Beaver Dam Mine Project
Environmental Impact Statement Summary
May 2021

Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment

Atlantic Mining NS Inc.

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1 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT

The Environmental Impact Statement (EIS) was submitted in 2017 (AGC 2017) and resubmitted as the Revised 2019 EIS (AMNS 2019) to address Information Requests (Round 1) from the Impact Assessment Agency of Canada (IAAC; formerly the Canadian Environmental Assessment Agency [formal change of name August 2019]) and Nova Scotia Environment (NSE) (CEAA 2017 and NSE 2017). This Updated 2021 EIS has been developed to support Information Requests (Round 2; CEAA 2019 and NSE 2019). The Updated 2021 EIS also addresses advances in the Project Descriptions as well as additional Regulatory, Public and Indigenous Peoples engagement that has been undertaken since the Revised 2019 EIS. The Project Description updates coupled with engagement has resulted in changes to Valued Component (VC) Sections (Section 6). Each section of the EIS includes a summary of changes before and after the 2021 updates. Changes to Updated 2021 EIS from the Revised 2019 EIS are highlighted. Sections that have been completely replaced from the Revised 2019 EIS version do not include highlighting. The completely replaced sections are:

- Section 2 Project Description;
- Section 3 Public Engagement;
- Section 6.7 Surface Water Quantity and Quality;
- Section 6.9 Fish and Fish Habitat;
- Section 6.14 Mi'kmaq of Nova Scotia;
- Section 6.16 Socio-economic Conditions; and.
- Section 8 Cumulative Effects.

The ownership of the company has also changed since the Revised 2019 EIS, which is presented in the Introduction (Section 1.4) as well as the Project Description (Section 2).

1.1 Proposed Beaver Dam Mine Project

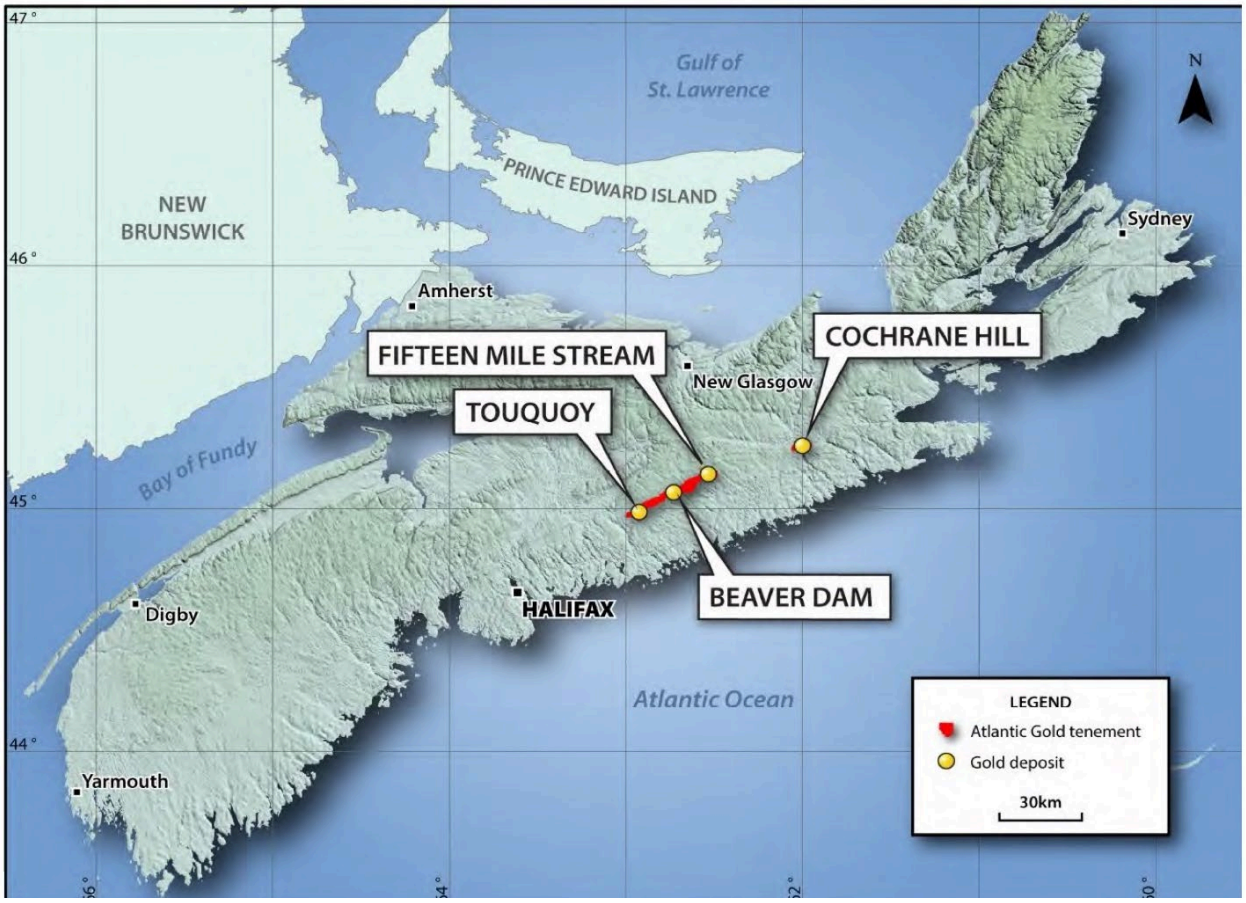
Atlantic Mining NS Inc. (AMNS; a wholly owned subsidiary of St Barbara Limited) is proposing to construct, operate, and reclaim the Beaver Dam Mine Project (Project), which is situated in Marinette, Nova Scotia (NS). The Project is approximately 18 kilometres (km) from Sheet Harbour, NS and 30 km northeast of the community of Mooseland within the Halifax regional municipality (Figure 1.1-1). The locations of AMNS other proposed projects that include Fifteen Mile Stream Gold Project and the Cochrane Hill Gold Project is also shown in Figure 1.1-1.

The Project will operate as a satellite open pit gold mine where mining and primary crushing of gold-bearing ore will be loaded into haul trucks. Approximately, 2.1 million tonnes (Mt) of gold-bearing ore per year (at a maximum rate) that will be transported from the Beaver Dam Mine to the Touquoy Mine for processing and tailings deposition. Tailings will be deposited sub-aqueously in the Touquoy mined-out pit, which will not result in any increase to the existing mine footprint (i.e., Touquoy Mine Site). The processing of ore from the Beaver Dam gold deposit at the existing Touquoy facilities is planned to begin upon completion of mining activities from the Touquoy open pit.

The proposed Beaver Dam Mine Site will have approximately one year of construction, five years of operations, two years of active closure (i.e., decommissioning, earthworks, and reclamation), and 10+ years of post-closure monitoring and adaptive management. Reclamation monitoring will be extended for some environmental parameters (i.e., lake refilling and PAG monitoring).

Details and descriptions of the proposed Beaver Dam Mine Site layout, infrastructure, facilities, and activities during each Project phase are discussed in Section 2 Project Overview.

Figure 1.1-1: Atlantic Mining NS Inc. Project Locations



1.2 Regulatory Process and Status

The Environmental Impact Statement (EIS) has been prepared to facilitate the approval of the Project in accordance with the *Canadian Environmental Assessment Act* (CEAA 2012), the Environmental Assessment Regulations made under the *Nova Scotia Environment Act* and project-specific guidelines provided in the Guidelines for the Preparation of an EIS issued by the Impact Assessment Agency of Canada (IAAC, formerly the Canadian Environmental Assessment Agency [CEAA 2016]).

The Project is currently undergoing a joint federal and provincial Environmental Impact Assessment/EARD process.

AMNS plans to apply for an Industrial Approval as well as other necessary provincial and federal permits and authorizations to allow construction, operation, and active closure of the mine following an approval of the EIS.

1.3 Proponent (Atlantic Mining NS Inc.) Information

Atlantic Mining NS Inc., (AMNS), a wholly owned subsidiary of St Barbara Limited, is a well-financed, growth-oriented gold development group with a long-term strategy to create a mid-tier gold production group focused on manageable, executable projects in mining-friendly jurisdictions. The board and management team, with extensive experience in geology, mining and mine development, process and metallurgy, and project financing, is currently focused on the development of gold development properties located in NS.

Currently, AMNS holds four gold development projects in NS. Collectively, the Moose River Consolidated (MRC) Projects comprising of the Touquoy Gold Project; the Beaver Dam gold deposit; the Cochrane Hill gold deposit; and the Fifteen Mile Stream gold deposit. The Touquoy Gold Project has been in operations since October 2017. The Beaver Dam Mine Project and Fifteen Mile Steam Gold Project have both been submitted to the Impact Assessment Agency of Canada (IAAC, formerly the Canadian Environmental Assessment Agency [CEAA]) and are both undergoing conformity reviews and approval phases. Advanced exploration activities and well as environmental baseline data collection are continuing at the Cochrane Hill Gold Project.

AMNS is committed to the highest practical standards of corporate governance and to being a responsible corporate citizen. Safe production and environmental stewardship are keys to the AMNS organization. The company relies upon its senior management team and Board of Directors who have extensive experience with past mining developments worldwide.

AMNS's corporate governance and management structure has mechanisms to ensure safe production and environmental stewardship are implemented and respected for the Project. These include but are not limited to:

- strength and experience of its senior management team and 8-member Board of Directors;
- Code of Conduct with obligations regarding environmental standards, health and safety, contributions to local communities and respect and tolerance;
- development of an Environmental Management System (EMS) and Environmental Protection Plan (EPP) for all phases of AMNS's development projects;
- management and reporting structure to ensure corporate policies are implemented on a day-to-day basis;
- establishment of a Review Board for the MRC Project which independently reports to the Chief Operating Officer on tailings management, waste rock storage and open pit mining activities;
- maintain adequate reclamation security and environmental liability insurance with respect to AMNS's mining projects; and
- adherence with best applicable practices (BAPs) and industry standards as per guides developed by Mining Association of Canada, such as the Towards Sustainable Mining initiative, and the Canadian Dam Association.

1.4 Environmental Assessment Context

An Environmental Assessment (EA) is a planning tool used to ensure that projects are carefully planned to avoid or mitigate possible negative environmental effects and to maximize potential benefits. Use of the EA process early in a project's planning phase can be used to encourage proponents to develop their projects in the most sustainable manner.

As described in Section 1.2, the EIS has been prepared in accordance with the *Canadian Environmental Assessment Act, Nova Scotia Environment Act,* and the Project-specific EIS Guidelines (CEAA 2016). The use of the EIS Guidelines required AMNS to carefully review and consider the Project, including its alternatives, and the potential effects on valued components.

The EIS was prepared by a consulting team that is provided in Table 1.4-1

Table 1.4-1: Environmental Assessment Consultant Team Contributions

Consultant	Contributing Role
Allnorth Engineering, Consulting, Project Management, and Surveying	• Reviewed the engineering feasibility of the new construction portion of the Haul Road, 2019 Moose River Consolidated NI 43-101 (Ausenco 2019)
Ausenco Engineering Canada Incorporated	• Preparation of the 2021 feasibility study for the Project (In Progress)
Brighter Community Planning & Consulting	• Public Engagement and Socio-Economic (Section 3, Section 6.16 and Appendix A.6 [draft Public Engagement Plan]) (AMNS 2021)
Confederacy of Mainland Mi'kmaq – Mainland Mi'kmaq Development inc.	• Prepared a Mi'kmaq Ecological Knowledge Study report for the Project (Appendix M.1, AMNS 2021)
Cultural Resource Management Group Limited	• Prepared archaeological screening and reconnaissance reports for the Project (Appendices N.1 to N.7, AMNS 2021)
GHD	• Noise environmental effects assessment and Noise Impact Assessment Technical Report (operations) and Memorandum (construction) (Section 6.1 and Appendices B.1 and B.2, AMNS 2021) • Air environmental effects assessment and Air Emissions Technical Report (Section 6.2 and Appendix C.1, AMNS 2021) • Light environmental effects assessment and Light Impact Assessment (Section 6.3 and Appendix D.1, AMNS 2021) • Surface Water Quantity and Quality environmental effects assessment, additional water quality modelling, water balance analysis, stormwater management, erosion and sediment control plan, predictive water quality, water treatment assessments, and baseflow mitigation assessment (Section 6.7 and Appendices G.1, G.3, G.4 and P.4, AMNS 2021) • Groundwater Quality and Quantity environmental effects assessment, field activities, baseline groundwater program, hydrogeological modelling report, and potential impacts from metals COCs to groundwater and surface water from dust deposition along the Haul Road (Section 6.6 and Appendices F.3, F.4, F.5 and F.9, AMNS 2021)
Golder Associates Ltd.	• Mine Waste Stockpile Geotechnical Design and Geotechnical Investigation: Data Report (Appendices A.2a and A.2c, AMNS 2021) • Preparation of a Geotechnical Assessment of the Beaver Dam Mine Open Pit (Golder [In Progress])
Intrinsik	• Prepared an evaluation of exposure and risks related to emissions from the Project onto recreational water usage and country foods and an aquatic effects assessment (reassessment) for the Killag and Moose rivers (Appendices C.2 and G.2, AMNS 2021)
KPMG	• Economic Impact Assessment Reports for the Project and the Moose River Consolidated Project (Appendices O.1 and O.2, AMNS 2021)
Lorax Environmental	• Prepared geochemical source term predictions and an ML/ARD assessment report, geochemical source terms update, kinetic test update and a draft ML/ARD management plan and nitrogen source control monitoring plan for Touquoy Mine (Appendices E.2 to E.5 and E.10) of the Updated 2021 EIS (AMNS 2021)

Table 1.4-1: Environmental Assessment Consultant Team Contributions (continued)

Consultant	Contributing Role
McCallum Environmental Ltd.	• Wetlands environmental effects assessment, wetlands functional assessment, characterization and preliminary Wetlands Compensation Plan (Section 6.8 and Appendices H.1 to H.3) of the Updated 2021 EIS (AMNS 2021) • Fish and Fish Habitat environmental effects assessment, photographic log, and Fish and Fish Habitat baseline (2015 to 2017 and 2019 to 2020) (Section 6.9 and Appendices J.1, J.2, and J.4) of the Updated 2021 EIS (AMNS 2021) • Habitat and Flora environmental effects assessment, master species list, preliminary Lichen Mitigation and Management Plan, (Section 6.10 and Appendices K.1 and P.6) of the Updated 2021 EIS (AMNS 2021) • Terrestrial Fauna environmental effects assessment, draft Wildlife Mitigation and Monitoring Plan and Landbird SAR Mitigation and Monitoring Plan (Section 6.11 and Appendix P.7 Updated 2021 EIS (AMNS 2021)) • Avifauna environmental effects assessment, relative abundance of avian species and Landbird SAR Mitigation and Monitoring Plan (Section 6.12 and Appendices L.2 and Appendix A of Appendix P.7 [draft Wildlife Mitigation and Monitoring Plan]) of the Updated 2021 EIS (AMNS 2021) • Species of Conservation Interest and Species at Risk environmental effects assessment (Section 6.13 of Updated 2021 EIS (AMNS 2021) • Mi'kmaq of Nova Scotia engagement and environmental effects assessment (Section 4 and Appendix A.5 [Mi'kmaq of Nova Scotia engagement log], and Section 6.14) • Review and update of physical and cultural heritage environmental effects assessment and assessment of valued components within Federal jurisdiction (Sections 6.15 and 6.17 Updated 2021 EIS (AMNS 2021)) • Cumulative effects assessment (Section 8) of the Updated 2021 EIS (AMNS 2021)
Moose Mountain Technical Services	• Preparation of Beaver Dam Mine Planning component of the Feasibility for the Project 2019 Moose River Consolidated NI 43-101 (Ausenco 2019) and 2021 Feasibility Study NI 43-101 2021 (In Progress)
Nortek Resource Solutions Inc.	• Prepared the visual simulations (zone of influence) for the Project (Appendix M.2) of the Updated EIS 2021 (AMSN 2021)
Wood Environment & Infrastructure Solutions	• Senior review of Fish and Fish Habitat environmental effects assessments (Section 6.9), review of Air (Section 6.2), Geology, Soils and Sediment Quality (Section 6.5) and Surface Water Quantity and Quality (Section 6.7) environmental effects assessments and development of the draft Fish Habitat Offset Plan (Appendix J.3) of the Updated 2021 EIS (AMNS 2021)
Stantec	• Prepared Phase I and Phase II's (limited and extended) environmental site assessments for the Project (Appendices E.6 to E.8) • Review of Geology, Soil, and Sediment Quality environmental effects assessment (Section 6.5) • Prepared the following studies at the Touquoy Mine Site; a water and tailings management plan, groundwater flow and solute transport model, an assimilative capacity study of Moose River, and a simulation of cumulative effects of deposition of tailings (Appendices F.6 to F.8, and F.10 of the 2021 Updated EIS (AMNS 2021)) • Prepared assessment of water quality downstream of tailings facility and water balance report (Rev. 2) for tailing management – Touquoy Mine (Appendices G.5a and G.5b of the 2021 Updated EIS (AMNS 2021))
WSP	• Preliminary Design of Haul Road including By-pass Roads (2021 Feasibility Study NI 43-101 2021[In Progress])

AMNS = Atlantic Mining NS Inc.; COC = Contaminant of Concern, ML/ARD = Metal Leaching/Acid Rock Drainage; SAR = Species at risk; EIS = Environmental Impact Statement.

The methodology used to conduct this EA is based on the identification and assessment of potential environmental effects of the Project on VCs. VCs refer to environmental, biophysical, or human features that may be affected by the Project that are of value or interest because they have been identified to be of concern to Mi'kmaq of Nova Scotia, regulators, non-government organizations, nearby residents and/or the general public. The selection of VCs was based on consideration of the following:

- regulatory guidance and requirements, specifically those outlined in Section 6.2 of the EIS Guidelines (CEAA 2016) and Section 5 of CEAA 2012;
- a review of federal, provincial, and municipal legislation, including an appraisal of species of conservation interest (SOCI) and SAR. Section 3.3.2 of the EIS Guidelines specifically requires consideration of the factors listed in Section 79 of the *Species at Risk Act* (SARA);
- workshops and discussions with representatives of CEAA, Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC), Transport Canada (TC), NSE, and Nova Scotia Department of Lands and Forestry (NSL&F);
- concerns raised by the public through open house meetings hosted by the Proponent;
- concerns raised by Indigenous Peoples, including traditional ecological knowledge obtained through completion of a Mi'kmaq Ecological Knowledge Study (MEKS);
- technical aspects of the Project, including the nature and extent of Project activities;
- the existing physical, biophysical, and socio-economic conditions and characteristics of the Project area;
- a review of publicly available information and reports submitted in support to nearby and similar environmental assessments; and
- the professional experience of the EA Study Team.

Based on these considerations, the following VCs were selected to facilitate a focused and effective EA:

The following Valued Components (VCs) were selected to facilitate a focused and effective EA:

- Physical VCs:
  - noise;
  - air;
  - light;
  - greenhouse gases;
  - geology, soil, and sediment quality;
  - surface water quality and quantity; and
  - groundwater quality and quantity.
- Biophysical VCs:
  - wetlands;
  - fish and fish habitat;
  - habitat and flora;
  - terrestrial fauna;
  - birds; and
  - species of conservation interest and species at risk.
- Socio-economic VCs:
  - Mi'kmaq of Nova Scotia;
  - physical and cultural heritage; and
  - socio-economic conditions.

The spatial boundaries represent anticipated geographic limits that will aid in defining the scale and range of interactions between Project activities and VCs. The following spatial boundaries will be used for this EIS.

1.4.1 Project Area (PA)

The PA encompasses the immediate area in which Project activities may occur and are likely to cause direct and indirect effects to VCs. This area has also been identified as the study area for the purposes of baseline investigations. The PA includes three primary components from Marinette to Moose River Gold Mines, Halifax County, NS:

- The Beaver Dam Mine Site will be located at the north end of the Beaver Dam Mines Road.
- The Haul Road will span from the Beaver Dam Mine Site west to Moose River Gold Mines.
- The Touquoy Mine Site is an existing mine that will process ore and dispose of tailings in the exhausted.

1.4.2 Local Assessment Area (LAA)

The LAA encompasses adjacent areas outside of the PA where Project related effects to VCs are reasonably expected to occur. Generally, the LAA is limited to the area in which Project activities are likely to have indirect effects on VCs; however, the size of the LAA can vary depending on the VC being considered, and the biological and physical variables present.

1.4.3 Regional Assessment Area (RAA)

The RAA encompasses all Project and VC interactions including diffuse or longer-range effects such as those from Project activities on the greenhouse gases, and socio-economic environments. The RAA may vary in size depending on the VC being considered, and the biological and physical variables present.

Spatial boundaries will vary for each VC and are described in Section 5 of the Updated 2021 EIS (AMNS 2021).

Methodology used to conduct the EA and predict the effects of the Project was developed to meet the requirements of the EIS Guidelines (CEAA 2016). This methodology was developed to incorporate:

- input from the Mi'kmaq of Nova Scotia and the public throughout the duration of the Project;
- environmental and social points of interest to the scientific and regulatory communities; and
- other federal, provincial, and municipal legislative and regulatory requirements that may apply to the Project.

Criteria or established thresholds for determining the significance of residual effects from Project activities are described for each VC in their corresponding subsection within Section 6 of the Updated 2021 EIS (AMNS 2021). These criteria or thresholds were established based on a combination of the following:

- applicable regulatory documents, environmental standards, guidelines, and/or objectives;
- scientific literature and best management practices;
- regulatory, stakeholder and right holder consultation;
- available information on the status and characteristic of each VC; and
- using professional judgement.

These criteria or thresholds establish a level beyond which a residual effect would be considered significant. Thresholds may be based on regulations, standards, resource management objectives, scientific literature, and/or ecological processes. Significance criteria has been defined quantitatively where possible, and qualitatively with supporting justifications where no regulatory standards exist.

The EIS Guidelines (CEAA 2016) require that the proponent demonstrate how all aspects of the project have been examined and planned in a precautionary manner to avoid serious or irreversible environmental effects. The EIS applies the precautionary approach through the following assessment methodologies:

- provides detail about the existing environment and develops mitigation measures to eliminate, reduce, or control the effect Project activities have on the environment;
- considers project design that will minimize disturbance to the existing environment;
- outlines contingency plans that address worst-case accidents and malfunctions;
- outlines follow-up and monitoring programs to verify project activity related impact predictions; and
- anticipates other projects in the area in an effort to eliminate, reduce, or control cumulative effects.

The application of a precautionary approach in developing the EIS will allow it to act as a planning tool which will be used to ensure the Project avoids or mitigates potential environment effects and promotes sustainable development.

Summaries for the selected VCs baseline conditions, potential changes and effects to the environment (indirect and direct effects), mitigation measures, significance of residual effects, and follow-up and monitoring programs proposed are provided in Sections 6 and 7 of the 2021 Updated EIS (AMNS 2021), respectively.

2 PROJECT OVERVIEW

The Beaver Dam Mine Project (the Project) proposed by Atlantic Mining NS Inc. (AMNS), a wholly owned subsidiary of St Barbara or the Proponent, will operate as a satellite open pit mine with total ore extracted over five years will range from 0.75 to 2.1 million tonnes per year (Mt/year). Crushed ore from the Beaver Dam Mine Site will be transported by an average of 190 trucks (i.e., round trip) approximately 31 kilometers (km) to the existing and fully permitted Touquoy Mine. Processing of ore from the Beaver Dam gold deposit at the existing Touquoy plant will begin upon completion of mining activities from the Touquoy open pit. The Project is anticipated to begin construction in 2022, come into production in 2023, cease operations in 2027 and then be reclaimed. The Project timelines, however, is subject to environmental assessment and associated permitting approvals.

The Project is subject to both federal and provincial environmental assessment (EA) processes. This document forms both the Environmental Impact Statement (EIS) and EA Registration Document (EARD) under the federal and provincial processes.

This EIS/EARD for the Project has been prepared to facilitate the approval of the Project in accordance with the *Canadian Environmental Assessment Act,* 2012 (CEAA 2012) and Environmental Assessment Regulations made under the *Nova Scotia Environment Act*. The EIS Guidelines (CEA Agency 2016) prepared by Canadian Environmental Assessment Agency (CEA Agency) have provided a framework for the organization of this EIS. No public money is being sought to undertake the Project.

The Project consists the **Beaver Dam Mine Property** (i.e., mining and storing of waste rock), an approximately 31-kilometre (km) **Haul Road** that connects to the two sites and the **Touquoy Property** (i.e., processing, and depositing tailings). The Project is bound within a Project Area (PA). The PA will result in approximately 243 hectares (ha) of disturbance with 34 ha or 14% occurring on crown land. The Beaver Dam Mine site is shown on Figure 2.2-1, the Haul Road is shown on Figure 2.2-2 and Touquoy Mine site is shown on Figure 2.2-3.

2.1.1 Beaver Dam Mine

The Beaver Dam Mine is in Marinette, Regional Municipality of Halifax Area, Nova Scotia, which is approximately 85 km northeast of Halifax. The Beaver Lake IR 17 is located approximately 6 km of the Beaver Dam deposit and 5 km from the intersection of the Beaver Dam Mine 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. The Beaver Dam mine footprint approximately 208 hectares (ha) with 26 ha or 14% on Crown land. Physical activities specific to the operation of the Beaver Dam Mine will include mining of ore, crushing of ore, operation of till and waste rock storage facilities, and treatment of surface water runoff and mine discharge water through collection and settling ponds. No ore processing or tailings management will occur at the Beaver Dam Mine Site. Operational infrastructure will be minimal as those Project activities will use infrastructure at the Touquoy Mine in Moose River. Electrical power demand required for the Beaver Dam Mine Site is not anticipated to be substantial and will be supplied by on site generators. Petroleum products will be stored on-site for use in generators, operational equipment, and haul trucks.

Beaver Dam Mine site will be reclaimed following operations, which will include two years of active closure (i.e., decommissioning and earthworks) and 10+ years of monitoring. The length of time of reclamation monitoring will be informed by successive reclamation plans as well as ongoing monitoring.

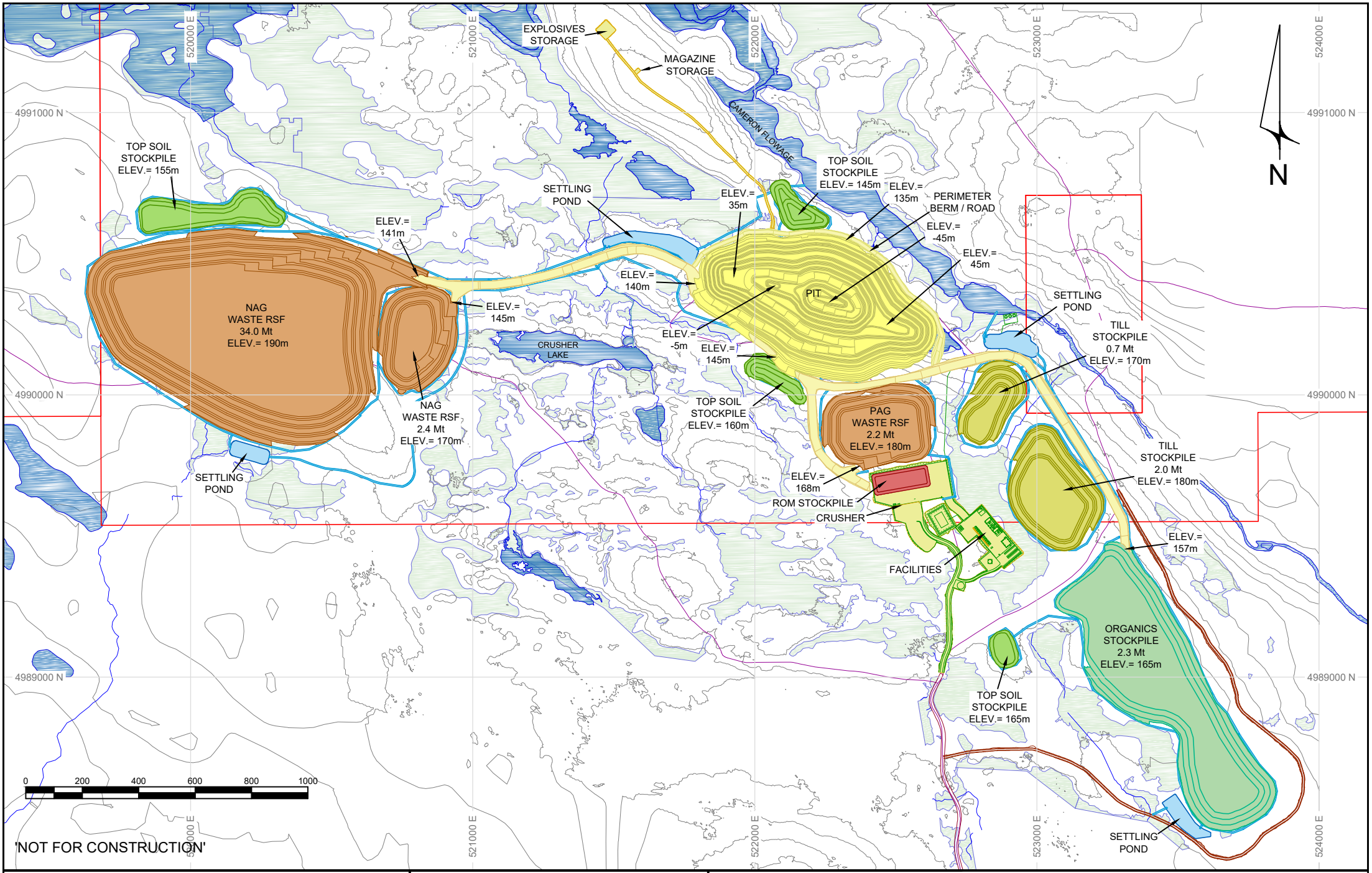


FIGURE 2.2.1
BEAVER DAM MINE PROJECT MINE SITE LAYOUT

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

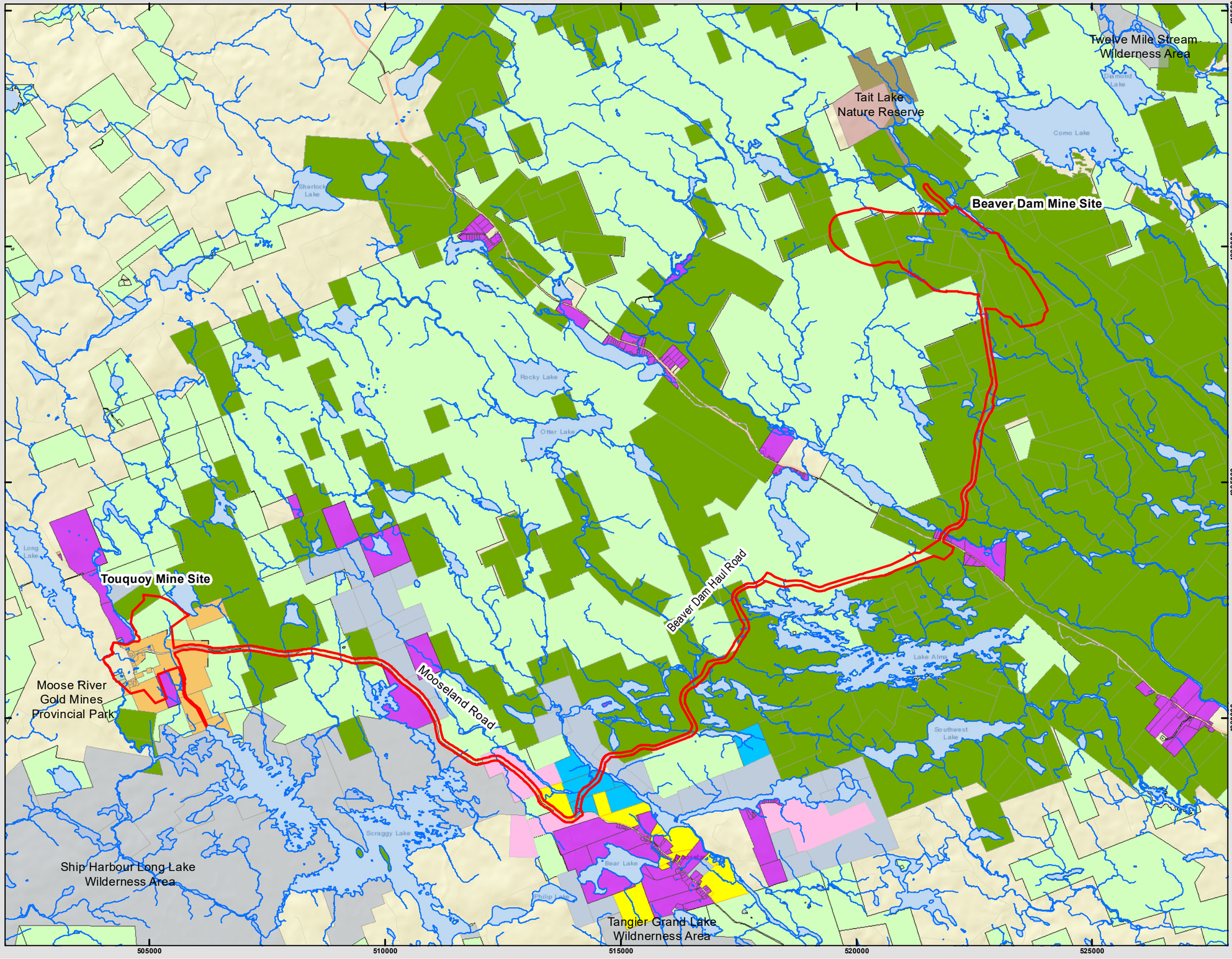
Moose Mountain Technical Services

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



Prepared For:

Atlantic Gold

FIGURE 2.2-2

Beaver Dam Mine

Haul Road

NSTDB Mapped Watercourse

Project

Nova Scotia Protected Lands

- Nature Reserve
- Provincial Park
- Wilderness

Other Land

- Private
- Crown Lands (Not surveyed)

Corporate Property

- D.D.V. Gold Limited
- Deepwood Estates Limited
- Forestex Limited
- Musquodoboit Lumber Co. Ltd.
- Northern Timber (Not surveyed)
- Prest Bros Limited
- Prest Enterprises Limited

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

0 1 2 4 km

1:75,000 Scale when printed @ 11" x 17"

Drawn By: EP Date: 2021-03-01
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

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Atlantic Gold

FIGURE 2.2-3

Touquoy Mine Site

Square Lake

New Dam Flowage

Moose River Road

By-Pass Road

Realigned Road

Plant

Till Stockpile

Till Stockpile

Till Stockpile

Till Stockpile

Till Stockpile

Till Stockpile

Till Stockpile

Touquoy Mine Waste Rock Storage

Mooseland Road

Bevear Dam Mine Tailings Management

Touquoy Mine Tailings Management

Moose River

Fish River

Indian Gulch

By-Pass Road

4982500
4982000
4981500
4981000
4980500
4980000

503500 504000 504500 505000 505500 506000 506500 507000

- 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

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

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X General Touquoy Arrangement

2.1.2 Haul Road

The Haul Road extends from the Beaver Dam Mine Site to the Touquoy Mine site (Figure 2.2-2). Transporting ore from the Beaver Dam Mine Site to the existing Touquoy Mine facilities is required for processing the ore and managing tailings in the exhausted Touquoy pit. Portions of the Haul Road route (approximately 16 km) will be upgraded to a dual lane road to facilitate the safe passage of two-way truck traffic at a maximum speed of 70 kilometres per hour (km/h). By-pass roads to allow light truck traffic and recreational vehicles (e.g., ATV and snowmobiles) to maintain continued access during operations will be constructed adjacent and parallel to portions of the Haul Road. The total disturbance of Haul Roads is 25 ha and by-pass roads are expected to disturb approximately 10 ha with 25 ha on crown land. Where possible, the upgrades will follow the course of the existing roadway; however, some adjustments to existing road alignment will be required to fulfill safe design standards.

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. Bypass 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 roads for ore transport during start-up (i.e., 6 to 8 months) depending on the timing of approvals and permits and construction restrictions.

2.1.3 Touquoy Gold Mine

The Touquoy Mine, is centered in former mining village of Moose River Gold Mines, will process ore and manage tailings in the exhausted or mined-out pit at the Touquoy facilities currently operating as part of the fully permitted Touquoy Mine.

The Touquoy Gold Project underwent a review in 2007 to determine if an EA was required under the existing provincial and federal legislation. It was determined by Nova Scotia Environment (NSE) and the CEA Agency that only a provincial EA was required in accordance with the Nova Scotia Environmental Assessment Regulations. Under the *Canadian Environmental Assessment Act* (1992) and its pursuant regulations, there were no triggers for a federal EA when the Touquoy Gold Project was reviewed in 2007. The CEA Agency file number for the review is 10700-40. The Touquoy Gold Project obtained EA approval in 2008 and has since obtained additional approvals through the applicable provincial regulatory processes, including the Industrial Approval (IA); the Touquoy Gold Mine has been in in operation as per the associated approvals since 2018.

Changes to the Touquoy Gold Mine as a result of the Project will be assessed through this EIS. They include: an increase in the duration of ore processing (approximately four additional years); minor adjustments to the ore processing facility; and disposal of Beaver Dam Mine tailings in the exhausted Touquoy Mine open pit. There is not anticipated disturbance to the exiting Touquoy Mine site that will result from processing Beaver Dam ore.

Due to the timing of the Beaver Dam Mine ore being processed at the Touquoy Mine site, the Beaver Dam tailings will not be stored in the Touquoy tailings management facility, but instead would be permanently stored in the pit after the Touquoy gold deposit has been mined. This allows the Touquoy Mine Site footprint to be maintained as permitted and no tailings management facility will need to be constructed at the Beaver Dam Mine Site (Project Description Section 2). Other aspects of the Touquoy Gold Mine will remain as assessed and approved through the Nova Scotia EA process in 2008 (NSE 2008) and/or currently being assessed as part of the Touquoy Mine Expansion that is currently planned to be submitted in June 2021.

Updates to the current reclamation plan for the Touquoy Gold Mine, as a result of the Project, would require approval by the Province of Nova Scotia as a condition of Mineral Lease (MLE11-1) and Industrial Approval (#2012-084244-08).

2.2 Purpose of the Project

The implementation of the Project will provide additional ore to the existing Touquoy Mine processing plant. This will extend the life of the Touquoy Mine Site to continue to provide economic and social benefits with minimal additional infrastructure. Completing the Project with safe production, environmental stewardship and community engagement is key for the Proponent to ensure that the Province, the community, and the Mi'kmaq of Nova Scotia receive optimum benefit.

Worldwide annual gold production is about 3,200 tonnes (NRCan 2019). Gold is used primarily for jewelry and as a storage form of wealth with China and India forming the majority of the demand. Canada produced about 5% of the world total in past years. With the Proponent's four gold development projects in Nova Scotia, there is much opportunity to supply gold with existing and expected future demand.

The Proponent has recognized that the quantity and unusual style of gold mineralization at the Beaver Dam Mine Site will support a commercially viable surface mining operation with on-site crushing and off- site processing of ore. The amount of gold expected to be recovered will represent more than one-third of the gold produced from the historic goldfields of Nova Scotia since the 1860s.

The Proponent is proposing to develop this resource in line with all applicable regulatory requirements and recognizes the significant potential benefits to the local economy, the Province of Nova Scotia, the Mi'kmaq of Nova Scotia and the AMNS in completing this Project. The Proponent has designed a project that is in line with the intent of NSL&F for efficient use of mineral resources and to "*promote the concepts of environmental responsibility and sustainable development, stewardship of the mineral resource sector, and integrated resource planning*."

All phases of the Project will provide employment opportunities for local residents and Indigenous Peoples, as well as provide tax revenue for the municipal, provincial, and federal levels of government. It is anticipated that additional labour force will be required during construction and a smaller, but still significant, labour force will be required during operation. Indirect employment will be generated by the Project through the use of external contractors and suppliers. Tax revenue in the millions of dollars per year will be generated through corporate income taxes paid by the Proponent, as well as its contractors and suppliers. Socio-economic benefits that will occur as a result of the Project are discussed further in Section 6.16.

2.3 Project Components

The Beaver Dam Mine Project will operate as a satellite surface mine with an approximate ore extraction rate of 2.1 million tones per year (t/y). Ore produced at Beaver Dam will be crushed on site, loaded onto trucks, and transported along a Haul Road for processing at an existing facility constructed as part of the Touquoy Project. Tailings will be disposed of in the exhausted Touquoy surface mine.

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

- Beaver Dam mine site;
  - surface mine for extracting ore and waste rock;
  - mine site roads;
  - waste material storage piles for waste rock (NAG and PAG), topsoil, till and organic stockpiles;
  - run of mine (ROM), and low-grade ore stockpiles;
  - optional crusher and operational facilities; and
  - water management.
- haul roads for transporting ore; and
- Touquoy processing and tailings management facility.

The location of components at the Beaver Dam mine site, the Haul Road route, and the location of processing and tailings management facilities at Touquoy, are displayed on Figures 2.2-1 to 2.2-3 respectively.

2.3.1 Beaver Dam Mine Site

2.3.1.1 Surface Mine

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; and
  - 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 Beaver Dam Mine Project are shown in Figures 2.2-1 to 2.2-3.

2.3.1.2 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, AMNS 2021). Wetland disturbance at Beaver Dam by waste storage piles is minimized, wherever possible (Section 6.8 Wetlands, AMNS 2021).

Project components of the Beaver Dam Mine Project have been altered since the February Revised 2019 EIS (Atlantic Gold 2019) and in consideration of the geographical restrictions include the following:

- Adjustment in the location of the Waste Rock Storage and Low -Grade storage area 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 2019 revised 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.

2.3.1.3 Open Pit

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 2.3-1. 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 Mt 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 45 ha.

Table 2.3-1: 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

Notes: Total Ore Milled differs from Total ore Mined from Pit because it includes ore includes from other operations.
Differences in LOM totals are attributed to rounding between Kilotonnes to Milltion tonnes.

Source: Aucenco 2021

LOM = Life of Mine.

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; therefore, blasting patterns will 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.

Ore and non-ore bearing waste rock will be loaded into off-highway haul trucks for transport out of the surface mine. From there, ore will be separated into low- and high-grade stockpiles prior to entering the crusher, while non-ore bearing waste rock will be stockpiled at its final disposal point.

2.3.1.4 Mine Site Roads

Mine site roads will be constructed to enable the mining fleet (e.g., loaders, dozers, off-highway haul trucks) to access topsoil and till stockpile locations. Mine site roads will also enable off-highway haul trucks to transport ore and non-ore bearing waste rock to stockpile locations. The ore haulage road will be dual lane and connect the surface mine exit with the run-of-mine (ROM) stockpile, crusher, and operational facility area. The waste haulage road will be dual lane and connect the surface mine exit with the topsoil, till, and non-ore bearing waste rock stockpiles.

Stockpiles are located to minimize impacts to wetlands, water courses, surveyed lichen and lichen habitat buffer zones and the Crusher Lake buffer zone. Waste material stockpile locations and design criteria are presented in Table 2.3-2.

Table 2.3-2: 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.

2.3.1.5 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. A PAG stockpile 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).

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 2.3-3). 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. The lift capacities is provided in Table 2.3-3.

Table 2.3-3: 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; MLCM = million loose cubic metres.

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 2.3-3).

Potential Acid Generating Stockpile

The PAG stockpile is located in the north-central section of site south of the open pit (Figure 2.2-1). 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 2.3-2). The design includes a 180 m maximum height crest (Table 2.3-3). The lift capacities for PAG are provided in Table 2.3-3.

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.

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 2.3-3). 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 (Ausenco *In Progress*), experience at the Touquoy Mine operations would suggest that a dedicated area should be planned for segregating additional mineralization identified during operations.

Topsoil Stockpiles

Four topsoil stockpiles are planned for the site and are spaced across the site near areas requiring topsoil stripping (Figure 2.2-1). 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 2.3-4). 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 2.3-4.

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 below

Table 2.3-4: 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.

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 2.3-5). 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) of the Updated 2021 EIS (AMNS 2021), 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 (Appendix P.4 Mine Water Management Plan, AMNS 2021).

Table 2.3-5: 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.

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 2.3-6). 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 2.3-6.

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 below.

Table 2.3-6: 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.

2.3.1.6 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 (Appendix A.2b) of the Updated 2021 EIS (AMNS 2021). 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.

2.3.1.7 Operational Facilities

The following operational facilities (9.5 ha) at the mine site will be located in a central ROM and facilities pad that provides access to the Haul Road:

- crusher and conveyors (optional);
- underground septic tanks and leach drains;
- raw water and potable water tank;
- diesel fuel storage and distribution system;
- diesel generators and power distribution overhead transmission lines;
- pole mounted lighting;
- vehicle washdown facility;
- pre-fabricated office facility, mine dry, security and workshop building;
- Truck shop, and
- fire protection systems.

A simple satellite primary crushing facility consisting of a grizzly feeder, jaw crusher, and primary coarse ore stockpile feed conveyor may be used for the Beaver Dam mine site or rock will be crushed through a series of small blasts in the pit. Used Touquoy equipment will be utilized where practical. However, a new ROM hopper will likely be installed at the Beaver Dam crusher.

2.3.1.8 Water Management

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), High-density Polyethylene (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.

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.

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, AMNS 2021) design are summarized in Table 2.3-7.

Table 2.3-7: 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.

Collection Ditches

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 mm to 1600 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.

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*.

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.

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. In order 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.

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.

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.

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.

2.3.2 Haul Roads for Transporting Ore

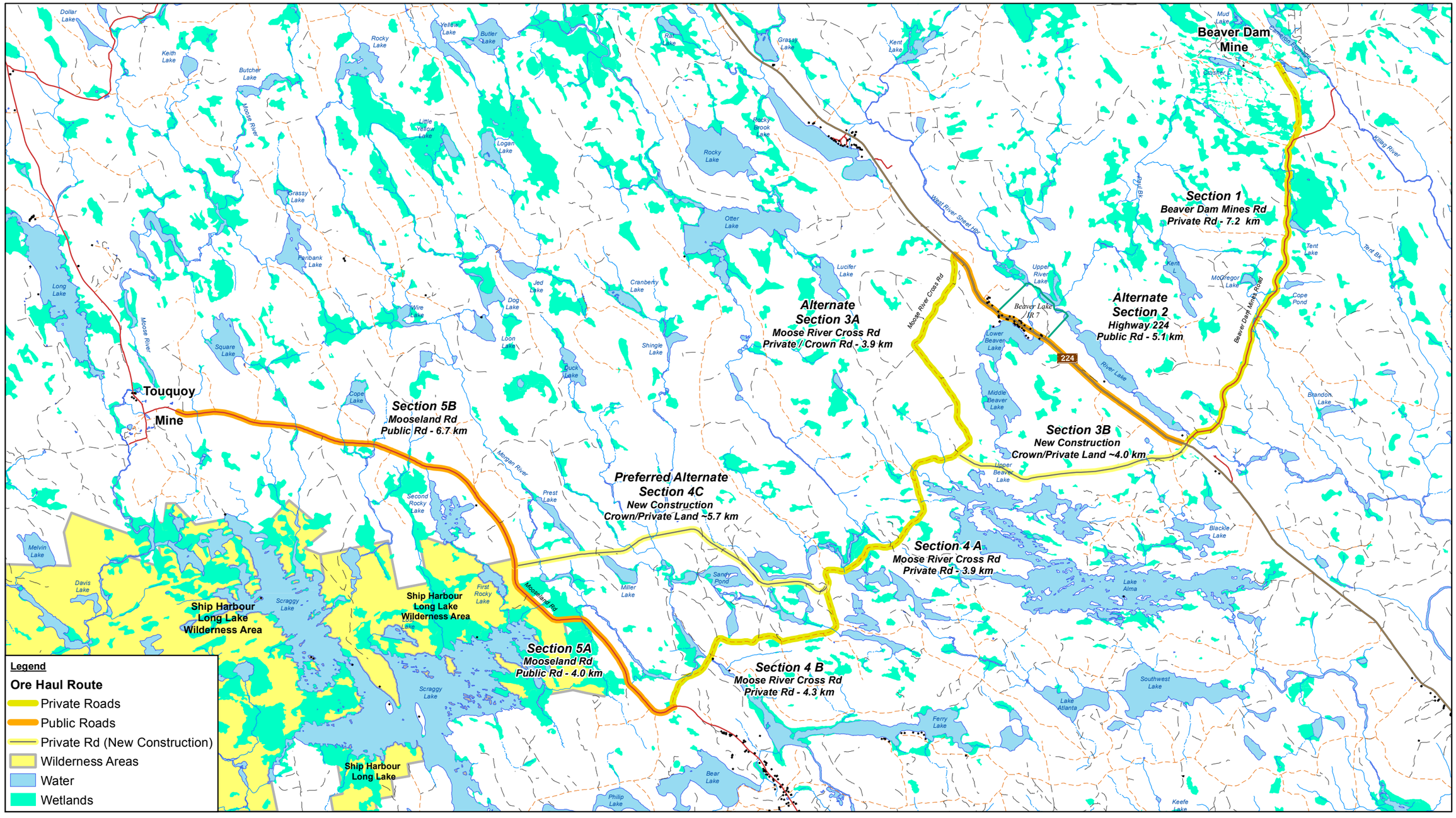
As Beaver Dam will operate as a satellite surface mine, ore produced will require transport by road to the Touquoy Processing and Tailings Management Facility. Portions of the existing Haul Road (approximately 15.4 km) will require upgrading to a dual lane road (8 m) to facilitate the safe passage of two-way truck traffic at 70 km/h. It may be necessary depending on timing of approvals and permits to use Public Roads during start-up.

A new section of road (approximately 4.0 km) constructed to the same design standards through a greenfield environment will also be required between the Beaver Dam Mines Road and the existing Moose River Cross Road. The alignment displayed in Figure 2.3-1 is based on preliminary engineering design. Final design will consider safety, social, and environmental constraints to ensure the best-case scenario for worker safety and environmental effects is developed. The new section of road is being construction to avoid travel on Hwy 224, through Beaver Lake IR 17. The alternate route as shown in Figure 2.3-1 was presented in the stakeholder and Mi'kmaq engagement and is no longer being proposed based on feedback received.

Approximately 20 highway trucks will be required to transport the ore from Beaver Dam to Touquoy. The exact number will depend on the hauling schedules, for 16-hour day (7 a.m. to 11 p.m.). This would mean approximately 60 individuals will be required to operate the highway transport fleet. The number of return truck trips per day will be an annual average of 95 trucks with potential peak of 150 trucks per day, 350 days per year for the anticipated duration of the Project (5 years). During construction and pre-production (approximately 1 year), the number of trips will be less and required for moving material from Touquoy to Beaver Dam and construction and upgrade of the haul roads.

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 will be up to 13 opportunities to improve fish habitat with new culvert installation and old culvert removed, up to 12 net zero scenarios where a new culvert will be installed, and 9 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 lease agreements.

Upon completion, the Haul Road will be approximately 31 km long. The Haul Road configuration includes four sections of road: the existing Beaver Dam Mines Road southwest to Hwy 224 (7.2 km); crossing Hwy 224 to a newly constructed road through a greenfield environment (4.0 km); the Moose River Cross Road (so-called) southwest to the Mooseland Road (8.2 km); and the Mooseland Road northwest to the Touquoy Mine Site (11.3 km).



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 2.3-1

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

2.3.3 Touquoy Processing and Tailings Management Facility

The Beaver Dam Mine Project will utilize the processing facility at the Touquoy Mine Site to process Beaver Dam ore. This 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 open pit after the Touquoy deposit has been mined. As a result, 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.

Changes to the Touquoy Project as a result of the Beaver Dam Mine Project will be assessed through the EIS and include the following:

- an increase in the duration of ore processing (four additional years);
- minor alterations to the Touquoy processing facility to accommodate Beaver Dam ore; and
- disposal of tailings from Beaver Dam ore processing in the exhausted Touquoy pit.

The Touquoy Processing and Tailings Management Facility will be operational for an additional four years beyond the current lifespan anticipated for the Touquoy Project. This will result in four additional years of ore processing, water management, and tailings management and disposal. Ore extracted and hauled from the Beaver Dam mine site will be processed at the Touquoy processing facility once reserves at Touquoy have been exhausted. 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 disposed of in the exhausted Touquoy open pit mine. Water from the deposited tailings will be recirculated through the processing facility in a closed loop. Top up water requirements will be sourced from Scraggy Lake or from natural precipitation as per NSE approvals. The location of these components is displayed in Figure 2.2-3.

The additional lifespan of the Touquoy facility involves no new construction or disturbance to the Touquoy facility or property. The Beaver Dam tailings will be managed in the exhausted Touquoy open pit mine. As originally planned in the approved Touquoy Gold Mine 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 plant operation during processing. The primary potential effect of the continued use of the Touquoy facility on surface water and groundwater quality results from the use of the exhausted open pit for tailings storage. Five years of data collected from the Touquoy Gold Project for surface water and groundwater quality and quantity will be available prior to the Beaver Dam tailings being introduced to the exhausted Touquoy pit.

Air, groundwater and surface water quality and quantity will continue to be monitored over the life of the Touquoy facility 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. The tailings management facility and waste rock stockpile will continue to be monitored throughout the life of the Touquoy facility as per the approved closure and reclamation plan for the Touquoy Gold Mine; these facilities will not be used as part of the Beaver Dam Mine Project.

2.4 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. The Project Schedule is shown in Table 2.4-1.

Table 2.4-1: Beaver Dam Construction, Operation, and Reclamation Schedule

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

2.5 Project Activities

The Project consists four phases

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

2.5.1 Construction

2.5.1.1 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 July 2022 to May 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.
  - 0.7 Mt of waste rock from the pit used for construction, a portion of which will be crushed on site.
  - Site access, truck shop, ROM pad area, site facilities, water diversions, and water management infrastructure will be constructed during the same time period.

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

- watercourse and wetland alteration;
- mine site road construction;
- surface infrastructure installation and construction; and
- collection and settling pond construction.

Development of the mine site will cause direct and indirect 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 mine site footprint are discussed further in Section 6.8 of the Updated 2021 EIS (AMNS 2021).

Increased environmental disturbance is anticipated during initial site preparation, when drilling and blasting is being undertaken in the surface mine, and during the construction of stockpiles, berms, and surface mine roads.

2.5.1.2 Haul Road

Construction for the Haul Road will begin one year prior to operations commencing. The following activities will be undertaken to prepare the Haul Road for construction activities:

- clearing, grubbing, and grading;
- topsoil, till, and waste rock management;
- watercourse and wetland alteration;
- culvert and bridge upgrades and construction; and
- Haul Road construction and upgrades.

Increased environmental disturbance is anticipated during initial construction of the new portion of the Haul Road, and during the replacement/upgrades that will be completed to culverts and bridges.

2.5.1.3 Touquoy Processing and Tailings Management Facility

Minor works to modify the Touquoy processing and tailings management facility will begin before initiation of operation of the Beaver Dam surface mine. This transition phase will likely not exceed two months and the following activities will be undertaken to prepare the processing and tailings management facility to receive Beaver Dam ore:

- ore processing equipment upgrades; and
- tailings line alteration.

To accept Beaver Dam ore, a new vibrating feeder and new collection conveyor will be fitted to tie-in to the existing secondary feed conveyor between the Touquoy ROM hopper and secondary crusher. No changes will be made to the remainder of the processing facility.

Tailings from processing Beaver Dam ore will be disposed of by re-routing the tailings line exiting the back end of the processing facility from the Touquoy tailings management facility to the exhausted Touquoy mine. The reclaim water pump and barge, with a re-routed pipeline to the process water tank, will be relocated from the Touquoy tailings management facility to the exhausted Touquoy mine once production of Beaver Dam ore provides sufficient reclaim water accumulation from the tailings slurry. The TMF will not be used in the processing of Beaver Dam ore.

Increased environmental disturbance is anticipated during the re-routing of the tailings line.

2.5.2 Operation and Maintenance

2.5.2.1 Beaver Dam Mine Site

During operations 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;
- petroleum products management; and
- site maintenance and repairs.

Increased environmental disturbance is anticipated during drilling and rock blasting, transportation of ore from the surface mine to the various stockpiles, maintenance activities, and at times of surface water discharge to Cameron Flowage.

2.5.2.2 Haul Road

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

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

Crushed ore from the Beaver Dam pit will be transported to the Touquoy process plant by truck travelling along upgraded existing roads and the newly constructed portion of the Haul Road.

Increased environmental disturbance is anticipated during peak transport times (7 a.m. to 11 p.m.) and during maintenance activities along the Haul Road.

2.5.2.3 Touquoy Processing and Tailings Management Facility

During operation and maintenance of the Touquoy processing and tailings management facility the following activities will be undertaken:

- ore processing; and
- tailings management.

Ore Processing

Other than the primary ore crushing, no mineral processing will be undertaken at Beaver Dam. All processing will be completed at the Touquoy facility after the ore 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.

Tailings Management

There is no requirement for tailings management at Beaver Dam as all mineral processing will be done at the existing Touquoy facility. 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 following 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.

Process water will be recycled from the Touquoy pit and from the Touquoy tailings management facility as required.

There is an existing Industrial Approval for the Touquoy Gold Mine, which has specific environmental mitigation and monitoring requirements. Given that the operational activities for the Beaver Dam Mine Project at the Touquoy Mine Site are limited to processing of ore and management of tailings, existing mitigation and monitoring requirements related to atmospheric emissions, surface water and groundwater will be continued for the processing of Beaver Dam ore at the Touquoy facility.

2.5.3 Active Closure (Decommissioning and Reclamation)

The purpose of site reclamation is to improve aesthetics and allow the site to return to its pre-development state or to a future planned use, while decreasing the potential for environmental risk.

Site Description at Closure

At closure, the Site will include the following:

- all mine site facilities will have been removed;
- the open pit will be allowed to fill with water to eventually form a lake with a wetland edge habitat;
- the waste rock pile will be capped with topsoil and re-seeded and all disturbed areas will be re-vegetated;
- mine site roads will remain in place, and ultimately will be returned to the land owner for forestry and recreational use;
- the Haul Road will be returned to the land owners in an upgraded condition with habitat and wetland improvements;
- fences will be removed once the majority of closure activities are completed; and
- the Touquoy processing and tailings management facility will be reclaimed under a separate plan developed for the Touquoy Project and already approved by regulatory agencies.

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.

Two of the three primary locations affected by the Beaver Dam Mine Project will be included in reclamation activities. The Touquoy processing and tailings management facility will be reclaimed under a separate plan developed for the Touquoy Project. It is anticipated that the Beaver Dam Mine Project will have an Industrial Approval with many similar components as the Touquoy Gold

Project Industrial Approval; this will likely include a specific closure and reclamation plan associated with the Beaver Dam Mine Project.

2.6 Accidents and Malfunctions

Accidents and malfunctions have the potential to occur through every phase of the Project. To decrease the likelihood of occurrence and level of magnitude should these accidents and malfunctions occur, AMNS will implement a preventative system approach to environmental protection, and worker health and safety. Contractors will be subject to the same health, safety, and environment policies and procedures, and all personnel (employees and contractors) will receive site specific training to prevent and mitigate workplace accidents and malfunctions. The health, safety, and environment policies and procedures implemented for the Touquoy Project will be extrapolated to the Beaver Dam Mine Project and made site specific, where required.

Accidents and malfunctions that have the potential to occur through every phase of the Project are described in the follow subsections, while an analysis of the risks, a determination of their effects, and preliminary emergency response measures for these potential worst-case accidents and malfunctions is included in Section 6.18 Accidents and Malfunctions of the Updated 2021 EIS (AMNS 2021).

2.6.1 Structural Failures

2.6.1.1 Surface Mine Slope Failure

All phases of the Project have the potential for slope failures within the footprint of the surface mine. During the initial stages of construction, slope failures will be limited to overburden; however, as blasting, and ore and non-ore bearing waste rock extraction commences, bedrock faces have the potential to fail even when properly designed. Based on the current delineation of ore, the surface mine will be excavated through bedrock to an end depth of approximately 175 m below ground surface. Bench heights and bench face angles are currently being assessed by (Golder [In progress]) will be implemented for specific depths and zones of the surface mine. A surface mine slope failure may result in fuel and/or other spills and/or injury or death to site workers.

2.6.1.2 Stockpile Slope Failure

All phases of the Project have the potential for slope failures of the topsoil, till, and waste rock stockpiles. Topsoil and till stockpiles will be stored in single lifts of 10 m and 15 m, respectively, with 1.5:1 active slopes. The waste rock stockpile will be stored in multiple lifts of 10 m with each lift having an active slope of 2:1. Ore stockpiles will be constructed in 15 m lifts with each lift having an active slope of 1.5:1. Slopes will be designed at an angle determined by geotechnical analysis and acceptable safety factors, thereby reducing the likelihood of a slope failure.

2.6.1.3 Settling Pond Failure

All phases of the Project have the potential for a settling pond failure. Surface water run-off from the non-ore bearing waste rock stockpile, mine site roads, topsoil stockpiles, and till stockpiles will flow by gravity, with the aid of berms and channels, to a settling pond located west of the surface mine. This settling pond will also receive water from the surface mine dewatering program. Water will be gradually decanted to Cameron Flowage by gravity via a water diversion structure that runs northeast from the settling pond.

The water diversion structure leading from the collection pond will discharge to a channel that will run down gradient to the northeast and ultimately discharge to Cameron Flowage. The discharge point will be equipped with a concrete flow-control structure.

In the event of a 1 in 100-year precipitation event, which in Nova Scotia is identified as approximately 115 millimetre (mm) in a 24-hour storm, a spillway into the water diversion structure will be used for overflow. In the case of a storm event or infrastructure failure, settling ponds will be monitored regularly.

2.6.1.4 Infrastructure Failure

Portions of all phases of the Project have the potential for infrastructure failure. Infrastructure at the Beaver Dam mine site will be minimal and given the short life of the Project, failure should not occur without being acted upon by extreme natural causes, such as a hurricane or earthquake, or human error.

2.6.2 Accidents

2.6.2.1 Fuel and/or Other Spills

All phases of the Project will involve the use of fuels, as well as equipment maintenance and servicing fluids. Generators and the majority of mobile equipment will utilize diesel fuel, which will be stored on-site in self bunded aboveground storage tanks. A small gasoline storage area may be included or may be satisfied by local retail outlets. Equipment maintenance and servicing fluids will include hydraulic oils, motor oils, greases, brake and steering fluids, antifreeze, and minor amounts of other maintenance fluids. The construction and operation phases will also utilize diesel fuel and ammonium nitrate as blasting agents. Ammonium nitrate will not be stored on-site.

The source of greatest risk for potential spills and releases of diesel fuel relates to the improper execution of procedures for transfer and handling to and from stationary and mobile tankage. Other sources of potential spills and releases of diesel fuel relate to equipment failures, damage to storage or piping systems, mobile equipment accidents, and mobile refueling truck accidents. Releases of maintenance fluids pose a lesser risk in terms of magnitude, but can still occur due to equipment failures, damage to storage containers, and mobile equipment accidents. A release of these fluids may result in soil, groundwater, and/or surface water contamination that may adversely affect ecological receptors through absorption, and/or ingestion of contaminated media.

2.6.2.2 Unplanned Explosive Events

An unplanned explosive event is limited to the site preparation and construction, and operation and maintenance phases of the Project. Explosives will be supplied by an off-site contractor and there will be no requirement for an on-site magazine.

2.6.2.3 Mobile Equipment Accident

All phases of the Project will have the potential for vehicular accidents to occur. Mobile equipment for the Project includes those outlined in Tables 2.3-1 and 2.3-2 of the Updated 2021 EIS (AMNS 2021). The majority of mobile equipment traffic will be limited to the Beaver Dam mine site where guided traffic patterns, speed limits, right-of-way signage, and training will minimize the risk of vehicular accidents. The remaining mobile equipment will include haul trucks, which will travel from the Beaver Dam surface mine to the Touquoy processing and tailings management facility. Speed limit and Right-of-way signage will be installed, and all haul truck operators will receive operator training to minimize the risk of haul truck collisions. All intersections will be designed to Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) Standards. A mobile equipment accident may result in fuel and/or other spills, fires, and/or injury or death to site workers and the general public.

2.6.3 Other Malfunctions

2.6.3.1 Forest and/or Site Fires

All phases of the Project will have the potential for forest and/or site fires to occur. A forest fire may occur through human or natural causes, while a site fire may occur due to an equipment failure and/or human error. Forest fires have the potential to affect the Project at the mine site and at the processing and tailings management facility; however, due to a lack of vegetation at the mine site and processing and tailings management facility, it is unlikely that a site fire could spread to and affect the surrounding forest. Forest fires along the Haul Road have the potential to affect Haul Road operations and likewise, site fires along the Haul Road could spread to and affect the surrounding forest.

3 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

As is required 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; and
- 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. A summary of the assessment of alternative means is provided in in Section 2.6.11 of the EIS.

3.1 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.

3.2 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 on the Beaver Dam mine site;
- ore extraction methods that employ drilling and blasting;
- ore processing methods that employ gravity and carbon-in-leach processing methodology which represents the most conventional processing option and is the preferred processing option in Canada;
- processing Beaver Dam ore at the Touquoy processing facility once reserves at Touquoy have been exhausted;
- transportation of ore from Beaver Dam to Touquoy for processing via a 30.7 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;

- the use of two (duty and standby) self-contained diesel-powered generators to provide electrical power to the Beaver Dam mine site;
- Project component locations as shown in Figure 2.2-1;
- on-site water supply and management, with delivery of potable water; and
- no mine waste management facilities located on the Beaver Dam mine site.

A summary of the review of alternative means to carry out the Project is presented in Table 3.2-1 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 3.2-1: Summary of Alternative Means of Undertaking the Project

Project Component or Activity	Alternative Means	Technical Feasibility	Economic Feasibility	Environmental and Social 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

Table 3.2-1: Summary of Alternative Means of Undertaking the Project (continued)

Project Component or Activity	Alternative Means	Technical Feasibility	Economic Feasibility	Environmental and Social Effects	Preferred Option
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 of 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 the EIS.	No
Ore Transportation	Haul Road avoiding Hwy 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 roads; however, the new road eliminates travel along Hwy 224 and the passing of Beaver Lake IR 17, which is a benefit for those residents.	Yes
	Haul Road along Hwy 224	Technically Feasible	Economically Feasible	Environmental effects are similar for both alternatives. Travel along Hwy 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

Table 3.2-1: Summary of Alternative Means of Undertaking the Project (continued)

Project Component or Activity	Alternative Means	Technical Feasibility	Economic Feasibility	Environmental and Social Effects	Preferred Option
Project Component Locations	Alternative Location	Technically Feasible	Economically Feasible	Environmental effects will include loss of habitat; however, this configuration avoids interference with aquatic habitats.	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. Project components have also been positioned to 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
Mine Waste Management Facilities	No on-Site mine waste management facilities	Technically Feasible	Economically Feasible	Environmental effects for the Touquoy facility have previously been identified. Storing Beaver Dam mine waste at the Touquoy facility will result in the generation of mine waste after processing for an additional four years.	Yes
	On-Site mine waste management facilities	Technically Feasible	Not Economically Feasible to transport mine waste from Touquoy back to Beaver Dam after processing.	Environmental effects for transporting Beaver Dam mine waste from the Touquoy Processing facility back to Beaver Dam would result in the in an increase in the cost of production and GHG emissions.	No

Hwy = Highway; IR = Indian Reserve, GHG = Green House Gas; km = kilometres, EIS = Environmental Impact Statement; VC = valued component.

4 PUBLIC ENGAGEMENT

AMNS is committed to stakeholder and rightsholders engagement throughout the EA process and life of the Project. Using key values of openness, transparency, collaboration, and respect, AMNS has continued to work with the local community, non-governmental organizations (NGOs), regulatory agencies, and interested members of the public for over a decade. As part of the planning, permitting, construction, and existing operation of the Touquoy Gold Mine, AMNS developed relationships with members of the local community and NGOs, such as the Moose River Gold Mine Museum Society. A Community Liaison Committee (CLC) has been in place since 2011 at the Touquoy Mine (AMNS 2021, Appendix A.3).

Both federal and provincial EA legislation requires engagement with the public to recognize concerns about adverse effects of the environment and identification of steps taken by AMNS to address these concerns; therefore, these are specifically identified in the EIS related to the Project (AMNS 2021). Beyond the regulatory requirements, AMNS strongly believes that meaningful engagement is crucial to the success of any development. AMNS is committed to maintaining stakeholder engagement throughout the life of the Project; these activities extend well beyond the EA process.

A public engagement strategy was developed by AMNS to guide initial engagement during the preparation of the Project Description and the original EIS submission in 2017 (AGC 2017). The strategy was expanded upon to become a draft Public Engagement Plan (AMNS 2021, Appendix A.6) that defines how AMNS will undertaken engagement throughout all phases of its exploration activities and mining operations in Nova Scotia (i.e., the proposed Project, the permitted Touquoy Mine Site, the Fifteen Mile Stream Gold Project and the Cochrane Hill Gold Project).

A successful Engagement Plan provides flexibility to allow adaptation to the needs of the public and stakeholders. This Plan outlines various engagement categories that link to different phases of the Project including:

- information sharing process for key concerns identified through public and stakeholder engagement;
- outlines why each community and/or stakeholder group needs to be engaged; and
- identifies indicators of success for engagement activities which link to engagement objectives.

The success indicators included in the draft Public Engagement Plan enable regular reporting, tracking, and evaluation of the effectiveness of the Plan. The Public Engagement Plan will be reviewed and updated yearly, or as required, using adaptive management approach to determine what is working and what is not throughout all phases of the Project. Public and stakeholder engagement activates, engagement communication type, key concerns and AMNS resolutions (e.g., follow-up actions and/or commitments) are tracked and logged. These are summarized in Sections 4.1 and 4.2 below. Additional details are provided in Appendix A.4a of the Updated 2021 EIS (AMNS 2021).

4.1 Public and Stakeholder Engagement Activities

Engagement with federal and provincial regulatory agencies has been ongoing since a regulatory initiation meeting for the Project was held in October 2014. This initial meeting was intended to present the planned Project and to receive feedback on the regulatory regime and regional expertise. Since the commencement of the federal EA process in December 2015, multiple meetings have been held, including one-on-one meetings or correspondence, larger meetings or workshops, and site visits. A one-day workshop was held on May 13, 2016 for interested provincial and federal regulators. On November 29, 2016, a site visit and tour was held for interested provincial and federal regulators and representatives of the two closest Mi'kmaq communities, Sipekne'katik and Millbrook, and staff of the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO).

Specific public engagement activities have also occurred to support the EA for the Project since the federal process was commenced in December 2015. Specifically, this includes community open houses and ongoing two-way information sharing with the CLC.

Four open houses were held in May 2016; two of these were open to the public while the other two were open to First Nations community members as described under Indigenous Peoples engagement (Section 5, AMNS 2021).

The two public open houses were advertised in the local papers, including the Eastern Shore Cooperator (monthly print issued on May 5, 2016), Guysborough Journal (weekly print issued on May 16, 2016) and the Town Cryer (monthly print issued on May 2, 2016). The members of the CLC also circulated information. Flyers were also posted in local communities. The format and layout were the same for both open houses. The dates and locations were as follows:

- May 18, 2016 at Natural Resources Education Centre, 12014 Hwy 224, Middle Musquodoboit; and
- May 19, 2016 at Sheet Harbour Lions Club, 183 Pool Road, Sheet Harbour.

The CLC was recently expanded to a nine-member committee and is now more diverse with representation from the surrounding communities for the MRC Project (including the two closest Mi'kmaq communities): Middle Musquodoboit, Millbrook First Nation, Mooseland, Musquodoboit Harbour, Sheet Harbour, Sipekne'katik First Nation, Pleasant Harbour, and Upper Musquodoboit. The volunteer membership acts as an advisory board to AMNS. The CLC provides a mechanism for information exchange between communities and the company, as well as a forum to share questions, concerns, and input regarding the MRC Project.

Six CLC meetings were held in 2016. Of these, the last two meetings held on October 29, 2016 and December 3, 2016 included the expanded membership of nine.

Due to the preparation of the EA for the Beaver Dam Mine Project, a special meeting on December 3, 2016 was held to focus on the Project. As per the Terms of Reference, the CLC may invite guests who may be interested in topics in forthcoming meetings. The CLC invited representatives from the Eastern Shore Forestry Watch and the Nova Scotia Salmon Association. Presentations were made by staff of AMNS and the EA Study Team, maps were provided, and a 3D model of the Beaver Dam mine site was used to demonstrate the existing conditions, proposed full mine development (including pit and waste rock pile), and reclamation of the site. Questions and answers were facilitated. Offers to meet with specific members of the CLC and/or NGOs present to provide additional information on the Project were made by AMNS.

In 2020, AMNS implemented a supplementary engagement program. The supplementary engagement program included contacting environmental groups, community associations, ATV Clubs and landowners with an offer to meet. In 2020 alone, AMNS had over 322 communications with stakeholders regarding the Project EIS. The supplementary engagement program also includes contacting property owners near the Project Area. All property owners were contacted by phone, letter or email and provided updated information and offered a meeting to answer questions or discuss concerns.

AMNS, in July 2020, began meeting regularly with the MACA where concerns regarding the Haul Road, recreational land use, potential community investment projects and other concerns were raised by the Association. At the request of MACA, AMNS organized and planned a series of community information sessions with the local community (Section 3.6.1, AMNS 2021).

A property owner from the Ferry Lake area contacted AMNS in 2020 expressing concerns regarding the Project. AMNS has attempted to meet with the property owner several times. AMNS continues to welcome the opportunity to answer questions, address concerns and develop a relationship with the property owners along Ferry Lake.

Also in 2020, AMNS met with property owners near Rocky Brook Lake, which is located in Pleasantville approximately 8 km from the intersection of the Beaver Dam Mines Road and Hwy 224. These residents expressed concern about their ability to continue to access the lands in and around the Beaver Dam Mine Site, for recreational uses. Specific recreational uses included fishing, hunting, ATV riding, hiking, accessing camps and snowmobiling. AMNS held a video call with five property owners in the area on December 14, 2020 to answer questions, validate information gathered about recreational land usage in the area, and review proposed mitigation measures. The main mitigation proposed to address recreational land access concerns is to construct alternative access routes or bypass roads to the desired recreational locations. A map showing proposed new bypass routes was reviewed with attendees and there was general agreement that the proposed bypass roads were acceptable.

Through the supplementary engagement program, new stakeholders were identified that have camps or land that are accessed from the proposed Haul Road. All known landowners were contacted and provided information on the Haul Road. Further contact and communication will occur as the Project progresses. AMNS will continue to identify other potentially impacted property owners and camp owners as the Project progresses.

In 2020, AMNS attempted to hold an Open House on November 27 and 28 in the community of Mooseland. This Open House was organized in response to a request from the local community to provide information on concerns relating to the proposed Haul Road and the proposed Beaver Dam Mine Site. AMNS recognized that additional engagement was required with the community as the last open house was held in 2016. Due to the COVID-19 pandemic, the Open House format had to be modified to small information sessions to meet Nova Scotia Public Health directives. AMNS created an internal plan to guide the delivery of information sessions in Mooseland to address concerns identified, in part, by the Mooseland and Area Community Association (MACA).

Invitations to the Information Sessions were delivered by hand, email or phone to most property owners in Mooseland and several residences in Jacket Lake. MACA also placed a notification of the meeting on the community sign located in front of the community hall in Mooseland. At least one property owner in Ferry Lake was notified of the meeting. Individuals were asked to pre-register to meet with an AMNS representative to discuss concerns or learn more about the Project.

Due to an increase in COVID-19 cases in Halifax Regional Municipality, the Office of Public Health issued an order on November 26, 2020 that restricted non-essential travel of people within most of HRM. AMNS cancelled the Information Session on November 26, 2020 in the interest of public safety and notified the local community through both formal means (phone calls and emails) and informal means (informing key community leaders about the cancellation and asking them to spread the word). AMNS will hold an Open House in Mooseland after the Updated 2021 EIS is submitted and COVID-19 restrictions have been lifted.

As the Information Sessions could not occur on November 27 and 28, 2020, AMNS provided copies of the Plain Language Summary (Appendix A.1 of AMNS 2021) to the 36 mailboxes in Mooseland along with a covering letter with the community relations phone line and email address, to which questions or concerns could be sent.

4.2 Key Concerns Raised by the Public and Stakeholders and Atlantic Mining NS Inc. Responses

A summary of key concerns raised during public and stakeholder engagement activities relating to the Project are provided in Table 4.2-1. For each key concern identified, a summary of the response from AMNS is provided along with reference(s) to sections in the EIS which address the issue.

Table 4.2-1: Summary of Key Concerns Raised During Public and Stakeholder Engagement, 2015 to 2020

Key Concerns	Summary of Proponent Response	Corresponding Updated 2021 EIS Section Reference[a]	Follow-up Commitment
2015 to 2019 Engagement			
Concern about metals leaching from waste rock pile, including arsenic, and acid rock drainage.	Leaching of metals is not expected, e.g., arsenic is expected to be within baseline conditions. PAG will be covered using an engineered cover that reduces infiltration rate and thereby limiting potential acid drainage. If necessary, water treatment will be put in place. Runoff from NAG and PAG will be monitoring during construction, operation, closure, and post closure to determine if adaptive management should be applied. .	Section 6.5.4 Bedrock Geology; Section 6.7 Surface Water Quality and Quantity, including Surface Water Quality and Quantity Mitigation (Section 6.7.8) and Hydrogeology Mitigations	Monitoring, Mitigations and Adaptive Management of waste rock throughout life of mine
Concern about effect on water quantity in Cameron Flowage from pit development.	Local hydrogeological conditions ensure that groundwater will be maintained to recharge Cameron Flowage. Baseline and ongoing monitoring of surface water and groundwater levels will be in place to identify trends.	Section 6.6.7 Project Activities and Groundwater Quality and Quantity Interactions and Effects	Implement Aquatic Effects Monitoring Program and Groundwater Monitoring Program.
Questions about contingency planning for accidents and malfunctions.	Hazards have been identified and assessed based on risk with mitigations and contingency planning in place. Future detailed planning and implementation of the Project will further address potential accidents and malfunctions.	Section 6.18 Accidents and Malfunctions	Establish Emergency Response Plan and Operational Procedures to manage planned and unplanned events.
Concern about wetlands being impacted at Beaver Dam Mine Site and future compensation.	Where possible, wetlands have been avoided; otherwise, minimization of effects was incorporated into Project planning. Any wetlands altered must have NSE approval and will require compensation.	Section 6.8 Wetlands, including Wetlands Mitigation (Section 6.8.8)	Limit mine footprint and compensate for wetlands that cannot be avoided
Questions about addressing species at risk if identified in Project area.	Species of conservation interest (SOCI) and species at risk (SAR) have been assessed. Effect is minimal and where a potential Project interaction, mitigation and monitoring plans are identified for priority species, including fish, vascular flora and lichens, terrestrial fauna and birds.	Section 6.13.8 Mitigation for SOCI and SAR	Monitoring, Mitigation and Adaptive Management of SOCI and SAR
Concern about effect on habitat from Haul Road construction.	Effects of road construction will be minimized by using existing corridors where possible and improving drainage where damaged culverts exist. Effects and mitigation measures are specifically identified for ecological VCs, including habitat and flora.	Section 2.5.1 Haul Roads for Transporting Ore, and key sections for each VC in Section 6 Environmental Effects Assessment	Limit the size of Haul t the extent possible. Replace culverts and
Concern about volumes of truck traffic in context of safety on public roadways and recreational vehicles.	Potential interaction exists with operation of the Haul Road and the public; the risk of a mobile equipment accident has been assessed as low with mitigations in place including design of Hwy 224 crossing, appropriate signage, and haul truck driver training.	Section 2.5.2.2 Haul Road; Section 6.16.10 Project Activities and Socio-economic Interactions and Effects; and Section 6.18.5.4 Mobile Equipment Accident	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee

Table 4.2-1: Summary of Key Concerns Raised During Public and Stakeholder Engagement, 2015 to 2020 (continued)

Key Concerns	Summary of Proponent Response	Corresponding Updated 2021 EIS Section Reference[a]	Follow-up Commitment
Request to prefer Haul Road option that does not travel along Hwy 224.	Based comments received on two options during the stakeholder and Mi'kmaq engagement, AMNS completed a feasibility review of the second option which does not pass by any residences. This was selected and is carried forward in the EA.	Section 2.3.2 Haul Roads for Transporting Ore; Section 2.5.5 Summary of Changes to Project Activities; Section 2.8.6 Ore Transportation	Re-Routing of Haul Road to avoid permanent residents and Beaver Lake IR
Concern on cyanide use at plant for gold processing.	The approved Touquoy Gold Project includes a gravity/CIL processing of the ore using a highly efficient cyanide destruction process. This use of this existing plant will be extended for the processing of ore from the Beaver Dam Mine Site. Mitigations for transportation, handling storage and processing will be incorporated into the extended use of the plant.	Section 2.5.2.3 Operations and Maintenance associated with the processing plant; Section 2.5.2.3 Ore Processing Methods	Maintain Operation and Maintenance Plan for Cyanide Use
Concern on effect of tailings disposal in mined-out Touquoy pit.	Use of the approved pit as part of the Touquoy Gold Project allows the existing footprint to be used and eliminates the need to process the tailings at the Beaver Dam Mine Site. Geological conditions predict minimal effect on the receiving environment; conditions will be monitored and compared with the developing baseline data set for the Touquoy Gold Project.	Section 2.5.2.3 Operations and Maintenance associated with tailings management (exhausted pit), and key sections for surface water and groundwater in Section 6 Environmental Effects Assessment	Establish operational plan for deposit of tailings into the mined-out pit and ongoing monitoring of surface and groundwater water will determine if adaptive management should be applied
Request to be informed on the Project activities.	AMNS is committed to maintaining its CLC for the life of the Project. Other aspects of community engagement will continue as per Engagement Plan.	Section 3.6 Public Engagement; Section 6.16.11 Mitigation for Socio-economic Conditions	Implement Engagement Plan
2020 Engagement			
Concerns about access to ATV and snowmobile trails.	Restrictions on usage are required for safety reasons. Alternative access for ATVs, snowmobiles and light vehicles are being considered.	Section 6.16.5.4 Land Use, Recreational and Indigenous, Section 6.16.11 Mitigation and Appendix A.4a Summary of Public Engagement as Completed for the Beaver Dam Mine Project	Construct bypass roads to maintain access during operations
Concerns about access to camps, hunting and fishing locations.	Access to camps, hunting areas and fishing areas will be maintained. Camps, hunting and fishing areas have been identified by stakeholders and AMNS will work with stakeholders to allow continued access.	Section 6.16.5.4 Land Use, Recreational and Indigenous, Section 6.16.5.5 Parks and Open Space, Tourism, Section 6.16.11 Mitigation and Appendix A.4a Summary of Public Engagement as Completed for the Beaver Dam Mine Project To-date	Construct bypass roads to maintain access during operations

Table 4.2-1: Summary of Key Concerns Raised During Public and Stakeholder Engagement, 2015 to 2020 (continued)

Key Concerns	Summary of Proponent Response	Corresponding Updated 2021 EIS Section Reference[a]	Follow-up Commitment
Concerns about traffic through Mooseland.	Traffic is not expected to impact Mooseland. As AMNS is developing routes for ATVs, snowmobiles and light vehicles, no traffic increases are expected in Mooseland.	Section 6.16.5.4 Land Use, Recreational and Indigenous, Section 6.16.5.6 Roads and Traffic, Section 6.16.11 Mitigation and Appendix A.4a Summary of Public Engagement as Completed for the Beaver Dam Mine Project To-date	Construct bypass roads to maintain access during operations Implement engagement plan to address public concerned during life of Mine
Concerns about noise in Mooseland.	Noise modeling shows that all residences and receptors in Mooselands meet guidelines.	Section 6.1 Noise, Section 6.16.5.4 Land Use, Recreational and Indigenous, Section 6.16.11 Mitigation, Appendix A.4a Summary of Public Engagement as Completed for the Beaver Dam Mine Project To-date and Appendices B.1 Beaver Dam Mine Construction Noise Assessment and B.2 Updated Noise Impact Assessment Technical Report	Implement a Noise Complaint Protocol and Engagement Plan
Concerns about safety of the road network and trail network on Haul Road.	AMNS Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee.	Section 6.16.5.4 Land Use, Recreational and Indigenous, Section 6.16.5.6 Roads and Traffic, Section 6.16.11 Mitigation and Appendix A.4a Summary of Public Engagement as Completed for the Beaver Dam Mine Project To-date	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee
Questions and concerns regarding receiving communications and information during the life of the Project.	Draft Public Engagement Plan has been drafted and will be circulated to stakeholders for feedback and comment. Community relations telephone line, email, website and news releases will continue. AMNS is evaluating opportunities to include social media platforms as well.	Sections 3.2 Objectives, Section 3.4 Engagement Strategy, and Appendix A.6 draft Public Engagement Plan	Implement Engagement Plan
Identification of potential mainland moose in the area.	The information provided by a stakeholder is being reviewed as of the updated 2021 EIS.	Section 6.11.4.1.1 Mainland Moose and Appendix A.4a Summary of Public Engagement as Completed for the Beaver Dam Mine Project To-date	Implement Engagement Plan
Concerns regarding slurry and dust from the Mooseland Road related to the Touquoy operations.	AMNS has a skid steer with a broom dedicated to cleaning the crossing. AMNS commits improving visibility and removing debris at the Mooseland Road crossing.	Sections 2.8.11 The Preferred Approach	Implement Operational Procedure to
Concerns that the original EIS incorrect statements regarding the distances between residents and the Mooseland entrance to the Haul Road (known as the “old dump road”).	Updated 2012 EIS will be corrected as appropriate.	Section 2.1 Project Location and History, Section 6.16.4.12 Land and Resource Use, Section 6.16.5.6 Roads and Traffic	Corrected in EIS

Table 4.2-1: Summary of Key Concerns Raised During Public and Stakeholder Engagement, 2015 to 2020 (continued)

Key Concerns	Summary of Proponent Response	Corresponding Updated 2021 EIS Section Reference[a]	Follow-up Commitment
Requested signage be placed on the "old dump road" to notify non-local residents that AMNS is considering construction of a Haul Road.	It is premature to place signage until project is approved. Also, signage would require landowner approval. Business cards are being provided to local residents for them to distribute so that anyone with questions can contact community relations.	Section 6.16.5.6 Roads and Traffic, Section 6.16.10 Project Activities and Socio-economic Integrations and Effects, and Section 6.16.11 Mitigation	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee
Concerns that the life of the Beaver Dam project use of the Haul Road will extend beyond 5 years.	The life of mine for the Project is 5 years but Fifteen Mile Stream Gold Project and Cochrane Hill Gold Project will also use the Haul Road.	Section 1.2 Atlantic Mining NS Inc. Information and Section 8 Cumulative Effects Assessment	Implement Engagement Plan
Request to have truck and ATV access between the Mooseland Road and Hwy 224.	truck and ATV access between the Mooseland Road and Hwy 224 is accommodated via bypass roads.	Section 6.16.5.6 Roads and Traffic and Appendix A.4a	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee
Request to have the Mooseland Road entirely paved between Touquoy and the entrance to the Hwy 224.	The Mooseland Road is a provincially owned road and decisions regarding paving at made at the provincial level. This concern has been forwarded to the CLC to assess next steps and possibly providing letter of support for paving.	Section 6.16.5.6 Roads and Traffic and Section 6.16.8 Consideration of Engagement Results	CLC Follow-up
Questions regarding the safety monitoring of the Mooseland road.	AMNS has a close working relationship with NS Department of Transportation and Active Transportation and will work collaboratively with an ad hoc advisory committee.	Section 6.16.5.6 Roads and Traffic, Section 6.16.11 Mitigation, and Appendix A.4a	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee
Question regarding if the Haul Road can have blended traffic	AMNS explored this option and determined that for safety and operational reasons, that blended traffic is not the best option and instead is pursuing a dedicated bypass option for ATVs, snowmobiles and light vehicles.	Section 6.16.5.6 Roads and Traffic	Commitment to reconsider blended traffic after Beaver Dam Mine operations is completed
Request for a public meeting in Mooseland.	AMNS organized an open house for Mooseland residents on November 27 and 28, 2020. Public Health restrictions issued by the province required that this meeting be cancelled. An open house potentially will occur in Q2/Q3, determined on health restrictions due to COVID-19.	Sections 3.6 Public Engagement and Section 3.8 Ongoing Engagement	Implement Engagement Plan
Request for input into the operational and safety plan for the Haul Road.	AMNS will seek input in the operations and safety plan for the Haul Road. AMNS may established an ad hoc advisory committee to solicit advice.	Section 6.16.5.6 Roads and Traffic, Section 6.16.11 Mitigation, and Appendix A.4a	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee
Concerns about impacts on hunting near the Haul Road.	Hunting will be governed by provincial hunting requirements, which will restrict hunting near the Haul Road.	Section 6.14.7.1 Project Interactions with Traditional Use/Rights	Implement Engagement Plan

Table 4.2-1: Summary of Key Concerns Raised During Public and Stakeholder Engagement, 2015 to 2020 (continued)

Key Concerns	Summary of Proponent Response	Corresponding Updated 2021 EIS Section Reference[a]	Follow-up Commitment
Concerns about providing access to Marilyn Prest's land.	Access will be provided to this particular landowner.	Section 6.16.5.4 Land Use, Recreational and Indigenous	Construct by-pass roads and provide landowner access
Concerns about AMNS is communicating its plan for the Haul Road to the general population outside of the immediate area.	Communication and engagement with this stakeholder will occur as per the draft Public Engagement Plan.	Appendix A.6 draft Public Engagement Plan	Implement Engagement Plan
Concerns about Impacts on Ferry Lake.	Ferry Lake is not modeled to be impacted by the Beaver Dam Mine Project. Ferry Lake property owners who have expressed interest in the project have been contacted.	Section 3.6 and Appendix F.9 (Response to IR2s. CEAA 2-36, CEAA 2-37, and NSE 2-130 Evaluation of Potential Impacts from Metals COCs to Groundwater and Surface Water from Dust Deposition along the Haul Road)	Implement Engagement Plan
Impacts on NSSA West River Project and fish habitat.	Fish and fish habitat assessment, mitigation and monitoring plans to address ongoing concerns. Develop an aquatic Effects Monitoring Program.	Section 6.9.8 Mitigation (Fish), Section 6.16.11 Mitigation (Socio-economic) and Section 8 Cumulative Effects Assessment	Implement Aquatic Effects Monitoring Program
Speeding by AMNS vehicles on the Mooseland Road.	Complaints from residents will be investigated. All AMNS vehicles include a GPS so that vehicle speeds can be tracked. AMNS committed to installing digital speed sign as a pilot project.	Section 6.16.8 Consideration of Engagement Results	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee
Concerns about the widening of the Haul Road on private landowners.	The width of the Haul Road right of way is approximately 100 m. The Haul Road and bypass road will remain within this right of way and no additional land is required for the bypass roads.	Section 2.2.2 Haul Road for Transporting Ore, Section 2.3 Project Activities	Implement Haul Road Operations and Safety Management Plan will be developed by an ad hoc advisory committee

[a] Updated 2021 EIS (AMNS 2021).

AMNS = Atlantic Mining NS Inc.; SOCI = Species of conservation interest; SAR = species at risk; VC = valued component; Hwy = highway; EA = Environmental Assessment; CIL = carbon in leach; CLC = Community Liaison Committee; MRC = Moose River Consolidated; ATV = All-terrain vehicle; NSSA = Nova Scotia Salmon Association; IR2s = Round 2, Information Requests; CEAA = Canadian Environmental Assessment Agency; NSE = Nova Scotia Environment; COCs = Contaminates of Concern; m = metre; N/A = not applicable; GPS = Global Positioning System.

5 INDIGENOUS PEOPLES ENGAGEMENT

AMNS is committed to developing a long-term, positive and productive relationship with the Mi'kmaq of Nova Scotia based on principles of mutual respect, transparency, honesty and integrity, and a partnership approach to engagement. Meaningful engagement is a key component of the Project and began as part of planning and environmental assessment of the Touquoy Gold Project over a decade ago. The engagement has focused on building relationships with the Assembly of Nova Scotia Mi'kmaq Chiefs and the Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO), as well as the community members, staff and Chief and Council of nearby Mi'kmaq communities, specifically Millbrook First Nation, and Sipekne'katik First Nation. AMNS has, and will continue to, exchange important Project information and answer questions; discuss the concerns and interests of the Mi'kmaq, including traditional and current use and the importance of the area; discuss potential impacts on the Mi'kmaq and develop avoidance and mitigations strategies together to address their concerns; and, to develop opportunities for involvement in environmental monitoring, and other aspects of the Project.

The EIS Guidelines (CEAA 2016) provides guidance on specific aspects of Mi'kmaq engagement. For Mi'kmaq groups with potential to be most affected by the Project, it was expected that AMNS would strive toward developing a productive and constructive relationship based on ongoing dialogue with the groups to support information gathering and effects assessment. Further, the *Province of Nova Scotia's Proponent's Guide: The Role of Proponents in Crown Consultation with the Mi'kmaq of Nova Scotia, 2011* provides guidance on engaging with Indigenous groups. AMNS continues to follow the guidance from the federal and provincial governments and intends to build on and strengthen the relationship developed with the Mi'kmaq of Nova Scotia during the past decade.

As per Supreme Court of Canada instruction and subsequent guidance from governments, such as the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult (Government of Canada, 2011) and AMNS's Guide: Engagement with the Mi'kmaq of Nova Scotia (Province of Nova Scotia, 2012), the Crown may delegate procedural aspects of consultation to proponents. However, the duty to consult, and constitutional obligation remains with the Crown. As noted in the EIS Guidelines (CEAA 2016) the results of the AMNS's Mi'kmaq of Nova Scotia engagement program *"helps to contribute to the Crown's understanding of any potential adverse impacts of the project on potential or established Aboriginal or treaty rights, title and related interests, and the effectiveness of measures proposed to avoid or minimise those impacts"*.

The Made-in-Nova Scotia Process is the forum for the Mi'kmaq, Nova Scotia, and Canada to resolve issues related to Mi'kmaq treaty rights, Aboriginal rights, including Aboriginal title, and Mi'kmaq governance. The process involves the Mi'kmaq of Nova Scotia as represented by the Assembly of Nova Scotia Mi'kmaq Chiefs and the provincial and federal governments. Both the federal and provincial governments have requirements for consultation under the *Updated Guidelines for Federal Officials to Fulfill the Duty to Consult: 2011*, and the *Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference. Further, the Nova Scotia Environmental Assessment Regulations* include a requirement to identify concerns of Indigenous People about potential adverse effects and steps taken, or proposed to be taken, by AMNS to address concerns, as well as the steps taken to identify these concerns.

Participation of the Mi'kmaq of Nova Scotia has been ongoing to identify impacts to the Mi'kmaq, in consideration of traditional knowledge as part mine planning and development of the EIS. AMNS respects the consultation, decision-making and governance structures that the Mi'kmaq of Nova Scotia have put in place within their organizations and communities. The focus of engagement has, and will continue to be, with the Assembly, the KMKNO, and the communities of Millbrook and Sipekne'katik. Focused engagement has and will continue with Millbrook due to their proximity to the Project. Aligning mutual interests, such as environmental protection specifically related to current use of land and resources for traditional purposes, is a core part of the engagement.

With the receipt of Information Requests from the Agency after AMNS submitted the EIS in 2017 and revised 2019 EIS (AGC 2017 and 2019), AMNS has continued to engage with the Mi'kmaq of Nova Scotia on a regular basis to better understand existing land uses. Millbrook initiated a Traditional Land and Resource Use Study (TLRUS) in 2018 and delivered the results in 2019 just prior to

the revised 2019 EIS (i.e., response Round 1 submission). AMNS has been working with Millbrook to review TLRUS results and continue ongoing and regular engagement throughout the Round 2 IR process.

5.1 Indigenous Peoples Engagement Activities

As part of an overall Indigenous Peoples Plan, AMNS's approach to Mi'kmaq engagement allows for flexibility to permit adaptation based on discussions and feedback from the Mi'kmaq and ongoing development of AMNS's projects.

AMNS uses the following methods, depending on the need, to engage with the Mi'kmaq of Nova Scotia:

- one-window regulatory meetings;
- face-to-face meetings with Mi'kmaq organizations, Chiefs and Councils and communities;
- one point of contact for the Mi'kmaq of Nova Scotia;
- phone calls;
- emails;
- dropbox and FTP sites for document sharing;
- Mi'kmaq community open houses;
- public open houses and town hall meetings;
- site visits and tours;
- newsletters and regular Project Updates; and
- website and other digital and social media;

In addition to AMNS's engagement program related to the EIS the following elements are being discussed to further develop the company's decade-long relationship with the Mi'kmaq of Nova Scotia – one that has been built on mutual understanding and transparency, maintaining flexibility and open lines of communication to adjust implementation as the relationship and Project develops:

- Providing opportunities and benefits to all Mi'kmaq in Nova Scotia. Benefits can take the form of, but are not limited to, opportunities for training and capacity building, contracting and procurement, support for education and employment. Supporting cultural and traditional activities of the Mi'kmaq of Nova Scotia; and, providing cultural learning exchange opportunities for mining staff.
- Engagement to date has been positive and productive; the relationship was formalized in a Memorandum of Understanding (MOU) with the ANSMC through the KMKNO from 2014-2016 with a renewed MOU proposed in 2018 and pending approval by ANSMC as of January 2021. AMNS initiated the engagement program for the Beaver Dam Mine Project in early 2016 with Mi'kmaq community open houses and Public open houses to provide general information on the proposed Project to all interested community members. The public open houses were followed by a series of face-to-face meetings with Millbrook and Sipekne'katik First Nations, and the KMKNO through to the end of 2020. Information regarding the EIS and the EA process was shared and discussed during these meetings, including archaeological reports, summaries of potential impacts and mitigations, and other key details of the Project. AMNS also arranged a tour of the area and invited both Millbrook and Sipekne'katik First Nations to participate in the Community Liaison Committee (CLC).

The objective of Mi'kmaq engagement relative to the development of the EIS for the Project is to gather views from Mi'kmaq groups with respect to both potential environmental effects of the Project and the potential adverse impacts of the Project on potential or established Aboriginal or treaty rights, title and related interests.

While broader engagement on the Touquoy Project has occurred for over a decade and will continue as per the Mi'kmaq engagement strategy, specific public engagement activities have occurred to support the EA for the Project since the federal process was commenced in December 2015.

These include aspects specific to the Project including:

- CLC, where two members were appointed by their Chief and Council as representatives of Millbrook First Nation and Sipekne'katik First Nation. Although Millbrook First Nation and Sipekne'katik First Nation have both withdrawn from the CLC, AMNS will continue to invite them to the CLC as guests.
- Open houses, specifically two community open houses occurred in May 2016 on lands of Millbrook and Sipekne'katik First Nations prior to the two public open houses.
- Presentations to Chief and Council of Millbrook First Nation and of Sipekne'katik First Nation, as well as the Benefits Committee Chiefs of the Assembly.
- Meetings, information sharing and correspondence with the KMKNO and thirteen Mi'kmaq First Nations of Nova Scotia, as well as the Nova Scotia Native Council for the purpose of good governance.
- Mini employment fairs set up in collaboration with staff of Millbrook and Sipekne'katik First Nations, as well as sharing of employment opportunities with Millbrook and Sipekne'katik First Nations and the KMKNO, with Mi'kmaq employment during the construction of the Touquoy Gold Project exceeding ten percent.
- Ongoing dialogue on formal agreements in terms of participation and benefits sharing with Millbrook First Nation, Sipekne'katik First Nation and the Assembly of Nova Scotia Mi'kmaq Chiefs.
- Participation of staff of KMKNO and Millbrook and Sipekne'katik First Nations in a site visit and tour of the proposed Beaver Dam Mine Project with provincial and federal regulators on November 29, 2016.
- Use of many tools for Mi'kmaq engagement that are used for the general community engagement, such as newsletters, signage, website, email and other digital media, media and press releases, meetings with local residents, and a complaints response procedure.
- Two Open Houses in January 2018 with Millbrook First Nation (one in Millbrook and one in Sheet Harbour) to address specific technical questions.
- Review of Project mitigation and monitoring with Sipekne'katik and KMKNO on September 12 and September 18, 2018, respectively.
- An online/virtual meeting was held with Millbrook First Nation's Chief and Council in early May 2020 to provide an overview of the Beaver Dam Mine Project and other Proponent projects to new council members.
- A Plain Language Summary (PLS) was prepared and shared with Millbrook First Nation on September 1, 2020, with the KMKNO on November 2, 2020 and with the Sipekne'katik First Nation on May 7, 2021.
- As part of on-going engagement and Project discussions specifically with the Millbrook First Nation, a draft Summary of Effects document outlining preliminary Project summaries, mitigation measures and cumulative effects was shared with the community in September 2020.
- On February 16, 2021, a draft response to Round 2 Information Requests CEAA-48/49 were shared with the Millbrook First Nation to support pending Millbrook community meetings that were being planned. This draft response and associated mapping were also reviewed in a virtual meeting with Gerald Gloade on February 3, 2021.
- On April 1, 2021, the Mi'kmaq of Nova Scotia section of the EIS was shared with the Millbrook First Nation for review and feedback.

5.2 Issues Raised by Indigenous Peoples and Proponent Responses

As part of submitting the EIS and EARD to respective government authorities, the Mi'kmaq engagement to date associated with the Beaver Dam Mine Project was documented, including a summary of key issues raised, Proponent responses and associated adjustments to Project design. This summary also includes general and specific feedback received from the Mi'kmaq of Nova Scotia. Note that Project adaptation will continue, as needed and practicable, through engagement with the Mi'kmaq.

For each key issue identified in the following table, a summary of proponent response is provided along with reference(s) to sections in the Updated 2021 EIS (AMNS 2021) which address the issue.

The issues raised during Mi'kmaq engagement activities were incorporated into the design of the Project and the development of the EIS. The fundamental change to the Project as a result of Mi'kmaq engagement was the change to the Haul Road to cross Hwy 224 which eliminated the haul trucks passing by the Mi'kmaq community of Beaver Lake. This addressed many concerns with safety, noise, air, and light emissions and other issues related to health and socio-economic aspects. In 2020, a multiuse bypass road was added to further reduce project impacts to traditional use and allow for continued access to areas around the Beaver Dam Mine Site and Haul Road during operations. It is the understanding of AMNS based on engagement with the Mi'kmaq that the changed Haul Road and addition of the multi-use bypass road were seen as positive change as effects on the community of Beaver Lake were greatly reduced through these project design changes.

In response to the interest of the Mi'kmaq, AMNS has made strong commitments to ongoing Mi'kmaq engagement, including specific activities to further support the participation of the Mi'kmaq in this EA process for the Beaver Dam Mine Project. The ongoing engagement ensures that the potential effects of the Project and the proposed mitigation measures and monitoring programs are understood by the Mi'kmaq of Nova Scotia in order to evaluate the effects on their communities and potential or established Aboriginal or treaty rights, title and related interests.

It is anticipated that engagement will continue throughout and beyond the current environmental assessment process. This will require ongoing dialogue regarding potential impacts on Mi'kmaq communities, and AMNS is committed to continuing those discussions. AMNS looks forward to receiving feedback and commits to discussing with Millbrook First Nation how best to address their feed back into Project design, mitigation and monitoring measures and potentially additional monitoring and mitigation measures.

6 SUMMARY OF ENVIRONMENTAL EFFECTS ASSESSMENT

This section includes a description of the baseline conditions, a summary of Project interactions and effects, and a brief discussion of residual effects, if any, anticipated for each of the VCs identified in Section 1.4 of this EIS Summary document. Residual effects are considered after mitigation measures have been applied. Additional detail regarding the baseline conditions and anticipated effects between each VC and the Project components are provided in the EIS.

A summary of anticipated interactions between each VC and the Project components is also provided in the Updated 2021 EIS (AMNS 2021) in Section 6.17 Assessment of Valued Components within Federal Jurisdiction Tables 6.17-1, 6.17-2, and 6.17-3.

A summary of the residual environmental effects and their significance associated with each VC is provided in the Updated 2021 EIS (AMNS 2021), Section 6.17 Assessment of Valued Components within Federal Jurisdiction Table 6.17-4. Detailed mitigation measures and monitoring programs for each VC are discussed in in the Updated 2021 EIS (AMNS 2021), Section 7 Effects of the Environment.

6.1 Noise

6.1.1 Baseline Conditions

Baseline ambient sound level monitoring was conducted at several locations in the Project Area between January 2007 and September 2016 (Section 6 Noise Assessment of the Updated 2021 EIS, AMNS 2021). Based on the data obtained from these sound level monitors, ambient sound levels are generally low, as expected for a characteristically rural environment. Specific non-residential locations of traditional land use and recreation have not been identified for inclusion in the analysis; however, it is understood that traditional uses such as hunting may occur in areas close to the Project Area.

The noise monitoring locations were chosen to be representative receptors and also to understand the ambient noise at the Beaver Dam Mine Site, along the Haul Road, and at the Touquoy Mine Site. Location #1, 2 and 3 and AN #1, 2, and 3 were placed so to understand the noise levels directly around the Beaver Dam Mine Site. The Beaver Dam Mines Road site was chosen as the closest receptor to a permanent resident to the Beaver Dam Mine Site and the Haul Road. It is a surrogate for the Beaver Dam IR 17 location because the monitoring site would be more greatly affected by noise than the IR but would also record the same vehicle traffic from Highway 224 as would pass by the Beaver Dam IR. The IR is located approximately 3 km north of this monitoring location. The Mooseland Road monitoring location was chosen as a mid-point between the nearest dwelling on the Mooseland Road and the Haul Road. Location #1 at Touquoy was chosen to understand the noise levels directly around the Touquoy Mine Site and proposed open pit. Baseline ambient noise levels are presented in Table 6.1-1 (and in Section 6 Noise Assessment in the Updated 2021 EIS [AMNS 2021]).

Based on the measured ambient sound levels discussed above, the estimated lowest baseline ambient sound levels throughout the Study Area are as follows:

- 7:00 AM to 7:00 PM 33 dBA;
- 7:00 PM to 11:00 PM 31 dBA; and
- 11:00 PM to 7:00 AM 27 dBA.

At the Touquoy Mine Site, noise monitoring will be undertaken throughout the operation of the facility if any complaints or concerns are received. To date, no noise complaints have been received or are anticipated.

Table 6.1-1: Baseline Ambient Noise Levels

Monitoring Location	Date	Time	Average L_{eq} Value	NSE Criteria
Location #1 Waste Rock Pile (near current secondary logging road)				
	June 16, 2008	12:00 - 18:59	50.5	0700-1900 <65 dBA
	June 16, 2008	19:00 - 22:59	47.3	1900-2300 <60 dBA
	June 16-17, 2008	23:00 - 06:59	48.1	2300-0700 <55 dBA
	June 17, 2008	07:00 - 18:59	55.1	0700-1900 <65 dBA
	June 17, 2008	19:00 - 22:59	47.2	1900-2300 <60 dBA
	June 17-18, 2008	23:00 - 06:59	**58.9**	2300-0700 <55 dBA
	June 18, 2008	07:00 - 18:59	**67.0**	0700-1900 <65 dBA
	June 18, 2008	19:00 - 22:59	**62.0**	1900-2300 <60 dBA
	June 18-19, 2008	23:00 - 06:59	**60.2**	2300-0700 <55 dBA
	June 19, 2008	07:00 - 09:51	59.1	0700-1900 <65 dBA
Location #2 Northwest of Beaver Dam Mine Site (near secondary logging road)				
	June 11, 2008	11:30 - 18:59	32.0	0700-1900 <65 dBA
	June 11, 2008	19:00 - 22:59	31.0	1900-2300 <60 dBA
	June 11-12, 2008	23:00 - 06:59	30.2	2300-0700 <55 dBA
	June 12, 2008	07:00 - 18:59	41.6	0700-1900 <65 dBA
	June 12, 2008	19:00 - 22:59	38.1	1900-2300 <60 dBA
	June 12-13, 2008	23:00 - 06:59	31.6	2300-0700 <55 dBA
	June 13, 2008	07:00 - 18:59	51.1	0700-1900 <65 dBA
Location #3 North of Beaver Dam Mine Site (wilderness location on topographic high)				
	June 6, 2008	15:00 - 18:59	34.7	0700-1900 <65 dBA
	June 6, 2008	19:00 - 22:59	29.2	1900-2300 <60 dBA
	June 6-7, 2008	23:00 - 06:59	28.4	2300-0700 <55 dBA
	June 7, 2008	07:00 - 18:59	34.3	0700-1900 <65 dBA
	June 7, 2008	19:00 - 22:59	30.0	1900-2300 <60 dBA
	June 7-8, 2008	23:00 - 06:59	31.0	2300-0700 <55 dBA
	June 8, 2008	07:00 - 18:59	34.2	0700-1900 <65 dBA
	June 8, 2008	19:00 - 22:59	35.3	1900-2300 <60 dBA
	June 8-9, 2008	23:00 - 06:59	33.2	2300-0700 <55 dBA
	June 9, 2008	07:00 - 14:40	38.1	0700-1900 <65 dBA
AN#1 Northeast of Beaver Dam Mine Site (beside primary logging road)				
	October 20, 2014	13:26 - 18:59	45.8	0700-1900 <65 dBA
	October 20, 2014	19:00 - 22:59	30.9	1900-2300 <60 dBA
	October 20-21, 2014	23:00 - 06:59	30.0	2300-0700 <55 dBA
	October 20-21, 2014	07:00 - 11:58	32.4	0700-1900 <65 dBA
AN#2 Northwest of Beaver Dam Mine Site (near secondary logging road)				
	November 20, 2014	11:36 - 18:59	33.6	0700-1900 <65 dBA
	November 20, 2014	19:00 - 22:59	34.6	1900-2300 <60 dBA
	November 20-21, 2014	23:00 - 06:59	27.4	2300-0700 <55 dBA
	November 21, 2014	07:00 - 11:30	32.4	0700-1900 <65 dBA

Table 6.1-1: Baseline Ambient Noise Levels (continued)

Monitoring Location	Date	Time	Average L_{eq} Value	NSE Criteria
AN#3 South of crusher location (along primary logging road)				
	November 20, 2014	11:13 - 18:59	36.4	0700-1900 <65 dBA
	November 20, 2014	19:00 - 22:59	38.5	1900-2300 <60 dBA
	November 20-21, 2014	23:00 - 06:59	29.3	2300-0700 <55 dBA
	November 21, 2014	07:00 - 11:12	29.9	0700-1900 <65 dBA
Beaver Dam Road (Haul Road) (near Highway 224)				
	September 8, 2016	11:26 – 18:59	44.2	0700-1900 <65 dBA
	September 8, 2016	19:00 - 22:59	43.1	1900-2300 <60 dBA
	September 8-9, 2016	23:00 - 06:59	42.5	2300-0700 <55 dBA
	September 9, 2016	07:00 - 11:59	44.6	0700-1900 <65 dBA
Mooseland Road (Haul Road) (south of proposed truck route)				
	September 20, 2016	15:42 - 18:59	31.1	0700-1900 <65 dBA
	September 20, 2016	19:00 - 22:59	34.1	1900-2300 <60 dBA
	September 20-21, 2016	23:00 - 06:59	36.0	2300-0700 <55 dBA
	September 21, 2016	07:00 - 15:37	36.9	0700-1900 <65 dBA
Location #1 (Touquoy Mine Site) (north of proposed open pit)				
	January 9, 2007	19:00 - 22:59	44.8	1900-2300 <60 dBA
	January 10, 2007	07:00 - 14:59	44.9	0700-1900 <65 dBA
	January 10, 2007	15:00 - 23:59	40.9	1900-2300 <60 dBA
	January 11, 2007	0:00 - 06:59	40.2	2300-0700 <55 dBA
	January 11, 2007	07:00 - 18:59	42.9	0700-1900 <65 dBA
	January 11, 2007	19:00 - 22:59	41.4	1900-2300 <60 dBA
	January 11-12, 2007	23:00 - 06:59	40.7	2300-0700 <55 dBA

Notes: Bolded and underlined numbers indicate Maximum Values

< = less than; dBA = decibels.

6.1.2 Anticipated Effects and Changes to the Environment

The Project will operate as a satellite open pit mine. Crushed ore from the Project will be transported by truck via the Haul Road to the existing and fully permitted Touquoy Mine. Noise will be generated at the Beaver Dam Mine Site, the Haul Road, and the Touquoy Mine Site. Sources of Project-related noise include heavy machinery and trucking during the Construction phase and haul truck and mining machinery traffic during Operations. The majority of mining operations will occur in the pit well below current ground elevation, which will attenuate the effects of noise. During the Construction and Operation phase of the Project, rock blasting using explosives was also considered as noise and vibration that would be generated.

Potential Noise interactions and effects for Construction and Operations are quantitatively assessed by acoustic modelling. The technical reports documenting the updated approach and inputs for Noise modelling (Construction, Operations) are provided in the Updated 2021 EIS as Appendix B.1 and Appendix B.2 (AMNS 2021).

Nine receptor locations were chosen based on updates to the Project Description, Public and Mi'kmaq of Nova Scotia Engagement, and in response to Round 2, Information Requests provided by IAAC and NSE (CEAA 2019; NSE 2019) to be used in the Construction Noise Assessment and Updated Noise Impact Assessment (Appendix B.1 and B.2 of AMNS [2021]). The sensitive receptor locations, which are in closest proximity to the Beaver Dam Project Area are described below:

- R1 9 Beaver Dam Mine Road (Marlborough Property);
- R2 4112 Highway 224 (Beaver Lake IR 17);
- R3 4115 Highway 224 (Cottage on Crown Land);
- R4 3492 Highway 224 (Hobbs Property);
- R5 3379 Highway 224 (McLeod Property);
- R6 3373 Highway 224 (Smith Property);
- R7 Tangier River (Deepwood Estates Property);
- R8 Tanger River (Musqudoboit Lumber Co. Ltd. Property/John Dickson Lease); and
- R9 5579 Mooseland Road (Lloy Property).

The prediction results for Construction represent the typical expected construction activities and equipment from the Beaver Dam Mine Site and Haul Road, at the predictable worst-case locations, assuming Construction activities will be limited to the day and evening time periods only (7:00 a.m. to 11:00 p.m.). A summary of predicted noise effects during construction phase is presented in Table 6.1-2. Noise level contributions at each receiver due to each noise source are provided in AMNS (2021, Appendix B.1).

Table 6.1-2: Predicted Noise Effects during the Construction Phase of the Project

Receptor ID	Receptor Description	Scenario A: Road Construction Near R1 and R4 (<2 months)		Scenario B: Remainder of Construction (>2 months)		Compliance
		Predicted Noise Level (Ldn)	MNL[(a)] (Ldn)	Predicted Noise Level (Ldn)	MNL[(a)] (Ldn)	
R1	9 Beaver Dam Mine Road (Marlborough Property)	53	57	49	52	Yes
R2	4112 Highway 224 (Beaver Lake IR 17)	52	57	52	52	Yes
R3	4115 Highway 224 (Cottage on Crown Land)	43	57	43	52	Yes
R4	3492 Highway 224 (Hobbs Property)	56	57	49	52	Yes
R5	3379 Highway 224 (McLeod Property)	41	57	40	52	Yes
R6	3373 Highway 224 (Smith Property)	38	57	39	52	Yes
R7	Tangier River (Deepwood Estates Property)	52	57	52	52	Yes
R8	Tanger River (Musqudoboit Lumber Co. Ltd. Property/John Dickson Lease)	41	57	41	52	Yes
R9	5579 Mooseland Road (Lloy Property)	49	57	49	52	Yes

(a) Indicates Noise Levels after Mitigation

MNL = Mitigated Noise Levels; Ldn = day-night average sound level; < = less than

During the worst-case scenario, noise effects from the Construction Phase activities are within the suggested MNL criteria. For Scenario A, these worst-case effects are predicted at the start of construction of Section 3B of the Haul Road, and will diminish

significantly as construction progresses due to the increased distance from the receptors. Based on these results, adverse effects are expected to be unlikely, and mitigation is not required.

Nine worst-case human receptor locations have been identified for assessment (R1 to R9). During the Operation Phase, predicted noise levels at each of the identified seasonal or permanent residential receptors, inclusive planned and required noise mitigation measures, are summarized in Section 6.1.8. The predicted noise levels include equipment and activities at the Beaver Dam Mine Site, the Haul Road, and the Touquoy Mine Site.

Predicted noise effects during the Operation Phase of the Project are within the applicable sound level limits at all the identified receptors (Table 6.1-3). Most notably, predicted noise levels during the nighttime period are at least 27 dBA below the applicable nighttime sound level limit at all identified receptors. Maximum (worst-case) predicted noise levels at property boundaries are presented in Table 6.1-4.

Table 6.1-3: Predicted Noise Effects during the Operation Phase of the Project

Receptor ID	Receptor Description	Noise Level (dBA) (Day/Evening/Night)	Sound Level Limit[(a)] (dBA) (Day/Evening/Night)	Compliance
R1	9 Beaver Dam Mine Road (Marlborough Property)	48 / 48 / 27	65 / 60 / 55	Yes
R2	4112 Highway 224 (Beaver Lake IR 17)	30 / 30 / 28	65 / 60 / 55	Yes
R3	4115 Highway 224 (Cottage on Crown Land)	32 / 32 / 28	65 / 60 / 55	Yes
R4	3492 Highway 224 (Hobbs Property)	50 / 50 / 27	65 / 60 / 55	Yes
R5	3379 Highway 224 (McLeod Property)	39 / 39 / 27	65 / 60 / 55	Yes
R6	3373 Highway 224 (Smith Property)	37 / 37 / 27	65 / 60 / 55	Yes
R7	Tangier River (Deepwood Estates Property)	53 / 53 / 20	65 / 60 / 55	Yes
R8	Tanger River (Musqudoboit Lumber Co. Ltd. Property/John Dickson Lease)	42 / 42 / 20	65 / 60 / 55	Yes
R9	5579 Mooseland Road (Lloy Property)	50 / 50 / 27	65 / 60 / 55	Yes

[(a)] Nova Scotia Pit and Quarry Guidelines

Source: NSEL 1999

dBA = decibels.

Table 6.1-4: Maximum (Worst-case) Predicted Noise Levels at Property Boundaries

Property Line Description	Maximum Noise Level (dBA) (Day/Evening/Night)	Sound Level Limit[(a)] (dBA) (Day/Evening/Night)	Compliance
Beaver Dam Mine Site Property, Option A	55/55/55	65 / 60 / 55	Yes
Beaver Dam Mine Site Property, Option B	55 /55 /55	65 /60 /55	Yes
Haul Road[(a)] (30 m from centerline of road)	59 /59 /-	65 / 60 / 55	Yes
Touquoy Mine Site Property	54 /54 /54	65 / 60 / 55	Yes

[(a)] Truck traffic used in the noise assessment and related modelling has been adjusted to a 16-hour shift, including the nighttime hour of 6:00 a.m. to 7:00 a.m.

Source: NSEL 1999.

m = metres; dBA = decibels.

6.1.3 Mitigation Measures

This combination of measures will adequately mitigate potential noise impacts. The mitigation procedures may vary as long as noise levels are in accordance with the regulatory approval. Mitigation measures for noise are presented in Table 6.1-5.

Table 6.1-5: Mitigation for Noise

Project Phase	Mitigation Measure
C, O	Restrict blasting to a specific and regular daytime schedule during weekdays. Specifically, lasting will not be undertaken on Sundays, statutory holidays, or any day between the hours of 1800 hours and 0800 hours (NSEL 1999)
C	Haul road construction will be restricted to the day and evening periods (7 a.m. to 11 p.m.)
O	If necessary, construct a large safety berm along the entire north boundary of the pit, dependent on how raw materials are processed at the Beaver Dam Mine Site:
O	Operating hours for trucking on the Haul Road will be restricted to the day and evening periods only
O	Maximum 4 drills will operate at the Beaver Dam Mine Site pit at any time during the Operation Phase of the Project
C, O, CL	Implement preventative maintenance plans for all mobile and stationary equipment
C	Noise-reduction as criteria in equipment selection
C, O	Communicate general blasting schedule to the local community
C	Consider placement of stockpiles and infrastructure to mitigate noise migration from processing equipment
C	Consider the use of natural landforms when available as noise barriers when designing final site details and when placing fixed equipment
O	Operating hours for processing plants and trucking on the Haul Road will be limited to reduce nighttime noise levels
O	Regular check by site manager for excessive noise on site and in relation to sensitive receptors so that resolution can be timely
C, O, CL	Implement preventative maintenance plans for all mobile and stationary equipment
C	Noise-reduction as criteria in equipment selection
C, O	Speed reduction
C, O	Use equipment that meets appropriate noise emission standards for off- road diesel equipment
C, O	Subcontractor agreements will include an obligation to comply with environmental protection including noise reduction
C, O	Site design to reduce need for reversing and vehicle reversing alarms
C, O	A procedure, including a response plan, will be available for public to be able to register complaints regarding noise concerns

Notes: C = Construction; O = Operations; CL = active closure (decommissioning and reclamation).

6.1.4 Significance of Residual Effects

Residual effects are effects to VCs that are predicted to occur even after the implementation of mitigation measures [Section 6.1.8 of the Updated 2021 EIS (AMNS 2021)]. Noise is a physical aspect of the environment that may be altered by the Project that can, in turn, affect related biophysical and socio-economic VCs [Section 6.11 to 6.12 and Section 6.16 of the Updated 2021 EIS (AMNS 2021]. Significant residual effects for the Noise VC would be defined as having high magnitude, occur beyond the PA and LAA, be of long-term to permeant duration, occur at regular intervals or be continuous throughout the Project and be only partially reversible to irreversible [Section 6.1.6 of Updated 2021 EIS (AMNS 2021)].

The effects to noise are predicted to be **low,** diverging from existing conditions but in compliance with appropriate guidelines; effects do not extend into the RAA, are long-term, and are considered reversible. The overall residual effect of the Project on noise is assessed as **not likely** to have significant adverse effects after mitigation measures have been implemented. The predicted residual environmental effects of Project development and production on Noise are, therefore, assessed to be **not significant**

In general, construction activities often produce significant noise levels that have the potential to impact the surrounding environment. Thus, noise levels produced by equipment planned for the Construction Phase of the Project have been assessed

at the identified worst-case receptors to determine the future impact on residents of the nearest communities. Predicted noise levels produced by worst-case activities during the Construction Phase of the Project is low in magnitude, being that they are within the applicable Health Canada and NSE guideline limits at all identified receptors, including noise emissions from the Beaver Dam Mine Site, the Haul Road, and the Touquoy Mine Site. General guidance has been provided to help ensure that construction noise levels are acceptable, including a specification that construction activities should be restricted to the day and evening time periods.

Mining operations often produce elevated noise levels that have the potential to impact the surrounding environment. Thus, noise levels produced by equipment at the proposed Beaver Dam Mine Project have been assessed at the identified worst-case receptors to determine the future impact on residents of the nearest communities. This is not intended to preclude residents at farther distances but rather is presented to document those residence that are closest and represent a worst-case scenario. The predicted noise levels produced by worst-case activities during the Operation of the Project, including noise emissions from the Beaver Dam Mine Site, the Haul Road, and the Touquoy Mine Site, are considered to be low. That is, within the applicable guideline limits for all identified receptors. Based on these predictions, noise levels at nearby residential receptors are expected to be within the NSEL (1999) noise level limits, provided the mitigation measures identified are followed.

The NSEL Pit and Quarry Guidelines also include noise level criteria for assessment at the property boundaries (NSEL 1999). The predicted noise levels from the Project meet the NSEL limits at all locations on the property boundaries of the Beaver Dam Mine Site, the Haul Road, and the Touquoy Mine Site, provided the mitigation measures identified are followed.

Follow-up and monitoring programs and discussed in Section 7 of the Updated 2021 EIS (AMNS 2021).

A significant adverse effect for noise has not been predicted for the Project for the following reasons, with consideration of the ecological and social context within the LAA of the Project:

1) **During Construction:** Noise will be elevated above baseline conditions for short duration (<1 year), extending into the RAA. However, noise levels are expected to remain within established guidelines at the property boundaries and thus the guidelines are also met within the LAA. Given the remote location of the Project, the likelihood of mobile receptors being regularly in close proximity to the FMS Mine Site is low.
2) **During Operations:** Noise will be elevated above baseline conditions extending into the RAA. However, noise levels will remain within established guidelines at the FMS Mine Site property boundary. The guidelines are met within the PA. The likelihood of mobile receptors being regularly in close proximity to noise generation sites is low.
3) **During Operations:** Predicted blasting noise will meet the *Nova Scotia Pit and Quarry Guidelines (NSDEL 1999)* criteria of 128 dBA at approximately 100 m from the blast location.
4) **During Closure:** Noise generation during closure will be less than predicted levels during construction and operation but are expected to still be elevated above baseline conditions potentially extending into the LAA or RAA during decommissioning activities, then drop to baseline conditions for the post closure period.
5) Noise effects from the Project are reversible and will dissipate to background concentrations once operations and active reclamation phases are complete.

6.2 Air

6.2.1 Baseline Conditions

Appropriate background air quality data was investigated for the Project. The background air quality concentrations for the existing conditions were added to the modelled concentrations for the Project to obtain an estimate of the air quality conditions when the proposed operations commence. There are currently no permanent air monitoring stations near the Beaver Dam Mine Site (AMNS 2021, Appendix C.1).

The most recent three years (2014 to 2016) for which all ambient air quality data were available were obtained from the Government of Canada National Air Pollution Surveillance (NAPS) program. The NAPS data for 2014 to 2016 are summarized in Table 6.2-1.

Table 6.2-1: Background Ambient Air Monitoring Results (NAPS) 2014 to 2016

	Concentration ($\mu g/m^3$)					
	25th Percentile	50th Percentile	75th Percentile	90th Percentile	Average	Maximum
24-hour PM_{10}						
Lake Major (030120)	—	—	—	—	—	—
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	3.0	6.0	14.0	31.0	14.1	176.0
Halifax (030118)	—	—	—	—	—	—
Sydney (030310)	—	—	—	—	—	—
24-hour $PM_{2.5}$						
Lake Major (030120)	3.0	5.0	6.0	8.0	5.4	24.0
Port Hawkesbury (030201)	4.0	5.0	7.0	**9.0**	**5.7**	31.0
Aylesford Mountain (030701)	4.0	5.0	7.0	8.0	5.7	23.0
Pictou (030901)	4.0	5.0	8.0	12.0	6.7	37.0
Norman Wells, NWT (129102)	1.0	2.0	3.0	5.0	3.5	85.0
Halifax (030118)	—	—	—	—	—	—
Sydney (030310)	1.2	2.1	3.7	5.8	2.8	358.6
1-hour NO_2						
Lake Major (030120)	0.0	1.9	3.8	5.6	2.8	47.0
Port Hawkesbury (030201)	0.0	1.9	3.8	9.4	3.4	79.0
Aylesford Mountain (030701)	0.0	0.0	0.0	1.9	0.6	13.2
Pictou (030901)	0.0	1.9	1.9	5.6	2.2	39.5
Norman Wells, NWT (129102)	0.0	0.0	1.9	7.5	3.6	73.4
Halifax (030118)	11.3	19.8	28.2	**41.4**	21.4	131.6
Sydney (030310)	1.9	3.8	7.5	13.2	6.7	69.6
24-hour NO_2						
Lake Major (030120)	1.9	1.9	3.8	5.6	2.7	11.3
Port Hawkesbury (030201)	0.0	1.9	5.6	7.5	3.3	28.2
Aylesford Mountain (030701)	0.0	0.0	0.0	1.9	0.5	5.6

Table 6.2-1: Background Ambient Air Monitoring Results (NAPS) 2014 to 2016 (continued)

	Concentration ($\mu g/m^3$)					
	25th Percentile	50th Percentile	75th Percentile	90th Percentile	Average	Maximum
Pictou (030901)	0.0	1.9	3.8	3.8	2.2	13.2
Norman Wells, NWT (129102)	0.0	1.9	3.8	9.4	3.5	30.1
Halifax (030118)	4.6	7.7	11.6	**17.0**	8.8	54.1
Sydney (030310)	0.8	1.5	3.1	5.4	2.7	28.6
1-hour SO_2						
Lake Major (030120)	0.0	0.0	0.0	2.6	0.4	6.8
Port Hawkesbury (030201)	0.0	0.0	2.6	2.6	1.9	222.5
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	0.0	0.0	2.6	2.6	0.7	5.2
Halifax (030118)	2.6	5.2	5.2	**7.9**	4.8	70.7
Sydney (030310)	0.0	2.6	2.6	5.2	2.3	172.9
24-hour SO_2						
Lake Major (030120)	0.0	0.0	0.0	2.6	0.3	7.9
Port Hawkesbury (030201)	0.0	0.0	2.6	**5.2**	1.9	31.4
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	0.0	0.0	0.0	2.6	0.5	2.6
Halifax (030118)	1.1	2.2	2.2	3.2	2.0	29.1
Sydney (030310)	0.0	1.1	1.1	2.2	0.9	71.0
1/2-hour CO						
Lake Major (030120)	—	—	—	—	—	—
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	—	—	—	—	—	—
Halifax (030118)	306.0	389.0	487.0	**834.0**	420.0	6,687.0
Sydney (030310)	264.0	334.0	417.0	695.0	397.0	2,099.0
1-hour CO						
Lake Major (030120)	—	—	—	—	—	—
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	—	—	—	—	—	—
Halifax (030118)	252.0	321.0	401.0	**687.0**	346.0	5,507.0
Sydney (030310)	218.0	275.0	344.0	573.0	327.0	1,729.0
8-hour CO						
Lake Major (030120)	—	—	—	—	—	—

Table 6.2-1: Background Ambient Air Monitoring Results (NAPS) 2014 to 2016 (continued)

	Concentration (µg/m³)					
	25th Percentile	50th Percentile	75th Percentile	90th Percentile	Average	Maximum
Port Hawkesbury (030201)	—	—	—	—	—	—
Aylesford Mountain (030701)	—	—	—	—	—	—
Pictou (030901)	—	—	—	—	—	—
Norman Wells, NWT (129102)	—	—	—	—	—	—
Halifax (030118)	141.0	179.0	224.0	**384.0**	193.0	3,077.0
Sydney (030310)	122.0	154.0	192.0	320.0	183.0	966.0

NAPS = National Air Pollutant Surveillance program; µg/m³ = micrograms per cubic metre; PM_{10} = particulate matter less than 10 micrometres in aerodynamic diameter; $PM_{2.5}$ = particulate matter less than 2.5 micrometres in aerodynamic diameter; NO_2 = nitrogen dioxide; SO_2 = sulphur dioxide; CO = carbon monoxide; — = not measured or reported.

The RAA and LAA for air quality are considered in baseline studies and subsequent effects assessment. Preliminary baseline particulate monitoring was undertaken for TSP and PM_{10}. Baseline air quality measurements were obtained from nine locations near the Beaver Dam Mine Site and along the proposed Haul Road, five locations on the Touquoy Mine Site, two locations near the proposed Fifteen Mille Stream Gold Project, and two locations near the proposed Cochrane Hill Gold Project and the data is presented in Table 6.2-2.

Further, baseline particulate monitoring including TSP and PM_{10} was conducted following United States Environmental Protection Agency (US EPA) sample methodology (US EPA 2011). The locations during each monitoring event are shown in Figure 6.2-1 of Section 6.1 of the Updated 2021 EIS (AMNS 2021). The date and locations were determined based on meteorological forecasts for the sampling period, and the proximity to sensitive receptors and proposed mine features. A 24-hour sample was collected on an 8x10 filter utilizing a high-volume sampler calibrated at a flow rate of approximately 40 cubic feet per minute (CFM). Pre-weighed filters were submitted to Maxxam Analytics in Sydney, Nova Scotia, for final particulate weights. Concentrations of TSP and PM_{10} were calculated based on the final weight of particulate on the filters and the total volume of air sampled. Baseline particulate data was compared to the NSAQS (Table 6.2-2).

A summary of these baseline measurements is presented in Table 6.2-2. Baseline TSP concentrations ranged from 1.7 to 41.7 micrograms per cubic metre (µg/m³), with the highest value obtained at Location #2 during monitoring in June 2008. Results for PM_{10} concentrations ranged from 7.1 to 13.1 µg/m³, with the highest value also obtained at Location #2 during monitoring in June 2008. This monitoring station was located in a recently clear-cut area, which may have contributed to higher particulate levels in comparison to the other locations. This area was resampled in 2014 (AN#2). The 2014 results for that area were 4.6 µg/m³. All samples collected were below the NSAQS for TSP, there is no NSAQS for PM_{10}.

Table 6.2-2: Beaver Dam Mine Project Background Air Quality Sampling Data

Location	Program Date	24-hour Total Suspended Particulate (TSP) (µg/m^3)	24-hour PM_{10} (µg/m^3)
Location #1	June 5-6, 2008	19.4	9.1
Location #2	June 5-6, 2008	41.7	**13.1**
Location #3	June 5-6, 2008	12.9	7.1
AN#1	October 20-21, 2014	6.9	—
AN#2	October 20-21, 2014	4.6	—
AN#3	October 20-21, 2014	1.7	—
AN#4	October 20-21, 2014	3.9	—
Beaver Dam Road	September 7-8, 2016	9.7	—
Mooseland Road	September 7-8, 2016	5.8	—
Location #1 (Touquoy)	January 3, 2007	11.6	—
Location #2 (Touquoy)	January 3, 2007	10.5	—
Location #3 (Touquoy)	January 4, 2007	14.0	—
Location #4 (Touquoy)	January 4, 2007	16.1	—
Location #5 (Touquoy)	January 4, 2007	14.4	—
Fifteen Mile Stream	November 2017	9.6	9.2
Fifteen Mile Stream	November 2017	14.0	9.5
Cochrane Hill	November 2017	10.7	10.5
Cochrane Hill	November 1, 2017	10.7	9.7
Average		**12.1**	
90th percentile		**17.1**	

Note: Bolded numbers indicate values used in assessment

µg/m^3 = micrograms per cubic metre; PM_{10} = particulate matter less than 10 micrometres in aerodynamic diameter.

The data obtained as part of the baseline program reported herein provides a preliminary snapshot of air quality in the area of the Beaver Dam Mine Site and Haul Road, and a general understanding of local air quality. Due to a lack of other sources of data for ambient TSP, the background concentration for TSP is based on the maximum measured 24-hour TSP concentration (there are insufficient data to provide a meaningful 90th percentile value), and the average of all the TSP measurements. There is uncertainty in how representative these values might be for background, but they represent the best available data at this time.

It is important to note that, to assess air quality, meteorological conditions need to be considered. Meteorology is also a major consideration for the design, construction, and maintenance of the proposed development. Information on meteorological conditions, such as wind and air temperature, are required for air dispersion modelling as they have a large effect on the dispersion of pollutants in the atmosphere. Solar radiation and precipitation data also provide information for the design of water management infrastructure and water balance calculations. Climate conditions that have been considered are summarized below.

The Project is located with the Eastern Nova Scotia climatic region, which is generally characterized by high rainfall and cool temperatures, due to the influence of the Nova Scotia Current. The nearest climate station with historical data is the Middle Musquodoboit climate station (ID# 8203535) operated by the Meteorological Service of Canada (MSC). The station is located approximately 15 kilometres (km) northwest of the proposed Beaver Dam Mine Site, near Middle Musquodoboit (45° 04 N, 63° 06 N).

The following is a summary of average climate conditions at the Middle Musquodoboit station, based on climate normals published by Environment and Climate Change Canada for the period from 1971 to 2000. Wind data is taken from the Halifax Airport climate station (MSC ID# 202250), which is located approximately 45 km west of the mine site. This is the closest station to the site with wind data.

Mean annual total precipitation is 1,370 millimetres (mm), which includes 165 centimetres (cm) of average snowfall per year (165 mm water equivalent). Highest precipitation generally occurs in the months of October and November, with lowest precipitation in the month of February. Measurable precipitation occurs on an average of 164 days per year, with 141 days of measurable rainfall, and 31 days of measurable snowfall.

The extreme one-day rainfall for the station is 173 mm on August 15, 1971 and extreme one-day snowfall is 70 cm on February 8, 1981. Average temperature is 6.2°C, with an average range from -6°C to 18.1°C. Temperature extremes can range from -34°C to 35°C. There is an average of 312 days per year with an average temperature above 0°C.

Wind direction is generally westerly to northerly in January through April, southerly in May through October and again westerly to northerly in November and December. Wind speeds average approximately 16.5 kilometres per hour (km/h), with an average range of 13.3 km/h in August to 18.5 km/h in March. Maximum hourly speeds can range from 56 km/h in August to 89 km/h in February, with maximum gusts of up to 132 km/h recorded.

6.2.2 Anticipated Effects and Changes to the Environment

The potential interactions identified for Beaver Dam Mine Site are presented in Table 6.2-3 and 6.2-4; emissions estimates for the operations phase (Haul Road traffic during mine operations) are provided in Table 6.2-5.

Table 6.2-3: Estimated Particulate Emissions from Beaver Dam Mine

Activity	Emission Rate (g/s)		
	TSP	PM_{10}	$PM_{2.5}$
Conveyors	2.87E-02	9.44E-03	2.67E-03
Crusher Option	2.46E-01	1.11E-01	2.05E-02
Truck Loading	6.57E-03	3.29E-03	1.64E-03
Total	**2.84E-01**	**1.24E-01**	**2.48E-02**

g/s = grams per second; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TSP = total suspended particulate.

Table 6.2-4: Maximum Predicted Concentrations due to Beaver Dam Mine Site Operations

Compound	Averaging Period	Assessment Criteria (Ambient Air Quality Standard) (µg/m³)	Maximum Predicted Concentration (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Combined Effect (µg/m³)	Percentage of Assessment Criteria for Cumulative Effect (%)
TSP	24-hour	120	3.8	3	41.7	45.5	38
	Annual	70	0.8	1	12.4	13.2	19
PM_{10}	24-hour	50	3.7	7	31.0	34.7	69
$PM_{2.5}$	24-hour	27	1.4	5	9.0	10.4	39
	Annual	8.8	0.3	3	5.7	6.0	68

µg/m³ - micrograms per cubic metre; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TSP = total suspended particulate; % = percent.

Table 6.2-5: Estimated Particulate Emissions from the Haul Road

Activity	Emission Rate (g/s)		
	TSP	PM_{10}	$PM_{2.5}$
Haul Trucks	4.28E01	1.16E01	1.16E00

g/s = grams per second; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TSP = total suspended particulate.

Dust emissions are the primary atmospheric issue for the Beaver Dam Mine Site and airborne particulate matter will be generated during construction and operation phases of the Project. Sources of project- related particulate matter at the Beaver Dam Mine Site may include the following:

- overburden (e.g., topsoil, till and organic) removal;
- blasting;
- rock crushing option;
- onsite heavy truck traffic;
- material loading;
- wind erosion of material storage piles;
- construction of mine site roads; and
- operation of other heavy machinery.

During operation, most of the dust will be generated at the Beaver Dam Mine Site will be due to material handling and crushing processes and trucking operations. Estimated emissions for the Beaver Dam Mine Site are provided in Table 6.2-3. The total emissions (in grams per second or g/s) are provided as the sum of the emissions from all sources as this site was modelled as an open pit source.

Results of air dispersion modelling for maximum predicted concentrations of emitted particulate species from the Beaver Dam Mine Site are presented in Table 6.2-4. This table summarizes the particulate size fraction considered, the averaging period, the assessment criteria against which the results are compared, the maximum predicted concentration from the modelling, the ambient background concentration, the combined effect (the modelled concentration from the site added to the assumed existing background concentration for that averaging period), and the percentage of the assessment criteria for the site modelling results alone and the cumulative effects.

For this site, maximum predicted concentrations occurred at the property boundary. Predicted concentrations for all indicator compounds and averaging periods were lower than existing background concentrations, and well below relevant assessment criteria. The cumulative effects were also found to be below the assessment criteria for all compounds and averaging periods.

Airborne particulate matter will be generated during construction and operation of the proposed Haul Road. Sources of project-related particulate matter would include upgrading the existing road to be suitable for the mine traffic, and truck traffic hauling ore from Beaver Dam Mine to the Touquoy Mine Site for processing. Dust can be generated from mine haul truck tires interacting with gravel surfaced Mine Haul Roads and Beaver Dam Haul Roads. Dust is also generated during the truck loading and dumping activities. Dust is not expected from uncovered trucks because the ore material is of a size that is unlikely to generate dust. Dust can be tracked across asphalt roads and re-entrained by traffic or by the wind.

The potential interactions identified for the development and use of the proposed Haul Road between Beaver Dam Mine Site are presented in the Updated 2021 EIS (AMNS 2021), in Table 6.2-8; the interactions are expected to be the same for the Haul Road as for the mine sites, except the construction phase will be shorter. Further, as the road is not currently anticipated to be decommissioned, there are no effects associated with the Active Closure. Emissions estimates for the operations phase (Haul Road traffic during mine operations) are provided in Table 6.2-5.

Results of air dispersion modelling for maximum predicted concentrations of emitted particulate species from the Haul Road are presented in Table 6.2-6. This table summarizes the particulate size fraction considered (i.e., TSP, PM_{10} and $PM_{2.5}$), the averaging period, the assessment criteria against which the results are compared, the maximum predicted concentration from the modelling, the ambient background concentration, the combined effect (the modelled concentration from the site added to the assumed existing background concentration for that averaging period), and the percentage of the assessment criteria for the site modelling results alone and the cumulative effects.

For this site, maximum predicted concentrations occurred within 30 m of the road, and predicted concentrations decreased, with increasing distance from the road. The maximum predicted concentrations for all compounds occurred in close proximity to the road, in areas that are not continuously occupied. Maximum predicted concentrations presented occur at 30 m from the road and decrease rapidly with distance. The TSP cumulative effects concentrations decline to values below assessment guidelines at all times within approximately 200 m of the road or less (Appendix C1, Section 6.1, AMNS 2021) A cumulative effects assessment for the Project, including the Haul Road, is presented in Section 8, AMNS 2021.

Table 6.2-6: Maximum Predicted Concentrations due to Haul Road Operations

Compound	Averaging Period	Assessment Criteria Ambient Air Quality Standard) (µg/m³)	Maximum Predicted Concentration (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Combined Effect (µg/m³)	Percentage of Assessment Criteria for Combined Effect (%)
TSP	24-hour	120	**251.1**	**209**	41.7	**292.8**	**244**
	Annual	70	**84.4**	**121**	12.4	**96.7**	**138**
PM_{10}	24-hour	50	**146.3**	**293**	31.0	**177.3**	**355**
$PM_{2.5}$	24-hour	27	16.2	60	9.0	25.2	93
	Annual	8.8	5.1	58	5.7	**10.8**	**123**

Note: Bolded numbers indicate Maximum values used in Asssessment

µg/m³ - micrograms per cubic metre; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TSP = total suspended particulate, % = percent.

For all the TSP size fraction, predicted concentrations decrease rapidly with distance and predicted cumulative effects are anticipated to be below guideline values at approximately 200 m distance from the road or less.

The PM_{10} cumulative effects concentrations are more strongly affected by the assumed background concentration (which is, itself, 62% of the assessment criteria). Using this highly conservative assessment, it is estimated that PM_{10} cumulative effects concentrations would decline to values below the assessment guideline at all times within 800 m of the road. If background PM_{10} were found to be half the current estimate, this distance would drop to approximately 350 m from the road, and in many areas less, demonstrating that accurate background data are needed to fully understand this issue.

Modelled $PM_{2.5}$ from road activities alone was predicted to meet 24-hour CAAQS even at the 30 m distance, possibly exceeding annual guidelines at this maximum location, but over half of the contribution to annual concentrations was found to be from background sources. The exceedance of the annual average $PM_{2.5}$ guideline in the combined effects assessment is limited to a very few individual roadside receptors (30 m from the road), and is not predicted to occur over a wide area or at any of the sensitive receptors.

The Touquoy Mine Site is currently in operation. The primary effect of the continued use of the Touquoy Mine Site is the continued generation of dust due to haul truck traffic on the site. There are no new or additional effects to air quality anticipated to be caused by the processing of ore and the management of tailings (exhausted pit) from the Project, as no new construction or disturbance is required at the Touquoy Mine Site related to the processing of Beaver Dam ore. Air emissions generated from the Touquoy Mine Site associated with the processing of Beaver Dam ore will include emissions generated from the processing plant, including the carbon reactivation furnace, the electrowinning cells, and the barring furnace (gold smelting), as well as mobile equipment sources

[The Updated 2021 EIS (AMNS 2021) Table 6.2-11]. Air emissions will occur from the processing plant, including CO_2, ammonia, off-gassing of hydrogen cyanide, and nitrogen oxides.

The Air Dispersion Modelling Assessment completed by GHD Ltd. (2019) considered the Touquoy processing facility as an input source, as the Beaver Dam Mine Site will use the Touquoy Mine Site for its refining capabilities. The crushing and mining emissions rates remained unchanged since being previously modelled for an Emissions Summary and Dispersion Modelling Assessment however emissions estimates have been updated using standard United States Environmental Protection Agency (US EPA) AP-42 emission factors and new dispersion modelling carried out. The emissions estimates are provided in Table 6.2-7. Emissions are shown from the two most significant sources at the Touquoy Mine Site: the crushing system (comprising primary, secondary, and tertiary crushing) and the ROMTRANS, which comprise the transfer operations around the Raw Material Storage Pile, including material handling, transferring and conveying, loading the Run of Mine (ROM) stockpiles, and unloading from the ROM stockpiles.

Table 6.2-7: Estimated Particulate Emissions from Touquoy Mine Site

Activity	Emission Rate (g/s)		
	TSP	PM_{10}	$PM_{2.5}$
Crushers	9.38E-02	4.22E-02	7.81E-03
ROMTRANS	8.42E-02	3.17E-02	1.58E-02

g/s = grams per second; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TSP = total suspended particulate.

Results of air dispersion modelling for maximum predicted concentrations of emitted particulate species from the Haul Road are presented in Table 6.2-6. Maximum predicted concentrations of emitted particulate species from the Touquoy Mine Site are presented in Table 6.2-8 This table summarizes the particulate size fraction considered, the averaging period, the assessment criteria against which the results are compared, the maximum predicted concentration from the modelling, the ambient background concentration, the cumulative effect (the modelled concentration from the site added to the assumed existing background concentration for that averaging period), and the percentage of the assessment criteria for the site modelling results alone and the cumulative effects.

For this site, maximum predicted concentrations occurred at the property boundary. Predicted concentrations for all indicator compounds and averaging periods were lower than existing background concentrations, and well below relevant assessment criteria. The cumulative effects were also found to be below the assessment criteria for all compounds and averaging periods.

Table 6.2-8: Maximum Predicted Concentrations due to Touquoy Mine Site Operations

Compound	Averaging Period	Assessment Criteria Ambient Air Quality Standard) (µg/m³)	Maximum Predicted Concentration (µg/m³)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m³)	Combined Effect (µg/m³)	Percentage of Assessment Criteria for Combined Effect (%)
TSP	24-hour	120	3.1	3	41.7	44.8	37
	Annual	70	1.1	2	12.4	13.4	19
PM_{10}	24-hour	50	3.1	6	31.0	34.1	68
$PM_{2.5}$	24-hour	27	1.3	5	9.0	10.3	38
	Annual	8.8	0.4	5	5.7	6.1	70

µg/m³ - micrograms per cubic metre; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TSP = total suspended particulate; % = percent.

6.2.3 Mitigations Measures

Results of air dispersion modelling for maximum predicted concentrations of emitted particulate species from the Haul Road are presented in Table 6.2-6. Maximum predicted concentrations of emitted particulate species from the Touquoy Mine Site are presented

in Table 6.2-7. This table summarizes the particulate size fraction considered, the averaging period, the assessment criteria against which the results are compared, the maximum predicted concentration from the modelling, the ambient background concentration, the cumulative effect (the modelled concentration from the site added to the assumed existing background concentration for that averaging period), and the percentage of the assessment criteria for the site modelling results alone and the cumulative effects.

For this site, maximum predicted concentrations occurred at the property boundary. Predicted concentrations for all indicator compounds and averaging periods were lower than existing background concentrations, and well below relevant assessment criteria. The cumulative effects were also found to be below the assessment criteria for all compounds and averaging periods (Table 6.2-9).

Table 6.2-9: Maximum Predicted Concentrations due to Touquoy Mine Site Operations

Compound	Averaging Period	Assessment Criteria Ambient Air Quality Standard) (µg/m^3)	Maximum Predicted Concentration (µg/m^3)	Percentage of Assessment Criteria (%)	Background Concentration (µg/m^3)	Combined Effect (µg/m^3)	Percentage of Assessment Criteria for Combined Effect (%)
TSP	24-hour	120	3.1	3	41.7	44.8	37
	Annual	70	1.1	2	12.4	13.4	19
PM_{10}	24-hour	50	3.1	6	31.0	34.1	68
$PM_{2.5}$	24-hour	27	1.3	5	9.0	10.3	38
	Annual	8.8	0.4	5	5.7	6.1	70

µg/m^3 - micrograms per cubic metre; PM_{10} = coarse particulate matter; $PM_{2.5}$ = fine particulate matter; TSP = total suspended particulate; % = percent.

6.2.4 Mitigation

Mitigation measures used to reduce and control air pollutants during construction, operation, and decommissioning phases are outlined in Table 6.2-10. A draft Fugitive Dust Control Plan is provided in Appendix C.3. The overall goal of this Plan is to provide a framework for the control of fugitive dust which will enable protection of the health and safety for mine workers and the public, as well as to mitigate potential effects to the natural environment (e.g., impacts to flora and fauna). The Fugitive Dust Control Plan will include procedures for inspection, monitoring, and reporting.

Table 6.2-10: Mitigation for Air

Project Phase	Mitigation Measure
C, O	Use wet suppression controls on unpaved surfaces.
C, O	Utilize paved surfaces where available.
C, O	Speed reduction.
O	Apply stabilized covers on inactive stockpiles.
O	Use mechanical sweeper on paved surfaces to prevent dust from remobilizing.
O	Apply dust suppressants, when and where practicable, to target 80 to 90% effectiveness.
O	Size haul vehicles appropriately to minimize trip frequency.
O	Implement appropriate dust suppression measures for crusher trains and associated activities/stockpiles.
O	Cover haul trucks to minimize dust during transportation between the mine site and the Touquoy facility.
O	Implement Dust Suppression Plan as part of the Fugitive Dust Control Plan (Appendix C.3 of the AMNS 2021).
O	A procedure, including a response plan, will be available for public to be able to register complaints regarding dust concerns.
CL	Stabilize slopes on inactive stockpiles to a safe and long-term angle of repose.
CL	Use soil and organics stockpiles for final capping and stabilization. Hydroseed as required.

Notes: C = construction; O = operations; CL = active closure (decommissioning and reclamation).

6.2.5 Significance of Residual Effects

The predicted residual environmental effects of Project on air quality are assessed to be adverse, but not significant. The overall residual effect of the Project on air quality is assessed as not likely to have significant adverse effects after mitigation measures have been implemented. A significant adverse effect for air has not been predicted for the Project for the following reasons, with consideration of the ecological and social context within the LAA of the Project:

- During Construction and Closure: Air concentrations will be elevated above baseline conditions within the mine footprint for limited periods but for short duration (<1 year for construction and 2 for active closure). Air concentrations (i.e., TSP, PM_{10}, $PM_{2.5}$) along the Haul Road are predicted to be within guidelines. Air effects are reversible once mining operations, including the transport of ore along the Haul Road and active closure activities are completed.
- During Operations: Air concentrations will be elevated above baseline conditions within the mine footprint for 5 years during operations. Air concentrations (i.e., TSP, PM_{10}, $PM_{2.5}$) along the Haul Road are predicted to be within guidelines as long as dust mitigation (i.e., 80 to 90% dust mitigation) are applied. Air effects are reversible once mining operations, including the transport of ore along the Haul Road.
- During Operations: Human Exposure to COPC from Dust Deposition for the Beaver Dam Mine Site are predicted to meet guidelines within the LAA. Adverse health effects from COPCs, either non-carcinogens or carcinogens, are not anticipated and considered negligible. Air effects are reversible once mining operations are completed.

6.3 Light

6.3.1 Baseline Conditions

The proposed Project is located in a historical mining area surrounded by forest, waterbodies, watercourses and wetlands. The nearest residential receptor to the Beaver Dam Mine Site is the Beaver Lake IR 17 located approximately 5 kilometres (km) southwest. A proposed haul route for transporting ore will connect the Beaver Dam Mine to the Touquoy Processing Plant, located approximately 30 km southwest.

The existing baseline light conditions around Beaver Dam Mine Site, Haul Road, and surrounding area are similar to that of the Touquoy Mine Site background conditions (CRA 2007a) due to the proximity, remote, rural, and mostly wooded location. Ambient nighttime light conditions are minimal and typical of a rural area. The largest artificial light sources near the proposed Project are from the closest residences, the Beaver Lake IR 17, and the occasional all-terrain vehicle. The largest artificial light sources along the Haul Road are from Beaver Lake IR 17, vehicles on Highway 224, the community of Mooseland, and other rural residences nearby. As such, additional on-site baseline light monitoring was not required to support the light impact assessment (Appendix D.1 of the Updated 2021 EIS [AMAN 2021]). The Beaver Dam Mine Site, Haul Road, background conditions for the Touquoy Mine Site (CRA 2007a), and surrounding area also fall under the classification for rural areas, small villages, or relatively dark urban areas: “E2 Low District Brightness Areas” (CRA 2007a).

6.3.2 Anticipated Effects and Changes to the Environment

The Institute of Lighting Professionals (ILP) developed an Environmental Zone classification system (ILP 2020) whereby the existing ambient light levels at a site are used to determine the recommended maximum amount of light trespass to nearby receptors. The classification for rural areas, small villages, or relatively dark urban locations is "E2 Low district brightness areas". Based upon this classification, the light trespass limit at an off-site receptor after curfew (i.e., typically considered to be 11 p.m.) is 1 lux, which is the accepted equivalent to moonlight. The after curfew (i.e., post-curfew: between 11 p.m. and 7 a.m.) limit was used to assess the impact of lighting from the proposed mine as mining operations under full-scale operation are scheduled to be 24 hours per day.

The ILP trespass limit at an off-site receptors before curfew (i.e., before 11 p.m.) is 5 lux (ILP 2020). AMNS has indicated that trucking transport along the Haul Road will occur approximately 16 hours a day, and not during post-curfew hours (i.e., not between

the hours of 11 p.m. and 7 a.m.). No other proposed lighting will exist along the Haul Road. As such, the light trespass at receptors along the haul route was evaluated against the before curfew (pre-curfew) limit of 5 lux.

The nearest permanent residential receptor to the mine is the Beaver Lake IR 17 (R2), at a distance of approximately 5 km southwest from the Beaver Dam Mine Site boundary. Five other residential receptors, farther away from the mine and located along Highway 224, are also considered; Marlborough property (R1), the cottage on crownland (R3), the Hobbs property (R4), the McLeod property (R5) and the Smith property (R6). These six residential receptors were mainly used in the analysis of the impacts of light trespass from the mine.

Sensitive receptors were also considered along the proposed Haul Road. Three seasonal residences located within 320 m of the haul route were assessed for light impacts from hauling trucks travelling along the route; the Deepwood Estates property (R7), the Musquodoboit Lumber Co property/John Dickson Lease (R8) and the Lloy property (R9). These three residential receptors were mainly used in the analysis of the impacts of light trespass from transport trucks travelling along the haul route. As previously mentioned, the illuminance from the haul route was evaluated against pre-curfew limits due to the hauling schedule.

Marlborough property (R1), the Hobbs property (R4), McLeod property (R5) and the Smith property (R6) were assessed for impacts of light trespass from both the transport trucks travelling along the haul route during Pre-Curfew Conditions and light trespass from the mine during Pre-Curfew and Post-Curfew conditions. Comparison of light levels at receptors (AMNS 2021) is presented in Table 6.3-1.

Table 6.3-1: Comparison of Light Levels at Receptors (2021)

Receptors	Illuminance (lux)		ILE Guidance Limit (lux)[a]		Percentage of Guidance Criteria	Post-Curfew
	Pre-Curfew[b]	Post-Curfew	Pre-Curfew[b]	Post-Curfew	Pre-Curfew[b]	
R1	8.49E-01	6.86E-02	5	1	16.97%	6.86%
R2	8.21E-02	8.21E-02	5	1	1.64%	8.21%
R3	7.88E-02	7.88E-02	5	1	1.58%	7.88%
R4	1.45E+00	6.57E-01	5	1	29.05%	6.57%
R5	8.06E-02	5.89E-02	5	1	1.61%	5.89%
R6	7.55E-02	5.84E-02	5	1	1.51%	5.84%
R7	4.88E+00	-	5	n/a[c]	97.5%	-[c]
R8	7.62E-02	-	5	n/a[c]	1.52%	-[c]
R9	1.39E+00	-	5	n/a[c]	23.73%	-[c]

(a) Based on assumed classification of the area as Environmental Zone E2 – low district brightness areas – Source: Guidance Notes for the Reduction of Obtrusive Light, ILE 2020.

(b) Curfew = the time after which stricter requirements for the control of obtrusive light will apply. If not defined by the local planning authority, the ILP suggest 11:00pm – Source: ILE 2020.

(c) Haul road operations will only occur between 7 a.m. – 11 p.m. (during Pre-Curfew hours).

Lights will be installed in active construction and operational areas and at the Beaver Dam Mine Site, including site roads. Lights will be operational at all times to provide for a safe working environment. Vehicle headlights moving around the site as well as entering and exiting the site will also be introduced. Temporary lighting systems (including portable lights) may be used during construction to illuminate specific areas and ensure the safety of staff.

The calculated light levels at the identified sensitive receptors are below the limits recommended by the ILP guidelines during both post- and pre-curfew conditions (ILP 2020).

The predicted illuminance levels represent the worst-case operating conditions of the mine. The assessment considers all the mobile equipment at the mine would be in use at the same time, illuminating towards receptors. The areas surrounding the Site are wooded with varying topography and inhibit the spread of light. It was conservatively assumed for screening purposes that 50 percent of the light will not reach the receptors due to directionality and line of sight obstructions. The amount of light blocked by the surrounding woodland and topographic changes, however, will likely be much greater than this (i.e., >90 percent), especially during the seasons when deciduous trees are leaf-on. The distance to sky glow dissipation is presented in Table 6.3-2.

Table 6.3-2: Distance to Sky Glow Dissipation

Component	Total Luminous Flux (Lumens)	Distance to Below 5.0 Lux (m)	Distance to Below 1.0 Lux (m)	Distance to Below 0.1 Lux (m)
Beaver Dam Mine Site (Based on 50% incident light)	5165700	719	1607	5082
Haul Road (Based on 50% incident light)	15600	39	88	279

Notes: 1.0 lux is approximately the brightness of a full moon under a clear sky.
0.1 lux is less bright than a full moon, but brighter than a moonless night.
On particularly overcast nights, sky glow may be visible farther due to reflection from low cloud cover.

The assessment of light impacts along the Haul Road was completed by considering a “worst case” scenario when two trucks are closest to each receptor and shining light towards the receptor. Because receptors along the Haul Road are not located on any road bends, with limited line of site to the travelling trucks, the assessed light impacts to these receptors were likely overestimated (Appendix D.1 of AMNS [2021]).

The calculated light levels at all receptors are below the limits recommended by the ILP guidelines during both pre- and post-curfew conditions (i.e., between 11 p.m. and 7 a.m. and before 11 p.m.; Table 6.3-1). The assessment considers worst-case operating conditions, for example, if all mobile equipment was in use at the same time and illuminating towards the receptors and the potential for light from both the Beaver Dam Mine Site and the Haul Road trucks to affect a receptor in a cumulative way.

The calculated light levels from the Haul Road are also below the limits recommended by the ILP guidelines.

The additional service truck round trips along the Haul Road are not anticipated to change the assessment results. The worst-case would still occur when two trucks are close to a single receptor and shining lights toward that receptor. As the road is only 2 lanes, only two trucks could approach a receptor at one time (one from each direction). During daylight hours, the truck lights are insignificant compared to ambient light levels, in the dawn, dusk and evening hours (until 11 PM when curfew is implemented), potential light impacts will be as presented in Table 6.3-1.

The predicted light spill anticipated to occur at the identified points of reception (Camp Kidston, Scraggy Lake Area and the nearest residence) ranges between 0.0587 and 0.294 lux, well below the established 1 lux threshold used at the Touquoy Mine Site for the Touquoy Gold Project (CRA 2007a).

The primary effect of the continued use of the Touquoy Mine Site is the continued lighting of facilities and vehicular traffic during the processing of Beaver Dam ore. There are no new or additional effects from light anticipated to be caused by the processing of ore and the management of tailings from the Project that would affect the conclusions presented above for the Touquoy Mine Site based on the Touquoy Gold Project evaluation of light.

Effects to birds, wildlife and Mi’kmaq of Nova Scotia from light are further discussed in Sections 6.10, 6.11, and 6.13 of the Updated 2021 EIS (AMNS 2021).

Although the light impacts from the Touquoy Mine Site and Beaver Dam Mine Site were not evaluated in combination, it is expected that the ILP limits at nearby receptors will not be exceeded from light trespass at both facilities. This is expected due to the low illuminance levels assessed at each receptor in both assessments and due to the large distances from the receptors to the sources

of light at the other facilities. For example, the Beaver Lake IR 17 sits on the edge of the potential sky glow dissipation to background point (approximately 5 km) from Beaver Dam Mine Site but over 13 km from Touquoy Mine Site so it would be well outside the sky glow of the Touquoy Mine so would not be impacted by both sites. Conclusions relating to potential cumulative effects are described in the Project Cumulative Effects Section 8 of the Updated 2021 EIS (AMNS 2021).

In a previous assessment under a separate cover, light impacts from the Touquoy Processing Plant were assessed against limits recommended by the ILP guidelines (2020). This assessment determined that light impacts from the Touquoy facility were also below the ILP limits.

6.3.3 Mitigation

The use of lights will be limited to the amount necessary to ensure safe operation, with the recognition that excessive lighting can be disruptive to wild species. Light pollution will be reduced by installing downward- facing lights on site infrastructure and Mine Site roads, as well as at the Touquoy Mine Site. Wherever possible, motion-sensing lights will be installed to ensure lights are not turned on when they are not necessary. Only direct and focused light will be used for worker safety. Mitigation measures for light is presented in Table 6.3-3.

Bird collisions with Project lighting and subsequent mortality are expected to be rare but if it occurs, it would not likely have significant effects on migrating bird populations. Efforts will be made to reduce the effect of lighting on migrating birds. Practices will be reviewed on an annual basis for BAPs, including illumination. No additional monitoring is recommended for the Project related to night-time light levels.

Ore will be hauled to the Touquoy Mine Site for approximately 16 hours per day during the operation phase. Ore hauling will not be occurring on the Haul Road during the post-curfew period. Maintenance activities may occur.

Table 6.3-3: Mitigation for Light

Project Phase	Mitigation Measure
C	Temporary lighting will be directly focused on work areas and shielded where practicable to avoid light trespass.
C, O, CL	Use of only downward-facing lights on site infrastructure and Mine Site roads.
C, O, CL	Install motion-sensing lights, where practicable.
C, O, CL	Only use direct and focused light when needed for worker safety.
C, O, CL	All floodlights will employ full horizontal cut-off, as appropriate.
C, O, CL	Lighting not in use will be turned off, whenever practicable.
C, O, CL	Site perimeter lighting will be directed to minimize light offsite light trespass.
C, O, CL	Utilize efficient sources of light to reduce overall magnitude of light, wherever practicable.
C, O, CL	A procedure, including a response plan, will be available for public to be able to register complaints regarding light concerns.

Note: C = construction; O = operations; CL = active closure (decommissioning and reclamation).

6.3.4 Significance of Residual Effects

During the construction and operation of the Beaver Dam Mine Site and Haul Road, ambient lighting will increase, noticeably at first as an offset to the original undeveloped area. Increases in and the subsequent effects of light on potential receptors can be minimized through effective lighting design and mine operation schedule. Ongoing monitoring of site activity will inform on areas where light reductions are warranted.

Given the distance of the Beaver Dam Mine Site and Haul Road to surrounding properties/ residences, the natural topography and vegetation, the modelling has shown no significant adverse effects due to light trespass into a receptor from the site or Haul Road will be experienced.

The predicted residual environmental effects of Project on ambient light are assessed to be adverse, but not significant. The overall residual effect of the Project on light is assessed as not likely to have significant adverse effects after proven mitigation measures have been implemented.

A significant adverse environmental effect for light has not been predicted for the Project for the following reasons, with consideration of the ecological and social context of the RAA surrounding the Project:

- **During Construction:** Light will be elevated above baseline conditions potentially extending into the RAA. However, light spill will be limited by surrounding topography prior to reaching the nearest receptors. Given the remote location of the Project the likelihood of mobile receptors being regularly in close proximity to light generation sites is very low. Light trespass has been qualitatively assessed during construction and is predicted to be lower than during operations, which was modelled and is described below.
- **During Operations:** Light spill is predicted to extend a maximum of 5 km from the Beaver Dam Mine Site into the RAA for the Project. However, light levels will be limited by surrounding topography prior to reaching the nearest receptors and given the remote location of the Project the likelihood of mobile receptors being regularly in close proximity to light generation sites is very low.
- **During Closure:** Light levels will be elevated above baseline conditions potentially extending into the RAA during decommissioning activities, then drop to baseline conditions for the post closure period. Light trespass has been qualitatively assessed during Closure and is predicted to be lower than during operations, which was modelled and is described above.

6.4 Greenhouse Gases

6.4.1 Baseline Conditions

The Beaver Dam Mine Site is located in a relatively undeveloped rural region of Nova Scotia with infrequent industrial operations that would contribute to GHG emissions. Existing GHG emissions would be generated primarily through recreational vehicle usage, local traffic, and limited forestry operations.

The ECCC document, "National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada – Part 3" (ECCC 2020), the total GHG emissions from Nova Scotia were identified to be 17,000 kt CO_2e during 2018.

Accurate tracking of GHG emissions is an important part of assessing Canada's overall environmental performance. In March 2004, the Government of Canada announced the introduction of the Greenhouse Gas Emissions Reporting Program. All facilities that emit the equivalent of 50 kilotonnes (kt) or more of GHGs in carbon dioxide equivalent units (CO_2^e) per year are required to submit a report. Facilities with emissions falling below the reporting threshold of 50 kt per year can voluntarily report their GHG emissions. AMNS voluntarily reports GHG at the Touquoy Mine and will continue to do so should Beaver Dam Mine Project be approved.

In 2009, Nova Scotia Environment (NSE) released the Greenhouse Gas Emissions Regulations, made under Section 112 of the *Environment Act*, establishing GHG emission caps on the electricity sector. These regulations apply to any facility located in the province of Nova Scotia that emits greater than 10 kt of CO_2e GHGs in a calendar year. The facility owner must submit an annual report no later than March 31 of the following year. AMNS reports on GHG at Touquoy as required in the Industrial Approval.

6.4.2 Anticipated Effects and Changes to the Environment

The primary sources of GHG emissions were considered for each phase of the Project (construction, operation, and active closure). The primary sources of emissions from each work phase are stationary and mobile fuel combustion sources. These fuel combustion GHG-specific emissions include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). During the construction and operation phase of the Beaver Dam Mine Site, GHG emissions that would be generated from explosives used in rock blasting were also considered. For rock blasting, the explosive considered is emulsion (30% Ammonium Nitrate Fuel Oil [ANFO] and 70%

emulsion), which is an explosive used by AMNS at other project sites. Under ideal conditions, the sole GHG emission from this explosive is CO_2, though small amounts of CH_4 and N_2O may also form as a result of the combustion. For the purposes of these emission estimates, it has been assumed the emulsion will be combusting under ideal conditions, with the primary CO_2 emissions being included only.

Other key assumptions used as part of the GHG emission estimates include:

- Sources of stationary and mobile combustion are operational 24 hours a day during the mine operation phase and during the construction and decommissioning phases would be limited to 16 hours. Down-time for equipment is assumed to occur up to 10 days out of a year due to weather conditions. This is a conservative estimate as additional downtime would be required for equipment maintenance/repair during this period.
- The primary source of GHG emissions is diesel fuel use. Estimates for diesel fuel use have been made for the construction, operation and active closure phases. Diesel emissions occur from mine diesel power generators and from the haul road trucks.
- The emulsion use during the operation phases has been estimated by AMNS based on prior mining experience at similar sites to be approximately 3,744 tonnes/year.
- The projected GHG emission estimates for the life of the Project, based on the available information, are presented in Table 6.4-1. It is expected that as the phase milestone activities approach, the information driving the emissions estimates below can be refined based on known rather than projected data.
- GHG emissions from Nova Scotia reported in 2018 were 17,000 kt CO_2^e (ECCC 2020). Based on the Project GHG assessment, in an average full year of operation of the Project (most GHG-intensive phase), the site would emit 8.13 kt CO_2^e - approximately 0.05% of the reported 2018 GHG total for Nova Scotia.

Table 6.4-1: Predicted Greenhouse Gas Emissions (Beaver Dam Mine Site and Haul Road)

Phase	Period	Greenhouse Gas	Phase Emissions	
			(tonnes)	Tonnes CO_2^e
Primary Haul Road and Mine Construction	2022	CO_2	2,408.16	2,426.19
		CH_4	0.05	-
		N_2O	0.05	-
Operation	2023 to 2027	CO_2	39,928.46	40,638.55
		CH_4	1.01	-
		N_2O	2.30	-
Active Closure	2028 to 2029	CO_2	8,970.17	9,114.01
		CH_4	0.21	-
		N_2O	0.47	-

CH_4 = Methane; CO_2 = Carbon dioxide; CO_2e = Carbon dioxide equivalents; N_2O= Nitrous Oxide; - = not applicable.

At the Touquoy Mine Site, GHG emissions will be generated from light and mobile fuel combustion sources, as well as emissions from the processing plant during the period of full-scale operations (2022 to 2029). The projected annual GHG emission estimates for the Touquoy Mine Site, based on the 2019 GHG emissions reported to the NPRI, is presented in Table 6.4-2.

GHG emissions from Nova Scotia reported in 2018 were 17,000 kt CO_2^e (ECCC 2020). The 2019 GHG emissions for the Touquoy Mine Site was 13.56 kt CO_2^e - approximately 0.08% of the reported 2018 GHG total for Nova Scotia.

In an average full year of operation of the Project (most GHG-intensive phase), including operation of the Beaver Dam Mine Site, hauling of ore, and the processing of ore at the Touquoy facility, the Project facilities would emit 21.69 kt CO_2^e - approximately 0.128% of the reported 2018 GHG total for Nova Scotia (ECCC 2020).

Table 6.4-2: Estimated Greenhouse Gas Emissions (Touquoy Mine Site)

Phase	Period	Greenhouse Gas	Phase Emissions	
			(tonnes)	Tonnes CO_2e
Maximum Annual Emissions	2022 to 2029	CO_2	13,183.2	13,560.8
		CH_4	1.3	-
		N_2O	0.2	-

CH_4 = Methane; CO_2 = Carbon dioxide; CO_2e = Carbon dioxide equivalents; N_2O= Nitrous Oxide; - = not applicable.

6.4.3 Mitigation

AMNS will take steps to minimize GHG emissions associated with the Project, through activities such as reducing engine idling, where possible, and considering the use of more fuel-efficient vehicles and equipment. GHG emissions will also be minimized through the adoption of good maintenance practices, including undertaking regular maintenance as specified by suppliers. A review of emissions will be completed on an annual basis. AMNS will seek to use Best Available Practices (BAP) that will evolve over time.

Mitigation measures for greenhouse gasses are presented in Table 6.4-3.

Mitigation measures at the Touquoy Mine processing facility are also described in the Air Quality Management Plan that was completed as part of the Industrial Approval application for this facility. These mitigation measures include regular equipment maintenance, choosing more efficient equipment and vehicles, and reduction of vehicle travel distances and idling where possible. These mitigation measures are anticipated to continue throughout the life of the Project.

Table 6.4-3: Mitigation for Greenhouse Gases

Project Phase	Mitigation Measure
C, O, CL	Limit engine idling, where practicable
C, O, CL	Implement fuel efficiencies, where practicable
C, O, CL	Implement preventative maintenance plans for all mobile and stationary equipment.
C, O, CL	Use renewable energy where reasonable (e.g., solar-powered lights)

C = Construction; O = Operations; CL = active closure (decommissioning and reclamation).

6.4.4 Significance of Residual Effects

The predicted residual environmental effects of Project development and production on the atmospheric environment are assessed to be adverse, but not significant. The overall residual effect of the Project on GHGs is assessed as not likely to have significant adverse effects after mitigation measures have been implemented.

A significant adverse environmental effect for 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_2^e - 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.

6.5 Geology, Soil, and Sediment Quality

Geology, soil, and sediment as a VC is centered on: the potential for acid rock drainage (ARD) to be produced during exposure of Halifax Group or sulphide–bearing bedrock to oxygen and surface water runoff, and the potential for contamination of soil and sediment from mining activities. ARD is provincially regulated through the *Sulphide Bearing Material Disposal Regulations*.

The Beaver Dam Mine Site is in an area of low topographic relief at 140 masl with scattered drumlins reaching 165 to 175 masl and Cameron Flowage channeling through a topographic low of 130 masl. Drainage is to the southeast along a number of poorly drained streams, shallow lakes, and wetlands.

6.5.1 Baseline Program

Each sample was analyzed for metals. Arsenic exceeded Canadian Council of Ministers of the Environment (CCME) Probable Effect Level (PEL) at the majority of locations and arsenic, mercury, cadmium, and copper exceeded CCME Interim Sediment Quality Guidelines (ISQG) at select locations.

Arsenic (As), a naturally occurring element in the earth's crust, is found throughout the environment; therefore, in a gold mining area rich in arsenic mineralization (e.g., arsenopyrite), high As concentrations indicate naturally occurring arsenic. Mercury (Hg) occurs in all types of rocks and is present in the atmosphere as metallic mercury vapours and as volatized organic mercury compounds. The Hg detections make further monitoring warranted but there are no indications of historic tailings at the Beaver Dam mine site and no indications that Hg was used in any of the historic stamp mill or other crude processing of ore.

A sediment quality investigation at the Touquoy Mine Site consisted of the collection of ten sediment samples from the site and surrounding area watercourses in January 2007 as part of the EA for the Touquoy Gold Mine. Since this mine construction commenced, surface and groundwater sampling have occurred as per its regulatory approvals.

Analysis of the historical in-situ ore and waste rock for ARD potential was completed at the Beaver Dam Mine site. Results indicated that the majority of the deposit is net acid consuming; however, there are areas that may require specific handling and disposal due to the sulphur content and resulting acid generating potential. The remainder of the samples had net acid consuming potential.

6.5.2 Project Activities Interactions and Effects

In general, limiting sedimentation and erosion from occurring will mitigate these interactions. Geology and soils outside the disturbed area have no potential for impacts. Quality of sediment is a valued part of aquatic habitats and mitigation measures will be implemented to protect sediment from potential impacts related to Project activities. Any potential ARD would interact with downgradient receiving water.

6.5.3 Residual Effects and Significance

Residual effects for geology, soils and sediment are not anticipated. The geology of the site and the soils are currently disturbed in many areas of the site. Sediment has the potential for residual effects, although none are anticipated. The mitigation and monitoring programs have been designed to avoid and monitor the potential long term residual impacts, including any potential ARD. No significant cumulative effects are expected.

6.6 Groundwater Quality and Quantity

Groundwater quality and quantity as a VC is centered on its potential ecological value in recharging surface water. The groundwater assessment for the Beaver Dam Mine Site has been updated to reflect additional hydrogeologic data collected since the Revised 2019 EIS (AMNS 2019), updates to Project layout, additional Contaminant of Concern (COC) source terms and comparison of predicted COC concentrations in groundwater to NSE Tier 1 EQS for potable groundwater, GCDWQ or NSE Tier 2 PSS for

groundwater discharge to surface water (>10 m) (Section 6.6.7.1) and in response to Round 2, Information Requests (IR2s) from the Impact Agency of Canada (IAAC; formerly the Canadian Environmental Assessment Agency [CEAA 2019]) and Nova Scotia Environment (NSE 2019). Responses to theses IR2s include: CEAA-2-35, NSE-2-2, NSE-2-35, NSE-2-135, NSE-2-145, NSE-2-150, NSE-2-166.

The hydrogeological model has been updated to address IR2s and provide additional details on groundwater predictions. The maximum, not average, simulated concentrations in groundwater discharge are used to evaluate potential health risks from the consumption of surface and/or groundwater that may be impacted by mining activities. In response to IR2 CEAA-2-41, only advection and dispersion were considered for contaminant transport to provide a conservative bias for predicted COC concentrations, which is Appendix F.5 (Hydrogeologic Modelling Report). The Post-closure (PC) transport simulations were run for 500 years to approximate a steady-state condition thereby simulating the maximum extent and concentration of potential COCs. For End-of-Mine (EOM), it is assumed the EOM COC sources will persist for approximately double the predicted duration to provide a further conservative bias towards simulating the maximum extent and concentration of potential COCs.

Groundwater drawdown predictions were updated to include cross-sections through the Beaver Dam open pit showing simulated drawdown (Figures 7.4a through 7.6b in Appendix F.5 [Hydrogeologic Modelling Report]). Updates in predicted drawdown from 2019 is attributed to changes in proposed site infrastructure. In general, there was a greater amount of simulated drawdown south of the pit in the 2019 that related to the proposed unlined surface water management ditches surrounding an eastern waste rock pile. The eastern waste rock pile had been removed therefore, the simulated drawdown south of the proposed pit decreased as there was no proposed infrastructure in that area. The simulated drawdown north of the proposed pit is similar between the 2019 and 2021 EIS. During PC, a greater amount of drawdown is simulated in the vicinity of the PAG waste rock stockpile due to the proposed engineer cover that will limit infiltration over the PAG waste rock stockpile.

A seepage face is also simulated along the pit walls at depth and porosity assessment are provided to evaluate potential impacts to overall water balance including inputs to changes in baseflow in the Cameron Flowage/Killag River at EOM and PC (i.e., responses to IR2s CEAA-2-14, CEAA-2-41, CEAA-2-42, NSE-2-162, NSE-2-163, NSE-2-190). The estimated total average annual flow in Cameron Flowage is 103,881 cubic metres per day (m^3/d). The estimated average annual baseflow for Cameron Flowage is 23,426 m^3/d, which is approximately 23% of the total average annual flow (Section 6.6.4.2.1). The estimated average annual baseflow in Cameron Flowage provides a baseline condition to compare predicted baseflow at the end of mine life and post-closure (Appendix F.5). The simulated change in baseflow throughout the Cameron Flowage watershed is presented in Appendix F.5 (Hydrogeologic Modelling Report) Table 7.4. The simulated baseflow reduction ranges from 677 to 754 m^3/d at EOM and from 446 to 620 m^3/d at PC. The range in baseflow reduction represents 2 to 3% of total baseflow in the Cameron Flowage watershed and is under 1% of the total average annual flow in Cameron Flowage (Section 6.6.4.2.1).

An updated assessment at Touquoy has been undertaken based on additional sampling as well as comparisons with NSE Tier 1 EQS for potable groundwater GCDWQ or NSE Tier 2 PSS for groundwater discharge to surface water (NSE-2-145). The updated Groundwater Flow Solute Transport Model (Appendix F.6, AMNS 2021) has been updated to included additional monitoring data (NSE-2-146) along with Moose River Accumulation Study (Appendix F.8, AMNS 2021) to assess potential impacts to Moose River from disposal of Beaver Dam Mine Tailings. The calculated mean annual baseflow in Moose River is 28,814 m^3/d, and the mean summer baseflow for 2019 and 2020 are 9,848 and 9,143 m^3/d, respectively (Section 6.6.4.2.2, AMNS 2021). As discussed, in Section 6.6.7.1, in the summer months, the dewatering of the Touquoy open pit occurs at a rate of 444 m^3/d, which is anticipated to reduce the flow in Moose River by 339 m^3/d. This accounts for approximately 1.7% of the mean summer flow at Moose River of 18,938 m^3/d at SW-2From a hydrological and hydrogeological perspective, the potential disconnection between bedrock aquifers and surface water in the area may limit groundwater recharging or being recharged by surface water and wetlands. In a mine dewatering scenario, groundwater may experience draw down and could subsequently adversely affect surface water quantity in Cameron Flowage.

Groundwater quality and quantity also has a socio-economic importance due to its potential to provide potable water through drilled and dug wells. The nearest domestic well is approximately 6 km southwest of the Beaver Dam mine site.

6.6.1 Baseline Program

The site is located in a rural, sparsely populated area of Halifax County. The nearest domestic well is 5.5 km southwest from and up-gradient of the site (residence along Hwy 224). Domestic wells are a mix of drilled and dug wells. Domestic water supplies in the area are typically vulnerable to surface water entry and associated coliform bacteria issues and elevated iron and manganese concentrations (Lin 1970). The Beaver Lake IR 17 is located approximately 5 km south of the mine site and 3 km from the nearest point of the Haul Road. Domestic wells located along Hwy 224 are a mix of drilled and dug wells based on a review of the NS Well Log Database. Drilled wells are often over 60 m deep, are typically fed by one or two sets of discrete water-bearing fractures and have relatively low yields, typically 5 to 10 litre per minute. Static groundwater levels range from 3 m to 12 m below ground.

The site hydrogeology consists of a fractured rock aquifer system which is overlain by a thin aquifer in the till. Based on previous studies of the hydrogeology of this deposit and others in the area, the degree of hydraulic connection amongst the smaller bedrock fracture systems is likely poor to moderate, and the main zones that are capable of storing and transmitting relatively large amounts of groundwater are the larger scale faults. The water table is close to the surface across the mine site, reflecting flat lying terrain, low permeability bedrock and the excess of annual rainfall over evaporation. The bedrock sequence and part of the overlying tills will be saturated with groundwater under ambient conditions.

The historic and recent data from the site provided a complete picture of the physical hydrogeology of the site as well as possible interactions that were examined as part of the groundwater VC. Baseline conditions at the Beaver Dam Mine Site have been updated in the Hydrogeologic Modelling Beaver Dam Mine Site Report (Appendix F.5, AMNS 2021) to include additional baseline sampling (Appendix F.4). A combination of changes in Project Description (Section 2, AMNS 2021) and specifically the mine layout Figure 2.2-1 along with additional baseline sampling have resulted to updates to the groundwater modelling predictions (from the Revised 2019 EIS, AGC 2019).

To confirm the average annual baseflow estimates, preliminary stage-discharge relationships were developed for six gauging locations using available flow monitoring measurement events and corresponding surface water elevations measured at the gauging locations. The preliminary stage-discharge relationships will be further refined as additional flow monitoring measurement events are conducted. The preliminary stage-discharge relationships were applied to estimate stream discharge (flow) at each of the six gauging locations. Two gauging locations, SW2A and SW1A, are located immediately upstream and downstream of Cameron Flowage, respectively, and were selected to verify the total flow and baseflow estimates calculated using the nearest four hydrometric stations. Consistent with the method applied for the nearest four hydrometric stations, a recursive digital filter (Eckhardt, 2005) as implemented in WHAT: Web based Hydrograph Analysis Tool (Lim et al. 2005) was applied to the average daily discharge data for SW2A and SW1A to estimate baseflow at those gauge locations. The average annual baseflow estimated for SW2A and SW1A is 24,686 m^3/d, with an average annual total flow of 112,420 m^3/d. Based on these values, the average annual baseflow to at SW2A and SW1A represents approximately 22% of the total average annual flow at those gauge locations. The estimated average annual baseflow at SW2A and SW1A is within approximately 5% of the estimated average annual baseflow estimated from the nearest four hydrometric station for Cameron Flowage. This comparison verifies that the estimated average annual baseflow from the nearest four hydrometric stations is reasonable and provides an appropriate baseline conditions against which to compare the relative predicted baseflow at end of mine life and post-closure.

A series of geotechnical/hydrogeological drill holes were sampled at the Touquoy Mine Site for groundwater quality in 2006. Samples were analyzed for general chemistry and metals at this time. Since 2016, groundwater monitoring has been ongoing at the Touquoy Mine Site as per regulatory requirements (32 pairs of wells). Results indicate that the groundwater is slightly basic with an elevated hardness. Certain metals such as aluminum, arsenic, manganese, strontium and zinc are elevated relative to guidelines for drinking water in Canada but within ranges found in groundwater in Nova Scotia. Given that the geology at Beaver Dam is similar to that at the Touquoy Mine Site, it is anticipated that similar hydrogeological conditions across the entire Project area.

The 2015 Peter Clifton & Associates Ltd. report (Appendix F.1 of AMNS 2021) indicates that groundwater occurs at shallow depths at the Beaver Dam Mine site. Cameron Flowage is likely an area of groundwater discharge. Groundwater can be expected to

seep into an open pit developed at the Beaver Dam Mine Site through the surficial glacial till deposits, and through fractures and structures in the bedrock. As dewatering progresses and groundwater levels in the vicinity of the open pit are lowered, some surface water bodies which are presently groundwater discharge areas may become areas of groundwater recharge.

Jacques Whitford and Associates (Appendix F.2 of AMNS 2021) reported that during site work completed in the 1980s, most of the diamond drill holes had static groundwater levels with 0.3 m of ground surface. Drill holes that penetrated the Mud Lake Faults zone were often flowing, albeit at very low rates (less than 5 litres per minute [L/min]). This indicates an area where bedrock groundwater is discharging upward into the overlying wetland systems. The same observation was made by GHD during field work completed to outline the surface water-groundwater interaction, which included the installation of sand points at select locations where groundwater discharge was suspected, to outline the groundwater-surface water relationships at the site.

6.6.2 Project Activities and Groundwater Quality and Quantity Interactions and Effects

Groundwater and surface water at the site interact in many areas with the main control being topography. Areas of recharge are typically the higher areas and areas of discharge being in the lower areas. Evidence of groundwater discharge to the surface water systems are abundant and mainly appear in the form of seeps and wetlands. The site has features that create these abundant interactions such as high precipitation (1.4 metres per year), shallow bedrock that is relatively impermeable, permeable soil and till units and undulating topography. Effects will be short term and limited to the local area of the mine site.

As identified in the Touquoy Gold Project Focus Report (CRA 2007a), the Touquoy Mine Site is located within a metamorphic bedrock hydrostratigraphic unit, cross cut by structural features (faults, anticlinal axes) that may represent separate hydrostratigraphic units. Groundwater inflows and outflows will be controlled by these relatively low permeability and fracture-controlled bedrock units. Given the high-water table in the study area and combined with the high-water surplus and general low permeability of the area, the groundwater flow system can be characterized as a “local” system, with topographic highs representing recharge zones that would discharge into the adjacent topographic lows. The till overburden hydrostratigraphic unit acts as a confining unit that creates non-flowing artesian conditions within the bedrock, Groundwater-surface water interaction is limited by the presence of this confining till, with flow rates controlled by the thickness, continuity and permeability of the till.

Single-well response tests conducted on wells across the Touquoy Mine Site including all of the monitoring wells installed as part of the groundwater monitoring plan (GHD, 2016 a, b). The hydraulic conductivity estimates were fairly consistent across the site, in both the silty-sand till overburden (geometric mean of 1.8 × 10 -6 m/s), and in the relatively shallow bedrock (geometric mean of 1.0 × 10 -6 m/s). No differentiation of hydraulic conductivity in the bedrock was observed in wells constructed in the two-dominant rock lithologies: argillite; and greywacke.

Seepage into the open pit at Touquoy from the till and bedrock was expected to range from 550 cubic metres per day (m^3/d) to 1,450 m^3/d (PCA, 2006). An additional assessment completed as part of the Touquoy Gold Project Focus Report (CRA 2007a) to determine the potential linkage between Moose River and the local groundwater system identified that groundwater upwelling was not measured from temperature profiling conducted through the portion of Moose River that lies adjacent to the proposed Touquoy open pit. The limited linkage between the Moose River and Touquoy Pit has been confirmed to date (Appendix F.6 Groundwater Flow and Solute Transport Modelling to Evaluate Disposal of Tailings in Touquoy Open Pit, AMNS 2021) by ongoing flow monitoring at the site during operations under the Touquoy Gold Project Industrial Approval.

The presence of faults in the vicinity of the Touquoy pit have been characterized by AMNS, including water bearing faults. Water bearing faults were identified on the pit wall in the vicinity of monitoring well OPM-2A/B. The faults are typically to be saturated relative to the rock mass surrounding the faults, significant volumes of flow to the Touquoy open pit have not been observed. The hydraulic conductivity of the shallow bedrock at OPM-2B based on single-well response testing was within the range of other bedrock wells installed at the Touquoy mine site.

Groundwater seepage into the Touquoy open pit is largely through the surficial glacial till, and through fractures in the shallow bedrock. The more competent deep bedrock is not expected to contribute significant groundwater inflow to the open pit. As the pit

dewatering progresses and groundwater levels in the vicinity of the open pit are lowered, a reduction in baseflow (i.e., the groundwater contribution to stream flow) is inferred in Moose River, although uncertainty in stream flow measurements in Moose River upstream and downstream the Touquoy site appear to overestimate the reduction in baseflow compared to the observed pit inflow rates.

Both total stream flow and baseflow were estimated for Moose River at SW-2 through analysis and review of stream flow data collected at nearby hydrometric stations. Mean annual flow in Moose River is estimated to be 1.15 m^3/s. Baseflow indices were calculated using a recursive baseflow filter implemented in the BFLOW software code (Arnold et al., 1995) for annual and monthly streamflow rates observed in Moose River at SW-2. The mean annual baseflow index for Moose River is estimated to be 0.29, with summer baseflow indices 0.52 in 2019 and 0.34 in 2020. The calculated mean annual baseflow in Moose River is 28,814 m^3/d, and the mean summer baseflow for 2019 and 2020 are 9,848 and 9,143 m^3/d, respectively.

6.6.3 Residual Effects and Significance

The predicted residual environmental effects of Project development on groundwater drawdown are assessed to be adverse, but not significant, beyond the LAA. There is the potential for residual groundwater quality effects within the PA/LAA.

The overall residual effect of the Project on groundwater is assessed as not significant after mitigation measures have been implemented. Effects to groundwater potable resources are not predicted to extend beyond the immediate PA. At the Beaver Dam Mine site changes in potable groundwater resources will likely persist immediately adjacent to the NAG and PAG stockpiles. Groundwater quality will be monitored to determine if an interception trench should be installed to isolate hydraulic connectivity to the surrounding environment.

The reclamation plan for both sites includes a refilling of each pit to attain steady state groundwater flow conditions so that post-mining groundwater conditions are stable (i.e., inflow is equal to outflow).

Interactions or pathways on receptors are assessed in the Surface Water (Section 6.7) Wetlands (Section 6.8) and Fish Habitat (Section 6.9) sections of the Updated 2021 EIS (AMNS 2021).

A significant adverse environmental effect for Groundwater with respect to potable recourses is not predicted for the Project for the following reasons, with consideration of the ecological and social context of the LAA surrounding the Project:

- **During Construction:** effects to groundwater potable resources are limited to PA and more specifically the mine site.
- **During Operations:** Effects are limited to the PA and more specifically the mine site.
- **During Closure**: Effects are limited to the mine site, and specifically adjacent to the NAG and PAG stockpiles at Beaver Dam Mine.

6.6.4 Mitigations

Groundwater monitoring will be completed to confirm predicted environmental effects and the effectiveness of the mitigation measure groundwater quality. Mitigations are outlined in Table 6.6-1. Groundwater monitoring programs will continue during baseline/pre-construction, to document groundwater baseline conditions. A Proposed Groundwater Monitoring Plan (Appendix G of Appendix P.4 Mine Water Management Plan, AMNS 2021) has been developed in consideration of wetland and watercourse alteration. The plan provides methods, timing, frequency, and locations for groundwater monitoring. This document will evolve through regulatory permitting, as well as public and Mi'kmaq engagement. Information generated from the groundwater monitoring will be included as part of the Aquatic Effects Monitoring Program that will be developed as part of the permitting process and submitted with the Industrial Approval application.

Groundwater monitoring at Touquoy Mine Site is ongoing and will be expanded before Beaver Dam Mine tailings are deposited in the exhausted or mined out pit

Table 6.6-1 Mitigation for Groundwater Quality and Quantity

Mitigation Category	Project Phase	Mitigation Measure
Quality	C	Conduct pre-construction well survey at Beaver Lake IR 17
	C, O	Use above ground fuel storage tanks that meet applicable regulatory standards
	C, O	Select appropriate type of explosive that will minimize nitrogen release to surface water and groundwater; explosive management plan will be developed before construction and a Nitrogen Management Plan has been developed with site specific adaptive management measures in the event that Nitrogen levels exceed predictions.
	C, O, CL	Sub-aqueous deposition of mine tailings to reduce/prevent oxides and leaching
	CL	In the event of acid rock drainage and metal leaching, implement mitigative measures that will manage the source material and drainage effectively utilizing methods such as an engineered cover to reduce infiltration and oxidation thereby limiting potential acid drainage.
	C, O, CL	Flowage, and existing groundwater wells at Touquoy between the open pit and the Moose River. The purpose of this groundwater treatment is to intersect groundwater seepage impacted with COCs above Tier 2 pathway specific guidelines or groundwater baseline/background prior to seepage discharging into surface water bodies.
Quantity	C, O	Use blasting and pit construction techniques that minimize the potential for negatively interacting the adjacent groundwater table and nearby surface water
	C, O	Implement water conservation program for onsite facilities
	C, O	Recycle site water for reuse wherever practical to reduce water withdrawal from lakes or streams
	C, O	Recycled water must meet acceptable water quality criteria for its intended use

Note: C = construction; O = operations; CL = active closure (decommissioning and reclamation); IR = Indian Reserves; COC = contaminates of concern.

6.7 Surface Water Quality and Quantity

Surface water is a VC because aquatic species and terrestrial species rely on an accessible water sources for their survival. Socially and economically, surface water resources are essential to municipal, agricultural, industrial and recreational sectors, among others.

The Surface Water Quality and Quantity Effects Assessment (EA) for the Project has been updated to reflect updates of the Project Description (Section 2) and to address Round 2, Information Requests (IR2) issued by the Impact Assessment Agency of Canada (IAAC, formerly the Canadian Environmental Assessment Agency [CEAA 2019]) and Nova Scotia Environment (NSE 2019). This includes:

- Updated description of the existing environment based on ongoing surface water monitoring studies (Section 6.7.4 and Appendix G.1, AMNS 2021).
- Identification and evaluation of potential water treatment for the Project is described in the Mine Water Management Plan (Appendix P.4) including:
  - Construction Phase (i.e., metals originating from historic mining and tailings Appendix F.1 of Appendix P.4; AMNS 2021);
  - Operation Phase (i.e., nitrite removal technologies (Appendix F.2 of Appendix P.4, AMNS 2021); and
  - Post-closure Phase Water treatment Assessment (Appendix F.3 of Appendix P.4, AMNS 2021).
- Update of the Mine Water Management Plan (Appendix P.4, AMNS 2021).
- Revised predictive water quality assessment for Construction, End-of-Mine (EOM) and Post-closure phases (Appendix D of Appendix P.4, AMNS 2021).
- Assessed the potential effects of Haul Road activities on Surface Water (IR2 responses CEAA-2-36, CEAA-2-37, and NSE-2-130) and included as Appendix F.9 [Evaluation of Potential Impacts from Metals COCs to Groundwater and Surface Water from Dust Deposition along the Haul Road] (AMNS 201).

Standalone responses to IR2s are provided in AMNS (2021). An outline of updates to the Surface Water Environmental Effects Assessment are summarized below.

6.7.1 Baseline Program

6.7.1.1 Surface Water Quantity

Baseline characterization of Surface Water Quantity (hydrology) conditions at the Project was undertaken to define the existing hydro-climatic regime for the watersheds that could potentially be affected by Project development. The results of these investigations are summarized in the following sections. The primary objectives of the surface hydrology baseline program were to:

- collect stream flow data from a representative suite of Project area watersheds;
- calculate relevant stream flow metrics, including annual runoff, low flows and peak flows, unit yields, etc.; and
- integrate the site-specific data with the available regional hydrometric data to estimate stream flow variability and recurrence intervals for low and peak flows.

The results of baseline characterization studies informed predictive water balance and water quality modelling, informed proposed water mitigation and management activities, and support the effects assessment for the Project (Section 6.7.9 and 6.7.8, respectively of the Updated 2021 EIS AMNS [2021]).

The proposed Project activities encompass three geographically distinct areas:

- Beaver Dam Mine Site;
- Haul Road; and
- Existing Touquoy Mine.

The Killag River, Crusher Lake, Mud Lake, Tent Brook and Cope Brook (Beaver Dam Mine Site area), and Moose River (existing Touquoy Mine) constitute the primary focus of the Project baseline surface water characterization studies (Appendix G.4, AMNS 2021), as well as subsequent effects assessment, as these watercourses will receive direct discharge and/or catchment areas have potential to be impacted by Project water management activities.

Beaver Dam Mine

The Beaver Dam Mine Site lies within the West River Sheet Harbour (WRSH) drainage basin, which is directly east of the Musquodoboit River Valley system. The watershed occupies an area of roughly 576 square kilometers (km^2), a moderately sized watershed in the Province. The area is characterized by rolling till plains, drumlin fields, extensive rockland, and numerous freshwater lakes, streams, bogs and wetlands having relatively low relief, hummocky type terrain. This inland area is somewhat removed from the immediate climatic influence of the Atlantic Ocean and is characterized by warmer summers and cooler winters.

The Killag River and Cameron Flowage is the main mapped linear watercourses of the Beaver Dam Mine Site, and Crusher Lake and Mud Lake are the major mapped lakes. The complex system of streams, lakes, bogs, and wetlands is a direct result of the underlying bedrock geology of greywacke and slate found in the region. The basin ultimately drains to the south via the West River Sheet Harbour, and discharge peaks are likely attenuated to a large extent by the numerous lakes and wetlands through which runoff is routed. The West River Sheet Harbour and Tangier River Secondary boundary runs through the center of the Project Area (Section 6.7.3) along the proposed Haul Road. Elevations within the catchment vary from approximately 135 to 165 meters above sea level (masl) in the headwater areas and gradually decrease to sea level at the final outlet located at Sheet Harbour. The headwaters of the drainage basin are located along the topographic divide separating the Musquodoboit River Valley to the northwest.

An inventory of surface water features was undertaken to identify water features that may be impacted directly or indirectly by the proposed mine and Haul Road construction and operations. Initially three waterbodies (Crusher Lake, Mud Lake, and an unnamed waterbody in the southwest section of the Project Area) were identified through a desktop review of available mapping as requiring characterization of baseline conditions. During the 2019 field evaluations, 10 additional watercourses were identified within the Beaver Dam Mine Site, totaling 24 watercourses within the Beaver Dam Mine Site area. Three additional watercourses outside of

the Beaver Dam Mine Site were also delineated (WC23 [Outlet to Cope Brook], WC26 [Outlet to Killag], and WC27 [Outlet of Mud Lake]), due to potential impacts to fish and fish habitat within the LAA (Section 6.9 Fish and Fish Habitat Assessment [AMNS 2021]). New watercourses are described in Section 6.7.5.

Most watercourses within the Beaver Dam Mine Site are first order streams originating within headwater wetland habitat inside of the PA. Many streams across the Beaver Dam Mine Site are generally small with minimal pool/riffle structure and consist of mucky organic substrate. While most are generally perennial in nature, many have intermittent patches, which go dry during prolonged rainless periods when percolation depletes all flow (Alberta Transportation 2009).

Tertiary basins potentially affected by the Project including four within the Beaver Dam Mine Site and six along the Haul Road footprint; were identified as a result of baseline characterizations studies, are listed below and shown in the Updated 2021 EIS (AMNS 2021) on Figure 6.7-4 in Section 6.7 Surface Water Quantity and Quality.

The four tertiary basins affected within the Beaver Dam Mine Site:

- Portion of Killag River (1EM-2-D);
- Tent Brook (1EM-2-F);
- Paul Brook (1EM-2-H); and
- Cope Brook (1EM-2-J).

The six tertiary basins affected along the Haul Road:

- Tent Brook (1EM-2-F);
- Keef Brook (1EM-2-G);
- Jack Lowe Brook (1EM-2-N);
- Little River (1EM-2-P);
- Portion of Sandy Pond (1EL-2-C); and
- Portion of Morgan River (1EL-2-H).

Haul Road

During field assessments in spring and summer 2016, 34 watercourses were mapped and evaluated within the Haul Road corridor. These watercourses straddle seven tertiary watersheds, and many are classified as first order streams, in high positions within the tertiary basins. Others, however, are second and third order streams, positioned lower in the tertiary watersheds and broader secondary watersheds, and offer more substantial aquatic and fish habitat.

Touquoy Mine

The Touquoy Mine Site is an active Mine Site that commenced operation on October 11, 2017 and is subject to an Industrial Approval to operate issued by NSE. A Class I Environmental Assessment under the *Nova Scotia Environment Act* and Environmental Assessment Regulations for the Project was reviewed and approved in 2008, subject to Approval conditions. The use of the Touquoy Mine Site for the processing of Beaver Dam Mine ore and deposition of the associated tailings will occur after ore extraction from the Touquoy open pit has ceased. As such, the baseline conditions for the Touquoy Mine Site for the Project operations will be the conditions expected near the end of the Touquoy ore processing operations.

Existing conditions with respect to surface water for the watershed was based on the available data collected as part of the 2007 submission (CRA), 2013 LiDAR (Leading Edge), and Water Management Plan (Stantec 2017a) for operation, the Reclamation Plan (Stantec 2017b) for reclamation and closure, and the 2017 surface water quality/quantity monitoring reports (Stantec 2018b).

The existing Touquoy Mine Site is part of the Moose River drainage basin, which is directly east of the Musquodoboit River Valley system. As described in the Environmental Assessment Registration Document (CRA 2007b), the Moose River watershed can be characterized by rolling till plains, drumlin fields, extensive rock land, and numerous freshwater lakes, streams, bogs and wetlands

in the headwaters and the relatively low relief hummocky terrain. Forests are predominantly coniferous of red and black spruce (CRA 2007b). Local ground surface elevations at the Touquoy Mine Site range from 102 to 145 masl. The Touquoy Mine Site is approximately 10 kilometers (km) northwest of the Tangier Grand Lake Wilderness Area. This protected area consists of 16,000 ha of predominantly coniferous forest and has abundant lakes, wetlands, and waterways. The waterbodies within the Wilderness Area are contained within a separate watershed from that of the Touquoy Mine Site, which lies in the Fish River Watershed.

The Moose River drainage basin ultimately drains to the south via Moose River, and runoff through the catchment to Moose River is likely attenuated by the many lakes and wetlands in the catchment thus reducing the peak flow. The catchment area of Moose River is 3,904 ha at surface water monitoring station TQ-SW-2 draining from topographical highs of 180 to 110 masl in elevation (CGVD 2013) at the banks of Moose River. Moose River flows south approximately 2.3 km downstream of SW-2 where it joins the Fish River. Watercourse No. 4 has a catchment area of 136.3 ha at surface water monitoring station TQ-SW-3 and flows south between the existing open pit and Tailings management Facility (TMF) to Moose River and eventually to the Fish River.

6.7.1.2 Surface Water Quality

Beaver Dam Mine

Generally, water quality at the Beaver Dam Mine Site is characterized as having been affected somewhat from the influence of past mining activities, local industry, road salting, or local residents. Some localized influences from road work (culverts, ditching) or forestry use would have occurred historically (total suspended solids for example), but these would be localized and short-term variations. Portions of the Haul Road where Nova Scotia Department of Transportation and Infrastructure Renewal (NSTIR) had a role in winter maintenance may have experienced salt and/or sanding, but there is little publicly available information on these activities or potential influence on surface waters.

Monitoring results for the Killag River (identified receiving water for the Project) are presented in Table 6.7-1 and a summary of baseline exceedances for all sampling locations is presented in Table 6.7-2. Detailed surface water baseline analytical results and guideline exceedance comparison, specifically for total metals are presented in Appendix G.1, Table G.1-3, AMNS (2021).

Data in Table 6.7-1 is for station SW1, the most relevant station to characterize the receiving environment. The baseline summary statistics water quality results for all stations are presented in Appendix G.1 (Surface Water Baseline Analytical Results). Metal concentrations were typically below detectable levels. Three of the baseline water quality locations (i.e., SW-5, SW-10 and SW-14A) located either within, or directly downstream of historic tailings, show metal concentrations exceeding guideline concentrations. During Construction, water impacted by historic activities will be treated as described in Section 6.7.9 and Appendix P.4 (Mine Water Management Plan, Appendix F.1 [Water Treatment Assessment - Construction Phase]) (AMNS 2021).

Most nutrients were below or slightly above detectable concentrations, but below available water quality guidelines, indicating little to no influence from agricultural operations in the area. The watersheds have been logged extensively, yet turbidity is low, indicating generally little long-term impacts and a lack of silt in the soils and/or little erosion from logging practices. The existing Haul Roads at the in and around the Beaver Dam Mine Site have been used to haul timber as well; however, measured TSS levels were low, which may be attributable to limited use, existing road conditions and allowable speeds

Table 6.7-1: Baseline Surface Water Concentrations Collected from Killag River, Station SW1 (Total Metals; µg/L; N = 7-15)[a]

Parameter	Min	Max	Mean	75th Percentile	90th Percentile	Number of Non-Detects	CCME (µg/L)	Nova Scotia Tier 1 (µg/L)
Silver	<1.0	<1.0	0.05	0.05	0.05	20/20	0.25	0.1
Aluminum	20	400	206	280	334	0/20	5	5
Arsenic	<0.1	3.7	1.3	2.1	2.6	7/20	5	5
Cadmium	<0.01	0.032	0.017	0.022	0.028	1/20	0.04	0.01
Cobalt	<0.40	0.55	0.27	0.21	0.52	15/20	0.78[d]	10
Copper	<0.50	1	0.67	1	1	18/20	2	2
Iron	5	1000	399	593	760	0/20	300	300
Mercury	0.0065	0.032	0.0082	0.0065	0.0074	18/20	0.026	0.026
Manganese	0	79	37	51.5	63.5	0/20	190	820
Molybdenum	1	1	1	1	1	0/20	73	73
Nickel	1	2.6	1.1	1	1	19/20	25	25
Lead	0.25	0.57	0.32	0.30	0.54	13/20	1	1
Antimony	0.5	0.5	0.5	0.5	0.5	20/20	NV	20
Selenium	0.25	0.5	0.4	0.5	0.5	20/20	1	1
Thallium	0.05	0.05	0.05	0.05	0.05	20/20	0.8	0.8
Uranium	0.05	0.05	0.05	0.05	0.05	20/20	15	300
Zinc	0.15	7.8	3.1	2.5	5.3	15/20	7[e]	30
Nitrate	0.025	0.096	0.044	0.061	0.081	11/20	13,000	NV
Nitrite	0.005	0.01	0.0053	0.005	0.005	20/20	60	NV
Ammonia	0.025	0.1	0.029	0.025	0.025	19/20	27,550[f]	NC
pH	2.63	6.48	5.1	5.8	5.9	-	6 to 9.5	6 to 9.5
Hardness (mg/L as $CaCO_3$)	1.6	16	4.9	4.8	8.3	-	NV	NV
TOC (mg/L)	2	20	10	12	18	-	NV	NV

[a] Summary statistics were calculated using the maximum value between duplicate samples and half the detection limit value when a chemical was not detected in a sample.

[b] Concentrations are in µg/L unless noted otherwise.

[c] For parameters measured below the detection limit, half of the detection limit was used when calculating this metric.

[d] Selected guideline represents Environment Canada (2017) FEQG for the protection of aquatic life at water hardness of 52 mg/L, which is the lowest hardness level cited for the FWQG equation. Site specific hardness falls below the accepted range of values for the equation.

[e] Selected guideline represents the Long-term CWQG, SSD 5th percentile at water hardness of 50 mg·L-1, pH of 7.5 and DOC of 0.5 mg·L-1. The CCME equation is valid between hardness of 23.4 and 399 mg $CaCO_3$/L, pH of 6.5 to 8.13, and DOC of 0.3 to 22.9 mg/L. The site-specific hardness and pH values in the Killag are slightly below the accepted ranges for these parameters. For screening purposes, the guideline of 7 was used, as site specific DOC will increase the guideline beyond 7 µg/L.

(f) Selected guideline represents the ammonia (total) CCME guideline value at pH 6.0 and temperature of 25ºC, multiplied by 0.8224 (for the conversion of NH_3 to total ammonia-N).

Notes: NV indicates no value provided; reported pH is based on lab analysis, as field measurements were unusually low (range of 2.63 to 6.48); less than indicates that the concentration reported is the analytical detection limit (value was not detected).

mg/L = micrograms per litre; $CaCO_3$ = calcium carbonate; µg/L = micrograms per litre.

At the Beaver Dam Mine Site, the following baseline observations include:

- **Aluminum and iron:** exceeded the CCME FWAL guidelines and NSEQSs at all sampling locations during most sampling events; however, this is a common feature of surface water in Nova Scotia (Dalhousie Hydrology Group 2018). Further, as described above, the Project is in a highly mineralized region; the geology will contribute to naturally elevated concentrations of many water quality parameters in the area, including aluminum. This is indicated here by elevated aluminum and iron concentrations recorded at both upstream (i.e., background) and downstream monitoring locations (Table 6.7-2). Detailed surface water baseline analytical results and guideline exceedance comparison, specifically for total metals are presented in Appendix G.1, Table G.1-3.
- **Mercury**: exceeded the CCME FWAL guidelines and NSEQSs at all sampling locations during the August 2015 sampling event; there were no mercury exceedances in recent sampling events (2018/2019).
- **Arsenic**: exceeded the CCME FWAL guidelines and NSEQSs at SW-4A, SW-5, SW-6A, SW-10, SW-14, SW-26, and SW-30. Arsenic concentrations were variable at all sampling locations but were generally elevated in the summer months. As described above, the Project is in a highly mineralized region; the geology will contribute to naturally elevated concentrations of many water quality parameters in the area, including arsenic (Section 6.5 Geology, Soils, and Sediment). This is indicated here by elevated arsenic concentrations recorded at both upstream and downstream monitoring locations (Table 6.7-2). Here, sulphide minerals (Section 6.5), such as myrrhotitie and arsenopyrite (an iron arsenic sulfide) are common in the surficial and bedrock geology in the Project area, and is the likely source of natural/background arsenic loadings. Detailed surface water baseline analytical results and guideline exceedance comparison, specifically for total metals are presented in Appendix G.1, Table G.1-3.
- **Lead**: fluctuates in surface water at most sampling locations and at times slightly exceeded the CCME FWAL guidelines and NSEQSs at SW-1A, SW-5, SW-10, and SW-32.
- **Copper**: fluctuates in surface water at most sampling locations and at times slightly exceeded the CCME FWAL guidelines and NSEQSs at SW-6A and SW-10.
- **Cadmium**: The NSEQS for cadmium, which is lower than the CCME FWAL guideline, was exceeded at most sampling locations during most sampling events. The CCME FWAL guideline for cadmium was only exceeded at five sampling locations, SW-4A, SW-6A, SW-10, SW-11, and SW-12, throughout the sampling program.
- **TSS**: levels were sampled during the 2019 to 2020 monitoring program, and exceeded the CCME FQAL guideline at SW-1A, SW-26A and SW-32.

Opportunities for improvement of the existing surface water conditions through proper sediment and erosion control measures during construction and maintenance and properly designed and installed culverts [Section 6.7.9 Surface Water Quality and Quantity of the Updated 2021 EIS (AMNS 2021)]. Similarly, proposed water treatment technologies (WTP) indicate that for some parameters (e.g., aluminum, arsenic) concentrations will be lower in Project discharges than baseline conditions of the receiving environment. In these instances, there is potential to reduce in-stream concentrations for these parameters, relative to existing conditions.

Haul Road

Monitoring results for the proposed haul road area are presented in Table 6.7-3; a summary of baseline exceedances are presented in Table 6.7-3. Similar to as described for the Beaver Dam Mine Site Area, most nutrients were below or slightly above detectable concentrations, but below available water quality guidelines, indicating little to no influence from agricultural operations in the area. The watersheds have been logged extensively, yet turbidity is low, indicating generally little long-term impacts and a lack of silt in the soils and/or little erosion from logging practices. Detailed haul route surface water baseline analytical results and guideline exceedance comparison, specifically Appendix G.1, Table G.1-5 (AMNS 2021).

Table 6.7-2: Summary of Baseline Surface Water Quality for Beaver Dam Mine Site, All Stations

Sample ID	Sample Location	Parameters Exceeding CCME FWAL	Parameters Exceeding NS Tier 1 EQS for Freshwater
SW-1	Killag River	pH, DO, Aluminum, Iron, Mercury	pH. Aluminum, Iron, Mercury
SW-1A	Killag River	pH, DO, TSS, Aluminum, Iron, Lead	Aluminum, Iron, Lead
SW-2A	Killag River upstream of Cameron Flowage	pH, DO, Aluminum, Iron, Mercury	Aluminum, Iron, Mercury
SW-4A	Wetland downstream of Mud Lake (WC27)	pH, DO, Aluminum, Arsenic, Cadmium, Iron, Mercury	Aluminum, Arsenic, Cadmium, Iron, Mercury
SW-5	Historical settling pond outlet (WC13)	pH, DO, Aluminum, Arsenic, Iron, Lead, Mercury	Aluminum, Arsenic, Iron, Lead, Mercury
SW-5A	Killag River	pH, DO, Aluminum, Iron	Aluminum, Iron
SW-6A	Watercourse between Crusher Lake and Mud Lake (WC5)	pH, DO, Aluminum, Arsenic, Cadmium, Copper, Iron, Mercury	Aluminum, Arsenic, Cadmium, Copper, Iron, Mercury
SW-9	West River Sheet Harbour	pH, DO, Aluminum, Iron, Mercury	Aluminum, Iron, Mercury
SW-10	Upstream of historical settling pond (WC12)	pH, DO, Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Mercury	Aluminum, Arsenic, Cadmium, Copper, Iron, Lead, Mercury
SW-11	Tent Lake	pH, DO, Aluminum, Iron	Aluminum, Iron
SW-12	Unnamed lake/wetland - headwaters of Paul Brook	pH, DO, Turbidity, Aluminum, Iron	Aluminum, Iron
SW-14	Historical settling pond	pH, DO, Aluminum, Arsenic, Iron	Aluminum, Arsenic, Iron
SW-19	Killag River	pH, DO, Aluminum, Iron	Aluminum, Iron
SW-26A	Cameron Flowage	pH, DO, TSS, Turbidity, Aluminum, Arsenic, Iron	Aluminum, Arsenic, Iron
SW-28	Tributary to Tent Brook (WC19)	pH, DO, Aluminum, Iron	Aluminum, Iron
SW-29	Killag River	pH, DO, Aluminum, Iron	Aluminum, Iron
SW-30	Killag River	pH, DO, Aluminum, Arsenic, Iron	Aluminum, Arsenic, Iron
SW-31	Tributary to Cope Brook (WC23)	pH, DO, Aluminum, Iron	Aluminum, Iron
SW-32	Killag River	pH, DO, TSS, Aluminum, Iron, Lead	Aluminum, Iron, Lead

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life; NSEQS = Nova Scotia Environmental Quality Standards; DO = dissolved oxygen; TSS = total suspended solids.

Table 6.7-3: Summary of Baseline Surface Water Quality along the Haul Road

Sample ID	Sample Location Description	Parameters Exceeding CCME FWAL	Parameters Exceeding NSEQS for Freshwater
WC2, WC7 to WC17	Watercourses along Beaver Dam Mines Road portion of the Haul Road	Aluminum, iron, pH	Aluminum, cadmium, iron
WC3	Watercourses along Beaver Dam Mines Road portion of the Haul Road	Aluminum, iron, pH	Aluminum, iron
SW-41	Watercourse along new construction through greenfield environment	Aluminum, pH	Aluminum, cadmium, iron
SW-42	Watercourse along new construction through greenfield environment	Aluminum, iron, pH	Aluminum, cadmium, iron
WC23 to WC28	Watercourses along the Moose River Cross Road portion of Haul Road	Aluminum, iron, pH	Aluminum, cadmium, iron
WC29	Watercourse along the Moose River Cross Road portion of Haul Road	Aluminum, pH	Aluminum, cadmium
WC30, WC31	Watercourses along the Moose River Cross Road portion of Haul Road	Aluminum, iron, pH	Aluminum, cadmium, iron
SW-43	Watercourse along the Mooseland Road portion of the Haul Road	Aluminum, copper, iron, lead, pH	Aluminum, cadmium, copper, iron, lead
SW-44	Watercourse along the Mooseland Road portion of the Haul Road	Aluminum, iron, pH	Aluminum, cadmium, iron
SW-45	Watercourse along the Mooseland Road portion of the Haul Road	Aluminum, arsenic, iron, pH	Aluminum, arsenic, cadmium, iron
SW-46	Watercourse along the Mooseland Road portion of the Haul Road	Aluminum, iron, pH	Aluminum, cadmium, iron
SW-47	Watercourse along the Mooseland Road portion of the Haul Road	Aluminum, iron, lead, pH	Aluminum, cadmium, iron, lead

CCME FWAL = Canadian Council of Ministers of the Environment Freshwater Aquatic Life; MDMER = Metals and Diamonds Effluent Regulations; NSEQS = Nova Scotia Environmental Quality Standards.

Metal concentrations were typically below detectable levels and/or available water quality guidelines. At the Haul Road the following baseline. Baseline observations include:

- **Aluminum and iron:** aluminum exceeded the CCME FWAL guideline and NSEQS at all sampling locations, and iron exceeded both guidelines at all but three sampling locations.
- **Arsenic, copper, and lead:** concentrations were identified to exceed the CCME FWAL guidelines and NSEQSs at several sampling locations (SW-43, SW-45, and/or SW-47).
- **Cadmium**: The NSEQS for cadmium, which is lower than the CCME FWAL guideline, was exceeded at most sampling locations during most sampling events. The CCME FWAL guideline for cadmium was not exceeded.

Note, there is also an opportunity for improvement of the existing surface water conditions through proper sediment and erosion control measures during construction and operation including maintenance and properly designed installed culverts (Section 6.7.9 and Appendix C [draft Erosion and Sediment Control Plan] of Appendix P.4 [Mine Water Management Plan]) (AMNS 2021).

Touquoy Mine Site

The Touquoy Mine Site is currently in operation and will be used for the processing of Beaver Dam Mine ore and deposition of the associated tailings. As such, the baseline conditions for the Touquoy Mine Site for the Project operations will be the conditions expected near the end of the Touquoy ore processing operations. However, the surface water quality in Moose River is not anticipated to be adversely affected by the operation of the Touquoy Mine Site. Therefore, the baseline conditions in Moose River for the Project at the Touquoy Mine Site are anticipated to be similar to the existing conditions.

As required under the Industrial Approval for operation of the Touquoy Mine Site, surface water quality monitoring is conducted at thirteen surface water monitoring locations applicable to the Beaver Dam Mine ore processing and tailings deposition (exhausted Touquoy pit), as shown the Updated 2021 EIS (AMNS 2021) in Figure 6.7-3 of Section 6.7 Surface Water Quantity and Quality. Existing surface water quality monitoring locations at the Touquoy Mine Site are summarized in the Updated 2021 EIS (AMNS 2021) Table 6.7-12. Surface water monitoring locations TQ-SW-1, TQ-SW-11, and TQ-SW-2 are located on Moose River. TQ-SW-1 and TQ-SW-11 are identified as "background" as they are located upstream from the Touquoy Mine Site and are not expected to be affected by the Touquoy Gold Project or the Project. Surface water quality monitoring station TQ SW-2 is located downstream of the project on Moose River and is used to identify potential impacts from the Project by comparison to the upstream monitoring stations. Surface water quality results both in 2016 and 2017 are used to represent the baseline conditions at these monitoring locations.

A baseline environmental effects monitoring program was conducted in 2017 and 2018 to establish existing conditions in what was designed to be the future aquatic receiving environment for effluent in Scraggy Lake. The program was designed to meet the MDMER. Near surface and near bottom surface water quality samples were collected at each location on Scraggy Lake (SGL-001, -002, -003, -004 and -008) for laboratory analysis which included general chemistry, dissolved metals, total metals, strong acid dissociated cyanide and chlorophyll a. Results are provided in the Baseline Environmental Effects Monitoring Program (Stantec 2018c).

Based on a review of the 2017 baseline surface water quality results (Stantec 2018a), surface water at the monitoring stations upstream and downstream of the Touquoy Mine Site had elevated baseline concentrations of arsenic, aluminum, iron, cadmium, copper, lead, zinc, and manganese that exceeded Nova Scotia Environment Tier 1 EQS. Parameter exceedances by monitoring locations is summarized in Table 6.7-4. In addition, cobalt, manganese, silver and mercury exceeded the Canadian Council of Ministers of the Environment (CCME 2018) guideline for the protection of freshwater aquatic life. These exceedances are considered to be naturally occurring, or the result of historical anthropogenic (i.e., non- Project related) activities, varying seasonally and representing baseline conditions at the Touquoy Mine Site. Site-specific standards have been developed for both the Beaver Dam Mine and the Touquoy Mine Site to establish thresholds for surface water quality that include the elevated concentrations of parameters under baseline conditions (Appendix G.2 Beaver Dam Mine: Killag River and Moose River Water Quality Predictions and Aquatic Effects Assessment – Reassessment of Killag River based on February 2021 Update [GHD modelling] Provided)

Table 6.7-4: Summary of Baseline 2016 and 2017 Surface Water Quality for Touquoy Mine Site Parameter Exceedance

Water Quality Parameter	TQ-SW-1	TQ-SW-2	TQ-SW-3	TQ-SW-11	TQ-SW-12	TQ-SW-13	TQ-SW-15	TQ-SW-18	TQ-SW-19	TQ-SW-20	TQ-SW-21	TQ-SW-23	No. of Stations with Parameter Exceedance
Exceedance of Tier 1 EQS													
pH	20	20	6	22	20	20	10	19	18	16	16	9	12
Total Aluminum (Al)	21	22	20	22	21	20	19	21	21	19	19	9	12
Total Arsenic (As)	20	18	14	22	0	2	9	11	8	2	0	3	10
Total Cadmium (Cd)	12	14	11	15	13	11	17	13	20	17	14	9	10
Total Cobalt (Co)[(a)]	0	0	0	0	0	0	0	0	1	0	0	0	1
Total Copper (Cu)	0	0	3	1	0	0	6	0	3	2	0	0	5
Total Iron (Fe)	17	17	14	16	1	2	18	14	17	18	6	7	12
Total Lead (Pb)	0	0	5	0	0	1	12	0	2	4	2	0	6
Total Manganese (Mn)[(a)]	0	0	1	0	0	0	1	0	2	0	0	0	3
Total Mercury (Hg)	0	0	0	0	0	1	3	0	0	1	0	0	3
Total Silver (Ag)[(a)]	0	0	0	0	0	0	0	0	1	0	0	0	1
Total Vanadium (V)	0	0	0	0	0	0	0	0	1	1	0	0	2
Total Zinc (Zn)	0	0	0	0	1	2	2	0	1	1	0	0	5
No. of Monitoring Events per Station	21	22	20	22	21	20	19	21	21	19	19	19	12

[(a)] Indicates exceedance of CCME guideline.

Note: Surface water quality parameter is listed if there is at least 1 exceedance in 2016/2017 monitoring. MDMER = Metal and Dimond Mining Effluent Regulations; Tier 1 EQS = Nova Scotia Tier 1 (Contaminated Sites) Environmental Quality Standards for Surface Water (Fresh Water).

Source: Stantec 2018a.

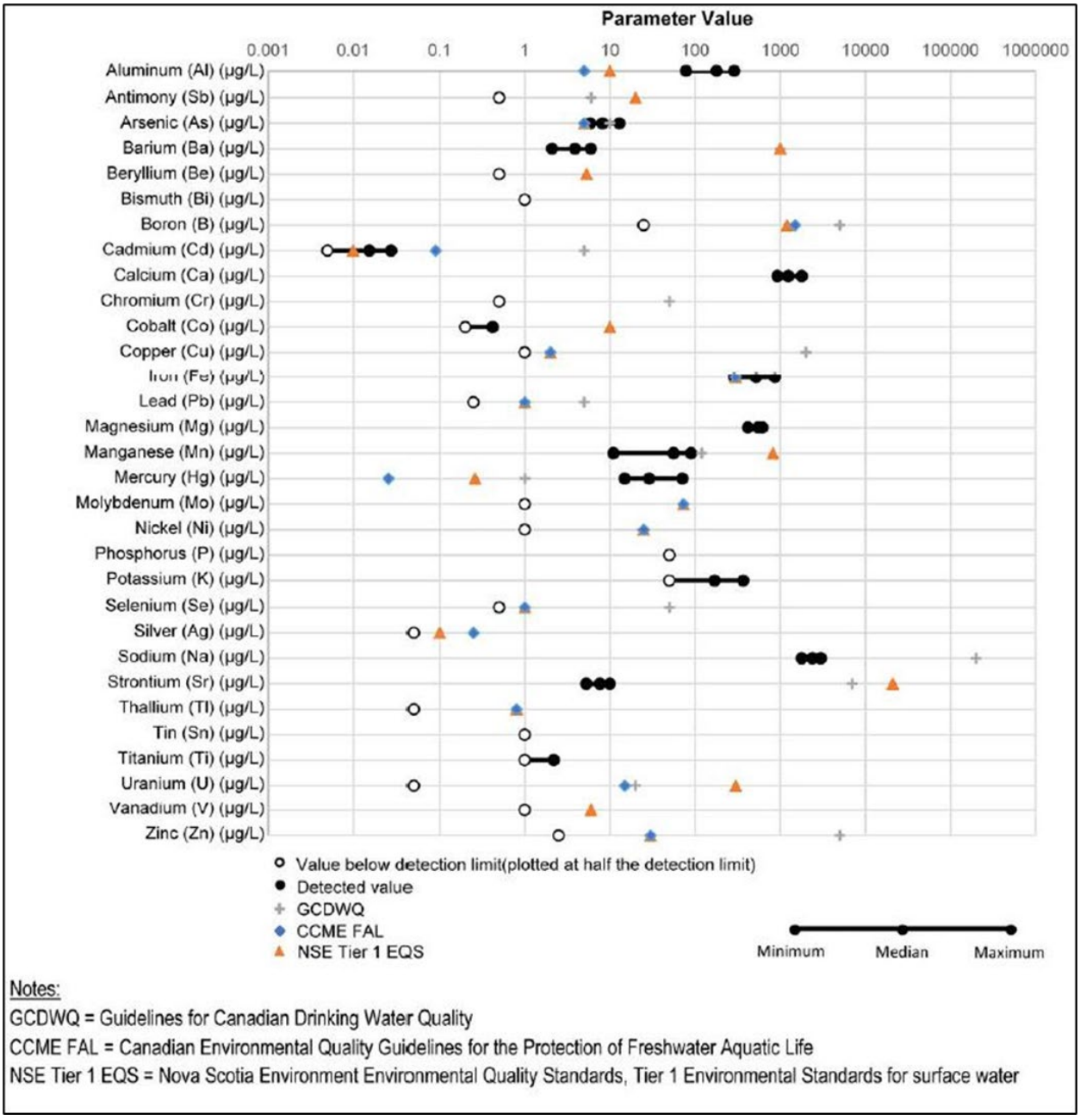
February 12, 2021]; Reassessment of Moose River based on March 2021 Update [Stantec modelling of March 11, 2021]). Surface water quality in Watercourse #4 and Scraggy Lake are predicted to have different water quality at the end of Touquoy operations (Appendix G.5a [Assessment of Water Quality Downstream of Railings Management Facility, Touquoy Gold Project]). These predictions are used as the baseline conditions for the Project at the Touquoy Mine Site in these watercourses. Surface water locations TQ-SW-12 located at the outlet of Square Lake, and TQ-SW-23 located on TQ-WC4 are identified as "background" as they are located upstream from the Touquoy Mine Site and are not expected to be affected by the Touquoy Gold Project or the Project. Water quality predictions are made at downstream locations TQ-SW-3 on TQ-WC4, and TQ-SW-13 on Scraggy Lake (the Updated 2021 EIS [AMNS 2021] Figure 6.7-3 and Table 6.7-12).

As reported in the 2017 groundwater and surface water monitoring report (Stantec 2018b), spatial trends were not apparent between conductivity and the observed Tier 1 EQS exceedances, or between background and downstream monitoring locations to indicate an effect of a specific mine facility (i.e., TMF, waste rock pile, open pit) on surface water resources during construction. Arsenic was noted to consistently exceed the Tier 1 EQS at TQ-SW-2 downstream of the open pit in both 2016 and 2017. As no trends in water quantity or quality were identified between baseline and operation, these elevated arsenic concentrations are not attributed to operation and may be from historical tailing piles and/or the Touquoy ore body itself. A remedial action plan is currently underway by AMNS that involves the delineation, removal, and management of these historical tailings piles around the open pit area (Appendix E.9: draft Historic Tailings and Waste Rock Management Plan AMNS [2021]).

Box plots that summarize the surface water quality for both the background and downstream locations at the Touquoy Mine Site is presented in Figures 6.7-1 to 6.7-4. These represent the baseline conditions for the use of the Touquoy Mine Site for the processing of the ore for the Beaver Dam Mine Project. The minimum, mean, and maximum concentration or value for the

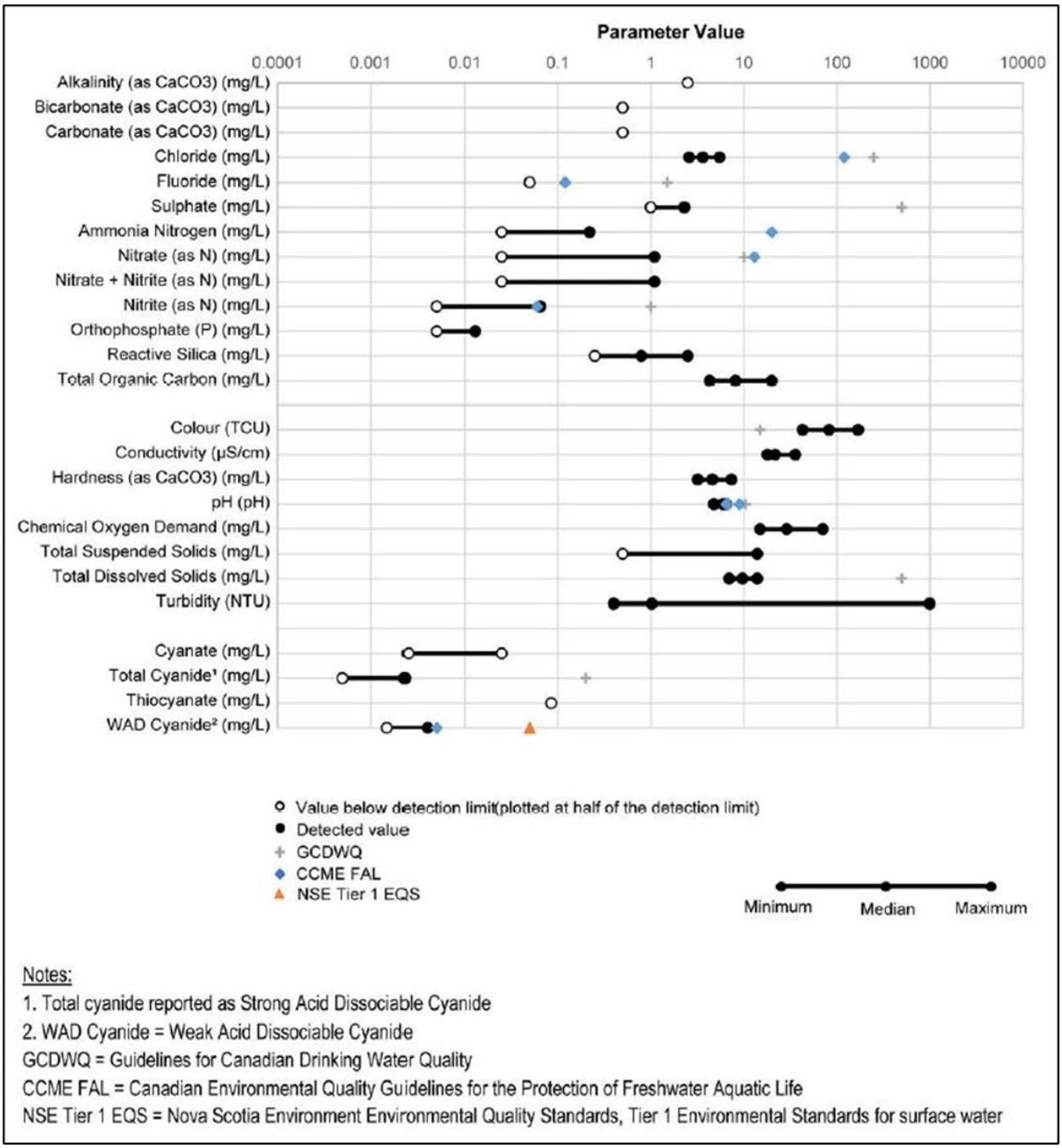
parameters are presented on a logarithmic scale. Values below the detection limits are flagged in the plots, as are the relevant guidelines or discharge limits. For example, in Figure 6.7-3, all values for total bismuth in the background data set (i.e., TQ-SW-1, TQ-SW-11 TQ-SW-12, and TQ-SW-23) are below the detection limit. In Figure 6.7-3 for the background data set, the minimum cadmium value is below the detection limit, the mean and maximum value is above Tier 1 EQS and CCME FWAL guideline.

Figure 6.7-1: Background Water Quality at Touquoy – Metal Parameters



Source: Stantec (2017a).

Figure 6.7-2: Background Water Quality at Touquoy – General Chemistry, Cyanide and Petroleum Hydrocarbons



Notes:

1. Total cyanide reported as Strong Acid Dissociable Cyanide
2. WAD Cyanide = Weak Acid Dissociable Cyanide

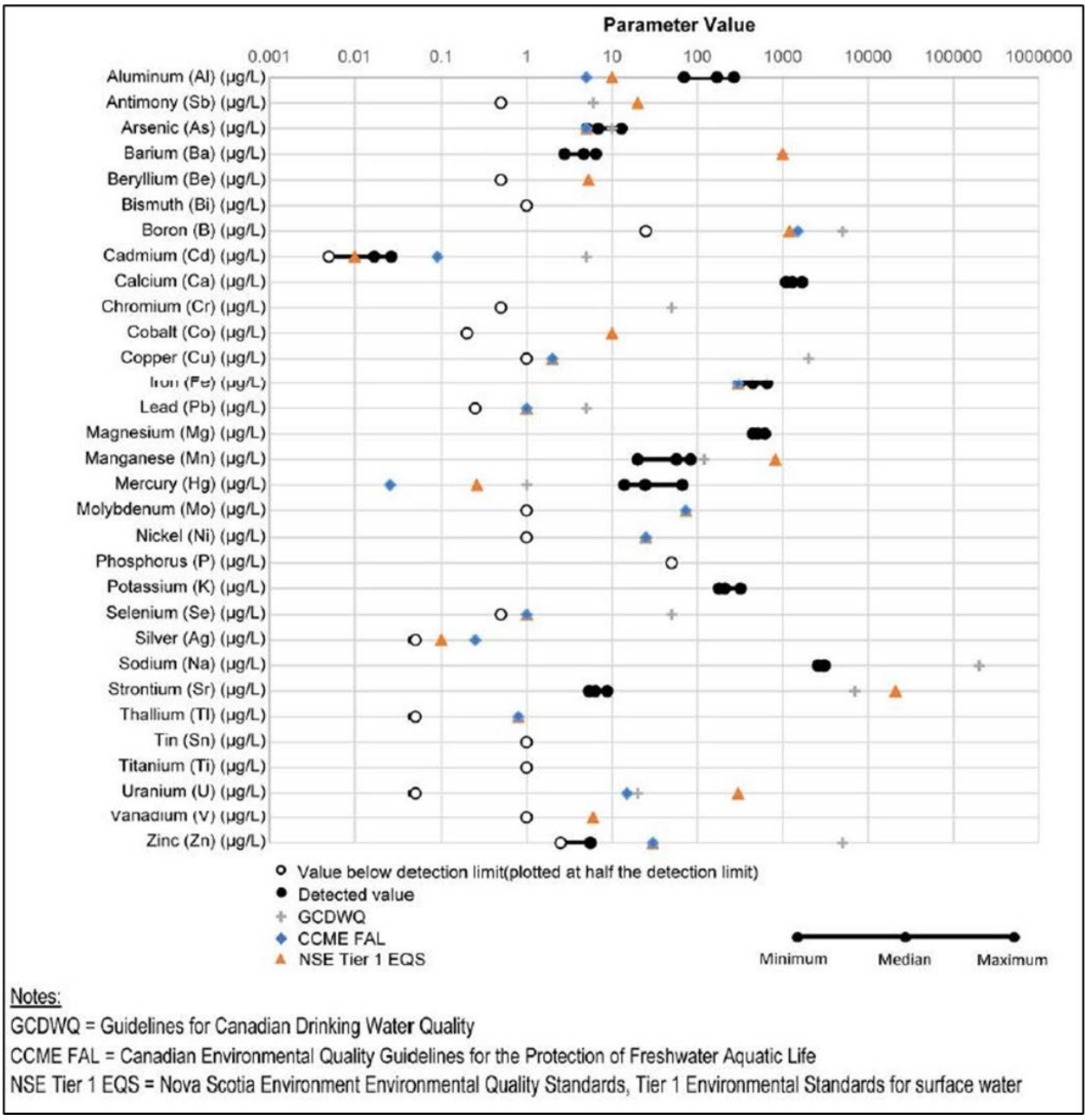
GCDWQ = Guidelines for Canadian Drinking Water Quality

CCME FAL = Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life

NSE Tier 1 EQS = Nova Scotia Environment Environmental Quality Standards, Tier 1 Environmental Standards for surface water

Source: Stantec (2017a).

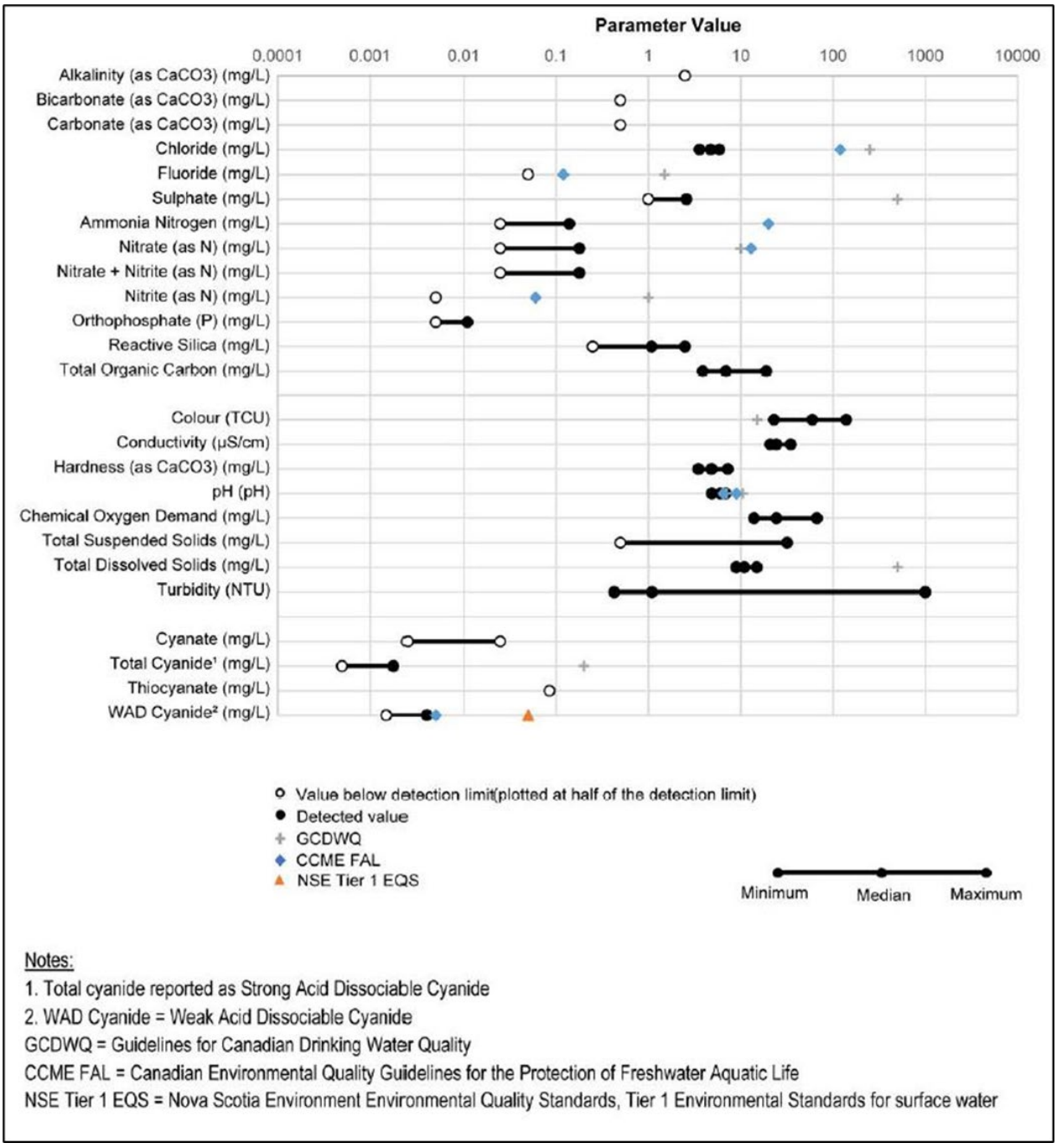
Figure 6.7-3: Downstream Water Quality at Touquoy – Metal Parameters



Notes:
GCDWQ = Guidelines for Canadian Drinking Water Quality
CCME FAL = Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life
NSE Tier 1 EQS = Nova Scotia Environment Environmental Quality Standards, Tier 1 Environmental Standards for surface water

Source: Stantec (2017a).

Figure 6.7-4: Downstream Surface Water Quality at Touquoy – General Chemistry, Metals and Petroleum Hydrocarbons



Notes:
1. Total cyanide reported as Strong Acid Dissociable Cyanide
2. WAD Cyanide = Weak Acid Dissociable Cyanide
GCDWQ = Guidelines for Canadian Drinking Water Quality
CCME FAL = Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life
NSE Tier 1 EQS = Nova Scotia Environment Environmental Quality Standards, Tier 1 Environmental Standards for surface water

Source: Stantec (2017a).

Overall, the water quality is similar between background and downstream surface water quality presented in the 2017 monitoring report (Stantec 2018b). All applicable parameters meet MDMER discharge limits, with the exception of pH which is slightly acidic in background water quality conditions. Organic sampling parameters related to hydrocarbons as well as cyanide related parameters were all below the detection limits for all 2016/2017 sampling locations, thus no exceedances are reported under the Tier 1 EQS for freshwater. There were no detections of radium 226 at the locations sampled (i.e., TQ-SW-2, TQ-SW-21).

Conductivity is generally stable at each location by month in 2016 and 2017 and is generally low (<43 microSiemens per centimeter [µS/cm]) at most sampling locations. The pH in surface water was noted to be slightly acidic and generally at or below 6.0 at both background and downstream locations with the exception of TQ-SW-3 where more neutral values (i.e., pH generally between 6 and 7) were observed. Total suspended solids (TSS) were generally less than 10 mg/L. Turbidity was generally low at less than 5.5 NTU at background locations but were slightly elevated in downstream locations at the site. Ammonia nitrogen concentrations were typically not detected or were less than 0.1 mg/L. There were no Tier 1 EQS surface water guideline exceedances noted for antimony, barium, beryllium, boron, molybdenum, mercury, nickel, selenium, strontium, thallium, uranium, benzene, toluene, ethylbenzene, total xylenes and total cyanide (i.e., strong acid dissociated cyanide). Complete water quality results are presented in the 2017 Annual Report - Surface Water & Groundwater Monitoring (Stantec 2018b).

6.7.2 Residual Effects and Significance

A summary of the assessment of potential environmental effects on surface water quality is presented in Table 6.7-4. The assessment of residual effects incorporated mitigation and management plans for Project effects as included in the proposed Project design and described in Appendix P.4 (Mine Water Management Plan). However, the proposed mitigation cannot eliminate the Project-related residual effect on water quality, and the following residual effects were identified:

- change in concentrations of total and dissolved metals, anions, and nutrients, and conductivity in the receiving environment due to direct discharge, groundwater interactions and seepage, and ML/ARD;
- change in nutrient concentrations in the receiving environment due to nitrogen loading from explosives; and
- change in turbidity and TSS in the receiving environment due to erosion and sedimentation.

The following sections summarize the effects assessment for each project area (Section 6.7.8) and present the residual effect characterization as per the methodology outlined in Section 6.7.7.

6.7.2.1 Beaver Dam Mine

A summary of the predicted surface water quantity impacts, detailed above, of the mine are provided below:

- The potential effects on surface water quality from increased erosion and sedimentation are qualitatively assessed; potential residual effects from sedimentation and erosion are most likely to occur during the Construction and (active) Closure phases, when surface materials will likely be disturbed during construction or reclamation activities. As TSS loads are generally low in Project area streams, any additional sediment loading has the potential to increase TSS and turbidity in the receiving environment. Potential residual effects due to sedimentation and erosion have the greatest potential to occur during periods of significant overland flow, such as freshet and rainfall events. However, planned disturbances in the Project Area are limited, and implementation of BMPs and mitigation measures as summarized in Section 6.7.9 and detailed in Environmental Management and Monitoring Plans, and will prevent substantial change of surface water quality near the proposed access corridor and other planned site upgrades. Further, water quality responses to run-off include increased concentrations of TSS but tend to be temporary and localized (Forman 1998).
- The proposed development of the Beaver Dam Mine Site results in small increases in streamflow volume at the Killag River assessment point defined in the water balance analysis (Appendix A [Water Balance Analysis] of Appendix P.4 Mine Water Management Plan) (AMNS 2021). The predicted increase in annual streamflow is 2.2% in EOM conditions and 1.1% in PC conditions. The small increases are a result of the change in land cover and the diversion away from the adjacent watersheds to the Killag River.
- There will be a 4.4% decrease in annual discharge from Crusher Lake due to the proposed water extraction to meet the domestic water demand. The proposed development results in a <1% increase in Crusher Lake discharge in PC conditions, and 18.3% and 13.7% decreases in Mud Lake discharge in EOM and PC conditions, respectively. The hydrologic impacts to Mud Lake are due to the placement stockpiles and influence of the open pit on groundwater flow patterns in the catchment.
- The proposed development results in a 1.1 to 1.2% and 5.7% reduction in annual streamflow volume at the Tent Brook and Cope Brook assessment points, respectively, in both EOM and PC conditions. The impacts to the Tent Brook system are

considered to be minor. The impacts to the Cope Brook system are due to the placement of the waste rock stockpile in its baseline catchment.

A summary of the predicted surface water quality impacts of the mine are provided below:

- The results of the predictive water quality assessment demonstrate the need for treatment of the mine effluent water prior to discharge to the Killag River.
  - Nitrite (EOM) and cobalt and zinc (PC) have the potential to exceed CCME, background or site-specific guidelines within the Killag River at the near-field mixing zone locations and far-field mixing zone location.
- Treatment will occur, as required, prior to discharge into the receiving environment to ensure discharge meets MDMER regulations and concentrations in the Killag River do not exceed CCME or site-specific guidelines.
- It is unlikely ARD onset will occur during the operations phase (5 years). An engineered will be placed immediately following operations during active closure.
- At closure, the pit will be filled by diverting all surface site water to the pit, therefore submerging most of the exposed pit walls with water. This should eliminate most of the risk associated with pit wall runoff.
- Initial predictions indicate that it will take 20 to 30 years for half of the Beaver Dam Mine PAG waste rock to turn acidic.
- As part of the final closure plan, AMNS will develop and implement a Beaver Dam Mine draft ML/ARD Management Plan (draft plan is provided in Appendix E.5). This plan will determine the path forward for continued kinetic test work for Beaver Dam waste rock samples during operations and monitoring to determine if mitigation is required to manage potentially long-term acidic conditions associated with PAG waste rock at the Beaver Dam Mine Site.
- If this Plan confirms that acidic conditions are predicted during the closure phase, appropriate mitigation will be applied (refer to Section 6.7.9 for mitigation measures).

6.7.2.2 Haul Road

At the Haul Road, potential residual effects from sedimentation and erosion, as well as dusting/air deposition, are most likely to occur during the Construction and (active) Closure phases, when surface materials will likely be disturbed during construction or reclamation activities. As TSS loads are generally low in Project are streams, any additional sediment loading has the potential to increase TSS and turbidity in the receiving environment. Potential residual effects due to sedimentation and erosion have the greatest potential to occur during periods of significant overland flow, such as freshet and rainfall events. However, planned disturbances in the Project Area are limited, and implementation of BMPs and mitigation measures, summarized in Section 6.7.9 and detailed in Environmental Management and Monitoring Plans, will prevent substantial change of surface water quality near the proposed access corridor and other planned site upgrades. Further, water quality responses to run-off include increased concentrations of TSS but tend to be temporary and localized (Forman 1998).

6.7.2.3 Touquoy Mine Site

A summary of the predicted surface water quantity impacts, detailed above, of the mine are provided below:

The use of the exhausted Touquoy pit for tailings storages will result in the accelerated filling of the pit from that of the Touquoy reclamation plan.

- Tailings will be deposited in the open pit for a total of 37 months reaching an elevation in the pit of 90.5 m (CGVD 2013). This amounts to approximately 17.5 m of water cover over the deposited tailings based on a spillway elevation of 108 m CGVD 2013 and will limit oxygen, reduce metal leaching conditions and further improved water quality.
- No water will be discharged from the exhausted Touquoy open pit until the pit reaches the spillway elevation in Year 9.
- Water withdrawal from Scraggy Lake will require to be extended for an additional three years for processing Beaver Dam ore.

The use of the exhausted Touquoy pit for tailings storage of Beaver Dam tailings effect the receiving environment of Moose River through seepage and effluent discharge. As the pit lake is planned to be treated to MDMER limits and any regulatory closure criteria or site-specific guidelines prior to discharge, the magnitude of the effect is expected to be low to negligible on Moose River quality and downstream tributaries.

- The predicted receiving environment concentration of arsenic of 0.023 mg/L; risks to aquatic life associated with predicted arsenic concentrations are anticipated to be low.
- The aluminum concentration of 0.184 mg/L for aluminum is well with the natural variation of existing conditions of the Moose River; i.e., predicted below the 75th percentile receiver quality in Moose River.
- Concentrations of key parameters of interest (arsenic, cobalt, copper and nitrite) in groundwater were predicted in the model to meet CCME FAL/NSE EQS after mixing with Moose River 100 m downstream of the discharge point.

There are no further effects to surface water quality or quantity anticipated to be caused by the processing of ore and the management of tailings (exhausted pit) from the Beaver Dam Mine. Surface water quality and quantity will continue to be monitored over the life of the Touquoy facility as part of existing approval for the Touquoy mine life and the revised approval for the proposed extended life of the Touquoy site associated with processing of Beaver Dam ore.

The overall residual effect of the Project on surface water is assessed as not significant after mitigation measures have been implemented (Section 6.7.4). The moose river will be monitored as part of the EEM program to confirm impact predictions and if necessary adaptive management will be applied to the operation. A water balance for the mine site was calculated to determine the amount of surface water runoff currently created given minimal impermeable surfaces in order to compare it against the amount of water surplus generated from an increase in impermeable surfaces as a result of the Project.

The mine site represents approximately 5% of the contributing drainage area to Cameron Flowage downstream of the Project area. The contributing drainage area to Mud Lake (approximately 165 ha) was divided into two separate drainage areas. The larger of the two encompasses the flow to Mud Lake originating from Crusher Lake and its contributing drainage area (approximately 140 ha). The second drainage area (approximately 25 ha) encompasses the area adjacent to Cameron Flowage that flows north into the southeast corner of Mud Lake.

An initial assessment of the existing Haul Road identified 23 watercourse crossings: 20 culverts (smaller watercourses) and 3 timber bridges (watercourses 6 to 13 m in width). A large number of the culverts were poorly installed. The overall poor culvert conditions have contributed to localized poor surface water quality conditions and obstructed fish passage.

Two main surface water systems flow through the area of the Touquoy facility. One system flows from Square Lake through Fish River and the other flows from Long Lake and the New Dam Flowage through Moose River. The Square Lake system discharges to Scraggy Lake, located south of the facility.

6.7.3 Proposed Compliance and Effects Monitoring Program

Surface water monitoring will be completed to verify the predicted environmental effects and the effectiveness of the mitigation measures for the surface water environment. Surface water monitoring will be completed to verify the predicted environmental effects and the effectiveness of the mitigation measures for the surface water environment. A draft Aquatic Effects Monitoring Program that includes Environmental Effects Monitoring (EEM) as defined under MDMER will be developed as part of the permitting process and submitted as part of the Industrial Approval application.

This document will evolve through regulatory liaison, as well as public and Mi'kmaq of Nova Scotia engagement.

6.7.4 Mitigations

The mitigations are outlined in Table 6.7-5.

Table 6.7-5: Mitigation Program for Surface Water Quantity and Quality

Mitigation Category	Project Phase	Mitigation Measure
Quality	C, O, CL	• Use of the following structures, as needed: • Silt fences • Silt curtains • Riprap • Check dams
	C, O, CL	• Limit exposed soil
	C, O	• Implement Erosion and Sediment Control Plan
	O, CL	• Segregate and manage waste rock with the potential for acid generation
	O	• Use adequately sized settling and containment ponds as required
	O	• Use flocculants and coagulants as required
	C, O	• Install perimeter ditches around site infrastructure
	O	• Provide appropriate settling time for suspended solids prior to discharge
	O	• Ensure pit water meets applicable regulatory quality criteria for discharge – otherwise treat water prior to discharge
	O	• Direct drainage ditches to designated settling ponds or other locations
	C, O	• Use above ground fuel storage tanks that meet applicable regulatory standards
	C, O	• Select appropriate type of explosive that will minimize nitrogen release to surface water and groundwater
	C, O	• Implement Surface Water Management Plan
	C, O	• Develop and implement an Emergency Response Spill Contingency Plan
	C, O	• Use clean, non-ore-bearing, non-watercourse derived and non-toxic materials for erosion control methods
	C, O, CL	• Sub-aqueous deposition of mine tailings to reduce/prevent oxides and leaching
	CL	• In the event of the potential for acid rock drainage and metal leaching, implement additional studies required to assess to actual risk and, as warranted, implement mitigative measures that will manage the source material and drainage effectively utilizing methods such as segregation and encapsulation
	C, O, CL, PC	• Minimize snow deposition into watercourses during snow removal activities
Quantity	C	• Construct drainage ditches and ponds to maintain natural flow directions when practical
	O	• Control release of settling ponds to mimic natural hydrograph, where practicable
	O	• Recycle site water for reuse wherever practical to reduce water withdrawal from lakes or streams
	O	• Recycled water must meet acceptable water quality criteria for its intended use

Notes: C = Construction; O – Operations; CL = active closure (decommissioning and reclamation); m = metre; PA = Project Area.

6.7.5 Summary of Residual Effects to Surface Water Quantity and Quality

Residual effects of the Project on Surface Water Quantity VC identified are characterized using standard criteria, including magnitude, geographical extent, duration, frequency, reversibility, and context of the effect are assessed as Not Significant (Section 6.7.10, Surface Water Quantity and Quality of the Updated 2021 EIS AMNS 2021).

Under the EOM scenarios, predicted near-field (North and East pond discharge) and far-field chemical concentrations in the base case and upper case are consistently below selected water quality benchmarks without water treatment, with the exception of nitrite, which exceeds the guideline only in the upper-case scenarios in three months/year. Under the PC scenarios, there is little difference between predicted chemical concentrations at near-field (pit lake discharge) and far-field locations for each assessment each case. In base case PC scenarios, all predicted constituent concentrations were consistently below selected water quality benchmarks. In the upper-case PC scenarios, both cobalt and zinc are predicted to exceed their respective guidelines in two months/year. Note, uppercase modelling scenarios are, by definition, of low likelihood. Thus, as water quality criteria are defined by national and international entities as protective of the receiving environment and all water users, there are no anticipated effects to surface waters as a result of discharges from the Project to the Killag River and water treatment during operations and posit closure phases is likely not required.

However, in response to IR2 issued by IAAC (CEAA 2019) and Nova Scotia Environment (NSE 2019), and as a result of ongoing water quality, water quantity and geochemical studies for the Project, water treatment for both EOM and PC is planned for the Project. Details for water management and evaluation of alternative water treatments are presented in Appendix P.4 Mine Water Management Plan (Appendix F.3 Water Treatment Assessment Post-closure, AMNS 2021). Note, the treatment system will be designed to ensure that all site effluent water meets MDMER and will reflect assimilation capacity of the receiving environment, such that any potential effects to the Surface Water Quality VC, and downstream water users, will be fully mitigated (Section 6.7.9, AMNS 2021).

Further details regarding characterization of Residual Effects as non-significant are summarized below by Project phase.

- During Construction:
  - Linear watercourses within the PA at the Beaver Dam Mine Site will be altered to support Project development.
  - Micro-sighting of infrastructure will reduce interactions with surface water features wherever possible.
  - Systems that will be altered to support Project construction are first order streams with limited fish habitat potential and low pH.
  - Haul Road upgrade and construction, with appropriate mitigation measures including proper culvert installation and erosion and sediment control measures, will have limited residual impact to linear watercourses along this route.
- During Operations:
  - With appropriate treatment of effluent discharge, the magnitude of the residual effect to the Killag River at the Beaver Dam Mine Site is considered negligible (within established criteria or background concentrations at the 100 m compliance point).
  - Effluent is predicted to be of neutral pH, limiting potential impact to Killag River.
  - Changes in flow to the Killag River from pit operations and dewatering have been predicted to be minimal.
  - There is a predicted alteration to WC5 relating to the operational water balance of the Beaver Dam Mine Site. Permitting is expected to be required to support this alteration.
  - Mud Lake will experience reductions in flow, which have been predicted to result in minimal impacts to fish.
- During Closure:
  - With appropriate treatment of effluent discharge, the magnitude of the residual effect to the Killag River at the Beaver Dam Mine Site is considered negligible (within established criteria or background concentrations at the 100 m compliance point).

- Effluent is predicted to be of neutral pH, limiting potential impact to Killag River, a low pH river with current efforts to increase pH to support salmon restoration.
- Considering water treatment, as required, for effluent discharge, the magnitude of the residual effect to the Moose River at the Touquoy Mine Site is considered negligible (within established criteria or background concentrations at the 100 m mixing zone).

Surface water monitoring will be completed to verify the predicted environmental effects and the effectiveness of the mitigation measures for the surface water environment. A draft Aquatic Effects Monitoring Program that includes Environmental Effects Monitoring (EEM) as defined under MDMER will be developed as part of the permitting process and submitted with the Industrial Approval application. The mitigations are outlined in Table 6.7-4 (AMNS 2021).

This document will evolve through regulatory liaison, as well as public and Mi'kmaq of Nova Scotia engagement.

6.8 Wetlands

Wetlands were selected as a valued component due to their ecological value in providing habitat for aquatic species and rare plants, the importance of wetlands in the daily lives of terrestrial species, their capacity to store water, managing downstream flooding, improving water quality, and the recharge/discharge of groundwater aquifers.

6.8.1 Baseline Program

Mapped wetland areas were identified from the NSDNR Wetland Inventory Database, the Nova Scotia Topographic Database, the Nova Scotia Wet Areas Mapping (WAM) database, and the Wetland of Special Significance (WSS) GIS predictive layer. Field surveys were completed in 2015 and 2016.

One hundred and seventeen wetlands were identified within the Beaver Dam Mine Site and 121 wetlands were identified along the Haul Road for a total of 236 freshwater wetlands (two large complexes are partially located within each component). The wetland types, approximate sizes within the Project area, and tertiary watershed locations are described in the Updated 2021 EIS (AMNS 2021).

A review of the NSE predictive WSS layer identified seven WSS within portions of the Project area based on historic ACCDC observations, Wetland 1, 29, 61, 64, 178, 205 and 209. Of these seven, Wetland 29 and 205 were identified as a WSS due to the presence of boreal felt lichen and blue felt lichen. The other five potential WSS were not evaluated as a WSS based on field assessments. Three additional wetlands were identified as a WSS based on field observations of blue felt lichen, Wetland 4, 14, and 17. Wetland 59 was assessed as a potential WSS based on the observation of a female snapping turtle and nest. Mainland moose tracks were observed in or in proximity to Wetland 56, 206 and 210. However, considering to the mobility of mainland moose and the presence of other unimpacted foraging habitat within the PA and surrounding LAA/RAA, these wetlands were not determined to be WSS. Rational for each WSS designation is provided in Updated 2021 EIS (AMNS 2021). Boreal Felt Lichen was confirmed by MEL during field surveys within Wetland 29. However, its location is beyond the PA and the footprint of the proposed Project is not within the defined critical habitat area. As such, impacts to it nor its critical habitat area are not expected as a result of the Project. Project Activities and Wetlands Interactions and Effects

6.8.1.1 Wetland Impacts

Development of the mine and Haul Road will cause direct and indirect impacts to wetlands, primarily during the construction phase of the Project. Direct impacts will be associated with clearing, grubbing, infilling, and development of the mine and its associated infrastructure. Across the entire PA, a total of 35 wetlands are expected to be completely altered to support Project development, and 73 wetlands are expected to require partial alteration to support Project infrastructure and development. Indirect impacts are a by-product of direct impacts associated with the construction activities, as well as potential indirect impacts to wetlands from mine operations (dewatering, blasting, and accidents). No new impacts to wetlands will occur as a result of this Project at the

Touquoy Mine Site as no increase in footprint is proposed beyond the approved construction now underway and no indirect effects are expected through proposed Project operations.

6.8.1.2 Potential Indirect Wetland Impacts

Potential indirect impacts to wetlands are predicted through groundwater drawdown near the open pit and downgradient flow reductions as a result of up-gradient hydrological alteration. Indirect impact extents and magnitudes were reviewed to assess if hydrological changes will have potential impacts to wetlands beyond natural variability.

Monitoring of potential indirect groundwater and flow reduction impacts will be conducted to verify the accuracy of the predicted environmental effects and the effectiveness of mitigation measures. Wetlands where groundwater drawdown and flow reduction effects are anticipated (i.e., WL34, 216, 205, 210, 215, and 231), or compounded with other direct and indirect effects, will be prioritized during wetland monitoring.

6.8.1.3 Wetland Avoidance

Due to the location in which the proposed activity can be performed (the location of the gold ore is fixed by geology), the extent to which the proposed Project location can be varied to avoid impact to wetland habitat is limited.

The preliminary Haul Road design has been based on following the existing footprint of the Beaver Dam Mines Road and the Moose River Cross Road to reduce overall wetland impact and habitat fragmentation. Wetland avoidance is a key consideration during planning and engineering of new sections of road, to the extent possible.

6.8.2 Residual Effects and Significance

The predicted residual environmental effects of Project development and production on wetlands are assessed to be adverse, but not significant. The overall residual effect of the Project on wetlands is assessed as not significant after mitigation measures have been implemented. No significant cumulative effects to wetlands are expected.

6.9 Fish and Fish Habitat

Fish and fish habitat may be affected, either directly or indirectly, by proposed Project activities.

6.9.1 Baseline Program

Baseline characterization studies for the proposed Project have occurred since 2014; the scope of monitoring programs has varied slightly from year to year to reflect updates to the Project Description (Section 2) as well as to respond to Round 2 information requests issued by IAAC (CEAA 2019) and Nova Scotia Environment (NSE 2019). The characterization studies have continued to be focused in three geographically distinct areas:

1. Beaver Dam Mine Site;
2. The Haul Road; and
3. The existing Touquoy Mine.

A Fish Habitat Assessment Area (FHAA) was developed to evaluate the effects of the Project on fish and fish habitat. The FHAA incorporates the Beaver Dam Mine Site and Haul Road portions of the Project Area (PA), and watercourses downstream for the Beaver Dam Mine Site (i.e., WC23, WC26 and WC27, and incorporating all of Cameron Flowage, downstream along the Killag River to the bridge and Nova Scotia Salmon Association (NSSA) Lime Dosing Station).

The downstream watercourses were incorporated into the FHAA to assess the maximum extent of effects of the Project from direct and indirect impacts to fish and fish habitat beyond the Beaver Dam Mine Site. The entire FHAA lies within the Local Assessment Area (LAA), which is defined by a selection of tertiary watersheds.

The baseline program methodology and results are summarized in the subsections below. The Fish and Fish Habitat Assessment (AMNS 2021) Figures 6.9-2, 6.9-3 and 6.9-4, present and overview of baseline sampling locations within the FHAA, including: fish, benthic macroinvertebrate, culvert condition, daily flow assessment points, and habitat assessment transects.

Baseline characterization studies for the proposed Project are provided in the Baseline Fish and Fish Habitat 2019-2020 Technical Report and the Baseline Fish and Fish Habitat 2015-2017 Technical Report (Appendix J.2, AMNS 2021). The baseline characterization studies and results from the Touquoy Gold Project (i.e., existing Touquoy Mine) used in this effects assessment have been summarized from the Touquoy Gold Project 2007 Focus Report (CRA 2007a) and Environmental Assessment Registration Document (EARD) (CRA 2007b).

Thirty-five (35) watercourses were identified within the Haul Road (Appendix J.4, Figure J.4-4) and 29 watercourses were identified within the Beaver Dam Mine Site (Appendix J.4, Figure J.4-3). Two waterbodies were identified within the Beaver Dam Mine Site (Crusher Lake and Mud Lake), both of which are confirmed fish frequented. A total of 236 wetlands were also evaluated for fish habitat potential, comprising 117 wetlands within the Beaver Dam Mine Site and 121 wetlands along the Haul Road, with two wetlands (wetlands 64 and 66) located partially within each component.

6.9.1.1 Fish Habitat Assessment

Fish habitat assessments were completed in two phases. During initial site assessments completed in 2015-2017 a qualitative evaluation of fish habitat was completed. This included delineation, characterization, and basic descriptions of all aquatic features, including reach-level measurements of fish habitat parameters. The details associated with the qualitative evaluation of fish habitat are provided in the 2015-2017 Baseline Report (Appendix H of the 2019-2020 Baseline Report, Appendix J.2, AMNS 2021); a summary is presented in this section.

Further to the initial delineation and description of watercourses, and in response to IR2 CEAA-2-19, a more detailed quantitative evaluation of fish habitat was completed in 2019-2020. The methods to describe habitats are outlined in detail in each of these baseline reports and summarized in this section.

Beaver Dam Mine Site

To support fish habitat assessments, each surveyed watercourse was delineated into individual reaches defined by discrete homogeneous units (e.g., riffle, run, pool, flat, etc.) as determined in the field in an upstream to downstream direction. Each habitat type contains discrete gradient, substrate types, water depth, and velocity ranges which have been determined using the described biological 'preferences' outlined in Grant and Lee (2004), whenever possible. In smaller, first-order streams, habitat types were often found to be extremely short and variable. For efficiency in the field, when individual habitat types were less than 5 m in overall length, they were be grouped together into one reach containing multiple smaller habitat units. The upstream and downstream ends of each reach were recorded with a handheld GPS device. Fish habitat reaches are presented in Appendix J.4, Figure J.4-2.

For each reach (homogenous section of watercourse), a detailed fish habitat survey was completed which included water quality measurements, designation of substrate and cover types, riparian habitat descriptions, and barrier assessments. Cross-sectional measurements (transects) were established to describe morphological (channel and wetted widths, bank heights) and flow characteristics (velocities and depths) within the reach. Transect measurements were recorded at every 50 m length of reach – for example, if a reach was 150 m in total length, three transects were established within the reach. If multiple habitat types (<5 m in length) were grouped together to form a reach, transects were established within each habitat type represented within the reach. The amount of transects and transect locations were selected and modified as needed in the field based on specific habitat features observed, or limitations related to access, wadeability, and safety concerns.

Fish habitat potential was determined during field identification/delineation through the collection of key fish habitat characteristics of each watercourse and wetland including channel morphology, biophysical descriptions. Quantitative fish habitat assessments revealed suitable habitat for spawning, young of the year, juvenile, and adult life stages for both cold and warm-water species throughout the FHAA.

All waterbodies identified within the Beaver Dam Mine Site (Crusher Lake, Mud Lake) have been confirmed to provide fish habitat. Open water features in wetlands confirmed or presumed to provide fish habitat are described below and displayed on Figure J.4-2 of Appendix J.4. It should be noted that Cameron Flowage while exhibiting both lotic and lentic-like habitat qualities as a contiguous feature with the Killag River, had been considered a waterbody within the context of the Revised 2019 EIS (AMNS 2019), to distinguish it from the more riverine portion of the Killag River.

Cameron Flowage, located at the northeastern edge of the FHAA, is the primary receiver for most surface water originating from within the Beaver Dam Mine Site prior to it draining offsite through the Killag River to the southeast. No dams or other barriers to fish passage have been observed on Cameron Flowage. The Killag River commences north of Cameron Flowage (Tait Lake) that is located directly northeast of the Beaver Dam Mine Site. The Killag River is one of two major tributaries to the WRSH. The Killag has a rather long and narrow drainage basin, with a main channel length of approximately 27 km. The Killag River system has several associated waterbodies, such as Tait Lake. West Lake, Mud Lake and Crusher Lake are associated with sub-tertiary basins that are tributaries to the Killag River.

Haul Road

The capacity of each linear watercourse along the Haul Road to support fish species and their life stages (i.e., spawning, young of the year (YOY), juvenile, and adult) has been assessed based on key fish habitat characteristics described through qualitative habitat evaluations and fish species confirmed through electrofishing and trapping surveys in each tertiary watershed intersected by the Haul Road. All species captured within each tertiary watershed along the Haul Road have been considered potentially present within all Haul Road watercourses, to be conservatively inclusive. Atlantic salmon has also been considered for watercourses within the West River Sheet Harbour secondary watershed – Atlantic salmon are considered extirpated from the Morgan River and are therefore not included in the assessment of those watercourses. It is important to note that fish habitat characterization was only performed on short sections of watercourse which overlapped the PA and is not considered representative of the fish habitat along the entire length of each watercourse. Instead, fish habitat characterization is representative of each discrete, homogenous section of watercourse described. In addition, due to the linear nature of the Haul Road Footprint, connectivity to downgradient fish-bearing systems have been assumed for all watercourses in absence of confirmation of barriers to downstream fisheries resources. Descriptions of fish habitat by species and life stage for each linear watercourse with potential impacts due to Haul Road construction are presented in Table 6.9-4 of Section 6.9 Fish and Fish Habitat Assessment of the Updated 2021 EIS (AMNS 2021).

As noted, the majority of streams delineated along the Haul Road are small, 1st order tributaries located high in their respective watersheds. Many are characterized as low gradient, homogenous streams with low velocity, abundant in-stream vegetation, and soft substrates. These streams may provide suitable spawning, young of year, juvenile and adult life stages of most forage fish/habitat generalists but lack the habitat provisions necessary to support earlier life stages of white sucker and salmonids. Higher gradient first order streams were observed to contain more complex habitat types (i.e., riffles, runs, pools), moderate velocities, and a variety of rocky substrates with limited fines. These streams likely support various life stages of brook trout, white sucker, and early life stages of lake chub which prefer abundant in-stream cover in the form of rocky substrate, undercut banks and woody debris. Some of these streams were also observed to gravel substrate over shallow riffles and are considered to support brook trout and white sucker spawning.

Higher order streams (2nd to 4th order) commonly contain more complex habitat, including both low velocity habitat types (i.e., flats, pools, glides), and moderate-high velocity types (i.e., runs, riffles, cascades). These streams likely support a more diverse range of species, including habitat generalist and specialists. Two, higher order watercourses are likely to support habitat for Atlantic salmon: the West River Sheet Harbour (WC-N) and Keef Brook (WC-H). The West River Sheet Harbour is considered to provide

suitable habitat for all life stages of salmon, with clean gravel-cobble sized substrate in well aerated areas, to deeper holding pools for adults. Keef Brook is considered to provide suitable habitat for older juveniles, but high velocities, limited water depths, and a lack of gravel substrate limit habitat suitability for spawning, young of year, and adults.

While several waterbodies are identified within close proximity to the proposed Haul Road, the road layout was optimized to avoid impacts to any waterbodies. As a result, detailed descriptions of fish habitat in waterbodies near the Haul Road (i.e., Tent Lake, Kidney Lake, Johns Pond) are not included.

6.9.1.2 Electrofishing and Fish Collection

Continued trapping efforts were conducted in September, November, and December 2019 in the western extension of the Beaver Dam Mine Site, specifically those watercourses within the Cope Brook Tertiary Watershed. The overarching goal of this particular fish collection program was to saturate selected watercourses with a variety of gear types for extended periods of time in order to clearly establish the presence of fish during a range of seasonal flow conditions and ecological periods.

From April through September 2020, a concentrated fishing program was completed within watercourses and waterbodies within and in proximity to the Beaver Dam Mine Site due to proposed impacts to fish and fish habitat within the Local Assessment Area (LAA). This program consisted of the following tasks:

- Continued trapping during high spring flow regimes within the Cope Brook tertiary watershed within selected watercourses identified within and downstream of the proposed Waste Rock Storage Area (WRSA) (Section 6.9 Fish and Fish Habitat Assessment [AMNS 2021] Figure 6.9-3); and
- Three rounds of summer fish sampling (electrofishing and trapping) within watercourses and waterbodies predicted to be directly affected, indirectly affected, and unimpacted by Project development.

Three rounds of quantitative and qualitative electrofishing surveys were conducted between June 1 and September 30, 2020 to identify seasonal fish usage throughout the Beaver Dam Mine Site. Sampling reaches of approximately 100 m in length were established within watercourses predicted to be directly impacted, indirectly impacted, and reference sites likely to be unimpacted by Project development (Appendix J.2, AMNS 2021).

Both Cameron Flowage and the Killag River were selected for focused fishing surveys during the 2019-2020 field program to provide additional baseline data for anticipated future monitoring programs.

During the 2019-2020 field program, three rounds of trapping efforts (early, mid, and late summer) resulted in the capture of seven species of fish. Species captured included American eel, creek chub, and brook trout, which were not reflected in trap surveys performed during 2015 baseline studies, and banded killifish, golden shiner, white sucker, and yellow perch. Banded killifish made up the vast majority of individuals captured. Within Cameron Flowage, suitable spawning habitat is available for generalist species that show preference for vegetation and soft substrates within lentic environments, including banded killifish, golden shiner, and yellow perch. Spawning habitat for brook trout, white sucker, and creek chub is limited, given the overall lack of clean gravel substrates observed within the along the shoreline. Cameron Flowage also supports both juvenile and adult life stages of American eel with soft substrate and a diversity of cover types.

The Killag River recorded the highest abundance of fish of all sites surveyed during the 2019-2020 field program. The Killag River was also the only site with confirmed presence of Atlantic salmon, with four individual parr captured in July 2020. Additional schools of small (<20 mm) white sucker were also observed during electrofishing surveys but were unable to be captured and are not reflected in population estimates. The Killag River is considered the location of most salmon spawning within the WRSH watershed (Ducharme, 1972), and the most important of the three major rivers (Killag, West, and Little) for overall salmon production. Brook trout, white sucker, and lake chub are also presumed to spawn in this system, which also provides habitat for juvenile and adult American eel.

Electrofishing and trapping efforts were also completed within on-site watercourses and in four stream systems that were determined to potentially be indirectly affected by the Project: WC5, WC23, WC26 and WC27. Fish populations were confirmed in these stream systems. Nine watercourses within the Beaver Dam Mine Site were identified as provincially regulated but are not considered fisheries resources. These watercourses are hydrologically isolated, meaning there is no contiguous surface water connecting these watercourses with any upgradient or downgradient fish-bearing systems.

As a result of fishing efforts completed in 2015 and 2016 within the Beaver Dam Mine Site and Haul Road, a total 10 species and 145 individual fish were captured across eleven of the eighteen survey locations (16 electrofishing reaches, Cameron Flowage and Crusher Lake). As a result of fishing efforts completed between September 2019 and September 2020 within the FHAA in close proximity to the Beaver Dam Mine Site, a of total eleven species and 1,732 individual fish were captured across ten of the fifteen survey locations. Within the Beaver Dam Mine Site and Haul Road, 12 different species of fish were identified through all electrofishing and trapping surveys including Atlantic salmon, American eel, banded killifish, brook trout, brown bullhead, creek chub, golden shiner, lake chub, ninespine stickleback, northern redbelly dace, white sucker and yellow perch.

Fourteen wetlands have been confirmed to provide or potentially provide fish habitat within the Beaver Dam Mine Site and are associated with the following surface water features. Wetlands with associated fish habitat in shallow open water features anticipated to be directly impacted by Project development within the Beaver Dam Mine Site (Wetlands 56, 59 and 61) were re-evaluated during Summer 2020 through quantitative, detailed habitat assessments and additional fish surveys.

Along the Haul Road, twelve wetlands have been assumed to be fish habitat. Details associated with fish habitat condition in each wetland is provided in the 2015-2017 Baseline Report, Table 3-14, appended to the 2019-2020 Baseline Report (Appendix J.2, AMNS 2021). The Haul Road is linear by nature, so a limited evaluation of each watercourse and associated wetland was completed within the confines of the Study Area. Where wetlands provided open water and connectivity to fish bearing watercourses, it was presumed that open water portions of the wetlands were accessible to fish as well, to be conservatively inclusive.

Fish observed from 2006 electrofishing surveys of Moose River as part of the EARD include: American eel, white sucker, and minnow species (CRA 2007a).

6.9.2 Project Activities and Fish and Fish Habitat Interactions and Effects

Project effects to Fish and Fish Habitat VCs are categorized as either:

1. **Direct Effects**: is any Project interaction that results in direct loss or removal (destruction) of fish habitat, through direct imprinting of Project infrastructure on fish habitat, or through complete removal of a stream's entire catchment area or water source
2. **Indirect Effects:** a Project-related effect which does not result in complete removal of a habitat; however, the quality or suitability of that habitat is altered or disrupted through pathways (a change in groundwater or surface water quality or quantity, for example).

Direct Impacts

The Project will result in direct effects to fish habitat. Direct impacts to fish and fish habitat will occur during the construction phase of the Project through activities such as mine site infrastructure and road construction and will be permanent.

Direct impacts include fish inhabited waters which will either be directly imprinted by Project infrastructure or are expected to experience complete loss of flow due to complete loss of catchment from infrastructure placement. Watercourses determined to be inaccessible to, and uninhabited by, fish are not included in direct impacts to fish and fish habitat.

Five watercourses and three wetlands within the Beaver Dam Mine Site comprising fish habitat will be directly impacted by the mine development and have either confirmed fish habitat, fish presence, or are accessible to fish. The total quantity of fish habitat directly lost by the Beaver Dam Mine Site is 39,443.44 m^2 (394.43 habitat units) which will require a *Fisheries Act* authorization

and therefore will be included in the draft Fish Habitat Offset Plan (Appendix J.3, AMNS 2021). All direct impacts to fish and fish habitat within the Beaver Dam Mine Site are shown on Figure J.4-6 of Appendix J.4 (AMNS 2021).

Impacts related to the development of the open pit, pit perimeter berm and internal haul roads are expected to be permanent. This includes impacts to Wetlands 56, 59, and 61 and Watercourses 5, 12, 13, 14 and 25. As part of the open pit development, the fish access between Wetlands 56/59 and Cameron Flowage via Watercourse 13 will be removed. A road around the open pit will impact the open water fish habitat within Wetland 61 and Watercourse 25. The internal haul road will also impact Watercourse 14.

Based on the results of fishing surveys and fish habitat assessments, no Atlantic salmon have been confirmed or are anticipated to reside in any of the fish-bearing aquatic features anticipated to be directly impacted by Project development. No direct impacts to Atlantic salmon will result from the Project.

A total of 36 watercourses located at or near crossings and/or road expansion of the Haul Road. Three watercourse crossings are expected to impact wetland habitat accessible to fish as well (WCA and WL64, WCB and WL66, and WCAA which is associated with WL159 and WL160).

- Of the 29 watercourse crossings required, 22 have existing crossings. Seven will require new culvert installations (no impacts to fish passage expected).
- Of the 22 existing crossings, three bridges are present and will be replaced, with no impact to fish habitat and no improvement to fish passage.
- Of the 19 culvert crossings, five culverts are properly installed, and currently allow fish passage. Culvert replacements will continue to allow fish passage, with no improvement to fish passage.
- Of the remaining 14 culverts are all currently limiting fish passage, due to improper installation and/or maintenance (hung, crushed, blocked or buried). By upgrading culvert crossings at each of these locations, fish passage to upstream systems is expected to improve.

All areas of wetland with confirmed or expected fish habitat (contiguous surface water and/or open water areas) overlapped by the Haul Road re-alignment cut and fill extent (maximum direct impact area of Haul Road) have been calculated using average width and length measurements recorded during qualitative habitat evaluation (i.e., width of watercourse x length of impacted watercourse = area of directly impacted waterbody). Haul Road potential fish habitat impacts total 2430.3 m^2 including new culvert installations, and replacement of existing culverts to accommodate widening of the road. Impact areas were assessed on a case-by-case basis, considering the context of whether a crossing was new or existing, and considering the condition of existing culverts.

The Fish and Fish Habitat Protection Policy (DFO 2019) outlines the prohibitions under the *Fisheries Act* related to the death of fish by means other than fishing, and to the harmful alteration, disruption and destruction of fish habitat. Through various Project revisions, AMNS has been able to reduce the direct loss of fish habitat to the extent practicable. The measures taken to avoid impacts to fish habitat are outlined in greater detail in Section 6.9.8 Section Fish and Fish Habitat Assessment of the Updated 2021 EIS (AMNS 2021).

Death of fish is expected to be low, once mitigation measures are implemented, including development and implementation of a fish rescue plan prior to commencement of construction activities in confirmed fish habitat. Mortalities are not expected, except through incidental mortalities associated with fish rescue activities. Details associated with the fish rescue approach are provided in Section 6.9.8.2.2. Recent and past experience suggests that mortality of fish during fish rescues is typically in the range of 1 to 3%. Furthermore, AMNS commits to adhering to approved timing windows for construction to minimize impact to eggs, larvae, and juvenile fish, wherever practicable.

Direct alteration within the Beaver Dam Mine Site is restricted to small first and second order streams and open water wetlands, which lack suitable habitat for Atlantic salmon. Road crossings to be constructed along the Haul Road will follow all avoidance, minimization and standard mitigations to reduce direct impacts to fish and fish habitat and limited direct impact. There is no expectation of change to the composition of populations of fish from direct loss and alteration of fish habitat. Furthermore, the

larger waterbodies present within the Beaver Dam Mine Site (Mud Lake, Crusher Lake) will be avoided during Project development, limiting impact to fish populations present in these relatively larger systems.

Road crossings to be constructed along the Haul Road will follow all avoidance, minimization and standard mitigations to reduce direct impacts to fish and fish habitat and limited direct impact. There is no expectation of change to the composition of populations of fish from direct loss and alteration of fish habitat. Furthermore, the larger waterbodies present within the Beaver Dam Mine Site (Mud Lake, Crusher Lake) will be avoided during Project development, limiting impact to fish populations present in these relatively larger systems.

Indirect Impacts

The assessment of Surface Water Quality results indicated that, while concentrations for some parameters are anticipated to increase above baseline levels, at the near-field mixing zone there are no exceedances of either CCME, NSE Tier 1 criteria. As water quality criteria are defined by national and international entities as protective of the receiving environment and all water users, there are no anticipated effects to surface waters are a result of discharges from the Project. Further note that a treatment system will be designed to ensure that all site effluent water meets MDMER and will reflect assimilation capacity of the receiving environment, such that any potential effects from nitrite to Fish and Fish Habitat, will be fully mitigated (Section 6.7.8, AMNS 2021).

Based on reduced flow comparisons to DFO framework for ecological flow, it was determined that reductions in four watercourses would have a moderate probability of detectable impacts to ecosystems that support fisheries. Flow reduction is anticipated due to drainage area and/or baseflow reductions in Crusher Lake Outflow (WC-5), South Tributary (WC-23), West Tributary (WC-26), and Mud Lake Outflow (WC-27). Although the actual area of reduced wetted channel due to the flow reductions is quantified at 322.41 m^2 we have quantified a much larger area as potentially altered. Through discussion with DFO the entire area below 30% MAD (approximately 7,728.88 m^2) is considered potentially altered due to uncertainty associated with extreme low flow and physicochemical habitat parameters. The amount of this habitat considered harmfully altered with be determined with DFO during the fisheries authorization process and is expected to be reduced or require less offsetting given that the habitats are expected to maintain the ability to support the existing fish communities.

These areas of flow reduction will be included in the site monitoring plans (AEMP) to verify the predictions and confirm that the systems continue to support the existing fish populations. Water quality predictions, and associated ecotoxicity evaluation, during both operations and closure phases conclude low ecological risk (including fish) in the receiving environment (Cameron Flowage).

Cold-water fish, including salmonids, require that surface water temperatures remain within a certain range for maximal suitability and survival. Under low-flow conditions during summer months, groundwater discharge (baseflow) to Cameron Flowage may sustain a significant portion of the total flow within Cameron Flowage; therefore, the potential reduction in baseflow as a result of the Beaver Dam Mine Site development may impact the average temperature within Cameron Flowage. While all water pumped from the proposed open pit will be rerouted via surface water ditches to maintain the same total flow within Cameron Flowage relative to baseline conditions, water entering Cameron Flowage via the surface water ditches may be at a higher temperature than if that water reached Cameron Flowage through subsurface baseflow. Therefore, measured groundwater and surface water temperatures were evaluated relative to the predicted reduction in baseflow to predict the potential average temperature change in Cameron Flowage under low-flow conditions that could result from development of the Beaver Dam Mine Site (Appendix P.4, AMNS 2021).

The potential temperature change in Cameron Flowage as a result of the development of the Beaver Dam Mine Site based on the measured flow rates and temperatures in Cameron Flowage, the measured groundwater temperatures and the predicted baseflow reduction at EOM and PC as presented in Appendix H (Baseflow Mitigation Assessment) in Appendix P.4 (Mine Water Management Plan) (AMNS 2021). Cameron Flowage will likely be most sensitive to potential reductions in baseflow during low-flow conditions in summer months when baseflow makes up the largest proportion of total stream flow and surface water temperatures within Cameron Flowages are near their maximum. Therefore, GHD selected the two-week period with the lowest average flow rate recorded at surface water monitoring stations (SW-1A and SW-2A), corresponding to August 16 through August

29, 2019, as being representative of low-flow conditions in Cameron Flowage. By applying heat and mass balance modelling, the predicted temperature increase during the identified low-flow conditions is 0.5°C under EOM conditions relative to baseline, and 0.26°C under PC conditions relative to baseline. These predicted increases correspond to an increase from mean baseline water temperature 20.21 to 20.71°C and 20.47°C for EOM and PC, respectively.

Monitoring will be completed to demonstrate that temperature changes within Cameron Flowage are within the predicted range. These monitoring commitments will be confirmed in the Aquatic Effects Monitoring Program (AEMP), which will be developed as part of the permitting process.

Touquoy Mine Site

The Touquoy Mine Site is currently operational. The use of the Touquoy Mine Site for the processing of Beaver Dam Mine ore and tailings management (exhausted pit) will not involve modification to the current footprint or further impacts to fish and fish habitat. The exhausted pit has the capacity to store all mine tailings until scheduled release post-closure. Moving the existing tailings pipeline from the permitted Tailings Management Facility (TMF) to direct water to the exhausted pit will occur within the disturbed footprint of the permitted Touquoy Project and will not result in additional impacts to fish and fish habitat.

There are no further effects to fish and fish habitat anticipated to be caused by the processing of ore and the management of tailings (exhausted pit) from the Beaver Dam Mine. Surface water quality and quantity will continue to be monitored over the life of the Touquoy facility as part of existing approval for the Touquoy mine life and the revised approval for the proposed extended life of the Touquoy site associated with processing of Beaver Dam ore.

6.9.3 Mitigation Measures and Conceptual Habitat Offsets

To mitigate and reduce overall loss of function of fish and fish habitat, a series of mitigation measures will be implemented by AMNS within wetlands and watercourses where direct impacts and potential indirect impacts to fish and fish habitat are expected. Mitigation measures will be confirmed and adaptively managed through ongoing monitoring requirements, as described at the permitting stage. Considering the extensive planning, the ongoing engagement with the Mi'kmaq of Nova Scotia and stakeholders, and the use of proven mitigation measures/best management practices, AMNS is confident that the Project can be constructed, operated, rehabilitated, and closed, in an environmentally responsible and safe manner that minimizes and mitigates impacts to fish habitat.

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

The Project as proposed would result in the permanent impact to fish habitat and its associated productive capacity, through a portion of waterbodies and watercourses within the Project Mine site as well as along the Haul Road. It also would result in indirect alterations to habitat downstream of the Project infrastructure footprint due to partial flow reductions. Proven techniques in similar geographic settings for similar fish species provide the greatest likelihood of offsetting lost productive capacity for the long term, are least likely to fail structurally, and require the least amount of maintenance. Low-risk options that are biologically relevant were prioritized during the development of offsetting concepts. In addition to offsetting using proven methods, a focus on habitat improvements and rehabilitation around Atlantic Salmon, a fish species of local and provincial importance, was also incorporated wherever possible in each offset option.

Several concepts have been identified for preliminary assessment and are presented in the draft Fish Habitat Offset Plan, (Appendix J.3).

6.9.4 Residual Effects and Significance

This effects assessment was developed to be consistent with Fish and Fish Habitat Protection Policy (DFO, 2019), which states "*the Department interprets "harmful alteration, disruption or destruction" as any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish.*" However, it is recognized that the total impacts determined within this assessment will be further reviewed and determination of the amount of HADD will be made by DFO during the authorization application process.

This effects assessment includes:

- impact assessment criteria, Section 6.9.5.2, (AMNS 2021) developed in consideration of the policy and relevant scientific literature (DFO, 2013b; DFO, 2019; DFO, 2005; Newbury and Gaboury, 1993; for example).
- Site specific mitigation measures to avoid and/or minimize the duration or extent of indirect effects to fish and fish habitat are provided in Section 6.9.8, (AMNS 2021).
- Direct and indirect impacts to fish and fish habitat have been quantified through detailed habitat evaluations, and hydrologic and hydraulic analyses. A conservative approach for quantifying indirect impacts due to flow reductions has been taken to identify potential alteration of the wetted areas below the 30% MAD, recognizing that the channels are expected to maintain existing fish communities. Furthermore, all areas with proposed direct and indirect impact have been accounted for in the Offsetting Plan, to meet the no-net-loss policy under the *Fisheries Act*. Work associated with fish and fish habitat will be completed in accordance with DFO and NSE regulatory approvals.
- Potential impact quantification and offsets have been provided within the Offset Plan (Appendix J.3, AMNS 2021) and will require confirmation of the HADD determinations by DFO.
- The assessment carefully considered potential impacts to the Atlantic salmon population and their habitat throughout both direct and indirect interactions resulting from the Project.
- An aquatic effects monitoring program (AEMP) is being developed to validate impact predictions as well as to identify adaptive management measures that may be required during construction, operations, and closure.

A significant adverse environmental effect for fish and fish habitat 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:
  - Direct impacts to fish and fish habitat will occur. However, the current Project infrastructure layout has allowed AMNS to achieve complete avoidance of first order tributaries to Crusher Lake and Mud Lake, and a more equalized site-wide water balance which reduces indirect impacts to downgradient fish habitat.
  - Direct loss of habitat within the Beaver Dam Mine Site will be required to allow for development of the Pit and pit perimeter berm primarily, with small direct impacts related to internal haul roads and loss of upstream flow (i.e., WC5, WC13, WC14). The majority of direct habitat loss within the Beaver Dam Mine Site is within WL59, which is an open water wetland constructed to support historic mine activities.
  - Direct impacts to fish habitat along the Haul Road are minimal in scale, and required to allow for upgrades to the existing forestry road. This involves installation of 29 watercourse crossings; 12 of which are expected to improve fish passage through upgrading culverts which are currently either crushed, buried, blocked or hung.
  - The water collection and treatment system will be constructed, and collection of contact water will commence near the end of the construction phase of the project.
  - Strict adherence to the Erosion and Sediment Control plan will limit the potential indirect effects to fish and fish habitat commencing in the construction phase, and continuing throughout the operational life of the Project.
  - The death of fish by means other than fishing will be limited by the completion of fish rescue wherever direct impact is required.
- During operations:

  - All direct impacts to fish habitat will have been completed, and no new direct impacts are expected.
  - Water collection, treatment and effluent release will occur, resulting in indirect effects to four watercourses through reduction of both daily and monthly average flows. Mud Lake is also predicted to experience a small reduction in water level (maximum 5 cm). Where flow reduction is of a magnitude that it is predicted to result in alteration of fish habitat; the impact area has been incorporated into the offset plan.
  - With appropriate treatment of effluent discharge, the magnitude of the residual effect to the Killag River at the Beaver Dam Mine Site is considered negligible (within established criteria or background concentrations at the 100 m compliance point).
  - Effluent is predicted to be of neutral pH, limiting potential impact to Killag River.
  - Changes in flow to the Killag River and resultant changes to fish habitat quality from pit operations and dewatering have been predicted to be low.
- During closure:
  - With appropriate treatment of effluent discharge, the magnitude of the residual effect to the Killag River at the Beaver Dam Mine Site is considered negligible (within established criteria or background concentrations at the 100 m compliance point).
  - Effluent is predicted to be of neutral pH, limiting potential impact to Killag River, a low pH river with current efforts to increase pH to support salmon restoration.
  - During pit filling, flows in the Killag River are expected to decrease by 2.2% MAD flows; however, the duration of low flow period based on daily flows is expected to decrease (fewer low-flow days compared to baseline). Following pit filling, the Killag River is expected to observe a surplus in surface water on the order of 2.2%. These interactions are low in magnitude and not expected to result in any harmful alteration of fish habitat within the Killag River.

6.9.5 Proposed Compliance and Effects Monitoring Program

An Environmental Effects Monitoring Plan (EEM) has been initiated and will be fully implemented to support compliance with the monitoring requirements in MDMER. This will form one component of the broader Aquatic Effects Monitoring Program (AEMP), which will monitor all aquatic ecosystems where Project effects are predicted to validate impact predictions as well as to identify adaptive management measures that may be required during construction, operations, and closure. A conceptual AEMP is provided in Appendix P.5. Baseline data to support the EEM and AEMP has, and continues to be, collected to support ongoing effects assessment over the life of mine.

The purpose of the AEMP is to identify potential changes the Project may have on the surrounding aquatic environment. This includes the following specific objectives:

- to determine any short- and long-term aquatic effects of the Project on downstream aquatic receptors;
- to evaluate the accuracy of impact predictions made in the EIS;
- to assess the efficacy of impact mitigation measures;
- to provide the data necessary to report on state of the environment on an annual basis, and to inform adaptive management approaches to reduce or eliminate Project-related effects; and
- to recommend any necessary and appropriate changes to future versions of the AEMP.

Proposed study areas include watercourses and waterbodies adjacent to planned infrastructure within the Beaver Dam Mine Site including WC5/Crusher Lake, WC23, WC26, WC27/Mud Lake, and Cameron Flowage/Killag River. Study areas also incorporate those selected for Environmental Effects Monitoring (EEM) downgradient of proposed effluent discharge locations as required under the MDMER (Cameron Flowage/Killag River).

In accordance with the federal *Fisheries Act,* mines in Canada regulated under the MDMER are required to conduct periodic EEM studies as part of their authority to deposit effluent. The objective of EEM under MDMER is to evaluate the effects of metal and

diamond mining effluents on fish, fish habitat, and the use of fisheries resources. EEM programs consists of two general components, namely biological monitoring studies (fish population study, fish tissue study, and benthic invertebrate community survey) and effluent and water quality monitoring studies (effluent characterization, water quality monitoring, and sublethal toxicity testing). The components of EEM monitoring have been brought forward into the Conceptual AEMP Design Plan.

The scope of the AEMP involves monitoring of water quality, water quantity, sediment quality, periphyton, benthic invertebrates, fish habitat and community, and fish health and fish tissue. The AEMP describes the proposed sampling frequency, schedule and intensity, as well as identified significance thresholds, action levels and suggested responses should significant thresholds be exceeded. The AEMP also provides a proposed reporting schedule to federal and provincial regulators. The Conceptual AEMP can be found in Appendix P.5, AMNS 2021.

6.10 Habitat and Flora

Flora species and communities, and the fauna species which rely upon these communities, may be altered, either directly or indirectly, by proposed Project activities.

6.10.1 Baseline Program

A detailed desktop study to examine potential for presence of and effects on SAR within the vicinity of the Project area was completed. A priority species list was compiled to identify potential SOCI and SAR for each taxonomic group which may be using the Project area and surrounding lands. Additional data from the Atlantic Canada Conservation Data Centre (ACCDC) and the NS Department of Communities, Culture and Heritage, including the NSDNR Significant Species and Habitats database, the Maritime Butterfly Atlas, and Odanata Central were reviewed based on these findings.

Habitat assessments were completed in October 2014, May 2015 and July/August 2019 within the Beaver Dam Mine Site, and in May 2016 within the Haul Road. Meander transects through each habitat type were conducted to ensure that a variety of habitat types were surveyed for vegetation. Vascular plant assessments occurred early and late in the growing season to capture plant species with different phenology. Overall, current and historic land use throughout the Project area has resulted in a patchwork of mature, immature, regenerating, and disturbed tree stands. The Project area contains a diversity of habitat types and landscape features, but has experienced a considerable amount of disturbance and habitat fragmentation as a result of historic mine operations and current and historic timber harvesting practices.

A total of 295 species of vascular plants were identified - six are considered priority species; lesser rattlesnake plantain (*Goodyera repens*, S3), southern twayblade (*Neottia bifolia*, syn. Listera australis, S3) appalachian polypody (*Polypodium appalachianum*, S3), highbush blueberry (*Vaccinium corymbosum*, S3S4) and Nova Scotia agalinis (*Agalinis neoscotica*, S3S4). The diversity of species is moderate to high, especially considering the low fertility of soils within the Project area; however, this is attributed to the range of habitat types encountered, from natural aquatic systems, a variety of wetland types, and both intact and disturbed upland habitats. The vegetation species observed are largely native species, with relatively low diversity and abundance of roadside exotic or invasive species.

Common lichen species observed opportunistically during priority lichen surveys were recorded. Twenty-three species were recorded within the lichen study area, which includes the Beaver Dam Mine, surrounding area, and, Haul Road. Of these species, 11 are listed as SAR or SOCI, which are further discussed in Section 6.13, Species of Conservation Interest and Species at Risk of the Updated 2021 EIS (AMNS 2021).

6.10.2 Project Activities and Habitat and Flora Interactions and Effects

Development of the mine footprint and Haul Road upgrades and construction will result in direct impacts to vascular and non-vascular individuals and to flora communities at the full or partial forest stand level in aquatic, wetland, and upland habitats. As such, many of the effects specific to wetland habitat will directly relate to effects on flora. The majority of direct mortality to flora

will occur during site construction. No new impacts to habitat and flora are expected to occur as a result of the Project at the Touquoy Mine Site as no increase in footprint is proposed beyond the approved construction now underway and no indirect effects are expected through proposed Project operations.

6.10.2.1 Direct Impacts on Old Forest and Interior Forest

Direct impacts to Old Forest will occur where the new section of the Haul Road is planned. This area is unavoidable as the Haul Road was re-routed through this area to avoid impacts to the Beaver Lake IR and has been placed to avoid the waterbodies in the area. Two patches of Potential Old Growth were identified in this area. Of the 2,660 ha of predicted interior forest that has been identified within the LAA, the Project is will affect a total of 237 ha of interior forest habitat, which accounts for 9% of predicted interior forest in the LAA and 0.3% within the RAA.

6.10.2.2 Indirect Impacts on Habitat and Flora

Project activities have the ability to indirectly affect flora throughout the Project, particularly during the construction phase. Indirect impacts could include altered hydrology as a result of activity in close proximity to wetland habitat; erosion and sedimentation from Project activities; dust accumulation on vegetation smothering and stressing plants; accidental spills involving deposition of a deleterious substance, including fuel oil, lubricants, or engine oil; and impoundment of up-gradient wetlands if inadvertent dams are built as part of the mine development (roads can act as dams if not constructed properly to allow water to flow through them)..

Movement of equipment can result in the transport of invasive species and deposition of dust on vegetation within close proximity of roads when conditions are dry. This affects flora through the deposition of dust on leaves, which temporarily reduces evapotranspiration and photosynthesis. Over time this may reduce overall growth rates. Similarly, winter maintenance of haul roads and mine site roads can affect plant growth adjacent to roads by placement of sand or stockpiling of snow. Road salt will not be used, thereby reducing potential impact to vegetation.

Additional indirect impacts to native plant communities include the potential for introduction of invasive species due to increased traffic levels.

6.10.3 Residual Effects and Significance

The predicted residual environmental effects of project development and operations on habitat and flora are assessed to be adverse, but not significant. The overall residual effect of the Project on habitat and flora is assessed as not significant after mitigation measures have been implemented. Historical and current land use (forestry and mineral exploration) with the Project area has undeniably negatively affected the local habitats in ways that have affected the local distribution and abundance of several species of flora.

6.11 Terrestrial Fauna

Terrestrial fauna, and the habitat upon which they rely, may be altered either directly or indirectly by proposed Project activities.

6.11.1 Baseline Program

Data on various fauna species was collected during targeted field surveys and incidental observations. Targeted surveys included bats, mainland moose, and wood turtle surveys. Incidental observations were recorded for all fauna species.

Mainland moose have been recorded within 3.4 km of the Beaver Dam Mine Site, and within 7.5 km of the Haul Road (ACCDC). Mainland moose tracks were observed within the Beaver Dam Mine Site in May 2015 in disturbed roadside habitat north of Wetland 56 and incidentally in two locations, in Wetland 210 and north of Wetland 206, just outside the Beaver Dam Mine Site, in September 2015. No mainland moose signs were observed incidentally or during dedicated moose surveys along the Haul Road, by the

Project Team. However, a local Mooseland resident recorded a moose observation near the proposed Haul Road in December 2020.

According to the ACCDC reports, no known bat hibernaculae are present within 5 km of the Haul Road or mine footprint Project area. Abandoned mine openings (AMOs) potentially provide bat hibernacula. Of the twenty AMOs evaluated at the site, all were either in-filled, contained a concrete cap blocking access, or were flooded, with the exception of one. This AMO, known as the J.H. Austin Main Shaft (BED-1-003), was determined to be inaccessible to bats. No bats, or evidence thereof, were observed incidentally during biophysical surveys, particularly bird surveys which are conducted when bats are more active.

Herpetofaunal species were inventoried within the PA through targeted searches of appropriate habitats and through incidental observations. Observed species included eastern American toad, eastern smooth green snake, red-spotted newt, red-backed salamander, spring peeper, bullfrog, green frog, northern leopard frog, wood frog, maritime garter snake and snapping turtle. Though not observed, it is likely that other common herpetile species use habitat within the Beaver Dam Mine Site and Haul Road, at least periodically. Specialized survey methods were used to identify wood turtles and their habitat, although non were observed.

Suitable habitat for the snapping turtle was observed within the Beaver Dam Mine Site and Haul Road. One female snapping turtle and active nest was observed by DFO within the Bever Dam Mine Site. Previously, one snapping turtle was observed incidentally on the Haul Road (Mooseland Road). Two other incidental snapping turtle observations were made within the vicinity of the Touquoy Mine Site, on roadsides near Moose River and Scraggy Lake.

Incidental sightings of fauna were recorded during all field programs throughout the Project area during all seasons. Aside from mainland moose tracks and snapping turtle observations, no priority fauna species or signs thereof were observed. Given the mobility of fauna species, the absence of observation does not confirm absence of the species within the Project area.

6.11.2 Project Activities and Fauna Interactions and Effects

Development of the mine infrastructure will cause direct impacts to habitat used by terrestrial fauna, including upland forested habitat and wetlands. This will occur mostly within the construction phase of the Project. Project activities are likely to result in increased habitat fragmentation and a decrease in habitat quality for those species which rely on interior forest conditions, where intact interior forest remains. This is based on increased activity and sensory disturbance, along with increased physical fragmentation. Increase in physical fragmentation is expected to be low, based on the current high level of disturbed habitat as discussed.

Sensory disturbance to terrestrial fauna would result from construction, rock blasting, and overall increased traffic along the Haul Road during operations. Overall, project activities will likely cause a change in usage of the PA by wildlife, with some species tending to avoid the area, while others may be attracted to the increased activity, including opportunistic species such as coyotes, raccoons, skunks, or black bears. Direct loss of habitat and the level of new fragmentation associated with the Project is anticipated to be low, given the habitat types, use by observed species and current level of disturbance. The majority of the proposed Haul Road follows an existing road corridor, thereby limiting new habitat fragmentation. The construction of the new section of the Haul Road will decrease the habitat quality for those species that rely on interior forest. Changes to ambient noise levels and the presence of periodic vibrations from blasting have the potential to adversely affect fauna. Noise may simply act as a sensory disturbance resulting in avoidance; however, noise can also affect fauna behavioral patterns, stress levels, communication and hunting success. Light effects on terrestrial fauna include changes to circadian patterns, seasonal patterns, movement and distribution, and community interactions and composition. Sensory disturbance impacts are expected to be greatest at the Beaver Dam Mine Site. Light impacts from trucks on the Haul Road are expected to be insignificant compared to baseline daylight illuminance and will be blocked by the surrounding natural buffers and topography. No permanent lighting will be installed on the Haul Road.

Direct mortality of fauna species could result from Project activities, particularly due to the increase in traffic during construction and operation of the facility. Indirect mortality could result from exposure to contaminants or spills from unplanned incidents. The

increased level of traffic poses an increased risk to wildlife collisions, particularly along the Haul Road, where the speed limit is proposed to be 70 km/hr. The risk of collisions within the mine footprint will be lower, as the speed limit will be reduced to 40 km/hr.

No new impacts on terrestrial fauna are expected to occur as a result of the Project at the Touquoy Mine Site as no increase in footprint is proposed beyond the approved construction now underway and no indirect effects are expected through proposed Project operations.

6.11.3 Residual Effects and Significance

The predicted residual environmental effects of Project development and production on terrestrial fauna are assessed to be adverse, but not significant. The overall residual effect of the Project on terrestrial fauna is assessed as not significant after mitigation measures have been implemented. Historical and current land use in the region has likely affected the local habitats in ways that have affected the local distribution and abundance of several species of fauna.

6.12 Avifauna

Avifauna habitat may be altered or lost as a result of direct or indirect disturbances from the Project. Migratory birds and SAR are protected under federal legislation by the *Migratory Birds Convention Act* (MBCA) (Government of Canada, 1994) and the Species at Risk Act (Government of Canada, 2002).

6.12.1 Baseline Program

A background review of potential avian species that could occur within the Project area was completed. Avian baseline monitoring programs, including fall migration, spring migration, breeding bird, nocturnal owl, spring raptor migration, winter wildlife, and common nighthawk surveys, were completed within the PA and summarized below (Table 6.12-1).

Ninety-two avian species were observed across all survey seasons. A total of 32 possible priority species, including nine SAR, were observed either during dedicated survey periods or incidentally. Avian diversity was relatively higher along the Haul Road than within the Beaver Dam Mine Site This is likely attributable to the fact that the mine footprint Project area is more extensively disturbed and fragmented as a result of historic mine operations and current and historic timber harvesting practices. Overall, avian diversity and abundance was moderate, and fell within expectations for the habitats available, and for forests located in Halifax County.

6.12.2 Project Activities and Birds Interactions and Effects

Mine site preparation may cause temporary and medium-term loss of habitat for birds and may cause disturbance or displacement of species. The widening of existing roads may cause a permanent loss of habitat for birds, and construction of new roads may affect habitat use by birds. Habitat fragmentation may alter habitat suitability for those species which rely on interior forest conditions. Within the Haul Road Project area, this change in habitat is expected to be permanent.

Table 6.12-1: Summary of Bird Observations for each Survey Period

Survey	Total # of Individuals	Total # of Species	Individuals Observed During Surveys	Incidental Individuals (Not Included in Analysis)	Species Observed Only Incidentally
Fall Migration 2014	950	45	534	418	American black duck, Canada goose, common loon, great horned owl, pine siskin, purple finch, red crossbill, rusty blackbird
Spring Migration 2015	874	57	550	324	Common raven, wood duck, common merganser, American crow
Spring Raptor Migration 2015	3	3	3	0	N/A
Winter Wildlife Survey (including avifauna) 2015	7	7	7	0	N/A
Breeding 2015	424	51	332	92	Canada goose, northern parula, olive-sided flycatcher
Common Nighthawk 2015	4	4	4	0	N/A
Spring Migration 2016	2269	71	1702	567	American crow, barn swallow, common goldeneye, common loon, red crossbill, mourning dove, northern waterthrush, pine siskin, ring-necked pheasant
Spring Nocturnal Owl 2015 and 2016	0	0	0	0	N/A
Breeding 2016	1,772	68	1,539	233	Northern harrier, common loon, eastern wood-pewee, olive-sided flycatcher.
Breeding 2019	218	35	217	0	N/A
Common Nighthawk 2019	0	0	0	0	N/A

N/A = not applicable.

Sensory disturbance to avifauna would result from construction, rock blasting, and overall increased traffic along the Haul Road during operations. Overall, project activities will likely cause a change in usage of the PA by avifauna. Construction, mine operations and truck traffic will increase dust emissions, which may affect surrounding vegetation and, consequently, avifauna Direct loss of habitat and the level of new fragmentation associated with the Project is anticipated to be low, given the habitat types, use by observed species groups and current level of disturbance. The majority of the proposed Haul Road follows an existing road corridor, thereby limiting new habitat fragmentation. The construction of the new section of the Haul Road will decrease the habitat quality for those species that rely on interior forest.

Changes to ambient noise levels from mine operations, truck traffic, and periodic blasting have the potential to adversely affect avifauna. Studies have found that increased noise levels have the potential to exhibit changes in song characteristics, reproduction, abundance, stress levels, and species richness. Project lighting may cause disturbance or displacement of species, while attracting other species, or may cause general behavioral changes (DaSilva, Valcu and Kempenaers, 2015). For those species which may be attracted to lights (i.e., insectivores), lights may increase potential for direct mortality of these species or may increase habitat suitability by supplementing their source of prey. Sensory disturbance impacts are expected to be greatest at the Beaver Dam Mine Site. Light impacts from trucks on the Haul Road are expected to be insignificant compared to baseline daylight illuminance and will be blocked by the surrounding natural buffers and topography. No permanent lighting will be installed on the Haul Road.

There is the potential for avifauna mortality as a result of increased truck traffic, construction and clearing activities and accidents (e.g., spills). Birds (particularly injured or fledgling) may get trapped in the open pit or collide with other project infrastructure (crushers or trucks), which could lead to death or injury. Migratory avifauna may be indirectly impacted as a result of the surface water quality in the pit lake created in the Touquoy Mine Site, used to store tailings from Beaver Dam Mine Site. Mitigation measures, such as avifauna deterrents are currently in place at Touquoy Mine Site and they will be applied to reduce the potential environmental impacts of the Project on migratory avifauna at the Touquoy facility as per existing approvals.

6.12.3 Residual Effects and Significance

The predicted residual environmental effects of the Project on birds and bird habitat are assessed to be adverse, but not significant. The overall residual effect of the Project on birds and bird habitat is assessed as not significant after mitigation measures have been implemented. Historical and current land use in the region has likely affected the local habitats in ways that have affected the local distribution and abundance of several species of birds.

6.13 Species of Conservation Interest and Species at Risk

Species at risk (SAR) are protected under federal or provincial endangered species legislation. Species of conservation Interest (SOCI) represent species whose populations are either currently or potentially threatened by natural or anthropogenic factors. These species are listed as S1-S3 (or any combination thereof, inclusive of S3S4) by the ACCDC and are not designated by federal or provincial endangered species legislation.

6.13.1 Baseline Program

6.13.1.1 Priority Fish Species

The desktop evaluation for priority fish species revealed that no priority species were documented within 5 km of the Project area (ACCDC). No location sensitive species of fish have been identified within 5 km of the Beaver Dam Mine Site or the Haul Road.

No fish SAR were observed within the Project area. Two priority species (American eel and brook trout) of fish were identified within the PA during field surveys, and a third priority species (Atlantic salmon) was identified in the Killag River, outside the PA. No other fish SAR or SOCI were observed, and none are expected based on habitat, species distribution and survey effort completed within the Project area.

6.13.1.2 Priority Vascular Flora Species

The desktop evaluation for priority species of vascular flora revealed that none were identified within 5 km of the Project Area (ACCDC). NSLF has classified several species as 'location sensitive', meaning their exact locations cannot be provided to proponents in ACCDC reports. Black Ash (*Fraxinus nigra*), a location sensitive vascular flora species, was not documented within 5 km of the Project Area.

A total of 295 species of vascular flora have been identified in field assessments. Six SOCI vascular flora species were observed. No SAR vascular flora species were observed. These SOCI identified within the Project area are outlined in Table 6.13-1.

Table 6.13-1: Priority Vascular Flora Observed within the Beaver Dam Mine Site and Haul Road

Common Name	Scientific Name	COSEWIC/ SARA/NSESA	S-Rank	Habitat in PA
Wiegand's sedge	*Carex wiegandii*	-	S3	Observed in three locations, all within the Beaver Dam Mine Site. Within Wetlands 12 and 33, and in one upland location between Wetlands 48 and 13.
Lesser rattlesnake plantain	*Goodyera repens*	-	S3	Observed in one location on the upland margin of Wetland 29, within the Beaver Dam Mine Site.
Southern twayblade	*Listera australis (syn. Neottia bifolia)*	-	S3	Observed along the Haul Road in Wetlands 80, 115, 129, 135, 137, 147, 161 and within the upland between 137 and 136. Twayblade was typically observed in clumps of 1-5 individuals.
Appalachian polypody	*Polypodium appalachianum*	-	S3	Observed in one location immediately adjacent to Wetland 137 growing on a boulder within the Haul Road.
Highbush blueberry	*Vaccinium corymbosum*	-	S3S4	Observed in one location within Wetland 157 within the Haul Road.
Nova Scotia Agalinis	*Agalinis neoscotica*	-	S3S4	Observed in two locations along existing access roads in the southeast expansion of the Beaver Dam Mine Site.

PA = project area; COSEWIC = Committee on the Status of Endangered Wildlife in Canada; SARA = Species at Risk Act, 2002; NSESA = Nova Scotia Endangered Species Act.

Three SAR species were identified as having elevated potential to be located within the Project area based on habitat preference and known distribution. These species are Redroot (*Lachnanthes caroliniana*, SARA & COSEWIC Special concern, NSESA Vulnerable), Spotted Pondweed (*Potamogeton pulcher*, NSESA Vulnerable) and Black Ash (Fraxinus nigra, NSESA Threatened). The preferred habitats for each of these species were focused on during all vegetation, habitat and wetland delineation surveys. None of these species were identified within the Project area.

6.13.1.3 Priority Lichen Species

The desktop evaluation for priority species of lichens revealed that Boreal Felt lichen has been documented within 5 km of the PA (ACCDC). The Boreal Felt lichen (*Erioderma pedicellatum*) is listed as Endangered by COSEWIC, SARA and NSESA, and ranked S1S2 by the ACCDC. NSLF has not determined any lichen species to be 'location sensitive'. No lichen species were documented by the Nova Scotia Department of Communities, Culture and Heritage Environmental Screening Report. The Mersey Tobeatic Research Institute provide an additional priority lichen database which was used during the desktop evaluation.

In total, 11 priority lichen species were observed within the PA during lichen surveys or incidentally (3 SAR and 8 SOCI). Of the 3 SAR identified, two are located within the PA. Blue Felt lichen (*Pectania plumbea*, SARA/COSEWIC Special Concern, NSESA Vulnerable, S3) was observed in the Beaver Dam Mine Site and Haul Road, as well as in the broader lichen study area. Frosted Glass Whiskers (*Sclerophora peronella*, SARA/COSEWIC Special Concern, S1?) was identified within the Beaver Dam Mine Site. Boreal Felt Lichen (*Erioderma pedicellatum*, SARA/COSEWIC/NSESA Endangered, S1) was identified in the lichen study area, but not within the PA.

6.13.1.4 Priority Terrestrial Mammal Species

Mainland Moose (Alces americanus, NSESA Endangered, S1) have been documented within 5 km of the Project Area (ACCDC). Three records were available for mainland moose within 5 km of the Beaver Dam Mine Site, Mainland moose tracks were observed within the Beaver Dam Mine Site in May 2015 in disturbed roadside habitat north of Wetland 56 and incidentally in two locations, in Wetland 210 and north of Wetland 206, just outside the Beaver Dam Mine Site, in September 2015. No mainland moose signs were observed incidentally or during dedicated moose surveys along the Haul Road, by the Project Team. However, a local Mooseland resident recorded a moose observation near the proposed Haul Road in December 2020.

According to the ACCDC reports, no known bat hibernaculae are present within 5 km of the Haul Road or mine footprint Project area. AMOs potentially provide bat hibernacula. Of the twenty AMOs evaluated at the site, all were either in-filled, contained a concrete cap blocking access, or were flooded, with the exception of one. This AMO, known as the J.H. Austin Main Shaft (BED-1-003), was determined to be inaccessible to bats. No bats, or evidence thereof, were observed incidentally during biophysical surveys, particularly bird surveys which are conducted when bats are more active.

6.13.1.5 Priority Herpetofauna Species

A desktop evaluation for amphibian and reptile priority species revealed that no priority herpetile species have been documented within 5 km of the mine footprint and Haul Road Project area by the ACCDC. No amphibians or reptiles were documented within the vicinity of the Project area by the Nova Scotia Department of Communities, Culture and Heritage Environmental Screening Report.

Suitable habitat for the snapping turtle was observed within the Beaver Dam Mine Site and Haul Road. One female snapping turtle and active nest was observed by DFO within the Bever Dam Mine Site. Previously, one snapping turtle was observed incidentally on the Haul Road (Mooseland Road). Two other incidental snapping turtle observations were made within the vicinity of the Touquoy Mine Site, on roadsides near Moose River and Scraggy Lake.

Targeted turtle surveys within the Beaver Dam Mine Site did not reveal any sightings of wood turtles, painted turtle or suitable nesting habitat. No opportunistic observations of wood turtles, painted turtle or suitable nesting habitat were documented during any wetland or watercourse surveys throughout the PA.

6.13.1.6 Priority Invertebrates

The desktop evaluation for priority invertebrate species revealed that one monarch butterfly was identified within 5 km of the PA by the ACCDC reports. NSL&F has not identified any invertebrate species as 'location sensitive' species and no invertebrate species were documented by the Nova Scotia Department of Communities, Culture and Heritage Environmental Screening Report. The Maritime Butterfly Atlas was reviewed (Squares 20NQ18, 20NQ28 and 20NQ29) for observations of priority Lepidopterans. A single record of a Monarch Butterfly was documented within Square 20NQ29. It is possible that it uses the mine footprint Project area, at least periodically, such as during migration.

A review of data provided by the Maritime Butterfly Atlas and ACCDC confirmed that one monarch butterfly was observed within the Beaver Dam Mine Site, adjacent to Wetland 59. Monarch butterflies rely on milkweed as a host plant for their larvae; as such, it is a key indicator for presence of the monarch. No milkweed was documented during surveys for vascular flora, or opportunistically during any other surveys. It is possible that the monarch uses the Beaver Dam Mine Site, at least periodically, during migration.

No priority invertebrate species were identified through sampling for benthic invertebrates.

The desktop review of damselflies and dragonflies through Odonata Central did not confirm presence of any priority species in the vicinity of the Project area nor were any priority species observed during surveys completed within the Project area.

No other targeted surveys were completed for invertebrates; however, no opportunistic observations of priority invertebrate species were recorded. No other priority invertebrate species were identified during the desktop review.

6.13.1.7 Priority Birds

A desktop review for priority species revealed that 33 priority bird species were identified as having the potential to occur within the Beaver Dam Mine Site and Haul Road based on habitat availability and geographic distribution. Eighteen species have been documented within 5 km of the Project area by ACCDC.

The Peregrine Falcon (*anatum/tundrius* pop.*)* is considered a location sensitive species; however, it has not been documented within 5 km of the Project Area in either of the ACCDC reports.

A report provided by the Nova Scotia Department of Communities, Culture and Heritage reported nesting records or probable nesting records for 16 priority species within the vicinity of the Project Area.

Twenty-three priority species were observed either during dedicated survey periods or incidentally, in consideration of their breeding status qualifiers. Of these, nine SAR avifauna were observed, which are described in detail in the Updated 2021 EIS (AMNS 2021). Given the mobility of bird species, the absence of observation does not confirm absence of the species within the Project area.

6.13.2 Project Activities and Species of Conservation Interest and Species at Risk Interactions and Effects

Project interactions and mitigation and monitoring for each broad taxonomic group are outlined in previous chapters. These mitigation measures are appropriate and should be applied for all SOCI and SAR within the same taxonomic group. SAR and SOCI specific Project effects and mitigations are discussed in the Updated 2021 EIS (AMNS 2021).

6.13.3 Residual Effects and Significance

Based on avoidance, mitigation measures, and monitoring, the residual effects anticipated for each priority species are summarized in Sections 6.6.3, 6.7.3, 6.8.3, and 6.9.3 of this Summary; residual effects are not expected to be significant. The Project is not expected to have significant cumulative effects. However, the alteration of the disturbance of habitats throughout the region from historic and current land use is likely to have affected the local distribution and abundance of various species.

6.14 Indigenous Peoples

Effects of changes to the environment on Indigenous Peoples is pursuant to the *Canadian Environmental Assessment Act* 2012 including assessment of: health and socio-economic conditions; physical and cultural heritage, including any structure, site or thing that is historical, archaeological, paleontological or architectural significance; and current use of lands and resources for traditional purposes.

Under Nova Scotia's Environmental Assessment Regulations, there is a requirement to identify concerns of Indigenous Peoples about potential adverse effects and clarify the steps taken or proposed to be taken by AMNS to address concerns.

The Crown has a duty to consult with the Mi'kmaq of Nova Scotia, which is achieved in accordance with the Mi'kmaq-Canada-Nova Scotia Consultation TOR. As per Supreme Court of Canada instruction and subsequent guidance from governments, such as the Updated Guidelines for Federal Officials to Fulfill the Duty to Consult (Government of Canada, 2011) and the Proponents' Guide: Engagement with the Mi'kmaq of Nova Scotia (Province of Nova Scotia, 2012), the Crown may delegate procedural aspects of consultation to proponents. However, the duty to consult, and constitutional obligation remains with the Crown. As noted in the EIS Guidelines (CEAA 2016) the results of the AMNS's Mi'kmaq of Nova Scotia engagement program *"helps to contribute to the Crown's understanding of any potential adverse impacts of the project on potential or established Aboriginal or treaty rights, title and related interests, and the effectiveness of measures proposed to avoid or minimise those impacts"*.

6.14.1 Baseline Conditions

Five main components were used to define the baseline information for the Mi'kmaq of Nova Scotia:

- information obtained during on-going engagement with the Mi'kmaq of Nova Scotia;
- completion of a Mi'kmaq Ecological Knowledge Study (MEKS)
- information shared with AMNS by Millbrook First Nation from a completed Traditional Land and Resource Use Study (TLRUS; MFC 2019) (Under Confidential Agreement);

- publicly available Indigenous knowledge related to the Mi'kmaq of Nova Scotia; and
- completion of archaeological screening and reconnaissance.

There are 13 Mi'kmaq communities in Nova Scotia, with two First Nation (Mi'kmaq) reserves in the vicinity of the Project: Beaver Lake IR 17 (49.4 ha) is located approximately 5 km southwest from the Beaver Dam Mine Site, and Sheet Harbour IR 36 (32.7 ha) is located 20 km south of the Project. Both these reserves belong to the Millbrook First Nation which is located in Truro, Nova Scotia, 54 km northwest of the Beaver Dam Mine Site. The 2017 Census reports 21 and 25 Mi'kmaw residents at Beaver Lake and Sheet Harbour, respectively (Statistics Canada 2017a, 2017b).

- Beaver Lake: established in 1867 and approximately 49.4 ha in size is situated along Hwy 224. The estimated population on reserve is 21 with a total of five homes and four small cottages/camps.
- Sheet Harbour: set aside under Millbrook administration in 1960 and approximately 32.7 ha along Hwy 7, the estimated population on reserve is 25 with a total of nine homes, two trailers, a community hall and a convenience/gas bar.

The Sipekne'katik First Nation, located in Indian Brook, Nova Scotia, is located approximately 61 km west of the Project. The Pictou Landing First Nation (PLFN), located north of the town of New Glasgow, is located 66 km north of the Project.

Mi'kmaq rights are communal rights and therefore shared amongst all members of the Mi'kmaq Nation in Nova Scotia. AMNS acknowledges the collective rights for all Mi'kmaq of Nova Scotia. Given the proximity of the Project to the Millbrook First Nation Beaver Lake IR and Sheet Harbour IR and, given the documented Millbrook First Nation traditional and current use presented in the TLRUS (MFC 2019), the EIS has tailored the description and analysis of the Project and current Mi'kmaq land and resource use, health and socio-economic conditions, physical and cultural heritage to the Millbrook First Nation community and its members. This approach has been validated through engagement with Millbrook First Nation, the KMKNO, and the broader Mi'kmaq of Nova Scotia community.

The Mi'kmaq of Nova Scotia have established Aboriginal and Treaty rights. This includes traditional rights to hunt, gather and fish, as well as treaty-protected rights to hunt and gather, and to fish for a "moderate livelihood", which may take place throughout the year. According to the TLRUS (MFC 2019), the LAA is used by the Millbrook First Nation for the following purposes:

- hunting deer, bear, rabbit and grouse for sustenance;
- trapping rabbits, bobcat, beaver, coyotes, musrat, mink, otter, weasel and other small fur bearing animals for pelts and food;
- gathering/harvesting various plants for medicinal and sustenance purposes;
- gathering/harvesting fallen wood and birchbark for handicrafts and cultural items;
- fishing for trout and other freshwater species; and,
- modern-day camps for recreational purposes.

The TLRUS (MFC 2019) states that local residents of the Beaver Dam, Sheet Harbour and Millbrook IRs frequently use the area (range of use from weekly to yearly, depending on availability of species) for hunting (deer, bear, rabbit, grouse, porcupine) and rely on the wild harvest as an important food and dietary source. Equally, community members harvest berries when in season, and a number of plants that are also used for sustenance, as well as traditional medicines. The seasonal and recreational use of animals and plants important to the Millbrook community members supports the continuity of traditional practices and is very important to the maintenance of their culture and the practice of their rights. Millbrook harvesting activities and practices are culturally important as they ensure the sharing and maintenance of cultural values and their practice. Millbrook First Nation community members use plants and animals harvested in the area for traditional sustenance purposes, health-related medicinal purposes, and spiritual and cultural purposes.

Additionally, the MEKS (CCM 2016) provided the following information related to current Mi'kmaq land and resource use sites, species of significance to Mi'kmaq, and Mi'kmaw communities, with the current Mi'kmaq land and resource uses categorized and identified as:

- **Kill/hunting:** trout, eel, bear, rabbit, deer, porcupine, partridge, coyote, mink, muskrat, weasels, raccoon, fox, otter and beaver.
- **Burial/birth:** potential burial sites recorded within the MEKS study area on the western side of the Beaver Dam Mine Road but not within the PA.
- **Ceremonial:** none identified.
- **Gathering:** wild fruit, berries, water, food plant, specialty wood, logs, feathers, quills.
- **Habitation:** anchored boat, travel route, overnight site.

There are a number of activities associated with the harvest and use of plants, animals and fish within the PA and in the LAA that relate to historical traditions and customs of the Mi'kmaq that are still practiced today. As described, the TLRUS (MFC 2019), the MEKS and residents of the Beaver Lake IR 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) 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) 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.

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 are five camps documented within 1 km of the Haul Road and multiple other camp locations throughout the LAA (MFC 2019). The Millbrook community is concerned that noise and activity from the Beaver Dam Mine Site and the Haul Road will negatively impact their ability to enjoy the remoteness and quiet of the area, as well as impact wildlife patterns and their hunting practices.

The evidence presented above shows Mi'kmaw occupancy and land/resource use in the PA, LAA and wider region of Eskikewa'kik – are changing, and more limited but uninterrupted use from pre-contact times to today.

In summary, both those aspects, the economic and cultural motivations for traditional land and resource uses, feed into a third impetus: the need to express, affirm and exercise their Aboriginal rights to live their cultural heritage within Mi'kma'ki, and their Treaty rights to continue harvesting the resources of their traditional territory.

The processing of Beaver Dam ore at the Touquoy Mine Site will not result in any additional impact to the Mi'kmaq of Nova Scotia, other than those effects already addressed and evaluated in the Touquoy EARD (CRA 2007a).

6.14.2 Project Activities and their Potential Effects on the Mi'kmaq of Nova Scotia

The assessment of potential effects on the Mi'kmaq of Nova Scotia includes consideration of changes in health and socio-economic conditions; physical and cultural heritage, including any structure, site or thing that is historical, archaeological, paleontological or architectural significance; and current use of lands and resources for traditional purposes.

The temporal scale of effects to the Millbrook First Nation and the Mi'kmaq of Nova Scotia more broadly will begin with initiation of site preparation activities, as the land and resources within the proposed site property boundaries at the Beaver Dam Mine Site and Haul Road will no longer be available for use and will continue throughout all Project phases until completion of the active closure phase. During the post-closure phase, the pit at the Beaver Dam Mine Site will be re-filling with water, and water

treatment as required and monitoring is predicted to continue, but no other site activities would affect the site area usage for the Mi'kmaq, as active reclamation activities will be completed.

Many of the potential Project effects to the Mi'kmaq of Nova Scotia health and socio-economic conditions, and current use of lands and resources for traditional purposes, are via effects to VCs assessed as part of the EIS (including potential adverse effects to noise, air, light, geology/soil/sediment, surface water, groundwater, wetlands, fish and fish habitat, habitat and flora, birds, fauna, and SAR/SOCI). A summary of each of these relevant VC predicted residual effects (post mitigation) are described in detail in the EIS and then are evaluated for potential interaction with the Mi'kmaq of Nova Scotia.

There will be a reduction in area available for hunting, trapping, gathering, fishing, spiritual ceremonies and other Millbrook and broader Mi'kmaq traditional activities within the Beaver Dam Mine Site and Haul Road. The infrastructure footprint (mine site and haul road) will result in direct habitat loss and the Project will restrict access within a proposed property boundary/compliance boundary for a period of eight years.

Additionally, due to the proximity of the Beaver Dam Mine Site and Haul Road to traditional harvesting areas, there will potentially be an area outside of the Beaver Dam Mine Site and Haul Road where Millbrook community members and other Mi'kmaq hunters may observe a changed pattern of wildlife movement. This area has been identified as a potential wildlife environmental effects zone. Within close proximity to the proposed property boundaries of the Beaver Dam Mine Site and Haul Road, there is the potential for sensory disturbance to wildlife and birds from noise and light above background conditions resulting in potential changes to wildlife patterns and by extension, hunting practices for the Mi'kmaq of Nova Scotia. There are limited Project effects expected to hunting, gathering and trapping activities beyond the potential Wildlife Environmental Effects Zone.

The Mi'kmaq may experience hunting limitations near the Beaver Dam Mine Site and Haul Road for the use of firearms. Participants in the TLRUS described how they might be displaced along the Haul Road and in proximity to the Beaver Dam Mine Site. This limited firearms zone demonstrates the maximum potential "loss of harvesting area for those individuals who do not feel comfortable shooting towards an active mine or haul road" (MFC 2019).

These direct and indirect impact areas are described in Table 6.14-1.

Table 6.14-1: Beaver Dam Mine Project Direct and Indirect Impact Areas for Mi'kmaq Traditional Use

Direct or Indirect Impact Areas	Area (Hectares [ha])[(a)]
Direct Infrastructure Footprint – associated habitat loss	243 (34 ha of which is Crown land)
Direct Access Loss – compliance boundary	727 (123 ha of which is Crown land)
Indirect Wildlife Environmental Effects Zone	3261 (1108 ha of which is Crown land)
Indirect Limited Firearms Zone	4358 (1411 ha of which is Crown land)

(a) Area calculations were completed using available property boundaries from Government of Nova Scotia Geomatics Centre (not survey plans).

Identified archaeological sites that will be affected by the Project are not Mi'kmaq resources. Identified areas of Mi'kmaq elevated potential within the Beaver Dam Mine Site and Haul Road for archaeological resources will be avoided. Identified or potential Mi'kmaq archaeological features (potential burial site west of Beaver Dam Mines Road) are outside of the proposed Beaver Dam Mine Site property boundaries and thus will not be affected by Project development.

Once the construction, operation, and active closure phases are complete (i.e., eight years), access will be re-established within the Beaver Dam Mine Site for Millbrook First Nation and the broader Mi'kmaq of Nova Scotia community members. At this time, the site infrastructure will be dismantled and removed, the waste rock piles will be covered and revegetated, and drainage will be re-established. Drainage immediately adjacent to the pit will be directed to towards the exhausted pit to facilitate pit filling, which is expected to take approximately 13 years. With the exception of the pit area, where filling will be on-going and water monitoring will be occurring, traditional practices within the Beaver Dam Mine Site can resume. The landscape will be altered, with more limited forested cover for an extended period of time. This will likely affect the specific nature of traditional practices that will resume

within the Beaver Dam Mine Site until the forest re-establishes. The majority of identified historical tailings and waste rock will have been managed and/or removed from the site thereby potentially improving the quality of the habitat. This is considered a positive impact of this Project on future traditional practices with the Beaver Dam Mine Site.

Where appropriate, individual VCs were included in a human health risk assessment (HHRA) completed by Intrinsik (2021), included in Appendix C.2, to evaluate potential risk to human health from the Project. This report assesses the potential for emissions from the Beaver Dam Mine Site and the Haul Road, released via Project activities, to change the chemistry of air, water and soils in the area, and whether the predicted changes have the potential to result in metals accumulation in, or on, vegetation, or other selected country foods that may be consumed by humans. In addition, this report also provides an assessment of other exposure pathways, such as recreational swimming (Cameron Flowage/Killag River), and inhalation and incidental ingestion of metals on dusts in air and soil. The focus of this assessment is on the Beaver Dam Mine Site and Haul Road, in areas outside of the proposed property boundary which could be accessed by the general public, including the Millbrook First Nation community members and the Mi'kmaq of Nova Scotia more broadly, during various activities. The Moose River was not evaluated due to demonstrated low water levels and limited opportunity for swimming in this receiving environment.

Based on the assessment conducted, the following can be concluded:

- Metals are naturally occurring in the environment and are present within existing soils and vegetation in the region. Mine activities will result in increased deposition of dust in the vicinity of the Mine Site outside the PDA, particularly related to Haul Road activities.
- Dustfall predictions indicate that the areas outside the PDA that will potentially receive higher dustfall rates are generally located near the Haul Road. Based on the estimated future soil concentrations of all metals considered, some accumulation within vegetation is anticipated to occur, but that accumulation would likely be localized to areas most affected by dust loadings which are generally limited in size and closer to the Beaver Dam Mine Site and Haul Road boundaries.
- It is considered unlikely that ore dust deposition and effluent releases from the Beaver Dam Mine Project at the rates considered in this assessment would result in levels of metals in country foods, soils and dust, and surface water (*via* recreational water use) that would be harmful to human health. Predicted risks associated with consumption of country foods are considered to be negligible.

As a key proposed mitigation measure, a multi-use bypass road is planned to support Project development. This multi-use bypass road is designed to allow pick-up truck/vehicle traffic and ATV traffic to transverse the length of the upgraded Haul Road without having to interact directly with the haul trucks. This bypass road will allow continued access for the Mi'kmaq of Nova Scotia and specifically, Millbrook First Nation community members, to lands and lakes used for traditional purposes to the south and north of the Beaver Dam Haul Road between Highway 224 and the Mooseland Road, to the east and west of the Beaver Dam Haul Road between Highway 224 and the Beaver Dam Mine Site, as well as access to the lands north of the Beaver Dam Mine Site.

Through direct engagement with Millbrook community members and conclusions provided within the TLRUS and MEKS, AMNS has been able to confirm areas of Mi'kmaq traditional use surrounding the Beaver Dam Mine Site and Haul Road. Mitigation measures will allow on-going access to the lands surrounding the Project where traditional use has been documented, during the eight years where direct access to the mine will be limited. However, after consideration of these mitigation measures, the Project is expected to limit traditional practices within the direct areas, and potentially affect traditional practices within the indirect areas described in Table 6.14-1. As a result, alternative areas have been described, where traditional practices may continue during the life of the Project.

Tracts of crown land are present in close proximity to the Project. These tracts of land are adjacent to the Project Area and, in most cases, overlap with areas with documented traditional use (MFC 2019). These areas of land are publicly owned, not limited by provincial or federal parks and protected areas, are all accessible and available with consideration of the proposed mitigation measures. These areas are presented as potential suitable alternative areas for traditional practices to continue, during the eight-year temporal scale of the Project.

It is anticipated that engagement will continue throughout and beyond the current environmental assessment process. This will require ongoing dialogue regarding potential impacts on Mi'kmaq communities, and AMNS is committed to continuing those discussions. AMNS looks forward to receiving feedback and commits to discussing with Millbrook First Nation how best to address their feed back into Project design, mitigation and monitoring measures and potentially additional monitoring and mitigation measures.

6.14.3 Residual Effects and Significance

Potential residual effects to the Mi'kmaq of Nova Scotia's physical health from Project-related changes to the environment (e.g., changes to country foods, water, and soils) are anticipated to be not significant. Potential pathways of effects on human health associated with consumption of or contact with country foods, water and soils will be minimized by implementing mitigation measures such as dust control, water management infrastructure and processes and water treatment (if required). Mitigation measures to reduce atmospheric emissions will be implemented to minimize potential related effects on human health, and the residual risk to human health from inhalation of Project-related dust and airborne contaminants is considered low.

Mitigation measures and conclusions relating to impacts to traditional practices and socio-economic, mental and social well-being will continue to be evaluated directly with Millbrook First Nation and the Mi'kmaq of Nova Scotia throughout the environmental assessment process, and throughout the lifecycle of the Project. AMNS has reviewed with Millbrook First Nation and the Mi'kmaq of Nova Scotia the proposed mitigation measure of a multi-use bypass road to access to lands surrounding the Haul Road and north of the Beaver Dam Mine Site, as well as the availability and proposed suitability of nearby Crown land as partial mitigation for loss of access during the eight years that the mine will be limiting access to the Beaver Dam Mine Site and Haul Road.

6.15 Physical and Cultural Heritage

Physical and cultural heritage are provincially regulated through the *Special Places Act*, which supports the preservation, regulation, and study of archaeological, historical, paleontological sites, and remains deemed to be important parts of Nova Scotia's natural or cultural heritage.

Given the proximity of the Haul Road and the mine site to the Beaver Lake IR 17, these areas were identified as having high potential for pre-European contact natural and cultural resources. In addition, the Beaver Dam mine site area has been subject to extensive exploration and mining activity since gold was first discovered in 1868. These activities have left behind 20 abandoned mine openings and several other areas with high potential for post-European contact natural and cultural resources.

6.15.1 Baseline Program

Archaeological screening and reconnaissance programs were conducted at the Beaver Dam mine site and the along the Haul Road. These programs, including shovel testing as necessary, occurred in 2008, 2014, 2015, 2018, 2019 and 2020 as a result of changes to Project infrastructure layout.

Archaeological screening has identified that the land within the study area was historically part of the greater Mi'kmaq territory known as *Eskikewa'kik,* meaning 'skin dressers territory'. Based on the environmental setting and Indigenous land use, as well as the Property's long history of industrial use, the Beaver Dam mine site was identified to exhibit high potential for encountering Pre-contact and historic Indigenous Peoples archaeological resources and high potential for encountering historic Euro-Canadian archaeological resources.

As a result of the archaeological reconnaissance programs, 13 sites/areas were identified within the Beaver Dam Mine Site as having elevated potential for encountering historic Mi'kmaw and/or Euro-Canadian archaeological resources. However, it was determined that some previously identified features had been destroyed by historic mining activities undertaken in the 1980s. Additional archaeological investigations and shovel testing was completed within Site 6, Area 2 and Area 3 in the fall of 2020. No

Pre-contact Mi'kmaq archaeological resources were encountered during shovel tests. There have been no identified archaeological sites/areas along the current Haul Road alignment.

Based on the recommendations of the archaeological reconnaissance and findings of the shovel tests, the alignment of Beaver Dam Mine Site infrastructure and the Haul Road, including the proposed new section of road, was cleared of any requirement for further archaeological investigation.

The Touquoy Mine Site was previously subjected to archaeological reconnaissance in November 2006. The results of the study indicated that there is a low archaeological potential ascribed to the area.

6.15.2 Project Activities and Physical and Cultural Heritage Interactions and Effects

The current infrastructure footprint of the Beaver Dam Mine Site will impact archaeological Site 6, Area 2 and Area 3, Site 6 was identified Additional shovel tests were completed in these areas in fall 2020 to assess for presence of Mi'kmaq archaeological resources prior to development. Site 6 was identified as having moderate to high potential for historic Euro-Canadian archaeological resources, while Areas 2 and 3 were identified as having elevated potential for historic Mi'kmaw archeological resources. No Pre-contact Mi'kmaq archaeological resources were encountered during shovel tests.

Where possible, the Project will avoid the areas identified. If areas of heritage resources are to be impacted, further work will be undertaken to document these resources. The potential for heritage resources to be impacted exists primarily during the construction phase of the Project, including at the mine site and the Haul Road; Mitigations for the potentially impacted sites/areas are presented in the Updated 2021 EIS (AMNS 2021) and were accepted by Nova Scotia Communities, Culture and Heritage.

The Touquoy Mine Site is currently operational. There are no effects to physical and cultural heritage anticipated as a result of the Project

There is no potential for the disturbance of cultural or physical heritage resources during the operational and reclamation phases of the Project.

6.15.3 Residual Effects and Significance

The predicted residual environmental effects of Project development and production on physical or cultural heritage resources are assessed to be adverse, but not significant. The overall residual effect of the Project on physical or cultural heritage resources is assessed as not significant after mitigation measures have been implemented.

6.16 Socio-economic Considerations

The VC is socio-economic, and is divided into themes, which are further broken into topics for more detailed analysis During the detailed review of the policy documents and plans impacting the LAA and RAA and comments and feedback from the public; themes emerged. These themes were further grouped into topics for analysis and to assess interrelationships. The themes included:

- Workforce Development;
- Demographics;
- Healthy Communities;
- Land Use;
- Parks and Open Space, Tourism;
- Roads and Traffic; and
- Impact on Government Revenues.

From a socio-economic perspective, the Project will generate employment and economic activity during all Project phases and has the potential to attract new residents to the RAA. During construction and operation there will be significant labour force needs to support the Project's activities. Additionally, with the number of jobs projected at the Beaver Dam Mine Site, increased traffic to and from the mine site from both the staff and visitors, and from trucks that will transport materials to the Touquoy Mine Site will result. Indirect employment will be generated by the Project by external contractors and suppliers.

Tax revenues and royalties will be generated by the Project that will benefit all levels of government: federal, provincial and municipal. Increased economic activity by suppliers and external contractors will contribute to government revenue as well as the local economy.

The increased economic activity has the potential to impact adjacent communities by attracting new residents, creating demand for housing, more traffic, creating opportunities for social conflict, increase the usage of public infrastructure such as health facilities, recreation facilities and other social services. The interrelationship between a positive impact, such as population growth, and other socio-economic topics, such as family doctor availability are identified, where possible.

6.16.1 Baseline Conditions

The baseline conditions before the mine construction and operation are established to fully understand the potential impacts on the VCs. From this, projections and assessment are made comparing the pre-mine conditions to post mine construction and operation.

The economic outlook of Nova Scotia has improved in the last few years. Pre-COVID, Nova Scotia had a growing economy, with gains in population and the lowest employment rate in 45 years. COVID-19 has created great uncertainly and the impacts of it may be felt for years. This makes it difficult to forecast future economic conditions. The extent to which the long-term impacts of COVID on the economy and society as whole will be felt is a point of debate and is difficult to quantify while Nova Scotia, Canada and the World continue to be in the midst of this unprecedented public health crisis. In this section, baseline conditions pre-COVID and post-COVID are discussed. During this time of uncertainly, this analysis assumes continued impacts from COVID-19 during 2021 with recovery occurring in 2022 and beyond.

All phases of the Project will provide employment opportunities for local residents and Indigenous Peoples, as well as provide tax revenue for the municipal, provincial, and federal levels of government. Indirect employment will be generated by the Project through the use of external contractors and suppliers. Tax revenue in the millions of dollars per year will be generated through corporate income taxes paid by AMNS, as well as its contractors and suppliers.

The presence of unauthorized cabins and hunting blinds on private land is a good indicator that the area is used for hunting and fishing activity. The area is open to several seasons of hunting that include deer, bear, snowshoe hare, ruffed grouse and ring-necked pheasant. Recreational fishing occurs in areas near the proposed Beaver Dam Mine Site. Camp Kidston, which operates only in the summer months, is located 3.5 km northeast (upstream) of the Touquoy Mine Site, and offers swimming, water activities, and canoeing as part of its program. In addition, the camp uses groundwater as a source for public drinking water.

There is no documented, observed or anecdotal evidence that supports recreational swimming in the area of the Beaver Dam Mine Site. However, through engagements there are reports of swimming in the rivers and lakes adjacent to the Haul Road. There are many structures that are built on lands that are not owned by private individuals that appear to be used by multiple parties throughout the region. Scraggy Lake has a number of private land holdings on its shore that have some type of cottage and outbuildings. A total of 12 cottages/camps were noted during a survey in July 2007 and a survey of aerial photographs from 2016 did not reveal any additional camps. Scraggy Lake camp owners have seen very limited boating canoe use and mainly in the spring if any as low water levels in the summer present extra challenges for navigability (rocks). Swimming is not a typical activity in Scraggy Lake.

The Snow Mobile Association of Nova Scotia trail system stretches 3,500 km connecting twenty local snowmobile clubs across Nova Scotia. Discussions are underway with local associations, including the Lake Charlotte all-terrain vehicle (ATV) Association.

The network of logging roads in this part of the Halifax Regional Municipality (HRM) could be used by local residents as trails to access recreational activities.

6.16.2 Anticipated Effects and Changes to the Environment

Positive socio-economic impacts are associated with the Project, including long-term employment gain and/or sustained activity within the area. All phases of the Project will provide employment opportunities for local residents and Indigenous Peoples, as well as provide tax revenue for the municipal, provincial, and federal levels of government. Indirect employment will be generated by the Project through the use of external contractors and suppliers.

The construction of a new portion of road and upgrades to existing roads will provide local residents and recreational users improved access to the interior areas of the region. This will extend beyond the life of the Project.

There is low potential for the Project to cause adverse socio-economic conditions. The potential does exist for a mobile equipment accident along the Haul Road. Haul trucks will travel daily from the Beaver Dam mine site to the Touquoy processing and tailings management facility. A haul truck accident may result in fuel and/or other spills, fires, and/or injury or death to site workers and the general public. The Haul Road will be dual lane and designed to facilitate the safe passage of two-way truck traffic at 70 km/h. Speed limit and right-of-way signage will be installed and all haul truck operators will receive operator training to minimize the risk of haul truck collisions. Discussions with NSTIR will identify additional mitigation measures that may be required, in particular at the Hwy 224 crossing.

6.16.3 Mitigation

Recreational activities that currently occur within the spatial boundaries of the Project, such as hunting and fishing, will, for safety reasons, be restricted during construction and operation. Recreational users will be notified of restricted access by signage at the entrance to the Beaver Dam Mine Site. Site restrictions will be within the PA and within the fly rock management area during blasting activities only. Liaison with local recreational groups, such as ATV associations, will be undertaken. Access to other recreational areas near the Beaver Dam Mine Site will be maintained through the construction of a series of bypass roads. Engagement with user groups will continue throughout the life of the project and operational procedures will be adjusted with advice of the user groups. Proposed mitigation and monitoring for socio-economic conditions is presented in Table 6.16-1.

Table 6.16-1: Proposed Mitigation and Monitoring for Socio-economic Conditions

Project Activity	Mitigation Measures
Construction	• Restriction of recreational activities within the spatial boundaries of the Project. Notification will be provided by signage. • Communication Plan to communication access information to key stakeholders (Sections 3 and 4 [Public Engagement and Mi'kmaq of Nova Scotia, respectively]). • Liaison with any local recreation groups, such as ATV associations through an Ad Hoc group. • Equipment maintenance. • Reduction of mobile equipment accident risk through discussions with NSTIR, appropriate signage, and operator training.
Operation	• Restriction of recreational activities within the spatial boundaries of the Project. Notification will be provided by signage. • Liaison with local recreation groups, such as ATV associations. • Equipment maintenance. • Limiting haul truck operational hours to 12 to 16 hours per day. • Reduction of mobile equipment accident risk through discussions with NSTIR, appropriate signage, and operator training. • Ongoing engagement with community associations, CLC and residents to assess and adaptively manage the site. • Potential housing and employment studies to monitor impacts on population growth and housing market.
Active Closure	• Ongoing engagement with community associations, CLC and residents to assess and adaptively manage the site.

ATV = all terrain vehicle, NSTIR = Nova Scotia Department of Transportation and Infrastructure Renewal; CLC = Community Liaison Committee.

A potential adverse effect on socio-economic conditions is related to a risk for mobile vehicle accidents along the Haul Road, in particular at the Highway 224 crossing. 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. Intersection requirements and additional mitigation measures will be determined through discussions with NSTIR.

6.16.4 Residual Effects and Significance

There are no significant adverse environmental effects anticipated on socio-economic conditions once mitigation measures are applied. Positive impacts are anticipated in the form of direct and indirect employment, and tax revenues for municipal, provincial, and federal governments. Additionally, improvements to local roads will be completed as part of the Project, which will provide improved access to the region's interior.

Significant adverse environmental effect for Socio-economic Conditions are not predicted for the Project. This determination includes consideration of the ecological and social context of the LAA surrounding the Project:

- **During Construction:** Changes occur but are similar to those that have occurred or will occur in other areas of the LAA and in line with the ecological and social context of the LAA surrounding the Project.
- **During Operations:** Changes occur but are similar to those that have occurred or will occur in other areas of the LAA and in line with the ecological and social context of the LAA surrounding the Project.
- **During Active Closure:** Changes occur but are similar to those that have occurred or will occur in other areas of the LAA and in line with the ecological and social context of the LAA surrounding the Project.

6.17 Summary of Project Interactions and Residual Effects

6.17.1 Project Interactions and Effects

Direct interactions between the Project and VCs are often obvious based on a good understanding of Project activities and the baseline physical, biophysical, and socio-economic conditions of the Project area. Indirect interactions require an active pathway between Project activities and the VCs that they are affecting. A pathway provides a link between a Project component or activity and VC, and facilitates the interaction and potential effect.

The Project activities for each Project area and the potential direct and indirect VC interactions are presented in Tables 6.17-1, 6.17-2, and 6.17-3. These potential interactions formed the approach to the assessment and resulting determination of residual effects and significance once mitigation measures were applied. An indication of a potential interaction does not imply that a direct, indirect or residual effect will exist.

6.17.2 Residual Effects

Residual effects are effects to VCs that are predicted to remain even after the implementation of mitigation measures. In order to identify if residual effects are significant or not, consideration of the magnitude, geographical extent, duration, frequency, reversibility, and ecological and social context was required. A summary of the residual environmental effects for each VC, and their associated significance is presented in Table 6.17-4. The proposed mitigation measures and monitoring programs are summarized in Section 7.

Table 6.17-1: Potential Valued Components Interactions with Project Activities at Beaver Dam Mine Site

	Physical Valued Components				Biophysical Valued Components						Socio-economic Valued Components		
	Atmospheric Environment	Geology, Soil, and Sediment Quality	Groundwater Quality and Quantity	Surface Water Quality and Quantity	Wetlands	Fish and Fish Habitat	Habitat and Flora	Terrestrial Fauna	Birds	SAR	Indigenous Peoples	Physical and Cultural Heritage	Human Health and Socio-economic Conditions
Site Preparation and Construction													
Clearing, Grubbing, and Grading	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Drilling and Rock Blasting	☑	☑	☑	☑	☑	☑		☑	☑	☑	☑	☑	☑
Topsoil, Till, and Waste Rock Management	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Existing Settling Pond Dewatering	☑	☑	☑	☑	☑	☑	☑		☑	☑	☑		
Watercourse and Wetland Alteration	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Mine Site Road Construction, including lighting	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Surface Infrastructure Installation and Construction, including lighting	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Collection and Settling Pond Construction, including lighting	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Environmental Monitoring		☑	☑	☑	☑	☑		☑		☑	☑		
General Waste Management	☑	☑		☑	☑	☑	☑		☑	☑			
Operation and Maintenance													
Drilling and Rock Blasting	☑	☑	☑	☑	☑	☑		☑	☑	☑	☑		☑
Surface Mine Dewatering		☑	☑	☑	☑	☑	☑		☑	☑	☑		
Ore Management	☑	☑	☑	☑	☑	☑		☑	☑	☑	☑		
Waste Rock Management	☑	☑	☑	☑	☑	☑		☑	☑	☑	☑		
Surface Water Management		☑	☑	☑	☑	☑		☑	☑	☑	☑		☑
Petroleum Products Management	☑	☑	☑	☑	☑	☑	☑			☑	☑		☑
Site Maintenance and Repairs, including lighting	☑			☑					☑				☑
Environmental Monitoring	☑	☑	☑	☑	☑	☑	☑	☑		☑	☑		☑
General Waste Management	☑	☑		☑	☑	☑	☑	☑	☑	☑			
Decommissioning and Reclamation													
Infrastructure Demolition	☑	☑		☑					☑				☑
Site Reclamation	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Environmental Monitoring	☑	☑	☑	☑	☑	☑	☑	☑		☑	☑		☑
General Waste Management		☑		☑	☑	☑	☑	☑	☑	☑			☑
Accidents and Malfunctions													
Fuel and/or other Spills	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Fire	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Slope Failure	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑	☑
Collection/Settling Pond Failure		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Unplanned Explosive Event	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑		☑
Mobile Equipment Accident	☑	☑	☑	☑	☑	☑	☑	☑			☑	☑	☑

Table 6.17-2: Potential Valued Components Interactions with Project Activities along Haul Road

	Physical Valued Components				Biophysical Valued Components						Socio-economic Valued Components		
	Atmospheric Environment	Geology, Soil, Sediment Quality	Groundwater Quality and Quantity	Surface Water Quality and Quantity	Wetlands	Fish and Fish Habitat	Habitat and Flora	Terrestrial Fauna	Birds	SAR	Indigenous Peoples	Physical and Cultural Heritage	Human Health and Socio-economic Conditions
Site Preparation and Construction													
Clearing, Grubbing, and Grading	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Drilling and Rock Blasting	☑	☑	☑	☑	☑	☑		☑	☑	☑	☑	☑	☑
Topsoil, Till, and Waste Rock Management	☑	☑		☑	☑	☑		☑	☑	☑	☑	☑	☑
Watercourse and Wetland Alteration	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Culvert and Bridge Upgrades and Construction/Removal	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Haul Road Construction and Upgrades	☑	☑		☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Environmental Monitoring	☑	☑	☑	☑	☑	☑	☑	☑		☑	☑		☑
General Waste Management		☑		☑	☑	☑	☑	☑	☑	☑			
Operation and Maintenance													
Ore Transport	☑	☑	☑	☑				☑			☑		☑
Road Lighting	☑								☑		☑		
Haul Road Maintenance and Repairs	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Environmental Monitoring	☑	☑	☑	☑	☑	☑	☑	☑		☑	☑		☑
Decommissioning and Reclamation													
N/A – Decommissioning and Reclamation of the Haul Road is not expected.													
Accidents and Malfunctions													
Fuel and/or other Spills	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Fire	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Haul Truck Accident	☑	☑	☑	☑	☑	☑	☑	☑			☑		☑

SAR = species at risk; N/A = not applicable.

Table 6.17-3: Potential Valued Components Interactions with Project Activities at Touquoy Processing and Tailings Management Facility

	Physical Valued Components				Biophysical Valued Components								Socio-economic Valued Components	
	Atmospheric Environment	Geology, Soil, and Sediment Quality	Groundwater Quality and Quantity	Surface Water Quality and Quantity	Wetlands	Fish and Fish Habitat	Habitat and Flora	Terrestrial Fauna	Birds	SAR	Indigenous Peoples	Physical and Cultural Heritage	Human Health and Socio-economic Conditions
Site Preparation and Construction													
Ore Processing Equipment Upgrades													
Tailings Line Alteration				☑									
Environmental Monitoring													
General Waste Management													
Operation and Maintenance													
Lighting of Facility and Mine Site Roads	☑								☑				
Ore Management and Processing	☑		☑	☑									
Tailings Management			☑	☑		☑			☑	☑			
Environmental Monitoring	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
General Waste Management			☑	☑	☑	☑	☑	☑	☑	☑			
Decommissioning and Reclamation													
Environmental Monitoring	☑	☑	☑	☑	☑	☑	☑	☑		☑	☑		☑
Accidents and Malfunctions													
Fuel and/or other Spills	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Fire	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑		☑
Mobile Equipment Accident	☑	☑	☑	☑	☑	☑	☑	☑			☑		☑

SAR = Species at risk.

Table 6.17-4: Summary of Residual Effects and Associated Significance for each VC

Valued Component Affected	Potential Effects of the Project on the Environment	Residual Effect	Significance of Residual Effect
Atmospheric Environment			
Air Quality	Dust emissions generated during the construction and operations phases of the Project, due to overburden removal, blasting, rock crushing, truck traffic, material loading, wind erosion of material storage piles, construction of mine site roads and haul roads, and operation of other heavy machinery	Disturbance	Not Significant
Greenhouse Gas Emissions	Greenhouse gas emissions generated during the construction, operations, and decommissioning phases	Disturbance	Not Significant
Noise	Noise generated on the mine site and the Haul Road during the construction and operations phases and extended operation at the Touquoy Mine Site	Disturbance	Not Significant
Night-time Light Levels	Night-time light levels generated on the mine site and the Haul Road during the operations phase and extended operation at the Touquoy Mine Site	Attraction and Disorientation (birds) None (other)	Not Significant
Geology, Soil, and Sediment			
Soil	Not Applicable	None	Not Applicable
Sediment Quality	Effects on sediment quality due to erosion, or effects on sediment quality downstream of the Project due to activities occurring on the mine site and Haul Road.	Disturbance	Not Significant
Surface Water Quality & Quantity			
Surface Water Quality	Changes to surface water quality as a result of Project activities, including construction, operations, and decommissioning.	Disturbance Habitat loss	Not Significant
Surface Water Quantity	Direct and indirect surface water body alteration due to infilling, draining, flooding, altering function, and altering groundwater recharge capacity on the mine site and the Haul Road	Habitat Loss Disturbance	Not Significant
Groundwater Quality & Quantity			
Groundwater Quality at Beaver Dam	Effects on groundwater quality due to change in chemistry or reduced infiltration due to disturbance	Disturbance	Not Significant
Groundwater Quality at Touquoy	Effects on groundwater quality due to the storage of Beaver Dam tailings in the expended pit at the Touquoy facility	Disturbance	Not Significant
Groundwater Recharge / Discharge	Hydrological effects on recharge/discharge due to construction, water body alteration and dewatering, and operations.	Disturbance	Not Significant
Potable water wells at Beaver Lake	Effects on groundwater quality or quantity from the mining activities on the potable water supply at Beaver Lake IR17	None	Not applicable
Wetlands			
Wetland Habitat	Progressive loss of wetland habitat due to construction of the mine site and Haul Road	Disturbance Habitat Loss	Not Significant
Wetland Hydrology	Hydrological changes due to direct and indirect wetland alteration, and Haul Road construction	Disturbance	Not Significant

Table 6.17-4: Summary of Residual Effects and Associated Significance for each VC (continued)

Valued Component Affected	Potential Effects of the Project on the Environment	Residual Effect	Significance of Residual Effect
Fish and Fish Habitat			
Fish Habitat	Fish habitat loss/alteration due to construction activities	Habitat Loss Disturbance	Not Significant
	Disturbance to fish habitat due to construction and operation of the mine site and Haul Road, including increased sediment, impacts to water quality from dust, introduction of invasive species, and wetland alteration	Habitat Loss Disturbance	Not Significant
Habitat and Flora			
Habitat and Flora	Habitat loss or damage due to construction and operation of the mine site and Haul Road, including increased sediment, clearing and grubbing, and wetland alteration	Habitat Loss Disturbance	Not Significant
Terrestrial Fauna			
Terrestrial Fauna Habitat	Habitat loss or damage due to construction and operation of the mine site and Haul Road, including increased sediment, clearing and grubbing, and wetland alteration	Habitat Loss Disturbance Direct Mortality	Not Significant
Terrestrial Fauna Mortality	Increased truck traffic on the Haul Road and on the mine site	Disturbance Direct Mortality	Not Significant
Birds			
Bird Habitat	Disturbance of bird habitat due to construction and operation of the mine site and Haul Road, including clearing and grubbing, heavy machinery operation, vehicle operation, construction of infrastructure and the Haul Road, open pit lighting, and blasting	Disturbance Habitat Loss Attraction and Disorientation Mortality	Not Significant
SOCI & SAR			
Priority Fish Species	Disturbance to fish habitat due to construction and operation of the mine site and Haul Road, including increased sediment, impacts to water quality from dust, introduction of invasives, and wetland alteration	Habitat Loss Disturbance	Not Significant
Priority Vascular Flora and Lichens	Habitat loss or damage due to construction and operation of the mine site and Haul Road, including increased sediment, clearing and grubbing, and wetland alteration	Habitat Loss Disturbance	Not Significant
Priority Terrestrial Fauna	Disturbance of wildlife habitat due to construction and operation of the mine site and Haul Road, including clearing and grubbing, heavy machinery operation, vehicle operation, construction of infrastructure and the Haul Road, open pit lighting, and blasting	Disturbance Direct Mortality	Not Significant
Priority Birds	Disturbance of bird habitat due to construction and operation of the mine site and Haul Road, including clearing and grubbing, heavy machinery operation, vehicle operation, construction of infrastructure and the Haul Road, open pit lighting, and blasting	Disturbance Habitat Loss Attraction and Disorientation Mortality	Not Significant

Table 6.17-4: Summary of Residual Effects and Associated Significance for each VC (continued)

Valued Component Affected	Potential Effects of the Project on the Environment	Residual Effect	Significance of Residual Effect
Indigenous Peoples			
Physical and Cultural Heritage	Direct effect on archaeological resources or burial site which is not in Project area	None	Not applicable
Traditional uses	Loss of plant specimens of significance to the Mi'kmaq for medicinal, food, beverage or art and craft purposes	Disturbance	Not Significant
Traditional uses	Loss of habitat including wetlands and other habitat supporting current use of land and resources for traditional uses	Habitat Loss	Not Significant
Economic opportunities	Benefits to the Mi'kmaq including employment opportunities, economic development, and capacity building	Economic Benefits	Not Significant
Physical and Cultural Heritage			
Physical and Cultural Heritage Resources	Damage to cultural/physical heritage resources during the construction phase	None	Not Applicable
Human Health & Socio-Economics			
Recreational Activities	Restriction of recreational activities within the Project area during construction and operation of the mine site	Disturbance	Not Significant
Employment	Direct and indirect employment opportunities throughout the construction, operation, and decommissioning phases	Creation of Employment Opportunities	Not Significant
Traffic	Increased traffic along the Haul Road, including the potential for a mobile equipment accident	Disturbance	Not Significant

IR = Indian Reserve.

7 MITIGATION MEASURES

Monitoring programs and mitigation measures will occur throughout all phases of the Project. Monitoring programs will proceed to gather pre-construction data for selected VCs or begin at construction or operational Project phases. These data will be used to refine mitigation measures and monitoring programs for all Project phases.

Monitoring programs will continue throughout the life of the Project to verify baseline conditions and to determine the effects of the Project on the surrounding environment relative to predictions made in the environmental effects' assessment.

Mitigation measures and monitoring programs that will be undertaken to reduce or eliminate potential adverse effects is outlined in Table 7.1-1. Details regarding proposed mitigation and monitoring programs are provided in the EIS.

There may be additional requirements identified in approvals which are not specified in Table 7.1-1, such as the Industrial Approval for which an application would be made to the Province of Nova Scotia. In addition, wetland and watercourse alteration approvals would be required. Any additional monitoring requirements of these approvals will be determined in consultation with regulatory agencies, such as NSE and Environment and Climate Change Canada under the requirement for Environmental Effects Monitoring (EEM) under the Metal Mining Effluent Regulations, as well as any other federal or provincial regulatory requirements.

Table 7.1-1: Summary of Mitigation Measures

Valued Component Affected	Mitigation and Compensation Measures	Monitoring Program
Atmospheric Environment		
Air Quality	Minimize dust through: • wet suppression controls on unpaved surfaces; • maintaining hardened surfaces where practical; • speed reduction on the mine site to keep dust levels to a minimum; • air quality monitoring including dust and ambient-air monitoring, as required at select baseline sampling locations; • slopes will be designed at an angle determined by geotechnical analysis and acceptable safety factors, to reduce the likelihood of a slope failure; • construction of a berm surrounding the surface mine, and berms and channels surrounding stockpiles to direct surface water to water diversion channels, minimizing the risk of causing unstable slopes; • stabilized slopes will be maintained on the waste rock stockpile following completion of operations; • the crushed ore stockpile at Touquoy will be covered to minimize wind and rain erosion; and • haul trucks will be covered to minimize dust during transportation between the mine site and the Touquoy facility.	• Complete baseline ambient air quality monitoring at select baseline sampling locations prior to the start of construction. • Air quality monitoring including dust as required at select baseline sampling locations as per AMNS's EPP and by regulators. Typical frequencies for this monitoring would be expected to follow NAPS locations or variations outlined in the EA or subsequent approvals. • Additional TSP monitoring may be required based on observations of dust generated once mine operations begin. An audit program of the same sampling sites originally chosen for the baseline monitoring will be implemented. Additional sites may be required beyond those used in baseline and sampling at a frequency of no less than annually. • A daily inspection of pit slopes by qualified personnel and an independent consultant to review slopes on a quarterly basis.
Greenhouse Gas Emissions	Minimize GHG emissions: • limited engine idling where possible; • implementing fuel efficiencies where possible; • regular maintenance on equipment; and • mitigation measures previously described in the IA for the Touquoy facility	• Review of emissions on an annual basis and seek to use best available practices that evolve over time.
Noise	Minimize noise through: • regular maintenance of equipment; and • highway truck traffic will not generally be present on the Haul Road during night-time hours.	• Complete baseline noise monitoring at select locations on the mine site and along the Haul Road prior to the start of construction • Noise monitoring program will be undertaken, including blasting noise monitoring and periodic noise level monitoring at the property boundaries. Additional monitoring may be required as directed by regulators with typical frequency being on an annual basis to confirm baseline or if complaints or issues are raised by the public or regulators. • Noise monitoring would be completed at nearest residence for each blasting event, as required by the conditions of any approval and as is typically the practice in Nova Scotia.
Night-time Light Levels	Minimize light pollution through: • install downward-facing lights on site infrastructure and haul roads; • wherever possible, install motion-sensing lights to ensure lights are not turned on when they are not necessary; • only use direct and focused light when needed for worker safety; and • maintain Haul Road operation to 12 to 16 hours per day (i.e., highway truck traffic will not generally be present on the Haul Road during night-time hours.	• Review of practices relative to mine site and Haul Road operation on an annual basis for BAPs including illumination
Geology, Soils, and Sediment		
Soil	• soils are being moved on site but reused for reclamation to greatest extent possible so no net loss or need for mitigation	• Quantities will be monitoring and used to determine reclamation plan.
Sediment Quality	• sediment and erosion control measures • design of settling ponds and outflow structures to minimize out flow velocities	• Annual sampling at select baseline sediment locations • The MMER program would involve more detailed sediment sampling to determine final EEM program components, locations, frequency and sampling.
Bedrock	• results of baseline sampling at the mine site indicate that the majority of the deposit is net acid consuming; ARD is not expected to be a concern	• During construction and operations, regular testing of rock will be conducted for acid generating potential at a rate to be determined by NSE, anticipated to be no less than 1 sample per 100,000 tonnes of rock generated.

Table 7.1-1: Summary of Mitigation and Monitoring Measures (continued)

Valued Component Affected	Mitigation and Compensation Measures	Monitoring Program
Surface Water Quality and Quantity		
Surface Water Quality	• Sedimentation ponds will be utilized to reduce suspended solids from surface runoff and pit water. Treated water will be allowed to discharge to the environment. • All surface water discharges from sedimentation ponds to the natural environment will be sampled as per requirements listed in industrial operating approvals and MMER to ensure water quality conforms to applicable guidelines. • Stockpiles will employ perimeter ditches to direct water to ponds. Topographic controls will ensure that overflow from extreme weather conditions, should it occur, will be directed to a spillway into the water diversion structure. • Development of an erosion and sediment control plan and a stormwater management plan. • Diesel fuel will be stored in double-walled, aboveground storage tanks with perimeter impact protection located on a concrete pad. • Fuel storage and transfer areas will be designed to limit areas of fuel transfer and will be located a minimum of 30 m from wetlands and watercourse locations. Spill response kits will be accessible in areas of fuel transfer. A petroleum management plan will be developed. • Development of an emergency response and spill contingency plan. • Development of a Wetland Compensation Plan that includes a monitoring program for Project area and adjacent wetlands will be developed in collaboration with NSE and the Mi'kmaq of Nova Scotia.	• The MMER program would involve more detailed surface water sampling as well as site effluent sampling to determine final EEM program components, locations, frequency and parameters to be sampled for as well as possible species involved in the EEM. • Surface water quality monitoring at select baseline sampling locations on the mine site and the Haul Road to compare data to applicable guidelines and baseline data. This is anticipated to be conducted monthly for general chemistry and metals throughout the construction, operations, and decommissioning phases. • Annual review of program and need for revisions based on baseline data comparison and discussions with regulators. • Monitored discharge guided by a Surface Water Monitoring Plan and regulatory requirements. • Inspection and Monitoring Plan that includes hydrologic flow analysis. • Emergency Spill Response Training, Annual updates. • Weekly inspections of diesel fuel supply and barriers. • Ongoing monitoring will continue at the Touquoy facility, as per regulatory requirements, which began in 2016. This program will be reviewed by regulators and any appropriate changes to the monitoring program due to the processing of Beaver Dam ore will be implemented. • Surface water, groundwater, and wetlands monitoring data to be reviewed annually for potential interactions and revisions to program(s) if warranted.
Groundwater Quality		
Groundwater Quality	• Sediment and erosion control. • Project design includes use of pit dewatering water and collected surface water instead of groundwater for dust control. No other on-site water use except for small domestic purposes expected.	• Installation of near and far networks of multi-depth monitor wells (6 to 8 locations for each of the near and far networks are anticipated) within and outside the disturbed footprint during the construction and operation phases. Select far-network monitoring wells will be installed and monitored for no less than one year prior to construction. • Select wells will also continue to be monitored during the decommissioning and reclamation of the project site. Water level and chemistry monitoring program to be proposed. It is anticipated that water levels will be collected monthly and chemistry samples will be collected quarterly for the duration of the monitoring program. • The frequency and location of groundwater monitoring will be described in greater detail in the EPP following consultation with regulatory agencies and will be outlined in the IA application. • Surface water, groundwater, and wetlands monitoring data will be reviewed annually for potential interactions and revisions to program(s) if warranted. • Ongoing monitoring will continue at the Touquoy facility, as per regulatory requirements, which began in 2016. This program will be reviewed by regulators and any appropriate changes to the monitoring program due to the processing of Beaver Dam ore will be implemented.

Table 7.1-1: Summary of Mitigation and Monitoring Measures (continued)

Valued Component Affected	Mitigation and Compensation Measures	Monitoring Program
Wetlands		
Wetland Habitat	• Wetland awareness with construction staff and personnel. • Sediment and erosion control. • Vegetation management in or near wetlands (i.e., to limit clearing, clearing by cutting, no herbicides, etc.). • Water management to maintain pre-construction hydrological flows. • Wetland avoidance and permitting, including engaging in the wetland alteration application process. • Limit driving and use of machinery in wetland habitat, where reasonable. • Reclamation during decommissioning, including maintenance or removal of water management structures as required, and implementation of erosion measures. • Fuel storage and transfer areas will be designed to limit areas of fuel transfer and will be located a minimum of 30 m from wetlands and watercourse locations. Spill response kits will be accessible in areas of fuel transfer. A petroleum management plan will be developed. • Spill control and emergency planning. • Development of a wetland monitoring plan. • Development of a Wetland Compensation Plan that includes a monitoring program for Project area and adjacent wetlands will be developed in collaboration with NSE and the Mi'kmaq of Nova Scotia.	• Baseline hydrological conditions prior to construction activities. • Baseline vegetative conditions will be evaluated and compared with post construction conditions. • Water quality will be monitored in down-gradient aquatics receptors to ensure that up-gradient activities are not compromising water quality conditions. • General observations during the construction and post construction phases. • A final wetland monitoring plan will be developed in conjunction with wetland alteration permitting. • Surface water, groundwater, and wetlands monitoring data to be reviewed annually for potential interactions and revisions to program(s) if warranted.
Fish and Fish Habitat		
Fish Habitat	• Sediment and erosion control. • Vegetation management in or near wetlands (i.e., to limit clearing, clearing by cutting, etc.). • Engage wetland and watercourse permitting processes such that any loss of fish habitat will be addressed in these alteration applications. • Fish habitat awareness and avoidance where possible. • Consider support of existing fish habitat restoration activities with local organizations, such as Nova Scotia Salmon Association. • Maintenance of pre-construction hydrological flows into and out of down-stream surface water habitats to the extent possible. • Recommended timing windows will be adhered to for potential direct loss of fish and fish habitat (to limit loss of eggs and juveniles) as directed by DFO. • Reclamation during decommissioning. • Limit driving and use of machinery within wetland and watercourse habitat where practical. • Fuel storage and transfer areas will be designed to limit areas of fuel transfer and will be located a minimum of 30 m from wetlands and watercourse locations. Spill response kits will be accessible in areas of fuel transfer. A petroleum management plan will be developed. • Spill control and planning.	• Complete baseline monitoring measurements and observations prior to surface water alteration activities taking place. • Regular monitoring during the construction phase to ensure protective measures are being implemented at schedule and location as by Proponent's EPP, anticipating daily for construction near sensitive areas or following a rain event, and weekly for operations and as appropriate for reclamation and post-reclamation periods. • Regular monitoring of fish habitat in wetlands and watercourses to evaluate their condition and integrity post decommissioning phase. • A fish and fish habitat monitoring program will be developed. The frequency and location of fish and fish habitat monitoring will be described in greater detail in the EEM following consultation with regulatory agencies related to wetland and watercourse alteration permits and local conservation organizations.
Habitat and Flora		
Habitat and Flora	• Intact forest stands and wetlands will be avoided wherever possible in favor of previously disturbed areas. • Where natural, intact habitat cannot be avoided, minimization of total project footprint will be considered. • Erosion and sediment control planning. • Monitoring dust conditions and when normal precipitation levels are not enough to suppress fugitive dust, water trucks can be used to suppress dust. • Winter road maintenance will include conventional snow clearing and deposition of sand for traction control where necessary. Road salt will not be used. • Haul trucks will be equipped with spill kits and instructed on their use and spill prevention and appropriate site personnel will be trained in spill isolation, containment, and recovery.	• Baseline monitoring measurements and observations prior to wetland alteration activities. • Construction monitoring to ensure protective measures are being implemented. • Ensure limits of work are maintained to avoid unnecessary habitat loss. • Monitoring of remedial activities to evaluate their success in establishing habitat for wild species, and monitoring wetlands for condition and integrity may be necessary post decommissioning phase.

Table 7.1-1: Summary of Mitigation and Monitoring Measures (continued)

Valued Component Affected	Mitigation and Compensation Measures	Monitoring Program
Habitat and Flora (con't)	• A wetland alteration application will be submitted to request an authorization to alter wetland habitat. Loss of function will be addressed in this wetland alteration application. • Compensation for permanent loss of wetland function will be completed through wetland restoration activities to support no net loss of wetland function, subject to NSE approval.	
Terrestrial Fauna		
Terrestrial Fauna Habitat	• Intact forest stands and wetlands will be avoided wherever possible in favor of previously disturbed areas. • Where natural, intact habitat cannot be avoided, minimization of total project footprint will be considered during planning. • Habitat fragmentation will be reduced by limiting the area of new roads, favoring upgrading of existing roads where possible as per proposed Project design. • Site infrastructure will be fenced where practical and deemed necessary to reduce interactions between project infrastructure and wildlife. • A speed limit of 50 km/hr within the mine footprint and 70km/hr along the Haul Road will be implemented to reduce likelihood of collisions with fauna. • An unvegetated buffer along roadsides will be maintained, where possible. • Clearing and construction will be limited within wetlands that could support snapping turtles during winter hibernation period. • Culverts installed within wetlands and watercourses will provide an alternative crossing location to amphibians and reptiles, thereby reducing direct mortality of species attempting to cross a road. • Watering of roads during dry conditions. • Waste management to reduce attracting opportunistic wildlife species.	Complete regular construction monitoring to ensure protective measures are being implemented. Ensure limits of work are maintained to avoid unnecessary habitat loss. Monitoring of remedial activities to evaluate their success in establishing habitat for wild species, and monitoring wetlands for condition and integrity may be necessary post decommissioning phase.
Terrestrial Fauna Habitat (con't)	• Erosion and sediment control planning. • A wetland alteration application will be submitted. Loss of function and habitat for species reliant on wetland habitat will be addressed in this wetland alteration application. • Compensation for permanent loss of wetland function will be completed through wetland restoration activities to support no net loss of wetland function, subject to NSE approval. • Water management, spill control and vegetation management (i.e., no use of herbicides). • Ensure all development related activity is located within areas where biophysical field evaluations have been completed and approvals/written authorizations are in place as required.	
Birds		
Bird Habitat	• Bird awareness and management, including avoiding clearing of trees during the breeding season for migratory birds, discouraging ground-nesting or burrow-nesting species, and applying a buffer zone around any identified nests for specified species. • Reduce impact of light pollution on birds by minimizing on-site lighting while still allowing for safe operation, and by installing lighting which faces the ground. • Maintain speed limits on mine roads (max. 50 km/hr within mine footprint, 70 km/hr along Haul Road). Reduce speed limit and install signage where specific wildlife concerns have been identified. • Noise controlled by attenuation, vertical separation, and equipment design. • Dust control where there are increased dust emissions. • Compensate for lost wetland functions that support migratory birds as part of the wetland compensation plan. • Notify Environment and Climate Change Canada within 24 hours in the event of the mortality or injury of ten or more migratory birds in a single event or in the event of the mortality or injury of a migratory bird species at risk.	• Conduct a pre-construction survey of known raptor nests in the Project area during breeding season. • Verify the effectiveness of mitigation measures related to light for a minimum of two years and implement adaptive measures. • Monitor known nests around stockpiles and exposed areas to verify the effectiveness of the buffer until the nests are inactive. • Conduct routine inspections, anticipating daily observations by operators for mortality or injured birds near site operations, and inspections by qualified avian experts if high level of mortality or injury noted or to remove any trapped or injured birds.

Table 7.1-1: Summary of Mitigation and Monitoring Measures (continued)

Valued Component Affected	Mitigation and Compensation Measures	Monitoring Program
SOCI and SAR		
Priority Fish Species	• Standard mitigation for fish and fish habitat as detailed above. • Work with organizations to form partnerships to allow for data sharing. • Adherence to of all watercourse alteration terms and conditions of approvals including those which support priority fish species. • Fish rescue will be completed prior to commencement of mine development as required and in consultation with DFO. • All culverts will be installed in accordance with the NSE standards to ensure fish passage through new culverts, and by upgrading or removing improperly installed culverts, where possible. • The location of all watercourses known to support priority species will be communicated to site personnel along with recommended mitigation measures.	• Standard monitoring programs proposed for fish and fish habitat. • A monitoring program will be developed to measure post construction water quality and quantity in the Killag River, where the potential effect of the project on surface water and priority fish species is the highest. • Monitoring will likely occur at the baseline sampling location on the West River Sheet Harbour and additional locations if directed by regulators.
Priority Vascular Flora and Lichens	• Standard mitigation measures for wetlands and habitat and flora. • SOCI awareness will be communicated to all personnel. • Priority species that are located within the direct footprint of the mine infrastructure or Haul Road, where deemed reasonable and appropriate in consultation with regulatory authorities, will be transplanted to nearby suitable habitat. • A lichen monitoring program for lichen SAR identified in close proximity to the Project area will be established.	• Standard monitoring programs proposed for habitat and flora.
Priority Terrestrial Fauna	• Standard mitigation for terrestrial fauna. • A moose management and monitoring program will be implemented in collaboration with the Mi'kmaq of Nova Scotia. • Implementing a buffer on aquatic habitat deemed suitable for snapping turtles, wherever possible. • Culverts will be installed in wetlands and watercourses under provincial permits as required. • Wetland and watercourse alterations. • Implement signage on the Haul Road during operations adjacent to major stream crossings or waterbodies. • Dust suppression.	• Standard monitoring programs proposed for terrestrial fauna. • A moose monitoring plan will be implemented including repeated winter track surveys and pellet group inventories, with consideration to partnering with the Mi'kmaq to study moose in a broader context. • Wildlife observation reporting to appropriate site personnel.
Priority Birds	• Standard mitigation for birds. • Communicate regulations related to nesting birds to all site personnel. If nesting behaviour of any bird is observed, site personnel are to report this activity. • To limit attraction of Common Nighthawk to the Project area, the amount of exposed soil should be limited during nesting season, favouring to cover or revegetate soil wherever possible.	• Standard monitoring programs proposed for birds. • Verify the effectiveness of mitigation measures related to light for a minimum of two years. • Monitor known nests around stockpiles and exposed areas to verify the effectiveness of the buffer until the nests are inactive.
Indigenous Peoples		
	• In the event that Mi'kmaq archaeological deposits are encountered during construction or operation of the Project, all work should be halted and immediate contact should be made with the Nova Scotia Museum and the Mi'kmaq of Nova Scotia.	• Monitoring of activities to ensure mitigation measures are undertaken to prevent irreversible damage to Mi'kmaq archaeological resources and burial site which is outside of Project area.
	• Continuation of the engagement of the Mi'kmaq of Nova Scotia including: representatives from the two nearest Mi'kmaq communities on the CLC; participation in the Project including key aspects of environmental monitoring and wetland compensation, and any targeted engagement of residents of Beaver Lake based on approach agreed with Chief and Council and staff of Millbrook First Nation.	• Review of Mi'kmaq input on specific actions and implementation where agreed on with Mi'kmaq of Nova Scotia.
	• Share Project benefits with the Mi'kmaq of Nova Scotia via negotiated benefits agreement(s).	• Monitoring of any future benefit agreement(s) as defined in the specific agreement, e.g., quarterly meetings of the implementation committee.
Physical and Cultural Heritage		
Physical and Cultural Heritage Resources	• Shovel testing shall be conducted around the possible cookhouse or a buffer be put in place around the feature to protect it from mining activities. • Intensified reconnaissance if development will occur within 100 m of Crusher Lake. • If any development is to occur specifically around the historic features identified during the reconnaissance, intensified research and archaeological shovel testing should be conducted. • Any further changes in the layout of the mine and facilities be evaluated. • In the event that archaeological deposits or human remains are encountered, the Coordinator of Special Places, Nova Scotia Communities, Culture, & Heritage Department must be contacted.	• Ensure mitigation measures are undertaken to prevent damage to identified features.

Table 7.1-1: Summary of Mitigation and Monitoring Measures (continued)

Valued Component Affected	Mitigation and Compensation Measures	Monitoring Program
Human Health and Socio-Economics		
Recreational Activities	•Restriction of recreational activities within the spatial boundaries of the Project. Notification will be provided by signage. •Liaison with any local recreation groups, such as ATV associations.	•Not applicable
Traffic	•Equipment maintenance. •Limiting haul truck operational hours to 12 to 16 hours per day. •Reduce risks of an accident through operator training, proper signage at intersections and along the Haul Road, and discussions with NSTIR.	•Not applicable

EPP = Environmental Protection Plan; TSP = total suspended particulates; GHG = green house gas; BAP = best available practices; MDMER = Metal and Diamond Mining Effluent Regulations; EEM = Environmental Effects Monitoring Plan; NSE = Nova Scotia Environment; ARD = acid rock drainage; EPP = Environmental Protection Plan; km/hr = kilometres per hour; SOCI = Species of Conservation Interest; km = kilometres; ATV = all terrain vehicle; NAPS = National Air Pollution Surveillance; EA = Environmental Assessment.

8 CLOSING

The Beaver Dam Mine Project proposed by AMNS will operate as a satellite surface mine with an approximate ore extraction rate of 2 million tonnes per year. The Beaver Dam Mine Project is part of the MRC Project which also includes the existing and fully permitted Touquoy Gold Project in nearby Moose River Gold Mines, Nova Scotia.

Processing of ore from the Beaver Dam gold deposit at the existing plant at Moose River will begin upon completion of mining from the Touquoy gold deposit. The Beaver Dam Mine Project is anticipated to begin construction in 2021, come into production in 2022, cease operations in 2026 and then be reclaimed. Reclamation would occur at the Beaver Dam Mine site following cessation of production and at the Touquoy facilities associated with ore processing and tailings management from processing Beaver Dam ore.

AMNS has recognized that the quantity and unusual style of gold mineralization at the Beaver Dam mine site will support a commercially viable surface mining operation with on-site crushing and off-site processing of ore.

AMNS is proposing to develop this resource in line with all applicable regulatory requirements and recognizes the significant benefits to the local economy, the Province of Nova Scotia, the Mi'kmaq of Nova Scotia, and the company in completing this Project. AMNS has designed a project that is in line with the intent of NSDNR for efficient use of mineral resources and to "*promote the concepts of environmental responsibility and sustainable development, stewardship of the mineral resource sector, and integrated resource planning.*"

All phases of the Project will provide employment opportunities for local residents and Indigenous Peoples, as well as provide tax revenue for the municipal, provincial, and federal levels of government. It is anticipated that additional labour force will be required during construction and a smaller, but still significant, labour force will be required during operation. Indirect employment will be generated by the Project through the use of external contractors and suppliers. Tax revenue in the millions of dollars per year will be generated through corporate income taxes paid by AMNS, as well as its contractors and suppliers.

As described throughout the EIS and this Summary document, Project-environment interactions are expected to occur throughout the life of the Project during the construction, operations, active closure, and post-closure phases. These interactions are expected, manageable and are typical of environmental impacts associated with quarry and mineral extraction projects in the region.

Given the considerations identified above and based on baseline studies completed for each of the identified VCs, the Project is not expected to result in any significant residual adverse environmental effects once mitigation measures have been applied. Monitoring programs will continue throughout the life of the Project to verify the effects of the Project on the surrounding environment relative to predictions made in the environmental effects' assessment. AMNS is committed to implementing the planned mitigative measures and monitoring programs, as well as ongoing stakeholder and Mi'kmaq engagement as outlined in this submission.

9 LIST OF ACRONYMS

ACCDC	Atlantic Canada Conservation Data Centre
AEMP	Aquatic Effects Monitoring Program
ALDs	Anoxic limestone drains
AMNS	Atlantic Mining NS Inc.
AMO	abandoned mine openings
ANFO	30% Ammonium Nitrate Fuel Oil
ARD	acid rock drainage
As	Arsenic
ATV	all terrain vehicle
BAPs	best applicable practices
bench	bench floor elevation
C	Construction
CAAQS	Canadian Ambient Air Quality Standards
CAR	commercial, aboriginal, or recreational interest
CCME	Canadian Council of Ministers of the Environment
CCME FWAL	Canadian Council of Ministers of the Environment Freshwater Aquatic Life
CEAA	Canadian Environmental Assessment Agency
CIL	carbon in leach
CL	active closure (decommissioning and reclamation)
CLC	Community Liaison Committee
CMM	Confederacy of Mainland Mi'kmaq

CO	Carbon monoxide
CO_2^e	carbon dioxide equivalent units
COC	Contaminant of Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRA	Conestoga-Rovers & Associates).
CSP	circular corrugated steel pipe
DFO	Fisheries and Oceans Canada
DO	dissolved oxygen
e.g.,	for example
EA	Environmental Assessment
EARD	Environmental Assessment Registration Document
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
EIS	Environmental Impact Statement
EMS	Environmental Management System
EOM	End-of-Mine
EPP	Environmental Protection Plan
EPP	Environmental Protection Plan
EQS	Nova Scotia Environment Quality Standards
FHAA	Fish Habitat Assessment Area
GAC	granular activated carbon
GCL	Geosynthetic Clay Liner
GHD	GHD Limited

GHG	greenhouse gases
HADD	Harmful Alteration, Disruption, or Destruction
HDPE	High-density Polyethylene
Hg	Mercury
Hg	Mercury
HHRA	Human Health Risk Assessment
HRM	Halifax Regional Municipality
Hwy	Highway
i.e.,	that is
IA	Industrial Approval
IAAC	Impact Assessment Agency of Canada
ILP	Institute of Lighting Professionals
IR	Indian Reserve
IR2s	Round 2, Information Requests
ISQG	Interim Sediment Quality Guidelines
KMKNO	Kwilmu'kw Maw-klusuaqn Negotian Office
LAA	Local Assessment Area
LGO	Low Grade Ore
LiDAR	Light Detection and Ranging
LOM	Life of Mine
MACA	Mooseland and Area Community Association
MBCA	Migratory Birds Convention Act
MDMER	Metal and Diamond Mining Environmental Regulations

MEKS	Mi'kmaq Ecological Knowledge Study
MEL	McCallum Environmental Limited
MIA	Mining Infrastructure Area
ML/ARD	Metal Leaching/Acid Rock Drainage
MMTS	Moose Mountain Technical Services
MNL	Mitigation Noise Leve
MOU	Memorandum of Understanding
MRC	Moose River Consolidated
MSC	Meteorological Service of Canada
N/A	Not applicable
NAG	Non-acid generating
NAPS	National Air Pollution Surveillance
NGO	non-governmental organizations
NO_2	Nitrogen dioxide
Northern Timber	Northern Timber Nova Scotia Corporation
NOx	Oxides of Nitrogen
NS	Nova Scotia
NSAQS	Nova Scotia Air Quality Standards
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment
NSEL	Nova Scotia Environment and Labour
NSESA	NS Endangered Species
NSL&F	Nova Scotia Department of Lands and Forestry

NSSA	Nova Scotia Salmon Association
NSTIR	Nova Scotia Department of Transportation and Infrastructure Renewal
O	Operations
OMS	Organic Material Stockpile
PAG	Potential Acid Generating Stockpile
PEL	Probable Effect Level
PLFN	The Pictou Landing First Nation
PLS	Plain Language Summary
PM_{10}	Particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$	Particulate matter less than 2.5 micrometres in aerodynamic diameter
RAA	Regional Assessment Area
ROM	run-of-mine
SAR	Species at risk
SARA	Species at Risk Act
SO_2	Sulphur dioxide
SOCI	Species of conservation interest
SOx	Oxides of Sulfur
SP	Stockpile
TC	Transport Canada
the Project	The Beaver Dam Mine Project
TIR	Transportation and Infrastructure Renewal
TLRUS	Traditional Land and Resource Use Study
TLS	Till Stockpiles

TMF	Tailings Management Facility
TSP	Total suspended particulates
TSS	Topsoil Stockpiles
US EPA	United States Environmental Protection Agency
VC	Valued Components
WC	Watercourse
WRSA	Waste Rock Storage Area
WSS	Wetland of Special Significance
WTS	Water treatment system
YOY	Young of the year

10 LIST OF UNITS

%	percent
<	less than
>	greater than
µg/L	micrograms per litre
µg/m^3	micrograms per cubic metre
µS/cm	microSiemens per centimetre
BCM	bank cubic meters
CFM	cubic feet per minute
cm	centimeters
CPUE	catch per unit of effort
dBA	decibels
g/s	grams per second
ha	hectares
km	kilometer
km/h	kilometers per hour
km^2	square kilometres
kt	kilotonne
L/min	Litres per minute
Ldn	day-night average sound level
L_{eq}	Equivalent continuous sound level
m	meters

masl	metres above sea level
MLCM	million loose cubic metres
mm	millimetre
Mm^3	million cubic metres
Mt	million tonnes
Mt/year	million tonnes per year
t	tonnes
t/m^3	tonnes per cubic meter
t/y	tonnes per year

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