



## **Hammerdown Gold Project – Environmental Preview Report**

Pursuant to the Newfoundland and Labrador *Environmental Protection Act (Part X)*

**Submitted by:**

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Prepared with the assistance of:

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## EXECUTIVE SUMMARY

Maritime Resources Corporation (“Maritime”, or the “Company”) is proposing to develop a new gold mine at their 100% owned Hammerdown Gold Project (the “Project”, or “Hammerdown”) located approximately 5 kilometres (km) southwest of the Town of King’s Point and 15 km northwest of the Town of Springdale, Newfoundland and Labrador (“NL”) in the Baie Verte mining district (Figure 1).

The Project is located primarily on a brownfields site with a history of mining operations. The Project will involve the extraction of gold-rich mineralization from the Property and is envisioned to comprise the following components:

- an open pit and underground mine;
- a waste rock stockpile and low grade ore stockpiles;
- a mobile crushing and ore sorting plant producing 700 tonnes per day of mill feed; and
- water management features including settling ponds, water diversion and catchment structures, and water treatment as required.

Mill feed will be transported and processed at the Nugget Pond Mill (NPM) gold circuit, currently owned and operated by Rambler Metals and Mining Canada Limited (Rambler), for gold doré production and tailings disposal. Maritime will use innovative ore sorting technology at the Project site to reduce the volume of mill feed to the NPM and to reduce the amount of traffic on the roads and associated greenhouse gas emissions. All tailings from the process plant will be stored in the existing licensed tailings storage facility at Nugget Pond. No tailings will be stored at the Hammerdown Project site.

The NPM is located approximately 140 km from the Project site and approximately 6 km west of the recently resettled community of Snook’s Arm in the provincial electoral district of Baie Verte, White Bay. During operations at the Hammerdown mine from 2000-2004, the NPM gold circuit recovered 97-98% of the gold using a conventional carbon-in-pulp leaching circuit. The gold circuit was last used in 2012 by Rambler and has been idle since then. Maritime will provide technical oversight and management of the sorting and processing plant at the NPM gold circuit operations.

A mine life of six years is expected for the Project based on current designs and planned production rates. Over the course of the Project, a total of approximately 310,000 ounces of gold is expected to be produced. An initial capital expenditure of \$57M is required to cover the cost of the Project construction phase, over a 6 to 12 month period. At peak capacity the Project, and associated Project components, are estimated to create over 150 direct employment positions.

Maritime initially submitted this Project to the Environmental Assessment Division (EAD) for review in July 2019. On September 16, 2020, the Minister advised Maritime an Environmental Preview Report (EPR) would be required. EPR guidelines were issued on November 12, 2020 and this document has been written to address issues identified in those guidelines.

Specific topics identified in the EPR Guidelines and addressed in this EPR, include the following:

- Land ownership and zoning in the area of the Project.
- Details, materials, methods, schedule, and location of planned construction activities including:
  - Location and design of planned settling ponds and other hydraulic control infrastructure, and
  - Information regarding Best Available Control Technologies (BACT).
- All aspects of the operation and maintenance including:
  - A Water Management Plan,
  - Commitments re groundwater monitoring and the installation of a real-time water quality/quantity network for surface water/groundwater, and
  - A Waste Management Plan.
- Socioeconomic considerations.
- A Gender Equity and Diversity Plan.
- Analysis of alternatives.
- Summary of environmental effects and mitigation.
- Decommissioning and rehabilitation.
- Project related documents.
- Public Information meeting.
- List of approvals for the Project.

Maritime has designed the Project with consideration for rehabilitation and closure, and undertook environmental baseline studies to inform the design. Static and kinetic geochemical testing has been performed on waste rock at the Project site, and to date, results indicate negligible potential for acid generation or metal leaching, and that most waste rock is essentially inert with much of its buffering potential remaining at the end of the 40 week laboratory testing period. This material was further tested for suitability as construction aggregate and has met specifications for several products, possibly representing a source of aggregate and income for the local community in the future.

Progressive rehabilitation activities are planned to occur over the life of the Project. Closure and rehabilitation activities associated with the Project will be initiated after operations cease and any post closure monitoring activities will be carried out in accordance with the overall Rehabilitation and Closure Plan (RCP) to be submitted.

Maritime is committed to developing an economically viable Project in an environmentally sound manner, and continues to maintain positive relationships with local communities and stakeholder groups.

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## LIST OF ABBREVIATIONS AND TERMINOLOGY

<b>%</b>	Percent
<b>AAQS</b>	Ambient Air Quality Standard
<b>ABA</b>	Acid Base Accounting
<b>ACCDC</b>	Atlantic Canada Conservation Data Centre
<b>Ag</b>	Silver
<b>Al</b>	Aluminum
<b>ANFO</b>	Ammonium-nitrate Fuel Oil
<b>ARD</b>	Acid Rock Drainage
<b>As</b>	Arsenic
<b>Au</b>	Gold
<b>Be</b>	Beryllium
<b>Bi</b>	Bismuth
<b>BMP</b>	Best Management Practice
<b>BIMP</b>	Blast Management Plan
<b>CAC</b>	Criteria Air Contaminant
<b>CCME</b>	Canadian Council of Ministers of the Environment
<b>Cd</b>	Cadmium
<b>CH<sub>4</sub></b>	Methane
<b>CIP</b>	Carbon in Pulp
<b>CO</b>	Carbon monoxide
<b>CO<sub>2</sub></b>	Carbon dioxide
<b>C of A</b>	Certificate of Approval
<b>COSEWIC</b>	Committee on the Status of Endangered Wildlife in Canada
<b>Cu</b>	Copper
<b>CWCS</b>	Canadian Wetland Classification System
<b>CWS</b>	Canadian Wildlife Service
<b>dBA</b>	A-weighted decibels of sound
<b>DFO</b>	Department of Fisheries and Oceans
<b>DMS</b>	Dense media separation
<b>DP</b>	Development Plan
<b>EA</b>	Environmental assessment
<b>EAD</b>	Environmental Assessment Division
<b>ECCC</b>	Environment and Climate Change Canada
<b>EEM</b>	Environmental Effects Monitoring
<b>EML</b>	Exempt Mineral Land
<b>EMP</b>	Environmental Management Plan
<b>EPR</b>	Environmental Preview Report
<b>EPP</b>	Environmental Protection Plan
<b>ERP</b>	Emergency Response Plan

<b>ES</b>	Exposed Site
<b>F</b>	Fluoride
<b>Fe</b>	Iron
<b>FAL</b>	Freshwater Aquatic Life
<b>GEDP</b>	Gender Equity and Diversity Plan
<b>GHG</b>	Greenhouse Gas
<b>GHGRP</b>	Greenhouse Gas Emissions Reporting Program
<b>GLC</b>	Ground level concentration
<b>GNL</b>	Government of Newfoundland and Labrador
<b>gpt</b>	Grams per tonne
<b>Ha</b>	Hectares
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>IT</b>	Information Technology
<b>kBcm</b>	Thousand banked cubic metres
<b>kg</b>	Kilogram
<b>km</b>	Kilometre
<b>km/hr</b>	Kilometre per hour
<b>kt</b>	Kilotonne
<b>kV</b>	Kilovolt
<b>kVA</b>	Kilovolt Ampere
<b>LOI</b>	Letter of Intent
<b>LOM</b>	Life of Mine
<b>m</b>	Metre
<b>m<sup>2</sup></b>	Square metres
<b>m<sup>3</sup></b>	Cubic metres
<b>MASL</b>	Metres above sea level
<b>MBCA</b>	<i>Migratory Birds Convention Act</i>
<b>MBGS</b>	Meters Below Ground Surface
<b>MEND</b>	Mine Environment Neutral Drainage
<b>MGGA</b>	<i>Management of Greenhouse Gas Act</i>
<b>MGGR</b>	<i>Management of Greenhouse Gas Regulations</i>
<b>ML</b>	Metal Leaching
<b>MinL</b>	Mineral lease
<b>Mm<sup>3</sup></b>	Million Cubic Metres
<b>Mn</b>	Manganese
<b>Mt</b>	Million tonnes
<b>mtpd</b>	Metric tonnes per day
<b>MW</b>	Megawatt
<b>NAG</b>	Non Acid Generating
<b>NAPS</b>	National Air Pollution Surveillance

<b>NH<sub>3</sub></b>	Ammonia
<b>NL</b>	Newfoundland and Labrador
<b>NLCDC</b>	Newfoundland and Labrador Conservation Data Centre
<b>NLDECCM</b>	Newfoundland and Labrador Department of Environment, Climate Change and Municipalities
<b>NLDFLR</b>	Newfoundland and Labrador Department of Fisheries and Land Resources
<b>NLDIET</b>	Newfoundland and Labrador Department of Industry, Energy and Technology
<b>NLDTW</b>	Newfoundland and Labrador Department of Transportation and Works
<b>NL EPA</b>	Newfoundland and Labrador <i>Environmental Protection Act</i>
<b>NL ESA</b>	Newfoundland and Labrador <i>Endangered Species Act</i>
<b>NLOA</b>	Newfoundland and Labrador Outfitters Association
<b>NL OHS</b>	Newfoundland and Labrador <i>Occupational Health and Safety Act</i>
<b>NLSF</b>	Newfoundland and Labrador Snowmobile Federation
<b>NLTCII</b>	Newfoundland and Labrador Department of Tourism, Culture, Arts and Recreation
<b>N<sub>2</sub>O</b>	Nitrous oxide
<b>NOC</b>	National Occupation Classification
<b>Non-PAG</b>	Non Potentially Acid Generating
<b>NOX</b>	Nitrogen Oxides
<b>NP</b>	Neutralizing Potential
<b>NSF</b>	Newfoundland Snowmobile Federation
<b>O<sub>3</sub></b>	Ozone
<b>oz/t</b>	Ounces per tonne
<b>PAG</b>	Potentially acid-generating
<b>PAO</b>	Provincial Archaeology Office
<b>ppb</b>	Parts Per Billion
<b>Pb</b>	Lead
<b>PDAC</b>	Prospectors & Developers Association of Canada
<b>PES</b>	Potential Explosion Site
<b>PM</b>	Particulate Matter
<b>PM<sub>2.5</sub></b>	Particulate matter less than 2.5 microns
<b>PM<sub>10</sub></b>	Particulate matter less than 10 microns
<b>PPD</b>	Pollution Prevention Division
<b>QP</b>	Qualified Professional
<b>RAA</b>	Revenue Administration Act
<b>RCP</b>	Rehabilitation and Closure Plan
<b>RQD</b>	Rock Quality Density
<b>ROM</b>	Run of Mine
<b>S</b>	Sulphur

<b>SAR</b>	Species at Risk
<b>SARA</b>	<i>Species at Risk Act</i>
<b>Sb</b>	Antimony
<b>SEOW</b>	Short-eared owl
<b>SO<sub>x</sub></b>	Sulphur oxide
<b>SO<sub>2</sub></b>	Sulphur dioxide
<b>SOCC</b>	Species of Conservation Concern
<b>SOP</b>	Standard Operating Procedure
<b>Te</b>	Tellurium
<b>T/h</b>	Tonnes per hour
<b>TCR</b>	The Climate Registry
<b>TIC</b>	Total inorganic carbon
<b>TMF</b>	Tailings Management Facility
<b>TPA</b>	Tonnes per annum
<b>tpd</b>	Tonnes per day
<b>TPM</b>	Total Particulate Matter
<b>T/m<sup>3</sup></b>	Tonnes per cubic metre
<b>TSP</b>	Total suspended particulate
<b>VOC</b>	Volatile organic compounds
<b>WaMP</b>	Water Management Plan
<b>WD</b>	Wildlife Division
<b>WMP</b>	Waste Management Plan
<b>WNS</b>	White Nose Syndrome
<b>WRMD</b>	Water Resources Management Division
<b>XRT</b>	X-Ray Transmission
<b>Zn</b>	Zinc

## 1.0 PROJECT NAME: HAMMERDOWN GOLD PROJECT

## 2.0 PROPONENT INFORMATION

Maritime Resources Corporation (Maritime or the Company) is a mining company that has 100% ownership of the Hammerdown Gold Project near King's Point, NL.

<b>Name of Corporate Body:</b>	Maritime Resources Corporation
<b>Corporate Address:</b>	1900 - 110 Yonge Street Toronto, ON M5C 1T4
<b>Chief Executive Officer:</b>	Mr. Garrett Macdonald, MBA, P.Eng. President and CEO Telephone: (416) 365 - 5321 Email: gareth@maritimegold.com
<b>Principal Contact Person for the Purpose of EA:</b>	Mr. Garrett Macdonald, MBA, P.Eng. President and CEO 1900 - 110 Yonge Street Toronto, ON M5C 1T4 Telephone: (416) 365 - 5321 Email: gareth@maritimegold.com

## **3.0 THE UNDERTAKING**

### **3.1 Nature of the Project**

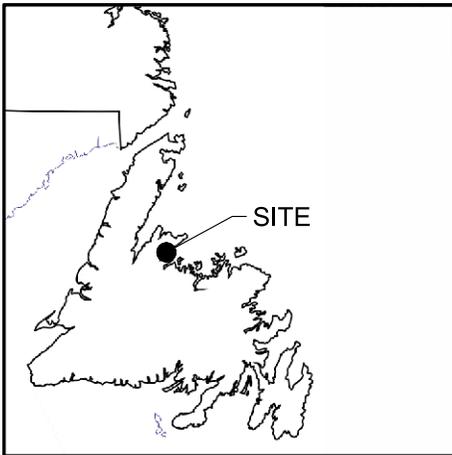
Maritime is proposing to develop a new gold mine at their Hammerdown Property (the Property) located approximately 5 kilometres (km) southwest of the Town of King's Point and 15 km northwest of the Town of Springdale, Newfoundland and Labrador (NL) (Figure 1). The Hammerdown gold deposit is characterized by near-vertical, narrow mesothermal quartz veins containing gold associated with pyrite. The former Hammerdown gold mine was last operated by Richmond Mines between 2000-2004, producing 143,000 ounces of gold at an average mine grade of 15.7 grams per tonne (gpt) Au through a combination of narrow vein open pit and underground mining. The former Hammerdown gold mine ceased operations due to low gold prices and the site was formally closed with all required rehabilitation and closure activities carried out at that time.

The Hammerdown Gold Project (the Project) will involve the extraction of gold rich mineralization from the Property and is envisioned to comprise an open pit mine, an underground mine, a waste rock stockpile, a low grade ore stockpile, a mobile crushing and ore sorting plant, haul road, and associated operational infrastructure including water management features. Existing all-weather access roads are in place and will require only minor upgrading. The Project covers approximately 90 hectares (ha) of the Hammerdown mine site.

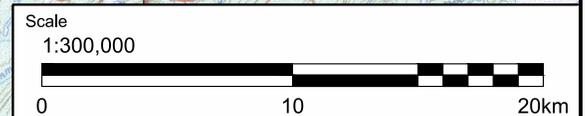
The current design of the Project will see total ore production of approximately 2.1 million tonnes (Mt) and 28.8 Mt of waste rock. Development activity at the mine site will include site clearing, removal of overburden (glacial till), drilling and blasting of the exposed rock, development of underground workings, crushing and sorting of ore material and transportation offsite to an existing processing plant.

The crushing and ore sorting plant will be designed to produce 700 tonnes per day (tpd) of product feed that would be transported and processed at the Nugget Pond Mill (NPM) gold circuit for gold doré production. Tailings will be stored in the existing, licensed Tailings Management Facility (TMF) at the NPM facility. The NPM is located approximately 140 km from the Project site and approximately 6 km west of the recently resettled community of Snook's Arm in the provincial electoral district of Baie Verte, White Bay. Maritime plans to own and operate the gold plant and associated infrastructure at the NPM (e.g., grinding mill, chemical storage), and will provide all technical oversight and management of its operation.

Following Project construction (approximately 6-12 months), the operations phase will last approximately six years based on currently planned production rates. The Project will operate 12 months a year, 24 hours (hrs) per day, seven days per week on a 12-hour shift basis. Additional exploration work is ongoing at the Hammerdown deposit area and if additional resources are identified, there is a potential that the life of mine (LOM) could be extended.



Note:  
 1. Topographic maps 12H and 02E, source GeoGratis (Government of Canada).  
 2. Coordinate system: NAD83 UTM Zone 21.



Project <b>ENVIRONMENTAL PREVIEW REPORT HAMMERDOWN GOLD PROJECT</b>			Drawing <b>PROJECT LOCATION</b>		 
Drawn By <b>CHG</b>	Date <b>February 2021</b>	Project No. <b>80044.12</b>	Drawing No. <b>FIGURE 1</b>	Revision No. <b>0</b>	

Progressive rehabilitation activities will take place during mine operations, and final closure and rehabilitation activities associated with the Project will take place after mine operations have ceased. Post-closure monitoring activities will be carried out in accordance with the overall Rehabilitation and Closure Plan (RCP) that will be in place for the Project.

Maritime will initiate construction activities upon receipt of all required permits beginning in late 2021 and 2022. Maritime recognizes there may be some constraints relative to the Project as a result of potential COVID-19 restrictions. Safety precautions will be developed and implemented to limit the potential for COVID-19 transmission.

Maritime registered the Project for environmental assessment (EA) in July 2020 under the NL *Environmental Protection Act* (NL EPA) (GNL 2002). Following public and governmental review of the EA Registration, the Minister of the Department of Environment, Climate Change and Municipalities (DECCM) issued a decision on September 16, 2020 calling for further review of the Project in the form of an Environmental Preview Report (EPR).

### **3.2 Purpose/Rationale/Need of the Project**

Maritime plans to construct and operate a new gold mine on the site of a former operating gold mine and in 2020 completed an independent Preliminary Economic Assessment (PEA) of the Project. The PEA considered market opportunities, risks such as precious metal commodity pricing, mining costs and various other financial factors. The results of this study strongly indicate that the Project is economically viable (WSP 2020). As such, it is Maritime's view that this Project presents an opportunity to create a positive return on investment for its shareholders and sustainable economic growth in the region without adverse environmental effects.

The Project may be initiated once all regulatory approvals and authorizations are in place, including a construction decision by the Company and the arrangement of any required project financing.

## 4.0 PROJECT DESCRIPTION

The Project involves the construction, operation and closure of an open pit and underground gold mine at a predominantly brownfield mine site near the Town of King's Point, NL. Ore from the mine will be trucked to a crushing and pre-concentration ("sorting") plant at the mine site at a nominal rate of 1,400 tpd. After sorting, the product will be hauled to the existing NPM for final processing to gold doré. Rejects from the sorting plant will be used for mine backfill or placed into the open pit for long term closure. The planned mine life is approximately six years, with approximately 2.1 Mt of run of mine (ROM) mineralized material mined and 1.1 Mt of sorted feed processed. Tailings will be stored in an existing, licensed tailings storage facility at the NPM complex. Waste rock from the open pit will be stored in a stockpile located near the Hammerdown deposit. LOM gold production is estimated to be approximately 310,000 ounces, with an average annual production of 52,000 ounces. Electrical power for the Project is proposed to be provided by the provincial grid, with its closest distribution point located approximately 1 km from the Project site.

### 4.1 Geographic Location

The Project will take place on Crown and municipal land within Maritime's larger Green Bay Property for which the company has a provincial Exploration Approval. The Project site is located within Mining Leases 191 and 237 and all leases and licenses for the Property are in good standing. Maritime also holds surface rights for the planned footprint of the Project (Figure 2). Project components will be located both within and outside the municipal boundary of King's Point (Figure 5). As previously noted by the NL Department of Industry, Energy and Technology (DIET), Maritime will ensure appropriate surface leases, issued in accordance with the *Mineral Act*, are in place to cover the complete footprint of the proposed operation.

Access to the Project site is provided by an all-weather gravel access road from secondary Highway Route 391 (Harry's Harbour Road), which connects to Highway Route 390 (Springdale Road) approximately 7 km to the southeast, and ultimately joins the Trans-Canada Highway approximately 12 km west of South Brook, NL. The overall Project footprint is roughly rectangular in shape, is approximately 2 km long (southwest to northeast), approximately 1 km wide (northwest to southeast) and is centred at Universal Transverse Mercator (UTM) coordinates 554475 East, 5488890 North (NAD83, UTM Zone 21).

The Project is situated along the northern extent of a northeast-southwest trending ridge rising to a maximum elevation of approximately 255 metres above sea level (masl). The ground surface elevation in the Project area ranges from approximately 190 to 240 masl.

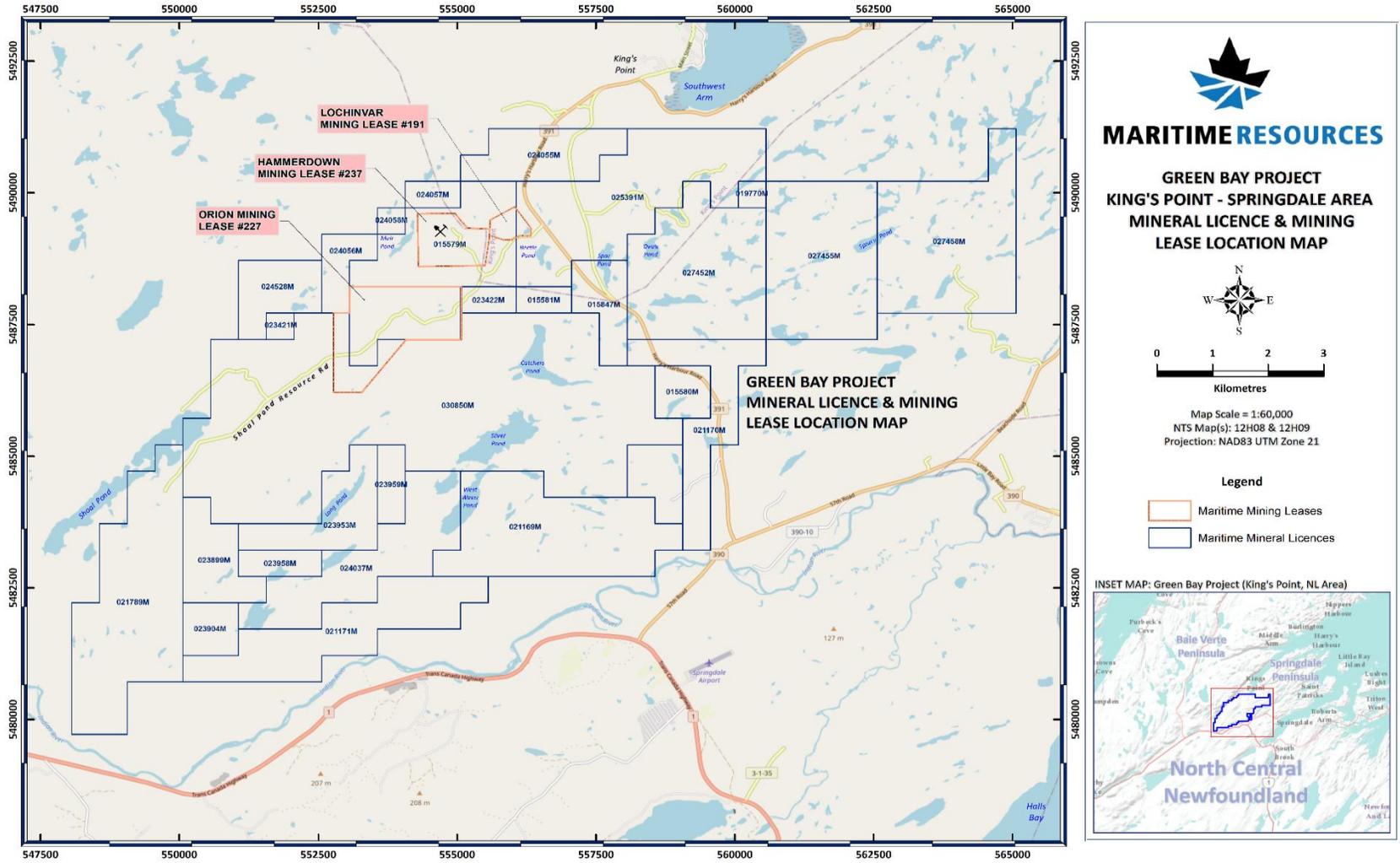


Figure 2: Maritime's Mining Leases

The land to be occupied by active mining features is centred on the footprint of the former Richmond Mines operation (Figure 3). Since it was decommissioned in 2005, the former mine site remains clear of large mature tree cover, with vegetation cover consisting primarily of shorter brush, immature trees, and grasses.

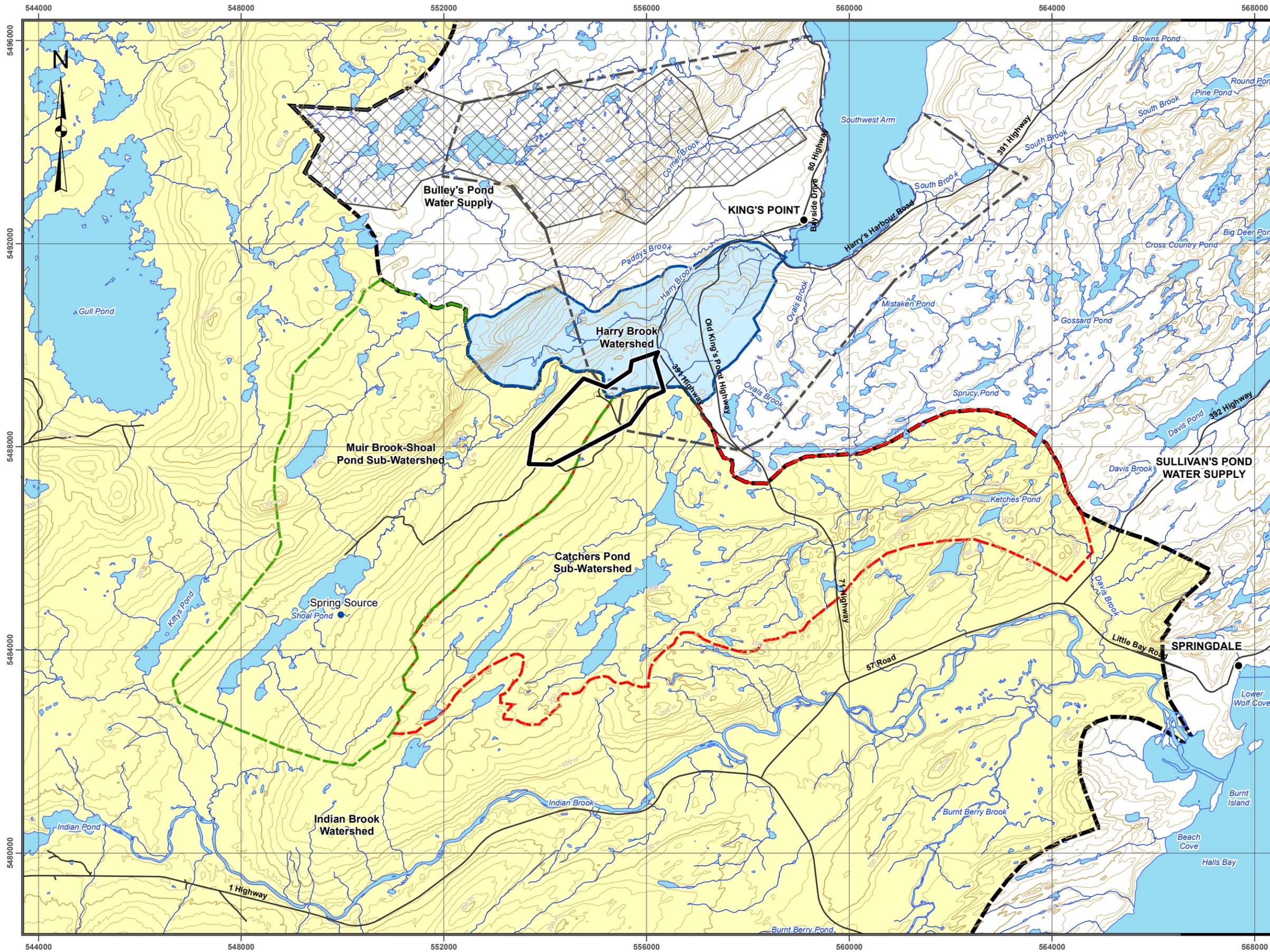


**Figure 3: Aerial Photo of Project Site with Proposed Principal Mine Features**

The Project area is located within three watersheds (Figure 4):

- Harry Brook watershed – located north of the Project with northeast-directed flow within Harry Brook that ultimately drains into Southwest Arm, Green Bay, approximately 4.5 km to the northeast;
- Catchers Pond watershed – located southeast of the Project; and
- Muir Brook-Shoal Pond watershed – located west of the Project.

The Catchers Pond and Muir Brook-Shoal Pond watersheds are both sub-watersheds within the regional Indian Brook watershed, which ultimately drains into Halls Bay, located approximately 14 km to the south in the community of Springdale.



**Legend**

- Spring Source
- Road
- Watercourse
- Water Supplies
- Waterbody
- Topographic Elevation Contour (20m)
- Topographic Elevation Contour (100m)
- Harry Brook Watershed
- Indian Brook Watershed
- Catchers Pond Sub-Watershed
- Muir Brook-Shoal Pond Sub-Watershed
- King Point Municipal Boundary
- Project Footprint

**Notes**

1. This drawing is a schematic representation. Sizes, locations and dimensions are approximate.
2. Coordinate System: NAD83 UTM Zone 21N
3. Topographic data acquired from GeoGratis (Government of Canada).
4. Site infrastructure provided by Maritime.

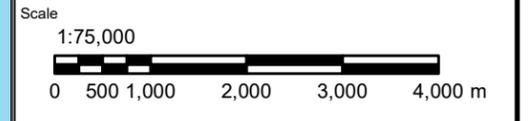
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**Project**

ENVIRONMENTAL PREVIEW REPORT  
HAMMERDOWN GOLD PROJECT

**Drawing**

PROJECT WATERSHED BOUNDARIES



Project No.	Drawing No.	Revision No.
80044.12	FIGURE 4	0

**MARITIME RESOURCES**

**GEMTEC**  
CONSULTING ENGINEERS  
AND SCIENTISTS

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## 4.2 Physical Components

The Project involves permitting, construction, operations, closure and rehabilitation, and post-closure monitoring activities associated with developing and operating an open pit and underground gold mine. Maritime will consider provincial climate change projections for La Scie in the planning and design of this Project. The Project includes the following physical components (Figure 5):

- Open pit mine and associated infrastructure;
- Underground mine and associated infrastructure;
- Overburden storage;
- Waste rock stockpile;
- Crushing and pre-concentration plant;
- Rejects Pile;
- Low-grade ore stockpile;
- ROM ore stockpile;
- Concentrate ore storage;
- Upgrades to existing site roads;
- Electrical and communications infrastructure;
- Temporary buildings: administrative, dry facility, maintenance and storage buildings;
- Weigh scale;
- Explosives Magazine;
- Earthworks for various Project site infrastructure construction; and
- Water use and management infrastructure.

### 4.2.1 Open Pit Mine

Proposed open pit mine development will consume much of the historic workings from previous underground mining.

The overall operations plan for the Project is to commence with open pit mining down to 125 m below surface, after which open pit mining will pause to allow underground mining to commence. Upon completion of underground mining operations, the open pit mine will re-commence operations and mine to an ultimate depth of 165 m below surface.

The mine design and scheduling is intended to provide a nominal 1,400 tpd of ROM feed to the sorting plant to produce 700 tpd of feed for the gold circuit. At Hammerdown, a total of 1.88 Mt grading 4.23 gpt Au with 28.8 Mt of waste rock is expected to be mined over the LOM. Waste rock from the open pit will be stored in a waste rock storage area. A conceptual rendering focusing on the open pit and waste rock stockpile area is presented in Figure 6.

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**LEGEND**

- Project Footprint
- King's Point Municipal Boundary
- ▶ Stream/Creek (Field-Mapped – Not Identified on 1:50,000 Topo)
- ▶ Stream/Creek (Field-Mapped – Identified on 1:50,000 Topo)
- Topographic Elevation Contour (masl)
- Waterbody (Identified on 1:50,000 Topographic Map)
- Wetland (Identified on 1:50,000 Topographic Map)
- Settling Pond
- Contact Water Ditch
- Non-Contact Water Ditch
- Pump from Open Pit
- Culvert
- Explosives Magazine
- Overburden and Organics Stockpile

Note

1. This drawing is a schematic representation. Sizes, locations and dimensions are approximate.
2. Coordinate system: NAD83 CSRC UTM Zone 21 North.
3. Topographic Data acquired from GeoGratis (Government of Canada).

Drawn By	Checked By
JSP	DR
Calculations By	Checked By

Date  
February, 2021

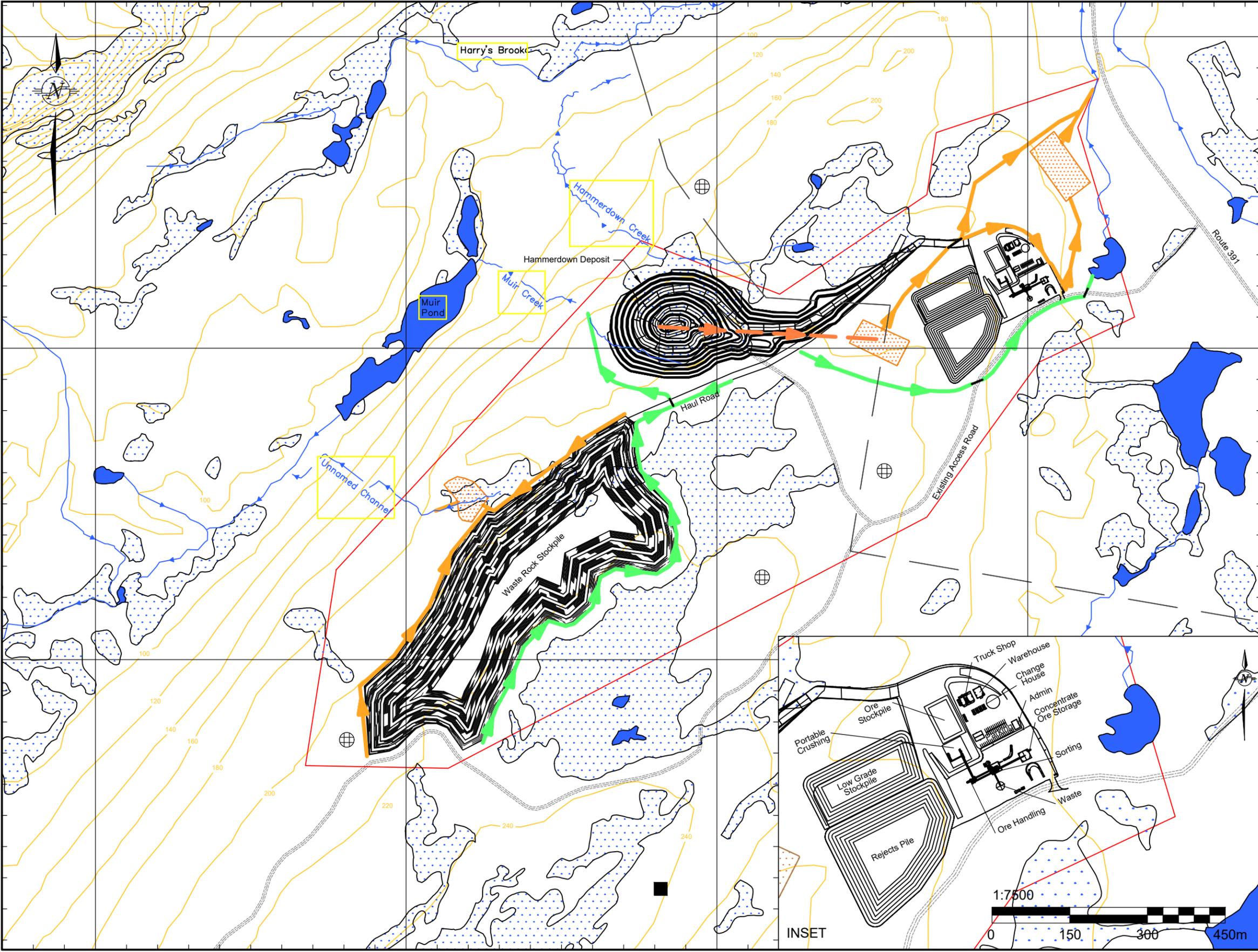
Project  
**Environmental Preview Report  
HAMMERDOWN GOLD PROJECT**

Drawing  
**PHYSICAL COMPONENTS OF  
THE PROPOSED PROJECT**

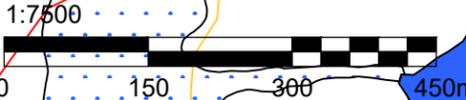
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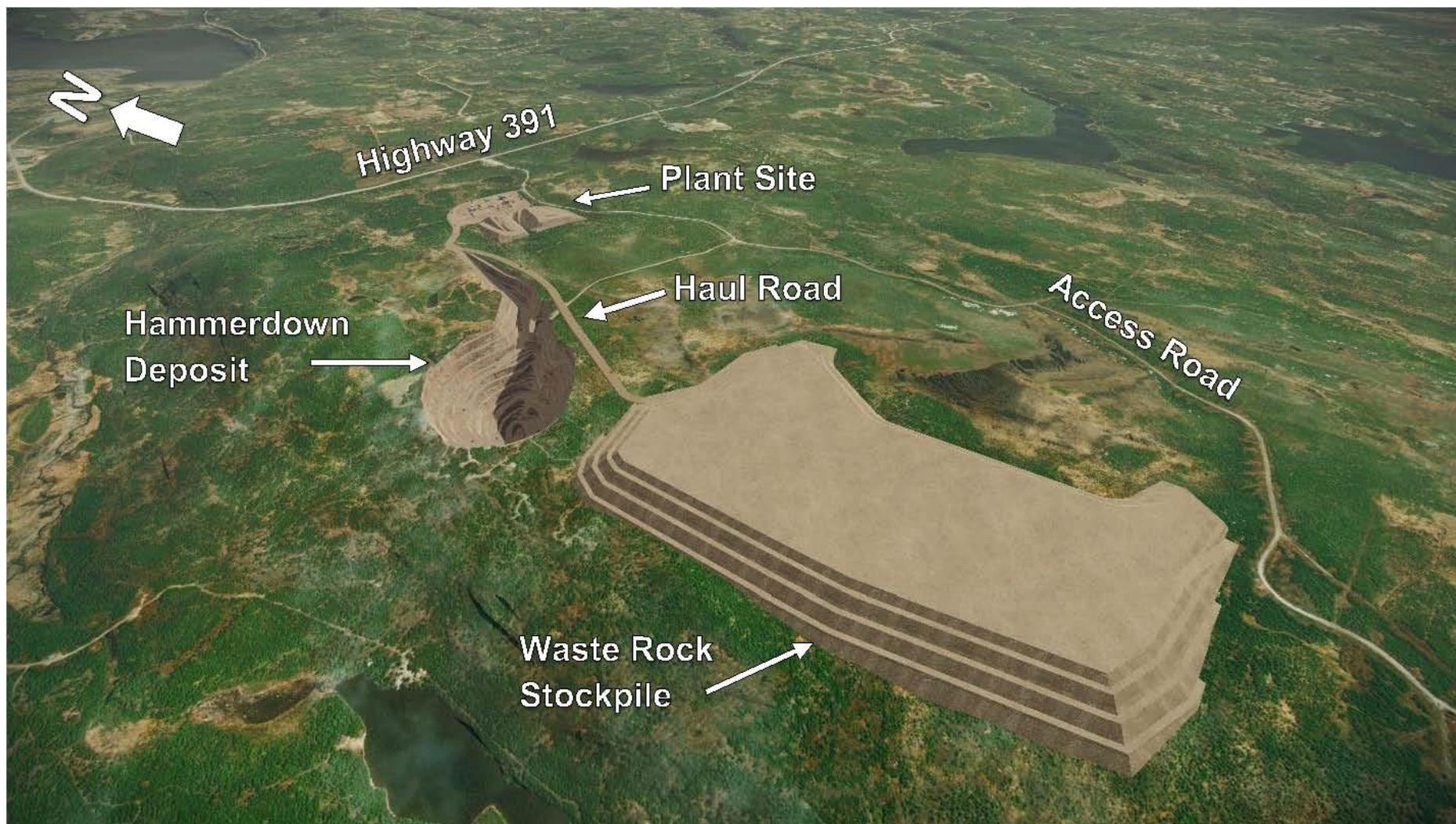


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INSET





**Figure 6: Rendering of Open Pit and Waste Rock Stockpile Area**

#### 4.2.2 Underground Mine

The Hammerdown mineralization targeted for underground extraction is located around and below the remaining historic underground workings. The underground mine design at Hammerdown is based on utilizing narrow vein, longhole open stoping to extract the mineralized veins, with stope widths varying between 1.5-3.0 m, and to an ultimate depth of 252 m below surface.

Due to the relatively high grades at Hammerdown, the majority of the underground stopes will be mined by standard longhole stoping methods between an upper and lower stope sill drift, and the stopes will be backfilled with uncemented rockfill. This stoping methodology removes the requirement for unrecoverable sill pillars between stoping levels, and thus maximizes resource recovery of this higher-grade resource. Approximately 76% of the Hammerdown stopes will be mined by the conventional longhole stoping method and the remaining 24% will be mined by blind up-hole methods. The historic ramp access development will be used to provide access to new mining areas and a permanent ramp portal will be accessed from the open pit ramp into the northern wall of the open pit. This location was selected to ensure potential destabilization of the open pit due to subsequent underground mining would not affect the main ramp portal.

A second temporary mine portal will be established on the floor of the paused open pit, 125 m below surface elevation to provide early access to the existing historic ramp access development.

The primary ventilation arrangement will comprise a single return air raise (RAR) developed in two legs. The ventilation raise arrangement will also serve as a secondary means of egress from the underground mine. A short horizontal ventilation drift connects the top of the raise to the open pit ramp. The primary ventilation fan is located at the top of the ventilation raise arrangement and exhausts into the open pit through the short horizontal connection to the pit wall.

Additionally, several short ventilation raises and associated development have been incorporated into the mine layout to provide local through-ventilation on some new levels to the north of the historic stoping area. Each stoping level will incorporate storage and electrical bays, and a local sump, as well as two production mucking bays to allow ROM material to be truck loaded from each active level and hauled to surface.

Sublevels will be set at 16 m intervals and mineralized material will be extracted and hauled to surface by 20 tonne trucks, after which it will be transported to the sorting plant by the surface mine fleet. The mine plan utilizes some of the existing underground development below the open pit to provide access to the mineralization. Backfilling of open stopes will be completed using crushed, uniform reject material from the sorting plant.

Over the LOM, the total ROM production from the Hammerdown underground workings will be 0.21 Mt of mineralized material grading 7.58 gpt Au (Table 1).

**Table 1: Hammerdown Open Pit and Underground Design**

Production Summary	
Open pit mineralized tonnes (Mt)	1.88
Open pit average Au grade (gpt)	4.23
Open pit Au ounces contained (oz)	258,100
Strip ratio (waste: mineralized)	15:2
Open pit waste rock (Mt)	28.8
Underground mineralized tonnes (Mt)	0.21
Underground average Au grade (gpt)	7.58
Underground Au ounces contained (oz)	51,500

#### 4.2.2.1 Surface Infrastructure for Underground Mine

Ventilation fans will be installed on return air raises in a pull-type ventilation system. Fresh air will be heated by a propane mine air heater. Propane will be stored in a tank close to the fans. Instruments will be installed in the fresh air raise to detect propane leakage, verify the flow of air, monitor air temperature and detect carbon monoxide.

A manual stench gas system will also be installed in the fresh air raise to provide evacuation alarming when required for the underground mine.

A compressed air system will be installed to support underground activities. The system will supply air to mining equipment and services and will be installed near the mine portals. All the equipment will be skid-mounted to reduce installation costs. To avoid a water loop, the compressors will be air-cooled.

#### 4.2.3 Overburden Handling and Storage

The overburden in the project area consists primarily of till comprising very loose to compact, silty sand with occasional gravel and cobbles, and clay occurring both as a thin discontinuous veneer and more extensive plain deposits. The average overburden thickness is approximately 2.4 m. Along with glacial deposits, poorly-drained organic and peaty soils are common in the Project area, overlying either till or bedrock (GEMTEC 2019b).

Trees in the area of the open pit, waste rock stockpile and the plant and ore storage area will be cut and/or mulched in accordance with applicable guidelines. Organics will be removed from these locations as well; however overburden will only be removed from the open pit area. These materials will be stored in strategic locations throughout the site and used to rehabilitate various areas of the site during progressive rehabilitation or upon mine closure. Peat, topsoil and mulched

vegetation in the development area will be segregated from the underlying glacial till and stockpiled separately from the glacial till soils.

The planned locations of the overburden stockpiles are shown in Figure 5. Estimated overburden volumes for the open pit, underground mine, waste rock stockpile area and ore stockpile are listed in Table 2. Dumped material is assumed to have a swell factor of 1.30 (i.e., volume increase from in-situ after excavation and dumping).

Based on the results of ongoing Acid Rock Drainage Metal Leaching (ARDML) (Appendix A) testing, stockpile areas for material with potential for ARDML will be designed appropriately with a means for containment and collection of drainage. Results of laboratory testing have shown low potential for ARDML in waste rock and overburden and no long term storage concerns are anticipated. All drainage from the waste rock stockpile will be collected in a Settling Pond (#1), designed to provide treatment by retention. Additionally, if further treatment is necessary, this location will also accommodate a mobile water treatment equipment. Alternatively, drainage collected in Pond #1 can be pumped to Settling Pond #2 where it can either be treated using mobile water treatment equipment or diverted to Settling Pond #3 where it can be treated using the permanent water treatment plant. Ore storage, and ore sorting rejects testing show higher potential for ARDML and all drainage from the ore storage pads and plant site area will be collected in Settling Pond #3, where water quality issues can be mitigated using the permanent water treatment plant. Details of the above water management infrastructure are discussed in Sections 2.2 and 5.2 of the Water Management Plan (WaMP) (Appendix B) and in the RCP for the rehabilitation and closure period.

**Table 2: Estimated Overburden and Organic Soil Volumes**

Open Pit Overburden		Waste Rock Stockpile Site Organic Soil	Ore Stockpile Site Organic Soil
Till	Organic Soil		
Mm <sup>3</sup>	Mm <sup>3</sup>	Mm <sup>3</sup>	Mm <sup>3</sup>
0.432	0.054	0.137	0.024

#### 4.2.4 Waste Rock Management

The waste rock stockpile, estimated to cover an area of approximately 56 ha, will be designed to accommodate the waste storage requirements of the open pit and underground workings. The overall capacity of the waste rock stockpile is approximately 16.4 Mm<sup>3</sup>, with additional capacity available to add more lifts. This capacity is more than enough for the anticipated total open pit waste material. Waste rock from the mine workings is expected to have a swell factor of 1.30 and an average specific gravity of 2.84 t/m<sup>3</sup>.

The stockpile slopes will be benched and designed/constructed to maintain an acceptable factor of safety for slope stability during operations and at closure. The design of the waste stockpile will be in lifts of 15 m with a 37° face slope. The overall slope will be 27.2° with a 10 m berm width. All design components/features will be confirmed as the Project advances. The waste rock stockpile will be progressively reclaimed during mine operations as it increases in height. The facility will have an overall height of approximately 73 m.

Results of ARDML static and kinetic testing performed on waste rock to date classifies all tested waste rock types as non-potentially acid generating, with a high degree of stability and neutralizing potential. Rock remains stable with high neutralizing potential. (SRK 2020 and Appendix A). In addition, non-contact ditches will collect runoff from upstream areas not impacted by mining operations and will divert this non-contact water to the receiving environment (i.e., eliminate runoff).

Long-term geotechnical stability of the waste rock stockpile will be achieved through proper slope design. If required, portions of the stockpile will be graded and natural re-vegetation will be promoted. Areas where natural re-vegetation may take longer to establish may be seeded to mitigate the erosion and transport of sediment. Some of these measures may also be implemented during operations as part of a progressive rehabilitation strategy.

Maritime considered comments from regulator consultation and industry best practices to minimize impacts to wetland areas from the waste rock storage stockpile. Specific features incorporated in the siting and sizing of the waste rock stockpile are described below.

Drainage from the waste rock stockpile will be collected in a contact water ditch and directed to Water Quality/Settling Pond #1 for sediment control and water quality treatment, if required, prior to discharge to the receiving environment.

To the extent feasible, trees within the waste rock stockpile footprint will be cut or mulched, depending on size, and organic-rich material (e.g., vegetation and topsoil) will be recovered for use in rehabilitation work.

The measures to limit potential impacts of waste rock contact or runoff on surface water quality during operations will be extended to closure where applicable. Also, where deemed necessary, security control measures will be implemented to prevent unauthorized access to the waste stockpile and other areas during operations.

#### **4.2.5 Ore Storage and Rejects Storage Area**

The estimated area of the ore storage area, rejects pile and crushing/sorting infrastructure is approximately 12 ha. The stockpile pad will be prepared using waste rock material, with 500 mm layer of coarse material (>112 mm) as a base and 150 mm of finer material (<112 mm) as a topping layer.

All rejected material from the Sorting Plant will be placed back in the open pit and/or underground workings for long-term closure. Maritime anticipates starting the placement of the sorted rejects back in the exhausted pit or using them in underground development during year three of the mine development and continuing to the end of mine life. Over the LOM, there will be approximately 1.1 Mt of sorted rejects generated. Based on the current plan, the maximum amount of sorted material stockpiled on the surface would be approximately 0.5 Mt (at the end of Year 2).

All runoff from the low grade ore stockpile will be collected in contact water ditches and directed to Water Quality/Settling Pond #3, to settle suspended solids and for monitoring and water quality treatment (if required) prior to discharge to the receiving environment in Harry Brook Details of the collection and management of surface water are presented in Sections 2.2 and 5.2 of the WaMP in Appendix B.

#### **4.2.6 Crushing and Sorting Plant**

At the mine site run of mine feed will be fed through a two-stage crushing and sorting process to produce a final mill feed product (Figure 7) to be loaded out and trucked to the off-site process plant.

The sorting plant is an innovative and environmentally-sensible pre-concentration process that will provide cost savings for the Project. This will be the first time this technology will be applied in the NL mining industry. ROM material will be pre-concentrated at Hammerdown using modern particle sorting technology (X-Rays and optical sensors) to produce feed for the process plant at a rate of approximately 700 tpd. Maritime anticipates the sorting process will reject roughly 50% of the mined mass as a low gold grade, low sulphide waste rock stream. This process utilizes dry X-Ray and optical sensor-based sorting. It was selected as the preferred method for pre-concentration as it reduces mine dilution, resulting in a higher grade, lower volume mill feed. It also allows a lower mine cut-off grade, enabling Maritime to capture additional resources from the open pit and underground workings. A lower volume mill feed has several advantages, including eliminating costs for unnecessary ore haulage and less mill processing of marginal material. In addition, this pre-concentration process will result in less water use, less effluent and tailings storage requirements at the NPM, and fewer haul trucks on the highway, resulting in reduced greenhouse gas emissions.

The pre-concentration processing method will include:

- Contractor-operated crushing and screening circuit;
  - Primary Crushing: A vibrating grizzly feeder and jaw crusher in open circuit, producing a final product P80 of approximately 57 mm.

- Secondary Crushing: Single-stage cone crusher in closed circuit with a primary single deck vibrating screen, producing a final product P80 of approximately 30 mm.
- Screening: A primary screen in closed circuit with the secondary crusher followed by a secondary screen to receive the primary screen undersize to screen out the fines, (this may also be achieved by a single double-deck screen and will be under the contractor's purvey).
- Sorting: Two sorting machines in series acting as a rougher and scavenger will produce both waste material and product.
- Crushed Material Stockpile: Two stockpiles will be produced from the sorting facility: one for product being conveyed to a load-out facility and trucked for further processing, and the other re-handled to either the waste rock or low-grade stockpiles.

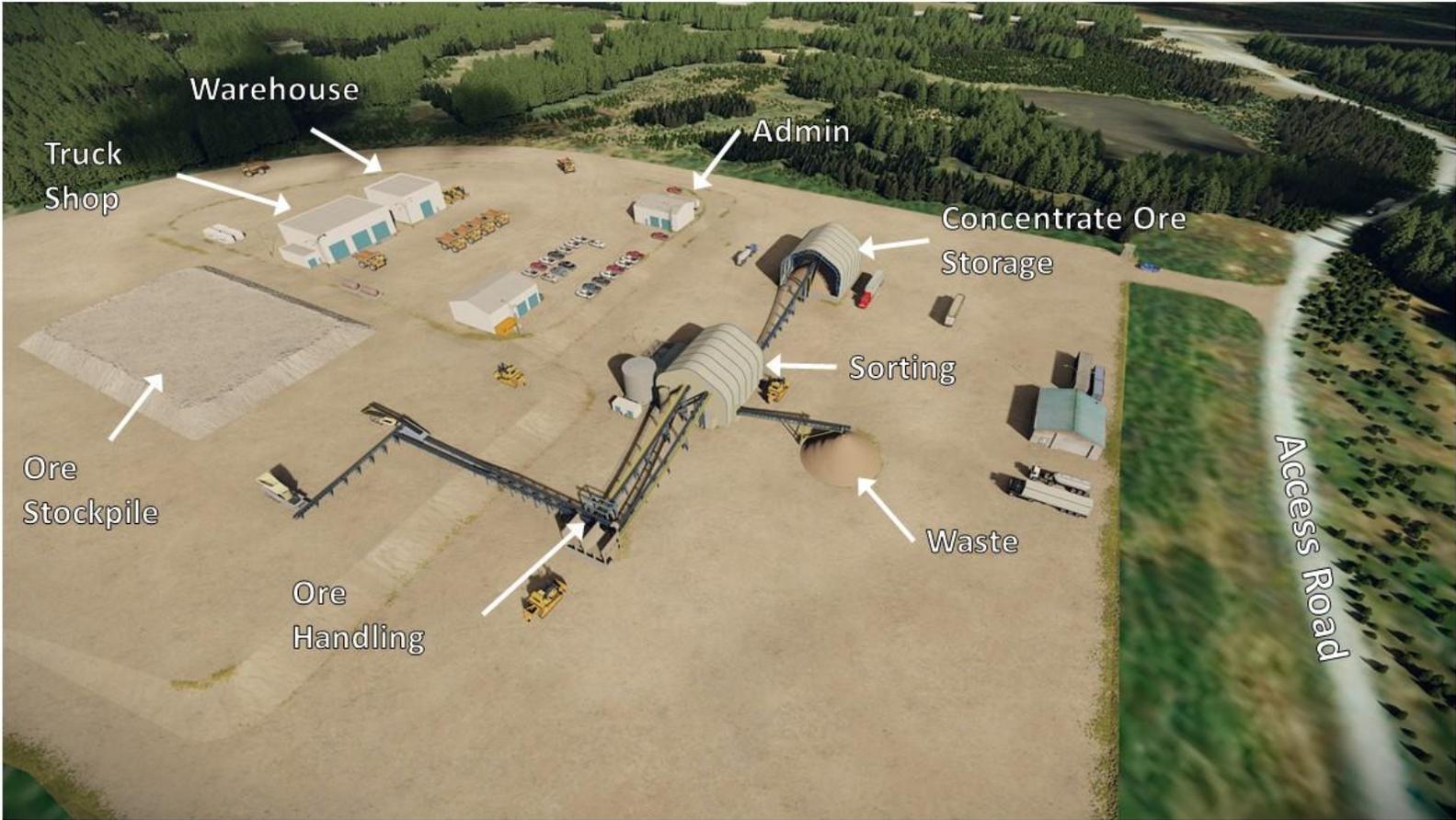


Figure 7: Conceptual Rendering of the Crushing and Sorting Plant Site Area

#### **4.2.7 Upgrades to Existing Roads and Site Access**

There are existing roads at the Project site and the location of new buildings and infrastructure areas were selected to maximize the use of these roads where possible. Most of these roads will require minor upgrades (i.e., partial clearing, minor granular refilling, culvert addition and/or repair) and levelling with a grader to handle the increase in heavy truck traffic while maintaining public access to the area. Road access to the Project site will be via a 1 km section of existing public forest access road. Appropriate control measures will be taken to isolate Project related traffic from public traffic, with consideration for road widening and berm construction. Prior to the start of mining operations in the Hammerdown open pit, an initial haul road will be developed connecting the proposed waste rock stockpile with the top bench of the planned Hammerdown pit (Figure 5).

Maritime will mitigate the risk of collision between heavy equipment and light vehicles by maintaining conservative road widths and by maintaining a clear line of sight on all roads. There is one intersection where haulage trucks will turn from the Project site road onto Route 391 for ore transport to the NPM. Maritime will provide and install appropriate signage and lighting where necessary. In addition, Maritime will develop a traffic management plan that will be updated and communicated regularly with its employees and contractors.

#### **4.2.8 Electrical and Communications Infrastructure**

The power required for the Project will be in the range of 2.5-3.5 MW. Maritime submitted a power assessment application to NL Hydro specific to the Project requirements. Based on the assessment requirements, NL Hydro completed the preliminary line design, and issued a cost estimate for the addition of two new voltage regulators and the construction of approximately 700 m of new three phase distribution line. NL Hydro understands Maritime's estimated connected load will be 3,184kW with an estimated peak demand of 2,402 kW at 90% power factor when accounting for power factor correction and a diversity factor of 90%. NL Hydro has a substation located at Springdale and indicated they will provide revenue metering on the primary side of the delivery point.

The electrical power from the grid will enter the Project site from the junction of Route 391, at a level of 25 kV via a 3-phase aerial powerline, along a distance of approximately 700 m. The powerline will be installed in the same corridor used during the previous mining operation at the site (Figure 8). From the measuring station, a 25 kV powerline will individually feed a main substation and infrastructure on site. A transformer for small and medium loads (up to 500 kVA) will be mounted on wood poles directly on the 25 kV powerline. Power transformers will be mounted on concrete pads and dry transformers will be used whenever possible. At the main substation, a small building will be required for the switchgear, auxiliary equipment and communication equipment.

The electrical power required for the underground facilities and equipment will be fed by cables installed in the ramp at a voltage level of 4.16 kV, 3 phases, 60 Hz. Portable substations will be located throughout the Project site to convert the voltage from 4.16 kV to 600 Volts. Equipment requiring electrical power will be fed from a portable substation distribution centre and equipment panel. Protection will be provided for electrical failures such as short circuits or ground faults.



**Figure 8: Existing Access Road and Electrical Infrastructure Corridor**

Other infrastructure to be installed at the Project site includes telecommunications equipment and a security system. The external communications services for the Project site will be provided by a local network and will follow the utility powerline. Cable and internet service will be provided to the Project site that will allow the installation of a system for telephone communication for internal and external use, as well as the installation of an automated system for control, fire alarm system, cameras, and security.

A leaky feeder system will be installed by the mine contractor in the underground mine to provide wireless communication to the personnel (via portable radio). The two-way radio will allow surface communication and underground communication with the leaky feeder system. The system can also be used for cameras, data transfer, tracking system, and maintenance systems. Analog telephones will also be installed in dedicated areas for regular communication and emergency communications.

In addition, an information technology (IT) system for the offices will be required. A server with switches and an ethernet network will be installed in the main office trailer and will be connected to the other areas, as required.

#### 4.2.9 Buildings and Weigh Scale

A number of modular buildings (Figures 5 and 7) will be installed/constructed in the vicinity of the Crushing and Sorting Plant to service the mine operations. The following buildings will be required:

- Office and dry facility;
- Garage and warehouse;
- Gate and fence;
- Truck weigh scale; and
- Fuel station.

The mine contractor will provide trailers that will operate as mine offices and dry trailers. The garage and warehouse will be the responsibility of the mine contractor and will be installed at a safe distance from the mine. The garage will include a washing bay, a maintenance bay and will contain a minimum amount of equipment to perform basic maintenance work. When more extensive maintenance or repair work is required, the machinery will be transported to shops in Springdale, NL. This building will not include an overhead crane.

The gates will be remotely monitored and operated through camera and automation systems by security personnel. There will be a fence to control access to key entry points at the Project site, the electrical substation, and the explosives magazine.

A portable, heavy duty truck scale will be located on the site access road near the Crushing and Sorting Plant for weighing the ore transfer trucks prior to their departure for the NPM.

The fuel station will be included in the fuel supplier package and will be the responsibility of the mining contractor to coordinate with the supplier. Fuel will be stored in above ground tanks and all safety and accident mitigation measures required by provincial permitting will be followed. Fuels that may be required at the Project site include diesel, gasoline and propane. The electrical power will be brought to this location to provide power for the lighting, control and motorizations of the fuel station.

#### 4.2.10 Explosives Magazine

The explosives and blasting caps magazines will be included in the explosive supplier package.

The licensed magazine area will be located at the Project site away from key infrastructure and exposed sites (ES) in accordance with the *Quantity-Distance* Standard (NRCAN) (Figure 5). This Standard specifies the minimum separation distances between potential explosion sites (PES) and ES to reduce the risk to life and property.

Packaged and initiating explosives will be stored in approved magazines that will comply with existing Standard, *Explosives – Magazines for Industrial Explosives* (NRCAN/BNQ) and access to the magazines will be secured and controlled. In this way, explosives will be stored so they do not present a hazard to people or property in the vicinity.

Bulk emulsion matrix will be stored on site in a heated tank approved for that use. Bulk ammonium nitrate storage may also be required depending on the product to be loaded. The location of bulk explosives will be at a distance away from the magazines as required by the standard.

Explosives will only be handled by personnel who are trained, authorized and licensed. Standard Operating Procedures (SOPs) will be in place to cover all aspects of the use of explosives including: transporting, loading, blast clearance, blast guarding, blast firing, post-blast inspections, secondary blasting, misfires, and any other activities related to blasting.

#### **4.2.11 Earthworks for Site Infrastructure**

Earthworks will be required for several site infrastructure components, specifically in the following areas:

- Vehicle parking;
- Fresh water pumping station;
- Crushing/Sorting plant;
- Modular mine office trailers, maintenance and warehouse structures on compacted fill;
- Exhaust raise pads;
- Underground air compressors;
- Explosives magazine and bulk explosives storage area;
- Ore stockpile pad;
- Concentrate ore stockpile; and
- Waste rock stockpile.

Whenever appropriate, the granular backfilling required for site development will be made using non-acid generating (NAG) waste rock material from mining operations.

#### **4.2.12 Water Use**

There will be various water use requirements at the Project site over the LOM. A drilled well will provide non-potable water for toilets and handwashing/showering at the mine dry and office areas. For underground supply and fire water protection, water from the site sedimentation ponds will be used.

Bottled potable water will be supplied to the Project site by local vendors for consumption. A drilled well will be constructed to service the dry facility, washrooms, lunchroom and administration building.

A septic system to service the office and dry trailers will be installed. The system will be installed and operated by a contractor in accordance with all applicable permits and regulations.

#### **4.2.13 Water Management**

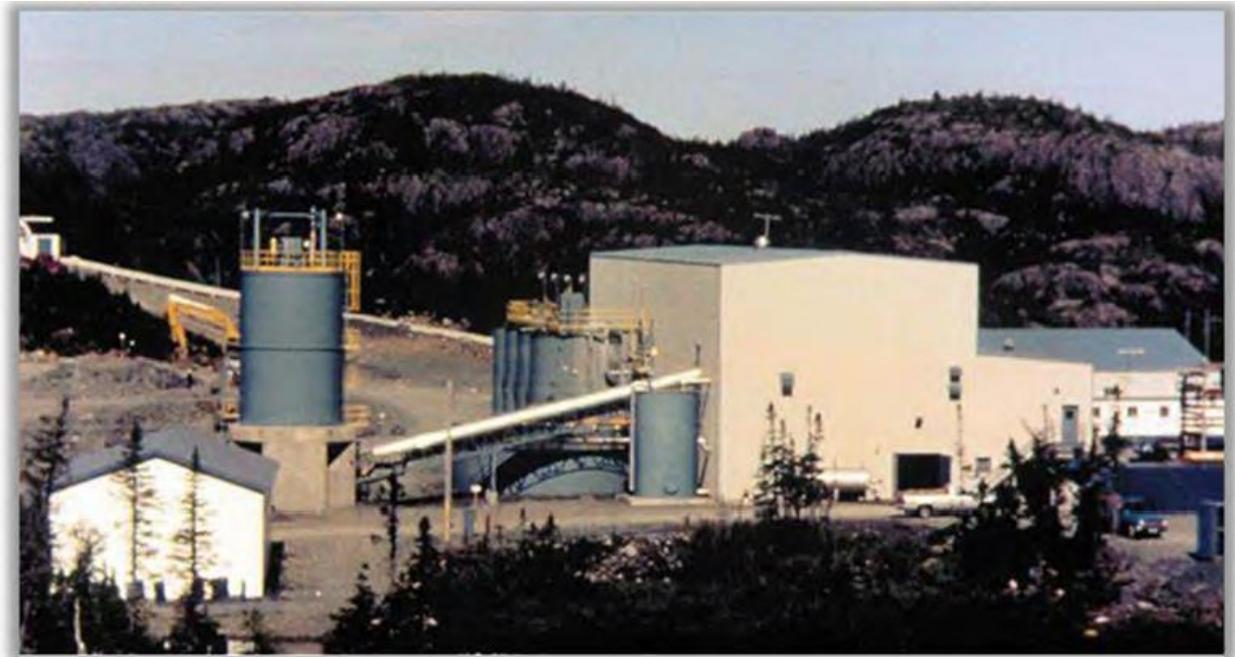
The Project is located at the intersection of three separate watershed divides (Figure 4). This setting requires careful consideration of surface water management at the site, and the potential effects of site activities on regional water quality. To gain a better understanding of the hydrological and hydrogeological regimes of the area, a number of baseline investigations were undertaken since 2016 (Stantec 2017b, GEMTEC 2019c, GEMTEC 2019d). As required by the EPR Guidelines for the Project, Maritime has prepared a detailed WaMP (Appendix B) for the Project site, designed to limit impacts to the surrounding environment. Additional information relative to water management is presented in the WaMP.

Potential surface water impacts as a result of Project activities were addressed in previous documents and the WaMP.

### **4.3 Associated Project Components**

#### **4.3.1 Ore Haulage to Offsite Mill**

During full operation, Maritime will transport approximately 700 tpd of pre-concentrated material and fines from the Hammerdown Project site to the NPM (Figure 9) utilizing 30-40 tonne haul trucks. Truck traffic is anticipated to range between four to eight trucks each completing two to three roundtrips per day. Maritime has had preliminary discussions with officials from the NL Department of Transportation and Works (NLDTW) relative to a Highway Access Permit, if required, and will complete this process once the Project is released from the EA process. A Highway Access Permit, if required, will be specific to Maritime accessing Route 391 from the Hammerdown property for material transport to the NPM. Ore haulage will be contracted to local trucking companies and Maritime anticipates this component will require 16 positions.



**Figure 9: View of the Nugget Pond Mill**

#### **4.3.2 Offsite Ore Processing – Nugget Pond Mill**

The NPM was built in 1996 by Richmond Mines and today consists of two processing plants – the first being the original “hydromet” plant, and the second being a newer sulphide flotation plant. The current plant has over 1,500 tpd capacity that is currently treating copper ore from the Ming Mine. Richmond Mines operated the NPM as a gold plant for over 10 years, processing ore from both the former Nugget Pond and Hammerdown gold mines. The NPM processed approximately 290,000 tonnes of Hammerdown ore between 2001 and 2004.

Historic gold recoveries on Hammerdown mineralization at the NPM were over 97.0% during past operations. Recent metallurgical test work on new samples from Hammerdown confirmed that gold recoveries of 97.0% can be expected through the whole-ore leach circuit. The Hammerdown sorting plant feed will be transported by road to the NPM where it will undergo the well-established CIP technology (Figure 10) to recover the gold into a doré product for sale. Additional metallurgical work has been completed and Maritime has determined that a fine grind (80% passing 60 microns) is necessary to achieve the target recovery rate.

As previously provided in the Registration document, Maritime is including a high level description of the offsite milling process in this EPR. All aspects of offsite processing of Hammerdown ore will be addressed in the Mill’s updated Certificate of Approval (C of A), Development Plan (DP) and RCP.

Maritime does not anticipate any issues related to the short-term storage of ore at the NPM site prior to processing due to the observed mineral stability. Additional protection will be achieved through controlled collection and containment of drainage around stockpiled ore.

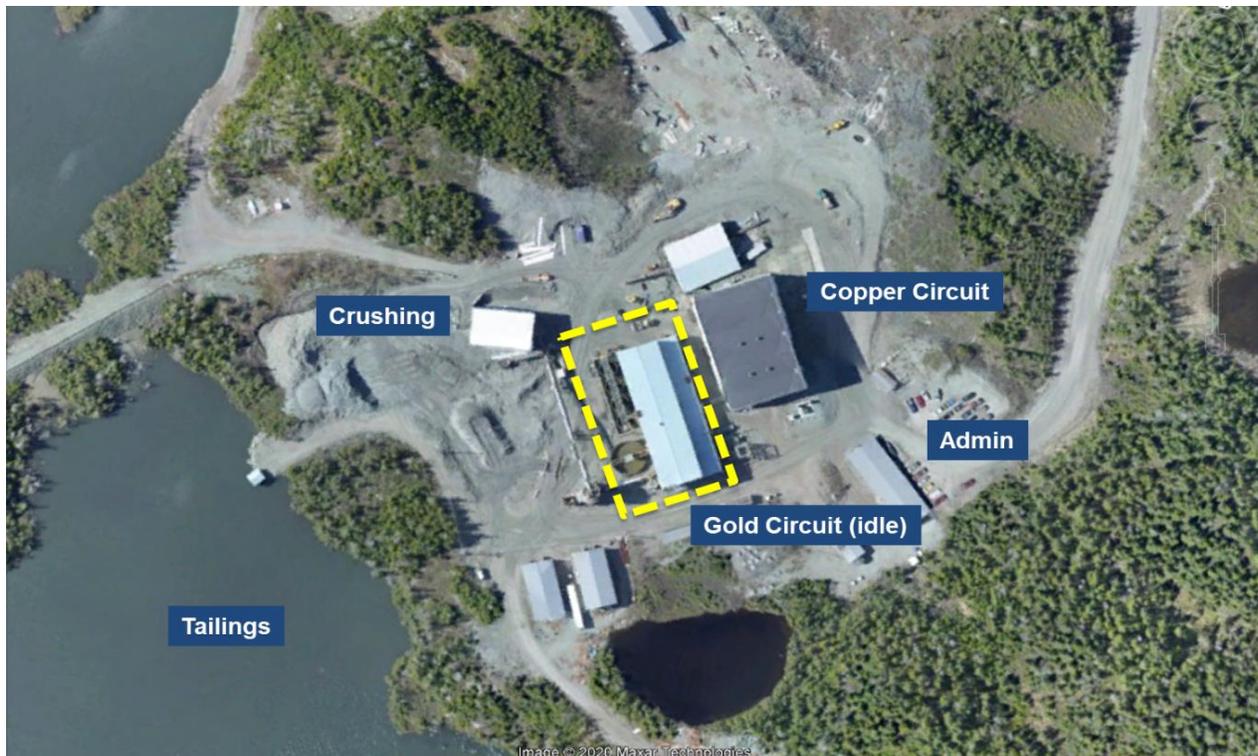


**Figure 10: Existing Grinding Circuit at the Nugget Pond Mill**

Once upgrades to the NPM have been completed, the copper and gold circuits (Figure 11) will be able to operate independently.

Tailings from the processing of Hammerdown ore are expected to be easily accommodated within the existing footprint and operational plans at the NPM TMF. Rambler and Maritime estimate that, on average, 3,000 m<sup>3</sup> (cubic metres) will be added to the licensed TMF on a weekly basis. When this volume is added to NPM's weekly tailings production, the total weekly addition will be approximately 9,600 m<sup>3</sup>. The NPM tailings facility does have capacity to store tailings from the Project. There are currently two tailings repositories in use at the Rambler TMF, with planned raises on existing dams by Rambler within the next five years. This will provide ample storage capacity in the NPM TMF for the anticipated six-year Hammerdown LOM.

Maritime does not anticipate additional air or noise emissions as a result of operating the gold circuit at the NPM.



**Figure 11: Existing Site Infrastructure at the Nugget Pond Mill**

#### **4.4 Existing Environment**

Maritime is presenting an overview of select elements of the existing environment as identified in the EPR guidelines.

##### **4.4.1 Cabin Owners**

There are three remote cabins located to the west and northwest of the Project in close proximity to Muir Pond (Figure 12) and a larger cabin area exists at Shoal Pond, approximately 5 km west of the mine site. Maritime engaged with all cabin owners and have noted all comments and concerns (Appendix C). Overall, cabin owners indicated that the project would be beneficial to the economics of the region. Questions were raised about interaction with mine traffic, future access to Shoal Pond Valley and parking area congestion. Cabin owners at Muir Pond asked about site runoff, and one question was raised about blasting and if it would impact traffic on the Shoal Pond access road.

The cabins noted on Figure 12 (Muir Pond) do not occur within the Project footprint or the Hammerdown Mining Lease and as such there is a sizeable existing buffer between Project activities and these cabins. However, the locations of the remote cabins identified will be considered when Maritime is designing their Blast Management Plan (BIMP) and Maritime will work with cabin owners to limit adverse effects as a result of Project operations. There are no

access roads leading to these cabins that pass through the Project area. As project activities progress, Maritime will continue with awareness of the presence of these cabin owners as they are the closest receptors to the site.

Maritime engaged with members of the Shoal Pond Cabin Owners Association to conduct a full project review, and provide an opportunity for cabin owners to raise concerns about the Project. As previously indicated, the cabins are located more than five kilometres from the Project area but some cabin owners do access their cabins via the existing forest access road used to also support access to the Project site. During the exploration phase for the Project, Maritime met with the Shoal Pond Cabin Owner's Association and there was unanimous agreement for an alternate location of an ATV and snowmobile route, in addition to the construction of a new parking lot for cabin owners and local residents. These improvements were proposed and accepted by Maritime as they reduced the risk of unwanted interaction between Project equipment and ATV/snowmobile traffic during the exploration phase for the Project, i.e., prior to EA registration. The new trail location will divert snowmobile and ATV traffic away from the Project area and that portion of the access road that Maritime will be using to support the Project. In addition, Maritime agreed to maintain and provide snow clearing of the new parking location throughout the winter season. Maritime has completed this work and appropriate signage has been erected to notify the public.

To manage interactions between Project vehicles and light vehicle traffic on the access road when Project construction activities begin, Maritime will implement additional mitigations with a goal of eliminating all risk of potential interaction.

#### **4.4.2 Land and Resource Use and Access**

Maritime has been engaging with local communities and various land users in the King's Point area since first submitting the Registration document for the Project to EA Division for review. Maritime has a good understanding of the various land uses in the area (Figure 12) and has maintained transparency with stakeholders during all engagement.

Maritime met with representatives of the Town Councils of King's Point and Springdale in 2019 and 2020 and presented details of the Project. It was recognized that local residents from both King's Point and Springdale were likely the most frequent users of the Shoal Pond Valley and areas of the project, and that residents from other towns utilized the area intermittently and seasonally for recreational hunting and snowmobiling. Town officials raised no concerns regarding potential negative impacts on recreational activities, and followed up with letters in which they expressed their support for the Project and/or outlined the community resources available that could be of benefit to Maritime during Project construction and operations.

Maritime consulted the Provincial Land Use Atlas to assist with determining if there are likely to be any land use conflicts associated with the Project (Figure 12). The Project occurs in a rural area within Forest Management District 9. There is a silvicultural management area located

approximately 3 km west of the mining lease and a western portion of the lease area intersects a domestic woodcutting area.

As noted in technical comments received during the Registration review, Maritime understands that if an existing forest operator cannot harvest timber from the Project site, then a Commercial Cutting Permit will be required prior to any harvesting or timber removal in the area. Maritime also notes there is a Home Garden Licence (108586) issued in an area near the Project site (Figure 12). No Project activities will overlap with this Home Garden License and existing buffers will be maintained.

Maritime has engaged with area cabin owners to communicate plans for Project site access via the existing Shoal Pond Valley forest access road. As this road is regularly used by local cabin owners and local residents to access cabins located at Shoal Pond, Maritime has committed to ensuring continued safe access by local residents, and will maintain this shared section of access road for the duration of the project. Throughout the project, Maritime will also continue to engage with residents and ensure that mitigative measures remain effective and relevant to prevent mine traffic interaction with activities of the general public along this section of road.

Existing natural buffers between the three cabins in proximity to Muir Pond and the Project will be maintained.

The Newfoundland and Labrador Snowmobile Federation (NLSF) maintains a snowmobile trail that passes to the southwest of the Property. In consultation with the NLSF, Maritime upgraded an alternate and existing snowmobile trail to limit the potential for interaction between NLSF users and Project vehicles and activities.

There is an Agriculture Lease (98154) located within one of Maritime's Mineral Licenses but outside the Project footprint. As this agricultural area is located on the opposite side of Route 391 from the Project, Maritime has not identified any land use conflicts and does not anticipate that any buffers or relocation will be required. There are a number of community gardens and greenhouses but only one that is in close proximity to the Project, a Home Garden located on the Project side of Route 391 but outside the Project footprint (Figure 12).

There is an abandoned dump site for the Town of King's Point (Lease No. 80291) located approximately three km from the Project. No Project activities will occur within the Service NL required 1.6 km buffer around this abandoned dump, which is currently being used as a salvage yard.

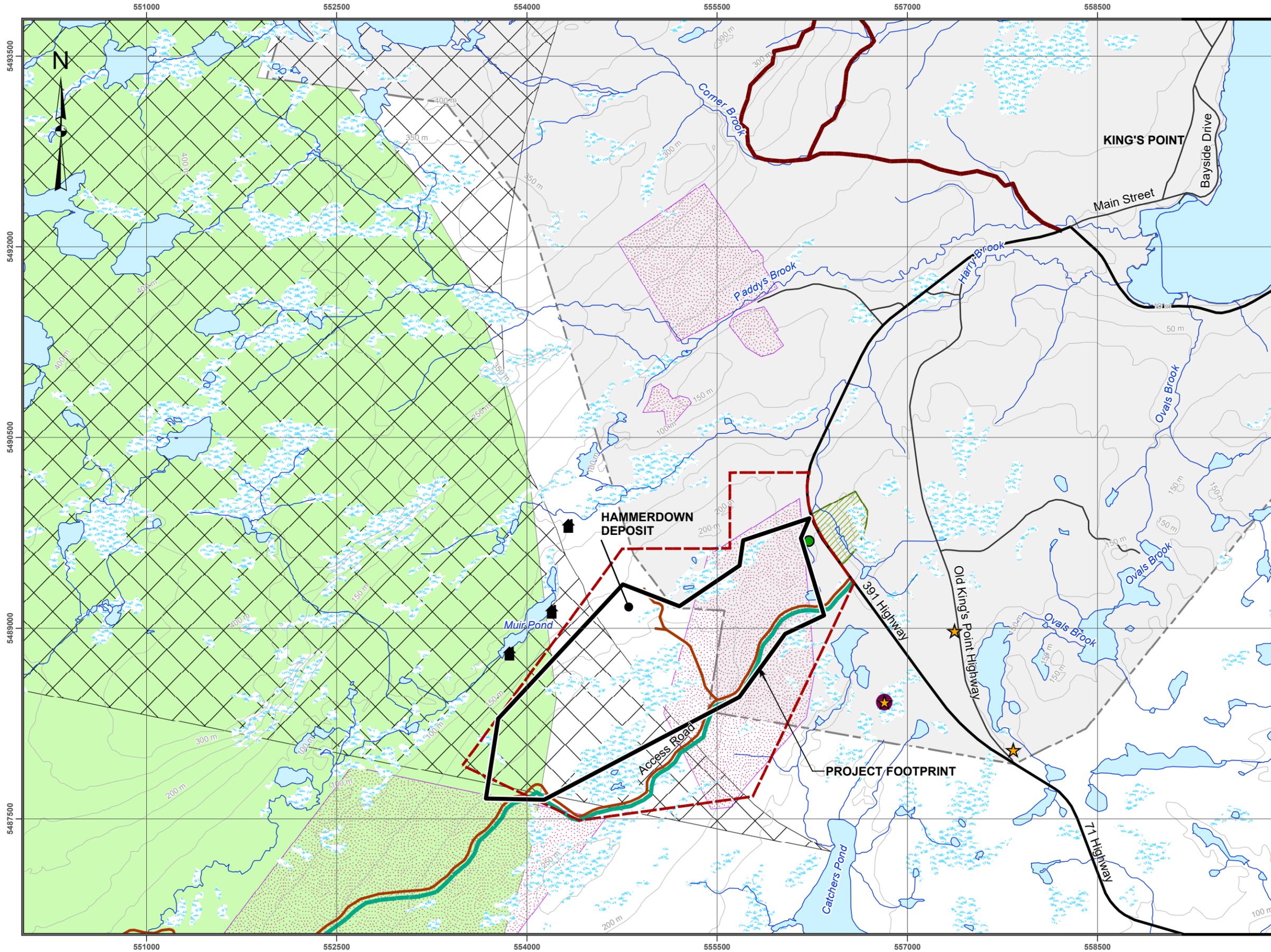
There are several quarries located 2-3 km to the southeast of the Project site along Route 391. The municipal landfill is located approximately 30 km southwest of the Town in the community of South Brook. Existing buffers will be maintained between the Project and these various land uses.

There are no federal or provincial parks or protected areas in the immediate area of the Project. There is an RV park located in the Town of King's Point and there are no private campgrounds located in proximity to the Project. The Project is located within Moose and Black Bear Management Area 14 (NLDFLR 2020). There is a popular and well-maintained hiking trail located at King's Point, the Alexander Murray Hiking Trail, but this is far-removed from the Project site.

There may be other land users in the Project vicinity during various development and operations activities as well, (e.g., wood cutters, snowmobilers, berry pickers). Maritime has provided numerous opportunities for public input over the past two years, in addition to a virtual presentation as required by the EPR guidelines, and is confident that all concerns have been brought to their attention and addressed satisfactorily. Maritime will continue to engage with potentially affected land and resource users throughout the Project's evolution.

There are two commercial outfitters, Island Safaris and Black Ridge Outfitters who operate in the vicinity of Gull Pond. The closest camp is located approximately 8.0 km to the west of the Project site and the commercial outfitter buffer zone extends approximately 400 m within the Project footprint. Maritime engaged with the Executive Director of the Newfoundland and Labrador Outfitters Association (NLOA), and both area outfitters (Appendix C).

The Project access road is also used by some outfitters to access the Shoal Pond valley area and Maritime committed to maintaining the shared portion of the road and to relocating a portion of this access for ATV and snowmobile traffic. Outfitters provided input on the relocated trail location and overall expressed support for the Project.



**Legend**

- Quarry Operation
- Cabin Location
- Home Gardening
- Metal Salvage Yard
- Highway
- Road
- Access Road
- Alexander Murray Hiking Trail
- Watercourse (Identified on 1:50,000 Topo)
- Topographic Elevation Contour (50m)
- NL Snowmobile Federation Trail
- Waterbody (Identified on 1:50,000 Topo)
- Wetland (Identified on 1:50,000 Topo)
- Domestic Harvest Area
- Agricultural Area
- Silviculture
- Outfitter Buffer
- King Point Municipal Boundary
- Project Footprint
- Project Study Area

**Notes**

1. This drawing is a schematic representation. Sizes, locations and dimensions are approximate.
2. Coordinate System: NAD83 UTM Zone 21N
3. Topographic data acquired from GeoGratis (Government of Canada).

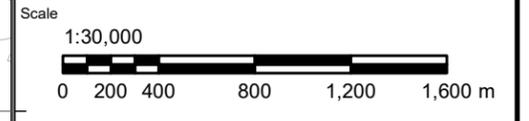
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February 2021	CHG	IS

**Project**

ENVIRONMENTAL PREVIEW REPORT  
HAMMERDOWN GOLD PROJECT

**Drawing**

LAND AND RESOURCE USE  
IN PROXIMITY TO THE PROJECT



Project No.	Drawing No.	Revision No.
80044.12	FIGURE 12	0

**MARITIME RESOURCES**

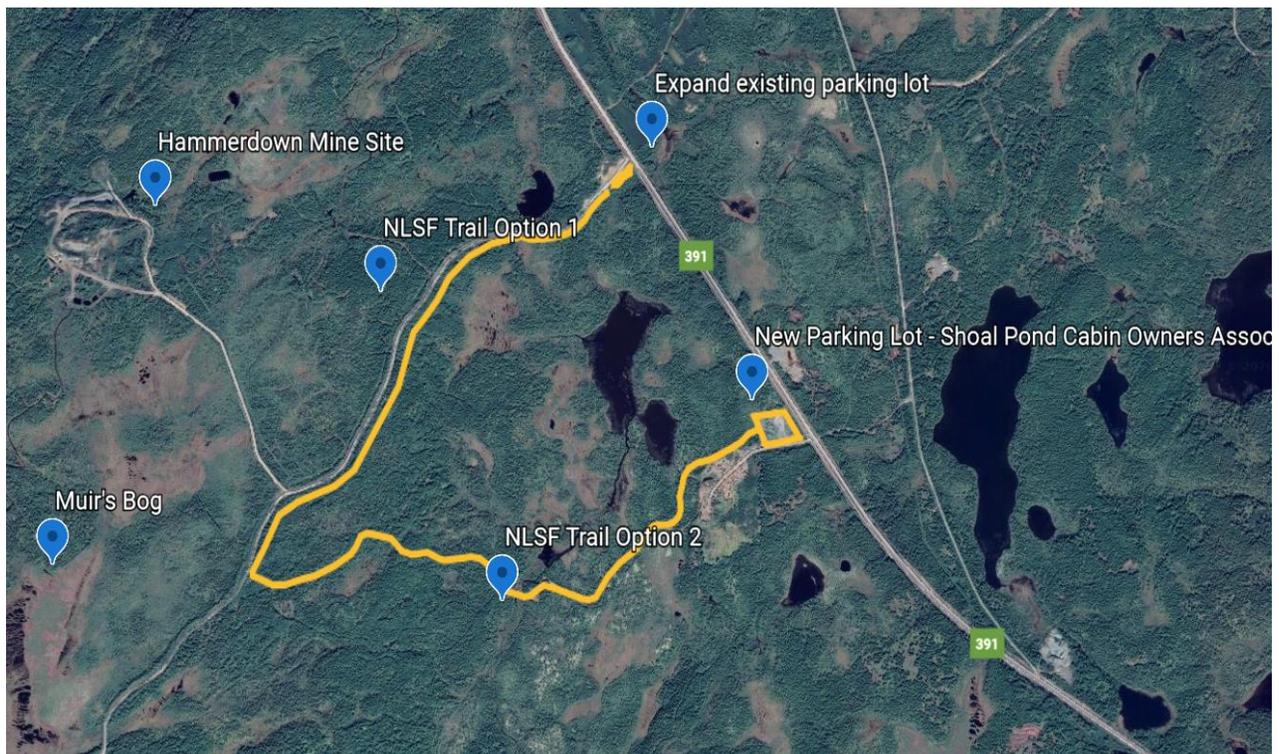
**GEMTEC**  
CONSULTING ENGINEERS  
AND SCIENTISTS

#### 4.4.3 Recreational Trails

A portion of the existing NLSF trail that passes to the southwest of the Property follows the existing access road, essentially Option 1 in Figure 13 below. As part of Maritime’s exploration program, Maritime engaged with NLSF officials in May and October 2020 (Table 4) to discuss concerns and the possible rerouting of a section of the existing snowmobile trail. Two trail options were considered and assessed to determine which offered fewer risks to area snowmobilers (Figure 13).

One of the main concerns with recreational trail use was the congestion caused by parking near the entrance to the Shoal Pond Valley access road in winter, by trail users and cabin owners. With equipment supporting exploration activities also using the area, the risk of potential interaction with heavy equipment increased.

The option 2 trail relocation was determined to provide the least amount of risk to trail users by both the Shoal Pond Cabin Owners Association and the NLSF, and also provided the space for construction of a new parking area for trail user’s personal vehicles. Maritime committed to providing snow clearing during the winter season, and will support any necessary repairs through the first year following construction.



**Figure 13: Trail Options Discussed with NLSF**

#### 4.4.4 Bats

Both the little brown bat (*Myotis lucifugus*) and the northern long-eared bat (*Myotis septentrionalis*) are federally protected species at risk (SAR) under the *Species at Risk Act* (SARA), and both can possibly occur within the Study Area. Both species were given an emergency listing of “Endangered” by SARA in 2014 because of rapid population declines in Canada due to a deadly wildlife disease known as White-nose Syndrome (WNS) (Environment and Climate Change Canada 2018).

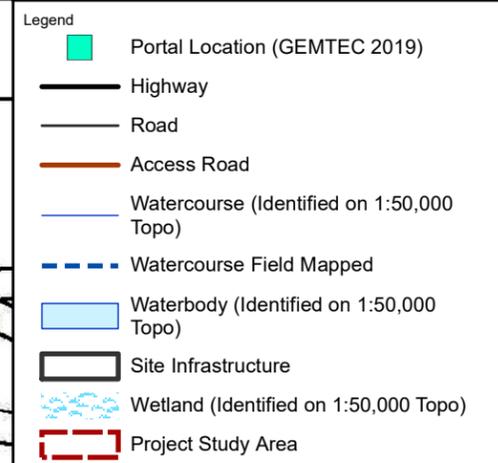
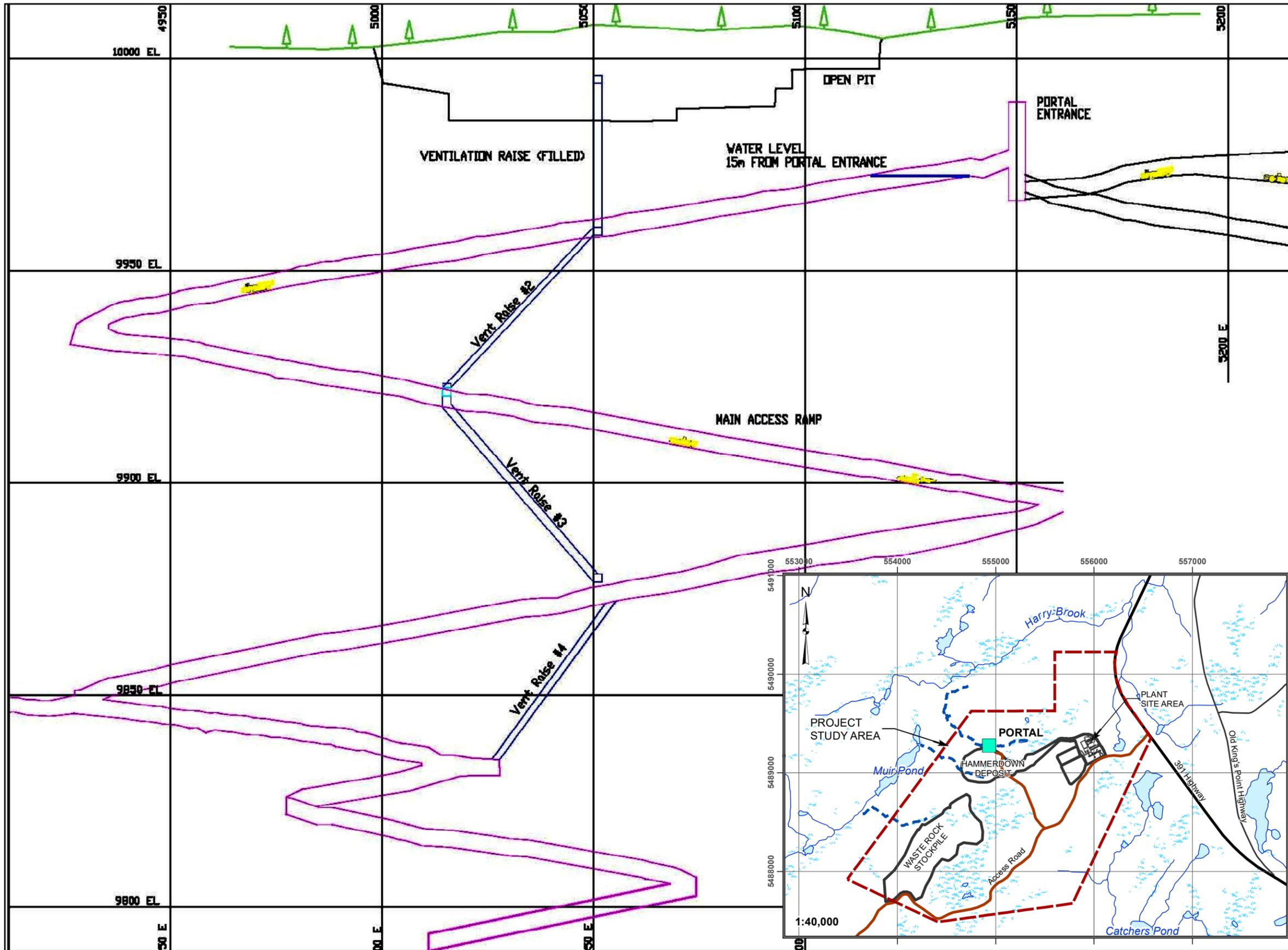
Efforts were made to detect the presence of the little brown bat and/or the northern long-eared bat in the Study Area given the existence of a mine shaft/adit associated with mining operations dating from the early 2000s. The portal was capped in 2005/2006 during rehabilitation and closure activities. However, the cap was removed by Maritime in 2018 to facilitate dewatering activities as part of planned exploration work. Although exploration work did not take place, the adit cap was not replaced. Given the little brown bat and the northern long-eared bat overwinter in caves in NL, the unsealed adit to existing underground workings presented a potential overwintering site (Figure 14).

The adit gradually descends at a gradient of between 15% starting at a distance of 15 m inside the portal. The below grade portions of the adit are permanently flooded or frozen and are unlikely to be suitable for bat roosting or hibernating (Figure 14).

Echolocation and emergence surveys were carried out in 2019 and 2020 at the portal of the former underground workings. Maritime presented the results of the 2019 bat monitoring to the wildlife division (WD) in the Registration document, and at their request, additional surveys were completed in 2020.

Acoustic surveys were completed in 2019 from August 7 - November 20 (106 days) and in 2020 from August 10 - September 29 (49 days). An Anabat Swift bat detector, equipped with a shielded directional microphone to protect it from rain and wind exposure, was attached to the exterior of the portal gate (Figure 15). As per recommendations from the WD, the directional microphone was not pointed inward toward the adit as this could lead to sound distortions.

The bat identification was completed manually by an experienced biologist. Echolocation calls recorded were associated with two *Myotis* species of bats (little brown bat (*Myotis lucifugus*), and northern long-eared bat (*Myotis septentrionalis*)) (Tables 3 and 4). No attempt to identify the calls to species was made because of the difficulty in achieving defensible identification (Broders 2011). Despite this, it was concluded that echolocation calls with characteristics consistent with both northern long-eared bats and little brown bats were detected.



- Notes
1. This drawing is a schematic representation. Sizes, locations and dimensions are approximate.
  2. Coordinate System: NAD83 UTM Zone 21N
  3. Topographic data acquired from GeoGratis (Government of Canada).
  4. Site infrastructure provided by Maritime.
  5. Hammerdown section created by RICHMONT, May 26, 2004.

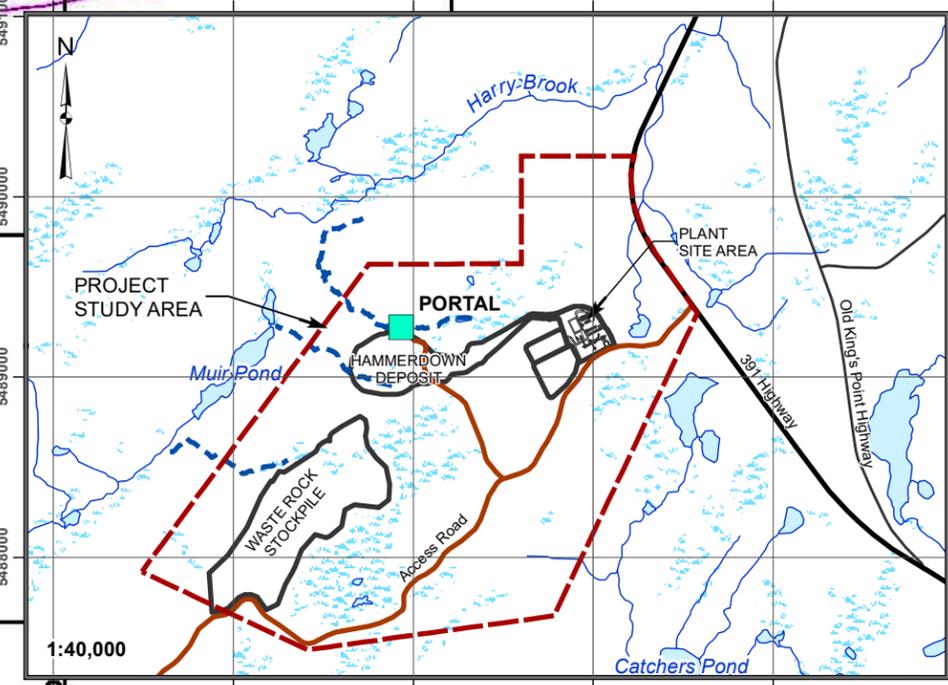
Date	Drawn by	Checked by
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Project  
**ENVIRONMENTAL PREVIEW REPORT  
 HAMMERDOWN GOLD PROJECT**

Drawing  
**ADIT DETAILS AND  
 LOCATION IN RELATION TO  
 SITE INFRASTRUCTURE**

Scale  
 NOT TO SCALE

Project No.	Drawing No.	Revision No.
80044.12	FIGURE 14	0





**Figure 15: Bat Detector Installation at Existing Mine Portal**

**Table 3: Record of Echolocation Calls – Fall 2019**

Date	Time	No. MYOT
2019-08-07	23:00	4
2019-08-08	22:00	1
2019-08-08	23:00	1
2019-08-08	00:00	1
2019-08-09	01:00	4
2019-08-10	01:00	1
2019-08-11	00:00	2
2019-08-16	03:00	3
2019-08-17	22:00	4
2019-08-19	03:00	13
2019-08-22	20:00	2
MYOT = <i>Myotis</i> spp.	<b>Total</b>	<b>45</b>

It would be expected that a pulse of high activity (i.e., frequent calls over a short duration) would occur in late autumn if the adit were being used as overwintering habitat (a hibernaculum). This activity is known as swarming but analysis of the echolocation data provided no evidence that this occurred. This strongly indicates that the adit is not being used as a hibernaculum. As the adit is permanently flooded at a distance of approximately 15 m from the entrance, this suggests that

the temperature and humidity levels within the un-flooded portions of the adit are not suitable as an overwintering site.

In addition to the analysis of echolocation survey data, GEMTEC conducted bat emergence surveys in 2019 and in 2020 at the portal exterior. In 2019 these surveys were completed on August 8 and 29 and over five days in late summer and early fall 2020 (August 12, September 3, September 18, October 5 and October 22). No bats were observed on any of these occasions.

Results of the bat surveys indicate that *Myotis* spp. are using the area for foraging but are not using the mine adit for roosting or overwintering habitat. In addition, no visual identification was made of the *Myotis* spp. so the presence of one or both species cannot be definitively confirmed in the Study Area.

**Table 4: Record of Echolocation Calls – Fall 2020**

Date	Time	No. MYOT
8/10/2020	21:00	9
8/10/2020	22:00	22
8/10/2020	22:00	1
8/10/2020	23:00	4
8/10/2020	23:00	2
8/10/2020	0:00	1
8/11/2020	21:00	2
8/11/2020	0:00	1
8/11/2020	1:00	1
8/11/2020	2:00	1
8/13/2020	21:00	5
8/13/2020	23:00	10
8/13/2020	0:00	6
8/13/2020	2:00	1
8/15/2020	21:00	3
8/15/2020	21:00	1
8/15/2020	22:00	1
8/15/2020	0:00	1
8/16/2020	21:00	4
8/16/2020	21:00	1
8/16/2020	22:00	4
8/16/2020	23:00	2
8/16/2020	23:00	6
8/16/2020	0:00	4
8/17/2020	23:00	4
8/18/2020	20:00	1

Date	Time	No. MYOT
8/19/2020	21:00	1
8/19/2020	23:00	1
8/20/2020	20:00	1
8/22/2020	21:00	1
8/23/2020	21:00	1
8/23/2020	22:00	2
8/24/2020	20:00	8
8/24/2020	21:00	2
8/24/2020	0:00	1
8/25/2020	20:00	4
8/25/2020	21:00	1
8/25/2020	21:00	4
8/26/2020	20:00	1
8/27/2020	23:00	1
8/29/2020	20:00	1
9/1/2020	21:00	1
9/2/2020	20:00	1
9/2/2020	21:00	1
9/2/2020	22:00	1
9/2/2020	22:00	4
9/3/2020	19:00	1
9/3/2020	21:00	1
9/3/2020	22:00	1
9/3/2020	23:00	2
9/3/2020	23:00	4
9/3/2020	0:00	1

Date	Time	No. MYOT
9/3/2020	5:00	1
9/4/2020	22:00	1
9/4/2020	23:00	1
9/4/2020	2:00	1
9/4/2020	4:00	4
9/5/2020	21:00	1
9/7/2020	20:00	1
9/7/2020	20:00	1

Date	Time	No. MYOT
9/7/2020	21:00	1
9/9/2020	1:00	1
9/28/2020	18:00	6
9/28/2020	18:00	1
9/28/2020	19:00	6
9/28/2020	19:00	1
9/29/2020	19:00	1
MYOT = <i>Myotis</i> spp.		<b>Total</b>
		<b>174</b>

#### 4.4.5 Baseline Noise

The Project will occur in an area of low industrial activity and as such Maritime predicted in the Registration document that the area would experience low ambient noise levels. The EPR guidelines indicated additional information would be required to support this. As such, Maritime engaged GHD Consultants to complete a noise impact study of the entire haul route and mining operations at the Project site in fall 2020 (Appendix D).

During the construction phase, noise will be generated by the following activities:

- Various earthworks;
- Overburden removal by heavy equipment;
- Vegetation clearing, using chainsaws;
- Excavating and blasting;
- Equipment mobilization and road upgrades;
- Infrastructure installation and construction; and
- Vehicle traffic, both heavy equipment and light duty.

During the operations phase, the mine will operate seven days per week with 12 hour daily shifts. Blasting of rock will occur intermittently and transportation of waste rock and ore will occur on a daily basis for the LOM. Blasting activities will result in elevated noise levels of short duration and there will be sustained noise from the open pit and underground mining activities, and the crushing and sorting plant operation at the Project site (Table 5). The reference locations are identified as T1-T5 and S1-S17 (Figure 16).

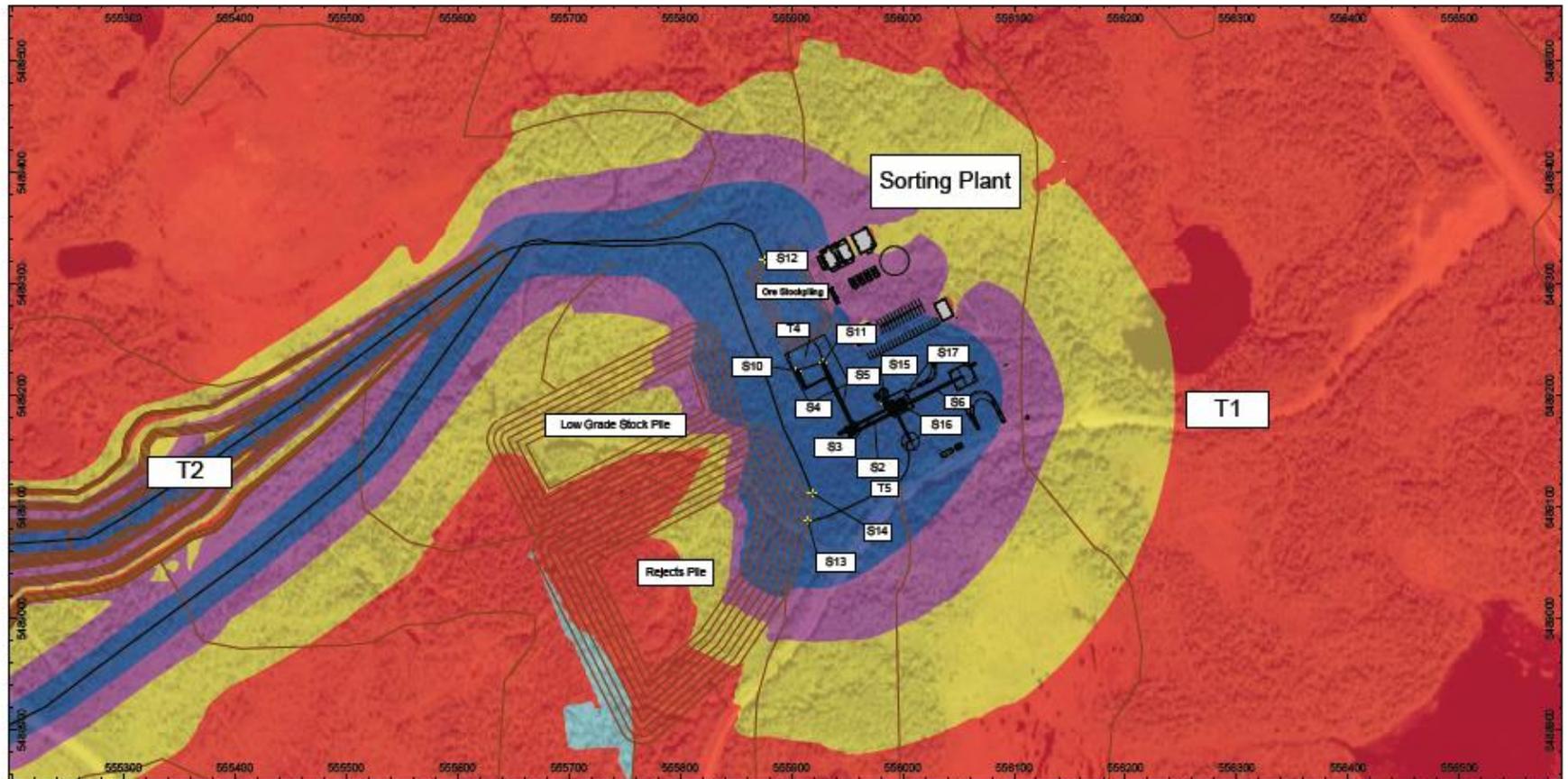
**Table 5: Estimated Sound Levels from Project Activities and Equipment**

Site/Location	Noise Source Description	CadnaA ID(s)	Trips/Hour or #/site	Sound Power Level (dBA)
Offsite Haul Roads	Truck – Ore Transport Between mine and NPM	T1	4	128.3
Hammerdown Deposit	Pit Hauling Trucks	T2	8 trips	117.2
	Waste Rock Hauling Trucks	T3	6 trips	118.7
	Waste Rock Hauling Trucks	T3	6 trips	118.7
	Loader – ROM to Crusher	T4	20 trips	103
	Loader – Reject Conveyor to Waste Pile	T5	30 trips	111.8
	Reject Conveyor	S1	1	106.7
	Process Building Conveyor #1 & #2	S2 – S3	2	106.7
	Ore Sorting Conveyor #1 & #2	S4 – S5	2	106.7
	Storage Conveyor	S6	1	106.7
	Production Drills	S7A – S7E	5	117.8
	Vibrating Packer/Roller	S8	1	108.0
	Tracked Dozer	S9A – S9C	3	106.3
	Ore Sorting Equipment	S10 – S11	2	85.0
	Truck Unloading Ore	S12 – S14	3	110.2
	Conveyor Dust Collectors	S15	1	93.6
	Crusher Building Walls	S16	1	87.8
Crusher Building Roof	S17	1	87.8	

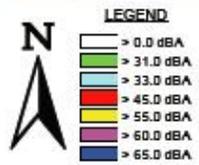
GHD 2020

The Project will occur in a rural area with an acoustical environment dominated by natural sounds and having little or no road traffic (GHD 2020). The Study evaluated the potential noise impacts from the Project generated during normal operation on the sensitive receptors located nearest to the project operations, based on continuous 24-hour operations. Mine operations are expected to increase the ambient sound levels for certain distances from the mine site.

The Study Area for the noise impact study was defined as the area extending 1,500 meters (m) from the proposed Project operations. The noise impact at a distance beyond 1,500 m from the subject site is not expected to be environmentally significant (GHD 2020).



Source: Google Satellite



Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

11219938  
07.12.2020

**NOISE CONTOUR PLOT - SORTING PLANT**

**FIGURE 1B**

CadnaA File: C:\Users\alivene\Desktop\Hammerdown Site - 05Dec2020-Figure1 zoomed out.cna

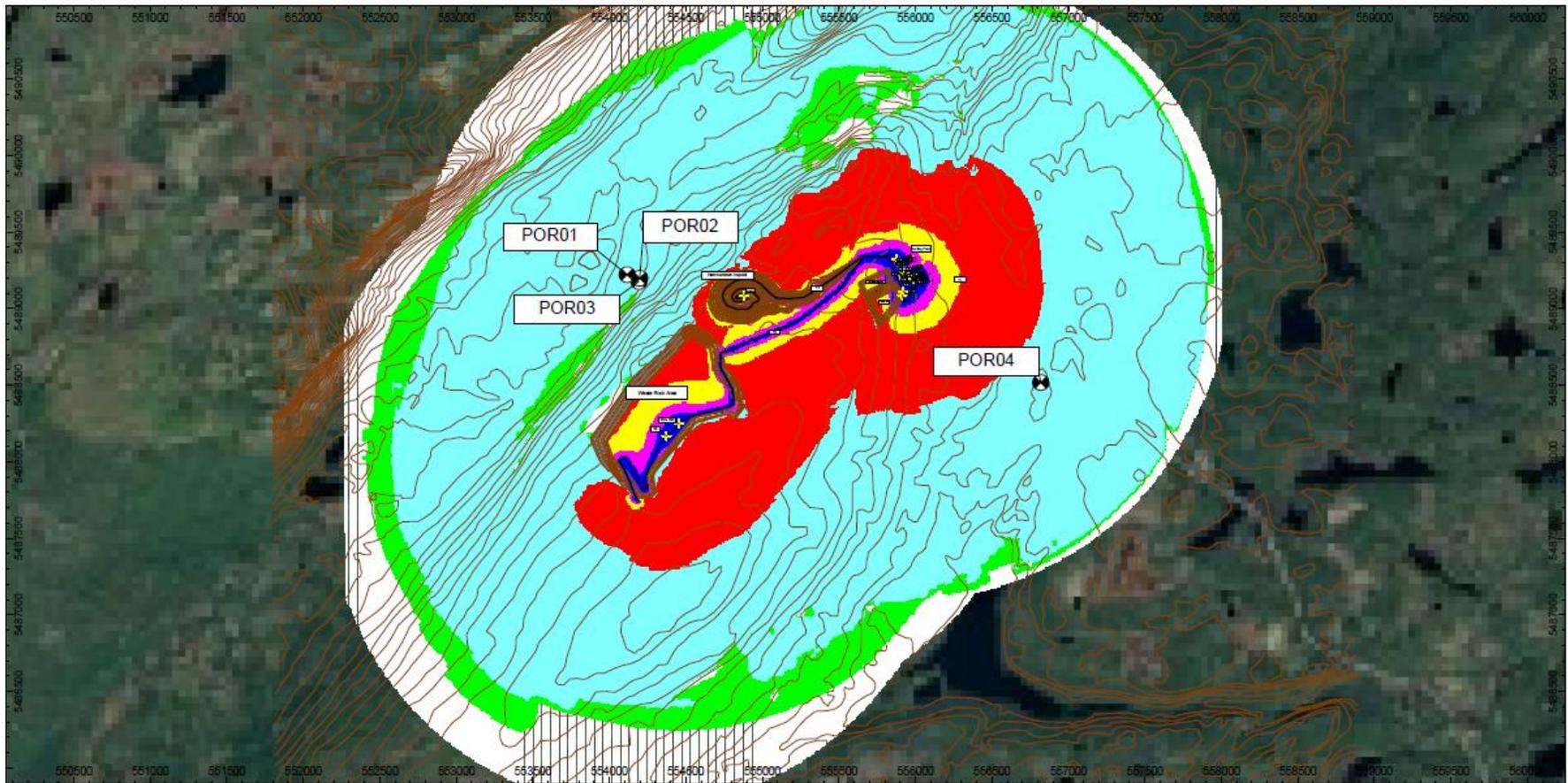
**Figure 16: Noise Contour Plot- Crushing and Sorting Plant**

GHD considered 'points-of-reception' (POR) and sensitive noise receivers in their 2020 study, the objective of which was to determine the predictable worst-case 1-hour equivalent sound level at the worst-case points-of-reception. The worst-case points-of-reception are defined as the sensitive receptor with the greatest potential exposure to the Project noise sources due to proximity and direct line-of-sight exposure (GHD 2020).

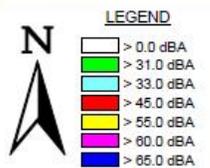
GHD defined a POR as any point on the premises of a person where sound origination from other than those premises is received. The study revealed that there are four PORs located within 4,000 m of the Hammerdown mine site.

The four PORs or noise sensitive receivers identified within 450 m of the Project site (i.e., three cabins and a metal salvage yard) where noise from a stationary source could be received are indicated on Figure 17.

There may be other land users in the vicinity of the Project during various construction and operations activities as well, (e.g., wood cutters, snowmobilers, berry pickers).



Source: Google Satellite



**GHD** Noise Study  
 Maritime Resources  
 Hammerdown Mine Site, Newfoundland

11219938  
 12.01.2021

**NOISE CONTOUR PLOT - HAMMERDOWN MINE SITE**

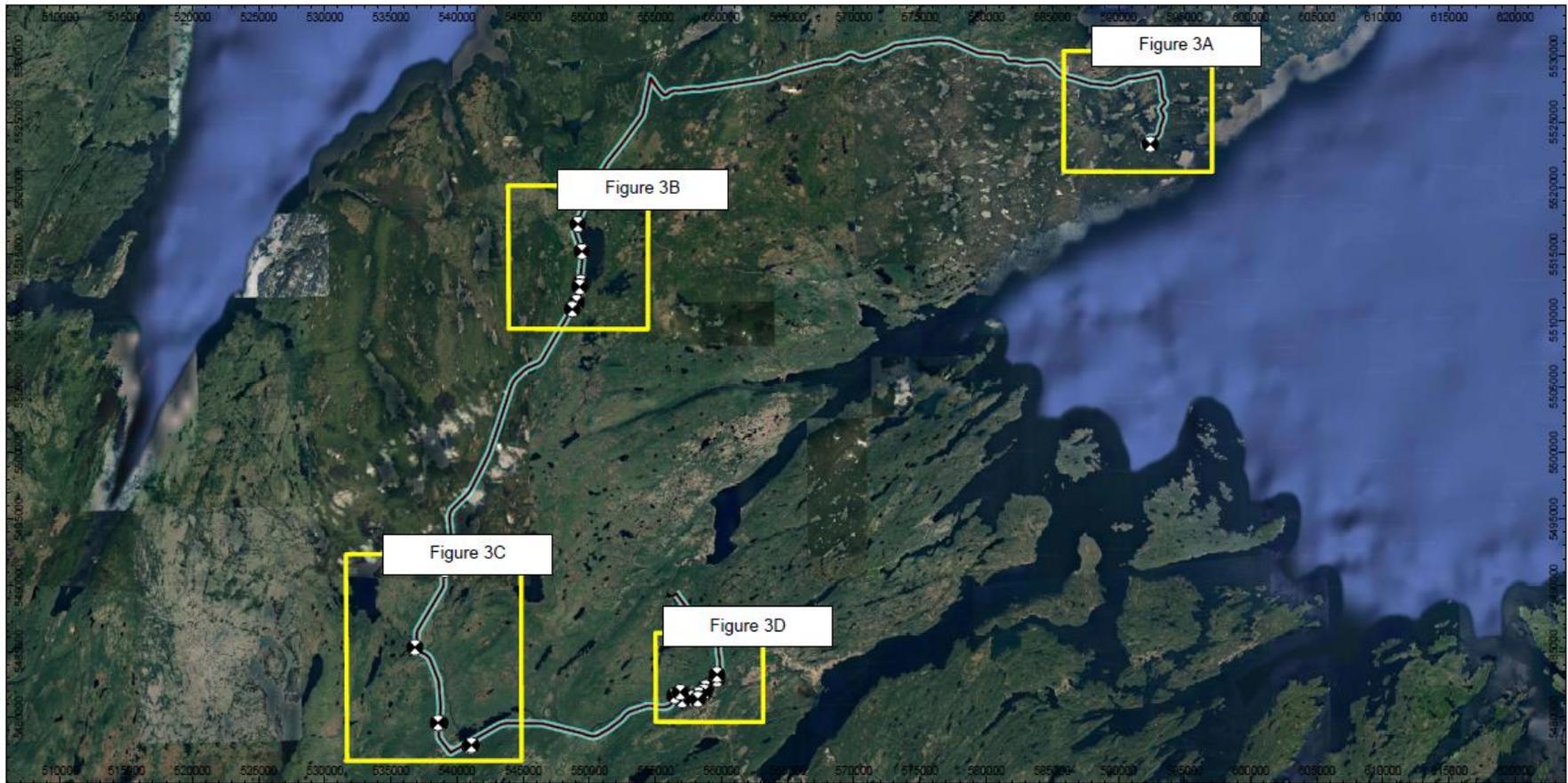
**FIGURE 1A**

CadnaA File: \\ghdnet\ghd\CA\St John's\Projects\66111219938\NOISE Study\Cadna Model\11219938 - Hammerdown Site and Haul Route.cna

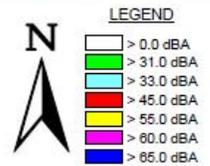
**Figure 17: Noise Contour Plot, Hammerdown Mine Site (GHD 2020)**

#### **4.4.6 Existing Road Traffic on Ore Transport Route**

Maritime estimates that at full operation capacity, approximately four to eight trucks will be transporting ore to the NPM on a daily basis. Ore transport to the NPM is expected to increase the ambient sound levels for certain distances from the ore haul route but predicted noise levels are expected to attenuate over large distances (GHD 2020). By using aerial imagery of the haul route to the NPM, GHD identified 26 PORs (POR4-POR30) (Figure 18) but it should be noted that the haul route does not pass through any communities. Figures 3A-3D in GHD's 2020 Noise Report provides greater detail on the location of all 26 identified PORs. Overall, Maritime concluded from the GHD report that ambient sound levels from ore transport will not significantly impact PORs along the route (GHD 2020).



Source: Google Satellite



Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

11219938  
07.12.2020

NOISE CONTOUR PLOT - ORE HAUL ROUTE

FIGURE 2A

CadnaA File: C:\Users\evens\Desktop\Hammerdown Site - 05Dec2020-Figure1 zoomed out.cna

**Figure 18: Modelled Noise Contour Plot on Ore Transport Route (GHD 2020)**

#### **4.4.7 Extent of Cultural Activities in the Project Area**

Through a number of in-person, virtual and telephone engagement activities, Maritime was able to gather the views of various community leaders and community groups on the Project since it was first submitted for EA review in July 2019. Municipal councils from the Towns of King's Point and Springdale were supportive and did not raise any concerns with respect to the practice of cultural activities in the area.

Maritime engaged with the general public, cabin owners, trail users, the NLSF and outfitters operating in the area leading up to the initial EA Registration and during the EPR writing process. No concerns relative to the practice of cultural activities such as fishing, hunting, woodcutting and berry picking were expressed by anyone, but issues related to cabin access and a safe snowmobile route were expressed and addressed. Cultural activities such as fishing, hunting, woodcutting and berry picking are likely practiced in the region but no concerns relative to their continued practice were expressed during Project engagement activities.

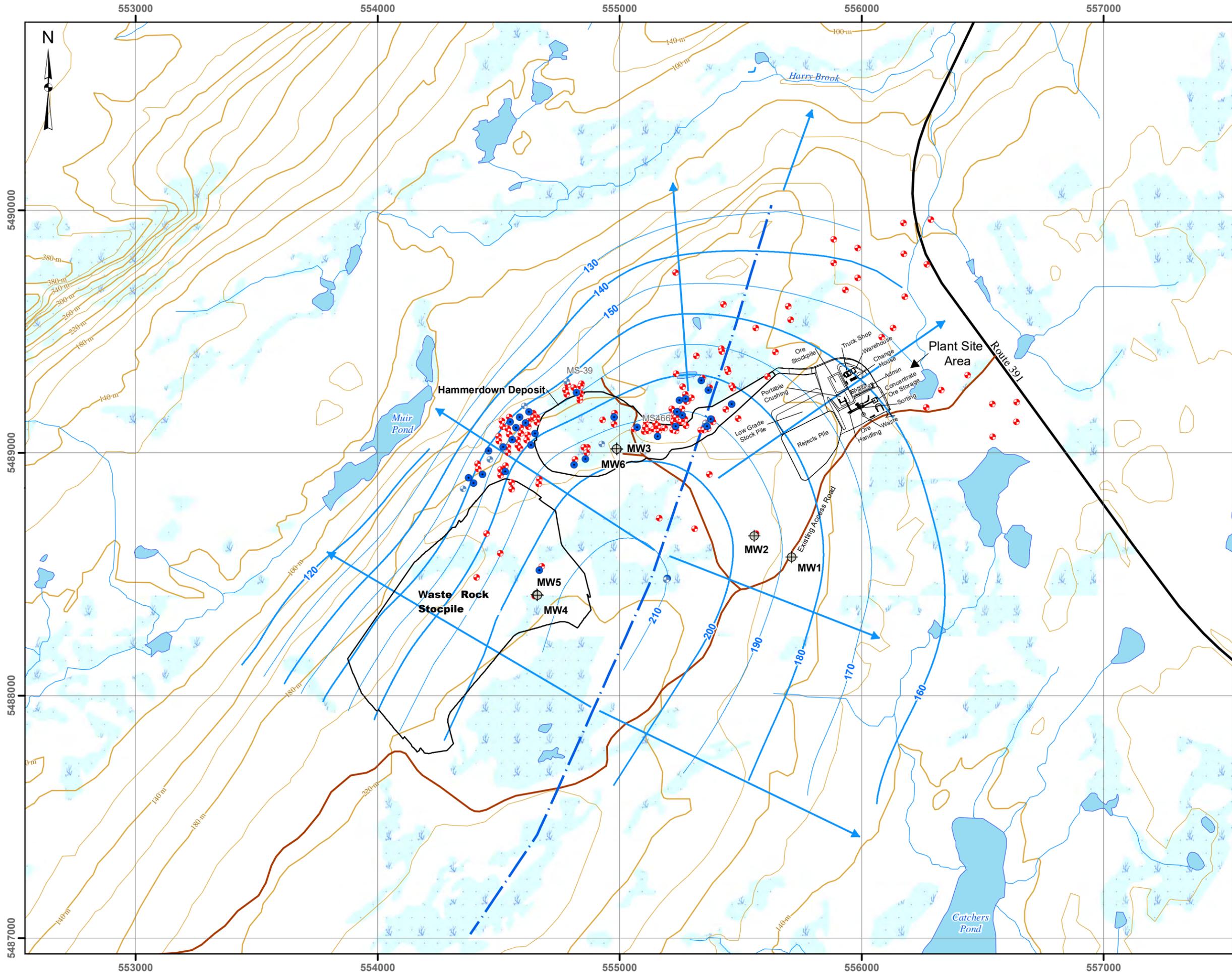
#### **4.4.8 Groundwater Resources**

Based on the proposed Project plan, groundwater will likely be encountered during mining activities and there is a potential for changes in groundwater and/or surface water interactions in and around the mine site primarily due to open pit and underground dewatering activities.

Maritime completed a baseline hydrogeology program to characterize the hydrogeological conditions at the Project site in 2019. The baseline hydrogeology field program involved the installation of six monitoring wells, including two paired well systems to evaluate vertical hydraulic gradients, along with in-situ hydraulic conductivity testing (packer testing and slug testing), groundwater level monitoring and groundwater sampling. Details of the baseline hydrogeology program can be found in GEMTEC (2019c), and are summarized in the 2020 Registration document for this Project. The hydrogeology test locations and inferred groundwater flow regime described in these documents are presented in Figure 19.

##### **4.4.8.1 Summary of Groundwater Flow**

The Project site is underlain by an unconfined to semi-confined aquifer within the saturated overburden and shallow bedrock, and is situated along the crest of a regional topographic ridge that corresponds to the groundwater/surface water divide between the Catcher's Pond, and Muir Brook – Shoal Pond sub-watersheds. Based on its topographic location at the height of land, the Project site is inferred to represent an area of groundwater recharge, and the bordering low-lying drainage features are areas of groundwater discharge. Groundwater flow is predominantly directed to the west-northwest in the vicinity of the proposed open pit and area, and to the north-northeast where the topographic ridge slopes northward toward Harry Brook, including in the Crushing and Sorting Plant area. Adjacent to the Crushing and Sorting



- Legend**
- GEMTEC 2019 Monitoring Well
  - Groundwater Survey Observation Point (Exploration BH)
  - Exploration BH (Artesian)
  - Exploration BH (Inspected)
  - Groundwater Flow Direction
  - Groundwater Flow Divide
  - Interpreted Groundwater Contour - 10 m
  - Highway
  - Existing Access Road
  - Topographic Elevation Contour (masl)
  - Planned Mine Infrastructure
  - Wetland

**Note**

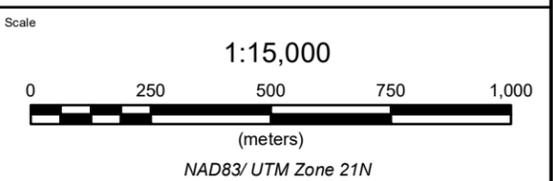
1. This drawing is a schematic representation. Sizes, locations and dimensions are approximate.
2. Coordinate System: NAD83 CSRS UTM Zone 21 North.
3. Topographic Data acquired from GeoGratis (Government of Canada).

Drawn By	MC	Checked By	CAM
Calculations By		Checked By	

Date: MARCH 2021

Project: ENVIRONMENTAL PREVIEW REPORT, HAMMERDOWN GOLD PROJECT

Drawing: PROJECT SITE PLAN WITH HYDROGEOLOGY TEST LOCATIONS AND GROUNDWATER FLOW REGIME



File No.	80044.12	Drawing	FIGURE 19	Revision	0
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Plant area, in the vicinity of the low grade and rejects stockpiles, groundwater flow is inferred to flow southeastwards towards the Catchers Pond drainage system. Calculated horizontal hydraulic gradients range from 6% towards the Catchers Pond sub-watershed up to 14% towards the Muir Brook sub-watershed. The vertical component of groundwater flow in the Project site area was found to be downward, ranging from 1% to 9%.

The hydraulic conductivity (K) and movement of groundwater through the overburden is controlled by primary porosity, while groundwater flow within the underlying bedrock mainly occurs within secondary porosity, such as fractures, joints and faults, and varies depending on the frequency and interconnection of these discontinuities. In-situ K testing indicates values ranging from  $8 \times 10^{-6}$  m/s for the shallow overburden and bedrock to  $9 \times 10^{-11}$  m/s for the deeper bedrock (to 30 m), with an overall geometric mean K determined for the Project site of  $2 \times 10^{-7}$  m/s. Based on these geometric mean K values, average linear groundwater flow velocity is estimated to range from approximately 4 m/yr (towards the Catchers Pond sub-watershed) to approximately 18 m/yr (towards the Muir Brook-Shoal Pond sub-watershed).

The groundwater table in the Project site area is shallow, occurring within 3 m of groundwater surface. An update on the most recent results of the long-term groundwater level monitoring program initiated in August 2019 is presented in Section 4.4.8.2.

#### 4.4.8.2 Long-Term Groundwater Level Monitoring

##### Methods

During the August 2019 baseline hydrogeology field program, groundwater levels in the monitoring wells were measured manually with a Solinst® water level meter immediately before slug testing and sampling. After sampling was complete, a Solinst® Levellogger® set to record water levels every 24 hours was installed in each well for long-term monitoring purposes. A Solinst® Barologger® was also placed outdoors at a central location on the Site to allow barometric correction of the long-term levellogger data. During a subsequent fall (November 2019) sampling program, groundwater levels were measured manually again, and the levellogger and barologger data were downloaded. The levelloggers and barologger were subsequently re-installed for continued monitoring. The locations of these monitoring wells are shown on Figure 19. The results for this early period of groundwater level monitoring were presented in the GEMTEC (2019c) hydrogeology baseline report.

More recent site visits have been completed in November 2020 and January 2021 during which time the wells were visited and manual water level measurements were taken as well as the data downloaded from the levelloggers. On November 9, 2020, the most recent data download was carried out for monitoring wells MW1, MW3, and MW6, and on January 21, 2021 the most recent data download was carried out on monitoring wells MW2, MW4 and MW5.

## Summary of Results

The current long-term groundwater level monitoring data set for the Project site spans an approximately 17 month period from August 28, 2019 to January 21, 2021. A summary of the manual groundwater level measurements collected from the monitoring wells over the monitoring period is presented below in Table 6, and the groundwater level data recorded by the levelloggers in the six monitoring wells are presented on time series groundwater level hydrographs provided in Appendix E. Please note that monitoring wells MW3/MW6 and MW5/MW4 are paired systems at the same location with the first referenced well serving as the shallow water table installation and the second referenced well serving as the deeper (30 m) aquifer installation.

Daily precipitation (total rainfall) data was taken from the closest active weather station at Middle Arm (Environment and Climate Change Canada, 2020), located approximately 18 km northeast of the Project site. Each groundwater level hydrograph also contains this daily total rainfall precipitation data to identify possible correlation between groundwater levels and precipitation.

**Table 6: Summary of Manual Groundwater Level Measurements**

Well ID	Surface Elevation (masl)	August 2019		November 2019		November 2020		January 2021	
		GW Level (mbgs)	GW Elevation (masl)						
MW1	194.80	0.43	194.37	0.35	194.46	0.30	194.50	-	-
MW2	206.70	0.18	206.52	0.11	206.60	-	-	0.28	206.42
MW3	203.64	1.23	202.41	0.83	202.81	1.04	202.60	-	-
MW4	213.7	0.47	213.23	0.42	213.28	-	-	0.65	213.05
MW5	213.8	0.24	213.56	0.15	213.65	-	-	0.22	213.58
MW6	203.20	3.11	200.09	2.51	200.69	3.45	199.75	-	-

Mbgs – meters below ground surface; masl – meters above sea level.

A summary of the groundwater level data collected from the levelloggers over the monitoring period are presented below in Table 7.

**Table 7: Summary of Groundwater Level Monitoring (October 8, 2019 – January 21, 2021)**

Well ID	Highest Observed Groundwater Elevation			Lowest Observed Groundwater Elevation			Mean Groundwater Elevation		Observed Groundwater Elevation Variability (m)
	Depth (mbgs)	Elevation (masl)	Date	Depth (mbgs)	Elevation (masl)	Date	Depth (mbgs)	Elevation (masl)	
MW1	0.15	194.65	20-10-11	0.91	193.89	20-08-18	0.37	194.43	0.76
MW2	0.01	206.29	19-11-02 20-05-10 20-10-11	0.61	206.09	20-08-18	0.20	206.50	0.60
MW3	0.50	203.14	20-05-02	2.07	201.57	20-08-24	1.23	202.41	1.57
MW4*	0.13	213.57	19-12-12	2.94	210.76	19-08-30	0.92	212.78	1.49
MW5	0.03	213.77	20-12-29	0.65	213.15	20-08-18	0.19	213.61	0.62
MW6	2.11	201.09	20-05-10	4.49	198.71	20-08-27	2.97	200.23	2.37

\* Long-term monitoring data for MW4 starts on December 3, 2019; the well showed slow recovery of water levels following the summer and fall field testing programs, resulting in uncertainty in static conditions prior to this date.

Over the monitoring period, the depth to shallow groundwater (MW1, MW2, MW3, and MW5) ranged from 0.01 mbgs (MW2) to 2.07 mbgs (MW3). In the two deeper wells (MW4 and MW6), the static water level ranged from 0.13 mbgs (MW4) to 4.49 mbgs (MW6). The monitoring well with the highest observed mean groundwater elevation during the monitoring period was MW5 (213.61 masl), while the lowest was observed at MW1 (194.43 masl).

The 17 month monitoring period depicted on the groundwater level hydrographs (Appendix E) captures a full range of seasonal groundwater level fluctuations, and indicates a transient groundwater system. For all six monitoring wells, groundwater levels were typically lower during the winter months prior to spring run-off and in the mid- to late-summer, corresponding to a period of relatively lower precipitation. The highest groundwater levels were recorded during spring run-off and during the fall rainy period.

Seasonal fluctuations in groundwater levels were generally similar for monitoring wells MW1, MW2 and MW5, ranging from 0.6 m to 0.76 m. More pronounced seasonal groundwater level fluctuations were observed in paired monitoring wells MW3 and MW6 of 1.57 m and 2.37 m, respectively. These monitoring wells also had lower groundwater levels than that measured at the other site monitoring well locations. The paired MW3/MW6 monitoring well installation is located within the footprint of the former underground mine, and GEMTEC interprets that the deeper groundwater levels, and increased seasonal groundwater level fluctuations observed in these wells are due to perturbations in the local groundwater regime in this area associated with the underground workings, and do not reflect natural groundwater conditions at the Project site.

Deep monitoring well MW4 also showed a high seasonal variation in groundwater levels similar to that observed in MW3 and MW6, and were more pronounced than that observed in its shallower paired monitoring well, MW5. An historical map shows the limits of the former underground mine workings terminate approximately 700 m to the northeast of monitoring well MW4 and do not extend into this area; however it is possible that an unidentified hydraulic connection exists between monitoring well MW4 and the underground mine that also influences groundwater levels in this well similar to that observed in MW3 and MW6. The groundwater levels in monitoring well MW5 do not appear to show this influence and are considered to represent natural groundwater conditions.

Observed day-to-day variability in groundwater levels and the apparent coincidence of these variations with rainfall events at all six monitoring well locations supports the concept that the Project site overburden and shallow bedrock aquifer is an unconfined system.

The long-term monitoring data collected to date span a 17 month monitoring period, providing a good record of seasonal groundwater level fluctuations at the Project site. The monitoring results from the 2019 groundwater monitoring well network have allowed for reasonable spatial characterization of natural conditions at the Project site, and also appear to show local groundwater level variability related to the former underground mine. As long-term groundwater level monitoring in the 2019 monitoring wells continues through Project development, groundwater level patterns and trends observed in the current data set will be better defined and understood. In addition, the Site's long-term monitoring well network was recently expanded to include an additional five monitoring wells equipped with levelloggers installed during the fall 2020 feasibility-level site-wide geotechnical and hydrogeological program. Going forward these new 2020 monitoring wells will enhance spatial coverage of the Site's long-term groundwater level monitoring data set, and in addition to further characterizing the natural groundwater regime, will help inform GEMTEC's interpretation that groundwater levels in the vicinity of the former underground mine are influenced by the undergoing workings.

#### 4.4.8.3 Groundwater Users

Within the immediate vicinity of the Project, there are no known permanent dwellings that rely on groundwater as a drinking water source. There are several remote cabins located to the west and northwest of the Project site in proximity to Muir Pond. Muir Pond cabin owners do not rely on surface or groundwater and transport potable water to these locations. Maritime was recently informed by a cabin owner that a new spring water source was established in the Shoal Pond area in the fall 2020 that is used as a potable source. This spring source is located approximately 6.5 kilometers from the Project site along the lower northwestern slope of the ridge (Figure 4). A site visit to the spring location was carried out by Maritime staff and the cabin owner on February 23, 2021. At the time of the site visit the ground was snow covered, which inhibited full inspection of the spring source. The spring has been enclosed by a 10 foot vertical piece of HDPE culvert

(15 inch diameter) that was manually installed, and is equipped with a submersible pump to bring water to surface (Photos 1 and 2).



**Photo 2: Spring source in Shoal Pond area.**



**Photo 2: Inside spring source pipe enclosure.**

The spring source is situated within a cleared area previously used as a fill borrow source. It was reported that the site is underlain by sand and gravel overburden material; the depth to bedrock is not known. The spring source expresses at surface as an area of pooled water that is reportedly always present, even during the dry summer months. The depth of the vertical pipe enclosure is 10 feet, but since it was manually installed it is assumed that it extends no deeper than the overburden/bedrock contact. Based on these observations, GEMTEC infers that the subject water supply is a surface water source derived from infiltration of local precipitation run-off that flows along the overburden/bedrock contact, or is possibly a true spring feature derived from groundwater discharge in this regionally low-lying area. Either of these two potential sources would be derived from upland areas along the ridge directly up-gradient of the supply, and situated approximately 6.5 km away from the Project site. Given the significant separation distance, the subject spring source water supply is not expected to receive any groundwater or surface water run-off contribution from the Project site, and is not expected to be affected by the Project.

The closest public potable water supply is the King's Point Bulley's Pond surface water supply, located approximately 4 km north of the Project site. The Springdale Sullivan's Pond surface water supply is located approximately 15 km to the east. Given the substantial distances and the number of intervening topographic and hydraulic drainage divides that separate the Bulley's Pond and Sullivan's Pond catchment areas (Figure 4) from the Project site, GEMTEC does not consider the Project site hydraulically connected to these public water supply areas.

#### 4.4.8.4 Planned Groundwater Monitoring

Maritime understands Project dewatering activities may impact surrounding water bodies and commits to monitoring and reporting groundwater quality and levels over the LOM. Groundwater monitoring will also occur to the northwest of the waste stockpile, within the Muir Brook-Shoal Pond sub-watershed, as this area is inferred to get most of the groundwater flow in the area at  $5.7E-7$  m/s (or 18 m/yr) and will require the installation of another monitoring well. Maritime will determine the exact location of this well in consultation with the Water Resources Management Division (WRMD).

Maritime also acknowledges that a Memorandum of Understanding (MOU) with the WRMD relative to the installation of a real-time water quality/quantity network for surface water/groundwater will be required for this Project.

#### 4.4.8.5 Long-Term Groundwater Quality Monitoring

Baseline groundwater quality investigated during the 2019 program indicates a calcium bicarbonate type and likely of meteoric origin, that is characterized as slightly basic to near-neutral (pH 8.30 to 6.47), and very soft to hard (less than 50 mg/L to 105 mg/L), with relatively low total dissolved solids; however a number of dissolved metals, including aluminium, arsenic, cadmium, copper, iron, lead, manganese, and silver were detected in at least one or more samples at concentration that exceeded federal environmental groundwater quality and Canadian Drinking Water Quality Guidelines.

As noted in the EPR guidelines, four seasons of data is required to fully characterize groundwater quality at the Project site. The current data set represents the summer and fall seasons. A winter groundwater quality sampling event is scheduled for March 2021, and a spring event is planned for May 2021. A report documenting the results of these groundwater quality sampling events will be provided by the fall 2021, along with updated long-term groundwater level monitoring data obtained during these sampling programs.

Additional information relative to planned monitoring and commitments relative to groundwater resources and the Project are addressed the WaMP.

#### 4.4.9 Human Health Receptors

Human health and safety, and environmental protection will be paramount considerations for Maritime in the planning and detailed design of the Project. In the construction, operation, decommissioning and maintenance of the Project, established safety procedures specific to human health and environmental protection will be strictly adhered to.

The Project will occur near the Town of King's Point, with some components of planned infrastructure situated within the municipal town boundary. Other portions of the operation will be developed on Crown Land. Figure 12 depicts land and resource uses in the Project area and is

also indicative of potential human health receptors that may be affected by Project activities. Potential receptors include trail users, home gardeners and cabin owners. The closest residential area is in King's Point, a distance of 5 km from the Project site. There is one school in King's Point, but no hospitals, clinics, retirement complexes or assisted care homes. The closest receptors adjacent to the Project are residents from the town of King's Point who occasionally occupy cabins in the vicinity of Muir Pond (Figure 12).

#### **4.4.10 Baseline Greenhouse Gas Emissions**

The Climate Change Branch (CCB) was consulted during the writing of the EPR to clarify the level of information required relative to baseline GHG emissions and informed Maritime that in the absence of the Project, GHG emissions in the area would remain status quo. The province compiles annual provincial GHG emission levels and does not break them down to a regional level. For purposes of this EPR, Maritime will provide the estimated GHG emissions during operations as required in the EPR guidelines (section 7.10). The baseline annual greenhouse gas (GHG) emissions for the area are assumed to be low given the lack of industry in the area. Sources of GHG emissions in the area are assumed to be from the combustion of gas and diesel powered vehicles and machines, wood stoves, and minor industry.

#### **4.4.11 Viewscapes**

The Project will not be located on public roadways and a portion of Project infrastructure will be constructed on an existing brownfield site. A description of how viewscapes will be mitigated through the maintenance of appropriate buffers is presented in section 7.11.

### **4.5 Construction Phase**

Project construction will involve site preparation activities covering an overall area of approximately 90 ha. Approximately 20% of the Project area is brownfield, which means less than 75 ha will require clearing. Maritime will implement a number of mitigation measures to limit or avoid adverse environmental effects as a result of Project-related construction activities. Construction activities will be completed using small to mid-sized, standard construction equipment, 6-12 months). In addition, Maritime will provide its existing Environmental Protection Plan (EPP) and other relevant environmental plans to contract personnel involved in the construction phase for review and implementation. Construction work will also adhere to other environmental protection measures outlined in Maritime's various management plans, and in keeping with regulations (i.e., WaMP, Waste Management Plan (WMP), Environmental Contingency Plan (ECP), and bird breeding seasons), which provide appropriate preventative and mitigative measures to limit potential adverse environmental effects of construction activities. Whenever revisions are required to the EPP, Maritime will complete them in a timely manner and communicate them to all relevant Project personnel. Maritime will also require that contractors comply with all regulations and permits relative to the Project construction activities.

Preliminary schedules of activities are presented below in Tables 8 and 9. General construction activities associated with the Project are noted below in Table 9.

**Table 8: Project Regulatory Approval, Construction and Operations Schedule**

Activity	2021					2022	
	Mar	Apr	May	Jun	H2*	H1*	H2*
EPR submission to EA Division							
Public & Government Review							
EA Decision							
Development Plan							
Rehabilitation & Closure Plan							
Environmental Management Plans, e.g., EPP, ECP, BIMP (develop or update)							
Other required Permitting							
C of A (Construction/Operations)							
Construction Start							
Operations Start							

\*Refers to six month period or half year

**Table 9: Preliminary Project Development Schedule**

Activity	2021				2022		
	Q1*	Q2*	Q3	Q4*	Q1*	Q2*	Q3*
Access road widening, site preparation, water management/distribution system							
Mine project facilities and pre-concentration plant construction							
Mine development and pre-stripping activities							
Nugget Pond Mill refurbishment, new crushing & grinding circuit construction							
Mine & processing operations ramp up							

\*refers to quarter

Additional information on Best Available Control Technology (BACT) for the construction phase of the Project is presented in the BACT Analysis Report (Appendix F).

#### 4.5.1 Site Preparation

This work includes the cutting and clearing of vegetation and the removal and storage of organic material and overburden from areas that will be developed. Road upgrades and ditching or other construction-related water and erosion control methods are also included here. This work will be carried out in planned development areas in accordance with cutting and burning permits and according to regulator recommendations relative to bird breeding seasons (March 15-July 31).

Approximately 75 ha will be cleared for the pit and waste rock stockpile development with a further 12 ha planned to be cleared for the sorting plant and low-grade ore stockpile.

#### **4.5.2 Earthworks**

Earthworks involves preparation work for infrastructure in development areas and includes excavation, placement of structural fill, and grading to accommodate infrastructure construction or installation. Earthworks relative to pit development drilling and blasting will follow overburden stripping in the pit area and will be carried out by a mine contractor.

#### **4.5.3 Installation of Major Infrastructure**

The crushing and sorting plant will be installed during the construction phase and will follow all recommendations and permit requirements as provided by government regulators.

#### **4.5.4 Other Infrastructure Installation**

A number of temporary modular buildings will be installed including the office and dry buildings, garage and maintenance buildings, weigh scale, explosives magazine, gate and fence.

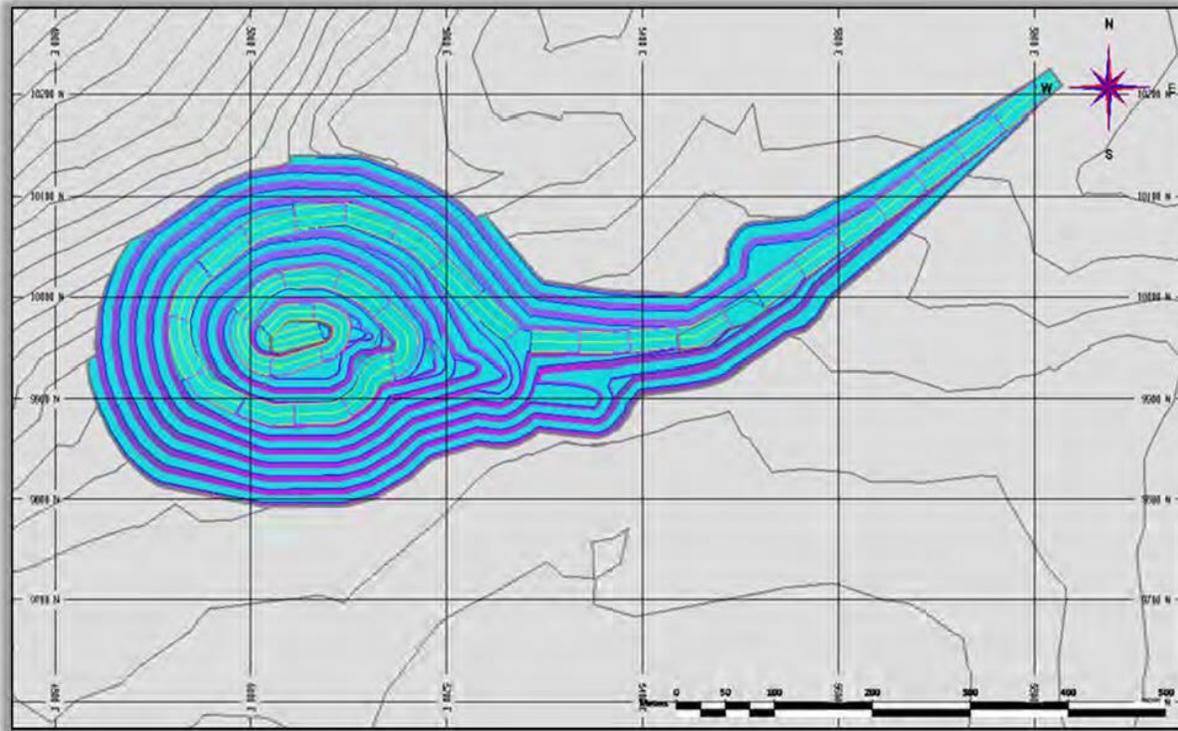
#### **4.5.5 Installation of Utilities**

All electrical and telecommunications infrastructure will be installed during the construction phase.

#### **4.5.6 Open Pit Development**

Maritime will carry out pre-stripping activities in the open pit area, approximately 18 ha, in preparation for developing the mine. The open pit has a designed depth of 140 m and will be approximately 1,000 m long and 350 m wide. The final design is shown on Figure 20, with a 100 m grid system north-south and a 200 m grid system east-west.

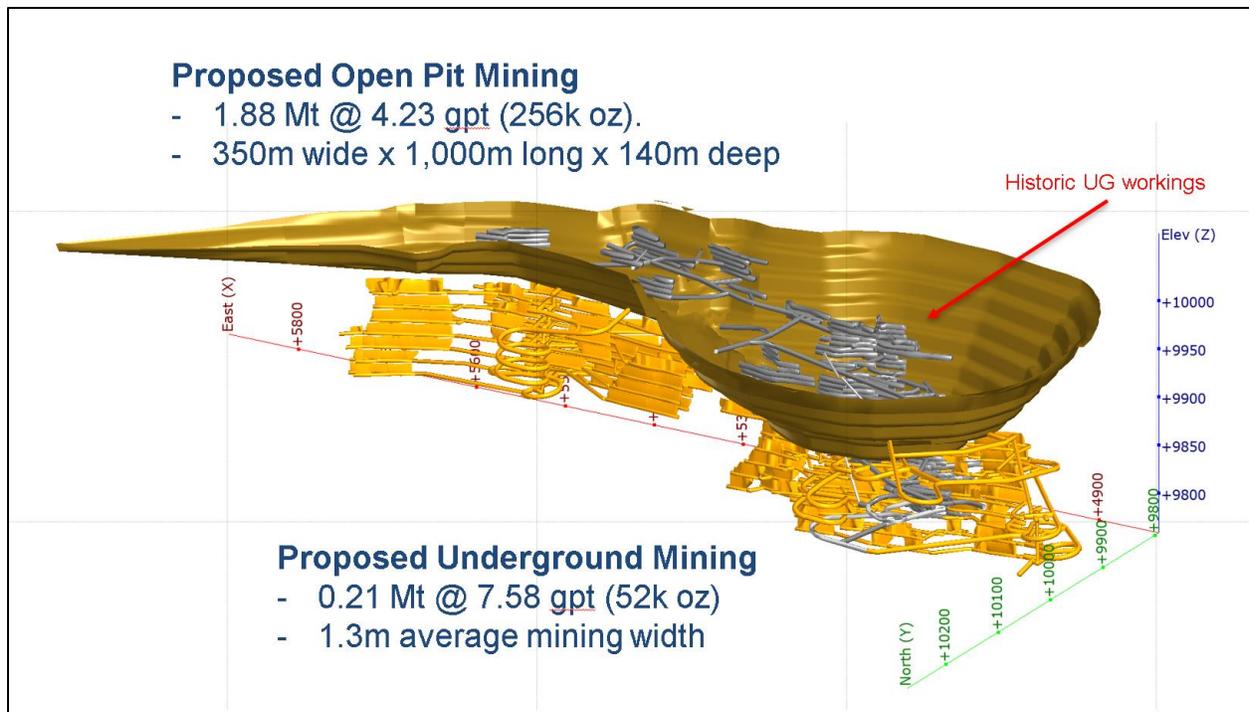
The open pit design incorporates a 5 m high bench height with ramps at a 10% gradient, varying in width from 15.6 m (single lane) to 20.4 m (double lane). Ramps have been designed for 46 t haulage trucks and a mobile fleet of 7.0 m<sup>3</sup> hydraulic excavators and 6.0 m<sup>3</sup> front-end loaders. These machines will be supported by 455 kW tracked dozers and road graders to maintain the pit floor, stockpile and road surfaces. An access road exiting the pit to the northeast will deliver feed to the sorting plant, and waste rock to the waste rock stockpile.



**Figure 20: Conceptual Hammerdown Open Pit Design**

#### 4.5.7 Underground Development

Underground development is anticipated to begin in year 4 and continue for three years. This development will work around the older workings to develop previously unexploited zones. In Figure 21 the open pit workings are paused while the underground is being exploited and the new ramp and level access and primary ventilation arrangement are developed. Note that some of the historic workings may require rehabilitation and will require further evaluation upon re-opening the mine.



**Figure 21: Proposed Underground Mine Development (2020 PEA Study)**

#### 4.6 Operation and Maintenance Phases

Once the Project has received all required approvals, mining activities will begin. The following are the mining-related operations for the Project:

- Open pit mining;
- Underground mining;
- Ongoing expansion of waste rock stockpile and low-grade stockpile; and
- Crushing and sorting.

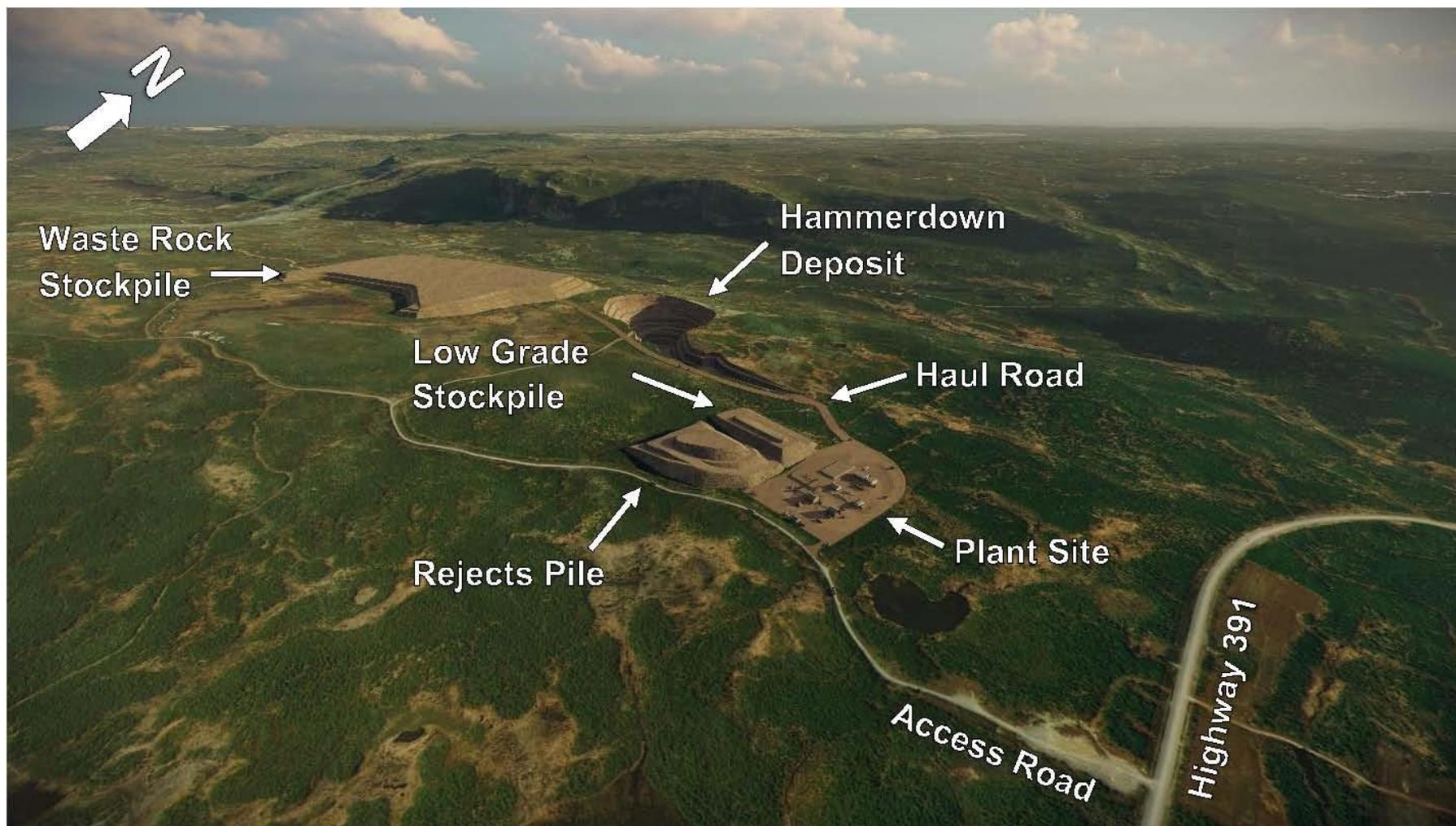
Maritime predicts the duration of mining operations at the Hammerdown deposit to be six years, operating 24 hours/ day and seven days/week. During the operations phase of the Project, there will be variable interactions with the biophysical environment (e.g., vegetation, wetlands, wildlife and SAR, avifauna, fish and fish habitat and surface water and groundwater resources). Operational activities will be characterized primarily by the mining of ore from both an open pit and underground development, and movement of ore and waste rock within the Project boundaries, the operation of the crushing and sorting plant and the storage and loading of pre-concentrated ore for transport to the NPM.

The planned production schedule during operations is outlined in Table 10 and a conceptual rendering of key operations infrastructure is presented in Figure 22.

**Table 10: Planned Production Schedule for the Project**

	<b>Development/ Construction</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>
<b>Open Pit (kt)</b>	52.13	585.57	660.16	473.18	0	0	111.75
<b>Underground (kt)</b>	0	0	0	0	36.68	141.07	31.56
<b>Total (kt)</b>	<b>52.13</b>	<b>585.57</b>	<b>660.16</b>	<b>473.18</b>	<b>36.68</b>	<b>141.07</b>	<b>143.31</b>

Additional information on BACT for the operations phase of the Project is presented in the BACT Analysis Report (Appendix F).



**Figure 22: Conceptual Rendering of Key Operations Infrastructure**

#### **4.6.1 Open Pit Mining**

The open pit mine production rate will be approximately 470 kt tonnes per annum (tpa) over four years of operations or 1,290 tpd of concentrated ore. Mining of mineralized material and waste will be carried out by contractors. Access to the waste rock stockpile may be via intermediate ramps.

ROM mineralized material will be placed in a stockpile and fed into a crusher using a front-end loader. All ROM mineralized material will be crushed to 80% passing 60 microns and placed in a feed stockpile adjacent to the crushing and sorting plant.

Mining will be carried out using conventional open pit methods, including drilling using conventional production drills, blasting using ANFO (ammonium-nitrate fuel oil) and loading and hauling operations performed with hydraulic shovel, front-end loader and rigid frame haulage trucks. The production equipment will be supported by bulldozers, graders and water trucks. Maritime will oversee the overall mining operation carried out by the mining contractor(s).

#### **4.6.2 Underground Mining**

The production of the underground mine is assumed to range from approximately 30-140 ktpa over three years or approximately 50-200 tpd of concentrated ore. Underground mining will include the following activities:

- Lateral development;
- Vertical development;
- Production drilling; and
- Blasting using ANFO and bulk emulsion.
- Use of stationary equipment including:
  - Main fan and propane heating system;
  - Secondary fans for ventilation;
  - Air compressor; and
  - Mine dewatering pumps at various locations.

#### **4.6.3 Waste Rock Stockpile**

The waste rock stockpile will receive all non-process feed materials from the open pit and underground workings.

#### **4.6.4 Crushing and Sorting Plant**

Material will be delivered from the mine to feed the crushing plant that consists of two stages of crushing. The plant will process between 54-83 tonnes per hour (t/h) of material and produce a final screened product size ( $P_{80}$ ) of approximately 30 mm.

The sorting of the mineralization will consist of two stages using machines with X-Ray Transmission (XRT) and Laser sensors. The sorting circuit will reject approximately 50% of the sorter feed material while maintaining gold recovery of 90-94%. With a recombining of the screen undersize fines, the overall gold recovery is expected to range between 93.0-95.8% at an average of 94.6% with 25-36 t/h of concentrate product produced.

The pre-concentration process does not use water and no chemical processes or chemicals are used in any of the crushing and sorting methods.

Over the LOM, the mine is expected to deliver a total of 1.05 Mt of sorted mill feed grading 8.67 gpt Au to the NPM for final processing and tailings storage.

A detailed description of the planned settling ponds and other water management infrastructure is presented in Sections 2.2 and 5.2 of the WaMP (Appendix B). A detailed WMP is presented in Appendix G.

## 5.0 SOCIOECONOMIC CONSIDERATIONS

The King's Point Area includes the towns of King's Point, Harry's Harbour, Jackson's Cove-Langdon's Cove-Silverdale, Nickey's Nose Cove and Rattling Brook (NL Statistics Agency). The Town of King's Point, the closest community to the Project, has a population of approximately 670 (website, Town of King's Point). The King's Point Area constitutes Local Area 68, within the Grand Falls-Windsor-Baie Verte-Harbour Breton Rural Secretariat Region and within Economic Zone 11.

The Project has a six year mine life and is located within five km of the nearest community, King's Point. Maritime expects net positive benefits of the Project by offering full time direct employment opportunities, as well as positively contributing to the economics of the region. Other spinoff employment is expected and creation of further employment opportunities that support the service and supply demands necessary to maintain Project operations.

Throughout Project planning, Maritime will ensure that appropriate consideration is given to the social, cultural and economic aspects of this resource development project and the uniqueness offered by the proximity of the Project to nearby rural communities.

### 5.1 Social Determinants of Health

Social determinants of health refer to a specific group of social and economic factors within the broader determinants of health that often relate to an individual's income, education or employment. While Maritime expects a net positive outcome for the employment and economics of the region, further examination of potential positive and negative impacts of the Project has been conducted through an examination of various social determinants of health.

Where net positive effects of the Project are anticipated, Maritime has provided details on how these effects can be maximized. Where the Project could be anticipated to result in an adverse effect, Maritime has indicated reasonable mitigative measures that could be employed to limit these potential negative outcomes. In addition to the noted mitigate measures below, Maritime will consider other additional measures as the Project evolves.

#### 5.1.1 Employment and Income

Current labor projections for the Project indicate that over 200 full time employment opportunities will be generated in support of mining operations, trucking of ore and mill operations at the NPM. Wage rates offered at Hammerdown will likely compare to other industry in the province, but will be higher than many of the employment opportunities currently available within the rural region. Additionally, Project employment opportunities will offer skills development for employees that are transferrable to other operations within the region and beyond, once Project operations end.

The construction phase will see a combination of direct company employee hires and contractor hires (Table 13). At this point in Project planning, Maritime has not finalized the development

strategy or the distribution of contractors for construction and operations. This will be determined as the Project moves closer to execution, and will be updated accordingly.

Over its anticipated yearlong construction phase, the Project will require an estimated 107 workers. Once operational, the Project will employ between 142 and 185 persons. The various occupations required for construction and operations of this Project, and their corresponding National Occupation Codes (NOC), are presented in Tables 11 and 12. Direct positions associated with operation of the NPM are shown in Table 13. Maritime has not yet finalized workforce planning so the exact distribution of contractor and company hires is not fully understood at this time. When the numbers are available, Maritime can provide the distribution if required.

**Table 11: Estimated Full-time Contractor-Hired (CH) or Direct Employee (DE) Hires, Construction Phase**

Occupation	NOC	Duration of Work (yr)	No. of Employees	CH/DE
Project Management	811	1	1	DE
Supervisors Skilled Trades	7301, 7302, 8221, 9211	1	8	CH/DE
Professionals	2113, 2263, 122, 1431, 3413	1	9	CH/DE
Semi-Professionals and Technicians	2113, 2212, 2143, 7372, 1414	1	12	CH/DE
Skilled Trades	7242, 7311, 9411, 9231, 7521, 8231, 7312, 7237, 7242, 7452	1	77	CH/DE

Enhancement of Project employment opportunities to maximize the value for local residents will be supported by company hiring practices, and skills development through training and job readiness initiatives where gaps in individual experience may exist. Additionally, ongoing training and part time employment opportunities offer skills development to ensure that the company is able to appropriately manage workforce attrition potentially stimulated by other projects within the region, by retirement and an aging workforce, or other factors.

**Table 12: Operations Employment Opportunities<sup>1</sup>**

Position Category	NOC Code	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
<b>Open Pit</b>							
Haul truck operator	7521	28	40	24	0	0	12
Hydraulic excavator operator	7521	8	8	8	0	0	4
Wheel loader operator	7521	8	8	8	0	0	8
Production drill operator	7372	20	20	8	0	0	8
Dozer operator	7521	12	12	12	2	2	4
Grader operator	7521	4	4	4	2	2	4
Ore Transport Driver	7511	16	16	16	16	16	16
Operations General Foreman	7301	1	1	1	0	0	0
Operations Supervisor	8221	4	4	4	0	0	4
Blasting technician	7372	1	1	1	0	0	1

Position Category	NOC Code	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
Health & Safety officer	2263	1	1	1	1	1	1
Clerk	1414	1	1	1	1	1	1
Mechanic	7312	2	2	2	0	0	2
Welder	7237	1	1	1	0	0	1
Electrician	7242	1	1	1	0	0	1
Maintenance Foreman	7301	3	3	3	0	0	2
<b>Subtotal</b>		<b>111</b>	<b>123</b>	<b>95</b>	<b>22</b>	<b>22</b>	<b>69</b>
<b>Underground Mine</b>							
Jumbo driller	8231	0	0	4	12	12	4
Bolter	8231	0	0	4	4	4	4
Scooptram operator	8231	0	0	4	16	20	16
Haul truck operator	8231	0	0	8	12	12	8
Longhole driller	8231	0	0	0	4	4	4
Blasting technician	7372	0	0	4	4	4	4
Service operator	8231	0	0	12	12	12	12
Mechanic	7312	0	0	2	4	4	3
Welder	7237	0	0	2	4	4	3
Electrician	7242	0	0	1	2	2	1
Maintenance Foreman	7301	0	0	3	3	3	3
Operations Supervisor	8221	0	0	4	4	4	4
<b>Subtotal</b>		<b>0</b>	<b>0</b>	<b>48</b>	<b>81</b>	<b>85</b>	<b>66</b>
<b>Sorting Plant</b>							
Superintendent	8221	1	1	1	1	1	1
Clerk	1414	1	1	1	1	1	1
Equipment operator	9411	4	4	4	4	4	4
Labourer	7611	4	4	4	4	4	4
Maintenance planner	2143	1	1	1	1	1	1
Crushing plant operator	9411	4	4	4	4	4	4
<b>Subtotal</b>		<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>
<b>General &amp; Administrative</b>							
Operations manager	0811	1	1	1	1	1	1
Senior engineer	2143	1	1	1	1	1	1
Planning engineer	2143	1	1	2	2	2	2
Blasting / geotech technician	2212	1	1	1	1	1	1
Surveying / mine technician	2212	1	1	2	2	2	2
Surveying helper	2212	1	1	2	2	2	2
Clerk	1414	1	1	1	1	1	1
Chief geologist	2113	1	1	1	1	1	1
Grade control geologist	2113	2	2	3	2	2	3
Sampling technician	2212	2	2	4	2	2	3
Human resources officer	0122	1	1	1	1	1	1
Accountant	1431	2	2	2	2	2	2
Warehouse technician	7452	1	1	1	1	1	1

Position Category	NOC Code	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
First aid attendant	3413	4	4	4	4	4	4
Trainer		1	1	1	1	1	1
<b>Subtotal</b>		<b>21</b>	<b>21</b>	<b>27</b>	<b>24</b>	<b>24</b>	<b>26</b>
<b>Total Positions</b>		<b>147</b>	<b>159</b>	<b>185</b>	<b>142</b>	<b>146</b>	<b>176</b>

<sup>1</sup> workforce planning has not been finalized to determine the exact distribution of contractor and company hires

**Table 13: Nugget Pond Mill Employment Opportunities<sup>1</sup>**

Position Category	NOC Code	Duration (years)	# Positions
Mill Superintendent	811	6	1
Executive Assistant	1222	6	1
Health and Safety Coordinator	2263	6	1
Electrical/Inst. Supervisor	7202	6	1
Mechanical Supervisor	7202	6	1
Maintenance planner	2143	6	1
Senior Metallurgist	2115	6	1
Shift Supervisors	9211	6	4
Crusher Operator	9411	6	4
Mill Operator	9411	6	4
Leach/CIP Operator	9411	6	4
Refinery Operators	9411	6	3
Electrician	7242	6	1
Instrumentation	2243	6	1
Mechanic	2243	6	4
Labourer	7612	6	4
Analytical Technician	2211	6	1
Sample Prep / Gen. Labour	9611	6	2
<b>Total</b>			<b>39</b>

<sup>1</sup> workforce planning has not been finalized to determine the exact distribution of contractor and company hires

Despite overall net positive Project benefits, Maritime has considered potentially adverse effects of the Project on employment and income and has provided mitigations.

Where wage inequities between men and women exist, especially for single parent females where childcare and schedules prevent them from working, Maritime proposes to implement a Gender Equity and Diversity Plan (GEDP) (Appendix H) that will apply to both direct and contractor hires. Aspects of the plan will provide direction and expectations for wage equity and strategies that allow equal opportunity for single parent females who wish to seek employment at the Project

Where high turnover rates with local businesses are experienced due to a worker's desire to seek employment at the mine, Maritime will engage with the communities prior to construction to provide details and awareness about employment opportunities and hiring so that local

businesses may better prepare for attrition that could occur within the range of small businesses in the region.

Where a boom-bust cycle due to a short term Project could potentially lead to future financial hardship, Maritime proposes to mitigate these effects by offering financial planning services for its employees through its benefits provider. Additionally, financial counselling services could be offered as a component of a company Employee and Family Assistance Program.

### **5.1.2 Work Conditions**

Communities in the Project region boast a working population demographic with extensive experience in the mining sector and other heavy industry sectors. This has contributed to a number of individuals seeking rotational employment outside the province, resulting in extensive travel and time away from home. Maritime, in fulfilling workforce requirements, will seek to hire individuals with direct experience and mining industry skill sets. This offers opportunities for locally skilled individuals to work close to home, to have an improved work-life balance and to have more time with family. Maritime is committed to hiring locally and enhancing worker skillsets to increase the number of local resident hires from communities that are close to the Project.

Potential adverse effects of the Project on work conditions centre mainly on a shiftwork scenario. Shiftwork may not be suited to all individuals as social and family responsibilities sometimes make it challenging to accommodate certain rotations. In addition, nightshifts and extended workdays have the potential to adversely impact health and well-being.

Maritime, through its workforce planning processes, will continue to evaluate the regional demographics, will engage with communities about workforce plans, and will collect feedback from local residents about work schedules. Maritime will also consult with other operating mines in the region to better understand the challenges and successes relative to this issue.

Maritime will also consider the following strategies to mitigate potentially adverse effects that shift work may present:

- offer an Employee and Family Assistance Program, and associated counselling services;
- offer flexibility and accommodation in work rotation (case by case basis);
- workplace health and wellness promotion;
- engagement in social events and community activities;
- for shiftwork, offer annual rotation cycle switch to ensure fair opportunity for calendar events every second year; and
- develop and deliver a fatigue management program to create awareness of impacts of shiftwork.

### **5.1.3 Housing and the Cost of Living**

The Project will require one year of construction, followed by a six year mine life. As a relatively small project, the construction phase of the Project is not expected to negatively impact the housing market or cause an increased demand for temporary housing when compared to other mega projects that have taken place in the province to support the offshore oil industry and hydro electric industry sectors.

Maritime plans to limit potential adverse effects on temporary housing and rental rates as a result of the Project through their commitment to hire locally. Meeting workforce requirements for both construction and operations phases by hiring locally will greatly reduce the need to import employees from outside the region who require temporary accommodations.

### **5.1.4 Food Security and Country Food Availability**

Provincially, food security continues to be an increasing challenge as healthy, safe and culturally appropriate food is not available to everyone at all times. Challenges to food security in NL and within the communities in the Project region include affordability of healthy food choices, drastically declining commercial farming activity, and reliance on provincial ferries to import most of the food consumed.

Many rural regions of the province continue with traditional country food harvesting activities and subsistence practices that are inherent to traditional NL culture. Big game and small game hunting, fishing, and wild berry harvesting are common in communities surrounding the Project region, and areas of Shoal Pond Valley accommodate many of these seasonal activities. Additionally, a small number of residents participate in home vegetable gardening and annual recreational cod fishing.

Project effects on country foods and food security can be both positive and negative. From a positive perspective, the Project is expected to increase employment and income in the region. Increased wages and family income can enable families to afford healthy food choices, and manage increasing costs of fresh produce. In addition, where traditional work schedules can limit time for traditional harvesting activities, flexible Project scheduling may provide more opportunity for subsistence activities. To enhance these positive opportunities, Maritime will:

- maximize potential to hire locally;
- implement a GEDP, focusing on females and single parents;
- develop shift schedules that offer a suitable work-life balance, and that allow time for subsistence activities;
- promote healthy living and lifestyles; and
- offer support for community sustainability initiatives that focus on food security and related projects.

Although the Project does have a relatively small footprint, it does present a net loss of natural habitat within the region. Additionally, for safety reasons, hunting and gathering activities within the approximately 90 ha Project footprint will be prohibited. To mitigate these potential adverse effects Maritime will:

- minimize the size of the Project footprint and extents of disturbance on the surrounding environment, clearing only what is required for operations, positively benefitting mine closure;
- minimize impacts within the Project footprint as Project engineering design continues; and
- complete progressive rehabilitation throughout operations to ensure effective and timely site restoration after closure.

#### **5.1.5 Impacts on Regional Health Care**

Project impacts on healthcare within the region will be related primarily to an increase in occupational related injuries, pre-employment medicals that are a component of recruitment processes, provincially legislated periodic medical assessments, and from non-occupational medical requirements due to population increase.

Although the region is supported by a medical center and one private practice clinic that are both within 20 km of the Project site, Maritime will take steps to limit a potential increase in demand for regional medical services. Steps to reduce health care system demand include:

- retention of a private health care service provider to offer occupational health assessment services, and for treatment of work-related injuries and illnesses that require support by company-managed processes;
- implementation of health and wellness, and injury prevention programs to minimize the need for medical assessment; and
- possibility of offering primary (first aid) treatment at the Project site for minor injuries, and, based on the nature of the injury, availing of advanced medical treatment by a physician for situations where primary treatment is not sufficient.

#### **5.1.6 Education System**

Impacts on the education system in this rural setting from adjacent industry development can be both positive and negative. As a potential primary employer in the region, Maritime anticipates creating a positive influence on post-secondary education choices and career aspirations among youth. To enhance this, Maritime remains committed to fostering positive relationships with local and regional educational institutions. To build youth interest in this sector and to encourage post-secondary education choices and skills development Maritime will:

- continue to participate in and support educational programs that provide specific learning opportunities for the exploration and mining sector;

- offer exposure to the mining operation through planned school field visits;
- offer high school and post-secondary student employment; and
- offer apprenticeship opportunities for students enrolled in trades programs.

As a potentially negative impact of the project, high school youth and young adults could choose opportunities for employment over pursuit of post-secondary education. Eliminating formal education and training could inhibit individual success for future opportunities when mining operations cease. Additionally, lifestyle changes provided by full time employment could make it more difficult for young adults to return to secondary studies once employment at the mine ends. To mitigate this Maritime will:

- engage with youth in the school systems and continue to support and encourage pursuit of post-secondary education, training, and career path development;
- evaluate required qualifications for employment opportunities, establishing reasonable minimum criteria for both education and experience for non-technical roles that encourage post-secondary training and skills development; and
- partner with post-secondary education institutions and offer career development opportunities at the Project site to encourage local high school graduate participation and enrollment.

### **5.1.7 Social Behaviour and Community Safety**

The Project will offer numerous opportunities for employment within a rural region of the province. While the infusion of wealth is anticipated to be a net positive benefit, increased personal wealth and the potential for temporary population growth does present a potential for negative influences on nearby communities, and an increase in at-risk behavior affecting community safety and security.

Increased personal wealth and a potential influx of (temporary) workers to the region could contribute to increased substance abuse, elevated presence of illicit street drugs, increased crime, and erosion of community safety.

To mitigate these potential negative consequences Maritime will:

- implement company zero tolerance policies on drug and alcohol use to discourage at risk behavior on and off the job, and ensure employees are fit for work;
- maximize opportunities to hire local during construction to minimize the influx of temporary workers;
- provide Employee and Family Assistance programming to assist company employees with financial management, and counseling services for at-risk social behaviour; and
- maintain communication and collaboration with municipal leaders, and support local initiatives for safe and caring communities.

### 5.1.8 Road Safety

Project operations will result in increased traffic on route 391, resulting from the transport of ore to the NPM, vendor and contractor supply of goods and services, and employee daily commuting. Route 391 is a 37 km north–south running road that connects King’s Point and other surrounding communities with Route 390 (Springdale). This tertiary road was recently re-developed in 2019, with new pavement and expanded right-of-ways. While it is anticipated that increased traffic required by the Project operations can be accommodated by this road, increased risk is inherent with increased traffic on this road, for both operations personnel and the public.

A short section of the Shoal Pond Valley Access Road will also present risk associated with public motor vehicle travel and potential interaction with mine traffic entering and departing the site. As noted in the Registration document, Maritime will consult with the NL Department of Transportation and Works (NL DTW) on any required permits post EA release.

To mitigate risks associated with increased traffic, Maritime will:

- implement a traffic management plan for all employees and contractors;
- provide education and awareness to the general public through social media and other forms of communication;
- physically isolate the Shoal Pond Valley Access Road public traffic from mine site traffic (by engineering design of the shared section of access road);
- ensure appropriate signage at the intersection of the mine site on Route 391;
- provide covered truck boxes for all ore trucks;
- ensure preventative maintenance and inspection programs for all mine and contractor equipment;
- implement speed monitoring devices for all ore transport trucks;
- implement zero tolerance policies for drugs and alcohol;
- implement a fatigue management plan (driving while fatigued);
- provide adequate road maintenance on Shoal Pond Valley Access Road (dust control, icy conditions); and
- provide an alternate access route to Shoal Pond Valley for ATVs and snowmobiles.

### 5.1.9 Business Opportunities

The Project is anticipated to provide opportunities for new business development and growth of existing businesses within the Project region. With two operating mines within 100 km of the Project site, the region currently contains many businesses that have the ability to support both the construction and operations phases of the Project.

To promote opportunities for local economic growth, Maritime will:

- develop and implement an Industrial Employment and Benefits Agreement with the province that outlines commitments to increase the benefits of the Project for people of the region and the province;
- provide timeliness and transparency relative to supply and service requirements for the benefit of local established business and potential entrepreneurs; and
- promote first and fair opportunity to local business for service and supply contract opportunities.

## 6.0 ALTERNATIVES

As noted in the EPR guidelines, Maritime has considered alternative means and locations of carrying out the Project that are technically and economically feasible.

### 6.1 Processing Technologies Considered

Maritime considered four different approaches for the processing of material from the Project site. Three of the approaches involves a level of pre-processing at the Project site prior to offsite transport or final processing. The alternative to pre-processing at the Project site was to transport all ore mined to an offsite mill for all stages of processing, e.g., NPM.

#### 6.1.1 Crushing, Screening and Sorting Process Onsite

Pre-concentration of ore at the Project site will involve a crushing, screening and sorting operation. Pre-concentration or “ore sorting” is a technology that separates mineralized rock from waste rock by using X-ray or laser scanners together with compressed air jets. If used at the Project site, this will be the first time this innovative technology and process will be used in NL. There are no chemicals used in this process whereby ROM ore is delivered from the mine to a crushing plant where it is crushed and screened. Coarse particles measuring 12-50 mm are conveyed to a pre-concentration plant where they are scanned and separated with jets of compressed air based on their scanned results. The desired particles are then combined with the screened ROM fines (-12 mm) and loaded into trucks for delivery to an offsite process plant. Rejected material is stockpiled, loaded and back-hauled to the mine for use as backfill or placed into the mine workings for long term closure.

The advantage of pre-concentration is that it removes waste or low-grade material before it is hauled and processed at the offsite Mill. By using ore sorting equipment, ore concentrates can be created at a reasonable cost and with fewer environmental risks. This technology is particularly applicable to small mining installations as the entire processing line can be planned in semi-mobile form and consists only of crushers, screens, belts and sorting machines.

This technology does not require water, nor are there any emissions from the process other than fugitive dust which will be mitigated using standard procedures as described in Maritime’s EPP. This processing option will result in fifty percent less material transport via truck from the Project site to the offsite processing plant and significant energy savings as a result of having to mill fifty percent less material. With this option, there will be a requirement for muck re-handling whereby rejects from the ore sorting process will have to be transported back to the open pit or stored at an interim location prior to being used as backfill underground. A big advantage of pre-concentration is that it removes waste or low-grade material before it is hauled and processed at the offsite Mill. This provides a substantial cost savings and also reduces the number of trucks on the highway. GHG emissions are also reduced through having fewer trucks on the road. A reduction in the volume of waste processed through the mill also maximizes the volume of space in the TMF, eliminating risk of volume restrictions in the future.

### 6.1.2 Dense Media Separation Onsite

Dense Media Separation (DMS) technology was another alternative considered by Maritime Resources for pre-concentration of ore from the Hammerdown Gold Mine. DMS technology, is a pre-concentration technology that achieves results similar to ore sorting, by concentrating the ore containing sulphides. DMS is a process of mineral beneficiation based on specific gravity that uses a dense medium and a cyclone. The dense medium most commonly used in mineral processing is a slurry of ferrosilicon suspended in water that is mixed with the mineral particles to be separated. That mixture is then injected tangentially into the cylindrical portion of a dense medium cyclone. The centripetal acceleration and tangential inertia of the slurry and mineral particles create a core of relatively low-pressure air in the centre of the cyclone. The denser “heavy” minerals pass through the slurry and move along the wall of the conical section of the cyclone and are ejected out the narrow apex of the spigot. The less dense mineral particles are carried towards the low pressure core in the cyclone and are ejected out of the vortex at the top of the cyclone. Because the net motive force acting on the mineral particles is centrifugal rather than gravitational the rate of mineral separation is greatly increased, DMS plants used in mineral processing are typically designed for large volumes (tonnes per hours) and coarse particle sizes (millimetres to centimetres) (Northern Prospector 2020).

### 6.1.3 Onsite Processing Mill

Maritime also considered constructing a new process plant and TMF at the Project site. The estimated energy requirement for an onsite mill was determined by reviewing consumption rates for nominal 1000 tonnes per day (tpd) gold circuit processing mills. For a mill with a throughput of between 800-1000 tpd, Maritime estimates the monthly energy requirements to be approximately 900,000 kW.

A new process plant and TMF would impact a relatively large and currently undeveloped area at the Project site. This option would also require new water sources for processing and additional power to support pumping systems to manage tailings, waste and reclaim water circuits, and additional equipment operation for road maintenance.

The Project site is located within two sub-watersheds containing salmonid habitat. Although the addition of a TMF can be safely engineered and built at the Project site, this option does increase the environmental risk in the area.

This option was considered to be a less desirable option than processing at the existing NPM complex for the following reasons:

- Level of environmental disturbance: A new process plant and TMF would impact a relatively large and currently undeveloped area at the Project site. This option would also require new water sources for processing. Maritime wishes to limit adverse environmental impacts and utilizing the existing process plant and TMF at Nugget Pond achieves this.

- Capital costs: The capital cost of a new processing plant and TMF at the Project site would be at least five times higher than refurbishing components of the existing NPM.
- Cost Recovery: The expected six year mine life would make it more difficult to pay back the investment of constructing a new process plant and TMF at the Project site.
- Schedule: The time to permit and construct a new process plant and TMF at the Project site would be considerably longer than refurbishing components at the existing Nugget Pond facility.

The Project, with a nominal ore production rate of less than 1000 tpd, and a relatively short mine life of less than 10 years, presents challenges with long term investment requiring extensive payback periods. As such, the use of the above-noted technology is not economically feasible for the scale of this Project.

The NPM processed ore from the original Hammerdown mine from 2000-2004 and achieved high gold recoveries of +97% using a standard carbon-in-pulp gold circuit. The NPM gold circuit is currently inactive as the mill is solely processing copper ore through a separate copper concentrator. Maritime is proposing additions to the gold circuit to include a new tertiary crushing circuit, fine ore storage and a new 10'x17' 700 kW ball mill. Refurbishment of the existing carbon-in-pulp (CIP) circuit is also proposed. Once completed, the gold circuit will be able to operate completely independently of the copper concentrator, including during any planned or unplanned shutdowns of the copper circuit.

Tailings generated by Hammerdown mill feed would be placed in the existing, permitted TMF at the NPM. Rambler also confirmed to Maritime there is ample capacity in their TMF at the NPM for all tailings resulting from processing the estimated LOM ore from the Project. Rambler indicated the storage capacity of the existing TMF, with some minor modifications to onsite infrastructure, is adequate to manage all anticipated waste (i.e., tailings and effluent) from the Project as well as from any ongoing operations at the facility.

#### **6.1.4 Complete Offsite Processing**

Another processing option involves hauling all commercial grade ore from the Project site to the existing NPM for complete processing. In this instance, no crushing, screening or sorting would occur at the Project site and haul truck traffic required to sustain the same rate of gold production at the NPM would effectively double. This option would result in higher capital costs, greater GHG emissions as a result of increased traffic, increased milling energy consumption and chemical reagents used, increased tailings storage capacity requirements, and increased potential for accidental events along the transport route.

## **6.2 Mining Methods**

Previous mining at Hammerdown was completed by a small open pit followed by underground mining. Selective cut and fill and shrinkage stoping methods were used to extract ore from the

narrow, high grade veins. At the time, gold prices averaged US\$320 per ounce. Richmond utilized a cut-off grade of 8.0 gpt Au for its operations, delivering a mined grade of 15.7 gpt Au over the life of the mine. Current gold prices are substantially higher, averaging US\$1800 per ounce. The higher gold price allows for the economic extraction of lower grade mineralization. Maritime has completed economic analyses and has determined that the Hammerdown deposit is optimally suited to a combination of open pit and underground mining methods. This approach maximizes economic benefit from mine operations, making it a more attractive investment for the Company and its investors who will be funding the mine's development upon receipt of all permits.

### **6.3 Location of Project Components**

There are alternatives to the placement of a number of Project components (e.g., waste rock stockpile location, temporary ore storage area, explosives storage area). In general, Maritime selected and planned the Project development and infrastructure placement to increase use of:

- Existing brownfield sites and existing access roads;
- Areas unlikely to directly or indirectly affect wetlands or other sensitive landscape features located within or outside the proposed mine footprint;
- Areas that met the non-sterilization requirements associated with the Mining Act; and
- Exhausted areas within the Hammerdown open pit and underground mine, where waste rock could strategically be placed.

The Project has been planned to limit potential adverse environmental effects while maximizing socio-economic benefits for the region and for the province as a whole.

## **7.0 POTENTIAL ENVIRONMENTAL EFFECTS AND MITIGATION**

Maritime has engaged in direct and virtual consultation with a number of community and non-governmental organizations such as local municipal officials, the NLOA, individual outfitters, the NLSF, various local cabin owners and the general public to better understand potential effects of the Project on the area.

### **7.1 Cabin Owners**

Maritime has identified several cabins that occur in the general vicinity but there are none that occur within the Project footprint or Mining Lease. Maritime has engaged in direct consultation with cabin owners to keep them informed of Project stages and is taking several approaches to minimize adverse impacts to cabin owners.

In particular, Maritime began producing and distributing a community newsletter aimed at providing information to public stakeholders on their activities and progress relative to the Hammerdown Gold Project. A number of copies of the first edition were delivered to the Town of King's Point office in April 2020 and mailed to the local residents of King's Point, Harry's Harbour and Rattling Brook. Another tool is the BIMP that Maritime will use to inform cabin owners of blasting activities and to limit potential adverse effects of blasting on local land and resource users through for example the establishment of safe blast perimeters. The locations of the remote cabins identified will be considered when Maritime is designing their BIMP. Other mitigations include adherence to the EPP and permit requirements issued relative to the Project.

Through engagement with local cabin owners during the exploration stage for the Project, Maritime determined that some Shoal Pond cabin owners accessed their cabins via snowmobiles or ATVs on the access road that also provides access to the Project site. Maritime agreed to reroute the shared access road portion to remove cabin traffic from direct Project activities. During development and operations, existing and Project built accesses will not be accessible by the public. Once the Project enters the closure phase, Maritime anticipates maintaining access roads only if closure and post-closure monitoring is required relative to water monitoring and physical stability.

### **7.2 Recreational Trails**

As part of its ongoing exploration program, Maritime continues to assess potential risks to public safety associated with use of existing access roads and trails. Mitigative measures employed during exploration program activities (e.g., trail modification, signage) will continue to benefit future proposed development activities and provide longer term risk management for Project construction, operations and closure. In consultation with the NLSF, Maritime agreed to upgrading an existing 1.5 km section of NLSF snowmobile trail located at a greater distance from the Project (Option 2) than the current trail (Option 1) (Figure 13).

The selection of Option 2 saw the construction of a new parking area for both Shoal Pond cabin owners and snowmobilers using the upgraded trail. This new construction eliminates much congestion common at the previous parking area and lowers the risk of interaction with Project equipment and vehicles. Snow clearing costs will be covered by Maritime.

Upgrades to the Option 2 route included vegetation clearing, widening and construction of drainage features, and installing a new stream crossing. The establishment of this new route eliminated the intersection and potential interaction at Shoal Pond Road, thereby lowering risk to snowmobilers. Maritime also installed an appropriate stream crossing on the upgraded snowmobile trail.

### **7.3 Bats**

In consultation with the WD, Maritime completed additional acoustic and emergence bat surveys in 2020 to better understand the use of an onsite adit. The 2020 results from acoustic surveys were tabulated over a longer period and yielded more bat calls than the 2019 data, 45 vs 174 (Tables 4 and 5). As with the 2019 data, there was no evidence of swarming behavior in the fall 2020 data. This suggests bats are foraging in the Project and adit area but does not support the use of the adit as overwintering habitat. Emergence surveys bear this out as no bats were observed on any of the days that the surveys were completed at the site. In addition, no visual identification was made of the *Myotis* spp. at any time during site visits in 2020.

Based on the additional acoustic and emergence surveys completed in 2020, we conclude that it is likely that *Myotis* spp. are using the area for foraging but are not using the mine adit for roosting or overwintering habitat. The layout of the adit also strongly suggests that it is unsuitable as overwintering habitat.

Despite a low potential as important bat habitat, Maritime will plan and finalize any potential mitigation measures in consultation with the WD prior to completing any work related to the adit.

### **7.4 Human Health Receptors**

Maritime has a “Safety, Health, Environmental and Social Policy” that outlines their commitment to the communities in which they work. In section 5.1, Maritime examined a number of social determinants of health and potential effects of the Project on those determinants.

There are also environmental factors that could affect an individual’s and population’s health. Maritime identified various land uses in the Project area in order to determine whether Project activities were likely to have adverse effects on human receptors (Figure 12). Human health can be affected as a result of a number of physical activities of the Project, including but not limited to, poor air quality and noise effects.

Human health and safety and environmental protection will be paramount considerations for Maritime in the planning and detailed design of the Project. In the construction, operation,

decommissioning and maintenance of the Project, established safety procedures specific to human health and environmental protection will be strictly adhered to.

Operations activities will be guided by established practices and applicable sections of the Occupational Health and Safety Act and Regulations (OHS). Maritime will support requirements relative to ensuring the health of company personnel and contractors working on the Project are maintained.

Activities associated with the Project will be conducted in compliance with the NL *Occupational Health and Safety Act (OHS)* and its *Regulations* and workers will receive relevant training as required by the legislation. Specifically, sections dealing with:

- Excavation Work, Underground Work and Rock Crushing;
- General Blasting;
- Access and Egress;
- Underground Operations;
- Confined Space Entry;
- Silica Code of Practice;
- General Mining Requirements;
- Explosives in Mines;
- Open Cut Workings in Mining Operations; and
- Use of Electricity in Mines.

Maritime also accepts responsibility that contractors hired to perform work also comply with this legislation, as per OHS Act s.10. Note that Maritime will have a trained team of Emergency Response personnel at the Project site during construction and operations.

Some baseline air quality data was collected in 2016 that indicated there is good air quality in the Project vicinity. In 2019/2020, Maritime consulted with officials with the Pollution Prevention Division (PPD) of DECCM who indicated that given the Project location, the local topography and the limited industrial activity in the area, baseline air quality data was not required at this time.

Prior to the start of any Project specific activities, Maritime will have a BIMP in place and this Plan will have specific mitigations designed to limit adverse impacts to air quality as a result of blasting activities. The crushing and sorting equipment will be electrically powered and enclosed so minimal particulate matter will enter the atmosphere. Dust collection systems will be utilized. Mitigations such as regular road watering contributes to substantially reducing fugitive dust levels at the Project site and, on nearby Route 391. All applicable mitigations to limit adverse impacts to regional air quality will be implemented as necessary, during development and operations of the Project.

A Noise Study completed by GHD in 2020 concluded that Project noise levels were insignificant relative to receptors in the vicinity of the Project (GHD 2020).

Given the rural location of the Project, the nature of land uses and the location of human receptors in the area, Maritime does not anticipate any adverse health effects as a result of physical Project activities.

As Maritime continues to work through Project feasibility and other deliverables necessary to support a production decision, a strong focus on health, safety, and environmental management will continue. Maritime will continue to develop associated management plans, procedures and guidelines to support all future phases of the Project, in order to appropriately manage health, safety and environment (HSE) related risk, and comply with applicable legislation. Maritime will continue to work with regulatory agencies, and comply with all conditions of future permitting required to conduct work at the Project site. Maritime will continue to seek and apply industry best practice where possible, and will work with local stakeholders to ensure that HSE related risks are appropriately identified and mitigated.

## **7.5 Land and Resource Access**

Maritime has engaged with cabin owners, outfitters and officials with the NLSF and the NLOA to better understand how Project operations could affect land and resource use and access in the area. An upgraded and rerouted ATV trail will limit interactions between trail users and Project vehicles and equipment (Figure 13), and a new and enlarged parking area will reduce congestion for local cabin owners and snowmobilers in the area.

Through various public engagement activities (e.g., newsletter, local governance meetings, online public meeting), Maritime believes there is a low probability for land use conflicts relative to recreational activities by hikers, hunters, and berry pickers. Maritime has discussed the Project with officials from the Town of King's Point and Springdale and no concerns were raised relative to potential land use conflicts.

Maritime engaged with several outfitters in the region and no objections or concerns to the Project were expressed. Feedback received includes comments expressing the need for this type of development in the region, and that projects like Hammerdown bring employment and create economic opportunities in the region.

## **7.6 Potential Noise Effects**

The closest residential neighbourhood is located 5 km away in King's Point and noise and vibration effects as a result of Project construction activities will be substantially attenuated by the rugged topography and the distance between Project activities and receptors.

A key mitigation relative to blasting activities is the establishment of a BIMP. Maritime's BIMP will have specific mitigations designed to limit adverse impacts of noise and vibration as a result of

Project activities and blasting. Maritime's BIMP will establish blast perimeter limits that provide a safe distance from the location of the blast to any personnel working at the Project site. Local land users, cabin owners, and communities will also be notified of the blasting schedule with mitigation measures implemented, as required. Maritime will engage with cabin owners and others and provide them with details of their BIMP and planned blasting activities to reduce the potential for adverse effects as a result of blasting activities.

The modelled noise levels of Project operations at the four identified PORs is between 30-50 dBA, sound levels that are not considered to be environmentally significant on the identified sensitive receptors or surrounding areas (GHD 2020). Based on the noise impact study rationale and results (GHD 2020), Maritime predicts there will be no adverse effects experienced at the metal salvage yard or the three cabins as a result of Project activities.

Based on the explosives factors and distance from the community, Maritime anticipates there to be negligible impacts of vibration from Project activities. If future conditions change, and if required, Maritime can adjust their blasting practices.

## **7.7 Potential Ore Transport Effects**

As noted above, the modelled noise levels at the four identified PORs in the Project vicinity are between 30-50 dBA, sound levels that are not considered to have an adverse effect on the identified sensitive receptors or surrounding areas. It should be noted that the haul route does not pass through any communities. GHD noted as well that only traffic associated with the Project has been modelled and other traffic using the haul route could also influence the sound levels at each POR (GHD 2020).

Since mid-2019, Maritime has been engaging with a various public bodies about the Project. No concerns were raised concerning the ore transport from the Hammerdown site to the NPM. Through communication and consultation with cabin owners and local residents no concerns were raised about noise associated with ore transportation. Additionally, no noise related issues were noted during the public consultation session held in November 2020.

## **7.8 Cultural Activities in the Project Area**

Maritime is aware that the Project will occur in a rural area where many people continue to practice subsistence and cultural activities as residents in the area have for generations. The Project area is the site of a previous gold mining operation and disturbance is common throughout the site. The area surrounding the Project site is largely undisturbed and provides numerous opportunities for these cultural activities. While acknowledging that the Project will remove some area from the land base available for the practice of cultural activities, it is unlikely that the continued practice of cultural activities in the area will be affected in an adverse way as a result of the Project. There are other and more appropriate locations where these activities are practiced than in the Project area.

To promote the continued practice of cultural and subsistence activities, Maritime will offer flexible shift scheduling where possible. Maritime will also support community initiatives that promote cultural and subsistence activities. Additional information is presented in Section.4.4.7.

## **7.9 Area Outfitters**

Maritime consulted with the Executive Director of the NLOA and with area outfitters about the Project. Consultation was constructive and all persons spoken to express their opinion on potential effects of the Project on their respective business. As a result of those consultations, Maritime will ensure that access to the outfitter region via Shoal Pond Valley Forest Access Road is maintained during all phases of the Project. The outfitter area adjacent to the Project is not actively utilized for guided big game hunting, but used as an access only, to other far reaching and established hunting areas of the outfitter designated zone. The established outfitter buffer zone for outfitters operating in the area marginally overlaps with the Project footprint and Mining Lease area. All of the outfitters consulted were supportive of the Project and Maritime commits to continued engagement with outfitters and other land users in the area throughout Project development and operations to inform them of planned Project activities. Based on feedback from area outfitters, Maritime does not anticipate any adverse effects of the Project on area outfitters or their businesses.

## **7.10 Estimated Annual Greenhouse Gas Emissions – Operations**

Both the federal government, as part of the 2015 Paris Agreement, and the provincial government, as part of The Way Forward on Climate Change (2019), have committed to reducing GHG emissions by 30% below 2005 levels by 2030. NL has also joined with other members of the Conference of New England Governors and Eastern Canadian Provinces in adopting a regional GHG reduction target for 2030. The target is to reduce regional GHG emissions by 35 to 45% below the 1990 regional GHG emissions level. Proposed GHG reduction targets are linked to carbon pricing and the 2016 PanCanadian Framework on Clean Growth and Climate Change included commitments to introduce carbon pricing in all provinces and territories.

For industrial facilities, there are three tiers in the NL Management of Greenhouse Gas Act (MGGA):

- Facilities that emit 15,000 tonnes of carbon dioxide (CO<sub>2</sub>) equivalent or more of GHG in a year must report their emissions to the provincial government in accordance with the methodology laid out in the *Management of Greenhouse Gas Reporting Regulations*.
- Facilities that emit between 15,000 and 25,000 tonnes of CO<sub>2</sub> equivalent of GHG in a year may apply to be designated as opted-in facilities.
- Facilities that emit more than 25,000 tonnes of CO<sub>2</sub> equivalent of GHG are subject to annual GHG reduction targets.

Additional information on BACT selected for the Project is presented in Appendix F. As the Project evolves, Maritime will be able to better estimate annual GHG emissions. If operational decisions result in annual GHG emissions under the 15,000 tonne threshold, Maritime will advise the CCB.

Amendments to the MGGA and the Revenue Administration Act (RAA) were passed in December 2018 and allowed for the introduction of a federally mandated price on carbon and finalized the performance standards system for large industrial facilities.

On January 1, 2019, NL's carbon program was implemented and includes performance standards for large industrial facilities and a carbon tax on fuels combusted outside regulated facilities' boundaries. In addition, certain new industrial facilities are required to utilize BACT. The two key elements of the carbon program are:

- A carbon tax applied to combusted fossil fuels at the federally mandated price of \$20/tonne of CO<sub>2</sub> equivalent in 2020. The tax equates to 4.42 cents per litre of gasoline and 5.37 cents per litre of diesel. However, it will be offset by the respective elimination of the remaining 4-cent temporary gasoline tax and removal of the 5-cent additional diesel tax introduced in Budget 2016.
- A performance standard system for large industrial facilities that emit more than 25,000 tonnes of GHG emissions annually.

The NL carbon program is projected to reduce cumulative GHG emissions by over 0.65 million tonnes between 2019 and 2030.

GHGs such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) can be emitted from a number of natural and anthropogenic sources. The main GHG emissions generated from diesel fuel combustion are CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. The 2017 total Newfoundland and Labrador GHG emissions expressed as carbon dioxide equivalent (CO<sub>2</sub> eq) was 10.0 Mt CO<sub>2</sub> eq (Environment and Climate Change Canada 2018), an increase of 6.9 % from the 2005 level.

The 2017 total Canada GHG's expressed as CO<sub>2</sub> eq was 714 Mt, a decrease of 2.0 % from the 2005 level (Environment and Climate Change Canada 2018).

GHG emissions will be generated from Project operations activities by diesel fuel combustion, gasoline combustion and blasting activities that use diesel-based blasting agents. In order to estimate the volume of GHG emissions during the operations phase, Maritime compiled the following information (Tables 14 and 15):

- List of equipment to be used during the operations phase;
- Calculation of anticipated volume of equipment fuel usages;
- Fuel consumption rates of each piece of equipment to be used;
- Emission factors;
- Anticipated duration of various Project construction activities; and
- Applied appropriate emission factors.

**Table 14: Open Pit Equipment and Estimated Diesel Usage during Operations**

Equipment Type	Power	Number of Pieces of Equipment Anticipated					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Haul truck	551 kW	7	10	6	-	-	3
Hydraulic excavator	578 kW	2	2	2	-	-	1
Wheel loader	396 kW	2	2	2	-	-	2
Production drill	242 kW	5	5	2	-	-	2
Dozer	337 kW	3	3	3	0.5	0.5	1
Grader	163 kW	1	1	1	0.5	0.5	1
Light Plants	6 kW	4	4	4	4	4	4
Pumps	10 kW	2	2	2	2	2	2
Site Dump Truck	208 kW	1	1	1	1	1	1
Support Excavator	270 kW	1	1	1	1	1	1
Water Truck	208 kW	1	1	1	1	1	1
Lube/Fuel Truck	208 kW	1	1	1	1	1	1
Total annual diesel-equipment (L)		5,371,126	6,292,568	4,728,908	624,301	624,301	2,913,946
Total annual diesel-explosives (L)		191,642	198,502	99,603	-	-	14,359
<b>Total annual diesel (L)</b>		<b>5,562,768</b>	<b>6,491,070</b>	<b>4,828,512</b>	<b>624,301</b>	<b>624,301</b>	<b>2,928,304</b>

**Table 15: Underground Mine Equipment and Estimated Diesel Usage during Operations**

Equipment Type	Power	Number of Pieces of Equipment Anticipated					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Jumbo - 2 Boom	110 kW	-	-	1	1	1	-
Jumbo - 1 Boom	55 kW	-	-	-	2	2	1
Bolter	111 kW	-	-	1	1	1	1
7.0t Scooptram	150 kW	-	-	1	2	2	2
3.5t Scooptram	72 kW	-	-	-	2	3	2
Haul truck	242 kW	-	-	2	3	3	2
LH drill (electric)		-	-	-	1	1	1
Explosives Loader	69 kW	-	-	1	2	2	2
Fuel and lube truck	111 kW	-	-	1	1	1	1
Scissor lift	103 kW	-	-	1	3	3	2
Grader	118 kW	-	-	-	1	1	1
Boom truck	103 kW	-	-	1	1	1	1
Toyota Truck	96 kW	-	-	4	4	4	4
8 Man Toyota	60 kW	-	-	1	1	1	1
Toyota Mechanics Truck	96 kW	-	-	1	1	1	1
Toyota Rescue Truck	96 kW	-	-	1	1	1	1
Sanitation Truck	69 kW	-	-	1	1	1	1
Total annual diesel-equipment (L)		-	-	1,658,597	3,054,722	3,194,334	2,412,504
Total annual diesel-explosives (L)		-	-	1,352	2,086	3,111	580
<b>Total annual diesel (L)</b>		-	-	<b>1,659,949</b>	<b>3,056,807</b>	<b>3,197,445</b>	<b>2,413,084</b>

The use of a backup 2MW diesel generator onsite is essential to ensure continuity of operations in the event of grid power interruptions. The backup generator selected will be a minimum Tier 2 unit that contains suitable emissions control technology. Based on information provided by Hatch Ltd (2015), average annual unplanned power outages in the area are 2.8 hours or 0.2 days. This number means that over the long-term, system conditions may lead to an average loss of 2.8 hours per year (Hatch 2015).

It is estimated that a 2MW generator will consume approximately 538 litres of diesel per hour for an annual diesel usage of 1,506 L. Based on a diesel emissions factor of 2,663 (Climate Change Branch, 2017), the estimated GHG emissions per year for a 2MW generator is calculated based on the following formulae:

$GHG\ Emissions/year = (fuel\ per\ hour) \times (hours\ per\ year\ of\ operation) \times [GHG\ emissions\ factor\ (EF)]/1000$

$GHG\ Emissions/year = (538\ L/hr \times 2.8\ hours/yr \times 2.663)/1000 = 4\ tonnes\ CO_2e\ per\ unit$

Emissions from one 2MW generator used for 2.8 hours/year is estimated to be 4 tonnes CO<sub>2</sub>e annually, and over the LOM the total emissions are estimated to be 24 tonnes CO<sub>2</sub>e.

**Table 16: Estimated Diesel Use during Operations**

Diesel Source	Operations Diesel Use (L)		Life of Project Diesel Use (L)
	Open Pit	Underground	
Equipment	20,555,000	10,320,000	30,875,000
Explosives	504,000	7,000	511,000
Backup Generator*	1,506		9,038
<b>Total</b>	<b>21,059,000</b>	<b>10,327,000</b>	<b>31,395,038</b>

Note: Volumes are rounded to nearest thousand

Estimates of the total GHG emissions expected over the operations period for the Project are presented in Table 17. This exercise was completed using guidance provided by the CCB (pers.com. 2019). Known fuel consumption rates for equipment and vehicles were used in these calculations. Over the LOM, Maritime will be pursuing options to reduce the overall GHG emissions estimates presented in Table 17. Actual amounts will be reported as required to the CCB.

**Table 17: Estimate of GHG Emissions during Operations**

GHG Component	Emissions Factor (kg/L)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
CO <sub>2</sub> (kg)	2.663	14,813,650	17,285,718	17,278,770	9,802,790	10,177,309	14,224,116	<b>83,582,353</b>
CH <sub>4</sub> (kg)	0.003325	18,496	21,583	21,574	12,240	12,707	17,760	<b>104,360</b>
N <sub>2</sub> O (kg)	0.1192	663,082	773,735	773,424	438,788	455,552	636,693	<b>3,741,275</b>
CO <sub>2</sub> e (kg)	2.786	15,497,871	18,084,120	18,076,850	10,255,566	10,647,384	14,881,106	<b>87,442,897*</b>
<b>Emissions Summary (tonnes) during Operations</b>								
CO <sub>2</sub>	83,582.35 tonnes							
CH <sub>4</sub>	104.36 tonnes							
N <sub>2</sub> O	3,741.28 tonnes							
CO <sub>2</sub> e	87,442.90 tonnes							

\*Plus potential 24 additional tonnes if backup generator is used

Although electrical power will be provided through the provincial grid for the operation of the crushing and sorting plant, Maritime estimates that approximately 31 million L of diesel could be consumed on site during the operations phase. Maritime estimates that approximately 87,442,921 tonnes of CO<sub>2</sub>e (Table 19) will be generated over the six year operating LOM.

GHG emissions will be mitigated over the LOM through the following means:

- Use of electricity provided by the provincial grid;
- Reduce idling of mining vehicles and equipment to reduce amounts of fuel consumed;
- Planning efficient waste rock and ore haulage to reduce the amount of fuel consumed;
- Considering the use of electrically powered equipment where practical; and
- Maintaining engines in proper working order.

When the predicted annual GHG emission levels over the LOM are compared to provincial and national levels, it is apparent that Project level GHG emissions are not substantial. Maritime does not anticipate any adverse cumulative effects as a result of GHG emissions from Project activities.

### **7.11 Viewscapes and Buffers**

Maritime will implement several mitigative measures to promote aesthetic viewscapes and to maintain appropriate buffers between Project activities and potentially sensitive receptors.

Any existing tree screen that conceals the Project site from public view will be maintained along the perimeter of the ore sorting and infrastructure areas adjacent to Shoal Pond Valley forest access road and near route 391. Progressive rehabilitation efforts will consider initiatives to further enhance the viewcape of the areas adjacent to the Project site.

During construction and operations, the extent of land clearing and grubbing will be restricted such that naturally vegetated areas between the site and surrounding properties and thoroughfares are maintained. Where possible, a 30 m naturally-vegetated buffer will be maintained between Project infrastructure and watercourses or water bodies, including wetland areas.

With respect to raptor nests, no vegetation clearing will occur within 800 m of a bald eagle or osprey nest during the nesting season (March 15 to July 31) and 200 m during the remainder of the year. The 200 m buffer also applies to all other raptor nests (e.g. Northern goshawk, sharp-shinned hawk, merlin, American kestrel, great-horned owl, boreal owl, Northern saw-whet owl). The location of any raptor nest site encountered will also be reported to the WD.

### **7.12 Groundwater**

There are a number of activities during construction (e.g., site clearing grubbing, initial excavation (pre-stripping) in the open pit, earthworks for construction of plant infrastructure and other supporting site buildings, road upgrades, installation of water and erosion control infrastructure, and buried infrastructure and pipelines) that could potentially interact with local groundwater resources at the Project site. Short-term interactions with shallow overburden groundwater levels may occur during initial grubbing and site preparation; however, the effects are likely to be local and limited to the immediate vicinity of the Project site, and are not expected to affect the adjacent,

down-gradient surface water features. Furthermore, there is potential for temporary diversion of shallow groundwater flow and lowering of the water table near excavations for buildings and sub-surface infrastructure. The expected water table levels at the Project site range from near surface to 1.4 mbgs. Excavation and dewatering during site preparation has the potential to affect shallow groundwater. These effects are expected to be temporary and the water levels are anticipated to rapidly return to normal after completion of the excavation or construction.

Potential changes to groundwater quality during the construction phase will be related to turbidity from excavation, accidental fuel releases, and blasting residue from mining activities (mainly nitrates, and petroleum hydrocarbons). These changes in groundwater quality are expected to be negligible, local and manageable through application of standard practices.

As the Project advances through permitting and detailed engineering design, requirements for dewatering will be determined, and supporting investigations including additional hydrogeological studies will be completed. These hydrogeological studies will further characterize the hydraulic conductivity of the overburden and bedrock in the vicinity of the open pit and underground mine and allow for better estimation of the extent of drawdown effects at the Project site. Based on these analyses, any surface water features and wetlands identified within the predicted radius of influence will be further assessed and monitoring, and mitigation measures will be implemented to maintain the hydraulic conditions of these features.

Limiting the amount of groundwater inflow in the open pit and underground development will reduce the effects on groundwater resources quantity from dewatering activities. This will be done through the regular monitoring of the pit walls and underground workings for measurable groundwater inflows; with a contingency plan for management of anomalous fracture-related groundwater seepage (e.g., grouting).

The WaMP describes the water management system to be utilized at the site and includes particular details relating to the management of water from the mine dewatering activities and collected seepage from the ore storage and overburden stockpiles and the waste rock stockpile.

In addition, a groundwater monitoring plan will be developed upon release of the Project from the EA process and prior to commencing any Project development activities, and will be reported to authorities as required. The groundwater monitoring plan will include monitoring of groundwater levels and groundwater chemistry in the Project site area, as well as overall down-gradient areas within the Harry Brook, Muir Brook-Shoal Pond, and Catchers Pond watersheds to detect changes in groundwater levels, flow direction, and chemistry. Groundwater monitoring will be ongoing from the onset of Project construction activities, and any deviation from established baseline groundwater quality and/or quantity will be noted and appropriate mitigation measures applied in a timely manner.

### **7.13 Summary of Environmental Effects Analyses**

A summary of potential environmental effects on components as outlined in the EPR guidelines, proposed mitigations and the significance of possible residual effects are presented in Table 18.

**Table 18: Summary of Environmental Effects Analyses**

Component	Project Phase & Potential Interaction			Key Considerations and Proposed Mitigations	Residual Effects
	Con <sup>1</sup>	Ops <sup>2</sup>	Potential Interactions		
Cabin Owners	X	X	<ul style="list-style-type: none"> <li>Remote cabins (Muir Pond and Shoal Pond) near the Project site. Potential for limited access and noise</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Follow EPP</li> <li>The BIMP will advise all residents (seasonal and otherwise) of planned blasting activities. A natural vegetated buffer exists between all remote cabins and the Project footprint</li> <li>During the exploration phase, Maritime upgraded an existing snowmobile trail and parking area that area residents and cabin owners use. Upgrades will be beneficial throughout LOM.</li> <li>Maritime has had regular consultation with cabin owners and has encouraged them to communicate any concerns to the Company</li> </ul>	P
Recreational Trails	X	X	<ul style="list-style-type: none"> <li>Snowmobile trail in proximity to the Project. Potential for interactions between Project vehicles and trail users</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Traffic Management Plan – signage, training, communications</li> <li>Community education and awareness campaigns</li> <li>Through engagement activities, Maritime will maintain upgrades to an existing snowmobile trail and parking area that were constructed as part of exploration activities for the area residents and cabin owners use</li> </ul>	P
Bats ( <i>Myotis</i> spp.)	X	X	<ul style="list-style-type: none"> <li>Two SARA listed <i>Myotis</i> species are likely using the Project area for foraging but not for roosting or hibernating</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Follow EPP</li> <li>Compliance with regulations and permits; Observations will be recorded and reported to the WD</li> <li>Additional emergence surveys completed in 2020</li> <li>Any Project activity that will result in adverse impacts to the existing adit will be completed prior to September</li> <li>Will continue communicating with the provincial WD on bat presence at the Project site</li> </ul>	NS
Social Determinants of Health	X	X	<ul style="list-style-type: none"> <li>Employment and income. Possible wage inequities and unequal opportunities</li> </ul>	<ul style="list-style-type: none"> <li>Implement a GEDP that will apply to direct &amp; contractor hires</li> <li>Commit to local hiring</li> </ul>	P
	X	X	<ul style="list-style-type: none"> <li>Work conditions - Shift work</li> </ul>	<ul style="list-style-type: none"> <li>Offer financial planning &amp; counselling services</li> <li>Offer an Employee &amp; Family Assistance Program</li> <li>Offer flexible scheduling, accommodation, health &amp; wellness promotion, fatigue management program</li> </ul>	P
	X	X	<ul style="list-style-type: none"> <li>Housing &amp; cost of living challenges</li> </ul>	<ul style="list-style-type: none"> <li>Commit to local hiring</li> </ul>	N
	X	X	<ul style="list-style-type: none"> <li>Food security &amp; country food availability</li> </ul>	<ul style="list-style-type: none"> <li>Support community sustainability initiatives</li> <li>Offer flexible scheduling, accommodation</li> </ul>	N
	X	X	<ul style="list-style-type: none"> <li>Impacts on regional health care services</li> </ul>	<ul style="list-style-type: none"> <li>Offer occupational health assessment services</li> <li>Implement health and wellness, and injury prevention programs</li> <li>Possibly offer primary (first aid) treatment at the Project site for minor injuries</li> </ul>	P

Component	Project Phase & Potential Interaction			Key Considerations and Proposed Mitigations	Residual Effects
	Con <sup>1</sup>	Ops <sup>2</sup>	Potential Interactions		
		X	<ul style="list-style-type: none"> <li>Effects on youth post-secondary educational choices</li> </ul>	<ul style="list-style-type: none"> <li>Offer exposure to the mining sector</li> <li>Offer student employment apprenticeship programs</li> <li>Encourage and support post-secondary education</li> </ul>	P
	X	X	<ul style="list-style-type: none"> <li>Social behaviour and community safety</li> </ul>	<ul style="list-style-type: none"> <li>Increased personal wealth could contribute to increased substance abuse, elevated presence of illicit street drugs, increased crime, and erosion of community safety.</li> </ul>	NS
	X	X	<ul style="list-style-type: none"> <li>Possible incidents and accidents affecting human health</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Accident event prevention and response</li> <li>Follow EPP</li> <li>Distance from, and minimal interaction with communities</li> <li>Maritime has engaged with a number of public bodies in the region maintains open lines of communication with public entities</li> <li>Accidental event prevention and response plans</li> <li>Will follow provisions of <i>OHS Regulations</i> applicable to Project</li> <li>Will follow all recommendations of the Chief Medical Officer of Health in NL relative to Covid 19</li> </ul>	NS
Land and Resource Access	X	X	<ul style="list-style-type: none"> <li>Cabin owners, outfitters, snowmobilers use the area. Potential for reduced access to land and resource access.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Follow EPP</li> <li>Limited public use of the area surrounding the Project</li> <li>Maritime produces a quarterly newsletter that provides updates, and planned upcoming stages of the Project</li> <li>Maritime has a BIMP in place that provides advance warning to local land and resource users of planned blasting activities</li> <li>Through engagement activities, Maritime will continue to maintain an established parking area and recreational vehicle trail constructed to mitigate risk to the public during exploration activities.</li> </ul>	N
Noise	X	X	<ul style="list-style-type: none"> <li>Typical construction activities leading up to mining commencement, e.g., heavy equipment, blasting etc. will generate localized noise and vibration.</li> <li>Typical mining operations, e.g. blasting, trucking, crushing, sorting, etc. will generate localized noise and vibration</li> <li>Potential for Project activities to result in adverse noise effects on area receptors.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Accident event prevention and response</li> <li>Follow EPP</li> <li>Limited public use of the area surrounding the Project</li> <li>Maritime produces a quarterly newsletter that provides updates, and planned upcoming stages, of the Project</li> <li>Maritime has a BIMP in place that provides advance warning to local land and resource users of planned blasting activities.</li> <li>Substantial distance (&gt;5km) from residential areas</li> <li>Onsite workers will follow OHS requirements re personal protective equipment</li> <li>No high levels of noise predicted</li> <li>Local topography will attenuate effects of noise and vibration</li> </ul>	N

Component	Project Phase & Potential Interaction			Key Considerations and Proposed Mitigations	Residual Effects
	Con <sup>1</sup>	Ops <sup>2</sup>	Potential Interactions		
Ore Transportation		X	Approximately 4 trucks per day, seven days a week will haul concentrated ore to the NPM on public roads	<ul style="list-style-type: none"> <li>• Compliance with regulations and permits</li> <li>• Accident event prevention and response</li> <li>• Follow EPP</li> <li>• Traffic Management Plan</li> <li>• Maintenance programs on equipment</li> <li>• No towns in close proximity to the haul route</li> </ul>	NS
Cultural Activities	X	X	Project activities could interfere with cultural activities such as hunting, angling, berry picking	<ul style="list-style-type: none"> <li>• Compliance with regulations and permits</li> <li>• Accident event prevention and response</li> <li>• Follow EPP</li> <li>• Project site is an existing brownfield site</li> <li>• Maritime upgraded an existing section of snowmobile trail to limit potential for Project vehicle and public interaction</li> <li>• Progressive rehabilitation will occur where possible and practical to do</li> <li>• Undisturbed areas surrounding the Project site likely preferred for cultural activities. Through extensive public engagement, no concerns raised.</li> </ul>	N
Area Outfitters	X	X	<ul style="list-style-type: none"> <li>• Noise, Project traffic, interrupted access could interfere with outfitter activities</li> </ul>	<ul style="list-style-type: none"> <li>• Project activities will occur outside the outfitter buffer zone.</li> <li>• A section of existing snowmobile trail was upgraded to limit potential for Project vehicle and public interaction.</li> <li>• Traffic management plan</li> <li>• Maintain light vehicle access along Shoal Pond Forest access road to permit safe passage</li> </ul>	N
Viewscapes and Buffers	X	X	<ul style="list-style-type: none"> <li>• Project activities could affect wildlife, viewscapes, water quality etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Compliance with regulations and permits</li> <li>• Accident event prevention and response</li> <li>• Follow EPP</li> <li>• Wherever possible, Maritime will maintain a 30 m buffer between all Project activities and waterbodies, including wetlands.</li> <li>• Where Project development may disturb wetlands, mitigations will be implemented that reduce effects to drainage patterns outside the Project footprint.</li> <li>• Only necessary clearing will be carried out</li> <li>• Progressive rehabilitation will be carried out wherever possible</li> <li>• The WaMP will detail appropriate mitigations such as the construction of appropriate channels/ditching to reduce impacts to affected waterbodies.</li> <li>• Appropriate wildlife buffers will be maintained as recommended by the WD.</li> <li>• Existing vegetated buffers will be maintained wherever possible and clearing will be limited to only necessary areas.</li> </ul>	NS

Component	Project Phase & Potential Interaction			Key Considerations and Proposed Mitigations	Residual Effects
	Con <sup>1</sup>	Ops <sup>2</sup>	Potential Interactions		
Groundwater	X	X	<ul style="list-style-type: none"> <li>Changes in groundwater quantity (water levels) may affect surface water features and wetlands, mainly through operations phase dewatering activities.</li> <li>Local changes in shallow groundwater quality near the ore and overburden stockpiles, and waste rock stockpile.</li> <li>Local changes to groundwater quality due to potential accidental spills.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Follow EPP</li> <li>The WaMP will detail appropriate mitigations to limit adverse impacts to groundwater resources and monitor changes over the LOM</li> <li>Appropriate baseline and monitoring will be completed to ensure potential adverse effects are understood and mitigated</li> <li>Best management practices</li> <li>Continuous monitoring of groundwater levels to track distance drawdown effects of groundwater around mine due to dewatering</li> <li>Monitoring of water levels in site surface water bodies and wetlands; along with continuous monitoring of precipitation to allow separation of groundwater-specific effects</li> <li>Final Project discharge released to maintain the hydraulic conditions of adjacent surface water features and wetlands, as required.</li> <li>Reduce pumped water from the mine through control of perimeter surface runoff, and excessive groundwater seepage through open fractures in mine walls</li> <li>Water management and water quality monitoring of mine discharge and seepage from ore storage and overburden stock piles and waste rock stockpile</li> <li>Additional monitoring well to be constructed</li> </ul>	NS
GHG Emissions	X	X	<ul style="list-style-type: none"> <li>NL has set GHG emission target reductions for the province and industrial activities.</li> <li>Project mining equipment will generate GHG emissions through fossil fuel combustion.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with regulations and permits</li> <li>Accident event prevention and response</li> <li>Maritime will monitor emissions on an ongoing basis</li> <li>Maritime will submit GHG emission estimates to the CCB</li> <li>Maritime will use sustainable and/or low emission energy sources where possible</li> </ul>	N
<b>Key:</b> X Potential Project Interaction (by Phase) N No likely adverse residual environmental effect NS Not significant adverse residual environmental effect S Significant adverse residual environmental effect P Positive residual environmental effect					

<sup>1</sup> Construction phase

<sup>2</sup> Operations phase

## 8.0 DECOMMISSIONING AND REHABILITATION

A Rehabilitation and Closure Plan (RCP) is a requirement of the Newfoundland and Labrador *Mining Act*, chapter M-15.1, Sections (8), (9), and (10). Under the *Mining Act*, the RCP is defined as the plan that describes the process of rehabilitation of a mining project at any stage of the project, up to and including cessation of operations and closure. Rehabilitation has been defined as the measures taken to restore the property as close as reasonably possible to its former use or condition, or to an alternative use or condition considered appropriate and acceptable by the NL NLDIET. Maritime anticipates submitting the RCP to NLDIET for review by May 2021.

The RCP will align with the main objective of mine rehabilitation which is to restore the site to a satisfactory condition by:

- Restoring the land to as close to natural state as practically possible;
- Minimizing any long-term impact on the environment, including fauna and flora;
- Creating a landscape that is visually acceptable and compatible with surrounding terrain and land use;
- Mitigating and controlling, to within acceptable levels, the potential sources of contamination, pollution, fire risk, and public liability; and
- Providing a safe environment for long term public access.

For most mines, there are three main stages of rehabilitation that occur over its life:

- Progressive rehabilitation;
- Closure rehabilitation; and
- Post-closure and long-term monitoring.

Progressive rehabilitation involves rehabilitation work completed throughout mining operations prior to closure, wherever possible or practicable to do so. Such activities may include the placement of a waste rock berm/barricade and signage around the perimeter of any exhausted open pits. There may also be an opportunity to carry out the demolition and removal of disused infrastructure, as well as the re-vegetation of disturbed areas no longer in use and completed areas of the waste stockpile. Re-shaping of the waste stockpile or designing it to blend into the landscape will be considered. In addition, there will be opportunities to back-haul the rejects and place them in exhausted open pits and/or underground workings.

Closure rehabilitation involves activities completed after mining operations cease to rehabilitate the site to as close to its pre-mining condition as practicable. This may include complete demolition and removal of site infrastructure, re-vegetation of disturbed areas, removal of contaminated materials if applicable, water management, and reshaping the landscape.

Once closure and rehabilitation activities have been completed, post-closure monitoring will be undertaken to confirm rehabilitation activities have been successful and mine discharges meet compliance standards. This may include, for example, the monitoring of slopes for long-term stability, re-vegetation success and environmental monitoring. Once post-closure monitoring demonstrates site rehabilitation has been successful, the site can be closed and released by the NL DIET, at which time an application can be made to relinquish the property back to the Crown.

Surface water quality monitoring will be carried out during closure and post-closure activities, as per regulatory requirements.

As planning and development continues, Maritime will consider all options and opportunities for optimal rehabilitation and closure and will work to incorporate them into the final plan. The RCP submitted to the NL DIET will include a financial assurance, based on the cost estimate to complete closure activities.

The above noted rehabilitation activities will be further described in the RCP submitted to the NL DIET following release from the EA process and as part of the regulatory permitting process.

All aspects of offsite processing of Hammerdown ore will be addressed in the NPM updated Certificate of Approval (C of A), Development Plan (DP) and RCP. Although offsite processing is not considered a component of this Project for EA purposes, Maritime is providing the following information in this Registration document for general information and a comprehensive understanding of the overall mining plan.

Closure and rehabilitation activities associated with the Project will take place after all economic ore has been removed from the site. Any post closure monitoring activities will be carried out in accordance with the approved RCP in place for Maritime's operations.

The QP's findings with respect to ARDML potential of the various rock types, and mine processed and waste materials (i.e., ROM ore and ore rejects, tailings, waste rock, and soil stockpiles) will inform the requirements for ARDML management as part of mine design, operations and closure, and if required, the management strategy to prevent, control and mitigate potential ARDML issues will be incorporated into Maritime's Development Plan and the RCP. To date, Maritime has conducted static and kinetic testing of waste rock, overburden and ore samples, and final analysis results will be submitted as required by the NL DIET. To date, all ARDML laboratory analysis results for waste rock collected from the site show that materials are mostly inert, with no concerns of ARDML associated with long term storage (Appendix A).

During the decommissioning phase, Maritime will carry out monitoring and inspections as required. Details specific to decommissioning, sampling and discharge procedures will be outlined in Maritime's RCP that will be submitted to the NL DIET for approval prior to the start of any construction activities.

Based on testing to date, no ARDML is expected to occur in overburden or waste rock during operations or at closure and therefore these components are not expected to cause adverse environmental effects during mine closure and decommissioning. Ore stockpiles are anticipated to be of short duration and unlikely to generate ARDML during the limited exposure period. Ongoing testing of ore sorting rejects, tailings and soils will confirm their ARDML characteristics but it is likely the soil results will be consistent with preliminary findings with no expectation of ARDML. Ore sorting rejects will be de-pyritized and therefore it is predicted they will not be a generator of ARDML.

The pit will flood after mine closure and discharge is expected to meet *Metal and Diamond Mining Effluent Regulations* (MDMER) discharge criteria as the major contribution to the pit will be direct precipitation, groundwater inflow and wall rock runoff from benign or low acid generating potential waste rock. Additional analyses, including geochemical modeling, will be carried out prior to closure in order to predict the chemistry of the pit lake. If modeling and monitoring of the water quality indicates the possibility of ARDML processes, Maritime will mitigate these adverse effects to the natural environment both during operations and after closure. In addition, water quality monitoring of the discharges from the settling pond systems will include parameters associated with ARDML processes including but not limited to pH, metals and sulfates. If monitoring and modeling of effluent discharges, e.g., mine water, mine contact runoff, settling pond system(s) discharge, show potential effects from ARDML, this will be addressed in Maritime's RCP. All kinetic testing results will be available for inclusion in the RCP.

## 9.0 PROJECT-RELATED DOCUMENTS

A number of Project-specific documents (e.g., baseline study reports, engineering reports) have been generated for the Project. In general, the Study Area for the biophysical reports noted below includes the Project area, the majority of the Mining Lease area and the surrounding landscape. Sampling methodology and locations specific to each biophysical component are described in greater detail in the individual reports and are available on request.

- Baseline Air Quality Monitoring Report, Hammerdown Underground Gold Mine Re-activation. Final Report. Stantec Consulting Ltd. 2017a.
- Surface Water and Water Quality Baseline Report, Hammerdown Underground Gold Mine Re-activation. Final Report. Stantec Consulting Ltd. 2017b.
- Terrestrial and Aquatic Baseline Program, Hammerdown Underground Gold Mine Re-activation. Final Report. Stantec Consulting Ltd. 2017c.
- Ecological Baseline Report, Hammerdown Gold Mine Development Project, King's Point, NL. GEMTEC Consulting Engineers and Scientists Ltd. 2019a.
- Fish Habitat Assessment, Maritime Resources Corp.'s Hammerdown Gold Mine Development Project. King's Point, NL. GEMTEC Consulting Engineers and Scientists Ltd. 2019b.
- Hammerdown Gold Mine Redevelopment Project: Baseline Hydrogeology Scoping Study, King's Point, NL. GEMTEC Consulting Engineers and Scientists Ltd. 2019c.
- Hydrogeology Baseline Report, Hammerdown Gold Mine Development Project. King's Point, NL. GEMTEC Consulting Engineers and Scientists Ltd. 2019d.
- Hydrology and Surface Water and Sediment Quality Baseline Report, Hammerdown Gold Mine Development Project, King's Point, NL. GEMTEC Consulting Engineers and Scientists Ltd. 2019e.
- Test Pit Soil Investigation for the Proposed Waste Rock Dump, Low Grade Ore Stockpile, Crushing Plant and Administration Building Areas, Hammerdown Gold Mine near King's Point, NL. GEMTEC Consulting Engineers and Scientists Ltd. 2019f.
- A Preliminary Geochemical Characterization on the Hammerdown Gold Project, Newfoundland & Labrador, Canada. SRK Consulting (UK) Limited. 2019.
- Environmental Protection Plan. GEMTEC Consulting Engineers and Scientists Ltd. 2019.
- Hammerdown Gold Project NL, Preliminary Economic Assessment. WSP. 2020
- Noise Impact Study of Haul Route and Mining Operations, Hammerdown Gold Project, King's Point, NL. GHD. 2020.

In addition to the above-noted reports, a number of other documents, noted below, have been prepared or are in draft preparation stages. These reports are either attached as appendices or their estimated completion date provided.

- External Memo – Humidity Cell Texts (HCT) - 40 Week Progress. SRK Consulting. March 2021. (Appendix A)
- Water Management Plan. GEMTEC Consulting Engineers and Scientists Ltd. 2020. (Appendix B)
- Public Consultation Log, Hammerdown Gold Project (Appendix C)
- Noise Impact Study of Haul Route and Mining Operations, Hammerdown Gold Project, King's Point, NL GHD. 2020. (Appendix D).
- Time Series Groundwater Level Hydrographs. GEMTEC 2020. (Appendix E).
- BACT Analysis. GEMTEC Consulting Engineers and Scientists Ltd. 2020 (Appendix F)
- Waste Management Plan. GEMTEC Consulting Engineers and Scientists Ltd. 2020. (Appendix G)
- GEDP. Maritime Resources Corporation, 2020. (Appendix H)
- Blast Management Plan (draft). GEMTEC Consulting Engineers and Scientists Ltd. Available April 2021.
- Environmental Contingency Plan (draft). GEMTEC Consulting Engineers and Scientists Ltd. Available April 2021.
- Rehabilitation and Closure Plan (draft). GEMTEC Consulting Engineers and Scientists Ltd. Available May 2021.
- Development Plan (draft). GEMTEC Consulting Engineers and Scientists Ltd. Available May 2021.
- Test Pit Soil Investigation for the Proposed Waste Rock Dump, Low Grade Ore Stockpile. (draft) GEMTEC Consulting Engineers and Scientists Ltd. Available May 2021.
- Preliminary Geochemical Characterization on the Hammerdown Gold Project, Newfoundland & Labrador, Canada. SRK Consulting (UK) Limited. 2019.
- External Memo, Summary of Kinetic Test Program, Hammerdown Gold Project, Newfoundland & Labrador, Canada. SRK Consulting (UK) Limited. 2020.

## **10.0 PUBLIC INFORMATION MEETING**

Given the restrictions in place to limit the spread of COVID-19 in the province, Maritime held a virtual Public Information Session via Zoom on November 4, 2020. At that meeting, Maritime officials presented a slide deck which described the planned Project development, the existing physical and socio-economic environment, potential Project interactions and associated impacts, along with mitigation measures to minimize these impacts. Additionally, the current regulatory status of the Project was presented, along with the work required to support regulatory approval for the Project to proceed

The material presented is appended in Appendix I as well as a record of attendees and questions asked. Prior to planning and executing this meeting, Maritime consulted with officials in the EAD, and issued the required notice of the meeting to the Minister on October 22, 2020. On the same day, correspondence was issued by EAD to Maritime confirming receipt of the notification with no issues or concerns indicated. The meeting notice was advertised in a regionally distributed newspaper, on the regional cable community channel, made available on Company social media sites, and issued to local municipal councils for posting on town social media pages. Documentation supporting communications of the virtual meeting is available in Appendix I.

## 11.0 APPROVAL OF THE UNDERTAKING

In addition to approval under the provincial EA process, the Project may require other permits, approvals and authorizations be obtained prior to the start of any construction and/or operations activities. Table 19 provides a list of existing permits and authorizations, and Table 20 a list of potential permits, approvals and authorizations that may be required.

**Table 19: Current Permits, Approvals and Authorizations**

Permit, Approval or Authorization Activity	Issuing Agency
Surface and Mining Lease	Mineral Lands Division - Department of Industry, Energy and Technology (DIET)
Mineral Licence	
Exploration Permit	
Water Use Licence - Exploration	WRMD - DECCM
Environmental Protection Plan (EPP) - Exploration	Pollution Prevention Division (PPD) and EA Division (EAD) - DECCM

**Table 20: Potential Permits, Approvals and Authorizations**

Permit, Approval or Authorization	Issuing Agency
Municipal	
Approval to use Municipal Waste Disposal Site	South Brook
Building permits for development within the Town's municipal boundary (as per section 194 of the <i>Municipalities Act</i> , 1999)	Town of King's Point
Provincial	
Release from EA Process	EAD & Minister – DECCM
Environmental Protection Plan (EPP) – Construction and Operations (Exploration EPP to be updated)	PPD and EAD - DECCM
Certificate of Approval for Construction and Operation	
Certificate of Approval for Generators	
Approval of Environmental Contingency Plan/Emergency Spill Response	
Pesticide Operators License	
Waste Management Plan	
Permit to Construct a Non-Domestic Well	WRMD - DECCM
Culvert Installation	
Water Management Plan	
Fording	
Pipe Crossing/Water Intake	
Real Time Water Quality Monitoring	
Stream Modification or Diversion	
Other Works Within 15 m of a Body of a Water	
Water Use Licence	Crown Lands Division - Department of Fisheries and Land Resources (DFLR)
Permit to Occupy Crown Land	
Highway Access Permit	
Permit to Control Nuisance Animals	Wildlife Division (WD) - DFLR

<b>Permit, Approval or Authorization</b>	<b>Issuing Agency</b>
Operating Permit to Carry out an Industrial Operation During Forest Fire Season on Crown Land	Forestry and Agrifoods Branch - DFLR
Permit to Cut Crown Timber	
Permit to Burn	
Development Plan	Mineral Development Division, Mines Branch – DIET
Rehabilitation and Closure Plan	
Financial Assurance	
Blaster Safety Certification	Occupational Health and Safety Division – Service NL
Explosive Magazine Permit – one per magazine	
Permits for Underground Use of Diesel Equipment	
Miners Medical	
Potential Restrictions re COVID 19	
Approval for Storage and Handling of Gasoline and Associated Products	Government Service Centre – Service NL
Fuel Tank Registration	
Temporary Fuel cache	
Approval for Used Oil Storage Tank System (Oil/Water Separator)	
Fire, Life and Safety Program	
Application to Develop Land for Septic	
C of A for a Sewage/Septic System	
Building Accessibility Registration	
Propane Use	
Mine Rescue Certification re Mine Rescue Training Standards	
<b>Federal</b>	
License to Store, Manufacture, or Handle Explosives (Magazine Licence)	Natural Resources Canada
Environmental Effects Monitoring (EEM) under MDMER	Environnement and Climate Change Canada (ECCC)

Maritime will comply with all terms and conditions of release, will apply for all required permits, approvals or authorizations and will abide by commitments made during the EA process.

As Maritime intends to process material from the Project at NPM, all Mill permits and authorizations relevant to processing Hammerdown material ore at the facility will be updated through that facility's permitting process.

In addition to the release from the EA process, other regulatory approvals and permits are required prior to the start of construction activities. Maritime will ensure all approvals and permits are complete and applications submitted to the appropriate regulators as soon as possible to ensure an efficient transition to the construction phase

## 12.0 SUMMARY AND CONCLUSIONS

The key components of the proposed seven year Project spanning construction, operations and closure include an open pit and underground mine, crushing and sorting equipment, ore storage area, waste rock storage and water management infrastructure. Other components of the Project include necessary and associated infrastructure such as modular office and dry buildings, garage, warehousing and truck weigh scales. The Project does not require an onsite mill as final processing and tailings disposal will occur at the existing NPM and tailings storage facility. The Project provides a technically feasible, environmentally- and socially-responsible means of mining a known gold deposit at a site with a history of mining operations. The commissioning of the Project will provide a new source of sustained employment opportunities and economic benefits to the region for years to come.

The Project will be planned and implemented in accordance with Maritime's environmental and health and safety policies, plans and practices, to promote safe and responsible construction and operations. This approach will avoid and reduce negative environmental effects of their activities while maximizing socio-economic benefits.

The Project will be constructed and operated in accordance with applicable provincial and federal legislation and regulations. Maritime is committed to obtaining all required permits and authorizations and ensuring any conditions associated with EA release are met.

Maritime does not anticipate any significant adverse effects of the Project on the following:

- Local cabin owners;
- Land and resource use and access;
- Recreational Trails;
- Bats;
- Human Health;
- Cultural Activities;
- Area Outfitters;
- Groundwater;.or
- Viewscapes.

Nor does Maritime anticipate a significant increase in GHG emissions or adverse effects of noise in the vicinity of the Project site or along the ore transportation route to the NPM as a result of the Project.

### 13.0 REFERENCES

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## **APPENDIX A**

ARDML Memo

## External Memorandum

**To:** Garrett Macdonald                      **From:** Craig Wickham and Rob Bowell  
**Company:** Maritime Resources Corporation                      **Project Number:** UK30515  
**Copied to:** -                      **Project Title:** Hammerdown HCT Progress  
30515  
**File Ref:** Hammerdown\_40\_Week\_                      **Date:** 3rd March, 2021  
HCT\_Memo\_Final.docx  
**Subject:** Humidity Cell Tests (HCT) – 40 Week Progress Memorandum

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### 1 INTRODUCTION

SRK Consulting (SRK) is currently undertaking a geochemical characterization study for the Hammerdown Gold Project on behalf of Maritime Resources Corporation (referred to hereafter as 'MRC' or the 'Client'). The primary purpose of the study is to develop geochemical characterization data that will ultimately form part of the planning and impact assessment for the Project. Geochemical testing of mine waste materials provides a basis for assessment of the potential for acid rock drainage and metal leaching (ARDML), prediction of contact water quality (i.e., surface water and groundwater that comes into contact with development rock, pit walls, or tailings), and evaluation of options for design, construction, and closure of the mine facilities.

A preliminary geochemical characterization study was undertaken in July 2019 (SRK, 2019). The study involved a desk-based assessment and the collection of 54 drill core samples from historic exploration drill holes (1989) within the Hammerdown deposit. Samples underwent static test work including Acid Base Accounting (ABA), whole rock analysis and short-term leachate extraction tests. A further 87 drill core samples from recent exploration drill holes (2018-2019) within the Hammerdown deposit were collected in August 2019. Samples underwent selected static test work including ABA and whole rock analysis.

The static test work results were used to select a representative subset of twelve samples for kinetic test work. Humidity Cell Tests (HCT) commenced in April 2020 and operated for 40 weeks prior to termination. This memorandum has been prepared to provide interim assessment and a summary of the HCT data collected to date.

### 2 KINETIC TEST WORK PROGRAM

Kinetic tests evaluate temporal changes in leachate chemistry, through the sequential rinsing of the rock weathered in a regular cycle of exposure to dry and wet air in a controlled laboratory environment.

These cycles simulate and accelerate the chemical weathering rates observed under field conditions, using test conditions that are specifically designed to target oxidation of sulfide minerals. The aim of kinetic testing is to provide reaction rate data to support prediction of the leachate chemistry that would likely develop during meteoric rinsing of waste rock dump facilities. The data can also be used to support development of waste management criteria

Geochemical reactions and reaction rates monitored throughout the testing include sulfide oxidation, depletion of initial neutralization potential, and mineral dissolution. HCT test results offer the greatest insight into mineral weathering when the test is continued until the majority of the mineral reactions that can be predicted from mineralogy or static testing have been observed which are usually shown by transitions to lower pH.

The endpoint is assessed by monitoring the release rates of key constituents such as pH, sulfate, acidity, alkalinity and iron as well as dissolved metals and metalloids. It is common practice to terminate cells when the release rates for these parameters become relatively constant with time and there is no substantial change in the calculated release rate of key parameters or there is no likelihood that changes will occur within the timeframe of the project schedule. The likelihood of conditions changing within the timeframe of the project can be assessed by determining the rate of sulfide oxidation and depletion of the initial neutralization potential (NP). In general, the rate of acid generation can be defined through the production of sulfate during the test after soluble sulfate is removed during the initial flush of the test. Assuming carbonate minerals are the main source of acid neutralization, the rate of calcium and magnesium production can provide an indication of the rate of NP depletion and allow an estimate of when acidic conditions may develop.

## 2.1 Samples

SRK determined in the initial characterization that sulfur concentration is the primary consideration in determining potential environmental impact. Consequently, utilizing the medium value for sulfur for each lithology as the most representative, a subset of twelve samples from the static database was selected for kinetic test work. Details of these samples are presented in Table 2-1 and are illustrated in scatter plots presented in Figure 2-1. These graphs show the distribution of the samples selected for kinetic testing in relation to the entire dataset.

## 2.2 Laboratory Test Program

The standard Humidity Cell Test (HCT) procedure (ASTM D-5744-18) was the chosen kinetic testing method for this Project which simulates water-rock interactions in order to predict the rate of sulfide mineral oxidation and thus the acid generation and metals mobility. Under ASTM methodology, the test follows a seven-day cycle, during which humidified air is introduced at the bottom of the column for three days of each cycle followed by three days of dry air and on the seventh day, the sample is rinsed with de-ionized water and the extracted solution is collected for analysis.

QA/QC has been undertaken on the humidity cell samples through duplicate analysis, the analysis of a blank sample (HCT13) and ion balance / electroneutrality (E N) calculations.

The kinetic testing and analysis of leachate is being undertaken at RPC Laboratories in Fredericton New Brunswick. Full analysis of leachate was completed for Week 0 (first flush) to Week 4, after which only key parameters including; pH, alkalinity, acidity, electrical conductivity, calcium, iron and sulfate were measured on a weekly basis with major and trace element chemistry measured on alternative weeks. Chloride, fluoride, nitrate and nitrate were analysed weekly up to week 10 after which they were analysed every 5<sup>th</sup> week.

At termination, the HCT were closed down in accordance with the procedure detailed in Price (2009). In this procedure, the humidity test sample is removed, washed and agitated with 3L of deionized water for a period of 24 hours and then allowed to settle. The supernatant is collected and filtered and tested as per above. A final residue of the solid sample is submitted for static testing (ABA, whole rock assay).

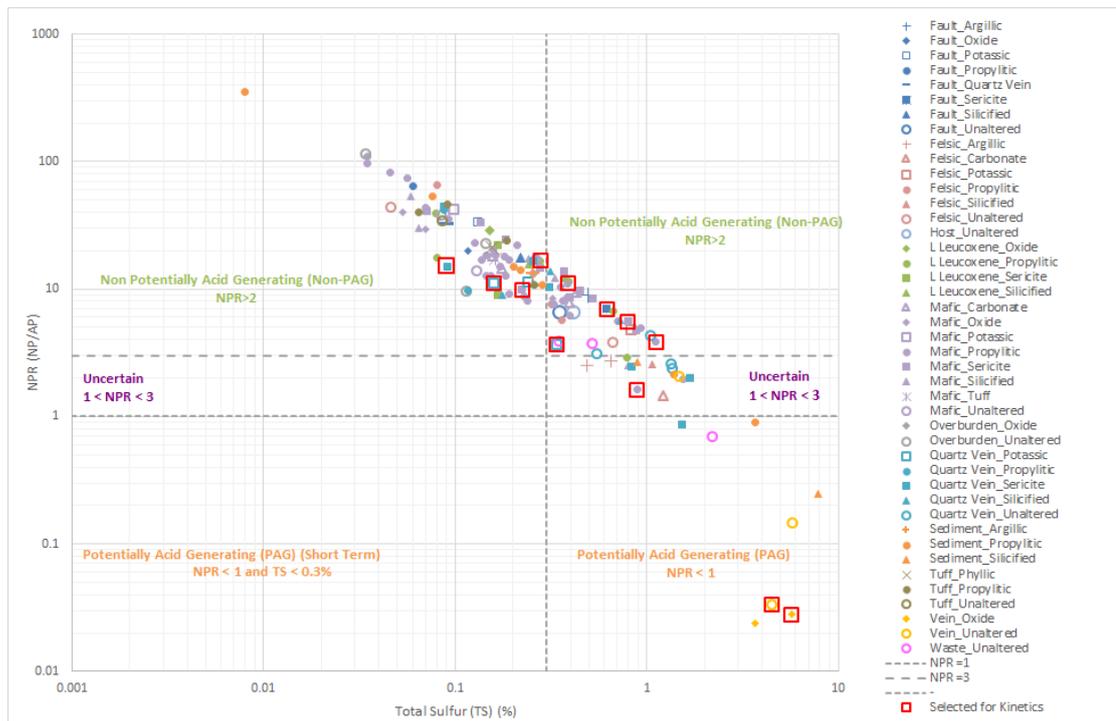


Figure 2-1: Total Sulfur versus Neutralizing Potential Ratio showing HCT samples

**Table 2-1: Characteristics of Waste Rock Samples Selected for Humidity Cell Testing**

Cell #	Static Sample ID	Hole ID	Lithology / Alteration	Paste pH (s.u)	Total S (%)	Sulfide S (%)	Sulfate S (%)	NP eq kgCaCO <sub>3</sub> /t	NPR (NP/AP)
HCT-01	18455	RM ore	Vein / unaltered	6.7	4.5	4.451	0.049	4.7	0.034
HCT-02	18457	J ore	Vein / oxide	7.8	5.7	5.692	0.008	5.0	0.028
HCT-03	18460	MP18-37	Mafic Volcanic & Overburden / Sericite	8.8	0.22	0.22	<0.005	67	9.8
HCT-04	18461	MP18-37	Mafic Volcanic / Propylitic	8.8	0.39	0.39	<0.005	134	11
HCT-05	18465	MP18-37	Quartz–feldspar porphyry / Potassic/Propylitic	9.2	0.34	0.34	<0.005	39	3.7
HCT-06	18470	MP18-47	Leucoxene / Propylitic	8.8	0.28	0.28	<0.005	149	17
HCT-07	18474	MP18-47	Mafic Volcanic / Propylitic	8.5	1.1	1.1	<0.005	131	3.8
HCT-08	18487	MP19-50	Quartz–feldspar porphyry Sericite	9.6	0.091	0.091	<0.005	43	15
HCT-09	18490	MP19-50	Mafic Volcanic / Sericite-Propylitic	9.0	0.8	0.8	<0.005	140	5.6
HCT-10	18720	MP19-58	Mafic Volcanic / Propylitic	9.0	0.89	0.89	<0.005	45	1.6
HCT-11	18729	MP19-58	Quartz–feldspar porphyry / Potassic	9.4	0.16	0.16	<0.005	55	11
HCT-12	18738	MP19-63	Fault / Sericite - silic	8.8	0.62	0.62	<0.005	134	6.9

Note: HCT-01 & HCT-02 are grab sample bulk met samples and HCT-03 to HCT-12 are continuous core

<b>ABA Criteria</b>	<b>PAG</b>	NPR<1
	<b>Uncertain</b>	NPR between 1 and 3
	<b>Non-PAG</b>	NPR >3

PAG = Potentially Acid Generating. Non-PAG = Non-Acid Generating

### 3 KINETIC TEST WORK RESULTS

The HCT results for each sample are provided in the following sections. Time-series plots for key parameters are provided in Attachment A to this memorandum. At the time of writing, all twelve cells are ongoing, with results available through week 40.

#### 3.1 Quality Assurance and Quality Control (QAQC)

##### 3.1.1 Ion balance

Data QAQC checks include an ion balance / electroneutrality (E N) calculation. The accuracy of the chemical analysis can be assessed through calculating the ion balance for each sample. A solution in nature would be balanced with the same number of cation and anions, therefore being electroneutral. Calculating the ion balance / electroneutrality determines if all major elements have been analysed and/or if there are issues with the analysis. The ion balance as followed:

$$E.N. [\%] = \frac{\sum_{cations} \left(\frac{meq}{l}\right) - \sum_{anions} \left(\frac{meq}{l}\right)}{\sum_{cations} \left(\frac{meq}{l}\right) + \sum_{anions} \left(\frac{meq}{l}\right)} * 100\% < 10\%$$

In accordance with SRKs Standard Operating Procedures, ion balance results are interpreted based upon the overall anion charge in solution, as higher degrees of error are tolerable at lower concentrations, where measurements approach the analytical limits of detection. Data are considered to be accurate within an error margin of 10% where the sum of anions is between 3 – 10 meq/L. For anion sums of <3 meq/L then a relative difference of +/- 0.3 meq/L is considered acceptable.

The ionic balance calculated for HCT-01 was consistently outside that deemed to be accurate. The large errors may be because certain unconventional ions are occurring as a main charge contributor, for example Fe, Mn, Al and Cu which may contribute charge under anoxic conditions or low pH conditions. All other cells were typically considered to be accurate.

##### 3.1.2 Blank HCT

A blank sample (HCT-13) was submitted to assess and confirm that no laboratory artefacts compromised the analytical results. SRK typically expect that blank sample analysis should recorded the presence of parameters at less than two times the limit of detection (LOD). During the initial weeks of testing, there were a number of parameters that were detected in the blank, many times more than the LOD. However, following this period and for all subsequent analysis the analysis of the blank HCT leachate yielded results that were within expectations, with the exception of the following.

- All results for tin. Result for tin were always more than 2x LOD. At week 0, 10.9 µg/L was recorded although by week 4 this had decreased to 0.9 µg/L. In subsequent weeks the results were between 0.3 µg/L and 1.5 µg/L and generally showed a decreasing trend throughout the test. Tin has been identified in blank HCTs by SRK for other programmes and has been found to be typically associated with meshes and filters used for sampling.

- Between weeks 0 and 24, results for zinc were more than 2x LOD, with concentrations ranging between 2 µg/L and 38 µg/L. As for tin, the results showed a decreasing trend throughout the testing period for zinc. After week 24, the results were within the accepted range.

Overall, the results of the blank analyses are considered acceptable and for the majority of the testwork, the results are within expected ranges.

### 3.2 Constituents Leaching Potential

Release rates calculated using the HCT results can be used to evaluate trends of elements to provide a qualitative indication of the leaching potential of these parameters. The release rates can also be used to develop water and load balance input source terms to evaluate if constituent concentrations pose environmental risk when accounted for in the context of the proposed mine waste and water management strategies. The development of the source terms and the water and load balance will be completed as part of the main characterisation report, therefore release rates are interpreted here to provide a qualitative interpretation of elemental leaching potential.

Time-series plots for key parameters are provided in Attachment A to this memorandum. Key parameters are defined as;

- those that provide insight to acid generation potential (pH, alkalinity, sulfate, NP remaining and sulfate remaining);
- elements greater than 12 times the average crustal abundances (arsenic, bismuth, cadmium, copper, lead, selenium, silver and zinc);
- had increasing concentrations during the testing period (e.g. EC, aluminium, beryllium, cadmium, copper, iron, lead and zinc); and
- are included in the Metal and Diamond Mining Effluent Regulations (MDMER) Schedule 4 discharge criteria (arsenic, copper, lead, nickel and zinc).

#### 3.2.1 Vein (HCT-01 and HCT-02)

The sample of unaltered vein material (HCT-01) produced acidic leachate throughout the humidity cell testwork, with pH declining from 5.4 initially to pH 3.7 by week 28. Subsequent to this the pH remained relatively stable and was generally between 3.9 and 4.4. These acidic conditions reflect the initial total sulfur content (4.5 %) and the lack of neutralizing potential (NP) in the cell. The sample of oxide vein material (HCT-02) was initially characterized by circum-neutral pH conditions (pH 6.7). The leachate pH declined through to week 30 when a pH of 4.7 was recorded. Subsequent to this, the pH in HCT-02 was generally stable and remained between 4.7 and 5.1 up to week 40. The increasing acidic conditions are partly a function of the initial total sulfur content (5.7 %) and NP depletion in the cell. The results are consistent with the PAG classification determined by the ABA results for both samples.

Sulfate concentrations and release rate trends were similar for both HCT-01 and HCT-02 samples. The highest sulfate concentrations were recorded during the initial three weeks of testing, with up to 82 mg/L and 85 mg/L of sulfate recorded in HCT-01 and HCT-02 respectively. This result is characteristic of HCT and is representative of a “first flush” of parameters. Following week three, concentrations of sulphate in HC-1 decreased from 31 mg/L to 25 mg/L at week 12 after which time there was a general increase in the concentrations of towards week 38. At week 38, the concentration of sulphate in HCT-01 was 35. However, at week 40, the sulphate was recoded to have decreased to 24 mg/L. The result for sulphate from HCT-02 showed a similar initial trend for sulphate up to week 15, after which time there were not the associated increases in the concentrations of sulphate as seen in HCT01. The concentration of sulphate in HCT-02 after week 15 was generally stable between 20 mg/L and 27 mg/L. In general, the results are evidence that sulfide oxidation has occurred in both cells, albeit at a higher rate in HCT-1.

Alkalinity results for both HCT-01 and HCT-02 are below the LOD (2 mg/L) for the majority of the testwork period and therefore indicates that acid buffering reactions are not occurring.

Increasing release rates of aluminium, copper, iron, lead and to a lesser extent zinc can be seen in HCT-01. The increases are summarised below;

- Release rates for aluminium have increased from 0.19 mg/kg/week to 1.1 mg/kg/week at week 40. The increasing trend does not show indication of stabilisation.
- Copper release rates increased from 1.3 mg/kg/week to 3.6 mg/kg/week at week 20, although subsequently has generally declined to week 40 when it was 2.9 mg/kg/week.
- Lead release rates increased from 0.47 mg/kg/week to 1.3 mg/kg/week at week 16, although subsequently has generally declined to week 40 when it was 0.83 mg/kg/week.
- Release rates for nickel in HCT-01 increased from 0.01 mg/kg/week at week 0 to 0.03 mg/kg/week at week 16. However, after this point there was a steep decline in the release rate for nickel – at week 40 it was <0.005 mg/kg/week.
- Release rates for zinc in HCT-01 have been variable between 1.2 mg/kg/week and 2.6 mg/kg/week. However, after week 26, the release rate is generally more stable between 1.4 mg/kg/week and 1.7 mg/kg/week.

Increasing release rates are evident in HCT-02, albeit it to a much lesser extent, for Iron, aluminium, cadmium, cobalt, copper and zinc. These increased re summarised below;

- The release rate for aluminium in HCT-02 was stable from week 0 until week 10. After this point and until 40 there has been a steady increase in the aluminium reels rate from 0.01 mg/kg/week to 0.06 mg/kg/week.
- After week 4, there has been a gradual increase in the release rate for cadmium from 0.002 mg/kg/week to 0.004 mg/kg/week.
- Copper release rates have increased from 0.01 mg/kg/week (week 1) to 0.03 mg/kg/week at week 40.
- Lead release rates have increased from 0.002 mg/kg/week to 0.10 mg/kg/week at week 24. Subsequently and to week 40 the release rate for lead has remained at a similar level.

- The release rate for zinc increases in HCT-02 from 0.1 mg/kg/week at week 2 to 0.73 mg/kg/week at week 40.

### 3.2.2 Mafic Volcanics (HCT-03, HCT-04, HCT-07, HCT-09 and HCT-10)

All five samples of mafic volcanic material (with sericite or propylitic alteration) have produced circum-neutral chemistry (between pH 6.2 and 7.8) throughout the 40 weeks. Alkalinity release rates decreased during the first five weeks, from between 20.6 to 27.5 mg/kg/week to 8.9 to 14 mg/kg/week, after which remained generally consistent. All five cells have greater than 98% of their original neutralizing potential (NP) remaining at week 40, demonstrating that there is still significant acid buffering capacity available in the materials and that acid generation is inhibited (hence NP is not being consumed).

The leachate chemistry for all five cells was generally stable. Sulphate release rates were less than 10 mg/kg/week after week 4 for all samples. After week 4, sulphate was generally recorded at or marginally above the laboratory Limit of Detection (LoD). Consistently low iron release rates (<0.02 mg/kg/week), suggest sulfide oxidation within the cells is negligible. The results are consistent with the non-PAG classification determined from the ABA results for HCT-03, 04, 07 and 09 and indicate that HCT-10, classified by the ABA results as inconclusive due to limited NP, is in fact non-PAG.

There were no constituents greater than 12 times the average crustal abundance for the five samples. This corresponds with the release rates of constituents which decreased to near steady-state conditions following the initial flush of the cells, reflecting the removal of soluble oxidation products from the material surfaces.

### 3.2.3 Quartz-Feldspar Porphyry (HCT-05, HCT-08 and HCT-11)

All three samples of quartz-feldspar porphyry material (with sericite, propylitic or potassic alteration) have produced circum-neutral chemistry (between pH 6.6 and 7.9) throughout the 40 weeks. Alkalinity release rates decreased during the first five weeks from between 19.6 to 23.4 mg/kg/week to 8.3 to 10 mg/kg/week after which remained generally consistent. All three cells have greater than 98% of their original neutralizing potential (NP) remaining at week 40, demonstrating that there is still significant acid buffering capacity available in the materials and that acid generation is inhibited (hence NP is not being consumed).

The leachate chemistry for all three cells was generally stable. Sulphate release rates were less than 10 mg/kg/week after week 3 for all samples. After week 3, sulphate was generally recorded at or marginally above the laboratory LoD. Also, consistently low iron release rates (<0.02 mg/kg/week), suggest sulfide oxidation within the cells is negligible.

There were no constituents greater than 12 times the average crustal abundance for the three samples. This corresponds with the release rates of constituents which decreased following the initial flush of the cell, reflecting the removal of soluble oxidation products from the material surfaces.

### 3.2.4 Leucoxene (HCT-06)

The sample of leucoxene material (with propylitic alteration) has produced circum-neutral chemistry (between pH 6.7 and 7.9) throughout the 40 weeks. These neutral conditions reflect buffering by neutralizing minerals. Alkalinity release rates decreased during the first four weeks from 26.1 mg/kg/week to 10.8 mg/kg/week after which remained generally consistent. The cell had greater than 99% of its original neutralizing potential (NP) remaining at week 40, demonstrating that there is still significant acid buffering capacity available in the materials.

The leachate chemistry in HCT-06 was generally stable. Sulphate release rates were always less than 10 mg/kg/week, indeed after week 3, sulphate was always below the LoD. These low concentrations coupled with consistently low iron release (<0.02 mg/kg/week), suggest sulfide oxidation within this cell is negligible. The results were consistent with the Non-PAG classification determined by the ABA results.

There were no constituents greater than 12 times the average crustal abundance. This corresponds with release rates of constituents which decreased following the initial flush of the cell reflecting the removal of soluble oxidation products from the material surfaces.

### 3.2.5 Fault (HCT-12)

The sample of fault material (with sericite/silic alteration) has produced circum-neutral chemistry (between pH 6.8 and 7.8) throughout the 40 weeks. Alkalinity release rates decreased during the first four weeks from 28.6 mg/kg/week to 11.9 mg/kg/week after which remained generally consistent. These neutral conditions reflect buffering by neutralizing minerals and at week 40, the cell had greater than 99% of its original neutralizing potential (NP) remaining. The results were consistent with the Non-PAG classification determined by the ABA results.

The leachate chemistry in HCT-012 was generally stable. Sulphate release rates were always less than 10 mg/kg/week, indeed after week 7, sulphate was mostly at or marginally above the LoD. Iron release was low (<0.02 mg/kg/week) up until week 4 after which ranged between 0.07 and 0.12 mg/kg/week. This likely reflects rinsing of iron oxide, however, does not appear to influence the behaviour of other trace metals.

There were no constituents greater than 12 times the average crustal abundance. This corresponds with release rates of constituents which decreased following the initial flush reflecting the removal of soluble oxidation products from the material surfaces.

**Table 3-1: Summary of HCT Behaviour**

Cell #	Static Sample ID	Lithology	ARD Prediction based on NPR	Week 40 (current)			Current HCT Conditions	Status
				pH (s.u)	%NP Remaining	% S <sup>2</sup> Remaining		
HCT-01	18455	Vein / unaltered	PAG	4.4	71.0%	99.1%	Acid	Terminated
HCT-02	18457	Vein / oxide	PAG	5.1	76.2%	99.4%	Acid	Terminated
HCT-03	18460	Mafic Volcanic & Overburden / Sericite	Non-PAG	6.8	99.0%	98.4%	Non-acid	Terminated
HCT-04	18461	Mafic Volcanic / Propylitic	Non-PAG	7.0	99.6%	99.6%	Non-acid	Terminated
HCT-05	18465	Quartz–feldspar porphyry / Potassic/Propylitic	Non-PAG	7.0	98.9%	99.4%	Non-acid	Terminated
HCT-06	18470	Leucoxene / Propylitic	Non-PAG	7.0	99.6%	99.4%	Non-acid	Terminated
HCT-07	18474	Mafic Volcanic / Propylitic	Non-PAG	7.0	99.5%	99.5%	Non-acid	Terminated
HCT-08	18487	Quartz–feldspar porphyry Sericite	Non-PAG	7.1	99.0%	98.5%	Non-acid	Terminated
HCT-09	18490	Mafic Volcanic / Sericite-Propylitic	Non-PAG	7.1	99.6%	99.8%	Non-acid	Terminated
HCT-10	18720	Mafic Volcanic / Propylitic	Non-PAG	7.1	99.0%	99.8%	Non-acid	Terminated
HCT-11	18729	Quartz–feldspar porphyry / Potassic	Non-PAG	7.1	99.2%	99.0%	Non-acid	Terminated
HCT-12	18738	Fault / Sericite - silic	Non-PAG	7.1	99.6%	99.6%	Non-acid	Terminated

ABA Criteria	PAG	NPR < 1
	Uncertain	NPR between 1 and 3
	Non-PAG	NPR > 3
HCT Criteria	Acid	pH < 5 s.u.
	Non-Acid	pH > 5 s.u.

### **3.3 Relative Percent Difference (HCT Week 30-40)**

RPDs have been calculated for the HCT week 30 and 40 data (shown in Table 3-2) in order to evaluate the variation in concentrations released over the period. The data shown that concentrations of most parameters are either trending down or are stable. Many of the apparent increases in concentrations, as indicated by the RPD are artefacts of low concentrations.

**Table 3-2: Calculated RPD for HCT results between Week 30-40**

Parameter	HC-1	HC-2	HC-3	HC-4	HC-5	HC-6	HC-7	HC-8	HC-9	HC-10	HC-11	HC-12
Effluent pH	10%	8%	1%	-4%	-3%	-1%	-1%	1%	0%	0%	0%	3%
Effluent EC	3%	1%	14%	12%	-5%	9%	-27%	6%	12%	-5%	0%	7%
Alkalinity (as CaCO <sub>3</sub> )	0%	0%	21%	26%	0%	17%	18%	0%	18%	0%	22%	8%
Fe	12%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	86%
Ca	-33%	-16%	9%	8%	-4%	5%	-2%	4%	12%	0%	1%	8%
SO <sub>4</sub>	-39%	-8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-67%
NO <sub>3</sub> as (N) (mg/L)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	200%
Aluminium	15%	30%	-25%	-3%	-14%	-15%	-16%	-2%	-3%	-11%	0%	42%
Antimony	0%	0%	0%	-67%	-50%	0%	0%	-67%	0%	-40%	-29%	-29%
Arsenic	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Barium	0%	0%	22%	0%	0%	0%	0%	0%	0%	0%	-40%	-67%
Beryllium	-40%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Boron	0%	0%	-100%	0%	-67%	-67%	-67%	-100%	-67%	-67%	-40%	0%
Cadmium	-5%	16%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Calcium	-33%	-16%	10%	11%	-2%	7%	-1%	5%	14%	2%	2%	8%
Chromium	67%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cobalt	-7%	16%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Copper	-3%	9%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Iron	12%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%	86%
Lead	-21%	4%	0%	0%	0%	0%	0%	0%	120%	0%	0%	40%
Magnesium	35%	5%	-7%	-5%	-18%	-21%	-22%	-22%	-12%	-22%	-35%	-4%
Manganese	-34%	19%	0%	12%	-7%	0%	0%	0%	10%	0%	11%	0%
Mercury	0%	0%	46%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Molybdenum	0%	0%	0%	0%	-67%	0%	0%	0%	0%	0%	-29%	0%
Nickel	-75%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Potassium	0%	-11%	-8%	-11%	18%	0%	-12%	-12%	0%	-11%	0%	-15%
Selenium	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Sodium	-33%	0%	-82%	-67%	-26%	0%	-67%	-46%	-57%	-29%	-12%	-46%
Tin	-18%	-22%	-40%	40%	0%	0%	0%	0%	0%	-29%	-22%	40%
Uranium	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Vanadium	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Zinc	-1%	18%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

### 3.4 HCT Termination Testing Results

Following termination of each of the HCT's, residues (i.e. post leach) were submitted for ABA and whole rock assay tests. A comparison of this data to the initial (i.e., pre-leach) sample allows for an assessment of the geochemical properties of the samples and the evolution of the leachate during the HCT.

#### 3.4.1 Acid Base Accounting

The pre-and post-leach total sulfur and paste pH results are summarized in Table 3-3. The results demonstrate that apart from the sulfide ore cells, HC1 and HC2 there is really no change in the results for all the waste rock reflecting the benign or inert nature of the materials and the low sulfide content. The cells HC-1 and HC-2 indicate that sulfide oxidation is ongoing in the materials and with weathering will increase reactivity and long term weathering of these materials is predicted, even though the tests were terminated early both samples indicate potential long term management concerns.

**Table 3-3: Head and Residue Results (Total S and Paste pH)**

Cell	Total Sulfur (wt%)		Paste pH (s.u.)	
	Head Assay	Residue Assay	Initial	Residue
HC1	4.5	4.9	6.7	4.8
HC2	5.7	6.2	7.8	7.7
HC3	0.22	0.29	8.8	8.9
HC4	0.39	0.46	8.8	8.9
HC5	0.34	0.43	9.2	9.6
HC6	0.28	0.29	8.8	8.9
HC7	1.1	1.2	8.5	8.7
HC8	0.09	0.10	9.6	9.6
HC9	0.80	0.62	9.0	9.0
HC10	0.89	0.56	9.0	9.0
HC11	0.16	0.21	9.4	9.4
HC12	0.62	0.71	8.8	8.8

A caveat to this is that the material will not be exposed for a long period and the material will be processed at an off-site location so the ore material exposure is less of an issue and more a consideration for tailings management.

#### 3.4.2 Multi-Element Assay

The pre and post leach results of HCT (head and reconstituted head residue assay samples) are summarized in Table 3-4. Reconstituted head is calculated from residue assay plus cumulative metal release during HCT. This result is used to assess the amount of leaching during the HCT for selected key parameters relating to ARDML.

**Table 3-4: HCT Residue and Reconstituted Residue Whole Rock Assay Results with % Mobilised During HCT.**

	Parameter ->	Al	Sb	As	Ba	Cd	Ca	Cr	Co	Cu	Fe	Pb	Mg	Mn	Hg	Mo	Ni	K	Se	Na	V	Zn
HC-1	Residue Assay	9300	0.90	60	24	6.0	700	104	9	985	60500	972	1720	100	0.12	1.9	8.0	4060	2.0	170	50	1580
	Reconstituted Residue Assay	9325	0.90	60	24	6.3	854	104	9	1092	60580	1014	1732	117	0.12	1.9	8.6	4067	2.0	175	50	1651
	% of original concentration mobilised during HCT	0.3%	0.4%	0.1%	0.7%	5.6%	18.0%	0.0%	2.6%	9.8%	0.1%	4.1%	0.7%	14.8%	0.8%	0.2%	7.0%	0.2%	1.9%	2.7%	0.1%	4.3%
HC-2	Residue Assay	23100	0.50	24	119	16.1	1230	97	9	70	54600	99	1840	195	0.08	1.6	6.0	10000	1.0	830	25	3620
	Reconstituted Residue Assay	23101	0.50	24	119	16.2	1592	97	9	71	54607	102	1854	214	0.08	1.6	6.1	10012	1.0	835	25	3637
	% of original concentration mobilised during HCT	0.0%	0.9%	0.2%	0.1%	0.7%	22.7%	0.0%	1.2%	1.0%	0.0%	2.7%	0.8%	8.9%	1.2%	0.2%	1.7%	0.1%	4.4%	0.6%	0.2%	0.5%
HC-3	Residue Assay	80600	0.40	1	125	0.1	30300	15	13	26	59100	6	22700	700	0.01	0.5	1.0	12000	1.0	21100	47	133
	Reconstituted Residue Assay	80604	0.41	1	125	0.1	30477	15	13	26	59101	6	22708	700	0.01	0.5	1.0	12012	1.0	21109	47	133
	% of original concentration mobilised during HCT	0.0%	3.4%	3.3%	0.1%	0.5%	0.6%	0.2%	0.0%	0.2%	0.0%	0.3%	0.0%	0.0%	8.0%	1.0%	3.4%	0.1%	3.3%	0.0%	0.1%	0.1%
HC-4	Residue Assay	68800	0.60	1	132	0.4	65800	128	32	76	60700	6	23900	1420	0.01	1.4	33.0	9730	1.0	16700	201	111
	Reconstituted Residue Assay	68803	0.61	1	132	0.4	65959	128	32	76	60701	6	23916	1420	0.01	1.4	33.0	9741	1.0	16709	201	111
	% of original concentration mobilised during HCT	0.0%	2.2%	3.6%	0.1%	0.1%	0.2%	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	8.6%	0.8%	0.1%	0.1%	3.6%	0.1%	0.0%	0.0%
HC-5	Residue Assay	69400	0.40	1	27	0.1	16500	90	8	20	19200	6	4260	459	0.01	2.3	2.0	1800	1.0	50600	30	40
	Reconstituted Residue Assay	69403	0.42	1	27	0.1	16643	90	8	20	19201	6	4265	460	0.01	2.3	2.0	1804	1.0	50611	30	40
	% of original concentration mobilised during HCT	0.0%	5.3%	3.7%	0.4%	0.5%	0.9%	0.0%	0.1%	0.3%	0.0%	0.1%	0.1%	0.2%	8.7%	0.8%	1.9%	0.2%	3.7%	0.0%	0.1%	0.1%
HC-6	Residue Assay	71500	0.20	1	31	0.2	64000	194	42	57	72000	4	33700	1430	0.01	0.7	45.0	2180	1.0	21900	234	113
	Reconstituted Residue Assay	71503	0.21	1	31	0.2	64161	194	42	57	72001	4	33708	1430	0.01	0.7	45.0	2187	1.0	21908	234	113
	% of original concentration mobilised during HCT	0.0%	3.0%	3.6%	0.2%	0.2%	0.3%	0.0%	0.0%	0.5%	0.0%	0.1%	0.0%	0.0%	8.5%	0.8%	0.1%	0.3%	3.6%	0.0%	0.0%	0.1%
HC-7	Residue Assay	65900	0.50	2	39	0.1	66800	67	43	51	85300	5	25800	1820	0.01	1.1	20.0	3370	2.0	17900	288	115
	Reconstituted Residue Assay	65903	0.51	2	39	0.1	67009	67	43	51	85301	5	25813	1821	0.01	1.1	20.0	3377	2.0	17907	288	115
	% of original concentration mobilised during HCT	0.0%	2.0%	1.8%	0.2%	0.4%	0.3%	0.1%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	8.6%	0.6%	0.2%	0.2%	1.8%	0.0%	0.0%	0.1%
HC-8	Residue Assay	65100	0.30	1	409	0.0	18300	39	3	9	14100	3	2810	404	0.01	1.3	2.0	17200	1.0	26600	21	19
	Reconstituted Residue Assay	65103	0.31	1	409	0.0	18427	39	3	9	14101	3	2813	404	0.01	1.3	2.0	17217	1.0	26610	21	19
	% of original concentration mobilised during HCT	0.0%	4.6%	3.6%	0.0%	1.2%	0.7%	0.1%	0.1%	0.5%	0.0%	0.2%	0.1%	0.1%	8.6%	0.9%	1.8%	0.1%	3.6%	0.0%	0.2%	0.3%
HC-9	Residue Assay	63200	0.50	1	39	0.3	74500	147	37	70	59700	6	28300	1640	0.01	0.7	28.0	4000	1.0	21900	206	149
	Reconstituted Residue Assay	63203	0.51	1	39	0.3	74667	147	37	70	59701	6	28310	1640	0.01	0.7	28.0	4005	1.0	21909	206	149
	% of original concentration mobilised during HCT	0.0%	2.4%	3.6%	0.1%	0.2%	0.2%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	8.6%	1.6%	0.1%	0.1%	3.6%	0.0%	0.0%	0.0%
HC-10	Residue Assay	75200	0.60	2	135	0.1	32500	13	21	50	68200	6	19600	965	0.01	1.0	3.0	7800	2.0	19300	167	110
	Reconstituted Residue Assay	75204	0.62	2	135	0.1	32644	13	21	50	68201	6	19608	965	0.01	1.0	3.0	7809	2.0	19310	167	110
	% of original concentration mobilised during HCT	0.0%	3.5%	1.8%	0.1%	0.3%	0.4%	0.3%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	9.1%	0.5%	1.2%	0.1%	1.8%	0.1%	0.0%	0.1%
HC-11	Residue Assay	76600	0.40	1	502	0.1	21200	40	6	28	14700	9	6010	413	0.01	1.1	7.0	16700	1.0	33600	45	46
	Reconstituted Residue Assay	76603	0.44	1	502	0.1	21339	40	6	28	14701	9	6015	413	0.01	1.1	7.0	16718	1.0	33614	45	46
	% of original concentration mobilised during HCT	0.0%	8.2%	3.7%	0.0%	0.5%	0.7%	0.1%	0.1%	0.2%	0.0%	0.0%	0.1%	0.1%	8.5%	3.2%	0.5%	0.1%	3.6%	0.0%	0.1%	0.1%
HC-12	Residue Assay	56200	1.00	4	115	0.1	67400	135	38	56	75500	80	29000	1720	0.01	1.2	40.0	6640	2.0	19000	282	208
	Reconstituted Residue Assay	56202	1.05	4	115	0.1	67583	135	38	56	75502	80	29015	1720	0.01	1.2	40.0	6649	2.0	19012	282	208
	% of original concentration mobilised during HCT	0.0%	5.0%	1.0%	0.1%	0.3%	0.3%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	8.6%	0.7%	0.1%	0.1%	1.8%	0.1%	0.1%	0.0%

The percent mobilized/leached during testing was typically less than five percent and often much less than one percent of the original (head) assay. The highest percentage release was generally associated with HC-1 and HC-2

Although Table 3-4 reports data to 5 sf (significant figures) the analysis is not sensitive to this range and is shown purely to allow assessment of differences between the two results to demonstrate minor differences. In general sensitivity of results is limited to 3 sf only.

### 3.5 Summary and Recommendations

The HCT data have been reviewed through week 40.

The results of this review indicate:

#### 3.5.1 HCT-01 (Vein) and HCT-02 (Vein);

- Have produced acidic leachate throughout the testing, that decline in both cells throughout testing. The pH generally stabilized in the last 10 weeks of testing at around 4 and 5 for HCT-01 and HCT-02 respectively.
- The iron and sulfate concentrations recorded in the leachate indicate that sulfide oxidation has occurred and continues to be active in the samples.
- The kinetic test work confirms the PAG classification from the static test work;
- Increasing release rates of aluminium was noted throughout testing, while copper, iron, lead, nickel and to a lesser extent zinc were also noted to increase at varying points during testing of HCT-01;
- Increasing release rates of aluminium, cadmium, copper, iron, lead and zinc were observed in HCT-02;

#### 3.5.2 HCT-03 to HCT-12 (Mafic Volcanic, Quartz-Feldspar Porphyry, Leucoxene, Fault);

- Have exhibited circum-neutral pH throughout the testing, with effluent pH ranging between pH 6.2 and 7.9;
- The iron and sulfate concentrations recorded in the leachate are low and indicate sulfide oxidation within the cell is limited;
- Have greater than 98% of their original neutralizing potential (NP) remaining, demonstrating that there is still significant acid buffering capacity available in the materials;
- The kinetic test work confirms the non-PAG classification from the static test work for the majority of samples
- The kinetic results show that HCT-10, classified by the ABA results as inconclusive due to limited NP, is in fact non-PAG.
- Release rates of constituents typically decreased to near steady-state conditions following the initial flush of the humidity cells.

The results of this review indicate that that pH conditions appear to have stabilised for all HCT. However, release rates for some metals are increasing in both HCT-01 and HCT-02. As the cells have been terminated, it is unclear how much further these release rates will increase. However, ore stockpiles are not anticipated to be stored on site long term.

### 3.6 Further Work

There remains some testwork for which SRK has not received full results for. Outstanding data not reported include.

- Tailings and ore sorter reject material HCT (ongoing, currently at week 10).

These aspects will be reported in a final geochemical characterisation report for the project.

#### For and on behalf of SRK Consulting (UK) Limited

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## 4 REFERENCES

Price, W.A. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Materials. Report prepared for MEND Program. MEND Report 1.20.1. 579p.

## **APPENDIX B**

Water Management Plan



# GEMTEC

[www.gemtec.ca](http://www.gemtec.ca)

## Water Management Plan Hammerdown Gold Project King's Point, NL

GEMTEC Project: 80044.12



# GEMTEC

[www.gemtec.ca](http://www.gemtec.ca)

Submitted to:

Maritime Resources Corporation  
1900-110 Yonge St.  
Toronto, ON  
M5C 1T4

## **Water Management Plan Hammerdown Gold Project King's Point, NL**

February 26, 2021  
GEMTEC Project: 80044.12

GEMTEC Consulting Engineers and Scientists Limited  
191 Doak Road  
Fredericton, NB, Canada  
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February 26, 2021

File: 80044.12 – R02

Maritime Resources Corporation  
1900-110 Yonge St.  
Toronto, ON  
M5C 1T4

Submitted via Email: [garrett@maritimegold.com](mailto:garrett@maritimegold.com)

Attention: Mr. Garrett Macdonald

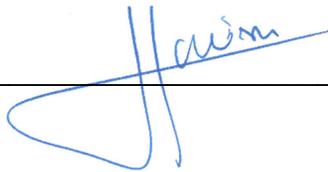
**Re: Water Management Plan  
King's Point, NL**

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Please find enclosed a draft of the Water Management Plan for the Hammerdown Gold Project in King's Point, NL. This report is intended to partially satisfy the requirements of an Environmental Preview Report, as outlined in the September 16, 2020 decision letter from the NL Department of Environment, Climate Change and Municipalities. The information contained in this report is based on the hydrologic and hydraulic modelling work performed over the past several months.

If you have any questions concerning this report, or if any information presented herein was superseded by newer data, please contact our office.

Respectfully submitted,



---

Hans Arisz, M.Sc.E., P.Eng., FCSCE

JP/pb

Enclosures

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## EXECUTIVE SUMMARY

This Water Management Plan (WaMP) was prepared for Maritime Resources Corporation to partially satisfy the requirements of the Environmental Preview Report guidelines.

A detailed hydrologic/hydraulic computer model was constructed and was used to optimize the general site arrangement and preliminary design of hydraulic control infrastructure. This information in-turn was used to describe the components and features of Erosion & Sediment Control, Surface and Groundwater Monitoring, and Surface and Groundwater Response Plans. The quality and accuracy of the data used to construct and calibrate the computer model were found to be more than adequate for the purposes of the WaMP and preliminary design of hydraulic control infrastructure, and results of the model simulations are deemed to be highly reliable.

The potential impacts of the Hammerdown Gold Project (Project) on the receiving aquatic environment are small as the Project is located on high ground along the divides of three (3) watersheds, the site activities are limited to mining and sorting of rock and ore (i.e., do not include ore grinding, gold leaching or tailings disposal), and the Project infrastructure is located to avoid the larger wetlands and the single high-value aquatic ecosystem on the Project site. The general site arrangement and design of hydraulic control infrastructure includes the following features to further reduce impacts to the receiving aquatic environment:

1. All runoff impacted by site operations and dewatering flows from the open pit/underground mine works is collected by contact water ditches and hydraulic control infrastructure, and is treated by a series of water quality/settling ponds prior to discharge to the receiving environment.
2. All runoff not impacted by site operations is collected by non-contact water ditches and hydraulic control infrastructure, is kept separated from the contact water and is discharged directly to the receiving environment.
3. All hydraulic control infrastructure is designed to high standards. Conveyance capacity of hydraulic control infrastructure is designed to a 100-year return period plus an allowance for climate change, while settling ponds are sized to accommodate the runoff volume from a 10-year return period, 24 hour duration storm event with allowances for snowmelt and climate change. The resulting preliminary settlement pond sizes are sufficiently large to settle suspended sediment down to a 5 micron particle size during a 10-year return period storm event and a 10 micron particle size during a 100-year return period storm event, and will ensure the total suspended sediment concentrations in the water discharged to the receiving environment will be well within the regulatory limits.
4. Preliminary pond sizing indicates they do not trigger Canadian Dam Association (CDA) classifications (i.e., dams greater than 2.5 m in height and impoundment volumes greater

than 30,000 m<sup>3</sup>) and the increased regulatory requirements associated with those classifications.

4. The peak flows of all discharges from site to the receiving environment are attenuated to pre-development peak flows to fully mitigate the risk to downstream channels (erosion) and hydraulic conveyance infrastructure (highway culverts).
5. The pre-development water balance between the three receiving watersheds is maintained as closely as possible.

The erosion and sediment control on site can easily be managed using standard industry best practices and the Erosion and Sediment Control Plan describes specific features to be utilized during final site design.

It is proposed monitoring of surface and groundwater to identify and define any water quantity and quality impacts of the mine operations continues at previous sampling locations, and utilize the same suite of testing parameters. The scope and frequency of sampling, testing and reporting will be confirmed following regulatory review of this WaMP and final site design.

The Surface and Groundwater Response Plan identifies water control and treatment options at the water quality/settling ponds to mitigate any unanticipated water quality issues.

In summary, the proposed general site arrangement and the preliminary siting and sizing of the hydraulic control infrastructure ensures the water quality at the three discharge points will be well within regulatory limits and maintain water quantity (water balance) impacts well within the range of natural flow fluctuations in all three receiving watersheds.

## 1.0 INTRODUCTION

### 1.1 Background

Maritime Resources Corporation (“Maritime”) is proposing to develop a new gold mine at their Hammerdown Property near King’s Point, Newfoundland and Labrador (NL). GEMTEC Consulting Engineers and Scientists Ltd. (GEMTEC) has prepared a Water Management Plan (WaMP) for the Hammerdown Gold Project (the Project) to partially satisfy the requirements of an Environmental Preview Report (EPR), as outlined in the September 16, 2020 decision letter from the NL Department of Environment, Climate Change and Municipalities (DECCM).

The scope of the WaMP includes:

- develop a baseline water balance model within the Project area using the PCSWMM Professional software (PCSWMM), based on existing topographic and hydrologic conditions within and adjacent to the mine site;
- determine the impacts of the proposed mine infrastructure and mining activities on the quantity and quality of surface water within the Project area during various phases of the Project;
- locate and size hydraulic control infrastructure (e.g., ditches, culverts, pumps, ponds, diversions and water treatment plants) to mitigate anticipated water quantity and quality impacts;
- describe erosion and sediment control measures (Erosion and Sediment Control Plan) to minimize the erosion and transport of sediment on site and ensure site discharges to the receiving environment do not exceed regulatory limits for suspended solids. Details of this Plan are to be developed/confirmed following regulatory review and final site design;
- describe Surface and Groundwater Monitoring Plans to confirm water quantity and quality impacts remain within anticipated ranges and within regulatory limits. Details of these Plans are to be developed/confirmed following regulatory review and final site design; and
- describe Surface and Groundwater Response Plans to mitigate environmental impacts if water quantity and/or water quality impacts exceed anticipated ranges and regulatory limits. Details of these Plans are to be developed/confirmed following regulatory review and final site design.

The water quantity and quality of the Project area prior to development, during operations and after decommissioning of the Project were quantified using model simulations of both design storm events (i.e., extreme events) and continuous long-term (30-year historical) events. The results of these simulations were used to optimize the location, size and relative arrangement of

the hydraulic control infrastructure. This in-turn minimized the impact of the Project on the local water quantity and quality, and maximized the ability to control the quality of water draining to the receiving environment during both normal operating and extreme weather/emergency conditions.

Although the model results are sufficiently detailed to size the hydraulic control infrastructure for the purposes of the WaMP, these results should be considered preliminary and will be subject to change following completion of final site design. The model can be used during the final design of site infrastructure and will be updated to confirm the predicted water quantity and quality impacts following the completion of final site design.

## **1.2 Water Management Plan Objectives**

The objectives of the WaMP are to:

- define the anticipated water quantity and quality impacts of the Project (during both the mine operation, and following mine closure and decommissioning);
- illustrate how the mine's hydraulic control infrastructure adequately mitigates these impacts;
- describe how the impacts will be monitored; and
- describe what measures will be put in place to mitigate unanticipated environmental water quantity and water quality impacts.

## **1.3 List of Plans**

The WaMP is comprised of five (5) major components:

- Site Water Balance;
- Erosion and Sediment Control Plan;
- Surface Water Monitoring Plan;
- Groundwater Monitoring Plan; and
- Surface Water and Groundwater Response Plan.

The following sections describe the purpose of each component and how each component relates to the WaMP.

### **1.3.1 Site Water Balance**

The purpose of the Site Water Balance is to define the anticipated water quantity and quality impacts of the Project on and immediately downstream of the project site. The water balance of the Project site and nearby areas was assessed using a hydrologic/hydraulic model developed using the PCSWMM Professional software. This model utilized high-resolution topographic data and historic data from nearby climate stations to simulate the hydrology of the Project area and predict the volume and peak rate of site runoff. The volume and peak rate of runoff were calibrated using data from nearby hydrometric stations and the flow measurements collected at some of the site surface water sampling locations.

Following the model calibration, a series of design storms (10-year and 100-year return period events) were used to quantify the pre-development peak flows, while long-term (30-years) records from nearby climate stations were used to define the pre-development volume of runoff and range of non-design storm flows from the project site and in the three receiving watersheds.

The proposed mine infrastructure and mining activities were incorporated in the model and the above simulations were re-run to obtain the peak flows and volumes of runoff for the operating phase of the Project.

The final site conditions following mine closure and decommissioning were incorporated in the model and the above simulations were re-run a third time to obtain the peak flows and volumes of runoff for the post-closure phase of the Project.

The peak flows obtained from the above model simulations were used to size the site ponds and mitigate water quality impacts based on retention/treatment time and suspended solids removal efficiency (down to 5 microns during a 10-year return period storm event and 10 microns during a 100-year return period storm event).

The use of a hydrologic/hydraulic model to simulate the water quantity and quality of the project site and nearby areas during the pre-development, operational and post-closure Project phases is far more flexible and reliable than a descriptive approach. The use of a model allows a more detailed identification of anticipated impacts, the preliminary siting and sizing of hydraulic control infrastructure to mitigate these impacts, and greatly simplifies the detailed design of the site and mining infrastructure components. It also simplifies the confirmation of the model assumptions and the re-assessment of water quantity and water quality impacts following completion of final site design or during operation.

### **1.3.2 Erosion and Sediment Control Plan**

The purpose of the Erosion and Sediment Control Plan is to describe the aspects of the site hydraulic control structures that will control erosion and sediment movement on the Project site and ensure the suspended solids in the site runoff to be discharged to the receiving environment is within regulatory limits.

The information presented in the Erosion and Sediment Control Plan describes the changes in the site drainage dynamics, the hydraulic control infrastructure to be incorporated in the site development, the features to be incorporated in this infrastructure and the basis of design to be used during the final design of this infrastructure.

Details for erosion and sediment control infrastructure will be included during detailed site design.

### **1.3.3 Surface Water Monitoring Plan**

The purpose of the Surface Water Monitoring Plan is to describe the approach to monitoring the quantity and quality of the surface water on the Project site and at the locations where site drainage is discharged to the receiving environment. This report defines the final three (3) discharge locations from the mine site and recommends an approach to monitoring the water quantity and water quality to confirm the surface water impacts predicted by the model are accurate and ensure the water quantity and water quality of site runoff is within regulatory limits.

Specific details of the Surface Water Monitoring Plan (e.g., sample frequency, water quality parameters to be analyzed, regulatory limits and reporting frequency) are expected to conform to applicable federal and provincial regulations, and are to be developed/confirmed following regulatory review of this WaMP, and following final site design.

### **1.3.4 Groundwater Monitoring Plan**

The purpose of the Groundwater Monitoring Plan is to describe the approach to monitoring the groundwater quantity and quality on and immediately downgradient of the Project site. This report recommends an approach to monitoring the groundwater quality to confirm the effects of the mining operations are within regulatory limits.

Specific details of the Groundwater Monitoring Plan (e.g., sample frequency, water quality parameters to be analyzed, regulatory limits and reporting frequency) will conform to applicable federal and provincial regulations, and are to be developed and confirmed following regulatory review of this WaMP and following final site design.

### **1.3.5 Surface Water and Groundwater Response Plan**

The purpose of the Surface Water and Groundwater Response Plan is to describe protocols and infrastructure (e.g., aeration equipment, liming station, chemical flocculants and/or coagulants, mixing and pumping equipment) to be developed and incorporated in the site design to mitigate quantity and/or quality issues detected by the Surface or Groundwater Monitoring Programs. Developing these response protocols and infrastructure prior to the start of mining operations will ensure a timely and comprehensive response to (ground) water quantity or quality issues.

## **2.0 SITE DESCRIPTION**

The following sections describe the general area, topography and local drainage dynamics, and watersheds within which the Project is located. This information identifies the receiving aquatic environments potentially impacted by changes in water quantity and quality, and informs the construction and configuration of the surface water model developed for this Project to assess these potential impacts.

The Project area is centred on the Hammerdown gold deposit (previously mined from 2000 to 2004) and is located approximately 4 km south of King's Point, NL. The site is to the east and north of an existing public access road, which intersects Newfoundland Route 391, and is located on local high ground draining into three (3) separate watersheds (Harry Brook, Muir Brook-Shoal

Pond, and Catchers Pond). The Project site location and the boundaries of the above three watersheds to the most downstream surface water field survey locations are presented in Figure 2-1.

Site descriptions are provided for the current pre-development conditions (baseline), the full mine buildout (operation) and the post-closure conditions.

## **2.1 Baseline**

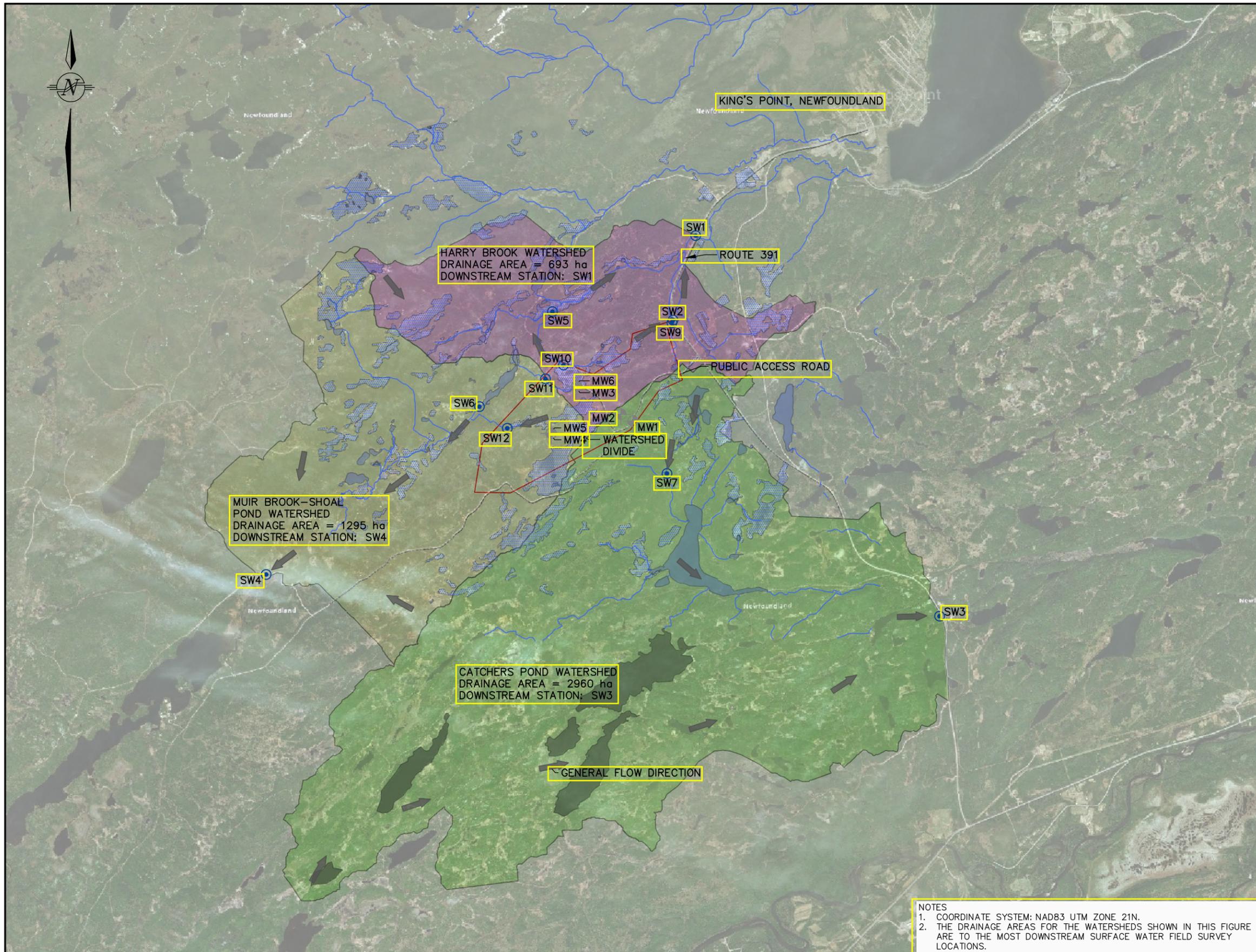
The topography, local drainage dynamics and the limits of the three receiving watersheds are shown in Figure 2-2 for the pre-development conditions. The Project site contains a large number of wetlands and streams, and a few ponds. None of the wetlands within the Project site are considered to be high-value aquatic ecosystems, most streams are ephemeral, and only the pond on the most eastern branch of Harry's Brook on the Project site, and the stream draining from this pond, are considered to be high-value aquatic ecosystems.

## **2.2 Operation**

The proposed mine development will be comprised of three (3) major components:

- Plant site area and ore stockpile pads;
- Open pit and underground mine, and
- Waste rock stockpile.

The general site arrangement showing the locations of the above major components, and the various anticipated ditches (contact and non-contact water), pit/mine dewatering and water quality/settling pond locations are presented in Figure 2-3. The waste rock stockpile will be located within the headwaters of the Muir Brook-Shoal Pond watershed and will avoid most of the wetlands in this area. The open pit and underground mine, the ore pads, and the plant site infrastructure will be located within the headwaters of the Harry Brook watershed, will avoid most of the wetlands in this area, and will completely avoid the high-value aquatic ecosystems associated with the pond and stream on Harry Brook located on the eastern most branch of Harry Brook in the Project area. No significant development of Project infrastructure is anticipated to be located within the headwaters of the Catchers Pond watershed.



**LEGEND**

- PROJECT SITE BOUNDARY
- SW# SURFACE WATER FIELD SURVEY LOCATION
- MW# MONITORING WELL
- WATERCOURSE
- WATER BODY
- WETLAND
- HARRY BROOK WATERSHED
- MUIR SHOAL-BROOK W.SHED
- CATCHERS POND WATERSHED
- GENERAL WATERSHED FLOW DIRECTION

Drawn By JSP	Checked By HA
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Date February, 2021
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Project Hammerdown Gold Project Water Management Plan
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Drawing Watershed Limits
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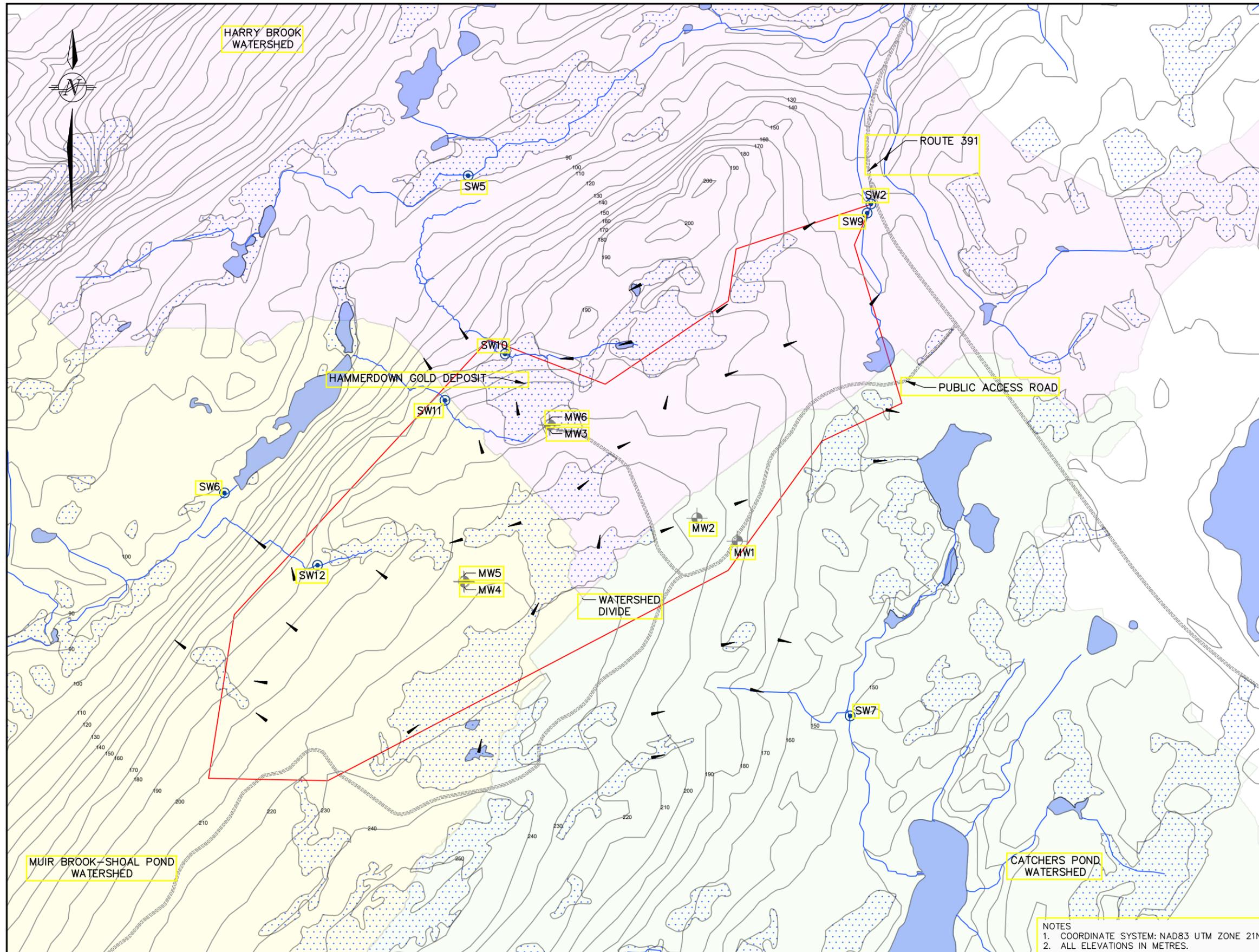
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File No. 80044.12	Drawing Figure 2-1	Revision No. 0
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**NOTES**

1. COORDINATE SYSTEM: NAD83 UTM ZONE 21N.
2. THE DRAINAGE AREAS FOR THE WATERSHEDS SHOWN IN THIS FIGURE ARE TO THE MOST DOWNSTREAM SURFACE WATER FIELD SURVEY LOCATIONS.



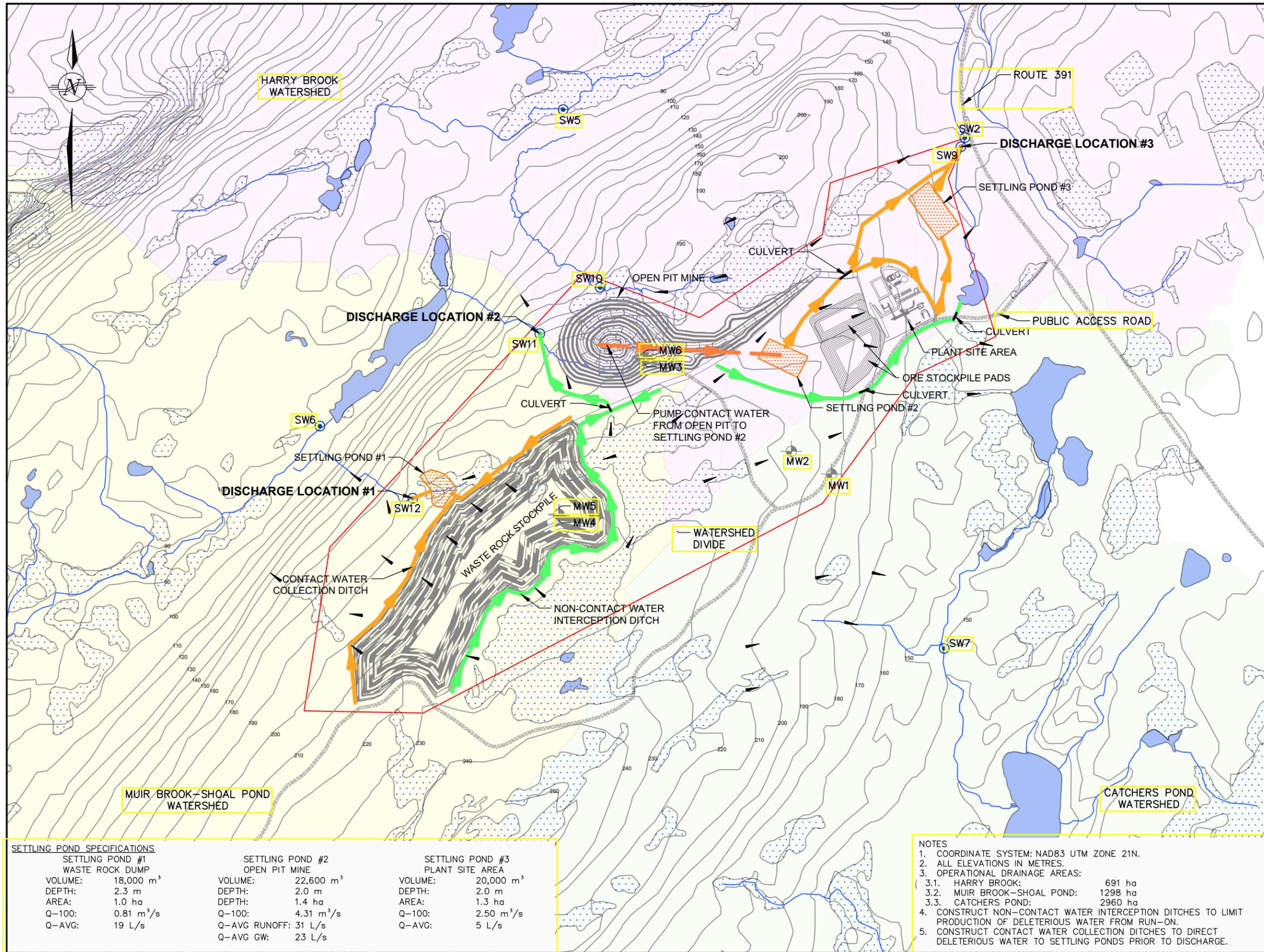


LEGEND	
	PROJECT SITE BOUNDARY
	SURFACE WATER FIELD SURVEY LOCATION
	MONITORING WELL
	WATERCOURSE
	WATER BODY
	WETLAND
	HARRY BROOK WATERSHED
	MUIR SHOAL-BROOK W.SHED
	CATCHERS POND WATERSHED
	SETTLING POND
	CONTOUR ELEVATION
	DRAINAGE DIRECTION

Drawn By	JSP	Checked By	HA
Date	February, 2021		
Project	Hammerdown Gold Project Water Management Plan		
Drawing	Site Drainage Pre-Development		
Scale	1:15,000 		
File No.	80044.12	Drawing	Figure 2-2
		Revision No.	0

NOTES  
 1. COORDINATE SYSTEM: NAD83 UTM ZONE 21N.  
 2. ALL ELEVATIONS IN METRES.





LEGEND	
	PROJECT SITE BOUNDARY
	SURFACE WATER FIELD SURVEY LOCATION
	MONITORING WELL
	WATERCOURSE
	WATER BODY
	WETLAND
	HARRY BROOK WATERSHED
	MUIR SHOAL-BROOK W.SHED
	CATCHERS POND WATERSHED
	SETTLING POND
	NON-CONTACT WATER DITCH
	CONTACT WATER DITCH
	PUMP FROM OPEN PIT
	CULVERT
	CONTOUR ELEVATION
	DRAINAGE DIRECTION

Drawn By: JSP      Checked By: HA

Date: February, 2021

Project: Hammerdown Gold Project  
Water Management Plan

Drawing: Operational Site Drainage

Scale: 1:15,000

File No. 80044.12      Drawing Figure 2-3      Revision No. 0

SETTLING POND SPECIFICATIONS		
SETTLING POND #1 WASTE ROCK DUMP	SETTLING POND #2 OPEN PIT MINE	SETTLING POND #3 PLANT SITE AREA
VOLUME: 18,000 m <sup>3</sup>	VOLUME: 22,600 m <sup>3</sup>	VOLUME: 20,000 m <sup>3</sup>
DEPTH: 2.3 m	DEPTH: 2.0 m	DEPTH: 2.0 m
AREA: 1.0 ha	DEPTH: 1.4 ha	AREA: 1.3 ha
Q-100: 0.81 m <sup>3</sup> /s	Q-100: 4.31 m <sup>3</sup> /s	Q-100: 2.50 m <sup>3</sup> /s
Q-AVG: 19 L/s	Q-AVG RUNOFF: 31 L/s	Q-AVG: 5 L/s
	Q-AVG GW: 23 L/s	

- NOTES
1. COORDINATE SYSTEM: NAD83 UTM ZONE 21N.
  2. ALL ELEVATIONS IN METRES.
  3. OPERATIONAL DRAINAGE AREAS:
    - 3.1. HARRY BROOK: 691 ha
    - 3.2. MUIR BROOK-SHOAL POND: 1298 ha
    - 3.3. CATCHERS POND: 2960 ha
  4. CONSTRUCT NON-CONTACT WATER INTERCEPTION DITCHES TO LIMIT PRODUCTION OF DELETERIOUS WATER FROM RUN-ON.
  5. CONSTRUCT CONTACT WATER COLLECTION DITCHES TO DIRECT DELETERIOUS WATER TO SETTLING PONDS PRIOR TO DISCHARGE.



The Harry Brook watershed was accorded the most attention during the development of the WAMP as it is the smallest of the three watersheds impacted (most of the mine infrastructure and development will be located in this catchment), contains high-value aquatic ecosystems and has permanent development (King's Point) located in the watershed immediately (4 km) downstream of the mine site.

The Muir Brook-Shoal Pond watershed was accorded the second most attention during the development of the WAMP as the waste rock stockpile will be located in this catchment. It should however be noted the impacts on the aquatic habitat in Muir Brook-Shoal Pond are expected to be negligible as the waste rock is inert and non-acid-generating.

The aquatic habitat in the Catchers Pond watershed is not expected to be impacted by the Project as no significant infrastructure will be located within this watershed.

The overall environmental impacts of the Project on the aquatic habitat in the three watersheds are anticipated to be non-significant as no water will be transferred between the watersheds, operations at the Project site will be limited to mining, crushing and sorting of ore (i.e., there will be no ore grinding, gold leaching or tailings generated/disposed on site), and the hydraulic control infrastructure will be designed to a high standards.

The following sub-sections present details of the site infrastructure.

### **2.2.1 Plant Site Area**

The plant site area, situated in the northeast portion of the Project area, will have a footprint of approximately 12 hectares (ha), and will consist of a Run of Mill (ROM) ore stockpile, low grade and rejected ore stockpiles, ore sorting infrastructure, a truck shop and warehouse, a change house and an administration building.

Mine design and scheduling will provide approximately 1,400 tonnes per day (tpd) of ROM feed to the sorting plant, yielding approximately 700 tpd of feed for further processing at the Nugget Pond Mill (NPM). The ROM feed will be stockpiled centrally within the plant site area, with a stockpile footprint of approximately 4,000 m<sup>2</sup>. Any feed not sent to the NPM will be stored in a low-grade ore stockpile or a rejects pile, depending on the grade of the ore.

The rejects stockpile, located at the southwest corner of the plant site area, will have a footprint of approximately 4.2 ha. The low-grade ore stockpile, adjacent to and north of the rejects stockpile, will have a footprint of approximately 2.4 ha.

An estimated 1.1 Million tonnes (Mt) of sorted rejects will be generated over the Life of Mine (LOM). The placement of sorted rejects back into the exhausted pit is expected to start during year three of the mine development plan and will continue until the end of mine life. The maximum

amount of sorted material stockpiled on the surface is expected to be approximately 0.5 Mt at the end of year two.

Ditching will be constructed around the low-grade ore stockpile to capture surface runoff of contact water for monitoring and potential treatment prior to discharge, while an upstream ditch will intercept non-contact water and divert it to the extreme upper reach of Harry Brook (see Section 4.0 for hydraulic infrastructure design).

### **2.2.2 Open Pit Mine**

The proposed open pit, adjacent to and west of the plant site area, will consume much of the historic workings from previous underground mining activities. The pit will have maximum dimensions of approximately 1000 m long by 350 m wide, and will have an estimated maximum footprint of 18 ha.

Open pit mining will be advanced to 125 m below the existing ground surface, below which underground mining operations will commence. Upon the completion of underground mining activities, the open pit mine will re-commence operations and advance to an ultimate depth of 165 m below the existing ground surface.

The open pit mine will require a dewatering plan to manage groundwater inflows and surface water runoff into the open pit and underground mine. See Section 4.0 for hydraulic infrastructure design.

### **2.2.3 Waste Rock Stockpile**

The waste rock stockpile, to be located southwest of the open pit mine, will accommodate the waste rock storage requirements of the open pit and underground workings. The footprint of the waste rock stockpile will be approximately 50 ha, with a volume of 16.4 Million cubic metres (Mm<sup>3</sup>). The maximum height of the waste rock stockpile will be 73 m, with a 10 m berm width and a face slope of 37° and an overall slope of 27.2°.

The waste rock stockpile will be progressively reclaimed during mining operations, as it will be graded to promote natural re-vegetation. Drainage controls, including an interception ditch to prevent run-on and a settling pond, will be constructed to divert non-contact water and collect and treat runoff from the waste rock stockpile before it enters downstream watercourses (see Section 4.0 for hydraulic infrastructure design).

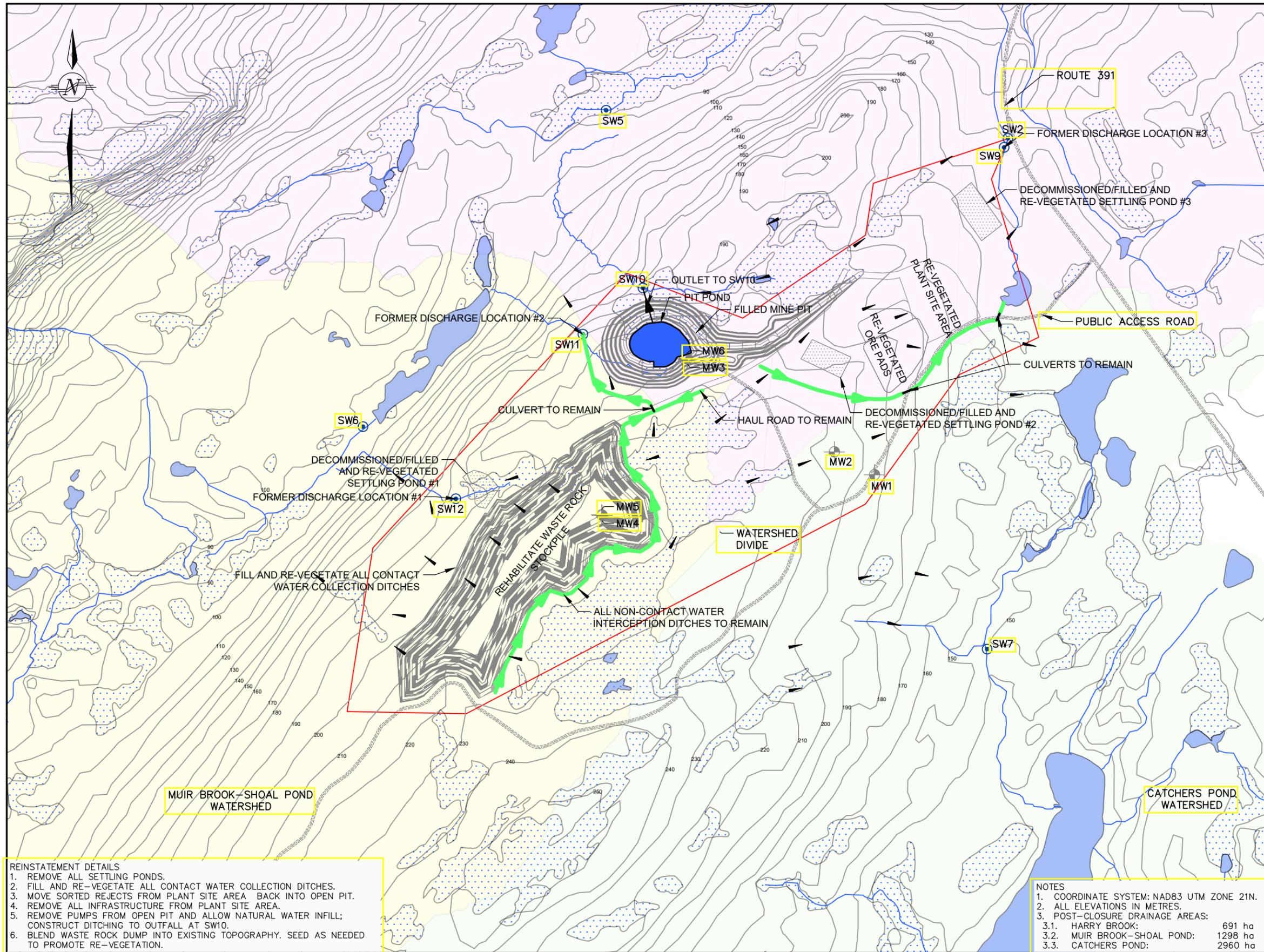
Concluding results of Acid Rock Drainage Metal Leaching (ARDML) testing of waste rock indicates waste rock material types are relatively benign, and classified as non-potentially acid generating. A liner and composite base will not be constructed for the waste rock stockpile due to the minimal reactivity of the material.

## 2.3 Post-Closure

The Project site will be reclaimed once mining operations have been completed. Reclamation will include the following activities:

- Decommissioning the waste rock stockpile,
- Filling the open pit with ore rejects and redirecting surface drainage back to the western branch of Harry Brook,
- Removal of all contact water ditches and associated culverts, and regarding and revegetation of affected areas,
- Draining, filling, regarding and revegetation of all water quality/settling ponds,
- Scarification and revegetation of the ore stockpile pads,
- Removal of all infrastructure from the plant site area, and scarification and revegetation of same, and
- Stabilization and cleaning of all non-contact ditches and culverts as required.

The anticipated post-closure site configuration is presented in Figure 2–4. The overall post-closure environmental impacts of the Project on the aquatic habitat in the three watersheds are negligible as no water will be transferred between the watersheds, all site infrastructure will be removed, and disturbed areas revegetated.



LEGEND	
	PROJECT SITE BOUNDARY
	SURFACE WATER FIELD SURVEY LOCATION
	MONITORING WELL
	WATERCOURSE
	WATER BODY
	WETLAND
	HARRY BROOK WATERSHED
	MUIR SHOAL-BROOK W.SHED
	CATCHERS POND WATERSHED
	DECOMMISSIONED SETTLING POND
	NON-CONTACT DITCH
	CULVERT
	CONTOUR ELEVATION
	DRAINAGE DIRECTION

Drawn By	JSP	Checked By	HA
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Date	February, 2021
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Project	Hammerdown Gold Project Water Management Plan
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Drawing	Site Drainage Post-Closure
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Scale	1:15,000

File No.	80044.12	Drawing	Figure 2-4	Revision No.	0
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- REINSTATEMENT DETAILS**
1. REMOVE ALL SETTLING PONDS.
  2. FILL AND RE-VEGETATE ALL CONTACT WATER COLLECTION DITCHES.
  3. MOVE SORTED REJECTS FROM PLANT SITE AREA BACK INTO OPEN PIT.
  4. REMOVE ALL INFRASTRUCTURE FROM PLANT SITE AREA.
  5. REMOVE PUMPS FROM OPEN PIT AND ALLOW NATURAL WATER INFILL; CONSTRUCT DITCHING TO OUTFALL AT SW10.
  6. BLEND WASTE ROCK DUMP INTO EXISTING TOPOGRAPHY. SEED AS NEEDED TO PROMOTE RE-VEGETATION.

- NOTES**
1. COORDINATE SYSTEM: NAD83 UTM ZONE 21N.
  2. ALL ELEVATIONS IN METRES.
  3. POST-CLOSURE DRAINAGE AREAS:
 

3.1. HARRY BROOK:	691 ha
3.2. MUIR BROOK-SHOAL POND:	1298 ha
3.3. CATCHERS POND:	2960 ha



### 3.0 HYDROLOGIC/HYDRAULIC MODEL

The water balance and the predictions of expected water quantity and quality impacts presented in this WaMP are based on a detailed hydrologic/hydraulic computer model developed using the PCSWMM Professional software. Details on the topographic, hydrologic and hydrogeologic data used to construct and calibrate the model are presented in the following sub-sections, along with information on the operational water usage and hydraulic control infrastructure.

The quality and accuracy of the data used to construct and calibrate the model is more than adequate to ensure the reliability of the model output for the purposes of the WaMP. The computer model allows the detailed analyses of both design storm events as well as long-term effects on the receiving aquatic environment.

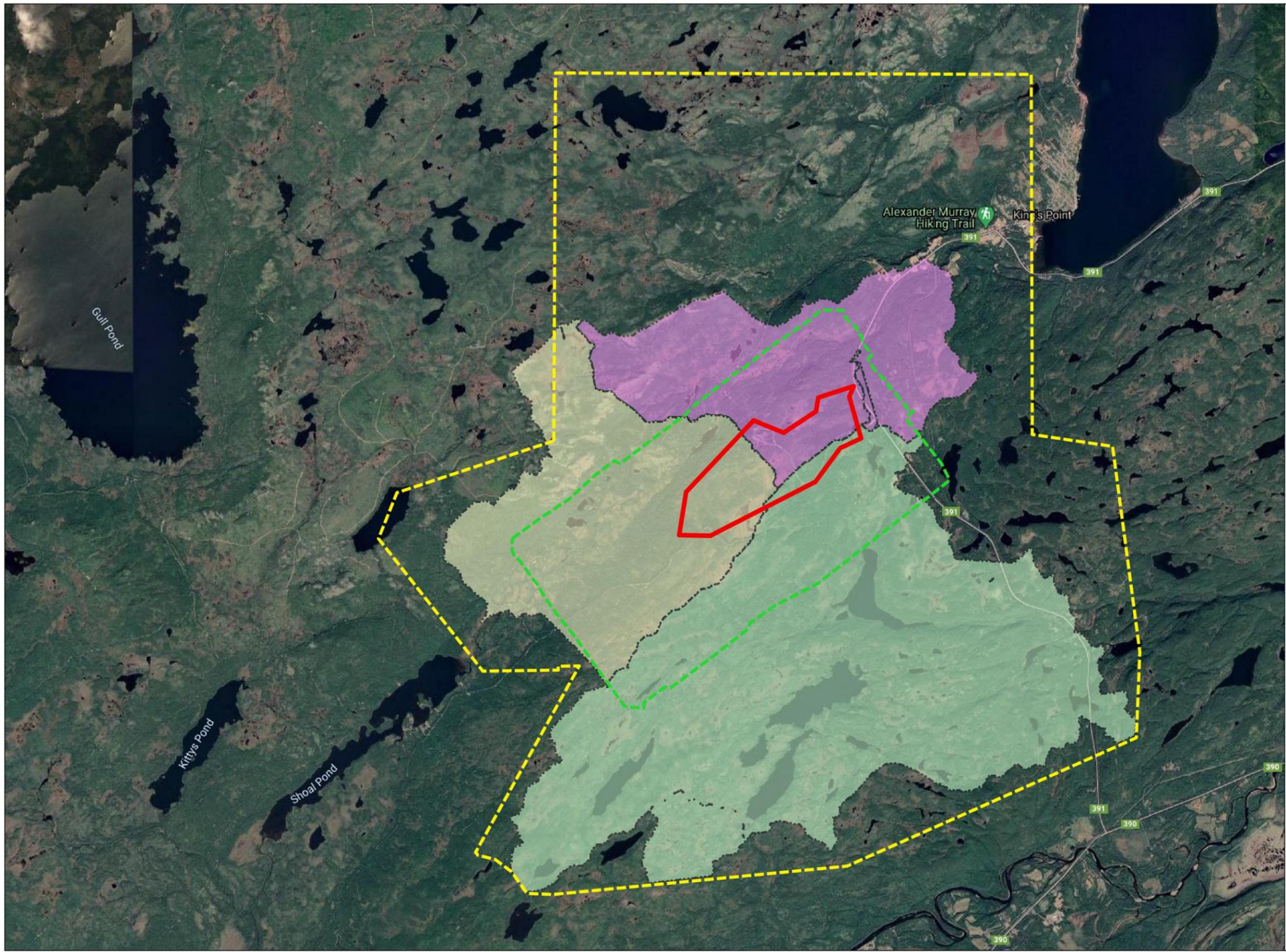
#### 3.1 Topographic Data

The water balance model utilized ground surface elevation data from a variety of sources. Lidar data was acquired by RPM Aerial Services via drone survey in 2019 and 2020, which encompasses the project area in its entirety and a 680 ha area to the southwest. The Lidar data was compiled into a conglomerate surface in the water balance model, and due to its high resolution (1 mm), was used to determine the flow paths of runoff and to locate hydraulic control infrastructure.

Areas within the water balance model not covered by LiDAR data were compiled using 1 metre interval contour mapping data from CanVec. The contour data was used to delineate watershed boundaries for three hydrometric stations studied by GEMTEC in the *Hydrology and Surface Water and Sediment Quality Baseline Report* from December 20, 2019 (*2019 Hydrology Report*). A breakdown of the topographic data sources for the water balance model are summarized in Table 3–1 and shown graphically in Figure 3–1.

**Table 3–1: Topographic Data Sources**

Data Type	Source	Resolution	Coverage Area (ha)	Description
LiDAR	RPM Aerial	1 mm	1840	Project Area
Contour	CanVec	1 m	9510	Watershed Delineation



**Figure 3-1:  
Topographic Data  
Extents**

- Project Site Boundary
  - Total CanVec Extent
  - Total LiDar Extent
- Watersheds
- Catchers Pond
  - Muir Brook-Shoal Pond
  - Harry Brook



3.5 km

## 3.2 Hydrologic Data

The hydrology for the project site was characterized using climate data from nearby Environment and Climate Change Canada (ECCC) Stations, hydrometric data from both the site hydrometric stations established during 2019 for the *2019 Hydrology Report* and nearby ECCC hydrometric stations, and water quality data from the 2019 site water quality sampling stations.

The following subsections present the data available from these different sources and identifies the data used to construct and calibrate the water surface model, evaluate the water quality and quantity impacts of the project, design (preliminary) the site infrastructure to mitigate adverse impacts, and secure regulatory approval.

### 3.2.1 Regional Climate Stations and Data

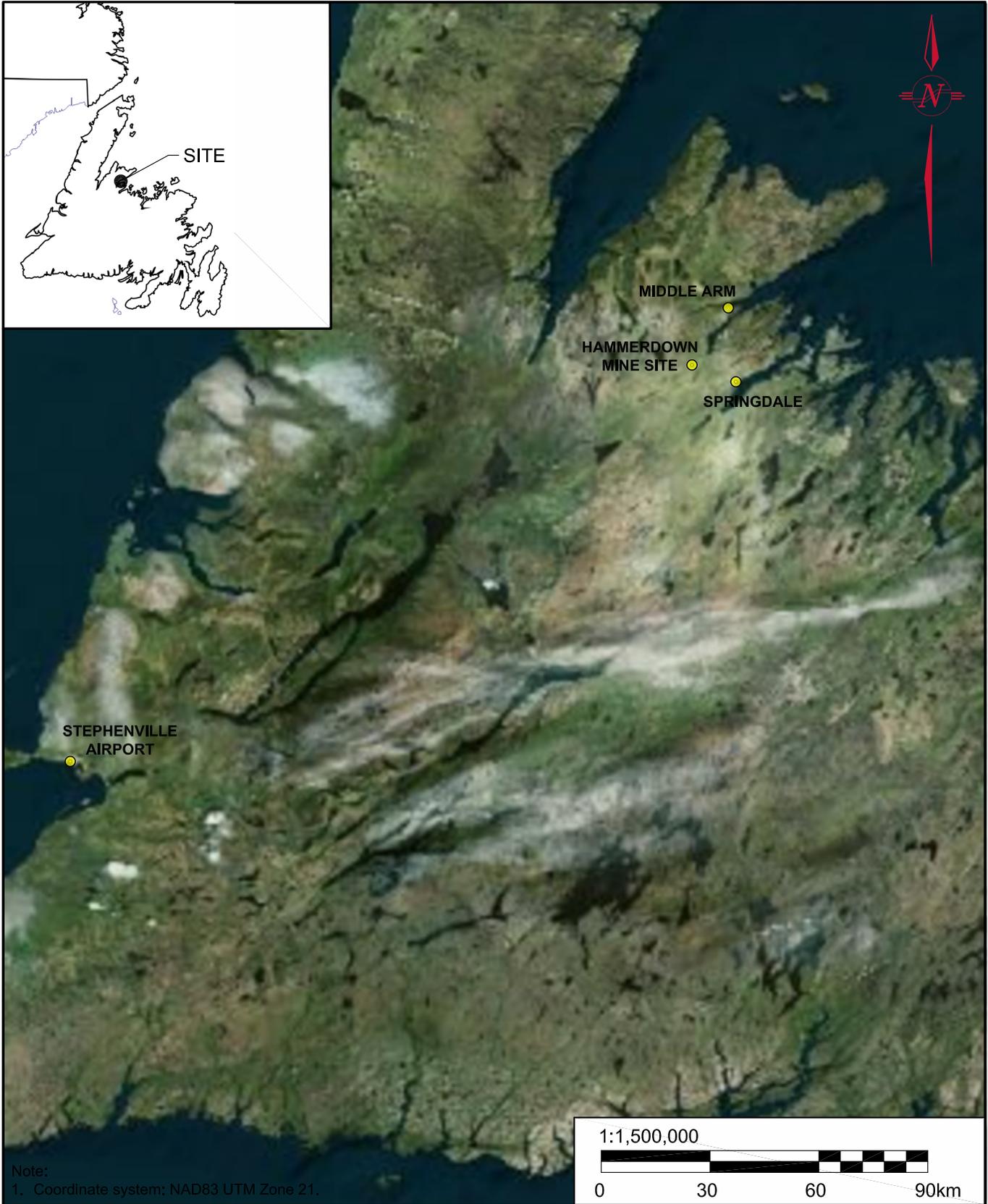
Climate data from nearby regional ECCC climate stations was used to characterize the climate conditions at the project site and calibrate the water balance model. The *Water Resources Atlas of Newfoundland* (1992) was used to assess the climate variability between the ECCC climate stations and the project area.

The closest regional climate stations are:

- Middle Arm - Station 8402644 located 18 km north of the project site;
- Springdale - Station 8403700 located 15 km east of the project site, and
- Stephenville - Station 8403800 located 203 km south of the project site.

The locations of these three stations relative to the project site are shown in Figure 3–2.

The climate stations at Middle Arm and Springdale were used to quantify the precipitation, snow on ground and temperature conditions at the project site due to their close proximity, while the climate station at Stephenville was used to quantify the evapotranspiration at the project site as this is the closest climate station collecting this data.



Note:  
 1. Coordinate system: NAD83 UTM Zone 21.

Project			Drawing		 
Hammerdown Gold Project Water Management Plan			Regional Climate Stations		
Drawn By	Date	Project No.	Drawing No.	Revision No.	
JSP	February 2021	80044.12	Figure 3-2	0	

### 3.2.1.1 Springdale Station

The Springdale climate station (Station ID 8403700) is located approximately 15 km east of the project area, and collects daily values for precipitation (rainfall and snowfall), snow on ground and temperature. The *2019 Hydrology Report* used the Springdale climate station to describe the climate conditions at the project area, as it is the closest climate station.

Climate data at Springdale Station is available from 1963 to 1993. Although this data is suitable to define the climate conditions at the project site, the 2019 rainfall data was not available from this climate station (it is no longer operational) to calibrate the water balance model.

The Climate Normals at the Springdale climate station are presented in Table 3–2.

**Table 3–2: Estimated Climate Normals at Springdale Climate Station (1963 to 1993)**

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	18.0	7.7	18.9	30.3	69.6	89.3	89.0	98.6	84.4	82.5	65.1	30.7	684.1
Snow (cm)	59.2	53.4	43.9	22.2	2.9	0.2	0.0	0.0	0.0	2.3	17.1	48.1	249.3
Precipitation (mm)	77.2	61.1	62.8	52.4	72.5	89.5	89.0	98.6	84.4	84.7	82.2	78.4	932.8
Temperature Mean (°C)	-8.3	-8.5	-4.6	1.0	6.3	11.5	16.2	15.5	10.7	5.5	0.9	-4.7	3.5
Temperature Max (°C)	6.3	6.2	9.1	13.8	22.5	27.9	30.4	29.3	24.9	17.6	13.3	8.1	30.4
Temperature Min (°C)	-27.2	-28.6	-24.0	-12.7	-4.9	-2.0	2.3	1.9	-2.1	-5.9	-12.3	-21.1	-28.6

The annual rainfall at the Springdale Climate Station is 684.1 mm, which is 19% lower than the corresponding value of 839.4 mm at the Middle Arm Climate Station. Similarly, the annual snowfall (249.3 cm) and precipitation (932.8 mm) at Springdale are 20% and 19% lower than the values at Middle Arm (311.9 cm and 1151.3 mm), respectively.

The *Water Resources Atlas of Newfoundland* (1992) shows Middle Arm and Springdale to have similar climate conditions and annual precipitation amounts. We surmise the above difference in climate and precipitation amounts is due to the different periods of record, 1963 to 1993 for Springdale and 1989 to 2019 for Middle Arm. As the data from the Middle Arm climate station is 26 years more recent and thus better captures the effects of climate change and the current

climate conditions at the project site, the climate data from the Middle Arm climate station was used to characterize the climate conditions at the project site and calibrate the water balance model.

### 3.2.1.2 Middle Arm

The Middle Arm climate station (Station ID 8402644) is located approximately 18 km north of the Project area, and collects daily values for precipitation (rainfall and snowfall), snow on ground and temperature.

The climate normal for the Middle Arm climate station were developed for the 1989 to 2019 records and are presented in Table 3–3.

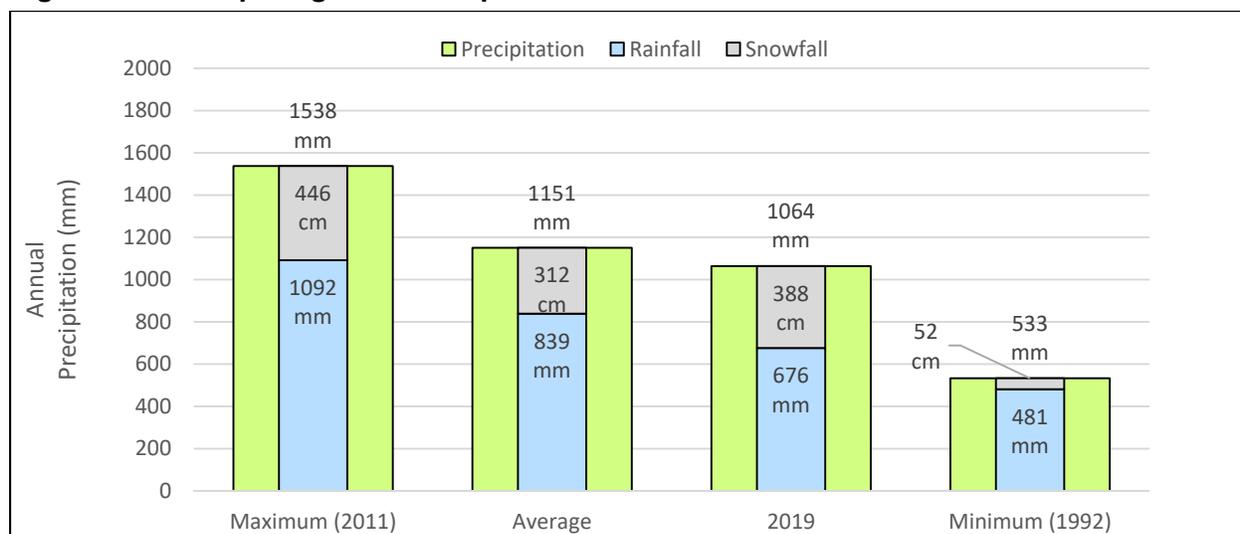
**Table 3–3: Estimated Climate Normals at Middle Arm Station (1989 to 2019)**

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	15.9	12.3	11.3	37.2	87.9	97.5	104.0	108.0	119.0	122.6	84.5	39.1	839.4
Snow (cm)	70.8	71.4	56.2	27.5	3.8	0.9	0.0	0.0	0.0	3.2	21.3	56.7	311.9
Precipitation (mm)	86.7	83.7	67.4	64.8	91.7	98.5	104.0	108.0	119.0	125.9	105.8	95.8	1,151.3
Temperature Mean (°C)	-7.0	-7.3	-3.9	1.0	5.7	10.8	15.8	16.2	11.9	6.1	1.0	-3.8	3.9
Temperature Min (°C)	-11.6	-12.0	-8.6	-3.6	0.3	5.0	10.0	10.7	6.4	1.5	-2.8	-7.7	-12.0
Temperature Max (°C)	-2.3	-2.5	0.8	5.6	10.9	16.6	21.5	21.7	17.3	10.7	4.8	0.1	21.7
Snow on Ground (cm)	41.1	72.4	86.6	46.3	1.1	0.0	0.0	0.0	0.0	0.1	2.3	14.5	22.0

The monthly precipitation within the Project area ranges from 91.7 to 125.9 mm between May to October, and 64.8 to 105.8 mm from November to April (winter months), with an average annual total precipitation of 1,151.3 mm. Monthly average snowfall ranges from 21.3 to 71.4 cm in the winter months, while the average daily temperature ranges from -7.3 to 16.2 °C.

Figure 3–3 presents the annual rainfall, snowfall, and precipitation amounts from the 2019 data (suitable for baseline water model calibration), and the historic annual maximum, minimum and average values.

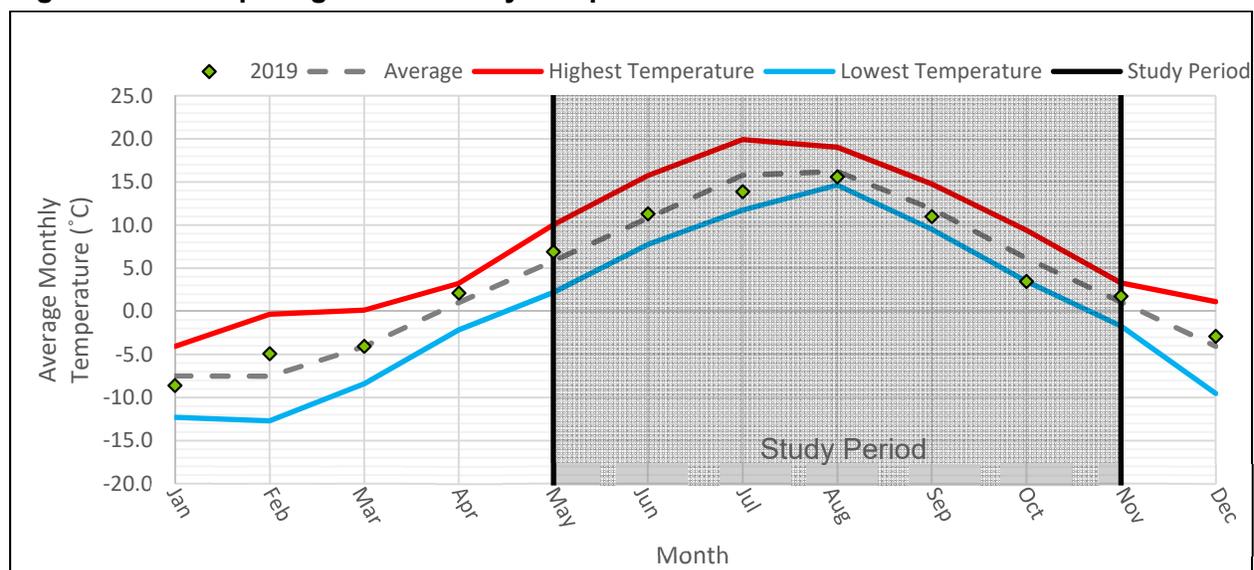
**Figure 3–3: Comparing 2019 Precipitation at Middle Arm to Record Values**



During 2019 the cumulative rainfall was 676 mm, significantly less than the average of 839 mm, while the cumulative snowfall was 388 cm, more than the average of 312 cm, bringing the total precipitation for 2019 to 1,064 mm, 87 mm shy of the average value of 1,151 mm.

The monthly average temperature values for 2019 at the Middle Arm climate station are presented in Figure 3–4, along with highest, mean and lowest monthly temperatures on record.

**Figure 3–4: Comparing 2019 Monthly Temperatures at Middle Arm to Record Values**



The average monthly temperatures for 2019 are close to the mean monthly temperatures from the past 30 years. The monthly temperature from July to October of 2019 (the study period for the 2019 Hydrology Report) are all below the historical monthly temperature, with October 2019 recording a record monthly low for the Project area.

The lower-than-average rainfall and precipitation experienced in 2019 indicates the flows measured at the on-site hydrometric stations during the *2019 Hydrological Study* were likely also lower than average. This was considered in the characterization of the climate conditions at the project site and the calibration of the water balance model.

### 3.2.1.3 Stephenville Airport

The Stephenville Airport climate station (Station ID 8403800) is located approximately 203 km south of the Project area, and is the only station in the province of Newfoundland collecting evapotranspiration data. The period of record for evapotranspiration data is 1942 to 2007.

To assess the suitability of the Stephenville Airport climate station to characterize the evapotranspiration values 203 km away at the Project site, the Water Resources Atlas of Newfoundland was consulted and showed the potential evapotranspiration values to be similar. The potential and actual evapotranspiration values at the Stephenville Airport are presented in Table 3-4 and were used in the water balance model to estimate evapotranspiration.

**Table 3–4: Average Monthly Evapotranspiration at the Stephenville Airport (1942 to 2007)**

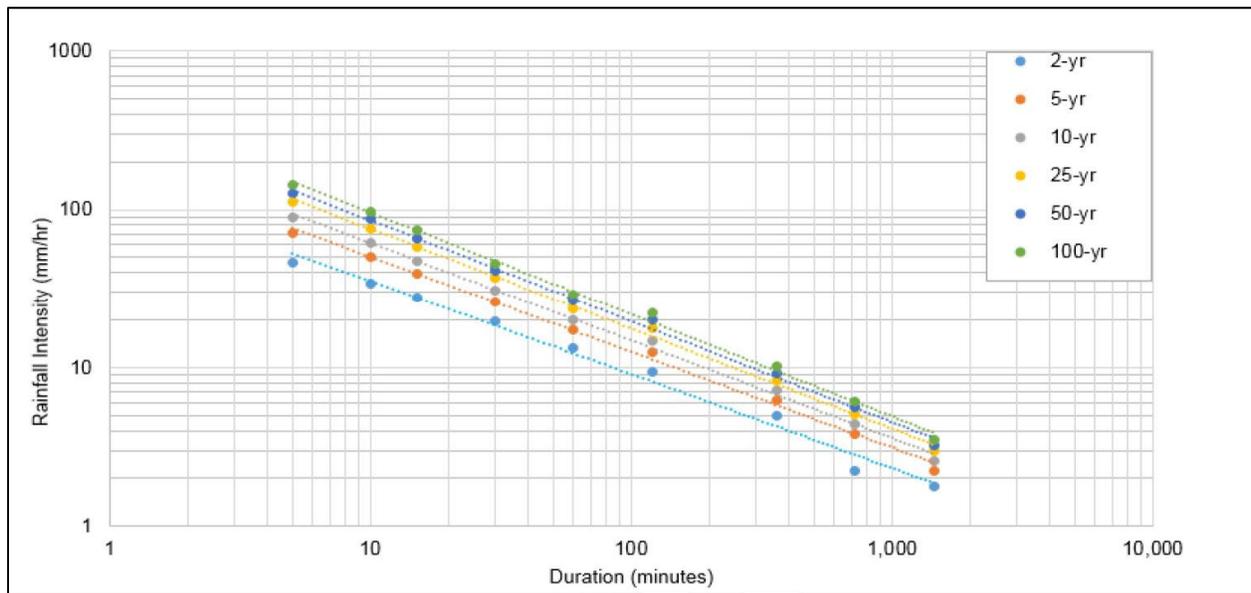
Evapotranspiration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Potential (mm)	2	2	5	19	55	87	115	107	72	40	15	3	522
Actual (mm)	2	2	5	19	55	87	114	102	71	40	15	3	515

### 3.2.2 Intensity-Duration-Frequency Data

Intensity-Duration-Frequency (IDF) curves was used to simulate the flows from design storms in the water balance model and as the basis of design for hydraulic control infrastructure. IDF curves are available for select climate stations across Newfoundland through ECCC.

Custom IDF curves were derived in the *2019 Hydrology Report* based on data from the Deer Lake Airport climate station (closest IDF station located approximately 92 km southeast of the Project area) and the *Rainfall Frequency Atlas for Canada* (Hogg, 1985). These custom IDF curves were based on 1966 to 2002 climate data and are shown in Figure 3–5, while the corresponding IDF tables can be found in Appendix A.

**Figure 3–5: IDF Curves for Project Area**



The IDF curves presented above were deemed to be representative of the project area in 2002 and were used (along with allowances for climate change, see below) to design hydraulic control infrastructure on site.

### 3.2.3 Climate Change

The Climate Change Branch of the NL DECCM suggested in the Governmental Screening of the EA Registration that, “the proponent consider provincial climate change projections for La Scie (nearest regional site) in planning for this undertaking.” The climate change projections at La Scie developed for a 2015 baseline, predict a 20% intensity increase for a 24-hour, 1-in-100 year storm, and a 21% intensity increase for a 12-hour, 1-in-100 year storm by 2050. This corresponds to an average increase of 0.59% per year.

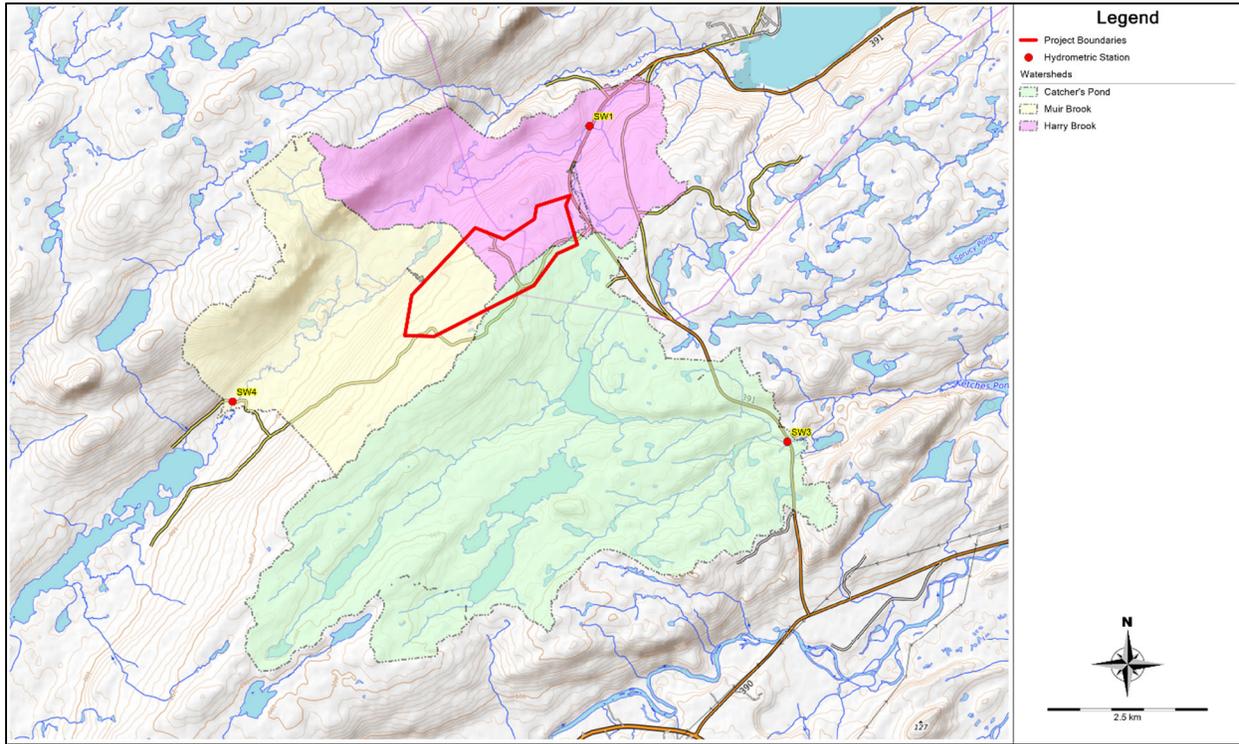
Mining activities are expected to conclude by 2028, 26 years after the 2002 IDF curves presented above in the above section. The intensities of the 2002 design storms were thus increased by 15% to accommodate the expected effects of climate change in the design of hydraulic control infrastructure.

### 3.2.4 Site Hydrometric Stations and Data

The baseline water model was calibrated by comparing flows from the computer model to flows observed at three site hydrometric stations established for the *2019 Hydrology Report* (SW1, SW3, and SW4). The site hydrometric stations are located in three separate watersheds: Harry Brook, Catchers Pond, and Muir Brook-Shoal Pond, respectively.

Water levels at the hydrometric stations were recorded continuously from late April to November of 2019. Rating curves were developed using stream gauging results from four site visits during the study period. The hydrometric stations studied in the *2019 Hydrology Report* are shown in Figure 3–6.

**Figure 3–6: Site Hydrometric Stations**



The peak and cumulative flow values recorded at the hydrometric stations from April 30 to November 24 of 2019 were used to calibrate the water balance model and are summarized in Table 3–5. Continuous flow data for each hydrometric station can be found in Appendix B.

**Table 3–5: Surface Water Flow Measurements used for Calibration**

Hydrometric Station	Watershed	Catchment Area (ha)	Peak Flow (m <sup>3</sup> /s)	Cumulative Flow (m <sup>3</sup> )
SW1	Harry Brook	753	1.48	5.09 x10 <sup>6</sup>
SW3	Catchers Pond	2,930	10.44	24.17 x10 <sup>6</sup>
SW4	Muir Shoal-Brook	1,270	1.56	6.08 x10 <sup>6</sup>

The runoff depths measured at each hydrometric station during the study period are summarized in Table 3–6 below. The runoff value for the month of November was extrapolated as the data collection for the *2019 Hydrology Report* ended on November 24.

**Table 3–6: Runoff Depths at Site Hydrometric Stations**

Hydrometric Station	Watershed	Runoff Depth (mm)							
		May	Jun	Jul	Aug	Sep	Oct	Nov	Total
SW1	Harry Brook	223.6	111.4	33.2	45.3	82.9	97.4	104.4	698.2
SW3	Catchers Pond	292.5	145.7	23.9	32.4	81.0	77.8	216.8	870.1
SW4	Muir Shoal-Brook	153.2	84.1	55.8	24.6	48.7	30.1	104.5	501.0
Average		223.1	113.7	37.6	34.1	70.9	68.4	141.9	689.8

The runoff depths at the hydrometric stations ranged from 501.0 to 870.1 mm due to variances in the topographic and hydrologic conditions of the respective catchment areas, with an average runoff depth of 689.8 mm from May to November of 2019.

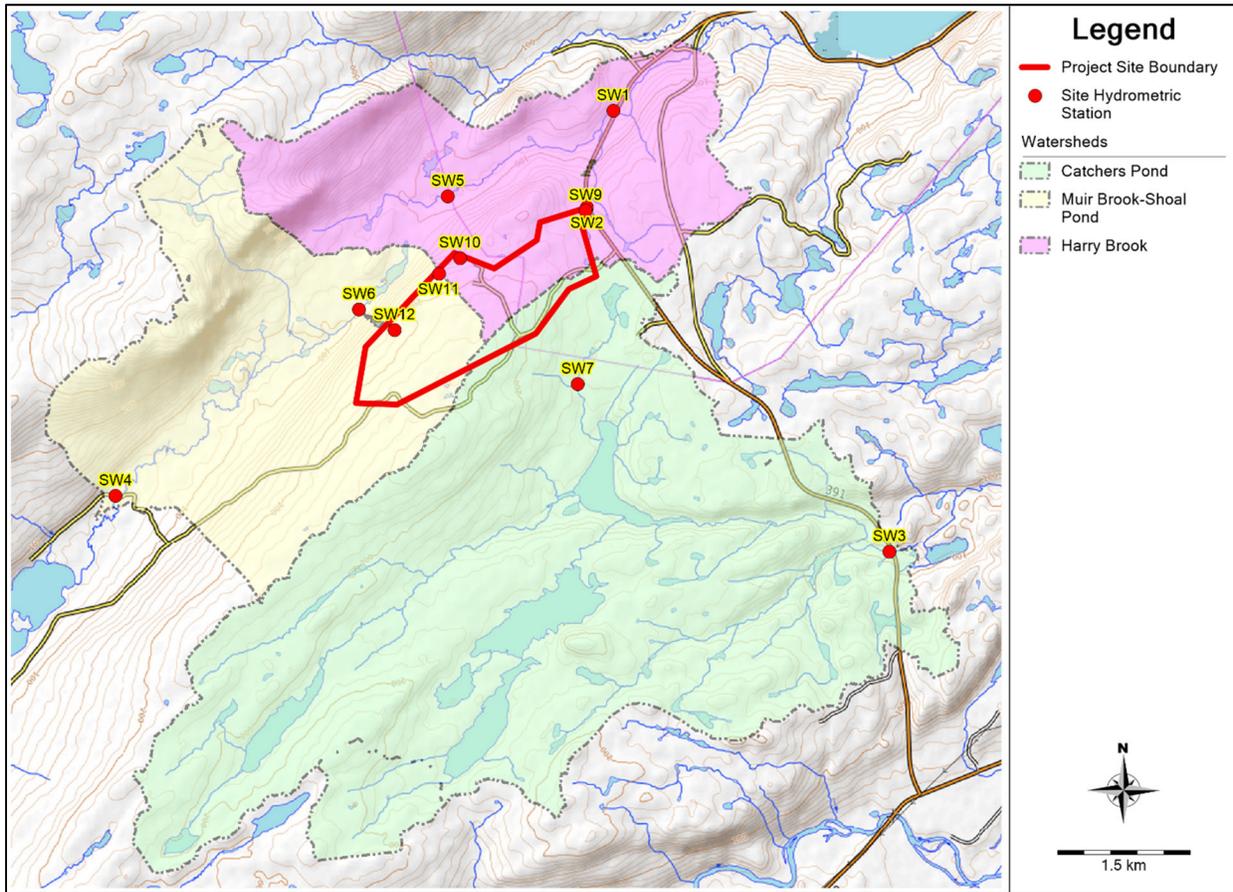
### 3.2.5 Site Water Quality Stations and Data

Water and suspended sediment quality data collected during the 2019 field program for the *2019 Hydrology Report* was used to construct the water quality component of the water balance model and calibrate the background water quality conditions.

Surface water and suspended sediment quality samples were collected during the spring, summer, and fall of 2019 at eleven water sampling stations across the Project site for the *2019 Hydrology Report*. The sampling station locations used for the *2019 Hydrology Report* are shown in Figure 3–7.

Field measurements for temperature, dissolved oxygen, conductivity, and pH at each of the water sampling stations are presented in Table 3–7. A complete laboratory testing summary, including Total Suspended Solids, Turbidity and a suite of other parameters is attached in Appendix C.

Figure 3–7: Water Quality Sampling Stations



**Table 3–7: Water Quality Field Measurements**

Sampling Station	Sampling Period	Temperature	Dissolved Oxygen	Conductivity	pH
		°C	mg/L	µS/cm	-
SW1	Apr 30 - May 1, 2019	3.1	16.93	45.0	6.57
	Jul 5 - 7, 2019	13.5	10.51	56.1	7.36
	Nov 24 - 26, 2019	1.0	13.97	33.2	7.62
SW2	Apr 30 - May 1, 2019	2.61	23.12	22.0	6.55
SW3	Apr 30 - May 1, 2019	1.8	23.13	23.0	6.61
	Jul 5 - 7, 2019	18.2	12.42	26.4	7.12
	Nov 24 - 26, 2019	1.0	13.78	18.4	8.32
SW4	Apr 30 - May 1, 2019	3.1	23.80	21.0	6.31
	Jul 5 - 7, 2019	10.0	14.32	24.5	7.03
	Nov 24 - 26, 2019	2.3	13.12	18.2	7.32
SW5	Apr 30 - May 1, 2019	6.9	18.45	26.0	6.59
	Jul 5 - 7, 2019	22.3	9.56	34.0	6.98
SW6	Apr 30 - May 1, 2019	5.1	28.27	26.0	6.50
	Jul 5 - 7, 2019	24.2	8.80	41.3	7.19
	Nov 24 - 26, 2019	2.1	12.26	25.4	7.41
SW7	Apr 30 - May 1, 2019	3.2	23.01	22.0	6.45
	Jul 5 - 7, 2019	12.7	12.79	29.4	6.63
	Nov 24 - 26, 2019	1.8	13.26	18.8	7.24
SW9	Jul 5 - 7, 2019	15.8	8.94	35.9	7.10
	Nov 24 - 26, 2019	1.0	13.31	18.1	7.48
SW10	Aug 27 - 29, 2019	14.4	9.25	-105.2	8.50
	Nov 24 - 26, 2019	2.2	13.73	38.1	7.71
SW11	Aug 27 - 29, 2019	12.3	10.21	49.8	8.03
	Nov 24 - 26, 2019	0.5	14.14	13.1	7.45
SW12	Aug 27 - 29, 2019	13.7	19.21	38.8	7.23
	Nov 24 - 26, 2019	0.8	13.72	12.5	6.82

### 3.2.6 Regional Hydrometric Stations and Data

Data from three regional hydrometric stations were used to quantify runoff depths and surface water flows in the general Project area and provide context for the site hydrometric data collected during 2019.

The nearest regional unregulated hydrometric station, Indian Brook at Indian Falls (02YM001), is 10 km southeast of the Project area. Indian Brook at Indian Falls is situated in Springdale near the mouth of Indian Brook and receives water from the Muir Brook-Shoal Pond and Catchers Pond watersheds. The other regional unregulated hydrometric stations used to quantify hydrometric data were Indian Brook Diversion above Birchy Lake (02YM004), and Shoal Arm Brook near Badger Bay (02YP001).

The locations of the three regional hydrometric stations are presented in Figure 3–8, while station information is presented in Table 3–8.

**Table 3–8: Regional Hydrometric Stations**

Station ID	Name	Active Years	Proximity to Site (km)
02YM001	Indian Brook at Indian Falls	1954 – 1996	10
02YM004	Indian Brook Diversion above Birchy Lake	1989 – 2019	34
02YP001	Shoal Arm Brook near Badger Bay	1982 - 1997	37

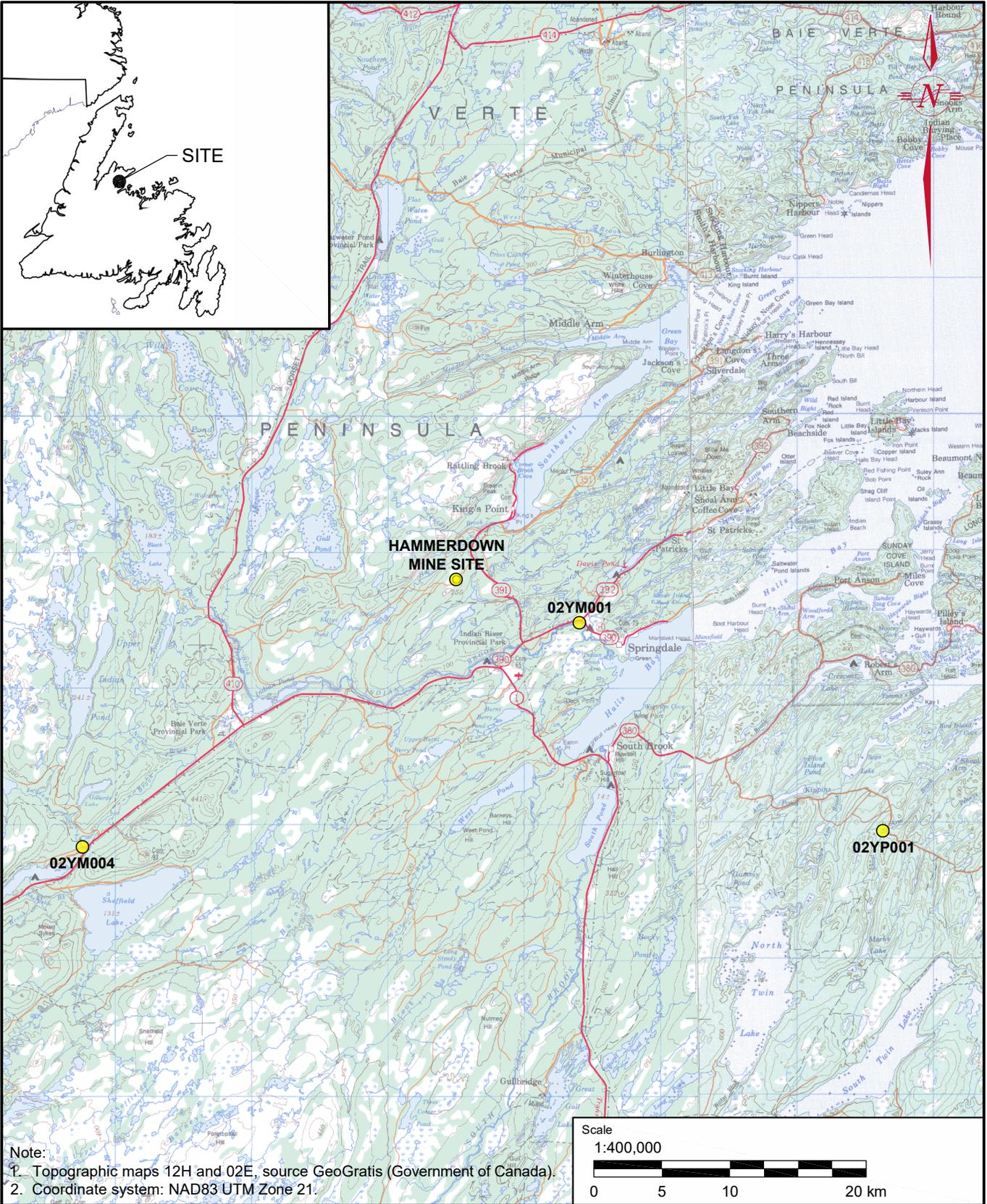
The average runoff depth at each regional hydrometric station is presented in Table 3–9 below.

**Table 3–9: Regional Hydrometric Stations Runoff Depths**

Regional Hydrometric Station	Runoff Depth (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
02YM001	36.3	23.0	33.7	86.7	176.8	63.6	25.2	22.6	22.1	41.6	52.2	44.6	626.9
02YM004	48.3	36.9	44.0	116.8	159.5	60.6	42.2	35.4	52.6	61.9	74.1	59.6	799.8
02YP001	40.5	32.8	68.8	173.7	232.4	74.8	40.7	39.5	40.8	57.1	69.7	53.7	924.0

Stations 02YM001, and 02YM004, and 02YG001 experience 626.0, 799.8, and 924.0 mm of annual runoff, respectively. These stations have an average runoff of 481.8 mm from May to November, which is comparable to the 501.0 mm of measured runoff from May to November of 2019 at site hydrometric station SW4.

The above-mentioned data indicates the hydrometric data from SW4, which will receive much of the runoff from the project area, compares well to the regional hydrometric conditions.



Project <b>Hammerdown Gold Project Water Management Plan</b>			Drawing <b>Regional Hydrometric Stations</b>		 
Drawn By JSP	Date February 2021	Project No. 80044.12	Drawing No. Figure 3-8	Revision No. 0	

### 3.3 Hydrogeology and Ground Water

The hydrogeology within the Project area was studied by GEMTEC and the results were presented in the *Hydrogeology Baseline Report* from December 20, 2019 (*2019 Hydrogeology Report*) and the *Preliminary Estimation of Pit Inflows* from February 22, 2020 (*2020 Pit Inflows Letter*). The *2019 Hydrogeology Report* used an extensive field program to estimate the characteristics of groundwater within the Project area. Data from these reports was used in the water balance model to account for baseflow within the Project area (i.e. flow not as a direct result of precipitation), and to estimate groundwater inflows into the open pit and underground mine.

The study concluded the geometric mean hydraulic conductivity of the overburden and bedrock on site may be highly variable, resulting in highly variable potential groundwater flows. This is particularly relevant for the underground mine, which will be up to 252 m below surface.

The approximate high and low mean geometric hydraulic conductivity, and their respective pit inflows for the main pit and pit extension, were reported in the *2020 Pit Inflows Letter* and are presented in Table 3–10.

**Table 3–10: Estimated Pit Inflows**

Scenario	Hydraulic Conductivity (m/s)	Main Pit		Pit Extension		Combined Total Inflow (m <sup>3</sup> /day)
		Methodology	Inflow (m <sup>3</sup> /day)	Methodology	Inflow (m <sup>3</sup> /day)	
High Hydraulic Conductivity	1.90 x10 <sup>-7</sup>	Marinelli and Nicolli (2000) solution	1,636	20% of Main Pit	327	1,963
Low Hydraulic Conductivity	6.25 x10 <sup>-9</sup>		80	Module 4 Equation from S.S. Papadopoulos & Associates Inc. (2007)	209	289

The combined groundwater inflows for the main pit and pit extension may vary from 289 to 1963 m<sup>3</sup>/day, depending on the mean geometric hydraulic conductivity used for design. Although these inflow estimates are conservative, the initial flow rates during pit excavation will likely be higher than those estimated above when the pit excavation encounters the highly-permeable backflow of the past underground workings.

A combined groundwater inflow of 1,963 m<sup>3</sup>/day was used in the water balance model. Note the dewatering demand in the open pit and underground mine will largely reflect surface water runoff into the excavation, which is expected to be significantly greater than groundwater inflow and will govern the design of hydraulic control infrastructure. The sensitivity of the hydraulic infrastructure designs will be assessed during detailed site design, and the combined total inflows will be adjusted as needed for the various mine development phases.

### 3.4 Operational Water Usage

The operational water uses identified for potential inclusion into the water balance model to accurately model the site water quantity and quality were: domestic wastewater, the wash bay and dust suppression on the site roads. The discharge water quantities associated with dust suppression, domestic wastewater and the wash bay are deemed too small to affect either the quantity or quality of the site water balance and were excluded from the water balance model.

## 4.0 HYDRAULIC INFRASTRUCTURE

### 4.1 Design Criteria

The hydraulic conveyance infrastructure (i.e. interception ditches, channels, and spillways) in the computer model were sized based on a 100-year return period, including the predicted effects of climate change.

The Project water quality/settling ponds in the computer model were sized (preliminary) to ensure the authorized limits of deleterious substances outlined in the *Metal and Diamond Mining Effluent Regulations* in the *Fisheries Act (SOR/2002-222)* are not exceeded. Pond size was based on the runoff volume from a 10-year return period storm event with a 24 hour duration and was found to be able to settle solids down to 5 microns during a 10-year return period storm event and 10 microns during a 100-year return period storm event.

### 4.2 Hydraulic Infrastructure Design

#### 4.2.1 Settling Ponds

A total of three (3) water quality/settling ponds will be constructed on site, one pond each to control the flow from the waste rock stockpile (Pond #1), the dewatering flows from the open pit/underground mine works (Pond #2) and the runoff from the ore stockpile pads and the plant site area (Pond #3). The pond locations were previously shown in Figure 2-3.

All three ponds will be designed as wet ponds and include an outlet control structure to attenuate inflow fluctuations, water level control measures to increase retention time and/or stop outflow (if/when desired), an emergency spillway to ensure pond embankment stability during extreme storm events, and will be dug into the ground/rock to minimize the height of the downstream embankment and maximize pond embankment stability and safety. The ponds will be lined if/as needed to ensure proper water containment. All site ponds will operate by gravity and the default mode of operation will not require action from site personnel (although site personnel can control flow and attenuation times if desired).

The primary purpose of all three ponds is to settle suspended solids and sorbed contaminants (metals), and strip potential ammonia from blasting residue through aeration, if needed. Pond #1 will incorporate optional mobile water quality treatment (liming, flocculation and/or coagulation) and aeration, and mobile pumping equipment will be available on site to pump flows to Pond#2

during upset conditions. Pond #3 will incorporate optional permanent water quality treatment (liming, flocculation and/or coagulation) and aeration as the flows into Pond #3 are expected to have the highest suspended sediment load and potential for ammonia from blasting residue, and the outflow from Pond #3 discharges into the Harry Brook watershed.

Outflow from Pond #2 can be routed through Pond #3 if additional water quality treatment is needed, or can be discharged directly to Harry Brook if the water quality meets regulatory discharge limits. This optional flow control and treatment will provide additional protection of the receiving aquatic environment should an upset condition affect water quality of Pond #2, preventing direct discharge to the environment.

#### **4.2.2 Non-Contact Water Interception Ditches**

Runoff and flows from areas of the Project site not impacted by mining operations will be collected in non-contact ditches and discharged to receiving watercourses.

#### **4.2.3 Contact Water Conveyance Ditches**

Runoff and flows from all site areas potentially impacted by mining and ore processing operations (open pit/underground mine, waste rock stockpile, ore stockpile pads and plant site) will be collected in contact water ditches. All flows collected in the contact water ditches will be kept separate from non-contact water and will be directed to one of three ponds to settle any suspended solids, strip potential ammonia from blasting residue or receive water quality treatment if needed.

## **5.0 SITE WATER BALANCE**

### **5.1 Site Water Quantity**

A review of the water balance for the Project site was performed to ensure the proposed WaMP achieves all design goals and satisfies regulatory requirements. This water balance takes into account the significant water inputs (rainfall and groundwater), losses (evaporation), and water usage/recycling during each phase of the mine life-cycle. Monitoring of the water balance will continue to occur at the current surface water stations during operations and post-closure.

The main factors expected to influence the site water balance are as follows:

- annual and seasonal variations in precipitation and temperature;
- changes to drainage patterns and catchment areas;
- stormwater ponds, interception ditches and other drainage infrastructure; and
- on-site water usage/reuse (pumping, operations and production).

The Project has three main surface water discharge points. One contact water discharge point is located within the Harry Brook watershed at SW9, and one contact and one non-contact water discharge point is located within the Muir Brook-Shoal Pond watershed at SW12 and SW11,

respectively. This WaMP accounts for water usage within each watershed, but also ensures changes to discharge rates/volumes do not adversely impact aquatic habitat and downstream infrastructure.

All analyses were completed using a water balance model developed in the PCSWMM Professional software package. This model included all hydrologic processes during (rainfall and snowmelt runoff, evaporation, groundwater infiltration) required to represent design magnitude storm events and continuous long-term simulation of a 30-year period of record for precipitation at the Middle Arm climate station (1989 to 2019).

The following sections describe the water balance during each phase of the mine life with notes describing the role and benefits of the water management infrastructure.

### 5.1.1 Baseline

Current conditions were used to model the baseline water balance for the mine site. Drainage divides between the Harry Brook, Muir Brook-Shoal Pond and Catchers Pond watersheds are located in the middle of the property, making it necessary to track water balance changes within each catchment. Extended duration monitoring of water quality and quantity was used to calibrate the water balance model to existing conditions, so the full period of precipitation records could be simulated to provide baseline flow rates/volumes (see Table 5–1 for flow rates and Table 5–2 for volumes) and an understanding of the annual flow variability.

**Table 5–1: Baseline Surface Water Discharges**

Watershed	Monitoring Station	Drainage Area (ha)	Average Annual Flow (m <sup>3</sup> /s)	Average Annual Volume (1000 m <sup>3</sup> )	Peak Design Flow (m <sup>3</sup> /s)	
					Q <sub>10</sub>	Q <sub>100</sub>
Harry Brook	SW1	693	0.243	7,674	5.70	10.42
	SW2 / SW9	109	0.035	1,097	2.51	4.24
	SW5	274	0.088	2,768	8.28	13.72
	SW10	56	0.018	575	3.71	6.32
Muir Brook-Shoal Pond	SW4	1,295	0.444	13,994	7.86	14.51
	SW6	144	0.046	1,457	4.08	6.82
	SW11	44	0.014	449	2.05	3.50
	SW12	56	0.018	560	1.44	2.41
Catchers Pond	SW3	2,960	1.021	32,210	14.92	25.83
	SW7	209	0.066	2,093	4.63	7.69

**Table 5–2: Baseline Runoff Volumes**

Watershed	Monitoring Station	Drainage Area (ha)	Average Annual Runoff Volume (1000 m <sup>3</sup> )		
			Minimum	Average	Maximum
<b>Harry Brook</b>	<b>SW1</b>	<b>693</b>	<b>3,960</b>	<b>7,674</b>	<b>10,200</b>
	SW2 / SW9	109	489	1,097	1,500
	SW5	274	1,240	2,768	3,790
	SW10	56	259	575	784
<b>Muir Brook-Shoal Pond</b>	<b>SW4</b>	<b>1295</b>	<b>6,810</b>	<b>13,993</b>	<b>18,800</b>
	SW6	144	652	1,457	1,990
	SW11	44	202	449	613
	SW12	56	251	560	768
<b>Catchers Pond</b>	<b>SW3</b>	<b>2,960</b>	<b>15,700</b>	<b>32,210</b>	<b>43,300</b>
	SW7	209	911	2,093	2,860

Data presented in the tables above are baseline flow targets and will be used to evaluate the effectiveness of proposed hydraulic control infrastructure.

### 5.1.2 Construction

Hydraulic control infrastructure will be constructed prior to commencing mining operations. The order of construction and implementation will be as follows:

- place erosion and sediment controls near construction areas and watercourses/wetlands potentially impacted by sediment-laden runoff;
- construct water quality settling ponds near the waste rock stockpile, mine and plant;
- construct interception ditches to direct contact water to the settling ponds and to divert non-contact runoff from impacted areas;
- commence pumping from the mine to the proposed settling pond as needed; and
- reinstate and revegetate impacted areas not required for mining activities.

Additional water management infrastructure required to support potable, domestic, and industrial use will be designed to meet the site requirements while satisfying applicable environmental and health criteria.

### 5.1.3 Operation

Mine operations are expected to alter site runoff characteristics and change the water balance. Water management infrastructure such as settling ponds, contact water and non-contact water diversion ditches, culverts and pumps will be employed to protect water quality and maintain a basic water balance to mitigate impacts to the receiving environment. Table 5–3 presents the surface water discharge rates and volumes expected during full operation of the mine.

**Table 5–3: Operational Surface Water Discharges**

Watershed	Monitoring Station	Drainage Area (ha)	Average Annual Flow (m <sup>3</sup> /s)	Average Annual Volume (1000 m <sup>3</sup> )	Peak Design Flow (m <sup>3</sup> /s)	
					Q <sub>10</sub>	Q <sub>100</sub>
Harry Brook	SW1	691 (-0.3%)	0.266 (+8%)	8,402 (+9%)	5.64 (-1%)	9.87 (-5%)
	SW2 / SW9	126 (+16%)	0.064 (+85%)	2,026 (+85%)	2.42 (-4%)	3.82 (-10%)
	SW5	254 (-7%)	0.082 (-7%)	2,569 (-7%)	7.37 (-11%)	12.17 (-11%)
	SW10	37 (-35%)	0.012 (-35%)	376 (-35%)	1.91 (-49%)	3.28 (-48%)
Muir Brook-Shoal Pond	SW4	1298 (+0.2%)	0.450 (+2%)	14,203 (+2%)	6.83 (-13%)	11.42 (-21%)
	SW6	188 (+30%)	0.059 (+29%)	1,875 (+29%)	5.64 (+38%)	9.51 (+39%)
	SW11	88 (+99%)	0.028 (+96%)	878 (+96%)	4.60 (+124%)	8.09 (+131%)
	SW12	72 (+30%)	0.023 (+30%)	731 (+30%)	0.34 (-76%)	0.57 (-76%)
Catchers Pond	SW3	2960 (0%)	1.021 (0%)	32,210 (0%)	14.92 (0%)	25.83 (0%)
	SW7	209 (0%)	0.066 (0%)	2,093 (0%)	4.63 (0%)	7.69 (0%)

\* Percentages in brackets indicate increases/decreases relative to existing (baseline) conditions.

The water balance results above for the operation phase of the Hammerdown Mine indicate:

- There are no changes to expected runoff conditions in the Catchers Pond watershed. Proposed mine operations and drainage infrastructure have been planned and located to avoid impacting the Catchers Pond watershed.
- The three (3) proposed settling ponds located near the waste rock stockpile, pit/mine and plant are expected to fully attenuate peak discharge rates from the Project (at monitoring stations SW1-Harry Brook and SW4- Muir Brook-Shoal Pond) up to the 1 in 100-year rainfall event to pre-development conditions. This attenuation is intended to mitigate increased erosion and flooding downstream of the Project.
- Average annual runoff volumes are expected to increase in the Harry Brook and Muir Brook-Shoal Pond watersheds (9% and 2%, respectively) due to the proposed changes in land use, imperviousness of the ponds and pumping of groundwater from the mine to the settling pond during operations.
- Runoff rates and volumes are expected to change at various locations within the Project area as described below:
  - Harry Brook Stations SW5 and SW10 – with runoff and pumping from the open pit and underground mine diverted to another branch of Harry Brook (SW2 / SW9), flow rates and volumes are expected to decrease. SW10 monitors flow in Hammerdown Creek, which is a small ephemeral watercourse that could see a 35% decrease in runoff. SW5 is located further downstream on upper Harry Brook and is expected to see a 7% decrease in annual runoff.
  - Harry Brook Stations SW2 and SW9 – are expected to see up to an 85% increase in annual runoff and will attenuate the peaks to pre-development conditions using proposed ponds near the mine and below the plant. This increase is associated with diverted runoff and groundwater pumping from the mine to the mine settling pond located upstream of SW2 and SW9.
  - Muir Brook-Shoal Pond Stations SW6, SW11 and SW12 – are all expected to see increased runoff volumes due to the proposed changes to drainage patterns (within the catchment) and the runoff from the waste rock stockpile. Peak flow increases will be offset by attenuation in the waste rock stockpile pond to ensure the peak flow rates from the property do not increase.
  - Peak flow increase at SW11 (Muir Creek) could result in channel erosion on the steep slope before discharging to Muir Pond. Potential erosion of Muir Creek will be addressed (additional flow attenuation, energy dissipation or slope stabilization) during detailed design.

#### 5.1.4 Closure

Following the end of mining operations, Maritime Resources Corporation intends to restore the mine site to a near-natural state by remove all mining and ore processing infrastructure, and scarifying and revegetating impacted areas. Once the post closure monitoring indicates hydraulic control infrastructure is no longer required, the site will be further decommissioned by filling all ditches, removing all culverts, and draining, filling and regrading all water quality/settling ponds.

The main water balance difference from baseline conditions is runoff from the east portion of the Muir Brook-Shoal Pond catchment will still need to be conveyed around the capped waste rock stockpile as it will not be levelled to pre-mining elevations. This will continue the higher than baseline flows experienced in Muir Creek (SW11) and the upper end of Muir Brook (SW6) as will be shown below in the post-closure water balance.

#### 5.1.5 Post-Closure

The post-closure water balance for the mine maintains discharges to the three watersheds as close as possible to baseline conditions. Although some drainage patterns may not be fully re-established to pre-mining conditions (i.e., flow diverted around the capped waste rock stockpile), annual flow volumes remain within 1 to 2% of baseline conditions. Table 5–4 presents the expected flow rates and volumes for post-closure conditions.

Based on results in Table 5–4, the following observations are made regarding the water balance post-closure of the mine:

- There will be slight decreases in the annual runoff volumes in the Harry Brook and Muir Brook-Shoal Pond watersheds (-1.9% and -0.1%, respectively). The volume decreases are primarily associated with attenuation and evaporation in the pit pond in the headwaters of Harry Brook, and flow routing changes around the waste rock stockpile in the Muir Brook-Shoal Pond headwaters.

**Table 5–4: Post Closure Surface Water Discharges (Based on 1989-2019 Precipitation)**

Watershed	Monitoring Station	Drainage Area (ha)	Average Annual Flow (m <sup>3</sup> /s)	Average Annual Volume (1000 m <sup>3</sup> )	Peak Design Flow (m <sup>3</sup> /s)	
					Q <sub>10</sub>	Q <sub>100</sub>
Harry Brook	SW1	691 (-0.3%)	0.238 (-2.1%)	7,502 (-2.1%)	5.56 (-2%)	9.82 (-6%)
	SW2 / SW9	111 (+2%)	0.034 (-1.5%)	1,080 (-1.5%)	2.34 (-7%)	4.00 (-6%)
	SW5	270 (-2%)	0.083 (-5%)	2,631 (-5%)	7.42 (-10%)	12.26 (-11%)
	SW10	52 (-8%)	0.016 (-15%)	489 (-15%)	1.94 (-48%)	3.33 (-47%)
Muir Brook-Shoal Pond	SW4	1298 (+0.2%)	0.443 (-1.3%)	13,980 (-1.3%)	6.90 (-12%)	11.73 (-19%)
	SW6	192 (+33%)	0.058 (+26%)	1,828 (+26%)	5.30 (+30%)	9.37 (+37%)
	SW11	92 (+108%)	0.027 (+96%)	855 (+90%)	4.23 (+106%)	7.93 (+127%)
	SW12	77 (+39%)	0.022 (+26%)	707 (+26%)	0.72 (-50%)	1.70 (-29%)
Catchers Pond	SW3	2960 (0%)	1.021 (0%)	32,210 (0%)	14.92 (0%)	25.83 (0%)
	SW7	209 (0%)	0.066 (0%)	2,093 (0%)	4.63 (0%)	7.69 (0%)

\* Percentages in brackets indicate increases/decreases relative to existing (baseline) conditions.

## 5.2 Water Quality

Water quality impacts of the Project will be managed using settling ponds downstream of the three primary areas of concern: the mine, the waste rock stockpile and the plant (including the low-grade and reject piles). The objective is to ensure runoff water quality satisfies MDMER and other associated environmental discharge regulations.

On-site operations will be limited to mining and sorting with processing to be performed off-site at the NPM. As such, primarily water quality concerns associated with runoff from the Project include

suspended sediment and sorbed metals, unionized ammonia (from blasting residue) and potential ARDML. Concluding results of ARDML testing of waste rock indicates waste rock material types are relatively benign, and classified as non-potentially acid generating.

The key elements of the water quality management plan are as follows:

- settling ponds to remove suspended sediment and contaminants, improve water quality and attenuate peak flows;
- interception ditches to convey contact runoff from mining operations to the settling ponds, minimizing mixing with runoff from non-impacted areas;
- diversion ditches to reroute non-contact runoff to local watercourses and avoid mixing with contact runoff; and
- continued operation of the monitoring stations to evaluate the performance of collection ditches and settling ponds, and to determine if additional aeration or chemical treatment is required to improve treatment efficiency.

### **5.2.1 Baseline**

Baseline water quality data collection has been ongoing since April 2019, with grab samples tested during spring, summer and fall at the eleven monitoring stations. Basic water quality results were presented in Table 3–7, while complete test results are included in Appendix C.

A review of the mine site and the rehabilitation works completed following previous mining operations revealed a series of small settling ponds in the footprint of the proposed open pit mine and previous waste piles that appear to have been capped and revegetated. Baseline monitoring did not identify significant water quality concerns, although there were a few instances where CCME discharge limits were exceeded for metals concentrations (aluminum and iron).

Baseline testing results collected to date will serve as a water quality baseline to evaluate the effectiveness of proposed treatment strategies during all phases of mining operation and closure.

### **5.2.2 Construction**

Key infrastructure components of the WaMP will be constructed prior to mining operations. Erosion controls, three settling ponds (waste rock stockpile, mine and plant) and proposed interception and diversion ditches will all be constructed before mining operations commence. This WaMP is intended to mitigate potential water quality issues by ensuring water management infrastructure is in place to settle suspended sediment in runoff from soils disturbed during construction.

### **5.2.3 Operation**

Three proposed settling ponds will be the primary means of achieving water quality objectives during operation. The ponds will be located near the waste rock stockpile, pit/mine and plant,

where the majority of contact runoff will be generated, and will be sized based on the following criteria:

- settling ponds must provide a minimum retention time of 24 hours during a 10-year return period rainfall; and
- ponds must capture at least a 10 micron soil particle during a 10-year return period, 24-hour duration rainfall.

Preliminary sizing of the settling ponds is presented in Table 5–5 and model simulations indicate particles down to a 5 micron diameter are expected to settle in each pond during a 10-year return period storm event and particles down to a 10 micron diameter are expected to settle during a 100-year return period storm event.

**Table 5–5: Preliminary Settling Pond Sizing**

Location	Q <sub>10</sub> (m <sup>3</sup> /s)	Q <sub>100</sub> (m <sup>3</sup> /s)	Pond Depth (m)	Pond Volume (m <sup>3</sup> )	Settleable Particle (microns)
Waste Rock Stockpile	0.27	0.81	2.3	18,000	5.3
Mine	2.71	4.31	2.0	22,600	5.7
Plant	1.46	2.5	2.0	20,000	4.6

Contact water will be conveyed to the ponds with designed ditching (waste rock stockpile and plant) or pumps (pit/mine). All ditching will be designed to convey peak runoff rates for the 100-year return event (including climate change) to mitigate the potential for overflow and uncontrolled release to local watercourses prior to treatment.

Long term (1989-2019) modelling of the settling ponds was completed using the PCSWMM Professional model to evaluate the performance of the three proposed ponds. These extended duration simulations of historic conditions help predict the pond performances during future wet-weather conditions including extreme events and consecutive rainfall events. These extended simulations indicated two overflows would have occurred for the waste rock stockpile pond and one for the mine pond, details of these theoretical events are as follow:

1. September 21, 2004: 157.2 mm rainfall over 4 days (23.2 + 30.4 + 59 + 44.6 mm)
  - a. 154 m<sup>3</sup> overflow from waste rock stockpile pond, peak overflow rate of 0.010 m<sup>3</sup>/s
2. April 18, 2006: 276.6 mm rain/snowmelt over 5 days (34 + 60.4 + 138.4 + 28.2 + 15.6 mm)
  - a. 34,800 m<sup>3</sup> overflow from waste rock stockpile pond, peak overflow rate of 0.435m<sup>3</sup>/s
  - b. 415 m<sup>3</sup> overflow from the mine pond, peak overflow rate of 0.014 m<sup>3</sup>/s

Two of the three theoretical overflow events would have been relatively minor with small discharges over the pond emergency spillways (designed to accommodate these rare events). The largest overflow event would have been at the waste rock stockpile pond during the April 2006 event. This event resulted in widespread flooding and damage in communities in north-east Newfoundland with nearby Middle Arm as the hardest hit. This far exceeded the 100-year return period event but overflows would be controlled in the emergency spillways sized to convey these extreme flows and protect the integrity of the pond embankments and spillways.

Runoff from all other rainfall and snowmelt events during the 30-year period of record would have been accommodated within the settling ponds, without overflow or untreated discharge to the environment.

#### **5.2.4 Closure**

Once operations have ceased and site rehabilitation activities are complete, temporary sedimentation ponds and diversion ditches will be rehabilitated. Testing will be completed to confirm that the water quality in the ponds meets regulatory requirements for discharge to the environment. Settled sediments will also be tested to confirm there is no elevated chemistry and will be left in place. The sedimentation ponds will be drained in a controlled manner, breached and filled. The sedimentation ponds have been located outside natural wetlands and floodplains not only to facilitate construction and satisfy watercourse/wetland setback requirements, but also to minimize impacts on natural drainage when decommissioned.

The main elements of the WaMP associated with mine closure will be as follows:

- reinstate and revegetate the plant site and waste rock stockpile;
- remove the pumps and prepare the mine to be flooded, ensuring a controlled outlet channel discharging to Hammerdown Creek (as per pre-mining conditions);
- decommission, breach, fill and rehabilitate the settling ponds;
- remove/revegetate contact water ditches and culverts, and unnecessary non-contact water ditches and culverts; and
- inspect the remaining interception ditches and culverts to remove accumulated blockages and stabilize erosion-prone areas.

#### **5.2.5 Post-Closure**

Water quality issues are not expected to occur once the site has been rehabilitated and returned to natural conditions. The water monitoring stations will remain operational through mine closure and post-closure to monitor water quality and promptly mitigate any issues.

## 6.0 EROSION AND SEDIMENT CONTROL PLAN

An Erosion and Sediment Control Plan will be developed to mitigate soil erosion and to treat sediment-laden runoff prior to release to the receiving environment. Mining activities involve large-scale soil and sub-soil disturbance, potentially generating sediment-laden runoff from exposed areas. The most effective strategy to reduce sediment discharge is source control and treatment, and diverting clean runoff away from areas with exposed soils. This will be accomplished by the three proposed settling ponds in conjunction with contact and non-contact water ditches to provide runoff control.

### 6.1 Baseline

Ongoing testing at the 11 surface water monitoring stations provides baseline water quality for the Harry Brook, Muir Brook-Shoal Pond and Catchers Pond watersheds. Grab samples collected at each monitoring station showed total suspended solids (TSS) concentrations to be less than 5 mg/L. While these measurements may not reflect peak sediment concentrations during significant rainfall events, they do provide an indication of baseline conditions in the catchments.

### 6.2 Construction, Operation, and Closure

Erosion and sediment control measures will be planned and implemented prior to commencing mining activities incorporating soil erosion control measures, exposed soils management, settling ponds and water control ditches. The basic elements of the Erosion and Sediment Control Plan are as follow:

- minimize disturbance whenever possible in sloped areas;
- cover exposed soils with appropriate material to prevent further erosion;
- stockpile erosion and sediment control materials (e.g., fencing, stakes, matting, etc.) on-site to allow prompt action where soils are disturbed;
- design sediment ponds to capture a 5 micron soil particle during the 10-year, 24-hour rainfall event;
- construct collection and diversion ditches to control contact and non-contact runoff;
- provide continuous monitoring of the erosion and sedimentation measures to evaluate effectiveness; and
- inspect all erosion and sediment control measures following significant runoff events.

A site-specific Erosion and Sediment Control Plan will be prepared following detailed site design and submitted prior to construction and will be updated/amended as necessary as mining operations progresses. Visual inspection and continued testing at the 11 surface water monitoring stations will confirm the effectiveness of erosion and sediment control measures.

The property will be revegetated following completion of mining activities. This will include draining, breaching and infilling of the ponds, removing unnecessary contact and non-contact

ditches and culverts, and revegetating exposed soils. Site specific sediment control measures will be implemented as needed until revegetation is complete.

### **6.3 Post-Closure**

Post-closure conditions on the Project site will reflect those of baseline conditions as topographic features are returned to a natural state. Water quality measurements will continue post closure to confirm the effectiveness of the closure and revegetation strategies, until final site decommissioning is accepted by regulatory agencies.

## **7.0 SURFACE WATER MONITORING**

### **7.1 Baseline**

Eleven surface water monitoring stations in the three watersheds have been in operation since April 2019 to provide continuous flow measurements. Grab samples have also been collected at each location to define baseline water quality data. The baseline results are discussed in Sections 4.3 and 4.4 of this report, with detailed water quality test results presented in Appendix B.

### **7.2 Construction, Operation, and Closure**

Surface water monitoring will continue through the lifecycle of the mine at each of the stations used in the baseline analysis. Continuous flow measurements will be reviewed to ensure water control infrastructure is effective at maintaining the peak flow control and water balance, while quality testing will be used to identify potential deficiencies in the treatment strategy so they can be promptly addressed.

### **7.3 Post-Closure**

Surface water monitoring will continue post-closure of the mine until it is demonstrated that water quality has returned to baseline conditions.

## **8.0 GROUNDWATER MONITORING**

The purpose of the Groundwater Monitoring Plan is to describe the approach to monitoring the quantity and quality of the groundwater on and immediately downgradient of the project site. This WaMP report recommends an approach to monitoring the groundwater quality to confirm the effects of the mining operations are within regulatory limits.

### **8.1 Baseline**

Six vertical hydrogeological boreholes were drilled across the mine site including four shallow boreholes (MW1, MW2, MW3, and MW5) to depths ranging from 3.96 to 6.20 m and two deeper monitoring wells (MW4 and MW6, paired installations with MW5 and MW3) to approximately 30 m depth. Water level data loggers were installed in each of the six wells for long-term groundwater level monitoring.

Groundwater (piezometric) contours were derived from baseline groundwater data from the six monitoring wells and 38 historical exploration boreholes distributed across the site. The Project site is interpreted to be situated along a groundwater divide and an area of groundwater recharge that corresponds to the surface water divide between the Catchers Pond and Muir Brook–Shoal Pond sub watersheds and Harry Brook watershed along the crest of the topographic ridge. Groundwater flow is predominantly directed to the west-northwest in the vicinity of the proposed open pit and waste rock stockpile areas, and to the north-northeast where the topographic ridge slopes northward toward Harry Brook, including in the plant area.

Preliminary groundwater monitoring and sampling has confirmed normal water levels and responses to rainfall, and will serve as the baseline for comparison of continuing observations during development of the mine site and dewatering the underground mine and open pit.

## **8.2 Construction, Operation, and Closure**

Regular monitoring of groundwater levels in monitoring wells and regular sampling for groundwater quality will be performed to document changes in response to site works and mine dewatering activities. Baseline groundwater characteristics and responses will be referenced and actions to mitigate adverse effects as per the Groundwater Response Plan will be implemented as monitoring dictates necessary.

## **8.3 Post-Closure**

Groundwater monitoring will continue post-closure of the mine until it is demonstrated that groundwater quality and quantity has returned to baseline conditions.

## **9.0 SURFACE WATER AND GROUNDWATER RESPONSE PLAN**

The purpose of the Surface Water and Groundwater Response Plan is to describe protocols and infrastructure (e.g., aeration equipment, liming station, chemical flocculants and/or coagulants, mixing and pumping equipment) to be developed and incorporated in the final site design to mitigate quantity and/or quality issues detected by the Surface or Groundwater Monitoring Programs. Developing these response protocols and infrastructure prior to the start of mining operations will ensure a timely and comprehensive response to (ground) water quality or quality issues.

Contingency actions will be developed for each stage of construction, operation and closure to be initiated when a performance threshold is exceeded. This will occur when monitoring indicates water management measures are not successfully mitigating impacts on surface or groundwater. Key elements of the response plan will include:

- performance targets and triggers for corrective action;
- continuous operational and compliance monitoring of surface and groundwater systems;
- response actions and remedial measures for potential surface and groundwater issues;

- management actions, reporting, timing, roles and responsibility;
- internal and external reporting procedures; and
- a framework for adaptive management and continual improvement.

Primary surface and groundwater risks addressed in the response plan will include:

- water management infrastructure (i.e., settling ponds) not achieving design performance;
- non-compliance with environmental discharge regulations;
- changes to the water balance as drainage infrastructure alters flow patterns or over/under-attenuates runoff;
- changes to the groundwater regime due to mine dewatering activities or related changes to surface water drainage;
- excessive erosion and sedimentation during wet-weather events; and
- emergency response to hydrocarbon and chemical spills.

## 10.0 SUMMARY

The Project WaMP provides a framework to define the anticipated water quantity and quality impacts of the Project (during the mining operations and following closure and decommissioning). This WaMP illustrates how the mine's hydraulic control infrastructure adequately mitigates these impacts, describes how the impacts will be monitored and what measures will be put in place to mitigate unanticipated environmental water quantity and water quality impacts. Proposed details and preliminary sizing of water management infrastructure indicate adverse surface water and groundwater impacts can be mitigated through all stages of the mine lifecycle.

The main water management infrastructure components for the mine site will include:

- three settling ponds located near the waste rock stockpile, mine and plant designed to remove suspended sediment/contaminants, improve water quality and attenuate peak flows;
- interception ditches to convey contact runoff from mining operations to the settling ponds, minimizing mixing with runoff from non-impacted areas;
- diversion ditches to reroute non-contact runoff to local watercourses and avoid mixing with contact runoff;
- erosion and sediment controls to mitigate the impact of runoff from exposed soils; and
- continued operation of the surface and groundwater monitoring stations to evaluate the performance of water management plan and promptly identify deficiencies that can be addressed as per the response plans.

Drainage divides between the Harry Brook, Muir Brook-Shoal Pond and Catchers Pond watersheds are located in the middle of the Project area, making it necessary to track water

balance changes within each catchment. There are no changes to expected runoff conditions in the Catchers Pond watershed as mine operations and drainage infrastructure has been planned and located to impact only the Harry Brook and Muir Brook-Shoal Pond watersheds.

Flow diversions (e.g., collection ditches, mine pumping) in the Harry Brook and Muir Brook-Shoal Pond watersheds during mining operations will change the water balance for the low-value ephemeral watercourses on the property. These changes are not significant downstream of the Project where annual runoff volumes are expected to vary by less than 2% from baseline conditions.

The three proposed settling ponds are expected to attenuate peak discharge rates from the Project up to the 1 in 100-year rainfall event to pre-development conditions. This attenuation is intended to mitigate increased erosion and flooding downstream of the Project. The ponds will also achieve settling targets (10 micron particles during a 10-year rainfall event) as all three are expected to remove particles to approximately 5 microns in diameter.

Surface and groundwater monitoring will continue through the life of mine and following mine closure until baseline or near baseline conditions are re-established. Details of these monitoring programs will be established following regulatory review and final site design. Where visual inspections, accidents, spills or water monitoring triggers a need to mitigate adverse impacts, detailed actions, responsibilities and reporting requirements as defined in the Response Plan will be initiated.

This WaMP has been developed based on the preliminary mine and infrastructure layout and can be adapted as detailed design is completed.

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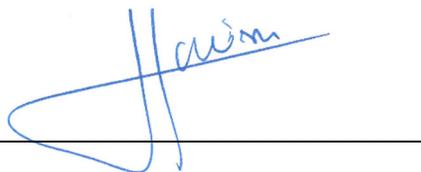
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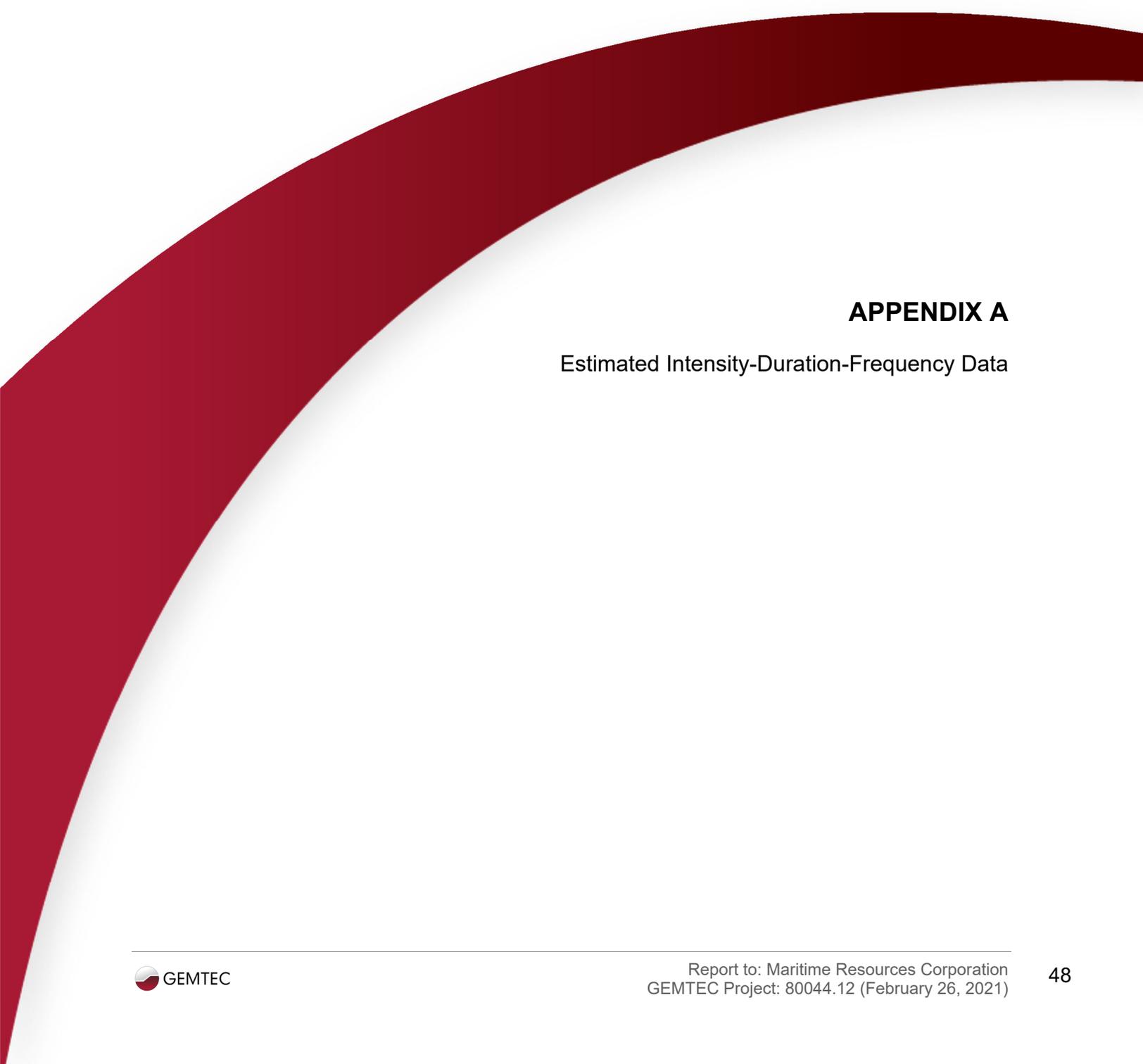
*Metal and Diamond Mining Effluent Regulations, SOR/2002-222.*

## 12.0 CLOSURE

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.



Hans Arisz, M.Sc.E., P.Eng., FCSCE  
Manager, Water Resources Group



## **APPENDIX A**

### Estimated Intensity-Duration-Frequency Data

**Table A-1: IDF Rainfall Estimation at Project Site (mm)**

Duration	Return Interval (year)					
	2	5	10	25	50	100
5 min	3.90	5.96	7.39	9.31	10.64	11.98
10 min	5.70	8.32	10.24	12.67	14.48	16.30
15 min	7.00	9.86	11.93	14.62	16.56	18.52
30 min	9.80	13.04	15.42	18.41	20.51	22.73
1 hour	13.40	17.25	20.17	23.71	26.44	29.06
2 hour	18.80	25.06	29.67	35.51	39.82	44.03
6 hour	29.70	37.38	43.08	50.24	55.40	60.55
12 hour	26.90	45.9	52.59	60.96	67.14	73.08
24 hour	42.90	53.30	62.07	70.70	77.78	84.73

**Table A-2: IDF Constants for Various Return Periods (years)**

Constant	Return Interval (year)					
	2	5	10	25	50	100
A	12.26	17.10	20.32	24.32	27.27	30.25
B	-0.592	-0.603	-0.616	-0.632	-0.639	-0.645

\* See equation 1 below for computing rainfall intensity,  $I$ , given constants  $A$  and  $B$

$$[1] \quad I = AT^B$$

Where

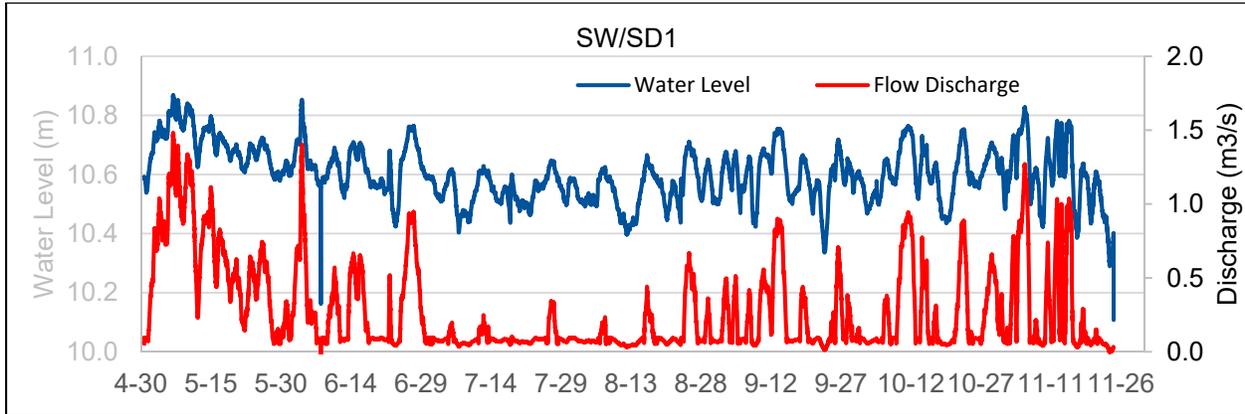
$I$  = Rainfall intensity (mm/hr);  
 $T$  = Duration (hours);  
 $A$  &  $B$  = Constants for various storm events



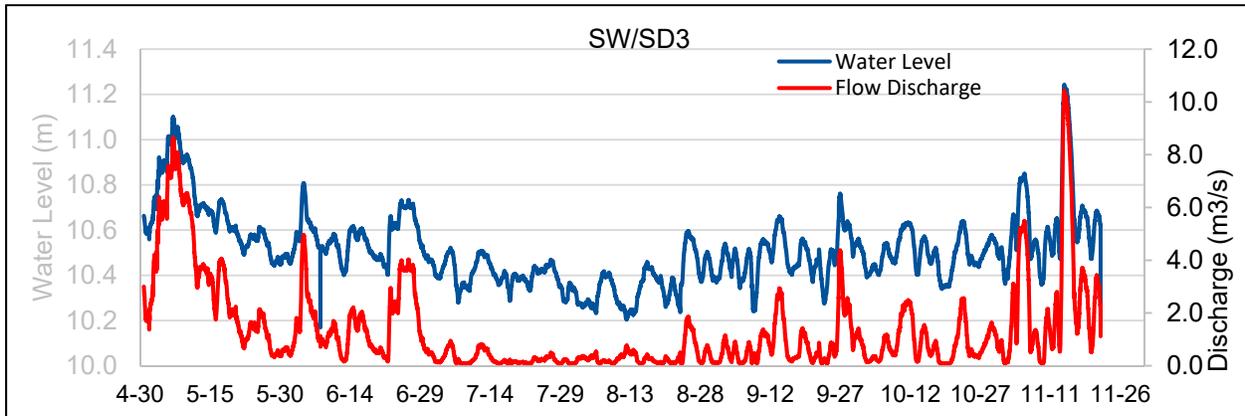
## **APPENDIX B**

Surface Water Flow Measurements  
April 30 to November 24, 2019

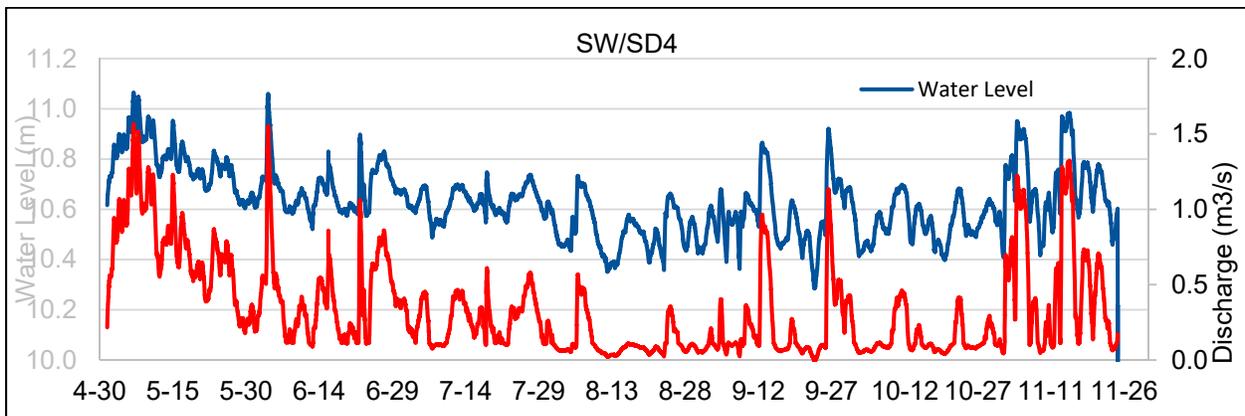
**Figure B-1: Continuous Flow Measurements at SW1 (Harry Brook)**

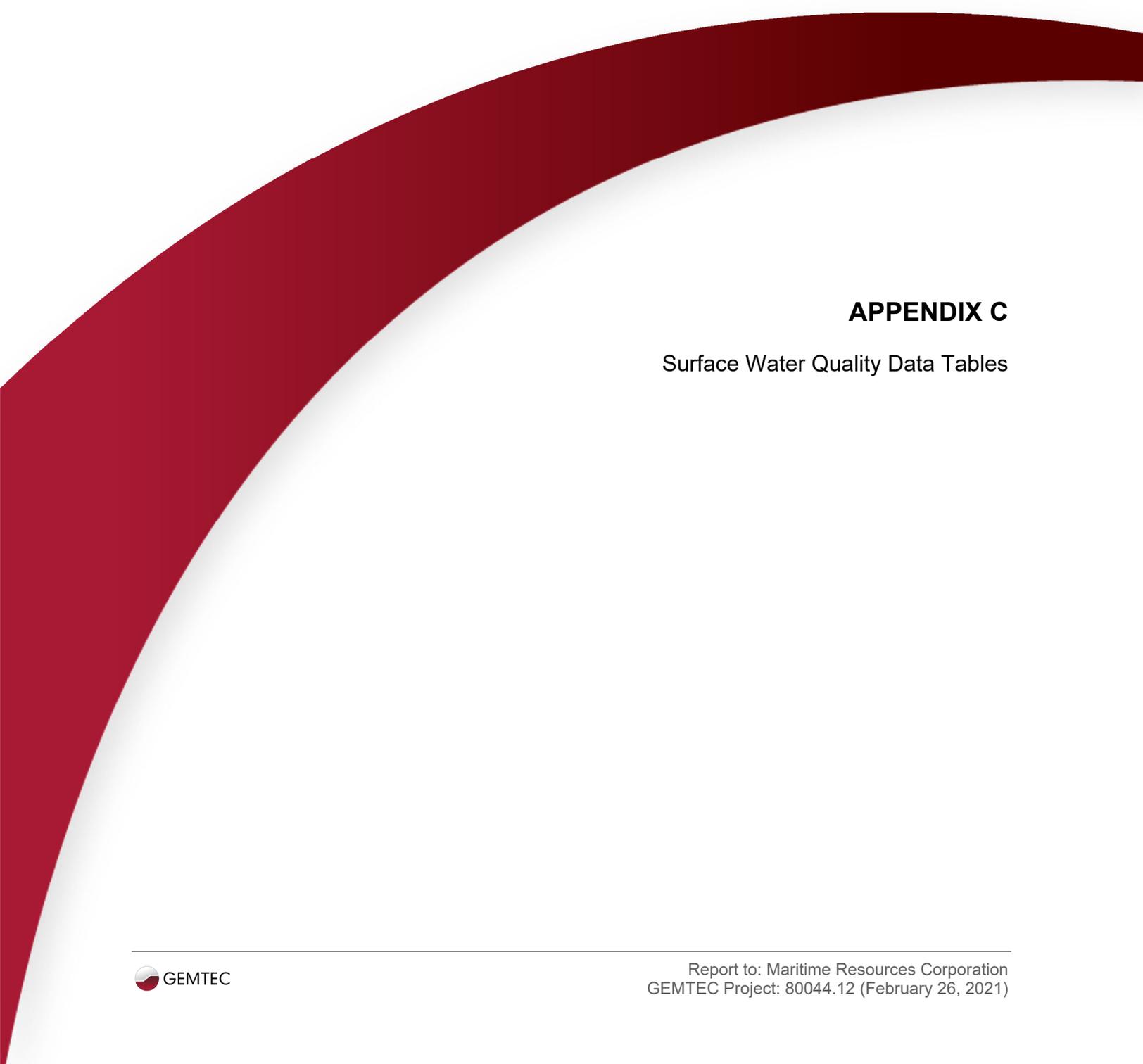


**Figure B-2: Continuous Flow Measurements at SW3 (Catchers Pond)**



**Figure B-3: Continuous Flow Measurements at SW4 (Muir Brook-Shoal Pond)**





## **APPENDIX C**

### Surface Water Quality Data Tables

**Table C1 Analytical Results for Inorganic Parameters in Surface Water**

Parameters	RDL	Units	Guideline	SW1	SW1	SW1	SW2	SW9	SW9	SW3	SW3	SW3	SW4	SW4	SW4	SW5	SW5
			Sample Date	30-Apr-19	06-Jul-19	24-Nov-19	30-Apr-19	06-Jul-19	24-Nov-19	30-Apr-19	05-Jul-19	24-Nov-19	01-May-19	05-Jul-19	24-Nov-19	01-May-19	07-Jul-19
<b>Ammonia guideline (mg/L as N)</b>				15.3	2.22	1.54	15.3	1.54	4.84	15.3	1.54	0.502	48.3	3.26	4.84	10.3	3.37
pH	NA	Units	6.5 - 9.0 <sup>3</sup>	6.97	7.38	6.96	6.68	7.17	6.70	6.71	7.01	6.80	6.61	7.14	6.76	6.75	7.01
Reactive Silica	0.5	mg/L SiO <sub>2</sub>	-	3.4	3.8	4.5	3.0	2.3	3.8	2.6	1.8	4.9	4.6	6.0	2.4	4.3	4.1
Chloride	1	mg/L	120	7	6	6	1	1	3	2	2	3	1	2	3	1	1
Fluoride	0.12	mg/L	0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Sulphate	2	mg/L	-	3	4	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Total Alkalinity	5	mg/L CaCO <sub>3</sub>	-	7	21	11	5	16	6	5	9	9	<5	13	6	6	10
Color	5	TCU	-	94	39	41	100	88	50	124	56	42	105	49	43	103	73
Turbidity	0.1	NTU	-	1.2	1.4	1	2.3	3.7	1.2	0.7	1.4	0.6	0.7	0.6	0.5	1.3	1.0
Conductivity	1	umho/cm	-	49	73	61	23	44	33	25	30	33	23	40	32	28	36
Nitrate + Nitrite as N	0.05	mg/L	-	0.06	<0.05	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.05	<0.05	0.05	<0.05	<0.05
Nitrate as N	0.05	mg/L	13	0.06	<0.05	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.05	<0.05	0.05	<0.05	<0.05
Nitrite as N	0.05	mg/L	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	0.03	mg/L	Table <sup>2</sup>	<0.03	0.08	<0.05	<0.03	0.08	0.15	<0.03	0.08	<0.05	<0.03	0.09	<0.05	<0.03	0.08
Total Organic Carbon	0.5	mg/L	-	5.6	5.4	6.6	6.8	8.5	8.9	5.9	7.0	7.3	8.3	4.9	6.8	7.4	6.7
Orthophosphate	0.01	mg/L P	-	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01
Sodium	0.1	mg/L	-	5.0	5.2	3.8	1.5	1.8	1.8	2.3	2.0	2.1	1.9	2.0	1.9	1.7	1.8
Potassium	0.1	mg/L	-	0.2	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Calcium	0.1	mg/L	-	5.5	6.4	5.8	3.0	5.6	3.8	2.8	2.9	3.4	2.8	3.8	3.3	3.2	3.4
Magnesium	0.1	mg/L	-	0.6	0.7	0.5	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.6	0.5	0.4	0.4
Total Phosphorous	0.02	mg/L	-	<0.02	<0.02	<0.1	<0.02	<0.02	<0.1	<0.02	<0.02	<0.1	<0.02	<0.02	<0.1	<0.02	<0.02
Bicarbonate Alkalinity	5	mg/L CaCO <sub>3</sub>	-	7	21	11	5	16	6	5	9	9	<5	13	6	6	10
Carbonate Alkalinity	10	mg/L CaCO <sub>3</sub>	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide	5	mg/L	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	1	mg/L	-	26	35	27	9	19	13	11	13	15	7	17	13	10	13
Hardness	NA	mg/L CaCO <sub>3</sub>	-	16.2	18.9	16.5	9.1	16.0	11.5	9.1	9.3	11.0	9.1	12.0	10.3	9.6	10.1
Langelier Index (@20C)	NA	NA	-	-2.97	-2.03	-2.76	-3.63	-2.39	-3.44	-3.63	-3.07	-3.22	-3.74	-2.68	-3.44	-3.46	-2.96
Langelier Index (@ 4C)	NA	NA	-	-3.29	-2.35	-3.08	-3.95	-2.71	-3.76	-3.95	-3.39	-3.54	-4.06	-3.00	-3.76	-3.78	-3.28
Saturation pH (@ 20C)	NA	NA	-	9.94	9.41	9.72	10.3	9.56	10.1	10.3	10.1	10.0	10.3	9.82	10.2	10.2	9.97
Saturation pH (@ 4C)	NA	NA	-	10.3	9.73	10.0	10.6	9.88	10.5	10.7	10.4	10.3	10.7	10.1	10.5	10.5	10.3
Anion Sum	NA	me/L	-	0.40	0.67	0.46	0.13	0.35	0.20	0.16	0.24	0.27	0.03	0.32	0.21	0.15	0.23
Cation sum	NA	me/L	-	0.57	0.62	0.52	0.27	0.42	0.34	0.30	0.29	0.33	0.30	0.35	0.31	0.29	0.31
% Difference/ Ion Balance	NA	%	-	16.9	3.8	6.56	36.3	9.4	25.0	31.8	10.5	9.88	80.7	5.0	20.1	32.6	15.0
Total Suspended Solids	5	mg/L	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5

**Notes:**

1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999 and updates)

2 = The guideline for Ammonia decreases as pH and temperature increase. To select the guideline for each sample, field-measured pH was rounded up to the next 0.5 pH units, and field-measured temperature was rounded up to the nearest 5 degrees Celsius.

"-" = None established

RDL = Reported Detection Limit.

NA = Not applicable

**Results that exceed the CCME guideline are bolded and shaded.**

**Table C1 Analytical Results for Inorganic Parameters in Surface Water**

Parameters	RDL	Units	Guideline	SW6	SW6	SW6	SW7	SW7	SW7	SW10	SW10	SW11	SW11	SW12	SW12
Sample Date				01-May-19	07-Jul-19	25-Nov-19	01-May-19	19-Jul-07	24-Nov-19	27-Aug-19	25-Nov-19	29-Aug-19	25-Nov-19	29-Aug-19	26-Nov-19
<b>Ammonia guideline (mg/L as N)</b>				32.4	1.08	4.84	48.3	6.98	4.84	0.239	1.54	0.239	4.84	2.22	15.3
pH	NA	Units	6.5 - 9.0 <sup>3</sup>	6.93	7.31	6.95	6.53	6.85	6.67	7.89	7.09	7.59	6.87	7.21	<b>6.23</b>
Reactive Silica	0.5	mg/L SiO <sub>2</sub>	-	2.8	1.8	2.9	2.9	2.1	3.3	3.3	2.6	2.9	2.0	2.6	1.9
Chloride	1	mg/L	120	1	3	3	2	3	3	1	3	<1	2	1	3
Fluoride	0.12	mg/L	0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Sulphate	2	mg/L	-	<2	<2	<2	<2	<2	<2	6	7	3	<2	<2	<2
Total Alkalinity	5	mg/L CaCO <sub>3</sub>	-	9	15	12	<5	9	5	65	15	30	8	21	<5
Color	5	TCU	-	56	37	28	103	96	52	34	51	16	16	46	46
Turbidity	0.1	NTU	-	0.5	2.4	0.8	1.0	1.2	0.9	1.5	1.7	0.3	0.9	4.7	0.7
Conductivity	1	umho/cm	-	32	45	46	24	38	34	134	70	67	32	50	23
Nitrate + Nitrite as N	0.05	mg/L	-	0.09	0.15	0.11	<0.05	<0.05	<0.05	0.10	0.09	0.11	0.06	<0.05	<0.05
Nitrate as N	0.05	mg/L	13	0.09	0.09	0.11	<0.05	<0.05	<0.05	0.10	0.09	0.11	0.06	<0.05	<0.05
Nitrite as N	0.05	mg/L	0.06	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	0.03	mg/L	Table <sup>2</sup>	<0.03	0.10	<0.05	<0.03	0.10	0.10	0.13	0.09	0.13	0.08	0.14	<0.05
Total Organic Carbon	0.5	mg/L	-	6.1	5.6	5.5	6.1	10.4	8.3	8.7	9.4	7.1	5.0	9.3	9.1
Orthophosphate	0.01	mg/L P	-	<0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	0.1	mg/L	-	1.6	2.2	1.6	2.0	3.0	2.4	2.1	1.4	1.5	1.4	1.6	1.5
Potassium	0.1	mg/L	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.1	<0.1	<0.1	<0.1
Calcium	0.1	mg/L	-	4.6	7.0	5.7	2.2	3.8	3.1	21.8	9.7	9.8	4.4	5.3	2.1
Magnesium	0.1	mg/L	-	0.4	0.5	0.5	0.4	0.5	0.5	1.4	0.5	0.7	0.4	0.7	0.4
Total Phosphorous	0.02	mg/L	-	<0.02	<0.02	<0.1	<0.02	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1	<0.02	<0.1
Bicarbonate Alkalinity	5	mg/L CaCO <sub>3</sub>	-	9	15	12	<5	9	5	65	15	30	8	21	<5
Carbonate Alkalinity	10	mg/L CaCO <sub>3</sub>	-	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide	5	mg/L	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	1	mg/L	-	14	23	19	7	16	13	72	31	34	14	25	8
Hardness	NA	mg/L CaCO <sub>3</sub>	-	13.1	19.5	16.3	7.1	11.5	9.8	60.2	26.3	27.4	12.6	16.1	6.9
Langelier Index (@20C)	NA	NA	-	-2.95	-2.19	-2.73	-3.93	-3.12	-3.64	-0.53	-2.28	-1.48	-3.08	-2.27	-4.25
Langelier Index (@ 4C)	NA	NA	-	-3.27	-2.51	-3.05	-4.25	-3.44	-3.96	-0.85	-2.60	-1.80	-3.40	-2.59	-4.57
Saturation pH (@ 20C)	NA	NA	-	9.88	9.50	9.68	10.5	9.97	10.3	8.42	9.37	9.07	9.95	9.48	10.5
Saturation pH (@ 4C)	NA	NA	-	10.2	9.82	10.0	10.8	10.3	10.6	8.74	9.69	9.39	10.3	9.80	10.8
Anion Sum	NA	me/L	-	0.21	0.40	0.33	0.06	0.26	0.18	1.46	0.54	0.67	0.22	0.45	0.08
Cation sum	NA	me/L	-	0.35	0.51	0.41	0.26	0.40	0.33	1.33	0.61	0.63	0.33	0.53	0.23
% Difference/ Ion Balance	NA	%	-	23.5	12.8	10.5	64.1	19.9	28.4	4.8	6.56	3.10	20.50	8.2	46.3
Total Suspended Solids	5	mg/L	-	<5	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	<5

**Notes:**

1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999 and updates)

2 = The guideline for Ammonia decreases as pH and temperature increase. To select the guideline for each sample, field-measured pH was rounded up to the next 0.5 pH units, and field-measured temperature was rounded up to the nearest 5 degrees Celsius.

"-" = None established

RDL = Reported Detection Limit.

NA = Not applicable

**Results that exceed the CCME guideline are bolded and shaded.**

Table C2 Analytical Results for Total Metals in Surface Water

Parameters	RDL	Units	Guideline	SW1	SW01	SW1	SW2	SW09	SW9	SW3	SW03	SW3	SW4	SW04	SW4	SW5	SW05
Sample Date				30-Apr-19	06-Jul-19	24-Nov-19	30-Apr-19	06-Jul-19	24-Nov-19	30-Apr-19	05-Jul-19	24-Nov-19	01-May-19	05-Jul-19	24-Nov-19	01-May-19	19-Jul-07
pH				6.97	7.38	6.96	6.68	7.17	6.70	6.71	7.01	6.80	6.61	7.14	6.76	6.75	7.01
Hardness (mg/L as CaCO <sub>3</sub> )				16.2	18.9	16.5	9.1	16.0	11.5	9.1	9.3	11.0	9.1	12.0	10.3	9.6	10.1
Aluminum guideline (ug/L)				100	100	100	100	100	100	100	100	100	100	100	100	100	100
Cadmium guideline (ug/L)				0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Copper guideline (ug/L)				2	2	2	2	2	2	2	2	2	2	2	2	2	2
Lead guideline (ug/L)				1	1	1	1	1	1	1	1	1	1	1	1	1	1
Nickel guideline (ug/L)				25	25	25	25	25	25	25	25	25	25	25	25	25	25
Aluminum	5	µg/L	Calculated <sup>2</sup>	<b>173</b>	53	<b>121</b>	<b>204</b>	70	<b>129</b>	<b>137</b>	64	82	<b>247</b>	72	<b>147</b>	<b>164</b>	94
Antimony	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Arsenic	2	µg/L	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Barium	5	µg/L	-	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	5	<5	<5	<5
Beryllium	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bismuth	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Boron	5	µg/L	1500	<5	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	0.09	µg/L	Calculated <sup>3</sup>	<0.09	<0.017	<0.017	<0.09	<0.017	<0.017	<0.09	<0.017	<0.017	<0.09	<0.017	<0.017	<0.09	<0.017
Chromium	1	µg/L	-	<1	1	1	<1	<1	1	<1	<1	<1	<1	1	1	<1	<1
Cobalt	1	µg/L	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Copper	1	µg/L	Calculated <sup>4</sup>	1	2	2	1	1	1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	50	µg/L	300	72	224	250	92	188	170	130	157	210	108	237	210	91	298
Lead	0.5	µg/L	Calculated <sup>5</sup>	<0.5	<0.5	<0.5	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5
Manganese	2	µg/L	-	9	8	25	6	19	9	26	12	16	9	15	15	12	17
Mercury	0.026	µg/L	0.026	<0.026	<b>0.043</b>	<b>0.027</b>	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026
Molybdenum	2	µg/L	73	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Nickel	2	µg/L	Calculated <sup>6</sup>	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	3	<2	<2	<2
Selenium	1	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	0.1	µg/L	0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	5	µg/L	-	11	17	14	7	16	10	8	12	12	8	14	10	8	10
Thallium	0.1	µg/L	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Titanium	2	µg/L	-	<2	<2	<2	4	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Uranium	0.1	µg/L	15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	2	µg/L	-	<2	3	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Zinc	5	ug/L	-	<5	<5	6	<5	<5	<5	<5	<5	<5	<5	6	<5	<5	<5

Notes:

1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999 and updates)

2 = Aluminum guideline = 5 µg/L at pH<6.5, or 100 µg/L at pH>=6.5

3 = Cadmium guideline [µg/L] = 10<sup>0.83[log(hardness)]-2.46</sup>, for water hardness between 17 and 280 mg/L as CaCO<sub>3</sub>; For water hardness<17, guideline =0.04; For water hardness>280, guideline =0.37; For unknown water hardness, guideline = 0.04

4 = Copper guideline [µg/L] = 0.2 \* e<sup>0.8545[ln(hardness)]-1.465</sup>, for water hardness between 82 and 180 mg/L as CaCO<sub>3</sub>; If water hardness is <82, guideline = 2; If water hardness is >180, guideline = 4; If water hardness is unknown, guideline = 2

5 = Lead guideline [µg/L] = e<sup>1.273[ln(hardness)]-4.705</sup>, for water hardness between 60 and 180 mg/L as CaCO<sub>3</sub>; If water hardness is less than 60, guideline = 1; If water hardness is greater than 180, guideline = 7; If water hardness is unknown, guideline = 1

6 = Nickel guideline [µg/L] = e<sup>0.76[ln(hardness)]+1.06</sup>, for water hardness between <60 to 180 mg/L as CaCO<sub>3</sub>. If water hardness <60 mg/L, guideline = 25 ug/L; For water hardness >180 mg/L, guideline = 150 ug/L. If hardness is unknown, guideline is 25 ug/L.

"-" = None established

RDL = Reported Detection Limit.

NA = Not applicable

Results that exceed the CCME guideline are bolded and shaded.

**Table C2 Analytical Results for Total Metals in Surface Water**

Parameters	RDL	Units	Guideline	SW6	SW06	SW6	SW7	SW07	SW7	SW10	SW10	SW11	SW11	SW12	SW12
Sample Date				01-May-19	07-Jul-19	25-Nov-19	01-May-19	07-Jul-19	24-Nov-19	27-Aug-19	25-Nov-19	29-Aug-19	25-Nov-19	29-Aug-19	26-Nov-19
pH				6.93	7.31	6.95	6.53	6.85	6.67	7.89	7.09	7.59	6.87	7.21	6.23
Hardness (mg/L as CaCO <sub>3</sub> )				13.1	19.5	16.3	7.1	11.5	9.8	60.2	26.3	27.4	12.6	16.1	6.9
Aluminum guideline (ug/L)				100	100	100	100	100	100	100	100	100	100	100	5
Cadmium guideline (ug/L)				0.04	0.04	0.04	0.04	0.04	0.04	0.10	0.05	0.05	0.04	0.04	0.04
Copper guideline (ug/L)				2	2	2	2	2	2	2	2	2	2	2	2
Lead guideline (ug/L)				1	1	1	1	1	1	1.67	1	1	1	1	1
Nickel guideline (ug/L)				25	25	25	25	25	25	65	25	25	25	25	25
Aluminum	5	µg/L	Calculated <sup>2</sup>	<b>125</b>	<b>113</b>	<b>103</b>	<b>139</b>	89	<b>121</b>	38	66	14	55	54	<b>114</b>
Antimony	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Arsenic	2	µg/L	5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Barium	5	µg/L	-	<5	<5	<5	<5	8	6	<5	<5	<5	<5	<5	<5
Beryllium	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bismuth	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Boron	5	µg/L	1500	<5	<5	<5	<5	7	<5	<5	<5	<5	<5	<5	<5
Cadmium	0.09	µg/L	Calculated <sup>3</sup>	<0.09	<0.017	<0.017	<0.09	0.034	0.02	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017
Chromium	1	µg/L	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	<1	1
Cobalt	1	µg/L	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2	<1
Copper	1	µg/L	Calculated <sup>4</sup>	1	2	1	<1	1	<1	2	2	<1	<1	<1	<1
Iron	50	µg/L	300	<50	121	90	276	<b>448</b>	240	187	250	85	190	<b>1130</b>	<b>330</b>
Lead	0.5	µg/L	Calculated <sup>5</sup>	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Manganese	2	µg/L	-	8	24	7	51	39	38	125	65	10	60	2190	60
Mercury	0.026	µg/L	0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<b>0.028</b>
Molybdenum	2	µg/L	73	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Nickel	2	µg/L	Calculated <sup>6</sup>	3	<2	<2	3	<2	<2	4	<2	<2	<2	<2	<2
Selenium	1	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Silver	0.1	µg/L	0.25	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Strontium	5	µg/L	-	8	12	11	8	14	13	45	20	23	11	15	8
Thallium	0.1	µg/L	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Titanium	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Uranium	0.1	µg/L	15	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vanadium	2	µg/L	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Zinc	5	µg/L	-	<5	<5	5	9	7	5	<5	<5	5	<5	<5	<5

**Notes:**

1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999 and updates)

2 = Aluminum guideline = 5 µg/L at pH<6.5, or 100 µg/L at pH>=6.5

3 = Cadmium guideline [µg/L] = 10<sup>0.83[log(hardness)]-2.46</sup>, for water hardness between 17 and 280 mg/L as CaCO<sub>3</sub>; For water hardness<17, guideline =0.04; For water hardness>280, guideline =0.37; For unknown water hardness, guideline = 0.04

4 = Copper guideline [µg/L] = 0.2 \* e<sup>0.8545[ln(hardness)]-1.465</sup>, for water hardness between 82 and 180 mg/L as CaCO<sub>3</sub>; If water hardness is <82, guideline = 2; If water hardness is >180, guideline = 4; If water hardness is unknown, guideline = 2

5 = Lead guideline [µg/L] = e<sup>1.273[ln(hardness)]-4.705</sup>, for water hardness between 60 and 180 mg/L as CaCO<sub>3</sub>; If water hardness is less than 60, guideline = 1; If water hardness is greater than 180, guideline = 7; If water hardness is unknown, guideline = 1

6 = Nickel guideline [µg/L] = e<sup>0.76[ln(hardness)]+1.06</sup>, for water hardness between <60 to 180 mg/L as CaCO<sub>3</sub>. If water hardness <60 mg/L, guideline = 25 ug/L; For water hardness >180 mg/L, guideline = 150 ug/L. If hardness is unknown, guideline is 25 ug/L.

"-" = None established

RDL = Reported Detection Limit.

NA = Not applicable

**Results that exceed the CCME guideline are bolded and shaded.**

**Table C3 Analytical Results for Available Metals in Sediment**

Parameters	RDL	Units	Guideline	SD1	SD2	SD9	SD3	SD4	SD5	SD6	SD10	SD11	SD12
				Sample Date	30-Apr-19	30-Apr-19	06-Jul-19	30-Apr-19	01-May-19	01-May-19	01-May-19	01-May-19	26-Nov-19
Aluminum	10	mg/kg	-	12800	30500	16300	15400	11000	9540	9020	16300	14800	14600
Antimony	1	mg/kg	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic	1	mg/kg	17	6	<b>191</b>	<b>90</b>	8	4	3	5	10	11	12
Barium	5	mg/kg	-	15	2210	689	113	26	19	23	76	55	675
Beryllium	2	mg/kg	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Boron	2	mg/kg	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Cadmium	0.3	mg/kg	3.5	0.3	<b>23.3</b>	<b>4.4</b>	0.7	<0.3	<0.3	0.3	0.8	0.7	2.9
Chromium	2	mg/kg	90	88	28	15	12	20	24	23	68	42	9
Cobalt	1	mg/kg	-	16	396	142	10	9	9	16	30	20	258
Copper	2	mg/kg	197	31	35	14	8	16	29	28	35	41	10
Iron	50	mg/kg	-	21200	168000	119000	44400	14800	15800	25800	34100	22700	88200
Lead	0.5	mg/kg	91.3	4.5	37.1	32.6	11.2	9.4	8.5	9.2	11.6	19.3	7.0
Lithium	5	mg/kg	-	6	19	5	9	8	7	9	9	7	<5
Manganese	2	mg/kg	-	908	98600	28100	7280	257	548	1470	5010	3040	148000
Mercury	0.05	mg/kg	0.486	<0.05	<0.05	0.03	<0.05	<0.05	<0.05	<0.05	0.01	-	0.13
Molybdenum	2	mg/kg	-	<2	30	13	<2	<2	2	<2	<2	<2	3
Nickel	2	mg/kg	-	36	251	51	17	25	24	23	38	35	69
Selenium	1	mg/kg	-	<1	1	<1	<1	<1	<1	<1	<1	<1	1
Silver	0.5	mg/kg	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Strontium	5	mg/kg	-	11	55	19	10	30	14	15	15	21	95
Thallium	0.1	mg/kg	-	<0.1	1.8	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3
Tin	2	mg/kg	-	4	4	3	4	4	4	5	3	4	3
Uranium	0.1	mg/kg	-	0.3	1.1	0.8	0.4	1.8	1.1	0.5	0.2	0.5	0.5
Vanadium	2	mg/kg	-	68	166	121	28	48	39	52	78	66	43
Zinc	5	mg/kg	315	85	<b>2050</b>	<b>526</b>	147	50	115	98	175	147	<b>470</b>

**Notes:**

1 = Canadian Council of Ministers of the Environment (CCME) Canadian Sediment Quality Guidelines for the Protection of Aquatic Life - Probable Effects Levels (PEL) for Freshwater Sediment (1999 and updates)

"-" = None established

RDL = Reported Detection Limit.

NA = Not applicable

**Results that exceed the CCME guideline are bolded and shaded.**



## **APPENDIX D**

### Groundwater Quality Data Tables

**Table D1: Analytical Results for Inorganic Parameters in Groundwater**

Sample Location:	Units	Guideline <sup>1</sup>		RDL	MW1		MW2		MW3		MW4		MW5		MW6	
		CCME FAL <sup>1</sup>	GCDWQ <sup>2</sup>		29-Aug-19	22-Nov-19	28-Aug-19	22-Nov-19	27-Aug-19	21-Nov-19	29-Aug-19	23-Nov-19	28-Aug-19	23-Nov-19	27-Aug-19	23-Nov-19
<b>Ammonia guideline (mg/L as N)</b>					26.6458	26.6458	2.6810	2.6810	0.8553	0.8553	0.0995	0.2821	1.8257	2.6810	0.8553	0.8553
<b>Inorganics</b>																
pH	units	6.5-9.0	7.0-10.5 <sup>OG</sup>	NA	7.28	<b>6.47</b>	7.65	<b>6.91</b>	8.26	7.88	8.17	8.04	8.06	7.15	8.30	7.90
Reactive Silica as SiO2	mg/L	-	-	0.5	10.5	7.5	12.6	8.6	7.6	9.0	6.6	6.2	8.2	7.9	11.8	10.5
Chloride	mg/L	120	250 <sup>AO</sup>	1	2	<2	5	9	7	8	3	13	4	4	3	5
Fluoride	mg/L	0.12	1.5	0.12	<0.12	<0.12	<0.12	<0.12	<b>0.33</b>	<b>0.46</b>	<b>0.31</b>	<b>0.26</b>	<0.12	<0.12	<b>0.19</b>	<b>0.16</b>
Sulphate	mg/L	-	500 <sup>AO</sup>	2	10	10	9	5	17	16	4	11	9	<2	8	9
Alkalinity	mg/L	-	-	5	27	16	91	49	209	200	106	229	126	54	239	199
True Color	TCU	-	15 <sup>AO</sup>	5	12	9	151	140	<5	<5	8	15	17	10	<5	9
Turbidity	NTU	-	0.1 <sup>OG</sup>	0.1	59.8	208	303	32.9	54.2	3.9	471	7164	73.3	44.7	3.2	45.6
Electrical Conductivity	umho/cm	-	-	1	83	71	187	119	416	432	196	332	252	120	414	413
Nitrate as N	mg/L	13	10	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	0.06	1	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L	Table <sup>3</sup>	-	0.03	0.22	0.16	0.20	0.11	0.13	0.04	<b>0.20</b>	<b>0.76</b>	0.17	0.09	0.12	0.08
Total Organic Carbon	mg/L	-	-	0.5	3.5	4.2	12.0	13.1	2.6	1.0	2.7	<0.5	7.0	3.7	3.6	3.0
Ortho-Phosphate as P	mg/L	-	-	0.01	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.01	0.02
<b>Calculated Parameters</b>																
Nitrate + Nitrite as N	mg/L	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bicarb. Alkalinity (as CaCO3)	mg/L	-	-	5	27	16	91	49	209	200	106	229	126	54	238	199
Carb. Alkalinity (as CaCO3)	mg/L	-	-	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Hydroxide	mg/L	-	-	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Calculated TDS	mg/L	-	500 <sup>AO</sup>	1	47	36	126	82	258	256	120	260	144	70	248	238
Hardness	mg/L	-	-	NA	28.5	28.5	43.5	19.8	199	271	86.8	105	103	69.1	218	236
Langelier Index (@20C)	N/A	-	-	NA	-1.91	-2.89	-0.85	-2.18	0.80	0.57	0.05	0.31	0.12	-1.27	0.94	0.51
Langelier Index (@ 4C)	N/A	-	-	NA	-2.23	-3.21	-1.17	-2.50	0.48	0.25	-0.27	-0.01	-0.20	-1.59	0.62	0.19
Saturation pH (@ 20C)	N/A	-	-	NA	9.19	9.36	8.50	9.09	7.46	7.31	8.12	7.73	7.94	8.42	7.36	7.39
Saturation pH (@ 4C)	N/A	-	-	NA	9.51	9.68	8.82	9.41	7.78	7.63	8.44	8.05	8.26	8.74	7.68	7.71
Anion Sum	me/L	-	-	NA	0.80	0.53	2.15	1.34	4.73	4.58	2.29	5.18	2.82	1.19	5.03	4.31
Cation sum	me/L	-	-	NA	0.97	0.83	3.12	1.69	5.41	5.60	2.45	4.76	2.85	1.66	4.81	5.30
% Difference/ Ion Balance	%	-	-	NA	9.3	22.0	18.5	11.6	6.7	10.1	3.5	4.2	0.6	16.5	2.2	10.3
TSS	mg/L	-	-	5	8	212	92	26	84	<5	368	928	22	20	<5	42

**Notes:**

1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999 and updates)

2 = Health Canada Guidelines for Canadian Drinking Water Quality (June 2019).

3 = The guideline for Ammonia decreases as pH and temperature increase. To select the guideline for each sample, field-measured pH was rounded up to the next 0.5 pH units, and field-measured temperature was rounded up to the nearest 5 degrees Celsius.

"-" = None established

RDL = Reported Detection Limit.

NA = Not applicable

**Results that exceed the CCME guideline or a health-based GCDWQ are bolded and shaded.**

Results that exceed a GCDWQ Aesthetic Objective (AO) or Operational Guideline (OG) are shaded.

Table D2: Analytical Results for Dissolved Metals in Groundwater

Sample Location:	Units	Guideline		RDL	MW1		MW2		MW3		MW4		MW5		MW6	
		CCME FAL <sup>1</sup>	GCDWQ <sup>2</sup>		29-Aug-19	22-Nov-19	28-Aug-19	22-Nov-19	27-Aug-19	21-Nov-19	29-Aug-19	23-Nov-19	28-Aug-19	23-Nov-19	27-Aug-19	23-Nov-19
				pH	7.28	6.47	7.65	6.91	8.26	7.88	8.17	8.04	8.06	7.15	8.30	7.90
				Hardness (mg/L as CaCO <sub>3</sub> )	28.5	28.5	43.5	19.8	199	271	86.8	105	103	69.1	218	236
				Aluminum guideline (ug/L)	100	5	100	100	100	100	100	100	100	100	100	100
				Cadmium guideline (ug/L)	0.06	0.06	0.08	0.04	0.28	0.36	0.14	0.17	0.16	0.12	0.30	0.32
				Copper guideline (ug/L)	2	2	2	2	4	4	2.10	2.47	2.43	2	4	4
				Lead guideline (ug/L)	1	1	1	1	7	7	2.66	3.39	3.30	1.99	7	7
				Nickel guideline (ug/L)	25	25	25	25	150	150	85.83	99.19	97.75	72.17	150	150
Dissolved Aluminum (Al)	ug/L	Calculated <sup>3</sup>	NA	5	<b>1030</b>	<b>343</b>	<b>10000</b>	<b>802</b>	<b>753</b>	11	65	<b>2120</b>	<b>1530</b>	<b>214</b>	24	15
Dissolved Antimony (Sb)	ug/L	-	6	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dissolved Arsenic (As)	ug/L	5	10	2	<2	<2	<b>26</b>	4	<2	<2	<2	<2	<2	<2	<2	<2
Dissolved Barium (Ba)	ug/L	-	1000	5	26	19	503	102	63	75	<5	6	15	<5	161	169
Dissolved Beryllium (Be)	ug/L	-	-	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dissolved Bismuth (Bi)	ug/L	-	-	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dissolved Boron (B)	ug/L	1500	5000	5	<5	<5	12	6	9	<5	9	19	6	<5	7	7
Dissolved Cadmium (Cd)	ug/L	Calculated <sup>4</sup>	5	0.017	<b>0.093</b>	<b>0.127</b>	<b>1.60</b>	<b>0.154</b>	<0.017	<0.017	<0.017	<0.017	0.157	0.041	<0.017	<0.017
Dissolved Calcium (Ca)	ug/L	-	-	100	8600	9600	13800	6300	70000	104000	28500	34200	36300	26200	77800	85800
Dissolved Chromium (Cr)	ug/L	-	50	1	3	3	11	3	6	5	2	8	6	3	2	5
Dissolved Cobalt (Co)	ug/L	-	-	1	6	4	8	3	<1	<1	<1	<1	2	<1	<1	<1
Dissolved Copper (Cu)	ug/L	Calculated <sup>5</sup>	2, 1 <sup>AO</sup>	2	<b>8</b>	<b>3</b>	<b>117</b>	<b>8</b>	<b>5</b>	<2*	<2*	<2*	<b>14</b>	<b>3</b>	<b>6</b>	<2*
Dissolved Iron (Fe)	ug/L	300	300 <sup>AO</sup>	50	<b>1110</b>	<b>334</b>	<b>13800</b>	<b>9280</b>	261	<50	<50	<b>1490</b>	<b>1660</b>	<b>951</b>	84	<b>426</b>
Dissolved Lead (Pb)	ug/L	Calculated <sup>6</sup>	5	0.5	<b>1.1</b>	<0.5	<b>45.7</b>	<b>3.2</b>	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	1.4	<0.5
Dissolved Magnesium (Mg)	ug/L	-	-	100	1700	1100	2200	1000	5900	2800	3800	4800	2900	900	5800	5400
Dissolved Manganese (Mn)	ug/L	-	120, 20 <sup>AO</sup>	2	<b>1680</b>	<b>1470</b>	<b>3030</b>	<b>3260</b>	<b>252</b>	<b>77</b>	16	<b>362</b>	<b>1450</b>	<b>1970</b>	<b>140</b>	<b>158</b>
Dissolved Mercury (Hg)	ug/L	0.026	1	0.026	<0.026	<0.026	<0.026	<0.026	<0.026	<0.026	-	<0.026	<0.026	<0.026	<0.026	<0.026
Dissolved Molybdenum (Mo)	ug/L	73	-	2	<2	<2	16	3	9	<2	2	6	<2	<2	<2	2
Dissolved Nickel (Ni)	ug/L	Calculated <sup>7</sup>	-	2	9	4	7	3	4	6	<2	11	4	2	2	70
Dissolved Phosphorus (P)	ug/L	-	-	20	<20	<20	190	<20	<20	<20	<20	<20	<20	<20	<20	<20
Dissolved Potassium (K)	ug/L	-	-	100	1000	400	4200	500	1700	400	1900	5300	500	200	500	800
Dissolved Selenium (Se)	ug/L	1	50	1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Silver (Ag)	ug/L	0.25	-	0.1	0.1	<0.1	<b>1.5</b>	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1
Dissolved Sodium (Na)	ug/L	-	200 000 <sup>AO</sup>	100	3300	3000	9300	16800	29200	3600	14900	49700	11300	3200	9500	11900
Dissolved Strontium (Sr)	ug/L	-	7000	5	39	49	85	31	166	195	308	327	67	39	254	374
Dissolved Thallium (Tl)	ug/L	0.8	-	0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Tin (Sn)	ug/L	-	-	2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dissolved Titanium (Ti)	ug/L	-	-	2	27	6	439	25	15	<2	<2	34	62	11	<2	<2
Dissolved Uranium (U)	ug/L	15	20	0.1	0.1	<0.1	1.3	0.2	0.8	0.1	<0.1	<0.1	0.3	<0.1	0.2	0.2
Dissolved Vanadium (V)	ug/L	-	-	2	<2	<2	19	2	<2	<2	<2	4	5	<2	<2	<2
Dissolved Zinc (Zn)	ug/L	-	5000 <sup>AO</sup>	5	13	<5	206	52	50	11	<5	23	7	<5	6	12

Notes:

- 1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999 and updates)
- 2 = Health Canada Guidelines for Canadian Drinking Water Quality (June 2019). NOTE: Guidelines are typically applied to unfiltered samples (i.e. total metals, not only dissolved metals)
- 3 = Aluminum guideline = 5 µg/L at pH<6.5, or 100 µg/L at pH>=6.5
- 4 = Cadmium guideline [µg/L] = 10<sup>0.83[log(hardness)]-2.46</sup>, for water hardness between 17 and 280 mg/L as CaCO<sub>3</sub>; For water hardness<17, guideline =0.04; For water hardness>280, guideline =0.37; For unknown water hardness, guideline = 0.04
- 5 = Copper guideline [µg/L] = 0.2 \* e<sup>0.8545[ln(hardness)]-1.465</sup>, for water hardness between 82 and 180 mg/L as CaCO<sub>3</sub>. If water hardness is <82, guideline = 2; If water hardness is >180, guideline = 4; If water hardness is unknown, guideline = 2
- 6 = Lead guideline [µg/L] = e<sup>1.273[ln(hardness)]-4.705</sup>, for water hardness between 60 and 180 mg/L as CaCO<sub>3</sub>. If water hardness is less than 60, guideline = 1; If water hardness is greater than 180, guideline = 7; If water hardness is unknown, guideline = 1
- 7 = Nickel guideline [µg/L] = e<sup>0.76[ln(hardness)]+1.06</sup>, for water hardness between <60 to 180 mg/L as CaCO<sub>3</sub>. If water hardness <60 mg/L, guideline = 25 ug/L; For water hardness >180 mg/L, guideline = 150 ug/L. If hardness is unknown, guideline is 25 ug/L.

"-" = None established  
RDL = Reported Detection Limit.  
NA = Not applicable  
\* = RDL is greater than the AO

Results that exceed an applicable CCME guideline or health-based GCDWQ are bolded and shaded.  
Results that exceed a GCDWQ Aesthetic Objective (AO) or Operational Guideline (OG) are shaded.

**Table D3: Analytical Results for Inorganic Parameters in Flowing Exploration Borehole MS-39\***

Sample Location: Date Sampled:	Units	Guideline <sup>1</sup>		RDL	MS-39*	
		CCME FAL <sup>1</sup>	GCDWQ <sup>2</sup>		29-Aug-19	25-Nov-19
<b>Ammonia guideline (mg/L as N)</b>					0.8553	0.8553
<b>Inorganics</b>						
pH	units	6.5-9.0	7.0-10.5 <sup>OG</sup>	NA	7.82	7.88
Reactive Silica as SiO <sub>2</sub>	mg/L	-	-	0.5	8.1	7.3
Chloride	mg/L	120	250 <sup>AO</sup>	1	2	2
Fluoride	mg/L	0.12	1.5	0.12	<b>0.46</b>	<b>0.47</b>
Sulphate	mg/L	-	500 <sup>AO</sup>	2	45	53
Alkalinity	mg/L	-	-	5	158	147
True Color	TCU	-	15 <sup>AO</sup>	5	<5	5
Turbidity	NTU	-	0.1 <sup>OG</sup>	0.1	1.9	1
Electrical Conductivity	umho/cm	-	-	1	439	428
Nitrate as N	mg/L	13	10	0.05	0.66	0.15
Nitrite as N	mg/L	0.06	1	0.05	<0.05	<0.05
Ammonia as N	mg/L	Table <sup>3</sup>	-	0.03	0.14	0.06
Total Organic Carbon	mg/L	-	-	0.5	3.0	1.6
Ortho-Phosphate as P	mg/L	-	-	0.01	<0.01	<0.01
<b>Calculated Parameters</b>						
Nitrate + Nitrite as N	mg/L	-	-	0.05	0.66	0.15
Bicarb. Alkalinity (as CaCO <sub>3</sub> )	mg/L	-	-	5	158	147
Carb. Alkalinity (as CaCO <sub>3</sub> )	mg/L	-	-	10	<10	<10
Hydroxide	mg/L	-	-	5	<5	<5
Calculated TDS	mg/L	-	500 <sup>AO</sup>	1	242	234
Hardness	mg/L	-	-	NA	237	217
Langelier Index (@20C)	NA	-	-	NA	0.35	0.34
Langelier Index (@ 4C)	NA	-	-	NA	0.03	0.02
Saturation pH (@ 20C)	NA	-	-	NA	7.47	7.54
Saturation pH (@ 4C)	NA	-	-	NA	7.79	7.86
Anion Sum	me/L	-	-	NA	4.20	4.11
Cation sum	me/L	-	-	NA	4.90	4.54
% Difference/ Ion Balance	%	-	-	NA	7.7	4.93
Total Suspended Solids	mg/L	-	-	5	<5	<5

**Notes:**

\* GEMTEC Sample ID "AW1"

1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic

2 = Health Canada Guidelines for Canadian Drinking Water Quality (June 2019).

3 = The guideline for Ammonia decreases as pH and temperature increase. Based on field parameters measured in August, a conservative value was chosen using a pH of 8 and a temperature of 10 degrees Celsius.

"-" = None established

RDL = Reported Detection Limit.

NA = Not applicable

**Results that exceed the CCME guideline or a health-based GCDWQ are bolded and shaded.**

Results that exceed a GCDWQ Aesthetic Objective (AO) or Operational Guideline (OG) are shaded.

**Table D4: Analytical Results for Total Metals in Flowing Exploration Borehole MS-39\***

Sample Location:	Units	Guideline		RDL	MS-39*		
Date Sampled:		CCME FAL <sup>1</sup>	GCDWQ <sup>2</sup>		29-Aug-19	25-Nov-19	
					pH	7.82	7.88
					Hardness (mg/L as CaCO <sub>3</sub> )	237	217
					Aluminum guideline (ug/L)	100	100
					Cadmium guideline (ug/L)	0.32	0.30
					Copper guideline (ug/L)	4	4
					Lead guideline (ug/L)	7	7
					Nickel guideline (ug/L)	150	150
Aluminum	ug/L	Calculated <sup>3</sup>	NA	5	<5	<5	
Antimony	ug/L	-	6	2	<2	<2	
Arsenic	ug/L	5	10	2	<2	<2	
Barium	ug/L	-	1000	5	18	20	
Beryllium	ug/L	-	-	2	<2	<2	
Bismuth	ug/L	-	-	2	<2	<2	
Boron	ug/L	1500	5000	5	<5	7	
Cadmium	ug/L	Calculated <sup>4</sup>	5	0.017	0.225	0.246	
Calcium	ug/L	-	-	100	91200	82400	
Chromium	ug/L	-	50	1	<1	<1	
Cobalt	ug/L	-	-	1	<1	<1	
Copper	ug/L	Calculated <sup>5</sup>	2, 1 <sup>AO</sup>	1	2	2	
Iron	ug/L	300	300 <sup>AO</sup>	50	72	220	
Lead	ug/L	Calculated <sup>6</sup>	5	0.5	3.2	<0.5	
Magnesium	ug/L	-	-	100	2300	2800	
Manganese	ug/L	-	120, 20 <sup>AO</sup>	2	72	123	
Mercury	ug/L	0.026	1	0.026	<0.026	0.038	
Molybdenum	ug/L	73	-	2	<2	<2	
Nickel	ug/L	Calculated <sup>7</sup>	-	2	<2	7	
Phosphorus	ug/L	-	-	20	<20	<100	
Potassium	ug/L	-	-	100	500	600	
Selenium	ug/L	1	50	1	<1	<1	
Silver	ug/L	0.25	-	0.1	<0.1	<0.1	
Sodium	ug/L	-	200 000 <sup>AO</sup>	100	2800	3500	
Strontium	ug/L	-	7000	5	180	269	
Thallium	ug/L	0.8	-	0.1	<0.1	<0.1	
Tin	ug/L	-	-	2	<2	<2	
Titanium	ug/L	-	-	2	<2	<2	
Uranium	ug/L	15	20	0.1	0.3	0.3	
Vanadium	ug/L	-	-	2	<2	<2	
Zinc	ug/L	-	5000 <sup>AO</sup>	5	84	86	

**Notes:**

\* GEMTEC Sample ID "AW1"

1 = Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Freshwater Aquatic Life (1999 and updates)

2 = Health Canada Guidelines for Canadian Drinking Water Quality (June 2019).

3 = Aluminum guideline = 5 µg/L at pH<6.5, or 100 µg/L at pH>=6.5

4 = Cadmium guideline [µg/L] =  $10^{(0.83[\log(\text{hardness})]-2.46)}$ , for water hardness between 17 and 280 mg/L as CaCO<sub>3</sub>; For water hardness<17, guideline =0.04; For water hardness>280, guideline =0.37; For unknown water hardness, guideline = 0.04

5 = Copper guideline [µg/L] =  $0.2 * e^{0.8545[\ln(\text{hardness})]-1.465}$ , for water hardness between 82 and 180 mg/L as CaCO<sub>3</sub>. If water hardness is <82, guideline = 2; If water hardness is >180, guideline = 4; If water hardness is unknown, guideline = 2

**Table 4 Notes, continued:**

6 = Lead guideline [ $\mu\text{g/L}$ ] =  $e^{1.273[\ln(\text{hardness})]-4.705}$ , for water hardness between 60 and 180 mg/L as  $\text{CaCO}_3$ ; If water hardness is less than 60, guideline = 1; If water hardness is greater than 180, guideline = 7; If water hardness is unknown, guideline = 1

7 = Nickel guideline [ $\mu\text{g/L}$ ] =  $e^{0.76[\ln(\text{hardness})]+1.06}$ , for water hardness between <60 to 180 mg/L as  $\text{CaCO}_3$ . If water hardness <60 mg/L, guideline = 25 ug/L; For water hardness >180 mg/L, guideline = 150 ug/L. If hardness is unknown, guideline is 25 ug/L.

"-" = None established

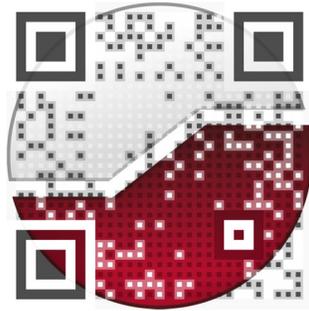
RDL = Reported Detection Limit.

NA = Not applicable

**Results that exceed an applicable CCME guideline or health-based GCDWQ are bolded and shaded.**

Results that exceed a GCDWQ Aesthetic Objective (AO) or Operational Guideline (OG) are shaded.

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité



## **APPENDIX C**

Public Consultation Log

**Appendix C**  
**Hammerdown Gold Project - Public Consultation Log**

Date	Organization	Communication Type	Purpose	Comments/Feedback	Follow-up
28/09/2020	Shoal Pond Cabin Owners Association	In-person meeting	Review of project and discuss next steps of consultation with cabin owners. Discussed parking lot and road with respect to hazards of potential interaction with Maritime vehicles/equipment.	<ol style="list-style-type: none"> <li>1) Agreed that parking area is restricted and needs to be addressed.</li> <li>2) Alternative route for snowmobile trail.</li> <li>3) ATV users need to be accommodated as well.</li> <li>4) all cabin owners have dug wells - very few potable wells.</li> <li>5) one communal well for drinking water near cabins and far from mine site activity.</li> <li>6) Could consider alternate route for mine access road as an option to reduce traffic interaction.</li> <li>7) overall pleased with level of communication by Maritime thus far.</li> <li>8) Suggest using FB to communicate in future.</li> </ol>	<p>Maritime to address NLSF route for this winter.</p> <p>Need to consult further with NLSF.</p>
05/10/2020	NL Snowmobile Federation	In-person meeting	Field assess proposed alternate access for winter groomed trail at Shoal Pond Road.	<p>Could cut new trail south of existing access road.</p> <p>Could also use previous groomed trail route near previous Municipal Landfill site.</p>	<p>Consult with Town to determine feasibility of developing future parking at old Landfill access road.</p> <p>Further consult with Shoal Pond cabin owners on alternative route and parking area at Landfill access road.</p>
13/10/2020	Cabin owner - Muir's Pond	Telephone		No issues or concerns. His opinion is that it is a good project for the region. He does not spend much time into his cabin anymore, and does not overnight at all. Offered to spend more time with him to explain the project in the future if he wanted more information. He indicated that he was fine with the information received and had no issues.	No follow-up required.
14/10/2020	Cabin owner - Muir's Pond	Telephone	Called to discuss project and asked if he would like to get together to review pertinent info about the development. Explained the project at a high level, and what he could expect to see from his cabin area (dust/noise from blasting, trucks and other equipment operating).	Cabin owner had no issues or concerns, and indicated that he didn't need any additional information. He had worked on the previous HD open pit area and indicated that it was a positive project for the area.	No follow-up required.
14/10/2020	Cabin owners	Virtual consultation	Presented overview of project, environmental baseline and next steps. Discussed snowmobile trail rerouting requirements and risk mitigation for vehicle/recreational vehicle interaction.	<p>Limited feedback about the project. Questions:</p> <ol style="list-style-type: none"> <li>1) Concern about water runoff from the site from a downstream cabin owner.</li> <li>2) Blast zone taking in Shoal Pond Access road?</li> <li>3) Will there be a power line?</li> <li>4) If an inside parking lot for cabin owners vandalism may be a concern. Can this be mitigated?</li> <li>5) Unanimous decision by all cabin owners to resurrect the previous groomed trail.</li> </ol>	Maritime Resources to follow up with NLSF about plans to change snowmobile trail route away from the entrance of Shoal Pond Access Road.

20/10/2020	Provincial Office-Deer Lake	Telephone	Discussion and consultation about trail relocation.	Spoke with Supervisor of Trails and grooming (province), and advised of changes proposed to local club trail. Asked about permitting for work required and suggested NLSF manage contractor, but invoice Maritime.	Maritime followed up with email and NLSF to respond with answers to questions. Maritime to attend club meeting on Thursday Oct 22 to present plan.
20/10/2020	NLSF local executive - trails	Telephone	Discussion and consultation about trail relocation.	Discussed the requirement to determine new routing around salvage yard and meeting with local executive at next meeting.	Follow up discussion with rest of executive for local club at Oct 22 meeting.
22/10/2020	NLSF local executive	In-person meeting	Final consultation on NLSF trail relocation with executive membership of local club. Presented slides with justification and discussed path forward.	Local membership feedback was positive and are very willing to work with Maritime to execute this project. Local executive members will work with Maritime and contractor.	Club to follow up on permitting (Stream crossing and forestry cutting). Club to follow up with Dept of Transportation on Route 391 crossing. Maritime to issue draft scope of work to club for review.
06/01/2021	Island Safaris	Telephone	Called to discuss project, providing overview of planned operations, and potential impacts to the region. Asked if there were any concerns from an Outfitters perspective about the project.	Owner indicated that the area needs this type of development, and expressed that there are no concerns from an Outfitters perspective. The region needs employment and projects like Hammerdown to create economic stimulus for the region.	No follow-up required.
13/01/2021	Gull Lake Lodge/Black Ridge Outfitters	Telephone	Called to discuss project, providing overview of planned operations, and potential impacts to the region. Asked if there were any concerns from an Outfitters perspective about the project.	Owner expressed no concerns. Expressed general support for the Project.	No follow-up required.

## **APPENDIX D**

Noise Impact Study of Haul Route and Mining Operations,  
Hammerdown Gold Project, King's Point, NL



January 13, 2021

Reference No. 11219938

Mr. Perry Blanchard  
Vice President – Environment & Sustainability  
Maritime Resources Corporation  
142 Little Bay Road  
Springdale, Newfoundland

Dear Mr. Blanchard:

**Re: Noise Impact Study of Haul Route and Mining Operations  
Hammerdown Gold Project  
King's Point, Newfoundland**

## **1. Introduction**

Maritime Resources Corporation (Maritime Resources) has proposed to develop a new gold mine at their Hammerdown Gold Project (Hammerdown, Project) located approximately 5 km southwest of the Town of King's Point and 15 km northwest of the Town of Springdale in Newfoundland and Labrador. GHD was retained by Maritime Resources to prepare a Noise Impact Study (Study) to assess the impacts of this project. The proposed project will take place at a brownfields mine site and include the following operations:

- An open pit and underground mine
- A waste rock dump and low grade ore stockpiles
- A mobile crushing and ore sorting plant producing 700 tonnes per day of mill feed

The mill feed will be transported and processed at the Nugget Pond Mill gold circuit, which is owned by Rambler Metals and Mining Canada Limited.

This report has been prepared to evaluate any acoustical impacts from the Facility's stationary noise sources within the immediate vicinity of the operations. The operations include the operation of the open pit, waste rock dump and stockpiling sites, the mobile crushing and sorting plant as well as the transportation route for mill feed to Nugget Pond Mill.

## **2. Methodology**

The Study consists of evaluating the noise from two operating components:

- Operational Mining Assessment - Mining and primary crushing of ore to be loaded into trucks at the Hammerdown site.



- Haul Route Transportation Assessment - Transportation of ore from the Hammerdown site along a 130 km haul to existing Nugget Pond Mill.

The Study Area was defined by the area extending 1,500 meters (m) from the proposed operations. Based on GHD's extensive experience conducting noise impact assessments, facilities or industries with significant potential environmental noise profiles or equipment evaluate the off-site environmental noise impact up to 1500 m from the site because the noise impact beyond this distance is expected to be environmentally insignificant.

The rationale for the selection of the Study Areas is that the off-site environmental noise impact from the existing operations is defined by the sound power generated by the equipment and activities on-Site and the proximity and line-of-sight noise exposure to any off-site sensitive receiver locations.

The Study Areas are rural with an acoustical environment that is dominated by natural sounds having little or no road traffic. There are three noise sensitive receivers within 450m of the Hammerdown Deposit site where noise from a stationary source could be received (such as a dwelling or noise sensitive commercial or institutional space). Various sensitive receptors have been identified along the ore hauling route and have been included in Figure 2 and Figure 3A-3D.

The Study presented herein provides an evaluation of the potential noise impacts from the Project generated during normal operation on the sensitive receptors located nearest to the project operations, based on continuous 24-hour operations.

## **2.1 Available Secondary Sources of Information: Collection and Review**

Available secondary sources of information were collected and reviewed to determine the proposed conditions within the Study Area:

- Review of current zoning plans, definitions and land use designations
- Ontario and Nova Scotia technical guidelines and standards for reference
- Previous noise impact studies completed in the area
- "Hammerdown Gold Project – Environmental Assessment Registration" prepared by GEMTEC Consulting Engineers and Scientists (dated July 6, 2020)

## **3. Noise Source Summary**

### **3.1 Site Activities and Noise Source Modelling**

In order to predict the future worst-case noise impacts from the Project activities, representative octave band noise data was used, measure from processing equipment similar to what is noted to be implemented with the Project. This noise data was obtained from the Department of Environment Food and Rural Affairs (DEFRA) "Update of Noise Database for Prediction of Noise on Construction and Open Sites, 2005 and 2006" which is a globally accepted published reference document for sound levels of this



equipment. GHD also used the United States Department of Transportation, Federal Highway Administration (FHWA) document "FHWA Roadway Construction Noise Model User's Guide, 2006" as a supplemental document to obtain sound level data for equipment not listed by DEFRA.

The environmentally significant noise sources or activities occurring in the Study Area are as follows:

Site/Location	Noise Source Description	CadnaA ID(s)	Trips/Hour or #/site	Sound Power Level (dBA)
Inter-mine Haul Roads	Truck – Ore Transport Between Sites	T1	4	128.3
Hammerdown Deposit	Pit Hauling Trucks	T2	8 trips	117.2
	Waste Rock Hauling Trucks	T3	6 trips	118.7
	Loader – ROM to Crusher	T4	20 trips	103
	Loader – Reject Conveyor to Waste Pile	T5	30 trips	111.8
	Reject Conveyor	S1	1	106.7
	Process Building Conveyor #1 & #2	S2 – S3	2	106.7
	Ore Sorting Conveyor #1 & #2	S4 – S5	2	106.7
	Storage Conveyor	S6	1	106.7
	Production Drills	S7A – S7E	5	117.8
	Vibrating Packer/Roller	S8	1	108.0
	Tracked Dozer	S9A – S9C	3	106.3
	Ore Sorting Equipment	S10 – S11	2	85.0
	Truck Unloading Ore	S12 – S14	3	110.2
	Conveyor Dust Collectors	S15	1	93.6
	Crusher Building Walls	S16	1	87.8
	Crusher Building Roof	S17	1	87.8

Locations of each noise source are indicated on Figure 1B-1D and Figure 2A.

#### 4. Points of Reception Summary

A "point-of-reception" (POR) is any point on the premises of a person where sound origination from other than those premises is received. A point-of reception may be located in areas where people may normally live, work, or take part in recreation and does not apply to the work force of a company.

The objective of this Study is to determine the predictable worst-case 1-hour equivalent sound level at the worst-case points-of-reception. The worst-case points-of-reception are defined as the sensitive receptor with the greatest potential exposure to the Facility noise sources due to proximity and direct line-of-sight exposure.

There are several PORs located within 4000 m of the Hammerdown mine site. These are labelled POR01 – POR04 on Figure 1A and include private residences and a scrap metal salvage yard. Using aerial imagery available through Google Earth, a preliminary search along the haul route was completed. This



search identified a number of potential PORs which have been labelled POR05 – POR31 on Figures 3A – 3D. Impacts at each POR were evaluated at a height of 1.5 m which is representative of a typical one-storey home.

## 5. Impact Assessment

Datakusik's Cadna A Acoustical Modelling Software (Cadna A) is the industry standard for environmental noise modelling in Canada. Cadna A 2020 was used to model the potential impact of the significant noise sources. Cadna A calculates sound level emissions based on the ISO 9613-2 standard "Acoustics – Attenuation of Sound During Propagation Outdoors", which accounts for attenuation effects due to geometric divergence, atmospheric attenuation, barriers/berms, ground absorption, and directivity. Topography for the site and surrounding environment was obtained from GHD's GIS department and input in the 3-D acoustical model.

Cadna A modelling assumption used in this Study included:

- **Noise Sources:** All sources were modelled using the 1/1 octave band data from the measured sound level data or reference materials:
  - Noise sources whose dimensions are small in comparison to the distance to the PORs are modelled as point sources in Cadna A. Noise sources extending in only one direction with small dimensions in the other two directions such as conveyor lines or trucking routes are modelled as line sources.
- **Reflection Order:** A maximum reflection order of 1.0 was used to evaluate indirect noise impact from one reflecting surface.
- **Ground Absorption:** The model included ground absorption factor of  $G = 1$  for soft ground, a ground absorption factor of  $G = 0.5$  was used for areas of gravel.
- **Tonality:** A +5 dBA adjustment was applied for tonal sources, if applicable.
- **Building Surfaces:** The buildings are modelled as reflective surfaces.

Default Cadna A acoustic modeling parameters used in this Study include:

Model Parameters	Model Setting
Temperature	10°C
Relative humidity	70%
Wind speed	Downwind condition; wind speed of 3 m/s
Noise source identification	Figure 1 & 2
Max. Search Radius (m)	2500 m
Noise propagation model	Cadna/A ver 4.6 (DataKustik 2016)

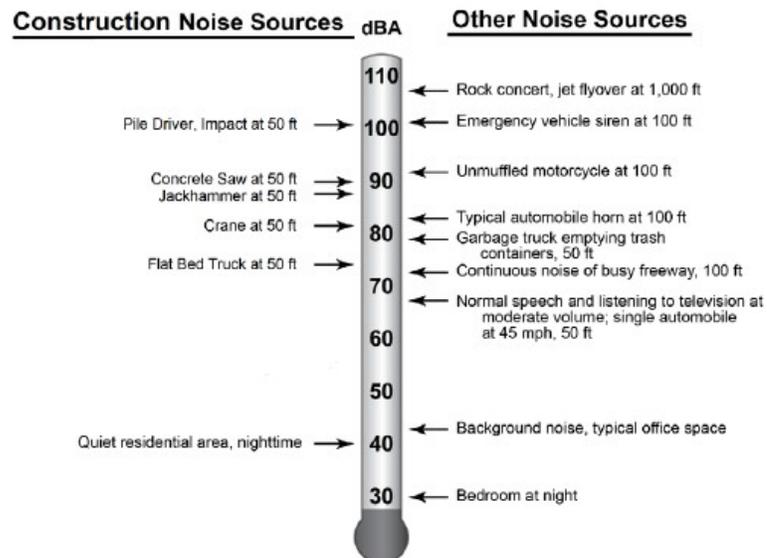


Model Parameters	Model Setting
Standard	ISO 9613
Terrain parameters	Digital ground terrain for area incorporated
Reflection parameters	1 order of reflection

The Cadna A model is the industry standard for environmental noise modeling in Canada. There are three sensitive receptors (POR01-POR03) located within 450m of the Hammerdown Mine Site boundary. The calculated noise impacts at the extent of the Study Area is presented visually with noise contour plots in Figures 1A – 1D. There have been sensitive PORs identified along the ore haul route which are labelled POR04 – POR30. The noise impacts along the haul route have been presented visually with noise contour plots in Figure 2 and Figures 3A – 3D.

Mine operations are at times expected to increase the ambient sound levels for certain distances from the mine sites and ore haul route. Predicted noise levels from the proposed mine operation are expected to attenuate over large distances. Figures 1B – 1D and Figures 3A – 3D shows contour plots which indicate the predicted noise levels from the mine operations and haul route on the surrounding areas.

The figure below provides examples of sound levels from common indoor and outdoor activities. According to the Ontario Ministry of Environment’s “Noise in our Environment” webpage from March 2019, noises are considered to be at an acceptable level between 40 and 60 decibels. The impact of the Hammerdown mining operation at the identified PORs is between 30-50 dBA. The modelled sound levels are not considered to have an adverse effect on the identified sensitive receptors or surrounding areas. It is also important to note that the haul route is utilized by many other mining operations and though the traffic associated with the Hammerdown operation has been modelled, other vehicles that travel this route could influence the sound levels at each POR.





## 6. Conclusion

In general, mining operations often produce significant noise levels that have the potential to impact the surrounding environment within the immediate vicinity. Thus, noise levels produced by equipment at the proposed Hammerdown Project area and associated mill feed hauling route have been assessed with noise contour plots to help understand the noise impacts at various distances relative to the noise sources. The Hammerdown mine site and associated haul route are not expected to have adverse effects at the identified sensitive points of reception or surrounding areas.

Sincerely,

GHD

A handwritten signature in blue ink that reads "Erin Ivens". The signature is written in a cursive style and is contained within a light gray rectangular box.

Erin Ivens, EIT

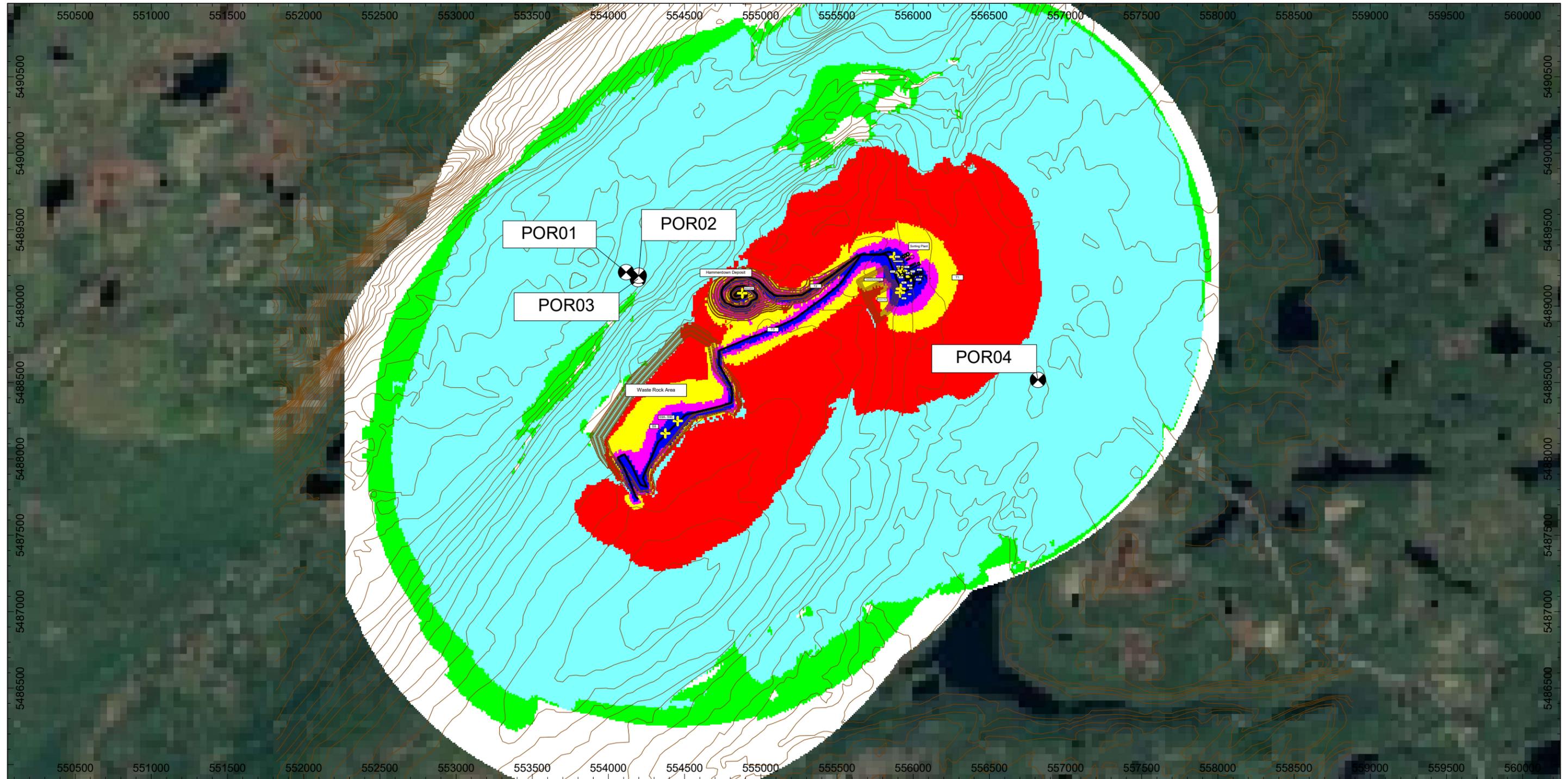
EI/cb/1

Encl.

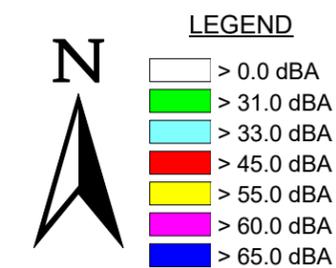
cc: Amy Copeland, GHD

A handwritten signature in black ink that reads "Michael Masschaele". The signature is written in a cursive style.

Michael Masschaele, LEL



Source: Google Satellite

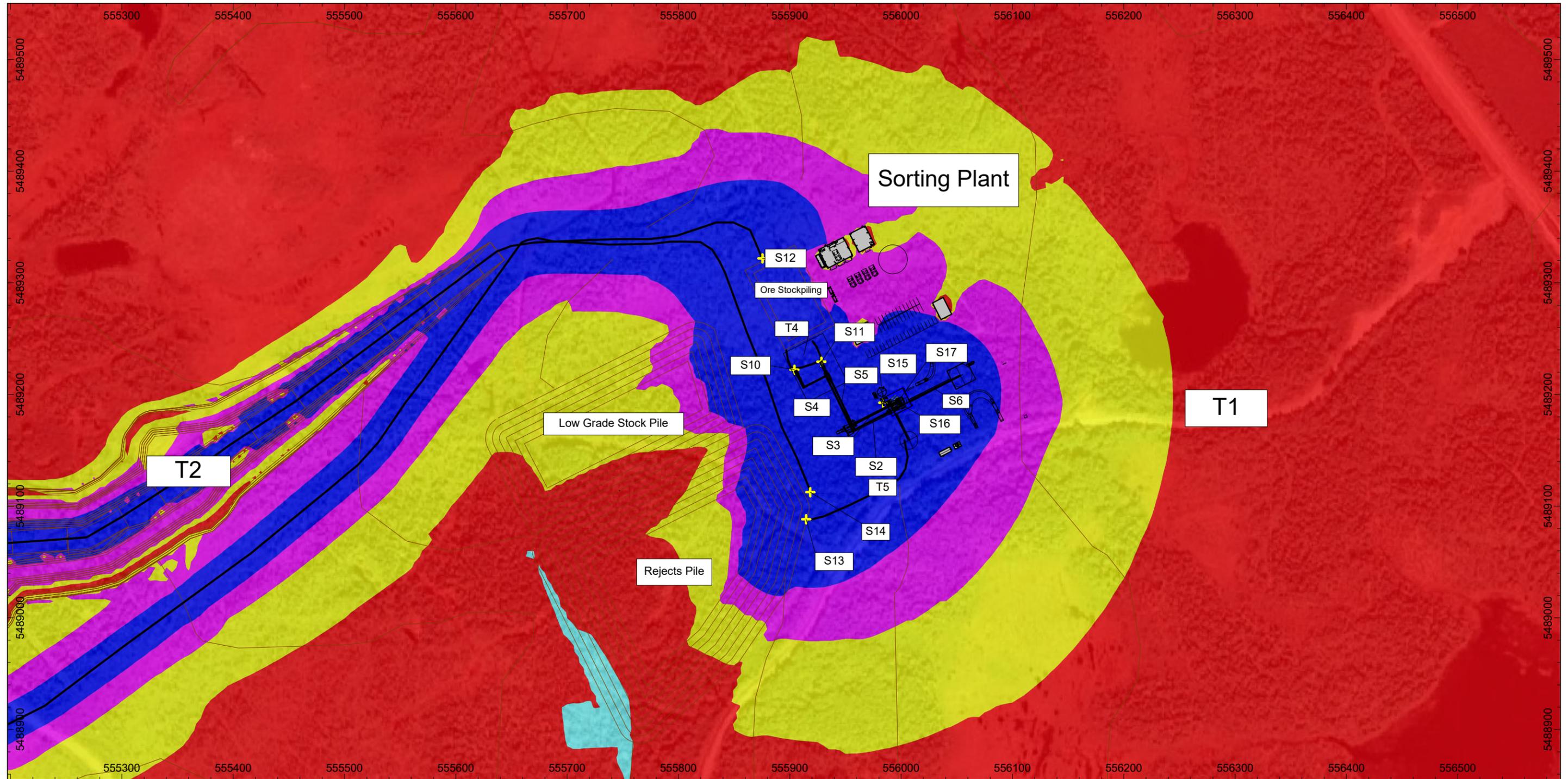


Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

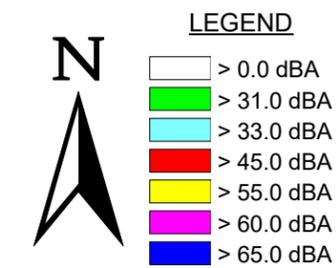
**NOISE CONTOUR PLOT - HAMMERDOWN MINE SITE**

11219938  
12.01.2021

**FIGURE 1A**



Source: Google Satellite

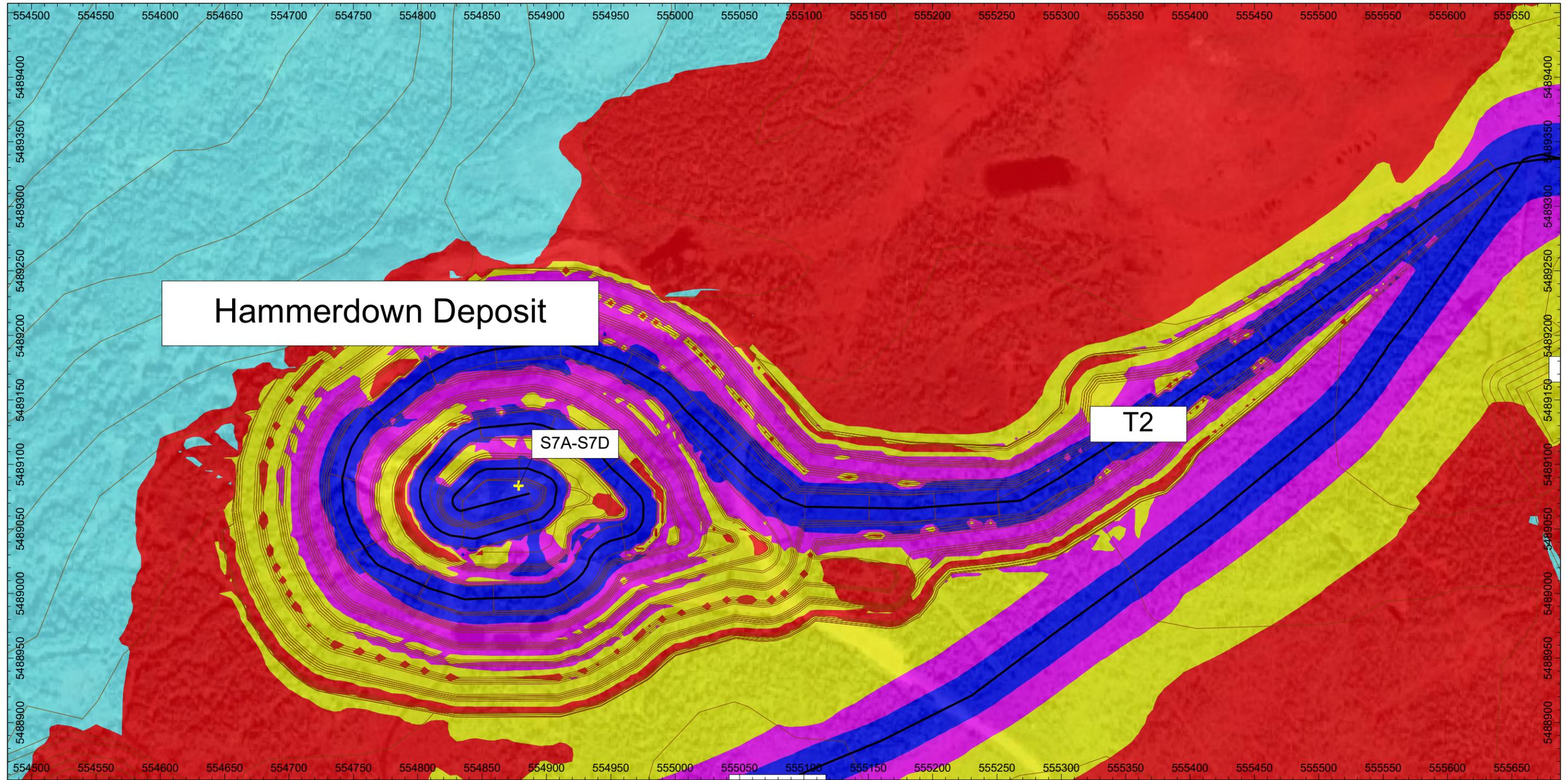


Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

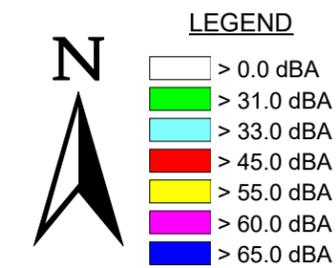
NOISE CONTOUR PLOT - SORTING PLANT

11219938  
07.12.2020

FIGURE 1B



Source: Google Satellite

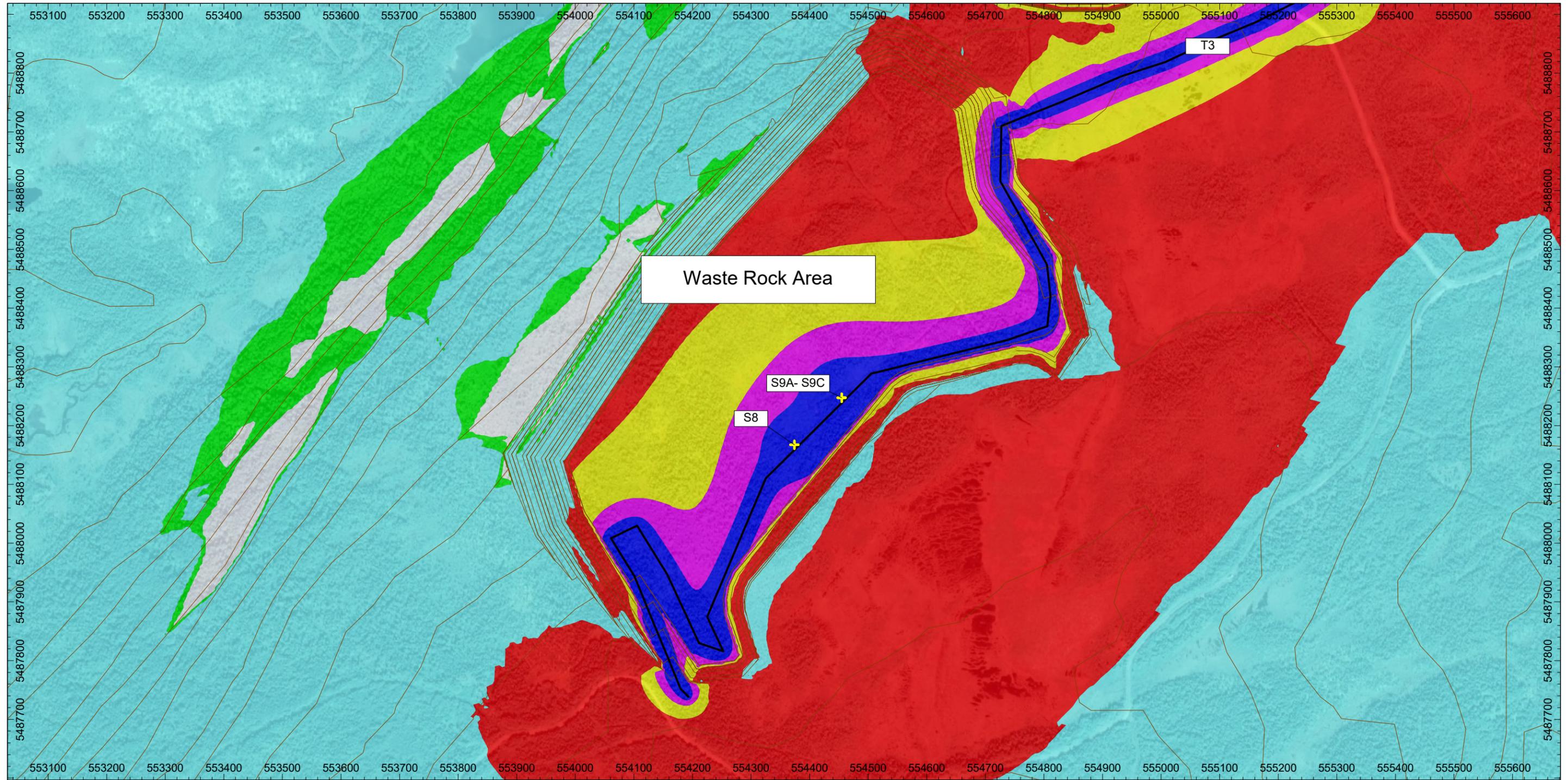


Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

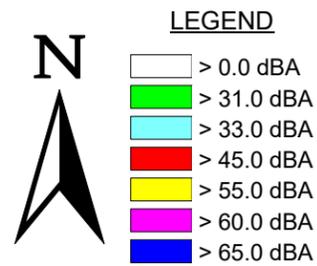
NOISE CONTOUR PLOT - MINE SITE

11219938  
07.12.2020

FIGURE 1C



Source: Google Satellite

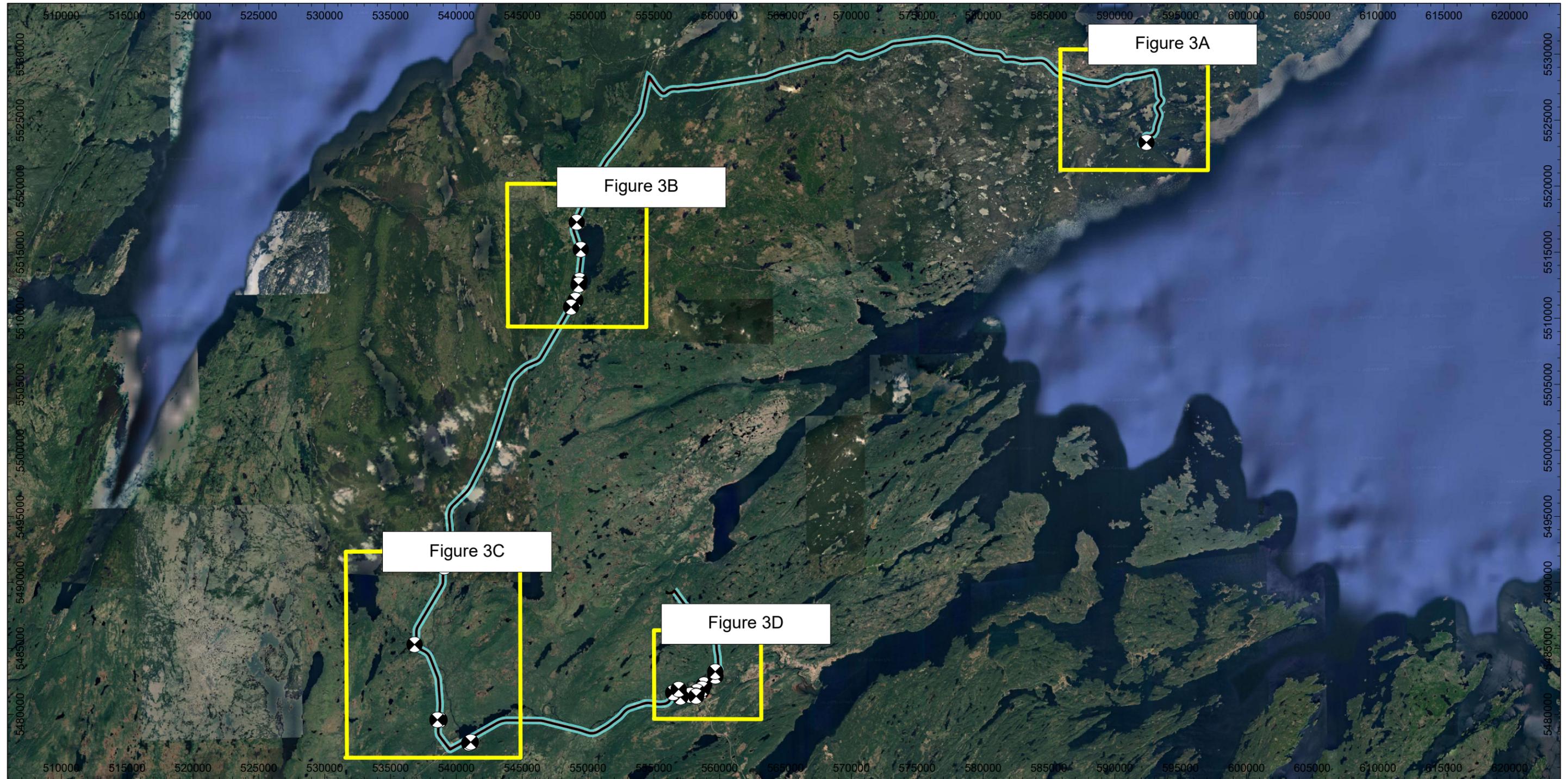


Noise Study  
 Maritime Resources  
 Hammerdown Mine Site, Newfoundland

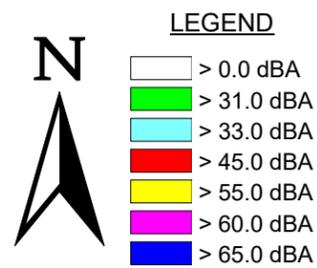
**NOISE CONTOUR PLOT - WASTE ROCK AREA**

11219938  
 07.12.2020

**FIGURE 1D**



Source: Google Satellite

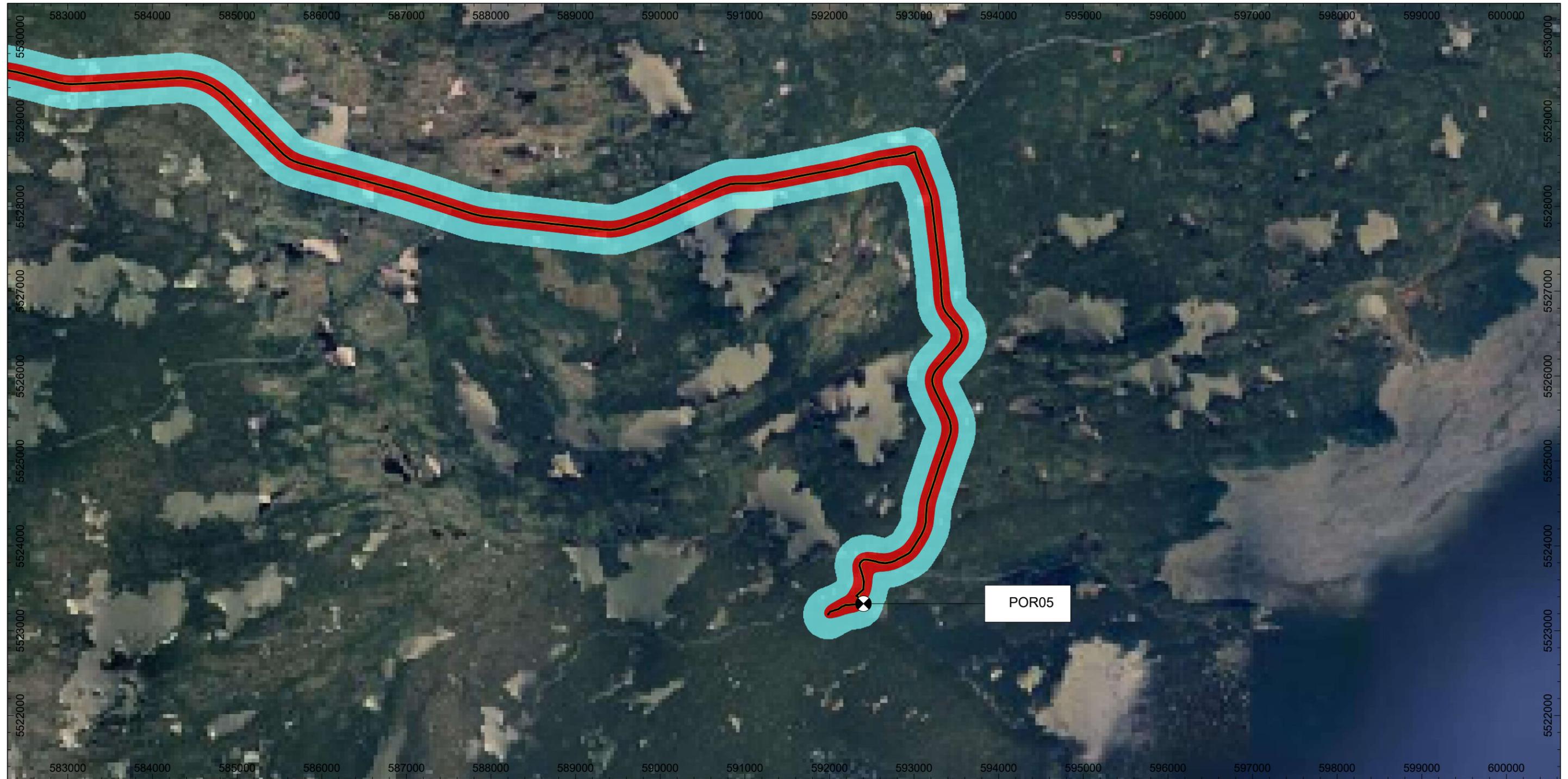


Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

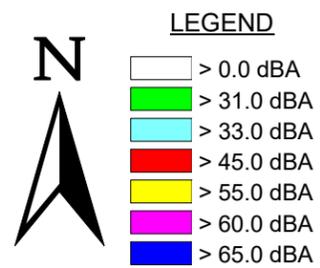
**NOISE CONTOUR PLOT - ORE HAUL ROUTE**

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07.12.2020

**FIGURE 2**



Source: Google Satellite



Noise Study  
 Maritime Resources  
 Hammerdown Mine Site, Newfoundland

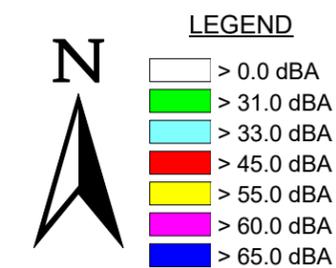
NOISE CONTOUR PLOT - ORE HAUL ROUTE (SECTION 1)

11219938  
 07.12.2020

FIGURE 3A



Source: Google Satellite

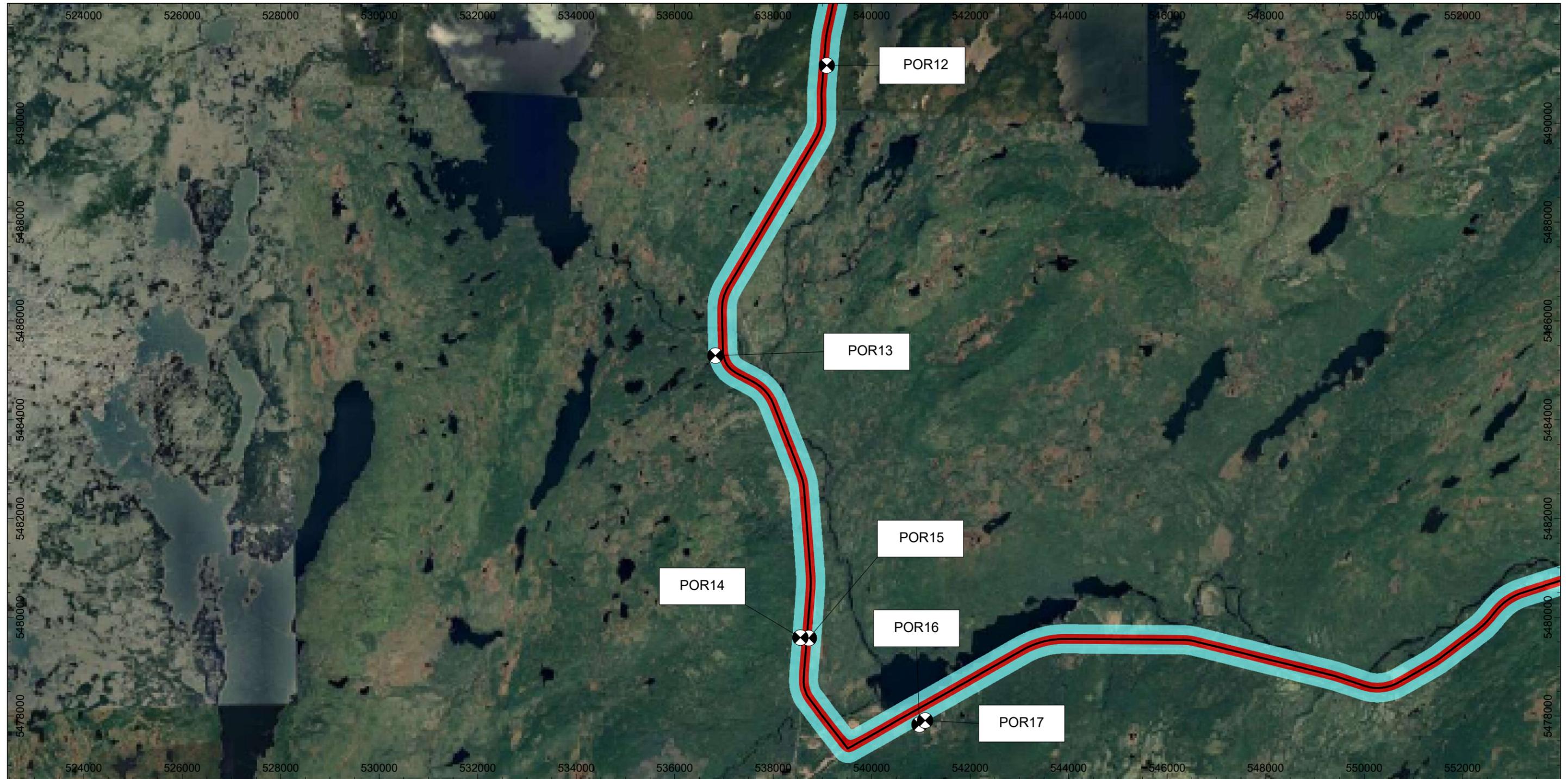


Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

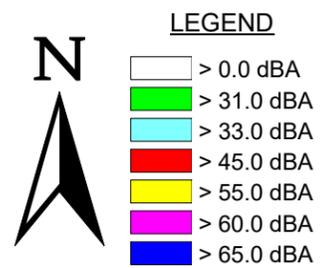
NOISE CONTOUR PLOT - ORE HAUL ROUTE (SECTION 2)

11219938  
07.12.2020

FIGURE 3B



Source: Google Satellite

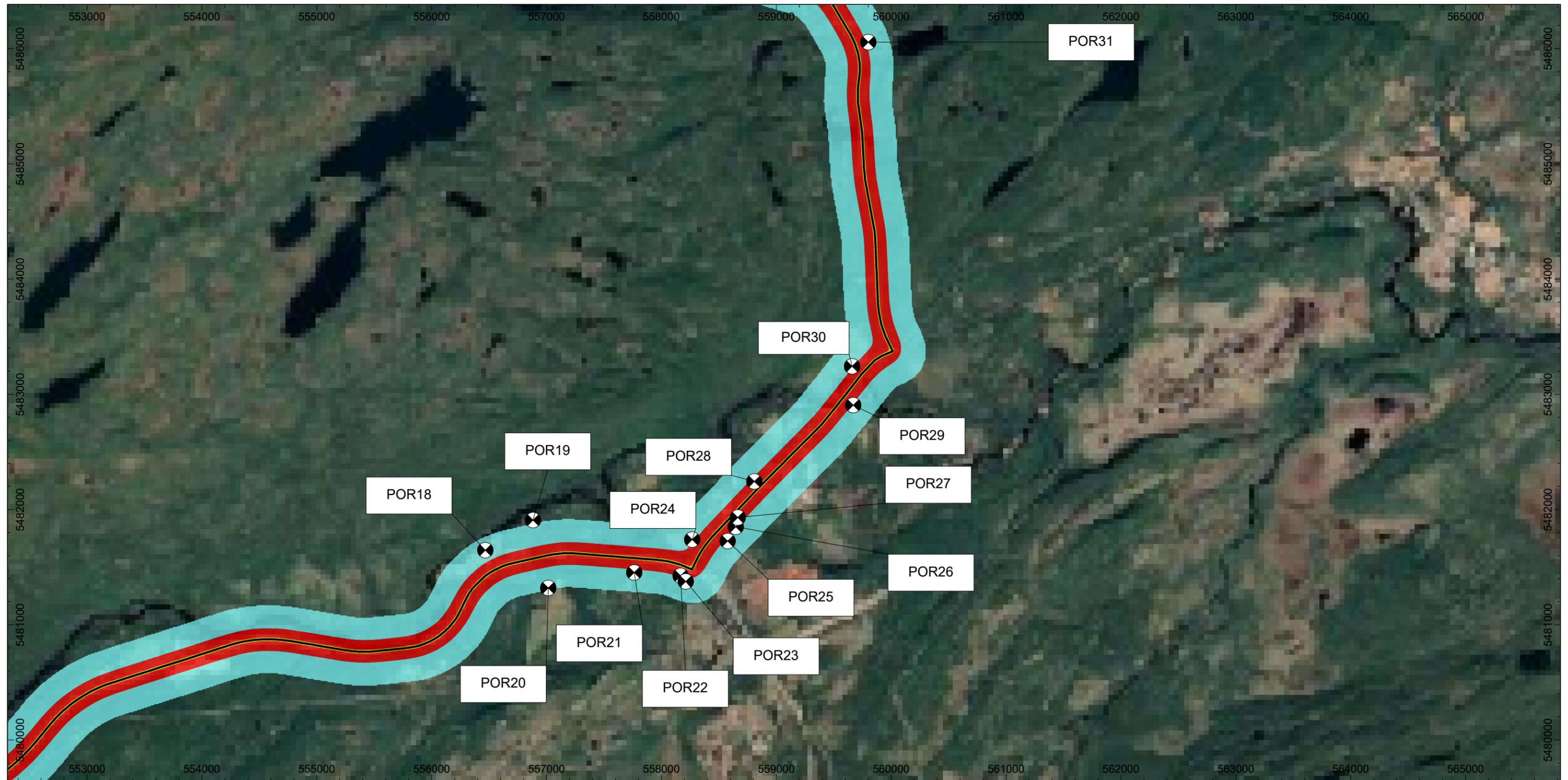


Noise Study  
Maritime Resources  
Hammerdown Mine Site, Newfoundland

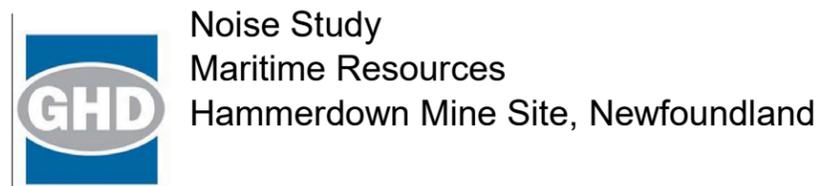
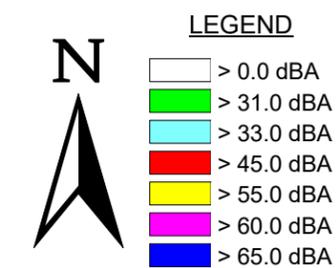
NOISE CONTOUR PLOT - ORE HAUL ROUTE (SECTION 3)

11219938  
07.12.2020

FIGURE 3C



Source: Google Satellite



NOISE CONTOUR PLOT - ORE HAUL ROUTE (SECTION 4)

11219938  
07.12.2020

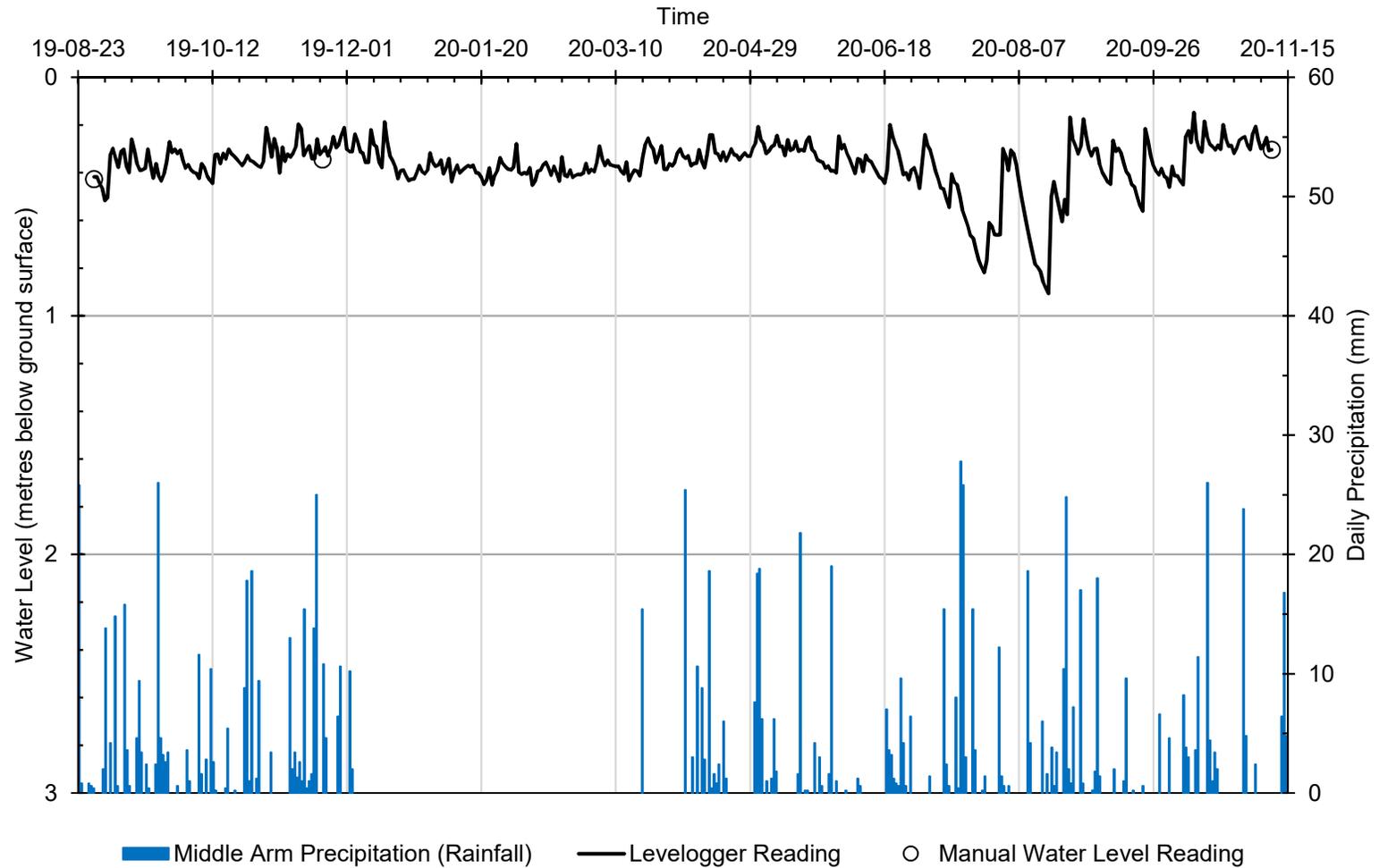
FIGURE 3D

## **APPENDIX E**

Time Series Groundwater Level Hydrographs

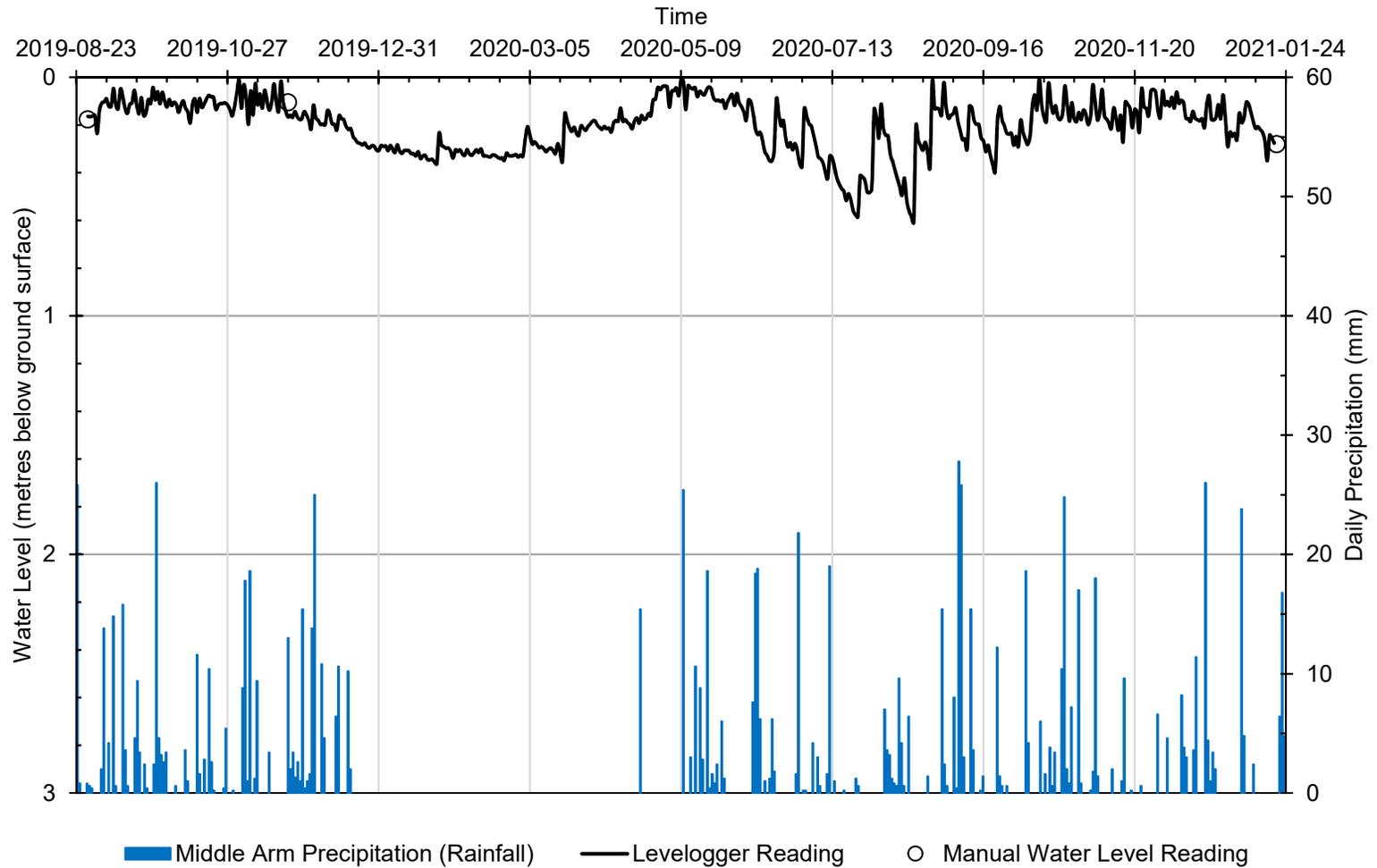
**Title: MW1 Long-Term Water Level Data**

**Project:** Long-term Groundwater Level Monitoring: 08/28/2019 to 11/09/2020  
Hammerdown Gold Mine Development Project, King's Point, NL



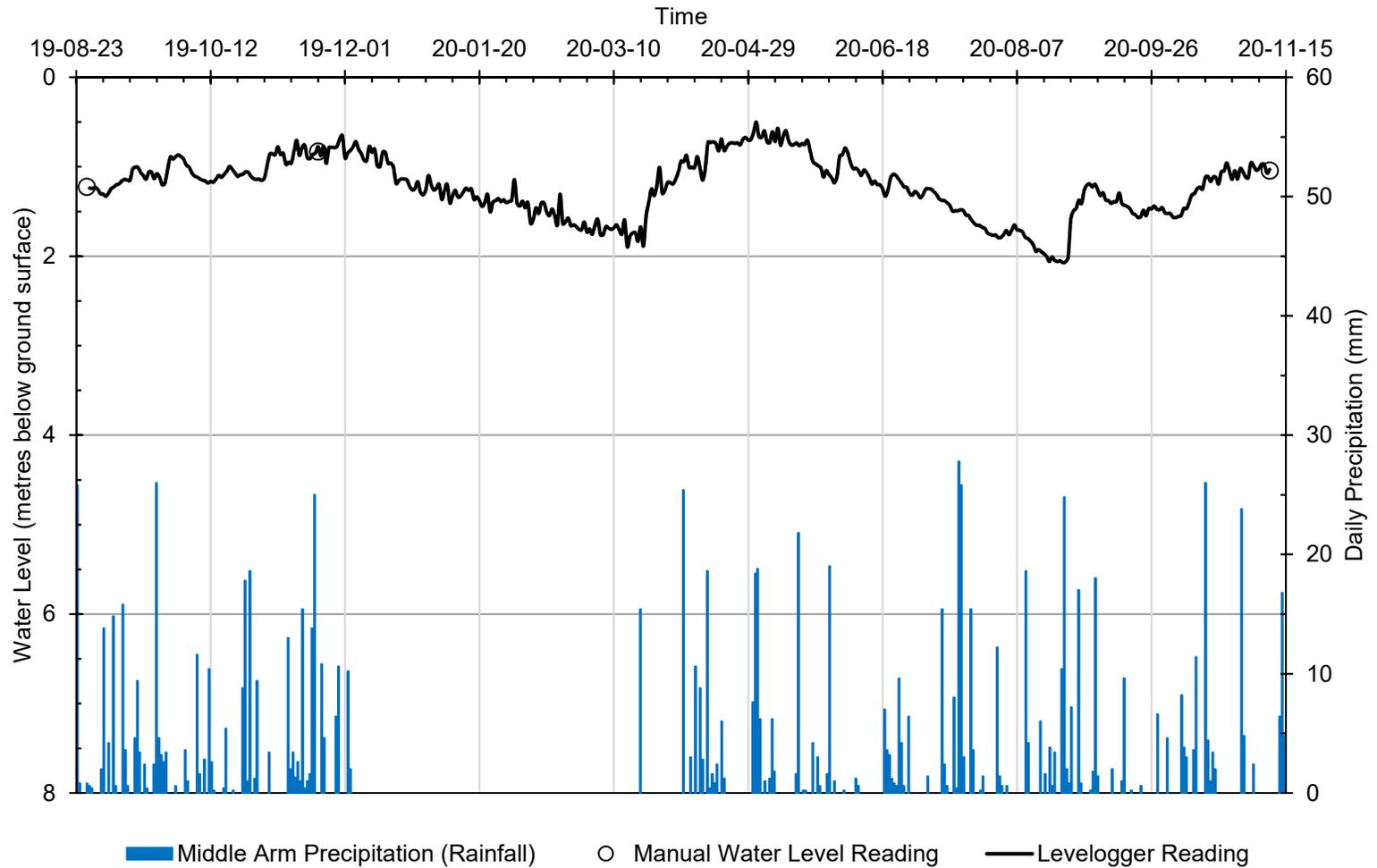
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Hammerdown Gold Mine Development Project, King's Point, NL



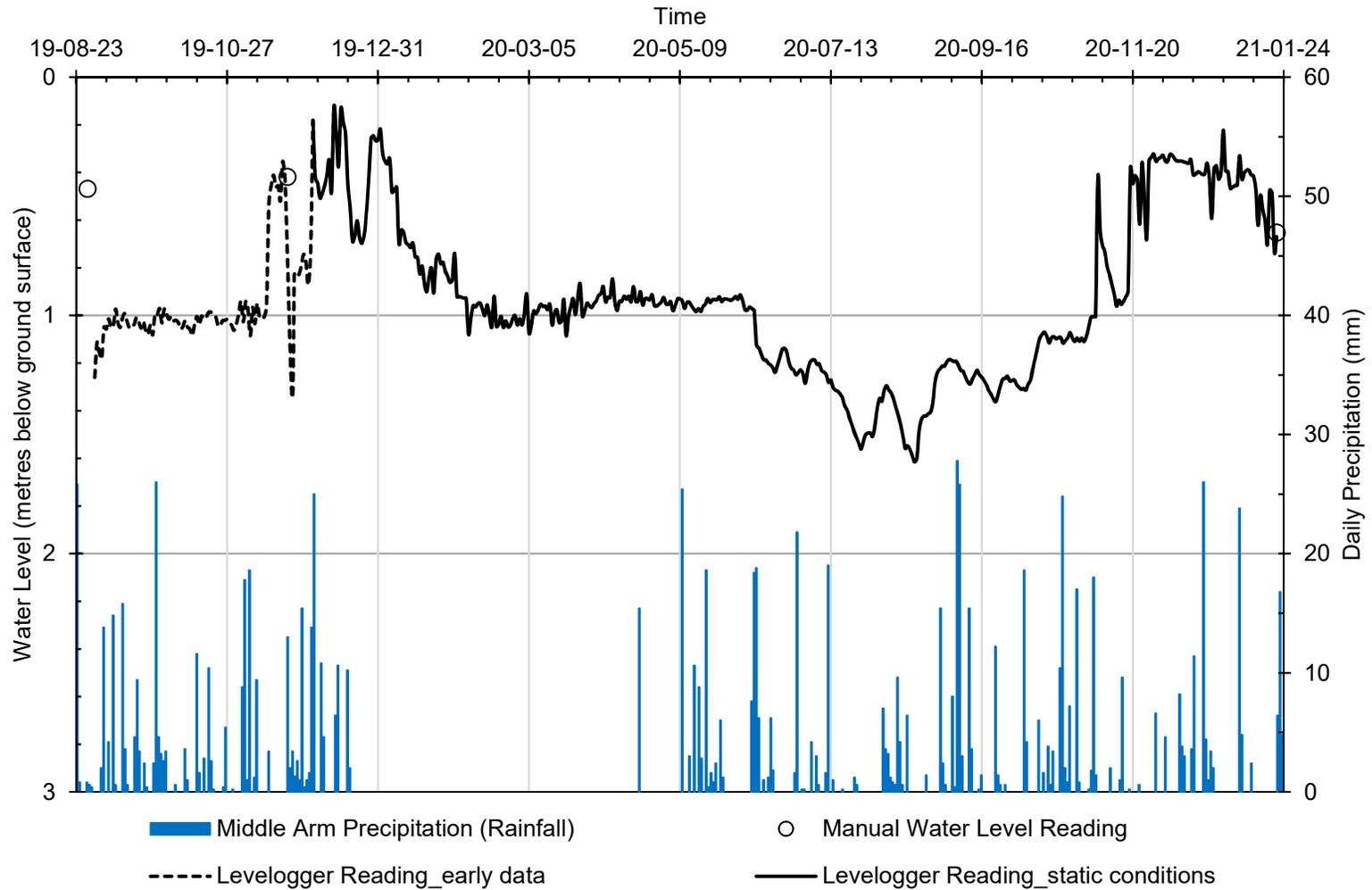
**Title: MW3 Long-Term Water Level Data**

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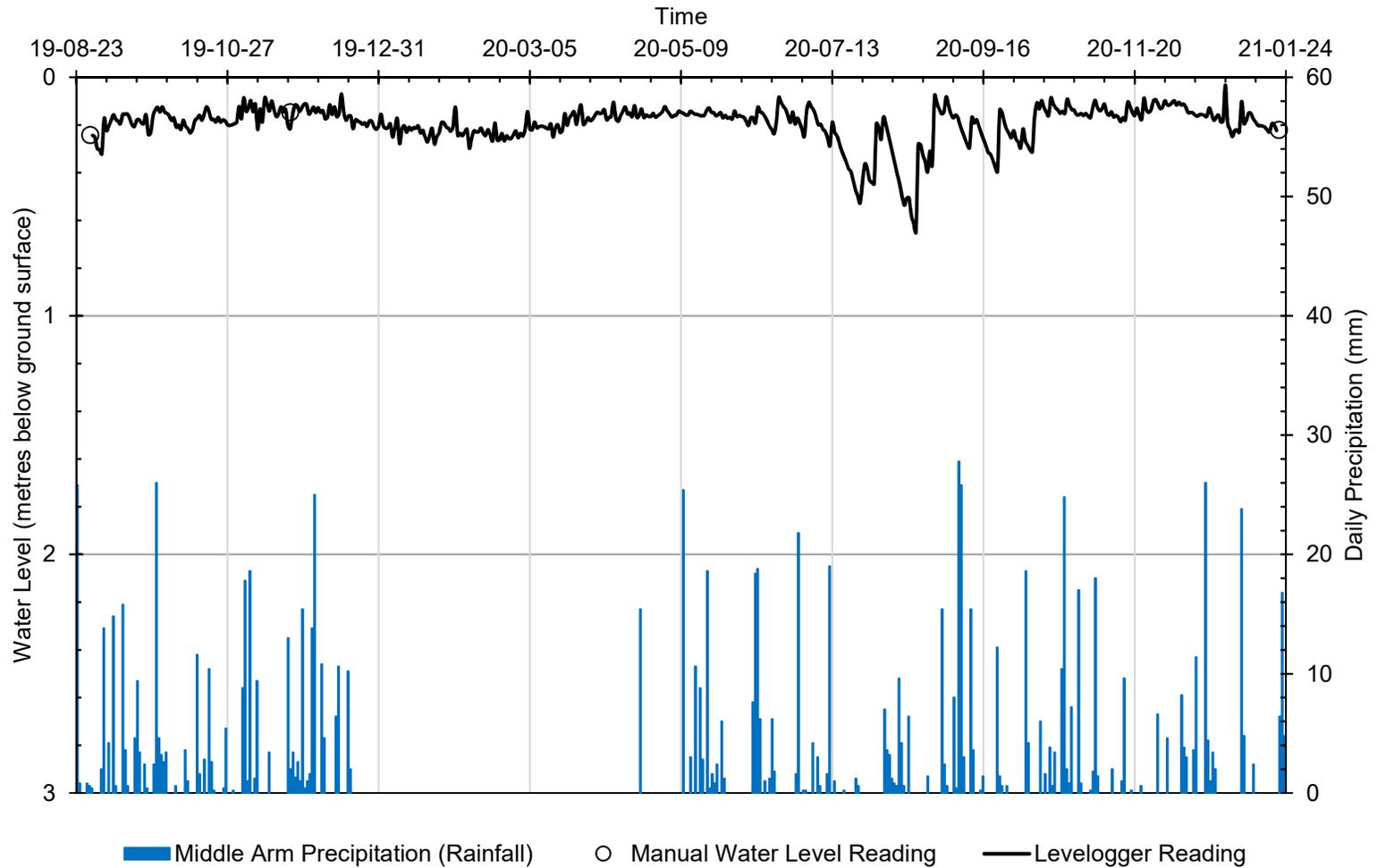
**Title: MW4 Long-Term Water Level Data**

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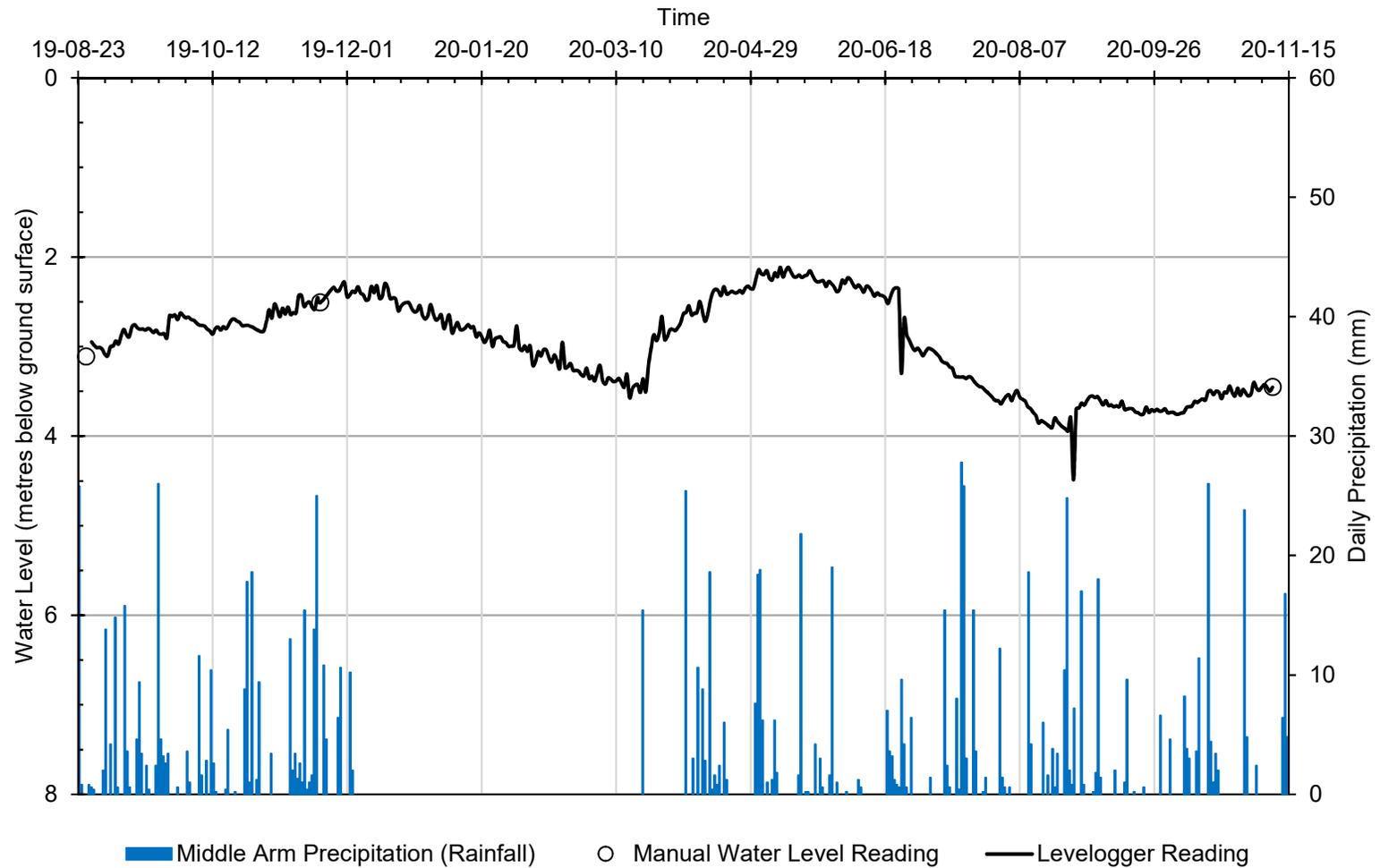
**Title: MW5 Long-Term Water Level Data**

**Project:** Long-term Groundwater Level Monitoring: 08/30/2019 to 01/20/2021  
Hammerdown Gold Mine Development Project, King's Point, NL



**Title: MW6 Long-Term Water Level Data**

**Project:** Long-term Groundwater Level Monitoring: 08/28/2019 to 11/09/2020  
Hammerdown Gold Mine Development Project, King's Point, NL



## **APPENDIX F**

BACT Analysis



# GEMTEC

[www.gemtec.ca](http://www.gemtec.ca)

## **BACT Analysis Hammerdown Gold Project King's Point, NL**

GEMTEC Project: 80044.12



# GEMTEC

[www.gemtec.ca](http://www.gemtec.ca)

Submitted to:

Maritime Resources Corp.  
1900-110 Yonge Street  
Toronto, Ontario  
M5C 1T4

**BACT Analysis**  
**Hammerdown Gold Project**  
King's Point, NL

March 2021  
GEMTEC Project: 80044.12

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## 1.0 INTRODUCTION

### 1.1 Project Background

Maritime Resources Corporation (“Maritime”) is proposing to develop a new gold mine at their Hammerdown Property (the Property) located approximately 5 kilometres (km) southwest of the Town of King’s Point and 15 km northwest of the Town of Springdale, Newfoundland and Labrador (NL) (Figure 1). The Project will comprise an open pit mine, an underground mine, a waste rock dump, a low grade ore stockpile, a mobile crushing and ore sorting plant, and associated operational infrastructure including water management features. The crushing and ore sorting plant will be designed to produce approximately 700 tonnes per day (tpd) of product feed that would be transported and processed at the existing Nugget Pond Mill (NPM) gold circuit, owned and operated by Rambler Metals and Mining Canada Limited (Rambler) for gold doré production. Tailings will be stored in the existing Tailings Management Facility (TMF) at the NPM. A Life of Mine (LOM) plan supporting six years of operations is expected for the Project based on currently planned production rates and estimated gold prices.

### 1.2 Regulatory Context

Both the federal government, as part of the 2015 Paris Agreement, and the provincial government, as part of The Way Forward on Climate Change (2019), have committed to reducing greenhouse gas (GHG) emissions by 30 percent below 2005 levels by 2030. NL has also joined with other members of the Conference of New England Governors and Eastern Canadian Provinces in adopting a regional GHG reduction target for 2030. The target is to reduce regional GHG emissions by 35 to 45% below the 1990 regional GHG emissions level. Proposed GHG reduction targets are linked to carbon pricing and the 2016 PanCanadian Framework on Clean Growth and Climate Change included commitments to introduce carbon pricing in all provinces and territories.

On January 1, 2019, NL’s carbon program was implemented and includes performance standards for large industrial facilities and a carbon tax on fuels combusted outside regulated facilities’ boundaries. For industrial facilities, there are three tiers in the *Management of Greenhouse Gas Act* (MGGA):

- Facilities that emit 15,000 tonnes of carbon dioxide (CO<sub>2</sub>) equivalent or more of GHG in a year must report their emissions to the provincial government in accordance with the methodology laid out in the *Management of Greenhouse Gas Regulations* (MGGR).
- Facilities that emit between 15,000 and 25,000 tonnes of CO<sub>2</sub> equivalent of GHG in a year may apply to be designated as opted-in facilities.
- Facilities that emit more than 25,000 tonnes of CO<sub>2</sub> equivalent of GHG are subject to annual GHG reduction targets.

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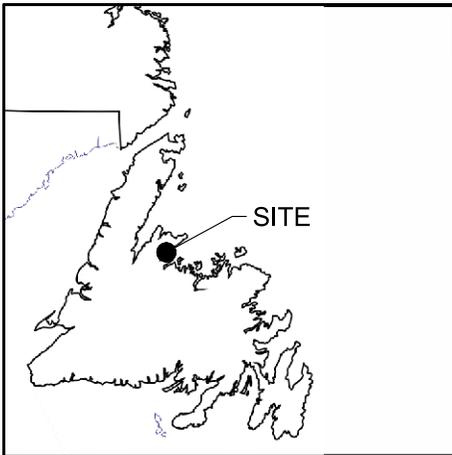
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Note:  
 1. Topographic maps 12H and 02E, source GeoGratis (Government of Canada).  
 2. Coordinate system: NAD83 UTM Zone 21.



Project <b>BACT ANALYSIS HAMMERDOWN GOLD PROJECT</b>			Drawing <b>PROJECT LOCATION</b>		  <small>Consulting &amp; Environmental Water Services</small>
Drawn By <b>CHG</b>	Date <b>February 2021</b>	Project No. <b>80044.12</b>	Drawing No. <b>FIGURE 1</b>	Revision No. <b>0</b>	

Based on the current plan for construction and operations, GHG emissions for the Project will be slightly above the 15,000 tonne threshold for select years within the proposed six year LOM. Therefore, this Project will be regulated under the NL MGGA.

S.4. (1) Except as provided in section 7, this Act applies to an industrial facility that emits 15,000 tonnes of carbon dioxide equivalent or more of greenhouse gases in any year after the coming into force of this Act. (*Management of Greenhouse Gas Act, 2019, SNL2019*).

The Project was registered with the NL Environmental Assessment Division (NLEAD) for environmental assessment (EA) review in July 2020 and Maritime was informed in September 2020 that an Environmental Preview Report (EPR) would be required.

EPR Guidelines issued to Maritime stipulate a requirement to provide additional information related to Best Available Control Technology (BACT) and in accordance with section 12.1 of the MGGR presented below.

S.12.1(4) An industrial facility is considered to meet [BACT] requirements where the Lieutenant Governor-in-Council is satisfied that the combination of machinery and equipment in the industrial facility: (a) has the most effective [GHG] emissions control, (b) has proven performance and reliability in comparable industrial facilities, (c) is economically feasible, based on consultation with the operator, and (d) complies with an Act or regulation relating to air pollution, occupational health and safety and fire and life safety. (*Management of Greenhouse Gas Regulations, 2019, NLR2019*).

It is Maritime's understanding that the BACT requirements of the MGGR apply to the Project. Evaluation of BACT will be discussed in the context of current project considerations for site power requirements, and operations equipment.

Maritime requested that GEMTEC complete a BACT analysis as required by the EPR guidelines for the Project and to provide an assessment that met the EPR requirements. To complete this work, GEMTEC reviewed the Registration stage comments provided by the climate Change Branch (CCB), reviewed the EPR guidelines, discussed issues associated with Maritime's Project and consulted with officials of the CCB. The steps in this analysis follow guidance provided by the CCB.

## **2.0 BACT ANALYSIS OBJECTIVES**

GHGs such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) can be emitted from a number of natural and anthropogenic sources. The main GHG emissions generated from diesel fuel combustion are CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. The 2017 total Newfoundland and Labrador GHG emissions expressed as carbon dioxide equivalent (CO<sub>2</sub> eq) was 10.0 Mt CO<sub>2</sub> eq (Environment and Climate Change Canada 2018), an increase of 6.9 % from the 2005 level.

The 2017 total Canada GHG's expressed as CO<sub>2</sub> eq was 714 Mt, a decrease of 2.0 % from the 2005 level (Environment and Climate Change Canada 2018). The NL carbon program is projected to reduce cumulative GHG emissions by over 0.65 million tonnes between 2019 and 2030.

The primary purpose of a BACT analysis is to demonstrate that technology decisions made relative to Project execution consider energy, environmental and economic impacts associated with the application of alternative control systems.

This BACT analysis has considered the combination of processes and equipment chosen for the Project with a view to demonstrating that the technology chosen:

- has the most effective (GHG) emissions control,
- has proven performance and reliability in comparable industrial facilities,
- is economically feasible, and
- complies with the NL *MGGA* and *MGGR*, *Occupational Health and Safety Act* and its *Regulations* and *Fire and Life Safety Regulations*.

This work included:

- Consultation with appropriate regulators;
- Identification and review of all technologies that were considered for the Project;
- Evaluation of technically feasible options;
- Ranking of options deemed technically feasible;
- Analysis of predicted impacts of technically feasible options; and
- Rationale for control options selected.

### **3.0 PROJECT COMPONENTS AND TECHNOLOGIES CONSIDERED**

The Project registration document presents the necessary project components, and associated execution details to support the six-year life of mine and has been based on environmental and technical studies completed to date. Currently, the Project has not been subject to a feasibility study analysis, and a production decision has not been reached. However, in determining the BACT for the project as it is described in the Project Registration document, an evaluation of applicable technology has been conducted. As Project planning continues and a feasibility study is performed to support a production decision, further analysis and considerations for BACT will be included, and consultation with the CCB will continue.

This BACT analysis will characterize the GHG emissions inventory for the Project, and will also address the following Project components in further detail in the sections that follow:

- Primary power to support total site requirements;
- Selection of an emergency back-up generator;

- Options for ore processing; and
- Mobile equipment for open pit and underground;

Additionally, and with respect to overall project GHG emissions, information will also be presented to highlight planned aspects of operations that help to create operational efficiencies, and at the same time, aid in reducing annual GHG emissions.

### 3.1 Project Energy Provision

Maritime considered two scenarios whereby adequate energy could be provided to the Project site over the life of the Project. The King's Point area is not considered remote and is served by provincially maintained roads, and communities in the area are serviced by a provincial electricity grid. There is no potential for wind or solar energy at the Project site as these options would prove unreliable, expensive and unnecessary given the availability of grid provided electricity, primarily derived from hydroelectric power generation. As such Maritime considered the following two options for supplying power to the site:

- Connection to the provincial electricity grid; and
- Use of diesel generators, i.e., power plant.

#### 3.1.1 Grid Connection

It is understood that the existing capacity of NL Hydro's grid is sufficient to provide the required power to the Project site, and NL Hydro has a substation located at Springdale, NL. As a feasible option, a new powerline to the Project site would be constructed from the main transmission corridor which parallels provincial Route 391, be approximately 1 km long, following the former utility corridor that supported the former Richmond Mines operation from 2000 to 2004 (Figure 2). A power measuring station would be installed near the entrance of the Project site and from there, a 25 kV powerline would feed a main substation and various infrastructures on site. A transformer for small and medium loads (up to 500 kVA) would be mounted on wood poles directly on the 25 kV powerline.

The estimated annual energy requirements for key components of the Project, excluding the construction phase, are shown below in Table 1.

**Table 1: Estimated Annual Energy Requirements from NL Power Grid**

Component	Power Installed (kW)	Horsepower	Connected Load (kW)	Demand Load (kW)	Annual Consumption (kW.h)
Crushing/Screening Plant	469.96	662.65	444.30	295.68	2,331,113
Sorting Plant	1,493.88	2,106.37	1,099.43	1,064.00	4,498,663
Infrastructure	785.40	1,107.41	743.00	712.30	3,288,508

Component	Power Installed (kW)	Horsepower	Connected Load (kW)	Demand Load (kW)	Annual Consumption (kW.h)
Underground Mine	957.92	1,350.67	897.51	329.76	2,888,708
Total	3,707	5,227	3,184	2,402	13,006,991

The electrical power required for the underground facilities and equipment would be fed by cables installed in the ramp at a voltage level of 4.16 kV, 3 phases, 60 Hz. Portable substations would be located in various locations of the mine to convert the voltage from 4.16 kV to 600 Volts. Equipment requiring electrical power will be fed from a portable substation distribution centre and equipment panel.



**Figure 2: Existing Access Road and Proposed Electrical Infrastructure Corridor**

### 3.1.2 Diesel Power Plant

An alternative to grid supplied energy is fixed station diesel generators, i.e., a dedicated Project power plant to provide all of the Project energy requirements. Maritime estimates that a generator configuration that provides approximately 4 MW would be required to power the site on an ongoing basis in the absence of grid supplied electricity, enough to maintain between 2.5-3.5 MW.

Assuming a scenario where two 2MW generators are used, and in order to sustain operations at the Hammerdown Gold Project, each 2MW generator would be required to operate at a full load capacity year round. Based on this scenario, it is estimated that each unit would consume

approximately 538 litres/hour. Based on a diesel emissions factor of 2,663 (Climate Change Branch, 2017), the estimated GHG emissions per year for two 2MW generator sets is calculated based on the following formulae:

*GHG Emissions/year = (fuel per hour) X (hours per year of operation) X [GHG emissions factor (EF)]/1000*

*GHG Emissions/year = (538 L/hr X 8,760 hours/yr X 2.663)/1000 = 12,550 tones CO<sub>2</sub>e per unit*

Estimated emissions from two 2MW generators are estimated to be 25,100 CO<sub>2</sub>e annually and over the LOM the total emissions are estimated to be 150,604 CO<sub>2</sub>e.

### **3.1.3 Backup Energy Provision – Diesel Generator**

In the event of grid supplied power interruptions, Maritime will address backup power requirements with diesel generator(s) that will provide a required capacity of approximately 2MW. Data from NL Power indicates that on average, power outages in the area last 2.8 hours or 0.2 days annually (Hatch Ltd 2015). Therefore, the estimated annual GHG emissions for this unit over the LOM is:

*GHG Emissions/year = (538 L/hr X 2.8 hours/yr X 2.663)/1000 = 4.0 tones CO<sub>2</sub>e per unit*

Diesel generators are subject to emission standards and fall into the category of non-road engines. The engines of on-road vehicles usually have advanced emission controls that are not typically found on non-road engines. The non-road engines generally emit air pollution particles at much higher rates. The main model regulations for emission standards that are used by many countries are the United States Environmental Protection Agency (USEPA) through section 213 of the Clean Air Act (42 U.S.C. 7547) (Wikipedia 2020).

Both CAT® and Cummins® manufacture the type of backup diesel generators required, and both market various Tier levels of diesel generators.

The Tier level relates to the emission standards level and corresponding emissions emittance. The four Tier system for non-road engines was developed in 1998 by the USEPA to establish emissions standards for non-road combustion engines.

## **3.2 Mining Activity**

### **3.2.1 Construction Phase**

During the 12-month construction phase of this Project, GHGs will be emitted primarily from the combustion of diesel fuel used in the heavy equipment fleet. Additional sources of GHG emissions include pumps, some small generators, lighting plants, and from the use of explosives (Table 5).

**Table 2: Equipment Type and Estimated Diesel Consumption during Construction**

Equipment Type	Power (kW)	No. of Pieces of Equipment Anticipated
Haul truck	551	3
Hydraulic excavator	578	1
Wheel loader	396	1
Production drill	242	3
Dozer	337	3
Grader	163	1
Light Plants	6	4
Pumps	10	2
Site Dump Truck	208	1
Support Excavator	270	1
Water Truck	208	1
Lube/Fuel Truck	208	1
Total annual diesel consumption – equipment (L)		3,276,938
Total annual diesel -explosives (L)		48,678
<b>Total annual diesel consumption (L)</b>		<b>3,325,616</b>

The construction period will last approximately one year and will operate on a 24/7 schedule with two shifts daily. The construction period will complete tasks that provide support for later production activities including overburden removal, blasting, material transport and stockpile, road building and site ditching/grading.

Maritime estimates that approximately 9,265 tonnes of CO<sub>2</sub>e (Table 6) will be generated over the construction period of the Project (one year).

**Table 3: Predicted GHG Emissions during Construction**

GHG Component (tonnes)	Predicted GHG Emissions (tonnes)
CO <sub>2</sub>	8,856.12
CH <sub>4</sub>	11.06
N <sub>2</sub> O	396.41
CO <sub>2</sub> e	9,265.17

\*Based on a predicted volume of diesel to be used of **3,325,616 L**

### 3.2.2 Operation Phase - Open Pit and Underground

The open pit mining component of the Project will require equipment noted in Table 7 as part of normal mining operations. Both open pit and underground mining will operate on a 24/7 schedule with two shifts daily. The operation phase will involve all manner of production activities, including mine excavation, blasting, material transport and waste rock stockpile construction.

**Table 4: Open Pit Equipment and Estimated Diesel Consumption during Operations**

Equipment Type	Power (kW)	No. of Pieces of Equipment Anticipated					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Haul truck	551	7	10	6	-	-	3
Hydraulic excavator	578	2	2	2	-	-	1
Wheel loader	396	2	2	2	-	-	2
Production drill	242	5	5	2	-	-	2
Dozer	337	3	3	3	0.5	0.5	1
Grader	163	1	1	1	0.5	0.5	1
Light Plants	6	4	4	4	4	4	4
Pumps	10	2	2	2	2	2	2
Site Dump Truck	208	1	1	1	1	1	1
Support Excavator	270	1	1	1	1	1	1
Water Truck	208	1	1	1	1	1	1
Lube/Fuel Truck	208	1	1	1	1	1	1
Total annual diesel consumption-equipment (L)		5,371,126	6,292,568	4,728,908	624,301	624,301	2,913,946
Total annual diesel-explosives (L)		191,642	198,502	99,603	-	-	14,359
<b>Total annual diesel consumption (L)</b>		<b>5,562,768</b>	<b>6,491,070</b>	<b>4,828,512</b>	<b>624,301</b>	<b>624,301</b>	<b>2,928,304</b>

The underground mining component of the Project will start in year three of the Project operation and will require equipment noted in Table 8 as part of normal mining operations.

**Table 5: Underground Mine Equipment and Estimated Diesel Consumption during Operations**

Equipment Type	Power (kW)	No. of Pieces of Equipment Anticipated					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Jumbo - 2 Boom	110	-	-	1	1	1	-
Jumbo - 1 Boom	55	-	-	-	2	2	1
Bolter	111	-	-	1	1	1	1
7.0t Scooptram	150	-	-	1	2	2	2
3.5t Scooptram	72	-	-	-	2	3	2
Haul truck	242	-	-	2	3	3	2
LH drill (electric)		-	-	-	1	1	1
Explosives Loader	69	-	-	1	2	2	2
Fuel and lube truck	111	-	-	1	1	1	1
Scissor lift	103	-	-	1	3	3	2
Grader	118	-	-	-	1	1	1
Boom truck	103	-	-	1	1	1	1
Toyota Truck	96	-	-	4	4	4	4

Equipment Type	Power (kW)	No. of Pieces of Equipment Anticipated					
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
8 Man Toyota	60	-	-	1	1	1	1
Toyota Mechanics Truck	96	-	-	1	1	1	1
Toyota Rescue Truck	96	-	-	1	1	1	1
Sanitation Truck	69	-	-	1	1	1	1
Total annual diesel consumption- equipment (L)		-	-	1,658,597	3,054,722	3,194,334	2,412,504
Total annual diesel-explosives (L)		-	-	1,352	2,086	3,111	580
<b>Total annual diesel consumption (L)</b>		-	-	<b>1,659,949</b>	<b>3,056,807</b>	<b>3,197,445</b>	<b>2,413,084</b>

### 3.3 Ore Processing Considerations

Maritime considered three different approaches for the processing of material from the Project site. Two of the approaches involves complete, or a certain amount of pre-processing at the Project site prior to offsite transport or final transport. The alternative to pre-processing at the Project site was to ship all ore mined to an offsite mill for all stages of processing, e.g., NPM. Each approach is discussed below.

#### 3.3.1 Crushing, Screening and Sorting Process Onsite

Pre-concentration of ore at the Project site that will involve a crushing, screening and sorting operation. Pre-concentration or “ore sorting” is a technology that separates mineralized rock from waste rock by using X-ray or laser scanners together with compressed air jets (Figure 3). If used at the Project site, this will be the first time this innovative technology and process will be used in NL. There are no chemicals used in this process whereby run-of-mine (ROM) ore is delivered from the mine to a crushing plant where it is crushed and screened. Coarse particles measuring 12-50 mm are conveyed to a pre-concentration plant where they are scanned and separated with jets of compressed air based on their scanned results. The desired particles are then combined with the screened ROM fines (-12 mm) and loaded into trucks for delivery to an offsite process plant. Rejected material is stockpiled, loaded and back-hauled to the mine for use as backfill or placed into the mine workings for long term closure.

The advantage of pre-concentration is that it removes waste or low-grade material before it is hauled and processed at the offsite Mill. By using ore sorting equipment, ore concentrates can be created at a reasonable cost and with fewer environmental risks. This technology is particularly applicable to small mining installations as the entire processing line can be planned in semi-mobile form and consists only of crushers, screens, belts and sorting machines.



**Figure 3: Pre-Concentration X-Ray and Laser Equipment**

This technology does not require water, nor are there any emissions from the process other than fugitive dust which will be mitigated using standard procedures as described in Maritime's Environmental Protection Plan (EPP). This processing option will result in fifty percent less material transport via truck from the Project site to the offsite processing plant and significant energy savings as a result of having to mill fifty percent less material. With this option, there will be a requirement for muck rehandling whereby rejects from the ore sorting process will have to be transported back to the open pit or stored at an interim location prior to being used as backfill underground.

### **3.3.2 Onsite Processing Mill**

Maritime also considered constructing a new process plant and TMF at the Project site. The estimated energy requirement for an onsite mill was determined by reviewing consumption rates for nominal 1000 tonnes per day (tpd) gold circuit processing mills. For a mill with a throughput of between 800-1000 tpd, Maritime estimates the monthly energy requirements to be approximately 900,000 kW.

A new process plant and TMF would impact a relatively large and currently undeveloped area at the Project site. This option would also require new water sources for processing and additional power to support pumping systems to manage tailings, waste and reclaim water circuits, and additional equipment operation for road maintenance.

The Project site is located within two sub-watersheds that drains to a salmon bearing river. Although the addition of a TMF can be safety engineered and built at the Project site, this option does increase the environmental risk in the area.

### 3.3.3 Complete Offsite Processing

Another processing option involves hauling all commercial grade ore from the Project site to the existing NPM for complete processing. In this instance, no crushing, screening or sorting would occur at the Project site and haul truck traffic required to sustain the same rate of gold production at the NPM facility would effectively double. This option would result in higher capital costs, greater GHG emissions as a result of increased traffic, increased milling energy consumption and chemical reagents used, increased tailings storage capacity requirements, and increased potential for accidental events along the transport route.

## 4.0 EVALUATION OF TECHNICALLY FEASIBLE OPTIONS

### 4.1 Provision of Project Energy

Given the Project location in proximity to maintained roads and an existing electricity grid, the decision relative to the best means of providing energy to the Project site was fairly straightforward.

Maritime did not consider a standalone diesel power plant to be a technically feasible option given the availability of grid supplied electricity. The generation of GHG emissions was also a factor in the evaluation of technically feasible options. The estimated GHG emissions for the Project if a diesel power plant was selected as the primary energy source for the Project would result in additional annual GHG emissions of approximately 25,100 CO<sub>2e</sub> tonnes.

Capital costs and LOM operating costs for both energy provision scenarios are provided in Table 9. Given the disparity in estimated costs, the option to use a diesel power plant was not considered economically feasible.

**Table 6: Comparison of Costs for Project Energy Options**

	<b>Capital Cost (CAD)</b>	<b>Long Term Operating Cost (6 year LOM) (CAD)</b>	<b>Total Cost (CAD)</b>
<b>Grid Powered</b>	941,420	1,287,692 <sup>1</sup>	2,229,112
<b>Diesel Powered</b>	2,400,000	50,899,104	53,299,104

<sup>1</sup>Maritime assumed a rate of \$ 0.099 per kWh

<sup>2</sup><https://www.globalpwr.com/products-page/diesel-generators/hipower-550-kw-hrvw-680-t4f-2/>

## 4.2 Mining Activities

### 4.2.1 Construction and Operation Phases

During the construction and operation phases, GHG emissions will be generated from Project activities by diesel fuel combustion, gasoline combustion and blasting activities that use diesel-based emulsion blasting products.

For all fuel fired combustion equipment required at the Hammerdown Gold Mine, Maritime estimates that approximately 35 million litres (L) of diesel could be consumed on site throughout the construction and operations phases. Maritime estimates that approximately 96,708 tonnes of CO<sub>2</sub>e (Table 11) will be generated over the life of the Project (seven years including construction).

GHG emissions will be mitigated over the construction and operation phases of the Project through the following means:

- Reduce idling of Project vehicles and equipment to reduce amounts of fuel consumed;
- Maintaining engines in proper working order;
- Reducing cold starts in winter by installing bull rails for vehicle block heater operation;
- Use of electricity provided by the provincial grid where possible;
- Efficient waste rock and ore haulage to reduce the amount of fuel consumed; and
- Using alternate energy sources where possible.

Maritime will invest in current model equipment for the open pit and underground operations fleet, as the feasibility and development plans dictate, and that have industry standard emissions control. New and current equipment will ensure best performance and reliability with vendor supported maintenance programs. Together, this will aid in better overall equipment fleet performance and positively contribute to GHG reduction over the life of the Project.

Table 10 indicates estimated GHG emissions during the operation phase of the Project. This Table does not include any GHG emissions for the diesel power plant option.

**Table 7: Estimate of GHG Emissions during Operations**

GHG Component (kg)	Emissions Factor* (kg/L)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
CO <sub>2</sub>	2.663	14,813,650	17,285,718	17,278,770	9,802,790	10,177,309	14,224,116	83,582,353
CH <sub>4</sub>	0.003325	18,496	21,583	21,574	12,240	12,707	17,760	104,360
N <sub>2</sub> O	0.1192	663,082	773,735	773,424	438,788	455,552	636,693	3,741,275
CO <sub>2</sub> e	2.786	15,497,871	18,084,120	18,076,850	10,255,566	10,647,384	14,881,106	87,442,897

\*Climate Change Branch, Government of NL, 2017

Maritime calculated estimates of GHG emissions for this Project (Table 11). Both construction and operations activities associated with the Project will use diesel powered equipment and require the use of explosives.

**Table 8: Predicted GHG Emissions over Life of Project**

GHG Component (kg)	Emissions Factor (kg/L)	Construction (tonnes)	Operations (tonnes)	Over Life of Project (tonnes)	Av. Annual Emissions (tonnes)
CO <sub>2</sub>	2.663	8,856	83,582	92,438	13,205.4
CH <sub>4</sub>	0.003325	11	104	115	16.4
N <sub>2</sub> O	0.1192	396	3,741	4,138	591.1
CO <sub>2</sub> e	2.786	9,265	87,443	96,708	13,815.4

### 4.3 Processing Technologies

Maritime evaluated technically and economically feasible options relative to processing options at the Project site, and also in consideration of environmental factors and health and safety regulations.

#### 4.3.1 Crushing, Screening and Sorting Process Onsite

Maritime will be using sorting technology provided by the Steinert company that uses dual energy x-ray transmission (XRT) that is capable of detecting metal even when it is not on the surface (Steinert 2020). This option provides a substantial cost savings and also reduces the number of trucks on the highway. GHGs are also reduced as a result of fewer trucks on the road. Additionally, energy and reagent savings can be realized by not milling and processing waste rock or low grade material. A reduction in the volume of waste processed through the mill also maximizes the volume of space in the offsite TMF, eliminating risk of volume restrictions in the future.

The equipment used in the muck rehandling process will be new and will all have modern emissions control features.

#### 4.3.2 Onsite Processing Mill

The option was considered by Maritime and determined to be a less desirable option than processing at the existing NPM for the following reasons:

- Level of environmental disturbance: A new process plant and TMF would impact a relatively large and currently undeveloped area at the Project site. This option would also require new water sources for processing. Maritime wishes to limit adverse environmental impacts and utilizing the existing process plant and TMF at the NPM achieves this.
- Capital costs: The capital cost of a new processing plant and TMF at the Project site would be at least five times higher than refurbishing components of the existing NPM.

- **Cost Recovery:** The expected six year mine life would make it more difficult to pay back the investment of constructing a new process plant and TMF at the Project site.
- **Schedule:** The time to permit and construct a new process plant and TMF at the Project site would be considerably longer than refurbishing components at the existing NPM.

The Project site is located in a watershed that drains to a tributary of a salmon bearing river. Although the addition of a TMF can be safety engineered and built at the Project site, Maritime opted to not pursue this option due to its capital cost, timeline for permitting requirements, water requirements and tailings disposal requirements.

#### 4.3.3 Complete Offsite Processing

This option would require the transport of all mined material with minimal crushing from the Project site to the offsite mill. This option would not be economically feasible and would result in significant vehicle traffic and GHG emissions over the LOM.

#### 4.4 Additional Technologies

To the extent possible and where economically feasible, Maritime will explore additional opportunities over the life of the Project to replace gasoline or diesel powered equipment with electric models, e.g., some underground equipment and potentially electric production drills. If these options prove to be economically feasible, there will be a decrease in previously estimated GHG emissions over the life of the Project.

### 5.0 ANALYSIS AND RATIONALE FOR CONTROL OPTIONS SELECTED

#### 5.1 Energy Provision

Given the scale and Project location in proximity to maintained roads and an existing electricity grid, decisions relative to the best options for the Project were fairly straightforward.

With respect to energy provision for the Project, the BACT in this case is the transmission line providing grid electricity that is ultimately derived from hydroelectric power. The choice of the electrification option will result in approximately 25,100 fewer tonnes of CO<sub>2e</sub> annually (Table 12).

**Table 9: Comparison of Project Energy Provision Options - Operations**

	<b>Predicted GHG Emissions (tonnes CO<sub>2e</sub>)</b>	<b>Predicted Cost to Operate LOM (CAD)</b>
<b>Grid Powered</b>	87,443	2,229,112
<b>Diesel Powered</b>	150,604	53,299,104

## 5.2 Backup Energy Provision – Diesel Generator

The use of backup up diesel generators onsite is essential to ensure continuity of operations in the event of grid power interruptions. The backup generator selected will be a minimum Tier II unit that contains suitable emissions control technology. Based on information provided by Hatch Ltd (2015), average annual unplanned power outages in the area are 2.8 hours or 0.2 days. This number means that over the long-term, system conditions may lead to an average loss of 2.8 hours per year (Hatch 2015). The backup generator will be housed in a heated area that will also provide storage area for a small amount of Diesel exhaust fluid (DEF). DEF is a liquid used to reduce the amount of air pollution created by a diesel engine that is consumed in selective catalytic reduction (SCR) that lowers the concentration of nitrogen oxides (NO<sub>x</sub>) in the diesel exhaust emissions from a diesel engine.

As noted in Section 3.13, there are four tiers for classifying non-road engines and each tier was built off the other to reduce harmful gases into the atmosphere and make compliance more manageable. Each tier level also has a certain standard with regard to harmful emissions and provides a cap at which point emissions must be limited.

Higher tier classifications for engines require more advanced technology to achieve associated reduced emissions limits. Benefits of higher tier-rated combustion systems include:

- Significant emission reduction;
- Quieter and smoother operation;
- Increased fuel efficiency;
- Advanced technologies for overall optimized performance; and
- Minimal downtime for extended service and reduction in costs.

Tier 1 standards were published in 1991, however the implementation for diesel engines and generators did not begin until 1996 with the intention that all diesel engines and generators be in compliance by 2005. Initially, Tier 1 standards focused on diesel equipment under 37 kW (50 hp) with the phase-in period from 1996 to 2000 (Table 2).

**Table 10: Overview of Tier 1 Emission Standards**

Year	Engine Power (hp)	CO	HC	NMHC+NO <sub>x</sub>	NO <sub>x</sub>	PM
1996	175 ≤ 300	8.5	1.0	–	6.9	0.4
	300 ≤ 600	8.5	1.0	–	6.9	0.4
	600 ≤ 750	8.5	1.0	–	6.9	0.4
1997	100 ≤ 175	–	–	–	6.9	–
	50 ≤ 100	–	–	–	6.9	–
1999	25 ≤ 50	4.1	–	7.1	–	0.6

Year	Engine Power (hp)	CO	HC	NMHC+NOx	NOx	PM
2000	< 11	6.0	–	7.8	–	0.75
	11 ≤ 25	4.9	–	7.1	–	0.6
	≥ 750	8.5	1.0	–	6.9	0.4

Source: <https://www.cdc.gov/niosh/mining/userfiles/workshops/dieseelko2007/5a-block.pdf>

Tier 2 standards were published in 1999 and Tier 3 standards were published shortly thereafter. These two levels required engines to be more sophisticated in design and advanced in performance in order to meet the criteria set out in the regulations (Table 3).

**Table 11: Overview of Tier 2 and 3 Emission Standards**

Year	Tier	Engine Power (hp)	CO	HC	NMHC+NOx	NOx	PM
2001	T2	300 ≤ 600	2.6	–	4.8	–	0.15
2002	T2	600 ≤ 750	2.6	–	4.8	–	0.15
2003	T2	100 ≤ 175	3.7	–	4.9	–	0.22
	T2	175 ≤ 300	2.6	–	4.9	–	0.15
2004	T2	25 ≤ 50	4.1	–	5.6	–	0.45
	T2	50 ≤ 100	3.7	–	5.6	–	0.3
2005	T2	< 11	6.0	–	5.6	–	0.6
	T2	11 ≤ 25	4.9	–	5.6	–	0.6
2006	T2	≥ 750	2.6	–	4.8	–	0.15
	T3	175 ≤ 300	2.6	–	3.0	–	–
	T3	300 ≤ 600	2.6	–	3.0	–	–
	T3	600 ≤ 750	2.6	–	3.0	–	–
2007	T3	100 ≤ 175	3.7	–	3.0	–	–
2008	T3	50 ≤ 100	3.7	–	3.5	–	–

Source: <https://www.cdc.gov/niosh/mining/userfiles/workshops/dieseelko2007/5a-block.pdf>

Of note, sulfur content was not originally limited by environmental regulations in Tier 1 for non-road diesel fuels but was later mandated and required to be met by 2007 in Tiers 2 and 3.

Tier 4 is the strictest of all regulations and the most advanced technologies are used to achieve the greatest reduction in emissions. The technologies used and needed for tier 4 level performance are those technologies that result in near-zero emission levels.

Tier 4 emission standards (Table 4) began to be phased-in in 2008. The regulations were designed to reduce NOx, particulate matter, and hydrocarbon emissions substantially with respect to all off-road and on-road engines and generator sets. Carbon monoxide standards for Tier 4

remain relatively similar to those established in Tiers 2 and 3 however. The intended and primary emissions to be reduced include:

- Nitrogen oxides (NO<sub>x</sub>);
- Hydrocarbons (HC);
- Carbon monoxide (CO);
- Particulate matter (PM); and
- Non-methane hydrocarbons (NMHC).

**Table 12: Overview of Tier 4 Emission Standards**

Year	Engine Power (hp)	CO	NMHC	NMHC+NO <sub>x</sub>	NO <sub>x</sub>	PM
2008	< 11	6.0	–	5.6	–	0.3
	11 ≤ 25	4.9	–	4.9	–	0.3
2011	Generator sets > 1200 hp	2.6	0.30	–	0.50	0.075
2011 – 2014	175 ≤ 750	2.6	0.14	–	0.30	0.015
2012 – 2014	75 ≤ 175	3.7	0.14	–	0.30	0.015
2013	50 ≤ 75	3.7	–	3.5	–	0.022
2015	All generator sets	2.6	0.14	–	0.5	0.022

Source: <https://www.cdc.gov/niosh/mining/userfiles/workshops/dieseletko2007/5a-block.pdf>

The general approach to setting emission standards in Canada has been to harmonize them with US EPA federal standards. The EPA notes that only prime or non-emergency generators need to adhere to Tier 4 standards and USEPA emission standards for emergency generators differ from those standards. The difference is based on the fact that emergency generators are used for temporary purposes and therefore not subject to the more stringent rules. Standby (or emergency) generator sets are usually subject to Tiers 2 and 3 emission standards.

Examples of technologies and design that promote compliance with emissions standards include:

- Engine design technologies;
- Fuel & lubricant technologies; and
- Exhaust add-ons and after treatment technologies (Worldwide Power Products 2021).

The past two decades of tiered emissions standards have driven a rapid evolution in diesel engine technology and current Tier 4 compliant diesel engines are far more complex, efficient, and expensive than their unregulated ancestors from the early 1990's. There has been a drastic reduction in emissions during this time as well: a 99% drop in both NO<sub>x</sub> and PM as well as a 95% decrease in tailpipe emissions overall (Generator Source 2020).

A key component of a BACT analysis is that control equipment selected should be both technically and economically feasible. The diesel generator(s) at the Project site will be used for emergency power generation only, and past data indicates the annual duration of power outages to be only 2.8 hours/year. Typically, jurisdictions and regulations consider the operational limits that will be in place for emergency generators and do not require higher than a Tier 2 engine for this purpose.

At this time, it will be difficult to provide confident and competitive pricing on a backup generator given the number of variables at play, e.g., manufacturer availability, new vs used, local vendor representation, price, confirmation of power requirements. However, it is apparent that Tier 3 and Tier 4 rated diesel generators are costly and difficult to source with a generating capacity greater than 500 kW for a single unit. Initial research shows that a new 500 kW Tier 4 generator can be acquired for approximately \$225,000 CAD. Since backup power requirements are in the area of 2MW, Maritime would need four such units, resulting in a capital cost of approximately \$1,000,000 CAD just for emergency backup. Additional emissions control features are estimated to cost \$50,000 per unit as well. Maritime is unable to justify a high capital cost for potential brief unplanned power interruptions in the area of 2-5 hours/year.

More economically feasible Tier 2 units to be used for emergency backup power will be sourced once Maritime is further advanced in the detailed design and feasibility analyses for the Project. At that time, Maritime can provide more confident and competitive pricing for these backup generators, if required.

### **5.3 Mining Activities**

The control options relative to underground mining deal with the use of electrically powered equipment and vehicles instead of conventional diesel powered equipment and vehicles. The use of electric underground mining equipment is still uncommon in Canada and currently, only one all electric mine exists. Operated by Newmont Goldcorp, the Borden Mine is considered a prototype all-electric underground mining operation, and more information can be found at the following link: (<https://mineconnect.com/borden-mine-canadas-first-all-electric-underground-mine/>). Newmont Goldcorp's Borden Mine is a gold mine near Timmins, Ontario with a production capacity of 4000 tonnes per day over a mine life of up to 15 years. The project was reviewed by the Canadian Environmental Assessment Agency (CEAA) in 2016 where it was determined that no environmental assessment was required (<https://acee.gc.ca/050/evaluations/proj/80134>). The mine started commercial production in Q4 of 2019.

Based on initial research, Maritime understands that capital costs associated with the purchase of an all-electric underground fleet is higher than the cost of an equivalent diesel fleet by an estimated 20-30%. The electrification venture for the Borden Mine was substantially subsidized with both the federal and Ontario governments each contributing \$5 million toward the electrification of the mine, which aided to offset the extra capital cost incurred

The scale of the Borden mine is significantly larger and has a LOM four times that of the underground portion of the Hammerdown Project (3.5 years). Based on the estimated life of the underground portion of this Project, Maritime concluded that while electrification would be cleaner, the cost would be prohibitively high for the scale of the Project and consideration would most likely be given to also applying for government subsidy to offset capital costs. Furthermore, since the concept of an all-electric underground mine is new, the short and long term feasibility of this technology has not yet been determined. For these reasons, Maritime will select new, lower emissions and energy efficient diesel and gasoline powered vehicles and equipment that are technically and economically feasible, and which are the best control options for the underground portion of this Project.

#### **5.4 Processing Technology**

The decision to use ore sorting technology at the Project site achieves a life of mine reduction in the amount of material shipped via truck to the offsite processing facility. This technology results in significantly lower GHG emissions caused by truck transport of ore over the LOM and is the best control option for the Project.

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## **APPENDIX G**

Waste Management Plan

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# **MARITIME RESOURCES CORP.**

## **HAMMERDOWN GOLD PROJECT Waste Management Plan**

**Date Issued: February 24, 2021  
Version 1.0**



**MARITIME RESOURCES CORP.  
WASTE MANAGEMENT PLAN**

Version: 1.0

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**Date Issued:**  
February 24, 2021

**Emergency Phone Numbers**

<b><u>Organization</u></b>	<b><u>Phone</u></b>
Springdale Health Centre	1-709-673-3911
Grand Falls Hospital	1-709-292-2500
Springdale RCMP	1-709-673-3864
Springdale Fire Department	1-709-673-4333/3394
King's Point Fire Department	1-709-268-2222
Department of Transportation & Infrastructure – Grand Falls-Windsor	1-709-292-4300
Emergency Measures Organization – Fire and Emergency	1-709-729-3703
Health and Community Services - Poison Control Centre	1-709-722-1110 Toll Free 1-866-727-1110
Department of Environment, Climate Change and Municipalities (PPD))	1-709-729-5782
Occupational Health and Safety	1-800-563-5471
<b>Maritime Resources - Main Office</b>	1-709-701-8514
Perry Blanchard – VP Environment and Sustainability	1-709-673-8746
Larry Pilgrim – Project Manager	1-709-699-7251
<b>Industrial Waste Disposal</b> Exploits Salvage and Demolition Ltd. Grand Falls-Windsor	1-709- 489-1170
<b>Waste Oil Disposal</b> Pardy's Waste Management, St. John's	1-709- 368-4350
<b>Hazardous Waste Disposal</b> Terrapure Industrial, St. John's	1-709- 834-7350

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## 1.0 INTRODUCTION

Maritime Resources Corp. (Maritime) is planning to construct and operate the Hammerdown Gold Project (the “Project”) near the Town of King’s Point, Newfoundland and Labrador (NL). The milling will take place at Nugget Pond, an existing facility owned by Rambler Metals and Mining Limited (Rambler). This Waste Management Plan (the Plan) focuses on waste generated at the Hammerdown Project site only. All waste generated at the Nugget Pond facility will be captured in an updated Waste Management Plan by Rambler.

The Project will include the construction, operation and eventual closure and decommissioning of the following key components (Figure 1):

- Open pit mine and associated equipment;
- Underground mine and associated equipment;
- Crushing and pre-concentration plant;
- Waste rock stockpile;
- Low grade, overburden and ore rejects stockpiles;
- Access roads;
- Electrical and communication infrastructure;
- Temporary buildings: administrative, dry facility, maintenance and storage buildings;
- Water management infrastructure;
- Weigh scale;
- Explosives magazine; and
- Other ancillary infrastructure and equipment.

The Project will generate a variety of hazardous and non-hazardous waste and safe and responsible management of waste generated from all streams is an important aspect of the Project. If improperly controlled and managed, waste generated can lead to adverse human health effects, negative effects on fish and wildlife, contamination of soil and groundwater, cause unsightly litter problems, and lead to unwanted human-wildlife interactions.

Maritime is committed to the collection, storage, transportation and appropriate disposal of waste generated from Project activities and this Plan outlines how that work will be conducted in a safe, efficient, and environmentally compliant manner. The Plan identifies potential waste streams, establishes roles and responsibilities for implementation of the Plan and outlines procedures for storing and processing the waste.

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**LEGEND**

- Project Footprint
- King's Point Municipal Boundary
- ▶ Stream/Creek (Field-Mapped - Not Identified on 1:50,000 Topo)
- ▶ Stream/Creek (Field-Mapped - Identified on 1:50,000 Topo)
- Topographic Elevation Contour (masl)
- Waterbody (Identified on 1:50,000 Topographic Map)
- Wetland (Identified on 1:50,000 Topographic Map)
- Settling Pond
- Contact Water Ditch
- Non-Contact Water Ditch
- Pump from Open Pit
- Culvert
- Explosives Magazine
- Overburden and Organics Stockpile

Note

1. This drawing is a schematic representation. Sizes, locations and dimensions are approximate.
2. Coordinate system: NAD83 CSRC UTM Zone 21 North.
3. Topographic Data acquired from GeoGratis (Government of Canada).

Drawn By	Checked By
JSP	DR
Calculations By	Checked By

Date  
**February, 2021**

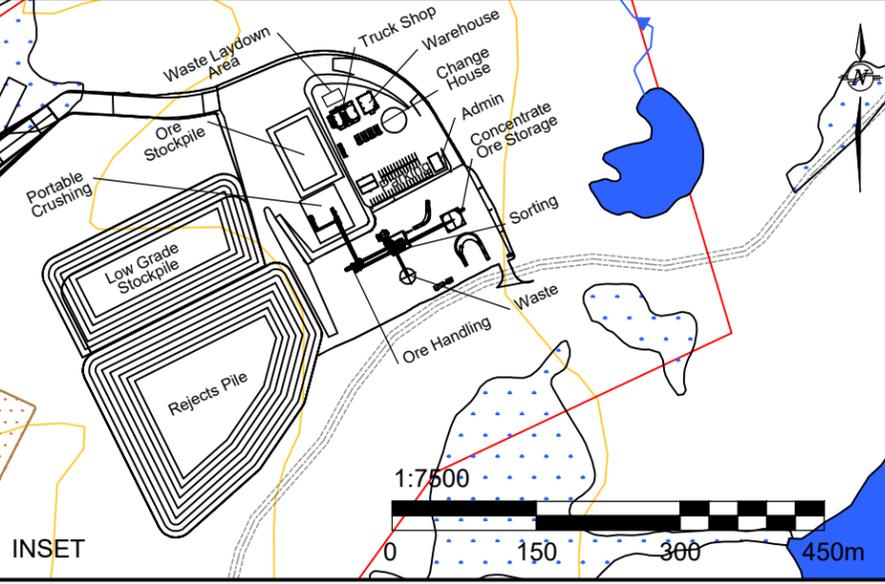
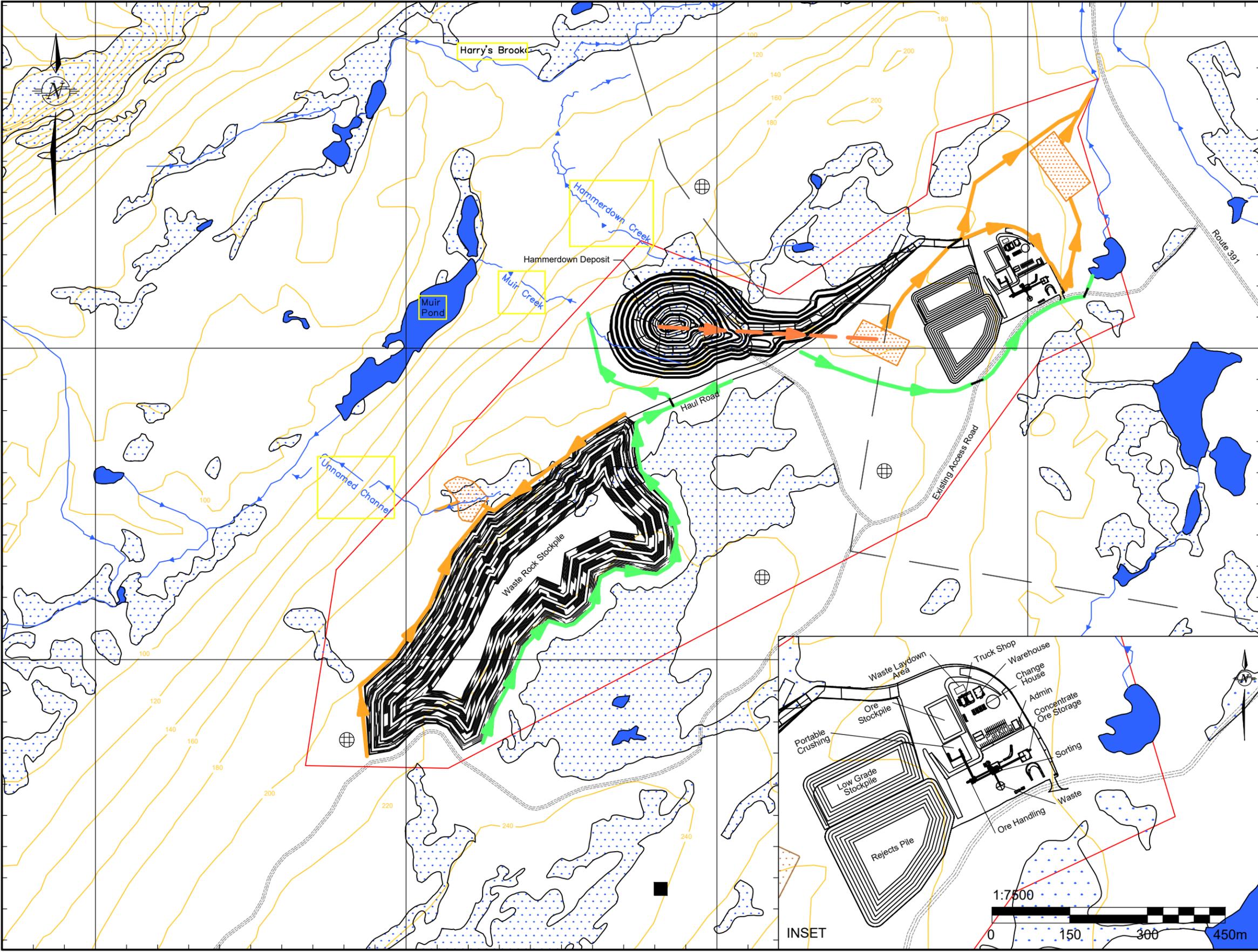
Project  
**Waste Management Plan  
HAMMERDOWN GOLD PROJECT**

Drawing  
**PHYSICAL COMPONENTS OF  
THE PROPOSED PROJECT**

Scale  
**1:12,500**



File No. 80044.12	Drawing Figure 1	Revision No. 0
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## 1.1 Objectives

This Plan provides direction on waste handling, storage, transport, treatment and disposal of the various wastes produced over the life of the Project, including both construction and operation periods. The Plan provides a waste management system to deal with waste streams and allows for the implementation of reduction and diversion opportunities. The Plan also serves as an internal quality control document that provides clear and concise direction for company staff and contractors regarding waste management policies and procedures that must be followed.

The objectives of this Plan are to:

- Ensure compliance with applicable acts, regulations, and standards;
- Promote compliance with industry guidelines and best management practices;
- Minimize adverse effects on the environment;
- Incorporate and optimize the basic principles of waste management including reduce, reuse, recycle, recovery and residual waste disposal;
- Identification and classification of potential wastes types and quantities generated;
- Provide guidelines for proper collection, segregation, storage and disposal of waste;
- Minimize the amount of waste generated;
- Reduce waste disposal costs;
- Protect the health and safety of Project personnel; and
- Ensure compliance with waste management protocols through operator and attendant training, appropriate surveillance and monitoring, and audits.

Note that management of surface water collected in the sedimentation ponds is part of the overall site water management system and is not included in the scope of this document.

Maritime is committed to ensuring that collection, storage, transportation, and disposal of all waste generated is conducted in a safe, efficient, and environmentally compliant manner. The first essential step toward achieving these goals is the preparation this Plan that identifies potential waste streams and establishes roles and responsibilities for all site personnel. There will be contractual obligations of each contractor to manage wastes generated at the Project site, however the principals and details provided in this Plan will be standard for all personnel.

The Plan will be reviewed on an annual basis during the operations period and will be updated as necessary to accommodate changes in operations, waste streams and disposal options.

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## 1.2 Plan Organization

The Plan is organized as follows:

- Section 1 - Provides an introduction, objectives, purpose, goals and scope of the Plan.
- Section 2 - Outlines the regulatory framework that informs the Plan.
- Sections 3-6 - Details the basic elements of Project waste management, including waste characterization, roles and responsibilities, operational procedures, handling practices and monitoring, reporting and auditing systems.

Much of the Plan information is presented in tabular format as concise listings that can be easily reviewed and updated as part of annual reviews.

## 2.0 REGULATORY FRAMEWORK

The Plan is informed by the regulatory framework for industrial waste management in NL and includes legislation, regulations and guidelines at the federal, provincial and municipal levels. The key regulations and guidelines that apply to waste management for the Project are provided below.

### 2.1 Provincial

- *Transportation of Dangerous Goods Act and Regulations;*
- *Fire Protection Act and Regulations;*
- *Water Resources Act;*
- *Environmental Protection Act;*
- *Storage and Handling of Gasoline and Associated Products Regulations;*
- *Used Oil Control Regulations;*
- *Air Pollution Control Regulations;*
- *Water and Sewer Regulations;*
- *Occupational Health and Safety Act and Regulations;*
- *Workplace Hazardous Materials Information System (WHMIS) Regulations;* and
- *Waste Management Regulations.*

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## 2.2 Federal

- *Canada Environmental Protection Act;*
- *Transportation of Dangerous Goods Act and Regulations;*
- *Canada Fisheries Act;*
- *Metal and Diamond Mining Effluent Regulations;*
- *National Building Code;* and
- *National Fire Code.*

## 2.3 NL Provincial Guidelines

- The Provincial Solid Waste Management Strategy (NL);
- Best Management Practices for storage of waste, dangerous goods/hazardous waste (WDG/HW) at business sites;
- Management of Waste Dangerous Goods/Hazardous Waste (WDG/HW) 2003-2013 for Newfoundland and Labrador;
- Environmental Standards for Construction and Demolition Waste Disposal Sites;
- Guide for the Disposal of Off the Road (OTR) Tires and Tire Material;
- NORM Waste Management; and
- Landfill Bans, Special Wastes and Diversion Programs.

## 2.4 Definitions

For purposes of this Plan, waste includes both Solid (Municipal Solid Waste) and Special Waste. Under the NL Solid Waste Management Strategy (NLSWMS), municipal solid waste (MSW) includes garbage, refuse, rubbish, litter and other discarded materials resulting from residential, commercial, institutional and industrial activities which are commonly accepted at a municipal solid waste management facility, mixed or unmixed.

Under the NLSWMS, Special Waste includes any waste material that requires special treatment or disposal precautions, due to its nature, quantity, volume, potential to react and/ or potential to produce an adverse effect. Examples include, animal carcasses/mortalities or roadkill, asbestos containing material, fish plant waste, and process related commercial or industrial waste streams.

Hazardous waste or material is defined in NLSWMS as wastes or materials that are corrosive, reactive, flammable, ignitable, carcinogenic, teratogenic, mutagenic, infectious, oxidizing, radioactive, explosive, poisonous/toxic (acute and chronic), bioaccumulative, persistent, TCLP\* (Toxicity Characteristic Leaching Procedure USEP A 1311) leachable toxic, or any wastes which do not meet any of the above criteria but have other properties of concern which are significant enough to consider the material to be hazardous.

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Hazardous waste is any waste which contains a hazardous substance in such a quantity liable to cause death, injury or impairment to living beings, pollution of water, air and soil, or unacceptable impact on the environment, if handled, treated or disposed of improperly. Includes 'waste dangerous goods' as defined under the NL *Environmental Protection Act*.

A hazardous waste transporter (licensed) is a company that holds a Certificate of Approval to transport hazardous waste in NL as issued under the *Environmental Protection Act*.

### **3.0 ROLES AND RESPONSIBILITIES**

All site personnel will have roles and responsibilities regarding waste management. The effectiveness of the Plan depends on the commitment and actions of all employees and key roles and responsibilities are outlined below.

#### **3.1 Management Commitment**

Maritime is committed to the preservation and protection of the environment and commits to the implementation, maintenance and upgrading of this Plan that incorporates existing waste management strategies with new initiatives.

Maritime Management recognizes that staff time and resources are required to implement and maintain this Plan.

#### **3.2 Vice President, Environment and Sustainability**

The Vice President, Environment and Sustainability (ES), will be responsible for the overall management of contractors managing Project waste and for reviewing Plan initiatives and procedures with the Health, Safety and Environment (HSE) department. This will ensure that the Plan is carried out pursuant to all applicable regulations and requirements, and that the Plan will be effectively implemented.

#### **3.3 Health, Safety and Environment Department**

Officials in the HSE department will provide guidance and expertise to the Mine Manager on all aspects of waste management activities. In addition, the HSE department will:

- Support waste management orientation and awareness training for all Maritime employees and contractors.
- Review results of routine monitoring and/or audits specific to waste handling, infrastructure, equipment and contractors as part of the continual approval process.
- Consult with regulators relative to waste management and recycling programs as required.

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### 3.4 Mine Manager

The Mine Manager will be responsible for ensuring onsite operational compliance with the Plan at all times. In addition, the Mine Manager will:

- Review onsite waste management needs and contract requirements with the HSE Department and Vice President, ES.
- Report any health and safety issues relative to the Plan to the HSE Department.
- Respond to any urgent onsite waste management issues.
- Report on any issues relating to the implementation of the Plan to the HSE Department.
- Forward results of routine monitoring and/or audits relative to waste handling, infrastructure and equipment to the HSE Department.
- Collect and maintain all records pertaining to waste management activities for compliance monitoring.
- Provide all necessary documentation relative to the transportation, final disposal location and disposal process for all waste removed from Project sites to the HSE Department.

### 3.5 Employees

Generally, all employees must be aware of and understand the waste management requirements specific to their area or type of work. In addition, all employees:

- Are encouraged to increase their efforts and awareness in waste reduction, reuse and recycling.
- Must participate in a site waste management orientation and training session and acknowledge receipt of this information.
- Are encouraged to share feedback with management related to site waste management practices, participating in efforts for continuous improvement.

### 3.6 Contractors

There will be contractual obligations for each contractor to manage waste generated at the Project site. Only contractors that demonstrate qualifications and experience in relation to the transportation, treatment and/or disposal of wastes similar to those expected at the site will be engaged. In addition, all contractors will be responsible for:

- Contractual obligations pertaining to managing and disposing of their own wastes generated at the Project site.
- Compliance with protocols outlined in this Plan.
- Ensuring waste materials are disposed of in accordance with Material Safety Data Sheets (MSDS) and local site requirements.

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- Development of waste management strategies, in consultation with Maritime, for the work being executed.
- Providing the necessary training to their employees for waste management requirements unique to their activities and/or work areas.

#### 4.0 WASTE CHARACTERIZATION

To determine the components of an effective Waste Management Plan, a qualitative and quantitative characterization of the waste materials being generated is required. This characterization establishes the baseline conditions and serves as a guide for monitoring and auditing. A material becomes waste when it can no longer be used for its original intended purpose. Waste types considered in this Plan include non-hazardous waste such as cans, filters, scrap metal, domestic garbage, and hazardous waste such as used oils, solvents, paints, batteries, and expired explosives.

This Plan is intended to be flexible and responsive to any changes in the various waste management systems, and will include provisions for reporting, auditing and monitoring procedures. These procedures will:

- Provide a means to review waste quantities generated and their segregation into specific waste streams;
- Provide appropriate infrastructure and equipment for handling waste materials;
- Establish appropriate collection frequency of waste materials; and
- Assist in assessing the feasibility of new waste reduction, diversion and disposal options.

A list of the various waste materials, sources, and disposal categories based on anticipated waste streams are provided in Table 1 and Table 2 below.

**Table 1: Waste Handling, Storage and Disposal Categories – Non-Hazardous Materials**

Category	Waste Type	Source	Initial Storage Location	Management/ Disposal
General	Domestic waste (all materials that cannot be recycled or reused)	All Areas	Laydown Area	Landfill
	Phones, computers, monitors, printers and related hardware	All Areas	Laydown Area	Recycled/reused
Sewage	Biological (Sewage) waste	Offices, Warehouse	Sewage plant	Sewage treatment on site
Rubber	Conveyor belts	Plant Area	Laydown Area	Recycled/Reused
	Used tires	Maintenance Workshops (adhering to NFC and NBC with regards to fire separation for indoor tire storage)	Laydown Area	Recycled
Food and Beverage Product Packaging	<ul style="list-style-type: none"> <li>• Aluminum cans</li> <li>• Plastic beverage and food containers</li> <li>• Glass bottles</li> <li>• Drink boxes</li> <li>• Steel cans</li> <li>• Other plastics - (yogurt drinks, flavoured drink pouches, etc.)</li> </ul>	All areas	Laydown Area	Recycled/Landfill
Food Waste	Personnel lunches	All areas	Laydown Area	Compost/landfill
Glass	Windows	Offices, Maintenance Workshops	Laydown Area	Recycled/landfill
Wood and Paper	Pallets	Maintenance Workshops, Plant Area and general site locations	Laydown Area	Landfill
	Wire/cable spools	Plant Area	Laydown Area	Recycled
	Scrap wood	Plant area and Maintenance Workshops	Laydown Area	Landfill
	Cardboard and paper	Maintenance Workshops, Offices	Laydown Area	Recycled

Category	Waste Type	Source	Initial Storage Location	Management/ Disposal
Metals	Large pieces of machinery and mobile equipment	All Areas	Laydown Area	Recycled/Reused
	Scrap metal, piping, small parts and machinery	Plant Area, Maintenance Workshops	Laydown Area	
	Coated wire and electrical cable	Plant Area, Maintenance Workshop	Laydown Area	

**Table 2: Waste Handling, Storage and Disposal Categories – Hazardous Materials**

Category	Waste Type	Source	Initial Storage Location	Management/ Disposal
Hazardous Materials	Aerosol cans	Maintenance Workshops and Dining Area	Hazardous Materials Storage/Laydown Area. In appropriately labelled containers or roll out bins.	Licensed Contractor
	Lithium/NiCad batteries	All Areas		
	Bulbs (fluorescent, halogen, etc.)	All Areas		
	Drums containing contaminant residues	Plant and Maintenance Workshops		
	Paint and other toxic product containers	Plant Area, Maintenance Workshops and Other Areas		
	Bio-medical waste <ul style="list-style-type: none"> <li>diabetic needles</li> <li>materials such as bandages, gloves, dressings etc. that have been in contact with blood</li> </ul>	Health and Safety Office		
	Used explosives	Pit area, explosive storage magazine	Laydown area	
Hydrocarbon Materials	Fuel and oil filters	Plant Area, Maintenance Workshops	Hazardous Materials Storage/Laydown Area. In appropriately labelled drums or roll out bins. Berms will be in place, where required.	Licensed Contractor
	Solvent/Oil contaminated rags, workwear, and absorbent pads	Plant, Maintenance Workshop and Mobile Equipment		
	Petroleum contaminated soils	All Areas		
	Paint filters	Maintenance Workshops		
	Grease tubes	Maintenance Workshop, Plant Area and Mobile Equipment		

Category	Waste Type	Source	Initial Storage Location	Management/ Disposal
	Hydraulic hoses	Maintenance Workshop, Plant Area		
	Waste grease	Maintenance Workshop, Plant Area		
	Solvents and oils	Maintenance Workshops, Plant Area		
	Glycol	Maintenance Workshops, Plant Area		
	Used oil	Plan Area, Maintenance Workshops and Mobile Equipment	Hazardous Materials Storage /Laydown Area, Mine Site. In appropriately labelled drums or roll out bins. Berms will be in place	

As per discussion with the PPD, no estimate of quantities for each waste stream have been included in this Plan. However, as the Project advances Maritime will provide these estimates for each stage of the mine operation, including construction, operation and decommissioning.

## 5.0 ORIENTATION, AWARENESS AND TRAINING

Information on this waste management for the Project site will be provided to all new employees, contractors and consultants during standard site orientation training. Project personnel and contractors will undergo regular training and refreshers to ensure they are familiar with potential environmental issues, roles and responsibilities, mitigation requirements, communication of concerns, and emergency response procedures. Additional information and training will be provided on an individual basis, specific to the work area of the employee, contractor and/or consultant as required.

Minimum training requirements for Project personnel and contractors include:

- Identification of waste streams, and proper disposal and storage procedures for each;
- WHMIS; and
- Emergency and spill response.

A record of all personnel trained (e.g., employees, staff, contractors and consultants), dates of training, and any updates or additional training required will be maintained by the HSE department.

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## 6.0 OPERATIONAL PROCEDURES

### 6.1 On-Site Waste Disposal

There will be no on-site waste disposal. All waste will be collected onsite and disposed of, recycled or reused off-site.

### 6.2 Off-Site Waste Disposal

Off-site waste disposal includes any waste that is to be disposed of outside the Project site and includes waste materials to be recycled, reused, treated, stored, sent to an off-site landfill, or returned to distributors. All waste products to be disposed of off-site will be handled by designated and trained employees. The current system for waste management involves transporting domestic waste to the the Green Bay Waste Authority Landfill, located in South Brook, and other hazardous materials to the appropriate designated recyclers or approved disposal facilities.

Recycling bins will be stored at various locations at the Project site to collect recyclables, e.g., air filters, batteries, pop bottles, etc., before they are transported offsite to the nearest recycling depot.

Waste materials will be managed based on their nature, with some items going to landfills, for recycling or special handling. Items such as clean, non-recyclable metals and other inert materials will be trucked to the designated landfill. Non-recyclable empty containers and steel drums will be drained, flushed if necessary, crushed and disposed of in the landfill. All non-recyclable scrap vehicle parts and machinery will be drained of their petroleum products prior to transporting to an offsite landfill or salvage yard. Inert office refuse, non-recyclable metal materials and other non-recyclable materials will also go to landfills.

Food waste will be placed in covered containers located in various locations at the Project site and hauled to the nearest permitted landfill or solid waste disposal site as required.

Used oil filters will be crushed or drained, then collected by approved handling companies. Waste oil, oily rags and used absorbent materials will also be collected and stored in appropriate containers before disposal by an approved waste management company.

Hazardous wastes will be handled by trained personnel in accordance with provincial regulations. If any materials are not designated for a disposal site, they will be sorted and shipped to an approved company for recycling or disposal.

### 6.3 Waste Diversion and Reduction Programs

Maritime recognizes that although waste cannot be completely eliminated, the amount of waste designated for disposal can be minimized. Waste diversion is a method for reducing the amount of landfill material such that measureable volumes of various materials are removed from the waste stream. Waste diversion is based on a strategy of reducing, reusing, recycling, recovery, and eventual disposal.

Both waste diversion and waste reduction programs are means of decreasing the volume of waste materials produced, reducing the cost of purchased materials, and increasing the return, rebate and sale of recyclable or reusable materials. Maritime management will review Plan waste reduction and diversion practices on a regular basis. That review will, at a minimum, cover the following aspects:

- Purchasing practices;
- Packaging materials;
- Supplier rebates;
- Recycling or reuse returns and rebates;
- Regional, government and commercial waste management initiatives, operations and services; and
- Examination of potential partnerships with regional municipalities and businesses to manage waste.

Over the life of the Project, Maritime will actively strive to reduce the volume of waste generated from all waste streams. A number of waste reduction initiatives will be implemented at the start of the Project (Table 3).

**Table 3: Waste Reduction and Diversion Options and Initiatives**

Initiative	Options and Issues
Reduce amount of beverage containers, e.g., glass bottles, plastic bottles, aluminum cans, steel juice cans, tetra pack & table top cartons, other drink containers	<ul style="list-style-type: none"> <li>• Supply refillable thermos bottles for personnel</li> <li>• Install large water and juice coolers and containers</li> <li>• Install an ice machine</li> <li>• Install a drinking water fill station</li> </ul>
Increase Project personnel participation in recycling programs	<ul style="list-style-type: none"> <li>• Incorporate a recycling section into the general site orientation program</li> <li>• Post signage as reminders to use recycling bins</li> <li>• Concrete examples of recycling benefits, e.g., donations to local charities or non-profit organizations</li> </ul>
Reduce amount of plastic waste disposed in landfill	<ul style="list-style-type: none"> <li>• Investigate recycling possibilities, including suppliers accepting return of plastic containers for re-use</li> <li>• Consider bulk packaging possibilities</li> </ul>
Reduce amount of paper and ink cartridges	<ul style="list-style-type: none"> <li>• Implement employee awareness training aimed at reducing paper use and printing, e.g., distribute electronically, double</li> </ul>

Initiative	Options and Issues
	sided printing, print only required documents, reuse one-sided paper, circulate hardcopies where possible <ul style="list-style-type: none"> <li>• Maintain copiers and printers in good repair</li> <li>• Use refillable ink cartridges, if possible</li> </ul>
Reduce amount of cardboard/paper waste disposed in landfill	<ul style="list-style-type: none"> <li>• Maximize amount that can be shredded and added to recycling system</li> <li>• Investigate recycling possibilities</li> </ul>
Use of environmentally friendly cleaning agents	<ul style="list-style-type: none"> <li>• Address use of cleaning agents with mining contractor and employees</li> </ul>
Metal segregation in the Laydown area	<ul style="list-style-type: none"> <li>• Separate scrap metal that can likely be reused or recycled from that destined for a landfill</li> </ul>
Tire separation in the Laydown area	<ul style="list-style-type: none"> <li>• Tires suitable for manufacturer retread or the used tire recycling program will be stored separately from larger heavy equipment tires at the Laydown Area</li> </ul>
Collection of compostable organic waste	<ul style="list-style-type: none"> <li>• Collection and composting of organic waste can provide useful benefits through eventual composting of this material, which can be used to enrich soil or as a cover material on disturbed land</li> </ul>

With diversion practices in place, Maritime is confident that disposal volumes for materials destined for landfills will decrease as the Project advances. To track how waste materials are managed over the life of the Project, Maritime will maintain a table that records approximate volumes of waste material generated and how they were managed.

#### 6.4 Waste Handling

By implementing waste reduction practices, e.g., prevent unnecessary use of materials, reduce materials used, and recycle materials wherever possible, the volume of waste material generated over the Project life will be reduced. Waste generated will require handling and disposal and handling covers all aspects of waste sorting, transportation, and storage of common and special wastes. The storage, transportation, and disposal of all waste (both hazardous and non-hazardous) will be in compliance with the *Transportation of Dangerous Goods Regulations* as well as the *NL Environmental Protection Act*.

A summary of the current general waste handling procedures including collection, storage and transportation practices are provided in Tables 1 and 2. Handling of waste material will be conducted using appropriate equipment and appropriate personal protective equipment (PPE) at all times. Note there are no plans for open burning at the Project site. Should this change, Maritime will apply for and obtain the appropriate permits.

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Waste handling procedures will conform to existing regulations and policies as identified in this Plan, and will be modified to reflect other internal and external regulations and policies that come into effect over the life of the Project.

Handling of waste related to an employee's specific job should be conducted by the employee as required within their normal duties. Depending on the waste type and method of storage, proper training and orientation may be required to ensure that the procedures as outlined in this Plan are followed.

#### **6.4.1 Special Waste Handling**

Special wastes are defined as wastes that must receive special handling to ensure that the material does not cause contamination, fire or affect the health of personnel. Special wastes may include hydrocarbons, sewage, bio-medical waste, hazardous or any other waste that, when not handled properly, could induce additional risk to personnel or property.

Special waste handling procedures are as follows:

- Special wastes must be handled by employees trained in all aspects of handling, transportation and storage of the material(s), or by a licensed waste disposal contractor.
- Inventory of special waste at the Project site will be completed on a monthly basis.
- All Special Wastes transported off-site will be in accordance with applicable transport laws, to a facility permitted in NL to receive them, by a carrier permitted in NL to receive and transport Special Wastes according to the Transportation of Dangerous Goods (TDG) Regulations.
- A movement control document (manifest) will be completed to document each shipment of
- Special Waste, as per TDG Regulations.
- Solid waste to be recycled or treated should be separately binned and/or stored in temporary containers until final storage. These wastes include, but not limited to:
  - Aerosol cans;
  - Lithium and NiCad batteries;
  - Bulbs, e.g., fluorescent, halogen, etc.; and
  - Plastic drums, e.g., totes and bags etc., containing contaminant residues.
- Liquid and liquid contaminated wastes to be recycled or treated will be drummed or put in approved containers ensuring no mixing of materials. These wastes include, but not limited to:
  - Fuel and oil filters;
  - Sweepings from shops;
  - Solvent or oil contaminated rags, workwear, and absorbent pads;
  - Paint filters;
  - Paint and other toxic products containers;

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- Grease tubes;
  - Hydraulic hoses;
  - Waste grease;
  - Solvents and oils; and
  - Glycol.
- For drum storage of waste, the following practices must be followed. Drummed waste will be stored in a properly dyked and protected storage area. The Mine Manager will be responsible for ensuring that there are proper interim storage areas for these materials. The drums must be clearly labelled indicating their contents and procedures followed to ensure the materials do not mix. The following handling and storage procedures are required:
    - Full Drums
      - Drums must have proper labelling and have MSDS labels where applicable.
      - Drums must be stored on pallets and in designated areas with proper ventilation to protect from damage.
      - Prior to moving, verify that drums are tightly closed to prevent spills.
      - For multiple drums, ensure drums are secured on pallet before moving.
      - For single drums, use proper slings or secure drum to cart before moving.
    - In-use Drums
      - Drums must have proper labelling and MSDS labels where applicable.
      - Drums must be stored in designated areas with proper ventilation to protect from damage.
      - Prior to moving, verify that drums are tightly closed to prevent spills.
      - When decanting, ensure the installed decanting nozzle does not leak. Use a drip pan when decanting to prevent spills and keep clean-up material nearby. Use only properly labelled decanting containers and do not mix products.
  - Bio-medical waste removal from the Project site will be handled by employees or contractors trained and certified in the TDG.
  - Appropriate equipment and appropriate PPE will be used at all times when handling special wastes.
  - Hazardous products will be transported from site via a licensed transporter to a licensed disposal facility.

#### **6.4.2 Waste Transportation**

Specific procedures apply to the movement of waste materials and will be conducted using appropriate equipment and appropriate PPE at all times.

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Transportation of waste may include:

- Movement of waste from a work area to the appropriate disposal or temporary storage area.
- Movement of waste from a temporary disposal or storage area to a bulk storage area or off-site.
- Movement of waste from a bulk storage area or laydown area to off-site.

The movement of common or routine waste from a work area to the appropriate disposal or storage area should be completed by a designated employee. The employee should be aware of the type of waste and the proper handling and transportation procedures specific to that type of waste.

The movement of waste from a temporary disposal or storage area to a bulk storage area or off-site storage should be completed by trained waste handling personnel, unless additional employees or contractors are designated to do that.

### 6.4.3 Waste Storage

Waste storage refers to the storage of waste on on-site temporary pallets, in bins, in laydown areas and in bulk storage areas. The following procedures relative to waste storage should be followed:

- All waste should be stored at the designated location in, or in approved containers, pallets or laydown areas and be in a dyke/berm, if required.
- Storage areas and containers are to be clearly marked and located at approved locations around the site based on the waste generated in each area.
- Waste placed at laydown areas or stored in containers will be collected at appropriate intervals to avoid spillage, overflow or congestion.
- Bulk storage areas will be maintained to ensure safety, will maximize available space and will provide access for waste haulers to all adjacent areas.
- Storage areas will be inspected and assessed to confirm adequate space, storage procedures, access, etc. as required or at a minimum, annually.
- The hydrocarbon and hazardous waste containment area will be properly maintained and inspected to ensure full access, proper storage procedures and early leak or spill detection.
- Used oil storage containers must be inspected and maintained on a regular basis.
- On-site storage of used tires will be minimized and storage areas will conform to the National Fire Code and National Building Code fire separation requirements.

### 6.4.4 Infrastructure and Equipment Maintenance

Waste management infrastructure and equipment includes infrastructure and equipment required for the handling, transportation, storage or removal of wastes from various locations at the Project site. A general laydown area for temporary waste storage is shown on Figure 1. Note the location may change as the

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projects advances. In this area, old equipment, scrap metal and wood, used tires etc will be stored temporarily while awaiting offsite transport for recycling or disposal. A designated storage area within the laydown area will be available for the temporary storage of hazardous waste in acceptable leak proof containers.

All waste management infrastructure and equipment will be maintained to ensure the health and safety of employees and to avoid contamination or degradation of waste during storage or transportation. A record of the volume of each waste stream generated will be maintained and available for inspection.

Maritime will use Project equipment, e.g., loaders, boom trucks and pickup truck, to aid in the management of waste materials. Inspection and maintenance of vehicles involved will be routinely carried out as the Project advances. Inspections generally include the following:

- An assessment of the condition of equipment or infrastructure. Any required repairs will be noted and completed, and
- The location of the equipment or infrastructure.

## **7.0 MONITORING, REPORTING AND AUDITS**

Annual review of the Plan will be completed with a goal of continuous improvement. The purpose of monitoring and auditing is to identify any problems or aspects of the Plan that can be improved on, and to determine appropriate actions to address problems or aspects identified.

### **7.1 Reporting of Problems or Concerns**

All Maritime employees are responsible for, and are encouraged to report problems or concerns related to the contents of this Plan.

Issues pertaining to training, waste handling, transportation, storage, infrastructure and equipment should be reported to the Mine Manager. Issues will be reviewed and, where appropriate, forwarded to the HSE Department for action. A record will be kept of all problems or concerns identified.

### **7.2 Record Keeping**

Records related to Maritime's Plan will be kept by the Mine Manager and copies will be provided to the HSE Department.

Records may include documents and information related to:

- Orientation and waste management training;
- Waste characterization;

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- Waste management legislation, regulations and guidelines;
- Waste management contractors;
- Off-site waste disposal;
- Waste Management Committee meetings;
- Inspections of waste storage facilities; and
- Other aspects or issues related to the waste management system.

All records, including inventory and tracking of hazardous materials transported to site will be maintained and made available for inspection by Pollution Prevention Division representatives and inspectors from the department of Environment, Climate Change and Municipalities.

### **7.3 Routine Monitoring**

Routine monitoring of waste management activities will be conducted to ensure that procedures outlined in this plan are being followed. Routine monitoring may consist of informal or formal checks on personnel, equipment and contractors, and a review of records related to waste management activities.

Monitoring may include, but will not be limited to:

- Verifying location and condition of on-site waste and recycling collection bins;
- Verifying condition and organization of waste laydown and storage areas;
- Verifying waste collection, transportation and handling operations for Maritime employees and waste management contractors;
- Verifying waste volumes from various locations at the Project site; and
- Other aspects or issues related to the waste management system.

### **7.4 Annual Monitoring, Reporting and Plan Revision**

This Plan will be reviewed annually, or as necessary to ensure that all components of the Plan are current and operating properly. The review of the Plan will be conducted by the HSE Department.

The annual review of the Plan will confirm:

- The Plan conforms with existing, new, and/or upcoming changes in legislation, regulations and guidelines;
- The Plan follows existing and potential waste diversion and reduction programs;
- The Plan accounts for any new waste streams on the Project site; and
- That operational procedures, equipment and infrastructure are functioning as required.

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Monitoring of some components of the waste management system may be required prior to or as a result of the annual review process. If monitoring is required as a result of the review, an additional formal Plan review may be required that may also result in changes to the Plan.

Revision of the Plan may only be completed with the approval of the HSE Department. Personnel affected by any revisions or changes will be notified by the Mine Manager and their training updated if necessary. Revisions or changes in the Plan will also be updated in the waste management orientation and operations training by the Vice President, ES.

## **APPENDIX H**

Gender, Equity and Diversity Plan



**Gender Equity and Diversity Plan  
Hammerdown Gold Project**

**Draft  
Jan 4, 2020**



**MARITIME RESOURCES**

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## APPENDICES

APPENDIX A Detailed Occupational Listing for the Hammerdown Gold Project

## **1. Introduction**

Maritime Resources Corporation (“Maritime” or the “Company”) is an exploration company holding a 100% interest in the Green Bay Property, including the former Hammerdown gold mine and Orion project plus the Whisker Valley exploration project, all located near the Baie Verte Mining District and King’s Point, Newfoundland and Labrador.

### **1.1 Hammerdown Gold Project**

Maritime is proposing to develop a new gold mine at their Hammerdown Property (the Property) located approximately 5 kilometres (km) southwest of the Town of King’s Point and 15 km northwest of the Town of Springdale, Newfoundland and Labrador (NL). The former Hammerdown gold mine was last operated by Richmond Mines between 2000-2004, The mine ceased operations due to low gold prices and the site was formally closed with all required rehabilitation and closure activities carried out at that time.

This new gold mine Project will involve the extraction of gold rich mineralization from the Property and is envisioned to comprise an open pit mine, an underground mine, a waste rock dump, a low grade ore stockpile, a mobile crushing and ore sorting plant, and associated operational infrastructure including water management features. The crushing and ore sorting plant will be designed to produce 700 tonnes per day (tpd) of product feed that would be transported and processed at the Nugget Pond Mill gold circuit, owned and operated by Rambler Metals and Mining Canada Limited (Rambler) for gold doré production. Tailings will be stored in the existing Tailings Management Facility (TMF) at Nugget Pond. The Nugget Pond Mill is located approximately 140 km from the Project site and approximately 6 km west of the recently resettled community of Snook’s Arm in the provincial electoral district of Baie Verte, White Bay.

### **1.2 LOM and Workforce Projections**

A Life of Mine (LOM) plan supporting six years of operations is expected for the Project based on currently planned production rates and estimated gold prices.

The Project, through its construction and operations phases, will provide employment opportunities for the communities adjacent to the site, and the surrounding region. During construction, the Project will create modest temporary employment opportunities in a variety of occupations with a primary focus on heavy equipment. Throughout the anticipated 6-12 month construction phase, the Project will require an estimated 107 workers. Once operational, the

Project will employ between 126 and 169 persons. A detailed list of occupations for both construction and operations is presented in Appendix A, in addition to employment requirements for the Nugget Pond mill operations. These opportunities will also be supplemented with the requirement for goods and services during Project construction and operation and indirectly, will provide opportunities for local businesses.

Tables 1 and 2 below provides a categorized breakdown of occupations with applicable National Occupational Code (NOC) required for the construction and operations phases of the Hammerdown Gold Project. At this point in project planning, Maritime has not finalized the development strategy or the distribution of contractors for construction and operations. This will be determined as the project moves closer to execution, and will be updated accordingly.

**Table 1: Estimated Full-time Contractor-Hired (CH) or Direct Employee (DE) Hires, Construction Phase, by Occupation/NOC**

Occupation	NOC	Duration of Work (yr)	Number of Employees	CH/DE
Project Management	811	1	1	DE
Supervisors Skilled Trades	7301, 7302, 8221, 9211	1	8	CH/DE
Professionals	2113, 2263, 122, 1431, 3413	1	9	CH/DE
Semi-Professionals and Technicians	2113, 2212, 2143, 7372, 1414	1	12	CH/DE
Skilled Trades	7242, 7311, 9411, 9231, 7521, 8231, 7312, 7237, 7242, 7452	1	77	CH/DE
Manual Workers	8614	0	0	CH/DE

**Table 2: Estimated Full-time Contractor-Hired (CH) or Direct Employee (DE) Hires, Operations Phase, by Occupation/NOC**

Occupation	NOC	Duration of Work (yr)	Employees per Year of Operation						CH/DE
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Project Management	811	6	1	1	1	1	1	1	DE
Supervisors Skilled Trades	7301, 7302, 8221, 9211	6	9	9	16	8	8	14	CH/DE
Professionals	2113, 2263, 122, 1431, 3413	6	9	9	9	9	9	9	CH/DE

Occupation	NOC	Duration of Work (yr)	Employees per Year of Operation						CH/DE
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
<b>Semi-Professionals and Technicians</b>	2113, 2212, 2143, 7372, 1414	6	25	25	41	35	35	39	CH/DE
<b>Skilled Trades</b>	7242, 7311, 9411, 9231, 7521, 8231, 7312, 7237, 7242, 7452	6	94	106	115	83	87	109	CH/DE
<b>Manual Workers</b>	8614	6	4	4	4	4	4	4	CH/DE

### 1.3 Project Schedule

The start of Project construction activities is contingent upon receipt of all necessary permits and scheduled to begin in H2 2021. Construction of the Project is expected to occur over a period of 6-12 months and will generally proceed according to the schedule presented in the Table below. Maritime recognizes the potential for delays which are directly attributed to the global pandemic, and the impact that it has on the public and service sectors of the province, which are both required to support many facets of project startup, permit approvals to supply of goods and services.

Following approximately one year of construction, the operations phase will last approximately six years based on currently planned production rates. The Project will operate 12 months a year, 24 hours (hrs) per day, seven days per week on a 12-hour shift basis. Maritime is currently engaged in ongoing mineral exploration at the Hammerdown deposit which has the potential to increase the mineable resource and extend the LOM beyond the current six year plan.

Closure and rehabilitation activities associated with the Project will take place after all economic ore has been removed from the site. Any post closure monitoring activities will be carried out in accordance with the approved Reclamation and Closure Plan registered with the provincial government for Maritime's operations.

**Table 3: Project Regulatory Approval, Construction and Operations Schedule**

Activity Name	2021							2022	
	Q1			Q2			H2	H1	H2
	Jan	Feb	Mar	Apr	May	Jun			
Submission of Environmental Preview Report									
Public & Government Review									
EA Decision (project release from Assessment)									
Required Plans and Permitting Applications									
C of A (Construction/Operations)									
Construction Start									
Operations Start									

**Table 4: Preliminary Project Development Schedule**

Activity Name	2021				2022
	Q1	Q2	Q3	Q4	Q1
Access road widening, site preparation, water management/distribution system					
Mine project facilities and pre-concentration plant construction					
Mine development and pre-stripping activities					
Nugget Pond Mill refurbishment, new crushing & grinding circuit construction					
Mine & processing operations ramp up					

## 1.4 Regulatory Requirements

The proposed Hammerdown Gold Project required registration and approval under the Newfoundland and Labrador Environmental Protection Act (NL EPA, Part 10) and associated Environmental Assessment Regulations. In July 2020, Maritime submitted a project registration document, and in September 2020 the Environmental Assessment Division of the Department of Environment, Climate Change and Municipalities provided the Company with a response outlining the requirement for an Environmental Preview Report (EPR).

The EPR Guidelines issued to Maritime stipulated the requirement for a Gender Equity and Diversity Plan (GEDP), with approval by the Minister of Industry, Energy and Technology, and the Minister Responsible for the Status of Women. Based on comments received on the registration document from the Office for the Status of Women, the GEDP will also include a

Women's Employment Plan (WEP), and additional information on occupations and hiring arrangements.

Additionally, as per comments received from the NL Department of Industry, Energy and Technology the GEDP (including a WEP) must be included as a component of a Benefits Agreement. The Benefits Agreement approval is a condition of release of the Project from the environmental assessment process.

## **2. Maritime Framework for Gender Equity and Diversity**

As a new organization operating in the mining sector, the Maritime corporate team contains a balanced gender distribution, with a 50% female roster. Building on this foundation, Maritime will continue to develop an employee base for the Hammerdown Gold Project to support site construction and operations. Through all phases of future development, the Company remains committed to integrating principles of equity and diversity throughout all facets of human resource management, for our employees, and our contractors.

For Maritime, the foundation of equity and diversity begins with organizational policies and procedures which are established to promote and sustain a respectful work environment, stimulate trust and transparency, and work for everyone throughout the organization, regardless of sex, gender, race, ethnicity, ability, sexual orientation, or age.

For the Hammerdown Gold Project, the beneficial drivers of equity and diversity within the workforce will be key in successful execution of the project. More specifically, principles of equality and diversity will benefit Maritime by:

- Supporting our license to operate by ensuring that our decisions consider the needs and interests of stakeholder diversity;
- Eliminating structural and cultural barriers to promote communications and interactions at all levels;
- Attracting, retaining and engaging a broader base of talented people;
- Enabling efficient management to impact societal change;

### **2.1 Maritime Policies and Procedures**

As Maritime continues to develop the Hammerdown Gold Project, and build its organizational processes, the supporting policies and procedures will be created with consideration for equity and diversity.

Additionally, Maritime will ensure that governing internal documentation:

- Aligns with regulatory expectations and requirements for inclusion and diversity;
- Is written with exclusion of bias;
- Contributes to the establishment of fairness and equality;
- Maximizes the representation of underrepresented groups; and

- Is reviewed and evaluated regularly;

### **3. Gender Equity and Diversity Plan**

The Maritime Benefits Plan has been developed for the construction and operation of the Hammerdown Gold Project. The Benefits Plan provides clear direction on the Company's commitment to maximize the value that the project brings to the region and the province for direct employment, purchase of materials and supplies, services contracting, training, and research and development. The project Benefits Agreement is supported by further commitments of this Gender Equity, & Diversity Plan.

It is important to note that the Hammerdown Gold Project, when compared to most mining operations (provincially and nationally), is relatively small, with a total daily ore production rate of approximately 1.4kt/day. For mines of this size, it is common to have a workforce comprised largely of contractors, both surface and underground, with Company management, technical and support staff. At this present time, the exact details regarding the balance of contractor and company employees, as well as the strategy for operations execution, have not been finalized. However, principles of gender equity and diversity still apply to the development and operation of the Hammerdown Gold Project, regardless of the final configuration of the workforce execution strategy.

#### **3.1 GEDP Scope and Purpose**

The Maritime Gender Equity, & Diversity Plan for the development of the Hammerdown Gold Project applies to all employees of Maritime, and contractors working at the Hammerdown site. It shall come into effect at the beginning of construction and remain in place until the end of mine life. The Plan provides the clear written commitment, and associated activities that will enable Maritime to ensure measures are being taken to provide fair and equal employment and procurement opportunities. The Plan will target members of traditionally underrepresented groups (women, persons with disabilities and people of visible minorities) in Newfoundland and Labrador to provide access to benefits arising the Hammerdown Project, during construction, and into Operations.

This plan will apply to work performed by Maritime and its primary contractors for work scopes of any duration and value. However, this plan will exclude support work provided consultant expertise offsite.

## 3.2 Gender Equity and Diversity Commitments

The Maritime Gender Equity and Diversity Plan commitments will focus on key elements of the Project Benefits Agreement, establishing a consistent integrated approach for equity, inclusion, and diversity, for all aspects of development and operations. Overall, commitments will contribute to a successful, and sustainable framework for human resources management and business development, driving established strategies to deliver on associated targets and deliverables.

### 3.2.1 Employment and Targets

Maritime, in efforts to recruit the workforce required for both construction and operations, will work to optimize employment equity through hiring processes, and ensure fair and equal opportunity for women, persons with disabilities and those of visible minorities.

Additionally, recruitment processes will:

- Support established gender equity and diversity targets;
- Include the Company's vision on gender diversity and inclusion in employment advertisements;
- Include outreach to advocacy organizations to ensure diverse candidate pools; and
- Eliminate bias in recruitment communications (job ads, interview questions, etc);

Maritime has established project diversity targets for the Hammerdown Gold Project to drive expectations and measure performance on equity and diversity on a project level, for the Company and its on-site contractors. These targets are presented in the table below:

**Table 5: Hammerdown Gold Project - Equity, Inclusion and Diversity Targets**

Group	Objective	National Avg
Female	20%	15% <sup>1</sup>
Visible Minority	5%	9% <sup>2</sup>
Persons with Disability	2%	1-3% <sup>3</sup>

1. Mining Industry Human Resources Council
2. Mining Industry Human Resources Council
3. Statistics Canada – National Range 1987-2017

### **3.2.2 Business Access**

The business access strategy for the Hammerdown Gold Project will provide equal opportunity for all groups to engage in business opportunities. While the project is small, both construction and operations contracting opportunities are limited, Maritime will provide fair and equal access to business opportunities to support construction and operation of the Hammerdown Gold Project. Business owners from underrepresented groups will be encouraged to self-identify as applicable, throughout the Company's procurement process.

Maritime will work with local stakeholder organizations to ensure meaningful collaboration and provide necessary early communications to allow ample time for business community response and preparation. Furthermore, the Company will make efforts to understand the existing local, regional, and provincial business capacity that exists to support the project. Contracting opportunities and tender documents can be developed with consideration for these existing business capacities.

## **4. Women's Employment Plan**

Maritime is committed to building and maintain a gender diverse workplace for the Hammerdown Gold Project, and will make efforts to address diversity throughout its operation, from senior level management to front line workforce, and for all opportunities ranging from science, trade and technology, through to non-tradition occupations in trades and heavy equipment operation. The Company will develop initiatives targeted at addressing the known barriers which contribute to workplace gender inequity. The Company is also committed to engaging with stakeholders and participating in partnering opportunities to maximize the benefits of collectively addressing this issue within the mining industry. Regulatory agencies, educational institutions, applicable organizations, and industry associations are all key in ensuring collective success and opening the understanding about the mining industry and the gender diverse work environment that exists.

### **4.1 Hammerdown Gold Project Diversity Targets**

Maritime will make efforts to reach the following diversity targets for the Hammerdown Gold Project, working closely with contractors to maximize opportunities to obtain the results. With the construction phase of the project lasting for only a short period of time, and the modular nature of planned infrastructure, building trades may not be as prevalent at the site, as commonly present on larger construction builds lasting for several years. However, Maritime will work with contractors to establish expectations, and identify areas that present gender diversity, even during the short-term construction period.

Targets have been established for construction through to operations. Maritime will make every effort to ensure a broad distribution of women across all classifications for the Project.

Additionally, these targets do not define the extent of gender diversity in the project workforce. Through the development and implementation of the strategies identified in this Plan, Maritime will work towards increasing this participation beyond the targets presented. The Company will also periodically review components of the plan and determine if revisions are necessary for targets and commitments to ensure a cycle of continuous improvement across occupational groups.

**Table 6: Construction Phase Diversity Employment targets for the Hammerdown Gold Project**

Occupation (NOC)	FT/PT/Seasonal	# of Employees	Target Female (%)	CH/DE	Estimated Timeframe (yr)
Project Management 811,	FT	1		DE	1
Administration 1414, 1121, 1431	FT/PT	6	80	DH/CT	1
Supervisors of Skilled Trades 7301, 7302, 8221, 9211	FT	8	25	DH/CT	1
Professionals, Semi-Professionals, Technicians 2113, 2212, 2143, 7372	FT	15	30	DH/CT	1
Skilled Trades 7242, 7311, 9411, 9231, 7521, 8231, 7312, 7237, 7242, 7452	FT	77	20	DH/CT	1
Manual Workers/Labourers 8614					
Apprentices	PT	7	25	DH/CT	1

**Table 7: Operations Phase Diversity Employment Targets for the Hammerdown Gold Project**

Occupation (NOC)	FT/PT/Seasonal	# of Employees <sup>1</sup>	Target Female (%)	CH/DE	Estimated Timeframe (yr)
Project Management 811, 714	FT	2	50	DH	6
Administration 1414, 1121, 1431,	FT/PT	7	80	CH/DE	6
Supervisors of Skilled Trades 7301, 7302, 8221, 9211	FT	11	25	CH/DE	6
Semi-Professionals, Technicians 2113, 2212, 2143, 7372, 1414	FT	33	30	CH/DE	6

Occupation (NOC)	FT/PT/Seasonal	# of Employees <sup>1</sup>	Target Female (%)	CH/DE	Estimated Timeframe (yr)
Skilled Trades 7242, 7311, 9411, 9231, 7521, 8231, 7312, 7237, 7242, 7452	FT	115	20	CH/DE	6
Manual Workers/Labourers 8614		4	25	CH/DE	6
Apprentices	PT	10	20		6

1- Occupation employment numbers are average numbers over the 6- year operations period due to production ramp up and transition from surface to underground phases;

## 4.2 Equity and Diversity Strategy

Maritime's success in meeting targets established for workforce diversity will focus on key parameters and supporting action plans throughout project construction and operations. As indicated previously, the project workforce execution strategy has not been finalized. However, if it is determined that operations will largely be supported by a contractor workforce, the Company will work directly with the contractor to communicate the commitments of this plan, and develop a cooperative and collaborative strategy which will include, but not be limited to, the execution actions presented below, and discussed accordingly in the sections that follow.

The plan supporting women's employment targets for the project will focus primarily on the following:

- communications;
- project policies and practices;
- stakeholder collaboration and consultation;
- recruitment and selection;
- education and training; and
- development and career advancement;

### 4.2.1 Communication

An effective strategy to communicate the initiatives, goals and targets for equity and diversity will be necessary to ensure effective implementation. A significant component of this communication will involve identifying and collecting feedback from stakeholders. The success and effectiveness of this plan will require supporting communication with the public, members of target organizations and applicable regulatory agencies. These efforts will aim to increase awareness of Maritime's commitments, identifying successes, addressing challenges, and creating a sustainable strategy to ensure continuous improvement and long term project success.

Maritime's commitments to communications will include:

- Clearly communicating Company expectations and targets for gender equity and diversity internally and externally, through company website, internal postings, and other means;
- Communicating internally to leadership, progress towards achieving targets established for gender equity and diversity;
- Ensuring women and other members of designated groups are visibly represented and inclusive language is utilized in promotional and public relations material. Designated groups will also be targeted during recruitment efforts such as career fairs and conferences.
- Using gender and diverse inclusive language and illustrations in job postings and advertisements and training materials.
- Holding public information sessions for women and designated groups.
- Supporting and participating in initiatives that promote opportunities for women with a focus on those occupations where women are underrepresented.
- Participating in school programs and career fairs to provide career, education and training information and seek participation by Maritime team members from underrepresented groups as potential role models.
- Developing and communicating an annual report to provide information, identify success and areas for potential improvement.
- Establishing communication mechanisms for stakeholder groups to receive ongoing information and provide feedback regarding diversity initiatives. This will include organizations such as Women in Resource Development Corporation, the Office to Advance Women in Trades, Multicultural Women's Organization of Newfoundland and Labrador, and Coalition of Persons with Disabilities.

#### **4.2.2 Project Policies and Practices**

Maritime will aim to provide a work environment that fosters mutual respect and working relationships free of harassment for all employees and strive to develop and sustain an inclusive and culturally accommodating work environment for the LOM. The Company will also fully comply with applicable legislation prohibiting discrimination on the basis of difference, and will recruit, select, train and pay based on merit, experience and other work related criteria. Zero tolerance will be established for workplace harassment and discrimination and will be supported by Company policies and practices which include:

- Ensuring site facilities accommodate gender diversity including appropriate washroom facilities, appropriate signage, posters, and adequately lit work areas, common areas and parking lots.
- The requirement for all contractors to develop and communicate zero tolerance policies for workplace violence and harassment.
- Conducting an audit annually to identify and if necessary, address behaviors, barriers or issues related to diversity such as disability accessibility and accommodation, gender, race, and visible minority status;

- Ensuring the on-site communication of policies and practices relating to diversity are visible and clearly outline incident reporting. Site communications will include images and inclusive language relating to members of diverse groups;
- Ensuring that health, safety and other programs or initiatives express inclusivity and gender neutrality.
- Where possible, provide flexible working schedules to accommodate work and family and disability-related requirements;
- Conducting periodic employee feedback surveys to determine workplace experiences regarding gender related issues and workplace accessibility and accommodation.

### 4.2.3 Stakeholder Collaboration and Consultation

Maritime will continue to establish collaborative stakeholder relationships to aid in strengthening processes which support gender equity and diversity in its workforce. Engaging with key stakeholders including advocacy groups, contractors, educational institutions, labour, government departments and agencies, as well as our partnering communities all have the ability to infuse positive input in order to maximize the value and effectiveness of Plan implementation.

Additionally, Maritime recognizes the importance of participating in focus group and other collaborative sessions to share industry experiences to assist government and other non-profit organizations in developing their own strategies for the overall benefit of industry and other stakeholders.

More specifically, Maritime will:

- Incorporate gender-based analysis information gathered from external stakeholders into the Company's plans, procedures, and workplace design decisions.
- Provide support for Women's Job Information Workshops.
- Provide career information to guidance counsellors in secondary school system.
- Develop scholarship program targeted at secondary school students to stimulate participation in post secondary programs in the mining sector. The Company will provide scholarships to women interested in non-traditional occupations.
- Link with and provide support to women's organizations/networks, which support the employment of women.
- Encourage female employees to act as role models and support a mentoring network.
- Meet with community groups and women's organizations periodically to review existing and potential women's employment initiatives and strategies.

#### 4.2.4 Recruitment and Selection

Maritime will ensure that hiring process for Company and contractor positions provide fair and equitable access to all eligible candidates. Additionally, efforts will be made through employment advertisements, and direct communication with key stakeholders to obtain a balanced roster of candidates for each position. Efforts will be made to ensure interview teams have male and female representatives and the interview discussion will be gender neutral and unbiased.

Through the interview process, efforts will be made to express the importance of workplace gender diversity, and feedback or discussion from candidates in this regard will be included in the evaluation process supporting candidate selection.

In support of recruitment and selection Maritime will:

- Develop fair and accessible hiring processes for everyone.
- Identify candidates who support the value of gender diversity.
- Give equal value to qualifications and work experience regardless of gender
- Ensure that job postings and recruitment advertisements include gender neutral language and/or pictorials.
- Develop and review leadership recruitment processes and establish expectations with hiring managers for a gender-neutral approach.
- Clearly indicate in all job advertisements and recruitment publications, the Company's support for workforce gender diversity, and ensure that images/graphics used show both male and female employees in underrepresented or non-traditional occupations.
- Ensure job advertisements are provided to women's agencies and organizations and follow up if necessary.
- Provide opportunities for women employed in non-traditional occupations to participate in recruitment drives, and other applicable stakeholder engagement events.
- Provide work term opportunities to women enrolled in cooperative education programs in the science, trades and technology fields.
- Where available, seek funding from federal or provincial sources to support apprenticeship programs designed to increase the number of female apprentices in non-traditional occupations.

#### 4.2.5 Development and Career Advancement

Maritime will continue to invest in the personal growth and development of employees after hire, and develop processes which support internal succession, identifying candidates and career paths for future leadership and supervision roles within the Company.

The Company will support the advancement of women as they express interest to advance in role or a willingness to expand into new or different roles. Internal development and advancement opportunities for women provides a mechanism to obtain gender balance and female representation throughout the organization, targeting female representation and candidates for front line supervision, management, and leadership roles at a corporate level.

To support gender diversity in development and career advancement at the Hammerdown Gold Project, Maritime will:

- Assist all employees in career planning.
- Implement a talent management program designed to identify potential employees for higher-level positions and advance women within the organization.
- Implement succession planning to identify opportunities to improve gender diversity at all levels in the workplace.
- Encourage employees to improve their knowledge and skills in line with the Company's overall approach to employee development.
- Support employees' development initiatives where those initiatives are aligned with business needs, including financial support, employment counselling, time to attend training programs, mentoring programs and developmental work assignments.
- Develop a mentoring system for women.
- Establish a career network that provides support to encourage career growth and planning for female employees.
- Support training costs for women engaging in training to qualify them for career advancement or work in science, trades, and technology related occupations.
- Offer personal development courses in the workplace.

#### **4.3 Contractor Requirements for Gender Equity**

At the Hammerdown Gold Project, contractors will play an important role in the success of developing a workforce which supports and includes gender equity and diversity. Maritime will work to establish clear expectations early in the contracts process and outline clear responsibilities and deliverables in support of this Plan. Information will be provided in tender packages and requests for proposal as applicable, and for more significant contracts, specific deliverables and reporting requirements will be expected.

More specifically, Maritime's contractors will:

- develop processes to increase representation of women and other traditionally underrepresented groups for their workforce at the Hammerdown site;
- develop and maintain zero tolerance policies for workplace harassment and develop procedures to support.
- provide for all contractor employees, orientation and training which covers workplace violence and harassment, respect, gender diversity and inclusion and provide workplace postings for further promotion of these ideals
- ensure procedures are in place to investigate in a timely manner, complaints of harassment or discrimination and report complaints to Maritime in a timely manner
- report on gender equity and diversity metrics as required by Maritime

- be fully accountable for their sub-contractors, ensuring they receive and provide adequate workplace training which includes gender equity and diversity, and workplace violence and harassment
- participate and cooperate in Company reviews or audit of contractor processes required to support gender equity and diversity,
- ensure job postings promote gender equity and diversity;

For larger valued, longer term contracts, contractors are required to:

- invest in applicable programs to promote gender diversity in non-traditional roles, and provide training opportunities for female employees;
- as part of a bid submission, provide all requested information which supports the contractors human resources strategy for gender equity and diversity and address recruitment and selection, training, development and termination;
- establish gender equity and diversity targets in support of the Company targets;

## **5. Reporting, Monitoring and Review**

Maritime will monitor and report on the Diversity Plan initiatives and targets and will deliver pertinent information relating to gender, designated groups and NOC codes (occupations), reflecting on overall performance of the Plan.

Maritime will work closely with its main contractor(s)/sub-contractors to ensure compliance and cooperation in meeting expectations of this Plan. Throughout the construction period, contractors will be provided a regular and ongoing opportunity to meet with the Company to discuss the performance as it relates to this plan, and to address issues or concerns related to gender equity and diversity as they arise.

The Company will submit a quarterly report to the Minister responsible for the Status of Women. Quarterly reports will include quantitative and qualitative descriptions of the following:

- the representation (number and percentages) of workers (by gender), location and NOC Code according to each occupational group;
- the duration of work (hours) broken down by gender and location;
- an update of qualitative supports/initiatives undertaken to encourage the employment of qualified women and to ensure a respectful workplace;

Maritime will also meet with stakeholders and community groups throughout the project to review progress on established plans and to consult on future efforts or initiatives to further enhance the Plan, collecting feedback and developing action plans for continuous improvement.

DRAFT

**APPENDIX A**

**Detailed Occupational Listing for the Hammerdown Gold Project**

**Hammerdown Mine Construction and Operations  
and  
Nugget Pond Mill Operations**

## Hammerdown Gold Project Construction and Operations Employment Opportunities

Position Category	NOC Code	Construction	Operations					
			Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
<b>Open Pit</b>								
Haul truck operator	7521	12	28	40	24	0	0	12
Hydraulic excavator operator	7521	4	8	8	8	0	0	4
Wheel loader operator	7521	4	8	8	8	0	0	8
Production drill operator	7372	12	20	20	8	0	0	8
Dozer operator	7521	12	12	12	12	2	2	4
Grader operator	7521	4	4	4	4	2	2	4
Ore Transport Driver	7511	0	16	16	16	16	16	16
Operations General Foreman	7301	1	1	1	1	0	0	0
Operations Supervisor	8221	4	4	4	4	0	0	4
Blasting technician	7372	1	1	1	1	0	0	1
Health & Safety officer	2263	1	1	1	1	1	1	1
Clerk	1414	1	1	1	1	1	1	1
Mechanic	7312	12	2	2	2	0	0	2
Welder	7237	10	1	1	1	0	0	1
Electrician	7242	5	1	1	1	0	0	1
Maintenance Foreman	7301	3	3	3	3	0	0	2
<b>Subtotal</b>		<b>86</b>	<b>111</b>	<b>123</b>	<b>95</b>	<b>22</b>	<b>22</b>	<b>69</b>
<b>Underground Mine</b>								
Jumbo driller	8231	0	0	0	4	12	12	4
Bolter	8231	0	0	0	4	4	4	4
Scooptram operator	8231	0	0	0	4	16	20	16
Haul truck operator	8231	0	0	0	8	12	12	8
Longhole driller	8231	0	0	0	0	4	4	4
Blasting technician	7372	0	0	0	4	4	4	4

Position Category	NOC Code	Construction	Operations					
			Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
Service operator	8231	0	0	0	12	12	12	12
Mechanic	7312	0	0	0	2	4	4	3
Welder	7237	0	0	0	2	4	4	3
Electrician	7242	0	0	0	1	2	2	1
Maintenance Foreman	7301	0	0	0	3	3	3	3
Operations Supervisor	8221	0	0	0	4	4	4	4
<b>Subtotal</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>48</b>	<b>81</b>	<b>85</b>	<b>66</b>
<b>Sorting Plant</b>								
Superintendent	8221	0	1	1	1	1	1	1
Clerk	1414	0	1	1	1	1	1	1
Sorting Equipment Operator	9411	0	4	4	4	4	4	4
Labourer	7611	0	4	4	4	4	4	4
Maintenance planner	2143	0	1	1	1	1	1	1
Crushing plant operator	9411	0	4	4	4	4	4	4
<b>Subtotal</b>		<b>0</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>
<b>General &amp; Administrative</b>								
Operations manager	811	1	1	1	1	1	1	1
Senior engineer	2143	1	1	1	1	1	1	1
Planning engineer	2143	1	1	1	2	2	2	2
Blasting / geotech technician	2212	1	1	1	1	1	1	1
Surveying / mine technician	2212	1	1	1	2	2	2	2
Surveying helper	2212	1	1	1	2	2	2	2
Clerk	1414	1	1	1	1	1	1	1
Chief geologist	2113	1	1	1	1	1	1	1
Grade control geologist	2113	2	2	2	3	2	2	3
Sampling technician	2212	2	2	2	4	2	2	3
Human resources officer	1121	1	1	1	1	1	1	1
Accountant	1431	2	2	2	2	2	2	2
Warehouse technician	7452	1	1	1	1	1	1	1

Position Category	NOC Code	Construction	Operations					
			Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6
First aid attendant	3413	4	4	4	4	4	4	4
Trainer		1	1	1	1	1	1	1
<b>Subtotal</b>		<b>21</b>	<b>21</b>	<b>21</b>	<b>27</b>	<b>24</b>	<b>24</b>	<b>26</b>
<b>Total Positions</b>		<b>107</b>	<b>147</b>	<b>159</b>	<b>185</b>	<b>142</b>	<b>146</b>	<b>176</b>

### Nugget Pond Mill Operations Employment Opportunities

Position Category	NOC	Duration (years)	# Positions
Mill Superintendent	811	6	1
Executive Assistant	1222	6	1
Health and Safety Coordinator	2263	6	1
Electrical/Inst. Supervisor	7202	6	1
Mechanical Supervisor	7202	6	1
Maintenance Planner	2143	6	1
Senior Metallurgist	2115	6	1
Shift Supervisors	9211	6	4
Crusher Operator	9411	6	4
Mill Operator	9411	6	4
Leach/CIP Operator	9411	6	4
Refinery Operators	9411	6	3
Electrician	7242	6	1
Instrumentation	2243	6	1
Mechanical (Millwright)	2243	6	4
Labourer - Maintenance	7612	6	4
Analytical Technicians	2211	6	1
Sample Prep / Gen. Labour	9611	6	2
<b>Total</b>			<b>39</b>

## **APPENDIX I**

Public Meeting Information

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**From:** Carter, Paul A. <pcarter@gov.nl.ca>  
**Sent:** Thursday, October 22, 2020 9:20 AM  
**To:** Perry Blanchard  
**Subject:** Message Received RE: Notice of Public Consultation Meeting - Hammerdown Gold Mine (Reg. 2091)

Message received.  
Thanks Perry,

Regards,

Paul Carter  
Environmental Scientist  
Environmental Assessment Division  
Department of Environment, Climate Change and Municipalities  
Government of Newfoundland and Labrador  
4th Floor, West Block, Confederation Complex  
P.O. Box 8700  
St. John's, NL, A1B 4J6  
Tel. (709)729-0188  
Email [pcarter@gov.nl.ca](mailto:pcarter@gov.nl.ca)

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**From:** Perry Blanchard <Perry@maritimegold.com>  
**Sent:** Thursday, October 22, 2020 9:14 AM  
**To:** Carter, Paul A. <pcarter@gov.nl.ca>  
**Cc:** Garrett Macdonald <garrett@maritimegold.com>  
**Subject:** Notice of Public Consultation Meeting - Hammerdown Gold Mine Project

Good morning Paul.

For your information, Maritime Resources Corporation will be conducting a public information session at 7pm on Wednesday, November 4, 2020 for its Hammerdown Gold Mine Project in Green Bay, near the town of King's Point. With continued concerns regarding public gatherings during the ongoing pandemic, this session will be conducted virtually, via on-line video platform.

The attached public notice will be distributed within the region to provide advance notice in accordance with the provisions of the Environmental Assessment Regulations 2003, Section 10, and guidance provided to Maritime Resources Corp on October 15, 2020 via email. Additionally, for your information, the local newspaper, The Central Voice, is no longer being printed, and is available on-line only. However, under the advice of Saltwire Network, the provincial newspaper media host, this ad will be printed in the Saturday edition of the Evening Telegram on October 24<sup>th</sup>, and October 31<sup>st</sup>, with limited distribution to the central NL region. It will also be made available online throughout the period by Saltwire Network. Maritime Resources will also provide the ad on its website and social media page. It will be sent to local towns within the project region for posting locally and/or on municipal social media sites.

If you have any questions or concerns please do not hesitate to contact me.

Regards,

Perry Blanchard  
Vice President – Environment & Sustainability



C: 1+(709) 673-8746  
[perry@maritimegold.com](mailto:perry@maritimegold.com)  
[www.maritimeresourcescorp.com](http://www.maritimeresourcescorp.com)



[CLICK HERE FOR CORPORATE VIDEO](#)



# MARITIME RESOURCES

## PUBLIC NOTICE

Public Information Session on the Proposed  
Hammerdown Gold Mine Project  
In Green Bay, near the town of King's Point

Virtually (on-line)

**Wednesday, November 4, 2020 at 7:00 PM NDT**

### ZOOM MEETING LINK

<https://us02web.zoom.us/j/82428080396>

You can also go to the Maritime Resources website:  
<http://www.maritimeresourcescorp.com>

This session shall be conducted by the Proponent,

**Maritime Resources Corporation**  
Newfoundland & Labrador Office  
142 Little Bay Road Springdale, NL  
Canada A0J 1T0  
Phone: (709) 701-8515

as part of the environmental assessment for the Hammerdown Gold Mine Project. The purpose of this session is to describe all aspects of the proposed Project, to describe the activities associated with it, and to provide an opportunity for all interested persons to request information or state their concerns.

To have the meeting link sent to you electronically, please email  
[info@maritimegold.com](mailto:info@maritimegold.com)

## ALL ARE WELCOME

Maritime Resources is committed to operating through sustainable resource development building positive legacies and minimizing impacts of its activities on the environment. We will strive to deliver employee and community prosperity, while developing a work culture that values human rights, equality, and diversity.

