# 5 ENVIRONMENTAL EFFECTS ASSESSMENT METHODOLOGY

## 5.1 Introduction

### 5.1.1 Summary of Environmental Effects Assessment Methodology Before the Updates

The Project being assessed through this EIS is a proposed surface gold mine consisting of the construction, operation, and decommissioning of a surface mine, Haul Road, and processing facility, known as the Beaver Dam Mine Project. The project will encompass three primary locations spanning from Marinette to Moose River Gold Mines, Halifax County, Nova Scotia.

The scope of the Project to be assessed in accordance with CEAA 2012 and the Environmental Assessment Regulations made under the *Nova Scotia Environment Act* includes Project components and activities outlined in Section 5.2.1. The methodology used to conduct this EA is based on the identification and assessment of potential environmental effects of the Project on Valued Components (VC), as defined in Section 5.4.

An effects assessment was conducted for each to determine the potential direct and indirect interactions between Project activities and VCs. The results of the effects assessments, in consideration of mitigation measures, were used to assess residual effects and determine the significance of Project effects on each VC. Follow-up management and monitoring programs area proposed as required

### 5.1.2 Summary of Updates to Environment Effects Assessment Methodology

The EIS has been updated due to changes in Project Description since the Revise 2019 EIS submission (AMNS 2019). While the general methods presented in this section by which the EA was conducted have not changed, VC specific baseline and effects assessments have been updated in consideration of revised baseline conditions and Project interactions. Additional analysis as defined in Section 5.11, Table 5.11-1 is also identified and supports the characterization and significance determination for residual effects. In response to Round 2, Information Request (IR2) from the Impact Assessment Agency of Canada (IAAC; formerly the Canadian Environmental Assessment Agency [CEAA 2019]) CEAA 2-02 criteria to assess significance thresholds, particularly magnitude have been defined quantitively to the extent possible. Detailed VC information and updates are presented in the corresponding subsection within Section 6 of this EIS update.

**Table 5.1-1: Updated Subsections from the Revised 2019 Environmental Impact Assessment – Environmental Effects Assessment Methodology**

| 2019 Revised EIS Submission (February 28, 2019) | | Updated in 2021 | Corresponding 2021 EIS Update Section Number | | Reason for Update |
|---|---|---|---|---|---|
| - | | - | 5.1 | Introduction | • New |
| 5.1 | Scope of Environmental Assessment | No | 5.2 | Scope of Environmental Assessment | • N/A |
| 5.2 | Overview of Approach | No | 5.3 | Overview of Approach | • N/A |
| 5.3 | Valued Component Selection | No | 5.4 | Valued Component Selection | • N/A |
| 5.4 | Project Boundaries | Yes | 5.5 | Project Boundaries | • Regional Study Areas have been considered for VCs; updates to length of time for each Project Phase |

**Table 5.1-1: Updated Subsections from the Revised 2019 Environmental Impact Assessment – Environmental Effects Assessment Methodology (continued)**

| 2019 Revised EIS Submission (February 28, 2019) | Updated in 2021 | Corresponding 2021 EIS Update Section Number | Reason for Update |
|---|---|---|---|
| 5.5 Standards or Thresholds for Characterization and Determining Significance | Yes | 5.6 Standards or Thresholds for Characterization and Determining Significance | • Minor updates |
| 5.6 Baseline Condition | No | 5.7 Baseline Conditions | • N/A |
| 5.7 Anticipated Project Environment Interactions | No | 5.8 Anticipated Project Environment Interactions - | • N/A |
| 5.8 Effects Prediction | No | 5.9 Effects Predicted | • N/A |
| 5.9 Mitigation | No | 5.10 Mitigation | • N/A |
| 5.10 Residual Effects and Determination of Significance | Yes | 5.11 Residual Effects and Determination of Significance | • Reference to updates to the characterization of effects as requested in CEAA 02-2 |
| 5.11 Follow-up and Effects Monitoring | No | 5.12 Follow-up and Effects Monitoring | • N/A |
| 5.12 Effects of Environment on the Project | Yes | 5.13 Proposed Compliance and Effects Monitoring Program | • Minor updates to reference CEAA 2-03 |

PA = Project Area; LAA = Local Assessment Area; RAA = Regional Assessment Area; - = no update; IR2 = Round 2, Information Requests; CEAA = Canadian Environmental Assessment Agency; EIS = environmental impact statement N/A = Not Applicable

## 5.2 Scope of the Environmental Assessment

### 5.2.1 Designated Project

The Project being assessed through this EIS is a proposed surface gold mine consisting of the construction, operation, and decommissioning of a surface mine, Haul Road, and processing facility, known as the Beaver Dam Mine Project. The project will encompass three primary locations spanning from Marinette to Moose River Gold Mines, Halifax County, Nova Scotia.

The scope of the Project to be assessed in accordance with CEAA 2012 and the Environmental Assessment Regulations made under the *Nova Scotia Environment Act* include the following components and activities:

**Physical Components**

- surface mine for extracting ore and waste rock;
- Mine Site roads;
- waste material storage piles for waste rock, till, and topsoil;
- run-of-mine (ROM), high grade, and low-grade ore stockpiles;
- crusher and operational facilities;

- water management;
- haul road for transporting ore; and
- Touquoy Mine Site (processing and tailings management using the exhausted Touquoy pit).

**Physical Activities**

- 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;
- surface infrastructure installation and construction;
- collection and settling pond construction;
- culvert and bridge upgrades and construction;
- Haul Road construction and upgrades;
- ore processing equipment upgrades;
- tailings line alteration;
- surface mine dewatering;
- ore management;
- waste rock management;
- surface water management;
- petroleum products management;
- site maintenance and repairs;
- ore transport;
- Haul Road maintenance and repairs;
- tailings management (exhausted pit);
- infrastructure demolition;
- site reclamation;
- environmental monitoring; and
- general waste management.

These components and activities reflect the scope of the Project outlined in Section 3.1 of the EIS Guidelines (CEAA 2016) and reflect the components and activities that would occur throughout the duration of the Project. The effects assessment outlined in Section 6 of this EIS is formed based on these components and activities.

Additional details regarding Project components and activities can be found in Section 2.7 and Section 2.9. A review of the potential interactions between valued components (VCs) and the Project components/activities outlined above can be found in Section 5.8, Tables 5.8-1, 5.8-2, and 5.8-3.

### 5.2.2 Factors to be Considered

This EIS considers all factors outlined in Section 19(1) of CEAA 2012 and Section 3.2 of the EIS Guidelines (CEAA 2016). Specifically, this includes the following:

- environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other physical activities that have been or will be carried out;
- the significance of effects;
- comments from the public;
- mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project;
- the requirements of the follow-up program in respect of the Project;
- the purpose of the Project;
- alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternatives (Project Description Section 2.10);
- any change to the Project that may be caused by the environment; and
- the results of any relevant regional study pursuant to CEAA 2012.

### 5.2.3 Scope of Factors to be Considered

The scope of the factors to be considered focuses this EIS on relevant issues and concerns. As indicated in Section 5(1) of CEAA 2012, the environmental effects that are to be considered regarding an act or thing, a physical activity, a designated project, or a project are:

(a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:

  *(i) fish and fish habitat as defined in subsection 2(1) of the Fisheries Act,*

  *(ii) aquatic species as defined in subsection 2(1) of the Species at Risk Act,*

  *(iii) migratory birds as defined in subsection 2(1) of the Migratory Birds Convection Act, 1994, and*

  *(iv) any other component of the environment that is set out in Schedule 2;*

(b) a change that may be caused to the environment that would occur

  *(i) on federal lands,*

  *(ii) in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out, or*

  *(iii) outside Canada; and*

(c) with respect to aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on

*(i) health and socio-economic conditions,*

*(ii) physical and cultural heritage,*

*(iii) the current use of lands and resources for traditional purposes, or*

*(iv) any structure, site, or thing that is of historical, archaeological, paleontological, or architectural significance.*

Certain additional environmental effects must be considered under Section 5(2) of CEAA 2012 where the carrying out of the physical activity, the designated project, or the Project requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than CEAA 2012. As the Project may require an authorization from DFO, the following environmental effects have also been considered:

(a) a change that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the Project; and

(b) an effect, other than those referred to in paragraph 1(c), of any change referred to in paragraph (a) on

*(i) health and socio-economic conditions,*

*(ii) physical and cultural heritage, or*

Any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance.

These categories of direct and indirect environmental effects have been considered in defining the scope of the assessment, including the selection of VCs and identification of spatial and temporal boundaries.

## 5.3 Overview of Approach

The methodology used to conduct the EA and predict the effects of the Project was developed to meet the requirements of the EIS Guidelines issued by CEAA on January 19, 2016. The EIS Guidelines include requirements for EA's under CEAA 2012 and the Nova Scotia Environmental Assessment Regulations made under the *Nova Scotia Environment Act*. In addition to these requirements, the EA methodology was developed to incorporate:

- input from Indigenous Peoples 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.

The following sections will describe the methodology used to derive:

- the general rationale in VC selection;
- the spatial, temporal, administrative, and technical boundaries for assessing effects on VCs;
- the standard and/or threshold for characterizing and determining significance of residual effects;
- the programs developed to assess the baseline condition of those VCs;
- the anticipated Project and environment interactions for the duration of the Project;
- the prediction of effects that Project activities may have on VCs;

- the mitigation measures that will be used to eliminate, reduce, or control the potential effects of Project activities;
- the residual effects that may remain after mitigation measures are applied and the significance of those residual effects;
- the cumulative effects of the Project may have in combination with the residual effects of other projects within temporal and spatial confines of the Project;
- the follow-up and monitoring programs proposed to verify the accuracy of predicted impacts; and
- the effects of the environment on the Project.

The defined methodology described herein has allowed the Consultants to carefully examine Project activities to ensure they will not cause serious or irreversible harm to the environment.

## 5.4 Valued Components Selection

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 Indigenous Peoples, regulators, the Consultants, and/or the general public. Their value not only relates to its role in the ecosystem, but also the value humans place on it.

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 provided by CEAA on January 19, 2016 and Section 5 of CEAA 2012. For a discussion of CEAA 2012 Section 5 requirements refer to Section 5.4 of this EIS;
- a review of federal, provincial, and municipal legislation, including an appraisal of species of conservation interest (SOCI) and SAR. Guidelines specifically requires consideration of the factors listed in Section 79 of SARA are provided in Section 6.13 and 6.17 of the EIS;
- workshops and discussions with representatives of CEAA, DFO, Environment and Climate Change Canada (ECCC), TC, NSE, and 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 Consultants.

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

**Physical VCs**

- noise, light, greenhouse gases, and air;
- 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;
- avifauna; 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

A summary of the rationale for the selection of each VC can be found in Table 5.4-1, detailed selection information is presented in the VCs corresponding subsection within Section 6 of this EIS update.

**Table 5.4-1: Rationale for Selection of Valued Components**

| Environment | Valued Component | Relevance to Environmental Impact Statement | | | | | | | | | | Valued Component Selection Rationale |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Project – Environment Interaction (Direct/Indirect [D/I]) | Legal Requirement | Scientific Interest | Biophysical Context | Socio-economic Context | Human Health | Human Quality of Life | Cultural | IAAC or Public Concern | Requirement of EIS Guidelines | |
| Physical Environment | Noise | D, I | X | | X | | X | X | | X | | • Potential for increases in noise |
| | Light | D, I | X | | X | | X | X | | X | | • Potential for increases in ambient light levels |
| | Air | D, I | X | | X | | X | X | | X | | • Potential for direct adverse effects to air quality |
| | Greenhouse Cases | D, I | X | | X | | X | X | | X | | • Potential for direct contributions to climate change |
| | Geology, Soil and Sediment | D, I | | | X | | X | | | X | | • Potential for direct adverse effects to soil and sediment<br>• Potential for ARD from Halifax Formation bedrock<br>• Pathway for potential adverse effects to surface water quality, wetlands, fish and fish habitat, habitat and flora, birds, fauna, SOCI/SAR, and human health |
| | Surface Water Quality and Quantity | D, I | X | X | X | | X | X | | X | | • Potential for direct adverse effects to surface water quality<br>• Potential for direct adverse effects to surface water quantity<br>• Pathway for potential adverse effects to wetlands, fish and fish habitat, birds, fauna, SOCI/SAR, and human health |
| | Groundwater Quality and Quantity | D | X | X | | | | | | X | | • Potential for direct adverse effects to groundwater quality<br>• Potential for direct adverse effects to ground water quantity |
| Biophysical Environment | Wetlands | D, I | X | X | X | | | | | X | | • Potential for direct loss and/or adverse effects to wetlands and their function<br>• Pathway for potential adverse effects to surface water quality and quantity, fish and fish habitat, habitat and flora, birds, fauna, and SOCI/SAR |
| | Fish and Fish Habitat | D, I | X | X | X | X | X | X | | X | X | • Potential for direct adverse effects to fish and fish habitat<br>• Pathway for potential adverse effects to birds, fauna, SOCI/SAR and human health |
| | Habitat and Flora | D, I | X | X | X | X | X | X | | X | | • Potential for direct loss of habitat<br>• Potential for direct adverse effects to flora<br>• Pathway for potential adverse effects to the atmospheric environment, surface water quality and quantity, wetlands, fish and fish habitat, birds, fauna, SOCI/SAR, Indigenous Peoples, and human health |
| | Avifauna | D, I | X | X | X | X | X | X | | X | X | • Potential for direct adverse effects to birds<br>• Pathway for potential adverse effects to fauna, Indigenous Peoples, and human health |
| | Terrestrial Fauna | D, I | X | X | X | X | X | X | | X | | • Potential for direct adverse effects to fauna<br>• Pathway for potential adverse effects to birds, Indigenous Peoples, and human health |
| | Species of Conservation Interest/Species at Risk | D, I | X | X | X | | | | | X | X | • Potential for direct adverse effects to SOCI/SAR<br>• Pathway for potential adverse effects to birds and fauna |
| Socio-economic Environment | Mi'kmaq of Nova Scotia | D | X | | | X | X | X | X | X | X | • Potential for direct adverse effects to the current use of land and resources for traditional purposes |
| | Physical and Cultural Heritage | D | X | | | X | | | X | | | • Potential for direct adverse effects to archaeological sites |
| | Socio-economic Conditions | D | | | | X | | | | | | • Employment opportunities<br>• Economic spin-off<br>• Contribution to government revenue through taxation |

Note: Refer to Section 5.8 Anticipated Project-Environment Interaction definitions and examples relating to direct and/or indirect interactions. D = Direct; I = Indirect; CEAA = Canadian Environmental Assessment Agency; SOCI/SAR = Species of Conservation Interest/Species at Risk

## 5.5 Project Boundaries

### 5.5.1 Temporal Boundaries

The temporal boundaries represent the duration over which Project activities interact with each valued component VC. Generally, the temporal boundary encompasses all Project phases (construction, operation, active closure, and post-closure); however, the temporal boundary can vary depending on the valued component VC being considered.

The construction phase will be completed in one year, while the operation phase will last approximately five years. Active closure (i.e., decommissioning and reclamation) activities will commence after operation has ceased and likely occur over approximately two years. Post closure involves the required monitoring period once active reclamation and decommissioning is completed and is estimated to be 10+ years in length (timeline for this phase will be refined through on-going geochemical testing and water quality modelling and will documented in updated closure plans).

Temporal boundaries for each VC are described in their corresponding subsection within Section 6 of this EIS.

### 5.5.2 Spatial Boundaries

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.

#### 5.5.2.1 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 and the Haul Road will span from the Beaver Dam Mine Site west to Moose River Gold Mines, where the Touquoy Mine Site (processing and exhausted pit [to be used to dispose Beaver Dam tailings]) is located. The three PA's (i.e., study areas) are outlined in Figure 5.5-1.

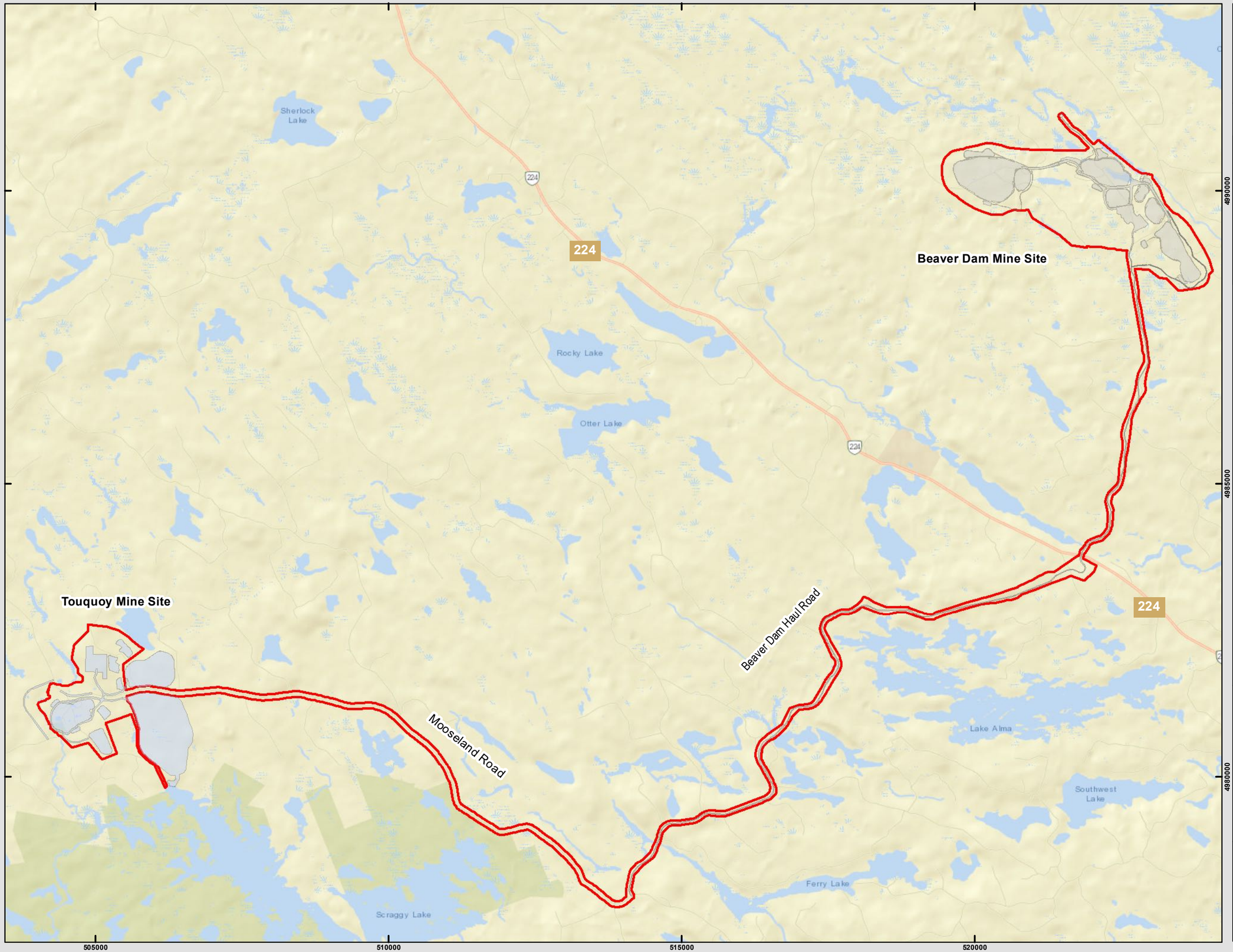
#### 5.5.2.2 Local Assessment Area (LAA)

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.

#### 5.5.2.3 Regional Assessment Area (RAA)

The RAA encompasses all Project and VC interactions including diffuse or longer-range effects such as those from Project activities are presented in Table 5.5-1. The RAAs 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 Table 5.5-1, as well as the corresponding subsections within Section 6 of this EIS.




Prepared For:

Atlantic Gold

**FIGURE 5.5-1**

# Beaver Dam Mine Project

## Project Area

Proposed Infrastructure
Touquoy Mine Infrastructure
Project Area


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

0 0.75 1.5 3 km

1:60,000

Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed by: XX

Date: 2021-05-09



McCallum Environmental Ltd.

**Table 5.5-1: Spatial Boundary Assessment by Valued Component**

| Environment | Valued Component | Project Area | Local Assessment Area | Regional Assessment Area | Spatial Boundary Selection Rationale |
|---|---|---|---|---|---|
| Physical Environment | Noise | X | X | X | Effects from the Project on noise may potentially occur within and immediately adjacent to the Project area, therefore, the Project Area, Local Assessment Area and Regional Assessment Areas are considered. |
| | Light | X | X | X | Effects from the Project on ambient light may potentially occur within and immediately adjacent to the Project Area, therefore, the Project area, Local Assessment Area and Regional Assessment Areas are considered. |
| | Air | X | X | X | Effects from the Project on air may potentially occur within and immediately adjacent to the Project Area, therefore, the Project area, Local Assessment Area and Regional Assessment Areas are considered. |
| | Greenhouse Gases | X | X | X | Effects from the Project on greenhouses gasses may potentially occur over a diffuse area and are related to provincial initiatives, therefore, the Project Area, Local Assessment Area, and Regional Assessment Area are considered. |
| | Geology, Soil, and Sediment Quality | X | X | | Effects from the Project on geology, soil, and sediment may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area and Local Assessment Area are considered. |
| | Surface Water Quality and Quantity | X | X | X | Effects from the Project on surface water quality and quantity may potentially occur within and immediately adjacent to the Project Area, therefore, the Project area, Local Assessment Area and Regional Assessment Areas are considered. are considered |
| | Groundwater Quality and Quantity | X | X | X | Effects from the Project on groundwater quality and quantity may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area and Local Assessment Area are considered. |
| Biophysical Environment | Wetlands | X | X | X | Effects from the Project on wetlands may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area, Local Assessment Area and Regional Assessment Areas are considered. are considered. |
| | Fish and Fish Habitat | X | X | X | Effects from the Project on fish and fish habitat may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area Local Assessment Area, and Regional Assessment Areas are considered. are considered are considered. |
| | Habitat and Flora | X | X | X | Effects from the Project on habitat and flora may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area Local Assessment Area and Regional Assessment Areas are considered. are considered are considered. |
| | Avifauna | X | X | X | Effects from the Project on birds may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area, Local Assessment Area and Regional Assessment Areas are considered. |

**Table 5.5-1: Spatial Boundary Assessment by Valued Component (continued)**

| Environment | Valued Component | Project Area | Local Assessment Area | Regional Assessment Area | Spatial Boundary Selection Rationale |
|---|---|---|---|---|---|
| | Terrestrial Fauna | X | X | X | Effects from the Project on fauna may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area, Local Assessment Area and Regional Study Area, and Regional Assessment Areas are considered. |
| | Species of Conservation Interest/Species at Risk | X | X | X | Effects from the Project on species of conservation interest and species at risk may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area, Local Assessment Area and Regional Assessment Areas are considered. |
| Socio-economic Environment | Mi'kmaq of Nova Scotia | X | X | X | Effects from the Project on Indigenous Peoples may potentially occur within and immediately adjacent to the Project Area, therefore, the Project Area, Local Assessment Area and Regional Assessment Areas are considered. |
| | Physical and Cultural Heritage | X | | | Effects from the Project on physical and cultural heritage are likely limited to the Project area, therefore, only the Project Area is considered. |
| | Socio-economic Conditions | X | X | X | Effects from the Project on socio-economic considerations of the area may potentially occur over a diffuse area, therefore, the Project Area, Local Assessment Area, and Regional Assessment Area are considered. |

### 5.5.3 Administrative Boundaries

The administrative boundaries represent the regulatory, public policy, and/or economic limitations placed on the execution of the Project. Administrative boundaries for each VC are described in their corresponding subsection within Section 6 of this EIS.

### 5.5.4 Technical Boundaries

The technical boundaries represent the limits of the Consultant team's ability to assess a VC. The limitations to measure, assess, and/or monitor the effects of the Project on VCs may be theoretical or physical. These technical boundaries may create gaps in knowledge and understanding related to key conclusions, therefore, limiting the Consultant's ability to predict potential effects of the Project on a VC. Technical boundaries for each VC are described in their corresponding subsection within Section 6 of this EIS.

## 5.6 Standards or Thresholds for Characterizing and Determining Significance of Effects

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 this EIS. These criteria or threshold were developed through the following avenues:

- consultation with appropriate regulatory agency responsible for each VC;
- using information obtained in stakeholder and right holder consultation;
- using available information on the status and characteristic of each VC;
- using applicable regulatory documents, environmental standards, guidelines, and/or objectives, and
- using professional judgement of the Consultant Team.

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 standards exist.

Additional analysis as defined in Section 5.11 and Table 5.11-1 also identifies and shows the characterization and significance determination for residual effects with cross-referencing to respective sections where this information has been updated from the Revised 2019 EIS (AMNS 2019).

## 5.7 Baseline Conditions

Baseline conditions for each physical, biophysical, and socio-economic VC are described in their corresponding subsection within Section 6 of this EIS to characterize the existing environment for which the Project is being undertaken, to establish an understanding of the receiving environment, and to provide sufficient context to enable an understanding of how the Project may affect existing environmental conditions. Inclusion of existing conditions is limited to that which is necessary to assess the effects of the Project and support the development of mitigation measures, monitoring and follow-up programs. Existing conditions consider the effects of past and current projects occurring within and outside of the PA.

Various methodologies were employed to obtain baseline conditions for each VC. Methodologies are outlined for each VC in their corresponding subsection within Section 6 of this EIS.

## 5.8 Anticipated Project-Environment Interaction

Interactions between Project activities, and the VCs outlined in Section 5.4 of this EIS will either be direct or indirect.

Direct interactions between the Project and VCs are typically more obvious and can be logically expected based on a good understanding of Project activities, and existing physical, biophysical, and socio- economic conditions and characteristics of the Project Area. Indirect interactions are less obvious and typically require an active pathway between Project activities and the VCs they are affecting. A pathway provides a link between a Project component or activity and VC and facilitates the interaction and potential effect.

As an example, a direct effect may be the potential loss of a wetland through clearing, grubbing, and grading in preparation of surface mine construction. Clearing, grubbing, and grading may also decrease infiltration and therefore increase runoff from the site; resulting in a potential indirect effect on surface water quality and quantity. Poor surface water quality and quantity may then affect fish and fish habitat; this is an example of a VC acting as both the receptor of an effect and the pathway for an effect.

In order to determine the potential direct and indirect interactions between Project activities, and VCs the Consultants conducted the following:

- reviewed the anticipated components and activities required to construct, operate, and decommission the Project;
- selected VCs that may have the potential to be directly or indirectly affected by Project activities;
- assessed the direct effects that Project activities may have on VCs;
- identified anticipated pathways between Project activities and any receiving VCs; and
- assessed the indirect effect that Project activities may have on VCs.

Once the direct or indirect interaction between Project activities and VCs is established, assessing the magnitude, duration, and other criteria for significance determination of the effects of those interactions becomes much easier. Subsequently, evaluating mitigation measures to eliminate, reduce, or control the effects of those interactions becomes easier as well.

Accidents and malfunctions have been considered for every phase of the Project; however, they are separated in the Project-VC interaction table to present the actual accidents and malfunctions that may occur during these phases.

The anticipated Project component and activities, and VCs interaction for the Beaver Dam Mine Site, Haul Road, and Touquoy Mine Site is presented in Tables 5.8-1, 5.8-2, and 5.8-3.

Interactions noted in Table 5.8-3 are specific to those that relate to new interactions as a result of the Project and not those that pre-exist at Touquoy Mine Site as part of that site's development, operation and reclamation.

**Table 5.8-1: Potential Valued Components Interactions with Project Activities at Beaver Dam Mine Site**

| | Valued Components | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Physical | | | | | | | Biophysical | | | | | | Socio-economic | | |
| | Noise | Light | Air | Greenhouse Gases | Geology, Soil And Sediment Quality | Groundwater Quality and Quantity | Surface Water Quality and Quantity | Wetlands | Fish and Fish Habitat | Habitat and Flora | Terrestrial Fauna | Avifauna | Species of Conservation Interest/Species at Risk | Mi' kmaq of Nova Scotia | Physical and Cultural Heritage | Socio-economic Conditions |
| **Construction** | | | | | | | | | | | | | | | | |
| Clearing, Grubbing, and Grading | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Drilling and Rock Blasting | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Topsoil, Till, and Waste Rock Management | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Existing Settling Pond Dewatering | | | | | X | X | X | X | X | X | | X | X | X | | |
| Watercourse and Wetland Alteration | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mine Site Road Construction, including lighting | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Surface Infrastructure Installation and Construction, including lighting | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Collection and Settling Pond Construction, including lighting | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X |
| General Waste Management | X | X | X | X | | | | X | | | | X | X | X | | |
| **Operation** | | | | | | | | | | | | | | | | |
| Drilling and Rock Blasting | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Surface Mine Dewatering | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Ore Management | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Waste Rock Management | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Surface Water Management | | | | | X | X | X | X | X | X | X | X | X | X | | X |
| Petroleum Products Management | | | | X | X | X | X | X | X | X | X | X | X | X | | X |
| Site Maintenance and Repairs, including lighting | X | X | X | X | | | X | | | | X | X | X | X | | X |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X |
| General Waste Management | X | X | X | X | | | X | | | | X | X | X | | | |
| **Active Closure** | | | | | | | | | | | | | | | | |
| Infrastructure Demolition | X | X | X | X | X | | X | | | | X | X | | X | | X |
| Site Reclamation | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X |
| General Waste Management | X | X | X | X | | | X | | | | X | X | X | | | |
| **Accidents and Malfunctions** | | | | | | | | | | | | | | | | |
| Fuel and/or other Spills | | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Fire | | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Slope Failure | | | | | X | X | X | X | X | X | X | X | X | | X | X |
| Collection/Settling Pond Failure | | | | | X | X | X | X | X | X | X | X | X | X | | X |
| Unplanned Explosive Event | X | | X | X | X | | X | X | X | X | X | X | X | X | | X |
| Mobile Equipment Accident | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X |

**Table 5.8-2: Potential Valued Components Interactions with Project Activities along Haul Road**

| | Valued Components | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Physical | | | | | | | Biophysical | | | | | | Socio-economic | | | |
| | Noise | Light | Air | Greenhouse Gases | Geology, Soil. And Sediment Quality | Groundwater Quality and Quantity | Surface Water Quality and Quantity | Wetlands | Fish and Fish Habitat | Habitat and Flora | Terrestrial Fauna | Avifauna | Species of Conservation Interest/Species at Risk | Mi' kmaq of Nova Scotia | Physical and Cultural Heritage | Socio-economic Conditions | |
| **Construction** | | | | | | | | | | | | | | | | | |
| Clearing, Grubbing, and Grading | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Drilling and Rock Blasting | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Topsoil, Till, and Waste Rock Management | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Watercourse and Wetland Alteration | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | |
| Culvert and Bridge Upgrades and Construction/Removal | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Haul Road Construction and Upgrades | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X | |
| General Waste Management | X | X | X | X | X | | X | X | X | X | X | X | X | | | | |
| **Operations** | | | | | | | | | | | | | | | | | |
| Ore Transport | X | X | X | X | X | X | X | | | | X | | | X | | X | |
| Road Lighting | | X | | | | | | | | | X | X | X | X | | X | |
| Haul Road Maintenance and Repairs | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X | |
| **Accidents and Malfunctions** | | | | | | | | | | | | | | | | | |
| Fuel and/or other Spills | | | X | X | X | X | X | X | X | X | X | X | X | X | | X | |
| Fire | | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | |
| Haul Truck Accident | X | X | X | X | X | X | X | X | X | X | X | | | X | | X | |

**Table 5.8-3: Potential Valued Components Interactions with Project Activities at Touquoy Mine Site**

| | Valued Components | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Physical | | | | | | | Biophysical | | | | | | Socio-economic | | |
| | Noise | Light | Air | Greenhouse Gases | Geology, Soil. And Sediment Quality | Groundwater Quality and Quantity | Surface Water Quality and Quantity | Wetlands | Fish and Fish Habitat | Habitat and Flora | Terrestrial Fauna | Avifauna | Species of Conservation Interest/Species at Risk | Mi' kmaq of Nova Scotia | Physical and Cultural Heritage | Socio-economic Conditions |
| **Construction** | | | | | | | | | | | | | | | | |
| Ore Processing Equipment Upgrades | X | X | X | X | | | | | | X | | | | X | | |
| Tailings Line Alteration | X | | | | | | X | | | | | | | | | |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X |
| General Waste Management | X | X | X | X | | | X | | | | X | X | X | | | |
| **Operations** | | | | | | | | | | | | | | | | |
| Lighting of facility and Mine Site roads | | X | | | | | | | | | | X | | | | |
| Ore Management and Processing | X | X | | | | X | X | | | | | | | | | |
| Tailings Management (exhausted pit) | X | X | | | | X | X | | X | | | X | X | | | |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X |
| General Waste Management | X | X | X | X | | X | X | X | X | X | X | X | X | | | |
| **Active Closure** | | | | | | | | | | | | | | | | |
| Environmental Monitoring | | | | | | | | | | | | | | X | | X |
| **Accidents and Malfunctions** | | | | | | | | | | | | | | | | |
| Fuel and/or other Spills | | | X | | X | X | X | X | X | X | X | X | X | X | | X |
| Fire | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X |
| Mobile Equipment Accident | X | X | X | X | X | X | X | X | X | X | X | | | X | | X |
| Tailings/Reclaim Waterline Event | | | | | | | X | | X | | | | | | | |
| Cyanide Release | | | X | | | X | X | | X | X | X | X | X | X | | X |

## 5.9 Effects Prediction

Potential Project-related effects are changes to the physical, biophysical, and/or human environment that are caused by Project activities. Interactions between VCs and Project activities are described in corresponding subsections within Section 6 and form the basis for effects prediction. Establishment of interaction relationships between VCs and Project activities is described in Section 5.8. Once these interaction relationships are established, determination of changes to VCs, defined as effects, as a result of Project activities is accomplished through:

- predicting adverse effects from Project activities, and evaluating the scope and scale of those effects;
- detailing mitigation measures triggered through regulatory requirements and/or best management practices to eliminate, reduce, or control the effect Project activities have on VCs;
- predicting cumulative effects from other projects occurring in the same spatial and temporal boundaries; and
- determining residual effects remaining after mitigation measures are considered and cumulative effects are identified, to assess the significance of those effects in the context of each VC.

## 5.10 Mitigation Measures

A variety of mitigation measures are typically available to eliminate, reduce, or control the effect Project activities have on the environment. These measures range from procedures within standard industry best management practices for construction and operation, policies and practices communicated through training programs and management plans, and/or engineering controls incorporated into the final design. Given the Proponents' experience with gold mining in the region, specifically the Touquoy Project, as well as past experience outlined in Section 1.4, a number of mitigation measures were proactively incorporated into the Project design in order to eliminate, reduce, and/or control the effect of Project activities on the environment. Mitigation measures for each VC are described in the corresponding subsections within Section 6. A summary of all mitigation measures is provided in Section 9 of this EIS update, as per Information request CEAA 2-03 (AMNS 2021).

## 5.11 Residual Effects and the Determination of Significance

Residual effects are effects to VCs that are predicted to remain even after the implementation of mitigation measures. The process by which they are identified are as follows:

- determine the potential interactions between VCs and Project activities and the effects those interactions will have;
- assess effect of each mitigation strategy applied to the interactions;
- characterize the extent and nature of the remaining, residual effects after mitigation measures have been applied for the Project; and
- evaluation of the Project including Haul Road.

To identify if residual effects are significant or not, consideration of the magnitude, geographical extent, duration, frequency, and reversibility is required. A description of these effects characteristics and the varying degrees in which they can contribute to the significance of an effect is presented in Table 5.11-1. Where possible, criteria will be described quantitatively. When residual effects cannot be characterized quantitatively, they will be characterized qualitatively.

**Table 5.11-1: Characterization Criteria for Residual Environmental Effects**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories | Valued Component Specific Definitions |
|---|---|---|---|
| Significance Threshold | The definition of a significant adverse effect based on Project interactions with each Valued Component. | Determinations of Significance based on characterization criteria as defined for each VC | Noise – 6.1.6.2<br>Air – 6.2.6.2<br>Light – 6.3.6.3<br>Greenhouse Gases – 6.4.6.2<br>Geology, Soils and Sediment – 6.5.6.2<br>Groundwater Quality and Quantity – 6.6.6.4<br>Surface Water Quality and Quantity – 6.7.7.2<br>Wetlands – 6.8.6.3<br>Fish and Fish Habitat – 6.9.6.2<br>Habitat and Flora – 6.10.6.2<br>Terrestrial Fauna – 6.11.6.2<br>Avifauna – 6.12.7.2<br>SOCI and SAR – 6.13.6.2<br>Mi'kmaq of Nova Scotia – 6.14.6.2<br>Physical and Cultural Heritage – 6.15.6.2<br>Socioeconomic Conditions – 6.16.12<br>Accidents and Malfunctions – 6.18.6.1.1, 6.18.6.2.3, 6.18.6.3.3, 6.18.6.4.1, 6.18.7.1.4, 6.18.7.2.1, 6.18.7.3.1, 6.18.4.1, 6.18.7.4.2, and 6.18.8.1.1 |
| Magnitude | The size or degree of the effects compared against baseline conditions or reference levels, and other applicable measurement parameters (i.e., standards, guidelines, objectives) | Negligible (N) – Differing from the average value for the existing environment/baseline conditions to a small degree, but within the range of natural variation and below a threshold value<br>Low (L) – Differing from the average value for the existing environment/baseline conditions, outside the range of natural variation, and less than or equal to appropriate guideline or threshold value<br>Moderate (M) – Differing from the existing environment/ baseline conditions and natural variation, and marginally exceeding a guideline or threshold value<br>High (H) – Differing from the existing environment/ baseline conditions and natural variation, and exceeding a guideline or threshold value | Noise – 6.1.6.2<br>Air – 6.2.6.2<br>Light – 6.3.6.3<br>Greenhouse Gases – 6.4.6.2<br>Geology, Soils and Sediment – 6.5.6.2<br>Groundwater Quality and Quantity – 6.6.6.4<br>Surface Water Quality and Quantity – 6.7.7.2<br>Wetlands – 6.8.6.3<br>Fish and Fish Habitat – 6.9.6.2<br>Habitat and Flora – 6.10.6.2<br>Terrestrial Fauna – 6.11.6.2<br>Avifauna – 6.12.7.2<br>SOCI and SAR – 6.13.6.2<br>Mi'kmaq of Nova Scotia – 6.14.6.2<br>Physical and Cultural Heritage – 6.15.6.2<br>Socioeconomic Conditions – 6.16.12<br>Accidents and Malfunctions – 6.18.4 |

**Table 5.11-1: Characterization Criteria for Residual Environmental Effects (continued)**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories | Valued Component Specific Definitions |
|---|---|---|---|
| Geographic Extent | The geographic area over or throughout which the effects are likely to be measurable | Project Area (PA) – the residual environmental direct and indirect<br>Local Assessment Area (LAA) – Occurs beyond the PA and LAA and within the RAA<br>Regional Assessment Area (RAA) – Occurs beyond the PA and LAA and within the RAA | Noise – 6.1.6.1<br>Air – 6.2.6.1<br>Light – 6.3.6.1.1<br>Greenhouse Gases – 6.4.6.1<br>Geology, Soils and Sediment – 6.5.6.1<br>Groundwater Quality and Quantity – 6.6.6.1<br>Surface Water Quality and Quantity – 6.7.7.1<br>Wetlands – 6.8.6.1.1<br>Fish and Fish Habitat – 6.9. 6.1.1/6.9.6.2<br>Habitat and Flora – 6.10.6.1.1<br>Terrestrial Fauna – 6.11.6.1.1<br>Avifauna – 6.12.7.1.1<br>SOCI and SAR – 6.13.6.1.1<br>Mi'kmaq of Nova Scotia – 6.14.6.1.1<br>Physical and Cultural Heritage – 6.15.6.1.1<br>Socioeconomic Conditions – 6.16.9.1<br>Accidents and Malfunctions – 6.18.4 |
| Timing | Considers when the residual environmental effect is expected to occur. Timing considerations are noted in the evaluation of the residual environmental effect, where applicable or relevant. | Not Applicable (N/A) — seasonal aspects are unlikely to affect VC's (i.e., fisheries productivity).<br>Applicable — seasonal aspects may affect VC's (i.e., fisheries productivity) | Light – 6.3.6.3<br>Groundwater Quality and Quantity – 6.6.6.4<br>Surface Water Quality and Quantity – 6.7.7.2<br>Fish and Fish Habitat – 6.9.6.2<br>No specific definitions for other VCs |
| Duration | The time period over which the effects are likely to last | Short-term (ST) – effects are limited to occur from as little as 1 day to 24 months<br>Medium-term (ML) – effects can occur beyond 24 months and up to 4 years<br>Long-term (LM) – effects extend beyond 4 years<br>Permanent (P) – valued component unlikely to recover to baseline conditions | Groundwater Quality and Quantity – 6.6.6.4<br>Surface Water Quality and Quantity – 6.7.7.2<br>Fish and Fish Habitat – 6.9.6.2<br>No specific definitions for other VCs |
| Frequency | The rate of recurrence of the effects (or conditions causing the effect) | Once (O) – effects occur once<br>Sporadic (S) – effects occur at irregular intervals throughout the Project<br>Regular (R) – effects occur at regular intervals throughout the Project<br>Continuous (C) – effects occur continuously throughout the Project | No specific definitions for other VCs |

**Table 5.11-1: Characterization Criteria for Residual Environmental Effects (continued)**

| Characterization | Description | Quantitative Measure or Definition of Qualitative Categories | Valued Component Specific Definitions |
|---|---|---|---|
| Reversibility | The degree to which the effects can or will be reversed (typically measured by the time it will take to restore the environmental attribute or feature) | Reversible (R) – VCs will recover to baseline conditions before or after Project activities have been completed.<br>Partially Reversible (PR) – mitigation cannot guarantee a return to baseline conditions<br>Irreversible (IR) – effects to VCs are permanent and will not recover to baseline conditions | No specific definitions for other VCs |

It should be noted that each of the criteria will also incorporate the social and ecological context, reflecting the importance of the environmental attribute or feature to ecosystem health and function as well as the influence of past and current human activity and the disturbance associated with that activity. Further, timing considerations will be noted in the evaluation of the residual environmental effect for each VC, where applicable or relevant. For example, if the VC has a period of time for sensitive life stages (i.e., breeding/spawning), the VC will provide a description of the timing considerations as part of the evaluation.

In conjunction with the effects characteristics outlined in Table 5.11-1, each VC assigns a standard or threshold as described in Section 5.6 of this EIS to determine the significance of an effect caused by the Project.

## 5.12 Follow-up and Effects Monitoring

Follow-up and monitoring recommendations for each VC are described in the corresponding subsections within Section 6. A summary of all monitoring recommendations is provided in Section 10 of this EIS as per Information request CEAA 2-03 (AMNS 2021a).

AMNS will also evaluate the need for effects monitoring to ensure regulatory compliance. To supplement the effects monitoring, AMNS will also develop and implement environmental management and contingency plans to prevent or address accidents or malfunctions that have the potential to occur and produce unexpected effects throughout the life of the Project.

## 5.13 Effects of the Environment on the Project

Effects of the environment on the Project consider potential changes to the Project that may result from interactions with the environment (Section 7). Project components and activities were reviewed for interaction with the natural environment and effects caused by variations in meteorological conditions from wind, ice, and extreme precipitation events, as well natural hazards like seismic activity. A significant effect on the Project from the environment would include, but not be limited to, the following:

- environmental conditions cause harm to Project personnel and/or the public;
- environmental conditions cause extended delays in construction or a shutdown of operations;
- environmental conditions damages infrastructure and compromises safety; and
- environmental conditions damages infrastructure to the point repair is not feasible.

The assessment of effects of the environment on the Project includes discussion regarding potential interactions, as well as details regarding planning, design, and construction strategies for reducing the likelihood of potential effects on the Project, thereby reducing the likelihood of accidents and malfunctions caused by the environment.

Project components and activities have been designed to consider the hazards and limitations imposed by the natural environment on the Project. The effects of the environment on the Project are discussed further in Section 7.