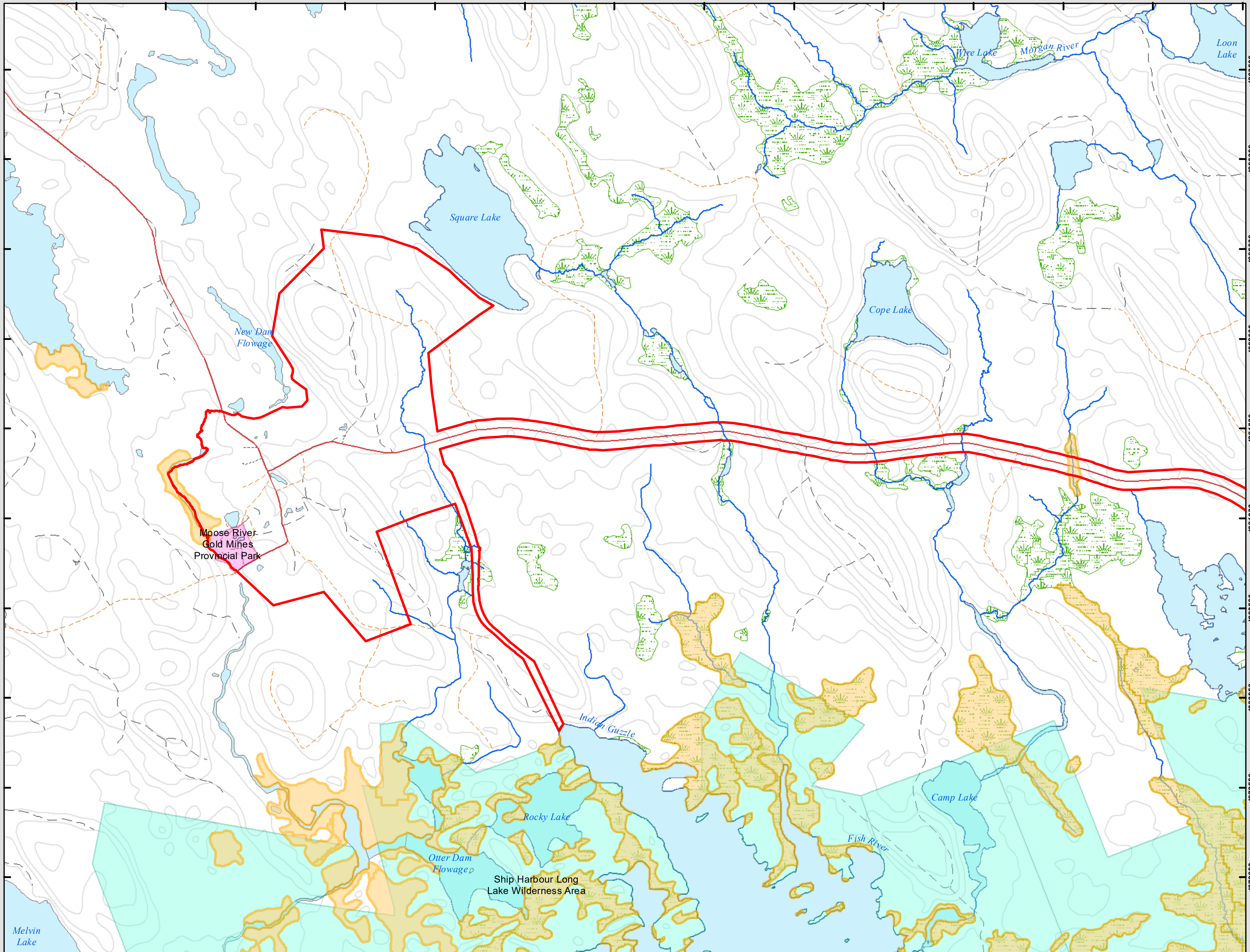


Prepared For:

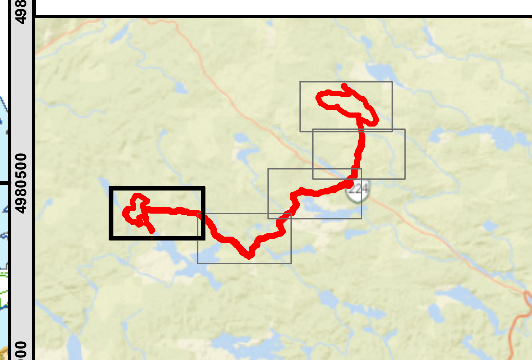
Atlantic Gold

FIGURE NSE-2-01-1e

Beaver Dam Mine Project

Potential Wetlands of Special Significance

- Local Road
- Dry Weather / Seasonal Road
- Diveways (>300 m)
- Track
- NSTDB Mapped Watercourses
- NSE Predicted Wetlands of Special Significance
- NSE Wetlands
- Proposed Infrastructure
- Wilderness Area
- Provincial Park
- Project Area



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

0 250 500 1,000 m

1:20,000 Scale when printed @ 11" x 17"

Drawn By: AS
Reviewed By: XX
Date: 2021-03-01

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

McCallum Environmental Ltd.

Document Name: BD_EIS_Figure6-8-XWSS

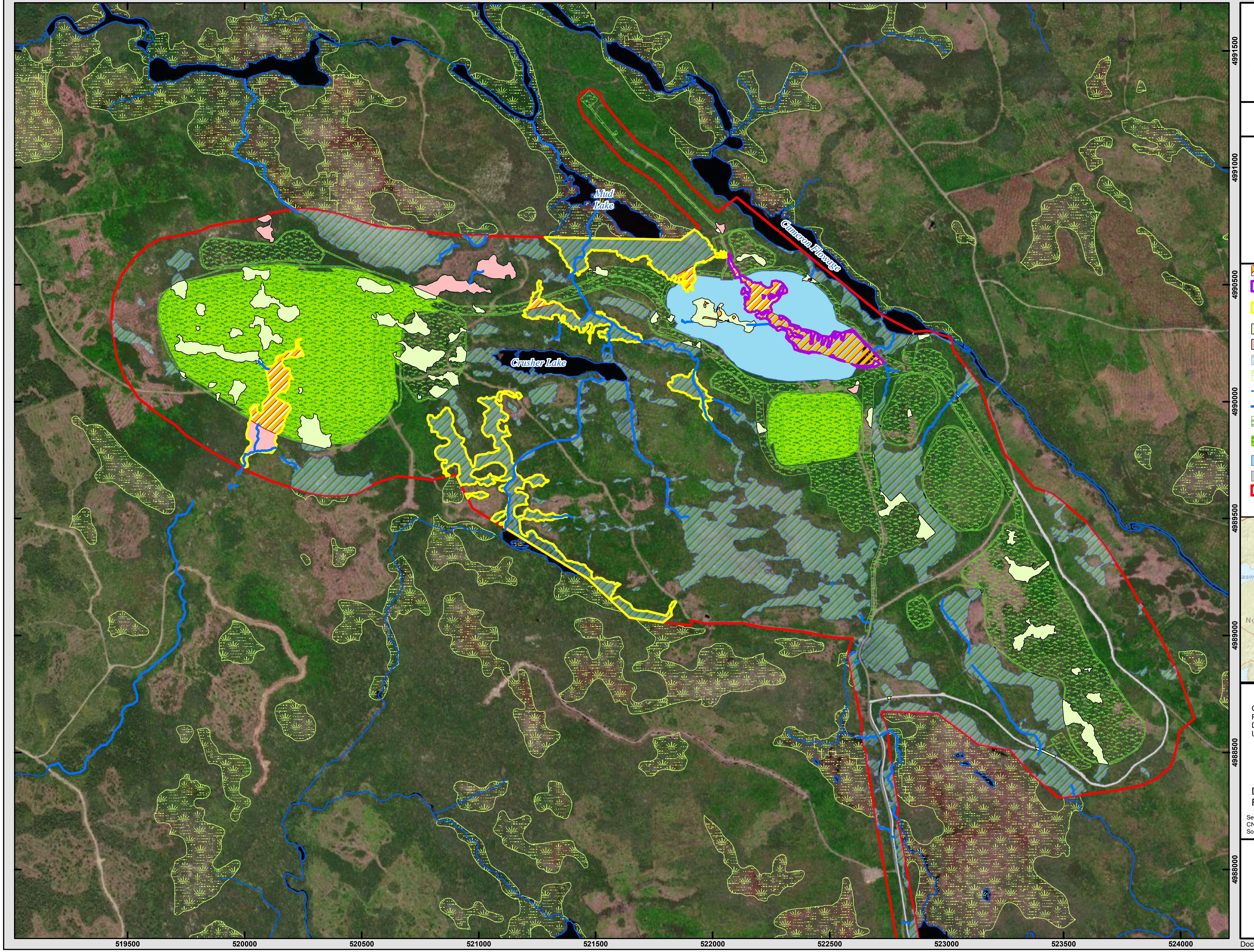
Prepared For:

Atlantic Gold

FIGURE IR NSE 2-01-2

Beaver Dam Mine Project

Post Closure: Remediated Site with Wetlands



- WSS Direct Impact (Wetland Altered)
- Potential Wetland of Special Significance
- Wetland of Special Significance (Field Identified)
- Direct Impact (Wetland Altered)
- Potential Indirect Impact (GW/Flow Reduction)
- Field Delineated Wetlands
- NSE Wetlands
- NSTDB Mapped Watercourses
- Field Delineated Watercourses
- Remediated Site - Infrastructure Removed
- Remediated Stockpile - Stabilized, Covered and Vegetated
- Pit Lake
- Multiuse Bypass Road
- Project Area

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

0 200 400 800 m

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

Drawn By: LP
Reviewed By: XX

Date: 4/12/2021

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig8-8-X RemediatedSite

A summary of all dedicated flora and fauna surveys is provided in Table NSE-2-01-1 below, including locations, years, seasons and time of day, where applicable. Survey locations, seasons, dates and, where applicable, times have been described in each respective Valued Component (VC) chapter within the Updated 2021 EIS (AMNS 2021). All other fauna species, including other mammals, reptiles and amphibians, were considered during all surveys and recorded incidentally, when observed. Incidental observations for priority invertebrates occurred during all field programs, particularly wetland and watercourse delineation, and fish habitat surveys. Incidental observations of odonates and lepidopterans include live adults or larvae or cast skins. Signs of molluscs include live or dead individuals and shells. SAR and SOCI were assessed and recorded during all survey efforts, especially during delineation and evaluation of wetland habitat. Survey effort to support wetland identification and functional assessment is extensive and results in significant time on the landscape from early spring (high flow conditions to evaluate fish habitat and connectivity) to late fall across multiple years, in key habitat where presence of SAR and SOCI would be expected. Priority species were assessed throughout the entire PA, and wetland specific species lists will be generated as necessary, at the permitting phase. It should be noted that, while it was not possible to confirm a species' absence from the landscape, all care was taken to identify the presence of preferred habitat within the PA (see Section 6.13, page 6-682 for further information). Where suitable habitat was observed for a SAR (particularly SAR fish, avifauna, and turtles), it was presumed to potentially be present, even if presence was not confirmed via observation of that species (or evidence thereof).

Table NSE-2-01-1: Summary of Dedicated Flora and Fauna Surveys, Locations and Times

Survey Type	Locations	Year(s)	Season/Date	Time of Day[a]
Avifauna (survey details in Section 6.12 (page 6-638) of the Updated 2021 EIS [AMNS 2021])				
Fall Migration	Beaver Dam Mine Site: 32 point count stations	2014	Fall (Sept. 17 to Oct. 19)	Began at, or within 30 mins of, sunrise and ended by 10:00 am
Spring Migration	Beaver Dam Mine Site: 12 point count stations Haul Road: 45 point count stations	2015, 2016	Spring (Apr. 21 to Jun. 4)	Began at, or within 30 mins of, sunrise and ended by 10:00 am
Breeding Surveys	Beaver Dam Mine Site: 24 point count stations Haul Road: 50 point count stations	2015, 2016, 2019	Summer (Jun. 8 to Jul. 13)	Began at, or within 30 mins of, sunrise and ended by 10:00 am
Common Nighthawk	Beaver Dam Mine Site: five stations Haul Road: 12 stations	2015, 2016, 2019	Summer (Jun. to Jul.)	Dawn or dusk
Diurnal Raptor Migration	Beaver Dam Mine Site	2015	Spring (April 15)	12:30 to 4:30 pm
Nocturnal Owl	Beaver Dam Mine Site: four stations Haul Road: seven stations	2015, 2016	Spring (Apr. 11 and 15)	Between 30 mins after sunset and midnight
Winter Wildlife Surveys	Beaver Dam Mine Site and Haul Road	2015, 2016	Winter (Feb. 18 to Mar. 31)	n/a
Fish (survey details in Section 6.9 (page 6-431) of the Updated 2021 EIS [AMNS 2021])				
Fish Habitat Surveys	All watercourses, wetlands and waterbodies within the Beaver Dam Mine Site and Haul Road	2015, 2016, 2019, 2020	All Seasons	n/a
Fish Collection (electrofishing, trapping, eDNA)	Reaches of watercourses and waterbodies with fish habitat	2015, 2016, 2019	All Seasons (Apr. 8 to Dec. 17)	n/a

Table NSE-2-01-1: Summary of Dedicated Flora and Fauna Surveys, Locations and Times (continued)

Survey Type	Locations	Year(s)	Season/Date	Time of Day[a]
Terrestrial Fauna (survey details in Section 6.11 (page 6-609) of the Updated 2021 EIS [AMNS 2021])				
Moose Tracking Surveys	Beaver Dam Mine Site: six transects Haul Road: eight transects	2015, 2016	Winter (Jan. to Apr.)	n/a
Moose Pellet Group Inventory Survey	Beaver Dam Mine Site: one transect Haul Road: 18 transects	2015, 2016	Spring (Apr. to May)	n/a
Herpetofauna Surveys (and opportunistic[e])	Beaver Dam Mine Site and Haul Road	2015 (all study years)	Spring (May 17 to Jun. 4)	n/a
Bat Surveys (Hibernacula Evaluation)	Beaver Dam Mine Site: eighteen AMOs	2014	Fall (Sept. 18)	n/a
Priority Invertebrates (survey details in Section 6.13 (page 6-682) of the Updated 2021 EIS [AMNS 2021])				
Incidental Observations	Beaver Dam Mine Site and Haul Road	2015, 2016, 2018, 2019 (all study years)	Growing Season	n/a
Flora (survey details in Section 6.10 (page 6-560) of the Updated 2021 EIS [AMNS 2021])				
Priority Lichen Surveys (and opportunistic[e])	Beaver Dam Mine Site, Haul Road, LSA	2015, 2016, 2018, 2019 (all study years)	Growing Season	n/a
Priority Vascular Flora Surveys (and opportunistic[e])	Habitats within the PA with elevated potential for priority species	2015, 2016, 2018, 2019 (all study years)	Spring (June) Fall (Sept. 8 to Oct. 9)	n/a
Wetlands (survey details in Section 6.8 (page 6-317) of the Updated 2021 EIS [AMNS 2021])				
Delineation and Functional Assessment	Beaver Dam Mine Site and Haul Road	2015, 2016, 2018, 2019 (all study years)	Growing Season[b] (Jun. to Oct.)	n/a
Watercourses (survey details in Section 6.9 (page 6-431) of the Updated 2021 EIS [AMNS 2021])				
Delineation and Assessment	Beaver Dam Mine Site and Haul Road[c]	2015, 2016, 2018, 2019 (all study years)	Year round[d]	n/a

Notes: [a] Survey times are included where applicable (i.e., where time of day influences species observation).

[b] December/January 2020/2021 exception noted in Appendix J2 of the Updated 2021 EIS [AMNS 2021].

[c] Assessment extended beyond the PA to assess inflows and outflows, where necessary.

[d] Assessment type is dependant on time of year.

[e] Opportunistic observations include observations made outside dedicated surveys (i.e., during other baseline surveys) and are in addition to dedicated survey efforts.

EIS = Environmental Impact Statement; AMOs = provincial abandoned mine openings; LSA = Lichen Study Area; PA = Project Area; n/a = not applicable.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-02
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Not listed

Context and Rationale

none

The Proponent is Required to …

3. A list of wildlife species currently using the WSS. The list should include migratory and non-migratory wildlife species (i.e. birds, reptiles, amphibians, mammals, etc.).
4. A list of species currently using the WSS. The list should include migratory and non-migratory species.
5. Identification of mitigation measures during the restoration phase to ensure that the resulting habitat supports biodiversity rather than support of only one or a few species. Mitigation measures could include types of vegetation/trees planted and water depth.

Response

3. Section 6.8.4.1, page 6-348 – Functional Assessment Results: Identification of Exceptional Features within the Wetlands chapter of the Updated 2021 EIS (AMNS 2021) has been updated to include an expanded discussion on SAR use of wetlands within the PA and WSS designation based on SAR observations. WSS determination is based on historic species observations and the Project Team's determination of that designation based on the mobility of the species, it's confirmed or historic presence (i.e., ACCDC) and the presence of habitat to support critical life functions of that species.

   Table NSE-2-02-1 presents observed fauna and priority lichen within each identified WSS, including additional 2019/2020 survey observations. While this table is specific to WSS, a representative list of all observed species has been included as Appendix H.2 (Wetlands Characterization Table) included in the Updated 2021 EIS (AMNS 2021), including the observation time/date. A summary of all dedicated flora and fauna surveys is provided in IR response NSE-2-01, including locations, years, seasons, and time of day, where applicable.

   Where avifauna point count stations were located in, or directly adjacent to, a WSS, the observed avifauna are listed in Table NSE 2-02-1, in addition to incidental observations. Fish species are included in Table NSE-2-02-1 if observed within a watercourse or waterbody in the WSS. A list of dominant and priority vascular flora species by wetland can be found in Appendix H.2 and H.1, respectively, of the Updated 2021 EIS (AMNS 2021).

   While Table NSE-2-02-1 provides a general overview of species present with the WSS, the lack of a species or taxa cannot determine species absence. Wetland habitat and its suitability to support a species is considered when assessing WSS potential. All identified WSS contain open water features (watercourses and waterbodies), which have the ability to support priority species from varying taxa. For example, while there were no avifauna observations directly within WL4, this wetland (tree fen-swamp complex) has the ability to support priority species, such as Olive-sided flycatcher and Canada warbler.

Table NSE-2-02-1: Observed Fauna and Priority Lichen Species in identified Wetlands of Special Significance within the Project Area

WSS ID and Type	Observed Species	Rank and Status	Migratory Status	Wetland Alteration?
WL4 - complex: treed fen, mixed wood treed swamp	Blue felt lichen (*Pectenia plumbea*)	SARA/COSEWIC SC, NSESA V, S3	Non-migratory	No
	Blistered jellyskin lichen (*Leptogium corticola*)	S3	Non-migratory	
	Salted shell lichen (*Coccocarpia palmicola*)	S3S4	Non-migratory	
WL14 - complex: shrub bog, mixed wood treed swamp, low shrub fen	Olive-sided flycatcher (*Contopus cooperi*)	SARA/COSEWIC T, NSESA T, S2B	Migratory	Yes (Partial)
	White-throated sparrow (*Zonotrichia albicollis*)	S5B	Migratory	
	American goldfinch (*Spinus tristis*)	S5	Migratory	
	Black-and-white warbler (*Mniotilta varia*)	S5B	Migratory	
	Blue-headed vireo (*Vireo solitarius*)	S5B	Migratory	
	Black-capped chickadee (*Poecile atricapillus*)	S5	Migratory	
	Black-throated green warbler (*Setophaga virens*)	S5B	Migratory	
	Common yellowthroat (*Geothlypis trichas*)	S5B	Migratory	
	Common raven (*Corvus corax*)	S5	Migratory	
	Dark-eyed junco (*Junco hyemalis*)	S4S5	Migratory	
	Magnolia warbler (*Setophaga magnolia*)	S5B	Migratory	
	Red-breasted nuthatch (*Sitta canadensis*)	S3	Migratory	
	Tree swallow (Tachycineta bicolor)	S4B	Migratory	
	Ovenbird (*Seiurus aurocapilla)*	S5B	Migratory	
	Ruby-crowned kinglet (*Regulus calendula)*	S3S4B	Migratory	
	Palm warbler (*Setophaga palmarum)*	S5B	Migratory	
	Swainson's thrush (*Catharus ustulatus)*	S3S4B	Migratory	
	Canada jay (*Perisoreus canadensis)*	S3	Migratory	
	American redstart (*Setophaga ruticilla)*	S4S5B	Migratory	
	Brook trout (*Salvelinus fontinalis)*	S3	Seasonal/Localized Movement	

Table NSE-2-02-1: Observed Fauna and Priority Lichen Species in Identified Wetlands of Special Significance within the Project Area (continued)

WSS ID and Type	Observed Species	Rank and Status	Migratory Status	Wetland Alteration?
	Lake Chub (*Couesius plumbeus)*	S5	Seasonal/Localized Movement	
	Blue felt lichen (*Pectenia plumbea*)	SARA/COSEWIC SC, NSESA V, S3	Non-migratory	
	Salted shell lichen (*Coccocarpia palmicola*)[1]	S3S4	Non-migratory	
	Eastern candlewax lichen (*Ahtiana aurescens*)	S2S3	Non-migratory	
WL17 - complex: tall shrub swamp, coniferous treed bog	Swainson's thrush (*Catharus ustulatus)*	S3S4B	Migratory	Yes (Partial)
	Ruby-crowned kinglet (*Regulus calendula)*	S3S4B	Migratory	
	Northern harrier (*Circus hudsonius)*	S3S4B	Migratory	
	Greater yellowlegs (*Tringa melanoleuca)*	S3B, S3S4M	Migratory	
	American robin (*Turdus migratorius)*	S5B, S3N	Migratory	
	Peregrine falcon (*Falco peregrinus)*	SARA/COSEWIC SC, NSESA V, SIB	Migratory	
	Brook trout (*Salvelinus fontinalis)*	S3	Seasonal/Localized Movement	
	Lake Chub (*Couesius plumbeus)*	S5	Seasonal/Localized Movement	
	Ninespine stickleback (*Pungitius pungitius)*	S5	Seasonal/Localized Movement	
	Yellow perch (*Perca flavescens)*	S5	Seasonal/Localized Movement	
	White sucker (*Catostomus commersonii)*	S5	Seasonal/Localized Movement	
	Golden shiner (*Notemigonus crysoleucas)*	S4	Seasonal/Localized Movement	
	Banded killifish (*Fundulus diaphanus)*	S5	Seasonal/Localized Movement	
	Brown bullhead (*Ameiurus nebulosus)*	S5	Seasonal/Localized Movement	
	American eel (*Anguilla rostrata)*	S2	Migratory	
	Blue felt lichen (*Pectenia plumbea*)	SARA/COSEWIC SC, NSESA V, S3	Non-migratory	
	Peppered moon lichen (*Sticta fuliginosa)*	S3	Non-migratory	

Table NSE-2-02-1: Observed Fauna and Priority Lichen Species in Identified Wetlands of Special Significance within the Project Area (continued)

WSS ID and Type	Observed Species	Rank and Status	Migratory Status	Wetland Alteration?
WL29 - complex: mixed wood treed swamp, low shrub fen, open bog, coniferous treed swamp, coniferous raised bog, graminoid fen	Canada warbler (*Cardellina canadensis)*	SARA/COSEWIC T, NSESA E, S3B	Migratory	No
	Canada jay (*Perisoreus canadensis)*[1]	S3	Migratory	
	Boreal Felt Lichen (*Erioderma pedicellatum)*	SARA/COSEWIC E, NSESA E, S1	Non-migratory	
	Blue felt lichen (*Pectenia plumbea*)	SARA/COSEWIC SC, NSESA V, S3	Non-migratory	
	Salted shell lichen (*Coccocarpia palmicola*)	S3S4	Non-migratory	
WL205 - complex: fen, soft wood treed swamp	Canada warbler (*Cardellina canadensis*)	SARA/COSEWIC T, NSESA E, S3B	Migratory	Yes (Partial)
	Red-breasted nuthatch (*Sitta canadensis)*	S3	Migratory	
	Rusty blackbird (*Euphagus carolinus)*[1]	SARA/COSEWIC SC, NSESA E, S2B	Migratory	
	Blue felt lichen (*Pectenia plumbea*)	SARA/COSEWIC SC, NSESA V, S3	Non-migratory	
	Salted shell lichen (*Coccocarpia palmicola*)	S3S4	Non-migratory	

Notes: [(a)] ACCDC observations.

WL = wetland; WSS = wetlands of special significance; ID = identification; SARA = *Species at Risk Act*; COSEWIC = Committee on the Status of Endangered Wildlife in Canada (SC = special concern; T = threatened; E = endangered); NSESA = *Nova Scotia Endangered Species Act* (E = endangered; T = threatened; V = vulnerable); S = s-rank (sub-national); S1 = critically imperilled; S2 = imperilled; S3 = vulnerable; S4 = apparently secure; S5 = secure; S#S# = range rank; S2B = Imperilled breeding; S3B = vulnerable breeding; S5B = secure breeding; S3N = vulnerable nonbreeding; S3S4M = vulnerable/apparently secure migrant; ; S3S4B = vulnerable/apparently secure breeding.

4. Please see above response to NSE 2-02 (Number 3).

5. AMNS has developed a conceptual closure plan with the goal of returning the site to self-sustaining ecosystems of equivalent capability (refer to the Section 2 – Project Description, page 2-1, and Appendix P.2 [draft Reclamation and Closure Plan], Section 4, PDF page 32, of the Updated 2021 EIS [AMNS 2021]. While individual land features may not be restored to pre-development conditions, the reclaimed site will target the ability to support similar land uses and biodiversity, including wetland and SAR habitat as is practicable.

   On-site options for wetland area and function (SAR habitat) restoration will be considered during the reclamation process, as is practicable. These obligations will be met foremost through the Preliminary Wetland Compensation Plan (Appendix H.3 in the Updated 2021 EIS [AMNS 2021]), Section 2.0, PDF page 6. Mitigations at Project closure are presented in Section 6.10.8, page 6-604 – Mitigations within the Habitat and Flora chapter of the Updated 2021 EIS (AMNS 2021). AMNS has discussed potential reclamation opportunities and methods with NSLF and NSE during a conference call held on December 2, 2020. AMNS will look for on-site opportunities for progressive reclamation during operations to avoid viability issues with long-term stockpiling of organic material. Native vegetation communities will be targeted and alternatives to traditional hydroseeding methods will be reviewed to advance vegetation re-establishment and reclamation methods. Consideration will be given to native species with Indigenous significance.

   A detailed closure and reclamation plan will be advanced as part of the Industrial Approval process.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-03
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.8.6.4 - Page 413 Table 6.8-19 Wetland Cumulative Effects Modelling Results

Context and Rationale

Unsure how the numbers were determined that relate to percentages of loss of SAR species wetland habitat when no information was provided about the existing percentages of habitat present within the project area (e.g. 50% of the lands currently support Canada warbler, after the project is initiated only 5% of that habitat will be lost due to the project).

The Proponent is Required to …

Provide total land % number for species. Report provides area loss but how much is left?

Response

Section 6.8 (Wetlands), Table 6.8-10, page 6-381 within Section 6.8.6.2, page 380 - Wetland Cumulative Effects Modeling of the Updated 2021 EIS (AMNS, 2021) has been updated to include the requested total wetland area determined to support the specified habitat for each species (as defined in Table 6.8-13, page 6-383 to page 386 – Metrics and Associated GIS Layers used in CEA), prior to development of the Beaver Dam Mine Site (Year 0). Results of the updated analysis are as follows and can be found in Section 6.8.7.2.1, page 6-421 of the Updated 2021 EIS (AMNS, 2021):

- Mainland Moose: Of the 137.3 ha of wetland area within the Beaver Dam Mine Site, 56.8 ha or 41% of this area supports Mainland moose habitat. Following Project development, 10.1 ha or 18% of this habitat will be altered.
- Snapping Turtle: Of the 137.3 ha of wetland area within the Beaver Dam Mine Site, 83.3 ha 60% of this area supports snapping turtle habitat. Following Project development, 10.6 ha or 13% of this habitat will be altered.
- Canada Warbler: Of the 137.3 ha of wetland area within the Beaver Dam Mine Site, 93.5 ha or 68% of this area supports Canada warbler habitat. Following Project development, 15.1 ha or 16% of this habitat will be altered.
- Olive-sided flycatcher: Of the 137.3 ha of wetland area within the Beaver Dam Mine Site, 108.6 ha or 79% of this area supports Canada warbler habitat. Following Project development, 15.4 ha or 14% of this habitat will be altered.
- Rusty blackbird: Of the 137.3 ha of wetland area within the Beaver Dam Mine Site, 26.4 ha or 19% of this area supports Canada warbler habitat. Following Project development, 4.3 ha or 16% of this habitat will be altered.

The Wetland CEA was designed to provide a conservative estimate of the defined species wetland habitat area. While aerial imagery was used to assess habitat quality within landscape units (e.g., wetlands, watercourses), the assessment scale and modeling metrics do not permit detailed delineation of niche habitat features (e.g., dead tree stands, waterbody substrate, etc.). Therefore, it should be noted that habitat area and loss is assumed to be overestimated when interpreting results.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-04
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands/Species at Risk
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.8.6.5 - page 416

Context and Rationale

The assumption should not be made that a wetland is not significant because there is lots of habitat nearby for SAR.... "it is not anticipated that these wetlands will be classified as WSS because the SAR birds are mobile species and similar suitable habitat is present within close proximity."

The Proponent is Required to …

SAR have home ranges which may include wetland in the project area. When the wetlands disappear, they will be displaced and may cause conflict with other SAR and wildlife. Revise and provide mitigation measures of how the project will avoid SAR (i.e. timing windows, buffers around nests, etc).

Response

Discussions with NSE (Online Teams Meeting December 2, 2020 and meeting notes) have confirmed that the presence of a sessile or non-mobile (primarily lichen) SAR within a delineated wetland triggers the determination of that wetland as a Wetland of Special Significance (WSS). Provincial guidance and policy are still required for WSS designation based on species presence. It is acknowledged that mobile SAR have home ranges that may include wetlands within and beyond the PA, which may be used at various times of the year (i.e., used during the breeding season, but not at other times). Given the mobility of some species, an observation of a mobile SAR has not immediately designated these wetlands as WSS. The determination of WSS based on the observation a mobile species is determined on a species-specific and site-specific basis, considering the following factors:

- whether the species was observed within the wetland (and/or historical observations);
- whether suitable habitat is present within the wetland;
- what the species uses the wetland habitat for (i.e., does the habitat provided within the wetland provide necessary life functions (i.e., nesting or overwintering habitat); and
- the discreteness or specificity of habitat use by the mobile species (i.e., wood turtles have specific and discrete nest beach requirements, compared with the in-discrete and non-specific foraging habitat usage by mainland moose, for example).

Irrespective of WSS designation, the Project aims to avoid and minimize all impacts to SAR. Species-specific SAR mitigation measures are presented in Section 6.13.8, page 6-752 of the Updated 2021 EIS (AMNS, 2021) and have been updated in accordance with IR requests (I.e., CEAA-2-24, CEAA-2-26, NSE-2-02, NSE-2-04), additional baseline data and improved understanding of Project interactions and impacts. Mitigations to avoid and minimize SAR interactions generally include, but are not limited to:

- Minimize clearing/grubbing activities during nesting season.

- Environmental staff will monitor for nesting activity during construction. If evidence of nesting is observed, AMNS will consult with appropriate regulatory agencies to determine an appropriate spatial and temporal buffer, based on site and seasonal specific parameters at the time of the observation.
- Safety and Environment orientation and training will include information on turtles and nesting season awareness training, particularly along the Haul Road.
- If snapping turtle activity is occurring within and/or adjacent to the Beaver Dam Mine Site or Haul Road, additional turtle awareness and management program will be implemented to ensure all staff are well informed regarding the increased turtle activity, especially during breeding season.
- Continue to look for opportunities minimize Project footprint to the extent practicable.
- Check abandoned structures on site for nests prior to disturbance/removal.
- Vehicles will adhere to posted speed limits and yield to wildlife.
- An un-vegetated buffer along roadsides will be maintained, where possible, to improve visibility along roadsides and reduce the potential for collisions with wildlife.
- Permitter road around the open pit will be constructed to reduce potential for wildlife interactions (e.g., accidental falls).
- Apply a 30m buffer on aquatic habitat, for snapping turtles, wherever practicable.
- Install turtle crossing signs near major watercourse crossings, or in areas where snapping turtles have been observed, in an effort to increase awareness and reduce vehicular interactions. Safety and Environment orientation and training will include information on environmental sensitive features including snapping turtles observed on sites to inform staff and contractors.
- Adhere to approved timing windows for construction in and around watercourses.
- Conduct fish rescue and relocation as deemed necessary in consultation with regulators.
- Blasting activities will adhere to setback recommendations and other mitigation strategies advised by DFO.

Furthermore, specific SAR monitoring and mitigation plans have been developed in response IR2 CEAA-2-24 and CEAA-2-26. The Landbird SAR Mitigation and Monitoring Plan (Appendix A of Appendix P.7 [Wildlife Mitigation and Monitoring Plan], Section 1.3, PFD page 28 and Preliminary Lichen Mitigation and Monitoring Plan (Appendix P.6), Section 5.2, PDF page 14, of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-05
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.8.6.0 – Page 398 – Table 6.8 – 14 Potential Wetland Interactions with Project Activities

Context and Rationale

Missing Information

The Proponent is Required to …

All the bullets under Operations and Maintenance have been deleted. Will no measures be taken?

Response

The Touquoy Mine Site is currently operational. The use of the Touquoy Mine Site for the processing of Beaver Dam ore and tailings management (exhausted pit) will not involve modification to the current footprint or further impacts to wetlands. No discharge events to the wetlands in the receiving environment are planned during operations. The exhausted pit has the capacity to store all mine tailings and. Moving the existing tailings pipeline from the permitted 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 wetlands. As a result, there are no direct or indirect–effects to wetlands anticipated from the Project at the Touquoy Mine Site during the construction and operations phases, with the exception of the continued potential for accidents and malfunctions and continued environmental monitoring.

Potential interaction between Project activities and wetland habitat within the Touquoy Mine Site are outlined below (Table NSE 2-05-1) and Section 6.8.7, Table 6.8-14, page 6-389 – Wetlands of the Updated 2021 EIS (AMNS 2021), which has been updated as necessary.

Table NSE-2-05-1: Potential Interactions with Project Activities and Wetlands at the Touquoy Mine Site

Project Phase	Duration	Relevant Project Activity
Construction	1 year	N/A
Operation	5 years	General waste management Invasive species introduction or spread Environmental monitoring
Active Closure	2 years	Environmental monitoring
Post-closure	10+ years (monitoring, adaptive management)	Post-closure interaction with discharge from Touquoy Mine Site pit to Moose River riparian wetlands

Note: N/A = not applicable.

For further information regarding the Touquoy Mine Site and wetland interactions, refer to the EARD (CRA 2007a) and Focus Report (CRA 2007b).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

CRA (Conestoga-Rovers & Associates Ltd.). 2007a. Environmental Assessment Registration Document for the Touquoy Gold Project.

CRA. 2007b. Focus Report, Touquoy Gold Project, Moose River Gold Mines, Nova Scotia

Round 2 Information Request Number:	NSE-2-06
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.8.6.1- Page 399 - Table 6.8 -15 Direct and Indirect Wetland Impacts

Context and Rationale

Clarification

The Proponent is Required to …

What is being done to ensure Vegetation and Habitat Integrity when it comes to vehicles? E.g. Vehicles are to be clean prior to entering the site and mud and debris are to be cleaned from machinery to prevent spread of invasive species from other locations. Seeds can spread through mud on vehicles from site to site.

Response

Potential impacts of invasive flora species have been considered in context of the Project and wetland integrity. A comprehensive wetland monitoring program, including invasive species monitoring, will be developed to meet the requirements of wetland alteration permits issued for direct and indirect wetland alterations associated with the Project. Mitigations and monitoring efforts are discussed in Section 6.8.8.2 (page 6-426) and 6.8.10 (page 6-430) of the Updated 2021 EIS (AMNS 2021).

Invasive species are currently monitored at the Touquoy Mine Site during the existing wetland monitoring program. All invasive species observed are documented. Invasive plants are determined by referring to the invasive species list provided in the Wetland Ecosystem Services Protocol (WESP) Supplementary Information which is presented in NSE-2-181 (Table NSE-2-181-1). This species list, which includes wetland and upland species, was developed by Paul Adamus (the creator of WESP) and includes species list generated by the New Brunswick Invasive Species Council and Maine Natural Areas Program. Nova Scotia, New Brunswick and Maine are all located within the Acadian Forest region. Additional supporting resources such as CARP (2007), Hill and Blaney (2009) and Belliveau (2012) are also used for invasive species identification and monitoring.

Mitigations regarding habitat integrity and invasive flora species as they relate to wetlands have been included in Section 6.8.8.2, Table 6.8-25, page 6-426 – Wetlands of the Updated 2021 EIS (AMNS 2021). AMNS has committed to the following mitigations to maintain habitat integrity and reduce the spread of invasive species into wetlands:

- Complete pre-construction site meetings for relevant staff/contractors related to working around wetlands and watercourses to minimize unauthorized disturbance.
- Educate site staff on invasive plant species identification and management.
- Topsoil will be salvaged and stored for use in site restoration where practicable.
- Re-vegetate slopes adjacent to wetlands, using native seed mixes, to limit erosion and sediment release.
- Project disturbance will be minimized, and natural vegetation will be retained, wherever possible.

- Inspect vehicles regularly, particularly vehicles arriving from outside the PA. If necessary, cleaning will be undertaken at a designated cleaning station, away from wetlands and watercourses. Avoid driving vehicles across areas with known invasive species.
- Post signage in areas containing noxious weeds or install barriers, if necessary.
- Invasive species best management practices will be followed to minimize impacts throughout constructions, operations, and active closure. A site-specific invasive species management plan may be developed as is necessary.

Mitigations regarding invasive flora species are also presented in Section 6.10.8, Table 6.10-12, page 6-605 – Habitat and Flora of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Belliveau, A. 2012. Invasive Alien Species in Nova Scotia: Identification and Information Guide. Mersey Tobeatic Institute. .pp. 20.

CARP (Clean Annapolis River Project). 2007. Spreading the Word About Weeds – Appendix A and B. pp 49.

Hill, N.M., and Blaney, C.S. 2009. Exotic and invasive vascular plants of the Atlantic Maritime Ecozonee. *In* Assessment of Species Diversity in the Atlantic Maritime Ecozone. *Edited by* D.F. McAlpine and I.M. Smith. NRC Research Press, Ottawa, Canada. Pages 1–18.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-07
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.8.6.3 – Page 401 - 407

Context and Rationale

Unclear how "partial alteration" is defined.

The Proponent is Required to …

When 94% of a wetland (WL 59) is impacted by development, 6% of WL 59 seems unlikely to recover to pre-impact condition for many species to use for habitat purposes. Partial alteration should be redefined, and it should be a range or under a certain percentage. The entire wetland should be compensated for.

Response

Section 6.8.7.1.1, page 6-392 – Direct Wetland Impacts of the Updated 2021 EIS (AMNS 2021) has been updated to define partial and complete wetland alteration. A wetland is considered completely altered when 100% of the wetland is directly impacted by Project development or the remaining area would not be able to perform its pre-alteration function.

Where a partial alteration is proposed, in some cases, remaining portions of a wetland may not be maintained in a natural condition and is thus considered a complete alteration. Therefore, each wetland proposed for alteration is assessed on a case-by-case basis. When determining alteration extent, the hydrologic regime, wetland type and morphology, alteration type, indirect effects (e.g., edge effects) and particularly the relative size of the wetland compared to alteration area, are considered. Where it is determined that the remaining wetland area will not be self-sufficient, a complete alteration is anticipated.

It was determined that if portions of wetland habitat are not likely to maintain a natural condition (i.e., a portion remains between two drainage ditches), the direct alteration area has been expanded to include wetland fragments which lie outside of proposed infrastructure. These areas were assessed on a case-by-case basis, considering flow regime, wetland type, and alteration type.

Direct wetland alteration areas are presented in Section 6.8.7.1.1, Table 6.8-17, page 6-392 and 6.8-18, page 6-394 of the Updated 2021 EIS (AMNS 2021). Percent alteration, as assessed through a case-by-case review, has been added to these tables for clarity. On-going refinement of wetland impact areas will be completed during the permitting process and in consultation with NSE.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-08
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Throughout report

Context and Rationale

Incomplete data for review.

The Proponent is Required to …

Years are provided for many of the all species searches, but not time of year or time of day.

Please provide an appendix of all species observed in the assessment area including Odonata and other invertebrates.

Response

A representative list of all species observed during Project field surveys (dedicated and incidental) has been provided in Appendix K.1, including the observation time/date, and will be added to the Updated 2021 EIS (AMNS 2021).

A summary of all dedicated flora and fauna surveys is provided in IR2 response NSE-2-01 and has been included below. Survey locations, seasons, dates and, where applicable, times have been described in each respective Valued Component (VC) chapter within the Updated 2021 EIS (AMNS 2021). All other fauna species, including other mammals, reptiles and amphibians, were considered during all surveys and recorded incidentally, when observed. Incidental observations for priority invertebrates occurred during all field programs, particularly wetland and watercourse delineation, and fish habitat surveys. Incidental observations of odonates and lepidopterans include live adults or larvae, or cast skins. Signs of molluscs include live or dead individuals and shells. SAR and SOCI were assessed and recorded during all survey efforts.

Table NSE-2-08-1: Summary of Dedicated Flora and Fauna Surveys, Locations and Times

Survey Type	Locations	Year(s)	Season/Date	Time of Day[1]
Avifauna (survey details in Section 6.12, page 6-638 of the Updated 2021 EIS [AMNS 2021])				
Fall Migration	Beaver Dam Mine Site: 32 point count stations	2014	Fall (Sept. 17 to Oct. 19)	Began at, or within 30 mins of, sunrise and ended by 10:00 am
Spring Migration	Beaver Dam Mine Site: 12 point count stations Haul Road: 45 point count stations	2015, 2016	Spring (Apr. 21 to Jun. 4)	Began at, or within 30 mins of, sunrise and ended by 10:00 am.
Breeding Surveys	Beaver Dam Mine Site: 24 point count stations Haul Road: 50 point count stations	2015, 2016, 2019	Summer (Jun. 8 to Jul. 13)	Began at, or within 30 mins of, sunrise and ended by 10:00 am
Common Nighthawk	Beaver Dam Mine Site: five stations Haul Road: 12 stations	2015, 2016, 2019	Summer (Jun. to Jul.)	Dawn or dusk
Diurnal Raptor Migration	Beaver Dam Mine Site	2015	Spring (April 15)	12:30 to 4:30 pm
Nocturnal Owl	Beaver Dam Mine Site: four stations Haul Road: seven stations	2015, 2016	Spring (Apr. 11 and 15)	Between 30 mins after sunset and midnight
Winter Wildlife Surveys	Beaver Dam Mine Site and Haul Road	2015, 2016	Winter (Feb. 18 to Mar. 31)	n/a

Table NSE-2-08-1: Summary of Dedicated Flora and Fauna Surveys, Locations and Times (continued)

Survey Type	Locations	Year(s)	Season/Date	Time of Day[1]
Fish (survey details in Section 6.9, page 6-431 of the Updated 2021 EIS [AMNS 2021])				
Fish Habitat Surveys	All watercourses, wetlands and waterbodies within the Beaver Dam Mine Site and Haul Road	2015, 2016, 2019, 2020	All Seasons	n/a
Fish Collection (electrofishing, trapping, eDNA)	Reaches of watercourses and waterbodies with fish habitat	2015, 2016, 2019	All Seasons (Apr. 8 to Dec. 17)	n/a
Terrestrial Fauna (survey details in Section 6.11, page 6-609 of the Updated 2021 EIS [AMNS 2021])				
Moose Tracking Surveys	Beaver Dam Mine Site: six transects Haul Road: eight transects	2015, 2016	Winter (Jan.to Apr.)	n/a
Moose Pellet Group Inventory Survey	Beaver Dam Mine Site: one transect Haul Road: 18 transects	2015, 2016	Spring (Apr. to May)	n/a
Herpetofauna Surveys (and opportunistic[(e)])	Beaver Dam Mine Site and Haul Road	2015 (all study years)	Spring (May 17 to Jun. 4)	n/a
Bat Surveys (Hibernacula Evaluation)	Beaver Dam Mine Site: eighteen AMOs	2014	Fall (Sept. 18)	n/a
Priority Invertebrates (survey details in Section 6.13, page 6-682 of the Updated 2021 EIS [AMNS 2021])				
Incidental Observations	Beaver Dam Mine Site and Haul Road	2015, 2016, 2018, 2019 (all study years)	Growing Season	n/a
Flora (survey details in Section 6.10, page 6-560 of the Updated 2021 EIS [AMNS 2021])				
Priority Lichen Surveys (and opportunistic[(e)])	Beaver Dam Mine Site, Haul Road, LSA	2015, 2016, 2018, 2019 (all study years)	Growing Season	n/a
Priority Vascular Flora Surveys (and opportunistic[(e)])	Habitats within the PA with elevated potential for priority species	2015, 2016, 2018, 2019 (all study years)	Spring (June) Fall (Sept. 8 to Oct. 9)	n/a
Wetlands (survey details in Section 6.8, page 6-317 of the Updated 2021 EIS [AMNS 2021])				
Delineation and Functional Assessment	Beaver Dam Mine Site and Haul Road	2015, 2016, 2018, 2019 (all study years)	Growing Season[(b)] (Jun. to Oct.)	n/a
Watercourses (survey details in Section 6.9, page 6-431 of the Updated 2021 EIS [AMNS 2021])				
Delineation and Assessment	Beaver Dam Mine Site and Haul Road[(c)]	2015, 2016, 2018, 2019 (all study years)	Year round[(d)]	n/a

Notes: [(a)] Survey times are included where applicable (i.e., where time of day influences species observation).

[(b)] December/January 2020/2021 exception noted in Appendix J2 of the Updated 2021 EIS (AMNS 2021).

[(c)] Assessment extended beyond the PA to assess inflows and outflows, where necessary.

[(d)] Assessment type is dependent on time of year.

[(e)] Opportunistic observations include observations made outside dedicated surveys (i.e., during other baseline surveys) and are in addition to dedicated survey efforts.

EIS = Environmental Impact Statement; AMOs = provincial abandoned mine openings; LSA = Lichen Study Area; PA = Project Area; n/a = not applicable.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-09
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.8.9 – Page 433 – Table 6.8-29

Context and Rationale

With habitat loss; incidental death of wildlife is likely and if habitat is not expected to fully recover for an extended period, impacts should be considered high.

The Proponent is Required to …

When a VC is unlikely to recover or removed from a system, it would be significant. Habitat loss and incidental deaths are significant impacts. Revise.

Response

In accordance with the Nova Scotia Wetland Conservation Policy (NSE 2011), the Project detailed design process has endeavored to follow the appropriate mitigation sequence to first avoid and minimize impacts to wetland habitat, whenever practicable. The waste rock stockpiles have been relocated twice to avoid impacts to fish and wetland habitat. There continues to be ongoing refinement of the Project design to avoid direct and indirect impacts to wetlands. During the wetland alteration permitting phase, additional micro-siting of infrastructure (i.e., road alignment and other supporting infrastructure) will occur where practicable to avoid wetland impacts, and infrastructure-specific buffers will be added to wetland impact areas where necessary.

Section 6.8.6.3, page 6-388 (Wetlands – Thresholds) of the Updated 2021 EIS (AMNS 2021) presents revised thresholds for determination of significant impact to wetlands and defines a significant adverse effect as:

- an effect that results in an unmitigated or uncompensated net loss of wetland habitat as defined under the NSE Wetland Conservation Policy, and its associated no-net loss policy; or
- an effect that is likely to cause a permanent loss of >10% of wetland habitat for a SAR species (identified in the PA) within the LAA, which is defined by the tertiary watershed boundary.

The updated Wetland Cumulative Effects Modeling (CEA; Section 6.8.6.2, page 6-380) quantifies observed SAR wetland habitat loss in relation to the PA and LAA species-specific wetland habitat area. The results of the CEA present that <3% of SAR wetland habitat will be lost within the LAA as a result of Project development Section 6.8.9, page 427 of the Updated 2021 EIS (AMNS, 2021).

Where further avoidance and impact minimization is not feasible, due to engineering and other biophysical constraints, the Wetland Compensation Plan (Appendix H.3 of the Updated 2021 EIS) was developed to meet provincial requirements for the prevention of net wetland loss and mitigate the adverse effects of wetland alteration (NSE 2011). The plan presents wetland compensation at a 2:1 ratio, and includes conservation allowances for SAR, in response to IR CEAA-2-24 and CEAA-2-26.

The Project will also endeavor to restore wetland function to the PA following Project closure. AMNS has developed a conceptual closure plan with the goal of returning the site to self-sustaining ecosystems of equivalent capability (Appendix P.2 [draft Reclamation and Closure Plan], Section 4, PDF page 32, in the Updated 2021 EIS [AMNS 2021]). While individual land features may not be possible to restore to pre-development conditions, the reclaimed site will target landforms that have capability to support similar land uses and biodiversity, including wetland habitat as is practicable. A Wetland Compensation Plan is being developed to further mitigate against habitat and species significant loss.

Furthermore, certain wetland functions will be improved through necessary Project upgrades and remediation. The largest impacted wetland (WL59), situated over the proposed open pit, is a settling pond anthropogenically created to store historic mine tailings. The remediation of this contaminated site will occur during site closure. The loss of this anthropogenic wetland habitat will be compensated for off-site. Wetland function in remaining wetland habitat along the Haul Road should also be improved as a result of restored hydrological connectivity and fish passage through culvert upgrades.

As a result of Project avoidance of wetlands, minimization of impact to wetlands, planned on-site reclamation, and off-site wetland compensation it was determined that Project impacts will result in non-significant effects to wetlands.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

NSE (Nova Scotia Environment). 2011. Nova Scotia Wetland Conservation Policy. Revised October 2019.

Round 2 Information Request Number:	NSE-2-10
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Throughout the report

Context and Rationale

Lack of mitigation measures considering aquatic species

The Proponent is Required to …

With wetland loss, no wetland mitigations seem to be present when it comes to species present within the wetland. Will salvage measures occur to rescue and remove hibernating and/or resident frogs (eggs, tadpoles, adults), turtles and fish?

Response

Site-specific wetland monitoring and mitigations will be proposed during the Wetland Alteration permitting phase, in consultation with NSE and NSLF. Wetland alterations will be suspended if Species at Risk (SAR) are observed. SAR permits will be acquired, as necessary, in consultation with NSLF.

In areas which have been identified as fish habitat, which is frequently inclusive of wetland habitat, fish rescues will be completed by a team of aquatic ecologists. The approach follows the Fisheries and Oceans Canada (2015) Fish Rescue Guidelines and generally involves a combination of passive trapping, seine netting, fish collection via electrofishing where possible, and dip-netting isolated pools during de-watering (see IR2 response CEAA-2-11 for more detail).

While other taxa are not targeting during fish rescues, they may be captured incidentally (e.g., amphibians). In such cases these individuals would also be removed from the wetland and released to a location where no Project impacts are anticipated.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

DFO (Fisheries and Oceans Canada). 2015. Guidelines for the design of fish passage for culverts in Nova Scotia. Fisheries Protection Program, Maritimes Region, 95 pp.

Round 2 Information Request Number:	NSE-2-11
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Habitat and Flora
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Figure 6.10-2 – Priority Species

Context and Rationale

Missing information

The Proponent is Required to …

One observation location box on figure has no species associated with it and the green box icon for Chelydra serpentina does not appear to exist.

Response

Section 6.10.4.2, Figure 6.10-2, page 6-580 illustrates priority species observations only and does not include all avifauna observed at each observation location. Where there is an observation location (box) without a species, no priority species was observed at this location.

This figure has been revised for the Updated 2021 EIS (AMNS 2021) and included here as Figure NSE-2-11-1. Avifauna observation locations without priority species observations have been removed from the priority species figures. All avifauna observation locations are shown on a separate figure.

One *Chelydra serpentina* observation was made at the Beaver Dam Mine Site. This has been shown on Figure NSE-2-11-1.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

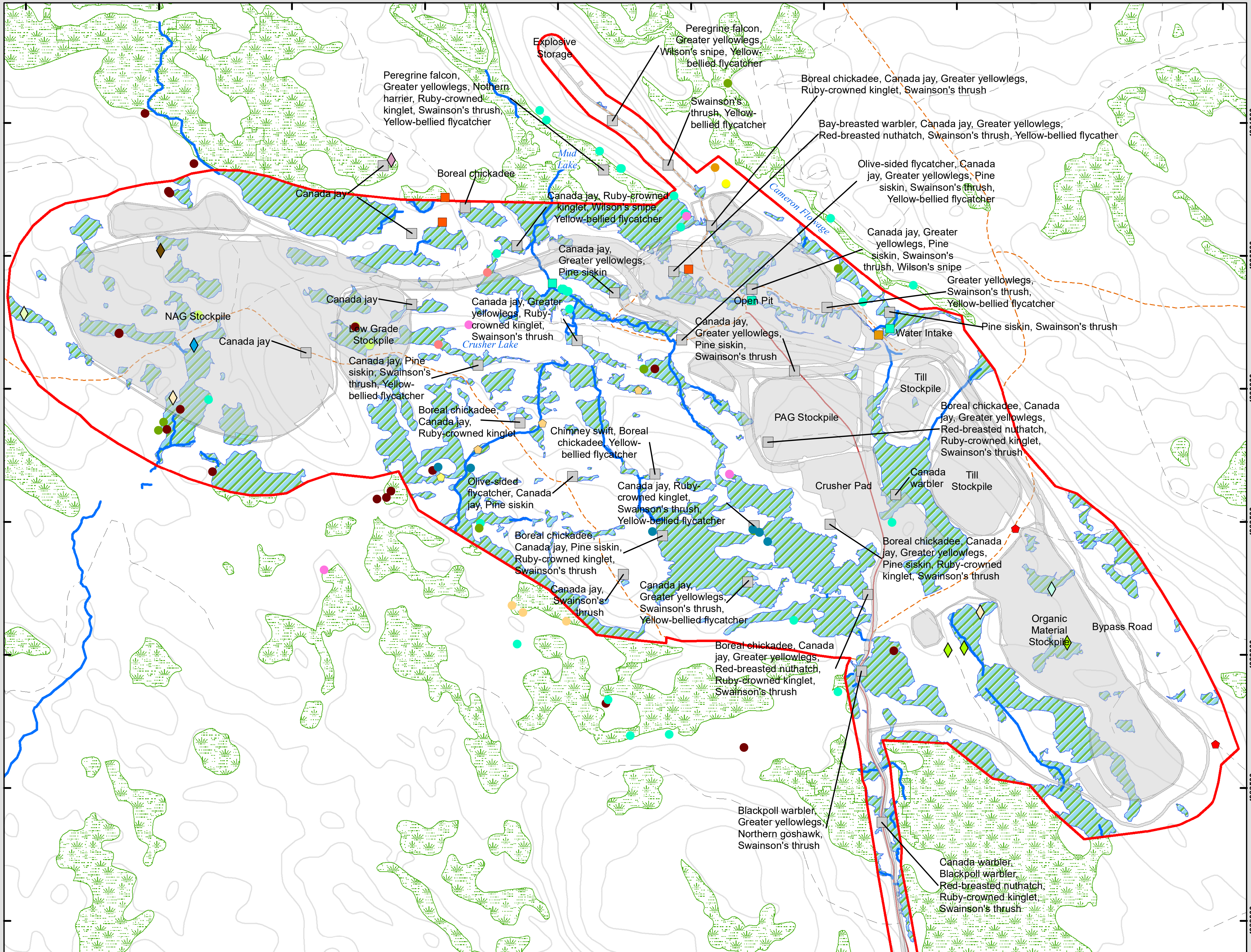
Prepared For:

Atlantic Gold

FIGURE NSE-2-11-1

Beaver Dam Mine Project

Priority Species



SPECIES
- Agalinis neoscotica
- Alces alces track
- Cardellina canadensis
- Carex wiegandii
- Chelydra serpentina
- Contopus cooperi
- Euphagus carolinus
- Goodyera repens
- Perisoreus canadensis
- Poecile hudsonicus
- Regulus calendula
- Salvelinus fontinalis
- Sitta canadensis
- Priority Bird Survey Locations
- Field Delineated Watercourses
- BD Mine Site Planned Infrastructure
- Project Area

Prioirty Lichens
- Ahtiana aurescens
- Coccocarpia palmicola
- Collema nigrescens
- Erioderma pedicellatum
- Heterodermia neglecta
- Heterodermia speciosa
- Hypogymnia vittata
- Leptogium corticola
- Pectenia plumbea
- Sclerophora peronella
- Sticta fuliginosa

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

0 165 330 660 m

1:13,500 Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed By: SS
Date: 2/24/2021

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

McCallum Environmental Ltd.

Document Name: BD_NSE_IR_PrioritySpecies_BD

Round 2 Information Request Number:	NSE-2-12
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Habitat and Flora
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Figure 6.10-2 L– Priority Species

Context and Rationale

Clarification

The Proponent is Required to …

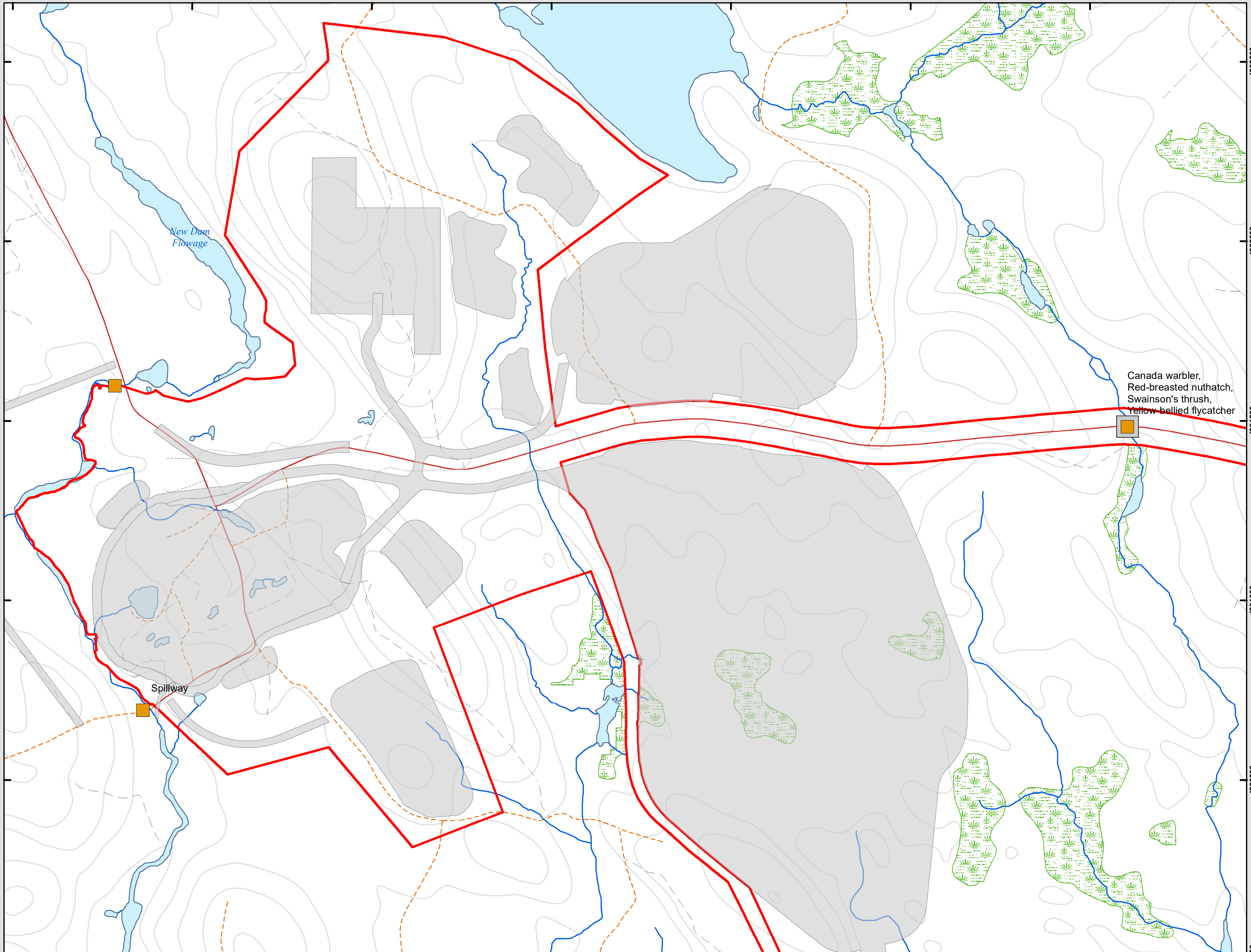
The green box is difficult to see within the observation location box.

Response

This figure has been revised for the Updated 2021 EIS (AMNS 2021) and included here as Figure NSE-2-12-1. All observations, including *Chelydra serpentina*, have been more clearly symbolized.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.



Prepared For:

Atlantic Gold

FIGURE NSE-2-12-1

Beaver Dam Mine Project

Priority Species

- Chelydra serpentina
- Priority Bird Survey Locations
- NSTDB Mapped Watercourses
- Touquoy Infrastructure Layout
- Project Area

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

0 125 250 500 m

1:10,000

Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed By: XX

Date: 2/25/2021

McCallum Environmental Ltd.

Round 2 Information Request Number:	NSE-2-13
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Wetlands/Species At Risk
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Throughout the report

Context and Rationale

Missing information

The Proponent is Required to …

Provide details related to restoration of the site and restoring habitat for SAR and wetlands.

Response

AMNS has developed a conceptual closure plan and a draft Reclamation and Closure Plan (Appendix P.2) with the goal of returning the site to self-sustaining ecosystems of equivalent capability (refer to the Section 2, page 2-1 – Project Description and Appendix P.2, Section 4, PDF page 32, of the Updated 2021 EIS [AMNS 2021]). While individual land features may not be restored to pre-development conditions, the reclaimed site will target the ability to support similar land uses and biodiversity, including wetland and SAR habitat as is practicable.

On-site options for wetland restoration will be considered during the reclamation process, acknowledging the time lag associated with this option and where practicable. Reclamation will consider biodiversity as a core objective, targeting SAR and other species known to use the site. These obligations will be met foremost through the Preliminary Wetland Compensation Plan (Appendix H.3, Section 2, PDF page 6 of the Updated 2021 EIS [AMNS 2021]). Other opportunities within the PA could include expansion of unaltered, existing wetlands, which could aim to detain water previously stored by wetlands and since lost (altered) by Project activities. AMNS has discussed potential reclamation opportunities and methods with NSLF and NSE (December 2, 2020 (online Teams meeting) meeting and notes). AMNS will look for on-site opportunities for progressive reclamation during construction and operations to avoid viability issues with long-term stockpiling of organic material. It should be noted this is a relatively short mine life of five years. Alternatives to traditional hydroseeding methods will be reviewed to advance vegetation re-establishment and reclamation methods. Consideration will be given to native species with Indigenous significance.

Wetland restoration will be completed as described in the Preliminary Wetland Compensation Plan provided in Appendix H.3, Section 2, PDF page 6 of the Updated 2021 EIS (AMNS 2021). The plan provides details on wetland and wetland SAR habitat restoration opportunities and proposed methods. Restoration of impacted SAR wetland habitat, specifically observed landbird and turtle SAR, has been specifically incorporated into the Preliminary Wetland Compensation Plan, in response to conservation allowance requests as per IR CEAA 2-24 and 2-26. Wetland habitat restoration is believed to offer the greatest benefit to these SAR due to their use of wetlands during critical life stages (i.e., breeding, overwintering) and due to habitat loss being a major threat to their persistence (ECCC 2016b; Westwood 2016). The recovery strategies for these species support habitat restoration as a conservation method (ECCC 2016b), deem habitat conservation as important to the species (Environment Canada 2015b, 2016a), or have acknowledged examples of its success (Environment Canada 2015a).

The Wetland Compensation Plan will prioritize identification of functionally valuable wetland restoration projects within the affected watershed. Should it be determined that valuable wetland restoration opportunities do not exist within the affected watersheds, in consultation with NSE and ECCC, AMNS will identify other areas within the province where wetland restoration opportunities are present. An evaluation of the value of the Project will be determined by comparing the proposed outcomes of the Project to the broader objectives of the Nova Scotia Wetland Conservation Policy (NSE 2011) and the Operational Framework for Use of Conservation Allowances (EC 2012), as well as local watershed benefits and support of any initiatives that the Project would provide to the Mi'kmaq of Nova Scotia, stakeholders and local communities.

A detailed closure and reclamation plan will be advanced as part of the Industrial Approval process.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Environment Canada. 2012. Operational Framework for the Use of Conservation Allowances. 17 pp.

Environment Canada. 2015a. Management Plan for the Rusty Blackbird (Euphagus carolinus) in Canada. Species at Risk Act Management Plan Series. Environment Canada, Ottawa. iv + 26 pp

Environment Canada. 2015b. Recovery Strategy for Olive-sided Flycatcher (Contopus cooperi) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vi + 51 pp.

Environment Canada. 2016a. Recovery Strategy for the Canada Warbler (Cardellina canadensis) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. vii + 56 pp.

ECCC (Environment and Climate Change Canada). 2016b. Management Plan for the Snapping Turtle (Chelydra serpentina) in Canada [Proposed]. Species at Risk Act Management Plan Series. Ottawa, Environment and Climate Change Canada, Ottawa, iv + 39 p.

NSE (Nova Scotia Environment). 2011. Nova Scotia Wetland Conservation Policy. Revised October 2019.

Westwood, A. 2016. Conservation of Three Forest Landbird Species at Risk: Characterizing and Modelling Habitat at Multiple Scales to Guide Management Planning. Submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy, Dalhousie University, Halifax, NS.

Round 2 Information Request Number:	NSE-2-14
Regulatory Agency/Indigenous Community:	NSE-Lands and Forestry–Regional Services
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	General

Context and Rationale

Clarification

The Proponent is Required to …

Please provide the rationale for applying the Australian water-based model to Nova Scotia and identify any modifications to the model that will be applied to adapt to Nova Scotia.

Response

The Australian Water Based Model (AWBM) is a conceptual hydrologic model that simulates surface runoff and baseflow from a mass balance of the soil storage. Input is precipitation, output is evapotranspiration, storage is the available water capacity of the soil, and overflow from the soil storage is partitioned into surface runoff and groundwater recharge based on the baseflow index (BFI). In the revised water balance model, precipitation was replaced with the sum of rainfall and snowmelt to provide a better representation of hydrologic processes in Nova Scotia. The model structure is not unique to Australia. The model parameters, including soil moisture storage capacity, BFI, and baseflow recession constant (Kb) were determined based on-site specific conditions. The snowpack was also modelled using a mass balance approach. Snowfall accumulates into the snowpack storage. Output from the snowpack storage is determined by the snowmelt rate. Snowmelt rate is calculated using the degree-day method when the daily mean temperature is greater than 0 degrees Celsius."

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-15
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Water Balance
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.5, Figure 2.2

Context and Rationale

none

The Proponent is Required to …

Touquoy Pit question: Is a monitoring station going to be installed downstream of the spillway? Are additional wells planned to be installed between the Pit and Moose River after deposition of tailings?

Spillway is designed in the Historical Tailings defined boundary. When will these tailings be removed? And where will they be disposed?

Spillway is planned directly through the public road. Is there a plan to build another public road?

Response

A. Once the spillway between the Touquoy pit and Moose River begins to discharge, it will become a second "final discharge point" (FDP) for the Touquoy mine, and a surface water monitoring station will be established. An Environment Effects Monitoring (EEM) study design will be completed prior to establishing the second FDP, and will include nearfield, midfield, and far field monitoring stations. Seven existing groundwater wells are present between the Touquoy Pit and Moose River, and no additional wells are planned to be installed at this time.

B. Historical tailings within the footprint of the spillway will be removed and disposed with other historical tailings in the existing Touquoy Tailing Management Facility (TMF), should approval be granted while this is still accessible. Alternatively, the historical tailings could be disposed subaqueously with the Beaver Dam Mine tailings in the exhausted Touquoy pit. Sufficient capacity is available within the Touquoy pit for the additional tailings.

C. The spillway is planned to cross the public road. An engineering crossing (i.e., a culvert or bridge) will be designed to cross the spillway, with detailed engineering occurring prior to the construction and operation of the spillway.

   Refer to the Touquoy Integrated Water and Tailings Management Plan in Appendix F.7 of the Updated 2021 EIS (AMNS 2021).

Reference

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-16
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Geology, Soil and Sediment Quality
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Table 1-1 Section 6.5.3.2.1

Context and Rationale

"There are no mapped historic tailings in any DNR or GSC reports, no air photo evidence, no geochemical anomalies to suggest any, no evidence seen during EBS work since 2014 and no evidence through historical research completed for the EIS."

"No known historic mining activity or mineral occurrences, and therefore, it can be assumed that elevated values are attributed to background levels"

The Proponent is Required to …

Inconsistent information throughout the report.

Geoscience and Mines Branch released a report in October 2015 stating Beaver Dam milled 44,4345 tonnes and produced 2,908 ounces. https://novascotia.ca/natr/meb/data/pubs/15ofr04/ofr_me_2015-004.pdf

A report prepared by CRA for Atlantic Gold proves that mining activities did occur at the previously at Beaver Dam. https://novascotia.ca/nse/ea/beaver-dam-mine- project/Appendix_O_Beaver_Dam_Mine_EIS.pdf

This area was not sampled in the GEOSCAN program; however, it is still unknown if historic tailings are present. Lands and Forest map show a sluice from the old stamp mill to the Crusher Lake. This map is also presented in Figure 4 of Appendix N.1https://novascotia.ca/natr/meb/download/mg/ofm/htm/ofm_1928-005.asp

Response

Summary Response

Stantec Consulting Ltd. (Stantec) conducted a Phase I Environmental Site Assessment (ESA) (Appendix E.6 [Stantec 2019a] of the Updated 2021 EIS), Limited Phase II ESA (Appendix E.7 [Stantec 2019b] of the Updated 2021 EIS), and Extended Phase II ESA (Appendix E.8 [Stantec 2021] of the Updated 2021 EIS) of the proposed mining operations for the Beaver Dam Mine Project.

Scope and Findings of Phase I ESA

The Phase I ESA (Appendix E.6 [Stantec 2019a] of the Updated 2021 EIS [AMNS 2021]) included a records review, interviews, and site visit which revealed evidence of potential environmental contamination associated with the Site. Stantec also conducted

LIDAR analysis to produce a Digital Elevation Model (DEM) of the Site which was used to approximately delineate potential historical tailings and waste rock storage areas prior to conducting the Phase I ESA site visit.

Based on the information gathered, there are suspected tailings and waste rock both within the area of the proposed open pit development as well the area of the adjacent pit operations, which are potentially impacted with arsenic and mercury and have potential acid generating potential. Additionally, the mine operation in the 1980s included power generation, maintenance work and underground fuel storage.

Scope of Phase II ESAs

The Limited and Extended Phase II ESAs assessed soil geochemistry at the Site and provided conclusions relating to naturally-occurring background concentrations and soil contamination associated with the historical mining activities identified in the Phase I ESA.

Soil sampling was conducted from test pits. Twenty-nine test pits were excavated as part of the Limited Phase II ESA, and 65 test pits as part of the Extended Phase II ESA (Appendix E.7 and E.8 of the Updated 2021 EIS [AMNS 2021].

Rationale and Methodology

Test pit locations during the Limited Phase II ESA were chosen in the field based on areas of concern (i.e., tailings and waste rock storage areas) identified during review of the DEM and a visual assessment of the Site, and based on the location of proposed mine infrastructure. LIDAR data specific to the Beaver Dam area was requested from the Nova Scotia Department of Natural Resources in August 2019 which identified historical tailing areas within the settlement pond, Crusher Lake and Forge Hill mining and stamp mill area.

Test pit locations during the Extended Phase II ESA were selected to further delineate the arsenic previously detected in 2019 in the area of the proposed pit. Stantec used a grid to assess areas around and between areas that Stantec considered to have been impacted with arsenic based on 2019 soil analytical results and field observations, and to screen newly identified areas. Locations were also chosen to screen the revised proposed mine infrastructure areas.

Soil sampling methodology is detailed in Section 2.2, PDF page 13 of the Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]) and Section 2.2, PDF page 18 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Regulatory Framework

Analytical results for soil were compared to the applicable Tier 1 Environmental Quality Standards (EQS) from Nova Scotia Environment and Climate Change (NSECC)'s Contaminated Sites Regulations (NSECC, 2013) for an industrial site with non-potable groundwater use and coarse-grained soil (standards for coarse-grained soil are more conservative than standards for fine-grained soil). For metals, the Tier 1 EQS for a potable and non-potable site are equivalent.

The regulatory framework applied to data at the Site is detailed in Section 1.5, PDF page 15 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Soil Observations and Results

Stratigraphy

The stratigraphy encountered in most test pits consisted of a layer of organics over poorly graded brown to grey silty sand with some gravel and cobbles.

Stratigraphy at test pits categorized as impacted by historical tailings was generally like the unimpacted locations with the addition of a layer of up to 0.65 m of distinct grey sand, gravelly sand, or silt (suspected tailings).

Stratigraphy at test pits categorized as impacted by historical waste rock was generally like the unimpacted locations with the addition of a layer of up to 0.62 m of gravel and/or cobbles, often infilled with brown or orange-brown sand (suspected waste rock).

Test pit stratigraphy is detailed within Section 3.2.1, PDF page 15 and Table B-1, PDF page 27, Appendix B of the Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]) and Section 3.2.1.1, PDF page 21 and Appendix B, PDF page 43 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Soil Analytical Results

Laboratory analysis for available (acid extractable) metals was conducted on 67 soil samples originating from 65 test pits, plus six field duplicate samples, collected in 2020 (Appendix E.8 [Stantec, 2021) and 29 soil samples originating from 29 test pits collected in 2019 (Appendix E.7 [Stantec, 2019]).[2] of the Updated 2021 EIS (AMNS 2021).

Results of the laboratory analysis of soil samples are summarized in Table NSE-2-16-1 below:

Table NSE-2-16-1: Summary of Soil Contamination (2019 to 2020)

Standard Exceedances	Tier 1 EQS	Exceeding (Samples)	Exceeding (Test Pits)
Arsenic	31 mg/kg	73 of 96 samples[(a)]	72 of 94 test pits*
Other Metals	Various	None	None

Notes: Numbers of exceedances do not include field duplicate samples.

(a) There are more soil samples than test pit locations as two soil samples, rather than one, were collected from two of the test pits.

Levels of arsenic ranged from non-detected to 3,900 mg/kg.

[2] Samples collected during Limited Phase II ESA activities were renamed within the Extended Phase II ESA to indicate the year of collection more clearly. For example, the sample previously reported as SA1 (collected from a test pit in 2019) has been renamed to TP19-01.

Lead and mercury have been associated with historical mining activities in Nova Scotia. Levels of lead and mercury in soil at the Project site were relatively elevated but did not exceed applicable Tier 1 EQS. The maximum identified lead concentration was 200 mg/kg versus a Tier 1 EQS of 740 mg/kg, and the maximum identified mercury concentration was 40 mg/kg versus a Tier 1 EQS of 99 mg/kg.

Results of the laboratory analysis of soil samples are presented on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 and Table C-1, PDF page 140, Appendix C PDF page 139 and discussed in Section 3.3.1, PDF page 23 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-16-1.

Soil Impact Classification

Based on field observations, including visible tailings within test pits and their proximity to Site features such as historical mining infrastructure/features (i.e., trenches, waste rock piles, stamp mill foundations, etc.), Stantec classified the test pit locations from both 2019 and 2020 as either non-impacted or impacted by historical mining activities. Of the impacted locations, Stantec further classified them as likely impacted by historical mine tailings or by mine waste rock. This impact classification assisted Stantec's assessment of background levels and delineation, discussed below.

Soil impact classifications are summarized in Table NSE-2-16-2.

Table NSE-2-16-2: Summary of Soil Impact Classification

Impact Classification at Proposed Mine Infrastructure Areas Based on Field Identification	Non-Impacted Test Pits	Impacted Test Pits	
		Tailings	Waste Rock
Crusher pad	2 of 2	0 of 2	0 of 2
LG (low grade) stockpiles	2 of 2	0 of 2	0 of 2
NAG (non-acid generating) stockpiles	4 of 4	0 of 4	0 of 4
Open pit	4 of 23*	6 of 23† [764]	13 of 23‡ [346]
Organic material stockpiles	6 of 6	0 of 6	0 of 6
PAG (potentially acid generating) stockpiles	2 of 2	0 of 2	0 of 2
Roadways and water management ditches	6 of 9	1 of 9 [230]	2 of 9 [125]
Settling pond	3 of 3	0 of 3	0 of 3
Till stockpiles	6 of 7	1 of 7 [130]	0 of 7
TSSPs (top-soil/sub-soil stockpiles)	4 of 6	1 of 6 [2,800]	1 of 6 [44]
Areas outside of proposed infrastructure	12 of 31	15 of 31 [294]	4 of 23 [104]

Notes:[ ] The value in brackets represents the mean arsenic concentration (mg/kg) in the soil samples within this proposed mine infrastructure area and impact classification.

* Non-impacted test pits within the proposed open pit were either on the extreme northern edge of the footprint (TP19-10), observed to be composed of natural soil deposits in the field (TP20-34, TP20-35, and TP20-58) and/or contained low concentrations of arsenic (TP20-58).

† Tailings-impacted test pits within the proposed open pit are largely near the central historical settling pond. This includes the highest identified concentration of 3,900 mg/kg at TP19-28.‡ Waste rock-impacted test pits were identified throughout the re-worked area composing the majority of the proposed open pit.

Sample photographs of observed suspected tailings and waste rock are included below, as well as in the photolog in Appendix E of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Photograph A: Suspected Tailings from TP20-63

Photograph B: Suspected Waste Rock at Surface of TP20-27

Soil impact classifications are highlighted on Table C-1, PDF page 140, Appendix C, PDF page 139 and discussed in Section 4.1.1, PDF page 27 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Background Levels

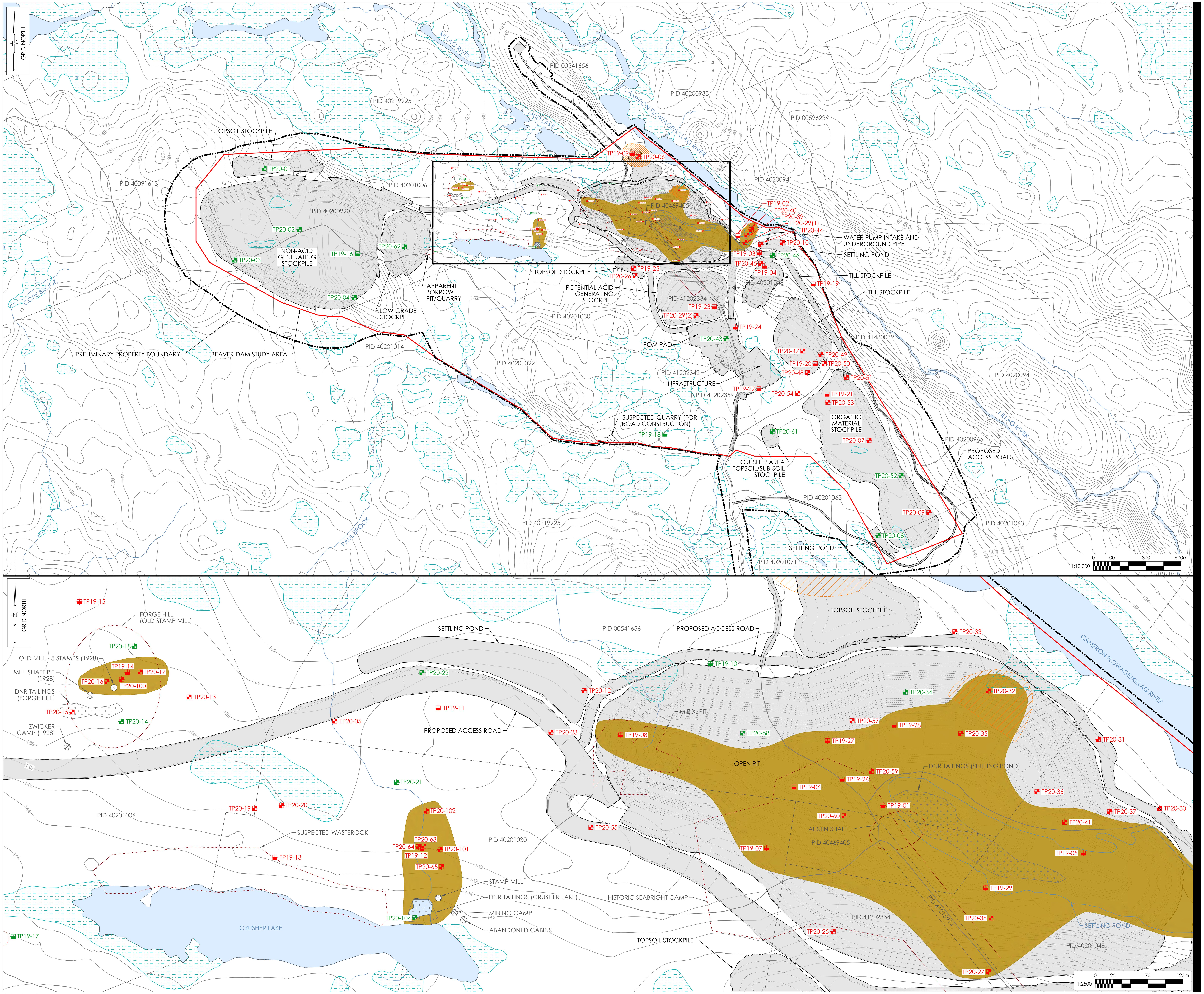
Some samples from non-impacted areas of the Site include arsenic concentrations higher than the Tier 1 EQS. Arsenic concentrations within non-impacted soil samples represent potential data on background levels in the Site area soil (i.e., arsenic in soil related to geology and not to historical mining activities).

Table NSE-2-16-3 presents statistical metrics calculated using the non-impacted soil concentrations, compared to the Tier 1 EQS. Statistical calculations, including distribution and outlier testing, were conducted using the United States Environmental Protection Agency's (US EPA) ProUCL statistics software package for environmental applications (USEPA 2016).

Table NSE-2-16-3: Statistics from Background Non-Impacted Data Set

Concentration (mg/kg)	Tier 1 EQS	Maximum	Mean	Median	75th Percentile	95th Percentile
Arsenic	31	270	75.34	43.5	112.5	228.0

Arsenic levels below the 95th percentile value (228 mg/kg) of the background non-impacted data set were considered to represent arsenic not related to historical mining activities. Delineation based on this value, as well as on field observations, is shown on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 of the Extended Phase II ESA Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-16-1.



Stantec

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Legend

- BEAVER DAM STUDY AREA
- TOPOGRAPHIC CONTOUR (2m INTERVAL)
- PROPERTY BOUNDARY
- PRELIMINARY PROPERTY BOUNDARY
- EXISTING ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED MINING INFRASTRUCTURE
- REPORTED TAILINGS - DNR
- HISTORIC MINING OPERATIONS AREA
- HISTORICAL MINING FEATURE LOCATION
- TEST PIT LOCATION (2020)
- TEST PIT LOCATION (2019)
- TEST PIT LOCATION - SOIL SAMPLE EXCEEDS NSE TIER I EQS FOR ARSENIC (>31 mg/kg) AT AN INDUSTRIAL SITE
- TEST PIT LOCATION - SOIL SAMPLE BELOW NSE TIER I EQS FOR ARSENIC (<31 mg/kg) AT AN INDUSTRIAL SITE
- POTENTIAL AREA OF ARSENIC IMPACTED SOIL RELATED TO HISTORICAL MINING OPERATIONS
- AREAS OF UNDELINEATED POTENTIAL ARSENIC IMPACTED SOIL RELATED TO HISTORICAL MINING OPERATIONS

Notes

1. DATA SOURCES: GOVERNMENT OF CANADA, GOVERNMENT OF NOVA SCOTIA, McCALLUM AND ATLANTIC MINING NS INC., AUSENCO (DRAWING No. 105227-0000-G-101, REV D, 07/DEC2020).
2. LOCATIONS OF HISTORICAL MINING FEATURES ARE APPROXIMATE.

1	INFRASTRUCTURE UPDATE	EA	MF	21.02.08
Revision		By	Appd.	YY.MM.DD
B	FINAL	EA	MF	21.02.XX
A	FOR REVIEW	EA	MF	20.11.09
Issued		By	Appd.	YY.MM.DD

File Name: 121619250.2500.995_A-5_REV1	JL	EA	GM	21.02.08
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

ATLANTIC MINING NS INC.

BEAVER DAM PROJECT

HALIFAX COUNTY, NS

Title

ARSENIC CONCENTRATIONS COMPARED TO NSE TIER 1 EQS (INDUSTRIAL LAND USE) AND POTENTIAL EXTENT OF ARSENIC IN SOIL RELATED TO HISTORICAL MINING OPERATIONS

Project No. 121619250 | Scale AS SHOWN

Drawing No. A-5 | Sheet 5 of 7 | Revision 0

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2021/02/08 1:24 PM By: Lockhart, Jeff

ORIGINAL SHEET - ISO A1

Background levels are discussed in Section 4.1.2, PDF page 28 and detailed methodology on statistical methods used, including distribution and outlier testing, is included in Appendix F, PDF page 220 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Contamination and Delineation Near Proposed Mine Infrastructure

Impacts above the calculated background value, considered to represent arsenic related to historical mining activities, were identified within the proposed open pit and to its east at the east end of the historical settling pond, as well as in the area of the proposed TSSPs to the north and northwest of the proposed open pit, and intersecting proposed roadways and water management ditches.

This level of impacted soil was also identified within an area spanning the proposed till stockpile and organic material stockpile; however, despite its high levels of arsenic which could affect soil management in this area, soil in this area was field-identified as non-impacted and may represent naturally elevated levels.

This level of impacted soil was also identified around the stream north of the suspected tailings at Crusher Lake (no proposed mine infrastructure in this area).

Proposed infrastructure in other areas may disturb soil or sediment with arsenic concentrations that naturally exceed the guidelines. This will be an important factor during construction for the management of soil and for the disturbance of sediments that may be mobilized on or off-site.

Historical mining-related arsenic contamination in soil identified during the Limited Phase II ESA and Extended Phase II ESA is horizontally delineated other than to the northeast of the proposed open pit near the Cameron Flowage, as shown by dashed lines on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-16-1.

Identified contamination is not vertically delineated given refusal of hand-held tools during sampling events. Bedrock may limit vertical soil contamination. Stantec has previously reviewed reports on historical Nova Scotia gold mines identifying tailings several metres thick.

Contamination and delineation near proposed mine infrastructure is discussed in Section 4.1.3, PDF page 29 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Conclusions

Based on the information gathered and on observations made during the Phase I ESA (Appendix E.6 [Stantec, 2019a]), Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]), and Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021), Stantec provides the following conclusions related to potential environmental contamination in soil associated with historical gold mining operations:

- Concentrations of arsenic in soil exceeding the applicable NSE Tier 1 EQS were identified. Some of these locations are considered non-impacted and are potentially indicative of background soil concentrations.

- Test pits were identified during the Limited and Extended Phase II ESA work in 2019 and 2020 that were classified as likely impacted by historical tailings or waste rock based on field observations, arsenic levels, and proximity to historical site features.
- Arsenic in soil at levels considered to represent impact from historical mining operations intersects with areas of proposed Project infrastructure, including the proposed open pit.

Closure

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report, and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

This report is limited by the following:

- This report summarizes results of investigations of soil geochemistry at the Beaver Dam Mine site and does not include a summary of results of investigations of other media including sediment or surface water.

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment.

In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

NSE (Nova Scotia Environment). 2014. Nova Scotia Environment, Nova Scotia Contaminated Sites Regulations, Environmental Quality Standards for Contaminated Sites. Retrieved from: https://www.novascotia.ca/nse/contaminatedsites/. Last modified: 2015-08-20.

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Stantec. 2019b. Limited Phase II Environmental Site Assessment - Beaver Dam Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.7 Limited Phase II Environmental Site Assessment - Beaver Dam Property (2019). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

Stantec. 2021. Final (Revised) - Extended Phase II Environmental Site Assessment - Beaver Dam Project Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.8 Extended Phase II Environmental Site Assessment - Beaver Dam Property (2021). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

US EPA (United States Environmental Protection Agency). 2016. Statistical Software ProUCL 5.1.00 for Environmental Applications for Data Sets with and without Nondetect Observations.

Round 2 Information Request Number:	NSE-2-17
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Water Management
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Sections 2.2.1.6, 6.6.6.2, 6.7.2.2.1, 6.7.3.1.2, 6.8.7.3.1.6

Context and Rationale

No mention of settling ponds along the Haul Roads.

"Both interactions have the potential to affect to groundwater quantity and groundwater quality, but such affects would be highly localized and limited in extent."

"TSS analysis was limited to the Haul Road due to the potential for haul truck traffic to suspend particulate matter for deposition into watercourses adjacent to the Haul Road. The potential for this interaction at the Beaver Dam Mine Site is low, due to the planned sediment and erosion control measures and nature of the pit design."

"Sixteen (16) mapped watercourses, including two major rivers, West River Sheet Harbour and Morgan River, intersect the Haul Road. Five smaller waterbodies are mapped west of Lake Alma."

Preferred Alternative Haul Road Water Quality: "The NovaWET evaluation determined that all wetlands within the Preferred Alternative Haul Road PA."

The Proponent is Required to …

The Haul Road at Touqouy creates a lot of sediment issues. This is not under control at Touquoy. What is the planned sediment and erosion control measures for Beaver Dam?

What are the predicted affects to these watercourses?

Response

A draft Sediment and Erosion Plan is provided in Appendix C, PDF page 159, of the Mine Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021). The road will be constructed of improved materials that will be sourced from local quarries as noted in response to IR NSE 2-18. Culverts will be replaced or upgraded. (AMNS) plans to maintain 80 to 90% dust suppression on the haul roads as noted in the Updated 2021 EIS (AMNS 2021) as a key mitigation, which will result in no predicted affects to watercourses along the Haul Road.

Watercourses along the Haul Road will be monitored to ensure effectiveness of the mitigation, which is described in Appendix P.5 draft Aquatic Effects Monitoring Program (AEMP) that will be submitted as part of the permitting process.

A summary of water course crossings along the Haul Road and current status of culverts are provided in Section 6.9.7.3.1, Table 6.9-19, page 6-511, of the Fish and Fish Habitat Assessment and is provided in Table NSE 2-17-1 Water Course Crossings Along the Haul Road.

Table NSE-2-17-1: Potential Direct Fish Habitat Impacts within the Haul Road

Watercourse Location	Current Crossing (Condition)	Plan for Upgraded Haul Road*	Direct Footprint Impact (m^2)	Impact to Fish Passage
WC-1	Culvert (functioning)	Proposed upgraded road alignment perpendicular to WC. Extend existing culvert, following standard mitigation measures.	0	None
WC-A	Culvert (buried)	Proposed upgraded road alignment perpendicular to WC. Replace buried culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through removal of buried culvert.	0	Improvement
WC-B	Culvert (crushed)	Proposed upgraded road alignment perpendicular to WC. Replace crushed culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through removal of crushed culvert.	0	Improvement
WC-C	Culvert (functioning)	Proposed upgraded road alignment perpendicular to WC on eastern side of road. Replace functioning culvert. On western side of road, alignment expected to have direct impact on WC through ditching. Standard mitigation will apply to limit impact to fish habitat.	7.4	None
WC-D	None	Proposed upgraded road alignment perpendicular to WC. Install new culvert at crossing location. Standard mitigation will apply to limit impact to fish habitat.	10.5	None – no mapped aquatic feature upstream of road
WC-E	Culvert (blocked)	Proposed upgraded road alignment perpendicular to WC, east of existing road. Remove blocked culvert on existing road and install new culvert downstream at new crossing location. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through removal of blocked culvert.	0	Removal of old buried culvert: Improvement New culvert: None
WC-F	Culvert (crushed)	Proposed upgraded road alignment perpendicular to WC, west of existing road. Remove blocked culvert on existing road and install new culvert downstream at new crossing location. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through removal of crushed culvert.	0	Removal of old crushed culvert: Improvement New culvert: None
WC-G	Culvert (crushed)	Proposed upgraded road alignment perpendicular to WC. Replace crushed culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through replacement of crushed culvert.	0	Improvement

Table NSE-2-17-1: Potential Direct Fish Habitat Impacts within the Haul Road (continued)

Watercourse Location	Current Crossing (Condition)	Plan for Upgraded Haul Road*	Direct Footprint Impact (m^2)	Impact to Fish Passage
WC-H	Bridge (functioning)	Proposed upgraded road alignment perpendicular to WC. Existing bridge to be expanded to facilitate multi-use bypass road, and parallel new bridge for Haul Road. Standard mitigation will apply to limit impact to fish habitat.	0	None
WC-I	Culvert (buried)	Proposed upgraded road alignment perpendicular to WC. Replace buried culvert. Standard mitigation will apply to limit impact to fish habitat.	0	None – no mapped aquatic feature upstream of road
WC-J	Culvert (buried)	Proposed upgraded road alignment perpendicular to WC on eastern side of road. Replace buried culvert. On western side of existing road, alignment overlaps approximately 19 m of parallel stream that flows into western ditch. Proposed road upgrade will funnel the WC directly across the road to the eastern side and away from the ditch network associated with the road. Standard mitigation will apply to limit impact to fish habitat.	21.6	Improvement
WC-K	Culvert (buried)	Proposed upgraded road alignment perpendicular to WC. Install new culvert. Replace buried culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through installation of culvert.	0	Improvement
WC-L	Culvert (functioning)	WC runs parallel to current road in western roadside ditch. Proposed road upgrade will require the functioning culvert to be replaced to funnel the WC directly across the road to the eastern side and away from ditch network associated with the road. Proposed road alignment overlaps approximately 53 m of parallel ditched stream. Standard mitigation will apply to limit impact to fish habitat.	15.9	None
WC-M	Culvert (functioning, North), None (South)	Proposed upgraded road alignment is perpendicular to WC at two locations (north and south). Northern crossing will require an extension to existing culvert which is functioning. Southern crossing will require installation of a new culvert. Standard mitigation will apply to limit impact to fish habitat.	10.9	None – no aquatic features mapped upstream of southern crossing
WC-N- West River	Bridge (functioning)	Proposed upgraded road alignment perpendicular to WC. Existing bridge to be expanded to facilitate multi-use bypass road, and parallel new bridge for Haul Road. Standard mitigation will apply to limit impact to fish habitat.	0	None

Table NSE-2-17-1: Potential Direct Fish Habitat Impacts within the Haul Road (continued)

Watercourse Location	Current Crossing (Condition)	Plan for Upgraded Haul Road*	Direct Footprint Impact (m^2)	Impact to Fish Passage
WC-O	None	Proposed new road designed perpendicular to WC. Requires culvert installation. Standard mitigation will apply to limit impact to fish habitat.	29.3	None
WC-P	None	Proposed new road designed perpendicular to WC. Requires culvert installation. Standard mitigation will apply to limit impact to fish habitat.	10.2	None
WC-T	Culvert (buried)	Proposed upgraded road alignment perpendicular to WC. Replace buried culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through removal of buried culvert.	0	Improvement
WC-U	Culvert (functioning)	Proposed upgraded road alignment perpendicular to WC. Replace functioning culvert. Standard mitigation will apply to limit impact to fish habitat.	0	None
WC-V	Culvert (buried)	Proposed upgraded road alignment perpendicular to WC. Replace buried culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through removal of buried culvert.	0	Improvement
WC-W	Culvert (hung)	Proposed upgraded road alignment perpendicular to WC. Replace hung culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through replacement of hung culvert.	0	Improvement
WC-X	None	Proposed upgraded road alignment is perpendicular to WC and will require a new culvert installation. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through providing fish access to upstream aquatic resources.	12.1	Improvement
WC-Y	Culvert (buried)	Proposed upgraded road alignment is perpendicular to WC. Replace buried culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through replacement of buried culvert.	0	Improvement
WC-AA	Culvert (hung)	Proposed upgraded road alignment perpendicular to WC. Replace hung culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through removal of hung culvert.	0	Improvement
WC-AC	None	Proposed upgraded road alignment overlaps with the top end of this watercourse (3.7 m). This area may be altered to support road upgrades. Standard mitigation will apply to limit impact to fish habitat.	8.3	None

Table NSE-2-17-1: Potential Direct Fish Habitat Impacts within the Haul Road (continued)

Watercourse Location	Current Crossing (Condition)	Plan for Upgraded Haul Road*	Direct Footprint Impact (m^2)	Impact to Fish Passage
WC-AD-Morgan River	Bridge (functioning)	Proposed upgraded road alignment perpendicular to WC. Existing bridge to be expanded to facilitate multi-use bypass road, and parallel new bridge for Haul Road. Standard mitigation will apply to limit impact to fish habitat.	0	None
WC-AE	Culvert (buried)	Proposed upgraded road alignment perpendicular to WC. Replace buried culvert. Standard mitigation will apply to limit impact to fish habitat and overall improve fish habitat through replacement of buried culvert.	0	Improvement
WC-AF	None	Proposed upgraded road alignment overlaps with the bottom end of this watercourse (40.2 m), at which point the watercourse currently empties into the southern ditch along the existing road. Current ditch drains east towards culvert at WC-AE. Proponent will consider installation of a culvert to funnel the watercourse directly across the road north towards WC-AH, away from the ditch network associated with the road. Standard mitigation will apply to limit impact to fish habitat.	46.3	Improvement
WC-AG	None	Proposed upgraded road alignment overlaps with the bottom end of this watercourse (18.4 m), at which point the watercourse currently empties into the southern ditch along the existing road. Current ditch drains east towards culvert at WC-AE. Proponent will consider installation of a culvert to funnel the watercourse directly across the road north towards WC-AH, away from the ditch network associated with the road. Standard mitigation will apply to limit impact to fish habitat.	12.0	Improvement
WL64	Culvert (buried) – see WC-A	Buried culvert associated with WC-A located at wetland crossing. Proposed upgraded road alignment overlaps surface water features (presumed fish habitat) both sides of road. Replacement of buried culvert likely to improve fish access into wetland.	48.7	Improvement

Table NSE-2-17-1: Potential Direct Fish Habitat Impacts within the Haul Road (continued)

Watercourse Location	Current Crossing (Condition)	Plan for Upgraded Haul Road*	Direct Footprint Impact (m^2)	Impact to Fish Passage
WL66	Culvert (crushed) at northern crossing – see WC-B, None at southern crossing	Proposed upgraded road alignment overlaps wetland complex at two locations – a northern crossing (associated with WC-B) and a southern crossing. At northern crossing, proposed upgraded road alignment overlaps surface water features (presumed fish habitat) on both sides of road. Replacement of crushed culvert on WC-B likely to improve fish access into wetland. No culvert/bridge currently exists at southern crossing. Proposed upgraded road alignment overlaps surface water features (presumed fish habitat) on west side of road. Proponent will consider installation of a culvert to re-establish natural wetland hydrology which may provide fish access into previously inaccessible fish habitat.	487.0	Improvement
WL73	None	No culvert is present at current wetland crossing. Proposed upgraded road alignment overlaps surface water features (presumed fish habitat) currently exist on both sides of road, likely caused by road impoundment. Proponent will consider installation of a culvert to re-establish natural wetland hydrology which may provide fish access into previously inaccessible fish habitat.	185.2	Improvement
WL76	Culvert (crushed) – see WC-G	Crushed culvert associated with WC-G located at wetland crossing. Proposed upgraded road alignment overlaps surface water features (presumed fish habitat) both sides of road. Replacement of crushed culvert likely to improve fish access into wetland.	398.6	Improvement
WL146	None	No culvert is present at wetland crossing. Proposed upgraded road alignment overlaps surface water feature (presumed fish habitat) on both sides of road – extensive flooding on west side likely caused by road impoundment. Proponent will consider installation of a culvert to re-establish natural wetland hydrology which may provide fish access into previously inaccessible fish habitat from WC-Z.	106.4	Improvement

Table NSE-2-17-1: Potential Direct Fish Habitat Impacts within the Haul Road (continued)

Watercourse Location	Current Crossing (Condition)	Plan for Upgraded Haul Road*	Direct Footprint Impact (m^2)	Impact to Fish Passage
WL154	None	Headwater wetland confined to west side of road. Proposed upgraded road alignment overlaps surface water feature (presumed fish habitat). No culvert proposed.	176.9	None
WL159	Culvert (hung) – see WC-AA	Hung culvert associated with WC-AA located at wetland crossing. Proposed upgraded road alignment overlaps surface water feature (confirmed fish habitat). Replacement of hung culvert likely to improve fish access upstream to WL160.	6.5	Improvement
WL160	Culvert (hung) – see WC-AA	Hung culvert associated with WC-AA located at wetland crossing. Proposed upgraded road alignment overlaps surface water feature (confirmed fish habitat). Flooding observed in wetland likely caused by improper culvert sizing. Replacement of crushed culvert likely to improve fish access and re-establish natural wetland hydrology.	836.5	Improvement
Total			**2,430.3**	

* For all reaches requiring fish rescue prior to culvert installation, fish will be released within the same watercourse or waterbody, typically in an area downstream of the proposed impact unless site conditions necessitate otherwise.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-18
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Project Activities
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3.1.2

Context and Rationale

"Construction material will be sourced from three quarries located along the length of the road with additional requirements for construction material, if required, sourced from either the Touquoy or Beaver Dam Mine Sites or local approved facilities"

The Proponent is Required to …

What is the erosion and sediment control plan for the quarries?

Will Industrial Approvals be required for the quarries along the Haul Road?

Noise conditions from these quarries were not included in the noise survey.

Response

AMNS commits to developing a site-specific Erosion and Sediment Control Plan that will be developed and submitted as part of the Industrial Approval application. A draft Sediment and Erosion Control Plan, Appendix C, PDF page 159, is provided in the Updated 2021 EIS (AMNS 2021, Mine Water Management Plan P.4).

It is anticipated that quarries selected to provide source material for the haul road will less than 4 ha in size and will follow the Nova Scotia Pit and Quarry Guidelines (NSEL 1999), including noise guidelines, which is consistent with noise predictions for the Haul Road in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

NSEL (Nova Scotia Environment and Labour). 1999. Pit and Quarry Guidelines. https://novascotia.ca/nse/issues/docs/Pit_and_Quarry_Guidelines.pdf, accessed November 2017.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-19
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Project Activities
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3.2.1

Context and Rationale

"Emulsion will be the primary blasting agent as the majority of holes will be wet. It is anticipated that explosives and all accessories will be supplied on an as needed basis from the contractor's base location off- site and delivered to the site explosive storage facilities or directly to the blast holes using the contractor's equipment."

The Proponent is Required to …

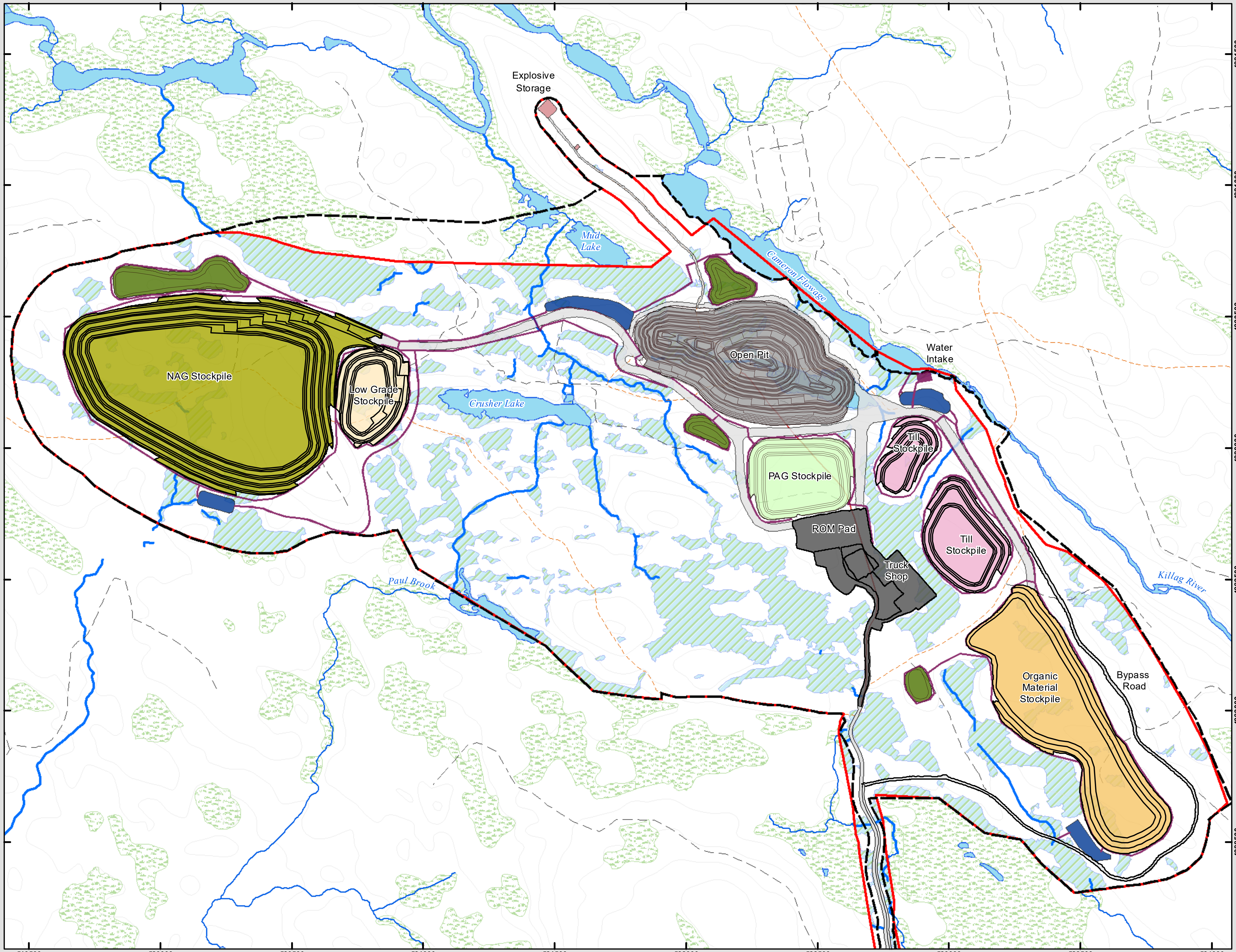
Explosive Storage Facilities are not shown on any maps.

Response

Refer to Figure NSE 2-19-1, which is the updated Beaver Dam Mine Site layout figure. The explosive storage areas are located in the northeast portion of the Project Area. Explosive storage areas are also described in the Project Description in the Updated 2021 EIS (AMNS 2021, Section 2.7.2.5, page 2-26) and can be found in Figure 2.2-2 (NSE-2-19-2), page 2-4 and Figure 2.3-2 (NSE-2-19-3), page 2-8.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.



Prepared For:

Atlantic Gold

FIGURE NSE-2-19-1

Beaver Dam Mine Site Layout

Proposed Infrastructure

- Crusher Pad
- Open Pit
- Low Grade Stockpile
- NAG Stockpile
- PAG Stockpile
- Organic Material Stockpile
- Topsoil Stockpile
- Till Stockpile
- Explosive Storage
- Road
- Settling Pond
- Water Management

- Topo Line - 5m contour
- Local Road
- Dry Weather / Seasonal Road
- Track
- NSTDB Mapped Watercourses outside PA
- Field Delineated Watercourses within PA
- Open Water / Lake
- Field Delineated Wetlands within PA
- NSE Mapped Wetlands outside PA
- Preliminary Property Boundary
- Project Area Boundary

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

0 125 250 500 m

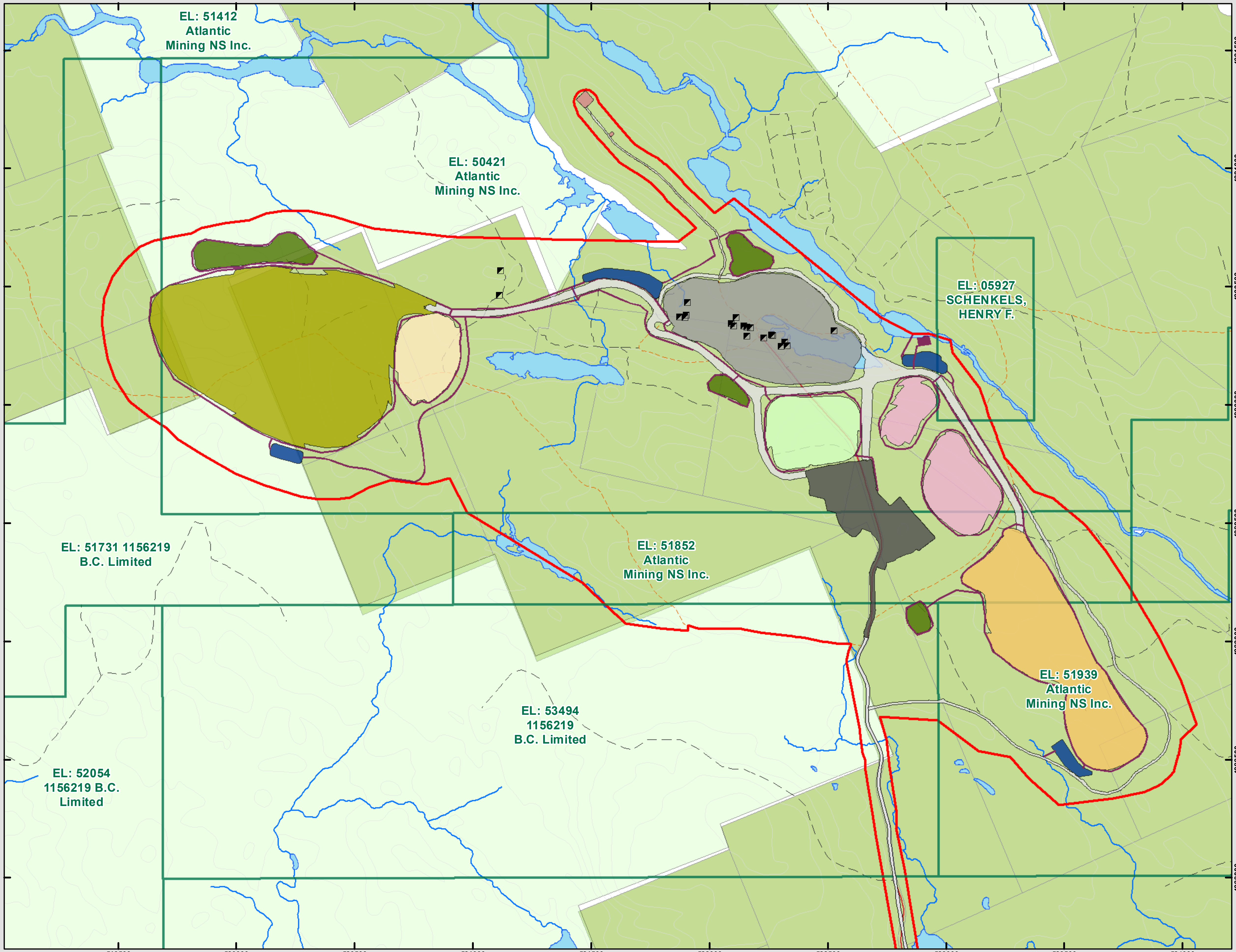
1:13,500 Scale when printed @ 11" x 17"

Drawn By: LP Date: 2021-04-12
Reviewed By: XX

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

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X General Mine Arrangement



Prepared For:

Atlantic Gold

FIGURE NSE 2-19-2

Beaver Dam Mine Project

Exploration License Boundaries

Proposed Infrastructure

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

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

0 125 250 500 m

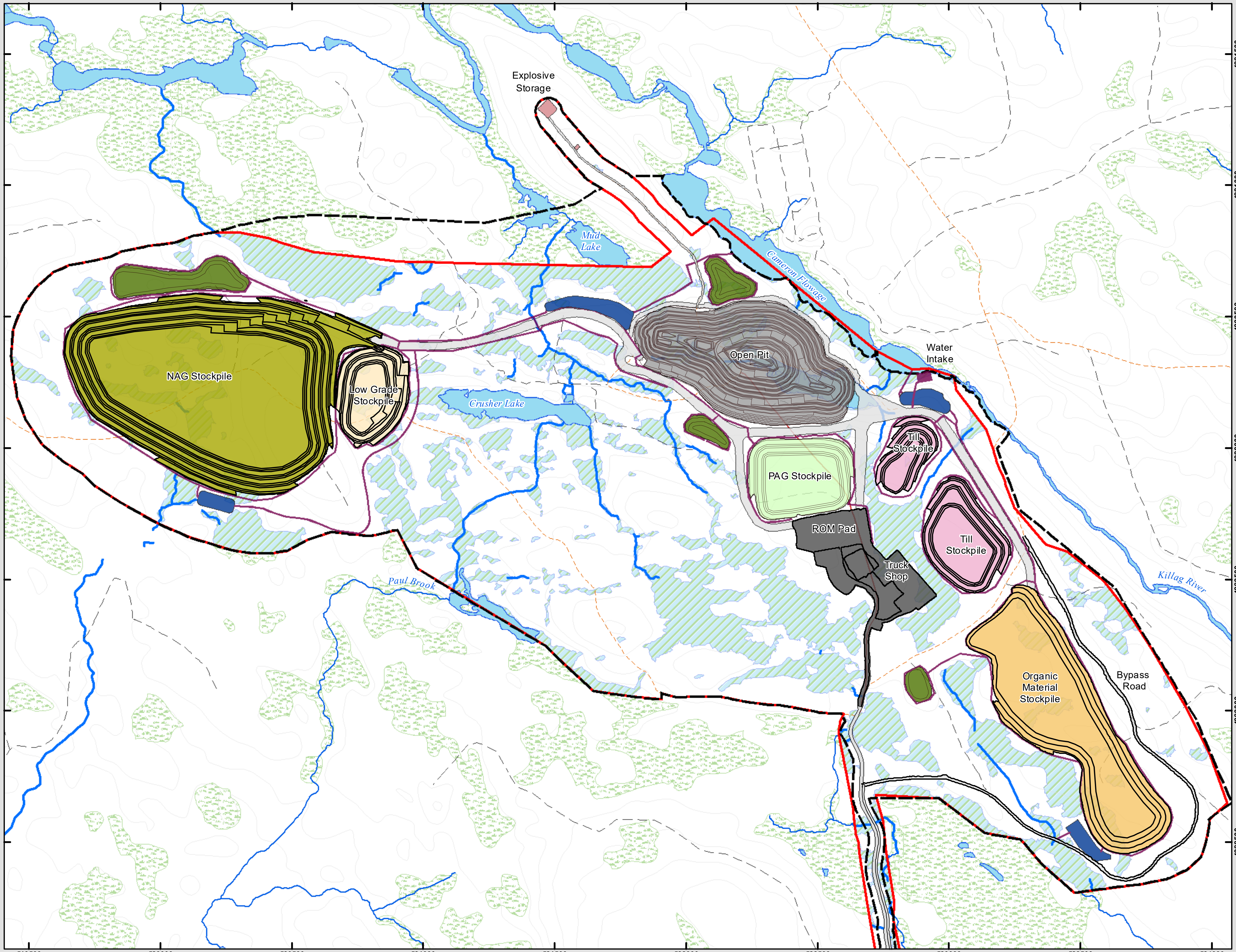
1:15,000 Scale when printed @ 11" x 17"

Drawn By: LP
Reviewed By: XX
Date: 2021-04-12

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

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X Exploration License Boundaries



Prepared For:

Atlantic Gold

FIGURE NSE 2-19-3

Beaver Dam Mine Project

General Mine Layout

Proposed Infrastructure

- Crusher Pad
- Open Pit
- Low Grade Stockpile
- NAG Stockpile
- PAG Stockpile
- Organic Material Stockpile
- Topsoil Stockpile
- Till Stockpile
- Explosive Storage
- Road
- Settling Pond
- Water Management

- Topo Line - 5m contour
- Local Road
- Dry Weather / Seasonal Road
- Track
- NSTDB Mapped Watercourses outside PA
- Field Delineated Watercourses within PA
- Open Water / Lake
- Field Delineated Wetlands within PA
- NSE Mapped Wetlands outside PA
- Preliminary Property Boundary
- Project Area Boundary

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

0 125 250 500 m

1:13,500 Scale when printed @ 11" x 17"

Drawn By: LP Date: 2021-04-12
Reviewed By: XX

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X General Mine Arrangement

Round 2 Information Request Number:	NSE-2-20
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Project Activities
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Table 2.3-2

Context and Rationale

States 1 Water/Gravel Truck Mine site road maintenance

The Proponent is Required to …

Touquoy has proven that one water truck is not enough. The Site uses three regularly throughout the summer months for dust control.

Response

AMNS will have adequate water trucks to control dust.

Round 2 Information Request Number:	NSE-2-21
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Project Activities - Decommissioning and Reclamation (years 5 to 7 and beyond)
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3.3

Context and Rationale

none

The Proponent is Required to …

What is the intent of land use after reclamation?

Response

A draft Reclamation and Closure Plan is provided in Appendix P.2 of the Updated 2012 EIS (AMNS 2021). Land Use following reclamation will be self-sustaining ecosystems with the potential to support land uses of an equivalent capability as predevelopment following closure. There will be a shift to upland vegetation from wetlands in some portions of the Project Area that will support a variety of habit types. There will also be an end pit lake. Reclamation and Closures Plans will be updated regularly and AMNS will engage with stakeholders, the Public and Mi'kmaq on suitable land uses before active closure.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-22
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Project Activities - Physical and Cultural Heritage
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Sections 2.3.3.2, 6.15.3.2

Context and Rationale

"The waste rock stockpiles will be constructed with 2.6:1 active slopes in 10 m lifts proceeding from north to south."

"The waste rock stockpile will be constructed in multiple lifts of 10 m with each lift having an active slope of 2:1."

The Proponent is Required to …

Inconsistent information; one section states slopes will be 2.6:1 and another section states 2:1.

Energy and Mines request final slopes of 3:1 for stability for reclamation.

Response

Atlantic Mining NS Inc. (AMNS) commits to final slope of 3:1 at closure for the waste rock pile (Updated 2021 EIS [AMNS 2021], Section 2.7.2.3.4, page 2-24, Topsoil Stockpiles).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-23
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Anticipated Project-Environment Interaction
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Tables 5.7-1 and 5.7-2

Context and Rationale

none

The Proponent is Required to …

Do not include the activity “Crushing”. Crushing consistently missing throughout report as an activity.

Response

Acknowledged and Updated 2021 EIS [AMNS 2021].

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-24
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Air Quality
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.2.2.3

Context and Rationale

"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 a great deal of uncertainty in how representative."

The Proponent is Required to …

If data is insufficient, is there a plan to sample more? Baseline TSP needs to be established as dust is going to be an issue.

Response

As it is, the assessment has used the highest measured TSP concentration as ""background"" for the purposes of the cumulative effects assessment. This is much more conservative than using a 90th percentile measured value, and likely to over-predict long-term background concentrations of TSP, and therefore provides a very conservative Project + Background and Project + Other Activities + Background (Cumulative Effects) assessment.

The Air effects assessment (Section 6.2, Table 6.2-15, page 6-89; Appendix C.3 draft Fugitive Dust Monitoring Plan). AMNS is proposing to include a dust monitoring program to confirm the effectiveness of proposed dust mitigation measures to be implemented along the roadway. This can be implemented prior to the commencement of operations to provide additional background concentrations for particulates.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-25
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Air Quality/Project Activities
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Sections 6.2.4.2, 2.3.1.1

Context and Rationale

"The Beaver Dam Mine mining, crushing, and transfer operations will primarily operate from within an open pit."

"A collection pond will be constructed to the south of the site facilities pad to collect surface water run-off from this area, ROM pad, primary crusher and crushed ore stockpile"

The Proponent is Required to …

Inconsistent with location of crusher. It is not realistic to place the crusher in the Open Pit with all the blasting events.

Response

There are two options being consider at the Beaver Dam Mine Site for crushing ore for transport to the Touquoy Mine. One operation is use small blasts within the pit to crush rock as described in the Project Description of the Updated 2021 EIS [AMNS 2021], Section 2.9.1.1.2, page 2-53. The other option is to use a Primary Crusher, which will be located adjacent to the run-of-mine pad.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-26
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Air Quality/Fish and Fish Habitat
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Table 6.2-6 Section 6.2.5.2 Table 6.9-23 and all other tables of this type

Context and Rationale

None provided

The Proponent is Required to …

Needs to include crushing. The blasted material will have to be crushed to specification for Haul Road construction.

Response

Particulate emissions from crushing have been included in the updated air quality assessment (Section 6.2 Air, page 6-32, and Appendix C.1 [Air Emissions Assessment Technical Report], Table 2A, PDF page 31 of the Updated 2021 EIS [AMNS 2021]) and references in Section 6.9 Fish and Fish Habitat Assessment, page 6-431, in the Updated 2021 EIS.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-27
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Air Quality
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Table 6.2-7 and Section 6.2.5.3

Context and Rationale

None provided

The Proponent is Required to …

Needs to include dust from deposition of tailings in the Touquoy Pit.

Response

Mine tailings will be deposited sub aqueously in a slurry as discussed in the Project Description in the Updated 2021 EIS [AMNS 2021] (Section 2.1.1, page 2-1) and detailed in the Touquoy Integrated Water and Tailings Management Plan (Appendix F.7), Section 3.0, PDF page 13 of the Updated 2021 EIS (AMNS 2021). As a result, no airborne emissions will occur from this activity and therefore not included in the Air effects assessment (Updated 2021 EIS [AMNS 2021] Section 6.2, page 6-32) and Air Emissions Assessment Technical Report (AMNS 2021, Appendix C.1), Section 2.1, PDF page 9.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-28
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Appendix C.3, Section 4.7

Context and Rationale

"Bench floors and haul roads should be constructed of material containing minimum fines. Capping should be competent granular material which doesn't easily break down into fines."

The Proponent is Required to …

Based on the assumption that the geology is the same compared to Touquoy, the rock will easily breakdown into fines once driven over. Is the Proponent planning to source "granular material that doesn't easily break down into fines" off site?

Report was written to provide Proponent options as opposed to having the Proponent commit to mitigation measures. From what we learned at Touquoy, this responsibility needs to have ownership ie environment or safety with daily commitment.

Response

AMNS commits to mechanical and chemical testing of materials to ensure suitability for road construction that includes erosion potential of the fines (i.e., preference for greywache and argillite; greywache is harder and less prone to erosion over time). AMNS will incorporate "lessons' learned" from Touquoy on final selection of materials as well as the placement of materials as described in the Project Description (Updated 2021 EIS [AMNS 2021] Section 2, page 2-1). The material will be sources from Touquoy, Beaver Dam Mine Site, local quarries and/or a commercial operation off-site. Appendix C.3, Section 4, PDF page 9, provides a draft Fugitive Dust Plan and the mitigations are focused on operational mitigations and not construction (Updated 2021 EIS [AMNS 2021])

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-29
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.3.3.1 Section 6.14.6 Appendix D Section 6 Section 2.4.2.4 Section 6.11.6

Context and Rationale

"Light monitoring was not completed during the baseline studies as ambient nighttime light conditions are not anticipated to cause any effects on the nearest residences. The Haul Road will not be active at night overnight and the Beaver Dam and Touquoy Mine Sites are located more than 5 km from the nearest residence. 3 km from the nearest resident at the Beaver Lake IR; however, the Haul Road will pass in proximity to a permanent dwelling on Beaver Dam Mines Road and seasonal dwellings on the Cross Road. Furthermore, other than the hauling trucks, no other lighting sources will be present along the Haul Road (i.e. street lights, traffic lights)."

"With regards to the Haul Road, the Proponent has indicated that trucking operations will occur under daytime and evening conditions (6am to 11 pm)."

"Atlantic Gold has indicated that trucking operations will occur under daytime and pre-curfew conditions and are unlikely to occur during dawn/dusk hours."

"The remaining mobile equipment will include haul trucks, which will travel from the Beaver Dam Mine Site to the Touquoy Mine Site, a distance of approximately 30 km. The number of return truck trips per day will be an annual average of approximately 185 (370 one-way trips) or between 31 and 23 trucks per hour for 12 or 16 hours per day, 350 days per year for the duration of the mine Project (3.3 years)."

"The calculated light levels at the residential receptors outlined within the Light Impact Assessment (Appendix D.1) are below the limits recommended by the Institute of Lighting Engineers (ILE) guidelines. Light impacts from trucks on the Haul Road are expected to be insignificant compared to baseline daylight illuminance and the amount of light blocked by the surrounding woodland and topographic changes at the Beaver Dam Mine Site will likely be >90%."

The Proponent is Required to …

Inconsistent information about daylight conditions during haulage. Haulage will not be occurring "overnight" however hauling will be occurring during no sunlight conditions especially during the winter season as "Pre-curfew" conditions are prior to 23:00.

Assess lighting for dark conditions or assess hours of haulage to be sunlight only.

Between 31 and 23 trucks per hour during winter conditions will have an impact on the nearest residences.

How is it compared to baseline no sunlight conditions?

Response

Hauling of ore from the Beaver Dam Mine site will be from 7AM to 11PM. An updated Light effects assessment is provided in Section 6.3, page 6-93, and Appendix D.1, Section 5, PDF page 8, (Light Impact Assessment) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-30
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	6.5.2 and Appendix C

Context and Rationale

none

The Proponent is Required to …

How did you determine how grab samples to collect along the "Preferred Alternative Haul Road" to establish baseline?

Response

The Preferred Alternative Haul Road is no longer being considered as discussed in the Project Description of the Updated 2021 EIS (AMNS 2021, Section 2, page 2-1). Baseline water sample locations and methods is described in Section 6.7 Surface Water Quality and Quantity, page 6-213 as well as in the Fish and Fish Habitat Baseline Report (Updated 2021 EIS [AMNS 2021] Section 6.9, page 6-431 and Appendix J.2).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-31
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Geology, Soil, and Sediment
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	6.5.3.2 and Appendix E.1

Context and Rationale

none

The Proponent is Required to …

Is the figure for Appendix E.1 Figure 2-1 from the Instrinsik report (Appendix C.2)? If so, why isn't SED10 included in the Appendix E.1 data.

Response

The information in Appendix E.1 (Sediment Baseline Analytical Results) has been updated with Environmental Site Assessments, which are provided in Appendix E.6 (Phase I - Environmental Site Assessment), Appendix E.7 (Limited Phase II - Environmental Site Assessment), and Appendix E.8 (Extended Phase II - Environmental Site Assessment) of the Updated 2021 EIS (AMNS 2021) that provides sediment, soil and water samples that better characterize historic tailings on the Beaver Dam Mine Site. These combined assessments (Appendices E.6 to E.8) are the basis for the removal of historic tailings and waste rock during construction as we well as the need for water treatment during construction and operations (updated Section 2.7, page 2-17 [Project Components] and Section 6.5.3, page 6-125 [Baseline Program Methodology for Soil and Sediments]). As a result, Appendix E.1 has been superseded by these assessments.

To address the specific, Information Request Figure 2-1 from the Intrinsik Report (Evaluation of Exposure Potential Related to Dust Deposition from Haul Road Traffic onto Soils Berries and Vegetation), Appendix C.2 of AMNS 2019 does not correspond to the locations in Appendix E.1. Table NSE 2-31-1 provides a description of the baseline sediment sampling undertaken in 2016, which were focused on an outdated Beaver Dam Mine Project Description and Mine Layout. Figure NSE 2-31-1 provides the location of the baseline sediment samples undertaken in 2016 (Referred in the legend of the figure as "Baseline Data" from Figure NSE-2-31-1). It does appear that one sample location is missing from the figure.

Table NSE-2-31-1: Baseline Sediment Locations for the Beaver Dam Mine Site (Baseline Samples, 2016)

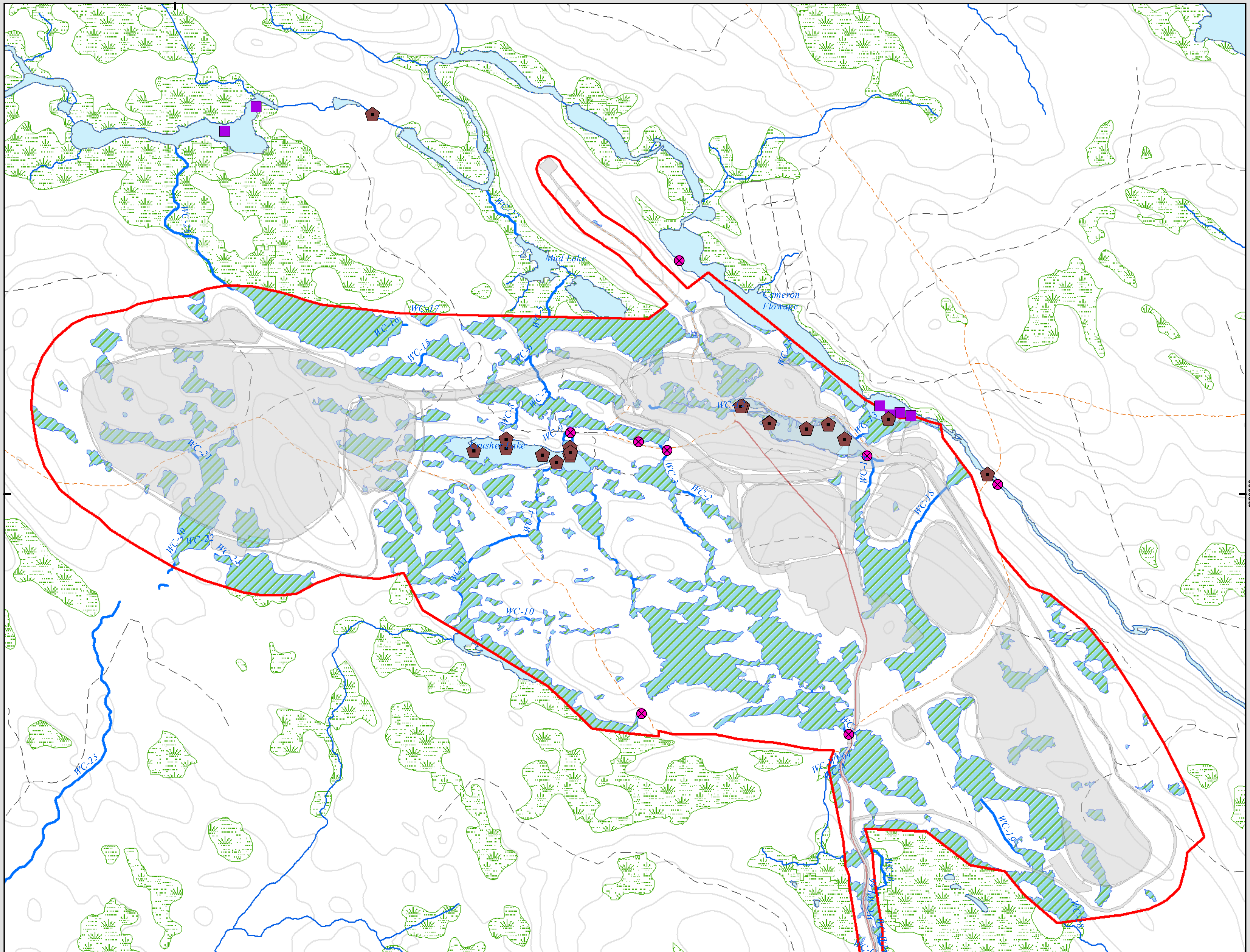
Sample ID	Sample Location	Sample Location Rationale
SED1	Downstream of Cameron Flowage	To characterize sediment quality downstream and south of Project activities
SED2	Upstream of Cameron Flowage	To characterize sediment quality upstream and north of Project activities
SED3	Down-gradient of till stockpile and outflow from Crusher Lake	To characterize sediment quality downstream of Project activities
SED4	Down-gradient of till stockpile	To characterize sediment quality downstream of Project activities
SED5	Down-gradient of till stockpile into Wetland 20	To characterize sediment quality downstream of Project activities
SED6	Downstream of Cameron Flowage	To characterize sediment quality downstream and south of Project activities
SED7	Downstream of facilities, ore storage and crushing facilities	To characterize sediment quality downstream and south of Project activities
SED8	Downstream of waste rock pile	To characterize sediment quality downstream of waste rock storage
SED9	Downstream of waste rock pile	To characterize sediment quality downstream of waste rock storage

Source: Revised 2019 EIS (AMNS 2019, Section 6.5, page 6-123 [Geology, Soils and Sediment Quality]).

References

AMNS (Atlantic Mining NS Inc.). 2019. Revised Environmental Impact Statement – February 28, 2019. Beaver Dam Mine Project. Submitted to the Canadian Environmental Assessment Agency and Nova Scotia Environment. February 2019. Middle Musquodoboit, NS.

AMNS. 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.



Prepared For:

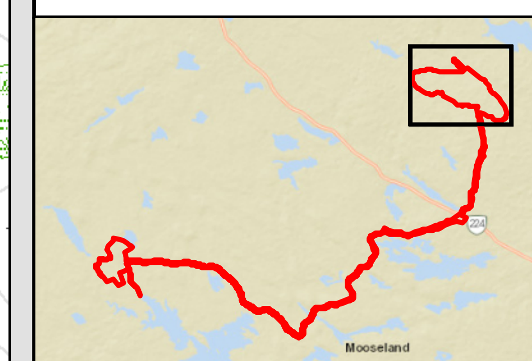
Atlantic Gold

FIGURE NSE-2-31-1

Beaver Dam Mine Project

Beaver Dam Mine Site and Haul Road Sediment Sample Locations

- Sediment Sample (2020)
- Baseline Sediment Locations (Table 6.5-1)
- Environmental Effects Monitoring Sediment Water Sample Locations
- Field Delineated Watercourses
- NSTDB Mapped Watercourses
- Local Road
- Dry Weather / Seasonal Road
- Track
- Proposed Infrastructure
- Field Delineated Wetlands
- Lakes
- NSE Wetlands
- Project Area



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

0 175 350 700 m

1:14,161 Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed By: LP
Date: 2021-05-24

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

McCallum Environmental Ltd.

Document Name: BD_EIS_Figure6-5-XSampleLocations

Round 2 Information Request Number:	NSE-2-32
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Geochemistry
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Table 1-1 Section 6.5.3.4 Appendix E.2 section 4.1.2.2 Section 2.3.3.3

Context and Rationale

"Acid is not expected to be produced during operating conditions. It is expected acid will be produced from the waste rock piles during post- closure conditions, however, onsite treatment and mixing with neutral groundwater in the pit prior to discharge will ensure minimal acid contribution to the Killag River. Discharge will likely have a pH higher than the background pH of approximately 5.4."

"Approximately 40% of the Beaver Dam samples were classified as potentially acid generating (PAG) based on having an NPR-threshold of 2, where samples with an NPR of < 2 are considered PAG, while samples with a NPR of ≥ 2 are non-acid generating (NAG). This NPR value is consistent with the criteria proposed in Price (2009). Generally, argillitic samples have a higher proportion of PAG samples than the greywacke sample population."

"The majority of PAG samples are expected to take several years to become acid producing."

"The results of this exercise are shown in Figure 4-11b and show that it will take around 20 years for 10% of all PAG samples and 28 years for 50% of all PAG samples to turn acidic."

"This post closure phase is estimated to be 15-20 years in length and is subject to revision with expected refinements to model predictions."

The Proponent is Required to …

ARD is anticipated to be generated 10-20 years. Post closure plan is scheduled to end at 20 year when more of the 50% of the PAG samples are expected to start generating ARD. Why doesn't the closure plan extend past this point?

Response

The Reclamation and Closure Plan (Appendix P.2) will be updated throughout the life of mine including the monitoring time period. The goal is to achieve physical, chemical, and biologically stable ecosystems. Monitoring will confirm when this goal is being achieved and it is difficult at the assessment stage to determine the appropriate length of time. The monitoring program results will determine if the reclamation goal has been achieved. The length of the post closure monitoring program would be subject to discussions with regulators and communities regarding the monitoring results. A draft Metal Leaching and Acid Rock Drainage (ML/ARD) Management Plan in the Updated 2021 EIS (AMNS 2021, Appendix E.5, Section 4, PDF page 18) has been developed to confirm and update monitoring predictions.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-33
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Groundwater
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.6.2.1

Context and Rationale

"To further define baseline conditions at the Beaver Dam Mine Site, a monitoring well drilling, installation and hydrogeologic investigation program was conducted from March 29, 2018 to May 7, 2018."

The Proponent is Required to …

This is only 2 months of data, it's not even one complete season. More data is required.

Response

More data has been collected. The Baseline Groundwater Program Beaver Dam Memorandum (Appendix F.4 of the Updated 2021 EIS [AMNS 2021]) presents groundwater quality and quantity data collection from approximately June 2018 through November 2020. Over the June 2018 through November 2020 groundwater elevations have been measured continuously using transducers installed in monitoring well locations. A total of 9 quarterly groundwater quality monitoring events have been completed to date. This is more than 2 years of groundwater quality and quantity data and is sufficient for the purpose of baseline monitoring.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-34
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.6.6.3 and Appendix F.6

Context and Rationale

"Upon the filling of the open pit to its ultimate lake stage at 108 m asl, groundwater flow is anticipated to flow from the pit to Moose River through the glacial till and weathered fractured bedrock. Solute transport modelling using the calibrated model simulates a slow migration of solutes to Moose River, with concentrations approaching a steady state after about 150 years of travel."

The Proponent is Required to …

What is the plan to decrease this timeline? as the Proponent is not planning to monitor the site for 150 years.

Also, as water is expected to flow through the fractured bedrock, what is the potential impacts to Moose River once tailings deposition starts?

Response

a. The predicted groundwater seepage to Moose River represents about 0.2% of the mean annual flow in Moose River. The solute transport model conservatively assumes that the concentration of solute in the pit water remains at the pore water concentrations indefinitely. This conservative assumption yields a relatively small mass loading to Moose River via groundwater despite the relatively high predicted concentrations in the groundwater seepage. The assimilative capacity modelling presented in Appendix F.8 (Beaver Dam Gold Project Assimilative Capacity Study of Moose River – Touquoy Pit Discharge, Updated 2021 EIS [AMNS 2021]), the groundwater seepage discharged to Moose River is diluted by a factor of 212 and are not predicted to adversely affect the water quality in Moose River.

b. The net effects of the flow through the overburden and fractured bedrock are characterized in Section 6.6.4.1, page 6-161 (Groundwater – Regional Baseline Conditions) and Appendix F.6 (Groundwater Flow and Solute Transport Modelling to Evaluate Disposal of Beaver Dam Tailings in Touquoy Open Pit) in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-35
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Groundwater
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.6.8

Context and Rationale

"Groundwater modelling was completed for the Beaver Dam Mine Site and included an assessment of the geographic extent for changes to the quantity and quality of groundwater for the site, Haul Road, and Preferred Alternative Haul Road. No current water supplies will be affected by the project as designed and proposed in this EIS document. Therefore, a mitigation plan is not necessary, however the Proponent has stated in public and Mi'kmaq engagement sessions that prudent project planning means that monitoring of the water supplies at Beaver Lake IR and any identified water supplies along the selected final Haul Road would be completed."

The Proponent is Required to …

This project is occurring on crown lands and could be considered potable in the future.

Response

It is recognized that the project is occurring on land and the comparison of simulated contaminants of concern (COC) concentrations in groundwater to GCDWQ and Tier 1 EQS for potable groundwater was completed for the Beaver Dam Site. Section 7.4.5 of the Hydrogeologic Modelling Report, PDF page 47 (Appendix F.5 of the Updated 2021 EIS [AMNS 2021]), presents the comparison of predicted COC concentrations against GDWQG and Tier 1 EQS for potable groundwater. Appendix F.9 of the Updated 2021 EIS [AMNS 2021] Section 1, PDF page 3, compares predicted concentrations at sensitive receptor locations (potential potable water sources) that could occur as a result of dust deposition along the Haul Road against GDWQG and Tier 1 EQS for potable groundwater.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-36
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.2.3

Context and Rationale

"The Touquoy Mine Site is in an area of historic gold mining activity, with a network of small underground workings and bottle pits dating from as far back as 1866. Gold production from Moose River Gold Mines, near the Mine Site, commenced around 1877. A field sampling plan of the Mine Site area identified historical tailings at the mines to have elevated concentrations of arsenic and mercury. Due to the wide distribution of historical tailings in the area, and the length of time the tailings have been in place, they have the potential to have a negative impact on surface water quality."

The Proponent is Required to …

Complete a Phase II ESA to delineate historic impacts at Beaver Dam.

Response

Environmental Site Assessments has been updated since the Revised 2019 EIS and are provided in Appendix E.6 (Phase I - Environmental Site Assessment), Appendix E.7 (Limited Phase II - Environmental Site Assessment), and Appendix E.8 (Extended Phase II - Environmental Site Assessment) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-37
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6 2.2.1.6 Section 6.7.6.1.1

Context and Rationale

"Based on results from recent surface and groundwater quality modelling, an effluent treatment plant will be utilized as required to ensure that any discharge meets the applicable federal MDMER criteria."

"The effluent treatment at the Beaver Dam Mine Site will be conceptually similar to the plant currently used at the Touquoy mine Site."

"The treatment system, if required, will be designed to ensure that all site effluent water meets MDMER and CCME, established background concentrations, or Site Specific objectives. During EOM conditions the treatment system will be placed adjacent to the North Settling Pond. The treatment system during PC conditions will likely be moved to the proposed discharge point from the pit lake."

The Proponent is Required to …

Inconsistent information about ETP requirements. Section states that recent surface and groundwater quality modeling proves the necessity of an ETP. This ETP will be similar to the Touquoy set-up.

How is this set-up going to be moved at EOM to the proposed discharge point from the pit lake? It is not a mobile structure. Is a second plant intended to be built?

Response

A Mine Water Management Plan that describes water treatment that will be undertaken during construction (Appendix F.7, PDF page 517), operation (Appendix F.7, PDF page 582) and active closure (Appendix F.7, PDF page 624) is provided in Appendix P.4 of Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-38
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.1.1

Context and Rationale

"There are three discharge points proposed during EOM conditions and PC conditions. During EOM conditions, site water from the waste rock, low grade ore stockpiles and the pit will be routed through the North Settling Pond prior to discharge into the Killag River."

The Proponent is Required to …

Why not change this to one discharge point at all times in order to better control water quality and use of ETP?

Response

Water will be discharged from the North and East Settling Ponds during construction and operations as described in Section 6.7, page 6-213 (Water Quantity and Quality) of the 2021 Updated EIS and the Mine Water Management Plan (Appendix P.4) (AMNS 2021). The north settling pond will collect the majority of water on site for treatment. Water the meets regulatory criteria will be discharged to the Killag River. The East Settling pond will collect contact water from the till stockpile, which is only predicted to treat run-off for total suspended solids (TSS) prior to discharge. If water quality in the East Settling Pond requires additional treatment then it will be directed towards the North Settling Pond for treatment, monitoring and will be discharged when it achieves discharge criteria. The South Settling Pond will collect water from the organic stockpile where it will be passively treated for TSS prior to discharge to the Tent River watershed. At closure water will be discharged from the pit via a spillway. Details are provided in the Mine Water Management Plan (Appendix P.4 Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-39
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.1.1

Context and Rationale

"The results of the pre-mining geochemical characterization will also be used to inform the operational phase ML/ARD Monitoring & Management Plan, which will consist of the following:

- Definition of geochemical analyses required for the classification or environmental rock types.
- Derivation of proxies and criteria to classify PAG versus NPAG materials rapidly on site.
- Definition of optimum sampling frequency of waste rock, ore, tailings and overburden throughout the life of mine based on the observed geochemical variability.
- Definition of criteria distinguishing construction from non-construction materials.
- Development of material handling and ARD prevention/mitigation strategies.

The implementation of the above Plan will confirm whether acidic conditions can be anticipated during the closure phase and will inform the adoption of appropriate mitigation to be applied (refer to Section 6.7.8, page 6-269 for mitigation measures)."

The Proponent is Required to …

What is the timeline for completing this work? This should be included in the EIS.

Response

The Beaver Dam Mine Project draft Metal Leaching and Acid Rock Drainage (ML/ARD) Management Plan has since been prepared and is provided in Appendix E.5 of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-40
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.1.2

Context and Rationale

"The time to fill the pit is equal to the sum of the volume of water in the pit divided by the total inflow rate to the pit at each stage. Based on these calculations the pit filling time is equal to 13.8 years."

The Proponent is Required to …

Can this time be decreased by pumping water from the ETP into the pit?

Response

AMNS included opportunities to reduce the pumping time by directing all surface water runoff to the pit at closure; however, supplemental pumping from the Killag or groundwater is not suitable to reduce the refilling time because of potential impacts on fish and wetlands (Section 6.7 Water Quantity and Quality, page 6-213; AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-41
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.3.1 and Appendix G.2 Figure 2.1

Context and Rationale

"Based on the water balance model results (Stantec 2018d), no water will be discharged from the exhausted Touquoy open pit until the pit reaches the spillway elevation in Year 7. This allows for many years of water treatment in the pit as a batch reactor with the objective of adjusting the pH to precipitate metals, potentially improving discharge criteria toward MDMER discharge criteria."

The Proponent is Required to …

Appendix G.2 Figure 2.1 shows an arrow from the Open Pit to the ETP for additional treatment at reclamation. Why is this not being utilized to treat the pit water? If it is, where is this water going to be release (ie back to the pit? Or to the Polishing Pond?)

Response

A Touquoy Tailings and Water Management Plan is provided in Appendix F.7 (Touquoy Integrated Water and Tailings Management Plan) of the Updated 2021 EIS (AMNS 2021). If treatment is required at closure, then an ETP may be repositioned near the pit so that water can be release to the pit. Water treatment at closure will be included in updates to the Touquoy Reclamation Plan.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-42
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.3.1

Context and Rationale

"Concentrations of cobalt, copper and nitrite in groundwater were predicted in the model above the CCME FAL (Freshwater Aquatic Life guidelines) or NSE EQS (Nova Scotia Environment Environmental Quality Standards) in the untreated pit lake at discharge. The groundwater seepage quality was assumed to be consistent with the source terms pore water quality, at an estimated average concentration of 0.002 mg/L of arsenic to Moose River. Based on the assimilative capacity model in Moose River these parameters meet CCME FAL/NSE EQS after mixing with Moose River 100 m downstream of the discharge point."

"The water quality discharged from the pit lake to Moose River will be treated to meet MDMER discharge/regulatory closure criteria or site- specific guidelines, if required. Without treatment, arsenic concentrations of 0.86 mg/L are predicted to exceed the MDMER discharge criteria of 0.3 mg/L in Year 19 based on climate normal conditions."

The Proponent is Required to …

Inconsistent information. Doesn't the second paragraph prove that treatment is required before discharged?

Why not utilize the ETP instead of mixing within Moose River?

Response

The intent of this section is to illustrate that although the groundwater mass loadings are estimated conservatively high, but don't result in adverse environmental effects to Moose River once the groundwater seepage mixes with the flow in Moose River (also provided in response NSE-2-34).

The mass loading to Moose River from groundwater seepage is predicted to occur much later than the surface water discharges following the filling of the Touquoy pit. The continued operation of an effluent treatment plant to extract and treat groundwater seepage for more than 100 years is not warranted in this case, as the water quality in Moose River will be similar to the existing water quality post-closure.

Round 2 Information Request Number:	NSE-2-43
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Fish and Fish Habitat
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.9.3.5

Context and Rationale

"The Nova Scotia Salmon Association (NSSA) is currently conducting a liming project in tertiary watersheds that are located within the PA."

The Proponent is Required to …

Proponent indicates that liming project won't be impacting by mining activities at Beaver Dam. The two discharges points upgradient (North Settling Pond and Pit Discharge) could impact water quality and the lime program.

Response

Predictive water quality modelling, mine water management, and treatment options have been revised in the Updated 2021 EIS (AMNS 2021, Appendix C, PDF page 159 of Appendix P.4 [Mine Water Management Plan]). Based on these updated evaluations, the Proponent has committed to maintaining compliance with all applicable water quality guidelines at the discharge points, given the proposed contact water collection and treatment plan. Provided treatment and mitigation measures outline throughout the EIS and associated management plans are followed, no direct impacts to the NSSA Acid Mitigation Project (NSSA AMP) are expected.

The interactions between the Project and the NSSA AMP are included in the Cumulative Effects Assessment in the Updated 2021 EIS (AMNS 2021, Section 8.3, page 8-3), as the projects overlap temporally and spatially (within the West River Sheet Harbour Secondary Watershed).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-44
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Fish and Fish Habitat
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Table 6.9-26

Context and Rationale

"Runoff from acid producing rock exposed during construction activities has the potential for negatively altering water quality within down- gradient fish habitat."

The Proponent is Required to …

Inconsistent information, Appendix E.2 Section 4.1.2.2 states that it will take approximately 20 years for ARD to generate. This table states it will happen during construction and development of the mine.

Response

The metal leaching and acid rock drainage (ML/ARD) assessment completed by Lorax (Appendix E.2) was a geochemical study to characterize mine material within the proposed pit. Initial predictions indicate that it will take at least 20 years for the onset of the Beaver Dam Mine potentially acid generating (PAG) waste rock to turn slightly acidic.

Historical tailings and waste rock have been deposited within the open pit and will be excavated early in the mine life. There is also a potential for ML/ARD to be generated from excavating or exposing material during construction activities. This information has been used to inform impact predictions on surface water quality during construction and are outlined in the Updated 2021 EIS in Section 6.7.8, page 6-269. The potential impacts to surface water quality are referenced in Section 6.9.7, Table 6.9-11, page 6-487 and is referenced in Section 6.9.7, page 6-485 (AMNS 2021).

A Metal Leaching and Acid Rock Drainage Management Plan (Appendix E.5) is being developed to monitor acid rock drainage during the life of mine. AMNS will adaptively manage the placement and long-term reclamation of acid rock drainage on-site. A Historic Tailings and Waste Rock Management Plan (Appendix E9) has also been prepared for the Project to monitor and update estimates when construction and operations commence.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Marinette, NS.

Round 2 Information Request Number:	NSE-2-45
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Fish and Fish Habitat
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.9.6.2.1

Context and Rationale

"Once the lake is full (approximately 14 years) additional water will overflow the pit walls through an engineered outfall structure directly into the Killag River (Appendix G.5, GHD, 2018)."

The Proponent is Required to …

This engineered outfall structure is not located in this Appendix. What is the set-back of the Pit East wall to Killag?

Is what from the pit expected to seep into the Killag?

Response

The engineered outlet structure of the pit lake will be set back from the Killag River by approximately 110 m in post-closure conditions. The pit lake discharge will be directed to an existing channel (WC13, which, under baseline conditions connects Wetland 59 to Cameron Flowage) towards Cameron Flowage. The outfall will be designed to control discharge so that it can be accommodated by the existing channel.

The shortest distance between the pit wall and the Killag River is approximately 60 m. While the pit is predicted to be a net groundwater sink, some groundwater seepage is predicted to move from the pit to Cameron Flowage. The details of seepage water quality and quantity will be outlined in detail in the groundwater chapter of the Updated 2021 EIS [AMNS 2021], and all mass loadings from groundwater to surface water, including that from the proposed Pit lake to Cameron Flowage, are incorporated into the surface water quality predictions (Section 6.7 Water Quantity and Quality, page 6-213). Furthermore, a technical memorandum outlining predicted effects of baseflow reductions on Cameron Flowage has been prepared and will be included in the Updated 2021 EIS (AMNS 2021, Appendix H, PDF page 664 [Baseflow Mitigation Assessment] of Appendix P.4 [Mine Water Management Plan]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-46
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Fish and Fish Habitat
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.9.6.2.2

Context and Rationale

"The removal of wetlands and watercourses also has the potential to alter surface flows and downgradient hydrology. Water quality could be further affected from an increase in Total Suspended Solids (TSS) associated with potential siltation and release of substances to downstream receiving surface water systems adjacent to mine infrastructure (LAA)."

The Proponent is Required to …

Proponent will require a sediment control plan for this not to happen.

Response

A Mine Water Management Plan that includes erosion controls is provided in Appendix P.4 of the Updated 2021 EIS [AMNS 2021]. A draft Erosion and Sediment Plan (Appendix C, PDF page 159 in the Water Management Plan Appendix P.4 Updated 2021 EIS [AMNS 2021]) will be implemented during construction and operation to mitigate the release of sediment from the mine site to the receiving surface water systems.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-47
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Fish and Fish Habitat
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.9.6.2.2

Context and Rationale

"Discharge from the till stockpiles does not require treatment because it is not anticipated to have any water quality concerns."

The Proponent is Required to …

Inconsistent information, Appendix E.2 states that overburden samples have potential for elevated Al and As in runoff, and potentially other elements.

There should be no anticipation at this point. Geochemistry should be fully assessed and evaluated at this stage.

Response

Runoff from the till stockpiles will be collected and discharged through the east settling pond where water quality will be monitored and discharged. Water quality predictions in the East Settling Pond based on runoff from the till stockpiles have been updated and indicate the elevated concentrations of aluminum and arsenic and other elements are not expected. Treatment is not expected to be necessary at the East Settling Pond; should monitoring indicate that treatment is necessary, water will be directed to the North Settling Pond for treatment and monitored prior to release, which is described in the Mine Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-48
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Fish and Fish Habitat
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.9.7.2 and 6.9.7.3.2

Context and Rationale

"No fish collection, electrofishing, or benthic macroinvertebrate sampling was conducted within the watercourses of the Preferred Alternative Haul Road PA because these watercourses are located upstream of and are contiguous with watercourses that cross the current Haul Road. Methodologies and baseline conditions of fish collection, electrofishing, and benthic macroinvertebrate sampling on the Haul Road are presented within Section 6.9.2 and 6.9.3."

"No electrofishing surveys were conducted within the Preferred Alternative Haul Road, however, all the watercourses within the Preferred Alternative Haul Road are tributaries to watercourses that are present within the Haul Road, to the south. Table 6.9-33 describes contiguity between watercourses."

The Proponent is Required to …

Just because they are contiguous/upstream doesn't mean the conditions are the same. One would expect similar results however this unknown unless the study is completed.

Response

This information request refers to insufficient fish surveys in watercourses along the Preferred Alternate Haul Road (PAHR). The PAHR route has been removed from the updated Beaver Dam Mine Project Description. Fish and fish habitat information along the Haul Road is presented in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-49
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 2.4.2.4

Context and Rationale

"The remaining mobile equipment will include haul trucks, which will travel from the Beaver Dam Mine Site to the Touquoy Mine Site, a distance of approximately 30 km. The number of return truck trips per day will be an annual average of approximately 185 (370 one-way trips) or between 31 and 23 trucks per hour for 12 or 16 hours per day, 350 days per year for the duration of the mine Project (3.3 years)."

"The Haul Road (sometimes locally referred to as the Cross Road) connects Hwy 224 and Mooseland Road. Currently, local traffic from a few seasonal properties and recreational use the Haul Road path. In the past (not observed during baseline studies) it is reported that the Haul Road will have intermittent high use periods (up to 100 truck trips per day) associated with haul trucks and forestry worker trucks from logging activities utilizing the Haul Road."

The Proponent is Required to …

Inconsistent information; one section states 185 trips per day and another section states up to 100 truck trips per day.

Response

The number of trucks is based on production schedule and truck availability in Nova Scotia. The number of return truck trips per day will be an anticipated annual average of approximately 95 for 16 hours per day, 350 days per year for the duration of the mine Project (5 years). The maximum number of truck trips will occur in years 2 to 3 of operations with significant reduction in year 1 and years 4 to 5 (Section 6.16.10, page 6-917). The final number of trucks used in this assessment is based on Pre-Feasibility assessment (Atlantic Gold 2019) and predicted project overlap, which may be subject to change based on permitting timelines. This has been updated and is presented in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-50
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.18.3.1

Context and Rationale

"A worst-case scenario is the severe collapse of areas directly adjacent to the open pit and ground surface slump of the surrounding area possibly affecting the site's infrastructure, Haul Roads, and on-site access roads and worker safety. However, the site's components and infrastructure have been designed as far from the perimeter of the open pit as possible so it is not expected that slope failure would affect the site's components and infrastructure."

The Proponent is Required to …

What is the distance between Killag River and the North/Northeast wall of the pit?

Response

The shortest distance between the pit wall and the Killag River is approximately 60 m.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-51
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.18.3.1

Context and Rationale

"An in-mine water diversion ditch will be established along the top bench of the mine to intercept any surface water that infiltrates the berm and flows into the mine. This ditch will direct water to in-mine sumps where it will be pumped out of the mine."

The Proponent is Required to …

This will require a big holding pond. The Proponent has stated these ponds will be sized and designed in the IA process however the size of these ponds will be very large and will have an impact on the proposed site layout.

Response

The holding ponds (called settling ponds in EIS) are designed to control site runoff generated from the 25 mm 4-hour to 100-year 24-hour storm events over a minimum 24-hour duration through passively controlled outlet structures. Table NSE 2-51-1 provides a summary of the settling pond details and dimensions. Settling pond locations are provided in Round 2, Information Request (IR2) NSE-2-58, Figure NSE-2-58-1.

Table NSE 2-51-1: Settling Pond Details and Dimensions

	North Settling Pond	East Settling Pond	South Settling Pond
Contributing Area (ha)	121.0	44.1	24.0
Surface Area (ha)	1.52	1.02	0.87
Volume (m^3)	48,438	36,834	22,880
Depth (m)	4.8	5.5	3.5
Permanent Pool Depth (m)	1.50	1.25	1.00
Active Storage Depth[(a)] (m)	2.60	3.25	2.00
Invert Elevation (mAD)	130	128	152

Source: AMNS (2021, Appendix P.4)

Notes: [(a)] Depth from top of permanent pool to emergency spillway invert; includes minimum 0.3 m freeboard.

ha = hectares; m^3 = cubic metre; m = metre; mAD = metres above datum.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-52
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.18.4.6, Table 6.18-9

Context and Rationale

"Unplanned Tailings/Reclaim Water Line Event Interactions with VCs"

The Proponent is Required to …

The following areas are listed as "No potential interaction anticipated" however there is potential for contamination with an unplanned tailings/reclaim water line event:

- Geology, Soil, and Sediment Quality
- Groundwater Quality and Quantity
- Habitat and Flora

Response

Accidents and Malfunctions is described in the Updated 2021 EIS (AMNS 2021, Section 6.18, page 6-934).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-53
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.18.4.6

Context and Rationale

"Other immediate responses may include lowering tailing pond levels, stopping the inflow into the tailings pond from the mill, stabilizing unstable slopes, and mitigating downstream consequences."

The Proponent is Required to …

Not fully understanding this action plan; the water level in the Touqouy pit will not be an issue for the deposition of tailings and to take Mill process water.

Why are there unstable slopes?

Response

This is corrected in the Accident and Malfunction Section of the Updated 2021 EIS (AMNS 2021, Section 6.18, page 6-934). A Touquoy Integrated Tailings and Water Management Plan is provided in Appendix F.7 of the Updated 2021 EIS (AMNS 2021) that provides more details on the management of tailings.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-54
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	*Not listed*
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.2.1.6 Section 6.18.3.2

Context and Rationale

Surface water run-off from the eastern and western waste rock stockpiles, low grade ore stockpiles, Beaver Dam Mine Site roads, and some natural area will flow by gravity, with the aid of berms and channels, to the north settling pond, located west of the pit. This settling pond will also receive water from the pit dewatering program. Overflow from the north settling pond is directed to the Killag River outfall (Cameron Flowage).

Based on results from recent surface and groundwater quality modelling, an effluent treatment plant will be utilized as required to ensure that any discharge meets the applicable federal MDMER criteria. Potential reagents include flocculants for solids settling, iron sulphate and oxidizers for metals precipitation, and liming for pH adjustment. If treatment for metals is required, the metal sludge will be collected and temporarily or permanently stored on site or shipped offsite to an appropriate landfill facility. The options for sludge collection include the use of geotubes and /or clarifiers. The effluent treatment at the Beaver Dam Mine Site will be conceptually similar to the plant currently used at the Touquoy Mine Site.

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

Given surface water runoff from all stockpiles will be directed to settling ponds for treatment and a slope failure would likely not result in disturbance to a greenfield environment, potential adverse effects to other VCs from a stockpile slope failure are anticipated to be non-existent.

The Proponent is Required to …

- Unknown whether treatment will be required? Geochem should already be done.
- No storage after ETP to ensure water quality meets effluent limits prior to discharge?
- No area for treatment identified on figures.
- Is storage volume adequate enough to allow for potential ETP shut down.
- Final disposal of waste sludge not mentioned.
- Is pond large enough to accommodate pit dewatering activities? What about all the water currently in pit. Has quality been assessed? Where is disposal?

- Why wouldn't a collection pond and treatment be required for this area? Surface water quality potentially no different than north pond.
- TSS from run-off a constant issue at Touquoy. Why would it be any different at BD?

Surface water runoff from ALL stockpiles (including topsoil) should be collected due to potential impacts (historical, TSS, increased potential for metal leaching)

Response

a) Unknown whether treatment will be required? Geochem should already be done.

In the current site layout, runoff from the till/organic stockpiles and surrounding site roads will be directed to the east settling pond for total suspended solids (TSS) treatment. Runoff from the remaining portion of the organic stockpile and topsoil stockpile will drain south toward the Tent Brook drainage system, where it will be captured by the south settling pond and treated for TSS.

The predictive water quality analysis demonstrates that inflows to the east and south settling ponds will only require treatment for TSS. However, a monitoring program will be implemented at each settling pond to test for water quality parameters during mine operations. The settling pond outlet structures will be equipped with emergency shut off valves. If water quality parameter exceedances are detected in the ponds, the emergency shut off valves will be closed, and contingency measures will be implemented.

b) No storage after ETP to ensure water quality meets effluent limits prior to discharge?

The north settling pond will discharge through a passively controlled outlet structure to an aeration lagoon, which will be designed to capture and treat inflow for an additional 24 hours. The aeration lagoon is being designed to treat inflow for nitrite to meet Canadian Council of Ministers of the Environment (CCME) (CCME 1999) and NSE Tier 1 (NSE 2013) regulatory limits in the Killag River. Discharge from the aeration lagoon will be released through a passive outlet structure toward the Killag River. The outlet structure will be equipped with an emergency shutoff valve, which will be closed if water quality parameter exceedances are triggered. Any overflow from the north settling pond/aeration lagoon system will be directed to the pit until capacity for treatment becomes available.

c) No area for treatment identified on figures.

The aeration lagoon will be located adjacent to the north settling pond. The location of the North Settling pond has been included on the site maps in the Predictive Water Quality Modeling and Water Balance Analysis technical documents (Appendix A, PDF page 44 and Appendix D, PDF page 184 in Appendix P.4 [Mine Water Management Plan] in the Updated 2021 EIS (AMNS 2021). The aeration lagoon will be constructed next to the outfall (eastern edge) of the north settling pond, north of the pit. The north, east and south settling ponds have been identified on all site infrastructure figures within the Updated 2021 EIS and corresponding appendices.

d) Is storage volume adequate enough to allow for potential ETP shut down.

The North Settling Pond will have the capacity to hold the 100-year 24-hour inflow volume without discharging. If this storage volume is used, additional overflow storage will be provided in the pit. Both the north settling pond and aeration lagoon outfall structures will be equipped with emergency shut-off valves with additional overflow storage provided in the pit.

e) Final disposal of waste sludge not mentioned.

Waste sludge will be transported to the Touquoy Tailings Management Facility (TMF) for treatment.

f) Is pond large enough to accommodate pit dewatering activities? What about all the water currently in pit. Has quality been assessed? Where is disposal?

Under operating conditions, the north settling pond will be large enough to accommodate pit dewatering activities as the active storage has been sized to hold the site runoff volume generated from the 100-year 24-hour storm event, including groundwater inflow to the open pit. The water currently in the pit will be pumped to the north settling pond for treatment prior to discharge to the Killag River. During construction phase, the water that is currently in the pit area will be dewatered to the north settling pond for treatment prior to discharge to the Killag. The size requirements of the north settling pond during operational phase is larger than required to control and treat the water currently in the pit during construction. The north pond will be one of (if not the very first) site infrastructure built during construction to accommodate site dewatering activities during construction phase. Water quality of the existing water currently in the pit has been assessed and it has indicated high levels of Arsenic. Treatment options have been evaluated and are included in Appendix F.1 (Beaver Dam Gold Mine Water Treatment Assessment - Construction Phase), PDF page 517 of Appendix P.4 (Mine Water Management Plan) included in the Updated 2021 EIS (AMNS 2021).

g) Why wouldn't a collection pond and treatment be required for this area? Surface water quality potentially no different than north pond.

See response to part 'a'. In addition, in the revised site layout, runoff from the crusher pad will be directed to the north settling pond for treatment of TSS and nitrites. The predictive water quality assessment results indicate that surface water runoff directed to the east and south settling ponds will only require treatment for TSS.

h) TSS from run-off a constant issue at Touquoy. Why would it be any different at BD?

AMNS and GHD conducted several lesson-learned sessions from the experience at the Touquoy site to develop a strategy to ensure the same TSS issues did not happen at the Beaver Dam site. The engineering of the site collection ditches along the on-site Haul Road will be constructed with a berm along the edge of the road to capture runoff and direct it towards intermittent (as needed) sedimentation pits / catchbasins prior to entering the site-wide collection ditches In addition to the intermittent Haul Road sediment pits / catchbasins and the large sedimentation ponds prior to each site discharge point, erosion and sediment control measures will be put in place across the site, resulting in a treatment train approach to sediment removals. For example, the ditches will be designed in a layered approach with a HDPE liner, sand demarcation layer and rock top layer to allow for easy removal of sediment in the ditches. This will prevent resuspension of sediment in the ditches during storm events. Small sedimentation basins will be incorporated into the erosion and sediment control plan throughout the site to encourage settling of sediment prior to the settling ponds. Within the settling ponds will be a rock filter berm separating the energy dissipation forebays from the main pond area, which will aid in settling large particles.

i) Surface water runoff from ALL stockpiles (including topsoil) should be collected due to potential impacts (historical, TSS, increased potential for metal leaching)

Runoff from all stockpiles will be collected in site-wide collection ditches and directed to one of three proposed settling ponds. The north settling pond system will provide TSS removal and water treatment for nitrites as required. The east and south settling ponds will provide TSS removal. Monitoring programs will be implemented at all ponds to assess water quality. Water collected in the east and south settling ponds will be directed to the north settling pond system for treatment, as required, based on the outcomes of the monitoring program. Contingencies will be in place to meet MDMER, CCME and Tier 1 effluent objectives.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

CCME (Canadian Council of Ministers of the Environment). 1999. Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, Water Quality Guidelines for the Protection of Freshwater Aquatic Life. Available at: http://ceqgrcqe.ccme.ca/en/index.html#void.

NSE (Nova Scotia Environment). 2013. Environmental Quality Standards for Surface Water. Table 3 Tier 1 Environmental Quality Standards for Surface Water (µg/L). Available at: https://novascotia.ca/nse/contaminatedsites/docs/Table_3_Tier1_EQS_for_Surface_Water.pdf

Round 2 Information Request Number:	NSE-2-55
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3

Context and Rationale

Site Preparation - Clearing, grubbing, grading, and stockpiling of vegetation, topsoil, and till in the pit area will be conducted progressively prior to accessing host rock for mining purposes, to avoid erosion.

The Proponent is Required to …

Drainage control and erosion protection should be established prior to any grubbing.

Response

A Mine Water Management Plan has been provided in Appendix P.4 in the Updated 2021 EIS (AMNS 2021) that described the site preparation requirements for the Beaver Dam Mine Site. This will include the construction of the North settling pond to manage water during construction.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-56
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3

Context and Rationale

Site Preparation - Clearing, grubbing, grading, and stockpiling of vegetation, topsoil, and till in the pit area will be conducted progressively prior to accessing host rock for mining purposes, to avoid erosion.

The Proponent is Required to …

- Where is the water going to be pumped from the current pit?

- No samples were presented of the current water conditions in the pit

Response

During construction and operations, water that currently overlies the pit and from the groundwater will be directed to the north settling pond for treatment prior to discharge. This is described in the Mine Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-57
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	*Not listed*
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3

Context and Rationale

Site Construction - A collection pond will be constructed to the south of the site facilities pad to collect surface water run-off from this area, ROM pad, primary crusher and crushed ore stockpile. A culvert will be constructed beneath the mine access road and will facilitate decant overflow from the pond along a discharge channel that will run down gradient to the south and ultimately discharge into wetland areas to the south of the Beaver Dam mine site.

The Proponent is Required to …

No mention of a need to assess this water quality before release into wetland habitat.

Response

In the revised site layout, runoff from the run-of-mine (ROM) pad, optional primary crusher and crushed ore stockpile will be collected in a settling pond within this area and after primary settling will be directed north to the north settling pond, where it will receive further treatment for total suspended solids (TSS) and nitrite. A portion of the organic stockpile and the topsoil stockpile continues to drain south to the Tent Lake system. Runoff from these stockpile areas will be collected in the south settling pond, treated for TSS and tested for water quality parameters as part of a monitoring program. Contingency measures will be implemented if water quality parameter exceedances are triggered (Appendix P.4 [Mine Water Management Plan] of the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-58
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	*Not listed*
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3

Context and Rationale

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

The Proponent is Required to …

Inconsistent information. Pond not shown on Fig. 6.7. – 15 or 16

Response

Site runoff from the till stockpiles, part of the organic stockpile, and the site roads will be collected in the east settling pond located east of the pit. The east settling pond will provide total suspended solids (TSS) removal. The settling pond locations are shown in Figure NSE 2-58-1. This is described in the Mine Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021).

References

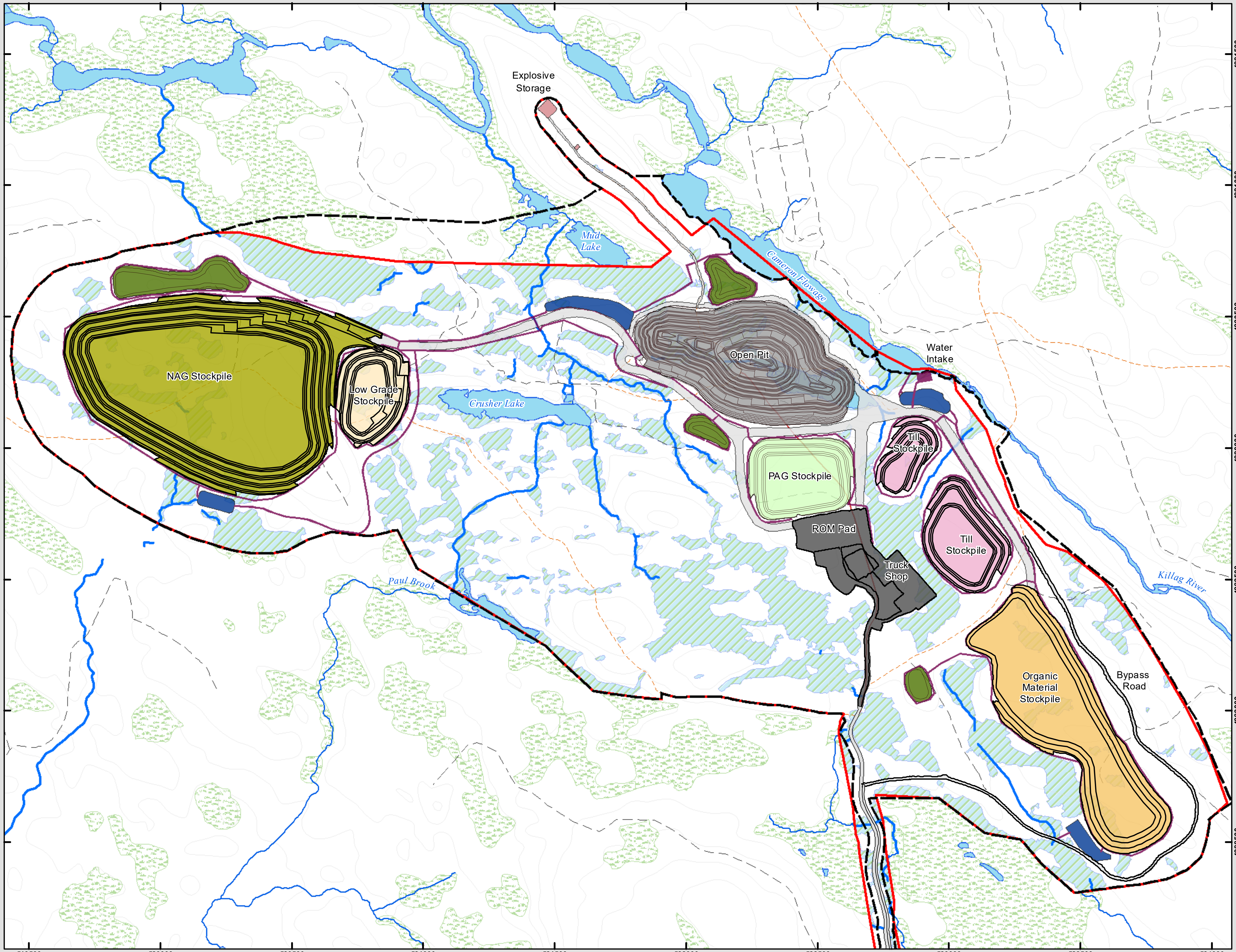
AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Prepared For:

Atlantic Gold

FIGURE NSE-2-58-1

Beaver Dam Mine Site Layout



Proposed Infrastructure

- Crusher Pad
- Open Pit
- Low Grade Stockpile
- NAG Stockpile
- PAG Stockpile
- Organic Material Stockpile
- Topsoil Stockpile
- Till Stockpile
- Explosive Storage
- Road
- Settling Pond
- Water Management
- Topo Line - 5m contour
- Local Road
- Dry Weather / Seasonal Road
- Track
- NSTDB Mapped Watercourses outside PA
- Field Delineated Watercourses within PA
- Open Water / Lake
- Field Delineated Wetlands within PA
- NSE Mapped Wetlands outside PA
- Preliminary Property Boundary
- Project Area Boundary

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

0 125 250 500 m

1:13,500 Scale when printed @ 11" x 17"

Drawn By: LP
Reviewed By: XX
Date: 2021-04-12

McCallum Environmental Ltd.

Document Name: BD_EIS_Fig2.1-X General Mine Arrangement

Round 2 Information Request Number:	NSE-2-59
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.4.2.2

Context and Rationale

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.

The Proponent is Required to …

- No mitigation noted. All fueling, storage and equipment maintenance should be done in an area with secondary containment.

Response

Fuel storage and fuel transfer will be undertaken in an area that meets Nova Scotia regulatory requirements. A discussion of fuel storage and fuel transfer is provided in the updated Project Description in the Updated 2021 EIS (AMNS 2021, Section 2.7.2.7, page 2-31). In addition, an emergency response and spill contingency plans have been developed to address spills including fuel spills. Environmental controls, mitigations and contingency for fuel spills is descripted in Section 6.18 Accidents and Malfunctions, page 6-934 of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-60
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	*Not listed*
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.1.1

Context and Rationale

Surface Water Quality Modelling Results - With the expectation that the composition of the material within the till stockpiles will be at or below background constituent levels, it is likely there will be no additional loadings of constituents, from background condition, into the Killag River. In addition, it is anticipated that the till stockpiles will have low infiltration rate and high absorption rate. Immediately after the till stockpiles are constructed, they will be vegetated and standard erosion protection measures will be implemented. Therefore, there is likely little to no significant effluent containing higher than background constituents expected to be discharged into the Killag River from this discharge point. The only discharge points with potential for discharge of impacted mine effluent into the Killag River system are the North Settling Pond (EOM) and the pit (PC).

The Proponent is Required to …

What is this expectation based on?

Response

It is anticipated that the till stockpiles will have low infiltration rates and high absorption rates. Immediately after the till stockpiles are constructed, they will be vegetated, and standard erosion protection measures will be implemented for the duration of mine operations (AMNS 2021, Section 2 [Project Description], page 2-1). The predictive water quality modelling demonstrates that runoff from the till stockpiles is not expected to result in exceedance of regulatory guidelines in the Killag River under base case or upper case conditions. The till stockpiles will be removed post-closure and the remaining area will be vegetated and standard erosion and sediment controls will be implemented. During operation phase all runoff from the till stockpiles will be, directed, collected and treated for total suspended solids (TSS) in the east settling pond. Water quality will be monitored during operations and if regulatory discharge criteria is exceeded the emergency shutoff valve (part of the outlet structure for the east settling pond) will be closed and runoff water will be directed towards the north settling pond for treatment, see Round 2, Information Request Response NSE 2-58, Figure NSE 2-58-1 for settling pond locations.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-61
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Not listed

Context and Rationale

Settling Pond Failure - Given the settling pond is a passive treatment process and it will not provide habitat for terrestrial species, adverse effects to other VCs from a settling pond failure are anticipated to be non-existent.

The settling pond will be lined with suitable materials, such as clay or a plastic liner. In the event of a 1 in 100 year precipitation event that creates volumes in excess of the capacity available in ponds and ditching, or infrastructure failure, 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.

If settling pond failure were to occur, emergency procedures would be implemented that will be outlined in the site emergency response plan.

Generally, settling pond failure emergency response includes raising the alarm and evacuation of all equipment and personnel from the area. If settling pond contents encroach on neighbouring properties or public roadways, appropriate authorities will be notified and construction of bunds and/or diversion drains may be required to contain settling pond contents on-site. An assessment is then made using on-site staff and possibly external resources (surface water specialists) as to what repairs are needed and actions to prevent future incidents. This will be detailed in a recovery plan. Depending on the regulator involvement there may be a requirement to file incident reports with certain regulatory agencies prior to initiating the repairs and return to work in the area, these are very case specific and often dependent on whether personnel were injured or equipment damaged as a result of the settling pond failure.

The Proponent is Required to …

Inadequate plan. Unacceptable to think that a settling pond failure is low risk. Not preventative nor protective of the environment.

Response

See response to Round 2, Information Request CEAA 2-16.

Round 2 Information Request Number:	NSE-2-62
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.2.1.6, pg. 30; Section 2.3.1.1, pg. 39; Section 2.3.2.1, pg. 52 ; Section 2.4.1.3, pg. 64 ; Section 2.6.9, pg. 75-76 ; Section 6.7.6.1.2, pg. 320 ; Section 6.9.6.2.2, pg.496 ; Section 6.18.3.2, pg. 831 ; pg.833 ; pg. 834

Context and Rationale

Section 2.2.1.6 and Section 2.6.9 state the following about the proposed till stockpiles located in the Beaver Dam Project Area: "Runoff from the till stockpiles located to the southeast of the open pit and east of the mine facilities area will be captured with the aid of channels around the stockpile perimeter and diverted north to Cameron Flowage by gravity via separate water discharge structures and engineered channels. At this time, it is not anticipated that a collection pond would be required, however such a pond can be constructed should settling of solids prior to discharge be required."

Section 2.3.1.1 states the following: "Runoff from the till stockpiles will be captured and directed into a collection pond located on the eastern side of the open pit."

Section 2.3.2.1 states the following: "Runoff from the till stockpiles located to the southeast of the open pit and east of the mine facilities area will be captured with the aid of channels around the stockpile perimeter and diverted north to Cameron Flowage by gravity via separate water discharge structures and engineered channels."

Section 2.4.1.3 states the following: "Runoff from the till stockpiles will be captured and directed into a collection pond located on the eastern side of the pit."

Section 6.7.6.1.2 states the following: "Surface water runoff from the surrounding area of the Mine Site, stockpiles, Mine Site roads and till stockpiles will be managed with the aid of berms and newly constructed channels, which will discharge into collection/sedimentation ponds."

Section 6.9.6.2.2 states the following: "Discharge from the till stockpiles does not require treatment because it is not anticipated to have any water quality concerns."

Section 6.18.3.2 (pg. 833) and (pg. 834) states the following: "Surface water run-off from the non-ore bearing waste rock stockpile, Mine Site roads, and till stockpiles will flow by gravity, with the aid of berms and channels, to a settling pond located west of the surface mine open pit."

There are contradictions between the above statements on whether a collection pond will be constructed to capture surface water runoff from the till stockpiles, and which collection pond (east or west) will receive the flow.

Additionally, Section 6.18.3.2 (pg. 831) states the following about how the till stockpiles will be managed with respect to stabilization: "Till stockpiles will be constructed to completion in single lifts of 15 m with 1.5:1 active slopes during the preparation and construction phase. They will be progressively capped with topsoil excavated from the surface mine open pit area and hydro seeded at the end of operations. This should allow for revegetation to being prior to or shortly after the decommissioning and reclamation commences."

The above statement indicates parts of the till stockpile will be not stabilized for extended periods, which could be potentially months or years.

The Proponent is Required to …

A. Will the surface water runoff from the till stockpiles in the Beaver Dam Project Area be captured and directed to a collection pond prior to discharge into Cameron Flowage?

B. Confirm that surface water runoff from the till stockpiles is not planned to drain into the collection pond located west of the Open Pit?

C. If a pond is to be constructed to receive surface runoff from the till stockpiles, will it be designed to remove suspended soil particles from the runoff via settling? What will be its design criteria?

D. If no pond is to be constructed and the till stockpile is to remain active with exposed soils for an extended period (e.g., months, years), what mitigation measures will be implemented to reduce potential sediment loading into the Cameron Flowage? Will these proposed measures be as or more effective than the use of a settling pond as part of the site water management system?

Response

A. Runoff from the till stockpiles will be collected in ditches and directed to the east settling pond located east of the pit, where it will be treated for total suspended solids (TSS) before discharging to Cameron Flowage.

B. Runoff from the till stockpiles will not be directed to the east settling pond that is located east of the pit.

C. Yes, the east pond will receive surface runoff from the till stockpiles and will be designed to remove suspended soil particles. The east settling pond will be designed with a permanent pool that is 1.25 m deep and of sufficient length to promote the settling of suspended solids prior to discharge through the outlet structure. There will be a rock filter berm separating the energy dissipation forebay from the main pond area which will encourage settling of larger particles. The active storage volume and outlet structure will be designed to hold the runoff generated from a range of storm events, including the 25 mm 4-hour water quality storm event to the 100-year 24-hour storm event for a minimum duration of 24-hours.

D. Not applicable.

Round 2 Information Request Number:	NSE-2-63
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3.2.1, pg. 52

Context and Rationale

The Surface Water Management sub-section states the following: "A berm surrounding the pit will direct surface water runoff into a water diversion channel that discharges to the settling pond to the west. Since this water is non-mine contact water, there will be a high likelihood that this water can be discharged directly to the Killag River should it meet applicable water quality criteria"

If the berm runoff is discharged into the north settling pond that receives surface water runoff from the waste rock stockpiles, low-grade ore stockpiles, site roads and the pit dewatering program, it would indicate that when mixed with these waters it will require some level of treatment during the how will it be able to be discharged directly into the Killag River (Cameron Flowage).

The Proponent is Required to …

A. Clarify whether the water diversion channel around the open pit will discharge into the north settling pond?

   a. If so, will the settling pond and its associated treatment system treat the water diversion channel waters prior to discharge to the Cameron Flowage? If not, how will the system function to separate the inflows from the various sources (pit dewatering, waste rock surface water runoff, pit diversion channel)

   b. If not, how will the surface water runoff be managed prior to discharge to the Cameron Flowage?

   c. What are the berm and diversion channel materials proposed for the berm surrounding the pit? Is there potential that potential acid generating materials will be used, and how will their potential use be managed?

Response

A. Yes:

   a. The water diversion channels around the open pit will discharge into the north settling pond. Therefore, the water from the diversion channels will mix with the contact water from the stockpiles and will receive the same water quality treatment prior to discharge to Cameron Flowage.

   b. Runoff collected in the diversion channel will be directed to the north settling pond and aeration lagoon prior to discharge to the Killag River.

   c. Berm and diversion channels will be constructed on non-acid generating rock and will not be constructed from acid generating materials, therefore no requirement for mitigation.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-64
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.5, pg. 67

Context and Rationale

As part of Year 1 for the Project Schedule the following is stated with respect to the surface water management infrastructure: "Surface and ground water management facilities including monitoring wells, ditches and berms will also be constructed during this period."

There is no confirmation that the collection ponds will be constructed during this period to receive and manage surface water runoff prior to discharge into adjacent surface water features.

The Proponent is Required to …

Confirm whether the collection ponds and treatment system will be constructed during Year 1 to manage surface water runoff? If not, what mitigation measures will be put in place to manage surface water runoff (quality and quantity)?

Response

Settling ponds and treatment system will be constructed during the construction (Year 1) to manage surface water runoff. The north settling pond will be constructed first to manage the surface water runoff as the other mine infrastructure is constructed. The other settling ponds and diversion ditches will be constructed in sequence with the construction of mine infrastructure. A description of Water Management during construction, operation and closure is provided in the Mine Water Management Plan (Appendix P.4) in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-65
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3.3.3, pg. 61; Section 2.5, pg. 68

Context and Rationale

For the Beaver Dam Project Area post-closure water treatment and monitoring is stated as the following in Section 2.3.3.3: "Water treatment will continue, as required, at this discharge location and monitoring programs will be on-going until such time that discharge water quality meets appropriate confirmed criteria at the point of discharge. This post closure phase is estimated to be 15-20 years in length and is subject to revision with expected refinements to model predictions."

Table 2.5-2 in Section 2.5 indicates Beaver Dam Reclamation and Environmental Monitoring will be 2027 to 2029+, which equates to 3+ years.

There is a discrepancy between how the information is presented between these two sections, with Table 2.5-2 indicating that reclamation will occur in a relatively short period of time instead of 15+ years in Section 2.3.3.3. Is the applicant expecting water treatment and supporting monitoring activities to take 15 to 20 years?

The Proponent is Required to …

Confirm that water treatment and supporting monitoring activities for post-closure will take a minimum of 15 to 20 years based on current model predictions. Is there a commitment to support water treatment activities beyond this timeframe if the discharge quality from the Beaver Dam pit does not meet applicable criteria?

Response

A Mine Water Management Plan is provided in Appendix P.4 of the Updated 2021 EIS (AMNS 2021) that details post-closure (Appendix F.3, PDF page 624) water treatment.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-66
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.6.7, pg. 74

Context and Rationale

The energy sources assessment states the following about the preferred approach of diesel generators: "The preferred approach based on economic and environmental feasibility is to provide electrical power to the Beaver Dam mine site through the use of diesel-powered generators."

None of the preceding alternatives discussion indicates why alternative energy sources are not environmentally feasible.

The Proponent is Required to …

Explain how the preferred energy source approach of diesel generators is environmentally feasible in comparison to the alternative energy sources of permanent grid tie-in and renewable energy sources.

Response

A trade-off study was undertaken as part of the pre-feasibility assessment for the Beaver Dam Mine Project (Project). It was determined that diesel generators are preferred for their durability, reliability, and versatility to handle the Project. Diesel generators require less service and maintenance when compared to their natural gas counterparts. Natural gas generators often need spark plug replacements, or a full carburetor rebuild, while diesel generators do not face these challenges. Diesel fuel is known for its stability, energy density to volume ratio, and efficient consumption rates. Generally, diesel generators burn less than half amount of fuel in comparison to their natural gas counterparts, while achieving the same amount of work output. Other environmental options such as wind and solar do not provide reliability to maintain equipment such as pumps and water treatment required to manage the sites environmental requirements.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-67
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.2.1, pg. 204 - 206

Context and Rationale

Table 6.5-2 lists the nine sites that sediment samples were collected at and describes their locations for the Beaver Dam site. No figure is provided with respect to where the samples were collected.

The Proponent is Required to …

Provide a figure presenting the locations of the nine sediment sampling sites with respect to the proposed project development areas.

Response

Please see Round 2, Information Request response NSE-2-31, Figure NSE-2-31-1 Beaver Dam Mine Site Sediment Sample Locations.

Round 2 Information Request Number:	NSE-2-68
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix E.1, pg.1

Context and Rationale

A. A table is presented of sediment quality lab analysis results for metals.

No listing of the lab that conducted the analysis is provided.

B. Sediment quality was only analyzed for metals. There is no indication within the Revised EIS Submission that other parameters were analyzed for in the samples. The current analysis results do not include other potential contaminants of concern associated with the project, such as petroleum hydrocarbons, chlorides and pH. Also, general chemistry parameters, such as calcium, sulphate, carbonate that would indicate the receiving environment conditions, such as buffering capacity to handle receiving acidic effluents is not included. Analysis for these parameters would assist with project impact assessment and understanding the receiving sediment environment response to discharges from the Project water management system.

The Proponent is Required to …

A. Were sediments samples submitted to an accredited lab for analysis? If so, provide lab result tables provided by the laboratory for reference.

B. Was chemical analysis conducted of the sediment samples for other parameters related to potential contaminants of concern (e.g., petroleum hydrocarbons, chlorides, pH)? What chemical analysis was conducted for general chemistry parameters of the sediment samples? If no analysis was conducted, please discuss how baseline concentrations will be estimated prior to project commencement, including whether additional baseline sampling and analysis will be conducted?

Response

A. The information in Appendix E.1 (Sediment Baseline Analytical Results) has been updated with Environmental Site Assessments, which are provided in Appendix E.6 (Phase I - Environmental Site Assessment), Appendix E.7 (Limited Phase II - Environmental Site Assessment), and Appendix E.8 (Extended Phase II - Environmental Site Assessment) of the Updated 2021 EIS (AMNS 2021) that provides sediment, soil and water samples that better characterize historic tailings on the Beaver Dam Mine Site. These combined assessments (Appendices E.6 to E.8) are the basis for the removal of historic tailings and waste rock during construction as we well as the need for water treatment during construction and operations (updated Section 2.7, page 2-17 [Project Components] and Section 6.5.3, page 6-125 [Baseline Program Methodology for Soil and Sediments]). As a result, Appendix E.1 has been superseded by these assessments.

B. The nine samples were analyzed for mercury (by CVAA - cold vapour atomic absorption spectroscopy) and 26 different metals (acid extraction followed by ICPMS- inductively coupled plasma mass spectrometry).

The sediment samples were not tested for general chemistry or other potential contaminants of concern such as hydrocarbons since metals alone are the parameters most likely to be enriched relative to typical background levels due to mining operations and are the primary contaminants that may be discharged to site watercourses. Metals may become naturally enriched in soils and sediments in the vicinity of ore mineralization and because past mining activities have the potential to discharge metals to the aquatic environment. Other contaminants such as hydrocarbons would not be expected to be present. If detected in sediment in future sampling events above provincial guidelines, hydrocarbons and other pollutants would be not be considered as 'baseline values' but would be remediated as required by provincial regulation.

Additional sampling and analysis will be conducted in advance of site construction as part of more detailed historical tailings management program (see response to IR NSE-2-69). Samples will be tested for hydrocarbons if visual or olfactory indications suggest they may be present.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-69
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.2.1, pg.204; Appendix E.1, pg. 1

Context and Rationale

The following statements are provided in the Revised EIS Submission with respect to arsenic concentrations in sediments within the Beaver Dam Project Area:

"Arsenic levels above CCME ISQG, CCME PEL and Tier 1 NSE EQS were identified at Sediment locations 1 to 7."

"In a gold mining area rich in arsenic mineralization (e.g. arsenopyrite), high As concentrations indicate naturally occurring arsenic. Arsenic concentrations in soils around Mine Sites have been reported as high as 4,700 ppm in areas where historic mining activity has concentrated As levels in mill waste."

"Historical regional studies completed by Nova Scotia Department of Natural Resources (DNR) show areas sampled around Beaver Dam Mine Site are below CCME Soil Quality Guideline for Inorganic Arsenic. The Killag Historic Gold Mining area is located approximately 9 km to the southeast of the project site. Studies show areas with elevated arsenic values over the CCME SQG (12 mg/kg) despite no known historic mining activity or mineral occurrences, and therefore, it can be assumed that elevated values are attributed to background levels."

The above conclusion that the arsenic concentrations observed in the sediment samples is attributed to background levels is based on a qualitative assessment. Additional information is required along with comparison to regional results, etc. to confirm that the observed arsenic concentrations are not associated with historic mining activities.

The Proponent is Required to …

Provide quantitative assessment of Beaver Dam arsenic results and for other metals with observed exceedances in comparison to the guideline criteria and appropriate literature/study results as to whether the Beaver Dam site results represent baseline conditions or are potentially associated with historic mining works.

If observed metal concentrations in the sediments potentially indicate historic mining activities, provide details on how the extent of these potentially contaminated soils and sediments will be delineated, impacts evaluated, and appropriate mitigation measures developed.

Response

Environmental Site Assessments has been updated since the Revised 2019 EIS and are provided in Appendix E.6 (Phase I - Environmental Site Assessment), Appendix E.7 (Limited Phase II - Environmental Site Assessment), and Appendix E.8 (Extended Phase II - Environmental Site Assessment) of the Updated 2021 EIS (AMNS 2021). These studies confirm that elevated arsenic levels attributed to Historic Mining has been found on the Beaver Dam Mine Site. ANMS will remove historic tailings and waste rock and deposit in the exhausted Touquoy pit (AMNS 2021, Section 2.5.1, page 2-13 [Project History - Beaver Dam Mine]). Water will be treated for metals during construction (Mine Water Management Plan [Appendix P.4] of the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-70
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.2.1 pg.204 - 206; 6.5.3.2.2 pg.206-207

Context and Rationale

Baseline sediment quality is discussed with respect to potential impacts at the Beaver Dam and Touquoy sites, but not along the haul road, which will intersect several surface water features (watercourses, wetlands). There will be potential impacts associated with accidents/malfunctions along the roadway (e.g., hydrocarbon spills), road salting for ice management and dust management (magnesium chloride).

The Proponent is Required to …

A. Confirm whether baseline sediment quality was sampled in appropriate watercourses along the haul road route (including preferred alternate)?

B. If not, discuss how baseline concentrations for contaminants of concern will be estimated prior to project commencement, including whether additional baseline sampling and analysis will be conducted?

Response

No sediment samples were collected along the Haul Road and Preferred Alternative Haul Road although 11 soil samples were collected in these areas during the country foods evaluation (Intrinsik 2019). The water features along the Haul Road are not expected to have been impacted by past industrial activity. Sediment quality was not systematically assessed along the Haul Road/Preferred Alternative is that 'background sediment quality' is not needed when remediating contamination resulting from accidents and malfunctions. In the event of an accident such as a hydrocarbon spill or haul truck upset, contaminated sediment and/or soil would be remediated to federal and provincial sediment and soil quality guidelines rather than to background values. In this context, AMNS understands that a generalized understanding of probable sediment quality, based on regional results, is sufficient for the purposes of environmental assessment; no additional sediment sampling is proposed before construction.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-71
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.7.3, pg. 215

Context and Rationale

The following statement is provided the Revised EIS Submission with respect to sediment sample results along the Preferred Alternative Haul Road:

"Sediment was sampled at several representative locations around the Beaver Dam Mine Site, Haul Road and one sample along the Preferred Alternative Haul Road route (Sediment #11). Table 6.5-2 presents the sediment quality results and exceedances from the Beaver Dam Mine Site. Sediment values from the 2018 program are found in Appendix E.1 and have been discussed previously."

Table 6.5-2 and Appendix E.1 do not present results for Sediment #11.

The Proponent is Required to …

A. Provide sediment quality results for the Preferred Alternative haul road, and appropriate figure indicating the locations of the monitoring sites.

B. Discuss baseline sediment quality results for the sample sites in comparison to applicable guideline criteria.

Response

The Preferred Alternative Haul Road is no longer being considered as part of the Beaver Dam Mine Project (Updated 2021 EIS [AMNS 2021], Section 2.1.3, page 2-2).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-72
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.2.2, pg.206-207; Figure 2.2-4

Context and Rationale

This section compares Touquoy site sediment sample chemical analysis results for 10 sites collected in 2007 against applicable guideline criteria and discusses exceedances observed at the site. There is no figure provided to indicate the locations of the sample sites at the Touquoy site. Figure 2.2-4 is provided identifying the surface water quality monitoring sites at the Touquoy Mine site, but it is not clear whether these sites match the sediment sample locations. There is no numeric results table provided within the Revised EIS Submission of the values with comparison to the applicable guideline criteria. Having the results and site locations would allow the reviewer to conduct a more thorough review to confirm that the proposed sites are enough with respect to the change in activities proposed for the Touquoy open pit being used as a tailings disposal site.

The results discussion indicates that cyanide concentrations above that detection were observed while the Touquoy site was in operation. There is no further discussion related to whether these detections represent background concentrations or are potentially representative of existing Touquoy project impacts.

The Proponent is Required to …

A. Provide a figure of the sediment sampling locations for the Touquoy site to provide additional context to the sediment quality discussion.

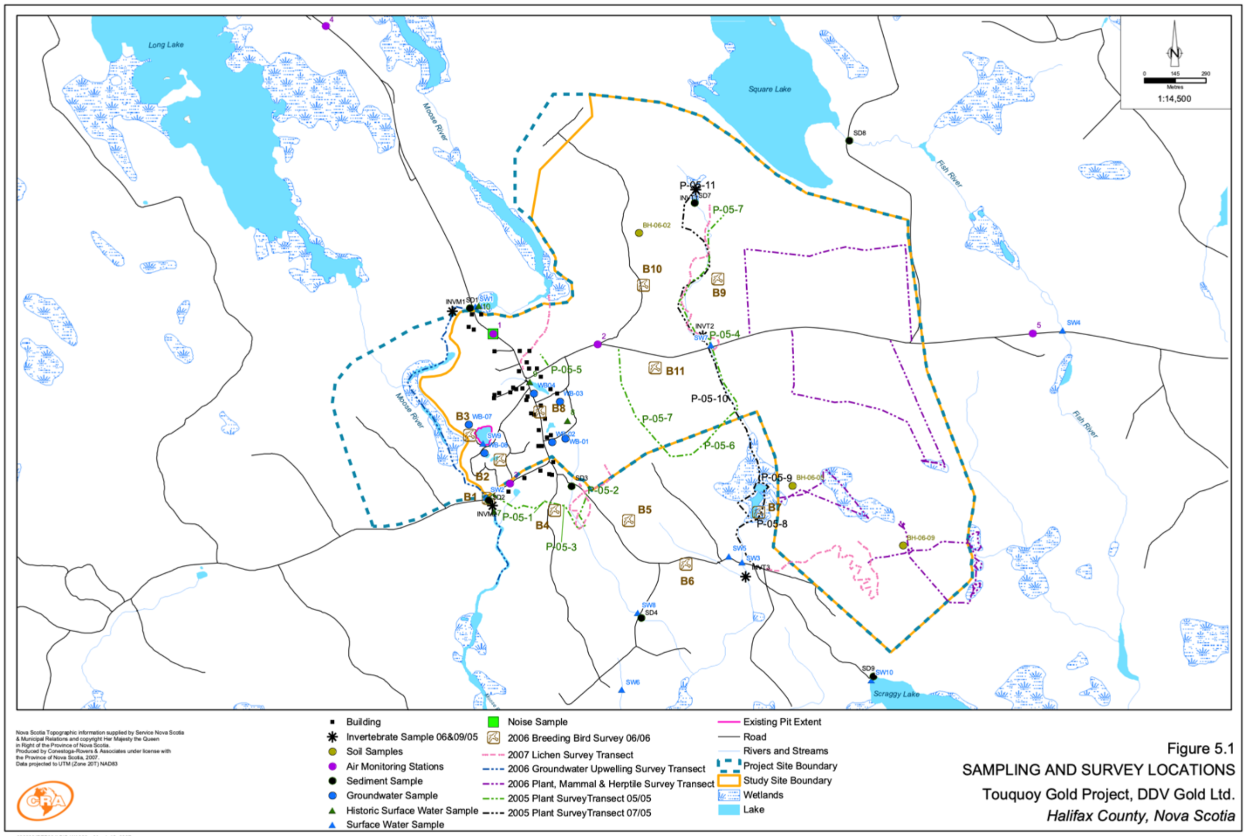
B. Provide a sediment sample results table for the Touquoy sampling program with comparison to applicable guideline criteria.

C. In conjunction with the figure and results table, provide discussion on relevant site results with respect to the Touquoy Open Pit and its proposed overflow discharge location.

D. Provide additional discussion on cyanide results observed above laboratory reportable detection limits at the Touquoy site, and whether they potentially represent project impacts or baseline conditions. If baseline, what are the potential sources.

Response

The 2007 Touquoy sediment sample locations are not always the same as the water sample locations; sediment sample locations are presented in Figure 5.1 attached. Table 7.2 presents these results and compares them to applicable federal and provincial guideline criteria. These results were first reported in the Touquoy Environmental Assessment Registration Document (CRA, 2007). Results in bold text exceed one or both guideline criteria.



Source: CRA 2007.

Table 7.2: Metals Concentrations in Sediments Collected from the Touquoy Gold Project Site on January 25, 2007

	Units	RDL	ISQG - PEL	SED 1	SED 2	SED 3	SED 4	SED 7	SED 8	SED 9
Metals										
Total Aluminum (Al)	mg/kg	100		58000	64000	70000	25000	70000	72000	36000
Total Antimony (Sb)	mg/kg	2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Arsenic (As)	mg/kg	2	5.9-17.0	66	340	200	15	23	17	15
Total Barium (Ba)	mg/kg	5		370	380	540	150	470	410	280
Total Beryllium (Be)	mg/kg	2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Cadmium (Cd)	mg/kg	0.15	0.6-3.5	<0.15	<0.15	0.33	<0.15	<0.15	<0.15	0.58
Total Chromium (Cr)	mg/kg	2	37.3-90.0	46	47	52	17	48	51	71
Total Cobalt (Co)	mg/kg	1		26	15	22	1.9	15	7.1	9.1
Total Copper (Cu)	mg/kg	2	35.7-197.0	15	21	23	4	11	19	42
Total Cyanide (CN)	mg/kg	0.5		ND	ND	ND	ND	ND	ND	2.1
Total Iron (Fe)	mg/kg	50		27000	33000	33000	4400	33000	28000	57000
Total Lead (Pb)	mg/kg	0.5	35.0-91.3	20	16	45	10	18	15	1100
Total Manganese (Mn)	mg/kg	2		2500	1200	2000	180	560	500	600
Total Mercury (Hg)	mg/kg	0.01	0.17-0.48	<0.01	0.52	0.44	0.16	0.07	0.04	0.22
Total Molybdenum (Mo)	mg/kg	2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Total Nickel (Ni)	mg/kg	2		38	18	23	2.8	17	17	9.7
Total Selenium (Se)	mg/kg	2		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Source: CRA 2007.

Metal concentrations in sediment samples appear to be broadly related to the sampling site's proximity to, or distance from, the mineralized zone as represented by the outlines of the open pit and areas of past mining activity. Past mining activity is presented on a map by Smith and Goodwin (2009). Elevated metal concentrations may also be related to past ore processing operations although the precise nature and location of past operations are not well known.

Samples SD2 (from the Moose River) and SD3 are nearest the pit and exhibit the highest arsenic values of all the samples (340, 200 mg/kg respectively). They also contain excessive concentrations of chromium, manganese and mercury that surpass provincial or federal guidelines. Elevated metal concentrations are consistent with the nearby mineralization and (in all likelihood) past mining and ore processing operations.

Sample SD1 was taken from the Moose River immediately upstream of the proposed open pit. Metal concentrations are lower than SD2 and SD3 but values for arsenic, chromium and manganese exceed federal or provincial sediment quality guidelines. These values suggest this sample location has been impacted by past mining activities. A detailed historical map of the site (Smith and Goodwin, 2009) confirms that mining shafts were sunk within the Moose River at the location of SD1 implying that sediments in the vicinity are composed of excavated, mineralized waste rock.

Samples SD7 and SD8 are located outside (north) of the historic mining area approximately 1 km and 2 km away, respectively, while SD4 is also considerably removed from historic mining activities. SD4 is located approximately 1.5 km south of past mining activities. All three of these samples report arsenic concentrations in excess of guideline values (17-23 mg/kg; average 18.3 mg/kg), but arsenic in these samples lower than in the others. In addition to arsenic SD7 and SD8 also exhibit elevated chromium levels but no other parameters exceed applicable guidelines in samples SD4, SD7 and SD8. These elevated, but comparatively low metal values (compared to samples within the mineralized area) suggest that samples SD4, SD8 and SD9 represent local background metal concentrations (e.g., arsenic ~18 mg/kg, chromium ~39 mg/kg).

Sediment sample SD9 was taken from Scraggy Lake, located approximately 2 km southeast of the mine site. At this distance, past mining effects would not be expected. Arsenic levels are low (15 mg/kg) and consistent with background levels at SD4, SD8 and SD9 (although even 'background levels' exceed CCME ISQG guidelines). Surprisingly, elevated copper, chromium, iron, lead, mercury and zinc are also observed in this sample; in fact SD9 exhibits more metal exceedances than any other sample, including those closest to the mineralized zone. SD9 is also the only sample with detectable (but low) cyanide concentrations.

Although the sediment sample was taken near the location of Touquoy tailings treated water discharge point, the mine was not yet in operation when the sample was obtained. The Touquoy mine began operation in March 2018 while the sample was taken almost ten years earlier in January 2007. This suggests that these sediments may have been impacted by past processed ore or wastewater discharge from historic mining activities. The unusual assemblage of metals, including copper, lead and zinc - which are not elevated in other samples within the mineralized zone – may indicate an unrecorded historical mine-related activity. Regardless, Scraggy Lake will in no way be impacted by activities associated with the Beaver Dam project.

References

CRA (Conestoga-Rovers & Associates Ltd.). 2007a. Environmental Assessment Registration Document for the Touquoy Gold Project.

Smith, P. K. and Goodwin, T. A. 2009: Historical gold mining, Carleton area, part of NTS sheets 21A/04 and 20P/13, Yarmouth County, Nova Scotia; Nova Scotia Department of Natural Resources, Mineral Resources Branch, Open File Map ME 2009-1 (sheet 1 of 64), scale 1:2000; http:// novascotia.ca/natr/meb/geoscience-online/maps-gallery.asp.

Round 2 Information Request Number:	NSE-2-73
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix E.3, 3.2.3.1, pg. 3-9; 4, 4-1

Context and Rationale

The till stockpile model setup discussion stated the following about the removal of one of the overburden sample results from the analysis: "Considered a geochemical outlier sample, one sample (LX-BDT-03) was excluded from source term calculations."

Appendix E.2, which describes the LX-BDT-03 laboratory chemical analysis results of the soil sample does not indicate that the results represent a geochemical outlier, and indicate it had the highest arsenic and sulphur content. Appendix E.2 also recommended further overburden characterization be conducted.

There is a lack of assessment within the Revised EIS Submission and its supporting documentation provided for why LX-BDT-03 is considered a geochemical outlier sample. Given that there were historic mining activities at the Beaver Dam Site there should be discussion of whether the sample results represent potential existing contamination that requires management.

The Proponent is Required to …

A. Provide reasoning for why in Appendix E.3 the LX-BDT-03 results are considered a geochemical outlier and not included in the till stockpile geochemical assessment. If no reason to exclude, provide a revised till stockpile geochemical assessment and results interpretation. The result should also be discussed with respect to whether it represents contamination from historic site activities.

B. Discuss whether additional till samples will be collected to confirm geochemical variability and how these will be incorporated into assessing potential project impacts and development of appropriate mitigation measures. If not, present appropriate mitigation measures to address potential variability, particularly with respect to metals concentrations.

Response

A. Since the Revised 2019 EIS (AMNS 2019) was submitted an assessment of Historic mining and tailings was undertaken at the Beaver Dam Mine Site, which is presented in Appendix E.6 (Phase I - Environmental Site Assessment), Appendix E.7 (Limited Phase II - Environmental Site Assessment), and Appendix E.8 (Extended Phase II - Environmental Site Assessment) of the Updated 2021 EIS (AMNS 2021). Historic tailings will be removed from site during construction and deposited off-site in the mined-out pit. A draft Historic Tailings Plan has been developed (Appendix E.9 of the Updated 2021 EIS [AMNS 2021]), which will be finalized as part of the permitting process. It is assumed that 50,000 tonnes of historic tailings and waste rock will be removed from the Beaver Dam Mine Site (Section 2.7.2.4 Historic Tailings and Waste Rock, page 2-26). A Mine Water Management Plan (Appendix P 4) of the Updated 2021 EIS (AMNS 2021) also describes how water will be managed and treated for metals during construction.

B. Additional sampling will be undertaken before construction to confirm location and quantities of historic tailings and additional analysis with respect to metal concentrations will also be undertaken. A Historic Tailings and Waste Rock Management Plan (Appendix E9) of the Updated 2021 EIS (AMNS 2021) has also been prepared to monitor and update estimates when construction and operations commence.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-74
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix E.2, 3.5, pg. 3-7; 5,pg. 5-1 to 5-2; Appendix E.3, pg. 4-1

Context and Rationale

Appendix E.2 presents and discusses the results following 24 weeks of kinetic testing of Beaver Dam mine rock. The report recommends in Section 3.5 that the kinetic tests continue to 120 weeks.

Appendix E.3 recommends that the Beaver Dam humidity cells (kinetic tests) continue to assess the long-term effect of metal leaching.

Both Appendices recommend that the kinetic tests continue.

The Proponent is Required to …

As part of the response to this information request, provide an update on the kinetic testing results to date, including discussion of potential acid generating material and metal leaching and if there are potential changes to predictions.

Response

An update on Kinetic Testing Results is provided below, which has been prepared by Lorax Environmental.

1. Introduction

The Beaver Dam project is a proposed gold mine owned by Atlantic Mining Nova Scotia Corporation (AMNS) who has submitted a revised Environmental Impact Statement (EIS) to the Canadian Environmental Assessment Agency (CEAA) and Nova Scotia Environment (NSE). This memorandum is in response to one of the Round 2 Technical Review Requirements from NSE. Specifically, Information Request (IR) # NSE 2-74 states:

As part of the response to this information request, provide an update on the kinetic testing results to date, including discussion of potential acid generating material and metal leaching and if there are potential changes to predictions.

At the time of the preparation of the Metal Leaching/Acid Rock Drainage (ML/ARD) Assessment Report (Lorax, 2018a) and geochemical source terms (Lorax, 2018b, 2019) in support of the revised EIS, the humidity cell kinetic tests had been running for 24 weeks. Additional data is now available for the humidity cells and is presented in the sections below. A brief summary of the static testing results that was included in Lorax (2018a) is provided in Section 2. Section 3 presents the updated kinetic testing results followed by conclusions based on the new results in Section 4.

2. Kinetic Test Sample Summary

Eight humidity cells were initiated in April 2018 using crushed drill core material and covering median and high sulphur content samples for each of the four lithologies – argillite (AR), argillite-greywacke (AG), greywacke-argillite (GA), and greywacke (GW). The objective of the program is to provide sulphide oxidation and metal leaching rates for a range of sulphide contents and material types under varying pH conditions to be used as input for the geochemical source term model. Six of the humidity cells were terminated in January 2019 after 39 weeks of testing, while HC4 and HC6 are currently ongoing. These two samples were selected since, at the time, they represent the most likely candidates to generate acidic leachate in the near future. This is an important information source for the prediction of longterm waste rock drainage chemistry. All samples used for humidity cell testing were initially characterized by acid-base accounting (ABA) (Table NSE-2-74-1).

Table NSE-2-74-1: Summary of Acid-base Accounting Results for Humidity Cell Samples

HC ID	Lithology	Rationale	Paste pH	Total S	Sulphate S	Sulphide S	Total C	CaNP	Modified NP	NPR
				%	*%*	*%*	*%*	*kg $CaCO_3$/t*	*kg $CaCO_3$/t*	*ModNP/AP*
HC1	Argillite	Median sulphur	8.9	0.02	0.02	0.02	*<0.05*	*<4.5*	6	9.6
HC2	Argillite	High sulphur	8.7	0.25	0.015	0.25	*<0.05*	*<4.5*	7.5	1.1
HC3	Argillite-Greywacke	Median sulphur	8.7	0.20	0.02	0.18	0.11	9.1	15	5.6
HC4	Argillite-Greywacke	High sulphur	8.2	0.77	0.015	0.76	*<0.05*	4.5	8	0.45
HC5	Greywacke-Argillite	Median sulphur	8.5	0.21	0.015	0.19	0.18	15	22	11
HC6	Greywacke-Argillite	High sulphur	8.6	0.39	0.015	0.39	*<0.05*	*<4.5*	5.5	0.47
HC7	Greywacke	Median sulphur	9.1	0.03	*<0.01*	0.03	0.2	15.9	23	25
HC8	Greywacke	High sulphur	9.3	0.36	0.03	0.35	0.05	4.5	8	0.74

Notes:

Values in *grey italics* are below the analytical detection limit. Values were set at the detection limit for calculation of NP, AP, and NPR values. Sulphate S is calculated using the HCl method.

AP (acid potential) calculated using sulphide sulphur (% non-sulphate sulphur x 31.25).

CaNP (carbonate neutralization potential) calculated using total inorganic carbon (% TIC x (100.09/12.01) x 10).

Modified NP is obtained by the modified Sobek method.

NPR = neutralization potential ratio, calculated as Modified NP / AP.

The four high sulphur humidity cells are classified as potentially acid generating (PAG) based on a neutralization potential ratio (NPR) <2, including the two tests that are currently ongoing (HC4 and HC6). The four median sulphur humidity cells are not potentially acid generating (NAG) with an NPR > 2. The humidity cell samples were also submitted for total solid-phase elemental analysis. These results were compared to the average upper continental crustal concentrations (AUCCC; Rudnick and Gao, 2014) to identify elements that are enriched in these samples. Elements above 3x the AUCCC include Ag (3 of 8 humidity cells), As (7 of 8), Cu (1 of 8), and Pb (1 of 8). The As content in the four high sulphur humidity cells (HC2, HC4, HC6, and HC8) is above 10x the AUCCC.

3. Updated Kinetic Test Results

Laboratory kinetic test procedures are designed to quantify weathering rates under standardized conditions. Following variable release rates in the initial cycles of testing, the exposed mineral surface will equilibrate, and stable reaction rates can be determined. Humidity cells often require several weeks to approach geochemical stability and reaction rates rarely remain constant on a week-to-week basis. At the time of reporting, HC4 and HC6 have been running for 107 weeks, while the remaining six humidity cells were terminated after 39 weeks.

The leachate pH from all humidity cells that were terminated after 39 weeks of operation has remained circum-neutral (Figure NSE-2-74-1) falling between 7.1 and 8.6. In general, HC7, which exhibits the highest Modified NP and carbonate content of all samples (Table NSE-2-74-1), shows the highest pH. HC4 and HC6 show a decreasing trend in pH as per the purpose of their continued operation. HC4 leachate, initially producing pH of ~7.5, has decreased to pH stabilizing just above 3.0 in the most recent weeks of testing. HC6 has decreased from pH 7.6 to values just below 4.0 (Figure NSE-2-74-1). The alkalinity of these two humidity cells has also shown a decreasing trend to values below detection in recent weeks (Figure NSE-2-74-1). The other humidity cells exhibit comparable or higher alkalinity relative to HC4 and HC6 up to kinetic test termination. HC1 in particular shows a decreasing, relatively low-alkalinity trend which can be explained by this cell being composed of oxidized material with very low NP and sulphur contents.

Leachate concentrations released by humidity cells are susceptible to changes in the volume of water added and collected at the end of each cycle and hence, concentration data do not provide a strictly quantitative estimate of drainage chemistry. To provide a more functional parameter which can be used to compare results between different humidity cells, sulphate and metal concentrations in mine rock leachate are normalized to the mass of sample in the humidity cell and the volume of leachate collected each week, producing weekly mass loadings (mgsolute /kgsample/ wk).

All humidity cells show relatively high sulphate loading rates initially, likely due to the flushing of readily-soluble oxidation products or in response mineral liberation due to sample crushing. Sulphate loading rates stabilize by week 15 (Figure NSE-2-74-2) in the majority of the humidity cells. HC1 and HC7 have the lowest stable sulphate loading rates (~0.4 to 2 mg/kg/wk), due to the low sulphide S content in these samples (0.02% and 0.03%, respectively). HC4, the sample with the highest sulphide S content, produces the highest sulphate loading rate throughout the kinetic test program, reaching values of >100 mg/kg/wk in the most recent test cycles. An increasing sulphate release rate is also evident for HC6, albeit not to the same extent. In both samples, the sulphate release rate is temporally correlated with the drop in pH indicating that sulphide oxidation rates are accelerating in response to the acidification of pore waters. The sulphate loading rates for both of these humidity cells have increased significantly since the original reporting (Lorax, 2018a).

Temporal trends of metal loading rates are provided in Figure NSE-2-74-3 and Figure NSE-2-74-4 for selected elements. Solid-phase As, Cu, and Pb (Figure NSE-2-74-3) were found to exceed 3x the AUCCC, while Cd, Co and Ni (Figure NSE-2-74-4) represent potential parameters of concern in the receiving environment. All of these species are known to be highly pH-sensitive in aqueous solutions.

Figure NSE-2-74-1: pH and total alkalinity in leachates from Beaver Dam humidity cells

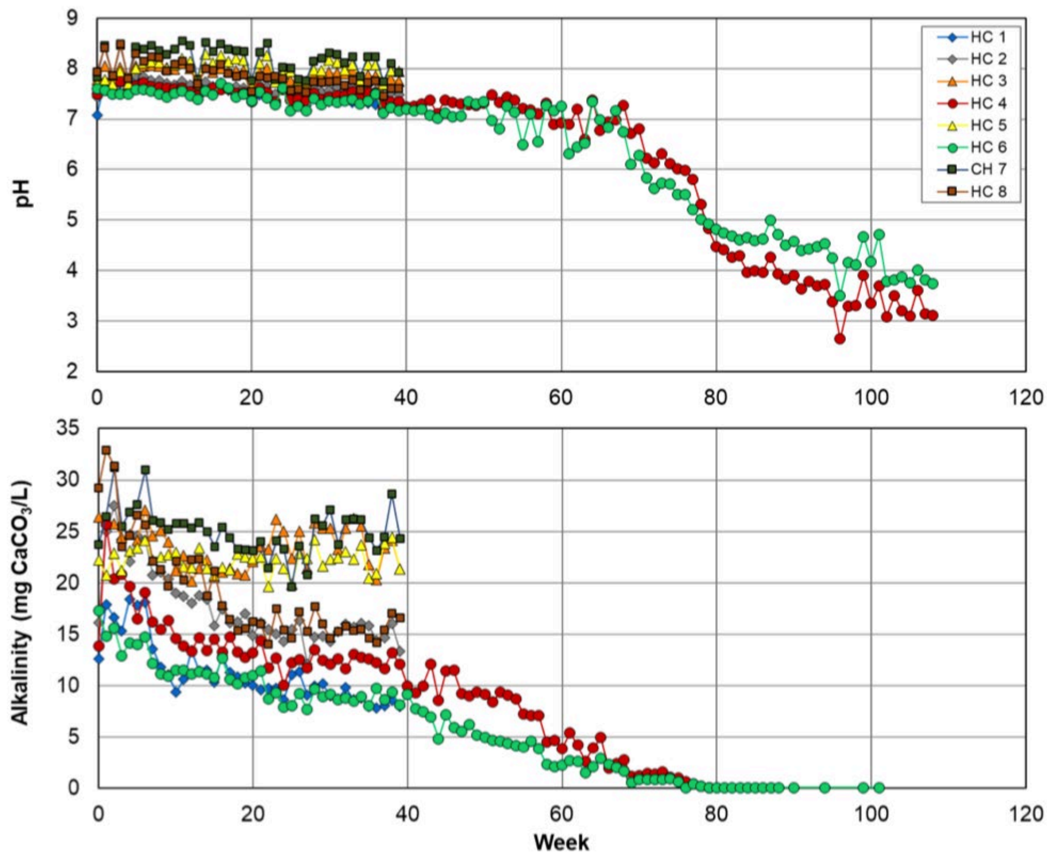


Figure NSE-2-74-2: Sulphate loading rates for the Beaver Dam humidity cells

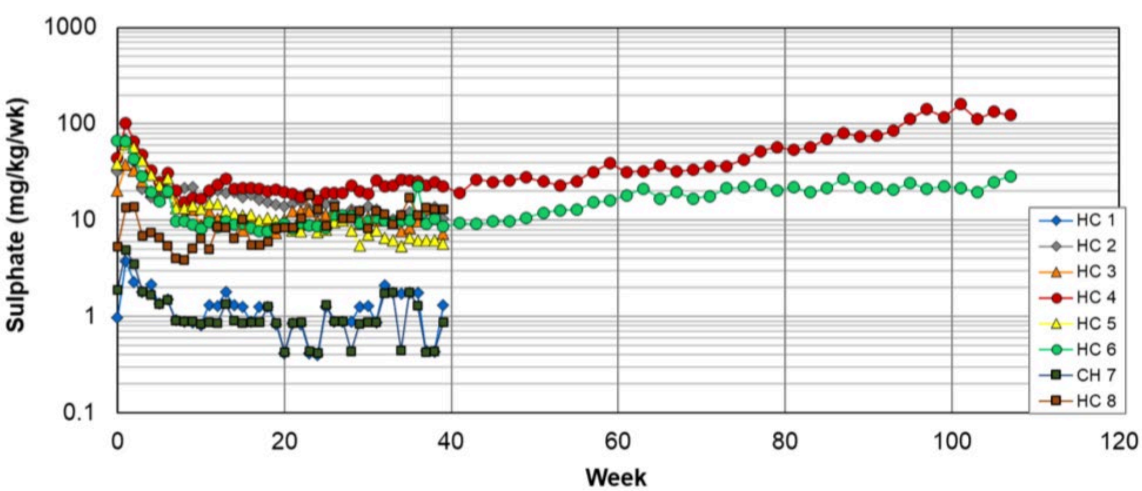


Figure NSE-2-74-3: As, Cu, and Pb loading rates for the Beaver Dam humidity cells

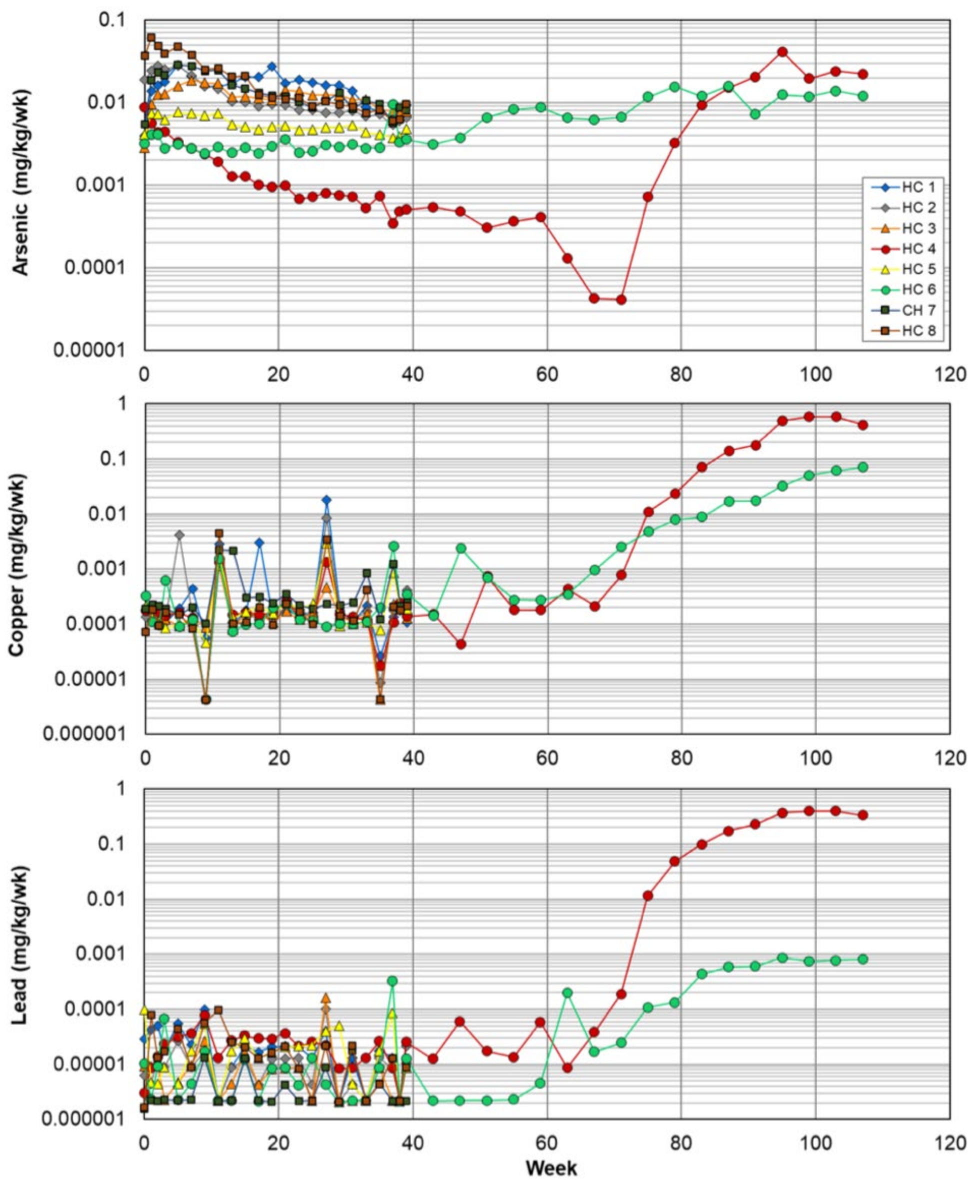
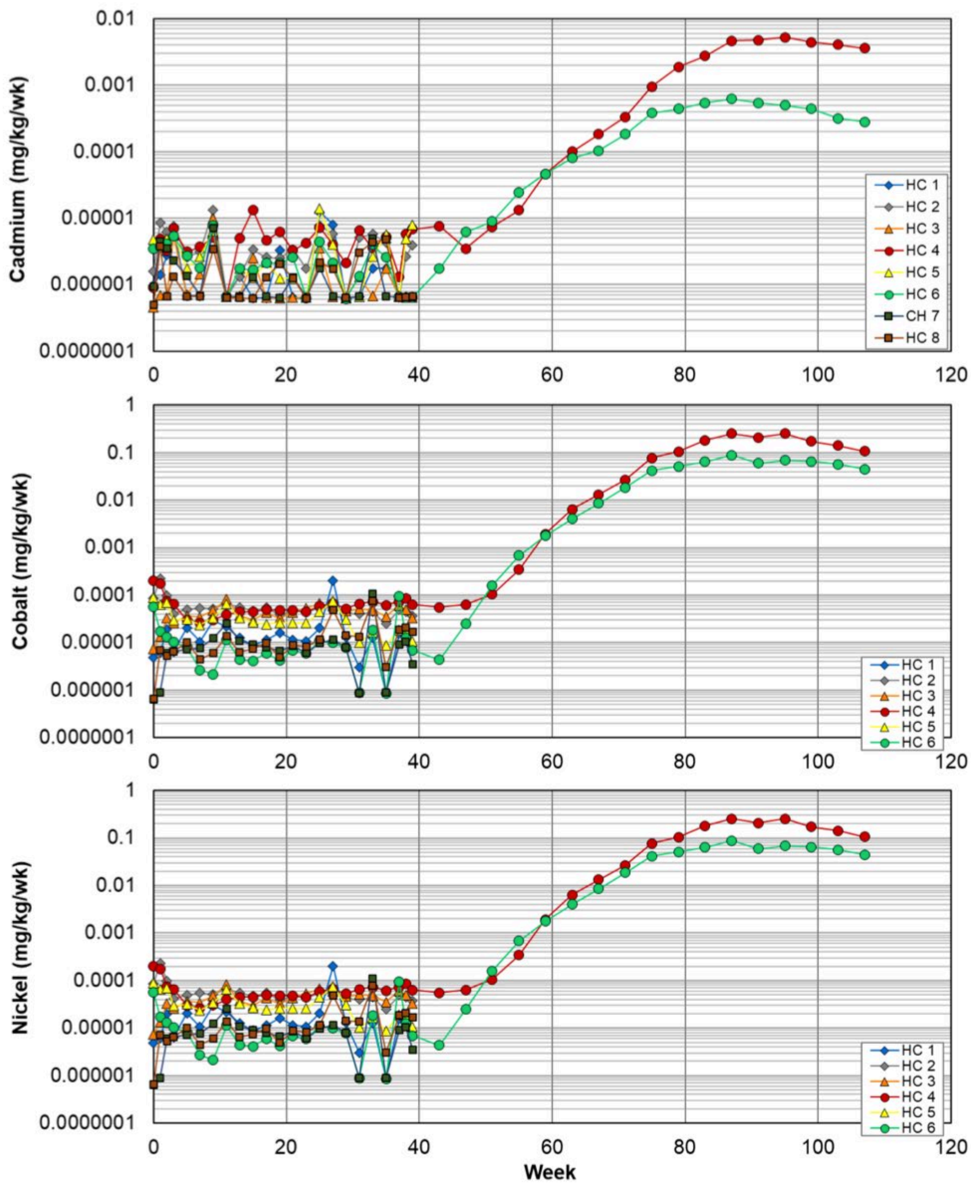


Figure NSE-2-74-4: Cd, Co, and Ni loading rates for the Beaver Dam humidity cells



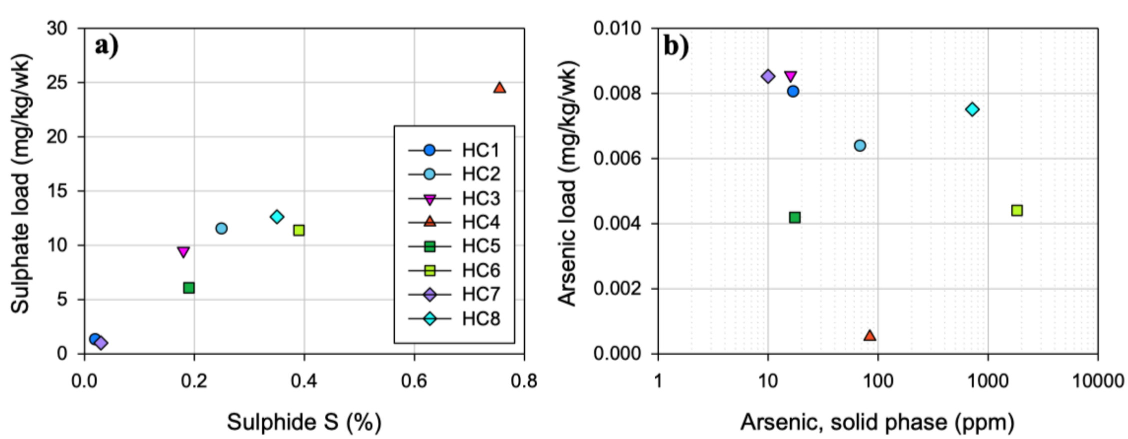
The six terminated humidity cells show a decrease in As loading rates over the duration of the experiments to values in the range of approximately 0.005 to 0.01 mg/kg/wk in the later test cycles. Under circum-neutral conditions, HC4 produces the lowest As loading rates of the eight humidity cells with As values remaining below 0.001 after week 19. Following the pH drop at around week 70, a marked increase of As loading rates is observed (Figure NSE-2-74-3). Although the difference in As loading rates from neutral to acidic conditions in HC6 is less pronounced than for HC4, an increase in As release accompanying the acidification of the system is apparent with loading rates between 0.01 and 0.02 mg/kg/wk being produced. Under neutral conditions, the HC6 sample generated relatively low As leaching rates despite having the highest solid-phase As content (1,833 ppm; Lorax 2018a). These trends illustrate the major effect of pH on As mobility which appears to be at a minimum within a pH range of 6.5 to 7.5.

The Cu and Pb loading rates are low in all humidity cells (mostly <0.005 mg/kg/wk) under circum-neutral conditions and do not display any notable trends. Both species see a spike in leaching rates associated with the drop in pH measured in leachates from both HC4 and HC6. HC4, which produces the slightly lower leachate pH in the most recent sampling cycles also currently displays higher Cu and Pb leaching rates than HC6 (Figure NSE-2-74-3).

Although not identified as parameters of potential concern during static testing, Cd, Co, and Ni are known to be highly pH-sensitive and may pose and environmental concern in long-term Beaver Dam PAG rock drainage. The loading rates for these two parameters were generally low (<0.00001 mg/kg/wk for Cd; <0.0001 mg/kg/wk for Ni and Co) and stable in all humidity cell leachate under circum-neutral conditions (Figure NSE-2-74-4). Following the depletion of NP and the drop in leachate pH, all three of these species display a gradual increase to values up four orders of magnitude higher than the corresponding neutral leaching rates. The highest loading rates are generally produced by HC4 which releases the lowest-pH leachate and had slightly higher Co and Ni solid-phase contents than the remaining samples (Lorax, 2018a). It is notable that HC 4 also shows among the highest release rates for Cd, Co, and Ni under neutral conditions (Figure NSE-2-74-4), while HC6 leaching rates for these species were relatively low during this test phase.

Average sulphate loading rates for the last five cycles of neutral leachate data for all humidity cells (week 33 to 39) show a strong positive correlation with the corresponding solid-phase sulphide S contents (Figure NSE-2-74-5a). In contrast, the As load for the same period does not show a correlation with the solid-phase As content (Figure NSE-2-74-5b). These results are comparable to the relationships, or lack thereof, observed at the time of the initial ML/ARD characterization (Lorax, 2018a). The phase association of As within the different humidity cell subsamples as well as pore water pH appear to have a stronger control over the respective leaching rates than solid-phase As abundance alone.

Figure NSE-2-74-5: a) Sulphate load vs solid-phase sulphide S.
b) As load vs solid-phase As. The loading rates are averaged for weeks 33 to 39.



4. Conclusions

- After >100 weeks of kinetic test operations, the two cells that were continued past 39 cycles have turned acidic with pH values currently falling between 3.0 and 4.0. This allows for the assessment of long-term metal loading rates for Beaver Dam specific PAG rock under acidic conditions. Due to the timing of the development of the geochemical source term model, acidic source term predictions currently still rely on the findings from Cochrane Hill (Lorax, 2018a, 2019). Future source terms will utilize Beaver Dam leachate chemistry directly, although a significant change in the predicted PAG drainage chemistry is not expected due to the generally consistent geochemical trends observed across the two mine sites.
- Arsenic leaching rates show a slightly decreasing trend in most of the humidity cells under neutral conditions. The acidification of contact water led to the increase in As leaching rates with a much more pronounced rise observed in HC4 which produced the lowest pH values (slightly above 3) in the most recent test cycles. The lowest As release rates are observed in leachates with 6.5< pH <7.5.
- Leaching rates of the base metals Cu, Pb, Cd, Co, and Ni are consistently low under circum-neutral conditions, with minor variations between the different material types. A drastic increase in loading rates, typically between three and four orders of magnitude, is associated with the drop in pH in HC4 and HC6.
- A strong correlation was observed for sulphide S content and sulphate release rates but not for As solid-phase content and As release rates under neutral conditions. The latter appears to be controlled more strongly by leachate pH rather than by solid-phase As content.

References

Lorax (2018a). Beaver Dam Project – ML/ARD Assessment Report. Technical report prepared for Atlantic Mining NS Corp.; submitted December 20, 2018.

Lorax (2018b). Beaver Dam Project Geochemical Source Term Predictions for Waste Rock, Low-Grade Ore, Tailings and Overburden. Technical report prepared for Atlantic Mining NS Corp.; submitted December 20, 2018.

Lorax (2019). Beaver Dam Project: Geochemical Source Term Update. Technical report prepared for Atlantic Mining NS Corp.; submitted October 10, 2019.

Rudnick, R.L. and Gao, S. (2014). Composition of the Continental Crust. In: Holland, H. and Turekian K. (eds). Treatise on Geochemistry 2 nd Edition, vol. 4, pp. 1-51. Oxford, UK, Elsevier Ltd.

Round 2 Information Request Number:	NSE-2-75
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.5.2, pg. 215

Context and Rationale

Table 6.5-6 lists no relevant operation and maintenance activities for the Touquoy Mine Site that would potentially interact with soils and sediments. Would the tailings discharge not interact with the soils and sediments associated with the pit area, and potential discharges outside the pit environment? What about construction of the spillway?

The Proponent is Required to …

Please confirm if there would be potential soil and sediment interactions at the Touquoy Mine Site during the operation and maintenance phase? If not, provide appropriate assessment of these activities.

Response

A Touquoy Integrated Water and Tailings Management Plan (Appendix F.7) of the Updated 2021 EIS (AMNS 2021). Tailings will be deposited subaqueous in the mined-out pit and water decanted from the pit will be used in processing. At closure, a freshwater cap will be placed over tailings and resuspension of sediment is not expected based on the physical characteristics of the tailings in the Tailings Management Facility (TFM) at Touquoy. As a result, soil and sediment interactions is not anticipated. Best management practices for erosion control will be established during construction of the spillway.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-76
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.8, pg. 216-217

Context and Rationale

As part of the proposed mitigation measures there is no mention of the settling ponds. Would these not reduce off-site sediment loading and reduce potential impacts to sediments and soils?

The Proponent is Required to …

Confirm that settling ponds will be part of the mitigation measure strategy for mitigating potential impacts to soils and sediments.

Response

Yes, settling ponds (north, east, south and west settling ponds) are part of the mitigation measure to mitigate potential impacts to soil and sediment (Updated 2021 EIS [AMNS 2021], Section 6.7.9 [Mitigations]), page 6-308. The use of settling and collection ponds is described in the Mine Water Management Plan (Appendix P.4) of the Update 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-77
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.4, pg. 207– 209; 6.5.8, pg. 216-217; 6.59, pg. 218; Appendix E.2; Appendix E.3

Context and Rationale

Acid rock drainage and metal leaching is discussed as potentially being generated from the ore and waste rock generated at the Beaver Dam site in Appendix E.2 and E.3. As well as the following statements in Section 6.5.3.4 about the potential for the mine rock to produce acidity and leach metals:

"Approximately 40% of the Beaver Dam samples were classified as potentially acid generating (PAG) based on having an NPR-threshold of 2, where samples with an NPR of < 2 are considered PAG, while samples with a NPR of ≥ 2 are non-acid generating (NAG)."

"Parameters of potential concern identified by the solid phase elemental analysis include As, Cu, Mn and Pb. Of these, As is considered the species with the greatest potential for deleterious effects on mine contact water." The mitigation measures proposed for geology, soil and sediment quality in Table 6.5-7 focus specifically on sediment and erosion control, which do list limiting exposed soils.

Table 6.5-8 lists a number of mitigation measures for the Beaver Dam Site that do not specifically align with sediment and erosion control, which include:

- Select removal of impacted materials
- wet dust suppression controls
- hardened surfaces where practical
- covering of haul trucks to reduce dust during transportation
- vehicle speed reduction to minimize dust

No reason is provided as to why acid rock drainage and metal leaching is not presented as a mitigation measure category or specifically discussed in the text supporting the tables in Sections 6.5.8 and 6.5.9. Acidic conditions and metals leaching into soils and sediment outside the project area would have potentially negative environmental impacts, and the current presentation of mitigation measures is potentially not sufficient to support the estimated residual environmental effects to geology, soil and sediment quality associated with the Beaver Dam site activities.

The Proponent is Required to …

Provide mitigation measures beyond sediment and erosion control to mitigate potential impacts to soils and sediments from acid rock drainage, including providing details on how those activities will address the potential issues (e.g., select removal of impacted materials). Discuss how these measures will be routinely installed.

Additional details on the acid rock drainage and metal leaching mitigation measures and how they are proposed to address environmental effects should be provided in the write-ups to support the information presented in Tables 6.5-7 and 6.5-8.

Response

Acid rock drainage and metal leaching are addressed directly in sections describing Surface Water Quantity and Quality and water management (Section 6.7, page 6-213, and Appendix P.4 [Mine Water Management Plan]) rather than in the Geology, Soils and Sediment (Section 6.5, page 6-123) in the Updated 2021 EIS (AMNS 2021). Mitigation measures including limiting the volume of exposed soil are presented in Section 6.7.9.2, Table 6.7-44, page 6-310. Other mitigation measures, such as segregating and managing waste rock, the underwater storage of tailings to prevent oxidation, mine-contact water treatment, and water quality monitoring are also presented in Section 6.7.9.2, Table 6.7-44, page 6-310. The methods used to mitigate against sediment discharge consist of standard erosion and sediment control measures during construction and reclamation (NSDEM, 1988) and stormwater management best practices during the construction and operations phases.

These measures will be systematically implemented and monitored as described in the draft Erosion and Sediment Control Plan (Appendix C, PDF page 159 of Appendix P.4 Mine Water Management Plan), Mine Water Management Plan (Appendix P.4), and draft Spill Contingency Plan (Appendix A, PDF page 94 of Appendix P.1 draft Emergency Response Plan) included in the Updated 2021 EIS (AMNS 2021). These site-specific plans with engineering drawings for different areas of the site will be developed before the project begins but following completion of detailed design and engineering.

To ensure that discharges meet maximum limits listed in the applicable guidelines as well as in the provincial operating permit that will be required for this Project, stormwater pond discharges will be monitored on an as-needed basis, as stipulated in the provincial permit.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

NSE 1988: Nova Scotia Environment, Erosion and Sediment Control Handbook for Construction Sites. 1988. Retrieved from: http://www.novascotia.ca/nse/surface.water/guidelines.asp. Last modified: 2014-03-31.

Round 2 Information Request Number:	NSE-2-78
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.10,pg. 221; Appendix O.1, 2.5

Context and Rationale

Section 6.5.10 states "Geology and soils monitoring will be completed to verify the accuracy of the predicted environmental effects and the effectiveness of the mitigation measures outlined in Table 6.5-7. There is no determined need for geology and soils to have compliance or effects monitoring programs."

The first sentence of the above statement indicates that geology and soils monitoring will be completed to verify the effectiveness of the mitigation measures in Table 6.5-7. How will not having a compliance or effects monitoring program be able to evaluate the effectiveness of mitigation measures.

Sediment is not listed as whether it will require compliance or effects monitoring programs.

The Proponent is Required to …

A. Provide reasoning for why geology and soils do not have to have compliance or effects monitoring programs to assess the effectiveness of mitigation measures?

B. Confirm that sediment will be included in compliance and effects monitoring programs for the Project.

Response

A. Section 6.5 (Geology, Soil, and Sediment Quality), page 6-123 has been updated in the Updated 2021 EIS and compliance monitoring associated with the draft Historic Tailings Management Plan (Appendix E.9 of the Updated 2021 EIS [AMNS 2021]).

B. Sediments will be monitored as part of an Aquatic Effects Monitoring Program that will be developed during the permitting process for the Beaver Dam Mine Site.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-79
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.1.1, pg.264

Context and Rationale

The following statement is made about surface water and groundwater interaction:

"These relatively impermeable and poorly jointed rocks result in slow groundwater recharge and most of the excess surface water is retained on the surface, often called a 'deranged' drainage pattern."

No reference is provided with respect to the source(s) of this information or any other geographic and drainage information presented in Section 6.7.2.1.

The Proponent is Required to …

Provide appropriate references for information presented in Section 6.7.2.1.1.

Response

The statement in Section 6.7.2.1.1 has been removed in the Updated 2021 EIS. Therefore, the reference is no longer required.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-80
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.2.1, pg.266 - 267

Context and Rationale

Table 6.7-1 lists surface water quality monitoring locations within the Beaver Dam project area. The numbering system is not a continuous list with some numbers missing: 3, 7, 8. There is no discussion on whether these monitoring sites existed or if they are located outside the project area.

Several of the sites are located within the project development area and will be potentially removed by activities such as pit construction and operation (e.g., SW-5)

The Proponent is Required to …

A. Confirm whether additional water quality samples were collected at monitoring sites are missing from the numerical list. If so, please discuss if the sites are outside the project area and whether associated results would be applicable as reference site results. If these sites were not include in the monitoring program, provide a response as to why the sites were dropped or not considered appropriate for use in the project baseline study.

B. Identify which monitoring sites will be maintained after site development with respect to the project development footprint. Indicate potential additional sites that will be added to the program.

Response

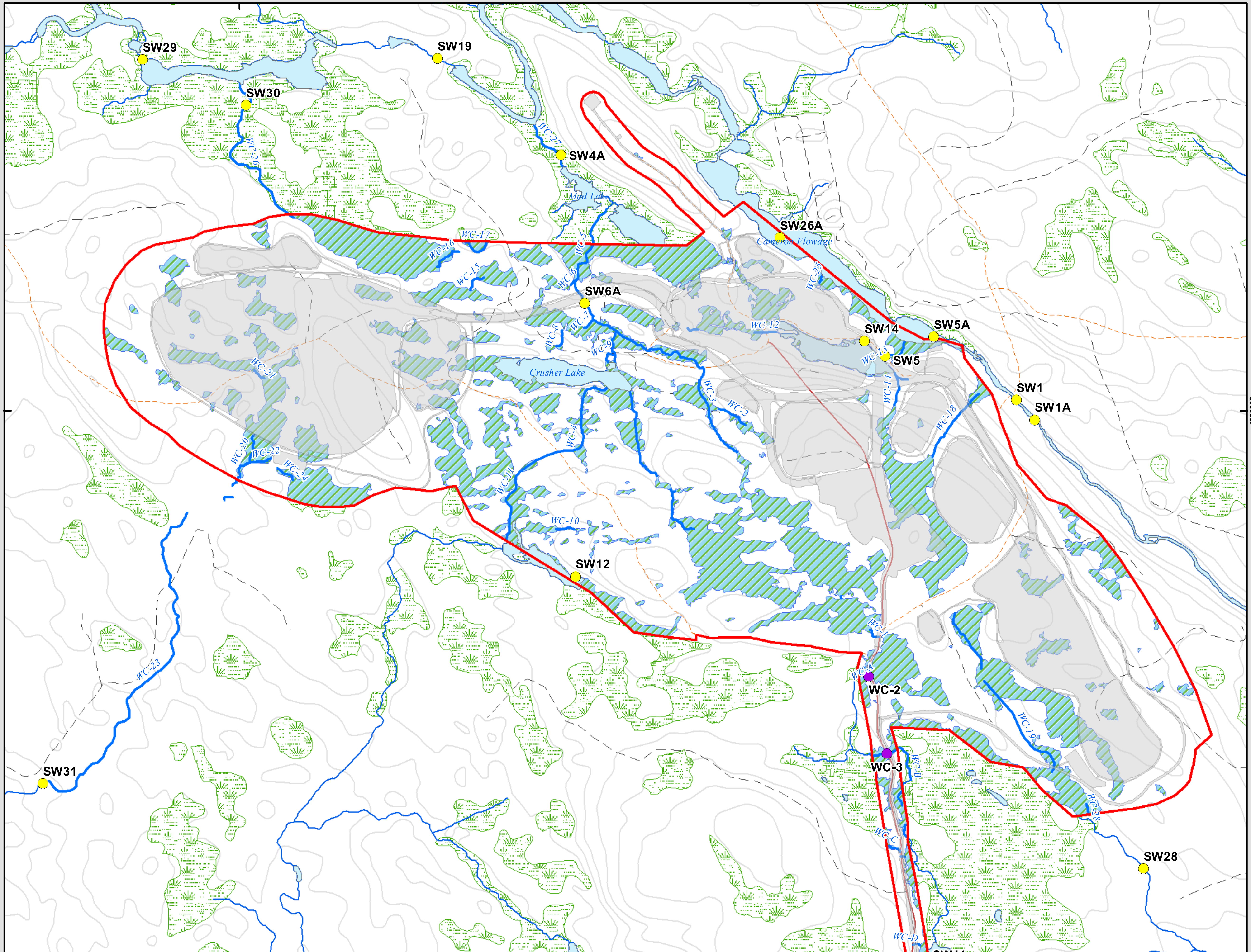
A. No, additional water quality samples were not collected at monitoring sites which are missing from the Section 6.7.5.1, Table 6.7-10, page 6-238 (AMNS 2019). Monitoring sites SW3 and SW7 were not identified in the field during the time of the project baseline study and were therefore removed from the sampling program. SW8 was selected to measure water quality related to the river and stream flow crossing the haul road. Since the submission of the Revised 2019 EIS, additional baseline locations have been added to the program and can be found in the Updated 2021 EIS in Section 6.7.5.1, Table 6.7-10, page 6-238 (AMNS 2021).

B. Monitoring sites that will continue to be monitored include: SW-1, SW-1A, SW-2A, SW-4A, SW-5, SW-5A, SW-6A, SW-11, SW-12, SW-19, SW-26A, SW-28, SW-29, SW-30, SW-31, and SW-32. Proposed additional sampling sites include SW-24, SW-25, SW-26 and SW-27. Monitoring locations SW-9, SW-10, SW-14A have been removed. Figures NSE-2-80-1 to NSE-2-80-2A to D.

References

AMNS (Atlantic Mining NS Inc.). 2019. Revised Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. February 28, 2019. Middle Musquodoboit, NS.

AMNS. 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.



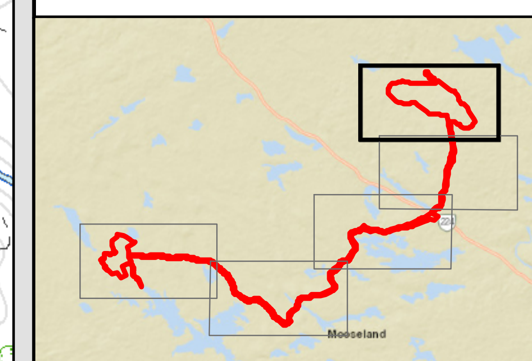
Prepared For:

Atlantic Gold

FIGURE NSE-2-80-1

Surface Water Quality Baseline Sampling Locations, Beaver Dam Mine Site

- Baseline Surface Water Quality Monitoring Location Haul Road
- Baseline Surface Water Quality Monitoring Location Mine Site
- Field Delineated Watercourses
- NSTDB Mapped Watercourses
- Local Road
- Dry Weather / Seasonal Road
- Track
- Proposed Infrastructure
- Field Delineated Wetlands
- NSE Wetlands
- Water Bodies
- Project Area



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Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

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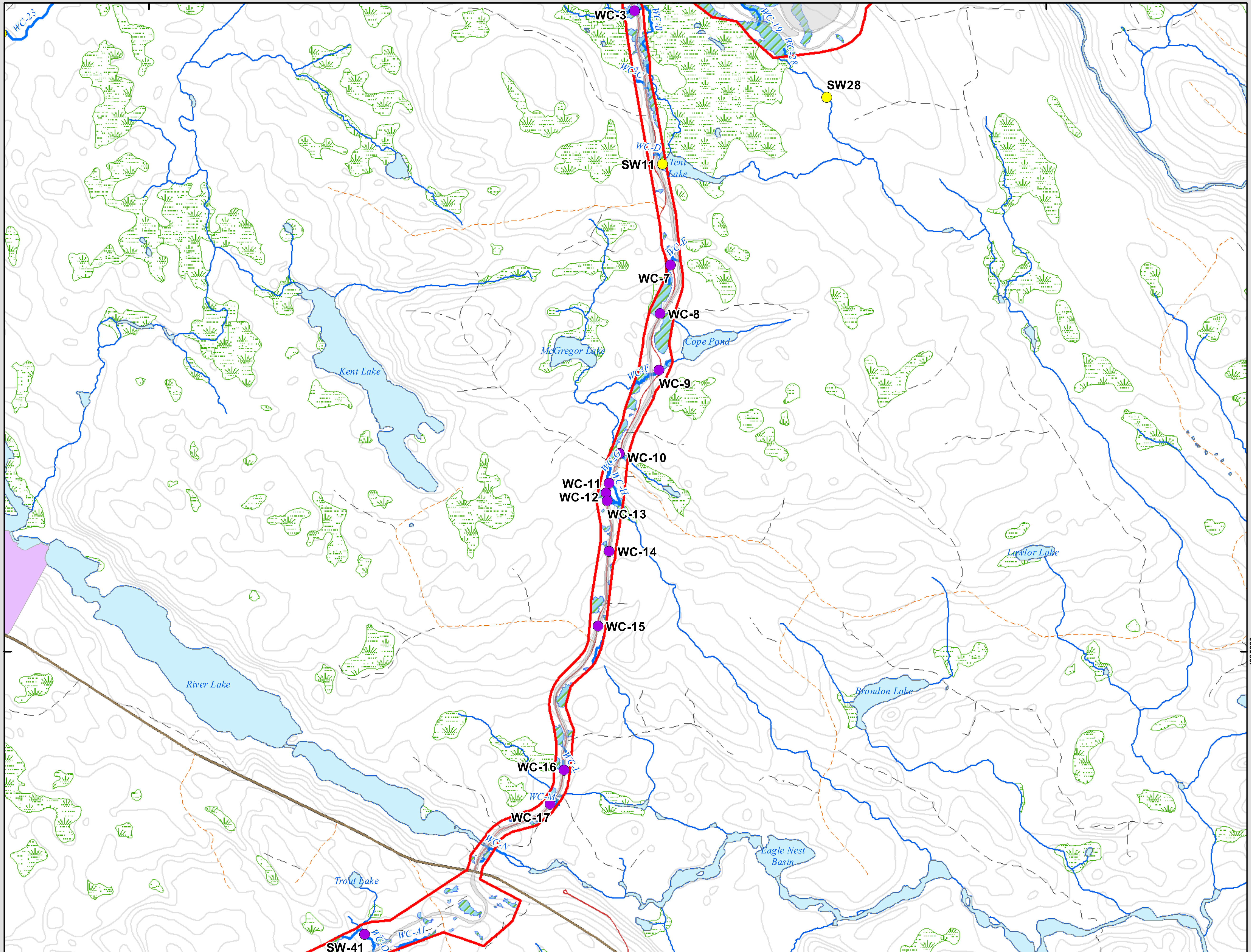
Drawn By: EP Date: 2021-04-30
Reviewed By: LP

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

McCallum Environmental Ltd.

Document Name: BD_EIS_Figure6.7-3SurfaceWaterMonitoringLocations



Prepared For:

Atlantic Gold

FIGURE NSE-2-80-2A

Surface Water Quality Baseline Sampling Locations, Haul Road

Baseline Surface Water Quality Monitoring Location Haul Road
Baseline Surface Water Quality Monitoring Location Mine Site
Field Delineated Watercourses
NSTDB Mapped Watercourses
Collector Road
Local Road
Dry Weather / Seasonal Road
Diveways (>300 m)
Track
Beaver Lake Indian Reserve
Proposed Infrastructure
Field Delineated Wetlands
NSE Wetlands
Water Bodies
Project Area

Mooseland

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

0 0.25 0.5 1 Kilometers

1:20,000 Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed By: LP
Date: 2021-04-30

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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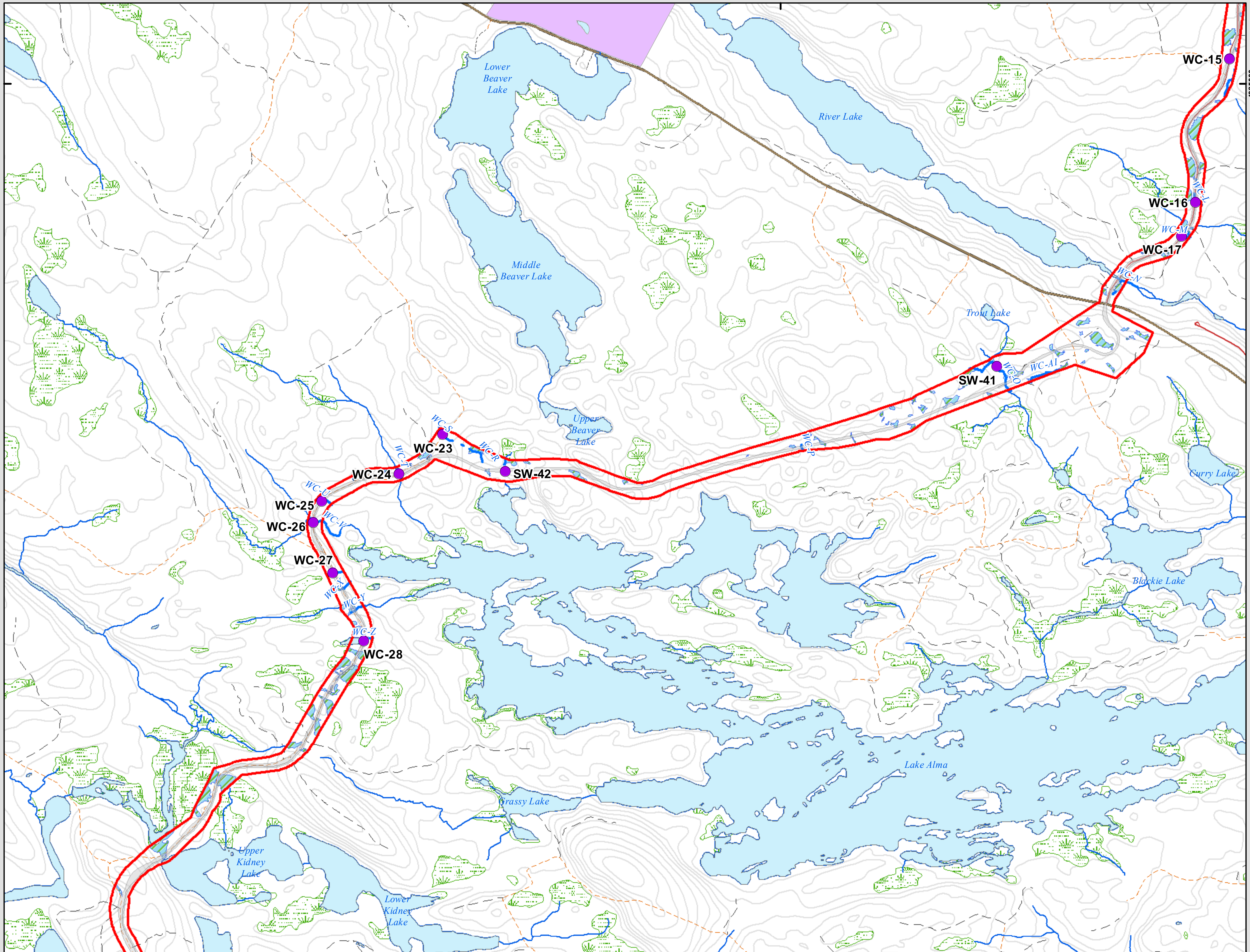
Document Name: BD_EIS_Figure6.7-3SurfaceWaterMonitoringLocations



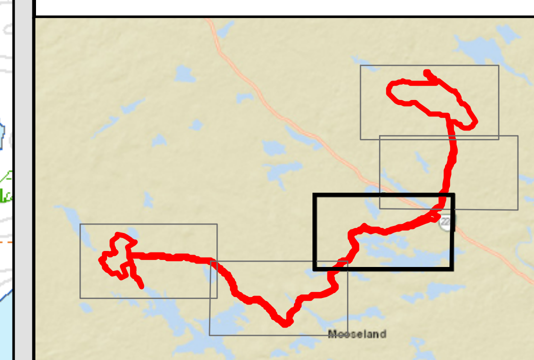
Prepared For:

Atlantic Gold

FIGURE NSE-2-80-2B

Surface Water Quality Baseline Sampling Locations, Haul Road

- Baseline Surface Water Quality Monitoring Location Haul Road
- Field Delineated Watercourses
- NSTDB Mapped Watercourses
- Collector Road
- Local Road
- Dry Weather / Seasonal Road
- Diveways (>300 m)
- Track
- Beaver Lake Indian Reserve
- Proposed Infrastructure
- Field Delineated Wetlands
- NSE Wetlands
- Water Bodies
- Project Area



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Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

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1:20,000 Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed By: LP
Date: 2021-04-30

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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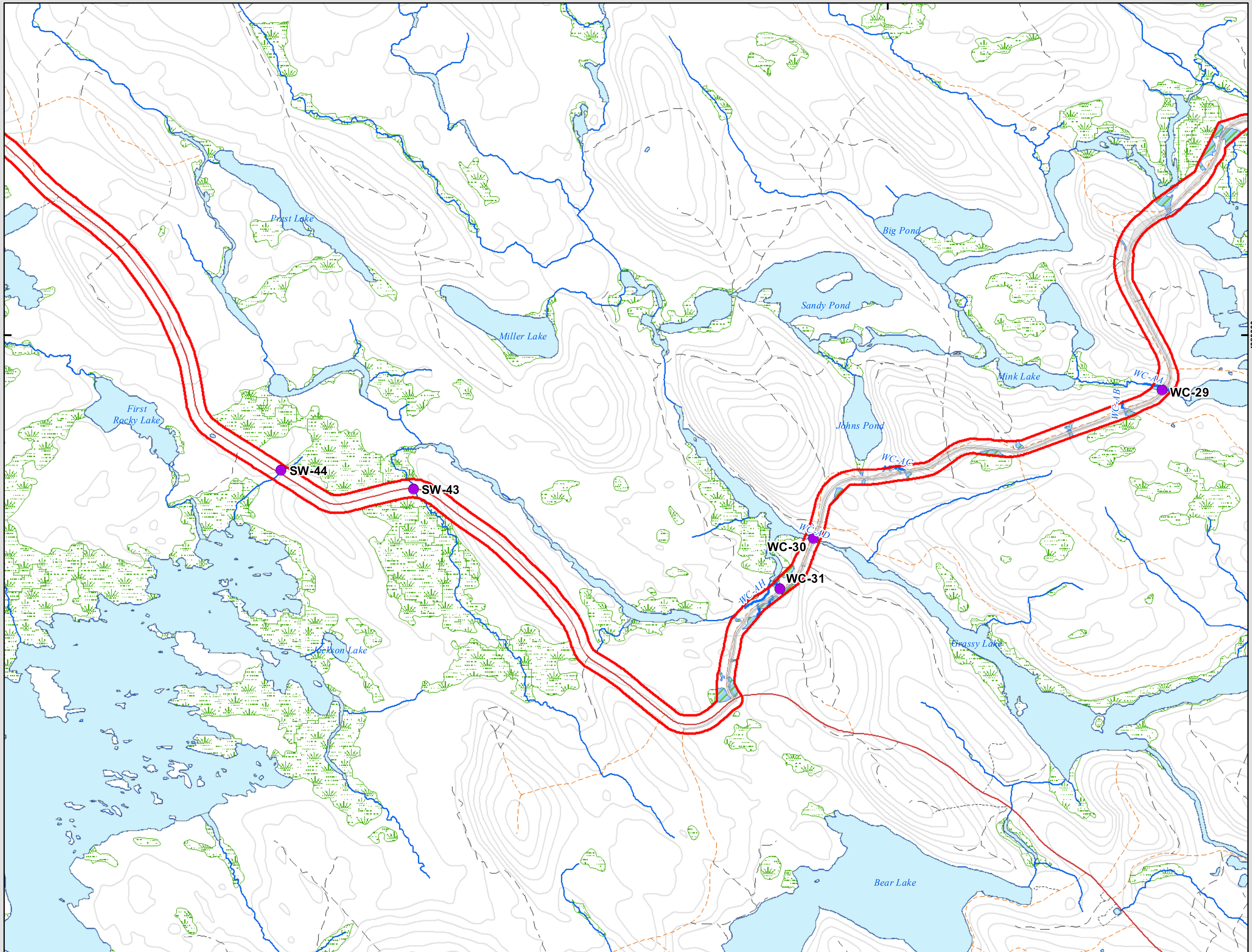
Document Name: BD_EIS_Figure6.7-3SurfaceWaterMonitoringLocations



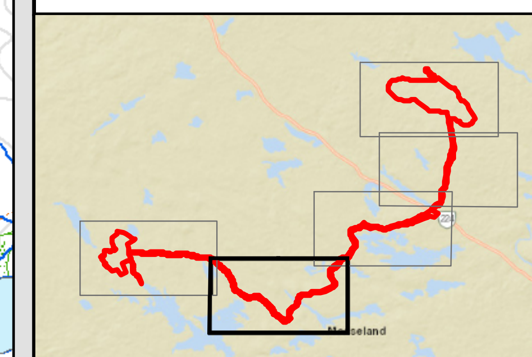
Prepared For:

Atlantic Gold

FIGURE NSE-2-80-2C

Surface Water Quality Baseline Sampling Locations, Haul Road

- Baseline Surface Water Quality Monitoring Location Haul Road
- Field Delineated Watercourses
- NSTDB Mapped Watercourses
- Local Road
- Dry Weather / Seasonal Road
- Diveways (>300 m)
- Track
- Proposed Infrastructure
- Field Delineated Wetlands
- NSE Wetlands
- Water Bodies
- Project Area



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Projection: Transverse Mercator
Datum: North American 1983 CSRS
Units: Meter

0 0.25 0.5 1 Kilometers

1:20,000 Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed By: LP
Date: 2021-04-30

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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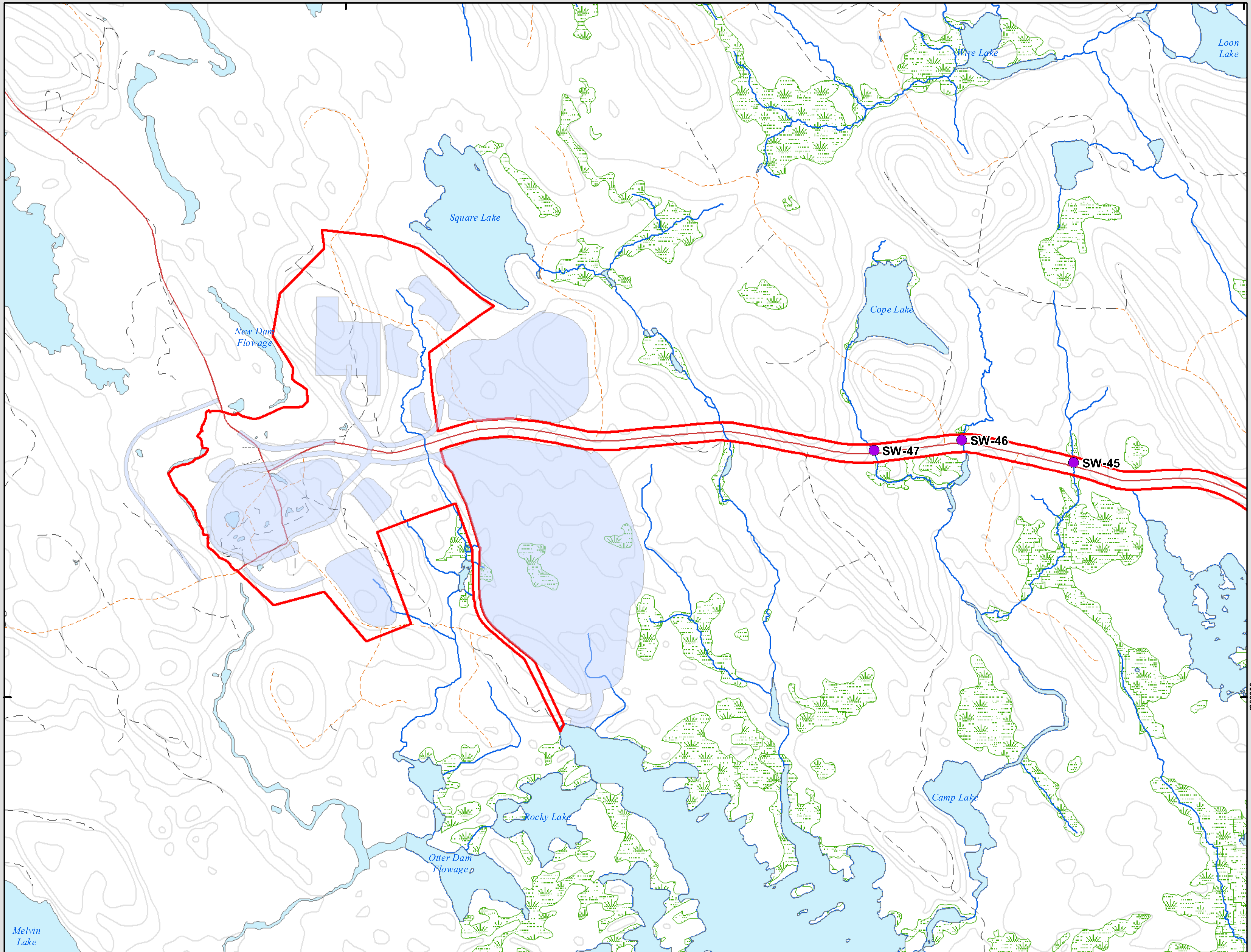
Document Name: BD_EIS_Figure6.7-3SurfaceWaterMonitoringLocations

Prepared For:

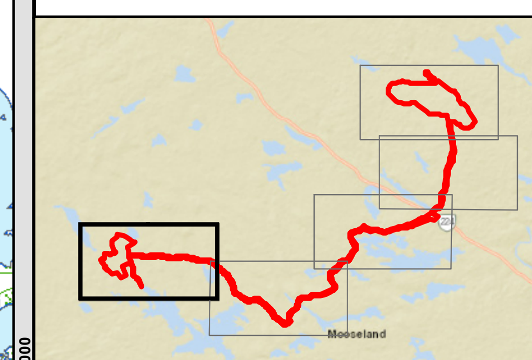
Atlantic Gold

FIGURE NSE-2-80-2D

Surface Water Quality Baseline Sampling Locations, Haul Road



- Baseline Surface Water Quality Monitoring Location Haul Road
- NSTDB Mapped Watercourses
- Local Road
- Dry Weather / Seasonal Road
- Diveways (>300 m)
- Track
- Touquoy Mine Infrastructure
- NSE Wetlands
- Water Bodies
- Project Area



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

0 0.25 0.5 1 Kilometers

1:20,000 Scale when printed @ 11" x 17"

Drawn By: EP
Reviewed By: LP
Date: 2021-04-30

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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Document Name: BD_EIS_Figure6.7-3SurfaceWaterMonitoringLocations

Round 2 Information Request Number:	NSE-2-81
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.2.1, pg.266

Context and Rationale

SW-9 is listed as a water quality monitoring reference site in a different watershed. No details are provided on the upstream drainage area, land uses and surface water features to confirm that it is an appropriate reference site for comparing baseline water quality to sites within Beaver Dam project area and the Killag River.

The Proponent is Required to …

Provide a comparison of the SW-9 monitoring site upstream watershed with appropriate sites within the Beaver Dam project area. The comparison should include at a minimum evaluation of drainage areas, land uses and hydrologic features between the two features.

Response

SW-9 is a water quality location monitors where the Beaver Dam Mine Road crosses the West River Sheet Harbour. SW-9 has been removed as a sampling location.

Round 2 Information Request Number:	NSE-2-82
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Figure 6.7-3 and its series A to B

Context and Rationale

A. There a red/orange dashed polylines on all the 6.7-3 figures without definition in the legend. They appear to be existing logging roads.

B. There is a linear wetland that extends approximately 2/3 up the Figure 6.7-3. This appears to be a graphical anemology and not a continuous wetland feature.

The Proponent is Required to …

A. Confirm what the red/orange dashed polylines on all the 6.7-3 figures are?

B. Confirm that the linear wetland approximately 2/3 of the way up the figure is a graphical anomaly?

Response

Figure 6.7-3 has been replaced and updated by Figure 6.7-1, page 6-218 and Figure 6.7-2 Series, page 6-219 to 6-222 in Section 6.7.3, page 6-217 of the Updated 2021 EIS (AMNS 2021) and have been included in IR2 response NSE-2-80 as Figures NSE 2-80-1 to NSE 2-80-2A to D. The legend has been updated to show the red/orange dashed polyline as a Seasonal Road. The linear wetland referred to as a graphical anomaly was removed as it was discovered to be an error in the map

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-83
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.2.1, pg.267; Appendix G.2; 6.7.3.1.1, pg. 275

Context and Rationale

A. The baseline monitoring program summary in Section 6.7.2.2.1 states the following: “Surface water monitoring data was collected around the Beaver Dam Mine Site to be representative of the site conditions and considers stream water rather than lake water.”

Lakes within the project development area, based on mapping include Crusher and Mud Lake. Sampling was conducted at the downstream of the outflow from Crusher Lake (SW6A) and downstream of the outflow of one section of Mud Lake (SW4a).

Section 6.7.2.2.1 further states the following: “The 2017 surface water samples collected from Mud Lake and the stream from Crusher Lake provide ample baseline SW data for these sites.”

No reasoning is provided as to why lake water sites in Mud Lake and/or Crusher Lake were not included in the surface water quality monitoring program.

Crusher Lake is indicated as having a lake depth of up to 10 m (Section 6.7.3.1.1, Table 6.7-5). Many lakes within the Province can become thermally stratified during the winter and summer season that are of similar depths. Stratified lakes can have different water quality between the various thermal layers and associated processes.

B. The following statement is also made about sample collection with respect to Mud Lake and Crusher Lake in Section 6.7.2.2.1: “The 2017 surface water samples collected from Mud Lake and the stream from Crusher Lake provide ample baseline SW data for these sites.”

Within Appendix G.2 no data is provided from 2017 with respect to surface water quality in Mud Lake and/or Crusher Lake.

C. Section 6.7.2.2.1 states the following about Kent Lake: “Kent Lake would provide no additional data. A monitoring location here prior to construction and during operation may be warranted.”

No rationale is provided to support the statement that monitoring Kent Lake would provide no additional data, or why a monitoring site should be established in Kent Lake prior to construction.

D. A single sampling event (October 2017) was conducted at Tent Lake and an unnamed Lake southwest of the project development area at the Beaver Dam site. These two sites, besides the single event haul road monitoring event locations are the only sites located downstream and south of the Beaver Dam project area, and Tent Lake will be receiving managed surface water runoff from the mine facilities, crusher and run-of-mine pads and associated haul roads. No rationale is provided as to why a single fall sampling event is sufficient to represent baseline water quality in these receiving waters.

No details are provided as to whether either lake was sampled at an inlet or outlet, or within the waterbody itself.

The Proponent is Required to …

A. Provide rationale for why lakes that will be potentially impacted by project development activities at the Beaver Dam project area did not have baseline surface water quality monitoring conducted within the lake bodies themselves. Indicate how lake water quality will be included/estimated in the assessment of potential project effects given the absence of lake water quality data. Provide a discussion on how outlet monitoring data will be used to evaluate impacts to in-lake water quality, particularly with respect to potential thermal stratification of Crusher Lake given its maximum depth.

B. Provide missing 2017 water quality results for Mud Lake and stream from Crusher Lake.

C. Provide rationale to support the statement that monitoring water quality in Kent Lake for the baseline study would provide no additional data, but that monitoring may be required here prior to construction and operation. Provide water quality results if monitoring is required for the baseline study.

D. Provide rationale as to why a single sample event in October 2017 is sufficient to represent baseline conditions in receiving waters southwest and south of the Beaver Dam project area, particularly with respect to Tent Lake, which is planned to receive managed surface water runoff from the mine facilities, and crusher and run-of-mine pad.

E. Indicate where the monitoring sites are located within each respective water body (e.g., inlet, outlet, water body deep spot).

Response

The Surface Water Quantity and Quality Assessment, Section 6.7, page 6-213 has been updated in the Updated 2021 EIS (AMNS 2021). The sampling effort has been expanded since the 2019 EIS.

A. Site-specific baseline results most salient to the effects assessment are presented in this section; results are summarized by Project Area and catchment; surface water monitoring locations are presented in IR2 response NSE-2-80 as Figures NSE 2-80-1 and NSE-2-80-2A to D in the Updated 2021 EIS (AMNS 2021). Figure NSE-2-83-1 (Surface Water Monitoring Locations) has been included. Physical characteristics of water courses are appended as Appendix G.4 (Physical Characteristics of Watercourses and Waterbodies) of the Updated 2021 EIS (AMNS 2021). Seventeen water quality sampling events were completed between 2014 to 2015 and 2019 to 2020 with an additional standalone event occurring in 2017. From these 18 samples, eight of these were collected during baseflow conditions, with the remaining 10 being collected during precipitation events. Surface water quality results are compared to Nova Scotia Environment Contaminated Sites Regulation 2013 Tier 1 Environmental Quality Standards (EQS) as per a requirement of the Industrial Approval to operate (NSE 2017), in addition to the CCME FAL. The baseline sampling was used in water quality predicted modeling provided in the Section 6.7, page 6-213 of Updated 2021 EIS to determine impact predictions. An updated discussion of potential impacts to Crusher Lake with respect to Surface Water Quantity is provided in Section 6.7.8.2.1, page 6-271.

B. Missing 2017 water quality data is provided in Appendix G.1 (Surface Water Baseline Analytical Results) of the Updated 2021 EIS (AMNS 2021).

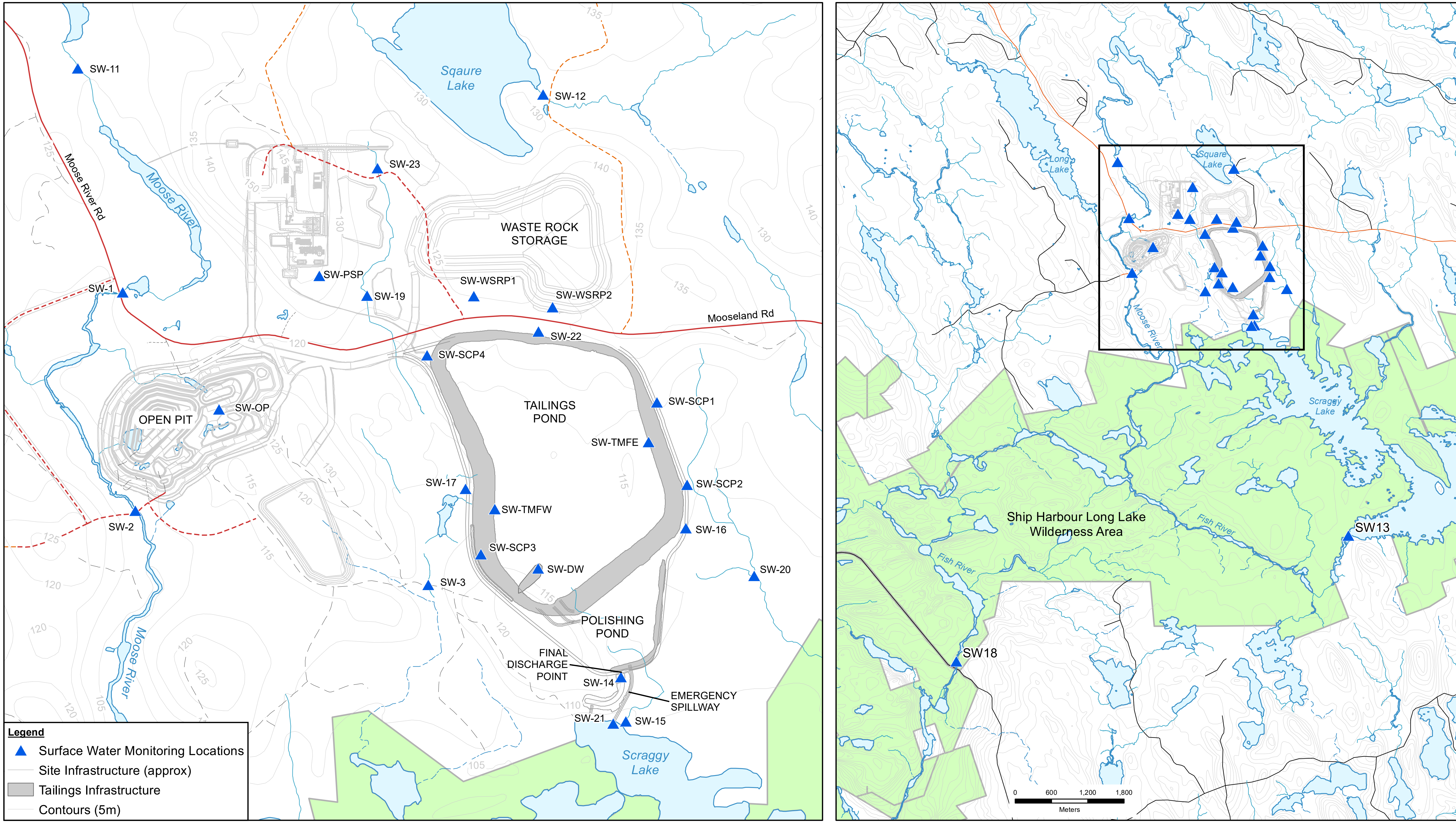
C. Water quality modelling does not predict impact to Kent Lake.

D. Water quality sampling events undertaken in Tent Lake watershed is provided in Appendix G.1 (Surface Water Baseline Analytical Results) of the Updated 2021 EIS (AMNS 2021).

E. As noted above, surface water monitoring locations are provided in Figures 6.7-1, page 6-218 through 6.7-3, page 6-223 (Figure NSE-2-83-1) of the Updated 2021 EIS (AMNS 2021) and included with IR2 response NSE-2-80, Figures NSE-2-80-1 and NSE-2-80-2A to D. Appendix G.4 of the Updated 2021 EIS (AMNS 2021) provides a detailed description of the physical characteristics of the Water Courses and Water Bodies sampled.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.



Source: Service Nova Scotia, AGC, Stantec, GHD

0 150 300 450
Meters

Coordinate System:
NAD 1983 CSRS UTM Zone 20N

N

GHD

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

TOUQUOY MINE
SURFACE WATER MONITORING LOCATIONS

088664
May 10, 2021

FIGURE NSE-2-83-1

GIS File: I:\GIS_DATA\Projects\6-chars\08----\088---\088664 Atlantic BD\088664(004)\Revised 2021\088664(004)GIS-DA066.mxd

Round 2 Information Request Number:	NSE-2-84
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.2.1, pg.267-268; Appendix E.2

Context and Rationale

A. The sampling criteria indicates that grab surface water quality samples were analysed for dissolved metals (RCAp-MS(dissolved).

B. Monitoring sites within the Beaver Dam project area are stated as not including analysis for total suspended solids, and no results are presented in Appendix E.2. The following rationale is provided: “TSS analysis was limited to the Haul Road due to the potential for haul truck traffic to suspend particulate matter for deposition into watercourses adjacent to the Haul Road. The potential for this interaction at the Beaver Dam Mine Site is low, due to the planned sediment and erosion control measures and nature of the pit design.”

   Given that haul roads and ground disturbance are proposed within the Beaver Dam project area, would this rationale not support monitoring of total suspended solids in these watercourses as part of the baseline study. No discussion is provided on how the efficacy of the erosion and sediment control measures within the project area will be evaluated given the absence of total suspended solids baseline data to confirm the project impacts.

C. Section 6.7.2.2.1 states the following: “Flow rate and water levels at sample locations along the Haul Road did not allow for consistent field parameter data collection.”

   This potentially indicates that water quality samples were collected at watercourse sites with little to no observed flow during a given sample event. No discussion is provided with respect to the potential effects on water quality results or whether sampling watercourses under these conditions is standard practice.

D. Additionally, in Appendix E.2 no field parameter results are provided for August 24, 2015 at all baseline water quality sampling sites.

E. No accredited lab results sheets/tables are provided with the Revised EIS Submission. These would provide an additional reference to the tables prepared within the document and may provided additional notes from the lab analysis.

The Proponent is Required to …

A. Confirm whether the surface water quality samples were analysed for total metals or dissolved metals. If dissolved, provide a discussion on the field filtering process, and how results were assessed with respect to guideline criteria, which are typically total.

B. Provide additional rationale on why total suspended solids at surface water quality monitoring sites within the Beaver Dam project area were not analysed for given the proposed construction and operation phase activities at the Site (e.g., disturbance of soils, hauling of materials). Indicate how baseline conditions will be estimated for total suspended solids given the absence of data (e.g., pre- and post- development modeling of sediment loads), or alternatively provide additional baseline water quality monitoring results for total suspended solids given that it is a contaminant of concern for the project.

C. Confirm whether surface water quality samples were collected from watercourses during periods of observed flow. If samples were collected during periods of no flow, indicate how baseline results were considered and interpreted for these watercourse conditions, and whether they should be included in the assessment of baseline conditions (e.g., average values, standard deviation).

D. Provide comment on the August 24, 2015 sample event and why flow conditions did not allow for field parameter measurements at all monitoring sites in the study area.

E. Provide accredited lab results sheets/tables for surface water quality samples.

Response

A. The Surface Water Quantity and Quality Assessment, Section 6.7, page 6-213 has been updated in the Updated 2021 EIS (AMNS 2021). The sampling effort has been expanded since the 2019 EIS. Surface water quality results are compared to Nova Scotia Environment Contaminated Sites Regulation 2013 Tier 1 Environmental Quality Standards (EQS) as per a requirement of the Industrial Approval to operate (NSE 2017), in addition to the CCME FAL. Appendix G.1 (Surface Water Baseline Analytical Results; Updated 2021 EIS [AMNS 2021]) provides baseline water quality sampling results. Samples were analyzed for Total Metals.

B. Baseline TSS was collected in Killag River as noted in Section 6.7.5.2.1, Table 6.7-15, page 6-244 of Updated 2021 EIS (AMNS 2021).

C. Appendix G.4 provides Physical Characteristics of the Water Sampling Locations in the Updated 2021 EIS [AMNS 2021].

D. Additional monitoring has been undertaken since 2015 sampling to improve the baseline date set, which includes field parameters. The specific event that precluded field parameter sampling measures on August 24, 2015 is not known.

E. Accredited lab results sheets/tables for surface water quality samples is provided in Appendix D (Laboratory Results) of Appendix J.2 (2019-2020 and 2015-2017 Fish and Fish Habitat Baseline Report), PDF page 214 in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-85
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.2.1, pg.268; Appendix E.2

Context and Rationale

A. The following statement is provided on how results were compared to guidelines: "Analytical results were compared to the CCME FWAL guidelines, updated to 2014; the MDMER guidelines (formerly MMER) updated to 2018; and the NSEQSs for Surface Water, updated to 2013."

   The revised EIS was prepared in 2019. There is no reasoning provided as to why the most recent versions of the CCME FWAL and NSEQSs for Surface Water were not applied for the baseline surface water quality assessment. In the fall of 2018 zinc was updated in the CCME FWAL guideline list, and in 2015 silver was revised from 0.1 µg/L to 0.25 µg/L.

B. Several of the guideline values (e.g., aluminum, ammonia as nitrogen) are calculated using pH values. Lab pH can substantially differentiate from field pH, and it is typical practice to use field pH to calculate whether a results exceeds a criteria value. There is no discussion on whether field pH was consistently used to calculate the criteria (e.g., August 24, 2015 results with no field pH).

The Proponent is Required to …

A. Provide a revised comparison table using the most recent versions of applicable guidelines and update relevant assessment sections.

B. Confirm that field pH was used to calculate whether applicable water quality results exceeded criteria values.

Response

A. The Surface Water Quantity and Quality Assessment, Section 6.7, page 6-213, has been updated in the Updated 2021 EIS (AMNS 2021). The sampling effort has been expanded since the 2019 EIS. Surface water quality results are compared to Nova Scotia Environment Contaminated Sites Regulation 2013 Tier 1 Environmental Quality Standards (EQS) as per a requirement of the Industrial Approval to operate (NSE 2017), in addition to the CCME FAL, Table NSE-2-85-1.

Table NSE-2-85-1: MDMER, CCME, Tier 1 EQS and Site-Specific Water Quality Regulations

Constituent	MDMER (µg/L)	CCME (µg/L)	Tier 1 EQS (µg/L)	Site-Specific[(a)] (µg/L)
	a	b	c	d
Silver	-	0.25	0.25	-
Aluminum	-	5.00	5.00	254
Arsenic	100	5.00	5.00	30.0
Cadmium	-	0.04	0.04	-
Cobalt	-	0.78	10	-
Copper	100	2.00	2.00	-
Iron	-	300	300	509
Mercury	-	0.026	0.026	-
Manganese	-	190	820	-
Mo	-	73.0	73.0	-
Nickel	250	25.0	25.0	-
Lead	80.0	1.00	1.00	-
Antimony	-	-	20.0	-
Selenium	-	1.00	1.00	-
Thallium	-	0.80	-	-
Uranium	-	15.0	300	-
Zinc	400	7.00	30.0	-
Nitrate	-	13,000	-	-
Nitrite	-	60[(b)]	-	-
Ammonia	-	27,550[(c)]	-	-

Source: Predictive Water Quality Assessment in the Updated 2021 EIS (AMNS 2021, Appendix D of Appendix P.4 [Mine Water Management Plan]), PDF page 184.

Notes: [(a)] Site-Specific guidelines are taken from Appendix C.2 (Intrinsik 2021) of the Updated 2021 EIS (AMNS 2021).

[(b)] Nitrite guideline is listed in µg nitrite/L.

[(c)] Ammonia guideline is in µg ammonia-N/L based on a conservative assumption of pH of 6.0 and water temperature of 25ºC.

MDMER = Metal and Diamond Mining Effluent Regulations; CCME = Canadian Council of Ministers of the Environment; Tier 1 EQS = Nova Scotia Tier 1 Environmental Quality Standards; µg/L = microgram per litre; - = not applicable.

B. Field pH were measured and provided for laboratory analysis.

References

AMNS. 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-86
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.2, pg. 268; 6.7.3.2.1, Table 6.7-8, pg.289-291; Appendix G.1

Context and Rationale

A. The following statement is provided about baseline sampling along the proposed haul road routes: "One sampling event was completed in June 2015 for the 29 sampling locations along the Haul road."

No further discussion is provided on whether a single sample event is sufficient to characterize baseline surface water quality in these watercourses.

B. Within the Revised EIS Submission no quantitative water quality results are provided for the Haul Road baseline surface water quality study. The results are only discussed with respect to exceedances of applicable criteria values and representing baseline conditions.

The Proponent is Required to …

A. Provide rationale on why a single sample event is expected to be sufficient for characterizing baseline water quality conditions in watercourses crossed along the proposed Haul Road route(s).

B. Provide the quantitative surface water quality results for samples collected for the Haul Road baseline study. Additionally, provide the accredited lab results sheets for reference and comparison.

Response

A. The Surface Water Quantity and Quality Assessment, Section 6.7, page 6-213, has been updated in the Updated 2021 EIS [AMNS 2021]. The sampling effort has been expanded since the 2019 Revise EIS. Water quality results are provided in Appendix G.1 (Surface Water Baseline Analytical Results; AMNS 2021).

B. Accredited lab results sheets/tables for surface water quality samples is provided in Appendix D, PDF page 214 (Laboratory Results) of Appendix J.2 (2019-2020 and 2015-2017 Fish and Fish Habitat Baseline Report) in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-87
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.3, pg.271; Appendix G.5, 3.2.2, pg. 4

Context and Rationale

The following statement is made about the type of water balance model used for the Beaver Dam site: "Under baseline conditions, the Australian water balance model (AWBM) was used to calculate runoff volumes based on the surplus of rainfall/snowmelt depths from the soil storage multiplied by the contributing drainage area."

No details are provided on the AWBM and its applicability to the Nova Scotia climate and local hydrologic cycle. There are other Canadian and North America developed water balance models available, and these were not discussed or compared to the AWBM to indicate why the AWBM was chosen as an appropriate model for this project.

The Proponent is Required to …

How is the Australian Water Balance Model appropriate for use to simulate the local hydrologic cycle at the Beaver Dam site in Nova Scotia, Canada? Particularly with respect to the snow portion of the hydrologic cycle. Provide rationale on why this model is most appropriate including potential comparison against other applicable water balance methods.

Response

The Australian Water Balance Model (AWBM) is a conceptual hydrologic model that simulates surface runoff and baseflow from a mass balance of the soil storage. Input is precipitation, output is evapotranspiration, storage is the available water capacity of the soil, and overflow from the soil storage is partitioned into surface runoff and groundwater recharge based on the baseflow index (BFI). In the revised water balance model, precipitation was replaced with the sum of rainfall and snowmelt to provide a better representation of hydrologic processes in Nova Scotia. The model structure is not unique to Australia. The model parameters, including soil moisture storage capacity, BFI, and baseflow recession constant (Kb) were determined based on-site specific conditions. The snowpack was also modelled using a mass balance approach. Snowfall accumulates into the snowpack storage. Output from the snowpack storage is determined by the snowmelt rate. Snowmelt rate is calculated using the degree-day method when the daily mean temperature is greater than 0 degrees Celsius (Updated 2021 EIS [AMNS 2021], Section 6.7.4.2, page 6-228).

References

AMNS. 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-88
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.5, 2.2.1, pg. 2; 4.1, pg. 17

Context and Rationale

The Harmon equation is used to estimate potential evapotranspiration and climate normal data is used to estimate lake evaporation within the water balance as described in Section 2.1.2. As presented in Table 2-1, no evaporation or potential evapotranspiration is predicted to occur during the months of December, January, February or March. However, in Table 4-1 evaporation is predicted to occur within the collection system with the Killag River outfall for the End-of-Mine and Post-Closure conditions. Both Tent Lake and Mud Lake outfalls have no winter evaporation estimated. No explanation is provided as to why evaporation is predicted for those months at the Killag outfall site.

The Proponent is Required to …

How is evaporation occurring within the water balance model for the Killag River in the months of December to March? If an appropriate water transport mechanism for this time period, why is transport via evaporation not occurring in Mud or Tent Lake, and not during the baseline condition at the Killag site?

Response

Different methods were used to calculate evaporation from the stockpiles and natural areas.

Stockpile evaporation rates were calculated as coefficients of the daily rainfall/snowmelt. The coefficients were determined from studies at the Touquoy Mine Site based on the type of stockpile material. Evaporation rates from the stockpiles were calculated on days when rainfall/snowmelt occurred. This approach was considered to be acceptable as the daily results were aggregated to monthly and annual time steps for analysis.

Site evaporation observation data was not available for natural land cover type. Therefore, potential evapotranspiration (PET) rates were calculated based on saturated water vapour/daily mean temperature and average monthly sunlight hours. The PET rates were previously rounded to 0 mm/day during the winter months, resulting in "zero" evaporation from the natural areas in the winter as reported in the previous EIS submission (AMNS 2019). The model has been revised to calculate PET when the mean temperature is above 0 degrees Celsius (Updated 2021 EIS [AMNS 2021], Section 6.7.4.2, page 6-228).

Lake evaporation normals recorded at the Truro Environment Canada climate station were used to represent evaporation from water surfaces (i.e., lakes, settling ponds, pit lake).

References

AMNS (Atlantic Mining NS Inc.). 2019. Revised Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. February 28, 2019. Middle Musquodoboit, NS.

AMNS. 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-89
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F.3, Table 4A – N; Figure 6.7.3; 6.7.3.2.1, Table 6.7-7, pg. 289; 6.7.3.3.1, pg298

Context and Rationale

SW10, which is located upstream of the existing settling pond, when water quality results for metal parameters are compared to the other sites monitored as part of the baseline program there are a few that are one to two orders of magnitude higher than the other monitored sites. An example of this is arsenic with values of 130, 36, 380 (370 duplicate) µg/L for three sequential events in the summer of 2015, and SW-5 which is the outlet of the existing settling pond at arsenic values ranging from 15 to 47 µg/L. SW-6A had one sample with an arsenic concentration of 130 µg/L on June 30, 2015 with its duplicate sample having a concentration of 3 µg/L. All other arsenic concentrations observed as part of the baseline program were below 10 µg/L. These results indicate that the waters within the settling pond have increased arsenic concentrations in comparison to baseline conditions to other water features in the area. Parson et al. (2012) found that total arsenic concentrations associated with natural waters range in concentration between 5 and 100 µg/L.

Other compounds with elevated concentration at SW10 compared to the other sites include calcium, cobalt, iron, manganese, nickel and strontium. Calcium, manganese and strontium also were elevated at the outlet monitoring station for the existing settling pond (SW5).

There is no discussion within the Revised EIS Submission about the elevated metals results at SW10 and for select metals at SW5 in comparison to the other baseline sites. Based on some of the observed concentrations, particularly for arsenic at SW10 there is potential for historic mining activity contamination within the area.

References: Parsons, M B; LeBlanc, K W G; Hall, G E M; Sangster, A L; Vaive, J E; Pelchat, P. 2012. Environmental geochemistry of tailings, sediments and surface waters collected from 14 historical gold mining districts in Nova Scotia; Geological Survey of Canada, Open File 7150, 326 pages, https://doi.org/10.4095/291923 (Open Access)

The Proponent is Required to …

Provide analysis comparing the baseline surface water quality results, particularly metal parameters, at SW10 and SW5 with the results from the other monitoring sites. The analysis should include assessment on whether the results represent background concentrations typical for the local geology and land use or indicate potential historic mine activity contamination within the site.

Response

Overall, the results of the observed baseline water quality metal concentrations at SW10 and SW5 are elevated in relation to background conditions through baseline monitoring and show indication of impacts from historic mining contaminations within the site. Currently, the historic tailings and waste rock piles are being delineated and a development for a management plan will be completed. The two surface water quality locations of primary concern, SW10 and SW5 are located in or just downstream of the historic tailings. SW10 is located directly within an area of historic tailings and SW5 is located directly downstream of the historic tailings. SW14 was added to the baseline monitoring in 2020 and is also located within the historic tailings, just north of SW5 (see IR2 response NSE-2-80, Figures NSE-2-80-1 to NSE-2-80-2A to D).

Figures for seven metals; arsenic, calcium, cobalt, iron, manganese, nickel and strontium have been created, comparing each of the surface water baseline monitoring locations (Figures NSE-2-89-1 to NSE-2-89-7).

Background concentrations of constituents of concern were previously developed during the Predictive Water Quality Assessment (Appendix D of Appendix P.4 Mine Water Management Plan in the Updated 2021 EIS [AMNS 2021]), PDF page 184 for five of the seven metals.

Table NSE-2-89-1: Background Concentrations of Chemicals of Concern in Killag River

Constituent	Concentration in Killag River (µg/L)	Detection Limit (µg/L)
Arsenic	1.59	1.0
Cobalt	0.29	0.40
Iron	509.29	--
Manganese	47.57	--
Nickel	1.11	2.0

Source: GHD (2021) Predictive Water Quality Assessment, Appendix G.3 in the Updated 2021 EiS (AMNS 2021).

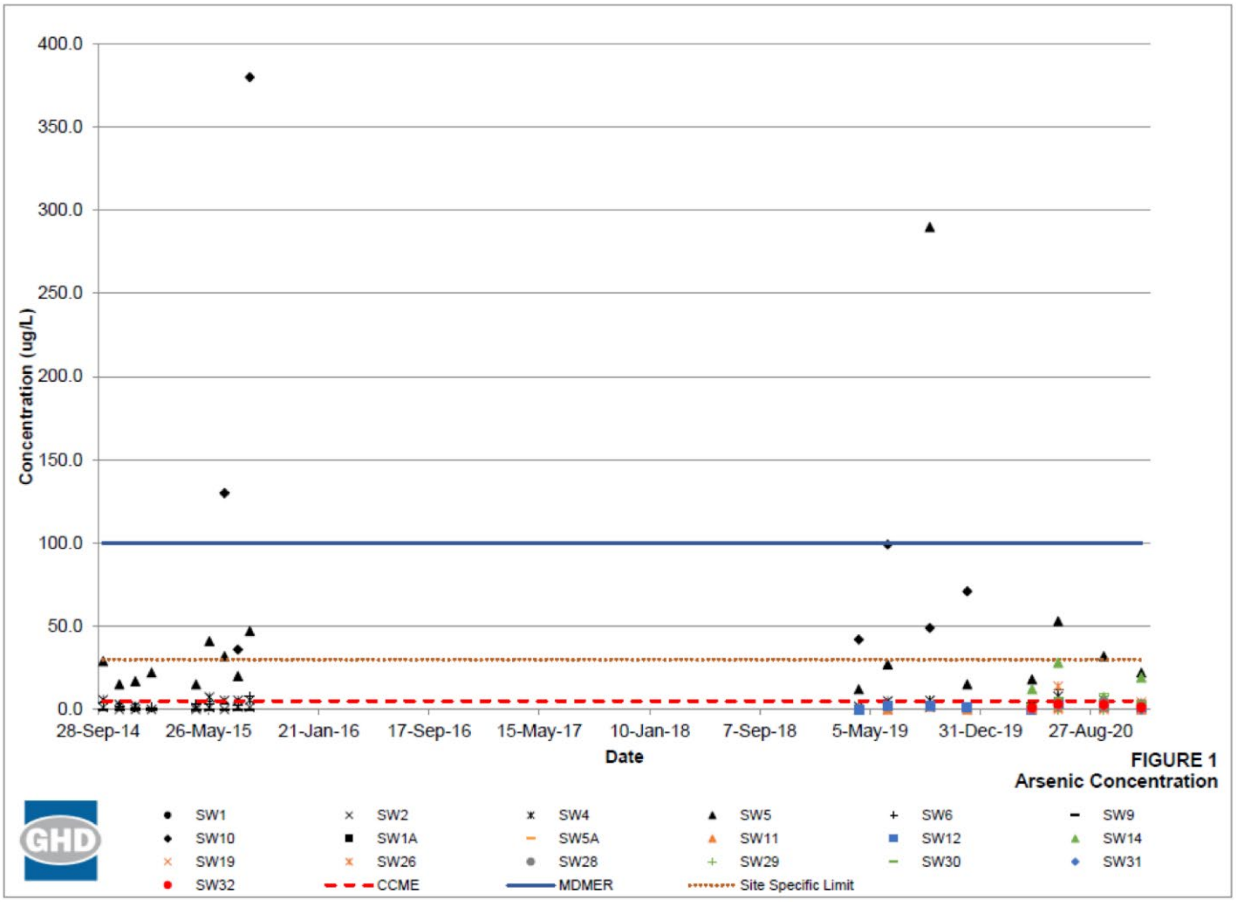
Notes: µg/L = microgram per litre; -- = not detectable.

The tables and graphs below present the surface water monitoring locations which experience increased levels of the seven constituents.

Table NSE-2-89-2: Surface Water Monitoring Location and Constituents Monitored

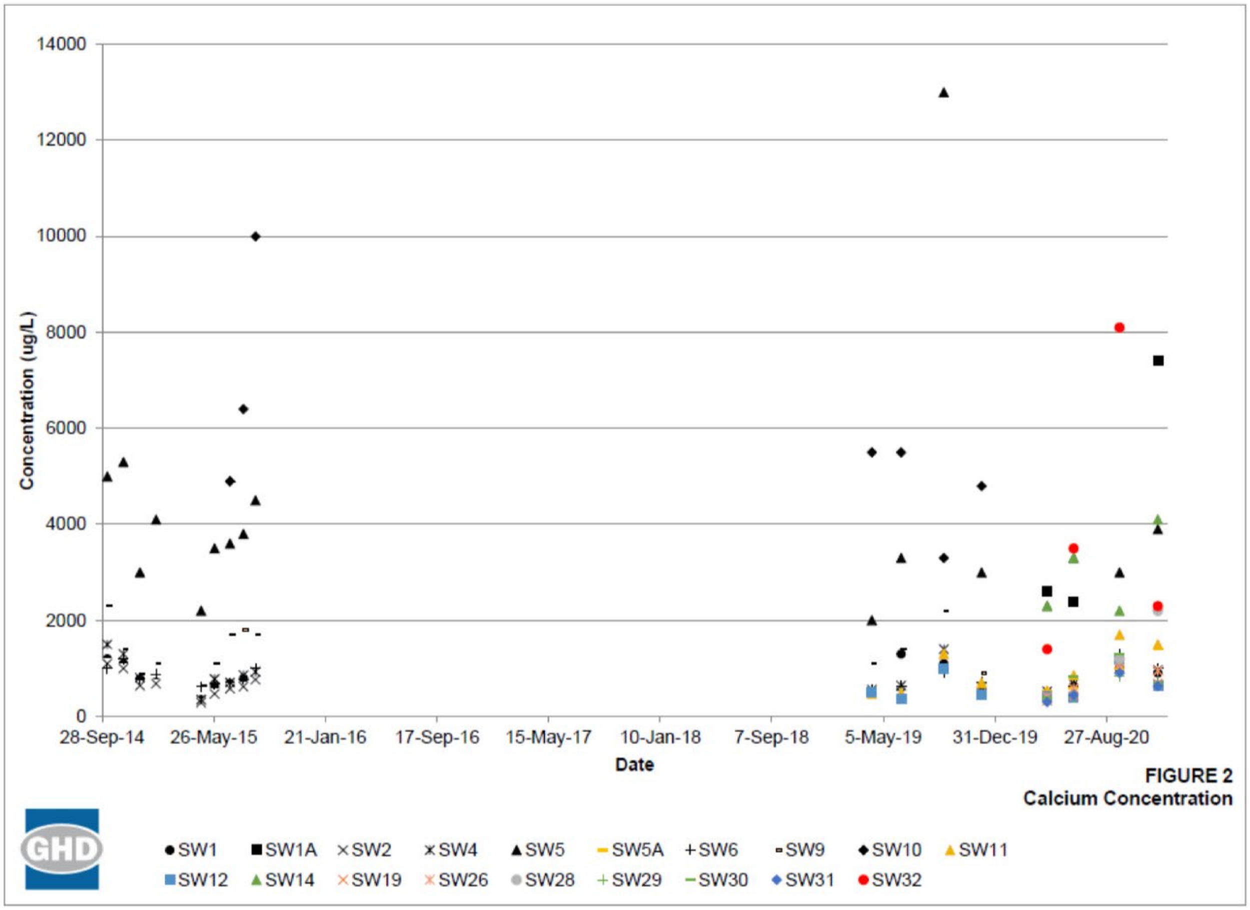
Constituent	Surface Water Monitoring Location																		
	1	1A	2A	4A	5	5A	6	9	10	11	12	14	19	26	28	29	30	31	32
Arsenic					X				X										
Calcium		X			X				X			X							X
Cobalt					X		X		X										
Iron					X				X										
Manganese		X			X				X										X
Nickel				X	X				X										
Strontium		X			X				X			X			X				X

Figure NSE-2-89-1: Arsenic Concentrations



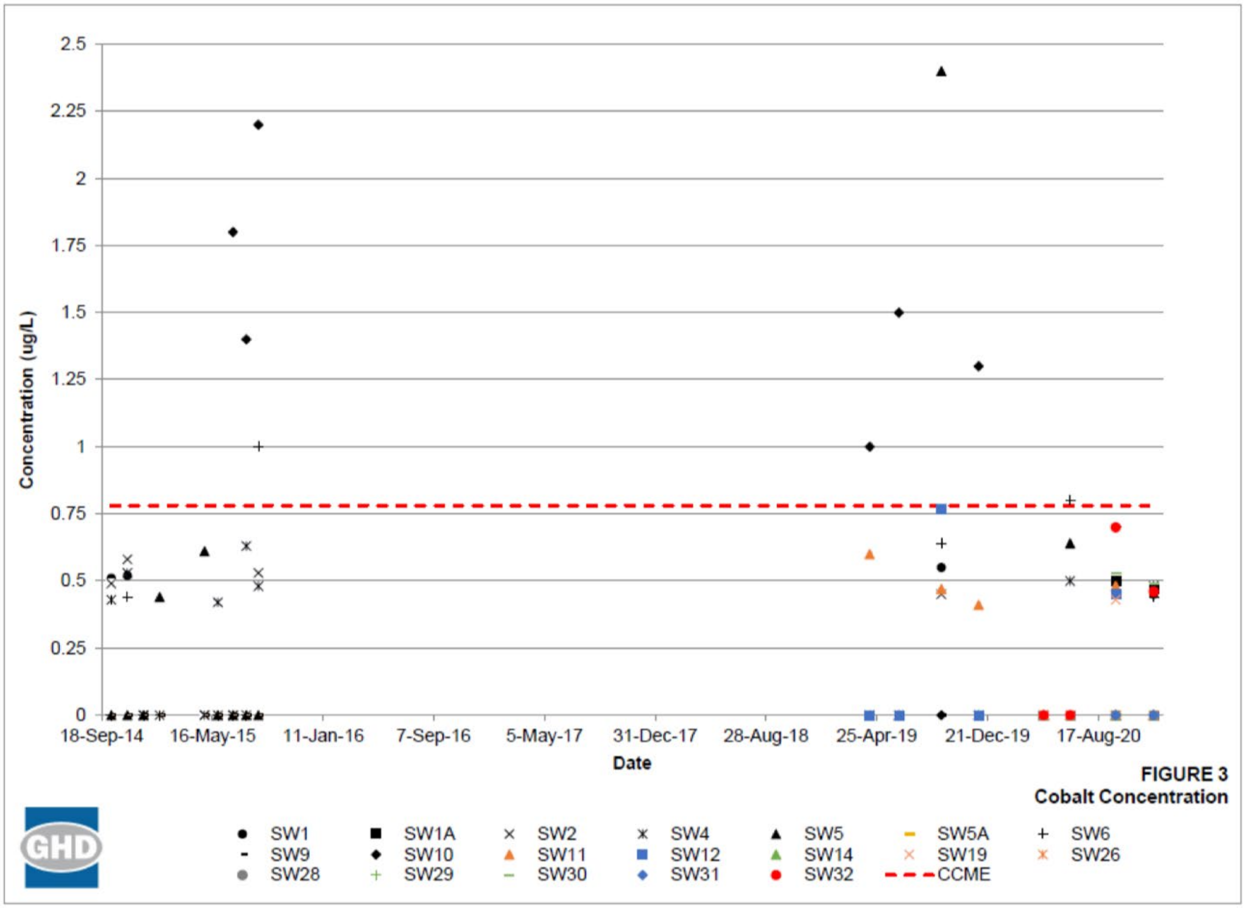
Arsenic is consistently high for SW5 and SW10 locations and far exceeds the background concentration found in the Killag River of 1.49 micrograms per litre (µg/L). SW14 is also located within the historic tailings area where there are higher concentrations. Water will be treated for metals in the North Settling Pond to achieve discharge criteria.

Figure NSE-2-89-2: Calcium Concentrations



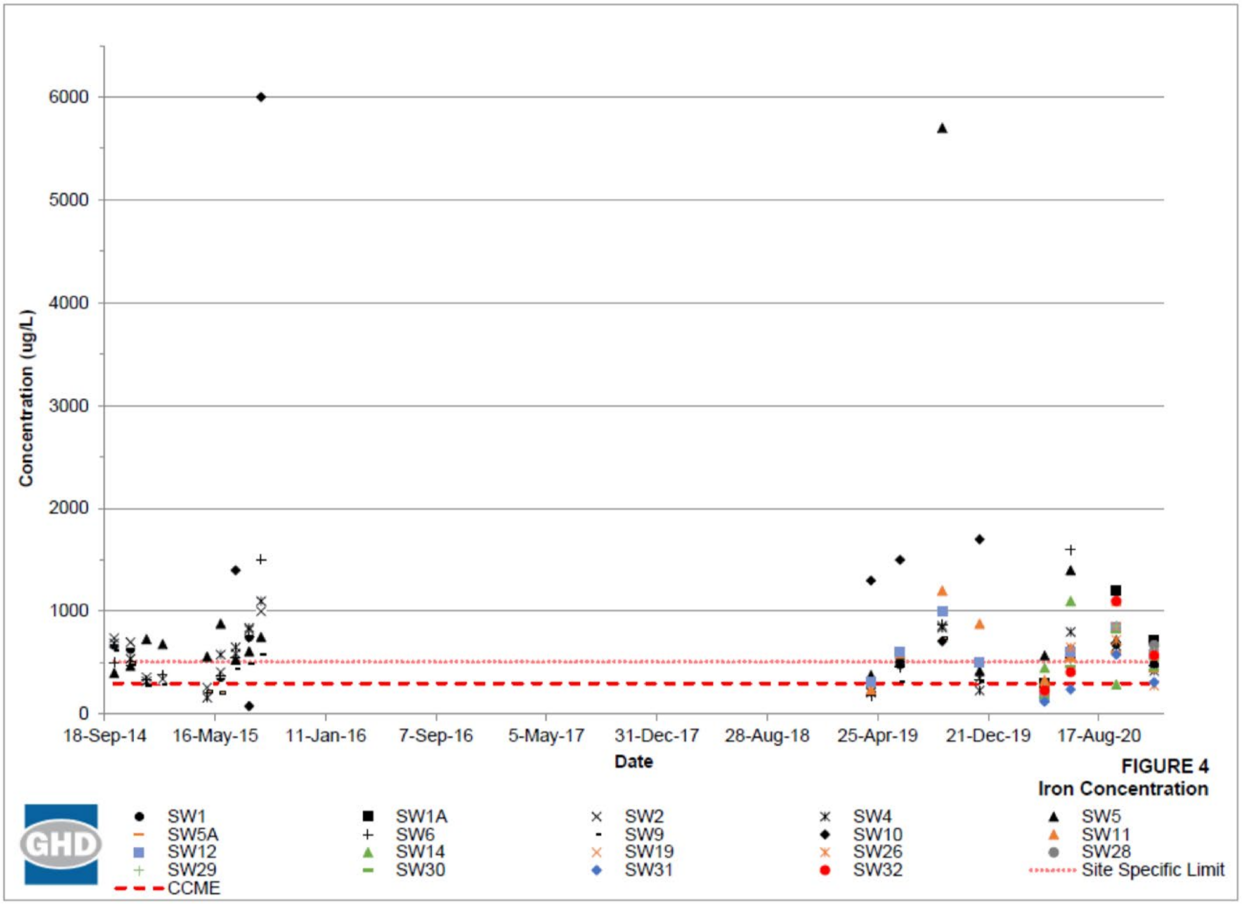
Calcium is consistently high for locations SW5, SW10 and SW14, all located within the historic tailings area. New baseline locations of SW1A and SW32 were established in 2020 downstream of Project activities along the Killag River. SW1 located just upstream of SW1A however does not have an increase concentration of calcium.

Figure NSE-2-89-3: Cobalt Concentrations



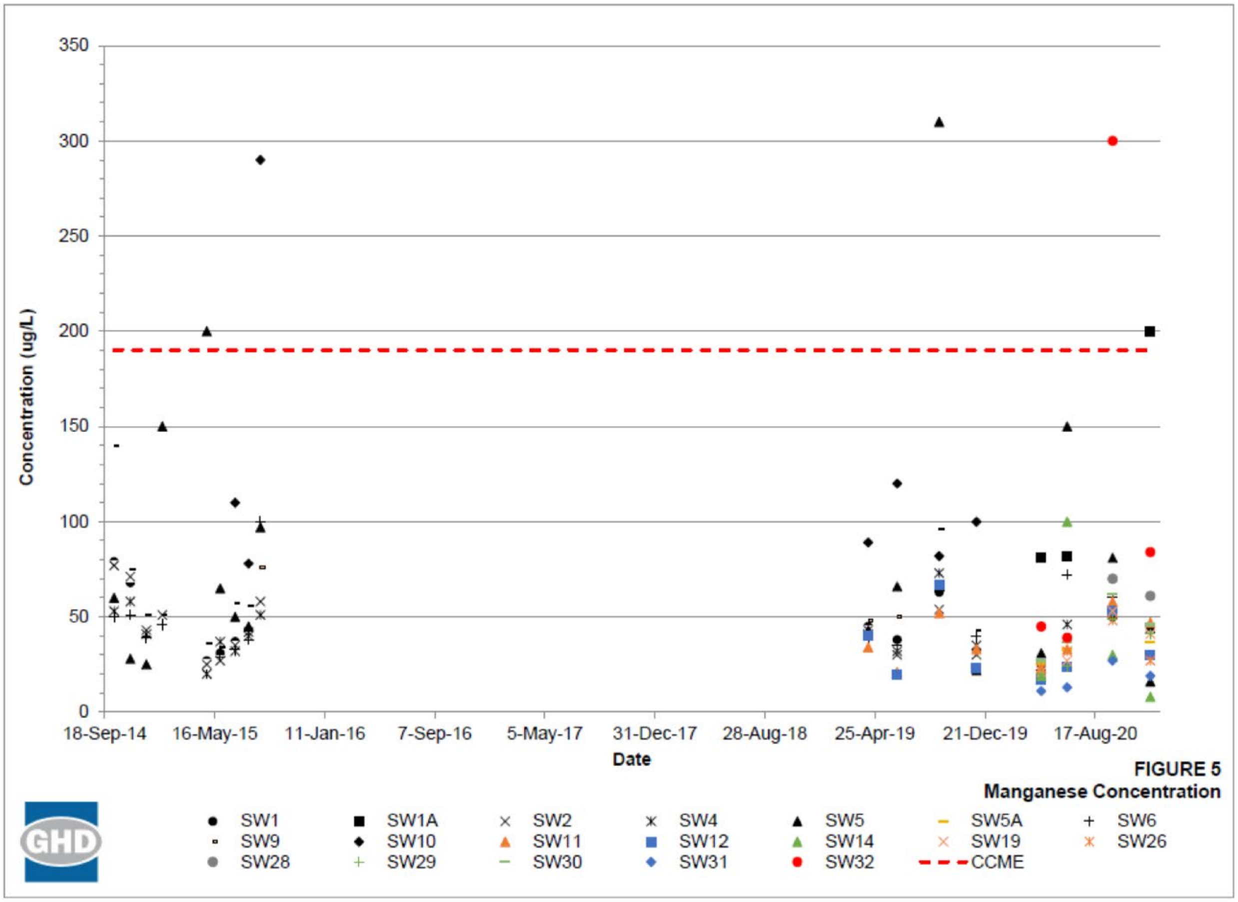
Cobalt is consistently high for SW5 and SW10 and far exceeds the background concentration found in the Killag River of 0.29 µg/L. Water will be treated for metals in the North Settling Pond to achieve discharge criteria.

Figure NSE-2-89-4: Iron Concentration



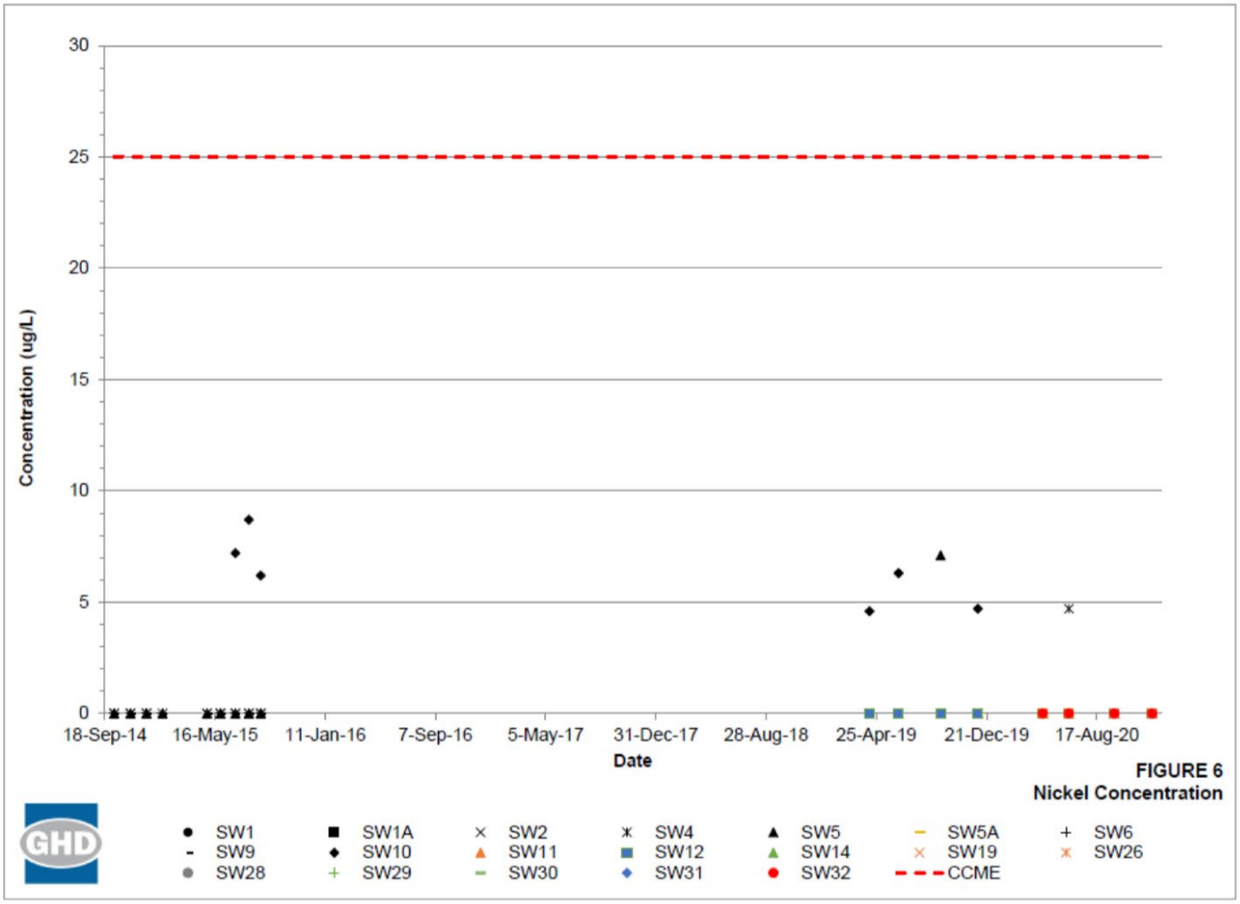
Iron appears to be consistently high for the majority of baseline locations, with concentrations exceeding the background concentration found in the Killag River of 509.29 µg/L frequently. SW5 and SW10 have experienced concentrations higher than other baseline locations. Water will be treated for metals in the North Settling Pond to achieve discharge criteria.

Figure NSE-2-89-5: Manganese Concentrations



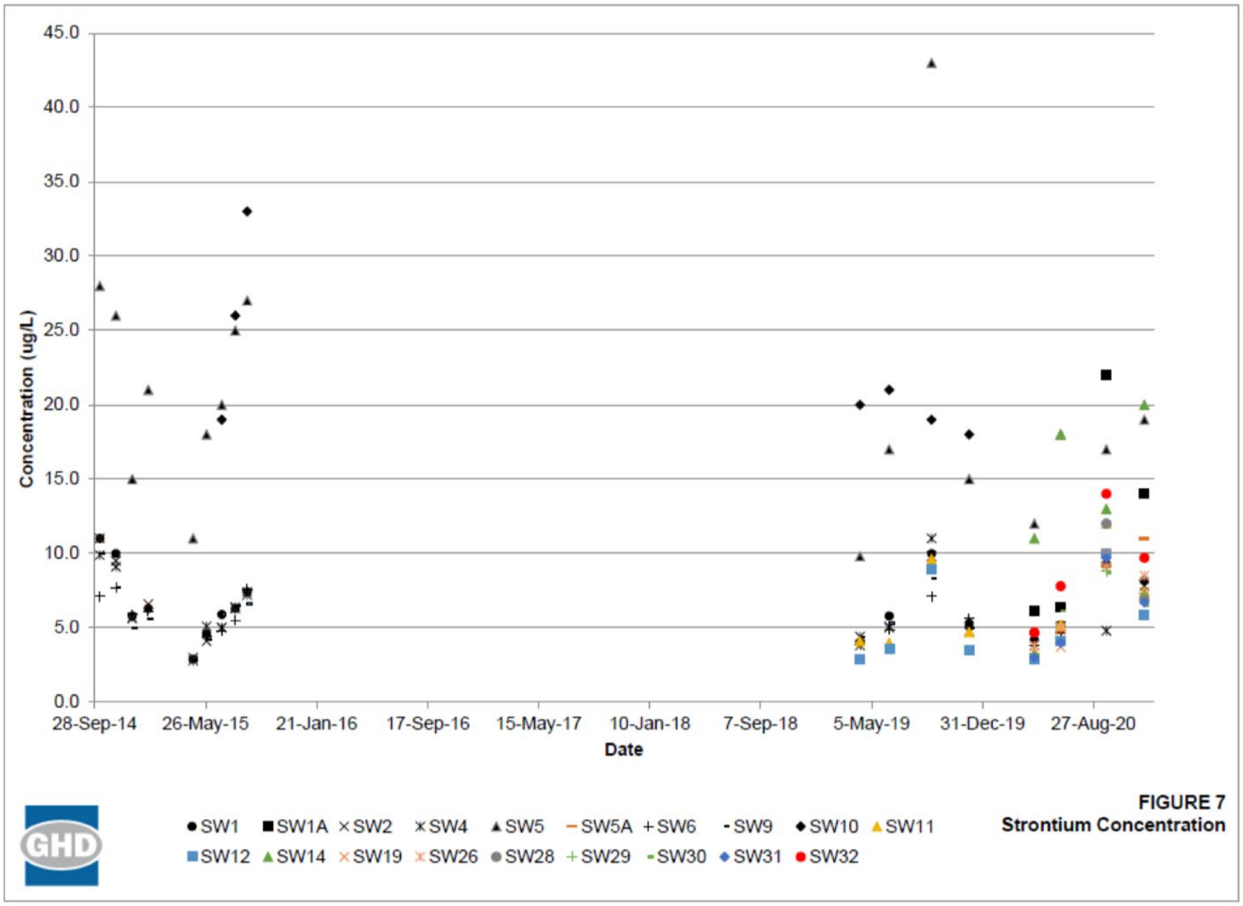
Manganese appears to be consistently high for the majority of baseline locations, with concentrations exceeding the background concentration found in the Killag River of 47.57 µg/L. Concentrations have exceeded CCME at SW5, SW10 and SW14, within the historic tailings area, and downstream of site at SW1A and SW32. Water will be treated for metals in the north settling pond to achieve discharge criteria.

Figure NSE-2-89-6: Nickel Concentrations



Nickel appears to be consistently high for SW10, with SW4 and SW5 experiencing an increased concentration, exceeding the background concentration found in the Killag River of 1.11 µg/L. Water will be treated for metals in the north settling pond to achieve discharge criteria.

Figure NSE-2-89-7: Strontium Concentrations



Strontium is consistently high for locations SW5 and SW10, with elevated concentrations also found at SW14, all located within the historic tailings area. New baseline locations of SW1A and SW32 were established in 2020 downstream of Project activities along the Killag River and also experienced an event with higher concentrations. SW1 located just upstream of SW1A however does not have an increase concentration of strontium.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-90
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.2.1, pg.287

Context and Rationale

A. The following statement is made in Section 6.7.3.2.1 with respect to sediment loading into the watercourses within the Beaver Dam site and along the Haul Road route: "The watersheds have been logged extensively, yet turbidity is low, indicating a lack of silt in the soils and/or little erosion from logging practices. The Haul Roads have been used to haul timber as well; however, TSS levels were low, which may be attributable to existing road conditions and allowable speeds."

There is no discussion with respect to when water quality samples were collected at each of the sites and local precipitation events. Higher sediment loads within the water column are typically observed in surface water systems during or immediately following precipitation events that contribute surface water runoff. If water quality samples were collected during precipitation events it would be expected increased TSS and turbidity levels would be observed. During baseflow conditions it is common for lower TSS and turbidity results.

B. Within Figures 6.7-3A to K there are a number of haul road water quality monitoring sites located on the upstream side of the existing haul road (e.g., WC-26, SW-46). The comments in Section A above include discussion about haul road activities and the monitoring program capturing their influence on water quality from the single June sampling event. Sampling upstream of infrastructure typically does not represent the influence of that infrastructure on local water quality.

The Proponent is Required to …

A. Provide precipitation data with respect to when water quality samples were collected for the baseline study for the Beaver Dam site and Haul Road. Assess whether the monitoring events coincide with storm flow or baseflow conditions. With this information, discuss potential influence of local land uses (e.g., logging, haul roads) and surface water runoff on observed water quality results.

B. Discuss if the baseline study for the Beaver Dam site captured a sufficient number of baseflow and stormflow events to represent those flow conditions at the site. Provide additional baseline results, if required, to represent different flow conditions.

C. Discuss how monitoring on the upstream side of the existing haul roads captures the full influence of the haul road activities on water quality. Will the project monitoring sites be moved to the downstream side of the haul road to capture potential impacts on water quality?

Response

A & B) Potential influences of local land use and baseline results are captured in the Cameron Flowage – Baseflow Mitigation Assessment Beaver Dam Mine Water Management Plan Memorandum in Appendix H of the Mine Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021), PDF page 664.

C) Monitoring stations have been installed upstream and downstream of the Haul Road.

A total of 17 water quality sampling events were completed between 2014 to 2015 and 2019 to 2020 with an additional standalone event occurring in 2017 (only two monitoring locations). From these 18 samples, 8 of these were collected during baseflow conditions, with the remaining 10 being collected during precipitation events. However, during this time frame, only four of the sample locations collected 17 sampling events. Two locations collected 13 events, two locations nine events, one location seven events, nine locations four events and one location only had two sample events. Ongoing collection of continuous flow data and additional water quality sampling will be conducted, in particular with newly established sample locations.

Table NES-2-90-1 is provided to below as an exp precipitation amount, flow monitoring range and type of event (baseflow or precipitation) can be found below.

Table NSE-2-90-1: Precipitation Versus Baseflow, Monitoring Results

Sample Date	Weather Stations	Precipitation Amount				Precipitation or Baseflow	Continuous Flow Monitoring (Rough Range L/s)						
		Day of Sample	1 Day Prior	2 Days Prior	7 Day Cumulative		SW1A	SW2	SW6A	SW19	SW30	SW31	SW32
10/9/2014	8203535	0	2.6	0	13.2	Baseflow	-	-	-	-	-	-	-
11/13/2014	8204193	0.9	1.2	0	31.8	Baseflow	-	-	-	-	-	-	-
12/18/2014	8204193	3.9	5,2	0	28.7	Precipitation	-	-	-	-	-	-	-
1/22/2015	8204193	0	0	0	14.9	Baseflow	-	-	-	-	-	-	-
4/29/2015	8204193	0	1.4	10.9	20.9	Precipitation	-	-	-	-	-	-	-
5/28/2015	8203535	0	0	7	18.8	Baseflow	-	-	-	-	-	-	-
6/30/2015	8204193	0	0	10.2	22.5	Precipitation	-	-	-	-	-	-	-
7/29/2015	8204193	0	2.8	1.7	10.8	Baseflow	-	-	-	-	-	-	-
8/24/2015	8204193	0.6	0	2.4	3	Baseflow	-	-	-	-	-	-	-
9/5/2017[(a)]	8204193	0	0	0	16	Baseflow	-	-	-	-	-	-	-
4/10/2019	8203405	0.2	2	7.1	15.4	Precipitation	-	-	-	-	-	-	-
6/12/2019	8204193	1.2	11.4	0	52.2	Precipitation	800 to 1,050	815 to 1,025	15 to 30	-	-	-	-
9/12/2019	8204193	0	15.5	0	45	Precipitation	710 to 920	930 to 1,100	13 to 17	-	-	-	-
12/2/2019	8203405/ 8202251	2.7	0	2.2	101.7	Precipitation	2,500 to 4.650	2,400 to 3,550	47 to 57	-	-	-	-
4/21/2019	8203405	0	0	0	2.5	Precipitation	950 to 1,310	815 to 1,005	32 to 41	540 to 650	-	-	-
4/22/2019	8203405	14.9	0	0	16.9	Precipitation	790 to 1,400	770 to 1,025	31 to 41	520 to 660	-	-	-
6/17/2019	8203405	0	0	1	7.8	Baseflow	110 to 150	140 to 240	2.5 to 3.5	110 to 140	0.8 to 1.3	2 to 3.2	190 to 324
6/18/2020[(b)]	8203405	0.2	0	0	8	Baseflow	95 to 140	105 to 140	2.2 to 3.0	85 to 120	0.7 to 1.1	1.7 to 2.3	150 to 250
9/24/2020[(b)]	8203405	0	24.8	40.1	67.4	Precipitation	2,400 to 4.300	-	-	-	37 to 52	33 to 43	1,740 to 2,800
9/25/2020[(b)]	8203405	0	0	24.8	64.9	Precipitation	1,800 to 3,600	-	-	-	17 to 37	22 to 33	1,600 to 2,600
12/15/2020[(b)]	8203405	1	1.4	15.1	22.1	Precipitation	-	-	-	-	-	-	-
12/16/2020[(b)]	8203405	0	1	1.4	22.1	Precipitation	-	-	-	-	-	-	-

Weather Stations

8203405 MALAY FALLS – 21.17 km

8204193 UPPER STEWIACKE RCS – 31.68 km

8203535 MIDDLE MUSQUODOBOIT – 29.80 km

8200051 HALIFAX STANFIELD INT'L A – 65.57 km (Dec. 1 and 2, 2019 ONLY)

Notes:

(a) Only two monitoring locations were sampled during this event.

(b) 2020 surface water samples were collected over a 2-day period, specific sample date/time not provided. Only one event was counted.

(c) This event was classified as a precipitation event based on recorded continuous flow monitoring from McCallum Environmental Ltd.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-91
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.1.1, pg.272

Context and Rationale

The following statement is made about the nature of the onsite watercourses: "Other streams across the Beaver Dam Mine Site are generally small with minimal pool/riffle structure and consist of mucky organic substrate. Many of these streams would be ephemeral in nature, with little water present at dry times of the year."

No details are provided on how watercourses were identified as ephemeral.

The Proponent is Required to …

Provide details on how watercourses at the site were identified as ephemeral.

Response

Section 6.7, page 6-213 (Surface Water Quantity and Quality) has been updated and word ephemeral is no longer included.

More specially, Section 6.7.4.1.1, page 6-225, in the Updated 2021 EIS (AMNS 2021) now states "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)".

References

Alberta Transportation. 2011. Erosion and Sediment Control Manual. Government of Alberta Transportation. Available at: http://www.transportation.alberta.ca/4626.htm. June 2011.

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-92
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Table 6.7-5, pg.275-276

Context and Rationale

Waterbodies within the Project development area for Beaver Dam are described within this section with surface area and depth measurements provided. There is no description within the Revised EIS Submission whether bathymetric mapping was conducted in these waterbodies.

The Proponent is Required to …

Was bathymetric mapping conducted within the waterbodies listed in Table 6.7-5?

Response

No bathymetric mapping was conducted within the waterbodies listed in Appendix G.4 (Physical Characteristics Watercourses and Waterbodies) of the Updated 2021 EIS (AMNS 2021). Surface area and water depth were measured from a combination of maps and fieldwork.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-93
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.1.2, pg.277; 6.7.3.2.1,pg. 287

Context and Rationale

The following statement is provided in the surface quality baseline assessment (Section 6.7.3.2.1): “The majority of nutrients were below or slightly above detectable concentrations, indicating little to no influence from agricultural operations in the area.” The existing site activities do not describe active agriculture within the Beaver Dam project development area. The description of the Killag River watershed (Section 6.7.3.1.2) also does not indicate the presence of agricultural activities, only sparse development and timber harvesting.

The Proponent is Required to …

Provide details on the agricultural operations within the Killag River and project development area watersheds and their potential influence on baseline conditions.

Response

There are no existing agricultural operations within the project development area or upstream Killag River watershed.

Round 2 Information Request Number:	NSE-2-94
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.2.3, pg.291

Context and Rationale

The two stations that are most applicable to the Touquoy pit discharge to Moose River are SW-11 (upstream of pit site on Moose River) and SW-2 (downstream of proposed discharge location to Moose River). Figures 6.7-8 to 6.7-11 present graphical representations of the multiple site results (10 sites total) within the Touquoy monitoring program, separated based on background and downstream classified locations. The baseline conditions should specifically focus on the watercourse monitoring sites and their results that would be applicable with the proposed Touquoy open pit discharging effluent to the Moose River. Background and downstream sites associated with Touquoy activities that are already permitted and not expected to change with the introduction of the Beaver Dam ore processing are potentially not as relevant for assessing baseline water quality within the project development area, if appropriate surface water quality monitoring site data is available.

The Proponent is Required to …

Provide baseline water quality results for the monitoring sites (e.g., SW-11 and SW-2) that are applicable to the Touquoy open pit operation and assess their general baseline water quality on their own as a receiving water environment for the Beaver Dam project.

Response

Section 6.7.5.2.3, page 6-246, of the Updated 2021 EIS (AMNS 2021), provides an assessment of baseline water quality results that are applicable to the Touquoy Site including the open pit. Table NSE 2-94-1 (Section 6.7.5.2.3, Table 6.7-17, page 6-247) provides a summary of the water quality results including SW-11 and SW-2.

Table NSE 2-94-1: 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

Source: Stantec 2018.

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).

[(a)] Indicates exceedance of CCME guideline.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Stantec (Stantec Consulting Ltd.). 2018. Touquoy Gold Project Groundwater Contingency Plan Revision 1.2.

Round 2 Information Request Number:	NSE-2-95
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.1.1, pg. 264

Context and Rationale

The Beaver Dam site and Haul Road project development area water quality monitoring sites did not conduct flow monitoring. Given the expected changes to site drainage and flows due to the proposed site activities within the Beaver Dam project development area the establishment of flow monitoring stations would assist with monitoring potential impacts to surface water flows, and effectiveness of mitigation measures.

The Proponent is Required to …

A. Confirm if flow monitoring was conducted at the Beaver Dam site. Provide baseline flow analysis results if available.

   a. If baseline flow monitoring was not conducted, include discussion on why this is not required for assessing potential impacts to flow from the project development? Or how baseline water quantity will be monitored and established prior to construction?

B. Provide locations for long-term flow monitoring stations at the Beaver Dam site to support assessing the effectiveness of mitigation measures on reducing surface water quantity impacts.

Response

Baseline flow monitoring was conducted at the Beaver Dam Mine Site at two locations, SW-1A and SW-19, in 2018, with 4 and 7 monitoring events completed respectively. In 2019 a more extensive, flow monitoring program was conducted at four locations, SW-1A, SW-2A, SW-6A and SW-19, on a monthly basis from April to December. In 2020, three additional baseline flow monitoring locations were established at SW30, SW-31 and SW-32. These new locations were monitored monthly from April to November 2020. The 2019 and 2020 calculated discharge from the flow monitoring locations is provided in Figure NSE-2-95-1 to Figure NSE-2-95-7. There are seven long-term flow monitoring stations located at the Beaver Dam Mine Site to support the effectiveness of mitigation measures on reducing surface water quantity impacts is provided in Figure NSE-2-95-7.

Figure NSE-2-95-1: SW-1A Calculated Discharge

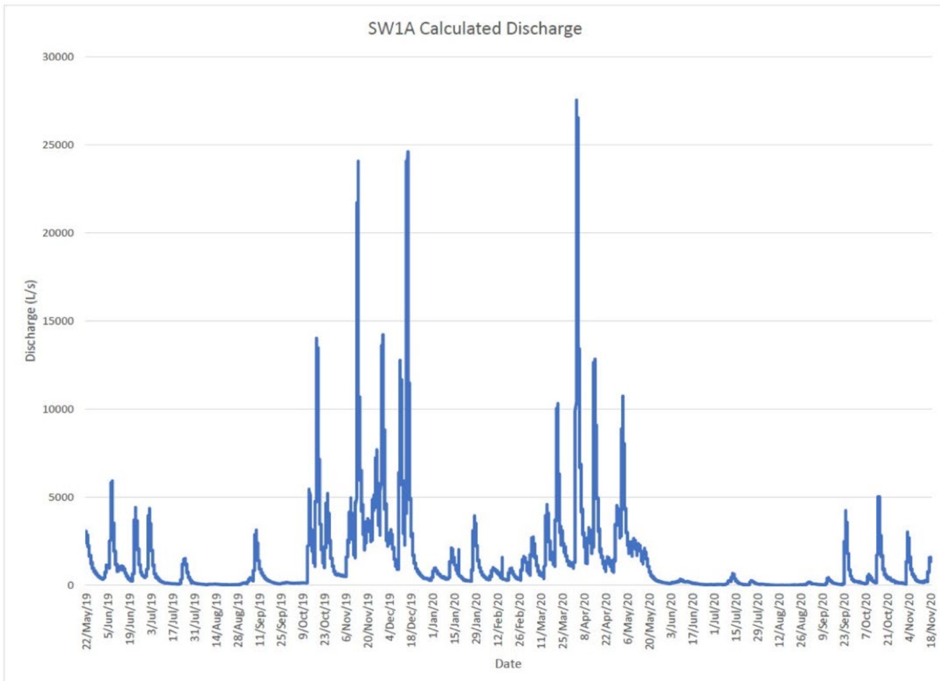


Figure NSE-2-95-2: SW-2A Calculated Discharge

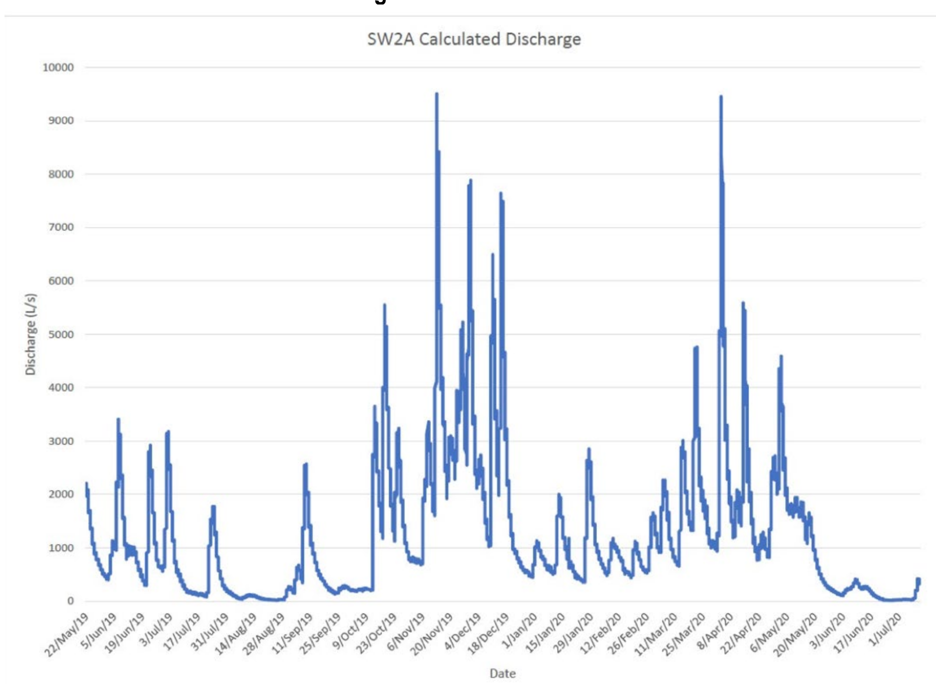


Figure NSE-2-95-3: SW-6A Calculated Discharge

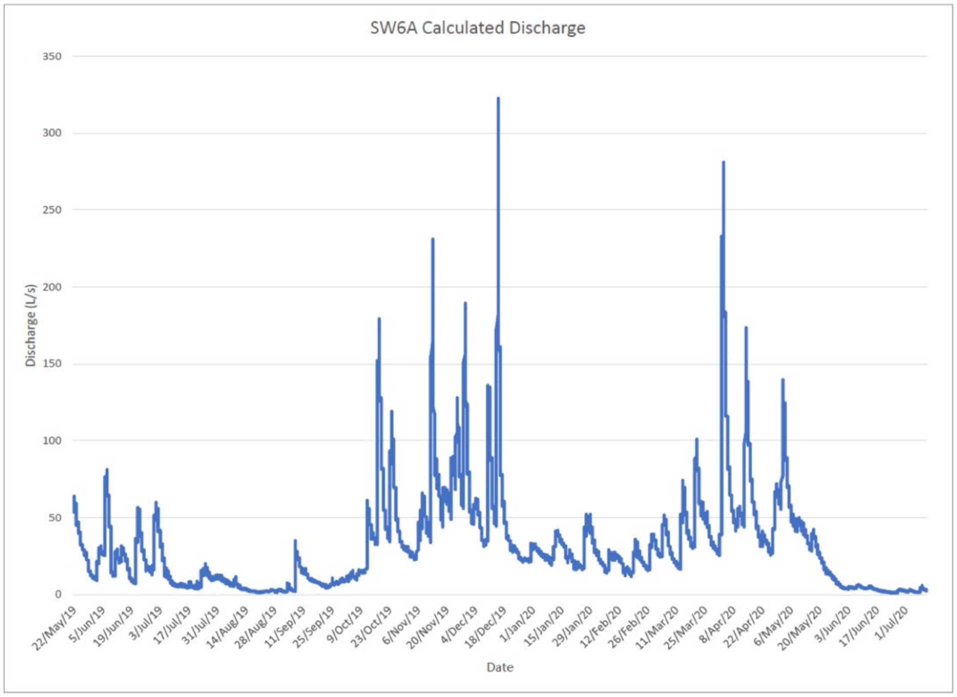


Figure NSE-2-95-4: SW-19 Calculated Discharge

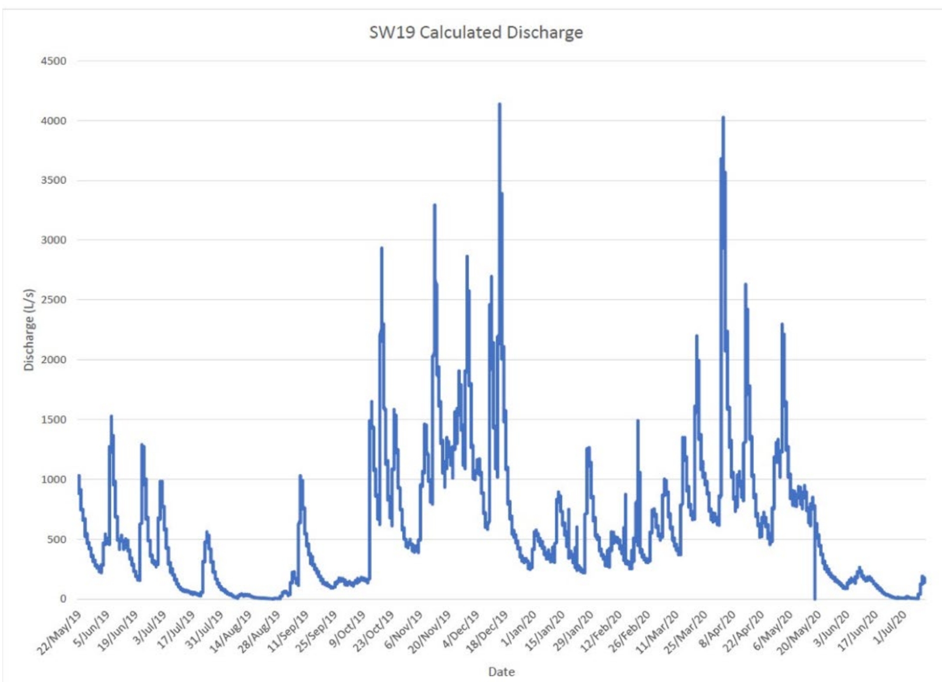


Figure NSE-2-95-5: SW-30 Calculated Discharge

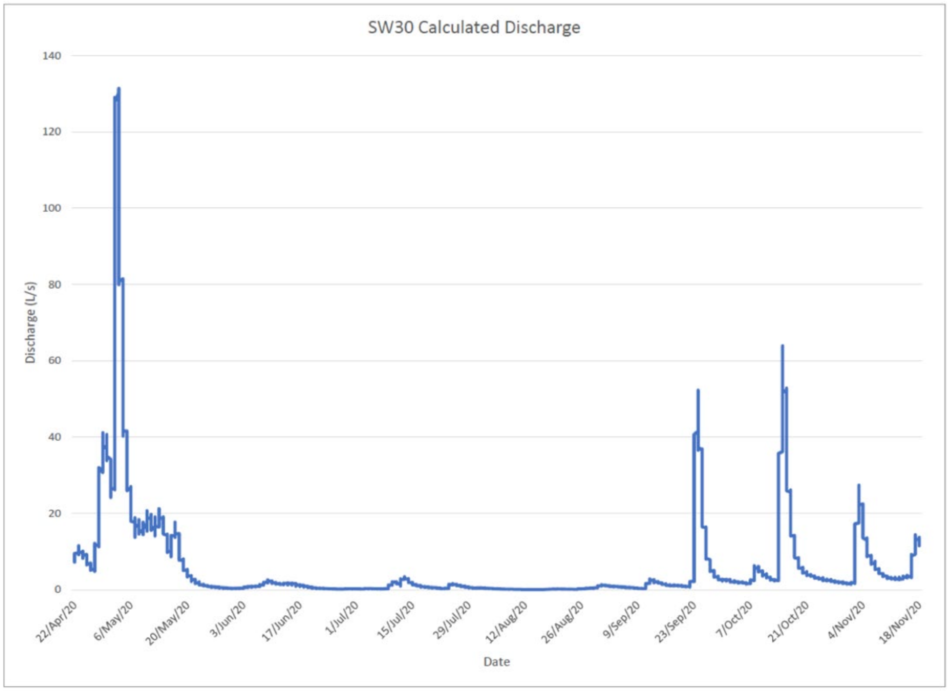


Figure NSE-2-95-6: SW-31 Calculated Discharge

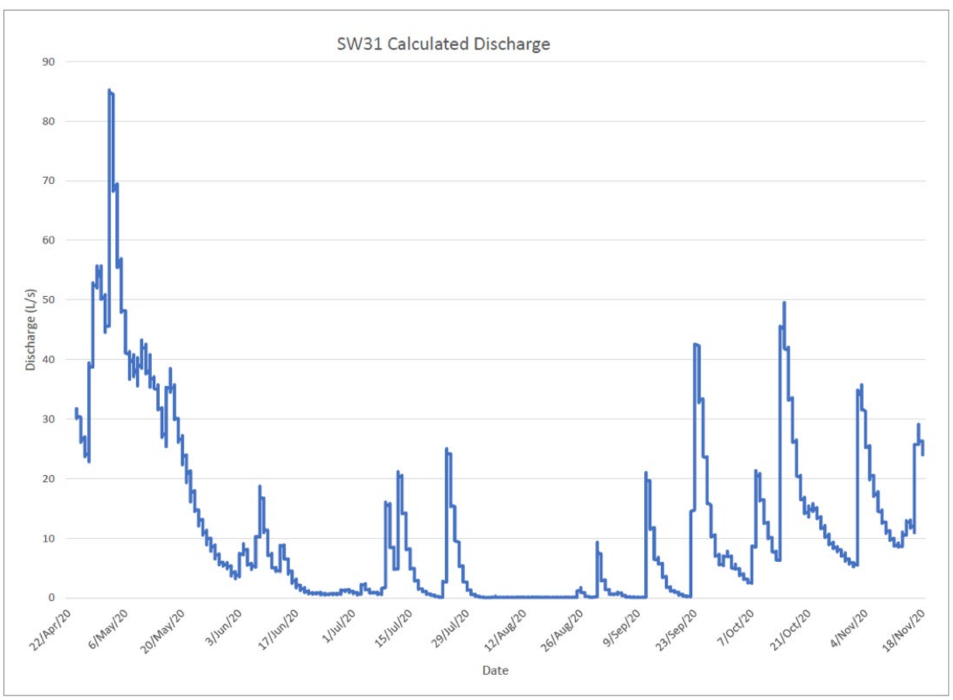
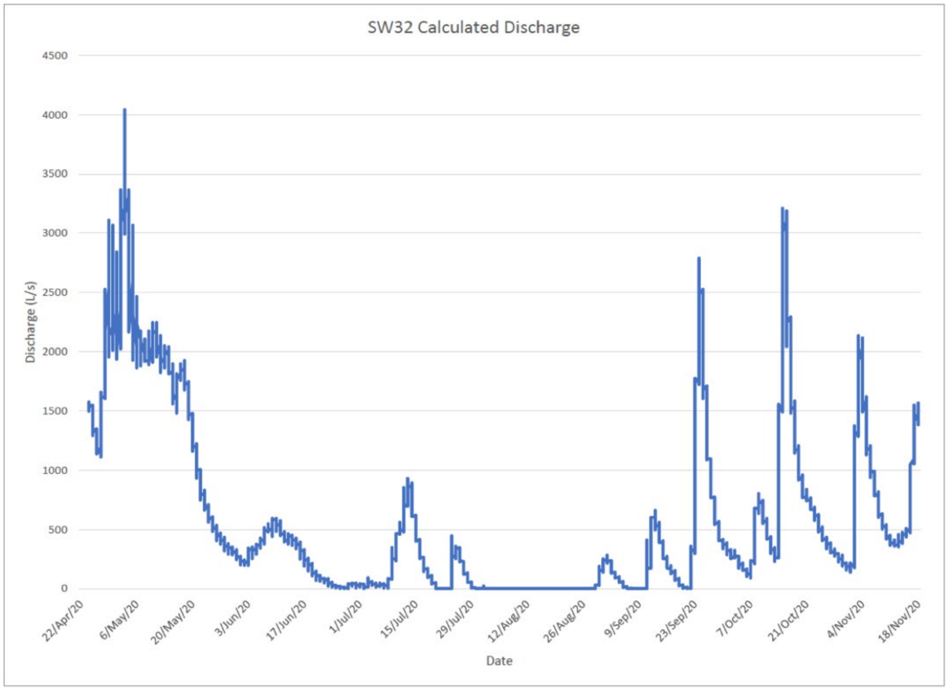


Figure NSE-2-95-7: SW-32 Calculated Discharge

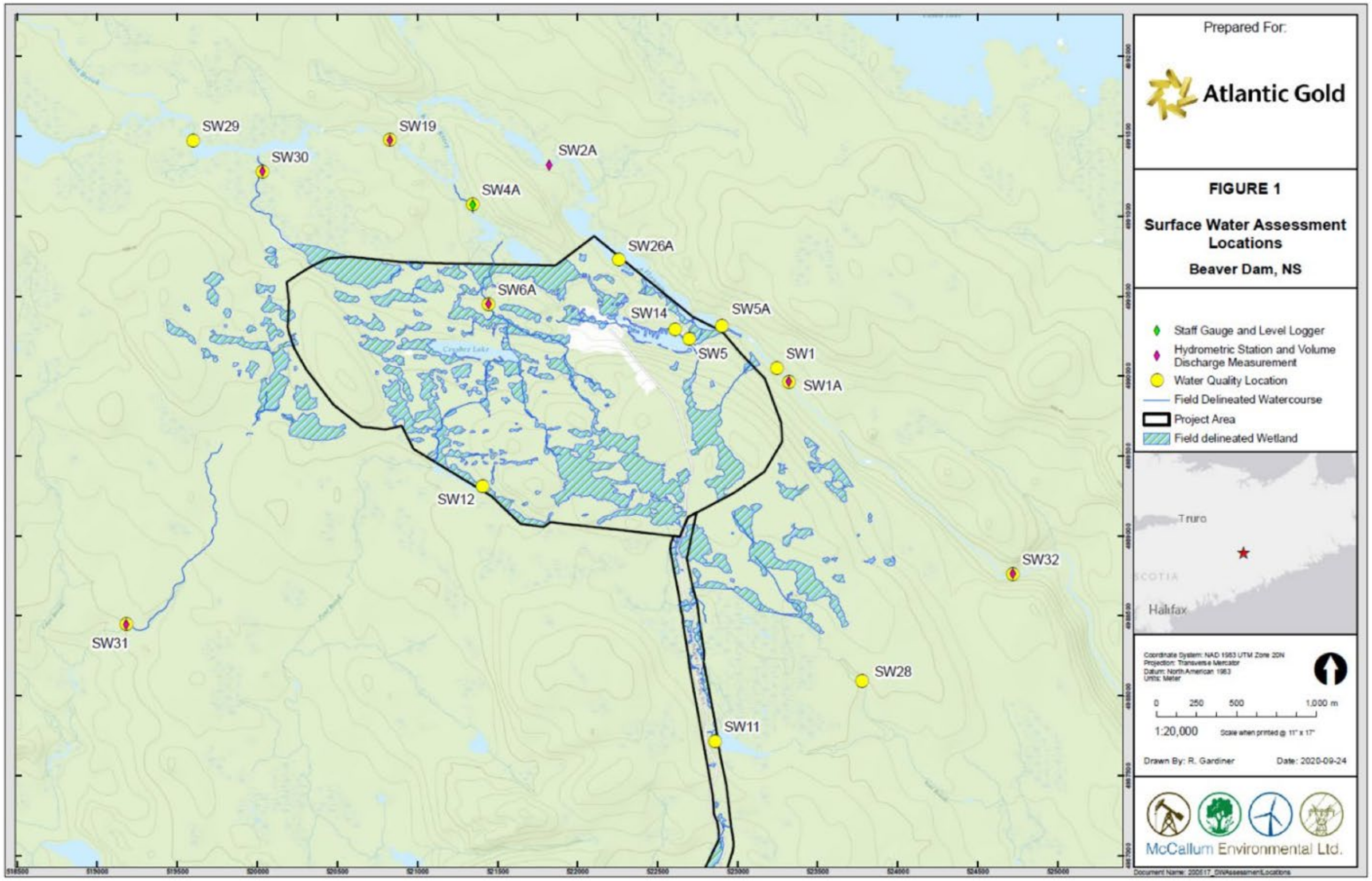


There are a total of seven long-term flow monitoring stations located at the Beaver Dam Mine Site to support the effectiveness of mitigation measures on reducing surface water quantity impacts. The station locations are shown on Figure NSE-2-95-8.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Figure NSE-2-95-8: Surface Water Assessment Locations



Round 2 Information Request Number:	NSE-2-96
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.3.1, pg. 299

Context and Rationale

The depth duration frequency (DDF) rainfall data used to represent the design rainfall events for the Beaver Dam site was from the Truro Environment and Climate Change Canada meteorological station. No explanation is provided as to why this DDF data was the most appropriate for the Beaver Dam site.

The Proponent is Required to …

Provide rationale for why the Truro Environment and Climate Change Canada meteorological station DDF data is the most appropriate for estimating design rainfall at the Beaver Dam site.

Response

The Environment and Climate Change Canada (ECCC) meteorological station of Upper Stewiacke was selected to estimate the design rainfall events at the site because it is the nearest ECCC station to the site with an ECCC produced IDF curve. It is approximately 33 km from the centre of the site. A five percent increase was applied to the design rainfall according to NSE climate change factors for the 2020s (period covering 2011-2041). This is discussed in Mine Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-97
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.4, Section 2.3, pg. 4

Context and Rationale

The following statement is provided with respect to derivation of baseline criteria for when observed concentrations exceed existing CCME CEQG-FAL criteria*: "Where substances were found to exceed the selected guideline, and the 75th percentile of baseline, consideration was given to developing a Site Specific Water Quality Objective (SSWQO), following CCME guidance (CCME, 2007)."*

The referenced guide lists that site-specific water quality objectives can be established for a site using a number of different methods to establish the upper limit of background, which includes the mean value plus two standard deviations, and using the 90th percentile.

There is no rationale provided in the Revised EIS Submission on why the 75th percentile of baseline values for given parameters was selected.

The Proponent is Required to …

Provide rationale for why site-specific criteria with baseline measurement values used 75th percentile to calculate the value for select parameters.

Response

The 75th percentile was selected as an upper bound estimate of baseline concentration ranges and represents a more conservative statistical metric than the 90th percentile, which is an accepted statistical metric according to the Canadian Council of Ministers of the Environment (CCME).

Round 2 Information Request Number:	NSE-2-98
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.4, Section 2.3 pg. 4 – 5; Section 3.1, pg. 7; Section 3.4, pg.11

Context and Rationale

Arsenic was selected to have a site-specific water quality objective (SSWQO) developed for the Beaver Dam and Moose River discharge sites, based on observed baseline exceedances of the CCME CEQG-FAL criteria at the two sites in existing surface water features. Other metals (aluminum, iron, lead, cadmium and copper) also were observed to exceed the CCME CEQG-FAL criteria at the Beaver Dam site, and the benchmark concentrations were selected to be either the CCME CEQG-FAL criteria (cadmium, lead, copper) or 75th percentile baseline concentration (aluminum, iron,).

The Proponent is Required to …

A. Provide rationale for why a SSWQO was used instead of the 75th percentile method for developing a baseline concentration for arsenic?

B. Provide rationale for why a SSWQO was not developed for other metals (aluminum, iron, lead, cadmium and copper) observed to exceed the CCME CEQG-FAL criteria as part of the baseline monitoring program.

Response

A. The 75th percentile of baseline is only considered for comparison to predicted future water concentrations in the instance that the baseline concentration exceeds the selected water quality benchmark. For example, in the case of arsenic in the Killag River, the 75th percentile of arsenic was 2.6 micrograms per litre (µg/L) (Updated 2021 EIS [AMNS 2021], Appendix G.2). This value is less than the CCME guideline of 5 µg/L for arsenic, and hence, comparisons to the baseline metric become irrelevant, since the guideline exceeds baseline. In this case, the Canadian Council of Ministers of the Environment (CCME) guideline would be the relevant benchmark to compare to, in the absence of a Site Specific Water Quality Objective (SSWQO). A SSWQO was developed because the predicted future concentrations for the receiving environment are higher than both the CCME guideline, and the 75th percentile of baseline. As an additional example, in the case of Moose River, the 75th percentile for arsenic is 18 µg/L, which exceeds the CCME guideline. In light of the fact that predicted future concentrations at Moose River were above this baseline level, a SSWQO was developed. The rationale supporting why a SSWQO was developed for arsenic is further discussed in the response to Round 2, Information Request (IR2) NSE-2-99 [i.e., the future concentrations were predicted to be higher than the CCME and baseline data, and the CCME guideline is old (2001), compared to more recently developed guidance and science on the development of water quality guidelines (CCME 2007)].

B. Rationale for why SSWQO were not developed for other inorganics is as follows:

Aluminum: The area is naturally enriched in aluminium, with the 75th percentile of baseline being noticeably above the CCME guideline. This is commonplace in Nova Scotia. As per CCME guidance, the use of natural baseline is appropriate as a benchmark of comparison. The CCME (2007) states: "It is the general recommendation that, where the site-specific natural background concentration of a substance exceeds the national guideline value derived primarily from laboratory toxicity data, the natural background concentrations should be taken as the site-specific guideline value unless another appropriate site-specific guideline value is derived according to recommended methods (e.g., CCME 2003). This advice is based on the assumption that the biological community present at a site has adapted to the local conditions, including a naturally elevated level of the substance of concern." Development of a site specific toxicity-based guideline is unlikely to yield a value below the baseline level, based on the low pH within the receiving environment, and consideration of other modifying factors for aluminum.

Iron: The area is also naturally enriched in iron, which is commonplace in Nova Scotia. As per aluminium, following CCME guidance is the most appropriate method for comparisons to water quality data.

Lead: The development of a SSWQO is only considered in the instance that predicted future concentrations exceed the guideline, or, baseline concentrations where they are higher than the guideline. Since there were no predicted exceedances of lead over the CCME guideline within either the Killag River or Moose River (see Table 3-3, PDF page 8 to Table 3-12, PDF page 19; Table 4-3 and Table 4-4, PDF page 29 in Appendix G.2), there was no need to consider the development of a SSWQO.

Cadmium: The development of a SSWQO is only considered in the instance that predicted future concentrations exceed the guideline, or, baseline concentrations where they are higher than the guideline. Since there were no predicted exceedances of cadmium over the CCME guideline within either the Killag River or Moose River (see Tables 3-3, PDF page 8 to Table 3-12, PDF page 19; Table 4-3 and Table 4-4, PDF page 29 in Appendix G.2), development of a SSWQO was not considered. Additionally, the CCME recently updated the cadmium water quality guideline (CCME 2014) using robust methods. As such, development of a revised SSWQO for cadmium would be unlikely to significantly differ from the CCME (2014) guideline.

Copper: The development of a SSWQO is only considered in the instance that predicted future concentrations exceed the guideline, or, baseline concentrations where they are higher than the guideline. Since there were no predicted exceedances of copper over the CCME guideline within either the Killag River or Moose River (see Tables 3-3, PDF page 8 to Table 3-12, PDF page 19; Table 4-3 and Table 4-4, PDF page 29 in Appendix G.2) development of a SSWQO was not considered. Refinement of source terms, and expansion of baseline data were identified as important next steps. A SSWQO may be developed in the future, pending the outcomes of this additional data review and assessment.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-99
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.4, Section 3.1, pg. 6-7; Section 3.5 & 3.6, pg. 11 -24

Context and Rationale

A. Within the Killag River at SW1, arsenic concentrations in water quality samples are assessed from nine sampling events conducted between October 2014 and August 2015 (Table 3-1). None of the samples had arsenic concentrations that exceeded the CCME criteria. The following statement is made about another station on the Killag River upstream of the Cameron Flowage (SW2A): "While an additional surface water station is available in the program (Station SW2A), it is north of the Cameron Flowage and distant to the proposed discharge site and hence was not used to characterize receiving environment conditions." Both sites did not have water quality samples that exceeded the CCME CEQG-FAL criteria for arsenic. No additional rationale is provided as to why SW2A was not included in the assessment for determining why a site-specific criterion for arsenic was required.

B. SW-11 and SW-12 had one sample taken at each site in October 2017, and arsenic concentrations were observed to be below the CCCME CEQG-FAL criteria. No rationale was provided as to why they were not included in the assessment of baseline conditions and rationale for why a site-specific criterion was developed.

C. The arsenic concentrations were observed to be elevated above the CCME CEQG-FAL criteria at several stations within the Beaver Dam study area (SW-4A, SW-5, SW-6A, and SW-10). Based on these elevated concentrations observed at these sites, a site-specific arsenic criterion was developed following the CCME protocol (2003). There is no additional rationale provided as to why these sites were used to determine that a site-specific arsenic criterion was required, and other sites listed above were not included.

   SW-5 and SW-10 are associated with an existing sediment pond from previous mining activities and are discussed in another information request with respect to potentially representing historic on-site contamination.

The Proponent is Required to …

A. Provide rationale for why SW2A was not considered in the assessment of background arsenic concentrations? Particularly given that other water quality monitoring sites were used to indicate elevated arsenic concentrations within the Beaver Dam Project Development Area.

B. Additionally, why were SW11 and SW12, also located within or near the project, were not included in the assessment for development of a site-specific criterion for arsenic?

C. Provide additional rationale for why a site-specific criterion was developed for discharge to Cameron Flowage based on the responses to the above questions. As part of the response provide comment on if the data associated with SW-5 and SW-10 water quality results is associated with historic mining activities and should be included in assessing baseline arsenic conditions within the Cameron Flowage.

D. Based on the responses to the questions above, if a site- specific criterion for arsenic is determined to not be appropriate for this site, provide additional assessment of whether treatment will be required for effluent discharge from the Beaver Dam project site to Cameron Flowage and Tent Lake.

Response

A. Surface Water Station (SW1) is a baseline sampling station downgradient approximately 1.2 km downstream of the mine discharge point with no other tributaries entering the Killag River between the proposed discharge point and the receiving environment. Therefore, it was selected to represent baseline water quality for the water quality modelling study (Appendix D [Predictive Water Quality Assessment] of Appendix P.4 [Mine Water Management Plan], PDF page 184 in the Updated 2021 EIS [AMNS 2021]), as this location was considered to be representative of the discharge area. Sampling station SW2A is upgradient of the discharge point and was not used to represent receiving environment conditions, as stated in Appendix D, PDF page 184 of Appendix P.4 (AMNS 2021). The water quality at SW2A appears similar to that at SW1. The background arsenic concentrations measured at SW-1 are less than the respective CCME guideline. There are no apparent impacts of historical mining activities, or enrichment of arsenic, observed at SW-1.

B. The SSWQO only considers toxicity information and does not include baseline data. The decision to proceed with the development of a SSWQO does include an evaluation of baseline, in the instance that baseline is greater than the CCME guideline. SW12 is located distant to the mine discharge point, and hence, is not considered relevant for characterizing the receiving environment. Similarly, SW11 is also distant to the receiving environment, as it is on a separate watercourse, due south of the mine. Therefore, these data were not used to characterize the receiving environment and to determine the 75th percentile of baseline.

C. Response to Round 2, Information Request NSE 2-99 provides rationale for the development of site-specific criterion. Data from SW5 and SW10, while relevant to the Project area, are not reflective of the receiving environment where the mine discharge will be released. Hence, these data were not considered to represent the baseline characteristics within the actual receiving environment of the Killag River. Further examination of the datasets for SW5 and SW10 suggest that both of these stations are influenced by historic tailings and mining activities. If the proposed mine discharge location was in either of these two areas, these data would have been considered to represent baseline conditions, but since these two locations are not representative of the proposed discharge locations, the data were not considered in characterizing baseline conditions within the actual receiving environment.

D. A site specific criterion is considered to be appropriate for arsenic. The development of this criterion follows standard procedures set out by the CCME (2007).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

CCME 2007. Water Quality Guidelines. https://ccme.ca/en/resources#

Round 2 Information Request Number:	NSE-2-100
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.3.2.3, pg. 56; Appendix G.2; Appendix G.4

Context and Rationale

The Touquoy open pit after receiving tailings from the Beaver Dam project is referred to in many locations within the report as a pit lake. This is typically associated with the end of mine and reclamation scenarios. If the open pit was to remain as an open pit with no addition of tailings it would eventually fill up to become a pit lake. No rationale is provided to support the reference referring to the open pit containing both Beaver Dam tailings, and surface water and groundwater inflows as a pit lake feature.

The Proponent is Required to …

Provide rationale on why the Touquoy open pit tailings storage facility should be referred to as a pit lake, particularly when it will contain tailings, as well as surface water and groundwater inflows following closure?

Response

The term “pit lake” is commonly used in mine reclamation.

Round 2 Information Request Number:	NSE-2-101
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.2, Section 4.2, pg. 17

Context and Rationale

The following statement is provided about the dry climate conditions and potential sources of water as there will be insufficient water available in the existing tailings management facility and the open pit tailings storage area: "Therefore, under dry climate conditions or based on the operational requirements of pumping infrastructure, start-up water in the open pit may be supplied from Scraggy lake (subject to provincial permitting) and/or effluent from the effluent treatment plant."

For the dry climate scenario where water from Scraggy Lake would be potentially required there is no discussion of the water balance condition within Scraggy Lake.

The Proponent is Required to …

Does the Touquoy site water balance estimate the volume of water available within Scraggy Lake? If so, for the dry condition scenario with consideration of ecological maintenance flows and the needs to downstream users, would withdrawing additional water from Scraggy Lake for the dry climate condition scenario be potentially feasible?

Response

The Touquoy Mine Site water balance does not estimate the volume of water within Scraggy Lake. However, water withdrawal from Scraggy Lake would be limited to the permitted withdrawal limits provided in the Nova Scotia Environment Industrial Approval. In addition to Scraggy Lake supply, process water could also be derived from multiple sources such as the mill site pond, tailings management facility, and waste rock pile, as required.

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Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-102
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.2, Section 5.2, pg. 25-27

Context and Rationale

Several water treatment strategies are proposed, which include in-pit treatment, pumping to the existing effluent treatment plant with discharge into Scraggy Lake at the existing discharge location, and pumping to the to the existing effluent treatment plant with discharge back into the Touquoy pit. Predicted water quality within the pit in Year 10 and Year 50 are presented in Table 5.2.

No confirmation is provided that the expected Touquoy pit tailing storage area water quality at Year 10, or any other time, can be adequately treated using the existing effluent treatment plant to meet the Metal and Diamond Mine Effluent Regulation criteria.

The Proponent is Required to …

Provide confirmation that the expected water quality within the Touquoy pit tailings storage area can be adequately treated using the existing treatment facility and meet discharge requirements for release into Scraggy Lake.

Response

As the ore mined from the Beaver Dam and Touquoy mine sites are from the same geologic formation with similar sulphur content (Section 6.6.3.1, page 6-160, Updated 2021 EIS [AMNS 2021] and Appendix E.3 (Beaver Dam Project: Geochemical Source Term Update) the processing of Beaver Dam ore and cyanide detoxification will occur in the Touquoy mill using the same general approach as the Touquoy ore processing. The water quality, therefore, in the Touquoy pit lake is expected to be similar to that of the existing Touquoy tailings management facility (Updated 2021 EIS [AMNS 2021], Appendix E.3. Given that the existing water treatment at the Touquoy site is able to discharge within the regulatory discharge criteria, it is reasonable to expect that Beaver Dam Mine Project will also meet regulatory discharge criteria using the existing Touquoy treatment facility.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-103
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.2.1, pg. 287-288; Appendix G.1, Table 1, pg. 1 -7

Context and Rationale

A. Field pH values observed at the Beaver Dam baseline surface water quality monitoring sites were typically acidic with pH values less than 7. SW1, which is located on the Killag River downstream of the Cameron Flowage and the proposed site water management discharge locations had the lowest observed field pH values, including two samples with values below 3. SW2A is upstream of Cameron Flowage and had the 2nd lowest field pH levels of the Beaver Dam sites. Section 6.7.3.2.1 provides comment on low pH waters occurring within Nova Scotia. Looking at water quality monitoring program field pH results for other provincial and federal programs within the province (Maritime Coastal Basin Long-term Water Quality Monitoring Data [https://open.canada.ca/data/en/dataset/b42b8484-95a2-4654-ad83- ebb2aa8407e3]; Surface Water Quality Monitoring Network Grab Sample Water Quality Data [https://data.novascotia.ca/Nature-and- Environment/Surface-Water-Quality-Monitoring-Network-Grab- Samp/wncu-ppda]; Acid Sensitive Lakes, Atlantic Canada, http://data.ec.gc.ca/data/substances/monitor/acid-sensitive-lakes- atlantic-canada/) there are no field program results for lakes and watercourses with field pH values observed below 3.

B. The Killag River is the proposed receiving water environment for the majority of water management discharge from the Beaver Dam site. There is no discussion within the Revised EIS Submission related to the observed low pH Killag River receiving water environment and potential effects from discharge from the site.

The Proponent is Required to …

A. Provide additional discussion of the observed low pH values (<3) at SW1 with respect to whether these are typical for local geological conditions or potentially associated with historic mining activities.

B. What effect will the water management discharge from the Beaver Dam site during the operation and closure phases have on pH and associated metals concentrations within the Killag River with respect to the existing low pH values (<3)? Will metal transformation potentially occur in the Killag River and become more bioavailable?

Response

A. Surface Water Station (SW-1) is downstream of the historic tailings area, this could account for some of the low pH values observed. Low pH levels had been observed between 2014 to 2015 at monitoring location SW-1, with field pH values reading less than 3 (<3) (2.63 and 2.89). In addition, nine water quality sampling events occurred between 2019 to 2020, of these eight events, the average lab pH levels at SW-1 was 5.38, and the lowest recorded value at 4.79. The average field pH levels during the same period was 4.69, and the lowest recorded value of 4.19. In addition, the water in the Killag River has been found to be very soft (approximately 3.5 mg $CaCO_3$/L) which can result in low pH (Appendix D [Predictive Water Quality Assessment] of Appendix P.4 [Mine Water Management Plan], PDF page 184 in the Updated 2021 EIS [AMNS 2021]).

B During operation and post-closure conditions, the water management at the site will result in discharge water that will likely be at or near a neutral pH (Appendix D [Predictive Water Quality Assessment] of Appendix P.4 [Mine Water Management Plan], Section 3.1.3 Mine Site Water Balance, *Pit Water Balance*, PDF page 198 in the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-104
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.2.2, pg. 268-270; Section 6.7.2.3.3, pg. 291-297

Context and Rationale

The Touquoy mine site baseline assessment focuses predominantly on all the existing water quality monitoring site, including SW1, SW2 and SW11 on Moose River which will be receiving discharge from the Touquoy pit. The assessment focuses on grouping all sites as either upstream or downstream of the existing project activities. Not all of the surface water quality monitoring sites assessed at Touquoy will be associated with the proposed Beaver Dam ore processing and tailings disposal activities. There is no discussion provided on which of the baseline and downstream monitoring sites will be applicable to these activities.

The Proponent is Required to …

Indicate which monitoring sites are applicable to baseline and downstream monitoring for the proposed Touquoy activities, specifically related to the Beaver Dam project.

Response

The existing Touquoy surface water monitoring stations will continue to be monitored to assess the effects of the Beaver Dam Project at different receiving environments. For example, upstream stations SW-11, and SW-1, and downstream station SW-2 on Moose River will be monitored to identify project effects of the Beaver Dam tailings deposition in the Touquoy pit on Moose River.

Round 2 Information Request Number:	NSE-2-105
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.2.3.1, p.g. 271; 6.7.3.3.1, pg.300-301; 6.7.5.2.2, pg. 307

Context and Rationale

Potential evapotranspiration for the project site is estimated using the Hamon equation on a monthly time step with daily average rates. The equation uses average temperature and hours of daylight as input parameters. There is no discussion provided on why the Hamon equation was selected. The results are provided but not compared to other regional estimations for potential evapotranspiration for area of Nova Scotia where the project is located.

The Proponent is Required to …

A. Provide rationale on why the Hamon equation was chosen in comparison to other potential methods for estimating potential evapotranspiration.

B. Compare the estimated potential evapotranspiration rates against literature values applicable for the region where the project site is located. Provide rationale on why the estimated rates are appropriate for the project site during the different project phases.

Response

A & B. The Hamon equation is suitable for estimating monthly potential evapotranspiration (PET) values using a limited available information (i.e., temperature and daylight hours). The calculated PET values are less than the lake evaporation norms measured at the Truro Environment Canada Climate Station, which is expected. Lake/pan evaporation is typically greater than evapotranspiration in the same environment (Updated 2021 EIS [AMNS 2021], Section 6.7.4, page 6-224).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-106
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.3.3.1, Table 6.7-13, pg. 301

Context and Rationale

The title of Table 6.7-13 is “Average Evaporation Runoff Volume per Year”. Evaporation runoff is not a common water balance term. Is it a combination of water available for either evaporation and/or surface water runoff?

The Proponent is Required to …

Provide a definition of the term evaporation runoff in Table 6.7- 13.

Response

The table title for Table 6.7-13 of the Revised EIS (AMNS 2019) should have read: “Average Runoff Volume per Year”.

In the Updated 2021 EIS (AMNS 2021), the monthly lake evaporation is summarized in Table 6.7-4 – Climate Normal, Hydrological Baseline Conditions Beaver Dam Project (Section 6.7.4.2.1, page 6-230). The monthly baseline metrics (runoff volumes) are presented for the Killag River, Mud Lake, Crusher Lake, Tent Brook, and Cope Brook in Tables 6.7-5 to 6.7-9, page 6-231 to page 6-233.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

AMNS 2019. Revised Environmental Impact Statement – February 28, 2019. Beaver Dam Mine Project. Submitted to the Canadian Environmental Assessment Agency and Nova Scotia Environment. February 2019. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-107
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.1; Appendix G.5; Appendix G.5, pg. 12

Context and Rationale

Runoff from the Beaver Dam site is proposed to be directed through the north settling pond prior to discharge to the Killag River and to the east settling pond prior to discharge to Tent Lake. Storage volumes are estimated within Appendix G.5 for each pond and simulated in the water balance model. There is no discussion of the design criteria for each of the ponds with respect to storage volume function and discharge water quality commitments. Examples of these design criteria would include the return period storm storage volume, # of days of pit dewatering storage prior to discharge, # of m of freeboard, spillway flow rate, pond berm materials (waste rock, clay core) and side slopes, and mitigation measures to reduce thermal charging from discharge into receiving water bodies. Appendix G.5 describes active and permanent storage volume values for the north and east settling ponds. No discussion or information is provided with respect to what are the design criteria used to estimate these volumes, particularly with respect to design storm event storage.

The Proponent is Required to …

A. What are the preliminary design criteria for the north and east settling ponds at the Beaver Dam site, including design storm event and dewatering storage capacities prior to discharge?

B. Based on the response above, describe the estimated active and permanent pool storage within the north and east settling ponds with respect to the design storage criteria.

Response

A. The settling ponds are designed to provide total suspended solids (TSS) removal for runoff generated from a range of storm events including the 25 millimetres (mm) 4-hour water quality event to the 100-year 24-hour storm event. These settling ponds will have a permanent pool depth of 1 to 2 m that is of sufficient length to promote the settling of suspended solids prior to discharge. The active storage volumes and outlet structures will be designed to provide minimum of 24-hour detention times for the range of storm events. The emergency spillways will be activated during events that are greater than the 100-year 24-hour storm event (Appendix B, page 92 of P.4 Mine Water Management Plan, Updated 2021 EIS [AMNS 2021]).

The east and south settling pond outlets and emergency spillways will discharge to the natural environment. The north settling pond will discharge to an aeration lagoon for treatment of nitrite. The aeration lagoon will be designed to accommodate the inflow from the north settling pond. A two-way pump will be installed to transfer water from the north settling pond to the open pit in advance of a storm event to increase the available storage volume in the pond. The pumps will run over the duration of the storm event; however, the pond was designed to control the 100-year 24-hour storm event with no pumps in operation as a contingency. The emergency spillway of the north settling pond will also be directed to the pit. Water in the pit will be pumped back into the pond when there is available capacity for treatment (Appendix B, page 92 of P.4 Mine Water Management Plan, Updated 2021 EIS [AMNS 2021]).

B. The permanent pool volumes of the north, east and south settling ponds are approximately 11,500 cubic metres (m^3), 5,300 m^3 and 5,100 m^3, respectively. The active storage volumes of the north, east and south settling ponds are approximately 27,700 m^3, 22,000 m^3 and 13,600 m^3, respectively. The active storage volumes are calculated to the emergency spillway inverts and are designed to control up to the 100-year 24-hour storm event with 0.3 m freeboard and a minimum retention time of 24 hours. This is discussed in the Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-108
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.5, Figure 3-6 and 3-8

Context and Rationale

The Mud Lake drainage area south of the proposed onsite Haul Road at the Beaver Dam site is displayed as flowing via a culvert system north to Mud Lake under the Haul Road and the west waste rock storage area drainage ditch. Given the low topographical relief of the Project site there is no indication that this proposed drainage network is feasible.

The Proponent is Required to …

Provide preliminary analysis to indicate that the proposed Mud Lake drainage area south of the proposed onsite Haul Road draining north under the Haul Road and west waste rock area drainage ditch is feasible.

Response

Topographic data shows the majority of the Mud Lake catchment located south of the Haul Road will drain toward the Haul Road without obstruction from mine infrastructure. Runoff will be collected into a roadside ditch system and conveyed north of the road through culverts. On the north side of the road, the ditches will discharge to existing natural channels, which flow into Mud Lake. The southwestern portion of the Mud Lake drainage area is located upstream of the proposed low grade ore (LGO) stockpile. During operations, clean runoff from this area will be collected in a diversion channel that will drain under the Haul Road through a culvert, and into a natural inlet channel to Mud Lake. Post-mine closure the LGO stockpile will be removed and the land will be graded to follow baseline drainage patterns (Updated 2021 EIS [AMNS 2021], Section 6.7.8.2.1, page 6-273).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-109
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.6, Section 7.0, pg. 12

Context and Rationale

Table 6 presents predicted average concentrations of select parameters in the groundwater seepage from the Touquoy open pit. The average concentrations in the groundwater seepage that are below the detection limit are represented by 'Below DL' and not quantitatively. There is no way to determine whether the average concentration detection limits are sufficiently low enough in comparison to the MDMER, NSE Tier 1 EQS Freshwater and CCME FAL criteria listed in the table.

The Proponent is Required to …

Provide quantitative values for the parameters with average concentration values listed as 'Below DL'. Provide discussion if any of the listed average concentration detection limits are higher than the criteria listed in the table.

Response

Measured parameters below the detection limit were assigned a quantitative value equal to half of the detection limit. Non-detected parameters were assigned a value of '0'.

None of the detection limits exceed the water quality criteria.

Round 2 Information Request Number:	NSE-2-110
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.5.1, pg. 305; 6.9.6.2.2, pg. 497

Context and Rationale

The Beaver Dam project administrative boundaries are listed for the site with discharge that would be subject to the Metal and Diamond Mining Effluent Regulations (MDMER) criteria, which are listed as the following:

- During operations, discharge from the North Settling Pond to the Cameron Flowage (Killag River) at the Beaver Dam Mine Site;
- During closure, discharge from the pit to the Cameron Flowage (Killag River) at the Beaver Dam Mine Site; and, During closure, discharge from the pit to the Moose River at the Touquoy Mine Site.

In Section 6.9.6.2.2 the following statement is made as well: "Additionally, no residual effect is expected on fish and fish habitat based on water quality because discharge from Tent Lake outfall does not require treatment as it is not anticipated to have water quality concerns."

At the Beaver Dam site during operations there will be an east settling pond that receives runoff from the crusher and run of mine stockpile pad prior to discharging south to Tent Lake. As this pad will be holding and processing various grades of ore for the project, its runoff and discharge into the environment would potentially contain contaminants of concern (e.g., suspended solids, metals) associated with those activities. The dust created by the crushing process would potential create a different type of substrate to potentially discharge from the site in comparison to the waste rock and ore stockpiles. No rationale is provided as to why this discharge point is not included as one that will be subject to the MDMER.

The Proponent is Required to …

Provide rationale on why the east settling pond discharge would not be included as a location subject to the MDMER criteria for the Beaver Dam site. Also provide rationale to indicate why discharge from the Tent Lake outfall does not require treatment in general (as per Section 6.9.6.2.2).

Response

Discharge from all three settling ponds (north, east and west) are subject to Metal and Diamond Mining Effluent Regulations (MDMER) criteria. This is discussed in Appendix B, Section 4, PDF page 99 of the Water Management Plan (Appendix P.4) of the Updated 2021 EIS (AMNS 2021).

In the revised site layout (IR2 response NSE-2-19, Figure NSE-2-19-1) runoff from a portion of the organic stockpile will be directed towards Tent Brook. This runoff will be captured in the south settling pond and treated for total suspended solids (TSS). The organic stockpile will be removed and the south settling pond will be decommissioned post-closure. The south settling pond discharges to the Tent Lake System. A predictive water quality analysis of the runoff from the south settling pond drainage area confirmed that treatment for metals and Nitrogen species would not be required, which can be explained as follows:

- Direct runoff from the drainage area is assumed to be clean as no mining or waste rock will be located within the contributing area of the south pond.
- Groundwater that becomes impacted within this drainage area may enter the stormwater management ditch network; however, the constituent loading due to groundwater influence is expected to be minimal. This has been confirmed in the predictive water quality analysis.
- As explained in the Predictive Water Quality Assessment technical report (Appendix D, PDF page 184 of Appendix P.4 [Mine Water Management Plan] of the Updated 2021 EIS [AMNS 2021]), it is estimated that 16% of the precipitation that falls on the till and organic stockpiles will infiltrate. It is anticipated that until the stockpiles become saturated, the majority of the infiltrated water will be absorbed by the stockpile material or recharge the groundwater system. The stockpiles will only be in place during operations and are planned to be removed post-closure. The stockpiles are not anticipated to reach a saturated state during operations; therefore, seepage is assumed to be negligible. However, in order to be conservative, it was assumed that 10% of the infiltrated water is discharged as seepage. The predictive water quality analysis of the south settling pond inflow considers the impacted stockpile seepage as this water will have remained in contact with the mine material for long enough to generate metal leachate.

Water quality monitoring will be conducted regularly within the settling ponds. Under normal operating conditions, the east and south settling ponds will discharge through passively controlled outlet structures equipped with an emergency shut off valve. The emergency shutoff valves will be closed if water quality parameter exceedances are triggered. The impacted water will be pumped, or collected in a vacuum truck and transported to the north settling pond for treatment. The south settling ponds have the capacity to hold the inflow volume generated by the 100-year 24-hour storm events, without discharging (Appendix B, PDF page 92 of Appendix P.4 (Mine Water Management Plan).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-111
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Table 6.7-20, pg. 315

Context and Rationale

A. The following statement is made about ore management at the Touquoy Mine site for the Beaver Dam project: "Ore management (drilling, blasting, loading and hauling of ore and waste rock)"

No other sections of the Revised EIS Submission mention drilling or blasting activities at the Touquoy site, or the hauling of waste rock.

B. Within Table 6.7-20 the construction of the Touquoy Open Pit spillway to discharge to Moose River is not included.

The Proponent is Required to …

A. Confirm whether drilling, blasting and hauling waste rock are expected to be activities at the Touquoy Site. If so, provide details on the processes and include effects assessment of potential activities on appropriate valued ecosystem components.

B. When is the construction of the spillway from Touquoy Pit to Moose River expected to be constructed within the project schedule?

Response

A. An error was made in the classification of drilling, blasting, loading, and hauling of waste rock as "ore management" activities at the Touquoy mine site. Blasting activities are proposed at the Touquoy mine site as required to establish the spillway from the Touquoy pit to Moose River. The volume of waste rock generated from this activity are anticipated to be minimal and are proposed to be deposited in the flooded Touquoy pit, therefore no hauling is anticipated. Blasting activities will follow the DFO guidelines on blasting, therefore no adverse environmental effects are predicted.

B. The construction of the Touquoy pit spillway is anticipated to occur during the closure phase of the project, as the open pit is filling.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-112
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.5, pg. 13

Context and Rationale

The Beaver Dam pit in the post-closure scenario is proposed to have its overflow directed to the Killag River. No preliminary concepts are provided on the routing, design and flow conveyance capacity for the proposed overflow.

The Proponent is Required to …

Provide preliminary design details on the overflow connection between the Beaver Dam pit and the Killag River. Will blasting be potentially required and how will effects be mitigated to the Killag River aquatic ecosystem? Will there be potential for exposure of historic mine workings and how will those effects be mitigated? What will be the design flow capacity of the proposed connection channel? Will aquatic organism barriers be required to prevent fish from entering the pit lake environment for the post-closure condition?

Response

A Mine Water Management Plan (Appendix P.4) is provided in the Updated 2021 EIS (AMNS 2021) that describes how water will be managed at closure. No blasting is anticipated in the development of the spillway. Historic tailings will be removed during construction phase of the project along with water treatment that is described in the Mine Water Management Plan (Appendix P.4). The design flow capacity will be developed as part of the closure planning process. The site will be monitored during post closure and it is possible the aquatic organisms will be re-establish in the pit lake.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-113
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.1.1, pg. 316

Context and Rationale

The following statement is provided about mixing within the Killag River: "Based on previous experience with mixing models in rivers of similar size to the Killag River and the results of the Touquoy Moose River mixing model (30 m distance to fully mixed) (Stantec, 2018f), it was assumed that full mixing would occur in a relatively short distance from the discharge point."

The Beaver Dam site is proposed to discharge into Cameron Flowage during the operations phase and immediately downstream of the Flowage via the open pit for the post-closure scenario. A flowage typically involves altering flow patterns within a watercourse through some type of control structure, and most often were constructed in support of logging activities. There is no discussion on whether flow within Cameron Flowage is managed by a historic or current control structure. Moose River is a free-flowing watercourse without a control structure near the proposed Touquoy Pit discharge location (SW-2). No rationale is provided to indicate how Cameron Flowage and the Killag River at the Beaver Dam site are similar in hydrology (e.g., watershed [land uses, size], flows, watercourse dimensions [width, depth, slope], channel bed and bank materials) to Moose River or other watercourses modeled for the Beaver Dam/Touquoy projects.

The Proponent is Required to …

Provide rationale to support the statement that the Killag River and Moose River are similar in size and why a site-specific mixing model is not required for the Beaver Dam site discharges to the Killag River. If the watercourse hydrology characteristics differ between the Moose and Killag Rivers are sufficient that the Moose River mixing model would not be applicable to the Killag River, then develop a Killag River mixing model to assess project effects on water quality within this river system.

Response

A Mine Water Management Plan (AMNS 2021, Appendix P.4) that provides an assessment of discharge to the Killag River is provided in the Updated 2021 EIS (AMNS, 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-114
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.3, Section 2.1, pg. 4-6

Context and Rationale

A. Table 2-1 presents background concentrations of constituents of concern within the Killag River and its tributaries. There is no discussion on how the values presented in this table were calculated, such as average values or median. Also, sample results would typically represent a range of values that potentially change seasonally and due to other environmental factors (e.g., storm events).

B. No discussion is provided on the appropriateness of the seven monitoring locations in representing background constituents of concentrations within the Killag River. Some of these sites are located within or adjacent to historic mining activities (SW10 and SW5), others are located downstream of small ponds or wetlands (SW4A, SW12). Also, no discussion is provided as to why the background water quality for the Killag River did not just use SW2A or SW1 monitoring results.

The Proponent is Required to …

A. Provide the method for how the values were calculated in Table 2-1. Also, discuss why a range of values not presented to represent concentrations of constituents of concern for the project for the water quality assessment.

B. Provide rationale on why the sites selected to represent water quality in the Killag River were chosen and indicate their appropriateness for estimating water quality within this watercourse. As part of the discussion, provide details on the differences in monitoring site environments and their potential influence on water quality results.

Response

A. The background concentrations presented in Table 2.1 (in AMNS 2019, Appendix G.3, Section 2.1) are representative of the average concentration of each constituent across 14 individual sampling events at SW-1. Sample results were not assessed on a seasonal basis as samples were collected over the course of 1 calendar year (October 2014 to August 2015) along with several sampling events in 2019.

B. Only SW-1 was used to develop the background water quality for the predictive water quality modelling because this location is the closest to the site with no major tributaries present between the proposed site discharge points and SW-1. As such, SW1 is the closest available station, representative of background water quality conditions at the proposed Site discharge points.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

AMNS 2019. Revised Environmental Impact Statement – February 28, 2019. Beaver Dam Mine Project. Submitted to the Canadian Environmental Assessment Agency and Nova Scotia Environment. February 2019. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-115
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.3.2, pg. 330; Appendix O.1, 2.7.2

Context and Rationale

The following statement is provided in the Revised EIS Submission: *"As shown in Figure 6.7-17, the spillway will discharge to a conveyance channel that outlets to Moose River, approximately 70 meters downstream of the surface water monitoring station SW-2."* No discussion is provided within the EIS on whether additional monitoring stations will be added along Moose River to monitor surface water quantity and quality. There are no monitoring sites located further downstream on Moose River from SW-2.

The Environmental Effects Monitoring Plan states that additional monitoring sites will not be anticipated for the Touquoy Mine Site following deposition of Beaver Dam tailings.

The Proponent is Required to …

Will additional surface water quantity and quality monitoring sites be established on Moose River downstream of the proposed spillway discharge point? Provide approximate locations, monitoring parameters and sampling frequencies be proposed based on the preliminary site layout.

Response

Additional monitoring of surface water quality and quantity will be considered if the current monitoring indicates a gap or a change in predictions. In addition, monitoring locations will be reviewed as part of the Reclamation and Closure Planning.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-116
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.8.1, Table 6.7-23, pg. 334-335

Context and Rationale

The following mitigation measure is listed as only being implemented during the operations phase: *"Ensure pit water meets applicable regulatory quality criteria for discharge – otherwise treat water prior to discharge"* No rationale is provided as to why this mitigation measure will not be implemented as part of the decommissioning and reclamation phases when in some cases for the Beaver Dam and Touquoy pits the discharge is expected to exceed applicable criteria.

The Proponent is Required to …

Will the proponent commit to having pit water meet applicable regulatory criteria for discharge during the decommissioning and post-closure phases.

Response

Atlantic Mining NS Inc. (AMNS) commits to meeting applicable regulatory criteria during all phases of the Beaver Dam Mine Project.

Round 2 Information Request Number:	NSE-2-117
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.9. Table 6.7-24, pg. 337

Context and Rationale

There is a reduction to surface flows to Crusher Lake and Mud Lake downstream, as well as WC-5 which connects the two waterbodies at the Beaver Dam site. The impacts to Crusher Lake and Mud Lake are predicted to be partially reversible; however, there is no indication in the report on how the proposed surface water management plan will partially reverse the permanent changes in surface water flows.

The Proponent is Required to …

A. Provide rationale, based on the proposed surface water management plan for the Beaver Dam site, on how will expected impacts to Crusher Lake and Mud Lake be partially reversed?

B. There is an unnamed watercourse downstream of Mud Lake where monitoring site SW4a is located. Given the reduction in surface water flow to this watercourse, would it not have irreversible impacts from the project to surface water quantity and associated VECs? Provide rationale to support why it was not included as potentially requiring a fisheries authorization or other permit due to reductions in surface water flows?

Response

A. The revised water balance model predicts an annual decrease in total inflow to Mud Lake of approximately 24.5% from baseline to EOM conditions. This decrease is attributed to a reduction in drainage area due to the placement of the NAG waste rock and LGO stockpiles and site roads. The inflow reduction is also attributed to a 22% decrease in baseflow due to the drawdown effect of the open pit on the groundwater aquifer in the Mud Lake catchment.

   As part of the reclamation plan, the LGO stockpile will be removed and surface runoff from this area will be directed back toward Mud Lake to reduce the environmental impact to the lake. In addition, the open pit will be filled with water to form the pit lake. This will reduce/eliminate the impact of the pit on groundwater flow patterns in Mud Lake catchment compared to EOM conditions. As a result of these improvements, the water balance model predicts an annual decrease in total inflow to Mud Lake of approximately 13.6% post-mine closure.

   There are no anticipated impacts to surface water inflows to Crusher Lake as a result of the revised site layout, as there are no proposed developments within the Crusher Lake catchment. In addition, the groundwater model results show a small increase in baseflow contributions to the lake in the order of 2 to 3% annually. The small gain in baseflow is likely due to the placement of the NAG waste rock and LGO stockpiles overtop of a watercourse. Under baseline conditions, this watercourse would have collected baseflow prior to reaching the Crusher Lake watershed. The Mine Water Management Plan (Appendix P.4) of the Updated 2021 EIS provides additional details (AMNS 2021).

B. The unnamed watercourse is referred to in the Fish and Fish Habitat Assessment as WC27, which is assessed in Section 6.9.7.4.4, page 6-521, of the Updated 2021 EIS (AMNS 2021). The assessment indicates that estimates of daily flows within WC27 were determined to decrease by 18.5% of the Mean Annual Discharge (MAD) at End of Mine (EOM), and 13.7% at Post Closure (PC). The predicted number of days which experience a decrease below 30% MAD is expected to increase from 115 at baseline to 132 days at EOM, and 128 days at PC. This represents a 21.4% increase in the number of low flow days at EOM, and a 14.3% increase in the number of low flow days at PC (Updated 2021 EIS [AMNS 2021], Section 6.9.7.3, Tables 6.9-18, page 6-508 to page 6-510 and Table 6.9-19, page 6-511 to page 6-514). The downstream effects to the Killag River are expected to be low in magnitude, with <10% change in MAD flow and a less than 10% increase in the number of days below 30% MAD. Using the Wetted Perimeter Method (WPM) to calculate loss of habitat due to flow reduction, WC27 is predicted to have an indirect loss of 37.54 m^2 during EOM, and only 4.26 m^2 at PC. It is included as part of the draft Fish Habitat Offset Plan (Appendix J.3) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-118
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Figure 6.7-17

Context and Rationale

The proposed spillway routing from the Touquoy open pit to Moose River is presented as crossing an existing road and a new site development area. No discussion is provided on the proposed routing, associated construction methodologies, local geology and soils encountered during construction and proposed mitigation measures.

The Proponent is Required to …

A. Provide discussion on expected soils and geology to be encountered by the construction of the Touquoy open pit spillway, including potential interception of historic mining activity sites/workings.

B. Provide preliminary construction methods, including whether blasting will be conducted. Assess the potential effects on applicable VECs (e.g, fish and fish habitat in the vicinity of blasting) from the construction activities and propose applicable mitigation measures.

C. Provide a description of the existing roadway to be intersected by the spillway routing, and an assessment of potential effects to the existing roadway and associated VECs, if applicable.

Response

A. A geotechnical investigation will be completed prior to detailed design of the pit lake spillway to identify the overburden and bedrock material that may be encountered during construction.

B. The footprint of the proposed spillway does overlap with a portion of the delineated historic tailings. Any delineated historic tailings within the construction footprint of the spillway is planned to be removed prior to completion of Touquoy operation, as discussed in Round 2, Information Request (IR2) response NSE 2-15b.

C. Please see IR2 response NSE-2-15c.

Round 2 Information Request Number:	NSE-2-119
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.1; Appendix A, Figure 6.7-3

Context and Rationale

SW10 has elevated concentrations for a number of contaminants of concern in comparison to the other locations at the Beaver Dam site. This location is located within the proposed open pit excavation site and in an area of historic mining activities. Based on the observed water quality there is potential for impacts if these waters were pumped and discharged into other surface water features within the Beaver Dam site.

The Proponent is Required to …

Provide an assessment of whether the waters associated with SW10 require treatment prior to discharge into other surface water features within the project area as part of the open pit site development. If treatment is required, identify mitigation measures to address the surface water quality issue.

Response

During dewatering and excavation of the historic tailings area any surface water with elevated concentrations of constituents of concern will be pumped to the north settling pond where it will be treated prior to discharge into the Killag River. Based on sampling of the historic tailings it is anticipated that treatment will be required prior to discharge. Appendix F (Water Treatment Assessments) of the Mine Water Management Plan (Appendix P.4), PDF page 516 of the Updated 2021 EIS (AMNS 2021) provides a detailed description of the treatment system required for the dewatering of waters associated with SW10. In summary the treatment system is likely to include aeration, lime softening, followed by coagulation media and GAC filtration with a final polishing pond.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-120
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.8.6.2.2, pg.496

Context and Rationale

The following statement is made above expected water level changes in Mud Lake: "The proposed Project would result in diversion of water from WC-5 and a 43.0% reduction in volume discharged into Mud Lake during EOM and 35.5% reduction during PC conditions (Appendix G.5). This is predicted to correspond to an approximately 7 cm of vertical drop in water levels year-round in Mud Lake."

There is no methodology provided in the Revised EIS Submission on how the 7 cm reduction in water levels in Mud Lake was calculated.

The Proponent is Required to …

A. Provide methodology for how the annual average 7 cm reduction in water level in Mud Lake was calculated.

B. Has a similar methodology been applied to Crusher Lake? If not how are expected changes to Crusher Lake quantified to support the results assessment?

Response

A. The predicted changes in inflow, discharge and water level at Mud Lake are incorporated in the revised Water Balance Analysis document (Appendix A, PDF page 44 of Appendix P.4 [Mine Water Management Plan] included in the Updated 2021 EIS [AMNS 2021]). Mud Lake water levels are controlled by and are not anticipated to drop below the invert of the outlet channel during EOM and PC conditions. A summary of predicted changes to Mud Lake is provided in the Information Request, Round 2 (IR2) response to CEAA 2-09, and in detail in the final Water Balance Analysis (Appendix A, PDF page 44 of Appendix P.4 [Mine Water Management Plan] included in the Updated 2021 EIS [AMNS 2021]).

B. Crusher Lake is part of the Mud Lake catchment; however, its catchment area remains unchanged from baseline conditions. As such, there is no predicted changes in runoff volumes to Crusher Lake from baseline conditions. There will be minor impacts to total inflow to Crusher Lake, attributed to small changes in baseflow contributions due to the influence of the mine pit development on groundwater flow patterns in the area. The predicted impacts to inflow and discharge at Crusher Lake are expected to be minor and are incorporated in the Revised Water Balance Analysis document (Appendix A, PDF page 44 of Appendix P.4 [Mine Water Management Plan] included in the Updated 2021 EIS [AMNS 2021]). Additional detail relating to Crusher Lake is provided in IR2 response CEAA-2-10.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-121
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.9.3.1, pg. 443

Context and Rationale

Cameron Flowage is identified as a water body as part of the fish habitat assessment. No rationale is supported with respect to why this section of the Killag River would be classified as a waterbody.

The Proponent is Required to …

A. Provide rationale on why Cameron Flowage is considered a waterbody.

B. If it is a waterbody, would this potentially change how discharge from the proposed North Settling Pond is assessed with respect to impacts to surface water quantity and quality, and fish and fish habitat?

Response

A. Cameron Flowage was defined as a waterbody to distinguish it from the more riverine portion of the Killag River. The Nova Scotia Environment (NSE) definition of watercourse includes rivers, lakes, streams, creeks, ponds, etc. so the classification of Cameron Flowage was based on physical parameters, not regulatory definitions (NSE *Environment Act*). For clarity, and for consistency with the modelling methods and results, we have now classified Cameron Flowage as a watercourse.

B. We can confirm that this determination of Cameron Flowage as a watercourse is consistent with the modelling approach (Updated 2021 EIS [AMNS 2021], Section 6.7.8.2.3, page 6-281).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-122
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.4.2, pg. 331; 6.9.6.2.2, pg. 497; Appendix G.6;

Context and Rationale

There is a 53.1% increase in annual surface water runoff predicted to discharge to Tent Lake from the Beaver Dam site due to the increase in drainage area for End-of-Mine and Post-Closure conditions. There is no discussion on the potential effects of this increase in surface runoff to these systems with respect to water quantity (e.g., increased scour, flooding) or how these water quantity impacts will be managed. Section 6.9.6.2.2 discusses how flooding within WC-B and adjacent wetlands will potentially have a positive impact and increase suitable fish habitat.

The Proponent is Required to …

Provide assessment of the potential impacts on downstream surface water features from the increased drainage area to Tent Lake from the Beaver Dam project. Include discussion of potential mitigation measures to manage this increase in surface water runoff.

Response

Based on the revised site infrastructure layout, the site water balance has been revised by GHD on behalf of AMNS (Appendix A, PDF page 44 of Appendix P.4 Mine Water Management Plan [AMNS 2021]). The predicted change in catchment area to Tent Lake is -2.1% at EOM and -2.0% during PC. As such, no effect to fish and fish habitat within the Tent Lake catchment area is expected from development of the Project. The revised Water Balance Analysis report will be included as part of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-123
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	n/a
Revised EIS (February 28, 2019) Reference:	Section 8.5.4.2.2, pg. 943

Context and Rationale

Fish and Fish Habitat only considers local forestry operations and the Touquoy Gold project in its assessment of effects from other projects. There is no mention of Fifteen Mile Stream and Cochrane Hill which are proposed to be adjacent to and potentially discharge into fish habitat at other locations along the Eastern Shore, including watercourses with known salmonid populations and habitat. American eel and Atlantic salmon are currently being reviewed for protection under the Species at Risk Act (SARA) and may be present in these watercourses.

The Proponent is Required to …

A. Provide rationale for why Fifteen Mile Stream and Cochrane Hill are not included in the Fish and Fish Habitat cumulative effects assessment, particularly with respect to fish species such as salmonids. This would be particularly applicable to species that are currently being reviewed for protection under the SARA.

B. If cumulative effects from these two projects should be considered in association with the Beaver Dam project, provide a revised residual cumulative effects and significance assessment.

Response

The Cumulative Effects Assessment (CEA) is being revised for all Valued Components (VCs), to ensure consistency with the Cumulative Effects Assessment Methodology Interim Technical Guidance document (version 2), prepared by CEAA (2018). This evaluation will include clearly defined determinations of Projects and spatial boundaries for each VC, which will demonstrate the decision-making process for inclusion and exclusion of particular projects for each VC. This CEA exercise will be completed when the effects assessment for each VC is finalized and provided in the Updated 2021 EIS (AMNS 2021).

The Proponent has determined that an ecosystem-based approach to the spatial boundary determination is the most appropriate to identify cumulative effects to fish and fish habitat. The spatial boundary determination is based on the VC geographic range and the zone of influence (ZOI) for that VC. The ZOI sets a spatial limit beyond which the residual effects of the Project on a VC are not detectable. For all aquatic VCs, the secondary watershed boundary (West River Sheet Harbour, 1-EM-2) has been selected as the appropriate spatial boundary (ZOI, or regional assessment area) for the Beaver Dam Mine Site (plus the Tangier River and Fish River-Lake Charlotte secondary watersheds for the Haul Road and Touquoy Mine Site). Based on the pathways of effects to fish and fish habitat, the spatial boundary for the CEA followed the ecosystem-based approach. This approach is supported by the CEA methodology guidance document (CEAA 2016).

While the Southern Upland (SU) Atlantic Salmon range encompasses the entire southern coast of Nova Scotia, from Canso through to Cape Split in the Bay of Fundy, Gibson et al. (2009a,b) state that they have very “precise homing to natal streams [which] restricts gene flow among fish at different spawning locations”. They continue to state that “this can lead to local adaptation and dissimilarities in life-history characteristics among fish inhabiting geographically distinct or environmentally distinct rivers”. Given that salmon return to natal rivers, the probability of a Project in one watershed or natal stream affecting a population in another natal stream is very low. Fish from each natal stream would experience the same effects in the marine environment, but effects to salmon from inland projects do not have a pathway of effect from one watershed to the next.

The determination of the secondary watersheds as the appropriate scale for the CEA (rather than the entire SU Atlantic Salmon range) is supported by the CEA methodology in another manner. The CEA methodology states that "adopting a large spatial area may lead to misinterpreting the incremental cumulative effects of the project as being insignificant relative to everything else that is affecting the VC in that region, i.e., negligible. If the Regional Assessment Area (RAA) were to be expanded to incorporate the entire range of the SU Atlantic salmon, it would necessitate inclusion of all marine effects, which present substantial threats to the recovery of the Atlantic salmon, negating the incremental effects of land-based Projects.

The salmon's return to natal streams and the incremental cumulative effect of the project being insignificant relative to everything else when adopting a large spatial area (i.e., negligible effect) justifies the determination of the secondary watershed as the appropriate spatial boundary for the CEA of fish and fish habitat. Therefore, the CEA will focus on identifying cumulative effects of projects within the defined RAA.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Marinette, NS.

CEAA (Canadian Environmental Assessment Agency). 2016. Guidelines for the Preparation of an Environmental Impact Statement. Pursuant to the *Canadian Environmental Assessment Act*, 2012 and Nova Scotia Registration Document pursuant to the *Nova Scotia Environment Act*. Beaver Dam Mine. Atlantic Gold Corporation. January 2016. Halifax, NS.

CEAA. 2018. Assessing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act*, 2012 Interim Technical Guidance. Retrieved from https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/assessingcumulative-environmental-effects-ceaa2012.html

Gibson, A.J.F., H.D. Bowlby, D.L. Sam, and P.G. Amiro. 2009a. Review of DFO Science information for Atlantic salmon (*Salmo salar*) populations in the Southern Upland region of Nova Scotia. DFO Canadian Science Advisory Secretariat Research Document 2009/081.

Gibson, A.J.F., R.A. Jones, and H.D. Bowlby. 2009b. Equilibrium analyses of a population's response to recovery activities: A case study with Atlantic salmon. North American Journal of Fisheries Management 29:958-974

Round 2 Information Request Number:	NSE-2-124
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.4, pg. 207-208; Appendix O.1, 2.5.2

Context and Rationale

At the existing Touquoy site, waste rock has been used to construct onsite haul roads, ditches and pad infrastructure around the site. Approximately 40% of the Beaver Dam samples were classified as potentially acid generating. The proposed rock testing program uses existing humidity tests cells to assess sulphide oxidation and metal leaching rates. The potential acid generating samples are expected to take several years to become acid producing. The Environmental Effects Monitoring Plan (Appendix O.1) proposes to conduct regular sampling of the fresh waste rock and tailings with respect to acid base accounting, total and percent sulphur.

The Proponent is Required to …

How will the proponent manage the materials used for the construction of haul roads, ditches, pads and other rocklined infrastructure at the Beaver Dam site to mitigate the potential use of acid generating materials? Will there be additional monitoring conducted in addition to that proposed in the Environmental Effects Monitoring Plan, given that these materials may be placed outside of proposed controlled drainage areas (e.g., berms, ditches)?

Response

A Metal Leaching Acid Rock Drainage (ML/ARD) Management Plan (AMNS 2021, Appendix E.5) will be implemented at the Beaver Dam Mine site. Materials used for construction will be for mechanical and chemical characteristics to ensure suitability for construction. Rock identified as PAG will be directed to the PAG stockpile area where an engineered cover will be placed over the stockpile at closure. Lined diversion ditches will direct water from the PAG stockpile as well as other engineered structures to the north settling pond. Water in the north settling pond will be tested to ensure it meets discharge criteria before being released to the environment. Details on Water Management including monitoring locations is provided in Appendix P.4 (Mine Water Management Plan) of Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-125
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G.3, Section 3.3.3, pg. 15; Table 3-2, 3-3, pg. 18-19; Section 4, pg. 34 ; Appendix G.4, pg.13-14

Context and Rationale

Exceedances of the MDMER criteria are not estimated for the end-of-mine scenario at the Beaver Dam site for base and upper scenarios as being discharged from the north settling pond. Section 3.3.3 recommends that a treatment system be installed during end-of-mine conditions and as well in post-closure even though end-of-mine settling pond water is predicted to meet the MDMER criteria.

The Proponent is Required to …

Will the proponent commit to the development, construction and use of a treatment system to treat discharge from the North Settling Pond prior to discharge into the Killag River? If not, what are the proposed criteria besides the MDMER to determine when the development of a treatment system will be required to treat project water prior to discharge into the Killag River or Tent Lake? Will the water management system be sufficiently sized to provide contingency storage prior to discharge to allow the Beaver Dam site to continue to operate and not discharge into the environment?

Response

A water treatment facility will be constructed to treat water from the north settling pond prior to discharge to the Killag River. Appendix F, PDF page 516 (Water Treatment Assessments) of the Mine Water Management Plan (Appendix P.4) in the Updated 2021 EIS (AMNS 2021) provides a detailed description of the different proposed treatment systems during construction, operations, and post-closure.

North settling pond overflow storage will be provided by the open pit (via pumps and an overflow spillway) so that the Beaver Dam site can continue to operate and not discharge to the environment in the event that the treatment plant has reached its capacity or is not operating.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-126
Regulatory Agency/Indigenous Community:	NSE – Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.3.1, pg. 326

Context and Rationale

It is estimated up to 17.5 m of water cover is predicted to be over the tailings stored within the Touquoy Pit eventually during the post-closure condition. Settled tailings are not predicted to be resuspended due to wind or wave action. The expected water depth cover could potentially become thermally stratified as many water bodies of that depth to in Nova Scotia. There will be expected times of the year when the anoxic waters that are expected to develop at depth will completely mix throughout the water column. No discussion is provided in the Revised EIS Submission with respect to tailings and surface water quality conditions in the Touquoy Pit due to thermal stratification potentially occurring.

The Proponent is Required to …

Provide assessment of predicted depth of water cover within the Touqouy open pit tailing storage area and potential effects to tailings and water quality due to thermal stratification processes.

Response

An assessment of the potential for thermal stratification of the water cover in the Touquoy pit based on dominant wind direction and peak velocities, pond depth, and pit footprint area indicate that there is low likelihood of thermal stratification (Touquoy Integrated Water and Tailings Management Appendix F.7 of the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-127
Regulatory Agency/Indigenous Community:	NSE - Surface Water Quality Specialist
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.4.2, pg. 331; 6.9.6.2.2, pg. 494-495

Context and Rationale

There are predicted reductions in flows to Mud Lake and Crusher Lake, and their associated wetland features and watercourses. The information provided is predominantly a predicted percent reduction in drainage area associated with a 1:1 ratio in reduced surface water runoff (e.g., 52% for Crusher Lake). Section 6.9.6.2.2 provides discussion of the expect changes in fish habitat within these surface water features related to the percentage reduction in surface water runoff at a qualitative level with one quantitative estimate of surface water level reduction (7% for Mud Lake). The information provided is insufficient to assess the potential impacts to fish and fish habitat within these surface water features.

The Proponent is Required to …

Provide more detailed analysis and rationale, including quantitative assessment, of the expected seasonal impacts to the surface water features associated with Crusher and Mud Lakes (wetlands and watercourses) due to the reduction in runoff. There should be discussion related to the baseflow/low flow conditions scenario and habitat impacts (quantity/quality).

Response

The water balance analysis (Appendix A, PDF page 44 in the Mine Water Management Plan [Appendix P.4] of the Updated 2021 EIS [AMNS 2021]) provides the simulated surface runoff, baseflow, and streamflow components to Mud Lake and Crusher Lake on a monthly basis. Monthly changes in surface runoff, baseflow, and total streamflow from baseline to EOM/PC conditions are included. Below is a summary of the results presented in Appendix A, PDF page 44 in the Mine Water Management Plan [Appendix P.4] of the Updated 2021 EIS (AMNS 2021).

The predicted impacts to Mud Lake water levels are highest in wet periods and lowest in dry periods of the year. The decrease in lake inflow volumes result in a maximum decrease in water level of 1.05 m in March and minimum decrease in water level of 0.20 m in August from baseline to EOM conditions. The results are based on a percent change in total lake inflow from a monthly assessment and average climate conditions.

The drainage area to Crusher Lake remains unchanged from baseline conditions throughout the mine development stages; however, the groundwater modelling results show a small increase in baseflow contributions to the lake in the order of 2 to 3% annually. In addition, during operations, water will be extracted from the lake at a rate of 3 m3/hour to meet the domestic and truck wash water demands. The combined impact is a 4.4% decrease in annual lake discharge during operations. During PC it is predicted that a 0.6% increase in annual lake discharge will occur. The results of the impact to water level in Crusher Lake indicate that there will be minimal to no change in water level Appendix A, PDF page 44 in the Mine Water Management Plan [Appendix P.4] of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-128
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Air Quality
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.2.10, Appendix O.1 Appendix C.1

Context and Rationale

The Proponent was requested to "provide monitoring locations identified on a map along with seasonal wind roses. The proposed baseline monitoring locations should be informed, in part, by results of air dispersion modelling". This information has not been provided. The proponent has indicated that an operational methodology and protocols will be established following granting of the IA with NSE.

The Proponent is Required to …

The proponent should submit a detailed ambient air monitoring plan for baseline, construction, operation and reclamation phase of the project, as part of their application for an Approval to Construct and Operate. The monitoring plan should include, but not be limited to, proposed parameters to be measured, details on proposed instrumentation, monitoring schedules, proposed monitoring locations, seasonal wind roses and proposed meteorological data to be measured.

Response

An air quality monitoring program will be developed in conjunction with the operational plan for the facility, and will include TSP and potentially $PM_{2.5}$, as identified in the Environmental Assessment (Updated 2021 EIS [AMNS 2021], Section 6.2.10 page 6-92)

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-129
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Air Quality
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.2 Appendix C.1

Context and Rationale

The Proponent was requested to complete an inventory of expected air contaminants from this project which includes both air contaminants regulated under the NS Air Quality Regulations and any others of concern (e.g. metals, volatile organic compounds etc.). The proponent provided air dispersion modelling of TSP, PM10, PM2.5, NOx, SO2 and total VOCs. The report was silent on metals.

The Proponent is Required to …

1) Are air emissions of metals a concern for this project? If not, the report should justify why specific metals were not included in the modelling.

2) The modelling identified predicted exceedences for TSP, PM10 and PM2.5. The submitted dust control plan requires more definitive actions and commitment to address the modelling results (see comments below regarding dust control plan).

3) The consultant has assumed that the air dispersion modelling results are conservative and that the exceedences are an overprediction. Therefore, the proposed ambient air quality monitoring plan should be designed to confirm the consultant's assumptions that the air dispersion modelling is an overprediction. The level of monitoring proposed should reflect this concern.

Response

Request 1: Are air emissions of metals a concern for this project? If not, the report should justify why specific metals were not included in the modelling.

Air emissions of metals are not a concern for this Project (Intrinsik 2021 in AMNS 2021, Appendix C.2). To address this IR, estimates of metals on coarse (particulate matter less than 10 microns; PM_{10}) and fine (particulate matter less than 2.5 microns; $PM_{2.5}$) particulate matter were estimated, and both short term (24-hour; PM_{10} and $PM_{2.5}$) and chronic (annual; $PM_{2.5}$) exposure levels and risks were predicted. Geochemistry from ore and road material at the Beaver Dam Mine Site were used to develop the ratios of metal on dust. Metal selection was based on Intrinsik 2019 (in AMNS 2019, Appendix C.2, Section 3.2) and criteria for 24-hour ambient air quality criteria were selected from Ontario (OMOE, 2012). The methods and results are discussed in the sections below.

Methods

The assessment of potential exposures to metals on particulate matter involves calculation of baseline metals concentrations in ambient air (as measured metals on PM_{10} and $PM_{2.5}$ are not available), as well as prediction of the incremental project concentration (Project Alone), and the Baseline + Project scenario. Atlantic Mining NS Inc. (AMNS) updated the 2021 Environmental Impact

Statement (EIS), Appendix C.1 Air Emission Assessment (GHD 2021 in AMNS 2021), wherein GHD conducted air modelling of Project related emissions associated with both the mine site and haul road activities. Health Canada guidance was considered in this assessment (Health Canada, 2016a). Each of these scenarios is discussed as follows:

- **Baseline:** Measured baseline concentrations of 24-hour PM_{10} are available from the study area, but sample numbers were limited. As discussed in GHD (2021 in AMNS 2021, Appendix C.1), PM_{10} samples were collected at nine locations near the Beaver Dam Mine Site and along the Haul Road, as well as two locations near Fifteen Mile Stream project area, and two locations near the Cochrane Hill Project area, and five locations on the Touquoy Mine site. PM_{10} values ranged from 7.1 to 13.1 µg/m^3. GHD (2021 in AMNS 2021, Appendix C.1, Section 3.2, PDF page 12) selected the maximum value of 13.1 µg/m^3 to represent background 24-hour PM_{10} levels. This value was also used in the current assessment to represent background PM_{10}. No measured baseline was available for 24-hour $PM_{2.5}$, and hence, GHD (2021 in AMNS 2021, Appendix C.1) estimated 24-hour $PM_{2.5}$ based on other existing datasets at 9.0 µg/m^3 (based on NAPS Port Hawkesbury station – 90th percentile of 2014 to 2016 dataset). For annual average $PM_{2.5}$, the annual average concentration at this station was used to represent background (5.7 µg/m^3 ; see Table 4, PDF page 35; GHD, 2021 in AMNS 2021, Appendix C.1). To predict baseline metals concentrations on the PM, the geochemistry of dustfall from the Beaver Dam Mine area was used. The specific geochemistry fractions were developed and are provided in Intrinsik (2021 in AMNS 2021, Appendix A, PDF page 91 of Appendix C.2). These fractions were applied to the baseline 24-hour PM_{10} and $PM_{2.5}$ data, to estimate metals-specific baseline air concentrations. It is recognized that the baseline metals composition on $PM_{2.5}$ and PM_{10} may be different than that estimated in this project, but since the area is naturally enriched in metals, it is anticipated that this approach is a reasonable surrogate in the absence of site-specific data. Note there are no other Projects in the vicinity of this Project that would be anticipated to influence baseline concentrations (the proposed Fifteen Mile Stream Project is approximately 20 km away and would not be expected to add to the exposures experienced from this mine pit).
- **Project Alone:** To calculate potential exposures to metals in areas near the Project where local land users could spend time, maximum predicted ground level air concentrations in areas outside the Project Development Area (PDA) were used to characterize upper bound exposures. The site-specific geochemistry fractions for the Mine Site (Intrinsik 2021 in AMNS 2021, Appendix A of Appendix C.2) were applied to these selected concentrations, to estimate possible Project Alone exposure concentrations to metals in ambient air, associated with Mine site or Haul Road activities. For $PM_{2.5}$, a predicted 24-hour concentration of 2.51 µg/m^3 was identified as the maximum point of impingement of the receptors modelled for Project Alone scenario (80% dust mitigation) (see Table 7A, GHD, 2021 in AMNS 2021, Appendix C.1; R1 location, PDF page 38). The maximum annual average Project alone $PM_{2.5}$ concentration was 0.96 µg/m^3 at the same location (along the haul road). For PM_{10}, a predicted Project alone concentration of 23.41 µg/m^3 was predicted for the 24-hour assessment as it was the maximum concentration predicted of the modelled receptors (R1 receptor location, along the haul road; Table 7A in GHD, 2021 in AMNS 2021, Appendix C.1, PDF page 38).
- **Project + Baseline:** The estimated baseline metals air concentrations were added to the estimated Project alone increment, to calculate an estimated total concentration for each metal in air.
- **Ambient Air Quality Guidelines (Short-Term Exposure Assessment):** To assess the predicted concentrations from an acute or short-term perspective, 24-hour ambient air quality criteria were selected from Ontario (OMOE, 2012).
- **Chronic TRVs**: To conduct the chronic air inhalation assessment, chronic inhalation toxicity reference values (TRV) that are defined as reference concentrations (RfC) for non-carcinogenic metals or risk-specific concentrations (RsC) for carcinogenic compounds, were identified from Health Canada (2010), or, in the absence of a TRV from Health Canada, other regulatory

agency TRVs were sought, such as those from United States Environmental Protection Agency's Integrated Risk Information System (US EPA IRIS). If values were not available from Health Canada or US EPA, then the most defensible value from Agency for Toxic Substances & Disease Registry (ATSDR), National Institute of Public Health and the Environment (RIVM), California Office of Environmental Health Hazard Assessment (OEHHA) or World Health Organization (WHO) was selected. Lastly, if these agencies did not recommend a TRV for a metal then the Texas Commission on Environmental Quality (TCEQ) Effects Screening Levels (ESLs) were selected. Table NSE-2-129-1 presents the chronic TRVs that were selected for the assessment.

Table NSE-2-129-1: Chronic Inhalation Toxicity Reference Values Selected for the Inhalation Assessment

Metals	Chronic TRV is an RfC / RsC [ug/m^3][(a)]	Endpoint	Reference / Comment
Aluminum	5	Health (not specified)	TCEQ ESL 2016
Antimony	0.5	Health (not specified)	TCEQ ESL 2016
Arsenic	0.0016	Lung cancer	Health Canada 2010
Barium	1	Hematological effects and cardiovascular effects	RIVM 2001
Beryllium	0.004	Lung cancer	US EPA 1998
Boron	5	Health (not specified)	TCEQ ESL 2016
Cadmium	0.001	Lung cancer	Health Canada (2010)
Chromium (III)	0.14	Respiratory irritation	TCEQ 2009
Cobalt	0.1	Respiratory irritation	ATSDR 2004
Copper	1	Respiratory and immunological effects	RIVM 2001
Lead	0.5	Haematological effects or neurological disturbances	WHO 2000
Manganese	0.05	Impairment of neuro-behavioural function	USEPA 1993
Mercury	0.3	Neurological effects	US EPA 1995
Molybdenum	12	Changes in body weight	RIVM 2001
Nickel	0.0077	Lung cancer	Health Canada 2010
Silver	0.01	Health (not specified)	TCEQ ESL 2016
Strontium	2	Health (not specified)	TCEQ ESL 2016
Vanadium	0.1	Respiratory irritation	ATSDR 2012
Zinc	2	Health (not specified)	TCEQ ESL 2016

Notes: n/a = not available

(a) RsC based on 1 in 100,000 risk level (Health Canada 2010).

(b) Selected lowest TRV of available chemicals forms to be conservative.

Results

Tables NSE-2-129-2 and NSE-2-129-3 present the estimated exposures to ambient metals on $PM_{2.5}$ (24-hour) and PM_{10} (24-hour), respectively, in the baseline, project alone, and baseline + project scenarios, based on the Maximum predicted concentrations along the haul road. These exposure concentrations are compared against Ontario 24-hour ambient air benchmark concentrations from the OMOE (2012). In addition, Table NSE-2-129-4 presents the estimated exposure to long-term ambient metals on $PM_{2.5}$ in the baseline, project alone, and baseline + project scenarios, based on maximum point of impingement predicted concentrations along the haul road (annual exposures).

Table NSE-2-129-2: Estimated Exposures to Ambient Metals on Particulate ($PM_{2.5}$) in Beaver Dam Project Area (24-hour) – Maximum Point of Impingement on Haul Road

Metals	Ontario 24- hour Benchmark (µg/m³)	Baseline $PM_{2.5}$[a] (µg/m³)	Mine outside Project Development Area ($PM_{2.5}$)		
			% Metals on dust – Mine[b]	Project Increment $PM_{2.5}$ (2.51 µg/m³)[b][c]	Baseline+Project (µg/m³)
Aluminum	12	0.192	2.14	0.0536	0.246
Antimony	25	0.00000943	0.000105	0.00000263	0.0000121
Arsenic	0.3	0.000301	0.00334	0.000084	0.000385
Barium	10	0.000703	0.00782	0.000196	0.000900
Beryllium	0.01	0.00000345	0.0000384	0.00000096	0.00000442
Boron	120	0.0000471	0.000524	0.0000131	0.0000603
Cadmium	0.025	0.00000230	0.0000256	0.00000064	0.00000294
Chromium (III)	0.5	0.000368	0.00409	0.000103	0.000471
Cobalt	0.1	0.000137	0.00152	0.0000382	0.000175
Copper	50	0.000236	0.00262	0.000066	0.000302
Lead	0.5	0.0000619	0.000688	0.0000173	0.0000792
Manganese	0.1	0.00489	0.0544	0.00136	0.00626
Mercury	2	0.0000000225	0.000000250	0.00000000628	0.0000000288
Molybdenum	120	0.00000606	0.0000674	0.00000169	0.00000775
Nickel	0.1	0.000281	0.00312	0.000078	0.000359
Silver	1	0.00000113	0.0000126	0.000000316	0.00000145
Strontium	120	0.000103	0.00115	0.0000288	0.000132
Vanadium	2	0.000404	0.00449	0.000113	0.000516
Zinc	120	0.000679	0.00754	0.000189	0.000868

Notes: All Ontario guidelines were from 'Ontario's Ambient Air Quality Criteria' April 2012. The limiting effect for all metals was "Health", except for Aluminum and Zinc, which were "Particulate". For chemicals where multiple ambient air quality criteria (AAQC) are available from the MOE (2012), the following AAQC were selected for use: the AAQC for manganese (Mn) is the AAQC for Mn in $PM_{2.5}$; the AAQC for nickel (Ni) is the AAQC for Ni in PM_{10}; and, the AAQC for uranium (U) is the AAQC for U in PM_{10}.

(a) Baseline $PM_{2.5}$ values were estimated at 9 µg/m³ (GHD, 2021 in AMNS 2021, Appendix C.1).

(b) Percent composition of particulates based on site geochemistry data (Intrinsik 2021 in AMNS 2021, Appendix C.2, Appendix A, PDF page 91).

(c) Project values selected from GHD (2021 in AMNS 2021, Appendix C.1).

Bolded and shaded values indicate an exceedance of the MOE (2012) air quality guidelines.

Table NSE-2-129-3: Estimated Exposures to Ambient Metals on Particulate (PM_{10}) in Beaver Dam Project Area (24-hour) – Maximum Point of Impingement on Haul Road

Metals	Ontario 24-hour Benchmark (µg/m^3)	Baseline PM_{10}[a] (µg/m^3)	Mine outside Project Development Area (PM_{10})		
			% Metals on dust – Mine[b]	Project Increment PM_{10} (23.41 µg/m^3)[b][c]	Baseline+Project (µg/m^3)
Aluminum	12	0.280	2.14	0.500	0.780
Antimony	25	0.0000137	0.000105	0.0000245	0.0000382
Arsenic	0.3	0.000438	0.00334	0.00078	0.00122
Barium	10	0.00102	0.00782	0.00183	0.00285
Beryllium	0.01	0.00000503	0.0000384	0.0000090	0.0000140
Boron	120	0.0000686	0.000524	0.000123	0.000191
Cadmium	0.025	0.00000335	0.0000256	0.00000599	0.0000093
Chromium (III)	0.5	0.000536	0.00409	0.00096	0.00149
Cobalt	0.1	0.000200	0.00152	0.000357	0.000556
Copper	50	0.000344	0.00262	0.000614	0.00096
Lead	0.5	0.0000902	0.000688	0.000161	0.000251
Manganese	0.2	0.00712	0.0544	0.0127	0.0199
Mercury	2	0.0000000328	0.000000250	0.0000000585	0.000000091
Molybdenum	120	0.00000883	0.0000674	0.0000158	0.0000246
Nickel	0.1	0.000409	0.00312	0.000731	0.00114
Silver	1	0.00000165	0.0000126	0.00000295	0.00000459
Strontium	120	0.000150	0.00115	0.000268	0.000419
Vanadium	2	0.000588	0.00449	0.00105	0.00164
Zinc	120	0.000988	0.00754	0.00177	0.00275

Notes: All Ontario guidelines were from 'Ontario's Ambient Air Quality Criteria' April 2012. The limiting effect for all metals were "Health", except for Aluminum and Zinc, which were "Particulate". For chemicals where multiple ambient air quality criteria (AAQC) are available from the MOE (2012), the following AAQC were selected for use: the AAQC for manganese (Mn) is the AAQC for Mn in PM_{10}; and the AAQC for nickel (Ni) is the AAQC for Ni in PM_{10}; and, the AAQC for uranium (U) is the AAQC for U in PM_{10}.

[a] Baseline Value is based on the maximum measured baseline PM_{10} value of 13.1 µg/m^3 (GHD, 2021 in AMNS 2021, Appendix C.1).

[b] Percent composition of particulates based on site geochemistry data (Intrinsik 2021 in AMNS 2021, Appendix C.2, Appendix A, PDF page 91).

[c] Project values selected from GHD (2021 in AMNS 2021, Appendix C.1).

Bolded and shaded values indicate an exceedance of the MOE (2012) air quality guidelines.

Table NSE-2-129-4: Estimated Exposures and Risks to Long-term Ambient and Incremental Metals on Particulate ($PM_{2.5}$) - Beaver Dam Project Area Maximum Point of Impingement

Metals	Chronic TRV (µg/m³)	Baseline $PM_{2.5}$[(a)] - Mine (µg/m³)	% Metals on dust – Mine[(b)]	Mine outside PDA ($PM_{2.5}$)	
				Project Increment $PM_{2.5}$ (0.96 µg/m³)[(c)]	Baseline+Project (µg/m³)
Aluminum	5	0.122	2.14	0.0205	0.142
Antimony	0.5	0.00000597	0.000105	0.00000101	0.00000697
Arsenic	0.0016	0.000191	0.00334	0.0000321	0.000223
Barium	1	0.000446	0.00782	0.0000750	0.000521
Beryllium	0.004	0.00000219	0.0000384	0.000000368	0.00000256
Boron	5	0.0000298	0.000524	0.00000503	0.0000349
Cadmium	0.001	0.00000146	0.0000256	0.000000246	0.00000170
Chromium (III)	0.14	0.000233	0.00409	0.0000393	0.000273
Cobalt	0.1	0.0000869	0.00152	0.0000146	0.000101
Copper	1	0.000150	0.00262	0.0000252	0.000175
Lead	0.5	0.0000392	0.000688	0.00000661	0.0000458
Manganese	0.05	0.00310	0.0544	0.000522	0.00362
Mercury	0.3	0.0000000143	0.000000250	0.00000000240	0.0000000167
Molybdenum	12	0.00000384	0.0000674	0.000000647	0.00000449
Nickel	0.0077	0.000178	0.00312	0.0000300	0.000208
Silver	0.01	0.000000717	0.0000126	0.000000121	0.000000838
Strontium	2	0.0000654	0.00115	0.0000110	0.0000764
Vanadium	0.1	0.000256	0.00449	0.0000431	0.000299
Zinc	2	0.000430	0.00754	0.0000724	0.000502

Notes:

(a) Baseline $PM_{2.5}$ value is based on the annual average measured baseline $PM_{2.5}$ value of 5.7 µg/m³ (GHD, 2021 in AMNS 2021, Appendix C.1).

(b) Percent composition of particulates based on site geochemistry data (Intrinsik 2021 in AMNS 2021, Appendix C.2, Appendix A, PDF page 91).

(c) Project value is the maximum at site boundary from GHD (2021 in AMNS 2021, Appendix C.1).

Bolded and shaded values indicate an exceedance of the Chronic TRV.

The results of this assessment indicate that all estimated exposures based on ambient metals on PM_{10} and $PM_{2.5}$ are orders of magnitude below Ontario 24-hour ambient air benchmark concentrations as well as chronic TRVs (assessed based on ambient metals on $PM_{2.5}$). Therefore, given that no chemical exceedances were identified based on the maximum point of impingement predicted concentrations along the haul road (which is the major source of dust emissions), metals particulate concentrations resulting from emissions at the Beaver Dam Mine Site area are unlikely to present inhalation risks to receptors in the Beaver Dam Project Area.

While additivity of metals was not directly considered, potential additivity of toxic effects via exposure to multiple chemicals can occur. Under typical ambient environmental exposure conditions, humans are exposed to complex mixtures of chemicals, rather than individual compounds. There can be a variety of types of interactions between chemicals in environmental mixtures that can alter the overall absorption, toxicokinetics, toxicodynamics and toxicity of metals in humans and animals. Additivity of chemical toxicity occurs when chemicals have a similar mode or toxicological mechanism of action. If all metals in air in the current assessment were considered additive, no change in the conclusions would occur.

With respect to cumulative effects of a possible nine year usage of the haul road, associated with the Fifteen Mile Stream Gold Project and Cochrane Hill Gold Project (if approved) and additional truck usage from other industries, the maximum point of impingement values would increase slightly, as shown in Table 7A of GHD, 2021 in AMNS 2021, Appendix C.1, PDF page 38, as follows:

- 24-hour $PM_{2.5}$ increases from 2.51 μg/m^3 to 3.79 μg/m^3;
- 24-hour PM_{10} increases from 23.41 μg/m^3 to 35.41 μg/m^3; and
- Annual average $PM_{2.5}$ increases from 0.96 μg/m^3 to 1.46 μg/m^3.

These increased values do not result in any changes to the assessment conclusions.

Metals have been assessed as part of the Human Health Risk Assessment, based on their proportions within the particulate]. Metals have not been identified as contaminants of concern for the purposes of the air quality assessment.

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Round 2 Information Request Number:	NSE-2-130
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Air Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix C.3

Context and Rationale

The Dust Control Plan does not provide the level of response required to address the air dispersion modelling results. The air dispersion modelling results predicted exceedences with the assumption that the dust control is 75% effective. Therefore, the plan should be designed to be at least 75% effective. The proposed plan should be more prescriptive.

The Proponent is Required to …

1) The loads of haul trucks should be covered at all times, not when feasible.
2) There should be a defined minimum schedule for the application of dust suppressant.
3) How will the haul road be monitored to determine adjustment of the schedule to apply dust suppressant?
4) What mitigation is proposed to ensure chemical dust suppressants and chemical additives will not enter waterways.
5) Technical details on proposed chemical dust suppressants or chemical additives should be included as part of the application for an Approval to Construct and Operate.

Response

1. Haul trucks are not covered because source of dust does not originate from the ore being transported in trucks because the size of the ore (i.e., crushed rock).
2. Dust suppression is not suitable to a scheduled approach since it depends on weather and rain events and therefore there requires some flexibility to apply dust suppressants at appropriate times given the weather conditions. Atlantic Mining NS Inc. (AMNS) does commit to having water trucks available at all times to address dust concerns for environmental and safety requirements. An operations and maintenance plan will be developed to address road watering as well as other environmental and safety requirements of the road.
3. The road will be inspected by a dedicated team throughout the day to determine dust levels as well as any other potential safety and environmental hazards. In addition, drivers will be in regular contact with dispatch as well as other drivers to communicate safety conditions that will dust levels. Drivers will include training on operations and maintenance of the Haul Road.
4. Dust suppressants may include those recommended in the Nova Scotia Highway Maintenance Standards (TIR 2019) that may include either “Calcium Chloride” or “Magnesium Chloride”. The “Highway Construction and Maintenance Standard Specification”, specification and application rates will be followed. In addition, optional dust suppressants that are proven to provide a higher level of effectiveness may also be considered. AMNS commits to discussing optional dust suppressants with Nova Scotia Environment (NSE) prior to use.

5. Information provided by AMNS to NSE may include available MSDS sheets, human and ecological health screening documents, and any other information provided by a supplier.

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Round 2 Information Request Number:	NSE-2-131
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 2.2

Context and Rationale

The proponent indicates "minimal volumes of water will be re-used from the north settling pond and/or collection pond for on-site dust suppression purposes, as required (assuming the water meets applicable regulatory criteria)."

The Proponent is Required to …

Provide details on the monitoring protocol for the use of site water as a dust suppressant. Details such as proposed contaminants to be tested, the proposed criteria to be used for comparison and sampling schedule should be provided.

Response

Water used for dust suppression sourced from the north settling pond will be tested to ensure if meets discharge criteria as determined by Nova Scotia Environment before use.

Round 2 Information Request Number:	NSE-2-132
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.2.1, pg. 204

Context and Rationale

Section 6.5.3.2.1 was referenced to address: "was sufficient baseline data collected (away from the former mine operations) to establish that elevated occurrences are not attributed to former mine operations?"

Soil

Section 6.5.3.2 (pg. 203) indicates a review of regional till samples collected by Seabright Exploration Inc. identified 98 samples in the vicinity of the project area. Results indicate arsenic concentrations were identified to be above CCME soil quality guideline of 12 mg/kg in 29 of the 98 samples. No details are provided on the magnitude/extent of arsenic in soil exceeding guideline value.

Section 6.5.3.2.1 indicates regional studies of till samples show high levels of arsenic that have no mineral occurrences, and therefore it can be concluded that the elevated arsenic levels are attributed to natural background levels.

Sediment

Section 6.5.3.2.1 indicates arsenic levels above CCME and Tier 1 EQS were identified at samples 1 to 7 (of 9). The report goes on to state…." In a gold mining area rich in arsenic mineralization (e.g. arsenopyrite), high As concentrations indicate naturally occurring arsenic, Arsenic concentrations in soils around mine sites have been reported as high as 4,700 ppm in areas where historic mining activity have concentrated As levels in mill waste".

The report goes on to state…." High levels of As in the hundreds of mg/kg in sediments indicate that further monitoring is warranted. It is noted that the action of movement in water concentrates many higher density materials including metals such as the naturally occurring arsenic".

The Proponent is Required to …

Clarification is required to differentiate between elevated concentrations attributed to natural background versus elevated concentrations attributable to historic mining activities (including mill waste/tailings).

Under supervision of a site professional, as defined by the Contaminated Sites Regulations, baseline studies should be conducted as necessary to determine natural background conditions of relevant environmental media (soil, sediment, surface water, groundwater).

Under supervision of a site professional, as defined by the Contaminated Sites Regulations, a Phase 2 Environmental Site Assessment should be conducted that provides a baseline for all areas within the project lease boundary which are known or suspected to have contamination resulting from historical mining activities (including mill waste/ tailings) which are likely to or potentially could be disturbed during the construction, operation or reclamation of the facility.

Response

Summary Response

Stantec Consulting Ltd. (Stantec) conducted a Phase I Environmental Site Assessment (ESA) (Appendix E.6 [Stantec 2019a] of the Updated 2021 EIS), Limited Phase II ESA (Appendix E.7 [Stantec 2019b] of the Updated 2021 EIS), and Extended Phase II ESA (Appendix E.8 [Stantec 2021] of the Updated 2021 EIS) of the proposed mining operations for the Beaver Dam Mine Project.

Scope and Findings of Phase I ESA

The Phase I ESA (Appendix E.6 [Stantec 2019a] of the Updated 2021 EIS [AMNS 2021]) included a records review, interviews, and site visit which revealed evidence of potential environmental contamination associated with the Site. Stantec also conducted LIDAR analysis to produce a Digital Elevation Model (DEM) of the Site which was used to approximately delineate potential historical tailings and waste rock storage areas prior to conducting the Phase I ESA site visit.

Based on the information gathered, there are suspected tailings and waste rock both within the area of the proposed open pit development as well the area of the adjacent pit operations, which are potentially impacted with arsenic and mercury and have potential acid generating potential. Additionally, the mine operation in the 1980s included power generation, maintenance work and underground fuel storage.

Scope of Phase II ESAs

The Limited and Extended Phase II ESAs assessed soil geochemistry at the Site and provided conclusions relating to naturally-occurring background concentrations and soil contamination associated with the historical mining activities identified in the Phase I ESA.

Soil sampling was conducted from test pits. Twenty-nine test pits were excavated as part of the Limited Phase II ESA, and 65 test pits as part of the Extended Phase II ESA (Appendix E.7 and E.8 of the Updated 2021 EIS [AMNS 2021]).

Rationale and Methodology

Test pit locations during the Limited Phase II ESA were chosen in the field based on areas of concern (i.e., tailings and waste rock storage areas) identified during review of the DEM and a visual assessment of the Site and based on the location of proposed mine infrastructure. LIDAR data specific to the Beaver Dam area was requested from the Nova Scotia Department of Natural Resources in August 2019 which identified historical tailing areas within the settlement pond, Crusher Lake and Forge Hill mining and stamp mill area.

Test pit locations during the Extended Phase II ESA were selected to further delineate the arsenic previously detected in 2019 in the area of the proposed pit. Stantec used a grid to assess areas around and between areas that Stantec considered to have been impacted with arsenic based on 2019 soil analytical results and field observations, and to screen newly identified areas. Locations were also chosen to screen the revised proposed mine infrastructure areas.

Soil sampling methodology is detailed in Section 2.2, PDF page 13 of the Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]) and Section 2.2, PDF page 18 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Regulatory Framework

Analytical results for soil were compared to the applicable Tier 1 Environmental Quality Standards (EQS) from Nova Scotia Environment and Climate Change (NSECC)'s Contaminated Sites Regulations (NSECC, 2013) for an industrial site with non-potable groundwater use and coarse-grained soil (standards for coarse-grained soil are more conservative than standards for fine-grained soil). For metals, the Tier 1 EQS for a potable and non-potable site are equivalent.

The regulatory framework applied to data at the Site is detailed in Section 1.5, PDF page 15 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Soil Observations and Results

Stratigraphy

The stratigraphy encountered in most test pits consisted of a layer of organics over poorly graded brown to grey silty sand with some gravel and cobbles.

Stratigraphy at test pits categorized as impacted by historical tailings was generally like the unimpacted locations with the addition of a layer of up to 0.65 m of distinct grey sand, gravelly sand, or silt (suspected tailings).

Stratigraphy at test pits categorized as impacted by historical waste rock was generally like the unimpacted locations with the addition of a layer of up to 0.62 m of gravel and/or cobbles, often infilled with brown or orange-brown sand (suspected waste rock).

Test pit stratigraphy is detailed within Section 3.2.1, PDF page 15 and Table B-1, PDF page 27, Appendix B of the Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]) and Section 3.2.1.1, PDF page 21 and Appendix B, PDF page 43 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Soil Analytical Results

Laboratory analysis for available (acid extractable) metals was conducted on 67 soil samples originating from 65 test pits, plus six field duplicate samples, collected in 2020 (Appendix E.8 [Stantec, 2021) and 29 soil samples originating from 29 test pits collected in 2019 (Appendix E.7 [Stantec, 2019]).[3] of the Updated 2021 EIS (AMNS 2021).

Results of the laboratory analysis of soil samples are summarized in Table NSE-2-132-1 below.

Table NSE-2-132-1: Summary of Soil Contamination (2019 to 2020)

Standard Exceedances	Tier 1 EQS	Exceeding (Samples)	Exceeding (Test Pits)
Arsenic	31 mg/kg	73 of 96 samples[(a)]	72 of 94 test pits*
Other Metals	Various	None	None

Notes: Numbers of exceedances do not include field duplicate samples.

(a) There are more soil samples than test pit locations as two soil samples, rather than one, were collected from two of the test pits.

[1] Samples collected during Limited Phase II ESA activities were renamed within the Extended Phase II ESA to indicate the year of collection more clearly. For example, the sample previously reported as SA1 (collected from a test pit in 2019) has been renamed to TP19-01.

Levels of arsenic ranged from non-detected to 3,900 mg/kg.

Lead and mercury have been associated with historical mining activities in Nova Scotia. Levels of lead and mercury in soil at the Project site were relatively elevated but did not exceed applicable Tier 1 EQS. The maximum identified lead concentration was 200 mg/kg versus a Tier 1 EQS of 740 mg/kg, and the maximum identified mercury concentration was 40 mg/kg versus a Tier 1 EQS of 99 mg/kg.

Results of the laboratory analysis of soil samples are presented on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 and Table C-1, PDF page 132, Appendix C PDF page 139 and discussed in Section 3.3.1, PDF page 23 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-132-1.

Soil Impact Classification

Based on field observations, including visible tailings within test pits and their proximity to Site features such as historical mining infrastructure/features (i.e., trenches, waste rock piles, stamp mill foundations, etc.), Stantec classified the test pit locations from both 2019 and 2020 as either non-impacted or impacted by historical mining activities. Of the impacted locations, Stantec further classified them as likely impacted by historical mine tailings or by mine waste rock. This impact classification assisted Stantec's assessment of background levels and delineation, discussed below.

Soil impact classifications are summarized in Table NSE-2-132-2.

Table NSE-2-132-2: Summary of Soil Impact Classification

Impact Classification at Proposed Mine Infrastructure Areas Based on Field Identification	Non-Impacted Test Pits	Impacted Test Pits	
		Tailings	Waste Rock
Crusher pad	2 of 2	0 of 2	0 of 2
LG (low grade) stockpiles	2 of 2	0 of 2	0 of 2
NAG (non-acid generating) stockpiles	4 of 4	0 of 4	0 of 4
Open pit	4 of 23*	6 of 23† [764]	13 of 23‡ [346]
Organic material stockpiles	6 of 6	0 of 6	0 of 6
PAG (potentially acid generating) stockpiles	2 of 2	0 of 2	0 of 2
Roadways and water management ditches	6 of 9	1 of 9 [230]	2 of 9 [125]
Settling pond	3 of 3	0 of 3	0 of 3
Till stockpiles	6 of 7	1 of 7 [130]	0 of 7
TSSPs (top-soil/sub-soil stockpiles)	4 of 6	1 of 6 [2,800]	1 of 6 [44]
Areas outside of proposed infrastructure	12 of 31	15 of 31 [294]	4 of 23 [104]

Notes:[ ] The value in brackets represents the mean arsenic concentration (mg/kg) in the soil samples within this proposed mine infrastructure area and impact classification.

* Non-impacted test pits within the proposed open pit were either on the extreme northern edge of the footprint (TP19-10), observed to be composed of natural soil deposits in the field (TP20-34, TP20-35, and TP20-58) and/or contained low concentrations of arsenic (TP20-58).

† Tailings-impacted test pits within the proposed open pit are largely near the central historical settling pond. This includes the highest identified concentration of 3,900 mg/kg at TP19-28.‡ Waste rock-impacted test pits were identified throughout the re-worked area composing the majority of the proposed open pit.

Sample photographs of observed suspected tailings and waste rock are included below, as well as in the photolog in Appendix E of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Photograph A **Suspected Tailings from TP20-63**

Photograph B **Suspected Waste Rock at Surface of TP20-27**

Soil impact classifications are highlighted on Table C-1, PDF page 140, Appendix C PDF page 139 and discussed in Section 4.1.1, PDF page 27 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Background Levels

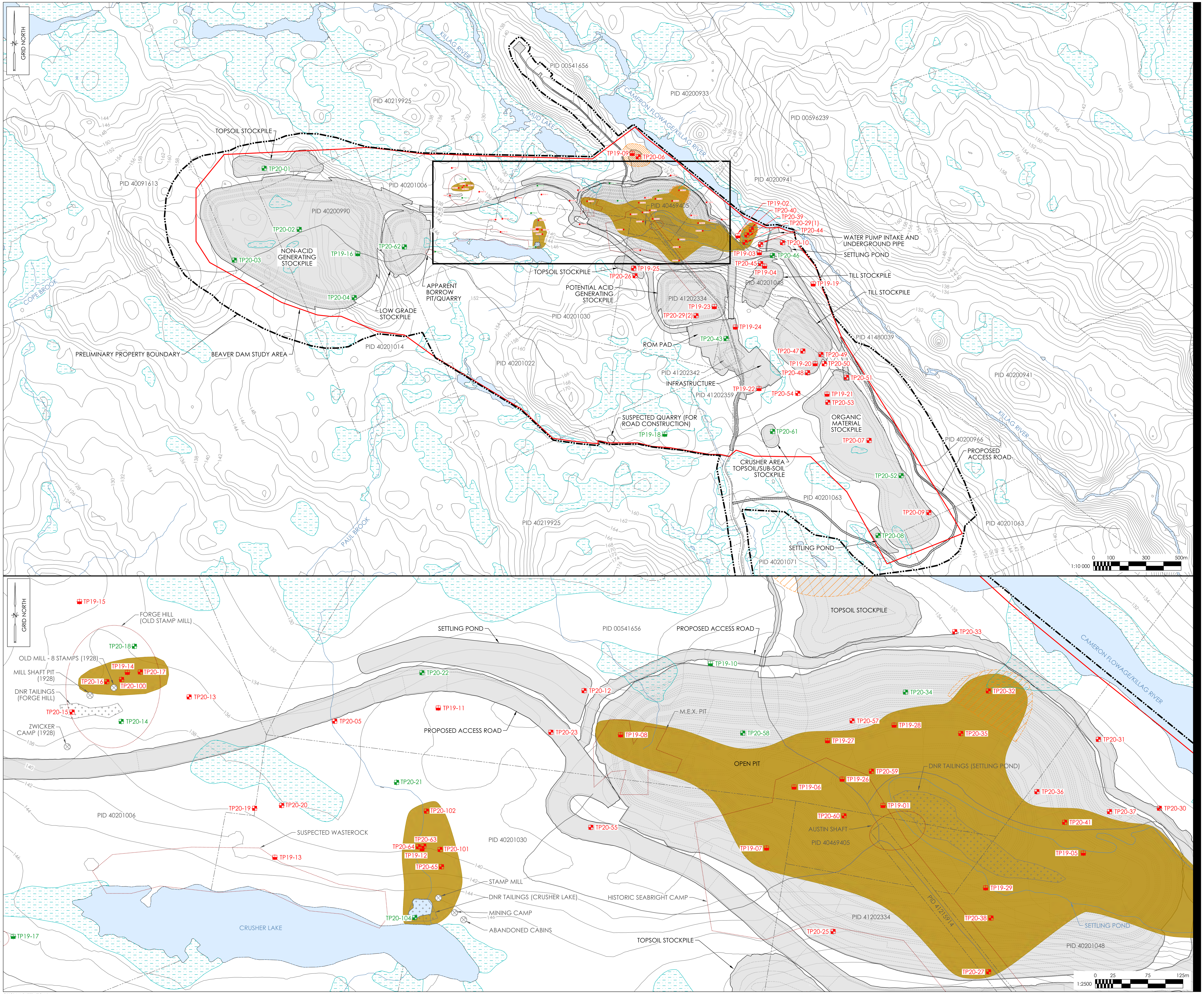
Some samples from non-impacted areas of the Site include arsenic concentrations higher than the Tier 1 EQS. Arsenic concentrations within non-impacted soil samples represent potential data on background levels in the Site area soil (i.e., arsenic in soil related to geology and not to historical mining activities).

Table NSE-2-132-3 presents statistical metrics calculated using the non-impacted soil concentrations, compared to the Tier 1 EQS. Statistical calculations, including distribution and outlier testing, were conducted using the United States Environmental Protection Agency's (US EPA) ProUCL statistics software package for environmental applications (USEPA 2016).

Table NSE-2-132-3: Statistics from Background Non-Impacted Data Set

Concentration (mg/kg)	Tier 1 EQS	Maximum	Mean	Median	75th Percentile	95th Percentile
Arsenic	31	270	75.34	43.5	112.5	228.0

Arsenic levels below the 95th percentile value (228 mg/kg) of the background non-impacted data set were considered to represent arsenic not related to historical mining activities. Delineation based on this value, as well as on field observations, is shown on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 of the Extended Phase II ESA Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-132-1.



Stantec

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Legend

- BEAVER DAM STUDY AREA
- TOPOGRAPHIC CONTOUR (2m INTERVAL)
- PROPERTY BOUNDARY
- PRELIMINARY PROPERTY BOUNDARY
- EXISTING ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED MINING INFRASTRUCTURE
- REPORTED TAILINGS - DNR
- HISTORIC MINING OPERATIONS AREA
- HISTORICAL MINING FEATURE LOCATION
- TEST PIT LOCATION (2020)
- TEST PIT LOCATION (2019)
- TEST PIT LOCATION - SOIL SAMPLE EXCEEDS NSE TIER I EQS FOR ARSENIC (>31 mg/kg) AT AN INDUSTRIAL SITE
- TEST PIT LOCATION - SOIL SAMPLE BELOW NSE TIER I EQS FOR ARSENIC (<31 mg/kg) AT AN INDUSTRIAL SITE
- POTENTIAL AREA OF ARSENIC IMPACTED SOIL RELATED TO HISTORICAL MINING OPERATIONS
- AREAS OF UNDELINEATED POTENTIAL ARSENIC IMPACTED SOIL RELATED TO HISTORICAL MINING OPERATIONS

Notes

1. DATA SOURCES: GOVERNMENT OF CANADA, GOVERNMENT OF NOVA SCOTIA, McCALLUM AND ATLANTIC MINING NS INC., AUSENCO (DRAWING No. 105227-0000-G-101, REV D, 07/DEC2020).
2. LOCATIONS OF HISTORICAL MINING FEATURES ARE APPROXIMATE.

1	INFRASTRUCTURE UPDATE	EA	MF	21.02.08
Revision		By	Appd.	YY.MM.DD

B	FINAL	EA	MF	21.02.XX
A	FOR REVIEW	EA	MF	20.11.09
Issued		By	Appd.	YY.MM.DD

File Name: 121619250.2500.995_A-5_REV1	JL	EA	GM	21.02.08
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

ATLANTIC MINING NS INC.

BEAVER DAM PROJECT

HALIFAX COUNTY, NS

Title

ARSENIC CONCENTRATIONS COMPARED TO NSE TIER 1 EQS (INDUSTRIAL LAND USE) AND POTENTIAL EXTENT OF ARSENIC IN SOIL RELATED TO HISTORICAL MINING OPERATIONS

Project No. 121619250
Scale AS SHOWN
Drawing No. A-5
Sheet 5 of 7
Revision 0

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2021/02/08 1:24 PM By: Lockhart, Jeff

ORIGINAL SHEET - ISO A1

Background levels are discussed in Section 4.1.2, PDF page 28 and detailed methodology on statistical methods used, including distribution and outlier testing, is included in Appendix F, PDF page 220 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Contamination and Delineation Near Proposed Mine Infrastructure

Impacts above the calculated background value, considered to represent arsenic related to historical mining activities, were identified within the proposed open pit and to its east at the east end of the historical settling pond, as well as in the area of the proposed TSSPs to the north and northwest of the proposed open pit, and intersecting proposed roadways and water management ditches.

This level of impacted soil was also identified within an area spanning the proposed till stockpile and organic material stockpile; however, despite its high levels of arsenic which could affect soil management in this area, soil in this area was field-identified as non-impacted and may represent naturally elevated levels.

This level of impacted soil was also identified around the stream north of the suspected tailings at Crusher Lake (no proposed mine infrastructure in this area).

Proposed infrastructure in other areas may disturb soil or sediment with arsenic concentrations that naturally exceed the guidelines. This will be an important factor during construction for the management of soil and for the disturbance of sediments that may be mobilized on or off-site.

Historical mining-related arsenic contamination in soil identified during the Limited Phase II ESA and Extended Phase II ESA is horizontally delineated other than to the northeast of the proposed open pit near the Cameron Flowage, as shown by dashed lines on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-132-1.

Identified contamination is not vertically delineated given refusal of hand-held tools during sampling events. Bedrock may limit vertical soil contamination. Stantec has previously reviewed reports on historical Nova Scotia gold mines identifying tailings several metres thick.

Contamination and delineation near proposed mine infrastructure is discussed in Section 4.1.3, PDF page 29 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Conclusions

Based on the information gathered and on observations made during the Phase I ESA (Appendix E.6 [Stantec, 2019a]), Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]), and Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021), Stantec provides the following conclusions related to potential environmental contamination in soil associated with historical gold mining operations:

- Concentrations of arsenic in soil exceeding the applicable NSE Tier 1 EQS were identified. Some of these locations are considered non-impacted and are potentially indicative of background soil concentrations.

- Test pits were identified during the Limited and Extended Phase II ESA work in 2019 and 2020 that were classified as likely impacted by historical tailings or waste rock based on field observations, arsenic levels, and proximity to historical site features.
- Arsenic in soil at levels considered to represent impact from historical mining operations intersects with areas of proposed Project infrastructure, including the proposed open pit.

Closure

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report, and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

This report is limited by the following:

- This report summarizes results of investigations of soil geochemistry at the Beaver Dam Mine site and does not include a summary of results of investigations of other media including sediment or surface water.

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment.

In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

NSE (Nova Scotia Environment). 2014. Nova Scotia Environment, Nova Scotia Contaminated Sites Regulations, Environmental Quality Standards for Contaminated Sites. Retrieved from: https://www.novascotia.ca/nse/contaminatedsites/. Last modified: 2015-08-20.

Stantec. 2019a. Final - Phase I Environmental Site Assessment - Beaver Dam Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.6 Phase I Environmental Site Assessment - Beaver Dam Property (2019). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

Stantec. 2019b. Limited Phase II Environmental Site Assessment - Beaver Dam Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.7 Limited Phase II Environmental Site Assessment - Beaver Dam Property (2019). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

Stantec. 2021. Final (Revised) - Extended Phase II Environmental Site Assessment - Beaver Dam Project Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.8 Extended Phase II Environmental Site Assessment - Beaver Dam Property (2021). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

US EPA (United States Environmental Protection Agency). 2016. Statistical Software ProUCL 5.1.00 for Environmental Applications for Data Sets with and without Nondetect Observations.

Round 2 Information Request Number:	NSE-2-133
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not Listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.2: pg. 200 Section 6.5.3.2: pg. 202 Section 6.7.3.2: pg. 287

Context and Rationale

Sections 6.5.2 and 6.5.3.2 were referenced to address: "compare baseline soil/sediment analytical results to Tier I EQS."

Full analytical results compared to CCME and Tier 1 EQS are indicated to be included in Appendix E.1.

The Proponent is Required to …

Sediment baseline analytical results table in Appendix E.1 does not compare results against Tier 1 EQS.

Also, sediment sample locations are indicated as being represented on Figure 6.5-7. However, the figure referenced presents geochemical overburden sample locations. Other than an approximate description of sediment sample locations within Table 6.5-1, there does not appear to be any graphic representation of sediment sample locations within the figures provided.

Response

Round 2, Information Requestion NSE-2-31, Figure NSE-2-31-1 provides the location of Sediment from the Beaver Dam Mine Site. This information has been expanded and updated in the Appendix E.7 (Limited Phase II - Environmental Site Assessment) and Appendix E.8 (Extended Phase II Environmental Site Assessment Beaver Dam Project Property) of the Updated 2021 EIS (AMNS 2021) with comparisons with Tier 1 EQS.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-134
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.5.2: pg. 200 6.7.5.5: pg. 312

Context and Rationale

Sections 6.5.2 and 6.7.5.5 were referenced to address: "Identify Tier 1 EQS soil/sediment exceedances as trigger for adverse effects should a release occur (as with surface water – Section 6.3.5.2)."

Section 6.5.2 presents baseline sediment conditions. There does not appear to be any mention of threshold for determination of significance for sediment within the report.

Section 6.7.5.5 presents threshold for determination of significance for surface water as "A significant adverse effect to surface water quality within Beaver Dam and Tourquoy mine sites is defined as a repeated or sustained exceedance of the MDMER criteria at the point of discharge from each mine site, and the CCME FWAL criteria, confirmed background concentrations, or site specific established criteria for TSS, and metals (especially arsenic), in surface water samples collected insitu from the receiving environments (Killag or Moose River)".

The Proponent is Required to ….

This issue remains to be addressed.

Tier 1 EQS should also be listed as a threshold for a significant adverse effect to surface water quality (It is noted that Section 2.1 indicates that no federal lands will be used to undertake the project).

Response

AMNS acknowledges that provincial Tier 1 EQS for sediments (freshwater) will be set as a threshold for a significant adverse effect to sediment quality. Tier 1 EQS for surface water (freshwater) has been considered with respect to the regulatory limits with in the Killag River. With respect to the constituents of concern, there are no Tier 1 EQS limits which are lower (i.e., more stringent) than the CCME FWAL limits. As such, CCME FWAL limits are the governing limits for the water quality within the Killag River.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-135
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.6.6: pg. 244

Context and Rationale

Section 6.6.6 was referenced to address: "compare groundwater quality results to Tier 1 EQS."

Tabulated groundwater data is presented within Appendix F4.

The Tier 1 EQS comparison column is not populated (nor is Tier 2 PSS for groundwater discharge to surface water >10m). No Table exceedances are highlighted. The field activities report (Appendix F3) indicates that the groundwater results were not compared to any guidelines or other criteria as data is only baseline and will be compared in the future to compliance values set out in the IA and later to CCME and/or MMER.

The Proponent is Required to …

Groundwater data should be compared to applicable guidelines/criteria (if only for comparison purposes) as with other media (soil, sediment, surface water).

Beyond establishment of baseline conditions, exceedances should be identified to ensure the requirement for appropriate risk mitigation measures are recognized (i.e. potable well restrictions, as warranted).

Response

The Baseline Groundwater Program Memorandum (Appendix F.4 in the Updated 2021 EIS [AMNS 2021]) includes comparison of groundwater data to applicable criteria including GCDWQ, NSE Tier 1 EQS for potable groundwater, and NSE Tier 2 PSS for groundwater discharge to surface water (>10m).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-136
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.6.6: pg. 244

Context and Rationale

In response to NSE 1-39(f, g) and 1-41 (a) with respect to historic tailings, the concordance table states "There are no mapped historic tailings in any DNR or GSC reports, no air photo evidence, no geochemical anomalies to suggest any, no evidence seen during EBS work since 2014 and no evidence through historical research completed for the EIS".

The Proponent is Required to …

No section of the report is referenced to support this statement.

Section 2.1.1 summarizes the area as being subject to exploration and mining since 1868. The report references approximately 967 ounces of gold production at Beaver Dam between 1889 and 1941; and 2,445 ounces of gold production between 1986 and 1989. Also, 20 abandoned mine openings are reported within the Beaver Dam Mine Site.

Figure 2.1-4 (Beaver Dam Mine Site Existing Mine Conditions) illustrates areas designated as Historic Mining Area and Settling Pond (Constructed).

Based on the historical information contained within the EIS, in conjunction with apparent anomalous metals chemistry data (specifically within surface water and sediment), it can be inferred that the Beaver Dam site is likely to include historical tailings along with other potential impacted materials caused by past mining activities.

Response

A Phase II Environmental Site Assessment has been undertaken and the results are presented in Appendix E.6 (Phase I - Environmental Site Assessment), Appendix E.7 (Limited Phase II - Environmental Site Assessment), and Appendix E.8 (Extended Phase II - Environmental Site Assessment) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-137
Regulatory Agency/Indigenous Community:	NSE ICE Division (Hydro-Geologist)
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 2.2.1.2

Context and Rationale

Section states, regarding mine roads, that 'The roads will be constructed out of non-ore bearing waste rock from the open pit'. Given that there is demonstrated potential for a significant portion of the mine rock to be acid-generating, roads made of waste rock could be acid generating.

The Proponent is Required to …

Please evaluate whether mine roads made of waste rock from the mine could be acid generating.

Please identify and evaluate the potential use of alternative sources of material for construction of mine roads. Are there any nearby quarries which could provide rock which is known to be non-acid generating for mine road construction?

Response

The Beaver Dam Mine Project draft ML/ARD Management Plan (AMNS 2021, Appendix E.5) assumes that all mine infrastructure is constructed with non-acidic generating (NAG) material, thereby eliminating the potential for ARD. The spatial extent of NAG and potential acid generating (PAG) zones within the open pit has been determined via preliminary geologic modelling and will be confirmed through operational ML/ARD monitoring. The materials will be tested to confirm source materials are non-acid generating.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-138
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 2.6

Context and Rationale

Only two alternatives were considered for disposal of Beaver Dam tailings at Touquoy: expansion of the existing TMF and use of the exhausted Touquoy pit. However a third alternative, creation of a second TMF at the Touquoy site, has not been considered or evaluated.

The Proponent is Required to …

Please evaluate the potential for construction of a new TMF at the Touquoy site for disposal of BD tailings as an alternative to disposal in the exhausted Touqoy pit. Given potential for long term water quality impacts to Moose River, could a second TMF, constructed in an area more isolated from surface water resources than the Touquoy pit provide more protection for surface water resources and aquatic life over the long term?

Response

Best Management Practices as outlined in the Global Acid Rock Drainage Guide (INAP 2018) indicated that encapsulating tailings in mined out pit provides the best environmental protection measures. Moving the existing tailings pipeline from the permitted 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. The Project has been planned to minimize footprint disturbance and impacts. An additional TMF at Touquoy or Beaver Dam would increase the overall project footprint which is not an acceptable option.

References

INAP (International Network for Acid Prevention). 2018. Global Acid Rock Drainage Guide (GARD Guide). Available at: Global Acid Rock Drainage Guide (http://www.gardguide.com/images/5/5f/TheGlobalAcidRockDrainageGuide.pdf). Accessed October 2021.

Round 2 Information Request Number:	NSE-2-139
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Surface Water Quality
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6 6.5.2 p. 200

Context and Rationale

This section states sediment grab samples were collected from nine locations throughout the BD mine site to obtain baseline sediment quality. It references Figure 6.5-7, presumably for sample locations. The scale of this figure is regional and it is difficult to see the BD mine site details to determine exactly where samples were taken. It does not appear that all nine samples at the BD site are on this figure. Table 6.5.1 references a sample downstream from Crusher Lake but it isn't clearly visible.

The Proponent is Required to …

Please provide a detailed figure identifying the locations of all sediment samples reported for the BD mine site.

Please clearly identify the location of the sample reported to be downstream from Crusher Lake (SED3).

Response

Round 2, Information Requestion NSE-2-31, Figure NSE-2-31-1 provides the location of Sediment from the Beaver Dam Mine Site. This information has been expanded and updated in the Appendix E.7 (Limited Phase II - Environmental Site Assessment) and Appendix E.8 (Extended Phase II Environmental Site Assessment Beaver Dam Project Property) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-140
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.2.1 p.g. 204

Context and Rationale

This section states that 'there are no indications of historic tailings at the Beaver Dam Mine Site and no indications that mercury was used in any of the historic stamp mills or other crude processing of ore'.

The archeological/ cultural heritage study shows that there are at least two known crusher (stamp mill) locations at Beaver Dam plus a sluice running from one of the crusher locations to Crusher Lake. A high probability inference that can be made is that there was disposal of tailings from the crusher via the sluice into Crusher Lake. Shoreline areas with sediment and wetlands at the eastern end of Crusher Lake require evaluation for tailings or tailings/sediment mixes based on arsenic concentrations in sediment.

Historically, the most common method of gold production at NS gold mining sites during the early 20th century was with mercury amalgam; therefore, it is very likely that there was some mercury use at the site.

It is notable that the sediment sample taken downstream of Crusher Lake (SED3) had mercury concentrations (0.31 mg/kg) exceeding the CCME sediment quality limits (0.17 mg/kg). While the sample location has not been mapped (see other comments), downstream from the crusher at Crusher Lake is where elevated mercury would be expected related to historic tailings disposal in Crusher Lake.

In order to avoid inadvertent disturbance and distribution of tailings, or of further redistribution of soils or sediments impacted by past disturbance of tailings, into the environment during mine development, a systematic sampling program to look for anomalously high arsenic and mercury concentrations in surficial materials is likely necessary to find historic (19th/ early 20th century) tailings. This should include those areas that may have been disturbed during subsequent generations of mineral exploration (eg 1980s) and any nearby 'overburden' piles or infills for land levelling from this era.

The Proponent is Required to …

The presence of historic crushers and the likely presence of historical tailings and /or historic tailings mixed with other overburden materials at the BD site in areas of past infill, surface disturbance, or sediment deposition, should be acknowledged. In light of this, an appropriate systematic methodology (eg grid sampling) should be used for sampling of soil and sediment in targeted portions of the site, for analysis of arsenic and mercury content. Lower lying areas downgradient of the old crushers and/or sluices, and areas of borrowed 'overburden' infill from more recent site disturbances should be targeted for grid sampling to maximize the chance of finding them. A systematic method is necessary so that tailings are not unknowingly (further) disturbed causing mobilization of arsenic or mercury. There should be a focus on the eastern end of Crusher Lake, any shoreline and wetland areas of the lake, and upstream of any flow constrictions in watercourses or wetlands that might be indicative of historic dam construction for tailings impoundments.

Initial systematic work should be followed by more detailed chemical delineation in three dimensions of any hotspots. This delineation work should be completed prior to any mine development and prior to applications for Industrial Approval. This is necessary so that locations, volumes and chemistry are fully understood, management plans are in place, appropriate volumes for containment (if necessary) of contaminants are designed into mine plans, and appropriate terms and conditions for Approvals are in place to ensure regulators can oversee implementation of the management plans during site development (grubbing and stripping) and construction, when the risk of accidental disturbance is highest.

Response

Summary Response

Stantec Consulting Ltd. (Stantec) conducted a Phase I Environmental Site Assessment (ESA) (Appendix E.6 [Stantec 2019a] of the Updated 2021 EIS), Limited Phase II ESA (Appendix E.7 [Stantec 2019b] of the Updated 2021 EIS), and Extended Phase II ESA (Appendix E.8 [Stantec 2021] of the Updated 2021 EIS) of the proposed mining operations for the Beaver Dam Mine Project.

Scope and Findings of Phase I ESA

The Phase I ESA (Appendix E.6 [Stantec 2019a] of the Updated 2021 EIS [AMNS 2021]) included a records review, interviews, and site visit which revealed evidence of potential environmental contamination associated with the Site. Stantec also conducted LIDAR analysis to produce a Digital Elevation Model (DEM) of the Site which was used to approximately delineate potential historical tailings and waste rock storage areas prior to conducting the Phase I ESA site visit.

Based on the information gathered, there are suspected tailings and waste rock both within the area of the proposed open pit development as well the area of the adjacent pit operations, which are potentially impacted with arsenic and mercury and have potential acid generating potential. Additionally, the mine operation in the 1980s included power generation, maintenance work and underground fuel storage.

Scope of Phase II ESAs

The Limited and Extended Phase II ESAs assessed soil geochemistry at the Site and provided conclusions relating to naturally-occurring background concentrations and soil contamination associated with the historical mining activities identified in the Phase I ESA.

Soil sampling was conducted from test pits. Twenty-nine test pits were excavated as part of the Limited Phase II ESA, and 65 test pits as part of the Extended Phase II ESA (Appendix E.7 and E.8 of the Updated 2021 EIS [AMNS 2021].

Rationale and Methodology

Test pit locations during the Limited Phase II ESA were chosen in the field based on areas of concern (i.e., tailings and waste rock storage areas) identified during review of the DEM and a visual assessment of the Site, and based on the location of proposed mine infrastructure. LIDAR data specific to the Beaver Dam area was requested from the Nova Scotia Department of Natural Resources in August 2019 which identified historical tailing areas within the settlement pond, Crusher Lake and Forge Hill mining and stamp mill area.

Test pit locations during the Extended Phase II ESA were selected to further delineate the arsenic previously detected in 2019 in the area of the proposed pit. Stantec used a grid to assess areas around and between areas that Stantec considered to have been impacted with arsenic based on 2019 soil analytical results and field observations, and to screen newly identified areas. Locations were also chosen to screen the revised proposed mine infrastructure areas.

Soil sampling methodology is detailed in Section 2.2, PDF page 13 of the Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]) and Section 2.2, PDF page 18 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Regulatory Framework

Analytical results for soil were compared to the applicable Tier 1 Environmental Quality Standards (EQS) from Nova Scotia Environment and Climate Change (NSECC)'s Contaminated Sites Regulations (NSECC, 2013) for an industrial site with non-potable groundwater use and coarse-grained soil (standards for coarse-grained soil are more conservative than standards for fine-grained soil). For metals, the Tier 1 EQS for a potable and non-potable site are equivalent.

The regulatory framework applied to data at the Site is detailed in Section 1.5, PDF page 15 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Soil Observations and Results

Stratigraphy

The stratigraphy encountered in most test pits consisted of a layer of organics over poorly graded brown to grey silty sand with some gravel and cobbles.

Stratigraphy at test pits categorized as impacted by historical tailings was generally like the unimpacted locations with the addition of a layer of up to 0.65 m of distinct grey sand, gravelly sand, or silt (suspected tailings).

Stratigraphy at test pits categorized as impacted by historical waste rock was generally like the unimpacted locations with the addition of a layer of up to 0.62 m of gravel and/or cobbles, often infilled with brown or orange-brown sand (suspected waste rock).

Test pit stratigraphy is detailed within Section 3.2.1, PDF page 15 and Table B-1, PDF page 27, Appendix B of the Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]) and Section 3.2.1.1, PDF page 21 and Appendix B, PDF page 43 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Soil Analytical Results

Laboratory analysis for available (acid extractable) metals was conducted on 67 soil samples originating from 65 test pits, plus six field duplicate samples, collected in 2020 (Appendix E.8 [Stantec, 2021) and 29 soil samples originating from 29 test pits collected in 2019 (Appendix E.7 [Stantec, 2019]).[4] of the Updated 2021 EIS (AMNS 2021).

Results of the laboratory analysis of soil samples are summarized in Table NSE-2-140-1 below:

[1] Samples collected during Limited Phase II ESA activities were renamed within the Extended Phase II ESA to indicate the year of collection more clearly. For example, the sample previously reported as SA1 (collected from a test pit in 2019) has been renamed to TP19-01.

Table NSE-2-140-1: Summary of Soil Contamination (2019 to 2020)

Standard Exceedances	Tier 1 EQS	Exceeding (Samples)	Exceeding (Test Pits)
Arsenic	31 mg/kg	73 of 96 samples[(a)]	72 of 94 test pits*
Other Metals	Various	None	None

Notes: Numbers of exceedances do not include field duplicate samples.

[(a)] There are more soil samples than test pit locations as two soil samples, rather than one, were collected from two of the test pits.

Levels of arsenic ranged from non-detected to 3,900 mg/kg.

Lead and mercury have been associated with historical mining activities in Nova Scotia. Levels of lead and mercury in soil at the Project site were relatively elevated but did not exceed applicable Tier 1 EQS. The maximum identified lead concentration was 200 mg/kg versus a Tier 1 EQS of 740 mg/kg, and the maximum identified mercury concentration was 40 mg/kg versus a Tier 1 EQS of 99 mg/kg.

Results of the laboratory analysis of soil samples are presented on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 and Table C-1, PDF page 140, Appendix C PDF page 139 and discussed in Section 3.3.1, PDF page 23 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-140-1.

Soil Impact Classification

Based on field observations, including visible tailings within test pits and their proximity to Site features such as historical mining infrastructure/features (i.e., trenches, waste rock piles, stamp mill foundations, etc.), Stantec classified the test pit locations from both 2019 and 2020 as either non-impacted or impacted by historical mining activities. Of the impacted locations, Stantec further classified them as likely impacted by historical mine tailings or by mine waste rock. This impact classification assisted Stantec's assessment of background levels and delineation, discussed below.

Soil impact classifications are summarized in Table NSE-2-140-2.

Table NSE-2-140-2: Summary of Soil Impact Classification

Impact Classification at Proposed Mine Infrastructure Areas Based on Field Identification	Non-Impacted Test Pits	Impacted Test Pits	
		Tailings	Waste Rock
Crusher pad	2 of 2	0 of 2	0 of 2
LG (low grade) stockpiles	2 of 2	0 of 2	0 of 2
NAG (non-acid generating) stockpiles	4 of 4	0 of 4	0 of 4
Open pit	4 of 23*	6 of 23† [764]	13 of 23‡ [346]
Organic material stockpiles	6 of 6	0 of 6	0 of 6
PAG (potentially acid generating) stockpiles	2 of 2	0 of 2	0 of 2
Roadways and water management ditches	6 of 9	1 of 9 [230]	2 of 9 [125]
Settling pond	3 of 3	0 of 3	0 of 3
Till stockpiles	6 of 7	1 of 7 [130]	0 of 7
TSSPs (top-soil/sub-soil stockpiles)	4 of 6	1 of 6 [2,800]	1 of 6 [44]
Areas outside of proposed infrastructure	12 of 31	15 of 31 [294]	4 of 23 [104]

Notes:[ ] The value in brackets represents the mean arsenic concentration (mg/kg) in the soil samples within this proposed mine infrastructure area and impact classification.

* Non-impacted test pits within the proposed open pit were either on the extreme northern edge of the footprint (TP19-10), observed to be composed of natural soil deposits in the field (TP20-34, TP20-35, and TP20-58) and/or contained low concentrations of arsenic (TP20-58).

† Tailings-impacted test pits within the proposed open pit are largely near the central historical settling pond. This includes the highest identified concentration of 3,900 mg/kg at TP19-28.‡ Waste rock-impacted test pits were identified throughout the re-worked area composing the majority of the proposed open pit.

Sample photographs of observed suspected tailings and waste rock are included below, as well as in the photolog in Appendix E of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Photograph A Suspected Tailings from TP20-63

Photograph B Suspected Waste Rock at Surface of TP20-27

Soil impact classifications are highlighted on Table C-1, PDF page 140, Appendix C PDF page 139 and discussed in Section 4.1.1, PDF page 27 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Background Levels

Some samples from non-impacted areas of the Site include arsenic concentrations higher than the Tier 1 EQS. Arsenic concentrations within non-impacted soil samples represent potential data on background levels in the Site area soil (i.e., arsenic in soil related to geology and not to historical mining activities).

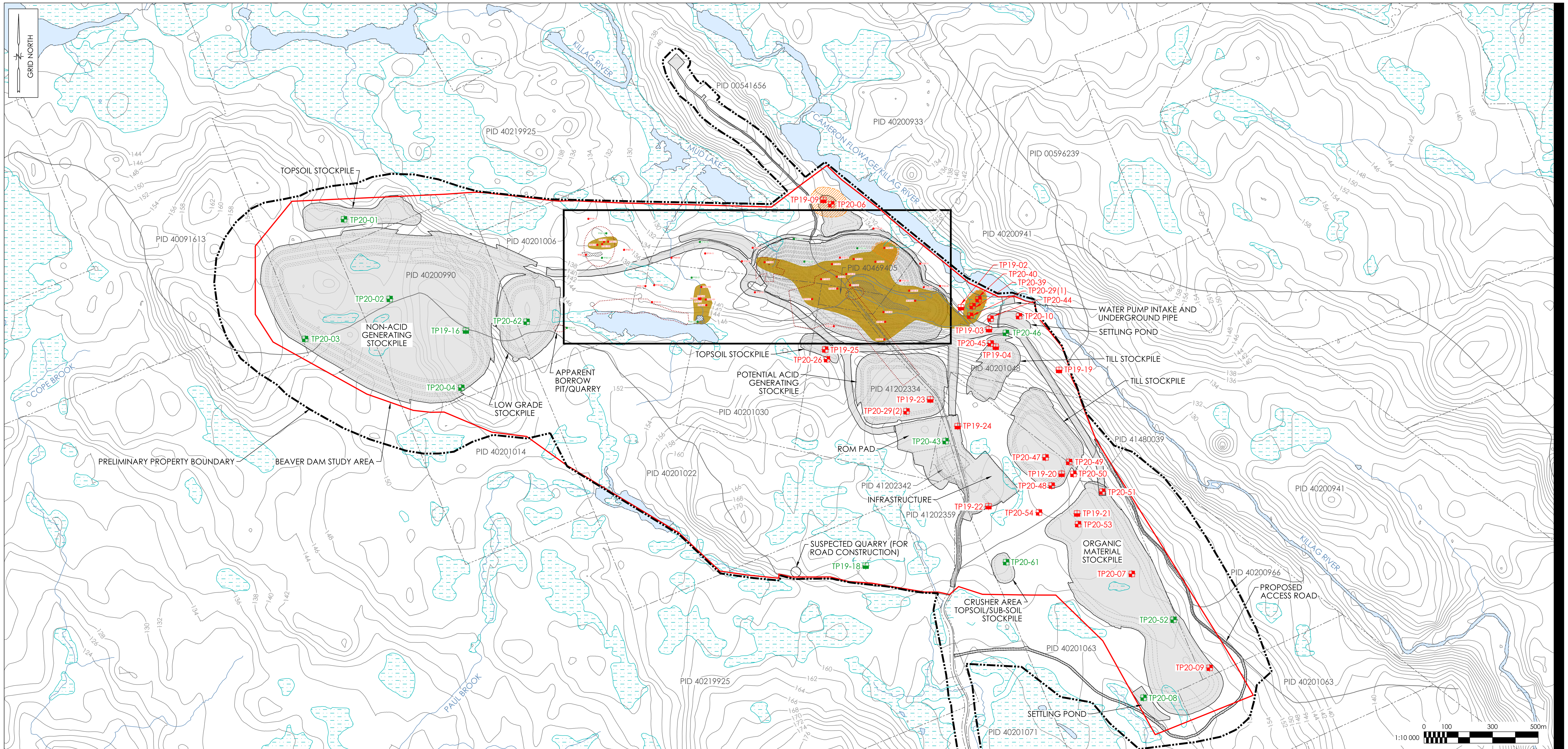
Table NSE-2-140-3 presents statistical metrics calculated using the non-impacted soil concentrations, compared to the Tier 1 EQS. Statistical calculations, including distribution and outlier testing, were conducted using the United States Environmental Protection Agency's (US EPA) ProUCL statistics software package for environmental applications (USEPA 2016).

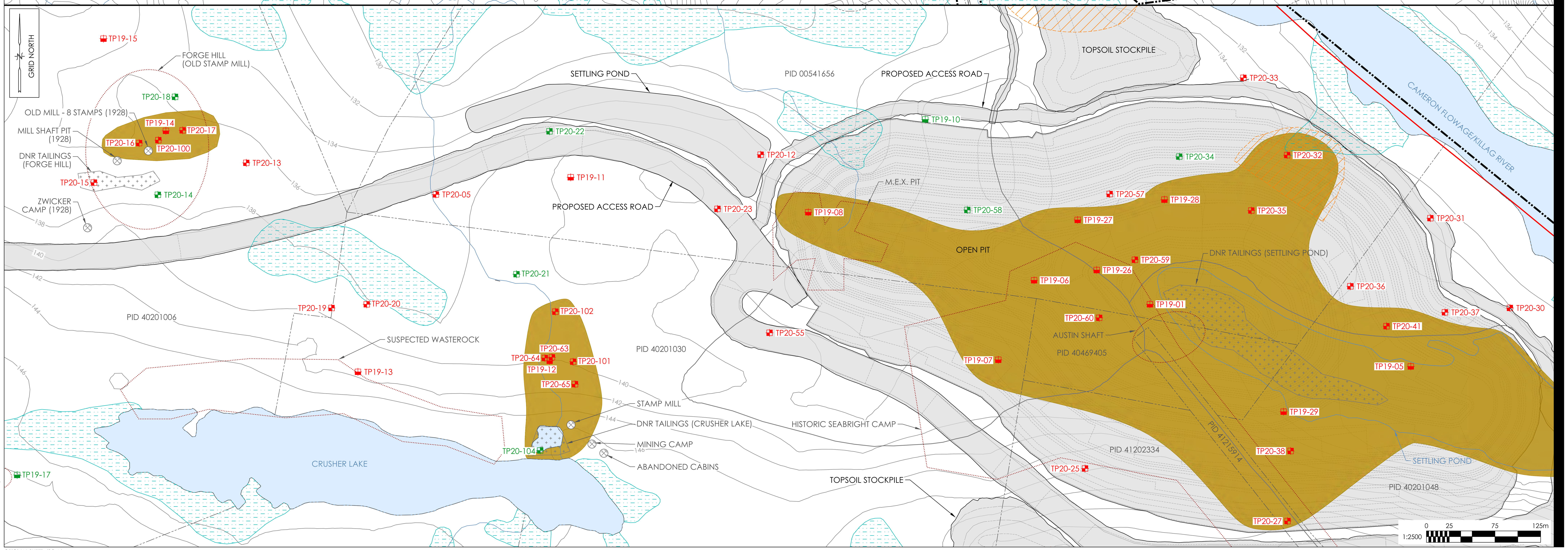
Table NSE-2-140-3: Statistics from Background Non-Impacted Data Set

Concentration (mg/kg)	Tier 1 EQS	Maximum	Mean	Median	75th Percentile	95th Percentile
Arsenic	31	270	75.34	43.5	112.5	228.0

Arsenic levels below the 95th percentile value (228 mg/kg) of the background non-impacted data set were considered to represent arsenic not related to historical mining activities. Delineation based on this value, as well as on field observations, is shown on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 of the Extended Phase II ESA Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-140-1.

Background levels are discussed in Section 4.1.2, PDF page 28 and detailed methodology on statistical methods used, including distribution and outlier testing, is included in Appendix F, PDF page 220 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).





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ORIGINAL SHEET - ISO A1

Stantec

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Legend

- BEAVER DAM STUDY AREA
- TOPOGRAPHIC CONTOUR (2m INTERVAL)
- PROPERTY BOUNDARY
- PRELIMINARY PROPERTY BOUNDARY
- EXISTING ROAD
- WATERCOURSE
- WETLAND
- WATERBODY
- PROPOSED MINING INFRASTRUCTURE
- REPORTED TAILINGS - DNR
- HISTORIC MINING OPERATIONS AREA
- HISTORICAL MINING FEATURE LOCATION
- TEST PIT LOCATION (2020)
- TEST PIT LOCATION (2019)
- TEST PIT LOCATION - SOIL SAMPLE EXCEEDS NSE TIER I EQS FOR ARSENIC (>31 mg/kg) AT AN INDUSTRIAL SITE
- TEST PIT LOCATION - SOIL SAMPLE BELOW NSE TIER I EQS FOR ARSENIC (<31 mg/kg) AT AN INDUSTRIAL SITE
- POTENTIAL AREA OF ARSENIC IMPACTED SOIL RELATED TO HISTORICAL MINING OPERATIONS
- AREAS OF UNDELINEATED POTENTIAL ARSENIC IMPACTED SOIL RELATED TO HISTORICAL MINING OPERATIONS

Notes

1. DATA SOURCES: GOVERNMENT OF CANADA, GOVERNMENT OF NOVA SCOTIA, McCALLUM AND ATLANTIC MINING NS INC., AUSENCO (DRAWING No. 105227-0000-G-101, REV D, 07/DEC2020).
2. LOCATIONS OF HISTORICAL MINING FEATURES ARE APPROXIMATE.

1	INFRASTRUCTURE UPDATE	EA	MF	21.02.08
Revision		By	Appd.	YY.MM.DD

B	FINAL	EA	MF	21.02.XX
A	FOR REVIEW	EA	MF	20.11.09
Issued		By	Appd.	YY.MM.DD

File Name: 121619250.2500.995_A-5_REV1	JL	EA	GM	21.02.08
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

ATLANTIC MINING NS INC.

BEAVER DAM PROJECT

HALIFAX COUNTY, NS

Title

ARSENIC CONCENTRATIONS COMPARED TO NSE TIER 1 EQS (INDUSTRIAL LAND USE) AND POTENTIAL EXTENT OF ARSENIC IN SOIL RELATED TO HISTORICAL MINING OPERATIONS

Project No.	Scale	
121619250	AS SHOWN	
Drawing No.	Sheet	Revision
A-5	5 of 7	0

Contamination and Delineation Near Proposed Mine Infrastructure

Impacts above the calculated background value, considered to represent arsenic related to historical mining activities, were identified within the proposed open pit and to its east at the east end of the historical settling pond, as well as in the area of the proposed TSSPs to the north and northwest of the proposed open pit, and intersecting proposed roadways and water management ditches.

This level of impacted soil was also identified within an area spanning the proposed till stockpile and organic material stockpile; however, despite its high levels of arsenic which could affect soil management in this area, soil in this area was field-identified as non-impacted and may represent naturally elevated levels.

This level of impacted soil was also identified around the stream north of the suspected tailings at Crusher Lake (no proposed mine infrastructure in this area).

Proposed infrastructure in other areas may disturb soil or sediment with arsenic concentrations that naturally exceed the guidelines. This will be an important factor during construction for the management of soil and for the disturbance of sediments that may be mobilized on or off-site.

Historical mining-related arsenic contamination in soil identified during the Limited Phase II ESA and Extended Phase II ESA is horizontally delineated other than to the northeast of the proposed open pit near the Cameron Flowage, as shown by dashed lines on Drawing No. A-5, PDF page 40, Appendix A, PDF page 35 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021). Drawing No. A-5 is also attached as Figure NSE-2-140-1.

Identified contamination is not vertically delineated given refusal of hand-held tools during sampling events. Bedrock may limit vertical soil contamination. Stantec has previously reviewed reports on historical Nova Scotia gold mines identifying tailings several metres thick.

Contamination and delineation near proposed mine infrastructure is discussed in Section 4.1.3, PDF page 29 of the Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021).

Conclusions

Based on the information gathered and on observations made during the Phase I ESA (Appendix E.6 [Stantec, 2019a]), Limited Phase II ESA (Appendix E.7 [Stantec, 2019b]), and Extended Phase II ESA (Appendix E.8 [Stantec, 2021]) of the Updated 2021 EIS (AMNS 2021), Stantec provides the following conclusions related to potential environmental contamination in soil associated with historical gold mining operations:

- Concentrations of arsenic in soil exceeding the applicable NSE Tier 1 EQS were identified. Some of these locations are considered non-impacted and are potentially indicative of background soil concentrations.
- Test pits were identified during the Limited and Extended Phase II ESA work in 2019 and 2020 that were classified as likely impacted by historical tailings or waste rock based on field observations, arsenic levels, and proximity to historical site features.

- Arsenic in soil at levels considered to represent impact from historical mining operations intersects with areas of proposed Project infrastructure, including the proposed open pit.

Closure

This report documents work that was performed in accordance with generally accepted professional standards at the time and location in which the services were provided. No other representations, warranties or guarantees are made concerning the accuracy or completeness of the data or conclusions contained within this report, including no assurance that this work has uncovered all potential liabilities associated with the identified property.

This report provides an evaluation of selected environmental conditions associated with the identified portion of the property that was assessed at the time the work was conducted and is based on information obtained by and/or provided to Stantec at that time. There are no assurances regarding the accuracy and completeness of this information. All information received from the client or third parties in the preparation of this report has been assumed by Stantec to be correct. Stantec assumes no responsibility for any deficiency or inaccuracy in information received from others.

The opinions in this report can only be relied upon as they relate to the condition of the portion of the identified property that was assessed at the time the work was conducted. Activities at the property subsequent to Stantec's assessment may have significantly altered the property's condition. Stantec cannot comment on other areas of the property that were not assessed.

Conclusions made within this report consist of Stantec's professional opinion as of the time of the writing of this report, and are based solely on the scope of work described in the report, the limited data available and the results of the work. They are not a certification of the property's environmental condition. This report should not be construed as legal advice.

This report has been prepared for the exclusive use of the client identified herein and any use by any third party is prohibited. Stantec assumes no responsibility for losses, damages, liabilities or claims, howsoever arising, from third party use of this report.

This report is limited by the following:

- This report summarizes results of investigations of soil geochemistry at the Beaver Dam Mine site and does not include a summary of results of investigations of other media including sediment or surface water.

The locations of any utilities, buildings and structures, and property boundaries illustrated in or described within this report, if any, including pole lines, conduits, water mains, sewers and other surface or sub-surface utilities and structures are not guaranteed. Before starting work, the exact location of all such utilities and structures should be confirmed and Stantec assumes no liability for damage to them.

The conclusions are based on the site conditions encountered by Stantec at the time the work was performed at the specific testing and/or sampling locations, and conditions may vary among sampling locations. Factors such as areas of potential concern identified in previous studies, site conditions (e.g., utilities) and cost may have constrained the sampling locations used in this assessment. In addition, analysis has been carried out for only a limited number of chemical parameters, and it should not be inferred that other chemical species are not present. Due to the nature of the investigation and the limited data available, Stantec does not warrant against undiscovered environmental liabilities nor that the sampling results are indicative of the condition of the entire site. As the purpose of this report is to identify site conditions which may pose an environmental risk; the identification of non-environmental risks to structures or people on the site is beyond the scope of this assessment.

Should additional information become available which differs significantly from our understanding of conditions presented in this report, Stantec specifically disclaims any responsibility to update the conclusions in this report.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

NSE (Nova Scotia Environment). 2014. Nova Scotia Environment, Nova Scotia Contaminated Sites Regulations, Environmental Quality Standards for Contaminated Sites. Retrieved from: https://www.novascotia.ca/nse/contaminatedsites/. Last modified: 2015-08-20.

Stantec. 2019a. Final - Phase I Environmental Site Assessment - Beaver Dam Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.6 Phase I Environmental Site Assessment - Beaver Dam Property (2019). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

Stantec. 2019b. Limited Phase II Environmental Site Assessment - Beaver Dam Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.7 Limited Phase II Environmental Site Assessment - Beaver Dam Property (2019). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

Stantec. 2021. Final (Revised) - Extended Phase II Environmental Site Assessment - Beaver Dam Project Property. *IN: Atlantic Mining NS Inc. 2021. Updated Environmental Impact Statement. Appendix E.8 Extended Phase II Environmental Site Assessment - Beaver Dam Property (2021). Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. May 2021. Middle Musquodoboit, NS.*

US EPA (United States Environmental Protection Agency). 2016. Statistical Software ProUCL 5.1.00 for Environmental Applications for Data Sets with and without Nondetect Observations.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-141
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.4, 207-209, and Appendix E.2 (Bedrock Geology, ML/ARD assessment)

Context and Rationale

This section reports the results from ML/ARD assessment. The only indication of the locations of samples is a map in Figure 3-1 in Appendix E-2. No cross sections are provided and so it is not possible to assess the distribution of samples throughout the proposed mine pit and the range of rock which will be encountered. Also it is not clear which of the samples are being assessed for kinetic testing represent ore (which will ultimately be disposed to the Touquoy pit) and what portion represent waste rock (which will remain at BD). As per the MEND Prediction Manual for Drainage Chemistry from Sulphidic Geological Materials (Page 8-5), geological cross sections should be provided showing the locations of the samples in three dimensions within the proposed mine pit, particularly for the kinetic.

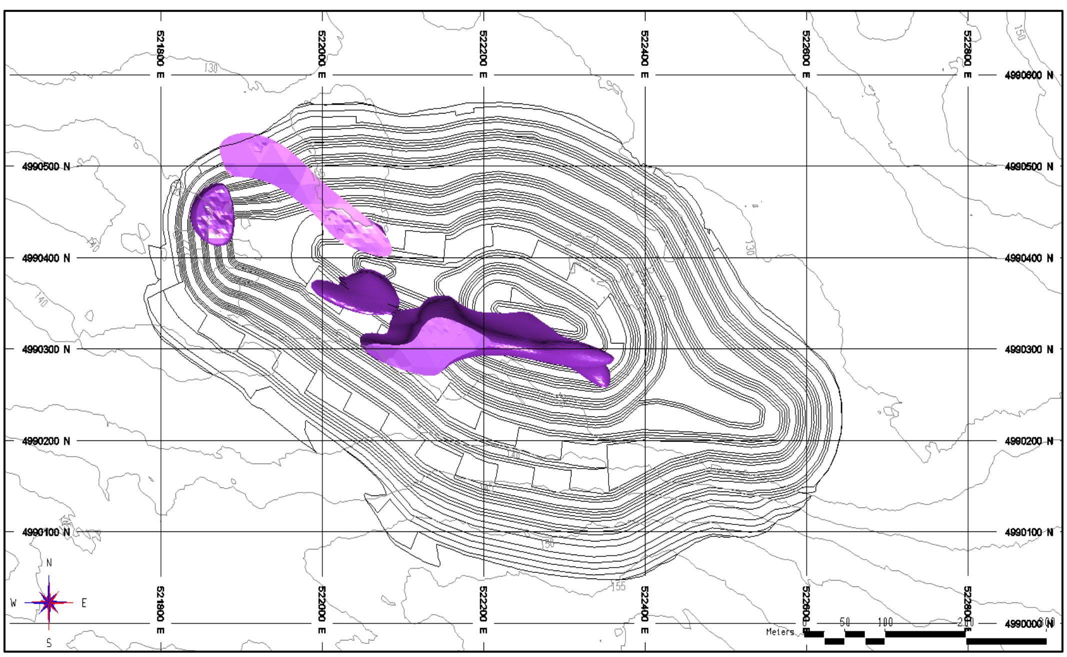
The Proponent is Required to …

Please provide geological cross sections showing the locations of the ML/ARD samples in three dimensions within the proposed mine pit, particularly for the kinetic test samples.

Response

Please see Figure NSE-2-144-1 for estimated in-pit potential acid generating (PAG) solids.

Figure NSE-2-141-1: Estimated In-Pit PAG Solids (purple)



Round 2 Information Request Number:	NSE-2-142
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Appendix E.2, section 3.1.1 (ML/ARD assessment)

Context and Rationale

This section states that 'Eight of the samples collected for the EIS submission could not be classified by lithology as the corresponding logs were not made available. The results from these samples are not included in the report.'

Eight (8) is a significant portion of the total number of bedrock core samples selected by Lorax for the EIS submission (30). It therefore raises a question as to the representativeness of the samples for which results are reported in the EIS submission.

The Proponent is Required to …

Please explain the reasons that the corresponding core logs were not made available for eight of the samples collected by Lorax.

Was ML/ARD analysis completed on these samples?

Is there kinetic testing occurring on these samples? What did analyses show? Are they different from the other samples? Please describe whether the eight samples that were selected but not classified are likely to be more or less representative of the potential for acid generation at either Beaver Dam during waste rock disposal, or at Touquoy during tailings disposal, based on criteria such as whether or not these cores are from the ore zone or from portions of the mine expected to be waste rock.

Response

In total 70 static test samples were reported as part of the Beaver Dam Mine Project Metal Leaching Acid Rock Drainage (ML/ARD) Assessment (Appendix E.2) included in the Updated 2021 EIS (AMNS 2021). The eight samples that were lithologically unclassified were not collected by Lorax during the site visit in September 2017 but were part of ML/ARD database (n=40) collected by Atlantic Gold in 2016. These samples were not used for kinetic testing or any other geochemical analyses. Therefore, they did not have a direct effect on the upscaling of humidity cells for the generation of waste rock drainage predictions. Note that three out of the eight samples represent ore material and are therefore not relevant for the assessment of waste rock ML/ARD characteristics.

Due to an update of the core log database, the eight samples in question have since been classified by rock type. They were also considered in the recent development of a geo-environmental block model for the calculation of PAG proportions across the Beaver Dam open pit. Two of the five waste rock samples were found to be potentially acid-generating (PAG), while the remaining ones are non-acid generating (NAG). The geochemical results fall within the range of their respective static test populations for total S, sulphide S, and neutralization potential (NP). The overall outcome of the ML/ARD assessment is not expected to change after inclusion of these samples into the static test database.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-143
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.5.3.4, p.g. 208 and ML/ARD Report Section 4.1.1.1

Context and Rationale

This section reports in the second paragraph that petrographic analysis was performed on the humidity cell samples (n=8) and that the main sulphide mineral identified by petrography was pyrrhotite (<1% to 3%).

In the Lorax ML/ARD report, the mineralogy reported for the XRD analysis of the mine rock samples it states that pyrite was the only sulphide phase detected and that it was only detected in 6 of the 8 samples. However the footnote notes that pyrrhotite was found in petrographic analysis.

In Touquoy ore, arsenopyrite is typically associated with gold, however it appears from this reporting that arsenopyrite was not detected in most of the humidity cell samples for BD.

The Proponent is Required to …

Please explain the source of the difference between the sulfide minerals reported by petrographic and XRD analysis of the humidity cell samples for the BD ore body and waste rock.

Please explain the significance of identification of pyrrhotite versus pyrite.

Do the 8/30 samples selected by Lorax which were not reported (Appendix E.2, section 3.1.1) have different sulphide mineralogy than the ones which are reported?

Please confirm the representativeness of the samples selected for humidity cell testing of the sulphide mineralogy of the overall ore body and mine waste rock at BD.

Response

The laboratory XRD raw file indicated an uncertainty with respect to the peaks associated with pyrite. Although the cause of this uncertainty is unclear, more emphasis should be given to the petrographic identification of sulphide minerals since pyrite is relatively easily distinguishable from pyrrhotite under the microscope. Note that this discrepancy was not observed in rock samples from other Nova Scotian mine sites where a different laboratory was used for XRD analysis.

The relevance of pyrite versus pyrrhotite from an ML/ARD perspective relates to the differing reaction rates of the two minerals. Generally, pyrrhotite oxidizes faster and is therefore known to generate acidity at a faster rate. However, this general trend may be masked or enhanced by the mineral morphology and grain size which also control sulphide reaction rates. Due to the fact that kinetic testing is being conducted on all samples with mineralogical data, the difference in sulphide mineralogy identified by the two test methods is of lesser importance since oxidation rates are quantified from humidity cell leachates.

As stated under the response for NSE 2-142, the eight samples that had previously been unclassified belong to the original static test database compiled by Atlantic Gold in 2016. None of these samples were used in the kinetic test program and did not undergo mineralogical analysis. Therefore, an assessment of these specific samples from a mineralogical standpoint cannot be made.

Round 2 Information Request Number:	NSE-2-144
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.6.1, p. 221

Context and Rationale

This section cites the relevant legislation in Nova Scotia as the Environmental Act. This is not correct.

The Proponent is Required to …

Please correct all citations of the name of the NS legislation to 'Environment Act'.

Response

Acknowledged and corrected.

Round 2 Information Request Number:	NSE-2-145
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.6.1; also section 6.6.5.1

Context and Rationale

The statement of groundwater as a VC should also identify that groundwater is a provincially owned resource and has inherent value even if not currently in use. In this area, where there are no municipal services, all groundwater is considered potable. The quality of any groundwater impacted by activities on the site, which could migrate under land not owned by the proponent, during or after operations, must be considered. If impacts were to occur to groundwater quality due to migration of contaminants from the proponent's site they would need to be remediated or managed pursuant to the Contaminated Sites Regulations; Tier 1 EQS or natural background criteria would apply off site for the contaminants of potential concern.

The Proponent is Required to …

Please acknowledge that all groundwater is owned by the Province of Nova Scotia and has inherent value; and that potable criteria apply off the site. In section 6.6.5.1., Administrative boundaries, evaluate the risks to the quality of potable groundwater resources under all lands not owned by the proponent (not just to existing wells), due to migration of impacted water off the site.

Response

As stated in Section 103 of the Environment Act, "*every watercourse and the sole and exclusive right to use, divert and appropriate any and all water at any time in any watercourse is vested forever in Her Majesty in right of the Province*". A watercourse is defined in Section 3be of the Environment Act as "*the bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not, and all groundwater*". It is further stated in Section 3.5.1 of the Environmental Quality Standards for Contaminated Sites Rationale and Guidance Document that "*Water, including groundwater, is an important public resource in Nova Scotia*" and that "*Groundwater has many beneficial uses and plays an important role in drinking water, the economy and the support of healthy aquatic ecosystems*". It is therefore recognized that all groundwater is owned by the Province of Nova Scotia and has both economic and environmental value.

It is also recognized that in the absence of an available municipal water supply all groundwater is defined as potentially potable under Notification of Contamination Protocol (NSE, 2013) and that Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) apply with respect to the notification of contamination. It is further recognized that NSE (2013) specifically states, "*for the purposes of this protocol, potable means the groundwater is potentially potable and is not a statement of whether or not the groundwater meets drinking water or other water supply standards*". Therefore, to evaluate potential risk to the quality of groundwater at or surrounding the site, the natural or baseline groundwater quality and quantity must be considered relative to the Tier 1 EQS. The consideration of baseline groundwater quality and quantity is consistent with the Ontario Ministry of Energy and the Environment (MOEE) Guideline B-7 (MOEE, 1994) and the British Columbia Ministry of Environment and Climate Change Strategy (MOECCS) Protocol 21 (MOECCS, 2017). Both MOEE (1994) and MOECCS (2017) set out a framework to determine the reasonable future use of groundwater in the vicinity of a site such that the site can be developed without adversely impacting the reasonable use of groundwater and to ensure the on-going protection of human health, the environmental and other beneficial uses of groundwater. This is consistent with Section 3.5.1 of the Environmental Quality Standards for Contaminated Sites Rationale and Guidance Document (NSE, 2014) that states, "*In the protection of groundwater quality, the strongest emphasis is placed on preventing groundwater resources from becoming contaminated. Where contamination of this valuable public resource has resulted in an impairment of the water quality, it is vital to remediate or manage any impacts adequately to ensure on-going protection of human health and the environment and the restoration of beneficial uses*".

The baseline groundwater quality at both the Beaver Dam and Touquoy mine sites are elevated in arsenic and other metals at levels that exceed the Guidelines for Canadian Drinking Water Quality and the NSE Tier 1 EQS. This limits the beneficial uses of groundwater. Furthermore, treatment of groundwater under pre-development conditions is required to reduce naturally occurring metals concentrations below the concentrations guidelines set out by the Guidelines for Canadian Drinking Water Quality and the NSE Tier 1 EQS to protect human health. Effective treatment for metals such as arsenic is generally limited to reverse osmosis treatment units, and this type of treatment is currently used by nearby groundwater users as confirmed by a recent survey of residences in the vicinity of Beaver Dam mine site and associated haul route. The application of such treatment units also would remove other metals that may be transported in groundwater, such as that due to the potential migration of impacted water off site from the Beaver Dam and Touquoy mine sites. Therefore, the potential migration of impacted groundwater from the Beaver Dam and Touquoy mine sites would not limit the potential beneficial use of groundwater off site since groundwater in these areas require treatment under baseline conditions to meet drinking water standards for the protection of human health.

Notwithstanding the above, the administrative boundaries Section 6.6.1.2, page 6-155 of the Updated 2021 EIS have been updated to include GCDWQ and the NSE Tier 1 EQS for potable groundwater or evaluate the risks to the quality of potable groundwater resources under all lands not owned by the proponent, due to migration of potentially impacted groundwater off the site.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

MOECCS, 2017. Protocol 21 for Contaminated Sites – Water Use Determination.

MOEE, 1994. Incorporation of the Reasonable Use Concept into MOE Groundwater Management Activities.

NSE, 2013. Notification of Contamination Protocol, Nova Scotia Environment Document No. Pro-100.

NSE, 2014. Environmental Quality Standards for Contaminated Site – Rationale and Guidance Document.

Round 2 Information Request Number:	NSE-2-146
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.6.3.3

Context and Rationale

Groundwater quality results for Beaver Dam are reported for only two quarterly sampling rounds. Further results are needed to clearly establish baseline groundwater quality before commencement of construction at Beaver Dam because of natural fluctuation in groundwater quality.

At Touquoy, the proponent has not clearly established baseline conditions prior to mining, despite the 9 years available for baseline water monitoring between EA approval and mine construction (and 5 years from IA Approval to mine construction). This is because baseline data collection was suspended and not restarted until a few months before mine construction started, and because (as expected) seasonal fluctuation is being observed in quarterly sampling. The proponent's groundwater consultant is now reporting for Touquoy (see Section 6.6.3.4) that there is insufficient baseline data available for groundwater at Touquoy to establish definitive baseline values to be used to develop triggers for responding to groundwater impacts, and is instead continuing to monitor results during operation and modify baseline results upward. This is not an ideal approach, as determining whether or not impacts are mine-related once construction and operations have started is very subjective.

The Proponent is Required to …

Please clearly define the number of groundwater sampling rounds that will be necessary to adequately define baseline for the Beaver Dam monitoring well network and which will be sufficient to serve as the basis for setting contingency levels for responding to groundwater impacts, prior to the start of construction at the site.

How many additional rounds of groundwater quality sampling have been completed since September 2018? Is quarterly groundwater quality monitoring ongoing as indicated in the EIS and how long will it continue regardless of timing of EIS?

Submission of the minimum amount of data required to establish groundwater baseline data should be a condition of Environmental Assessment and should be completed prior to application for Industrial Approval.

Response

More data has been collected. The Baseline Groundwater Program Memorandum (Appendix F.4 of the Updated 2021 EIS [AMNS 2021]) presents groundwater quality and quantity data collection from approximately June 2018 through November 2020. Over the June 2018 through November 2020 groundwater elevations have been measured continuously using transducers installed in monitoring well locations. A total of 9 quarterly groundwater quality monitoring events have been completed to date. This is more than 2 years of groundwater quality and quantity data and is sufficient for the purpose of baseline monitoring

Quarterly groundwater quality sampling is ongoing as indicated in the EIS. Groundwater quality monitoring may be discontinued depending on the timing of the EIS as the data collected to date is sufficient for the purpose of defining baseline monitoring and additional monitoring is not required. A draft Groundwater Monitoring Program is provided as Appendix G, PDF page 646 within Appendix P.4 of the Updated 2021 EIS (AMNS 2021). This plan will be finalized as part of the permitting process.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-147
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Appendix F.2; Appendix F. 5

Context and Rationale

Data from hydraulic conductivity testing done in the 1980s, in a report by Jacques Whitford reproduced in Appendix F.2, is relied on for conclusions about how to incorporate the Mud Lake Fault zone in groundwater modelling. It is reported that the Mud Lake Fault zone is filled with 'clay-like gouge' and that hydraulic conductivity is low and similar to the surrounding bedrock; the BD groundwater model reported in Appendix F.5 concludes model calibration is best when the fault has similar hydraulic conductivity to the rock. However, the report in Appendix F.2, prepared to assess groundwater inflows to a proposed underground mine, states: "It is concluded from the above, that the Mud Lake Fault zone will not likely be a major source of groundwater inflow to the mine. It should be noted, however, that the fault zones are saturated, and could be very unstable and would require special consideration should mining penetrate such rock materials."

The Proponent is Required to …

What are the implications of dewatering of the open pit and its drawdown cone for the stability of the 'clay- like gouge' and water flow in the Mud Lake Fault Zone? Will the fault gouge become destabilized during mining and would this change the way this zone should be modelled during or after mining?

Response

As stated in Section 6.6.4.2.1, page 6-171 of the Updated 2021 EIS [AMNS 2021], JWA conducted a hydrogeological investigation at the Beaver Dam Mine Site in 1986 (JWA, 1986a) and Stantec conducted a hydrogeological investigation in 2014 (Stantec 2015). Based on the results of pumping tests and packer tests, the geometric mean (approximate median) of the hydraulic conductivity values obtained by JWA (1986a) and Stantec (2015) is relatively low at 4.5 x 10-8 metres per second (m/s). The results of extensive packer testing within bedrock drill holes at the Beaver Dam Mine Site did not identify any large-scale permeable zones from which high rates of groundwater seepage into an open pit could be expected. As discussed further in this section, the packer tests specifically targeted the Mud Lake Fault Zone and results indicate that the Mud Lake Fault has a hydraulic conductivity similar to the surrounding bedrock.

GHD (2018) (included as Appendix F.3, Section 5, PDF page 4 Field Activities Report [AMNS 2021]) conducted further packer testing in summer 2018 at three deep drill holes installed surrounding the proposed pit location. These packer tests were conducted to better define hydraulic conductivity values surrounding the pit and better support pit inflow calculations. Each deep drill hole was tested at 10 depth intervals for a total of 30 packer tests. Hydraulic conductivity results from the packer tests range from 2.1 x 10-6 to 7.2 x 10-10 m/s with a geometric mean of 3.2 x 10-8 m/s, consistent with the previous packer test results summarized by PCA (2015). The packer test results indicate the bedrock has a low hydraulic conductivity, which is consistent with the lithology observed in diamond drillhole cores drilled at the Beaver Dam Mine Site.

The bedrock hydraulic conductivity at the Beaver Dam Mine Site generally decreases with depth. The shallow bedrock zone (referred to as the top 22 m of bedrock by JWA, 1986a) has a geometric mean hydraulic conductivity (across all packer and slug tests) of 5.6 x 10-7 m/s, while the geometric mean hydraulic conductivity of bedrock below 22 m is 2.9 x 10-8 m/s. Therefore, the amount of groundwater flow is expected to be greater in the shallow bedrock relative to the deep less permeable bedrock.

Drill holes that penetrated the Mud Lake Fault 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 near the proposed open pit mine. The same observation was made by GHD (2018) (Appendix F.3 Field Activities Report [AMNS 2021]) during recent fieldwork completed to evaluate groundwater/surface water interaction (Section 6.6.4.2.1, Table 6.6-4, page 6-173), which included the installation of well points at select locations where groundwater discharge was suspected.

Considering all packer testes conducted in bedrock drill holes at the Beaver Dam Mine Site (JWA 1986; Stantec 2015 and Appendix F.3 Field Activities Report [AMNS 2021]), bedrock hydraulic conductivity values ranged from 1.0 × 10 10 m/s to 2.1 × 10 6 m/s with a geometric mean of 3.4 × 10 8 m/s. Six packer tests were conducted at drill hole intervals that intersected the Mud Lake Fault. Hydraulic conductivity results determined from these tests ranged from 1.2 × 10 9 m/s to 1.9 × 10 6 m/s with a geometric mean of 1.2 × 10 8 m/s, which is only slightly less than the geometric mean hydraulic conductivity calculated for all packer test results. This indicates that the Mud Lake Fault is likely of similar permeability or lower permeability than the surrounding bedrock. This is consistent with the observation by JWA (1986a) that the Mud Lake Fault is infilled with clay-like gouge and if necessary, a grouting will be applied to limit hydraulic connectivity of potential fractures.

A geotechnical stability assessment of the open pit design was undertaken by Golder (2021 *In Progress*). The outcomes of this assessment did not conclude that Mud Lake fault will result in destabilization of the pit walls. Faults will be mapped as part of mining practices to ensure the overall stability of the Beaver Dam Mine pit. Modelling will be revised throughout the life of the mine with monitoring information.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Golder 2021 (In Progress). Geotechnical Stability Assessment of Beaver Dam Mine Open Pit Design. Submitted to AMNS.

Jacques, Whitford & Associates Ltd. (JWA), 1986a. Environmental Assessment of Gold Mining Exploration Beaver Dam, Nova Scotia.

Peter Clifton & Associates (PCA), 2015. Assessment of Potential Open Pit Groundwater Inflows, Beaver Dam Gold Project, Nova Scotia.

Round 2 Information Request Number:	NSE-2-148
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.6.3.4

Context and Rationale

It is not clearly stated what the definition of baseline conditions for groundwater quality will be for disposal of Beaver Dam tailings at Touquoy. Given that monitoring of slowly migrating groundwater to monitoring wells will, for most parameters, not be able to distinguish between impacts arising from Beaver Dam tailings and impacts arising from Touquoy mining or mining-related disturbance of historical impacts at Touquoy during the Touquoy mine development, baseline definition for groundwater quality at Touquoy for the Beaver Dam project should be based on pre-mining conditions at Touquoy.

Responsibility of the mine operator (whoever that is) for changes to groundwater quality arising from either phase of the overall development of the Touquoy Consolidated Project at the Touquoy site (Touquoy mining or BD tailings disposal) must be recognized for the current proponent AND all future owners of the Touquoy and Beaver Dam mines, rather than 're-setting' of background after completion of each phase of activity.

Baseline conditions at Touquoy which would have to be used to evaluate whether or not an impact has occurred due to Beaver Dam tailings are described as not fully defined yet. The reason given is insufficient baseline data from prior to initiation of Touquoy mining activity (although other documents to regulators submitted previously described baseline as robust). It is therefore not clear how the potential impact of Beaver Dam tailings disposal on groundwater quality at Touquoy will be determined or responded to.

The Proponent is Required to …

Please clearly define baseline conditions and Contingency Action levels for Beaver Dam tailings disposal, based on pre-mining Touquoy baseline conditions. It should not depend on future interpretation of ongoing monitoring results during operations at Touquoy.

Response

A Touquoy Integrated Tailings and Water Management Plan (Appendix F.7 of the Updated 2021 EIS [AMNS 2021]) has been developed. Groundwater contingency measures will be updated in an updated Groundwater Contingency Management Plan. (Stantec 2019), Appendix G of [Appendix P.4 (Mine Water Management Plan), Updated AMNS 2021 [AMNS 2021]. An action level contingency plan will be developed and submitted for approval before Beaver Dam Mine Tailings are disposed of the Touquoy exhausted pit.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Stantec Consulting Ltd. (Stantec). 2019. Touquoy Gold Project Groundwater Contingency Plan Revision 1.2.

Round 2 Information Request Number:	NSE-2-149
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Section 6.6.5.2, Appendix F.5, p.26

Context and Rationale

In the description of the groundwater model calibration for the Beaver Dam site, the report by GHD Limited states: "The river boundary conditions within the model domain were held constant between the base case, dry, and wet conditions as average observed surface water levels at the Beaver Dam Mine Site showed less than 6 centimetres (cm) variation over the four synoptic rounds of groundwater/surface water monitoring conducted at the Beaver Dam Mine Site from July 18 through September 5, 2018. In general, the dry and wet condition residual statistics are similar to the base case calibration."

During the summer period (the period of surface water elevations used to calibrate the wet conditions model), water elevations are often significantly lower than in other seasons in Nova Scotia, particularly in flowing rivers such as Cameron Flowage/ Killag River, so may not represent wet conditions well; while the model fit was considered acceptable, the final calibration is probably not a unique solution .

The Proponent is Required to …

Please explain how BD model calibration would likely have changed if river boundary conditions were varied so that they reflected typical wet conditions in Nova Scotia; would model calibration have needed to change significantly, which parameters, and how would that have influenced the predictions made using the model?

It is suggested that additional data be collected for surface water elevations to develop river boundary conditions for actual wet conditions, and the model recalibrated.

Response

The model has been updated to include additional data collected for surface water elevations to develop river boundary conditions for actual wet and dry conditions. The model was recalibrated using the updated river boundary conditions and corresponding wet and dry condition calibration targets as described in Appendix F.5, Section 6.1, PDF page 34 of the Hydrogeologic Modelling Report (Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-150
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F.5, p.32

Context and Rationale

This section states: "There are no potable groundwater uses at the Beaver Dam Mine Site, therefore, simulated COC concentrations are compared against the Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards (EQS) for non-potable course grained soil for agricultural/residential use. The NSE Tier 1 EQS guidelines do not specify concentration limits for the potential COCs at the Beaver Dam Mine Site, therefore there will be no significant groundwater impacts above applicable groundwater guidelines."

The absence of current groundwater users at the mine site or adjacent properties does not mean that Tier 1 QS for a potable site do not apply. In the absence of municipal drinking water supply, the site and its surrounding properties are considered potable. Any off site migration of contamination to third party property would need to meet Tier 1 EQS for a potable site.

For most metals, Tier 2 PSS comparisons are more conservative than Tier 1, therefore the comparison conducted of modelled potential groundwater quality impairment is adequately conservative to understand potential impacts. However, the need to manage to meet potable criteria for groundwater migrating off site to property not owned by the proponent should be recognized for this section and all sections of the EIS relating to groundwater quality.

The Proponent is Required to …

Revise all sections of the EIS addressing groundwater quality, including monitoring and mitigative measures, if necessary, to acknowledge potability criteria must be applied to any off site migration of groundwater to lands not owned by the proponent.

Response

The Updated 2021 EIS and the Hydrogeologic Modelling Report (Appendix F.5 of the Updated 2021 EIS [AMNS 2021]) have been revised to acknowledge potability criteria applied to off-site migration of groundwater to lands not owned by the proponent.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-151
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.7.5.3. page 322-4

Context and Rationale

This section states that "The objectives of the Touquoy water quality model are to predict the period of time that water treatment will be required prior to the pit lake effluent discharge to Moose River…."

The findings do not appear to be stated in the summary document description of modelling results.

The Proponent is Required to …

What is the period of time that water treatment will be required prior to the pit lake effluent discharge to Moose River?

How will the costs of this be accounted for in the post- mining period? Will it form part of bonding for the Beaver Dam project and/or the Touquoy project based on the model predictions?

Response

A Touquoy Tailings and Water Management Plan is provided in Appendix F.7 (Touquoy Integrated Water and Tailings Management Plan) of the Updated 2021 EIS (AMNS 2021). As stated in Appendix F.7, Section 2.2.3, PDF page 12 "Once water quality meets regulatory reclamation criteria without treatment, the exhausted Touquoy pit is prepared for closure, in accordance with the mine site closure plan. The effluent treatment plant is no longer required. Surplus water in the exhausted Touquoy pit is allowed to discharge via the proposed spillway/conveyance channel to Moose River, subject to meeting regulatory discharge."

The bonding requirements will be determined by NSE; however, it is expected that this will form part of the Touquoy Mine Industrial Approval process.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-152
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Section 6.7.6.1, p.g. 316 (Feb 28 version)

Context and Rationale

At the BD mine site, the plan is currently to divert some portion of the clean water from the site to Crusher Lake.

Based on experience at other historic gold mining sites across NS, Crusher Lake likely contains historic mine tailings (perhaps covered by organics and other sediment from runoff since historic mining ended). There may also be historic tailings downstream from Crusher Lake (toward and in Mud Lake) which were remobilized over time from Crusher Lake, during high flow events. Adding flow from the site could remobilize these historic tailings.

The Proponent is Required to …

Please identify an alternative location for diversion of clean water from the site which does not have potential for the presence of historically deposited or re-deposited historic tailings. Any change to the shoreline or hydrology of Crusher Lake or its outflow through addition of water from engineered site drainage should be avoided unless a high density sediment and soil sampling program can prove that tailings are absent.

Response

As described in the Mine Water Management Plan (Appendix P.4 of the Updated 2021 EIS [AMNS 2021]) water from Crusher Lake will be diverted through a culvert. There is no evidence to suggest that this will result in suspension of historic tailings. Water naturally drains from Crusher Lake.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-153
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Appendix F.6, Section 5.4.1, page 5.17

Context and Rationale

The Model Setup section describing the groundwater model for BD tailings disposal in the open pit at Touquoy reports use of the following assumption:

'The water quality associated with the tailings pore water was …based on this (sic) assumption that the Beaver Dam tailings would have the same characteristics as Touquoy based on the general rock characteristics, and that the tailings will be produced by the same mill at the Touquoy site'.

The rock at Beaver Dam has been identified as having the potential for ARD in 40% of reported samples; and field pH results of surface water baseline data collection at BD show significantly acid water at SW-1 immediately downstream from the BD site, particularly during 2014 sampling rounds. Sulfide mineralogy appears to be quite different from Touquoy. Despite the differences in sulfide mineralogy between the BD and Touquoy ore, the tailings for Touquoy have been used to determine the source terms for predictive modelling of metal leaching from the disposal of Beaver Dam tailings in the Touquoy open pit.

The Proponent is Required to …

Given the apparent differences between the sulfide mineralogy of Touquoy versus Beaver Dam rock, and the prediction that ARD will start to occur after about 25 years for BD rock, please provide analysis of the suitability of using Touquoy tailings as a surrogate for derivation of source terms for modelling the impacts to water of disposal of BD tailings at the Touquoy site. What criteria will be used to determine when and if modelling should be re-conducted using results from rock extracted from the BD ore body?

Response

Limited data was available for Beaver Dam, which justified the use of Touquoy tailings material and associated kinetic testwork as the best surrogate for Beaver Dam tailings. These data included 13 head assays representing Beaver Dam ore which were used for metallurgical testing to derive tailings samples. Analytical results for sulphide S and carbon were compared with Touquoy ore analysis presented in Golder (2007; Table 5). Median sulphide contents are 0.4 and 0.54% for Beaver Dam and Touquoy ore samples, respectively, while carbon values are 1.46 and 1.57%, respectively. Once additional metallurgical testing is being conducted on Beaver Dam ore, representative and site-specific tailings slurries materials will be recovered and undergo supernatant testing and static testing on the tailings solids. Should these materials prove to be geochemically different from the Touquoy tailings, additional kinetic testing (saturated columns) would be initiated to inform geochemical source terms for the Beaver Dam TMF.

Round 2 Information Request Number:	NSE-2-154
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	Not listed
Revised EIS (February 28, 2019) Reference:	Appendix F/6, Section 5.4.2.1, page 5.26

Context and Rationale

This section recommends additional testing of the hydraulic conductivity of the mapped faults to assess the potential for zones of higher permeability which could increase the potential for higher solute transport rates and associated increased impacts to Moose River arising from disposal of BD tailings in the Touquoy pit.

Also it does not appear that modelling has referenced the available information about drawdown resulting of dewatering of the open pit at Touquoy to date (particularly in the area of existing OPM 2A/B). Drawdown in OPM2B was significantly greater than predicted in the first year of pit development.

The Proponent is Required to …

Additional testing of the hydraulic conductivity of the faults intersecting the Touquoy pit should be completed and used to update the groundwater model and solute transport predictions.

The model should also be calibrated in the zone between the pit and Moose River using results of water level monitoring from the existing monitoring wells since pit development and dewatering started.

Response

AMNS is currently in the process of undertaking additional assessment to the Touquoy Pit to confirm hydraulic conductivity predictions.

Round 2 Information Request Number:	NSE-2-155
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Table 10-1.3, Page 993

Context and Rationale

The Groundwater Quality and Quantity section states: " Based on evaluation of predicted aquatic risk, pump and treatment of groundwater (if required based on monitoring results) from installed groundwater wells at Beaver Dam Mine Site including those at Crusher Lake, Mud Lake, outlet from Mud Lake to the Killag, and Cameron 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 II pathway specific guidelines or groundwater baseline/background prior to seepage discharging into surface water bodies"..

The Proponent is Required to …

Please provide a quantitative evaluation of the potential effectiveness of pump and treat to capture an impacted groundwater plume in the hydrogeological conditions at the BD and Touquoy sites and if viable, describe the approximate number, location and design of wells, and probable duration of the required program, which would be required to implement an effective pump and treat system.

Response

A quantitative evaluation of the potential effectiveness for a groundwater interceptor trench to capture an impacted groundwater plume is described in Section 7.6, PDF page 53 of Appendix F.5 (Hydrogeologic Modelling Report) in the Updated 2021 EIS (AMNS 2021). A groundwater intercept trench was selected over extraction wells as the low permeability bedrock present at the Beaver Dam Mine Site will limit the radius of capture that can be achieved by an extraction well thereby limiting the effectiveness of extraction wells for the application of capturing an impacted groundwater plume at the Beaver Dam Mine Site. The evaluation of the groundwater interceptor trench to capture an impacted groundwater presented in Section 7.6, PDF page 53 of Appendix F.5 (Hydrogeologic Modelling Report) of the in the Updated 2021 EIS (AMNS 2021) show that an interceptor trench with an average depth of 3 m below the interpolated top of bedrock provides simulate hydraulic containment of potential COC migration west from the PAG waste rock stockpile. The interceptor trench was designed to achieve gravity drainage towards the pit lake such that the interceptor trench would operate passively to redirect potential COC migration in groundwater to the pit lake where mixing within the lake and within Cameron Flowage would reduce COC concentrations. Therefore, should monitoring indicate that the groundwater interceptor trench is required to intercept impacted groundwater migrating west form the PAG waste rock pile, the interceptor trench can operate passively until COC concentrations are reduce below applicable guidelines. Completed evaluation of groundwater interceptor trench as a potential mitigation measure for groundwater seepage to east of the PAG waste rock stockpile

Groundwater concentrations are predicted to be greater than the Tier 2 PSS for some parameters post-closure. However, as discussed in response to NSE 2-34, the mass loading to Moose River is low, and is not predicted to adversely affect the water quality in Moose River. Therefore, no pump and treat systems are anticipated to be required for Touquoy.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-156
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix O.1

Context and Rationale

Groundwater monitoring program

The groundwater monitoring well network at BD or the Touquoy pit are not adequate for purposes of monitoring potential contaminants migrating toward surface water or off site. A higher well density will be required at both locations.

The Proponent is Required to …

Please provide locations and design of a comprehensive groundwater monitoring program for the Beaver Dam project with wells more closely spaced and located directly between all potential contamination sources and surface water receptors or downgradient third party property.

Please provide locations and design of an enhanced groundwater monitoring program between the Touquoy pit (during and after BD tailings disposal) and Moose River with wells placed in the centerline of any potential preferential pathways for an impacted groundwater plume.

Response

A comprehensive groundwater monitoring program for the Beaver Dam Mine Site has been developed and is presented in Appendix G, PDF page 464, Proposed Groundwater Monitoring Plan of Appendix P.4 (Mine Water Management Plan included in the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-157
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix E.3 3.2.1, page 3-6

Context and Rationale

Geochemical results show 35-40% of waste rock stockpile will be potentially Acid-Generating and that this may last for decades. The expectation that mixing with NAG material will allow pH to be acceptable and not an issue seems overly hopeful and perhaps not realistic based on the discussion of pH estimates. Potential Low pH releases into the local watercourses are of major concern to water quality

The Proponent is Required to …

What are the mitigation plans for addressing acidic generation from waste rock drainage in the short and long term?

Response

A draft Metal Leaching Acid Rock Drainage (ML/ARD) Management Plan has been developed and is included as Appendix E.5 in the Updated 2021 EIS (AMNS 2021).

The purpose of this ML/ARD Management Plan is to formalize monitoring procedures as well as to provide guidance with respect to best practice ML/ARD mitigation strategies that may be considered should the results from the monitoring program indicate mitigation is necessary. The Plan will allow for proactive material handling and contaminant source control to minimize mining effects on water quality and protect the downstream aquatic environment. Specific components discussed in the Plan include:

- ML/ARD monitoring and analysis in support of understanding of the site's waste rock and ore classifications;
- Definition of materials suitable for construction of site infrastructure;
- Potentially Acid Generating (PAG) material handling strategies; and
- Verification sampling and monitoring of mine rock, tailings, and associated seepage to test the effectiveness of the implemented mitigation measures.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-158
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F5, 1.1 Page 1

Context and Rationale

Statement that Seabright Resources recovered 2,445 oz gold from bulk samples from an open pit mine at Beaver Dam.

The Proponent is Required to …

Did Seabright process ore from Beaverbank on-site (1986-1989) ? If so is there any residual contamination from the process?

Response

A Phase II Environmental Site Assessment (ESA) was undertaken to delineate Historic Tailings at the Beaver Dam Mine Site. The results are presented in in Appendix E.8 (Extended Phase II Environmental Site Assessment Beaver Dam Project Property) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-159
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F5, 1.1 Page 3

Context and Rationale

Report describes scope of work for calibration to include steady state water conditions only and not transient conditions or flow discharge measurement. However, since the model is being used to predict transitory/changing conditions, its prediction validity under different conditions should ideally be calibrated.

The Proponent is Required to …

Can the model be better calibrated if measured stream/river discharges are incorporated into stream boundary conditions?

Was the model calibrated for a range of conditions – low water table, high water table etc?

Response

Stream/river baseflows were incorporated into the groundwater flow model as calibration targets. Incorporation of measured stream/river discharges into boundary conditions imposes a structural bias into using baseflow as a calibration target (i.e., to match the target all one has to do is adjust the input value). Without baseflow as a calibration target parameter estimation can only resolve relative differences between hydraulic conductivity values. Including baseflow as a calibration target, rather than assigning it as a boundary condition, allows the magnitudes of hydraulic conductivity to be estimable.

The model was calibrated to wet, dry and average annual conditions as described in Section 6.1, PDF page 34 of the Hydrogeologic Modelling Report (Appendix F.5 of the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-160
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F2 Appendix 1

Context and Rationale

Appendix F2 includes a 1986 report with pumping test data from Austin Shaft at the site which presumably could be used

The Proponent is Required to …

Was pumping test data from the site used in calibrating the model? Will it be incorporated at some point for future model revisions?

Response

The pumping test data for the Austen Shaft presented by Jacques, Whitford & Associates Ltd. (JWA), 1986 (in AMNS 2021, Section 6.6.4.2, page 6-171) was applied during model calibration to support the range of hydraulic conductivity values determined for the shallow bedrock unit. Using the pumping test data, JWA (1986) estimated that the shallow bedrock had a hydraulic value of approximately 9 x 10^{-5} cm/s. The hydraulic conductivity value estimated by JWA (1986) from the Austen Shaft pumping test is within the range of hydraulic conductivity values estimated for the shallow bedrock from rising/falling head tests and packer tests (ranging from 1.6 x 10^{-2} cm/s to 1.7 x 10^{-7} cm/s) and compares well against the geometric mean hydraulic conductivity of 5.6 x 10^{-5} cm/s for the rising/falling head tests and packer tests. The calibrated hydraulic conductivity value for the shallow bedrock ranges from 3.7 x 10^{-5} cm/s to 4.3 x 10^{-5} cm/s and also compares well against the hydraulic conductivity value estimated by JWA, 1986 from the Austen Shaft pumping test.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

JWA (Jacques, Whitford & Associates Ltd.), 1986. Environmental Assessment of Gold Mining Exploration Beaver Dam, Nova Scotia.

Round 2 Information Request Number:	NSE-2-161
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F5 Section 5.2 Page 19

Context and Rationale

The model assumes no-flow boundary conditions combined with river, drain and general head boundary conditions. These may not be completely representative of the natural flow system as the model thus assumes a bathtub-like condition with inputs/outputs, rather than a regional-flow-towards-the-ocean system. Constant or specified-head conditions that could represent cross-domain flow were not used.

The inferred base of the active flow system is modelled at 250 m bgs

The Proponent is Required to …

Was the possibility of representing some degree of regional flow by constant or specified head boundary conditions considered for the model domain? What were your conclusions?

Does the conceptual site model not include any regional flow component at depths to 250 m bgs?

Explain why the model does not appear to be designed to represent regional groundwater flow systems. Could regional groundwater flow ever be important with respect to fate and transport related to long-term impacts from the site?

Response

Yes, the possibility of representing some degree of regional flow by constant or specified head boundary condition was considered for the model domain. A constant head boundary condition was tested along the southeast model domain limit in addition to the selected no-flow boundary condition. The simulated groundwater flow field in the vicinity of the Beaver Dam Mine Site was insensitive to the specification of a constant head boundary condition along the southeast model domain. This is due to the low permeability of the deep bedrock which does not lend itself to the development of large regional scale groundwater flow systems.

As identified by the Nova Scotia Department of Natural Resources (Kennedy et al, 2010), “in Nova Scotia groundwater flow systems are relatively shallow (i.e., most groundwater flow occurs in the upper 150 m) and, therefore, are likely controlled by hydraulic boundaries associated with primary watersheds. The province’s geology does not lend itself to simple determination of large regional aquifer flow systems, and large-scale groundwater flows between primary watersheds have not been observed”. Consistent with the description of groundwater flow systems in Nova Scotia presented by Kennedy et al (2010) and the low permeability of bedrock at depth, the conceptual site model does not include any regional flow components at depths to 250 m bgs.

The model is not designed to represent regional groundwater flow systems because the geology of the province (i.e., low permeability bedrock at depth) does not lend itself to the determination of large regional aquifer flow systems. Regional groundwater flow is not important with respect to fate and transport related to long-term impacts from the site because:

1. The maximum extent of simulated COC impacts under an approximate steady-state condition (500 years simulation time) are largely confined within the property boundary and do not approach the model domain limits.

2. The potential COC impacts are simulated to occur primarily within the overburden and weathered fractured bedrock units, where the groundwater flow system tends to follow topographic relief, recharging in areas of higher elevation and discharging to low-lying surface water bodies. Groundwater flow within the overburden and shallow weathered bedrock is not controlled by a deeper regional groundwater flow system.
3. Regional groundwater flow within Nova Scotia, and particularly in the vicinity of the Beaver Dam Mine Site is limited due to the low permeability of the deep bedrock.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-162
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F5 Section 6.1 Page 22

Context and Rationale

The model has been calibrated only with observed water level conditions. Groundwater-surface water interaction and calibration with measured surface water flows was not included. MODFLOW does allow the incorporation of conditions that use measured stream flow discharges as inputs and these can result in a more representative groundwater model.

The Proponent is Required to …

Did you considered calibration targets that incorporate measured stream/river flow discharge values and observed stage levels related to baseflow? Explain.

Response

The model was calibrated to estimated annual baseflow values and corresponding average stage elevations were assigned to river boundary conditions. Model domain baseflow estimates are described in Appendix F.5, Section 2.3.3.1, PDF page 21 and the calibration to the estimated baseflow is described in Appendix F.5, Section 6.3, PDF page 36. In the absence of site-specific baseflow estimates at the time of model calibration, stream flow data from the nearest four hydrometric stations was scaled to estimate total stream flow and baseflow within the model domain. The estimated baseflow value for the model domain was applied as calibration target. Following model calibration preliminary site-specific stream discharge data has been estimated through the application of stage-discharge relationships.

As described in Appendix F.5, Section 2.3.3.1, PDF page 21 *'The average annual baseflow estimated for SW2A and SW1A is 24,686 cubic 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 percent of the total average annual flow at those gauge locations. The estimated average annual baseflow at SW2A and SW1A is within approximately 5 percent 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 model calibration target.'*

The estimated stream discharge data was applied to confirm the total flow and baseflow estimates used for comparison in model calibration as described in Appendix F.5, Section 2.3.3.1, PDF page 21.

As indicated in response to NSE 2-159, including baseflow as a calibration target, rather than assigning it as a boundary condition, allows the magnitudes of hydraulic conductivity to be estimable.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-163
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F5 Section 5 7 Page 28

Context and Rationale

The groundwater model may also be used to predict changes in groundwater interaction with surface water bodies during the proposed mining operation – not only at EOM (End of Mine life) or PC (post- closure)

The Proponent is Required to …

Explain/quantify flow estimates in Cameron Flowage during stages of mine operations, based on modelling with note of groundwater flow contributions to, or depletion of, dry, summer baseflow. Is baseflow reduced, and if so by how much.

Response

It is not necessary to explain/quantify flow in Cameron Flowage during stage of mine operations as those impacts will be less than that which are predicted to occur at EOM. EOM represents the worst-case scenario with respect to baseflow reduction as the pit is excavated and dewatered to its maximum depth and all Site infrastructure is fully developed. Therefore, it is conservative to evaluate the baseflow reduction at EOM and not during intermediate stages of mine operation as the impact to baseflow during intermediate stages of mine operation will be less than that at EOM. Given that baseflow estimates during mine operations will be less than that at EOM and that the impacts during operations will be short term (i.e., 5-year operational period), evaluation of baseflow impacts during operation is not warranted. Furthermore, potential impacts to baseflow during operations, EOM and PC will be mitigated as described in the Baseflow Mitigation Assessment (Appendix H, PDF page 664 of the Mine Water Management Plan Appendix P.4 in the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-164
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G4 Section 4, Tables 4-1 to 4-3, Section 6, Page 21

Context and Rationale

Water balance is used to assess volume impacts to Killag River, Mud Lake, Crusher Lake and Tent Lake outfalls at EOM and PC conditions. The effects on groundwater baseflow contributions to Cameron Flowage and the Killag River during the open pit mining operations are not clear.

The Proponent is Required to …

Do the open pit groundwater dewatering extractions during mining and culminating at EOM decrease dry, summer baseflow contributions to Cameron Flowage and/or the Killag River. And by how much?

During dry, summer conditions, what are the maximum decreases in stream/river flow that may occur?

How are changes from groundwater dewatering reflected in the surface water runoff values predicted at drainage outlet locations?

Response

Effects to baseflow contributions to Cameron Flowage and the Killag River are described in The Baseflow Mitigation Assessment, Section 2. Baseflow Assessment – Operating Conditions, PDF page 665 and Section 3. Baseflow Assessment – Post Closure Conditions, PDF page 667. (Appendix H of the Mine Water Management Plan Appendix P.4 in the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-165
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix G4 2.1.3 and Figure 3.7

Context and Rationale

It does appear that some inputs from groundwater modelling (Appendix F5) were used in the Water Balance Analysis Appendix G4. The GoldSim Model used (Figure 3.7) seems to include groundwater inputs.

The Proponent is Required to …

Are all of the results of the Water Balance Analysis consistent and inclusive of the Groundwater Model results?

The water balance largely reports in terms of monthly and annual surface runoff. Can groundwater baseflow be incorporated into the water balances in Tables 4-1, 4-2 and 4-3 and Cameron Flowage?

Response

The water balance model outputs are consistent and inclusive of the groundwater modelling results. Baseflow has been included as a line in summary Tables 5-6 to 5-12 and 5-15 to 5-23, PDF page 69 to PDF page 88 of the updated water balance analysis (Appendix A, Water Balance Analysis, PDF page 44 of the Water Management Plan P.4 in the Updated 2021 EIS [AMNS 2021]).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-166
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F5, Section 7.4.5, Page 34

Context and Rationale

The report states that "aluminum, silver, arsenic, cadmium, and copper are simulated to exceed both the Tier 2 PSS guidelines and the observed background groundwater concentrations."

The Proponent is Required to …

Please explain the mitigation measures developed to address the simulated predictions of COC exceedances and avoid contamination off site.

Response

Significant long-term impacts to potable groundwater quality are not predicted beyond the property boundary are discussed in Section 6.6.6.1, page 6-181 of the Updated 2021 EIS (AMNS 2021). The extent of potential COC exceedance has been limited due to the separation of the waste rock material into a non-acid generating (NAG) and potentially acid generation (PAG) waste rock pile. An engineered cover is proposed for the PAG waste rock pile to limit the percolation of water through the waste rock pile and the leaching of metals from the PAG waste rock pile and seepage into groundwater (Appendix F.5, Section 7.1.5, PDF page 42.

Potential short-term exceedances of potable criteria for Arsenic are simulated to extend slightly beyond the property boundary for the EOM source terms in the vicinity of the PAG stockpile as discussed in Section 6.6.7.1, page 6-196 of the Updated 2021 EIS. As the EOM source terms transition to the PC source terms, arsenic concentrations are predicted to decrease below potable criteria beyond the properly boundary. Groundwater monitoring will be conducted to assess potential impacts to groundwater quality in the vicinity of the NAG waste rock stockpile as described in the Groundwater Monitoring Plan (Appendix G, PDF page 646 of Appendix P.4 Mine Water Management Plan [AMNS 2021]).

The groundwater simulated groundwater loadings to surface water are incorporated into the Predictive Water Quality Assessment (Appendix D, Section 3.1.3, PDF page 197 of Appendix P.4 Mine Water Management Plan [AMNS 2021]) to assess the impact on the Killag River. Where a potential exceedance of applicable criteria is predicted an appropriate mitigation measure is proposed as described in the Beaver Dam Gold Mine Water Treatment Assessment - Operational Phase Report (Appendix F.2, PDF page 582 of Appendix P.4 Mine Water Management Plan [AMNS 2021]), the Beaver Dam Gold Mine Water Treatment Assessment - Construction Phase Memo (Appendix F.1, PDF page 517 of Appendix P.4 Mine Water Management Plan [AMNS 2021]), Beaver Dam Gold Mine Water Treatment Assessment - Post-Closure Phase Memo (Appendix F.3, PDF page 624 of Appendix P.4 Mine Water Management Plan [AMNS 2021]).

Where COCs are simulated to migrate west from the PAG waste rock pile towards surface water mapped surface water features a potential groundwater mitigation is simulated to assess the effectiveness of an interceptor trench to intercept groundwater migrating west from the PAG waste rock stockpile. The simulation of the mitigation measure is described in Section 7.6, PDF page

52 of Appendix F.5 of the Updated 2021 EIS (AMNS 2021). It is demonstrated that an intercept trench can be an effective mitigation to intercept COC migration in groundwater to the west of the PAG waste rock stockpile.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-167
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F5 Section 6.4 Page 27 And Appendix F5_II Table 6.6

Context and Rationale

Sensitivity analysis results should demonstrate which input parameters the model is most sensitive to, or in other words what are the most significant input parameters in being able to adequately calibrate the model

The Proponent is Required to …

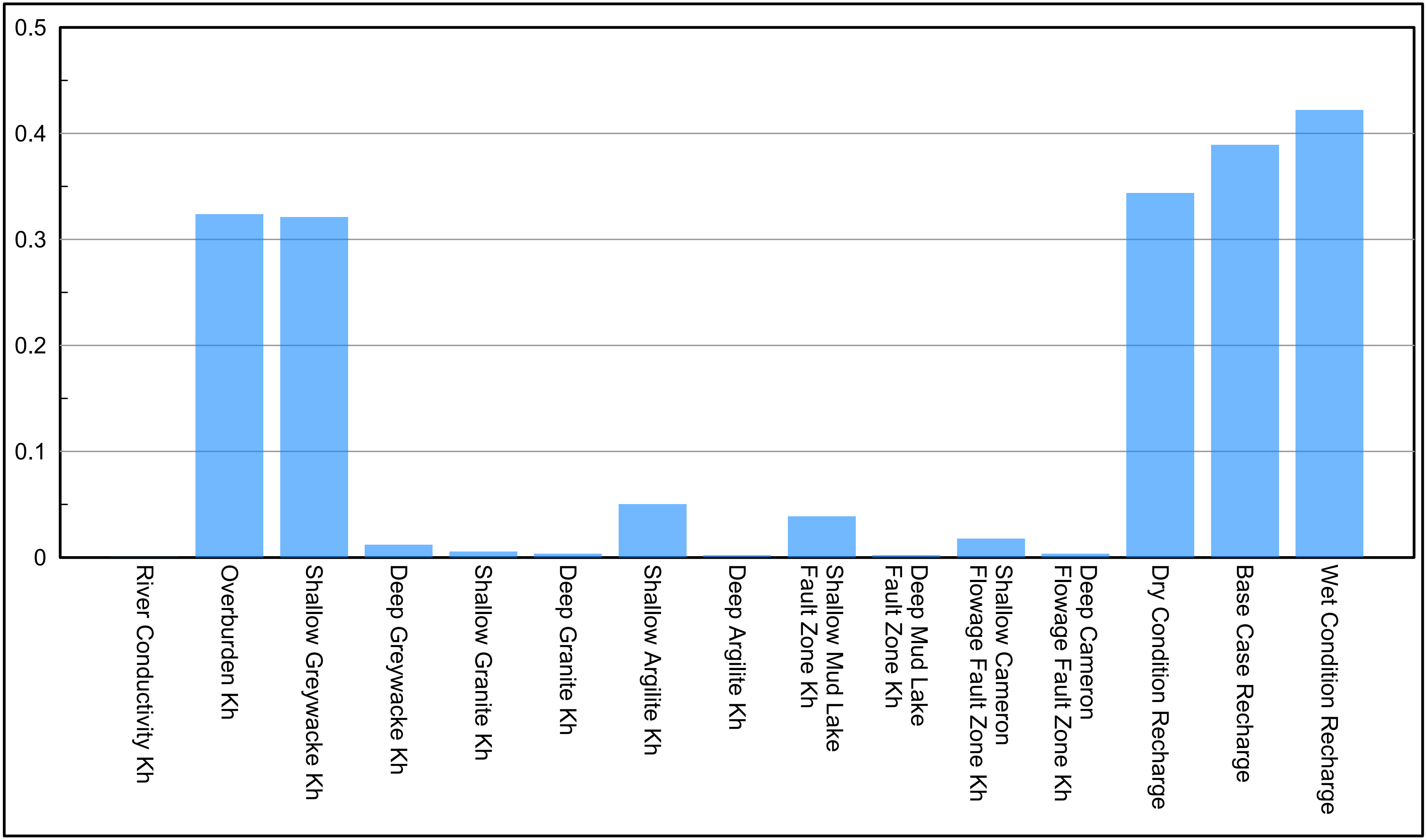
A simple description, or list, or graphical plot of the most important (sensitive) model parameters, from highest to lowest rating would help to show relative importance of the faults etc. For example – see Figure 4.4 in the other Groundwater Model report in Appendix F6 as an easy-to-interpret plot.

Response

A figure has been developed to depict the most sensitive model parameters. Please see Figure NSE-2-167-1, Figure 6.7, PDF page 91 in Appendix F.5 (Hydrogeologic Modelling Report) of the Updated 2021 EIS (AMNS 2021).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.



ATLANTIC GOLD CORPORATION
MARINETTE, NOVA SCOTIA
BEAVER DAM MINE

CALIBRATED MODEL PARAMETER
COMPOSITE SENSITIVITIES

088664-031

November 11, 2019

FIGURE NSE 2-167-1

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Round 2 Information Request Number:	NSE-2-168
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F6 Section 4.4.2, Page 4.8

Context and Rationale

Model calibration is based on water levels.

The Proponent is Required to …

Several data sets for water levels were noted. Do these reflect different seasonal conditions- i.e. was the model calibrated for a range of conditions – low water table, high water table etc?

Response

The water level data presented in the Updated 2021 EIS (AMNS 2021), Appendix F.6, Section 4.4.2, PDF page 30 (Groundwater Flow and Solute Transport Modelling to Evaluate Disposal of Beaver Dam Tailings in Touquoy Open Pit) was grouped based on the level of accuracy we ascribed to the data for calibration purposes. The data ranges for some of the data sets are provided, which represent the variability in the water level responses observed over the respective periods of record. The groundwater flow model for the Touquoy site was based on the average annual conditions.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-169
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F6 4.3 Page 4.6

Context and Rationale

The model assumes no-flow boundary conditions combined with river, drain and general head boundary conditions. These may not be completely representative of the natural flow system as the model thus assumes a bathtub-like condition with inputs/outputs, rather than a regional-flow-towards-the-ocean system. Constant or specified-head conditions that could represent cross-domain flow were not used.

The Proponent is Required to …

Was the possibility of representing some degree of regional flow by constant or specified head boundary conditions considered for the model domain? What were your conclusions?\

Explain why the model does not appear to be designed to represent regional groundwater flow systems. Could regional groundwater flow ever be important with respect to fate and transport related to long-term impacts from the site?

Response

Refer to Round 2, Information Request response NSE-2-168. The bulk of regional groundwater occurs in the upper 150 m of bedrock and is represented in both the Touquoy and Beaver Dam Mine Site groundwater flow models. All model boundaries selected for the Touquoy Mine Site groundwater model correspond to watershed divides which were assigned no-flow boundary conditions, consistent with the modelling approach used by Kennedy et al. (2010).

For the Beaver Dam Mine Site groundwater flow model, it was recognized that regional groundwater flow could exit the southeast model domain boundary as the southeast boundary did not correspond to a watershed divide. A general head boundary condition was initially assigned to represent the potential groundwater flow across the southeast model boundary. However, due to the low permeability of the bedrock flow at depth was found to be negligible with respect to the groundwater flow conditions at the Beaver Dam Mine Site. Therefore, a no-flow boundary condition was assigned along the entire southeastern model domain limit (Section 3.2, PDF page 25 of Appendix F.5 Hydrogeologic Modelling Report [AMNS 2021]).

Similarly, at the Touquoy site, based on the low permeability of the bedrock at depth, groundwater flow through the deeper bedrock was deemed to be negligible with respect to the groundwater flow conditions elsewhere at the site.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Kennedy, G.W., K.G. Garroway and D.S. Finlayson-Bourque. 2010. Estimation of Regional Groundwater Budget in Nova Scotia, Nova Scotia Department of Natural Resource, Open File Illustration ME 2010-2

Round 2 Information Request Number:	NSE-2-170
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Appendix F6 Page 4.5

Context and Rationale

The inferred base of the active flow system seems to be at approximately 160 m, based on the description on page 4.5.

The Proponent is Required to …

The two models (Appendix F6 – 160 m and Appendix F5 – 250 m) appear to use different inferred depths for base of the active flow system. Please provide a rationale for why the CSM value wasn't used for both models and the relative importance of this.

Response

A separate conceptual site model (CSM) was developed for both the Touquoy and Beaver Dam Mine Sites as documented in the Updated 2021 EIS (AMNS 2021) in Appendix F.6, PDF page 19 (Groundwater Flow and Solute Transport Modelling to Evaluate Disposal of Beaver Dam Tailings in Touquoy Open Pit) and Appendix F.5, PDF page 24 (Hydrogeologic Modelling Report), respectively. Each groundwater flow model was constructed consistent with the CSM for the site which it represents. The permeability of the deep bedrock is sufficiently low such that a non-flow boundary condition could be applied at a shallower depth than that use in either model without impacting simulated water levels at observation well locations. However, in order to represent the full depth of the proposed open pits as the Touquoy and Beaver Dam Mine Site, the inferred non-flow boundary condition depth was set such that the location of the boundary condition did not unduly influence the simulated water levels surrounding the proposed open pit. The different depths to the inferred no-flow boundary for Touquoy and Beaver Dam reflect the different proposed pit depths at both mine sites.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-171
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Revised EIS Section 6.6.3.4, Page 238 Figure 6.6-5 Section 6.6-5

Context and Rationale

Groundwater quality around the open pit at the Touquoy Mine Site containing cyanide as shown in Figure 6.6-5

The Proponent is Required to …

Please explain why cyanide and cyanide derivatives are present in groundwater around the open pit at the Touquoy Mine site. What areas are affected?

Response

Low-levels of total (strong acid dissociable) and weak acid dissociable cyanide (WAD) were occasionally reported in the OPM wells, as presented Stantec (2019). Concentrations of total cyanide were reported as high as 0.0014 mg/L compared to the detection limit of 0.0010 mg/L. Concentrations of WAD cyanide were reported as high at 0.003 mg/L compared to the detection limit of 0.003 mg/L. These low-level detections were most common in the shallow (typically overburden) wells.

No active mining discharges of cyanide have occurred at the open pit, therefore these low-level detections are attributed to possible laboratory errors.

References

Stantec 2019. 2018 Annual Report – Surface Water and Groundwater Monitoring Touquoy Gold Mine Project. Submitted to AMNS. 468 p.

Round 2 Information Request Number:	NSE-2-172
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Revised EIS Section 6.6.5.4, Page 243

Context and Rationale

Thresholds for determining significant adverse effect

The Proponent is Required to …

What are appropriate thresholds of significance for groundwater baseflow inputs into surface water bodies such as Cameron Flowage and the Killag River?

Response

Thresholds for determining significance of adverse effects on baseflow in the surface water bodies is assessed in Surface Water Section 6.7.7.2, page 6-259 of the Updated 2021 EIS (AMNS 2021) since groundwater is small contribution to baseflow. The significance determination for water quantities is as follows:

- **Significant Residual Effect:** residual effects have high magnitude, be of potential regional geographic extent and of medium to long term duration, occur at any frequency and only be partially reversible to irreversible.
- **Not Significant Residual Effect:** to Surface Water Quality Valued Component is defined as: negligible to moderate magnitude, are restricted to the Project Area or near-field receiving environment, are of sporadic or short-term duration, occur at any frequency and are reversible to partially reversible.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-173
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Not listed
EIS Guideline Reference:	*Not listed*
Revised EIS (February 28, 2019) Reference:	Revised EIS Section 6.6.6, Table 6.6-4

Context and Rationale

Table 6.6-4 provides activities and durations

The Proponent is Required to …

Given the predicted development of ARD in 40% samples over time from the waste rock stockpiles, shouldn't monitoring be specified for a longer term than 3+ years Post-Closure?

Response

Note that the incorporation of the static test results into the Beaver Dam geological block model has led to a strong decrease in the estimated waste rock PAG proportion to less than 10%. Although the static test sample locations provide a good spatial representation across the open pit volume, the spatial interpolation of the static test results via the site's block model has shown that samples classifying as PAG are commonly clustered in certain areas and that a relatively much larger volume of waste material is in fact NAG. The discrepancy in the previous versus current PAG% estimates can hence be explained by the lack of spatial consideration in the geo-environmental model.

As noted in the Updated 2021 EIS, Section 6.8.7, Table 6.8-14, page 6-389, post closure monitoring will be 10+ years depending on the outcomes of the monitoring results and outcomes from the Beaver Dam Mine ML/ARD Management Plan (Appendix E.5 in the Updated 2021 EIS).

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-174
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Wetlands
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	6.8.2 Wetlands: Baseline Program Methodology Pg. 343 6.8.3.1 Wetland Functional Assessment Results Pg. 357

Context and Rationale

Delineated wetlands that extended outside of the PA (for both the mine footprint Beaver Dam Mine Site and the Haul Road footprint) were only delineated to the PA boundary. Wetland habitat extending beyond the PA was evaluated through desktop resources, including topographic mapping, NSDNR NSL&F wetland inventory, and the WAM to estimate wetland type, size, and broad wetland function.

The Proponent is Required to …

Provide additional discussion on function assessment methodology in relation to how desktop study was included in assessment of the wetland function. While the NovaWet assessment is currently recognized as a suitable methodology, it is possible that future approvals may require assessment using WESP-AC. Provide discussion on how function assessment results will be used in future to support post-construction evaluation and approval process.

Response

Section 6.8.3, page 6-320 – Wetlands Baseline Program Methodology of the Updated 2021 EIS (AMNS 2021) provides clarity on how desktop data was used in the functional assessment of wetland which extend beyond the Project Area (PA).

Where wetland habitat extended beyond the PA, a functional assessment is based on observations made within the PA, landscape position and connectivity observed via desktop review in portions of the wetland that extend beyond the PA boundary. Connectivity to other aquatic habitats (i.e., wetlands, watercourses, lakes and ponds) are an important component of any functional assessment. Where a wetland extended beyond the PA boundary but did not coincide with an NSE mapped wetland, provincial topographic datasets (i.e., NSE wetland inventory, local topography, Wet Area Mapping, flow accumulation, watercourses and waterbodies) and aerial imagery interpretation were used to identify the likely extents of wetland boundaries to support functional assessment conclusions. Approximate wetland area beyond the PA, estimated through this exercise, is presented in Round 2, Information Request Response NSE-2-175, Table NSE-2-175-1 - Wetlands Delineation Summary Results., Functional assessments are based on field observations within a defined study area, supplemented by desktop resources where appropriate.

Section 6.8.3.4 – Wetland Functional Assessment, page 6-324 describes how NovaWET (NSE 2011) is currently recognized by NSE as an appropriate method for assessing wetland function and providing baseline conditions to compare against post-construction evaluations. At the time of baseline data collection, NovaWET was the primary functional assessment tool recommended for use in Nova Scotia. The WESP-AC method for functional assessment of wetland habitats was not calibrated for use in Nova Scotia. In 2016, a calibration study was completed to support NSE in the implementation of WESP-AC as the preferred functional assessment technique. To date, WESP-AC has not been fully implemented as the preferred technique, and NovaWET is still recognized as an appropriate method for assessing wetland functions (NSE 2011).

AMNS will consult NSE to determine functional assessment methodology requirements at the permitting phase.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Nova Scotia Environment (NSE). 2011. Nova Scotia Wetland Evolution Technique (NovaWET) – Version 3.0. Retrieved from: https://novascotia.ca/nse/wetland/assessing.wetland.function.asp

Round 2 Information Request Number:	NSE-2-175
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Wetlands
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Table 6.8-1: Wetland Types and Approximate Sizes

Context and Rationale

As indicated in section 6.8.2, wetland habitat extending beyond the PA was evaluated through desktop resources to estimate wetland type, size, and broad wetland function

The Proponent is Required to …

Provide total approximated wetland areas determined from this exercise.

Response

The methods described in the response to NSE-2-174 were employed to estimate the wetland areas that extend beyond the Project Area (PA). Calculated estimated wetland area beyond the PA, where applicable, is presented in below (Table NSE-2-175-1) and in Section 6.8, Table 6.8-2, page 6-325 of the Updated 2021 EIS (AMNS 2021).

Table NSE-2-175-1: Wetland Delineation Summary Results

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[(a)] (m^2)	Tertiary Watershed
Beaver Dam Mine Site				
1	complex: mixed wood treed bog, tall shrub bog, open low shrub bog	37,188	-	Tent Brook and Paul Brook
2	complex: coniferous treed bog, graminoid bog, low shrub bog, shrub bog	196,857	-	Tent Brook, Paul Brook, and Killag River
3	shrub bog	4,658	-	Killag River
4	complex: treed swamp/treed fen, mixed wood treed swamp	13,139	-	Killag River
5	mixed wood treed swamp	6,202	-	Killag River
6	mixed wood treed swamp	262	-	Killag River
7	cutover treed swamp	306	-	Killag River
8	complex: coniferous treed swamp, graminoid fen, low shrub fen, shrub swamp	16,603	-	Killag River
9	open bog	307	-	Paul Brook
10	low shrub fen	18,817	-	Killag River

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[a] (m^2)	Tertiary Watershed
11	complex: low shrub bog, mixed wood treed swamp	2,955	-	Killag River
12	complex: open mixed wood treed swamp, coniferous treed swamp	4,475	-	Killag River
13	complex: treed swamp, coniferous treed swamp	4,816	-	Killag River
14	complex: shrub bog, mixed wood treed swamp, low shrub fen	31,655	-	Killag River
15	graminoid fen	1,249	-	Killag River
16	open shrub swamp	3,670	-	Killag River
17[c]	complex: tall shrub swamp, coniferous treed bog	76,341	181,113	Killag River
18	coniferous treed swamp	1,864	-	Killag River
19	shrub bog	11,428	-	Killag River
20	mixed wood treed fen	10,106	-	Killag River
21	mixed wood treed swamp	202	-	Paul Brook
22	mixed wood treed swamp	274	-	Paul Brook
23	coniferous treed swamp	419	-	Paul Brook
24	coniferous treed swamp	328	-	Paul Brook
25	coniferous treed swamp	1,416	-	Paul Brook
26	coniferous treed swamp	658	-	Paul Brook
27	mixed wood treed swamp	493	-	Paul Brook
28	coniferous treed swamp	222	-	Paul Brook
29[c]	complex: mixed wood treed swamp, low shrub fen, open bog, coniferous treed swamp, coniferous raised bog, graminoid fen	112,835	204,763	Paul Brook and Killag River
30	coniferous treed swamp	964	-	Paul Brook
31	coniferous treed swamp	10,473	-	Paul Brook and Killag River
32	coniferous treed swamp	120	-	Paul Brook
33	coniferous treed swamp	1,900	-	Paul Brook
34	mixed wood treed swamp	1,382	-	Killag River
35	coniferous treed swamp	3,376	-	Paul Brook and Killag River
36	coniferous treed swamp	916	-	Paul Brook
37	deciduous treed swamp	253	-	Paul Brook
38	coniferous treed swamp	388	-	Paul Brook and Killag River
39	coniferous treed swamp	1,857	-	Killag River

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[a] (m^2)	Tertiary Watershed
40	coniferous treed swamp	8,091	-	Killag River
41	graminoid marsh	910	-	Killag River
42	coniferous treed swamp	1,879	-	Killag River
43	mixed wood treed swamp	81	-	Killag River
44	coniferous treed bog	10,611	-	Killag River
45	coniferous treed swamp	295	-	Killag River
46	coniferous treed riverine swamp	754	-	Killag River
47	fresh water marsh	1,029	-	Killag River
48	coniferous treed swamp	2,876	-	Killag River
49	coniferous treed swamp	117	-	Killag River
50	coniferous tall shrub swamp	117	-	Killag River
51	mixed wood treed swamp	898	-	Killag River
52	coniferous treed swamp	1,620	-	Killag River
53	low shrub swamp	824	-	Killag River
54	coniferous treed bog	416	-	Paul Brook
55	mixed wood treed swamp	616	-	Killag River
56	complex: coniferous treed swamp, tall shrub swamp, low shrub bog	14,823	-	Killag River
57	complex: coniferous treed swamp, deciduous treed swamp	88,717	-	Tent Brook and Killag River
58	deciduous treed swamp	581	-	Killag River
59	coniferous treed swamp	28,233	-	Killag River
60	coniferous treed swamp	2,963	-	Killag River
61	complex: deciduous treed swamp, tall shrub swamp, open low shrub fen	25,809	-	Killag River
62	coniferous treed swamp	832	-	Killag River
63	coniferous treed swamp	486	-	Paul Brook
64	complex: low shrub bog, mixed wood treed swamp	42,047[b]	-	Tent Lake
66[c]	complex: graminoid fen, mixed wood treed swamp, high shrub fen	55,419.49[2]	485,495	Tent Lake
200	coniferous treed swamp	1,677	-	Killag River
201	mixed wood treed swamp	284	-	Killag River
202	coniferous treed swamp	571	-	Killag River
203	open bog	3,925	-	Killag River
204	coniferous treed swamp	8,295	-	Killag River

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[a] (m^2)	Tertiary Watershed
205	mixed wood treed swamp	45,975	-	Cope Brook
206[c]	shrub swamp	3,298	6,507	Killag River
207[c]	complex: mixed wood treed swamp, bog	86,450	553,032	Killag River
208	coniferous treed bog	6,478	-	Killag River
209	shrub bog	11,514	-	Killag River
210	coniferous treed bog	11,058	-	Killag River
211	coniferous treed swamp	10,474	-	Killag River
212	shrub swamp	13,987	-	Killag River
213	shrub swamp	992	-	Killag River
214	mixed wood swamp	6,041	-	Killag River
215	shrub swamp	16,447	-	Killag River
216	shrub swamp	1,397	-	Killag River
217[c]	coniferous treed swamp	5,230	7,783	Killag River
218	open bog	115	-	Tent Brook
219	complex: fen, mixed wood treed swamp	90,880	-	Tent Brook
220	coniferous treed fen	15,691	-	Cope Brook
221	mixed wood treed swamp	4,082	-	Cope Brook
222	coniferous treed swamp	7,788	-	Killag River and Cope Brook
223	coniferous treed swamp	475	-	Cope Brook
224	coniferous treed swamp	1,693	-	Cope Brook
225	coniferous treed swamp	235	-	Cope Brook
226	complex: coniferous swamp, bog	15,039	-	Cope Brook
227	mixed wood treed swamp	365	-	Cope Brook
228	coniferous treed bog	11,835	-	Killag River
229	coniferous treed swamp	4,644	-	Killag River
230	coniferous treed swamp	1,812	-	Killag River and Cope Brook
231[c]	coniferous treed swamp	4,808	1,669	Killag River
232	mixed wood treed swamp	875	-	Killag River and Cope Brook
233[c]	mixed wood treed swamp	8,025	1,085	Cope Brook
234	coniferous treed swamp	3,328	-	Cope Brook
235	mixed wood treed swamp	619	-	Cope Brook
236[c]	complex: swamp, bog	37,699	6,381	Cope Brook
237	coniferous treed swamp	429	-	Tent Brook
238[c]	deciduous treed swamp	4,685	3,324	Killag River
239	open bog	1,004	-	Killag River and Tent Brook

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[a] (m^2)	Tertiary Watershed
240[c]	mixed wood treed swamp	21,799	9,590	Killag River
241[c]	mixed wood treed swamp	821	478	Killag River
242[c]	mixed wood treed swamp	2,366	760	Killag River
243	mixed wood treed swamp	1,104	-	Killag River
244	coniferous treed swamp	131	-	Killag River
245	mixed wood treed swamp	1,864	-	Killag River
246	mixed wood treed swamp	8,871	-	Killag River
247	mixed wood treed swamp	9,371	-	Killag River and Tent Lake
248	mixed wood treed swamp	401	-	Killag River
249	mixed wood treed swamp	2,322	-	Tent Brook
257	shrub swamp	230	-	Killag River
258	shrub swamp	954	-	Tent Brook
Total Beaver Dam Mine Site Wetland Area		**1,411,567 m^2 (141.2 ha)**		
Haul Road (incl. bypass road)				
64[c]	complex: low shrub bog, mixed wood treed swamp	6,306[b]	3,128	Tent Brook
65	open bog	65	-	Tent Brook
66[c]	complex: graminoid fen, mixed wood treed swamp, high shrub fen	15,578[b]	574,882	Tent Brook
67[c]	complex: low shrub fen, tall shrub fen	1,535	574,882	Tent Brook
68[c]	complex: shrub fen, graminoid fen and mixed wood treed swamp	5,568	574,882	Tent Brook
69[c]	complex: shrub fen, graminoid fen, and mixed wood treed swamp	3,899	574,882	Tent Brook
70[c]	tall shrub swamp	613	1,512	Tent Brook
71	deciduous treed swamp	425	-	Keef Brook
72	deciduous treed swamp	1,471	-	Keef Brook
73[c]	complex: tall shrub swamp, tall shrub fen	27,091	15,010	Keef Brook
74[c]	complex: mixed wood treed swamp, fresh water marsh	12,339	17,437	Keef Brook
75	mixed wood treed swamp	144	-	Keef Brook
76[c]	complex: mixed wood treed swamp, open graminoid fen	10,406	8,045	Keef Brook
77[c]	mixed wood treed swamp	1,688	852	Keef Brook
78	mixed wood treed swamp	194	-	Keef Brook
79[c]	coniferous treed swamp	3,294	3,019	Keef Brook
80	coniferous treed bog	978	-	Keef Brook

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[a] (m^2)	Tertiary Watershed
81	tall shrub swamp	154	-	Keef Brook
82	mixed wood treed swamp	616	-	Keef Brook
83[c]	mixed wood treed swamp	529	2,188	Keef Brook
84[c]	low shrub swamp	695	1,431	Keef Brook
85	low shrub swamp	322	-	Keef Brook
86[c]	mixed wood treed swamp	4,607	1,511	Keef Brook
87[c]	open bog	362	3,086	Keef Brook
88[c]	tall shrub swamp	409	226	Keef Brook
89[c]	treed swamp	6,170	8,927	Keef Brook
90[c]	mixed wood treed swamp	4,495	9,277	Keef Brook
91[c]	mixed wood treed swamp	1,060	414	Keef Brook
92[c]	mixed wood treed swamp	1,943	37,214	Keef Brook
93	graminoid marsh	166	-	Keef Brook
94[c]	mixed wood treed swamp	1,693	991	Keef Brook
95[c]	mixed wood treed swamp	263	138	Keef Brook
96[c]	mixed wood treed swamp	861	1,180	Keef Brook
97	mixed wood treed swamp	107	-	Keef Brook
98[c]	mixed wood treed swamp	1,540	967	Jack Lowe Brook
99[c]	mixed wood treed swamp	694	540	Jack Lowe Brook
100	shrub swamp	1,582	-	Jack Lowe Brook
101	cutover swamp	219	-	Jack Lowe Brook
102	complex; mixed wood treed bog, mixed wood treed swamp	5,439	-	Jack Lowe Brook
103	low shrub bog	455	-	Jack Lowe Brook
104	low shrub swamp	102	-	Jack Lowe Brook
105	low shrub bog	284	-	Jack Lowe Brook
106[c]	low shrub bog	1,701	850	Jack Lowe Brook
107	coniferous treed swamp	186	-	Little River
108	tall shrub swamp	183	-	Little River
109	coniferous treed swamp	1,606	-	Little River and Jack Lowe Brook
110	shrub bog	3,353	-	Little River
111[c]	mixed wood treed swamp	1,060	2,216	Little River
112[c]	mixed wood treed swamp	3,595	2,913	Little River
113	mixed wood treed swamp	2,782	-	Little River
114	coniferous treed swamp	242	-	Little River

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[a] (m^2)	Tertiary Watershed
115[c]	mixed wood treed swamp	582	490	Little River
116	coniferous treed swamp	892	-	Little River
117	coniferous treed swamp	147	-	Little River
118	coniferous treed swamp	428	-	Little River
119	coniferous treed swamp	328	-	Little River
120	low shrub swamp	115	-	Little River
121	coniferous treed swamp	866	-	Little River
122	coniferous treed swamp	200	-	Little River
123	mixed wood treed swamp	818	-	Little River
124[c]	mixed wood treed swamp	528	418	Little River
125	mixed wood treed swamp	344	-	Little River
126	mixed wood treed swamp	63	-	Little River
127[c]	treed bog	185	17,002	Little River
128	tall shrub bog	409	-	Little River
129	treed bog	2,006	-	Little River
133	low shrub bog	102	-	Little River
134	treed swamp	398	-	Little River
135[c]	shrub fen	1,227	9,284	Little River
136	mixed wood treed swamp	522	-	Little River
137[c]	mixed wood treed swamp	2,404	4,032	Little River
138	shrub bog	1,521	-	Little River
139	tall shrub bog	106	-	Little River
140	treed bog	230	-	Little River
141	high shrub bog	60	-	Little River
142	low shrub bog	342	-	Little River
143	complex: graminoid bog, deciduous treed swamp	527	-	Little River
144[c]	tall shrub fen	2,034	672	Little River
145[c]	low shrub bog	1,462	3,026	Little River
146[c]	complex: graminoid fen, mixed wood treed swamp	2,265	2,696	Little River
147[c]	complex: low shrub bog, mixed wood treed swamp	2,708	2,061	Little River
148[c]	low shrub bog	9,221	64,070	Little River
149[c]	low shrub bog	1,835	857	Little River
150	marsh	145	-	Little River

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[(a)] (m^2)	Tertiary Watershed
151[(c)]	tall shrub bog	2,827	653	Little River
152[(c)]	cutover mixed wood swamp	2,275	5,520	Little River
153[(c)]	shrub swamp	2,416	1,135	Little River
154[(c)]	open bog	1,927	69	Little River
155[(c)]	mixed wood treed swamp	540	406	Little River
156[(c)]	shrub bog	14,745	272,320	Little River and Sandy Pond
157[(c)]	complex: shrub fen, shrub swamp	7,006	57,089	Little River and Sandy Pond
158	shrub swamp	575	-	Sandy Pond
159[(c)]	mixed wood treed swamp	1,995	34,340	Sandy Pond
160	marsh	1,237	-	Sandy Pond
161	mixed wood treed swamp	1,618	14,809	Sandy Pond
162[(c)]	mixed wood treed swamp	1,756	440	Sandy Pond
163[(c)]	cutover swamp	1,107	199	Sandy Pond
164[(c)]	mixed wood treed swamp	3,320	14,719	Sandy Pond
165[(c)]	mixed wood treed swamp	1,623	760	Sandy Pond
166	shrub swamp	68	-	Sandy Pond
167[(c)]	mixed wood treed swamp	875	74	Sandy Pond
168[(c)]	open bog	664	2,202	Sandy Pond
169[(c)]	mixed wood treed swamp	607	785	Sandy Pond
170[(c)]	mixed wood treed swamp	1,893	12,748	Sandy Pond
171[(c)]	mixed wood treed swamp	4,329	119,985	Morgan River
172	mixed wood treed swamp	229	-	Morgan River
173[(c)]	mixed wood treed swamp	4,814	10,815	Morgan River
174[(c)]	mixed wood treed swamp	2,649	6,608	Morgan River
175[(c)]	shrub swamp	632	534	Morgan River
176[(c)]	mixed wood treed swamp	446	565	Morgan River
177[(c)]	shrub swamp	808	1,341	Morgan River
178[(c)]	mixed wood treed swamp	4,385	6,652	Morgan River
179[(c)]	mixed wood treed swamp	3,376	808	Morgan River
250	coniferous treed swamp	656	-	Morgan River
251[(c)]	mixed wood treed swamp	1,462	9,223	Lake Alma
252[(c)]	coniferous treed fen	391	260	Lake Alma
253[(c)]	coniferous treed fen	404	3,985	Lake Alma
254[(c)]	coniferous treed swamp	104	390	Lake Alma
255[(c)]	shrub swamp	716	99	Lake Alma

Table NSE-2-175-1: Wetland Delineation Summary Results (continued)

Wetland ID	Wetland Type	Wetland Area within PA (m^2)	Wetland Area beyond PA[(a)] (m^2)	Tertiary Watershed
256[(c)]	coniferous treed swamp	205	1,747	Lake Alma
259[(c)]	coniferous treed swamp	162	201	Keef Brook
Total Haul Road Wetland Area		**250,930 m^2 (25.1 ha)**		
Total Wetland Area		**1,662,496 m^2 (166.3 ha)**		
% Total Beaver Dam Mine Site Area (592 ha)		**24%**		
% Total Haul Road Area (189 ha)		**13%**		

Notes: [(a)] Approximate wetland area that extends beyond the PA, were applicable. Area is estimated through desktop review.

[(b)] Wetland area is partially within the Beaver Dam Mine Site and Haul Road.

[(c)] Wetland extends beyond the PA boundaries. Total size is estimated.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-176
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Wetlands
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.8.3 Baseline Conditions: Touquoy Mine Site Pg. 357

Context and Rationale

"Six wetlands were identified within the Touquoy Mine Site in 2006 as part of the EARD process, five of which were assessed. One of these wetlands was deemed to not be affected from Project development and therefore was not evaluated (CRA 2007).

A total of 52 wetlands were identified within the Touquoy Mine Site (including the western bypass road) during field studies by MEL biologists from 2015-2017. These wetlands were identified for wetland permitting process and functional assessments were completed to support permitting. Evaluation will be limited to riparian wetlands along Moose River, downstream of the discharge location, to confirm potential indirect impacts from the Beaver Dam Mine Project."

The Proponent is Required to …

Provide the baseline information and discussion on wetlands in proximity to Touqouy Mine Site infrastructure.

Provide details on evaluation referenced and rational as to why this is limited to riparian wetlands and clearly identify those wetlands.

Response

Information pertaining to wetlands at the Touquoy Mine Site has been brought forward from the EARD (CRA 2007a) and Focus Report (CRA 2007b), along with wetland information collected during wetland permitting in 2015/2016. Methods and results are summarized where applicable in applicable subsections of Section 6.8, page 6-317 – Wetlands of the Updated 2021 EIS (AMNS 2021). However, this data is not being re-evaluated in context of the Beaver Dam Project.

The Touquoy Mine Site is currently operational. The use of the Touquoy Mine Site for the processing of Beaver Dam ore and tailings management (exhausted pit) will not involve modification to the current mine footprint or new direct or indirect disturbances to wetlands during the construction and operations phase of the Project.

As per Section 6.8.4.2, page 6-376, at post-closure and once water quality in the Touquoy Mine Site open pit meets MDMER discharge criteria, water surplus will be released into Moose River via a spillway. Wetland surveys, in the context of the Beaver Dam Mine Project, were conducted in along the Moose River, in response to IR NSE 2-176. Surveys were conducted up to 200 m downstream of the proposed discharge point, considering the predicted mixing zone from the spillway (100 m from discharge location, Appendix F.8 [Beaver Dam Gold Project Assimilative Capacity Study of Moose River – Touquoy Pit Discharge], AMNS 2021). The survey was focused to approximately 50 m east and west of the river to capture potential indirect impacts to wetland hydrology adjacent to the Moose River, focusing on riparian wetlands with direct hydrologic connectivity.

One wetland was observed along the eastern side the Moose River (within 20 m), approximately 60 m south of the proposed discharge point (Figure NSE-2-176-1). This wetland was delineated and characterized in October 2020 and again in April 2021, to assess its connectivity with the Moose River. The wetland is a 0.17 ha shrub dominated swamp generally located at a higher elevation that the adjacent Moose River, separated by an upland berm along the majority of its western boundary. Overland flow from the adjacent upland was observed as the predominant hydrologic input. Flow was observed from the wetland through a drainage feature to the Moose River. While no bidirectional flow, from the river to the wetland, was observed during either visit (October or April), it was noted that the southern portion of the wetland may have periodic connectivity with the Moose River, due to elevation and vegetation composition. However, hydrologic connectivity was not observed during high flow in April, which indicates that river-wetland connectivity is limited to extreme high flow events (AMNS 2021, Section 6.8.4.2, page 6-376).

Potential bidirectional flow was observed beyond the 100 m mixing zone. As water quality will meet MDMER at discharge, and CCME/NSE Tier I/background concentrations or site-specific water quality objective at the end of the mixing zone in the Moose River, indirect impact analyses for riparian wetlands were limited to water quantity (AMNS 2021, Section 6.8.4.2, page 6-376).

The average monthly flow of the Moose River, in August when flows are lowest, is 38,880 m3/day, or 450 L/s (Appendix F.8 [Beaver Dam Gold Project Assimilative Capacity Study of Moose River – Touquoy Pit Discharge]; AMNS 2021). The predicted increase in flow from both open pit overflow and groundwater seepage is 3.76% of the average August Moose River flow (when flows are lowest). Due to the topographic setting and limited bi-directional hydrological connectivity of the assessed wetland adjacent to the Moose River, no indirect impacts to wetlands are expected from this minor increase in flow (AMNS 2021, Section 6.8.7.1.4, page 6-420).

Therefore, with the exception of the continued potential for accidents and malfunctions, there are no direct or indirect effects to wetlands from the Project anticipated at the Touquoy Mine Site during the construction, operations, and closure phases. For further information regarding Touquoy Gold Project and wetland interactions, refer to the EARD (CRA 2007a) and Focus Report (CRA 2007b). Wetland mitigations will be further addressed as part of the permitting process (AMNS 2021, Section 6.8.7.1.4, page 6-420).

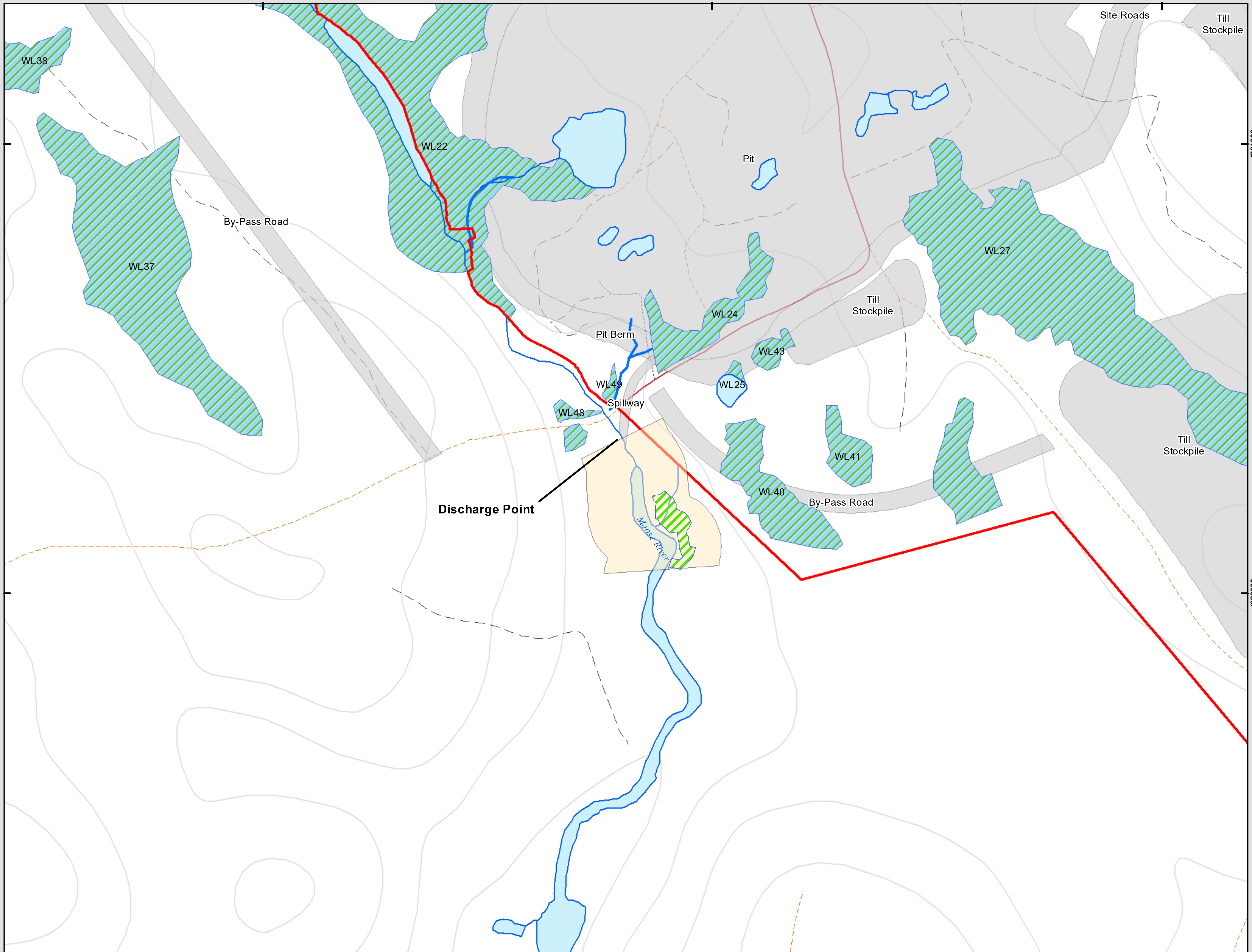
Applicable sections within Section 6.8, page 6-317 Wetlands of the Updated 2021 EIS (AMNS 2021) has been updated to address the additional Touquoy Mine Site baseline wetland assessment and direct and indirect wetland interactions, respectively.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

CRA (Conestoga-Rovers & Associates Ltd.). 2007a. Environmental Assessment Registration Document for the Touquoy Gold Project.

CRA. 2007b. Focus Report, Touquoy Gold Project, Moose River Gold Mines, Nova Scotia



Prepared For:

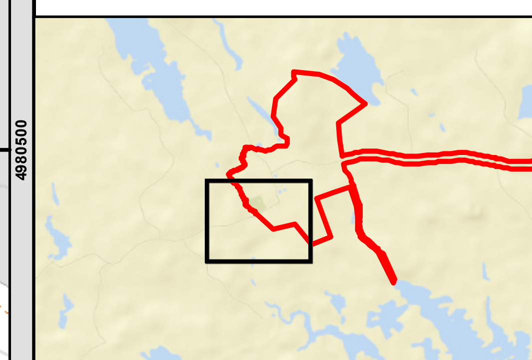
Atlantic Gold

FIGURE NSE 2-176-1

Beaver Dam Mine Project

Wetlands in Proximity to Moose River Discharge

- Field Delineated Watercourses
- NSTDB Mapped Watercourses
- Local Road
- Dry Weather / Seasonal Road
- Diveways (>300 m)
- Track
- Field Identified Wetlands: Moose River
- Field Delineated Wetlands
- NSE Wetlands (None Identified)
- Open Water
- Moose River Wetland Study Area
- Touquoy Infrastructure Layout
- Project Area



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

0 50 100 200 m

1:4,000 Scale when printed @ 11" x 17"

Drawn By: AS
Reviewed By: LP
Date: 2021-04-13

McCallum Environmental Ltd.

Document Name: BD_EIS_Figure6-8-XWetlandsMRDischarge

Beaver Dam Mine Project Environmental Impact Assessment
Information Request Responses, Round 2

Round 2 Information Request Number:	NSE-2-177
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Wetlands
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Table 6.8-4 Wetland Functional Information, Pg. 362

Context and Rationale

Table identifies existing stressors on wetlands related to forestry and recreational trails.

The Proponent is Required to …

Given potential for historical mining in the region, what information was used to determine if historical mining stressors are present within or near wetlands on the project site. Have soil and/or water quality results been used to support not including historical mining as a stressor to wetland habitat. If so, provide rational.

Response

Historical tailings have been assessed within the updated the Phase I and II Limited and Expended (Appendix E.6 (Phase I - Environmental Site Assessment), Appendix E.7 (Limited Phase II - Environmental Site Assessment), and Appendix E.8 (Extended Phase II - Environmental Site Assessment) of the Updated 2021 EIS (AMNS 2021).

Tailings from historic mining operations were assessed and mapped within the PA, through soil test pit and water quality analysis Underclaimed tailings may contain elevated levels of arsenic and mercury, although mercury was not identified at levels exceeding NSE Tier 1 Environmental Quality Standards (Appendix E.8 Table 6, PDF page 24 of the Updated 2021 EIS). These reports were reviewed with consideration of wetland interactions. Where applicable, historical tailings with arsenic impacted soil have been included as a potential stressor. Wetlands within or near mapped areas of historic tailings with arsenic impacted soil are identified in Table 6.8-5, page 6-354 of the Updated 2021 EIS (AMNS 2021). These wetlands include Wetlands 8, 14, 56, 59, 60, 61, 210 and 215. Of these, Wetlands 56, 59 and 60 are proposed for complete alteration, Wetlands 14, 61 and 216 are proposed for partial alteration, while no direct impacts are planned for Wetlands 8 and 210.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

Round 2 Information Request Number:	NSE-2-178
Regulatory Agency/Indigenous Community:	NSE
Topic/Discipline:	Wetlands
EIS Guideline Reference:	*Not Listed*
Revised EIS (February 28, 2019) Reference:	Section 6.8.3.1 Functional Assessment Results Pg. 379

Context and Rationale

Under the Identification of Exceptional Features discussion, the report states an excerpt from the NS Wetland Conservation Policy:

"The [Nova Scotia] Government will consider the following to be WSS:

- All salt marshes;
- Wetlands that are within or partially within a designated Ramsar site, Provincial Wildlife Management Area (crown and provincial lands only), Provincial Park, Nature Reserve, Wilderness Area or lands owned or legally protected by non-government charitable conservation land trusts; • Intact or restored wetlands that are project sites under the North American Waterfowl Management Plan and secured for conservation through the NS– EHJV;

Wetlands known to support at-risk species as designated under the federal Species at Risk Act; (endangered or threatened) or the Nova Scotia Endangered Species Act (endangered or threatened); and, Wetlands in designated protected water areas as described within Section 106 of the Environment Act."

The Proponent is Required to …

Wetlands that support a significant species or species assemblages, high wildlife diversity, significant hydrological value or high social/cultural importance can also be classified as WSS.

Provide a summary tables identifying wetlands that provide high functional significance within discussion of all the function groups listed. Also provide summary table and figure(s) identifying wetlands that will be impacted by the project that provide multiple significant functions, have the potential to provide multiple significant functions, or otherwise support the conditions listed above within the impacted watersheds identified as a result of all project components.

Response

The NS Wetland Conservation Policy states that the province is in the process of developing a system for classifying additional wetlands or wetland types as WSS (NSE 2019). Among the wetland characteristics, functions, and services to be considered during the process are whether the area:

- Supports a significant species or species assemblages (e.g., coastal plain flora);
- Supports high wildlife biodiversity;
- Has significant hydrologic value, or;

- Has high social or cultural importance.

The above functions were considered when evaluating wetland functional assessments.

Table NSE-2-178-1 presents a summary of wetlands assessed to support critical functions (highlighted red in Appendix H.1 of the Updated 2021 EIS [AMNS 2021]) or contain a significant attribute, based on NovaWet SF groups. Specific SFs which identify unique or rare qualities described above were selected to narrow the scope to wetlands observed to support significant functions or SAR/SOCI. Bolded wetlands provide multiple significant functions.

Table NSE-2-178-1: Summary of Wetlands with High Functional Significance

Significant Function (NovaWet SF)	Wetlands with High Functional Significance	
	Beaver Dam Mine Site	Haul Road
Floodplain Association (SF11)	WL **217**	n/a
Drinking Water Protected Area (SF10)	n/a	n/a
Groundwater Recharge (SF19)	WL 7, 18, 55, 58, 209, 221, **222**, 230, 232, 257, 258	WL 70, 84, **85, 88**, 163, 172, 175, 176, 178, **179**, 250, 252, 253, 254, 255, 256
Shoreline Stabilization and Integrity (SF21)	WL **4, 8, 10, 14, 17, 29**, 44, 48, **61, 66**	WL **66**, 69, 74, **76,** 79, **157, 171**
Fish and Wildlife SAR/SOCI (SF27)	WL 2, 8**, 10, 14**, 16, **17**, 19, 29, 42, 51, 53, 54, 56, 57, **59, 61, 64, 66, 205,** 206, 210, **217**, 218, 219, 229, 233, 246	WL **66,** 71, **76, 85, 88**, 89, 98, 110, 113, 129, 136, 142, 143, 148, 151, 156, **157**, 164, 165, 168, **173,** 177, **179**
Flora SAR/SOCI and Significant Community (SF9, 22, 25)	WL **4, 10**, 12, **14, 17, 29**, 33, **64, 205**, 212, 220, **222**	WL 80, 115, 127, **129**, 135, 137, 147, **157**
Social and Cultural Importance (SF6, 8, 12, 29)	WL **61**	WL **171, 173**, 174
Field Identified WSS[a]	WL **4, 14, 17, 29, 59, 205**	n/a

(a) Identified and potential WSS as presented in Section 6.8.4.1.3 – Identification of Exceptional Features.

The bolded wetlands in Table NSE-2-178-1 have been assessed to support multiple unique or rare attributes, and therefore, may provide, or have the potential to provide, multiple significant functions. These wetlands, including the field-evaluated identified or potential WSS (bolded), are presented below in Table NSE-2-178-2 and Figure NSE-2-178-1a to 2-178-1e, with expected direct impacts (i.e., direct habitat alteration) as a result of Project activities. Direct and indirect impacts to wetlands with significant functions are discussed in Sections 6.8.7.1, page 6-390 – Wetland Impacts of the Updated 2021 EIS (AMNS 2021).

Table NSE-2-178-2: Direct Impacts to Wetlands with Multiple Significant Functions

Wetland ID	PA Component	Wetland Area[a] (m^2)	Estimated Direct Impact Area (m^2)	Direct Impact Type[b]
4	**Beaver Dam Mine Site**	**13,139**	**0**	**-**
8	Beaver Dam Mine Site	16,603	0	-
10	Beaver Dam Mine Site	18,817	3,565	P
14	**Beaver Dam Mine Site**	**31,655**	2,953	**P**
17	**Beaver Dam Mine Site**	**76,341**	5,967	**P**
29	**Beaver Dam Mine Site**	**112,835**	0	**-**
59	**Beaver Dam Mine Site**	**28,233**	**28,233**	**C**
61	Beaver Dam Mine Site	1,618	676	P
64	Beaver Dam Mine Site / Haul Road	48,353	49	P
66	Beaver Dam Mine Site / Haul Road	70,998	1,795	P
76	Haul Road	10,406	398	P
85	Haul Road	322	10	P
88	Haul Road	409	0	-
129	Haul Road	2,006	15	P
157	Haul Road	7,006	714	P
171	Haul Road	4,329	0	-
173	Haul Road	4,814	1,308	P
179	Haul Road	3,376	796	P
205	**Beaver Dam Mine Site**	**45,975**	**31,997**	**P**
217	Beaver Dam Mine Site	5,230	153	P
222	Beaver Dam Mine Site	7,788	7,788	C
Total		**510,253 m^2 (51.0 ha)**	**86,417 m^2 (8.6 ha)**	**No proposed alteration 5** **Partial alterations 14** **Complete alterations 2**

Note: Identified and potential WSS are in **BOLD**.

[a] Wetland area within PA.

[b] P – Partial habitat loss of wetland. C – Complete habitat loss of wetland.

References

AMNS (Atlantic Mining NS Inc.). 2021. Updated Environmental Impact Statement. Beaver Dam Mine Project. Submitted to the Impact Assessment Agency of Canada and Nova Scotia Environment. October 2021. Middle Musquodoboit, NS.

NSE (Nova Scotia Environment). 2011. Nova Scotia Wetland Conservation Policy. September 2011. Revised in 2019. 27 pp.