 to finalize the MEKS to include the revised Project Area (PA) and any additional information.

In addition to the MEKS cited above, in 2018, a Traditional Land and Resource Use Study (TLRUS; MFC 2019 – Under Confidential Cover) was undertaken by Millbrook First Nation to document historical and current use of the Project Area and surrounding areas by the Millbrook First Nation. This document was shared with AMNS under a confidentiality agreement. AMNS has integrated information obtained from the TLRUS, with permission from Millbrook First Nation, in appropriate sections of the EIS.

There are a number of activities associated with the harvest and use of plants, animals and fish within the PA and in the Local Assessment Area (LAA) that relate to historical traditions and customs of the Mi'kmaq that are still practiced today. As described, the TLRUS (MFC 2019 – Under Confidential Cover), the MEKS and residents of the Beaver Lake IR 17 identify trapping and hunting activities, plant and berry gathering, and fishing in, near and surrounding the PA for purposes of sustenance, spiritual and cultural practice. The TLRUS (MFC 2019 – Under Confidential Cover) described the frequency of use within the LAA which can be summarized as regular: weekly to annually across all seasons. This means the area was, and still is, an important resource area for the Millbrook First Nation community members and by extension, all Mi'kmaq of Nova Scotia, and any Project activities may have potential impacts on the ability of the Mi'kmaq of Nova Scotia to access certain areas to practice their rights where species with important cultural relevance may be found. Wild meat was traditionally a staple of the Millbrook First Nation diet, and a few of the harvesters interviewed for the TLRUS (MFC 2019 – Under Confidential Cover) indicated they rely mainly on this food source and they share their food with other community members, rather than purchase their meat at a local supermarket.

2.4.5 Significant Areas

Some Mi'kmaq community members have camps on Crown land where they go to enjoy peaceful recreational and traditional activities with family and community members. There camps are documented within 1 km of the Haul Road and multiple other camp locations throughout the LAA (MFC 2019 – Under Confidential Cover) The approximate distances of these areas from the PA (i.e., Beaver Dam Mine Site, Haul Road, and Touquoy Mine Site) is summarized in Table 2.4-1.

Table 2.4-1: Protected Areas with Provincial Designation

Provincially Designated Areas	Approximate Distance (From Beaver Dam Mine Project Area)	Direction	Type of Designation
Tait Lake Nature Reserve	1 km from Beaver Dam Mine Site	North	Nature Reserve
Cowan Brook Nature Reserve	9.5 km from Touquoy Mine Site	South	Nature Reserve
Twelve Mile Stream Wilderness Area	4.5 km from Beaver Dam Mine Site	Northeast	Wilderness Area
Liscomb Game Sanctuary	7.3 km from Beaver Dam Mine Site	East	Game Sanctuary
Tangier Grand Lake Wilderness Area	2.2 km from intersection of Moose River Cross Road and Mooseland Road	South	Nature Reserve
Ship Harbour Long Lake Wilderness Area	Adjacent to Mooseland Road	West	Nature Reserve

2.5 Project History

2.5.1 Beaver Dam Mine

The proposed Beaver Dam mine site has been subject to exploration and mining activity since gold was first discovered in 1868. Between 1871 and 1949, there were intermittent attempts to develop and mine the area, initially focused on the Austen Shaft area and later the Mill Shaft area located approximately 1.2 km west of the Austen Shaft. The small Papke Pit located approximately 400 m west of the Austen Shaft was excavated in 1926; however, the majority of development was focused on a belt of quartz veins in greywacke and slates that was approximately 23 m wide where intersected from the Austen Shaft. Approximately 967 ounces (oz) of gold production is recorded for Beaver Dam between 1889 and 1941. From 1978 until 1988, several companies drilled a combined 251 diamond drill holes for 47,935 metres (m). Some of these drill holes were completed underground via an exploration decline installed in the mid-1980s that reached a maximum depth of 100 m below surface. In 1987, a small open pit was also excavated in the Austen Shaft zone. Approximately 2,445 oz of gold production was also recorded for Beaver Dam between 1986 and 1989. Between 2005 and 2009 two companies drilled a combined 153 diamond drill holes for 22,010 m and completed several other exploration programs including an aeromagnetic survey, a till survey, and a follow-up reverse circulation drilling program for geochemical purposes. Additional details on historic mining at the Beaver Dam Mine Site is provided in Section 6.5 (Geology, Soil, and Sediment Quality).

AMNS secured rights to the property in 2014 and executed an exploration program whereby 38 diamond drill holes for 7,810 m were completed over the proposed surface mine area with the goal of increasing subsurface knowledge of the site and converting inferred gold resources to measured or indicated resources

There is evidence of historical mining at the site, including access roads/laydown areas, abandoned cabins, hunting blinds, old mine workings, dam structures, apparent building foundations, waste rock piles, and an old mining excavation. There are currently no permanent buildings in use and the site is not serviced. AMNS is committed to removing the historic tailings and waste rock from the site and disposing in the mined-out pit at Touquoy.

AMNS has undertaken exploration activities with the proposed Beaver Dam Mine Site. A project description was submitted to IAAC in 2015 (Atlantic Corporation 2015) with an EIS submitted in 2017 (AGC 2017). A revised EIS was submitted in February 2019 to address the first-round information requests. This updated Project Description and EIS is submitted to address changes in the Project Description and advances in detailed engineering as well as to address the second-round of information requests (AMNS 2021a).

2.5.2 Touquoy Mine

In 2012, an application for Industrial Approval and supporting documentation was prepared by Conestoga-Rovers & Associates (CRA) (CRA 2012) and submitted to NSE on behalf of AMNS. The application was based on the feasibility level design completed by Golder Associates Ltd. (Golder) in 2007 and revised in 2010. The 2011 Preliminary Reclamation plan (CRA 2011) was submitted as part of the Industrial Approval Application. The Industrial Approval application was approved on March 24, 2014, under Approval No. 2012-084244.

Following receipt of the initial Industrial Approval in March 2014, an update to the project feasibility level design was completed in July 2015 by Stantec (Stantec, July 7, 2015) to include updates to the mine development plan primarily relating to design changes for the Tailings Management Facility (TMF). The design was finalized, and drawings issued for construction in 2016 by Stantec.

The Project has and is currently in the process of applying for amendments with the NSE for modifications of infrastructure. A Class 1 Provincial Environmental Assessment for the site will be submitted later in June 2021. This will be followed by Industrial Approval amendment applications.

2.6 Geology and Resources

2.6.1 Regional Geology

In Nova Scotia, two distinct geological terranes, the Avalon Terrane to the north and the Meguma Terrane to the south, are juxtaposed along the Cobequid–Chedabucto Fault Zone (CCFZ).

The Avalon Terrane comprises multiple successions of sedimentation and volcanism, together with felsic to mafic igneous intrusion. A number of metalliferous deposits have been recognized in the Avalon Terrane, mostly within Pre-Cambrian rocks, including carbonate hosted zinc skarn deposits, stratabound massive sulphide deposits, quartz-vein hosted high-grade gold mineralization in gneiss and diorite, polymetallic volcanic-hosted massive sulphide deposits in volcanic rocks and porphyry-style mineralization (Donohoe, 1996).

The Meguma Terrane consists of marine sedimentary and volcaniclastic rocks together with bimodal volcanic rocks. The terrane has hosted most of the gold mineralization exploited historically (from 1860 onward) in Nova Scotia with approximately 1.2 million ounces of gold (Moz Au) produced (Bierlein and Smith, 2003).

Post juxtaposition, a series of shallow basins developed on both sides of the CCFZ. These are infilled by slate, quartzite and volcanic rocks of the Rockville Notch Group, and range in age from Early Silurian to Early Devonian (White and Barr, 2012).

Numerous, late syntectonic to post-tectonic, mainly Middle to Late Devonian, peraluminous, granitic plutons have intruded the earlier sequences (White and Barr, 2012).

The oldest known rocks of the Meguma Terrane are the greywackes and argillites of the Cambrian to Ordovician-aged Meguma Supergroup. The Meguma Supergroup is divided into two stratigraphic units, the basal greywacke dominated Goldenville Group and the overlying, finer-grained, argillite-dominated Halifax Group (Figure 2.6-1).

The basal contact of the Goldenville Group is not known, but the Goldenville Group is at least 5,600 m thick while the overlying Halifax Group averages approximately 4,400 m. These sediments were uplifted and deformed into a series of tightly-folded, subparallel, northeast-trending anticlines and synclines during the Acadian Orogeny (ca. 410–380 Ma). The sediments have been metamorphosed to greenschist to amphibolite (staurolite) facies and have been intruded by granites and minor mafic intrusions.

The Goldenville Group comprises, from oldest to youngest:

- Moose River Formation;
- Tangier Formation; and
- Taylors Head Formation.

2.6.2 Beaver Dam Deposit (Resource)

The Beaver Dam deposit is hosted in the southern limb of a north-dipping overturned anticlinal fold. The Moose River Formation is relatively thick in the vicinity of the Beaver Dam deposit (Figure 2.6-1 and Figure 2.6-2). The host stratigraphy is offset into segments by two northwest trending faults; the sinistral Mud Lake Fault and the dextral Cameron Flowage Fault. The Mud Lake Fault truncates, and forms the eastern boundary to, the Main Zone mineralization.

Lithologies at Beaver Dam have been metamorphosed to amphibolite facies (biotite grade) increasing to higher (staurolite) grade with proximity to the River Lake Pluton, the contact of which is about 2 km west of the Beaver Dam deposit.

Gold mineralization at Beaver Dam has been recognised over a strike length of approximately 1.4 km, extending from the Main Zone northwest to the Mill Shaft Zone. Historic drilling has shown that mineralization weakens between the Main Zone and Mill Shaft Zone. The eastern end of the main zone is controlled by the Mud Lake Fault and possible offsets to the mineralization have been identified between the Mud Lake and Cameron Flowage faults and in the Northeast Zone, immediately east of the Cameron Flowage Fault.

The mineralised zone can reach as much as 100 m in width with better gold grade (e.g., >0.5 grams per tonnes [g/t]) material typically confined to 5 to 40 m widths within that zone. Mineralization has been identified in historical drill holes at vertical depths of >600 m below surface and remains open below that depth.

Gold mineralization is hosted within quartz veins and within the argillite and greywacke host rocks. Mineralized quartz veins are typically 0.5 to 20 cm in thickness, are commonly bedding parallel, but can also include cross-cutting veins. Sulphide assemblages include pyrrhotite, pyrite and/or arsenopyrite with lesser chalcopyrite, galena or sphalerite. Gold commonly occurs within quartz veins as coarse (>1 mm) grains and clusters of finer, but still visible (<1 mm), grains. Coarse gold grains are more likely to be found at vein-wall rock contacts and are often spatially associated with sulphides.

In the immediate vicinity of the deposit the host stratigraphy has been subdivided into several mappable units, from oldest to youngest: the Crouse Mudstone, Hangingwall Greywacke, Papke Mudstone, Millet Seed Sandstone and Austen Mudstone. The mineralized zone appears to gently cross-cut this macro-stratigraphy. Gold mineralization is often associated with sulphides including pyrrhotite, pyrite, arsenopyrite, and chalcopyrite.

Figure 2.6-1: Beaver Dam Deposit

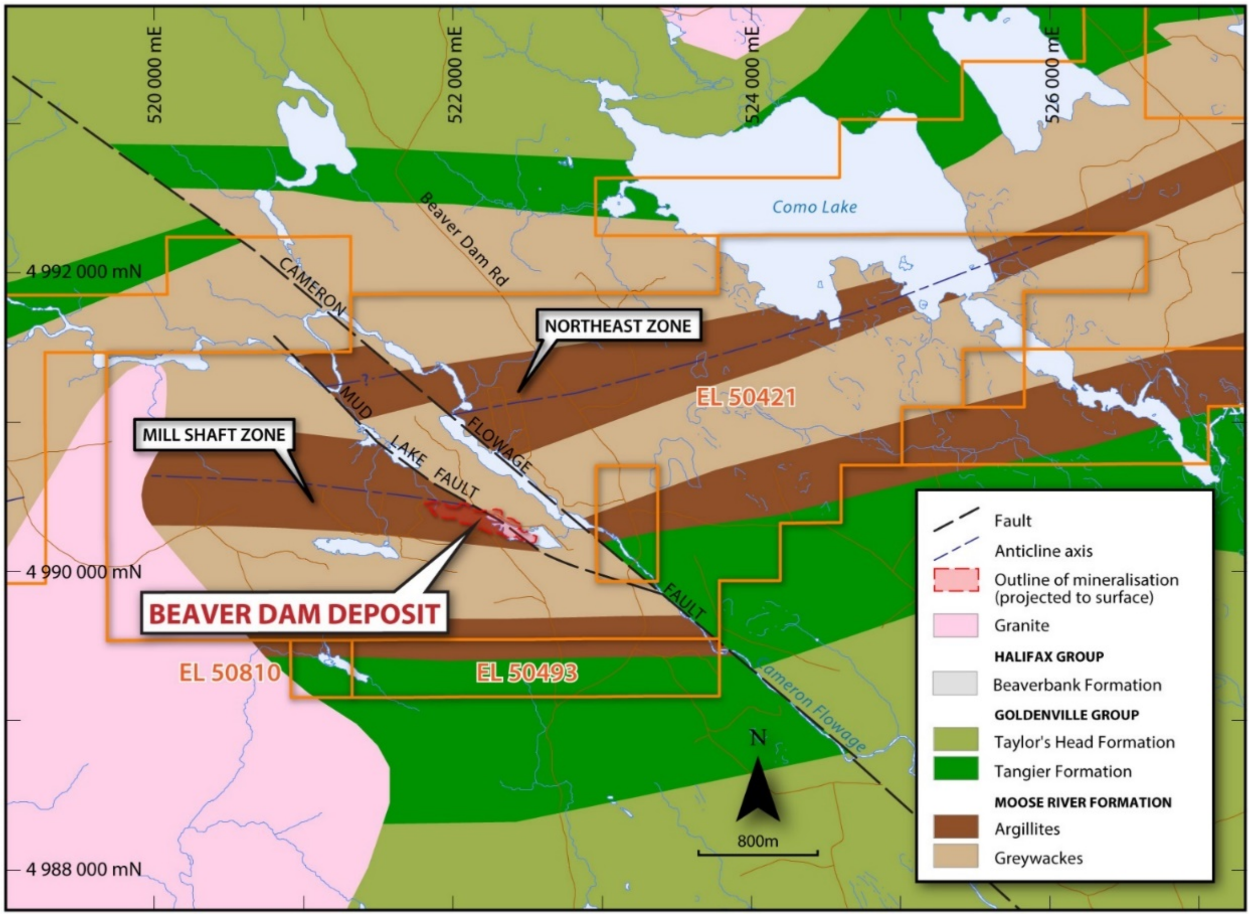
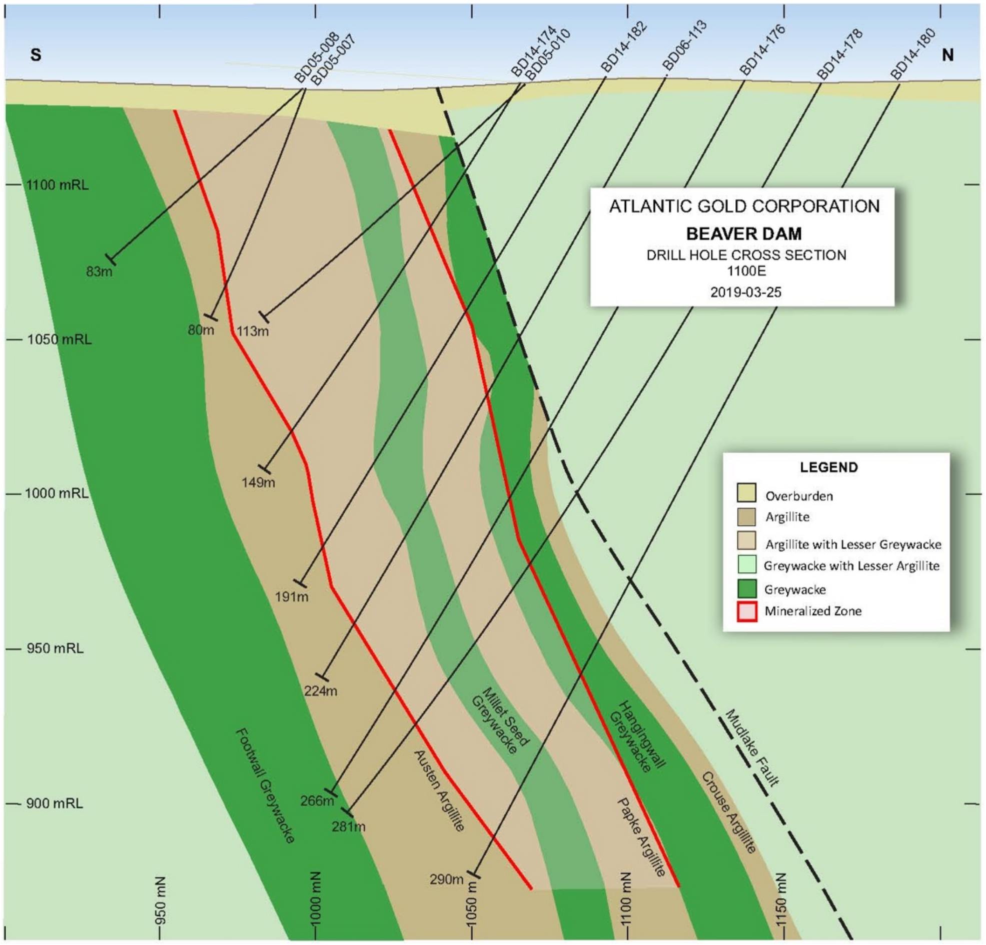


Figure 2.6-2: Cross Section of Beaver Dam Deposit



2.7 Project Components

The Beaver Dam Mine Project will operate as a satellite surface mine that will transport crushed ore along an approximately 31 km Haul Road to the Touquoy Mine in Moose River. Tailings will be disposed of in the exhausted Touquoy open pit.

The primary components associated with the Beaver Dam Mine Project include the following:

- Beaver Dam Mine Site:
  - Open pit for extracting ore and waste rock;
  - Mine site Haul Roads;
  - Waste material storage piles for waste rock (non-acid generating (NAG) and potential acid generating (PAG), one topsoil, three till and one organics stockpiles;
  - Run of mine (ROM), and low-grade ore (LGO) stockpiles;
  - Optional primary crusher;

  - Operational facilities; and
  - Water management.
- Haul Road any bypass roads for transporting ore; and
- Existing Touquoy Mine Site.

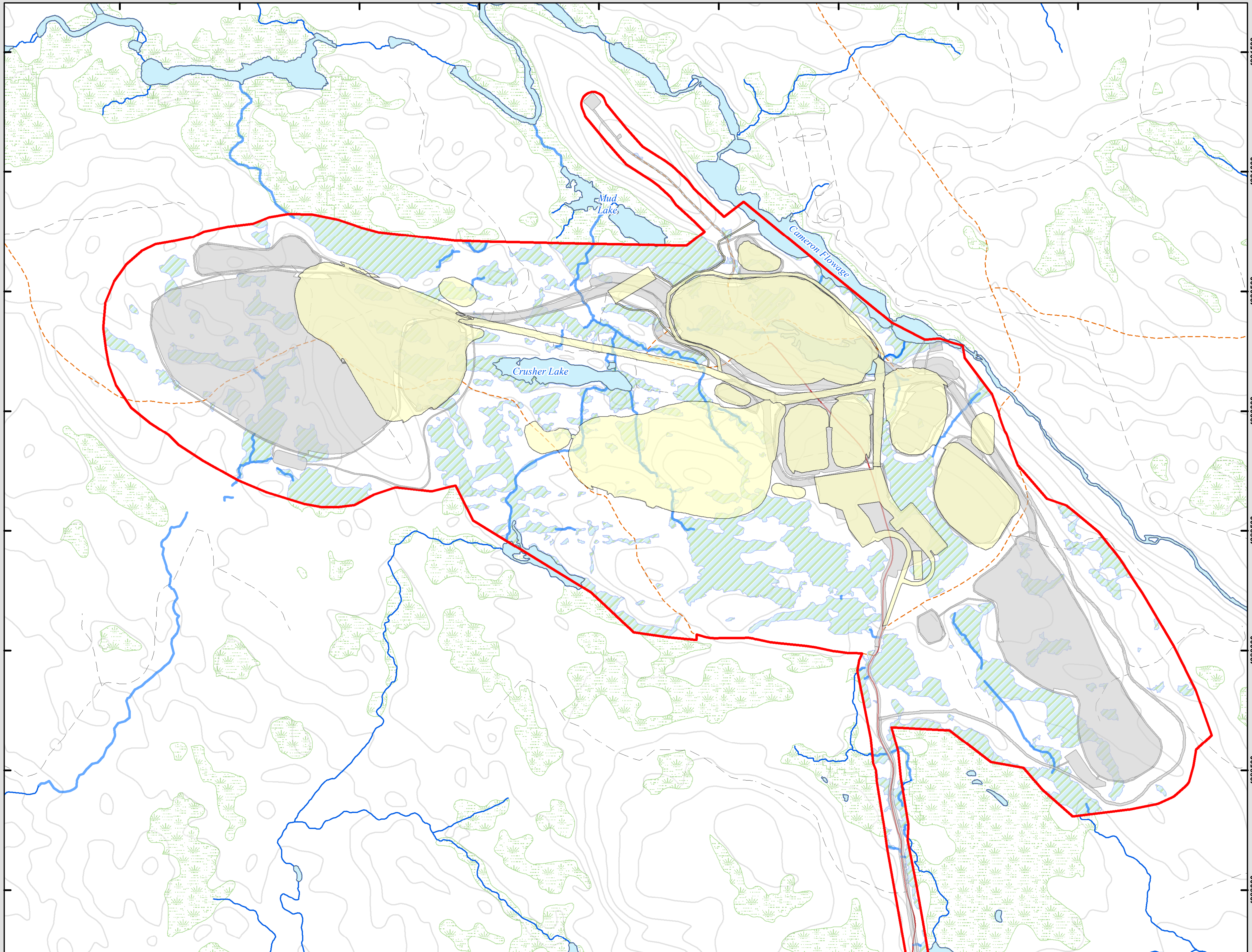
The location of components at the Beaver Dam Mine Site, the Haul Road, and the location of the relevant components of the Touquoy Mine Site related to the Project are shown in Figures 2.3-1 to 2.3-4.

2.7.1 Summary of 2021 Updates

Geographical restrictions have been applied to the Beaver Dam Mine infrastructure layout to minimize disturbance to environment. The open pit, for example is at least 50 m away from the Cameron Flowage/Killag River to the north. Waste and till storage facilities, as described in Section 2.7.2 are distant from lakes and property boundaries, 500 m from all surveyed Boreal Felt Lichen, 50 m from all surveyed Boreal Felt Lichen habitats, and 100 m from all surveyed Frosted Glass Lichen (Section 6.13 Species of Conservation Interest and Species at Risk). Wetland disturbance at the Beaver Dam Mine Site by waste storage piles is minimized, wherever possible (Section 6.8 Wetlands).

Project components of the Beaver Dam Mine Project have been altered since the February Revised 2019 EIS (AMNS 2019) and in consideration of the geographical restrictions defined above are shown on Figure 2.7-1 that include the following:

- Adjustment in the location of the Waste Rock Storage and Low -Grade storage areas to the west and away from critical habitat including blue felt lichen and frosted glass lichen.
- High Grade Stockpile will form part of the ROM Stockpile.
- Inclusion of a PAG stockpile south of the pit.
- Adjustment in the location of temporary stockpiles (i.e., topsoil, till and organic) to avoid critical habitat and minimize impacts to wetlands. The organic stockpile was not included in the Revised 2019 EIS Project Description.
- Adjustments in the location of mine site haul roads to avoid critical habitat and minimize impacts to wetlands.
- Adjustments and more detailed engineering on administrative and ancillary areas that include the following:
  - Administration/Security Building;
  - Truck Shop/Truck Wash;
  - Crusher Structure and Conveyor (optional);
  - Stormwater/Evaporation Retention Pond;
  - Various Trailers;
  - Septic and Propane Tanks;
  - Petroleum and Hazardous Material Storage; and
  - Explosive Storage Area.
- Detailed water management structures including water management settling ponds, diversion ditches and water treatment.



Prepared For:

Atlantic Gold

FIGURE 2.7-1

Beaver Dam Mine Project

2019 vs 2021 Updated Infrastructure Layout

- 2019 Infrastructure Layout
- 2021 Updated Infrastructure
- Local Road
- Dry Weather / Seasonal Road
- Track
- Field Delineated Watercourses
- NSTDB Mapped Watercourses
- Field Delineated Wetlands
- NSE Wetlands
- Lakes
- Project Area

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

0 200 400 800 m

1:15,000 Scale when printed @ 11" x 17"

Drawn By: XX Date: 5/10/2021
Reviewed By: XX

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X 2019vs2021

2.7.2 Beaver Dam Mine Site

2.7.2.1 Open Pit

Mining is based on conventional open pit methods suited for the project location and local site requirements. The mining fleet will include diesel powered down the hole (DTH) drills with 144 mm bit size for production drilling, diesel-powered RC drills for bench-scale grade control drilling, 5.0 cubic metres (m^3) bucket size diesel hydraulic excavators and 9.0 m^3 bucket sized wheel loaders for production loading, and 64 tonne (t) payload rigid-frame haul trucks and 41 t articulated trucks for production hauling, plus ancillary and service equipment to support the mining operations. In-pit dewatering systems will be established for the pit. All surface water and precipitation in the pits will be handled by submersible pumps.

Holes will be drilled into the host rock to receive explosives used for blasting. Previous exploration drilling has mapped the host rock for ore-bearing potential. Further grade control drilling will be undertaken to confirm any local variation in ore distribution allowing blast patterns to be executed to maximize production of ore and minimize production of non-ore bearing waste rock. All blasting activities will be conducted by a licensed contractor.

The open pit will remove approximately 56.6 million tonnes (Mt) of material (i.e., ore, non-ore bearing waste rock, till, and organic material) over the life of mine. The production schedule for the Beaver Dam Mine is shown in Table 2.7-1 and Figure 2.7-2. The pit will be mined in a west/east phases. Ultimate pit limits are split into phases or pushbacks to target higher economic margin material earlier in the mine life. The ultimate pit is subdivided into two phases, west and east, but for considerations of vertical advance the pit is mined as one phase from top to bottom. A small starter pit phase is also planned for the northwest corner of the pit to provide construction materials early in the mine life. The ore mined from the pit will range from 0.75 to 2.1 Mt per year over the life of mine with approximately 0.5 Mt to a maximum of 14.9 Mt of waste being generated over life of mine. The open pit will be advanced from the surface at 130 to 155 masl down to 45 masl. At completion, the open pit will measure approximately 900 m along its east-west axis, approximately 500 m along its north-south axis, with a depth of ranging approximately 175 to 200 m based on the current ore delineation. The total area comprising the open pit will be approximately 31 ha.

Table 2.7-1: Summary of Mine Production Schedule

Materials	Unit	LOM	2022	2023	2024	2025	2026	2027
Total ore Mined from pit	Mt	7.84	0	1.32	2.10	1.76	1.90	0.75
Total waste mined	Mt	44.03	2.85	14.96	11.98	9.35	4.33	0.55
Strip ratio		5.6	0.0	11.4	5.7	5.3	2.3	0.7
Total material mined	Mt	51.86	2.85	16.28	14.08	11.12	6.23	1.30
Cumulative Material Mined	Mt		2.85	19.13	33.22	44.33	50.56	51.86
Total Material Moved	**Mt**	**56.66**	**2.85**	**16.36**	**14.08**	**11.45**	**6.43**	**3.00**
Total Ore Milled	Mt	12.47	0	1.23	2.10	2.10	2.10	2.40
Gold Grade	g/t	1.03	0.00	1.59	1.38	1.27	1.19	0.65

Source: Aucenco 2021

Note: LOM – Life of Mine; Differences in (LOM) totals are attributed to rounding between Kilotonnes to Milltion tonnes

Note: Milled includes ore includes from other operations

At Beaver Dam, ore will be hauled to a ROM pad that will be located 600 m south of the pit, and then ROM ore will be hauled by on-highway haulers from Beaver Dam to the process plant at Touquoy operations. Waste rock from Beaver Dam will be deposited into PAG and NAG Waste Rock Storage Facilities (WRSFs) to be situated 200 m south and 1,500 m west of the pit, respectively. The high grade ore will be stored on ROM stockpile.

Mining operations will be based on 365 operating days per year with two 12 hour shifts per day. An allowance of 12 days of no mine production has been built into the mine schedule to allow for adverse weather conditions.

Maintenance on mine equipment will be performed in the field with major repairs to mobile equipment in the shops located near the ROM pad.

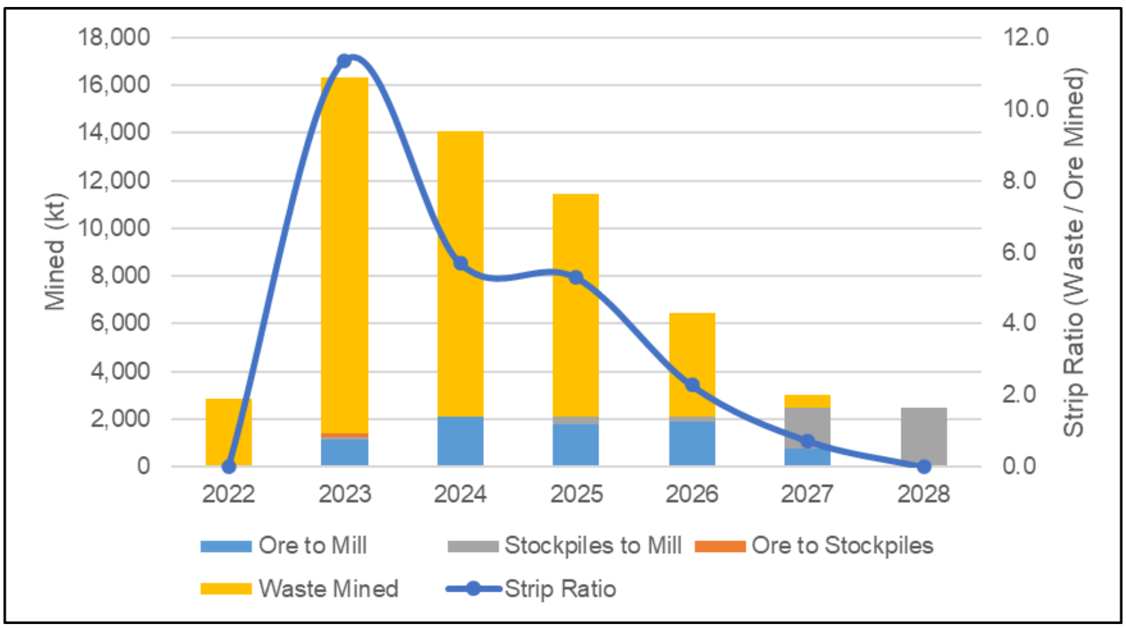
Clearing, grubbing, grading, and stockpiling of vegetation, topsoil, and till in the pit area will be conducted progressively prior to accessing bedrock for mining purposes, to avoid erosion. All topsoil and till will be stored in stockpiles for use in reclamation and construction of berms, impoundments, mine site roads, and/or general site grading. Stockpile locations are shown on Figure 2.3-2 and detailed in Section 2.7.2.3. Once vegetation, topsoil, and till have been removed, drilling and blasting will be used to mine ore and non-ore bearing waste rock, as well as establish benches along rock walls.

2.7.2.2 Waste Material Stockpiles

The stockpiles on the Beaver Dam Mine site consist of the following:

- Waste Rock Storage Area (NAG and LGO stockpiles);
- Potential Acid Generating (PAG) Stockpile;
- Topsoil Stockpiles (TSS);
- Till Stockpiles (TLS); and
- Organic Material Stockpile (OMS).

Figure 2.7-2: Mine Production Schedule



The proposed stockpile locations including the waste rock storage area, potential acid generating stockpile and reclamation material stockpiles is summarized in Table 2.7-2. Stockpiles are located to minimize impacts to wetlands, water courses, surveyed lichen and lichen habitat buffer zones and the Crusher Lake buffer zone.

Table 2.7-2: Waste Material Stockpile Location and Design Criteria

Stockpile	General Description	Design Criteria				Bulk Density (t/m^3)	Swell Factor	Placed Density
		Area (ha)	Maximum Crest Height (m)	Weight (Mt)	Volume (Mm^3)			
Waste Rock Storage Area								
Non-Acid Generating Stockpile (NAG)	One NAG Stockpile located in the most Western extent of site, accessed by existing public roadways off Beaver Dam Road.	60	190	34.28	16.32	2.73	30%	2.10
Low Grade Ore Stockpile (LGO)	One LGO located in the Western portion of site directly East in near proximity to the NAG stockpile, accessed by existing public roadways off Beaver Dam Road.	12	170	2.45	1.17	2.73	30%	2.10
Potential Acid Generating Stockpile Area								
Potential Acid Generating Stockpile (PAG)	One PAG Located in the North-Central section of site, directly North of the originally proposed crusher pad, accessed by Beaver Dam Road.	10	180	2.50	1.19	2.73	30%	2.10
Temporary Stockpiles								
Topsoil Stockpiles (TSS)	Four small topsoil stockpiles are planned for the site. They are spaced across the site near areas requiring topsoil stripping.	15	165	1.10	0.55	2.00	-7%	2.00
Till Stockpiles (TLS)	Two till stockpiles are planned. They are both located East of the in the Central-East end of site.	15	165	2.66	1.73	2.00	30%	1.54
Organic Material Stockpile (OMS)	Located on the South-East section of site, accessed by public roads off Beaver Dam Road.	31	165	2.29	1.49	N/A	N/A	N/A

Source: Golder 2021 included in Appendix A.2a (Mine Wasted Stockpiles Geotechnical Design) .

ha = hectares; m =meters Mt = million tonnes; Mm^3 = million cubic metres; t/m^3 = tonnes per cubic metre; % = percent; N/A = not applicable.

2.7.2.3 Waste Rock Storage Area

Waste rock is generated during open pit development and used during operations for grading and construction of embankments and other infrastructure. The waste rock (NAG and PAG) stockpiles locations are within areas to avoid water courses, surveyed lichen and lichen habitat buffer zones and the crusher lake buffer zone (AMNS 2021). Stockpiles are also sited to minimize disturbance of surveyed wetland area. Waste rock not used for site development is stored permanently in the Waste Rock Storage Area (WRSA) to be reclaimed at closure. The WRSA (i.e., NAG rock stockpile, and the LGO stockpile), is located to the northwest of the Beaver Dam Mine Site as shown on Figure 2.3-2. A PAG stockpile, situated immediately south of the pit (Figure 2.3-2), described below, to allow for closure drainage to be directed towards the pit. Preliminary waste rock characterization has been completed, with pit excavated materials tagged as PAG vs. NAG based on block model codes defined by 3D solids delineating PAG materials (AMNS 2021).

2.7.2.3.1 Non-Acid Generating Stockpiles

The NAG rock stockpile will consist of benches 10 m in height with approximate with 15 m horizontal benches between each lift during construction (Table 2.7-3). During placement, waste rock is end-dumped at angle of repose of the waste rock. As construction proceeds to a higher lift, the preceding lift will be progressively recontoured during operations to a closure slope of 2.7H:1V, with benches left between each lift to allow a final overall slope from toe to crest of 3.0H:1V. The bench widths in some areas may vary between 3 to 4 m. The waste rock areas will have a 21 m dual lane haul road wrapping around the sides of facility for progressive access to all lifts, suitable for 64 t payload haulers. A 10% maximum grades on access haul ramps is included in the design. Table 2.7-3 provides the lift capacities.

Table 2.7-3: Waste Rock (NAG LGO and PAG) Lift Capacities

Lift top Elevation (m)	NAG Volume (MLCM)	NAG Capacity (Mt)	NAG Cumulative Capacity (Mt)	Low Grade Ore Volume (MLCM)	Low Grade Ore Capacity (Mt)	Low Grade Cumulative Capacity (Mt)	PAG Volume (MLCM)	PAG Capacity (Mt)	PAG Cumulative Capacity (Mt)
150	0.38	0.80	0.80	0.26	0.54	0.54			
160	3.53	7.41	8.21	0.58	1.23	1.77	0.2	0.43	0.43
170	4.84	10.17	18.38	0.32	0.68	2.45	0.59	1.24	1.67
180	4.16	8.73	27.11				0.25	0.52	2.19
190	3.41	7.17	34.28						

Source AMNS 2021.

m = metre; Mt = million tonnes; NAG = non-acid generating; PAG = potential acid generating.

Slope stability analysis of the WRSA was completed by Golder Associates Ltd. (Golder 2021, Appendix A.2a). The slope stability report recommended that the stockpile could be constructed to elevation 190 m using the geometry above and satisfy the stability requirements. In accordance with the Golder recommendations (Golder 2021, Appendix A.2a), further construction to the final design elevation is based on monitoring and surveillance results during construction. Stability analysis will be completed by a professional engineer and provided to NSECC/DEM prior to exceeding elevation 190 m (Table 2.7-3).

2.7.2.3.2 Potential Acid Generating Stockpile

The PAG stockpile is located in the north-central section of site south of the open pit (Figure 2.3-2). As noted above, preliminary waste rock characterization has been completed, with pit excavated materials tagged as PAG vs. NAG based on block model codes defined by 3D solids delineating PAG materials. The PAG stockpile has been designed to store 2.5 Mt of PAG within 10 ha footprint (Table 2.7-2). The design includes a 180 m maximum height crest (Table 2.7-3). The lift capacities for PAG are provided in Table 2.7-3.

During construction, historic tailings and waste rock designated as PAG will be either temporarily or permanently stored in the PAG area depending on final quantities. It is anticipated that the majority of historic tailings will be removed from the Beaver Dam Mine site and stored sub-aqueously in mined-out Touquoy Pit. Appendix A.2b (Conceptual PAG Closure Options) additional details on historic tailings assessment of disposal options and is discussed in Section 6.5 (Geology, Soils and Sediment Quality) as well as the draft Reclamation and Closure Plan (Appendix P.2).

2.7.2.3.3 Ore Stockpiles

The LGO stockpile is located adjacent to the NAG Stockpiles with a footprint of 12 ha and is designed to achieve a maximum height of 170 m (Table 2.7-3) and Figure 2.3-2. The ROM stockpile is located near the pit. When ore is mined from the pit it will either be delivered to the ROM pad or the "low grade waste" stockpile in accordance with the following sequence:

- The ROM stockpile is for storing ore for delivery to Touquoy within the coming weeks. There is up to a 4-week capacity that can be stored during short-term periods of ore mining from the pit that exceed capacity to haul off site.
- During the construction period of the mine, any ore encountered in planned pit excavation will be stockpiled within the "low grade waste" NAG waste rock stockpile footprint. This material, less than 200 kilo tonnes (kt) estimated, is planned to be directed to the ROM pad before this area gets covered over by waste rock mined later in the mine life.
- The "low grade waste" stockpile is also planned to store all inferred resource and any mineralized materials that the short to medium term mine planning may want segregated from the bulk NAG waste rock. While this material is not considered ore for the purposes of the Feasibility Study (AMNS Internal, *In Progress*), experience at the Touquoy Mine operations would suggest that a dedicated area should be planned for segregating additional mineralization identified during operations.

2.7.2.3.4 Topsoil Stockpiles

Four topsoil stockpiles are planned for the site and are spaced across the site near areas requiring topsoil stripping (Figure 2.3-2). Topsoil will be salvaged as required from all disturbed areas and stockpiled in designated areas. An average topsoil thickness of 0.3 m has been assumed for all disturbed areas. The total disturbance for topsoil stockpiles is 15 ha with a design crest height maximum of 165 m and total storage capacity of 1.10 Mt and 0.55 Mm^3 (Table 2.7-2). The topsoil lifts will be 5 m and 3:1 slope. A 17 to 20 m berm allowance is included in the design. An overall slope range of 3:1 will be established once berms and ramps are completed. A summary of the amount of topsoil lift capacities for each stockpile during construction is provided in Table 2.7-4.

Additional topsoil piles with the following capacities are designed to store materials salvaged from the waste and ore stockpile footprints, as well as from the haul road footprints. Where possible, the topsoil materials will be windrowed directly outside the design footprints, rather than hauled to these stockpiles. An annual or light seeding will be applied to limit erosion and potential suspended solids. Drainage ditches will be established around the stockpile and water collect will be directed to settling ponds, which are described in Water Management (Section 2.7.2.9).

Table 2.7-4: Topsoil Storage Capacities

Source	Area (m^2)	Topsoil Volume (BCM)	Placed Volume (MLCM)	Planned Pile
Open Pit	314,000	94,200	0.11	North Pit Pile
Non-acid generating stockpile Haul Roads	829,000	248,700	0.34	North SP Pile
PAG SP	98,000	29,400	0.07	South Pit Pile
Crusher Area	120,300	36,100	0.03	South Site Pile

m^2 = square metres; BCM = bank cubic metres; MLCM = million loose cubic metres; SP = stockpile; PAG = potential acid generating.

2.7.2.3.5 Till Stockpiles

Two till stockpiles are planned (i.e., west and east) and they are both located east of the in the Central-East end of site (Table 2.7-5 and Figure 2.3-2). Till is defined as all materials between the topography surface and the bedrock contact surface, minus estimates for topsoil. Updates to bedrock contact surface have recently been made that will be included in design. The altered surface will be incorporated into an updated till quantity estimate during the detailed mine planning stage of the Project. The planned lifts for till stockpiles will be 10 m and a 20 m berm allowances for access around each lift. An overall slope range of 3:1 will be established once berms and ramps are completed. The lift top elevation, volume, and capacity is provided in Table 2.7-5. A portion of the till materials, related to the historic tailings and contamination from historic workings, is planned to be stored in the PAG stockpile location, however, the majority of historic tailings, as discussed below and in Section 6.5 (Geology, Soil and Sediment Quality), will disposed sub-aqueously in the mined-out pit at the Touquoy Mine.

An annual or light seeding will be applied to limit erosion and potential suspended solids. Drainage ditches will be established around the stockpile and water collect will be directed to settling ponds, which are described in Water Management (Section 2.7.2.9 and Appendix P.4 Mine Water Management Plan).

Table 2.7-5: Till Storage Capacities

Lift top Elevation (m)	West Till Capacity (Mt)	West Till Cumulative Capacity (Mt)	East Till Capacity (Mt)	East Till Cumulative Capacity (Mt)
150	0.15	0.15		
160	0.30	0.45	0.27	0.27
170	0.24	0.69	0.96	1.24
180			0.73	1.97

m = metre; Mt = million tonne.

2.7.2.3.6 Organic Stockpile

One organic stockpile is planned for the site, which is located on the south-east section of site. Organics will be salvaged as required from all disturbed areas and stockpiled in designated areas. The total disturbance for topsoil stockpiles is 31 ha with a design crest height maximum of 165 m (Table 2.7-6). The organic lifts will be 5 m and 7:1 slope. A 17 to 20 m berm allowance is included in the design. A summary of the organic lift capacities is provided in Table 2.7-6.

An annual or light seeding will be applied to limit erosion and potential suspended solids. Drainage ditches will be established around the stockpile and water collected will be directed to settling ponds, which are described in Water Management (Section 2.7.2.9).

Table 2.7-6: Organic Storage Capacities

Lift top Elevation (m)	Organic Till Capacity (Mt)	Organic Till Cumulative Capacity (Mt)
160	0.85	0.85
165	1.45	2.30

m = metre; Mt = million tonne.

2.7.2.4 Historic Tailings and Waste Rock

Historic tailings have been deposited within the footprint of the open pit and will be excavated early in the mine life. Estimated quantities of 50,000 t of historic tailings are described in Historic Tailings Quantities Estimate (Beaver Dam Mine Project Amended Mineral Lease Application – Under Confidential Cover). This quantity occurs above the bedrock contact surface and therefore has been measured as part of the overall till quantities coming out of the open pit. A further 350,000 t of till materials is estimated to be affected by the historic tailings and historic mine operations.

These materials will not be sent to the till stockpiles, but rather to the PAG storage area. The historic tailings are planned to be directed off site from Beaver Dam to Touquoy for final deposition. An Historic Tailings Management Plan and a Potential Acid Generating Management Plan have been prepared for the Project to monitor and update estimates when construction and operations commence.

2.7.2.5 Mine Site Roads

Mine site roads will be constructed to enable the mining fleet (loaders, dozers, off-highway haul trucks) to access the stockpile locations and site facilities. The primary use of mine site roads will be the transportation of ore and non-ore bearing waste rock from the open pit to stockpile locations. Mine site Haul Roads will be dual lane and connect the pit exit with the topsoil, till, non-ore bearing waste rock stockpiles and ROM stockpiles.

The roads will be constructed out of non-ore bearing waste rock from the open pit and be approximately 27 m wide, including berms and drainage, with a maximum speed limit of 40 km/h. The density for cut and fill is provided in Table 2.7-7. Specifically, the mine haul road designs include the following inputs:

- 27 m wide haul roads that incorporate dual lane running width and berms on both edges of the haul road;
- 10% maximum grade;
- primarily constructed using pit run waste rock, hauled from pit, then dumped out, with final contouring done by dozers;
- running surface capped by 0.5 m crushed rock layer;
- balanced cut and fill areas built by dozers; and
- areas with excess cut handled by excavators and construction haulers.

Table 2.7-7: Density for Cut and Fill

Material	Bank Cut Density (t/m^3)	Swell Factor	Placed Density (t/m^3)
Haul Road Rock	2.78	30%	2.10

Additional roads surround the west, north and east limits of the open pit, as well as out to the explosives and magazine storage pads. A pit perimeter road on top of the berm surrounding the pit will be a gravel base and be 12 m wide. The general location of the mine site roads is displayed on Figure 2.3-2. Mine site Haul Roads will be dual lane and connect the pit exit with the topsoil, till, organic and non-ore bearing waste rock stockpiles and ROM stockpiles.

The following design criteria is used for these additional roads.

Pit perimeter road:

- 2 m in height;
- 12 m wide top surface to fit berms on both sides, and sized for travel by highway class vehicles as well as one way travel for articulated hauler;
- 10% maximum grade; and
- primarily fill constructed using pit run waste rock, hauled from pit, then dumped out, with final contouring done by dozers.

Explosive access road and pads:

- 6 m wide for on-highway class vehicle traffic;
- following existing on-site road paths;
- magazine pad dimensions of 20 m x 15 m as per supplier recommendations;
- explosive storage pad dimensions of 50 m x 50 m as per supplier recommendations; and
- balanced cut/fill construction by dozers.

The haul roads run from the open pit entrances on the west side of the pit:

- west of the NAG and low-grade WRSA;
- switchbacking southeast at the exit towards the ROM pad and PAG; and
- till will come out of the east side of the pit onto the haul road to the east and south towards the till stockpiles. The depth of the pit during till excavation will not require exiting to the west.

The pit haul roads at the Beaver Dam Mine Site will be built during the construction phase of the Project. The following table lists the cut and fill quantities estimated to construct the designed Beaver Dam mine haul roads, as well as the pit perimeter berm and the explosives access roads. Fill volumes for the haul road and pit perimeter berms are sourced as NAG rock from the open pit and quantities are provided in Table 2.7-8. The explosives storage road and pad are balanced cut to fill.

Table 2.7-8: Haul Road Construction Quantities

Road	Cut Volume (kBCM)	Fill Volume (kLCM)
Ex-Pit Haul Roads	42	140
Pit Perimeter Berm	0	43
Explosives Roads and Pads	1	2

Source: AMNS (2021).
kBCM = kilo bank cubic metre; kLCM = kilo loose cubic metre.

A pit perimeter road on top of the berm surrounding the pit will be a gravel base and be 12 m wide. The general location of the mine site roads is displayed on Figure 2.3-2.

Mine site Haul Roads will be dual lane and connect the pit exit with the topsoil, till, organic and non-ore bearing waste rock stockpiles and ROM stockpiles.

2.7.2.5.1 In-Plant Roads

One In-Plant Road is identified:

- Mining Infrastructure Area (MIA) In-Plant Access Road.

The road will be designed to a 30 km/hr design and posted speed limit and use the following design criteria: maximum longitudinal grade 12%, two lanes per road with lane width of 3.0 m per lane, 3% road cross-slope. Batter slopes shall be 1 vertical (V) to 3 horizontal (H) fill slopes and 1 V:2H back slopes and 1 vertical to 3 horizontal side slopes with a trapezoidal ditch shape.

2.7.2.5.2 Low-Volume Haul Road

One Low-Volume Haul Roads is identified:

- ROM to MIA Haul Road.

The road will be consistent with a 30 km/hr design and posted speed limit and use the following design criteria: maximum longitudinal grade 8%, two lanes per road with lane width of 15.0 m per lane, 2% road cross-slope. Batter slopes shall be 1 vertical to 3 horizontal fill slopes and 1 vertical to 2 horizontal back slopes and 1 vertical to 3 horizontal side slopes with a v-ditch shape.

At the entrance of the site, the road design modifications will allow for separation of the lanes, so that a gatehouse will be situated between the two lanes.

2.7.2.5.3 Dosing Station Bypass Road

The Dosing Station Bypass Road will be constructed to allow external traffic to access the Nova Scotia Salmon Association (NSSA) Lime Dosing station located along the Cameron Flowage to the east of the project site.

The road will be designed to a 30 km/hr design and posted speed limit and use the following design criteria: maximum longitudinal grade 12%, single lane per road with a lane width of 5.0 m per lane, 3% road cross-slope. Batter slopes shall be 1 vertical to 3 horizontal fill slopes and 1 vertical to 2 horizontal back slopes and 1 vertical to 3 horizontal side slopes with a trapezoidal ditch shape.

2.7.2.6 Infrastructure and Facilities

2.7.2.6.1 Earthworks Platforms

The following earthworks platforms will be constructed for the Beaver Dam Mine Site:

All new facility areas and surrounding areas are graded to ensure stormwater drains away from the facilities during rainfall. Drainage ditches, where necessary, along roadways are 0.6 m bottom channels with a minimum longitudinal grade of 0.5%. At the intersection of drainage paths and access roads or site roads, water will be conveyed across the road via a culvert crossing. Culverts will be installed with rip-rap erosion protection at inlets and outlets and will require regular maintenance to keep them sediment free and free-flowing during rainfall.

2.7.2.6.2 Buildings Administration, Mine Dry and Security

The principal buildings at the Project Site will include a truck shop, a combined building consisting of mine dry, offices and security administration, a gatehouse, and lunch/breakout room building. Where practical, buildings will be modular type construction to reduce construction costs. The truck shop building will be a fabric type construction with 3 haul truck bays and two maintenance bays for lube handling and a warehouse and workshop.

Figure 2.3-2 illustrates the overall site layout and Figure 2.7-3 illustrates the general layout of the plant and ancillary facilities.

The building list including WBS Area, name, building type and size is show in Table 2.7-9.

Table 2.7-9: Beaver Dam Mine Building List

Item	WBS Area	Building Description	Building Type	Building Area (m^2)
1	1311	Truck Shop	Fabric Building	882
2	1330	Mine Dry and Offices	Modular Complex	407
3	1330	Security Administration	Modular Complex	60
4	1330	Lunch / Breakout Room	Modular Complex	21
5	4230	Gate House	Security Trailer	20

2.7.2.6.3 Truck Shop Building

The maintenance shop facility will be a pre-engineered fabric structure with a roof and low walls and limited interior support steel structures. The building will be supported on pre-cast concrete footings.

The facility will house a lube handling bay, warehouse/workshop bay and 3 haul truck bays with 7 m wide door openings. The facility is designed to service and maintain both the mining fleet and the process plant/site services fleet.

2.7.2.6.4 Mine Dry, Office and Security Administration Building

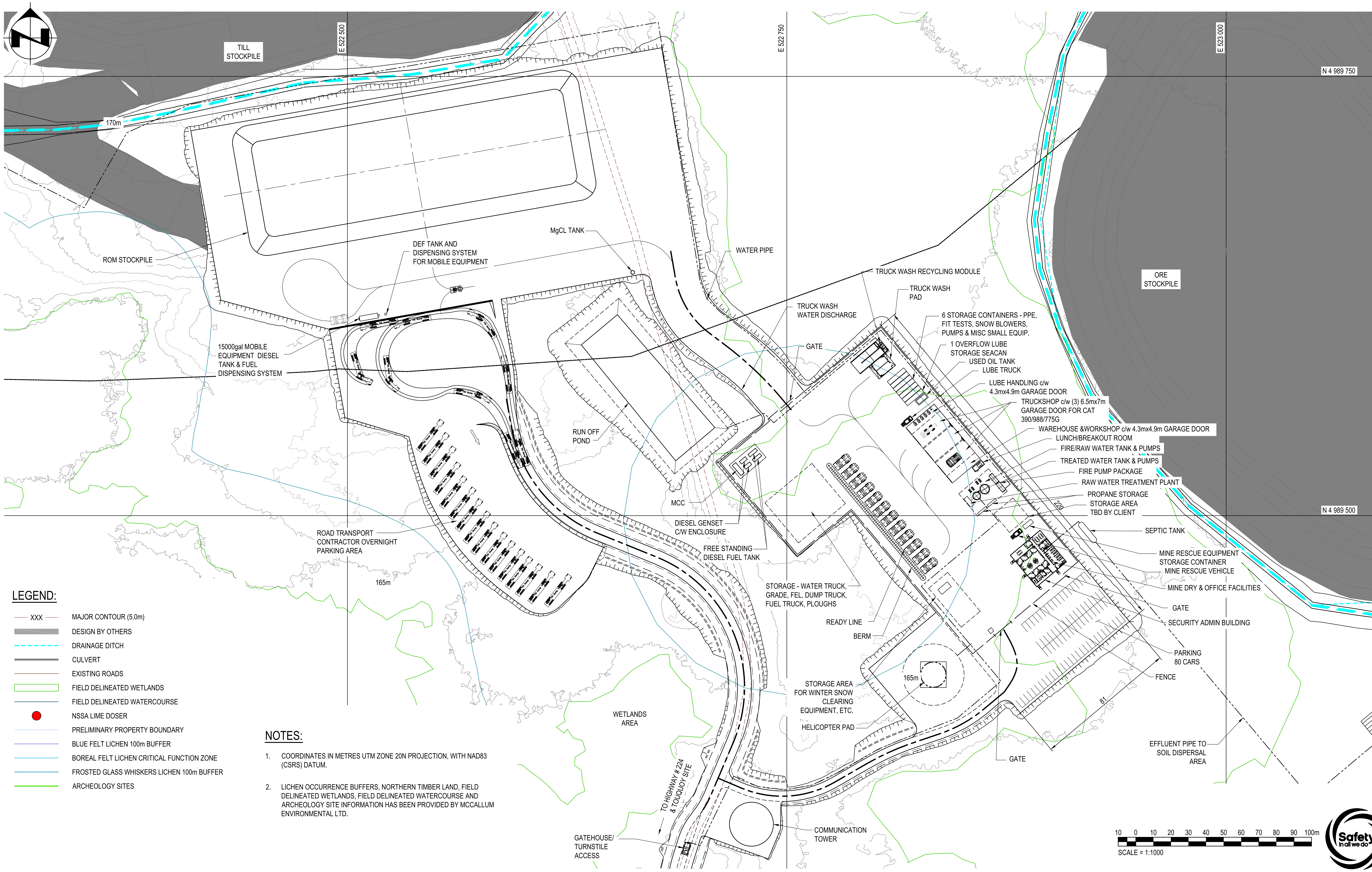
The mine dry, offices and security administration building will be a single-story, modular complex. The building will be supported on timber sleepers sitting above the finished grade level. This security administration building will have separate entry from the mine dry and office building, though it will share common walls.

2.7.2.6.5 Lunch / Breakout Building

The lunch / breakout room building will be a standalone modular building situated south-west of the truck shop. The building will be supported on timber sleepers sitting above the finished grade level.

2.7.2.6.6 Gate House

The gatehouse will be a security trailer situated at the entrance to the Project Site between the two road lanes. The building will be supported on timber sleepers sitting above the finished grade level.



LEGEND:

- XXX — MAJOR CONTOUR (5.0m)
- DESIGN BY OTHERS
- DRAINAGE DITCH
- CULVERT
- EXISTING ROADS
- FIELD DELINEATED WETLANDS
- FIELD DELINEATED WATERCOURSE
- NSSA LIME DOSER
- PRELIMINARY PROPERTY BOUNDARY
- BLUE FELT LICHEN 100m BUFFER
- BOREAL FELT LICHEN CRITICAL FUNCTION ZONE
- FROSTED GLASS WHISKERS LICHEN 100m BUFFER
- ARCHEOLOGY SITES

NOTES:

1. COORDINATES IN METRES UTM ZONE 20N PROJECTION, WITH NAD83 (CSRS) DATUM.
2. LICHEN OCCURRENCE BUFFERS, NORTHERN TIMBER LAND, FIELD DELINEATED WETLANDS, FIELD DELINEATED WATERCOURSE AND ARCHEOLOGY SITE INFORMATION HAS BEEN PROVIDED BY MCCALLUM ENVIRONMENTAL LTD.

Atlantic Gold

REF	DRAWING No.	REFERENCE DRAWING	No	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			K	NH	08APR2021	ISSUED FOR STUDY	KS	KS	AW
			J	SC	07DEC2020	ISSUED FOR CLIENT REVIEW	KS	KS	BH
			C	PM	28SEP2020	PRELIMINARY ISSUE	KS	KS	BH
			B	PM	18SEP2020	PRELIMINARY ISSUE	KS	KS	BH
			A	PM	18SEP2020	PRELIMINARY ISSUE	KS	KS	BH

DRAWN	S. CUI	16SEP2020
DRG CHECKED	K. SHARIATI	07DEC2020
DESIGNED	K. SHARIATI	16SEP2020
DES. APPR	A. WEISZBECK	16MAR2021
PROJ APPR		

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CLIENT: ATLANTIC GOLD CORPORATION

TITLE: MOOSE RIVER CONSOLIDATED PROJECT
BEAVER DAM MINE
SITE LAYOUT
GENERAL ARRANGEMENT

PROJECT No 105227 | SCALE 1:1000 | SIZE A1

DRAWING No 105227-0000-G-102 | REV K

2.7.2.7 Fuel Storage and Distribution

The site will be serviced by both propane and diesel. Diesel will be stored primarily at the mobile equipment fuelling station meant to serve both the mining fleet and the transport fleet. The fueling station consists of a 3,000 heated and insulated tank with a hybrid pump. The fueling system will supplied and owned by a 3rd party vendor who will rent to the site as part of the fuel contract.

The generators will also be supplied with fuel tanks at 13,200 litres (L) each and will be filled by the 3rd party vendor. Propane will be stored at site in two 7,500 L tanks which will be owned by the same vendor as the diesel fuel supplier. Propane will then be plumbed to the various buildings for heating.

2.7.2.8 Power Generation and Distribution

There is no external power supply being considered for the beaver dam site. All power will be generated on site via a diesel fueled generating plant. The generating plant will consist of two low voltage generators rated for 250 kW at 600 V. The plant design includes load shedding in the event of a failure of either generator.

Distribution is accomplished via cabling as there are no significant loads at a distance sufficient to warrant an overhead power line.

2.7.2.9 Water Management

2.7.2.9.1 Mining Infrastructure Area Collection Pond

The Mining Infrastructure Collection Pond is located adjacent to the Mining Infrastructure Area (MIA) and south of the ROM Pad. Contact water run-off from the plant pads will be collected and diverted to the collection pond. Stormwater run-off that does not come in contact with the plant pads, is considered clean, and is directed away from the plant site.

The MIA Collection Pond is sized to contain the run-off from the MIA Pad, Loading Pad and Trucking Contractor's Laydown. The pond will comprise of a Geosynthetic Clay Liner (GCL), HDPE geomembrane along with rock ballast.

The MIA Collection Pond for the plant site follows a wet pond design concept and delays the peak flow into the project's overall water management network. The MIA Collection Pond is sized to contain and convey the 100-year, 24-hour event storm.

2.7.2.9.2 Contact Water Treatment/Disposal System

The Mine Water Management Plan (Appendix P.4) and associated design measures have been developed based on the proposed feasibility level mine site arrangement with inputs from AMNS, Moose Mountain Technical Services (MMTS) and Ausenco. The Mine Water Management Plan will be implemented during the initial mine development phase and will be adjusted as necessary throughout the mine operations and closure phase.

Site contact water will be managed to meet the following regulatory discharge requirements prior to discharge to the natural environment:

- Metal and Diamond Mining Environmental Regulations (MDMER) Objectives.
- Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Aquatic Life.
- Tier 1 Nova Scotia Environment Quality Standards (EQS) for Surface Water.
- Site specific criteria (based on background).

Based on predictive water quality modelling, it is understood that the water quality at some locations may be acceptable for discharge to the environment with TSS removal as the only form of treatment. Where this is not the case, contingency measures (shutoff valves and pumps etc.) will be put in place to redirect water towards the north water treatment system (WTS) in case of exceedances. The primary objectives of the Mine Water Management Plan are as follows:

- Provide mechanism to dewater and treat ponded water within the project area (including the historic tailings area) to allow for development and excavation of mine infrastructure (e.g., pit, waste piles, haul road etc.).
- Capture, treat and provide controlled discharge for all site contact water during construction and operations.
- Divert all off-site clean water away from the mine site infrastructure to maintain existing drainage features (e.g., Mud Lake) and reduce the total volume of water entering the settling ponds for treatment.

2.7.2.9.3 Design Basis Criteria

The criteria used for the design of the water management infrastructure are based on the feasibility level design site arrangement, regulatory discharge water quality requirements, operational requirements, and environmental site conditions. The design basis criteria for storm events utilized for the Mine Water Management Plan (Appendix P.4) design are summarized in Table 2.7-10.

Table 2.7-10: Water Management Design Basis Criteria

Item	Design Basis
Contact Water. Non-contact Water Ditches and Culverts	Designed to convey stormwater runoff resulting from the 1 in 100 year, 24-hour, climate change adjusted storm event (113 mm).
Collection Ponds	Designed to contain runoff resulting from the 2 5 mm 4-hour storm event, 1 in 10-year 24-hour climate change adjusted storm event (87 mm) and 1 in 100-year 24-hour climate change adjusted storm event (113 mm) for a minimum of 24 hours to allow for TSS removal due to settling. Designed to convey runoff resulting from the 1 in 100-year 24-hour climate change adjusted storm event (113 mm) to Cameron Flowage via a concrete outlet structure. Designed to convey runoff from Hurricane Beth, modelled as a 48-hour storm event, through an emergency spillway. All discharge water from collection ponds must meet MDMER water quality requirements. All discharge water must meet CCME, Tier 1 NSE WQS or site-specific requirements within the 100 m mixing zone of the natural watercourse receiver (Killag River).
Pump Systems and Pipelines	Designed to convey stormwater runoff water from low-lying areas to settling ponds for up to the 1 in 2 year 24-hour, climate adjusted storm event (66 mm). Multiple back up pumps for larger storm events are to be located across the Site to be moved to different areas across the Site as needed.

mm = millimetres; TSS = Topsoil Stockpiles; MDMER = Metal and Diamond Mining Environmental Regulations; CCME = Canadian Council of Ministers of the Environment; m = metres.

The Site was modelled using PCSWMM (Version 7.3.3095) which is a hydrologic and hydraulic modelling software that uses the EPA SWMM (Version 5.1.015) engine. PCSWMM was used to develop the design storm hydrographs, estimate peak flow rates and runoff volumes for the design storm events.

To add contingency to the design, the impacts due to climate change were considered when developing the design storm hydrographs. To account for the project duration (operation life of less than 15 years) and nearest climate regions (Halifax Regional Municipality and Truro), a 3.3% increase in the total rainfall depth was applied to each design storm based on the requirements outlined in Climate Data Nova Scotia as the projected increase in annual precipitation for 2050 (https://climatechange.novascotia.ca/climate-data?tid=8#climate-data-map).

The estimated runoff volumes resulting from the 24-hour, 1 in 100-year climate change adjusted storm event were used to determine the storage capacity of the settling ponds. The 25 mm 4-hour, 10-year and 100-year climate change adjusted storm events were used to design the settling pond outlet structures such that a minimum 24-hour detention time was achieved in each settling pond to allow for settling of TSS. Hurricane Beth (as recorded by Halifax International Airport Climate Station (Climate ID: 8202251)) was used to size the emergency spillway of the settling ponds. The 100-year climate change adjusted storm event was used to size the swale, culverts and other conveyance pathways leading to the settling ponds. Additional design details for the various water management design elements are provided in the following sections.

2.7.2.9.4 Collection Ditches and Culverts

The Mine Water Management Plan (Appendix P.4) consists of a series of surface water ditches and culverts collecting all Site stormwater runoff. The surface water ditches include contact water ditches, which collect runoff from all mine infrastructure, and clean water ditches. The surface water ditches all include clean water diversion ditches, which collect water from adjacent undisturbed lands and direct it away from the Site. Culverts are dispersed throughout the Site to convey stormwater below mine infrastructure (i.e., haul roads). The contact water ditches drain to one of three settling ponds located across the Site.

Each ditch will be trapezoidal in section with 3H:1V side slopes and bottom widths and depths ranging from approximately 0.5 m to 2 m. Ditch slopes range between 0.3% and 7.5% depending on the location across the Site. Ditches will be excavated into the existing overburden and/or bedrock or formed by grading existing surface material to form the required channel cross-section. All excess material used to grade the channel to the required cross-section will be sloped to existing ground at a 3H:1V slope. The exposed slopes will be covered with a bio-degradable erosion control matting and seeded upon reaching finished grade to prevent erosion of these previously disturbed areas.

Contact water ditches will be lined with an HDPE liner followed by a layer of sand and a layer of riprap to prevent infiltration of stormwater into the surficial groundwater and protect the ditch from erosion. The riprap layer in the liner system will be sized appropriately to prevent erosion during the 1 in 100-year 24-hour climate change adjusted storm event. Detailed riprap requirements will be determined during later design stages. Rock check dams will be put in place on ditches that have a slope of greater than 3% in addition to the riprap layer to prevent erosion. Rock check dams reduce the overall slope of the water surface, reducing the potential for erosion. Rock check dams also allow time for suspended sediment to settle out prior to reaching the settling pond. The ditches leaving the settling ponds will contain clean water following TSS removal and any additional required water treatment via the WTS in the case of the north settling pond. The outlet of the effluent ditch into the receiving watercourse will be lined with riprap to prevent erosion. Detailed outlet design will be determined during later design stages.

Culverts are to be circular corrugated steel pipe (CSP) culverts with diameters ranging from 600 to 1,600 mm and lengths between 30 m and 50 m. Culvert slopes range between 0.5% and 7% across the Site. Each culvert will include a riprap apron on the upstream and downstream sides of the culvert to prevent erosion around the inlet and outlet. The outlet riprap aprons are designed to include an energy dissipation basin. The energy dissipation reduces velocities in the downstream ditch, reducing the potential for erosion. The energy dissipation basin is to be lined with riprap specifically sized to withstand culvert exit velocities and reduce flow velocity downstream of the culvert.

The Site haul road crosses over top of WC-5, the watercourse leading from Crusher Lake to Mud Lake. In order to prevent disruption of the natural flow path, clean water ditches will collect surface water runoff on the south side of the haul road and drain this runoff back towards WC-5. WC-5 will be channelized in a culvert below the haul road for 50 m. The outlet of the WC-5 culvert will have an energy dissipation basin to reduce channel velocities and promote fish passage through the culvert. The contact water ditches will pass overtop of the WC-5 culvert. As with all other sections of the ditch, the contact water ditch in this area will be lined with an HDPE liner to prevent infiltration of contact water into the adjacent watercourse.

2.7.2.9.5 Settling Ponds

Settling ponds will be constructed to collect and treat contact water prior to discharging to Cameron Flowage. Collection ponds are included for runoff from the NAG Waste Rock Stockpile, PAG Waste Rock Stockpile, Till Stockpile, Low Grade Ore Stockpile, Organics Stockpile and Crusher Pad/administrative building area. The ponds were designed to maintain a 0.3 m freeboard during the 1 in 100-year 24-hour climate change adjusted design storm event. All ponds were also designed with an emergency overflow spillway sized to convey Hurricane Beth sized storm event.

It is anticipated that the settling ponds will be excavated into the existing overburden. Due to the depth to bedrock in the areas of the settling ponds (approximately 4 m to 7 m deep depending on location) it is not anticipated that drilling or blasting into the bedrock will be required. The settling ponds will be lined with a similar liner to the contact water ditches including an HDPE liner and a sand and riprap layer. Due to the high groundwater elevation near the settling ponds (slightly above the bottom of pond invert in the east settling pond) the riprap layer will also act as a ballast to prevent the liner from being impact by buoyancy forces of the nearby groundwater. The ponds will be trapezoidal in cross-section with 3H:1V side slopes. The maximum depth in the ponds varies between 3.5 m and 5.5 m, depending on the location. Settling pond dimensions vary from 45 m to 60 m in width and between 200 m and 325 m in length. Two of the settling ponds (north settling pond and east settling pond) will be classified as dams due to the north embankment berm exceeding the 2.5 m threshold.

To assist with the removal of TSS from the stormwater runoff, each settling pond is to contain a gravel filter berm. The filter berm will consist of a gravel core with an outer riprap layer to provide erosion protection. Geotextile will be placed between the riprap layer and the gravel core to assist with TSS removal and separate the two material layers. In addition, the settling ponds have been designed to contain the 25 mm 4-hour storm event, 1 in 10 year 24-hour climate change adjusted design storm and 1 in 100-year 24-hour climate change adjusted design storm events for a minimum of 24 hours. A detention time of 24 hours allows for suspended particles to settle prior to discharge from the settling pond into the natural environment.

The settling ponds each consist of a concrete outlet structure and emergency overflow spillway. The concrete outlet structure will control storm events up to and including the 1 in 100-year, 24-hour climate change adjusted design storm event through a series of orifices and an overflow weir. The concrete outlet structures will be surrounded with a layer of riprap in order to recue exit velocities and further assist with TSS settling. The emergency overflow channel will convey flows resulting from storm events greater than the 1 in 100 year, 24-hour climate change adjusted design storm event, up to and including Hurricane Beth. The north settling pond will direct the emergency overflow spillway towards the open pit. Directing the overflow spillway towards the open pit will ensure no uncontrolled discharges occur from the Site. Effluent from the north settling pond will pass through the WTS prior to discharge into Cameron Flowage. All settling ponds will discharge effluent at concentrations below the federal MDMER regulations as per the *Fisheries Act*.

2.7.2.9.6 Pump Systems and Pipelines

A collection pond will be situated on the northeast side of the PAG stockpile. A pump and pipeline system will convey stormwater from the collection pond to the north settling pond. In addition to the PAG stockpile pump and pipeline system there will be portable back up pumps located across the site to deal with any potential pooling of water. The pumps will be moved around the Site as needed to dewater ponded water. The PAG stockpile pump system will consist of a single permanent pump, sized to convey the runoff generated from up to a 1 in 2-year 24-hour climate change adjusted storm event. In the event that a storm event greater than the 1 in 2-year climate change adjusted storm event occurs then back up pumps will be brought to the PAG stockpile collection pond to assist with pumping.

2.7.2.9.7 Erosion and Sediment Control Measures

Erosion control measures in the contact water ditches and settling ponds are to be maintained during operations including replacement of riprap, restoration of check dams if damaged and general visual inspection of the ditches and settling ponds. Experience at the Touquoy Mine indicates that significant sediment build up could occur in the collection ditches. The contact water ditches should be inspected regularly and cleaned out as needed to ensure sediment does not build up within the ditches or travel directly into the settling pond, reducing the available storage volume of the settling pond itself.

Contact Water Treatment

During operations stormwater runoff will be directed towards three settling ponds prior to discharge to the natural environment. All potentially impacted water will be directed towards the north settling pond and the associated WTS. The east and south settling ponds are not anticipated to experience water quality concerns, however, regular monitoring will take place in these ponds as a part of federal MDMER regulations. If water quality exceedances occur in the east or south settling pond, a shut off valve on the pond outlet will be closed and the water will be pumped to the north settling pond and WTS for treatment.

During operations, the only constituent predicted to exceed CCME, Tier 1 EQS and Site-Specific guidelines is nitrite. To reduce the nitrite concentrations in effluent from the north settling pond, effluent will be routed through a nitrite oxidation unit (aeration treatment pond) to reduce the concentration of nitrite in the effluent. The effluent will pass through a final settling pond, to remove any further suspended solids which were re-suspended during aeration, prior to discharge.

The WTS which was present during construction will remain on Site in case of exceedances of constituents other than nitrite, consisting of aeration (oxidation), lime softening, coagulation/flocculation and multimedia and granular activated carbon (GAC) filtration.

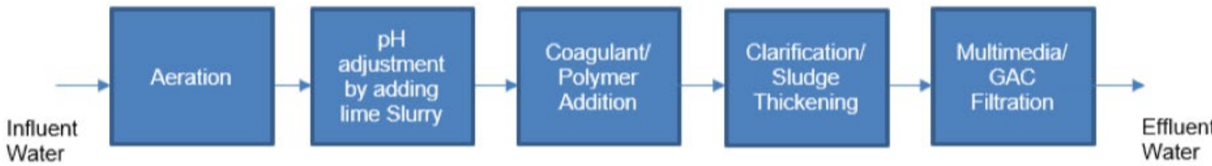
2.7.2.9.8 Construction Water Treatment System Alternative

It is expected that metals such as aluminum, arsenic, cadmium, cobalt, copper, iron, manganese, mercury, lead, and zinc may be among the elements that potentially need treatment during the construction stage. Also, most of the COCs are likely attached to suspended solids, suggesting that a significant fraction of the COCs could be removed by physical filtration.

Aeration, lime softening, followed by coagulation, media and GAC filtration is proposed as the alternative WTS for the construction phase. This system includes an aeration phase at the beginning of the treatment train, which will help to oxidize metals and will reduce chemical demand in the downstream units.

A simplified block flow diagram of this alternative is shown in Figure 2.7-4.

Figure 2.7-4: Simplified Block Flow Diagram for Water Treatment



In the first step, collected contaminated water will be stored in a Frac tank sized to provide an approximate one-hour retention time for aeration purposes. The effluent will be monitored for pH, turbidity, and its flow recorded prior to discharge. There will be a sample port at the final effluent discharge line for sampling and monitoring purposes.

This proposed water treatment alternative will address higher concentration of COCs. The selected alternative technology will be tested in a bench-scale study before implementing the full-scale treatment system to identify optimum chemical conditioning parameters such as aeration rate and chemical dosing rates. This will inform the Standard Operating Procedures that will be developed before implementation.

2.7.2.9.9 Operation Water Treatment System Assessment

The water quality assessment also indicated that nitrite level will be the only exceeded CCME guideline parameter for the EOM scenario, and zinc and cobalt are the exceedances for the PC scenario at Killag River which will require treatment during the post closure stage of the Mine.

Reviewing the feasible alternatives, it was found that a nitrite oxidation unit such as aeration treatment pond could potentially reduce nitrite concentration and obtain the nitrite removal requirement of this project while also having the lowest capital and operation cost.

The proposed aeration treatment pond would consist of three ponds. The first Settling Pond will act as an equalization pond and capture the high influent water volumes during storm events. Furthermore, this pond will help to reduce total suspended particles by allowing settling. A coagulant injection point will be considered at the influent stream to the first pond to be used in case of high suspended solids concentrations or during large storm events to help accelerating precipitation of suspended solids. Water will then flow by gravity to an aeration pond, the air will be introduced by surface agitators to oxidize nitrite, as well as metals. Next, the water will flow by gravity to the third pond for resettling of suspended particles that are generated as the results of oxidation in the second pond.

It is expected that the concentration of nitrite and metals will be below discharge limits during large storm events. For that reason, a bypass ditch will be designed to directly discharge the water from the first pond after removal of suspended particles.

In addition, to address elevated arsenic concentration during operation phase, the water treatment system of construction phase will be used as contingency in case of higher metals concentrations during operation phase. If the aeration treatment pond's final effluent does not meet the discharge objectives, the water could be pumped into the water treatment train to address high metal concentrations.

The general chemistry of impacted water will determine if any nutrient or chemical addition would be required. These parameters could potentially drive the operation cost of the treatment system. It is highly recommended that the selected nitrite removal technology be tested in a bench-scale or even in a pilot-scale before designing the full-scale treatment system.

2.7.2.9.10 Post-Closure Water Treatment System

GHD has completed a predictive water quality assessment and developed a mass balance model which shows that zinc and cobalt are the only likely exceeded parameters during the PC phase. However, the exceedances are not significantly higher than the discharge limit and a passive water treatment system could reduce the concentration of these elements below discharge criteria. In mine-related settings, passive treatment systems are often designed to neutralize acidity and remove metals in drainage waters. Such systems do not require continuous chemical inputs because they are sustained by naturally occurring chemical and biological processes. Anoxic limestone drains (ALDs) have been selected as the passive alternatives for addressing high concentrations of metals in impacted water during the PC phase.

In this treatment approach, impacted water will initially pass through a settling pond for the removal of suspended solids. Then, water will pass through a trench ALDs. ALDs generate alkalinity and increase the pH of the impacted water. By increasing the pH, metals such as zinc and cobalt will precipitate in their hydroxide forms. The ALDs will be followed by an aeration cascade, pond, or aerobic wetland that oxidizes and removes the precipitated metals. A settling pond will then provide adequate hydraulic retention time to let those formed metal hydroxides precipitate. This treatment system is proposed due to its passive nature and the fact that utilities are not required for implementation. The success of an ALD depends on site-specific conditions, primarily on low dissolved oxygen, and minimal ferric iron and aluminum concentrations in the drainage.

The operation and maintenance of this alternative is minimal as no labour or power is required. The primary maintenance would be replacing depleted limestone which is dependent on-site condition and water chemistry. In suitable conditions, limestone could work efficiently for several years.

2.7.2.9.11 Surface Water Monitoring

Surface water quality assessment sites were selected to monitor baseline/construction, operation and post-closure water quality and water quantity at the Beaver Dam Mine. These include both surveillance locations and compliance locations.

During the construction phase, 16 water quality surveillance locations are proposed to be sampled monthly, along with two water quality surveillance locations to be sampled quarterly. At each surveillance monitoring stations, water quality grab samples are collected. Grab will be analyzed for the following list of parameters, in line with the baseline analysis:

- Total metals – (RCAp-MS);
- Total dissolved metals – (Dissolved RCAp-MS);
- Mercury (total, dissolved, methyl);
- Total Phosphorus;
- Cyanide (total, free);
- Tungsten (total, dissolved);
- Zirconium (total, dissolved);
- Dissolved Organic Carbon;
- Dissolved Fluoride;
- Total Chemical Oxygen Demand;
- Chlorophyll A;

- Salinity;
- Acidity;
- Total Suspended Solids;
- Total Dissolved solids; and
- Radium-226.

Three compliance locations are discharge monitoring locations required by the MDMER and are analyzed to this standard.

During the operation phase, the proposed surveillance and compliance locations do not change from the construction phase, although the proposed frequency changes for certain sample locations from monthly to quarterly.

During the two years of active closure, the surveillance locations are proposed to be reduced to the ditches, three settling pond locations, and upstream and downstream of the Killag River. It is proposed that the sample frequency also be reduced, with samples collected quarterly during the first year and semi-annually for the second year. The three compliance locations discharging to the Killag River will continue to be monitored to MDMER standards.

After the completion of active closure, the proposed surveillance locations will further be reduced to three locations the Pit lake and upstream and downstream of the Killag River with a proposed sample frequency of semi-annually. The compliance locations discharging to the Killag River is proposed to be reduced to one location.

Continuous water levels (automated transducers) and manual flow data have been collected at seven water quantity surveillance locations historically by McCallum Environmental Limited (MEL) in 2019 and 2020. The collection of continuous water level and manual flow data at these seven surveillance locations is proposed to continue on a monthly frequency to support and improve the existing stage-discharge relationship/rating curves established by MEL and further help validate modelling completed for the Mine. This monitoring will continue until the completion of active closure.

2.7.3 Haul Roads

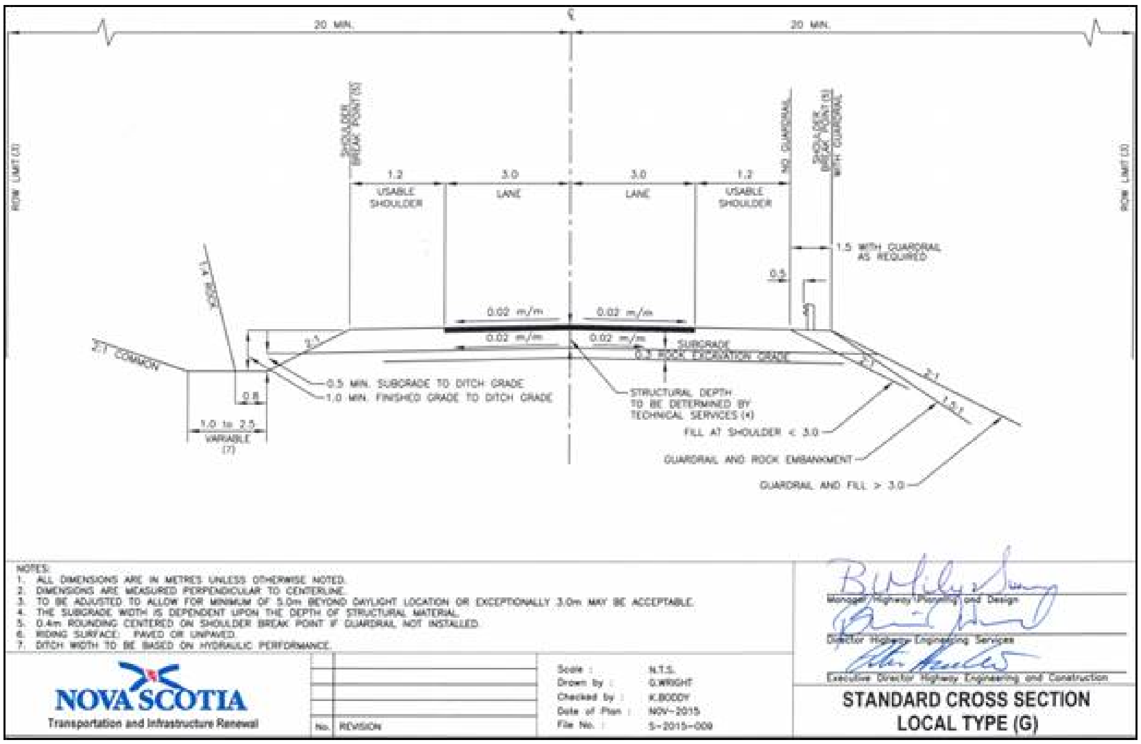
As Beaver Dam Mine Site will operate as a satellite surface mine, ore produced will require transport by road to the Touquoy Mine Site (Figure 2.3-3). Portions of the existing logging roads (Section 1 and Section 4A/B) between Beaver Dam Mine Site and the Touquoy Mine Site will require upgrading to a dual lane road to facilitate the safe passage of two-way truck traffic at 70 km/h. The total length of the Haul Road is approximately 31 km. It may be necessary to use the Public Roads during start-up (i.e., 6 to 8 months) depending on approval and permitting timelines and construction restrictions.

A new section of road (Section 3B; approximately 4.0 km in length) constructed to the same design standards connecting the Beaver Dam Mines Road/Highway 224 intersection with an existing woods road. The alignment displayed in Figure 2.3-3 is based on a preliminary engineering design. Final design will consider safety, social and environmental constraints to ensure the best-case scenario that will optimize worker safety and minimize potential environmental effects. The new 4.0 km section of road is being construction to avoid travel on Highway 224, through the community at Beaver Lake IR 17.

The upgraded and newly constructed Haul Road will be designed to accommodate up to a 68 t gross vehicle weights in either a B-Train or C-Train configuration year-round. Where upgrades will follow the course of the existing woods roads, the width will be increased from approximately 4 to 10 m, with an additional width of 6 m, on average, to account for sloping and ditching on both sides of the road. Where new road construction is required, including deviations from the existing roads to ensure safe design standards, the daylighted corridor for the Haul Road will be approximately 16 m wide (on average). Wider areas of disturbance will exist along the route where the natural topography exceeds design grades. In these areas, increased cut and fill will be required to reduce grade and maintain safe design standards. Where possible existing roads will be used in an effort to minimize disturbance of undeveloped areas.

Figure 2.7-5 below, Transportation and Active Transit standard cross-section for Type G gravel roads, represents the intended dimensional road cross section for the full length of Segments 1 through Segment 4. Thicknesses of Type 1 and Type 2 gravels for Segments 2 to 4 will be determined by road design contractor based on expected loadings. The road design contractor will recommend a road structure for the Mooseland Road upgrade, although NSTAT will perform the final detailed design in-house.

Figure 2.7-5: Transportation and Active Transit Standard Cross-section for Type G Gravel Road



Construction material will be sourced from either Touquoy Mine, Beaver Dam Mine, local quarries (<4 ha) or from a commercial operation. Before material is used it will be physically and chemically tested to ensure suitability for road construction. The lessons learned from Touquoy is select road construction material that is of a hardness that will not erode overtime, which will minimize siltation, which is discussed in Fish and Fish Habitat (Section 6.9).

Over 20 culverts are identified as fish bearing and these culverts will be constructed from concrete with specific details developed for each. The balance of simple drainage applications will be constructed of CSP culverts.

The Haul Road will be upgraded where required to enable the safe and economic transportation of ore. Relict portions of the Haul Road may be properly reclaimed at the end of the Project lifespan or returned to the original owner as per the lease arrangement. Re-vegetation may be undertaken on portions of the Haul Road to minimize stabilize slopes and minimize erosion.

For the purposes of this description, the Haul Road has been sectioned off as follows (Figure 2.3-3).

2.7.3.1 Beaver Dam Mines Road (Section 1)

- 7.2 km of unsealed two-lane private road historically used for logging known as Beaver Dam Mines Road and currently owned by Northern Timber with varying quality from the Beaver Dam Mine Site to Highway 224.
- The intersection between the Beaver Dam Mines Road, Highway 224, and the new construction will be designed to meet Nova Scotia Transportation and Infrastructure Renewal (NSTIR) standards.
- The extent of required Haul Road upgrades and new construction will encroach on land owned by Northern Timber and NSDL&F.
- Upgrades to this section of the Haul Road will also require replacement or new installation of up to 9 culverts, and upgrades to, or replacement of, single lane bridges with dual lane bridges across 2 watercourses. All upgrades will be made to government standards and permit requirements.

2.7.3.2 New Construction East of Highway 224 Section 3B

- Approximately 4.0 km of new construction from the Beaver Dam Mines Road and Highway 224 intersection to the Moose River Cross Road through a greenfield environment.
- The land required for new construction is currently owned by Northern Timber and NSDLF.
- Construction of the Haul Road will also require installation of one stream culvert. Others may be required to maintain flow in some wetlands. All installations will be made to NSE standards and permit requirements.

2.7.3.3 Haul Road to Mooseland Road Section 4A/B

- 8.2 km portion of the Moose River Cross Road that ends at the intersection with the Mooseland Road. This section is an unsealed single lane private road historically used for logging and currently owned by Northern Timber and others with varying road quality along its length.
- The intersection between the Moose River Cross Road and Mooseland Road will be designed to meet NSTIR standards.
- The extent of required Haul Road upgrades and new construction will encroach on land currently owned by Northern Timber, NSDL&F, Musquodoboit Lumber Limited, Deepwood Estates Limited, Prest Bros Limited, and private residences.
- Upgrades to this section of the Haul Road will also require replacement or new installation of up to 10 culverts and upgrades to, or replacement of, a single lane bridge with a dual lane bridge across one watercourse (WC-AD, Morgan River). All upgrades will be made to NSE standards and permit requirements.

2.7.3.4 Haul Road Mooseland Road to Touquoy Section 5A/B

- 10.7 km of sealed and unsealed dual lane provincial local road known as Mooseland Road and owned by NSTIR suitable for heavy traffic from the Moose River Cross Road to the Touquoy Mine processing facility.

Haul Road upgrades will utilize existing road centre lines where possible to minimize encroachment on adjacent lands. Where encroachment on Crown land is unavoidable, lease agreements through NSDL&F will be pursued. Similarly, where encroachment on private land is unavoidable, lease or purchase agreements will be pursued with the individual landowners. Leases will be in place prior to the beginning of any site work.

Mooseland Road is currently a Class G road with maximum Gross Vehicle Weight (GVW) of 41,500 kg. Most of the route is gravel surface although there is a short section of asphalt close to Touquoy mill. Based on a desktop study currently underway, cross section is fairly consistent at 10 m (+/- 0.2 m) and indications are that this could be designed to a Type G road (8.4 m cross section) with a built-up gravel cap on the existing road without increasing the existing cross section width, dependent on the extent of additional Type 1/Type 2 gravels required to build up the road surface.

The intent is to upgrade the segment of Mooseland Road to a Schedule B all-season road with GVW capacity of 62,500 kg (C-train), which will maximize payload and eliminate spring weight restrictions. Classification will remain as a Type G road. It is anticipated that the upgrade to Mooseland Road will be designed and executed by Nova Scotia Transportation and Active Transit during 2022, under a cost sharing agreement with AMNS.

2.7.3.5 Bypass Roads

The bypass roads are intended to provide an alternate route for recreational users such as ATVs and pick-up trucks as well as Indigenous rightsholders. The existing logging road represents an integral part of the current ATV Association of Nova Scotia's trail network. It is anticipated that without a bypass road, recreational users will continue to use the haul road to access the trail network. Due to the high traffic volumes and large hauling trucks, it is not desirable to have uncontrolled vehicle conflicts between hauling trucks and ATV's. As a result, an adjacent and parallel bypass road is planned to be constructed adjacent to the haul road. The bypass road routing will improve the safety of the recreational users and haul truck operators by separating the traffic and reducing the number of crossings.

The preliminary haul road routing has been established as part of the 30% design submission. This alignment is not finalized and can be adapted to facilitate an optimized design for both roads simultaneously. As a starting point, the 30% haul road alignment was reviewed against the trail network to establish which side of the haul road the bypass road alignment should follow. To minimize trail crossings, the bypass road will be kept on one side of the haul road with connecting trails crossing the haul road as required.

Large sections of the existing logging road remain after the establishment of the 30% alignment. When possible, WSP has routed the bypass road along the existing logging road. This will reduce the amount of clearing and grubbing and overall construction to establish a bypass road.

There is one existing bridge structure along this portion of the alignment and is currently on the west side of the proposed haul road. The connections of the bypass road to the trail network at the start and end of the alignment are also along the west of the haul road. For this reason, the alignment through Segment 2 has been placed on the west side of the haul road. This will result in one primary intersection location at the mid-point of the alignment for the ATVANS trail network. Additional intersections may be required during construction or during operation to facilitate local users.

There are also options under review for connecting the existing trail south of Mooseland Road to the start of the bypass. The existing trail south of Mooseland, locally known as Scott Road, is approximately 300 m west of the start of the bypass road. The bypass road is currently planned to run on the north side of Mooseland Road and cross perpendicular at Scott Road. Consideration is being given to a gravel parking area be considered at the start of entrance from the Mooseland Road to the Haul Road to allow for recreational users to park and offload their ATVs – this parking area is intended for discussion with Nova Scotia Department of Transportation and Active Transit within the broader scope of Mooseland Road upgrades for summer 2022. The parking area is intended to keep the shoulders of Mooseland Road clear and minimize potential for interaction with vehicles and trailers at Mooseland/Haul Road intersection. This has been identified as part of Public Engagement (Section 3).

2.7.3.6 Haul Road Bridges

There are three bridges along the existing logging roads. These bridges are not sufficient to support the increased loading of the haul traffic. Rather than remove and replace these with new bridges, they will remain in place for use in establishing the bypass road network. The existing capacity of these bridges is under review to establish if any upgrades are required to support mine construction activities.

2.7.3.6.1 Bridge 1 (north of Highway 224)

The intended project use of Beaver Dam Mine Road Bridge 1 is for mobilization of construction and mine development activities, as well as continued use in the bypass road network. This bridge is located just north of Highway 224 on Beaver Dam Mines Road. The structure is a single span timber superstructure supported on timber crib abutments. The timber girders were treated with creosote and generally appeared to be in fair to good condition. The girders are supported on timber cap beams that are spaced 11.2 m apart (clear span). The cap beams are supported on localized timber cribwork founded on loose rock.

The bridge was inspected by Harbourside Engineering Consultants (HEC) in October 2019 and HEC noted that the foundations are not considered to be adequate. The foundations are not considered to be adequate for the loadings proposed on the haul route. An upgrade to the east and west foundations will be necessary before commencing with construction mobilization to Beaver Dam mine site.

A structural assessment of the bridge superstructure itself is being assessed to determine whether it is suitable for the anticipated loads exerted during the construction period before the new bridge is constructed – the largest load anticipated is expected to be the 58T chassis of a Caterpillar 390 excavator (with 11 tonne boom removed).

2.7.3.6.2 Bridge 2 (Beaver Dam Mine Road)

The intended project use of Beaver Dam Mine Road Bridge 2 is for mobilization of construction and mine development activities, as well as continued use in the bypass road network.

This bridge is a single span timber superstructure supported on timber crib abutments. The runners are in poor condition with visible rot and deterioration. The deck members appeared to be pressure treated and in fair to good condition. The deck is attached to nine 8”x12” timber girders which appear to be pressure treated and are generally in good condition. The girders are supported on timber crib abutments that are spaced 3.4 to 3.5 m apart (clear span).

2.7.3.6.3 Bridge 3 (Moose River Cross Road)

The intended project use of Moose River Cross Road Bridge is for use in Segment 2 road construction activities, as well as continued use in the bypass road network. The bridge at the entrance to Moose River Cross Road is located just off Mooseland Road. The Moose River Cross Road Bridge is a single span timber superstructure supported on concrete abutments in overall good condition. The wearing surface included two timber runners in fair to good condition. The deck members appeared to be in fair condition with some visible wearing on the top of the deck between the runners. The deck is attached to nine 9”x18” timber girders which are treated with creosote and in fair condition. The girders are supported on concrete abutments that are spaced 8.6 m apart (clear span). The width of the bridge deck is approximately 4.9 m. The wingwalls are concrete from the footings to the level of the bearing seat and are timber cribs above the bearing seat. The foundations appear in good condition with some cracking noted.

The prefabricated steel girder bridges from Algonquin Bridge (a subsidiary of AIL) is being considered. This bridge has a CL625 loading and offers a rapid construction schedule with minimal cranage requirements.

2.7.4 Touquoy Mine Site

The Beaver Dam Mine Project will utilize the existing permitted processing facility at the Touquoy Mine Site to process Beaver Dam ore. Processing of ore from the Beaver Dam gold deposit at the existing Touquoy processing plant will begin upon completion of mining ore from the Touquoy deposit. Beaver Dam tailings will not be stored in the Touquoy tailings management facility, but instead will be permanently stored in the exhausted Touquoy pit after that deposit has been mined. This allows the Touquoy Mine Site footprint to be maintained as originally permitted and no tailings management will be needed at the Beaver Dam Mine Site. All other aspects of the Touquoy Gold Project will remain as assessed and approved through the Nova Scotia EA process in 2008 and as approved and regulated under the Touquoy Industrial Approval (IA).

Changes to the Touquoy Mine Site as a result of the Beaver Dam Mine Project will include the following:

- an increase in the duration of ore processing (five years additional years);
- weigh scales, a pair of weigh scales will be installed within the existing footprint to quantify the tonnage haul (i.e., one for incoming load and one to weigh the empty trucks;
- minor alterations to the Touquoy processing facility to accommodate Beaver Dam ore; and
- disposal of tailings Beaver Dam ore processing in the exhausted Touquoy mine. Historic tailings collected during construction will be disposed in the pit as well.

The Touquoy Mine Site will be operational for an additional five years beyond the current lifespan anticipated for the Touquoy Project. There will be no increase in the Touquoy processing rate to accommodate Beaver Dam ore. This will result in four additional years of ore processing, water management, and tailings management (exhausted pit).

The Touquoy processing facility main building houses ball mill, gravity recovery, reagent make-up, elution, and refinery sections. The crushing, carbon in leach (CIL), and cyanide destruction sections are located outdoors. Tailings produced from processing Beaver Dam ore will be stored in the exhausted Touquoy open pit. Water from the deposited tailings will be recirculated through the processing facility in a closed loop. Make up water requirements will be sourced from Scraggy Lake or other sources as per existing approvals. Water withdrawal from Scraggy Lake for the processing of Beaver Dam Mine ore is only expected during start-up. A technical report that presents the technical water and tailings management plan (Appendix F.7 Touquoy Integrated Water and Tailings Management Plan), including tailings deposition and the overall mine site water balance including the direction of flow between components, effluent discharge locations, mine component drainage areas, and locations of MDMER final discharge. The existing Effluent Treatment Plant will be used will be utilized during closure until such time regulatory discharge requirements are met and excess water from the pit discharges to the Moose River along a constructed discharge outline.

The additional operational life of the Touquoy Mine Site involves no new footprint disturbance to the existing Touquoy facility or property. The Beaver Dam tailings will be managed in the exhausted Touquoy open pit. As originally planned in the approved Touquoy Gold Project Reclamation Plan, the inflow of groundwater, surface flow and precipitation into the pit will naturally create a lake upon closure of the site. Air emissions generated from the Touquoy Mine Site associated with the processing of Beaver Dam ore will be limited to emissions from the existing permitted plant operation during processing. The primary potential effect of the continued use of the Touquoy Mine Site is on surface water and groundwater quality associated with processing the Beaver Dam ore through the use of the exhausted open pit for tailings storage. It should be noted that geochemical and water quantity/quality data collected during the operational phase of the current permitted Touquoy Mine Site has been utilized to model surface and groundwater and to make predictions of future water quantity and quality. As the Touquoy operation progresses, these predictive models will continue to be refined and revised as warranted.

An amendment to the Touquoy Industrial Approval will be sought as necessary to accommodate these changes. As well, the currently approved Reclamation Plan will be updated to reflect the above changes and re-submitted.

2.7.4.1 Currently Approved Operations at the Touquoy Mine Site

The Touquoy Gold Project was described in a Provincial EARD and planned as a surface operation using drilling and blasting, with processing on site. As described in Section 2.7.2.1, ore production from the pit will vary with a maximum of approximately 5,480 tonnes of ore per day with a total ore production estimate over the life of the mine of at least 9.2 million tonnes for recovery of 0.4 million ounces (oz.) of gold. The Touquoy Gold Project is currently in its fourth year of commercial production, the mine life is estimated to be five to seven years for processing of Touquoy ore, three to four years for processing of Beaver Dam ore based on favorable permitting, and two years for closure and decommissioning.

The open pit and associated infrastructure are centered on areas of previous (bulk sample in 1980s) and historic mining activity at Moose River Gold Mines. The Touquoy facilities include an open pit, processing plant, tailings storage facility, waste rock piles, power and water supply systems, offices, and a service support complex. The total area of the development at the Touquoy Mine Site is approximately 265 ha. The open pit and mine site roads will occupy approximately 40 ha, processing plant and service complex will occupy approximately 60 ha, the tailings management facilities will occupy approximately 130 ha, and the waste rock stockpile will occupy approximately 35 ha.

Ore is mined from the nearby Touquoy pit and delivered to the mill for processing. Processing involves size reduction of the ore by crushing and grinding and recovery of the contained gold by mechanical and chemical processes. Recovery entails gravity concentration, carbon-in-leach (CIL), elution and carbon regeneration, electro-winning and smelting, and cyanide destruction. Tailings from processing of the Touquoy ore are deposited in the permitted TMF. Water associated with the Touquoy tailings is recycled for use in processing. At closure, all facilities will be removed, disturbed lands rehabilitated, and the property returned to otherwise functional use.

As part of the conceptual reclamation plan for the Touquoy Mine Site identified in the Provincial EARD, all site facilities will be removed, and the pit will be allowed to fill with water forming a lake. The flooding of the pit will create a lake approximately 15 ha in size with edge habitat.

2.7.4.2 Touquoy Gold Mine Environmental Assessment

An Environmental Assessment Registration Document (EARD) was submitted for the Touquoy Gold Mine on March 15, 2007. As a result of the subsequent review, a Focus Report was requested by the Minister of Environment and Labour to provide additional details on certain specific aspects of the project. The nature of the Focus Report was detailed in the Terms of Reference (TOR) in a public letter to DDV Gold dated April 15, 2007. The Focus Report was submitted on November 19, 2007.

The EARD assessed the potential environmental effects of the Touquoy Project on biophysical and socio-economic Valued Environmental Components (VECs). This assessment was based on inputs from members of the public, the Mi'kmaq community, government regulators and the professional judgement of the study team. The VECs identified and evaluated for the Touquoy Gold Mine included:

- Air Quality;
- Noise;
- Surface Water Resources;
- Geology and Hydrogeology;
- Terrestrial Resources;
- Wetlands;
- Archaeological and Cultural Resources; and
- Population and Economy.

Species of special concern were also considered within each applicable VEC.

A review of the EARD and Focus Report identified that the following VECs were evaluated in terms of effects of the processing of ore during the Touquoy Project: air quality, noise, surface water resources, and terrestrial resources. The remaining VECs were evaluated in terms of the effects of construction, mining operations, and use of the tailings management facility, and no additional effects were anticipated in the EARD or the Focus Report beyond the scope of these operations.

2.7.4.3 Existing Industrial Approval at the Touquoy Mine Site

An Industrial Approval was developed by NSE to add specific conditions for environmental management and monitoring associated with the construction, operation and reclamation phases of the Touquoy Project. The Industrial Approval contains over one hundred specific requirements in 25 sections which include but are not limited to the following:

- Particulate emissions (dust) and sound levels;
- Blasting management and monitoring;
- Air emissions from plant operations;
- Groundwater and surface water management and monitoring;
- Liquid effluent discharge management and monitoring;
- Tailings management and requirement for an engineer of record for the tailings management facility;
- Management and containment of historic tailings;
- Management of waste rock and sampling procedures;
- Handling, storage and management of reagents;
- Contingency / emergency response plan;
- Environmental impairment liability insurance requirements;
- Complaint response procedures;

- Community liaison committee (CLC) facilitation;
- Reporting requirements; and
- Reclamation planning and posting of bond to ensure completed.

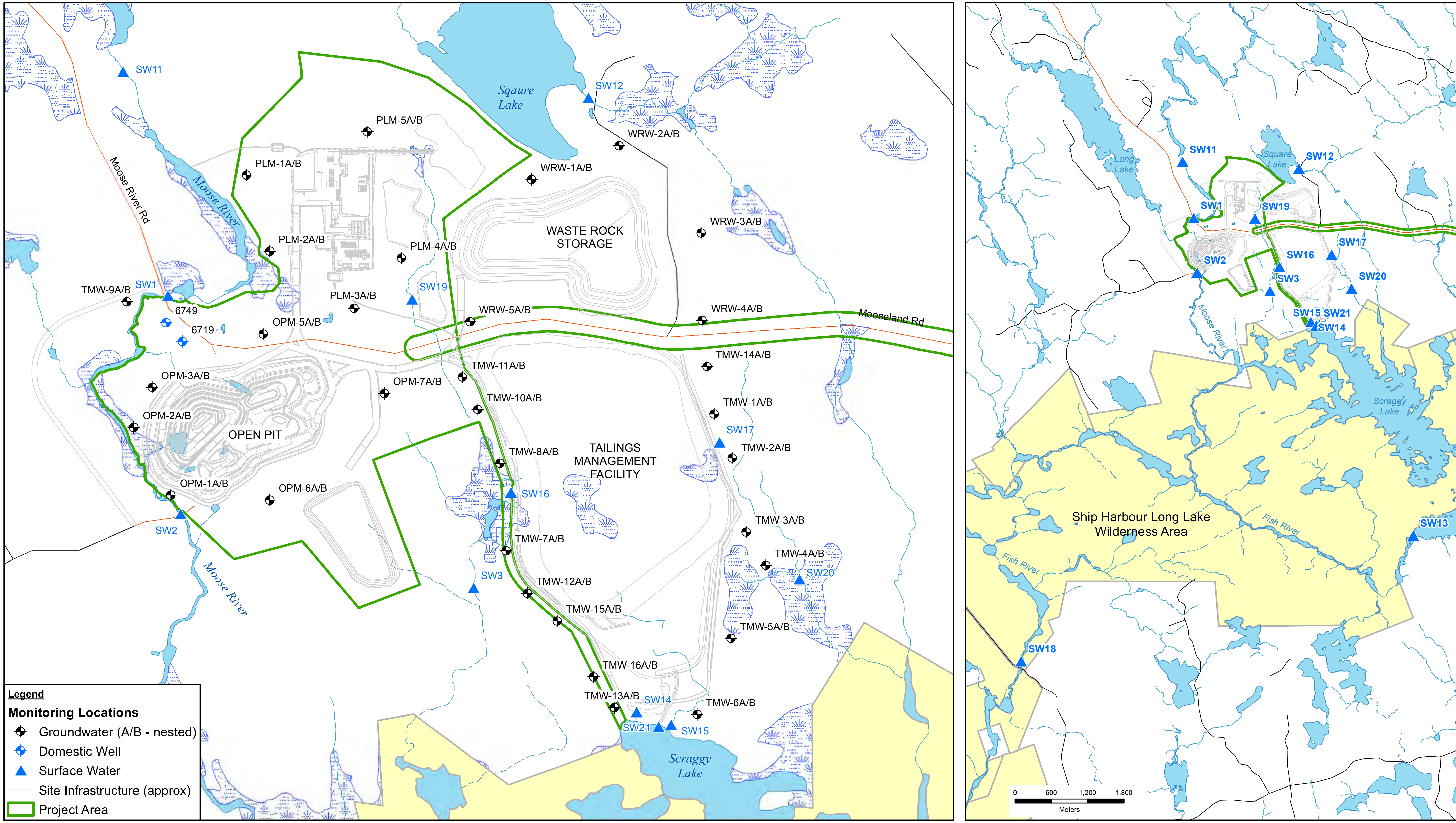
The Industrial Approval has specific requirements at various project stages of the Touquoy Project. This included installation of 32 nested pairs of groundwater monitoring wells prior to construction and completion of four quarterly monitoring events prior to operation. Subsequent to the start of operations, an additional 10 groundwater wells have been installed monitored: 8 shallow wells, and 1 nested pair. These groundwater monitoring data as well as surface water monitoring data are now being collected at the Touquoy Mine Site and are being used to periodically update the surface and groundwater modelling predictions for operations and post closure. The current compliance monitoring locations at the Touquoy Mine Site for groundwater and surface water are shown in Figure 2.7-6.

It is anticipated that many of the components of the Touquoy Project Industrial Approval will be included in a future Beaver Dam Mine Project Industrial Approval application reviewed by NSE prior to the Beaver Dam Mine Project commencing. As with other federal and provincial permits and approvals, these will be issued after the EA process is completed; typically, the conditions and framing of follow up programs as part of EA approval are reflected as appropriate at the permitting level.

2.7.4.4 Touquoy Mine Site and Benefits to the Beaver Dam Mine Project

Prior to the use of the Touquoy facility for the processing of Beaver Dam ore and storage of tailings in the exhausted Touquoy pit, approximately five years of operational data from the Touquoy operations will have been collected and modelling studies will be updated based on a review of these data. Monitoring of the current Touquoy Project includes air and noise monitoring, surface water monitoring of nearby waterbodies, and groundwater monitoring of an extensive network of near and far groundwater monitoring wells. This ability to have actual data from an operational setting that is very similar to that proposed at Beaver Dam Mine Site is unique and important. The two sites have similar geology, ore, mining methods, wetlands and surface waterbodies in close proximity to the extraction areas. AMNS will utilize the operational data to update models and provide greater refinement in the potential effect prediction for the Beaver Dam tailings deposition in the exhausted Touquoy pit.

Mining is complex and necessitates the proper use of personnel and equipment in creating an operation that is safe, benefits communities, and is executed in a manner that minimizes potential harm to the current and future natural settings. This operational expertise gained through the development and operation of the Touquoy Mine will be applied at the Beaver Dam Mine Site as proposed. The primarily local workforce will be able to be used at the Beaver Dam facility as it is in the same general area (within 30 km) and they will have over 5 years of additional operational experience beyond what they had prior to the Touquoy Project being opened.



Source: Service Nova Scotia, AGC, Stantec, GHD

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Metres

Coordinate System:
NAD 1983 CSRS UTM Zone 20N

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GHD

ATLANTIC GOLD CORPORATION
MARINETTE, HALIFAX CO., NOVA SCOTIA
ENVIRONMENTAL IMPACT STATEMENT - BEAVER DAM MINE

TOUQUOY MINE
COMPLIANCE MONITORING LOCATIONS

088664
Feb 22, 2019

FIGURE 2.7-6

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2.8 Project Schedule

Site preparation and construction for the Beaver Dam Mine Project will begin in 2022 prior to exhaustion of the Touquoy pit so that the ore supply from the Beaver Dam Mine Site to the Touquoy Mine Site will follow shortly after the mining operations at Touquoy have ceased. Table 2.8-1 shows the Project Schedule.

Table 2.8-1: Beaver Dam Mine Construction, Operation, and Active Closure Schedule

Event	Timeline
Beaver Dam Mine Construction	Q4 2022
Beaver Dam Mine Operation	Q1 2023 to Q2 2027
Touquoy Partial Reclamation (waste rock stockpile and tailings management facility) and Environmental Monitoring	2023-2026+
Beaver Dam Mine Reclamation and Environmental Monitoring	2027-2029+
Touquoy Complete Reclamation (processing facility, surface mine/beaver dam tailings management facility) and Environmental Monitoring	2027-2029+

2.9 Project Activities

The Project consists four phases:

- one-year construction phase;
- five-years operations phase;
- two-year active closure and reclamation; and
- 10+ years post-closure monitoring and adaptive management.

2.9.1 Construction (Year 1)

2.9.1.1 Beaver Dam Mine Site

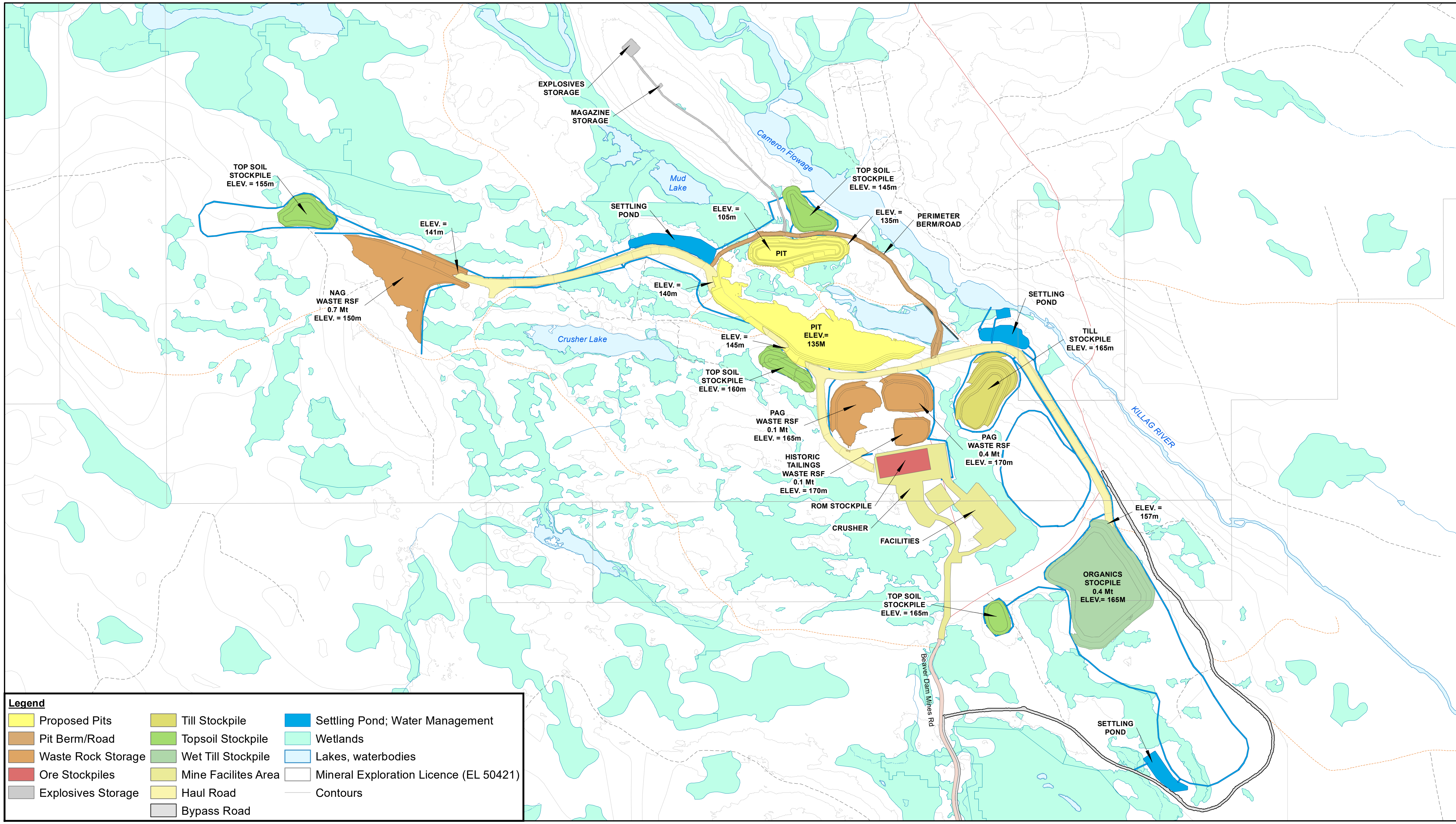
Pre-production mine operations at Beaver Dam include the following tasks. These tasks are planned to take roughly eleven months of calendar time, from Q4 2022 to Q2 2023 so will be achievable within the year prior to opening the ore Haul Road to Touquoy.

Clearing and grubbing of planned disturbance footprints, including ex-pit haul roads, explosives storage access road and pads, topsoil stockpiles, till stockpiles, PAG rock stockpile, NAG rock stockpile, low grade waste stockpile, and open pit areas.

- Ditching around pit and stockpiles and development of north settling pond.
- Fish Out of the open pit area.
- Pump out of open pit area.
- Excavation and stockpiling of historic tailings along with potentially contaminated till materials.
- Removal and windrow/stockpiling of topsoil from haul road, till storage, PAG storage, NAG storage and open pit areas. Topsoil thickness of 30 centimetre (cm) is assumed in all areas.

- Removal and stockpiling of till from the open pits, starting with the construction pit areas in the northwest, then the upper elevations along the south side of the pit, and moving on to the remaining pit once the historic tailings are excavated.
- Grade control drilling on 10 m x 5 m pattern, 40 m depth, through estimated mineralized areas of the pit.
- Mining entire starter construction pit, P610.
- 1.7 Mt mined from 135 elevation down to the bottom on the 105 m bench.
- 0.6 Mt of topsoil/till material mined out and stockpiled.
- 0.7 Mt of rock used for haul road and pit perimeter berm construction.
- 0.3 Mt rock mined and stockpiled in the NAG pile.
- Mt rock mined and stockpiled in the PAG pile.
- Mining of benches 135 to 120 of the remaining pit.
- 8.0 Mt mined:
  - 4.7 Mt of topsoil/till material mined out and stockpiled.
  - 2.7 Mt of rock mined and stockpiled in the NAG pile.
  - 0.4 Mt rock mined and stockpiled in the PAG pile.
  - 0.2 Mt ore mined and stockpiled in the low-grade waste pile.
- Construction of haul roads as described in Section 2.7.3 above:
  - 0.7 Mt of waste rock from the pit used for construction, a portion of which will be crushed on site.

Mine construction to full operations is illustrated in Figures 2.9-1 to 2.9-3. Site access, truck shop, ROM pad area, site facilities, water diversions, and water management infrastructure will be constructed during the same time period.



Source: Atlantic Gold, Service Nova Scotia, NS Natural Resources, NS Environment

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Metres

Coordinate System:
NAD 1983 CSRS UTM Zone 20N

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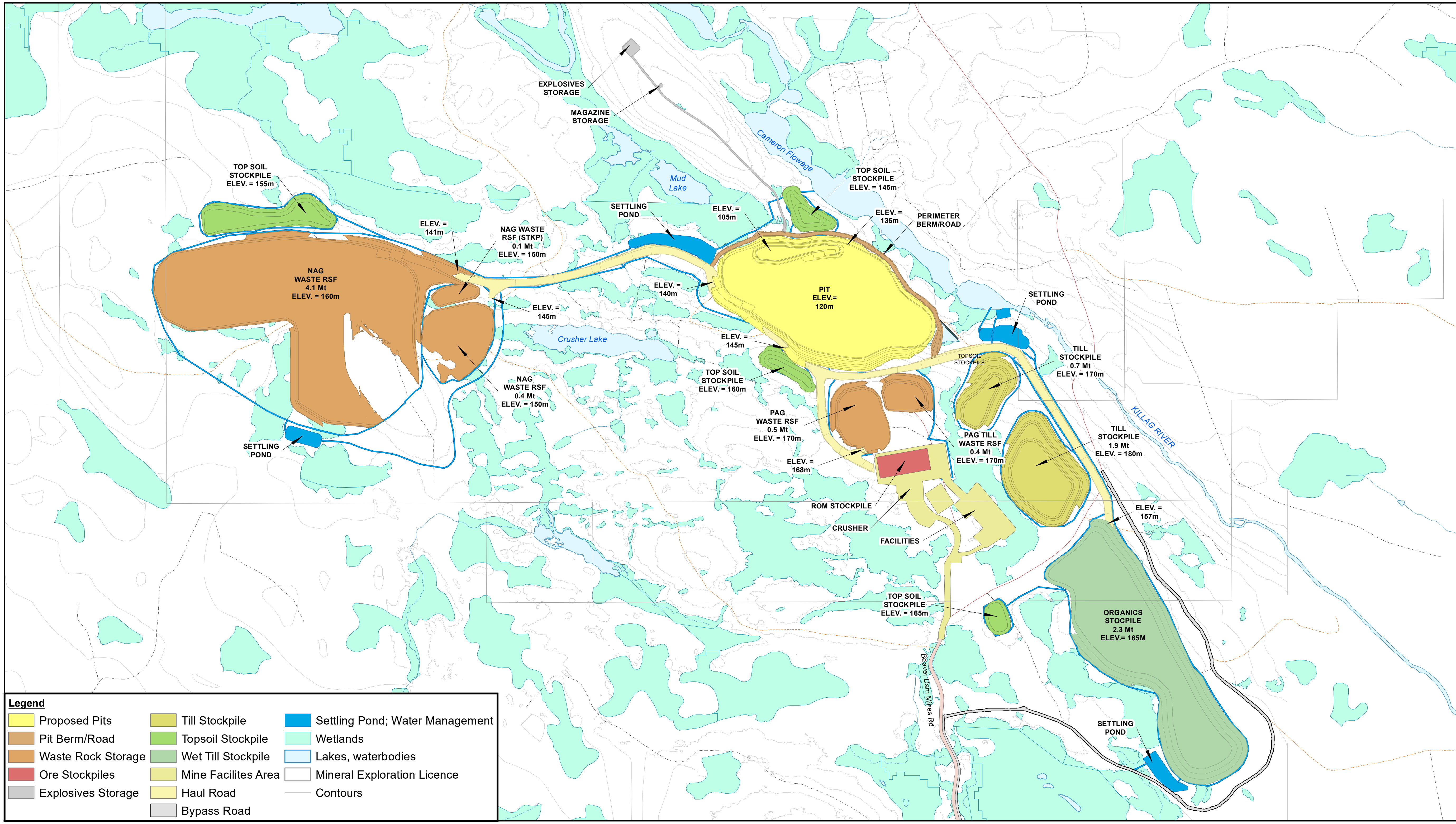
ATLANTIC MINING NS INC
MARINETTE, HALIFAX CO., NOVA SCOTIA
ENVIRONMENTAL IMPACT STATEMENT - BEAVER DAM MINE

END OF PERIOD - Q4 2022

088664
May 11, 2021

FIGURE 2.9-1

GIS File: I:\GIS_DATA\Projects\6-chars\08----\088---\088664 Atlantic BD\088664(004)\Revised 2021\088664(004)GIS-DA067.mxd



Source: Atlantic Gold, Service Nova Scotia, NS Natural Resources, NS Environment

0 140 280 420
Metres

Coordinate System:
NAD 1983 CSRS UTM Zone 20N

N

GHD

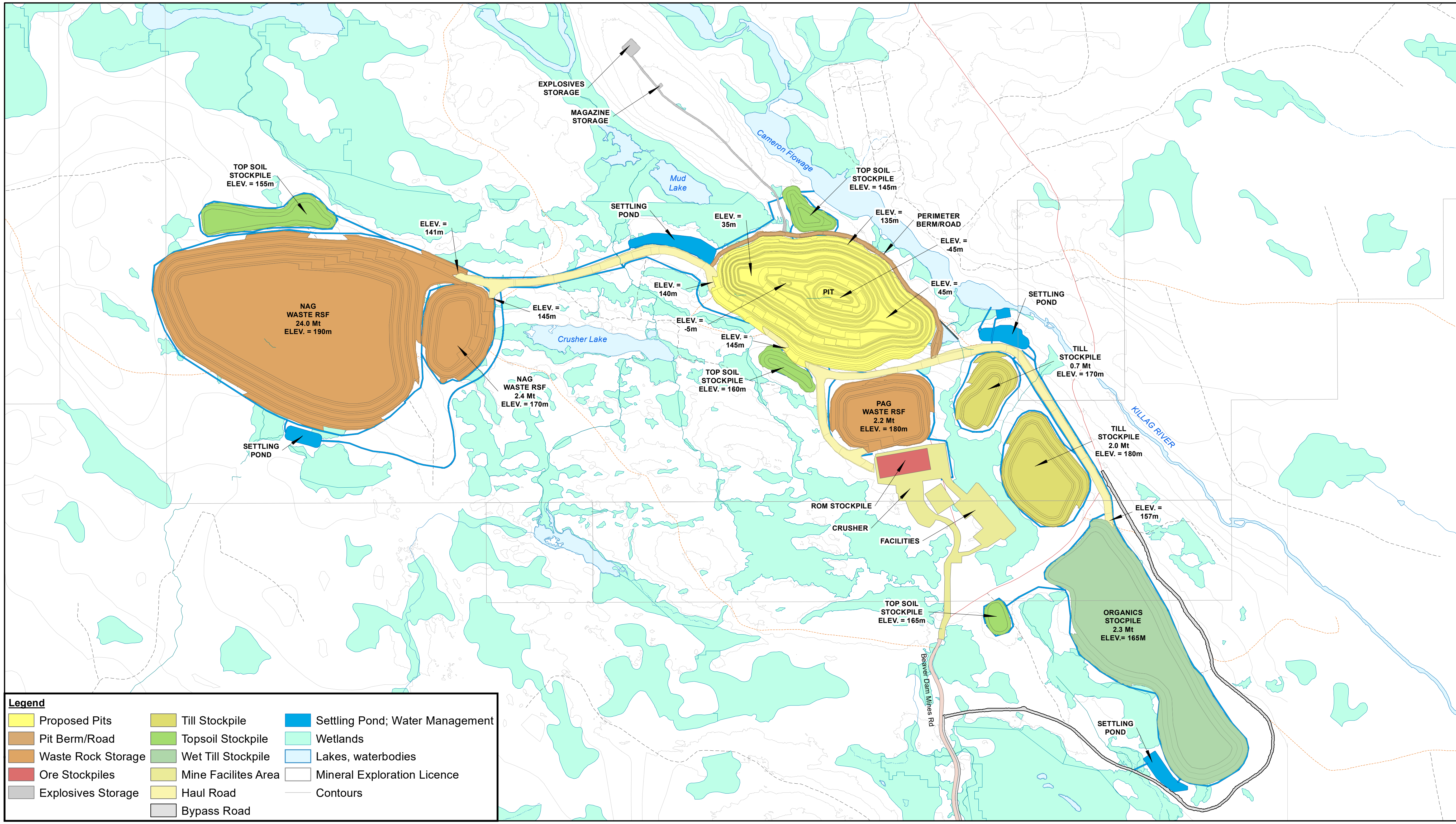
ATLANTIC MINING NS INC
MARINETTE, HALIFAX CO., NOVA SCOTIA
ENVIRONMENTAL IMPACT STATEMENT - BEAVER DAM MINE

MINE DEVELOPMENT
END OF PERIOD - Q2 2023

088664
May 11, 2021

FIGURE 2.9-2

GIS File: I:\GIS_DATA\Projects\6-chars\08----\088---\088664 Atlantic BD\088664(004)\Revised 2021\088664(004)GIS-DA068.mxd



Source: Atlantic Gold, Service Nova Scotia, NS Natural Resources, NS Environment

0 140 280 420
Metres

Coordinate System:
NAD 1983 CSRS UTM Zone 20N

N

GHD

ATLANTIC MINING NS INC
MARINETTE, HALIFAX CO., NOVA SCOTIA
ENVIRONMENTAL IMPACT STATEMENT - BEAVER DAM MINE

MINE DEVELOPMENT
END OF PERIOD - 2027

088664
May 11, 2021

FIGURE 2.9-3

GIS File: I:\GIS_DATA\Projects\6-chars\08----\088---\088664 Atlantic BD\088664(004)\Revised 2021\088664(004)GIS-DA069.mxd

2.9.1.1.1 Site Preparation

Clearing, grubbing, grading, and stockpiling of vegetation, topsoil, organics and till in the pit area will be conducted progressively prior to accessing host rock for mining purposes, to avoid erosion. All topsoil, organics, and till will be stored in stockpiles for use in reclamation and construction of berms, impoundments, mine site roads and/or general site grading. Vegetation clearing will be conducted in compliance with nesting bird directives from NSDL&F and Environment and Climate Change Canada. Once vegetation, topsoil, organics and till have been removed, drilling and blasting will be used to mine ore and non-ore bearing waste rock, as well as to establish benches along rock walls. Holes will be drilled into the host rock to receive explosives used for blasting. The open pit will be advanced from the surface at 130 to 155 masl down to 45 masl (i.e., pit depth will range from 175 to 200 m). A berm surrounding the pit will be constructed to act as an access road, noise attenuation and a flood berm.

Areas of waste material storage at the Beaver Dam Mine Site will include six topsoil stockpiles, four till stockpiles, and two non-ore bearing waste rock stockpiles (NAG and PAG). All these locations will be cleared and grubbed concurrently with the pit. The till and waste rock stockpile areas will also have topsoil removed and stored at the topsoil stockpile locations. The existing settling pond at the Beaver Dam Mine Site has been identified as a wetland during the baseline studies (Wetland 59). Inflow into the wetland will be removed and the wetland will be dewatered in preparation for the open pit development. As discussed in Section 6.9 (Fish and Fish Habitat), brook trout have been confirmed within this wetland and a fish rescue and relocation program is anticipated as an approval requirement prior to the pit development.

2.9.1.1.2 Site Construction

Mine site Haul Roads will be constructed to enable the mining fleet (loaders, dozers, haul trucks) to access various site locations including the open pit, waste rock areas, stockpiles and ROM pad area. A waste haulage road will be constructed connecting the pit exit with the topsoil, till, and non-ore bearing waste rock stockpiles. An ore haulage road will also be constructed connecting the pit exit and ROM stockpile. The roads will be dual lane and approximately 27 m wide, including berms and drainage, with a maximum speed limit of 40 kilometres per hour (km/h).

Where practical, mobile equipment and some support facilities will be transported from the Touquoy Mine Site to the Beaver Dam Mine Site for re-use. The mine plan currently is looking to using small blasts within the open pit to break up rock during construction and small crusher will be used for construction material that will be placed adjacent to the pit. Where practical, equipment will be relocated from Touquoy. In the event this is not possible new or used equipment will be sourced from contractors during construction. Fuel storage and distribution will be installed and managed by contractor similar to Touquoy.

Outdoor lighting for at the Beaver Dam Mine Site will be provided by 3 m pole-mounted high-pressure sodium weatherproof lights, while 8 m pole-mounted floodlights will be utilized for the ROM as well as operational facilities pad.

A temporary prefabricated facility equipped with office space, washroom facilities, a mine dry room, and a first aid facility will be provided. In addition, workshop facilities for general maintenance of the mining fleet and ore haulage fleet will be constructed.

A vehicle wash facility likely consisting of manually directed water jets and a high-pressure hot water and steam generator cleaner will be provided for the Beaver Dam Mine Site. The bulk of the mud will be washed off equipment within the pit area with surface water run-off captured within a sump. Final cleaning will occur in the truck wash where water will be circulated through an oil water separator before being directed to an evaporation pond located north of the facilities. Water from the pond will be ditched such that overflow will be directed towards the north settling pond. Water from the evaporation pond will be recycled for truck washing.

The north settling pond will be the first piece of site infrastructure early in construction to prevent discharge of sediment laden water from the Mine Site during construction. All site water will be directed towards the north settling pond (via an expanding network of surface water ditches or pumping) prior to discharge until the east settling pond and south settling pond have been constructed. The north settling pond is to be constructed prior to any clearing or grubbing in preparation for construction of other components of the Mine Site.

Historic tailings will be initially placed within the pit to allow dewatering and later to potentially the ROM pad for storage before being shipped to Touquoy Pit.

Runoff from the till stockpiles will be captured and directed into a collection pond located on the eastern side of the open pit. Water from both these ponds will be gradually decanted to Cameron Flowage by gravity via separate water discharge structures and engineered channels.

The discharge structures on all the settling ponds will be equipped with flow-control devices. The final design of the collection and settling ponds will be submitted as part of the IA application and process.

A berm will be constructed surrounding the pit to prevent shallow groundwater flow and/or surface water originating in Cameron Flowage from entering the pit. A water diversion ditch will be established around the perimeter of the open pit to intercept any surface water that infiltrates the berm and flows into the mine. This ditch will direct water to in-pit sumps where it will be directed to collection ponds located to the east and west of the open pit.

Development of the Beaver Dam Mine Site will cause direct and in-direct impacts to wetlands mostly within the construction phase of the Project. Direct impacts will be associated with clearing, grubbing, infilling and development of the mine and its associated infrastructure. Wetlands located within the Beaver Dam Mine Site are discussed further in Section 6.8 (Wetlands).

2.9.1.2 Haul Road

Site preparation for the Haul Road will begin one year prior to operations commencing, with construction of key infrastructure following shortly thereafter. Based on permitting timelines and environmental restrictions it may be necessary to transport ore along existing Public Roads until such time as Haul Road construction is complete.

The following activities will be undertaken to prepare the Haul Road for construction activities:

- clearing, grubbing, and grading; and
- topsoil, till, and waste rock management.

Once site preparation activities have been completed, construction will commence and involve the following activities:

- watercourse and wetland alteration;
- culvert and bridge upgrades and construction; and
- Haul Road construction and upgrades.

Clearing and grubbing will be conducted prior to upgrading or construction of the Haul Road. Saleable timber will be cut and stockpiled along the road length and the remaining vegetation mulched. Topsoil will be removed and stockpiled along the road length or used in berm construction, water diversion or reclamation of relict portions woods roads not required as part of the realignment.

Where upgrades follow existing woods roads, the width will be increased from approximately 4 to 10 m, with an additional 3 m on either side to account for sloping and ditching on average. The portions of the Haul Road that require upgrading are anticipated to include approximately 17.8 ha of disturbance.

New road construction totaling approximately 4.0 km, built through a "greenfield" environment, will also be required to avoid travel on Highway 224 and through Beaver Lake IR 17. The new road construction through the "greenfield" environment is anticipated to result in 6.4 ha of disturbance. The new construction will have a daylighted corridor of approximately 16 m width (on average) with wider areas of disturbance associated with cut and fill sections required to minimize grade and maintain safe design standards. Where possible existing roads will be used to minimize newly disturbed areas.

The upgraded and newly constructed Haul Road will be designed to accommodate up to a 68 t gross vehicle weight in either a B-Train or C-Train configuration year-round. It is estimated for construction at total of approximately 275,000 m^3 of material will be excavated during the bulk earthworks phase of construction. The majority of this material will be utilized as fill to establish rough grading of the road. An additional 400,000 T of rock will be required for final grading comprising approximately 225,000 T rock fill for the road base and 175,000 T of gravel for the road surface. Construction material will be sourced from three quarries located along the length of the road with additional requirements for construction material, if required, sourced from either the Touquoy or Beaver Dam Mine Sites or local approved facilities. Road construction will allow for a clear porous subgrade or cross drainage culverts in order for wetland hydrology to be maintained post-construction. Sources of suitably tested clear stone may include the Haul Road corridor and/or the Beaver Dam Mine Site and Touquoy Mine Site or local approved facilities.

Three watercourses between 6 m and 13 m wide are currently crossed via single lane timber bridges; these will be replaced by dual lane clear-span pre-engineered single arch modular bridges with an approximate lifespan of 30 years. Smaller watercourse crossings currently utilize culverts of varying sizes, makes, and conditions. Where the upgraded Haul Road follows the course of the existing Haul Road, culverts will be replaced by 600 mm corrugated steel culverts, each designed to extend 2 m beyond the edge of the Haul Road. Where deviations from the existing course are required, culverts of the same design will be installed beneath the new span and culverts beneath the old span will be removed where appropriate to facilitate the restoration of corresponding watercourses and to improve fish passage. Haul Road grades will be designed to maintain a minimum cover of 1 m over all culverts. Culverts will be installed in accordance with DFO and NSE guidance to reduce potential impacts to fish and fish habitat. Where appropriate, AMNS will work to install open bottom box culverts to reduce potential impact on the watercourses and associated fish habitat during road construction. Wetlands that are expected or confirmed to support fish habitat will be partially altered within the Haul Road to support road upgrades, widening and re-alignment as required.

The Haul Road will be upgraded where required to enable the safe and economic transportation of ore. Along the existing Haul Road at locations where the proposed road upgrade alignment will fall, it is anticipated that there could be up to 13 locations where there will be opportunity to improve fish habitat with new culvert installation and old culvert removed, up to 13 net zero scenarios where a new culvert could be installed, and 8 watercourses that will not be affected. Relict portions of the existing portions of the Haul Road that are not reclaimed during Haul Road construction will be properly reclaimed at the end of the Project lifespan or returned to the original owner as per any future lease arrangements.

Speed limit and right-of-way signage will be installed, and all haul truck operators will receive operator training to minimize the risk of collisions. All intersections will be designed to NSTIR Standards. Final design will consider safety and environmental constraints to ensure the best-case scenario for worker safety and environmental effects is developed.

Increased environmental disturbance is anticipated during initial site preparation, construction of new portions of the Haul Road, and during the replacement/upgrades that will be completed to over 20 culverts and 3 bridges.

Prior to construction it is anticipated that the following authorizations will be required:

- Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR)
  - Highway 224 crossing (preliminary discussions have occurred)
  - Haulage along Mooseland Road (preliminary discussions have occurred)
- Nova Scotia Department of Lands and Forestry (NSL&F)
  - Crown land access/lease (preliminary discussions have occurred)
- Nova Scotia Department of Environment (NSE)
  - Watercourse/Wetland alteration
- Department of Fisheries and Oceans
  - Fisheries Authorization

Authorizations will be sought during the Beaver Dam Mine Project Industrial Approval process.

2.9.1.3 Touquoy Mine Site

2.9.1.3.1 General

The Touquoy process plant is located east of Moose River, north east of the Touquoy open pit and north-west of the tailings storage facility. The approach by road to the plant will be from the east via the Mooseland Road.

The Touquoy plant, in particular the crushing circuit, has been designed for simple modification to handle the Beaver Dam feed ore once Touquoy pit is exhausted. The Ball Mill has been sized to accommodate the harder ore from Beaver Dam. Consequently, the Touquoy process flowsheets will remain fundamentally unchanged with the processing of Beaver Dam ore.

The main plant building houses the grinding, gravity recovery, reagent, elution, and refinery sections. The crushing, preleach thickener and CIL sections are located outdoors. The fine ore stockpile is covered for snow protection and dust control. The existing three stage crushing circuit is based on modular mobile crushing equipment to allow the modifications necessary to allow the introduction of Beaver Dam ore to Touquoy.

As noted in Section 2.7.4 weigh stations will be added.

No changes will be made to the remainder of the processing facility are anticipated.

2.9.1.3.2 Crushing Circuit

Ore from the Beaver Dam Mine Site will be transported to the Touquoy Mine Site and fed into the Touquoy ROM hopper by front end loader where it will be transferred by conveyor to the secondary crushing module. Both the secondary and tertiary crushers are similarly sized cone crushers and are designed to produce a fine ore product of P80 of 10 mm. This material is conveyed by a stockpile feed conveyor to the 12,000 t fine ore stockpile (FOS).

The FOS is protected with a cover to reduce moisture, prevent freezing, and minimize dust from the fine ore.

2.9.1.3.3 Grinding

The fine ore is transferred from the FOS via conveyor into the grinding circuit to be processed through one single pinion ball mill in closed circuit with hydrocyclones producing a final product of P80 150 micro metres (µm). The mill has a nominal solids throughput of 5,479 tonnes per day (t/d) and can process 250 tonnes per hour (t/h) at 91.3% availability. The overall ball mill circulating load is 250%. The mill has been sized to handle both the Touquoy and Beaver Dam ores without any mechanical adjustment required during the transition between mines. The Beaver Dam ore is expected to operate at a higher ball volume and steel ball consumption than Touquoy ore to compensate for the difference in hardness and abrasion characteristics.

Mill slurry discharge overflows onto a rubber lined trommel screen with trommel oversize discharging to a bunker for regular collection and disposal by a skid steer loader. The trommel undersize gravitates to the cyclone feed hopper where the slurry is diluted with process water and pumped with a duty/standby cyclone feed pump to the cyclone cluster. A density meter monitors and controls the amount of process water required to produce a target density to the cyclones. The cyclone underflow is split, with up to 30% feeding the gravity circuit and the remaining underflow stream gravitating back to the ball mill.

The cyclone produces a fine ground overflow product of P80 150 µm which is sampled and then gravitates to the vibrating trash screen. Oversize debris is removed and falls to a trash bin at ground level. The trash screen underflow flows by gravity to the pre-leach thickener.

2.9.1.3.4 Gravity and Intensive Cyanidation

A portion of the cyclone underflow (up to 30%) is split and fed into two 50% duty parallel gravity concentrator trains. The gold concentrate recovered is treated in an intensive batch leach system designed to handle 2.4 t/d of concentrate. The resulting concentrated gold solution is pumped to a dedicated eluate tank at the gold room.

The equipment is arranged to provide a gravity cascade under the cyclones. The gravity circuit splitter box provides the feed slurry to the two gravity concentrator trains. Each train consists of a scalping screen, gravity concentrator and gravity area electric chain hoist. The two gravity concentrators in parallel are sized for 188 t/h solids feed rate.

A controlled split of the cyclone underflow to each train is provided with orifice plates located in the underflow launder. The oversize from the scalping screen gravitates to the ball mill feed chute, while the undersize feeds the concentrator. The concentrate gravitates to the intensive cyanidation circuit at ground level.

The intensive cyanidation circuit receives the periodic gold concentrate for treatment in an intensive leach reactor. The gold containing pregnant solution pumps periodically to a dedicated eluate tank in the gold room.

The tailings from the concentrators are transferred back to the ball mill circuit for further processing.

2.9.1.3.5 Carbon-in-Leach (CIL)

The trash screen underflow is increased from 35 to 50% solids in the pre-leach thickener in preparation for the CIL step. The trash screen underflow enters the preleach feedwell after mixing with metered

flocculant. Thickener overflow gravitates to the process water standpipe and is recycled for plant use while the underflow slurry is pumped to the leach feed box for slurry conditioning prior to leaching.

The leach feed from the thickener underflow is pumped to a linear primary CIL feed sampler. The leach feed slurry is mixed with lime slurry in the leach feed box to raise the slurry pH for cyanide gold extraction. The feed box gravitates to the leach tank and optionally can feed directly to CIL Tank 1.

The circuit is a hybrid CIL type and consists of one leach tank and six adsorption tanks in series, each having a live volume of 1,169 m^3. The design allows for a 250 t/h solids feed rate at 50% solids for an average 24-hour residence time. Each tank is interconnected with launders to allow slurry to flow sequentially by gravity to each tank in the train.

Barren carbon enters the adsorption circuit at CIL Tank 6. The carbon advances countercurrent to the main slurry flow during periodic transfers of slurry and carbon using air lift movement from a downstream to upstream tank. Carbon concentrations of 10 to 15 g/L are required in all tanks. Carbon will be retained in the upstream tank by an inter-tank screen. The countercurrent process is repeated until the carbon becomes loaded and reaches CIL Tank 1. Then a recessed impeller pump is used to transfer slurry and carbon to a loaded carbon recovery screen. The loaded carbon is washed with water and released to the acid wash column located inside the main plant, in the desorption area. The slurry will be returned to CIL Tank 1.

Following elution of the loaded carbon and thermal regeneration, the barren carbon is screened and reports to CIL Tank 6. Fine carbon is discarded to the CIL tailings hopper.

Tailings slurry from CIL Tank 6 flows by gravity to the vibrating carbon safety screen to recover any carbon in the event of damage, wear or other issues with the CIL Tank 6 inter-stage screen. Recovered carbon is collected in a bin that can be manually transferred for re-use or disposal. Tailings discharging from the safety screen gravitates to the cyanide detox Tank 1 in the cyanide detoxification circuit.

2.9.1.3.6 Desorption and Regeneration

The following operations are carried out in the desorption and regeneration areas:

- acid washing of carbon;
- stripping of gold from loaded carbon; and
- regeneration of carbon.

This circuit comprises a fibre reinforced plastic column located within the process building. A separate acid-proofed concrete bund is provided under the acid wash column area to ensure that all spillage is captured and kept separate from other process streams. Transfer and fill operations of the acid wash column are controlled manually. All other aspects of the acid wash and the pumping sequence are automated.

A pressure Zadra elution comprising an elution column, strip solution tank, strip solution pump and a strip solution heater package operates in a closed loop with the electro-winning cells located inside the Gold room.

The elution column is a pressure vessel with a live volume equivalent to 6 t of carbon. The elution column is constructed from carbon steel and includes insulation of all hot surfaces. The column is located next to the acid wash column and shares a bund and a sump pump with the strip solution and transfer water tanks.

The strip solution heater package is located inside the process building, near the elution column, but separately bunded. Within this package there is a recovery heat exchanger, trim heat exchanger, direct- fired heater, control panel, all interconnecting electrics and pipework. The heater is a direct-fired type with a propane fuel modulating burner. The heater is designed for a heat output to maintain the strip solution at 145°C during the stripping cycle. Both heat exchangers are plate and frame type and ensure that the nominal temperature of solution entering the electro-winning cells is less than 100°C.

After completion of the elution process barren carbon is transferred from the elution column to the kiln dewatering screen and into the carbon regeneration kiln feed hopper. In the kiln feed hopper, any residual and interstitial water is drained from the carbon before it enters the kiln. The kiln is a horizontal rotary unit sized for a feed rate of 330 kg/h at 75% utilization and is propane-fired.

The kiln operates at 650 to 750°C and has a nominal retention time of 15 minutes to allow reactivation to occur. Regenerated carbon discharges from the kiln to a quench tank and is then pumped using a recessed impeller pump to the carbon sizing screen. The screen oversize returns to CIL Tank 6, while the quench water and fine carbon report to the tailing's hopper via the carbon safety screen for disposal in the TMF. Fumes from the kiln pass through a wet scrubber to remove entrained minute carbon particles and then to atmosphere via an exhaust stack.

2.9.1.3.7 Gold Room

Three electrowinning sludging cells are used; one cell will be dedicated to the intensive cyanidation circuit and the other two to the elution circuit.

The electrowinning cell dedicated to the intensive cyanidation circuit is fed leach solution via a fixed speed centrifugal pump from the gravity leach liquor storage tank. Solution is pumped to the electrowinning cell and then gravitates back into the gravity leach solution storage tank in a closed loop until suitable gold recovery is achieved. The duration of this cycle varies with the quantity of gold recovered by gravity but is typically less than 24 hours.

The two electrowinning cells dedicated to the elution circuit operate in a closed loop with the elution column and associated equipment. Eluate flows directly from the top of the elution column to the electrowinning cells after cooling through heat exchangers. The eluate flows through the electrowinning cells and then gravitates back to the strip solution tank and then to the elution column in a continuous closed loop. The duration of this cycle is about 16 hours.

2.9.1.3.8 Cyanide Handling and Detoxification

Sodium cyanide (NaCN) is a key reagent used to leach gold from a sold matrix to form a gold cyanide complex that can be extracted from the slurry by adsorption onto activated carbon.

NaCN is delivered in the form of in dry briquettes from an approved supplier as per the International Cyanide Management Code (ICMC) standards. NaCN deliveries are made by truck in one tonne secured (strapped)wooden crates. Within the crates the NaCN is double and sealed close. At site the sodium cyanide is stored in a locked fenced area within the secure reagent building and kept under camera surveillance.

Prior to use, NaCN is mixed with water and sodium hydroxide (NaOH) for dilution and pH control within a mixing tank. Prior to mixing, operators will suit up in full personal protective equipment (PPE) including Tyvek suits and powdered air purifying respirators (PAPR). Water and NaOH are added to the cyanide mix tank. The wooden crates are opened, and a gantry crane lifts the bags out and transports them to the mix tank. The bags are lifted by crane into the bag cutter on top of the mix tank and the door is shut to enclose the bag. The bag is slowly lowered onto the bag cutter and the dry solids are emptied into the mix tank. The bag cutter has water sprays to clean the cyanide bags prior to removing from the enclosure. This process is repeated for 4 cyanide (NaCN) bags to achieve a mix concentration of -22%. Once the NaCN storage tank level is below 20% the mix tank is then transferred to the storage tank for distribution throughout the plant.

Cyanide is added into three areas; Leach tank #1, Intensive Leach Reactor (ILR) and Barren Eluate tank #12. Leach tank #1 is a continuous addition whenever the leach circuit is being fed with ore. It is controlled based on constant cyanide titrations throughout the leach/CIL circuit. The ILR and Barren Eluate tank are dosed based on a batch process. When a batch is ready, the dosage is controlled based on a flowmeter to a targeted concentration. All these addition points have pH control reagents (NaOH or Lime) with automated interlocks that will not permit NaCN addition until a suitable pH is achieved to avoid the formation of hydrogen cyanide (HCN) gas.

Cyanide target concentrations are as follows:

- Leach tank # 1 = 50 ppm (0.005%). By the end of the CIL circuit (CIL tank #6), the remaining cyanide is about 30 ppm (0.003%).
- ILR= 14,000 ppm (1.4%). Once the process is complete, this small volume (5.2 m^3) is transferred and diluted in the much larger Leach/CIL circuit (9,100 m^3) for consumption.
- Barren Eluate Tank #12= 1000 ppm (0.1%). Once the process is complete, the remaining cyanide stays in the tank to be re-used during the next batch. Each new batch, the cyanide is just topped up to the target concentration.

2.9.1.3.9 Cyanide Destruction

Cyanide destruction occurs within the cyanide destruction circuit. Slurry passing through the carbon safety screen gravitates to two 300 m^3 cyanide detoxification tanks which are designed on the conventional air- SO_2 process and can operate in series or parallel for operational flexibility. The average slurry residence time at 250 t/h is 1.5 hours.

The tanks utilize high shear agitators and air injection to enhance high oxygen dissolution in the slurry to meet the high oxygen demand of the cyanide destruction process. Sodium metabisulphite and copper sulphate solutions are dosed into either tank providing the oxidizing agent and catalyst respectively for the cyanide destruction. Acid generation is neutralized by the addition of lime slurry to the detox tanks via a ring main.

The detoxified slurry stream gravitates to the tailings hopper from where it is pumped through a single pipeline to the TMF by variable speed tailings pumps (1 duty/1 standby). The tailings slurry is then discharged at selected outlet points around the periphery of the facility. Pipe runs are designed to be self- draining to avoid dead legs.

Contingency measures for cyanide detoxification include primary linear and secondary rotary vezin tailings samplers taking representative tailings samples after the slurry has been detoxified and prior to entering the tailings hopper. The cyanide destruction and tailings hopper area has a dedicated bunded concrete area for collecting spillage. A local sump pump returns any spillage to the carbon safety screen. The area is enclosed for cold weather protection. A CNWAD analyzer automatically monitors slurry levels and an HCN detector provides monitoring for airborne gas.

Shutdown procedures are in place in the event of process upsets including cyanide detoxification.

2.9.1.3.10 Tailings Disposal

Prior to the completion of mining operations at Touquoy, a tailings line will be routed to the exhausted Touquoy pit in preparation to receive Beaver Dam tailings. Tailings will flow by gravity to the open pit. Initially, reclaim water will be withdrawn from the supernatant pond in the existing TMF to supply processing water needs for Beaver Dam ore. A reclaim water pump and barge, with a new pipeline to the process water tank, will be installed when process water accumulation from the tailings slurry deposited in the pit is adequate. The transition from the TMF to the open pit reclaim water system is expected to be smooth requiring minimal downtime and no extra fresh water requirements beyond what is currently permitted from Scraggy Lake under Touquoy water withdrawal approvals. It may be necessary to withdrawal water from Scraggy Lake at start-up but it is expected that water will be recycled from the pit for processing Beaver Dam mine ore.

Supernatant water collected in the open pit will be pumped to the process water tank located next to the pre-leach thickener. The sections of the tailings and reclaim pipelines between the plant site and open pit will be double-walled and run in HDPE lined trenches to an adequately sized lined collection ponds capable of containing the volume of the pipeline. Monitoring systems will be installed on the pipelines for leak detection and shutdown procedures.

The Touquoy Mine currently employs an Operation, Maintenance and Surveillance (OMS) Manual for the existing TMF. This manual will be updated in advance of using the open pit for storage of Beaver Dam tailings to reflect changes in operating conditions and environmental factors. As well, Touquoy also currently employs an Emergency and Spill Response Plan which will also be updated, Environmental monitoring will continue as prescribed under the Touquoy IA which will be amended as necessary to reflect the changes in processing of Beaver Dam ore and storage of Beaver Dam tailings.

The minor works necessary to modify the Touquoy Mine Site for Beaver Dam ore, as described above, will begin before initiation of operation of the Beaver Dam Mine Site. This transition phase will likely not exceed two months.

No other changes will be made to the remainder of the processing facility and no additional land disturbances are anticipated to prepare the Touquoy Mine Site to receive Beaver Dam ore.

2.9.1.4 Construction Environmental Mitigations and Monitoring

The construction activities at Touquoy Mine Site required for the Beaver Dam Mine Project are minimal and within the existing Touquoy project footprint. The existing Touquoy Industrial Approval well addresses construction activities, such as sediment and erosion control and spill protection and containment associated with construction equipment (e.g., fueling).

The existing environmental monitoring requirements at Touquoy include surface and groundwater monitoring as part of the Industrial Approval. This will have occurred for about five years before construction activities associated with the Beaver Dam Mine Project commences. Also, existing approvals for wetland alteration include requirements for monitoring and compensation; these will be completed during the life of the Touquoy Gold Mine and no additional disturbance of wetlands is required as part of the Beaver Dam Mine Project activities at Touquoy.

2.9.1.4.1 Project Schedule

During the one-year construction phase, flexibility in the schedule may be employed to take advantage of seasonality. The upgrades to the Touquoy processing facility are not anticipated to exceed two months. This will likely be completed near the end of Year 1, after exhaustion of the Touquoy pit. Details regarding, the time of year when activities will begin will be determined at a later date and addressed during the Industrial Approval process.

2.9.2 Operations and Maintenance (Years 2 to 6)

2.9.2.1 Beaver Dam Mine Site

During operation and maintenance of the Beaver Dam Mine Site the following activities will be undertaken:

- surface mine operation and maintenance:
  - drilling and rock blasting;
  - surface mine dewatering;
- ore management;
- waste rock management;
- surface water management;
- dust and noise management;
- petroleum products management; and
- site maintenance and repairs.

2.9.2.1.1 Surface Mine Operation and Maintenance

Once accessible, in-situ rock will be drilled and blasted on 5 m bench heights. Diesel powered rotary drills will be used for production drilling and horizontal high wall depressurization drilling on the ultimate pit walls if required. Dedicated reverse circulation grade control drilling and sampling will be used to define ore and waste rock limits, while a fleet management system will track each load transported from the surface mine.

The open pit will remove approximately 56.6 million tonnes (Mt) of material (i.e., ore, non-ore bearing waste rock, till, and organic material) over the life of mine. The production schedule for the Beaver Dam Mine is shown in Table 2.7-1 and Figure 2.7-2. The pit will be mined in a west/east phases. Ultimate pit limits are split into phases or pushbacks to target higher economic margin material earlier in the mine life. The ultimate pit is subdivided into two phases, west and east, but for considerations of vertical advance the pit is mined as one phase from top to bottom. A small starter pit phase is also planned for the northwest corner of the pit to provide construction materials early in the mine life. The ore mined from the pit will range from 0.7 Mt to 2.1 Mt over the life of mine with approximately 0.5 Mt to a maximum of 14.9 Mt of waste being generated over life of mine. The open pit will be advanced from the surface at 130 to 155 masl down to 45 masl. At completion, the open pit will measure approximately 900 m along its east-west axis, approximately 500 m along its north-south axis, with a depth of ranging approximately 175 to 200 m based on the current ore delineation. The total area comprising the open pit will be approximately 31 ha.

A contract explosives supplier will provide the blasting materials for the mine. Emulsion will be the primary blasting agent as the majority of holes will be wet. It is anticipated that explosives and all accessories will be supplied on an as needed basis from the contractor's base location off-site and delivered to the site explosive storage facilities or directly to the blast holes using the contractor's equipment. If required, magazines will be suitably located to conform with quantity and distance requirements as regulated by Natural Resources Canada (NRCAN). All on and off-site permitting requirements will be the responsibility of the contractor through NRCAN.

Diesel powered hydraulic excavators and a wheel loader will load both ore and waste rock into separate haul trucks. These loading units will also function to re-handle mine material, and load overburden and topsoil, as well as conduct mine clean up, road construction, and snow removal. The off-highway rigid frame haul trucks will have a 64-tonne capacity and haul ore to the ROM pad and ore stockpiles as required, while waste rock will be hauled to the waste rock stockpiles. If dust is generated from hauling during warmer months, it will be controlled by applying water to the Haul Roads utilizing a specialized water truck. At the ROM pad, off-highway haul trucks will dump ore material directly into the primary crusher or place it in an active stockpile on the pad to be re-handled as crusher feed later on. Active stockpiles will be constructed in lifts. Loading of stockpiled ore into the primary crusher will be accomplished via a diesel-powered wheel loader. At the waste rock stockpiles, haul trucks will dump waste rock and diesel-powered track dozers will spread it into lifts.

As all ore processing will be carried out at the existing Touquoy processing facility, no mill reagents, including cyanide, will be utilized at the Beaver Dam Mine Site. No changes will be made to the mill reagents used in the Touquoy gravity/CIL process as described in Section 2.7.4 due to the processing of Beaver Dam ore. All mill reagents used at the Touquoy will continue to be transported, stored, used, and disposed of, where necessary, in accordance with existing Touquoy standard operating procedures, permits, approvals and relevant regulations.

The only chemicals expected to be used at the Beaver Dam Mine Site, not including fuels, oils, lubricants, coolants, etc., are:

- flocculants, which will likely be used to meet suspended solids discharge limits at the discharge point; and
- chemical dust suppressants, such as magnesium chloride, to supplement the use of water in controlling fugitive dust generation on roads and other trafficable areas. Chemical dust suppressants will be considered for use when conditions render water use alone inefficient in controlling fugitive dust from traffic.

In the event water treatment is required during the operational or post closure phases of mine development, reagents could include ferric sulphate (for arsenic and other metals removal), oxidizers such as hydrogen peroxide and potassium permanganate, lime for pH adjustment, and flocculants for final sludge removal.

The anticipated 246-person workforce at the Beaver Dam Mine Site will include approximately 105 mine personnel (working two or three shifts per day of 12 or 8 hours respectively, or approximately 26 persons per shift (includes 26 on leave at any time). The workforce also includes 60 haul truck drivers, 57 plant staff (at the Touquoy Mine Site), and 24 general and administrative staff (between the Beaver Dam mine site and the Touquoy Mine Site). An allowance of 12 days per year of no mine production has been assumed to allow for adverse weather conditions. No group transportation to the mine site or on-site lodging are anticipated at this time so long as the local labour pool can supply the necessary labour requirements.

A summary of the major mining equipment fleet requirements is provided in Table 2.9-1.

Table 2.9-1: Beaver Dam Primary Mining and Hauling Equipment Requirements

Activity and Equipment	Requirement				
	2022 (Partial year)	2023	2024	2025	2026 (Partial year)
Drilling					
Diesel DTH Tracked Drill, 110 mm holes	4	5	4	2	1
Diesel RC Tracked Drill, 135 mm holes	2	2	2	2	2
Loading					
Hydraulic Excavator - 4.55 m^3 bucket	4	4	3	2	2
Wheel Loader - 7.0 m^3 bucket	2	2	2	1	1
Hauling					
Haul Truck - 64 tonne payload	13	13	11	5	4

To facilitate successful mining operations, the following in situ support services will be available:

- mine site road maintenance;
- mine floor and ramp maintenance;
- ditching;
- reclamation and environmental controls;
- surface mine dewatering;
- surface mine lighting;
- mine safety and rescue;
- transportation of personnel and operating supplies; and
- snow removal.

A summary of the equipment chosen to conduct these support services and their specific role is provided in Table 2.9-2.

Table 2.9-2: Beaver Dam Operational Equipment Requirements

Equipment	Function	Requirement
Motor Grader (4.3 m blade)	Mine site road maintenance	1
Water/Gravel Truck	Mine site road maintenance	1
Track Dozer (325 kW)	Waste rock stockpile maintenance	3
Water Pumps (150 m^3/h)	Mine sump dewatering	2
Track Dozer (237 kW)	Mine support and construction	1
Wheel Loader (5.5 m^3)	Mine support and construction	1
Hydraulic Excavator (2 m^3)	Utility excavator and rock breaker	2
On-highway Dump Truck	Utility material movement	2
Fuel and Lube Truck	Mobile fuel/lube service	2
Shuttle Bus (16 passenger)	Employee transportation	1

Table 2.9-2: Beaver Dam Operational Equipment Requirements (continued)

Equipment	Function	Requirement
Backhoe Loader (69 kW)	Utility loader and stemming loader	1
Pickup Trucks (1/4 tonne)	Staff transportation	7
Light Plants (20 kW)	Surface mine lighting	6
Skid Steer (54 kW)	Utility material movement	1
Track Dozer (149 kW)	Utility material movement	1
Maintenance Trucks	Mobile maintenance crew and tool transport	2
Mobile Crane (36 tonne capacity)	Mobile maintenance material handling	1
Float Trailer (55 tonne capacity)	Equipment transport	1
Forklift (3 tonne capacity)	Shop material and tire handling	1
Mobile steam cleaner	Mobile maintenance equipment cleaning	1

The majority of this equipment will be utilized during the site preparation and construction phase as well. Maintenance activities for the mobile mining, hauling, and operation equipment will be performed in the field and at the mine maintenance workshop facility located near the primary crusher. All field maintenance will be performed with dedicated maintenance equipment operated by qualified staff. A grader will be used to maintain the mine site roads. Snow clearing will be conducted regularly during the winter months. No salting of mine Haul Roads is anticipated during winter conditions for traction.

The maximum anticipated daily volume on Highway 224 and the Beaver Dam Mines Road associated with the Beaver Dam Mine Project is estimated to be 175 (passenger and service vehicles). Based on use of the Haul Road, intermittent service vehicle schedules and car-pooling, the number on Highway 224 could be reduced by 50% to around 85 to 90 per day over a 24-hour period or roughly four per hour on Highway 224. Traffic on Highway 224 is expected to remain within the traffic count ranges as provided by NSTIR (Section 6.16 Socio-economic Conditions).

The Beaver Dam Mine Site will require a water source for fire protection and dust control. Raw water will be pumped either directly from Cameron Flowage or recycled from the site water collection ponds or ditches assuming the water quality meets regulatory requirements. Water will be distributed from the storage tank to various users including, but not limited to, the site facilities facility and primary crusher location if required. Dust control will occur as required and will consist primarily of wet suppression controls using only water on unpaved surfaces. However, in some high traffic areas including site facilities and internal access roads, a chemical suppressant (e.g., Magnesium Chloride) may be used to more effectively control dust. This will be applied during the summer/fall months (May to October) in liquid form using the mine water truck and in granular form during the colder months (November to April). There is no requirement for decant water and potable water will be delivered via specialized truck.

Daily domestic water usage is based on approximately 30 employees on the mine site at any time. It is anticipated that one drilled domestic water well will be required to provide water for sanitary usage as domestic wells in this area generally yield 5 to 10 L/min based on a literature review of several sources and the demand is estimated at less than 5 L/min. The use of a storage tank on-site and water demand equipment will keep extraction rates within the well capability.

A mobile vehicle wash down unit likely consisting of manually directed water jets and a high-pressure hot water and steam generator cleaner will be utilized at the Beaver Dam Mine Site.

Surface water runoff from truck washing will be contained and directed to the site collection pond. Sampling will determine whether this wastewater stream will require treatment prior to release to the receiving environment.

Sewage from the Beaver Dam Mine Site office facility will flow by gravity drain via a piped network buried below the frost line to septic tanks equipped with leach drains. No chemical waste will be disposed of through the septic system. The septic tanks will be pumped out as required by a contractor.

Hazardous wastes, such as used oil, lubricants, batteries and antifreeze will be collected by qualified hazardous waste contractors and taken off-site for re-cycling or disposal in accordance with relevant legislation. General non-mine waste will be collected by a contractor and transported off site for disposal.

2.9.2.1.2 Ore Management

Ore will be loaded into off-highway haul trucks for transport out of the open pit. From there, ore will be separated into low and ROM stockpiles prior, while non-ore bearing waste rock will be stockpiled for final disposal.

Waste Rock will either be directed to the Waste Rock Storage Area (NAG) or to the PAG Storage Area. The design capacities are described in Section 2.7.2.3.

The ROM stockpile will likely have up to a 30-day capacity for storing ore during plant shut-downs or short-term periods where ore extraction from the mine exceeds crusher or plant capacity. The ROM stockpile can also accommodate plant feed if ore hauling from the mine is reduced for weather or other reasons.

2.9.2.1.3 Waste Rock Management

Material storage at the mine site will include six topsoil stockpiles, two till stockpiles, and two non-ore bearing waste rock stockpile comprising a total of 98 ha.

2.9.2.1.4 Surface Water Management

Mine Water Management is described Appendix P.4 and is described in Section 2.7.2.9.

2.9.2.1.5 Petroleum Products Management

The site will be serviced by both propane and diesel. Diesel will be stored primarily at the mobile equipment fuelling station meant to serve both the mining fleet and the transport fleet. The fueling station consists of a 3,000 heated and insulated tank with a hybrid pump. The fueling system will supplied and owned by a third party vendor who will rent to the site as part of the fuel contract.

The generators will also be supplied with fuel tanks at 13,200 litres each and will be filled by the 3rd party vendor. Propane will be stored at site in two 7,500 L tanks which will be owned by the same vendor as the diesel fuel supplier. Propane will then be plumbed to the various buildings for heating.

The delivery of diesel fuel will be conducted by tanker trucks from suppliers who routinely transport and distribute petroleum products. Transfer of these products from the tanker truck to double-walled tanks with bollards will be constantly supervised by the delivery person to ensure constant observation and immediate response should a spill occur. Based on anticipated equipment, associated efficiency ratings, and hours of operation, diesel fuel consumption by operational equipment and haul trucks has been estimated to be approximately 9.02 million litres of diesel fuel per year during full scale operations. During construction and decommissioning, diesel fuel consumption will be approximately 3.7 million litres per year.

2.9.2.2 Haul Road

During operation and maintenance of the Haul Road the following activities will be undertaken:

- ore transport; and
- Haul Road maintenance and repairs.

The only change in Haul Road is the removal of the Preferred Alternative Haul Road option, which has been noted in each the VC Sections (Section 6). It may be necessary to use the Public Roads during start-up (i.e., 6 to 8 months) depending on approval and permitting timelines and construction restrictions.

During operation and maintenance of the Haul Road the following activities will be undertaken:

- ore transport; and
- Haul Road maintenance and repairs.

2.9.2.2.1 Ore Transport

Crushed ore, either from either a primary crusher or small blasts in the pit, from the Beaver Dam Mine Site will be transported to the Touquoy Mine Site by truck travelling along the upgraded Haul Road. The route is Beaver Dam Mines Road to Highway 224 to logging roads herein referred to as the Moose River Cross Road to Mooseland Road for a total distance of 31 km. It is anticipated that ore will be hauled under contract between the two sites, however, this is subject to further review and availability of suitable qualified contractors.

Approximately 20 haul trucks will be required to transport the ore from the Beaver Dam Mine Site to the Touquoy Mine Site. The exact number will depend on final payloads and the hauling schedules, which will likely be a single 12-hour shift, or two 8-hour shifts per day operating between the hours of 7:00 AM to 11:00 PM. The number of return haul truck trips per day will be an annual average of approximately 95 round trips (e.g., return trips or two-way trips) but will vary with production schedule (Table 2.7-1) for 353 days per year for the anticipated duration of the Project (5 years). Approximately 12 days a year the site will require shutdowns due to maintenance and/or weather events. This will result in an increase from the current average daily traffic on the Haul Road (when forestry operations are not occurring) which is estimated to be approximately 10 vehicles per day. Hours of operation during active hauling will likely occur between 7:00 AM to 11:00 PM. The exact number trucks will depend on final payloads, production schedule and the hauling schedules. During construction and pre-production truck traffic will be reduced and will be associated with construction and upgrade of the Haul Road and transportation of equipment between the Touquoy Mine Site and the Beaver Dam Mine Site.

2.9.2.2.2 Haul Road Maintenance and Repairs

All grading, maintenance, snow clearing, gritting and dust suppression conducted on the Haul Road will be completed by a third-party contractor. With regards to Haul Road maintenance, it is anticipated that only minor surface repairs will be undertaken during the planned haulage schedule. Most of the road maintenance will occur outside of the planned hauling schedule so as not to impede the haul trucks and increase the safety risk on the road. Apart from road surface maintenance it is anticipated that major repairs will be localized in kept to a minimum with appropriate road design.

Snow clearing will be undertaken using an on-highway truck outfitted with a snow plough sand spreader. Clearing will occur on an as needed basis throughout the winter months and will require operations outside the planned haulage schedule depending upon the snowfall event. The sand spreader will be utilized during the winter months for traction control. In addition, localized salting during significant ice events will occur for safety reasons. Salting will be restricted to road sections with steeper grades and at least 30 m from any watercourses.

Dust control will occur as required and will consist of a combination of chemical suppressant and/or water on unpaved surfaces. In order to provide longer term dust suppression, particularly throughout the winter months where water is not practical, an approved chemical dust suppressant will be applied to the road surface. Periodic application is anticipated depending upon road conditions and traffic. To support chemical dust suppression and provide short term suppression of dust throughout the warmer drier months, water will be applied. A water truck will spray the width of the Haul Road and operate during the haulage period.

Increased environmental disturbance is anticipated during peak transport times (7:00 AM to 11:00 PM) and during maintenance activities along the Haul Road.

All grading, maintenance, snow clearing, gritting and dust suppression conducted on the Haul Road will be completed by a third-party contractor. With regards to Haul Road maintenance, it is anticipated that only minor surface repairs will be undertaken during the planned haulage schedule. Most of the road maintenance will occur outside of the planned hauling schedule so as not to impede the haul trucks and increase the safety risk on the road. Apart from road surface maintenance it is anticipated that major repairs will be localized and kept to a minimum with appropriate road design.

Snow clearing will be undertaken using an on-highway truck outfitted with a snow plough sand spreader. Clearing will occur on an as needed basis throughout the winter months and will require operations outside the planned haulage schedule depending upon the snowfall event. The sand spreader will be utilized during the winter months for traction control. In addition, localized salting during significant ice events will occur for safety reasons. Salting will be restricted to road sections with steeper grades and will only be applied at least 30 m from any fish bearing watercourses.

Dust control will occur as required and will consist of a combination of chemical suppressant and/or water on unpaved surfaces. In order to provide longer term dust suppression, particularly throughout the winter months where water is not practical, an approved chemical dust suppressant will be applied to the road surface. Predictive modelling and evaluation of potential effects within this EIS has been completed based on 80-90% effective dust mitigation. Periodic application is anticipated depending upon road conditions and traffic. To support dust suppression and provide short term suppression of dust throughout the warmer drier months, water will be applied. A water truck will spray the width of the Haul Road and operate during the haulage period.

2.9.2.3 Touquoy Mine Site

During operation and maintenance of the Touquoy Mine Site the following activities will be undertaken:

- ore processing; and
- tailings management (exhausted pit).

2.9.2.3.1 Ore Processing

Other than the primary ore crushing, no mineral processing will be undertaken at the Beaver Dam Mine Site. All processing will be completed at the Touquoy Mine Site after mining from the Touquoy pit has been exhausted.

The Touquoy plant is designed to treat Beaver Dam ore with no modifications other than an increase in the total weight of grinding balls in the ball mill to accommodate the slightly harder ore from the Beaver Dam pit. This will not require any larger equipment.

Details regarding water and tailings management (exhausted pit) are provided in the Integrated Water and Tailings Management Plan presented in Appendix F.7. A summary is provided below for operational and closure phases of the Project.

2.9.2.3.2 Tailings Management - Operations

There is no requirement for tailings management at the Beaver Dam Mine Site as all mineral processing will be undertaken at the Touquoy Mine Site. Tailings generated from this operation will be pumped to the mined-out Touquoy pit for storage and covered with water to create a lake during reclamation. The approved Touquoy Environmental Assessment stated that the pit would be allowed to fill naturally with water over a period of time through precipitation, surface flow and groundwater in-flow. No change to this method is planned to follow the deposition of Beaver Dam tails, except that the time frame for refilling will be shorter given the decrease in available volume taken by the tailings.

The processing of Beaver Dam ore at Touquoy involves the continued use of Touquoy water management facilities but flow patterns will be altered and rerouted as described, below. The Tailings Management Facility (TMF) will continue to receive surface runoff from the waste rock pile, seepage collection ditches, and direct precipitation and will continue to operate under the existing Industrial Approval (IA) which includes TMF effluent treatment plant operation and discharge to Scraggy Lake. Runoff from the mill site pond and run-of-mine (ROM) stockpile will continue to be collected and routed to the plant for use as make up water for the processing of Beaver Dam ore. Dewatering of the open pit to the TMF will cease at the end of Touquoy open pit mine life which will allow water inflows to accumulate in the open pit. At initial stages of Beaver Dam ore processing, reclaim water will be directed to the mill from the TMF through the existing decant tower or floating barge infrastructure for processing of Beaver Dam ore. Delay of water reclaim from the open pit will allow time for water inflows to collect in the pit as a start-up process water supply. When water is to be reclaimed from the open pit, the existing floating barge and associated infrastructure will be relocated from the TMF to the exhausted open pit. The barge will raise with the water and tailings elevation in the pit, decreasing pump head and associated pumping costs over time. If required, additional Beaver Dam ore processing start-up water supply will be sourced from Scraggy Lake, subject to NSE water withdrawal approval. Freshwater make-up for the process will continue to be sourced from Scraggy Lake as provided in existing water withdrawal approvals. Additional make-up process water required in a dry year will be sourced from effluent from the TMF treatment plant or Scraggy Lake, subject to NSE approval. Beaver dam tailings will be deposited in the open pit. The existing tailings slurry pipeline from the mill will be redirected from the TMF to the Touquoy open pit.

2.9.2.3.3 Tailings Management - Closure

During the closure phase, the objective is for water in the pit lake to meet the reclamation regulatory water quality requirements or site-specific criteria. Key water management features are described below.

The existing TMF effluent treatment plant and downstream discharge facilities will continue to be in operation to treat TMF water surplus. At the cessation of tailings deposition to the Touquoy open pit, the open pit will fill with water. During this period, there may be an opportunity to treat the pit lake as a batch reactor with the objective of adjusting the pH to precipitate metals thus improving discharge quality. Surplus water in the open pit will be pumped to the TMF for treatment, until such time as water quality monitoring indicates that water quality is suitable for direct discharge to the environment. Until water quality meets discharge criteria, the water level in the pit lake will be maintained at or below elevation 104 masl (i.e., corresponding to the shallow permeable zone), thus reducing seepage to Moose River and normalizing treatment rates to the extent feasible. A minimum of 1 m water cover will be maintained above the deposited tailings to facilitate pumping. The water cover depth will vary over the tailings depositional period. The effluent treatment plant will operate intermittently during non-frozen periods (April - November, inclusive) to lower the pit lake to 103 masl seasonally by the end of November, thus providing storage over the period when the effluent treatment plan is shut down during the winter months. Assuming the existing effluent treatment rate of 400 m^3/hr, the effluent treatment plant would be in operation for an additional 4.4 months to pump and treat the annual climate normal surplus of the open pit watershed of 436,000 m^3. Operation of the existing effluent treatment plant will be modified to accommodate Beaver Dam water surplus or additional capacity will be added to effluent treatment plant to treat water over a shorter period simultaneously.

The effluent treatment plant and downstream discharge facilities are not required for the Project once effluent discharge meets regulatory discharge criteria and will not require treatment. Surplus water in the open pit will be discharged via a constructed spillway/conveyance channel to Moose River, subject to meeting regulatory discharge criteria. The spillway and conveyance channel will be sized to accommodate the inflow design flood in accordance with the Canadian Dam Association (CDA) guidelines. The spillway invert is set at elevation 108 m, approximately 2 m below the lowest open pit elevation to prevent overtopping.

2.9.2.4 Existing Environmental Mitigation Requirements Associated with Operations

There is an existing Industrial Approval for the Touquoy Project which has specific environmental mitigation and monitoring requirements. This is relevant to the Beaver Dam Mine Project in two ways:

- Monitoring data is being collected since 2016 and will continue to be collected through to the start of the Beaver Dam Mine Project as part of requirements under the existing Industrial Approval. This provides much background data to support the follow up programs anticipated at the Touquoy Mine Site for the Beaver Dam Mine Project.
- Mitigation measures required as part of the Industrial Approval and other associated Touquoy Gold Mine environmental management plans will continue to be implemented as part of the Beaver Dam Mine Project.

Given the operational activities at the Touquoy Mine Site are limited to processing of ore and management of tailings (exhausted pit), existing mitigation and monitoring requirements applicable are directly related to atmospheric emissions, surface water and groundwater.

2.9.3 Active Closure and Reclamation (Years 5 to 7)

2.9.3.1 Reclamation Objectives and Goals

The objective of the Final Reclamation Plan is to return the site to a safe and stable condition, compatible with the surrounding landscape and anticipated final land use. The plan will employ recognized reclamation best practices, acknowledged principles of ecological restoration, and consultation with stakeholders and First Nations including the Millbrook First Nation and other Mi'kmaq communities. In the past, the site has hosted numerous mining/exploration activities (exploration declines, roads, camps, settling ponds, and small waste piles of rock and overburden), along with successive tree harvesting and silviculture operations. Evidence of recreational land use (hunting and off-road vehicles) and surface water use (fishing and boating) directly within the Beaver Dam Mine Site is limited and suggests these activities could be re-instated once the surface mine ceases operation and reclamation activities have been completed.

The goals of a successful Final Reclamation Plan include:

- remove all equipment and infrastructure not necessary for future use and care of the site;
- Create a physically, chemically and biologically stable site.
- stabilize the terrestrial environment and revegetate the site to encourage regrowth of native species;
- minimize disruption to the aquatic environment; and
- restore land and surface water use potential.

The reclamation goals are designed to enable eventual abandonment of the site in a safe and stable state. In order to achieve these goals, AMNS will undertake general decommissioning and reclamation activities as described below.

2.9.3.1.1 Beaver Dam Mine Site

A draft Reclamation and Closure Plan has been developed for the Beaver Dam Mine Project and is provided in Appendix P.2. Figures 2.9-4 and 2.9-5 show closure landforms during active and post-closure.

2.9.3.1.2 Final Land Use

The goal of reclamation is to return the physical, chemical, and biological qualities of the land and water regimes disturbed by the Project to a state that is safe, stable, and compatible with the surrounding landscape and final land use.

The final land use of the Crown lands will require the landowner's (Nova Scotia Crown Lands) approval and the acceptance by Nova Scotia Department of Lands and Forestry (NSLF), Nova Scotia Environment and Climate Change (NSECC) and the Nova Scotia Department of Energy and Mines (NSDEM).

Specific objectives, criteria, planned reclamation activities and performance monitoring to achieve the closure goals are also outlined (Section 2.9.3.1).

2.9.3.1.3 Engagement

Initial land use activities identified by stakeholders for the post-mining landscape included outdoor recreation, commercial forestry and traditional land uses (AMNS 2021). Specific engagement is summarized below.

Continued engagement with the public and traditional land users regarding the mine's operational and closure planning will be undertaken through a combination of groups, as described in the draft Public Engagement Plan (AMNS 2021), including but not limited to:

- Millbrook First Nations;
- Mi'kmaq of Nova Scotia;
- Community Liaison Committee (CLC); and
- Reclamation and Closure working group that is anticipated to include representatives from members of the public, ATV association and other stakeholder groups.

It is anticipated, based on the results of this ongoing engagement, that the final land use concepts during post-closure will continue to evolve. It should be noted that future land use will need to comply with some restrictions related to minimizing disturbance and maintaining the structural, chemical and biological integrity of some of the closure measures. A brief description of the current closure vision for each major mine component is included in Table 2.9-3.

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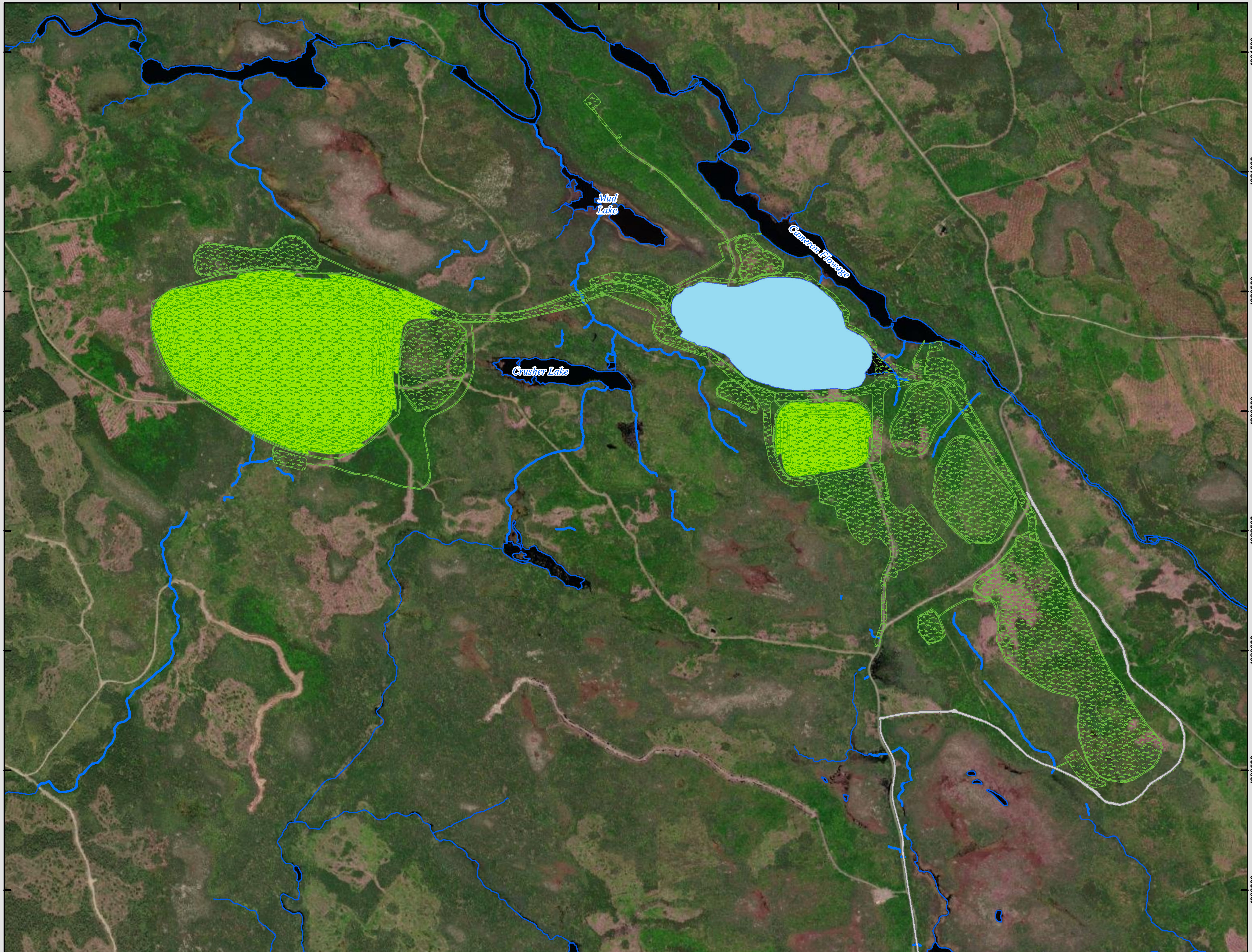
FIGURE 2.9-4

Beaver Dam Mine Project Active Closure



BD Mine Site Planned Infrastructure

- Reclaimed Site Infrastructure Removed -
- Reclaimed Stockpile - Stabilized, Covered and Vegetated
- Pit Lake
- Multiuse Bypass Road

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

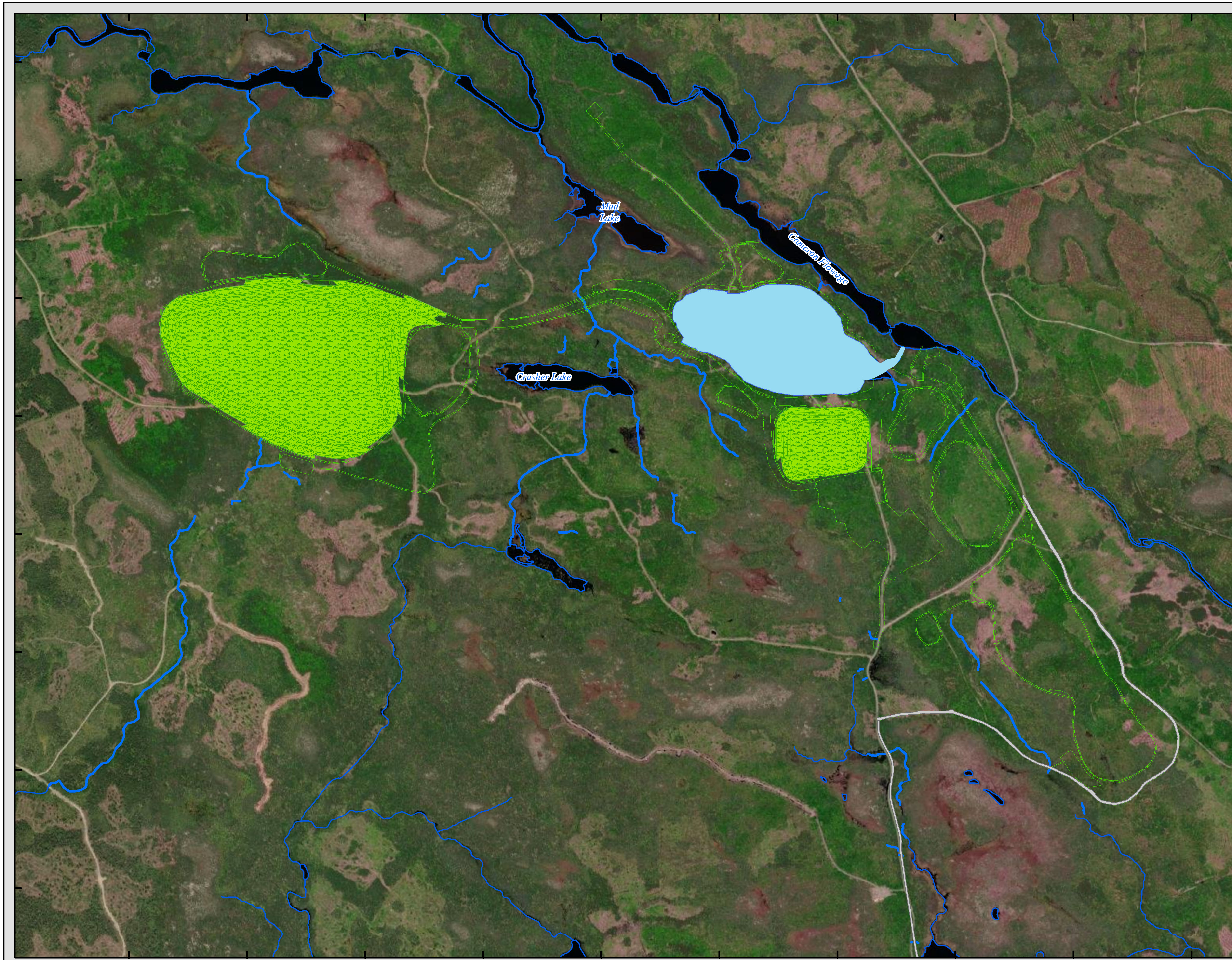
0 200 400 800 m

1:15,000 Scale when printed @ 11" x 17"

Drawn By: LP Date: 5/11/2021
Reviewed By: XX

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X RemediatedSite



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Atlantic Gold

FIGURE 2.9-5

Beaver Dam Mine Project

Post-Closure Far Futrue

- Multiuse Bypass Road
- Reclaimed Site - returned to similar mixed habitat types as surrounding area
- Reclaimed Stockpile - Hill revegetated to mixedwood forest
- Pit Lake - connection to Cameron Flowage established

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

0 200 400 800 m

1:15,000 Scale when printed @ 11" x 17"

Drawn By: LP
Reviewed By: XX
Date: 5/12/2021

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Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri

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Document Name: BD_EIS_Fig2.1-X RemediatedSiteAfter

Table 2.9-3: Overview of Preliminary Closure Objectives/Criteria

Mine Component	Closure Vision	Closure Objective	Closure Criteria	Primary Reclamation Activity	Post-Closure Inspection/Monitoring	Notable Uncertainty/ Research
Administration and Ancillary Areas	The Mill Site will have all buildings, equipment, and related items removed, and the area will be revegetated. The area will be safe for the public to use for potentially outdoor recreation (e.g., hiking, trails, etc.).	Physical Stability	Buildings and equipment removed. Soil capping and revegetation treatments demonstrate early succession has been successful. No signs of significant erosion or sloughing prior to revegetation cover establishment.	Buildings demolished and removed from site. Equipment and other infrastructure removed from site. Surfaces graded and seeding/planting to allow drainage and prevent erosion.	Periodic inspections by a professional engineer will be completed.	No major uncertainties.
		Chemical Stability	Confirmatory soil sampling and ESA (as required) have been completed and results accepted by NSE. Runoff water quality is suitable for discharge to surrounding area.	Removal of impacted soils (if required) as recommended by the confirmatory soil sampling program and/or ESA.	Confirmatory soil sampling and ESA (as required) have been completed. Surface water quality monitoring completed in adjacent watercourses.	
		Ecological and Land Use	Wildlife and the public can travel across the area safely.	Following building removal, area is graded, soil cover placed and revegetated.	Vegetation and soil monitoring will be completed.	
Open Pit and Spillway	The Open Pit will flood, and overflow will discharge to Cameron Flowage/Killag River via an engineered spillway. The shoreline will be designed with shallow grading at the predicted water level to allow safe egress for wildlife, and a shallow water zone that can provide riparian and wetland habitat. The existing mine ramp at the northeast shoreline will be maintained to allow safe access to the pit lake. (e.g., boat launch site). The presence of self- sustaining fish populations is not intended and will be limited. The riparian zone and shallow water may provide habitat for avifauna, amphibians, and other species.	Physical Stability	Final conditions of the open pit walls, overburden slopes and spillway (once constructed) are confirmed to be within approved design constraints by a professional engineer. No visual indications of significant deformation and degradation is observed during a final inspection by a professional engineer.	Annual geotechnical inspections will be completed during the mine's operation to manage pit wall stability prior to final closure. The overburden bench and barrier berm materials will be re-sloped.	Periodic inspections by a professional engineer will be completed.	No major uncertainties.
		Chemical Stability	Water quality in the Pit Lake demonstrates a stable and/or decreasing trend and meets approved criteria. Decant elevation is suitable for discharge to Cameron Flowage/Killag River.	Dewatering will cease at the end of mining and the pit will be allowed to flood, eventually discharging via spillway to Cameron Flowage/Killag River. No treatment of this water is expected to be required prior to discharge.	Pit water quality and water levels will be monitored during flooding, and after discharge to Cameron Flowage/Killag River via spillway.	Pit flooding timelines and the Pit Lake water quality are uncertain. These processes will be assessed as part of ongoing monitoring and updated predictions completed prior to closure and during flooding.
		Ecological and Land Use	Safe access and egress options are available where practical to the Pit Lake once flooding is complete. Shallow water zones (< 5 m deep) are created along the Pit Lake perimeter where practical.to provide options for ecosystem restoration design.	Retreat blasting and benching and waste rock deposition is completed to allow construction of a shallow water zone where practical along the Pit perimeter. Final Pit slopes and shoreline are approved by a professional engineer.	Periodic inspections by a professional engineer will be completed.	The post-closure aquatic habitat quality and quantity is uncertain. As predictions for post-closure pit lake water quality are refined, options for riparian and littoral zone habitat enhancement will be considered for various flora and fauna.
Waste Rock Storage Area	The WRSA will consist of benched outer slopes and be revegetated, likely resembling a grass/shrub land and/or open meadow condition.	Physical Stability	Inspection and monitoring results indicate structures are stable and performing as intended. Soil cover is stabilized by means of a sustainable vegetative cover. Acceptable rates of erosion are observed, soil/vegetation cover is not adversely affecting the surrounding environment.	Design and construction of the WRSA within the approved design. Geotechnical stability analysis to be updated as required as part of the detailed design. Detailed design is signed by a professional engineer. The WRSA will be re-sloped progressively during mining, the final lift will be completed at closure. A soil cover is placed and revegetated to reduce erosion concerns to acceptable levels. Detailed design includes surface grading and drainage structures that will prevent erosion.	Periodic inspections by a professional engineer and vegetation specialist will be completed.	Desktop studies are planned to complete numerical simulations for runoff on the existing WRSA shape and identify any areas of erosion concern during construction and closure. Revegetation trials will be completed to confirm effective methods for establishing a vegetated cover.
		Chemical Stability	Water quality of runoff and seepage discharging from WRSA to perimeter ditches and WC-4 demonstrates a stable and/or decreasing trend and meets approved criteria.	Deposition of waste rock will occur as designed. Construction of a revegetated soil cover, properly graded, will reduce infiltration rates and water-rock interactions.	Surface water and groundwater monitoring will be completed through operations and following final sloping and soil cover placement.	Water quantity and quality of the runoff and seepage discharge from the WRSA are uncertain. These processes will be assessed as part of ongoing monitoring and updated predictions prior to closure.
		Ecological and Land Use	Wildlife travel and forage, and public use for safe outdoor recreation activities (e.g., hiking) that can be conducted across the WRSA.	Construction of a revegetated soil cover at the WRSA surface.	Periodic inspections by a professional engineer and vegetation specialist will be completed.	No major uncertainties.

Table 2.9-3: Overview of Preliminary Closure Objectives/Criteria (continued)

Mine Component	Closure Vision	Closure Objective	Closure Criteria	Primary Reclamation Activity	Post-Closure Inspection/Monitoring	Notable Uncertainty/ Research
Site Wide Revegetation	The various disturbed areas will have a soil cover placed and be revegetated to promote a mix of habitats suitable for the post-mining landscape (e.g., grassland/open meadow, shrubland, forest). The composition of habitats may be unique relative to surrounding area due to the changed landforms. Native seed mix will be used suitable to the area will be applied. Potentially traditional shrub species will be considered. Vegetation Trials at Touquoy and Beaver Dam will inform revegetation efforts.	Physical Stability/ Land Use[(a)]	Soil cover and revegetation treatments demonstrate early succession has been successful. Soil cover quality does not pose an elevated risk to humans and wildlife compared to surrounding areas.	Salvaged material stockpiling and management during operations. Revegetation trial plots will be completed to assess practical post-mining ecosystems possible and determine effective treatment applications prior to final closure. A soil cover and seeding/planting treatments will be applied to all disturbed sites as designed in the Final Plan.	Vegetation, soil and biodiversity monitoring.	Revegetation studies and field trials will be completed to assess practical post-mining ecosystems at each of the mine areas. An ad hoc committee will be established to confirm final land uses and provide input into final closure

Notes: [(a)] Additional land uses may be identified through ongoing engagement efforts with the Millbrook First Nations, the Mi'kmaq of Nova Scotia, CLC and Reclamation and Closure Working Group. Final approval of land uses requires the approval of NS Crown Lands, and acceptance by NSECC, DEM, and NSL.

2.9.3.1.4 Administration and Ancillary Areas

The reclamation of the Administration and Ancillary Areas consists of removal of buildings and other infrastructure, grading and revegetation. The final layout is shown on Figure 2.9-4.

The buildings will be removed during the first year of reclamation and either demolished, sold or re-used at other sites. Fuel, reagents, hazardous materials, chemicals etc. will be removed from structures prior to demolishing or removed from site. The wood-frame structures will be dismantled, with reusable parts being salvaged for recycling or re-use. The steel-frame and fabric-covered structures can be dismantled and removed from site. Trailer/mobile office units will be hauled from site. Crushing infrastructure, if used, will be dismantled, and removed from site. Septic tanks will be removed from site and disposed of at an approved facility.

Concrete foundation and slabs will be broken up into pieces with a maximum size of 0.5 m, any protruding reinforcing steel removed, and provided with a minimum of 0.5 m of cover using overburden soils.

The Stormwater/Evaporation Retention Pond will be drained, backfilled with overburden material, and re vegetated.

Following the removal of buildings and burial of foundations, the Administration and Ancillary area will be covered in salvaged overburden and topsoil, graded tore-establish drainage thereby prevent pooling, and revegetated.

2.9.3.1.5 Petroleum and Hazardous Waste

Petroleum products and waste will be removed from site at closure. Unused fuel will be returned to the supplier or disposed through a recognized waste management company. The contents of all fuel tanks will be pumped out by the fuel distributor or a waste management contractor. The petroleum and propane tanks owned by the suppliers will be removed form site by the supplier at the time of reclamation.

Reagents and other chemicals used in the mining/milling process remaining on site will be returned to the supplier or disposed of offsite at an approved facility.

2.9.3.1.6 Non-Hazardous Waste

Non-hazardous waste such as domestic waste will be removed from site. There is no landfilling on site.

2.9.3.1.7 Explosive Storage

Explosives onsite will be managed by contractors and will be removed from site once no longer required. Infrastructure associated with explosive storage will be removed following removal of explosives.

2.9.3.1.8 Touquoy Site

The Touquoy Mine Site will be reclaimed under a separate plan developed for the Touquoy Project and already approved by regulatory agencies. As mentioned previously, the currently approved Reclamation Plan will be updated to reflect the above changes associated with processing Beaver Dam ore and re-submitted. Water treatment at discharge location into the Moose River from the pit, as required, will occur, and monitoring programs will be on-going.

Ultimately the land will be returned to conditions similar to its original state as a natural woodland and wetland habitat used for recreation and forestry. The existing conditions at the site have been previously described as being in a disturbed state in many areas and therefore improvements at the site will be realized through the reclamation activities proposed.

2.9.4 Post-closure Monitoring and Adaptive Management (Year 7 to 10+ Years)

GHD has completed a predictive water quality assessment and developed a mass balance model which shows that zinc and cobalt are the only likely exceeded parameters during the PC phase. However, the exceedances are not significantly higher than the discharge limit and a passive water treatment system could reduce the concentration of these elements below discharge criteria. In mine-related settings, passive treatment systems are often designed to neutralize acidity and remove metals in drainage waters. Such systems do not require continuous chemical inputs because they are sustained by naturally occurring chemical and biological processes. Anoxic limestone drains (ALDs) have been selected as the passive alternatives for addressing high concentrations of metals in impacted water during the PC phase.

In this treatment approach, impacted water will initially pass through a settling pond for the removal of suspended solids. Then, water will pass through a trench ALDs. ALDs generate alkalinity and increase the pH of the impacted water. By increasing the pH, metals such as zinc and cobalt will precipitate in their hydroxide forms. The ALDs will be followed by an aeration cascade, pond, or aerobic wetland that oxidizes and removes the precipitated metals. A settling pond will then provide adequate hydraulic retention time to let those formed metal hydroxides precipitate. This treatment system is proposed due to its passive nature and the fact that utilities are not required for implementation. The success of an ALD depends on site-specific conditions, primarily on low dissolved oxygen, and minimal ferric iron and aluminum concentrations in the drainage.

The operation and maintenance of this alternative is minimal as no labour or power is required. The primary maintenance would be replacing depleted limestone which is dependent on-site condition and water chemistry. In suitable conditions, limestone could work efficiently for several years.

2.9.4.1 <u>Beaver Dam Mine</u>

During decommissioning, the pit will be filled with water, creating a lake, with the re-establishment of a connection between the newly formed lake and Cameron Flowage. Figure 2.9-4 and 2.9-5 show landforms during active and post-closure.

GHD has completed a predictive water quality assessment and developed a mass balance model which shows that zinc and cobalt are the only likely exceeded parameters during the PC phase. However, the exceedances are not significantly higher than the discharge limit and a passive water treatment system could reduce the concentration of these elements below discharge criteria. In mine-related settings, passive treatment systems are often designed to neutralize acidity and remove metals in drainage waters. Such systems do not require continuous chemical inputs because they are sustained by naturally occurring chemical and biological processes. Anoxic limestone drains (ALDs) have been selected as the passive alternatives for addressing high concentrations of metals in impacted water during the PC phase.

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The operation and maintenance of this alternative is minimal as no labour or power is required. The primary maintenance would be replacing depleted limestone which is dependent on-site condition and water chemistry. In suitable conditions, limestone could work efficiently for several years.

Water treatment will continue as described above and in Appendix P.4 monitoring programs will be on-going until such time that discharge water quality meets appropriate confirmed criteria at the point of discharge. This post closure phase is estimated to be 10+ years in length and is subject to revision with expected refinements to model predictions.

2.9.4.2 Touquoy Mine

During decommissioning, the tailings will be covered with water and the pit will fill, creating a lake, with the re-establishment of a connection between the newly formed lake and Moose River. Water treatment will continue, as required, at this discharge location and monitoring programs will be on-going until such time that discharge water quality meets appropriate confirmed criteria at the point of discharge. This post-closure phase is estimated to be 15 to 20 years in length and is subject to revision with expected refinements to model predictions.

During decommissioning, the tailings will be covered with water and the pit will fill, creating a lake, with the re-establishment of a connection between the newly formed lake and Moose River. Water treatment will continue, as required, at this discharge location and monitoring programs will be on-going until such time that discharge water quality meets appropriate confirmed criteria at the point of discharge. This post-closure phase is estimated to be 15 to 20 years in length and is subject to revision with expected refinements to model predictions.

2.9.4.3 Reclamation Schedule

The estimated timeline for decommissioning and reclamation (i.e., active closure) for the Beaver Dam Mine Site is presented in Table 2.9-4.

Table 2.9-4: Beaver Dam Reclamation Schedule

Reclamation Activity	No. of Years	Start Date[(a)]	End Date
Construction	1	2022	2023
Operations	5	2023	2028
Active Closure (decommissioning and reclamation)	2	2028	2030
Post-closure (reclamation, monitoring and adaptive management)	10+	2029	2032+

(a) Schedule is preliminary based on permitting and current model predictions that are subject to refinement.

2.9.5 Greenhouse Gas Emissions

A significant adverse environmental effect for Greenhouse Gases (GHG) has not been predicted for the Project for the following reasons, with consideration of the ecological and social context of the LAA surrounding the Project:

- **During Construction:** GHG will be elevated above baseline but not a significant contributor with a low magnitude (above 1% NS 2018 levels) that will be intermittent and short-term in duration and reversible.
- **During Operations:** GHG will be elevated above baseline during this period but not a significant contributor with a low magnitude (i.e., combined 21.69 kt CO_2e 21.69 kt CO_2e - approximately 0.128% above NS 2018 levels) that will be continuous but mid-term in duration and reversible.

- **During Active closure:** GHG will be elevated above baseline but expected to be negligible in magnitude (i.e., less that 0.1% above NS 2018 Levels) intermittent to allow for earthworks and reclamation activities and medium-term duration (i.e., 2 years in duration) and reversible.

Mitigations presented in Section 6.4 (Greenhouse Gases), Table 6.4-8 will be established to reduce the impact to GHGs from Project activities.

2.10 Alternative Means of Carrying out the Project

In accordance with Section 19(1)(g) of CEAA 2012, environmental assessments for designated projects must consider alternative means of carrying out the Project that are technically and economically feasible, as well as the environmental effects of any such alternatives.

The process for consideration of alternative means is outlined in the CEAA Operational Policy Statement entitled "*Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012*" and includes the following steps:

- Step 1 - identify technically and economically feasible alternative means.
- Step 2 - list their potential effects on valued components.
- Step 3 - select the approach for the analysis of alternative means.
- Step 4 - assess the environmental effects of alternative means.

The evaluated alternative means of carrying out the Project are discussed following identification of alternative means.

2.10.1 Identification of Alternative Means

Alternative means of carrying out the Project are defined as means of similar technical character or methods that are functionally the same. Alternative means differ from alternatives in that they represent the various technical and economically-feasible ways that a project can be carried out, and which are within AMNS's scope and control.

As a minimum, the EIS Guidelines require AMNS to conduct an alternative means analysis for the following Project components:

- mine type;
- ore extraction methods;
- ore processing methods;
- ore processing locations;
- ore transportation;
- energy source;
- project component locations;
- water supply and management; and
- mine waste management facilities.

A qualitative approach primarily utilizing the professional knowledge and judgement of the Consultant Contributors has been employed for the assessment of alternative means in Section 1 (Introduction) of this EIS.

2.10.2 Mine Type

The potential alternatives to mining the Beaver Dam ore are through open pit (ramp access) and underground (shaft access) methods.

2.10.2.1.1 Open Pit Mining

Open pit mining requires the removal of overburden (topsoil, till) and non-ore bearing waste rock, followed by the stepped development of concentric levels into the deposit with an inclined roadway connecting subsequent levels. Open pit mining methods are best suited to:

- shallow ore deposits at or near surface that are covered by shallow overburden;
- large deposits with a uniformly distributed ore body or scattered randomly distrusted pockets; and
- high tonnage, low grade deposits which are not economical using underground mining methods.

2.10.2.1.2 Underground Mining

Underground mining typically requires the construction of a vertical, underground shaft from surface to a targeted depth into the ore body. Horizontal tunnels are then driven from the shaft at strategic intervals to access the ore body. Underground mining methods are best suited for:

- smaller ore bodies which are higher in grade; and
- disseminated ore bodies that easily traceable underground.

2.10.2.1.3 VCs Potentially Affected

The environmental effects of underground mining would be similar to those of open pit mining at the Beaver Dam Mine Site with the need for the infrastructure noted for the surface operation with a smaller disturbed footprint but likely a longer duration for ore extraction and overall project activities.

2.10.2.1.4 Preferred Approach

In this particular instance the gold at the Beaver Dam Mine Site is relatively uniformly distributed, and at relatively low grades, throughout the local rock mass to the extent that large scale, high volume throughput from an open pit is commercially viable. Concentrations of gold of sufficient grade, continuity or predictability in quartz veins, or other specific sites at the Beaver Dam Mine Site to support a commercially viable underground operation have not been identified through exploration and feasibility studies completed to date. An underground mine configuration for the Beaver Dam gold deposit is not currently a viable option.

Mining can theoretically be undertaken by either underground or open pit methods, but underground mining as a primary extraction method does not make practical or economic sense in this situation. In this particular case, the resource is near surface. The proximity to surface and lower grade make it amenable to open pit methods. A continuation of the surface mining into an underground operation may be viable depending on the final depth of the deposit but this is currently not under consideration and would not be economic unless there was a dramatic increase in gold price.

2.10.3 Ore Extraction Methods

2.10.3.1.1 Drilling and Blasting

Drilling and blasting is proposed to extract ore at the Beaver Dam Mine Site. Drilling and blasting is generally accepted as the most efficient method of breaking large volumes of rock. Drilling and blasting will generate noise; however, the noise from drilling would be significantly less than that generated by rock breaking. Blasting will generate short duration noise less frequently.

2.10.3.1.2 Rock Breaking (Ripping)

Rock breaking, or ripping, involves the use of heavy equipment that breaks the rock by inserting hardened metal teeth or prongs into fractures or planes of weak within the rock. Rock breaking creates continuous significant noise. Due to the extremely hard nature of the ore in the vicinity of the Beaver Dam Mine Site, rock breaking is not considered to be economically, technically, or environmentally feasible.

2.10.3.1.3 VCs Potentially Affected

The atmospheric environment is the key VC that would be affected by both drilling and blasting, and rock breaking (ripping); however, ripping would create significantly more noise over a continuous time period whereas drilling and blasting creates noise at lower levels and blasting occurs less frequently.

2.10.3.1.4 Preferred Approach

Drilling and blasting is the preferred approach for ore extraction from the Beaver Dam Mine Site. Alternative methods of extracting ore, such as rock breaking (ripping), are not technically or economically feasible due to the extremely hard nature of the ore in the vicinity of the mine site. There are no feasible alternatives to ore extraction at the Beaver Dam Mine Site.

2.10.4 Ore Processing Methods

2.10.4.1.1 Gravity/CIL Processing

The gravity/CIL processing methodology described in Sections 2.9.1.3.4 and 2.9.1.3.5 of this EIS represents the most conventional processing option. It is the preferred processing option in Canada and is used worldwide in almost all major gold mining/processing operations. Two independent experienced consultant gold metallurgists have determined that gravity/CIL processing is extremely well suited to this particular ore in that gold recoveries are very high (about 95%) resulting in maximum use of the resource, and the cyanide destruction process is highly efficient (Ausenco 2015). Furthermore, gold ore is produced at the Touquoy facility, with minimal off-site value-adding.

2.10.4.1.2 Gravity/Flotation

Regardless of the above, a second processing option, gravity/flotation with either intense cyanidation or smelting of the flotation concentrate, has been explored. Gravity/flotation recoveries are also very high (about 95%), with the flotation concentrate comprising 4 to 5% of the total throughput. On the basis of expected daily throughput, about 200 tonnes of concentrate would be produced per day. The gold in the flotation concentrate may be recovered either by high intensity cyanidation or by off-site smelting.

High intensity cyanidation of the float concentrate will require at least the same quantity of sodium cyanide as conventional CIL (since the same amount of gold is available for dissolution) or possibly more. This multi-stage process is unorthodox, inherently more complex than conventional CIL processing and commercially unattractive with no perceived advantage.

This multi-stage process could potentially be undertaken off site with the concentrate transported to an existing CIL plant for contract treatment, the closest plants being in Quebec and Ontario. Enquiries have been made to eleven such operations with no availability offered. Indicative costs, including freight, determined from this exercise show this option to be commercially unattractive, with the added disadvantage of substantial off-site value-adding and reduced benefits to Nova Scotia.

The flotation concentrate could also potentially be transported elsewhere for smelting to recover the gold. Indicative costs for freight and contract treatment of the concentrate at Falconbridge's Horne smelter in Rouyn-Noranda have been obtained and these confirm this option to be commercially unviable, and again with substantial resultant off-site value-adding and reduced benefits to Nova Scotia.

2.10.4.1.3 VCs Potentially Affected

Environmental effects are generally similar in both alternatives. The same quantity of sodium cyanide is required in both alternatives, if not more for gravity/flotation. Smelting required during the flotation process would require transport to an off-site facility, thereby generating additional GHG emissions. The key VCs affected by the use of gravity/flotation processing would include the atmospheric environment.

2.10.4.1.4 Preferred Approach

Having carefully examined the above processing options AMNS has selected conventional gravity/CIL as its preferred processing methodology. The required equipment is in place at the Touquoy Mine Site prior to the Beaver Dam operation beginning thus reducing infrastructure needs at the Beaver Dam Mine Site.

2.10.5 Ore Processing Locations

2.10.5.1.1 Touquoy Mine Site

No new processing or tailings facility is planned for this site - ore will be trucked to Touquoy for milling and tailings will be deposited in the exhausted Touquoy pit. The Touquoy plant is designed to treat Beaver Dam ore with no modifications other than an increase in the total weight of grinding balls in the ball mill to accommodate the slightly harder ore from the Beaver Dam pit.

2.10.5.1.2 Beaver Dam Mine Site

If the economics of the Project change significantly such that this Project could be developed without Touquoy then a mill and a tailings storage plan for the Beaver Dam Mine Site would be required, which would involve a significant increase in the Project footprint. Alternatives to processing ore at the Touquoy Mine Site are cost prohibitive and environmentally inferior.

2.10.5.1.3 VCs Potentially Affected

Construction of an additional processing and tailings management facility would affect all VCs being considered in this EIS.

2.10.5.1.4 Preferred Approach

The preferred approach for ore processing locations is to utilize the Touquoy Mine Site for the milling of Beaver Dam ore, and depositing tailings in the exhausted Touquoy pit.

2.10.6 Ore Transportation

Off-site processing at the Touquoy Mine Site involves the transport of material via local roadways. This haul is an increase in the cost of production and will generate additional greenhouse gases from the highway truck fleet as compared to on-site processing. This will be at least partially offset by the significant environmental benefits of processing Beaver Dam ore at the Touquoy mill and the storage of tailings in the exhausted Touquoy pit. No other gold processing facilities exist within the economic trucking limit that can handle the planned volume of material. In addition, no new construction or expansion of the approved processing or tailings storage facilities at Touquoy to process Beaver Dam ore is required.

2.10.6.1.1 Alterative Haul Road Routes

Alternative Haul Road routes were considered to transport the Beaver Dam ore to Touquoy for processing. The original Haul Road route considered included approximately 5.1 km of travel along Highway 224 (Alternate Section 2; Figure 2.3-3) and 3.9 km along Moose River Cross Road (Alternate Section 3A). The current Haul Road configuration includes a more direct route on the Moose River Cross Road. Specifically, the travel along Highway 224 itself has been replaced with a direct route of 4.0 km of new construction which allows direct crossing of Highway 224 (Section 3B; Figure 2.3-3). This increases the travel along private logging roads and eliminates the travel along Highway 224 completely as only a direct crossing is required. The total Haul Road is then reduced by 5 km (from 35.1 km to 30.1 km).

It is intended to use sized waste rock from the local borrow pits or Beaver Dam waste rock as the surge rock base material to reduce the cost and disturbance of the road upgrading and new construction activity.

2.10.6.1.2 Valued Componets Potentially Affected

The key VCs affected by the Alternative Haul Road locations are the atmospheric environment, Indigenous Peoples populations, and socio-economic conditions due to additional noise and dust being generated along Highway 224, near Beaver Lake IR 17. Air, noise and light considerations are also evaluated for the Preferred Alternative Haul Road, as this route is farther away from residences and private land considerations.

2.10.6.1.3 Preferred Approach

The Haul Road as currently planned is the preferred approach. The current Haul Road route for the Project reduces the total length and eliminates travel along Highway 224, including the passing of Beaver Lake IR 17 which is a satellite community of Millbrook First Nation.

2.10.7 Energy Source

2.10.7.1.1 Diesel-Powered Generators

Two (duty and standby) self-contained, skid mounted, 500-kilowatt (kW) diesel powered generators will provide 600 volt (V) electrical power to all Beaver Dam surface consumers via 60 hertz (HZ), three phase, four wire overhead power lines. The generator fuel tank will receive diesel fuel from the dedicated refueling truck and has a one-day capacity at maximum power demand.

2.10.7.1.2 Alternative Energy Sources

The power demand required for the Beaver Dam Mine Site is insufficient to justify construction of a permanent grid tie-in to the existing electrical distribution lines.

Renewable energy sources are considered technically feasible but would also not be economically feasible or practicable due to the short duration of the Project.

2.10.7.1.3 Valued Components Potentially Affected

The key VCs affected by the use of diesel-powered generators on the mine site include the atmospheric environment, surface water, wetlands, fish and fish habitat, and habitat and flora.

The key VCs affected by a permanent grid tie-in include the atmospheric environment, wetlands, habitat and flora, and terrestrial fauna due to disturbances caused by constructing a right-of-way for the power lines.

The environmental effects associated with a renewable energy source would depend on the renewable energy technology used; however, air emissions would likely be reduced.

2.10.7.1.4 Preferred Approach

The preferred approach based on economic and environmental feasibility is to provide electrical power to the Beaver Dam Mine site through the use of diesel-powered generators.

2.10.8 Project Component Locations

There are no alternatives for the positioning of the open pit - the gold deposit is fixed and the open pit has been designed to envelope the existing settling pond (wetland 59). The settling pond that had been previously established on the Beaver Dam Mine Site will largely become part of the proposed open pit and thereby reclaimed. The Project components have also been placed to generally avoid heritage resources that have been identified during field investigations.

The waste rock stockpiles have been re-positioned to be located down-gradient of nearby watercourses and waterbodies and removed from the Boreal Felt Lichen Critical Function Zone. The site configuration, including other Project components, has been specifically designed to avoid interference with aquatic habitat, and hence it is the preferred option to minimize environmental effects. Wetlands were avoided to the greatest extent possible for the placement of site infrastructure and the use of existing roads has been maximized in site layout planning as well.

2.10.8.1.1 Valued Components Potentially Affected

The key VCs affected by altering the Project component locations include wetlands, surface water, fish and fish habitat, and physical and cultural heritage resources.

2.10.8.1.2 Preferred Approach

The preferred approach is to maintain project component locations as shown on Figure 2.3-2. This limits the impacts to watercourses, avoids wetlands to the greatest extent possible, and avoids the Critical Function Zone for the Boreal Felt Lichen.

2.10.9 Water Supply and Management

2.10.9.1.1 On-Site Water Supply and Management

Water use on the Beaver Dam Mine Site will be limited to water required for dust control, the vehicle wash down facility, fire protection, and domestic water usage. Sources of raw water include water collected during mine dewatering, surface water runoff from waste rock piles and constructed areas and, if needed, raw water pumped from Cameron Flowage. Raw water drawn from Cameron Flowage, if needed, would be pumped by a single duty submersible water pump to a combination raw water and firewater reserve storage tank. Two (duty and standby) centrifugal pumps will supply various users including, but not limited to, the vehicle wash down facility and the de-dusting crusher area locations. Potable water will be delivered via specialized truck to the site for use in facilities at the crusher area for personnel. It is anticipated that one drilled domestic water well will be required to provide water for sanitary usage as domestic wells in this area generally yield 5 to 10 L/min and the demand is estimated at less than 5 L/min. Dust control will occur as required and will consist of wet suppression controls on unpaved surfaces using water, or chemical dust suppressants, as required.

2.10.9.1.2 Off-Site Water Supply

Alternatives for water supply, such as transporting all required water to the Beaver Dam Mine Site were considered but the availability of adequate water for site operations (for site staff only and dust control) is a more reasonable approach, is economically sound and is technically feasible. One domestic water well will be required based on the demand anticipated and regional water resources studies confirm the low amount (less than 10 litres per minute) is easily available.

2.10.9.1.3 Surface Water Management

Surface water run-off from the Beaver Dam Mine Site crusher pad will flow by gravity, with the aid of berms and channels, to a collection pond located to the south of the crusher pad. A culvert located beneath the mine entrance road will facilitate decant overflow from the collection pond to a discharge channel that will run down gradient to the south and ultimately discharges into wetland area (Wetland 64) located to the south of the Beaver Dam Mine Site. Surface water run-off from the eastern and western waste rock stockpiles, low grade ore stockpiles, Beaver Dam Mine Site roads, and some natural area will flow by gravity, with the aid of berms and channels, to the north settling pond, located west of the pit. This settling pond will also receive water from the pit dewatering program. Overflow from the north settling pond is directed to the Killag River outfall (Cameron Flowage). On-site control of water with batch discharges when water quality meets applicable standards is typical for this type of operation and the most technically and economically feasible.

Runoff from the till stockpiles located to the southeast of the open pit and east of the mine facilities area will be captured with the aid of channels around the stockpile perimeter and diverted north to Cameron Flowage by gravity via separate water discharge structures and engineered channels. At this time, it is not anticipated that a collection pond would be required, however such a pond can be constructed should settling of solids prior to discharge be required.

No alternatives for water supply management were considered to be technically or environmentally feasible. Cameron Flowage is a valuable local and regional watercourse and direct discharge without settling and back-up ability for other treatment is not acceptable to AMNS.

2.10.9.1.4 Valued Components Potentially Affected

The key VCs affected by the transportation of potable water to the Beaver Dam Mine Site include the atmospheric environment. If all required water were transported to the Project, a greater volume of emissions would be generated during the transport of water.

2.10.9.1.5 Preferred Approach

On-site water collected from surface water run-off and pit dewatering will be used for dust control, the vehicle wash down, and fire protection. Domestic water requirements will be fulfilled by potable water delivery, and an on-site drilled well for sanitary usage.

2.10.10 Mine Waste Management Facilities

2.10.10.1 Waste Rock Storage

2.10.10.1.1 Stockpile

The two waste rock stockpiles will have capacities of 20.7 Mt and 14.8 Mt of material and final peak grade elevations of 210 masl and 190 masl respectively. Waste rock will be stored in multiple lifts of 15 m with each lift having an active slope of 1.5:1. This approach will minimize the amount of exposed waste rock at any given time and reduce the potential for erosion and acid rock drainage (ARD). A safety berm will separate each lift resulting in overall slope angle of 2.6:1. A 20 m wide dual lane Haul Road running up the side of each stockpile will provide progressive access to all lifts. At reclamation, the waste rock stockpile will be reclaimed with topsoil and growing medium to a depth matching the native surroundings. After final shaping and vegetating, the piles will mirror current local topography and landscapes.

2.10.10.1.2 Backfill

Backfilling of the open pit with waste rock would eliminate the permanent storage stockpile as described above. However, the same stockpile would still be required to be constructed over the life of the mine and then re-handled to place back in the pit at closure and the footprint would require reclamation. Such re- handling would result in additional emissions due to equipment use and would be cost prohibitive for the overall Project viability. As well, backfilling with broken rock would overfill the open pit due to the swell factor, requiring reclamation of the open pit area as well as the remaining excess waste rock.

2.10.10.1.3 Valued Components Potentially Affected

Environmental effects are generally similar in both alternatives as the stockpile is required in both cases and either the stockpile itself or the footprint would be reclaimed at closure. Additional atmospheric effects are associated with the backfill alternative due to the extensive equipment use requirements associated with re-handling the waste rock.

2.10.10.1.4 Preferred Approach

The preferred approach for mine waste rock management includes the on-site management of using the waste rock stockpile.

2.10.10.2 Tailings Storage

2.10.10.2.1 Touquoy Open Pit

As processing of Beaver Dam ore at the Touquoy Mine Site is not scheduled to commence until mining at Touquoy is complete, the mined out open pit at Touquoy will be available for storage of tailings. The mined out Touquoy open pit will provide a very stable natural containment structure for tailings and will have the capacity to store all projected Beaver Dam tailings. Hydrogeological assessments of the Touquoy open pit indicate that it will eventually fill with water from rainfall, runoff and groundwater infiltration creating an in-pit lake which is in accordance with the approved closure plan. Tailings storage in the pit will therefore be sub-aqueous and will require no additional disturbance.

2.10.10.2.2 Touquoy Tailings Management Facility

The existing TMF at Touquoy was designed to accommodate projected tailings volumes generated from processing of Touquoy ore and does not have the capacity to store all the projected Beaver Dam tailings under the approved design. The tailings dams were constructed using a downstream construction technique. As a result, expansion of the Touquoy TMF to accommodate Beaver Dam tailings would require continued raising of the dams by downstream construction. This would result in substantially higher dams and a much larger footprint. Such expansion would also impact other existing infrastructure such as the polishing pond which would have to be decommissioned and re-established further away. For these reasons, this alternative is not considered to be favorable economically, technically, or environmentally.

2.10.10.2.3 Beaver Dam Tailings Management

There is no requirement for tailings management at the Beaver Dam Mine Site as all mineral processing is proposed be done at the Touquoy Mine Site as per Section 2.7.4. It is not considered economically or environmentally feasible for tailings to be transported back to the Beaver Dam Mine Site following processing at Touquoy.

Processing of ore at the Beaver Dam Mine Site would require construction of a new gravity/CIL cyanide processing facility as described in Sections 2.9.1.3.4 and 2.9.1.3.5, duplicating the existing facility at the Touquoy Mine Site. As well, storage of tailings on-site at the Beaver Dam Mine Site would require construction of a new Tailings Management Facility along with all of the associated raw water requirements and water management structures, including pumphouse, raw water line, tailings line, reclaim water line and water storage tanks. All of this additional infrastructure would substantially increase the disturbance footprint at the Beaver Dam Mine Site and potential environmental effects. For these reasons, this alternative is not considered to be favorable economically, technically, or environmentally.

2.10.10.2.4 Valued Components Potentially Affected

The key VCs potentially affected by the use of the exhausted Touquoy open pit for tailings storage are surface water and groundwater quality as described in more detail in Sections 6.7 (Surface Water Quantity and Quality) and 6.6 (Groundwater Quality and Quantity). It should be noted however that an existing monitoring program is already in place under the Touquoy Industrial Approval and that groundwater and surface water quality and quantity will continue to be monitored over the life of the Touquoy Mine Site as part of existing approvals for approved life span of the facility and for the proposed extended life of the Touquoy Mine

Site associated with processing of Beaver Dam ore. As well, there will be over seven years of data available prior to the Beaver Dam tailings being introduced to the exhausted Touquoy pit, which will enhance water quality modeling and predictions.

The key VCs potentially affected by the expansion and use of the Touquoy TMF are the same as for using the open pit, surface and groundwater quality, plus additional VCs associated with the increased disturbance area.

Construction of an additional processing and tailings management facility at the Beaver Dam Mine Site would affect all VCs being considered in this EIS.

2.10.10.2.5 Preferred Approach

The preferred approach for tailings management is to manage Beaver Dam tailings at the Touquoy Mine Site by storage in the mined out open pit.

2.10.11 The Preferred Approach

Based on the consideration of technical and economic feasibility, environmental effects, and socioeconomic effects, the preferred approach for the Project consists of:

- an open pit gold mine located at the Beaver Dam Mine Site;
- ore extraction methods that employ drilling and blasting;
- ore processing methods that employ gravity/CIL processing methodology which represents the most conventional processing option and is the preferred processing option in Canada;
- processing Beaver Dam ore at the Touquoy Mine Site once reserves at Touquoy have been exhausted;
- transportation of ore from the Beaver Dam Mine Site to the Touquoy Mine Site for processing via a 31 km Haul Road, which will include upgrades to approximately 15.4 km of existing road and approximately 4.0 km of new road construction through a greenfield environment (Figure 2.3-3);
- the use of two (duty and standby) self-contained, skid mounted, 500-kilowatt (kW) diesel powered generators to provide) electrical power to the Beaver Dam Mine Site;
- Project component locations as shown on Figure 2.3-2;
- on-site water supply and management, with delivery of potable water;
- waste rock management stockpiles located on the Beaver Dam Mine Site; and
- tailings management by storage of tailings from Beaver Dam ore processed at the Touquoy facility in the mined out Touquoy open pit.

A summary of the review of alternative means to carry out the Project is presented in Table 2.10-1 for each Project component of activity. This provides justification on the preferred approach for the Project relative to technical feasibility, economic feasibility and environmental and social effects. The VCs considered are noted as applicable under the environmental and social effects.

Table 2.10-1: Summary of Alternative Means of Undertaking the Project

Project Component or Activity	Alternative Means	Technical Feasibility	Economic Feasibility	Environmental Effects	Preferred Option
Mine Type	Surface Mine	Technically Feasible	Economically Feasible	Environmental effects are associated with the surface mine construction and operation; however, no significant residual environmental effects are anticipated for the Beaver Dam Mine Site.	Yes
	Underground Mine	Not Technically Feasible considering the configuration of the gold deposit.	Not Economically Feasible	Not assessed	No
Ore Extraction Methods	Blasting	Technically Feasible	Economically Feasible	Environmental effects include noise and dust impacts; however, blasting will be conducted in shorter duration and will be controlled.	Yes
	Rock Breaking	Not Technically Feasible considering the hardness of the ore deposit	Not Economically Feasible based on the hardness of the ore deposit	Environmental effects include continual noise and dust impacts.	No
Ore Processing Methods	Gravity/CIL	Technically Feasible considering it is the preferred processing option in Canada and is used worldwide in almost all major gold mining/processing operations. Well suited to this particular ore	Economically Feasible	Environmental effects are generally similar in both alternatives: the same quantity of sodium cyanide is required in both alternatives, if not more for gravity/flotation.	Yes
	Gravity/Flotation	Not Technically Feasible based on an unorthodox complex multi-stage process for cyanidation or off-site smelting.	Not Economically Feasible as it requires a complex multi-stage process or additional off-site smelting.	Environmental effects are generally similar in both alternatives: the same quantity of sodium cyanide is required in both alternatives, if not more for gravity/flotation. Smelting would require transport to an off-site facility.	No
Ore Processing Locations	Touquoy	Technically Feasible as the Touquoy facility is already designed to treat Beaver Dam ore with minimal modifications.	Economically Feasible as the infrastructure for processing Beaver Dam ore is already in place. Haul Road upgrades will need to be completed but are off-set by the benefits or using the existing processing facility.	Environmental effects for the Touquoy facility have previously been identified. Processing Beaver Dam ore at the Touquoy facility will result in an additional four years of processing beyond the current lifespan of the Touquoy Project and will result in an increase in the cost of production and greenhouse gas emissions due to transporting ore to Touquoy.	Yes
	Beaver Dam	Technically Feasible	Not Economically Feasible as the infrastructure for processing Beaver Dam ore is already in place at the Touquoy facility.	Environmental effects of processing ore at the Beaver Dam Mine Site are greater in this scenario as a second processing facility and tailings management facility would be required to be constructed and operated. Construction of an additional processing and tailings management facility would affect all VCs being considered in this EIS.	No

Table 2.10-1: Summary of Alternative Means of Undertaking the Project (continued)

Project Component or Activity	Alternative Means	Technical Feasibility	Economic Feasibility	Environmental Effects	Preferred Option
Ore Transportation	Haul Road avoiding Highway 224 via new construction	Technically Feasible	Economically Feasible	Environmental effects are similar for both alternatives. Construction of 4.0 km of new Haul Road will cause additional environmental effects than simply upgrading the Haul Road; however, the new road eliminates travel along Highway 224 and the passing of Beaver Lake IR 17, which reduces potential effects on those residents. The Preferred Alternative Haul Road reduces interaction with residence and private landowners.	Yes
	Haul Road along Highway 224	Technically Feasible	Economically Feasible	Environmental effects are similar for both alternatives. Travel along Highway 224 through the Beaver Lake IR will cause noise and dust issues for residents due to the increased truck traffic.	No
Energy Source	On-site Generators	Technically Feasible	Economically Feasible	Environmental effects will include emissions associated with two diesel fuel-powered generators.	Yes
	Provincial Grid Tie-in	Technically Feasible	Not Economically Feasible as the current power demand is insufficient to justify the construction of a permanent grid tie-in.	Environmental effects would include construction of a right- of-way for electrical lines, including noise and emissions generated during construction and habitat and vegetation loss in the right-of-way.	No
	Renewable Energy Sources	Technically Feasible	Not Economically Feasible due to short duration of Project	Environmental effects would depend on renewable energy technology used; however, air emissions would be reduced	No
Project Component Locations	As shown in Figure 2.3-2	Technically Feasible	Economically Feasible	Environmental effects will include loss of habitat; however, this configuration avoids interference with aquatic habitats and Critical Function Zone for Boreal Felt Lichen.	Yes
	Alternative Locations	Technically Feasible	Not Economically Feasible as this would require the reconfiguration of the components	Environmental effects would be similar in both scenarios; however, the alternative location of the waste rock stockpile could interfere with nearby aquatic habitat and Boreal Felt Lichen. Project components have also been positioned to generally avoid identified heritage resources.	No
Water Supply and Management	On-site water supply and management, with delivery of potable water	Technically Feasible	Economically Feasible	Environmental effects will include emissions associated with the transport of potable water to the mine site.	Yes
	Alternative sources of water	Technically Feasible	Not Economically Feasible to transport all water requirements to the mine site.	Environmental effects would include a greater volume of emissions generated during the transport of all water to the mine site.	No
	Waste rock stockpiles	Technically Feasible	Economically Feasible	Stockpiles to be rehabilitated at closure	Yes
	Waste rock backfill in open pit	Technically Feasible	Not Economically Feasible	Stockpile disturbed area footprint backfilled open pit and excess waste rock require reclamation after backfill	No

Table 2.10-1: Summary of Alternative Means of Undertaking the Project (continued)

Project Component or Activity	Alternative Means	Technical Feasibility	Economic Feasibility	Environmental Effects	Preferred Option
Mine Waste Management Facilities	Beaver Dam tailings stored in Touquoy open pit	Technically Feasible	Economically Feasible	Potential environmental effects on surface and groundwater	Yes
	Beaver Dam tailings stored in expanded Touquoy TMF	Technically Feasible	Not Economically Feasible	Potential environmental effects on surface and groundwater; Increased disturbed footprint area; higher TMF dams increasing failure risk.	No
	Beaver Dam tailings stored in new TMF at Beaver Dam Mine site	Technically Feasible	Not Economically Feasible to transport tailings back to Beaver Dam; Not Economically Feasible to construct new processing facility at Beaver Dam; Not Economically Feasible to construct new TMF at Beaver Dam	Potential effects on all VCs. Substantially larger disturbed area at Beaver Dam and potential environmental effects associated with significant additional infrastructure development.	No

2.11 Conclusions

The environmental benefits of the Project to Nova Scotia are numerous to correct past practices with respect to the environment. Given the area has been subjected to extensive exploration, mining, and logging activity over several decades, baseline conditions show obvious effects from these historic activities (Section 6.5 Geology, Soil, and Sediment Quality). The current condition at the Beaver Dam Mine Site is disturbed, and fragmented habitat based on significant timber harvesting, associated road building and yarding areas and historic exploration/mining activity. The PA contains a diversity of habitat types and landscape features but has experienced a considerable amount of disturbance and habitat fragmentation as a result of these activities. The level of disturbance within the Beaver Dam Mine Site disproportionately affects uplands, over wetlands. The level of new fragmentation associated with the Project is anticipated to be moderate, given the existing disturbance. Historic tailings and waste rock will be removed from the site and encapsulated in the Touquoy exhausted pit. Water will be treated during construction to remove metals associated with historic tailings.

The poor condition of the majority of existing Haul Road culvert crossings directly contributes to poor surface water quality and fish passage in watercourses and wetlands along the Beaver Dam Mines Road and the Moose River Cross Road (Figure 2.3-3) Upgrades to this existing Haul Road will include culvert replacements at over 20 locations and 3 new bridges, where determined to be necessary (Section 2.7.3 and Section 6.9.7.3 Fish and Fish Habitat). It is expected that correctly installed culverts will increase fish passage and positively affect fish habitat through improved surface water quality.

All environmental baseline investigations for the Project have added to the scientific understanding of the area and improved background data held by the province. Background data helps increase the knowledge base of its users and increases public ecological awareness and promotes conservation of natural ecosystems.

At closure, reclamation will occur at the Project Site and Touquoy Mine Site. The reclamation plan will be secured with a bond held by the Province of Nova Scotia to ensure there are sufficient funds to reclaim the site at any point during the Project. The plan for reclamation requires approval of the Nova Scotia Department of Lands and Forests.

KPMG International completed an Economic Impact Assessment of the Moose River Consolidated (MRC) Project to evaluate the economic benefits stemming from the Proponent's mining projects in Nova Scotia (KPMG 2015). This assessment considered the Touquoy and Beaver Dam Mine Projects together and found that socio-economic benefits will stem primarily from the construction and operation phases of the Project.

Construction activities will involve preparing the Project Site, setting up infrastructure and facilities, and purchasing mining processing equipment to enable the MRC Project to reach full production. Much of the spending associated with these activities will be incurred in Nova Scotia and Canada. As per the KPMG report, it was projected that construction costs will be approximately $146 million, with approximately $97.6 million, or 67%, being spent in Nova Scotia, and approximately $111.9 million, or 77%, being spent in Canada. As a result of this spending, it is anticipated that 391 full time equivalent jobs will be created in Nova Scotia per year during construction. For Canada as a whole, the construction phase will create 437 full time equivalent jobs per year. Tax revenues stemming from the construction phase are expected to be $4.1 million for the Government of Nova Scotia and $5.5 million for the Government of Canada. This is a conservative estimate as corporate income taxes paid by contractors and suppliers cannot be estimated.

Operational mining and processing activities will involve the deployment and operation of new mining production capacity. Similar to the construction phase, much of the spending associated with operation of the MRC Project will be incurred in Nova Scotia and Canada. As per the KPMG report, it was projected that annual operating costs will be approximately $52.3 million, with approximately $38.1 million, or 73%, being spent in Nova Scotia, and approximately $39.4 million, or 75%, being spent in Canada. The costs include several spending components, the most important being:

- salaries and benefits for 27% of total annual operating costs;
- cyanide, lime, and reagents for 24% of total annual operating costs;
- diesel for 22% of total annual operating costs;
- wear parts and spare parts for 15% of total annual operating costs; and
- electricity (Touquoy only) for 7% of total annual operating costs.

As a result of this spending, it was anticipated in the KPMG report that 228 yearly and recurrent full-time equivalent jobs will be created in Nova Scotia during operation. For Canada as a whole, the operation phase will create 278 yearly and recurrent full-time equivalent jobs during operation. Tax revenues stemming from the operation phase are expected to be $10.2 million annually for the Government of Nova Scotia and $8.1 million annually for the Government of Canada. These represent conservative estimates as corporate income taxes paid by suppliers cannot be estimated.

The Province of Nova Scotia's unemployment rate is higher than the national average (8.8%>6.9%) and its gross domestic product (GDP) growth was the slowest of all Canadian provinces the last few years. In addition, the GDP per capita is the second lowest in Canada. The MRC Project would greatly benefit the Province of Nova Scotia due to substantial upfront investments and significant annual operation costs contributing to job creation and government tax revenue.

AMNS is committed to working with local communities and the Mi'kmaq of Nova Scotia to maximize socio-economic benefits as the Company developments its projects in the Province, including the Beaver Dam Mine Project.