Atlantic Gold

# Appendix E.5

DRAFT Beaver Dam Mine ML/ARD Management Plan – August 8, 2019
Completed for the Updated 2021 Beaver Dam Mine EIS

# Beaver Dam Mine ML/ARD Management Plan

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# *Document Revision Record*

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# 1. Introduction

# 1. Introduction

## 1.1 Project Background

The Beaver Dam project is a proposed gold mine owned by Atlantic Mining Nova Scotia (AMNS). The property is located in the Moose River Gold Mines District, around 85 km northeast of Halifax, Nova Scotia, and 37 km by road from the currently operating Touquoy gold mine. Based on a cut-off grade of 0.3 g/t Au, the total measured and indicated mineral resource estimate is 9.69 Mt at a grade of 1.26 g/t Au and the mine is expected to produce 391,500 oz. of gold (Atlantic Gold, 2019). Ore will be crushed at Beaver Dam and then hauled to Touquoy for processing.

Geologically, the Beaver Dam deposit falls into the Meguma Terrane which hosts various gold deposits in southern and central Nova Scotia. The main geological units at the site are argillite and greywacke; however, these units are interbedded and intermediate classifications are included in between these two endmembers. Lithological codes for main units encountered on site include ***AR*** (argillite with <5% greywacke), ***AG*** (argillite with 5-49% greywacke), ***GA*** (greywacke with 20-50% argillite), and ***GW*** (greywacke with <20% argillite). Rock with a higher proportion of argillite beds generally have a higher risk of ARD due to the higher overall sulphide content and lower neutralization potential (Lorax, 2018).

This metal leaching and acid rock drainage (ML/ARD) management plan has been prepared in support of the Environmental Impact Statement (EIS) as the need for to management and monitoring of ML/ARD produced by Beaver Dam mine rock and tailings is expected. This ML/ARD management plan is intended to be a living document and will be updated as additional geochemical data become available and/or based on the requirements by regulatory agencies.

Mine rock is herein defined as ore and waste material that is produced by blasting. While ore is either directly processed or temporarily stockpiled for later processing, waste material may be permanently stored in a Waste Rock Storage Facility (WRSF) or is used as construction material for site infrastructure.

Tailings are the fine-grained waste product of the ore extraction process which will occur at the Touquoy mill. Once operations at Touquoy cease, the final Touquoy open pit will serve as the Tailings Management Facility (TMF) for Beaver Dam tailings. The tailings will be saturated and covered by a tailings pond. The well-mixed nature of the tailings materials along with the saturated storage conditions need to be considered when assessing the ARD potential within the TMF. The location of the Beaver Dam project is shown in Figure 1-2 and a site layout map is provided in Figure 1-2.

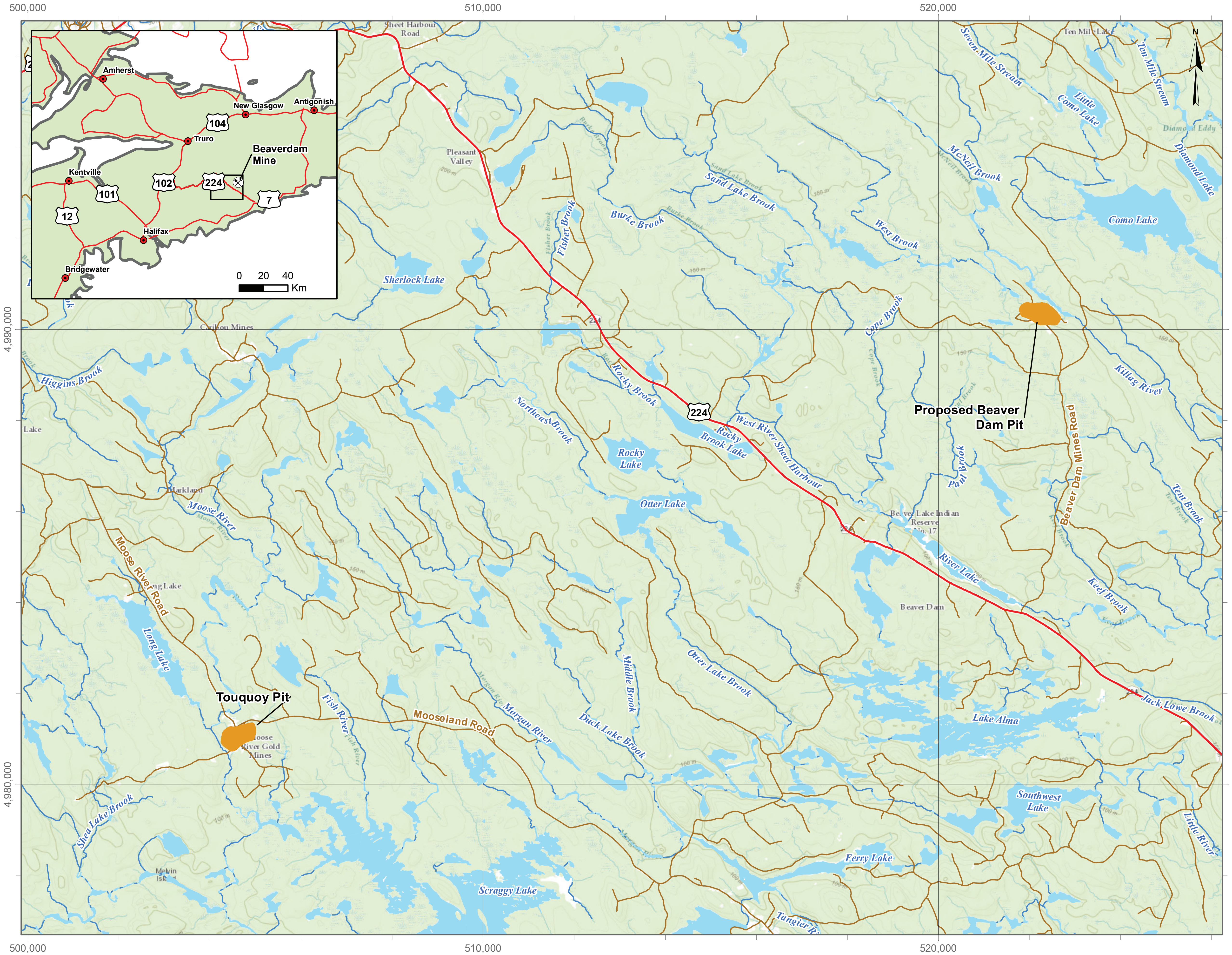
## 1.2 Scope and Purpose

The purpose of this ML/ARD Management Plan is to formalize monitoring procedures as well as to provide guidance to AMNS with respect to best practice ML/ARD mitigation strategies that may be considered should the results from the monitoring program indicate mitigation is necessary. To that end, this document is intended to serve as a geochemical reference guide for the various different activities at the mine that have a direct or indirect impact on ML/ARD-related processes. Ultimately, 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 to be discussed in this 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.

## 1.3 Report Structure

Following the introduction and background provided in this chapter, Chapter 2 provides an overview of the classification of ML/ARD potential at Beaver Dam. Chapter 3 covers the specific roles and responsibilities of personnel involved in ML/ARD management. Chapter 4 summarizes the monitoring and management requirements for waste rock and tailings and lastly, Chapter 5 outlines the reporting requirements.




## LEGEND

- Pit
- Local Road
- Highway

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

**1:80,000**

0 1 2 Km

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| **DATE SAVED:** | Jul 15, 2019 |
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| **REVIEWED:** | JO |
| **VERSION:** | 1 |

CLIENT:

ATLANTIC GOLD

LORAX ENVIRONMENTAL

PROJECT:

**Beaver Dam IR Geochemistry Support**

TITLE:

Location of the Beaver Dam Gold Project

PROJECT #: A458-2 FIGURE: 1-1

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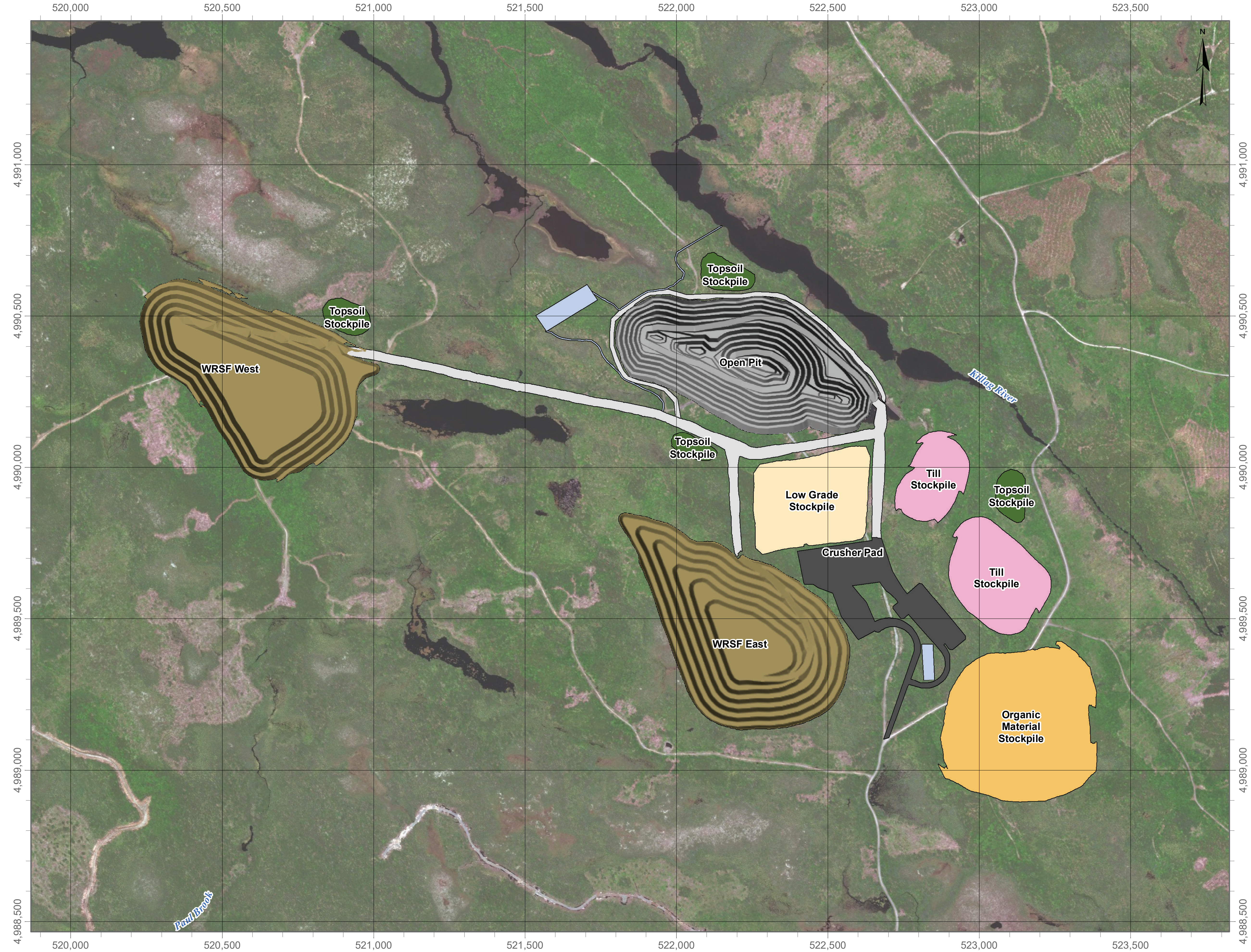


**LEGEND**

- Low Grade Stockpile
- Open Pit
- Crusher Pad
- Organic Material Stockpile
- Road
- Topsoil Stockpile
- Till Stockpile
- WRSF
- Water Management

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

1:12,000

0 200 400 Meters

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ATLANTIC GOLD

LORAX ENVIRONMENTAL

PROJECT:

**Beaver Dam IR Geochemistry Support**

TITLE:

Beaver Dam Site Layout

PROJECT #: A458-5 FIGURE: 1-2

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# *2. Classification of Metal Leaching & Acid Rock Drainage Potential*

# 2. Classification of Metal Leaching & Acid Rock Drainage Potential

The ML/ARD potential of the various geologic materials at Beaver Dam has been previously assessed through geochemical testing (Lorax, 2018). Both static and kinetic were conducted on the Beaver Dam mine rock and tailings. The results indicate that, although the sulphide contents at Beaver Dam are low, there is some potential for ML/ARD and operational in-pit and confirmatory sampling is warranted.

The ML/ARD potential for the operational monitoring samples will be classified using acid-base accounting (ABA) results. These analyses are expected to be performed externally at an accredited laboratory.

## 2.1 Neutralization Potential (NP) Determination

The geochemical characterization program included both modified neutralization potential (modified NP) and carbonate neutralization potential (CaNP) (Lorax, 2018). Modified NP provides a bulk measurement of NP. The CaNP is calculated from the total inorganic carbon (TIC) content as it is assumed that the inorganic C is present as carbonate minerals. For the purpose of this Plan it is recommended that the modified Sobek NP is used for classification of the samples. The modified NP is determined through a titration-based method conducted at room temperature that is not mineral-specific. Therefore, this method inherently accounts for the buffering capacity from non-carbonate minerals as well as the reduced neutralization potential of Fe- and Mn-bearing carbonates (*e.g.*, ankerite, siderite). Silicate minerals that may act as neutralizing agents once carbonate phases are depleted include biotite, chlorite, and certain clay minerals. Calcite was the only carbonate mineral identified in the Beaver Dam kinetic test subsamples (Lorax, 2018).

## 2.2 Acid Potential (AP) Determination

The acid generating potential of a rock sample is estimated based on its sulphur content. The amount of acidity generated per mass of sulphur depends in large part on the mineralogy and solid phase speciation of sulphur. That is, different sulphide and sulphate minerals produce different amounts of acidity when weathered. The sulphide mineralogy of the Beaver Dam samples includes pyrite, pyrrhotite, chalcopyrite, and arsenopyrite, all of which generate acidity in response to oxidative weathering. Due to the lack of acidic sulphate salts in the Beaver Dam mine materials, acid potential (AP) has previously been calculated on the basis of the sulphide sulphur content in a given sample (Lorax, 2018).

Sulphide sulphur was calculated by subtracting the total sulphate by carbonate leach from the total sulphur value.

The AP for the Beaver Dam mine rock is calculated as:

$$AP\ (kg\ CaCO_3/tonne) = 31.25 \times sulphide\text{-}S\ (wt.\ \%)$$

This conversion stoichiometrically accounts for the amount of acidity released per 1% of pyrite contained in the rock material and assumes that all sulphide is available for oxidation. The AP is given in units of kg $CaCO_3$/tonne to allow the direct comparison with NP.

## 2.3 PAG Definition

The likelihood for a sample to generate acidity can be quantified by the comparison of NP and AP. The net potential ratio (NPR = NP/AP) represents a measure that is commonly used to identify whether a sample is PAG or Not Potentially Acid Generating (NPAG). Typically, in agreement with recommendations made in Price (2009), a sample can be considered PAG if the NPR falls below a value of 2, while samples with NPR $\geq$ 2 can be considered NPAG. In other words, according to this classification the NP has to be at least twice as high as the AP in order to render a sample NPAG. This approach is conservative and accounts for the potential partial liberation of carbonate (and other acid-buffering) minerals.

In the initial geochemical characterization (Lorax, 2018), 39% of the samples collected, independent of rock type, were classified as PAG. The argillite (AR) unit had the highest proportion of PAG samples (80%), while the greywacke (GW) unit had the lowest (21%). The spatial discretization of the PAG proportions was subsequently conducted through the incorporation of NPR values into the site's block model. NPR values were interpolated across the deposit, as would be done for gold grades, and the model output was provided to the mine planning team for the calculation of PAG and NPAG tonnages. In comparison with the static test database, this reduced the estimated quantity of PAG to less than 10% of the total waste rock tonnage. Pre-mine supplementary sampling may be necessary to confirm the validity of this approach in areas with a low sample density.

# 3. Roles and Responsibilities

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A summary of the roles and responsibilities for the ML/ARD management sampling programs are provided in Table 3-1. Mine rock sample collection and material management should be undertaken by the Mine Geologist and Mine Operations. Tailings sampling will be conducted by the metallurgists at site. The on-site analyses will include rinse pH, total S and NP. These analyses will be conducted by personnel in the on-site laboratory. The pH monitoring of waste rock and tailings contact water should be conducted by environmental field technicians as part of a large water quality monitoring program at site. Ultimately, the Environmental Manager will review the ML/ARD results from the sampling programs and report to Nova Scotia Environment (NSE), if required.

**Table 3-1:**
**Summary of Roles and Responsibilities**

| Department/Title | Roles and Responsibilities |
|---|---|
| *Grade Control or Blast Hole Sampling* | |
| Mine Geologist | • Collect grade control samples, if possible<br>• If blast hole samples are to be collected, classify the blast material and determine the variability in geology in the blast area<br>• Determine if the sampling density is suitable to characterize the blast<br>• Communicate with Mine Operations & Engineering<br>• Oversee the ML/ARD sampling program |
| Mine Operations & Engineering | • Plan blasting and oversee blasting activities<br>• Appropriate material handling for PAG and NPAG material, once classified |
| Health & Safety | • Review and audit Blast Hole Sampling procedure |
| Environment | • Review ML/ARD sampling results<br>• Notifying Mine Operations & Engineering if PAG material is identified<br>• Make recommendations to Mine Operations & Engineering with respect to material handling of temporarily stockpiled material<br>• Report results to NSE |
| *Tailings Sampling* | |
| Chief Metallurgist | • Review and update tailings sampling procedure |
| Metallurgist | • Review and update tailings sampling procedure<br>• Assist Metallurgical Technician in the undertaking of the sampling procedure |
| Metallurgical Technician | • Perform tailings solid sampling following the sampling procedure |
| Health & Safety | • Review and audit Tailings Solids Sampling procedure |
| Environment | • Review ML/ARD sampling results<br>• Report results to NSE |

**Table 3-1:**
**Summary of Roles and Responsibilities (continued)**

| Department/Title | Roles and Responsibilities |
|---|---|
| *On-Site Analyses* | |
| Laboratory Manager | • Review and update the rinse pH, total S, and NP on-site analytical procedures<br>• Assist the Laboratory Technician in undertaking the analyses<br>• Review the results of the on-site analyses and provide to Environment |
| Laboratory Technician | • Perform the rinse pH, total S, and NP analyses |
| Health & Safety | • Review and audit the analytical procedures |
| *pH and Conductivity Monitoring* | |
| Department/Area Supervisors | • Provide field technicians with necessary tools required to complete the work safely |
| Field Technician | • Collect weekly pH and conductivity measurements of drainage water pumped from the open pit (surface) mine and draining from the waste rock stockpiles<br>• Enter field results into the database |
| Health & Safety | • Review and audit Surface Water Sampling procedure |
| Environmental Manager | • Maintain database for inspection by NSE, if required |

# 4. Monitoring and Management

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# 4. Monitoring and Management

## 4.1 Mine Rock

### 4.1.1 In-Pit Monitoring

Waste rock will be monitored by either collecting grade control samples or blast hole cuttings from within the open pit. To allow for flexibility with respect to material classification and handling, the collection and analysis of ML/ARD monitoring samples should be conducted as early as possible. Two types of samples could be used for the ML/ARD monitoring program operationally, namely grade control and blast hole samples. Grade control samples are preferable as they are generally collected well before blasting occurs and serve the final definition of ore reserves. Conversely, blast holes are drilled only shortly (1 to 3 days) before a blast is executed. This type of sample is acceptable if rapid on-site testing can provide an ARD class for the blasted mine rock before placement in designated storage areas.

The recommended minimum sampling frequencies for in-pit waste rock and construction fill include:

- One sample for every 200,000 tonnes of waste rock mined in-pit; and
- One composite sample for shake flask extraction (SFE) testing per 100,000 tonnes of construction fill material.

ML/ARD potential for the Beaver Dam project will be determined via on-site acid-base accounting (ABA). Parameters determine as part of the operational monitoring program should, at a minimum, include:

- Rinse pH;
- Total sulphur; and
- Modified NP.

In order to obtain rapid results, it is recommended that total S and modified NP are determined at an on-site laboratory. If it is not feasible to determine modified NP rapidly on-site, an NP proxy based on total C may need to be developed.

The NPR (NP/AP) is calculated using the NP and AP. For the on-site testing, total sulphur content will be used as the basis for AP and the calculation of the NPR. For the purpose of this ML/ARD Management Plan, a sample is considered PAG if it shows an NPR < 2 in accordance with recommendations made in Price (2009).

A total sulphur content of 0.15% can be used as a proxy with respect to the geochemical class where samples exceeding this sulphur value have a very high probability of being PAG (Figure 4-1). This relationship can be used for guiding storage considerations and may be refined once NP measurements become available.

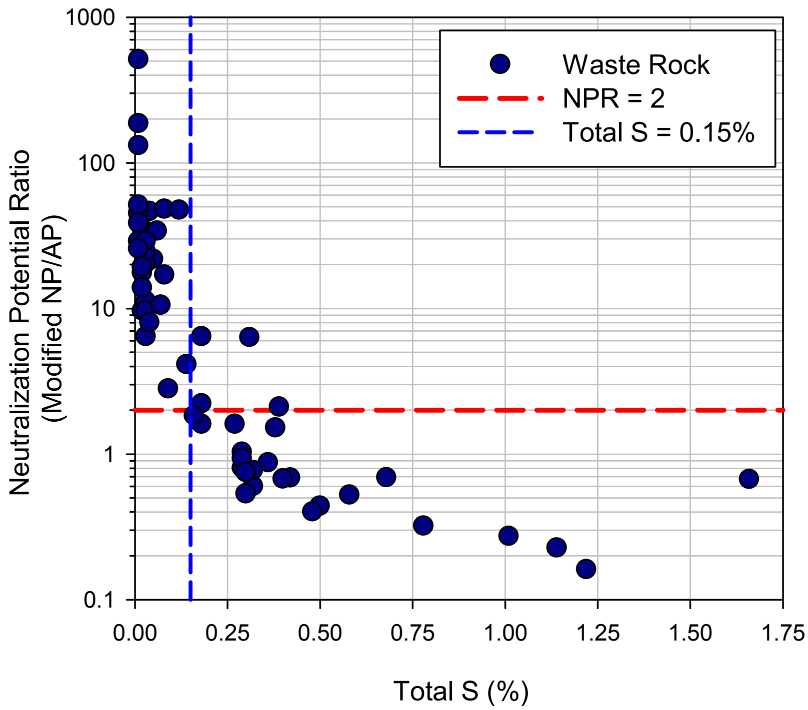


**Figure 4-1: NPR versus total S in Beaver Dam waste rock samples**

### 4.1.2 Material Handling and Management

From an environmental standpoint, three general types of material are expected to be produced during mining, namely NPAG waste rock, PAG waste rock, and ore. While ore will either be processed directly or temporarily stockpiled for later processing (if low-grade), waste material will be hauled to the WRSF for permanent storage or used for the construction of mine infrastructure. Material handling recommendations made in this document are based on industry best practice standards.

#### *4.1.2.1 Waste Rock*

Waste rock within the storage area must be tracked in case it is determined that management is required. If the on-site results indicate that the material is PAG, it should be stored in a separate stockpile (Figure 4-2). If material from a specific mining block contains PAG rock (NPR < 2), one or more of the following material handling strategies may be implemented in order to mitigate the risk for acidic drainage from the Beaver Dam WRSF:

- Strategic placement of PAG material (*i.e.*, away from watercourses);
- Blending of PAG and NPAG materials;
- Encapsulation of PAG within NPAG material; or
- Placement of synthetic or natural cover systems.

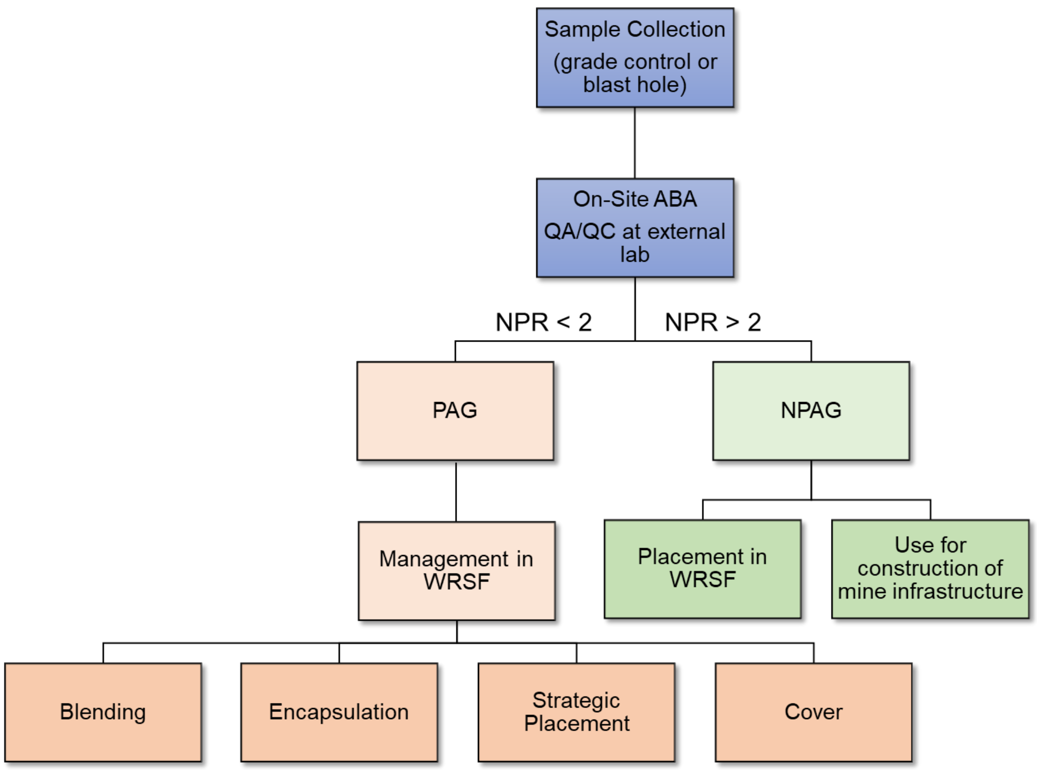


**Figure 4-2: In-Pit Material Handling Decision Tree**

Strategic placement of PAG material

If the total volumes of PAG rock are relatively low, the simplest mitigation strategy would be to strategically place the material in an area within the WRSF or other approved storage area. Segregation of PAG from NPAG material during operations will minimize the volume of material requiring management. At closure, the PAG material could be covered in-place or re-handled and deposited in the pit. The prediction of PAG zones and volumes within the undeveloped portions of the pit is important for this mitigation strategy to accommodate for early planning, segregation and design considerations.

Blending of PAG and NPAG materials

The objective of blending PAG and NPAG materials is to obtain a NPAG composite. The principle of the method is based on the principle that excess NP in the NPAG material will neutralize the acid produced by the PAG material. A good understanding of the variability in NP and AP for both PAG and NPAG material is required in order to determine the proportions of PAG and NPAG material that will consistently produce a NPAG composite. Generally, since complete mixing of PAG and NPAG rock may not be easily achievable in coarse waste rock materials and zones with higher PAG material concentrations can be expected, the blended layers pile should have a target bulk NPR of ≥ 3. In order to prevent the development of ARD, either the dissolved pore water alkalinity must be sufficient to buffer the generated acidity or the NPAG zones must neutralize any acidic seepage generated by the PAG zones.

Blending has better success where the PAG material has low sulphide S and slow reaction rates. Possible mixing strategies (Figure 4-3) include:

1) Alternate end dumping of NPAG and PAG rock,
2) Alternate lifts of NPAG and PAG rock,
3) Alternate tips of NPAG and PAG rock in multiple lifts, and
4) Encapsulation of PAG within NPAG rock.

With each of the options, suitable thicknesses of the NPAG and PAG layers must be determined. In general, the layered waste rock in each of these methods is placed over a thicker NPAG base layer. A PAG layer thickness of 1 m or less should be targeted to prevent the development of hotspots within the dump.

The maximum allowable fraction of PAG rock that would result in a bulk blended NPR of ≥ 3 can be calculated per the following relationship:

$$\frac{[(1-f)\ NP_{NPAG} + f\ \ NP_{PAG}]}{[(1-f)\ AP_{NPAG} + f\ AP_{PAG}]} = 3$$

where $NP_{NPAG}$ is the NP content of the NPAG sample population; $NP_{PAG}$ is the NP content of the PAG sample population; $AP_{NPAG}$ is the AP content of the NPAG sample population; $AP_{PAG}$ is the NP content of the NPAG sample population; and *f* is the maximum allowable PAG fraction. Solving for *f*, this equation can be re-arranged as follows:

$$f = \frac{[NP_{NPAG} - 3\ AP_{NPAG}]}{[3\ AP_{PAG} - 3\ AP_{NPAG} - \ NP_{PAG} + NP_{NPAG}]}$$

Using median AP and NP results for the PAG and NPAG populations from the Beaver Dam waste rock static test database, the maximum allowable PAG proportion in the blended waste rock facility would be 39% or 61% NPAG. Assuming a 0.5 m thick PAG layer, this translates into a required NPAG layer thickness of >0.8 m. Based on the current estimates for PAG proportions within the pit boundaries, this ratio is achievable even when accounting for the reduction of available NPAG waste rock for construction purposes. However, additional pre-mine geochemistry data is recommended to confirm the block modelling results as well as static test statistical values for the PAG and NPAG populations.

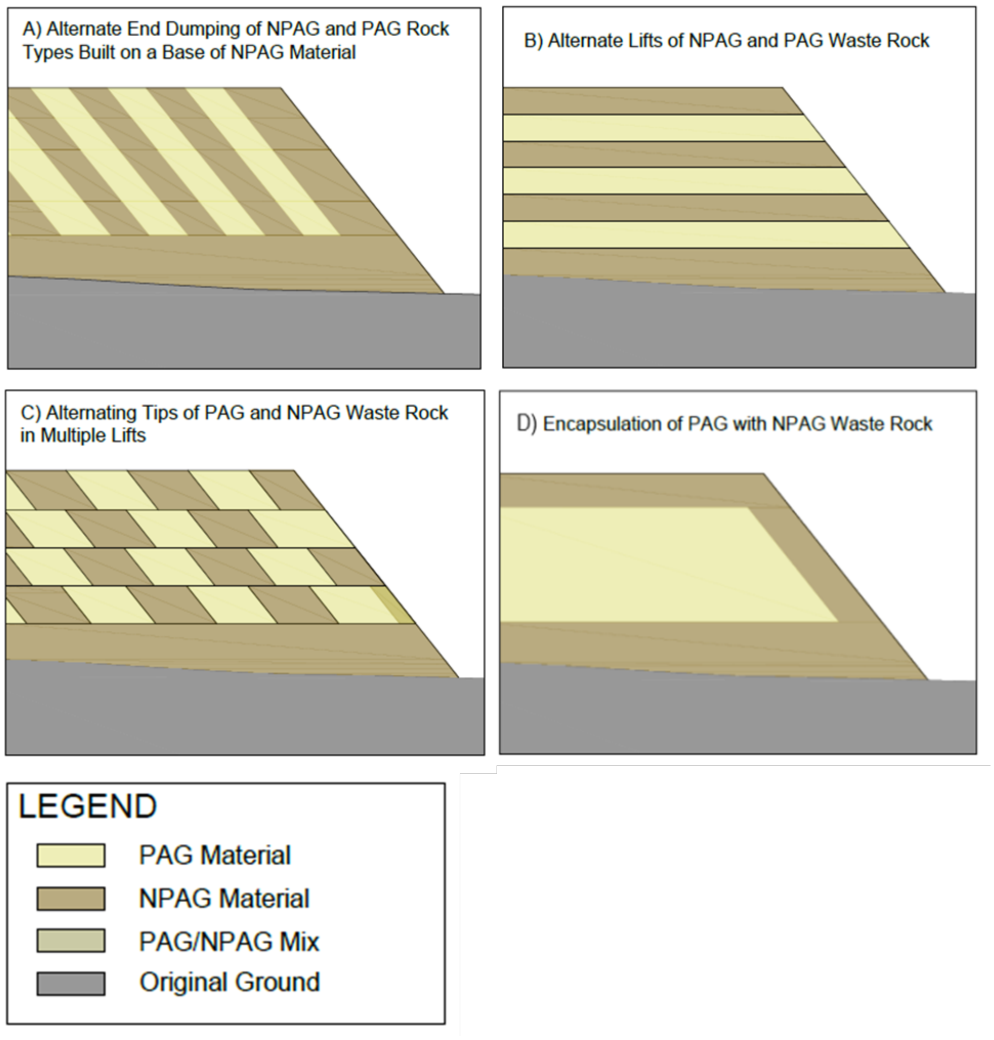


**Figure 4-3: Schematic cross sections of different approaches to blending NPAG and PAG material.**

<u>Encapsulation of PAG within NPAG material</u>

Encapsulation is a specific type of blending option that requires PAG material to be entirely enclosed by NPAG material. This decreases the exposure of the PAG material to both water and oxygen and provides alkalinity before and after water comes in contact with the PAG zone. In order to be effective, any acidic seepage generated by the PAG material must be neutralized by the encapsulating NPAG material. In this regard, similar considerations to blending PAG and NPAG material are required, including the placement of a layer of NPAG material that provides sufficient alkalinity to neutralize any acidity produced by the PAG rock. When choosing such WRSF areas, strategic placement of the PAG core as far as possible away from the receiver should be considered.

Synthetic or Natural Covers

Covers will only be considered if the other management options are not suitable for the material excavated at site (i.e., if the acid generating potential of the material is higher than expected). Covers over PAG material limit ML/ARD by reducing the exposure of the PAG material to water and oxygen. These can include geosynthetic covers or geomembranes as well as natural covers made of low hydraulic conductivity material such as till or clay or store and release covers. The covers must be carefully constructed in order to meet the design objectives and may require regular inspection for potential damage.

The benefits of cover placement are twofold. First, the cover will shed precipitation and thereby reduce the infiltration rate and net percolation within the WRSF. The resulting lower seepage rates will result in a reduction of the overall geochemical load being released from the WRSF which facilitates water management or treatment, if necessary. Second, both synthetic and natural covers may be designed to act as an oxygen barrier that slows the diffusion of oxygen into the waste pile. Once pore water oxygen is depleted by sulphide oxidation, the slow replenishment of oxygen through the cover will result in a lower proportion of the WRSF being exposed to oxygen. As such, the risk for ARD developing in the pile is reduced.

#### *4.1.2.2 Ore*

Material classified as ore will either be processed directly or transported to the low-grade ore stockpile for temporary storage. Based on the current knowledge of Beaver Dam ore, these materials contain sufficient NP to buffer acidity at circum-neutral pH levels for the duration of the operating mine life until re-handling and processing is initiated prior to closure. Therefore, no special handling considerations are currently proposed. Should continued operational monitoring indicate contiguous areas of low-NP PAG material, a geochemical investigation into the lag time to onset of ARD and potential mitigation measures will be triggered. In addition, if unforeseen circumstances render the low-grade ore stockpile uneconomic effectively making it a permanent waste rock facility, then ARD mitigation measures will need to be re-evaluated and implemented as necessary.

### 4.1.3 Verification Monitoring

Confirmatory sampling of placed waste rock should be conducted in the WRSF and in areas where waste rock is used for construction. This sampling program will comprise surface sampling along freshly placed material and will ensure that proper material handling protocols have been implemented and that placement of PAG material has been properly managed. A sampling frequency of one sample per every 400,000 tonnes of material placed is recommended. These samples should be submitted for ABA and aqua-regia digestible metals.

In addition to waste rock sampling, regular surface water monitoring of the waste rock collection ponds as well opportunistic sampling of surface seeps is recommended as part of the verification monitoring for the site. Any ML/ARD influence on the pond water quality would be indicated by a decrease in pH and/or an increase in metal concentrations. Such water monitoring will allow for the early detection of waste rock zones that have turned acidic and trigger adaptive management.

## *4.2 Tailings*

### 4.2.1 Monitoring

The recommended monitoring frequency for tailings samples is one sample for every 100,000 tonnes of ore processed. Tailings slurry samples will be collected from the discharging spigot on the tailings line at the TMF. The slurry is then filtered, and the tailings solids are submitted to the lab for analysis. These samples should be analyzed for ABA at a minimum. Analysis for aqua-regia digestible metals is also recommended.

### 4.2.2 Material Handling and Management

The tailings slurry will be deposited in the final open pit at Touquoy and a water cover will be maintained over the tailings. ML/ARD risk from the Beaver Dam tailings is expected to be limited due to water-saturated storage within the TMF. Ore from Touquoy and Beaver Dam is expected to be similar as the two pits mine ore from the same geologic formation and static test results show that ore generally has similar sulphide sulphur content (0.54 wt. % at Touquoy versus 0.40 wt. % at Beaver Dam). Furthermore, as opposed to blast rock, the acid-producing and -consuming phases in the tailings slurry will be relatively well mixed which generally bears a lower risk of localized ARD generation for a given NPR. Operational experience at Touquoy will be used to develop management strategies for the Beaver Dam tailings, if needed. Nevertheless, should operational monitoring unexpectedly show larger quantities of PAG tailings being deposited in the TMF, potential mitigation strategies include:

- Strategic discharge of PAG tailings slurry into TMF zones that will be immediately and permanently saturated; and
- Blending of high NP ore with ore that produces PAG tailings before processing.

Subaqueous Storage

Storage of PAG material under water cover reduces sulphide mineral oxidation by decreasing the availability of dissolved oxygen; however, there may be impacts to water quality through pH and/or redox-dependent processes. In order to maintain a continual water cover over the PAG material, consideration must be given to the design of the storage facility's water balance and long-term geotechnical stability.

Blending of PAG and NPAG ore

Similar to waste rock blending discussed in Section 4.1.2.1, blending of PAG and NP-rich NPAG ore before being processed will lower the likelihood of tailings being PAG and release ARD during subaqueous storage. This option should be considered if the exposure of tailings beaches is expected for extended periods of time.

## *4.3 Quality Assurance/Quality Control (QA/QC)*

QA/QC measures will be implemented during both the sampling and the geochemical analysis of the blast hole and tailings materials. One in every 10 samples will be submitted to an external laboratory for full ABA and solid phase metals. The full ABA analysis will include sulphur speciation (total S, sulphate S, and sulphide S), total inorganic carbon and modified NP. These results will be compared to the on-site analyses to ensure that the results are in good agreement.

The sampling QA/QC protocol will also include the collection of a replicate sample for every $10^{th}$ blast hole monitoring sample and for every $10^{th}$ tailings sample. The sample collection procedure for the replicate sample should be identical to that for the original sample. Laboratory QA/QC measures will include the implementation of analytical duplicates and the use of certified reference materials.

The field pH probe should be properly maintained and calibrated regularly. Field QA/QC for pH monitoring should include collecting duplicate readings at one in every ten sites. In addition, the field measurements should be compared to laboratory values when water quality samples are collected at these monitoring stations.

# 5. Implementation and Reporting

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# 5. Implementation and Reporting

## 5.1 Record Keeping and Tracking

The Environmental Manager or designate is responsible for the implementation of the ML/ARD Management Plan. The laboratory chain of custody (COC) and raw data files from the laboratory should be kept on file. Field notes and both on-site and external laboratory test results should be compiled into an electronic database. The Environmental Manager or designate will be responsible for the maintenance of the original records and database. Records of ML/ARD assessment testwork and weekly pH measurements for drainage water quality must be available on site for inspection by NSE.

Tracking of lithologies (argillite- versus greywacke-dominated) for the individual blasts is recommended where possible due to the known different geochemical behaviour of the two rock type end-members. A record of the volume, material type, and material placement should be maintained by Mine Operations & Engineering and updated on a regular basis. A copy of the record should be provided to Atlantic Gold's environmental department on a monthly basis. Investigation and corrective action will be undertaken if monitoring data indicates that actual geochemical characteristics are significantly different than expected based on geochemical characterization testwork conducted to date.

### 5.1.1 Monitoring Reporting

A summary of the ML/ARD results and material placement should be provided in the Annual Report. An analysis of the new sampling results should be included and any notable deviations from previous years should be discussed.

### 5.1.2 Incident Reporting

If test results indicate that currently AG rock is encountered, NSE will be notified. The location and volume of AG material should be recorded. At a minimum, an AG sample would trigger confirmatory analysis. Additional monitoring and/or mitigation may be required.

# 6. Closure

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# 6. Closure

This report was prepared by Lorax Environmental Services Ltd. for the exclusive use of Atlantic Mining Nova Scotia. This initial plan has been developed to outline ML/ARD monitoring measures and management options that can be considered for the Beaver Dam project. Please contact the undersigned should you have any questions or comments or require additional information in support of this work.

Sincerely,
**LORAX ENVIRONMENTAL SERVICES LTD.**

Prepared by:

***Original Signed By***

**Jennifer Stevenson, M.Sc.**
Environmental Scientist

***Original Signed By***

**Timo Kirchner, M.Sc., P.Geo.**
Environmental Geoscientist

**Reviewed by:**

***Original Signed By***

**Bruce Mattson, M.Sc., P.Geo.**
Senior Environmental Geoscientist.

# *References*

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